Arizona Department of Water Resources – Hydrology Division

Public Comment Draft

Statewide Hydrologic Monitoring Report

(Late 1980s Early/Mid 1990s to Mid/Late 2000s)

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ACKNOWLEDGEMENTS

Arizona's hydrologic data collection activities are fundamental components of the state's water management program. This report is dedicated to the well owners who have allowed their wells to be measured over the years, and to the individuals and organizations that have collected hydrologic data in Arizona, data that are essential to reliable resource evaluation that support informed decision making.

PURPOSE

This report provides data and analysis of Arizona's groundwater conditions over the last two decades. The period analyzed includes a time of significant variability in groundwater use trends both inside and outside Arizona's Active Management Areas (AMAs), and covers the first 20 years of Central Arizona Project (CAP) water deliveries for direct use and recharge in central Arizona. The last 20 years also includes an extended drought period that has affected groundwater and surface water resources throughout the state.

The report provides insight into the effectiveness of major water management strategies and programs, and also into the impacts of extended groundwater overdraft. The analysis presented also attempts, where possible, to identify the effects of drought on local groundwater conditions. The report appendix contains information on ADWR's hydrologic data collection program and a discussion of current and future directions in ADWR's data collection activities.

BACKGROUND ON HYDROLOGIC DATA PRESENTED IN THIS REPORT

This report presents a comprehensive analysis of groundwater conditions in Arizona covering the late 1980s and early/mid 1990s to the mid/late 2000s. The analysis presents general and detailed information on the cause and effect relationships between groundwater use, recharge and observed water level changes in various parts of the state. A variety of hydrologic data (water level, pumping, recharge, climate, and surface water data) are presented to support the analysis. The report covers many locations in the state, both inside and outside Active Management Areas (AMAs).

The data and analyses are organized by statewide water planning areas (groupings of basins within regions of Arizona) that were introduced in the Arizona Water Atlas (ADWR, 2010). The analyses are further sub-divided by the groundwater basins and sub-basins (Table 1) that compose each AMA and the six, mainly rural, water planning areas (Figure 1) Table 2 lists typical geologic and hydrologic characteristics for basins in each planning area.

Figure 1 AMAs and Arizona Water Planning Areas

Basin	Area (Sq. Miles)	Basin Category[1]	Major Aquifers[2]
Eastern Plateau Planning Area			
Little Colorado River Plateau	26,700	Plateau	RSA,VR, SR
Southeastern Arizona Planning Area			
Aravaipa Canyon	517		RSA, BF
Bonita Creek	457		RSA, BF, VR
Cienega Creek	606		RSA, BF
Donnelly Wash	293		BF
Douglas	949		BF, IVR
Dripping Springs Wash	378		RSA, SR
Duncan Valley	550	Southeast	RSA, SR
Lower San Pedro	1,624		RSA, BF
Morenci	1,599		RSA, VR
Safford	4,747		RSA, BF
San Bernardino Valley	387		RSA, VR
San Rafael	229		RSA, BF
Upper San Pedro	1,825		RSA, BF
Willcox	1,911		RSA, BF
Upper Colorado River Planning Area			
Big Sandy	1,988	Highland/Southeast	RSA, BF, SR
Bill Williams	3,350	Highland/West	RSA, BF, VR
Detrital Valley	892		RSA, BF, SR
Hualapai Valley	1,212	West	BF, SR, VR
Lake Havasu	252		BF
Lake Mohave	980	Colorado River	RSA
Meadview	190	West	SR
Peach Springs	1,409	Plateau	BF, SR
Sacramento Valley	1,587	West	BF, VR
Central Highlands Planning Area			
Agua Fria	1,263	Central/Highland	BF, SR
Salt River	5,232		RSA,VR,SR
Tonto Creek	955	Highland	BF, SR
Upper Hassayampa	787	West	BF
Verde River	5,661	Highland	RSA, BF/VR, SR, IR, MR
Western Plateau Planning Area			
Coconino Plateau	5,812		VR, BF, SR
Grand Wash	959		RSA, BF/VR, SR
Kanab Plateau	4,247	Plateau	RSA, SR
Paria	408		SR
Shivwits Plateau	1,821		RSA
Virgin River	434	West	BF,SR
Lower Colorado River Planning Area			
Butler Valley	288		BF
Gila Bend	1,284		BF
Harquahala	766	West	BF
Lower Gila	7,309		RSA, BF
McMullen Valley	649		BF
Parker	2,229	Colorado River	RSA, SR
Ranegras Plain	912		BF
San Simon Wash	2,284	West	BF
Tiger Wash	74		BF
Western Mexican Drainage	610		BF
Yuma	792	Colorado River	BF
Active Management Areas (AMAs)			
Phoenix	5,646		RA, BF, BF/VR,SR
Pinal	4,000	Central	RSA, BF
Prescott	485	Highland	BF, IR, MR
Santa Cruz	716		RSA, BF
Tucson	3,866	Central	RSA, BF

Table 1 Groundwater basins and Planning Areas **(Adapted From Arizona Water Atlas, Vol. 1)**

1 See Table 2 for generalized descriptions of basin categories

2 Major aquifers from ADWR (1994) and Arizona Water Atlas Vol. 1 Table 1-4

BF=Basin Fill, BF/VR= Basin Fill inter-bedded with Volcanic Rocks, RA=Recent Alluvium, RSA=Recent Stream Alluvium, SR=Sedimentary Rock, MR=Metamorphic Rock, VR=Volcanic Rock, IR=Igneous Rock.

		Basin Category (From Table 1)					
		Central	Colorado River	Highland	Plateau[3]	Southeast	West
Geology of Major Aquifers	Recent Stream Alluvium	Up to 300 feet in thickness of coarse material along major streams	Deposited in channels cut into basin fill	Common beneath floodplains	Sand and gravel along major streams	Relatively thin layers of sand and gravel	Limited to areas along the lower Gila River
	Basin Fill and Younger Volcanics	Upper Basin Fill – Typically less than 1,000 feet of fine- to coarse-grained deposits becoming coarser near the basin margins and at land surface	Older alluvial deposits underlain by marine estuarine sediments (Bouse Formation)	Up to 500 feet of sediment that may include consolidated lake deposits (e.g. Verde Formation); limited areal extent	Basaltic lava flows found locally in some basins [4]	Upper Basin Fill – typically about 300 feet of lacustrine silt and clay	Upper Basin Fill- thin and heterogeneous
		Lower Basin Fill – Up to 5,000 feet of fine-grained sediments that include evaporate deposits near the basin margins				Lower Basin Fill – typically greater than 1,000 feet of coarse-grained sediment becoming coarser near the basin margins	Lower Basin Fill – coarse- to fine-grained sediment becoming coarser near basin margins
	Pre-Basin and Range Sediments	Occur at significant depths with relatively little known of their extent or character; include conglomerate	Primarily cemented sandy gravel (fanglomerate)	Not a major aquifer	Sandstone, siltstone and conglomerate interbedded with volcanic rocks in a few basins (e.g. Cottonwood Wash and Muddy Creek formations)	Moderately thick conglomerate	Conglomerate, sandstone, and volcanic rock occurring at relatively shallow depths (e.g. Muddy Creek Formation)
	Older Consolidated Rocks	Not a major aquifer	Not a major aquifer	Coconino sandstone (C Aquifer) Redwall Limestone (R Aquifer), and volcanic, igneous and metamorphic rocks locally	Coconino, Dakota, and Navajo sandstones (C,D and N aquifers), Mauv and Redwall limestones (R aquifer), and other sedimentary rocks (Bidahoci, Chinle, Kayenta, Mesa Verde, Moenave, and Moenkopi formations)[5]	Not a major aquifer	Not a major aquifer
Hydrologic Characteristics	Natural Aquifer Inflows	Mostly stream infiltration with some underflow and mountain-front recharge	Mostly stream infiltration with very minor underflow and mountain-front recharge	Mostly stream infiltration and underflow with some mountain-front recharge	Mostly mountain-front recharge where sandstones and limestones outcrop, with minor to some leakage between units	Mostly mountain-front recharge and stream infiltration with minor underflow	Mostly stream infiltration with some underflow and mountain front recharge
	Natural Aquifer Outflows	Mostly evapotranspiration with some underflow and minor baseflow	Mostly evapotranspiration with minor baseflow and minor underflow	Mostly baseflow and evapotranspiration with very minor underflow	Mostly discharge to springs and baseflow with minor to some leakage between units	Mostly evapotranspiration with some baseflow and minor underflow	Mostly evapotranspiration with some baseflow and minor underflow
	Direction of Groundwater Flow	From areas of recharge along basin margins perimeter toward central basin axis and then down valley	Away from Colorado River toward its floodplain where evapotranspiration occurs; also some flow parallel to the river and locally towards the river where irrigation has reversed the flow gradient	From areas of recharge along basin perimeter toward central basin axis	Downgradient from permeable outcrops, along bedding planes and locally along faults and solution channels	From areas of recharge along basin perimeter toward central axis of basin	Down valley
	Pressure Conditions	Locally confined due to fine-grained deposits of basin fill: otherwise, unconfined	Confined in the fanglomerate; otherwise unconfined	Typically unconfined	Can be confined over relatively large areas by overlying siltstone and claystone layers	Aquifer in lower basin fill is often confined; otherwise unconfined	Typically unconfined
	Depth-to-Groundwater	From land surface to as much as 700 bls near the mountain fronts	From land surface to a few hundred feet bls	From land surface to a few tens of feet bls; hundreds of feet or more bls for sandstone and limestone aquifers	Typically several hundred feet to over 3,000 feet bls in some areas	Above land surface (flowing wells) to more than 500 feet bls at basin perimeter	Few feet to more than 1,300 feet bls near the mountain fronts
Groundwater Responses to development (Well Pumping)		Mostly loss of water from storage and, near major rivers, may eventually decrease baseflow and evapotranspiration and locally increase stream infiltration. Ground level declines expected but locally may rise or stabilize where irrigation return flows are significant or other types of recharge occur	Most well water derived from the river; may locally decrease evapotranspiration and increase infiltration, but not cause much loss of water from storage	Over time may increase stream infiltration and decrease baseflow and evapotranspiration; could eventually lead to groundwater level declines	Mostly a loss of water from storage with relatively large groundwater level declines possible, over time may decrease spring discharge. Over time may increase stream infiltration and decrease baseflow	Initial loss of water from storage; may eventually decrease baseflow and evapotranspiration and increase stream infiltration	Mostly a loss of water from storage; near Gila River, may eventually decrease evapotranspiration and increase stream infiltration

Table 2 Generalized Basin Hydrogeology (Adapted From Arizona Water Atlas, Vol. 1) [1,2]

1) Primary source: Anderson and others (1992); secondary sources – ADWR (1994b) and USGS (1984 and 1995); 2) Actual hydrogeologic conditions may vary considerably with individual basins and basin categories; 3) The Hydrologic Characteristic and Responses to Well Development listed for the Plateau basin category apply to the regional sandstone and limestone aquifers which are primary sources of water. 4) Gravel beds and lake deposits are important in the Aubrey and Truxton valley, respectfully, of the Peach Springs basin. 5) The D Aquifer also includes the Cow Springs and entrada Sandstones; the N Aquifer also includes the Wingate Sandstone, and the C- Aquifer also includes the Kaibab Limestone and upper Supai Formation.

The water level data that are presented in this report were selected from measurements compiled in the ADWR Groundwater Site Inventory (GWSI) database. The selected measurements were chosen for analysis based on a review of the availability of water level measurements for each groundwater basin in the state for each year during the period mentioned (Table 3). The beginning and ending years that were selected for data analysis for each basin generally corresponded to water level "sweep" years that covered the period from the late 1980s and early 1990s to the mid-to-late 2000s. During "sweeps" ADWR typically measures as many wells in a basin as time and staffing levels allow, thereby providing a comprehensive water level dataset. Although it would have been desirable to have water level change data covering the same time period for each basin there were insufficient common beginning and ending water level measurement data "pairs" available on a statewide basis to allow for a comprehensive statistical analysis of water level change trends in all areas. As the data show, there are many undeveloped groundwater basins in the state where few, if any, water level measurements were available. Statistical analyses or inferences concerning typical groundwater conditions are of limited usefulness in basins with sparse water level data.

Using the water level measurement selection criteria previously mentioned, over 12,000 "beginning" year, and over 9,000 "ending" year water level measurements were initially selected for potential analysis. These initially selected measurements were then reduced in number by eliminating multiple water level measurements for the same well in the same year. The number of beginning and ending year water level measurements were further reduced to exclude water level measurements that had been made with remarks indicating that the well was pumping, recently pumped, obstructed, destroyed or dry. Additional measurements were excluded for 39 wells where significantly anomalous water level changes were observed that did not fit the general trends of water level change that were observed in the vast majority of surrounding and/or adjacent wells. Ultimately this process of elimination reduced the number of beginning/ending water level measurement pairs that were used for this analysis to 4,692 (Plate 1). Of the 4,692 beginning/ending water level measurement pairs, 1,017 were from GWSI Index wells that ADWR typically monitors on an annual basis.

As discussed previously, the water level change data were generally selected from water level "sweep" years for each basin that covered the period from the late 1980s and early/mid 1990s to the mid/late 2000s. The water level change data and statistics that are presented in Table 3 and shown in accompanying water level change maps are generally representative of current basin-wide and local water level change trends. However, there are some basins in the state where the long-term change trends may not be reflective of current local or basin-wide water level change conditions. This situation has been observed in areas with significant recent changes in local or regional groundwater pumping and surface water use or recharge.

For example, over the last few years groundwater pumping has been reduced in the City of Tucson's central well field area because of the recent importation of groundwater recovered from areas within the Avra Valley where significant artificial recharge has occurred (see Tucson AMA hydrograph, TUC11, in Appendix A). As a consequence, the long-term (1994-2010) water level change trends presented in Table 3 are different from more recent (circa 2005-present) trends for that general portion of the upper Santa Cruz basin (Appendix A). For these reasons, a complete review of all available water level data including the water level change statistics, maps and hydrographs is recommended to gain a more comprehensive understanding of current groundwater conditions in a particular area.

Table 4 presents a summary of statewide water level change and depth-to-water information. The data show that of the 4,692 wells measured during the study period, 1,596 wells (about 34 percent) showed water level rises that averaged 25.1 feet during the study period. The median positive change was 12.8 feet and the average positive water level change rate was 1.9 feet/year.

The number of wells of the total 4,692 that showed declining water levels during the study period was 3,054 (about 65 percent). The average water level decline was -24.0 feet and the median decline was -17.7 feet. The average negative water level change rate was -1.5 feet/year.

Out of the 4,692 wells measured statewide, 42 wells showed no water level change during the study period. However, some of the wells that showed no change were flowing wells where the pressure head could not be determined with available equipment, therefore the change was not able to be determined.

The average statewide water level change considering all measurements (positive and negative) was -7.2 feet over the study period. The median statewide water level change was -5.6 feet.

The average statewide depth-to-water for all 4,692 wells included in this study was 203 feet below land surface (BLS). The median statewide depth-to-water for the study wells was 173 feet BLS. As mentioned previously, flowing artesian wells were observed in a few specific locations. However, in non-flowing wells, the measured depth-to-water ranged from about 2 feet BLS in two wells located in the San Simon Valley and Cienega Creek basins to about 1,241 feet BLS in a well located in the Little Colorado River Plateau basin (Table 3).

			Statistical Summary of Depth-to-Water and Water Level Change Data For Arizona Groundwater Basins (From Late 1980's Early/Mid 1990's to Mid/Late 2000's)																							
			Period Analyzed		Counts				Statistics For Wells With Increasing Waterlevels (+)						Statistics For Wells With Decreasing Waterlevels (-)						Overall Basin WL Changes		Overall Basin Depth-to-Water Stats (For Ending Years, Only)			
	Basin	Name	Begining Mo/Yr	Ending Mo/Yr	All	+	-	NC	Mean + Change	Median + Change	Mean + Change Rate	Max + Change	Min + Change	SD of + Changes	Mean - Change	Median - Change	Mean - Change Rate	Max - Change	Min - Change	SD of - Changes	Mean Basin Change	Median Basin Change	Min DTW	Max DTW	Median DTW	Mean DTW
									feet	feet	feet/yr	feet	feet	feet	feet	feet	feet/yr	feet	feet	feet	feet	feet	feet-BLS	feet-BLS	feet-BLS	feet-BLS
1	AGF	AGUA FRIA	Oct-91	May-08	6	3	3	0	2.2	2.8	0.1	3.6	0.3	1.7	-1.8	-1.9	-0.1	-3.4	-0.04	1.7	0.2	0.1	21	120	42	55
2	AGV	AGUIRRE VALLEY	Nov-93	Dec-07	1	0	1	0	NA	NA	NA	NA	NA	NA	-11.9	-11.9	-0.8	-11.9	-11.9	NA	-11.9	-11.9	273	273	273	273
3	ALF	ALLEN FLAT	Nov-90	Dec-06	7	1	6	0	7.8	7.8	0.5	7.8	7.85	NA	-6.8	-4.125	-0.4	-24.7	-0.1	9.2	-4.7	-2.3	7	373	139	141
4	ALR	ALAMO RESERVOIR	Oct-91	Nov-09	3	2	1	0	1.8	1.8	0.1	2	1.5	0.4	-3	-3	-0.2	-3	-3	NA	0.2	1.5	51	640	137	276
5	ARA	ARAVAIPA CANYON	Dec-90	Nov-07	2	0	2	0	NA	NA	NA	NA	NA	NA	-2.5	-2.52	-0.1	-3.2	-1.84	1	-2.5	-2.5	38	54	46	46
6	AVR	AVRA VALLEY	Dec-94	Mar-10	131	98	33	0	29.1	23.7	1.9	87.3	0.5	20.7	-15.5	-9.3	-1	-47	-0.2	13.8	18	18.1	5	745	323	300
7	BIC	BIG CHINO	Feb-92	Apr-09	60	43	16	1	6.7	5	0.4	45.1	0.2	7.6	-3.8	-2.2	-0.2	-19.6	-0.22	5.3	3.8	4.1		694	72	132
8	BON	BONITA CREEK	0/0	0/0	0	0	0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
9	BRB	BLACK RIVER	0/0	0/0	0	0	0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
10	BUR	BURRO CREEK	Nov-95	Jan-08	0	0	0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
11	BUT	BUTLER VALLEY	Nov-90	Jan-08	20	0	20	0	NA	NA	NA	NA	NA	NA	-18.5	-28.2	-1	-36.4	-1.3	13.3	-18.5	-28.2	88	515	210	247
12	CCK	CIENEGA CREEK	Dec-87	Mar-05	54	19	33	2	3.3	2.4	0.2	17.4	0.1	4.6	-4.7	-3.34	-0.3	-28.4	-0.2	5.9	-1.7	-0.8	2	405	96	113
13	CGW	CAMP GRANT WASH	Oct-94	Nov-06	17	3	14	0	2.8	1.9	0.2	5.5	0.9	2.4	-12.1	-5.955	-0.9	-38.6	-1.22	12.6	-9.5	-3.5	9	319	42	72
14	CHV	CHILDS VALLEY	Nov-92	Dec-07	1	1	0	0	14.2	14.2	0.9	14.2	14.2	NA	NA	NA	NA	NA	NA	NA	14.2	14.2	676	676	676	676
15	CIB	CIBOLA VALLEY	Jan-91	Nov-09	0	0	0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
16	CLA	CLARA PEAK	Oct-91	Nov-08	1	1	0	0	5.4	5.4	0.3	5.4	5.4	NA	NA	NA	NA	NA	NA	NA	5.4	5.4	22	22	22	22
17	COP	COCONINO PLATEAU	Apr-94	Nov-09	2	0	2	0	NA	NA	NA	NA	NA	NA	-8.7	-8.705	-0.5	-11.2	-6.25	3.5	-8.7	-8.7	95	274	185	185
18	CRF	CAREFREE	Nov-91	Dec-09	1	1	0	0	50.6	50.6	2.7	50.6	50.6	NA	NA	NA	NA	NA	NA	NA	50.6	50.6	94	94	94	94
19	CRI	COLORADO RIVER INDIAN RESERVATION	Dec-91	Nov-09	1	0	1	0	NA	NA	NA	NA	NA	NA	-0.1	-0.1		-1	-0.1	NA	-0.1	-0.1	78	78	78	78
20	DEN	DENDORA VALLEY	Nov-92	Nov-09	1	0	1	0	NA	NA	NA	NA	NA	NA	-30.4	-30.4	-1.7	-30.4	-30.4	NA	-30.4	-30.4	96	96	96	96
21	DET	DETRITAL VALLEY	Oct-95	Apr-06	15	10	5	0	2.4	1.7	0.2	11.8	0.1	3.4	-9.1	-2.3	-0.8	-38.6	-0.7	16.5	-1.4	1	7	773	382	354
22	DIN	DOUGLAS INA	Dec-90	Nov-09	13	2	11	0	8.4	8.4	0.4	8.6	8.3	0.2	-25.2	-6	-1.3	-73	-1.2	28	-20	-5.7	67	358	121	165
23	DNM	VIRDEN VALLEY-DUNCAN -NM	Jan-87	Nov-07	1	0	1	0	NA	NA	NA	NA	NA	NA	-1.2	-1.2	-0.1	-1.2	-1.2	NA	-1.2	-1.2	320	320	320	320
24	DON	DONNELLY WASH	Nov-96	Apr-04	0	0	0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
25	DOU	DOUGLAS	Jan-90	Dec-04	272	31	240	1	6.5	2.4	0.4	28.4	0.4	7.5	-19.4	-13.5	-1.2	-89	-0.2	17.4	-16.4	-9.6	17	347	159	162
26	DSW	DRIPPING SPRING WASH	Dec-90	Nov-09	2	0	2	0	NA	NA	NA	NA	NA	NA	-7.5	-7.55	-0.4	-8.4	-6.7	1.2	-7.5	-7.5	90	100	95	95
27	DUN	DUNCAN VALLEY	Dec-90	Nov-07	7	2	5	0	2.3	2.3	0.1	4.4	0.3	2.9	-3.4	-3.4	-0.2	-4.1	-2.6	0.6	-1.8	-3	23	194	45	76
28	ELO	ELOY	Nov-93	Jan-08	490	314	175	1	20.3	18.4	1.3	144.3	0.1	15.3	-26.7	-16.1	-1.8	-119.1	-0.1	26.3	3.5	9.7	32	619	171	195
29	ESR	EAST SALT RIVER	Nov-91	Feb-09	172	149	23	0	83.5	76.9	4.6	244.1	2.95	55.2	-20.6	-13.9	-1.1	-57.7	-1.3	16.5	69.6	58.5	13	855	186	217
30	FNH	FOUNTAIN HILLS	Nov-91	Dec-09	7	4	3	0	8.2	4.8	0.4	20.4	2.6	8.4	-40.6	-22.9	-2.1	-96	-2.8	49	-12.7	2.6	13	663	88	194
31	FTR	FORT ROCK	Nov-95	Mar-08	6	2	4	0	2.7	2.7	0.2	4.8	0.6	3	-5	-4.65	-0.4	-9.5	-1.3	4.1	-2.5	-1.6	7	686	42	214
32	GIL	GILA BEND	Nov-93	Feb-08	124	8	116	0	31.3	23.2	2.1	100.7	0.7	29.7	-65	-52.75	-4.3	-170.8	-1.8	45.6	-58.8	-50.4	3	645	215	221
33	GSK	SAN CARLOS VALLEY	Jan-92	Nov-07	1	0	0	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA			722	722	722	722
34	GWA	GRAND WASH	Oct-91	Oct-09	2	2	0	0	23.1	23.1	1.2	45.3	0.9	31.4	NA	NA	NA	NA	NA	NA	23.1	23.1	10	508	259	259
35	HAR	HARQUAHALA INA	Nov-93	Nov-09	27	18	9	0	23.8	24.3	1.4	54	2.7	14.4	-18	-14	-1.1	-37.4	-1.2	12.4	9.9	14.2	28	607	404	342
36	HAS	HASSAYAMPA	Oct-91	Mar-09	35	18	17	0	17.5	6.6	0.9	58.4	0.3	18.4	-4.4	-3	-0.2	-11	-0.1	3.6	6.8	0.3	24	658	203	234
37	HUA	HUALAPAI VALLEY	Jan-91	Mar-06	46	26	20	0	6.2	1.7	0.4	54.2	0.4	12	-14.9	-9.8	-0.9	-55.8	-0.5	15.3	-2.9	0.8	24	925	469	459
38	JCI	JOSEPH CITY INA	Aug-87	Oct-08	0	0	0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
39	KAN	KANAB PLATEAU	Oct-92	Oct-09	2	1	1	0	0.9	0.9		1	0.9	NA	-0.1	-0.1		-1	-0.1	NA	0.4	0.4	484	611	548	548
40	LCR	LITTLE COLORADO RIVER	Jan-91	Dec-04	64	12	51	1	11.4	3.9	0.8	46.2	0.3	15.6	-20.9	-7.1	-1.4	-149.2	-0.11	33.8	-14.5	-3.4	12	1241	152	230
41	LIC	LITTLE CHINO VALLEY	Feb-94	Mar-10	35	4	31	0	15.4	15.5	0.9	30.3	0.2	15	-23.7	-25.9	-1.4	-37.9	-7.3	8.1	-19.2	-25.3	15	435	224	214
42	LKH	LAKE HAVASU	Oct-91	Oct-09	1	1	0	0	25.3	25.3	1.3	25.3	25.3	NA	NA	NA	NA	NA	NA	NA	25.3	25.3	28	28	28	28
43	LKP	LAKE PLEASANT	Nov-91	Dec-09	3	2	1	0	11.3	11.3	0.6	13.7	9	3.3	-7.9	-7.9	-0.4	-7.9	-7.9	NA	4.9	9	27	275	205	169
44	LPC	LA POSA PLAINS	Nov-92	Nov-09	3	0	3	0	NA	NA	NA	NA	NA	NA	-17.1	-15	-0.9	-30.1	-6.2	12.1	-17.1	-15	66	510	138	238
45	LVR	VERDE CANYON	Jan-90	Nov-09	7	1	6	0	16.2	16.2	0.8	16.2	16.2	NA	-50.6	-47.73	-2.4	-74.7	-23.1	18.5	-41.1	-47.6	85	318	184	173
46	MAM	MAMMOTH	Oct-94	Dec-06	112	57	55	0	7.5	5.1	0.6	34.9	0.1	8.2	-7.3	-2.3	-0.6	-64.3	-0.01	12.2	0.2	0.1	5	606	40	94
47	MEA	MEADVIEW	Nov-95	Feb-06	8	1	7	0	0.5	0.5		1	0.5	NA	-12.6	-13.95	-1.1	-25.5	-3.1	8	-11	-10.2	397	494	443	439
48	MHV	LAKE MOHAVE	Oct-91	Oct-09	2	1	1	0	22.7	22.7	1.2	22.7	22.7	NA	-2.7	-2.7	-0.1	-2.7	-2.7	NA	10	10	346	427	387	387
49	MMU	MCMULLEN VALLEY	Nov-89	Dec-04	84	4	80	0	5.4	5.1	0.3	9.2	2.2	3.5	-36.2	-33.3	-2.2	-141	-0.2	22.9	-34.2	-32.6	122	700	483	474
50	MOR	MORENCI	Nov-90	Oct-07	1	0	1	0	NA	NA	NA	NA	NA	NA	-10	-10.01	-0.6	-10	-10.01	NA	-10	-10	16	16	16	16
51	MST	MARICOPA - STANFIELD	Nov-93	Jan-08	174	140	33	1	52	53.2	3.4	143.5	0.4	33.9	-15.5	-13.3	-1	-52.7	-0.1	12.4	38.9	41.9	52	674	324	314
52	PAR	PARIA	Oct-91	Mar-07	5	0	5	0	NA	NA	NA	NA	NA	NA	-19.9	-23.5	-1.2	-25.5	-10.3	6.8	-19.9	-23.5	111	519	384	322
55	PSC	PEACH SPRINGS	Oct-95	Oct-09	2	1	1	0	5.5	5.5	0.4	5.5	5.5	NA	-1.3	-1.3	-0.1	-1.3	-1.3	NA	2.1	2.1	146	825	486	486
57	RAN	RANEGRAS PLAIN	Jan-88	Dec-04	89	20	69	0	4.6	3.3	0.3	17.8	0.3	4.9	-16.5	-9.2	-0.9	-49.4	-0.1	14.8	-11.7	-6.7	44	482	231	231
58	SAC	SACRAMENTO VALLEY	Jan-90	Mar-06	82	60	20	2	14.3	8.9	0.8	79	0.1	16	-8.8	-2.45	-0.5	-50	-0.1	14.9	8.3	4.6		1229	101	241
59	SAF	GILA VALLEY	Dec-90	Feb-08	14	6	7	1	7.5	3.6	0.4	28.3	0.02	10.5	-3.9	-2.61	-0.2	-10.7	-0.6	3.5	1.3	-0.3	24	631	55	105
60	SBV	SAN BERNADINO VALLEY	Dec-90	Mar-07	24	6	17	1	1.2	0.7	0.1	4.3	0.3	1.5	-6.3	-2.3	-0.4	-31.5	-0.1	9.5	-4.2	-1.2		464	49	74
61	SCA	SANTA CRUZ AMA	Dec-87	Feb-10	48	6	42	0	5.7	4.3	0.2	14.6	1.4	5.1	-11.7	-9.2	-0.5	-43.6	-0.3	9.1	-9.6	-8.5	6	255	54	78
62	SEV	SIERRA VISTA	Nov-90	Mar-07	379	111	244	24	5.1	1.9	0.3	97.7	0.08	11.1	-8.7	-6.025	-0.5	-69.9	-0.08	10.2	-4.1	-1.9		611	55	116
63	SHV	SHIVWITS PLATEAU	Oct-92	Mar-05	1	0	0	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA			959	959	959	959
64	SKU	SKULL VALLEY	Oct-91	Dec-09	7	3	4	0	6.5	2.9	0.3	14.4	2.1	6.9	-24.2	-12.5	-1.3	-69.7	-2.2	31.8	-11.1	-2.2	37	248	111	150
65	SMR	SANTA MARIA	Oct-91	Dec-09	5	2	3	0	3.2	3.2	0.2	3.4	3.1	0.2	-1.8	-2.05	-0.1	-3.1	-0.2	1.5	0.2	-0.2	19	91	50	55
66	SRF	SAN RAFAEL	Dec-87	Jan-08	6	2	4	0	2.1	2.1	0.1	3.6	0.53	2.2	-8.9	-10.75	-0.4	-13.4	-0.7	6	-5.2	-4.5	7	209	52	75
67	SRL	SALT RIVER LAKES	Jan-91	Nov-03	15	0	15	0	NA	NA	NA	NA	NA	NA	-30.2	-30.09	-2.2	-41.8	-15.35	9.5	-30.2	-30.1	46	82	80	68
68	SRO	SANTA ROSA	0/0	0/0	0	0	0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
69	SSI	SAN SIMON VALLEY	Jan-87	Mar-07	286	85	201	0	9.1	4.9	0.4	76.8	0.1	11.2	-26.2	-18.7	-1.2	-91.2	-0.29	22.4	-15.7	-12.9	2	537	134	178
70	SSW	SAN SIMON WASH	Jan-89	Apr-04	1	1	0	0	4.9	4.9	0.3	4.9	4.92	NA	NA	NA	NA	NA	NA	NA	4.9	4.9	6	6	6	6

Table 3 Statistical Summary of Depth-to-Water and Water level Change Data For Arizona Groundwater Basins (Late 1980s Early/Mid 1990s to Mid/Late 2000s)

Statistical Summary of Depth-to-Water and Water Level Change Data For Arizona Groundwater Basins (From Late 1980's Early/Mid 1990's to Mid/Late 2000's)																										
			Period Analyzed		Counts				Statistics For Wells With Increasing Waterlevels (+)						Statistics For Wells With Decreasing Waterlevels (-)						Overall Basin WL Changes		Overall Basin Depth-to-Water Stats (For Ending Years, Only)			
	Basin	Name	Begining Mo/Yr	Ending Mo/Yr	All	+	-	NC	Mean + Change	Median + Change	Mean + Change Rate	Max + Change	Min + Change	SD of + Changes	Mean - Change	Median - Change	Mean - Change Rate	Max - Change	Min - Change	SD of - Changes	Mean Basin Change	Median Basin Change	Min DTW	Max DTW	Median DTW	Mean DTW
71	TIG	TIGER WASH	Nov-93	Dec-07	3	3	0	0	4.1	4	0.3	7.2	1.2	3	NA	NA	NA	NA	NA	NA	4.1	4	21	217	44	94
72	TON	TONTO CREEK	Jan-90	Apr-08	9	5	3	1	7.2	5.8	0.4	15.7	3.48	4.8	-8.5	-8.15	-0.4	-14	-3.24	5.4	1.2	3.5	4	82	32	38
74	UAG	UPPER AGUA FRIA	Feb-94	Nov-09	20	6	14	0	2.6	3	0.2	4.6	0.5	1.7	-24.1	-10.145	-1.4	-174.6	-1.6	44.7	-16.1	-7.2	44	652	214	245
75	UHA	UPPER HASSAYAMPA	Nov-90	Apr-08	5	4	1	0	2.1	2.2	0.1	3.5	0.5	1.4	-7.6	-7.6	-0.4	-7.6	-7.6	NA	0.1	1.3	15	817	400	356
76	USC	UPPER SANTA CRUZ	Dec-94	Mar-10	529	78	450	1	17.9	6.7	1.2	75.3	0.1	20.5	-26.4	-24.3	-1.7	-162.4	-0.1	18.6	-19.8	-20.6	7	620	200	215
77	USR	SALT RIVER CANYON	Oct-91	Oct-07	1	0	1	0	NA	NA	NA	NA	NA	NA	-4.3	-4.3	-0.3	-4.3	-4.3	NA	-4.3	-4.3	20	20	20	20
78	VEK	VEKOL VALLEY	Nov-93	Dec-07	12	3	9	0	0.8	0.8	0.1	1	0.6	0.2	-1.3	-0.9	-0.1	-4.6	-0.2	1.4	-0.8	-0.4	213	529	343	351
79	VER	VERDE VALLEY	Apr-94	May-09	174	33	138	3	9.6	3.3	0.6	58.5	0.6	12.3	-18.8	-10.27	-1.2	-161.6	-0.1	25.2	-13.1	-4.7		883	106	183
80	VRG	VIRGIN RIVER	Apr-90	Dec-09	3	2	1	0	6.1	6.1	0.3	10.6	1.6	6.4	-2.1	-2.1	-0.1	-2.1	-2.1	NA	3.4	1.6	46	313	145	168
81	WAT	RAINBOW VALLEY	Nov-91	Jan-08	22	8	14	0	12.8	7.3	0.7	51.4	0.4	16.5	-9.5	-8.4	-0.6	-34	-0.1	9.1	-1.4	-0.7	256	582	361	370
82	WEM	WELLTON - MOHAWK	Oct-92	Dec-07	20	9	11	0	5.6	3.2	0.3	16	0.9	5.7	-6.6	-1.8	-0.4	-51.4	-0.1	15	-1.1	-0.2	12	383	107	141
83	WIK	WIKIEUP	Nov-95	Mar-08	37	21	16	0	5.7	3.7	0.4	22.9	0.3	5.8	-6.4	-4	-0.5	-28.7	-0.3	7.5	0.5	0.7	4	523	32	70
84	WIL	WILLCOX	Jan-90	Dec-05	587	27	560	0	11.5	5.7	0.7	77.5	0.2	17.1	-34.2	-29.53	-2	-100.8	-0.2	23.9	-32.1	-28.4	3	730	226	211
85	WMD	WESTERN MEXICAN DRAINAGE	Oct-91	Apr-04	5	1	4	0	4.9	4.9	0.4	4.9	4.86	NA	-6.5	-6.615	-0.5	-11.9	-0.87	6.1	-4.2	-1.6	28	99	85	74
86	WRB	WHITE RIVER	0/0	0/0	0	0	0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
87	WSR	WEST SALT RIVER	Oct-91	Feb-09	273	111	162	0	31.7	14.5	1.7	126.1	0.7	33.8	-18.5	-17.25	-1	-85.4	-0.2	13.6	1.9	-6.3	16	525	134	182
88	YUM	YUMA	Nov-92	Nov-09	4	0	4	0	NA	NA	NA	NA	NA	NA	-7	-6.4	-0.4	-15	-0.1	6.3	-7	-6.4	16	121	44	56
			Counts->		4692	1596	3054	42																		

Table 3 (continued) Statistical Summary of Depth-to-Water and Water Level Change Data For Arizona Groundwater Basins (Late 1980s Early/Mid 1990s to Mid/Late 2000s)

Statewide Statistics	
Statewide Count of Wells With Positive Water Level Changes	1596
Statewide Mean Positive WL Change (feet)	25.1
Statewide Mean Positive WL Change Rate (feet/year)	1.9
Statewide Median Positive WL Change (feet)	12.8
Statewide Count of Wells With Negative Water Level Changes	3054
Statewide Mean Negative WL Change (feet)	-24.0
Statewide Mean Negative WL Change Rate (feet/year)	-1.5
Statewide Median Negative WL Change (feet)	-17.7
Statewide Count of Wells With Zero (No Water Level Changes)	42
(Note! Some wells with no change are flowing wells where pressure head could not be measured using available equipment)	
Statewide Count of Wells With Measured Water Level Changes	4692
Statewide Mean WL Change (feet)	-7.2
Statewide Median WL Change (feet)	-5.6
Statewide Depth-to-Water Statistics	
Statewide Mean DTW (feet-BLS)	203
Statewide Median DTW (feet-BLS)	173

Table 4 Summary of Statewide Depth-to-Water and Water Level Change Statistics

GENERAL FACTORS THAT INFLUENCE HYDROLOGIC CONDITIONS

Over the last two decades many significant changes and events have impacted hydrologic conditions within the state. Major factors affecting hydrologic conditions include, but are not limited to the following:

- Changes in overall water use (both surface water and groundwater)
- Importation of new surface water supplies (in AMAs)
- Variations in incidental recharge, precipitation and natural recharge
- Increased use of reclaimed water
- Water conservation
- Artificial recharge activities

The collective impact of these factors on the state's aquifers (Table 2) is directly reflected by changes in groundwater levels and stream runoff and baseflow.

In many areas of the state, water demand increases with population growth. However, in some urbanized areas the groundwater demand may not increase proportionally to population growth because new urban demands may be replacing existing agricultural demands and/or new renewable water supplies are being utilized. These trends are discussed in more detail throughout the report. Table 5 lists populations in 1990, 2000 and 2010 for each of Arizona's 15 counties.

County	AMA(s) That Are Fully or Partially Included In County	1990	2000	2010
Apache		61,591	69,423	71,518
Cochise		97,624	116,320	134,421
Coconino		96,591	117,755	131,346
Gila		40,216	51,335	53,597
Graham		26,554	33,489	37,220
Greenlee		8,008	8,547	8,437
La Paz		13,844	19,715	20,489
Maricopa	Phoenix, Pinal	2,122,101	3,072,149	3,817,117
Mohave		93,497	155,032	200,186
Navajo		77,658	97,470	107,449
Pima	Pinal, Santa Cruz, Tucson	666,880	843,746	980,263
Pinal	Pinal, Phoenix, Tucson	116,379	179,727	375,770
Santa Cruz	Santa Cruz, Tucson	29,676	38,381	47,420
Yavapai	Phoenix, Prescott	107,714	167,517	211,033
Yuma		106,895	160,026	195,751
Total		**3,665,228**	**5,130,632**	**6,392,017**

Table 5 Population Data from 1990 to 2010 in Arizona
(Data source: U.S. Census Bureau, 2011)

Active Management Areas (AMAs)

The following section provides information on significant factors that have impacted hydrologic conditions in the AMAs, and provides a framework for the detailed discussion of hydrologic conditions in each AMA.

Municipal, Industrial and Agricultural Water Use, CAP Water and Artificial Recharge

Between 1990 and 2010, the combined urban and rural populations of Maricopa, Pima and Pinal counties grew from about 2.9 million to about 4.1 million (US Census, 2011). In Yavapai and Santa Cruz counties, the population grew from about 137,000 to 258,000 (Table 5).

In general, total municipal and industrial water demand has grown in response to population growth. However, municipal and industrial groundwater demand in the Phoenix, Pinal and Tucson AMAs has not increased in proportion to the population growth because of the introduction of Central Arizona Project (CAP) water in the mid-to-late 1980s, increasing use of reclaimed water, and conservation efforts (Tables 6 and 7). In areas where municipal and/or industrial pumping has been stabilized or reduced, water tables have recovered significantly. In the Santa Cruz and Prescott AMAs, where CAP water is unavailable, the demand for groundwater has grown more proportionately to the population increase, and continuing groundwater level declines have been observed in some municipal pumping centers.

Over the last 20 years, the introduction of CAP water has coincided with an overall reduction in agricultural water use in the Phoenix and Tucson AMAs as large agricultural areas have urbanized or been retired. In the Pinal AMA, total agricultural water use remained relatively constant or increased slightly during the last two decades as large volumes of CAP water were introduced to the area and groundwater pumping decreased (Table 6). The direct use of CAP water for farming was facilitated by the development of the Groundwater Savings Facility (GSF) program that allows municipalities and other water users to subsidize the purchase and use of CAP water at permitted GSFs (typically farmers and irrigation districts). In most areas where CAP water has replaced or reduced agricultural groundwater pumping, water tables have recovered significantly from earlier levels (see PHX8, PHX30, PIN3, PIN4, PIN6, PIN13, TUC2 hydrographs, Appendix A). In the Santa Cruz AMA agricultural water use from pumped wells fluctuated between about 10,000 to 14,000 acre-feet per year during the last 20 years. Groundwater pumping for agriculture in the Prescott AMA declined with the general reduction in agricultural activity in that AMA.

AMA		1985			1990			2000			2006		
		GW	CAP	Eff.	GW	CAP	Eff.	GW	CAP	Eff.	GW	CAP	Eff.
Phoenix	Municipal	225.3	0	0	293.3	150.8	2.8	289.2	260	47.6	252.1	338.1	40.6
	Industrial	69.3	0	13.6	63.3	0.8	51.2	83.2	2.5	61.4	88.3	1.7	62.9
	Agricultural	647.7	0	30.1	700.1	77.6	30	420.5	318.4	28.2	271.5	203.5	30.6
	Indian	98.3	0	0	112.5	0	0	80.2	0	0	77.5	12.1	0
	Total	1040.6	0	43.7	1169.2	229.2	84	873.1	580.9	137.2	689.4	555.4	134.1
Pinal	Municipal	13.6	0	0	15.5	0	0	21.6	0.9	0.6	28.9	3	0.8
	Industrial	4.9	0	0	4.7	0	0.1	9.4	0	0.3	17.1	1.5	1.7
	Agricultural	594.4	0	1.8	399.1	304	5	400.7	382	1.6	327.7	401.2	2.3
	Indian	24.5	0	0	51.9	67	0	60.9	69	0	61	80.3	0
	Total	637.4	0	1.8	471.2	371	5.1	492.6	451.9	2.5	434.7	486	4.8
Tucson	Municipal	113.1	0	0	123.6	0	4.3	159	0.1	10.2	100.6	72.2	15.9
	Industrial	45.9	0	0	50.1	0	0	61	0.2	0.1	51.7	0.1	0.9
	Agricultural	111.3	0	3.5	81.8	0	4.4	72	28	0	63.5	24.2	0
	Indian	0.2	0	0	1.6	0	0	3.3	0.7	0	1	10.6	2.1
	Total	270.5	0	3.5	257.1	0	8.7	295.3	29	10.3	216.8	107.1	18.9
Santa Cruz	Municipal	4.1	0	0	6.2	0	0	7.4	0	0	8.2	0	0
	Industrial	1.4	0	0	1.3	0	0	1.4	0	0	1.8	0	0
	Agricultural	9	0	0	11.6	0	0	14.7	0	0	10.7	0	0
	Indian	0	0	0	0	0	0	0	0	0	0	0	0
	Total	14.5	0	0	19.1	0	0	23.5	0	0	20.7	0	0
Prescott	Municipal	4.5	0	0	7.7	0	0.3	12.6	0	0	16.9	0	1.9
	Industrial	0.6	0	0	0.5	0	0	1	0	0	1.3	0	0
	Agricultural	11.2	0	0	6	0	0	7.1	0	0	2.1	0	0
	Indian	0	0	0	0	0	0	0	0	0	0	0	0
	Total	16.3	0	0	14.2	0	0.3	20.7	0	0	20.3	0	1.9
5 AMA Totals		1979.3	0	49	1930.8	600.2	98.1	1705.2	1061.8	150	1381.9	1148.5	159.7

Table 6 Groundwater (GW), CAP and Reclaimed Water (EFF) Use by Sector for AMAs 1985, 1990, 2000 and 2006*
(ADWR, 2009-2011, Data from AMA Assessment Water Budgets)
(*Volumes are in 1,000s acre-feet, rounded to nearest 100 acre-feet)
Note: Not all CAP use in AMAs is shown in table, considerable use for artificial recharge and replenishment not shown.

Year	Bouse	Harquahala INA	Phoenix AMA	Pinal AMA	Tucson AMA	Total
1988	0	83,062	146,868	212,602	0	442,532
1989	0	122,671	208,888	379,323	0	710,882
1990	0	60,231	228,904	453,501	0	742,636
1991	0	36,260	109,165	265,488	77	410,990
1992	0	21,461	200,495	306,918	7,840	536,714
1993	0	27,329	252,299	338,416	49,215	667,259
1994	0	55,393	341,354	386,926	24,364	808,037
1995	0	102,956	409,222	430,107	10,613	952,898
1996	0	113,399	511,307	471,164	19,969	1,115,839
1997	0	117,192	677,047	502,559	34,543	1,331,341
1998	0	87,688	461,903	426,131	40,232	1,015,954
1999	0	77,384	632,064	487,414	55,996	1,252,858
2000	0	110,487	820,752	531,275	75,383	1,537,897
2001	1,033	118,261	641,883	467,293	92,720	1,321,190
2002	969	121,112	661,826	630,669	111,101	1,525,677
2003	0	101,952	791,357	522,154	135,499	1,550,962
2004	0	71,114	876,438	481,369	168,710	1,597,631
2005	0	77,109	568,454	457,366	176,037	1,283,296
2006	0	100,407	715,805	363,971	161,101	1,509,414
2007	0	88,762	859,422	459,271	176,987	1,700,033
2008	0	75,704	739,581	507,785	222,726	1,547,924
2009	0	86,456	841,900	445,541	181,941	1,610,545

Table 7 CAP Water Deliveries (Acre-Feet) By Area (1988-2009)
(Data from CAP Annual Water Delivery Reports)

During the last two decades many large-scale artificial recharge projects, Underground Storage Facilities (USFs), were constructed in the Phoenix, and Tucson AMAs. Recharge of CAP water and treated effluent at these facilities significantly impacted local and regional groundwater conditions. Smaller scale artificial recharge projects were also constructed in the Prescott, Santa Cruz and Pinal AMAs. In most cases, these facilities recharge treated municipal effluent and have had a measureable impact on local groundwater conditions. Outside AMAs, USFs were constructed in the Harquahala INA and the Sierra Vista area. Between 1989 and 2009 about 4.3 million acre-feet had been recharged in the state's USFs (Figure 2).

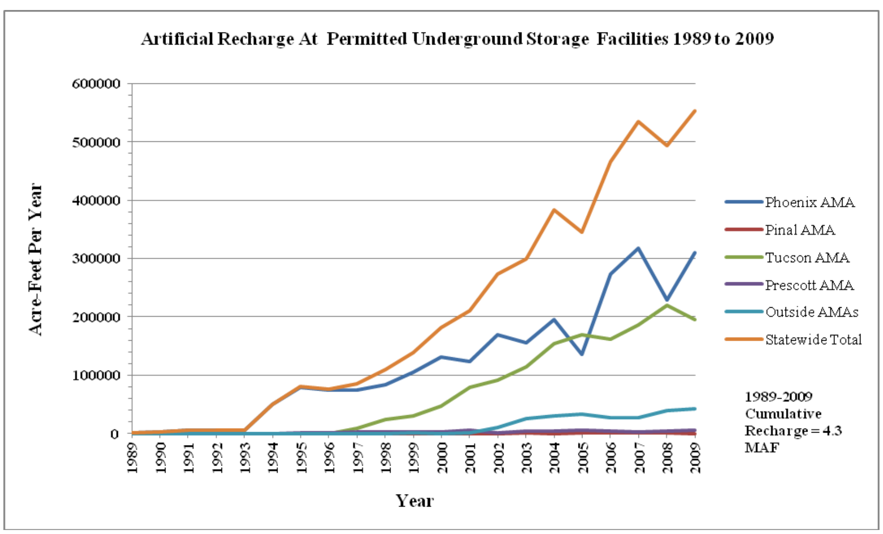

Figure 2 Artificial Recharge at Permitted Underground Storage Facilities 1989 to 2009

Climate and Stream Flow

During the 1990s and 2000s, annual precipitation volumes varied significantly across the state. These variations in precipitation have provided a few sporadic years of above average stream flow, but more generally resulted in a sustained period of below average precipitation (drought) with decreased stream flow (see Tables 8 and 9).

Variations and general reductions in annual precipitation over the Colorado River watershed have also occurred. These variations have significantly impacted the runoff to the Colorado River and storage at lakes Powell and Mead. Eventually, reduced runoff and storage may create shortage conditions that would translate into reduced deliveries of CAP water to the Phoenix, Pinal and Tucson AMAs. Fortunately, due to a combination of large reservoir storage and the implementation of strategic operating rules, Arizona CAP deliveries were not reduced between 1990 and 2010 (Table 7).

The hydrologic impact of decreased stream flow is highly dependent upon the extent of of surface water resources within the AMAs and the natural recharge provided from surface flow events. Table 10 presents annual stream flow data for selected gages on the Gila, Salt and Verde River watersheds. In general, most stream gages show very high flows in water year 1993 (October, 1992 through September, 1993) due to the impact of above average precipitation in late 1992 and 1993. Above average annual precipitation and stream flow also occurred in 2005 and 2010 (Tables 8 and 9). More information on Arizona's drought monitoring activities is presented later in this report.

YEAR	Phoenix	Mesa	Casa Grande Nat. Mon.	Tucson	Red Rock New Mexico	Cliff New Mexico	Alpine	McNary	Payson	Sedona	Flagstaff	Prescott	Walnut Creek
1990	7.7	10.3	13.2	15.0	17.4	19.5	26.0	25.8	23.0	14.8	25.7	20.2	16.1
1991	8.4	9.5	9.2	10.8	16.8	20.4	22.6	25.8	20.9	19.9	21.8	24.2	15.0
1992	14.2	18.5	15.9	16.4	17.8	20.9	26.1	31.9	31.1	29.6	34.7	20.3	20.5
1993	13.3	16.1	15.5	15.0	13.3	17.7	19.9	25.4	27.7	25.2	35.6	19.8	24.2
1994	8.8	7.7	10.4	11.6	14.4	16.9	24.5 x	30.8	17.7	17.6	21.9	18.3	9.9
1995	9.5	7.5	8.2	11.2	7.2	7.7	15.8	23.9	18.8	18.8	17.7	16.2	13.9
1996	4.4	5.6	8.1	10.5	14.5	17.8	19.1	20.8	15.8	9.1	11.2	10.8	11.2
1997	4.7	6.2	7.4	10.6	16.0	20.7	22.8	25.7	17.2	18.1	15.6	16.2	14.2
1998	10.5	11.1	9.7 x	13.6	10.4	13.1	19.1	21.7	25.7	23.5	27.3	22.7 x	18.2
1999	6.6	5.6	7.5	9.7	10.3	10.8	25.3	23.5	18.6	14.6	15.7	16.5	13.5
2000	7.9	9.1	6.1	12.4	11.4	12.9	20.4	22.8	18.9	15.0	15.4	15.8	15.9
2001	6.7	9.1	9.7	7.8	10.1	12.0	18.6	21.7	20.8	13.9	17.6	12.8	16.5
2002	2.8	4.2	4.8	7.8	14.4	11.9	16.3	22.0	9.6	10.9	12.9	7.2	5.2
2003	6.8	7.6	5.3	10.1	4.5	6.9	16.9	23.0	19.7	15.1	17.9	15.4	11.6 x
2004	8.0	10.2	8.9	7.6	13.3	17.9	19.5	22.0	27.5	24.9	23.6	17.8	26.0
2005	7.0	10.6	10.3	9.6	12.6	14.0	18.1	29.0	25.0	22.5	24.0	17.3	16.5
2006	5.5	8.8	7.1	11.8	16.6	18.3	25.6	24.1	17.5	12.1	15.6	11.4	10.2
2007	5.1	8.4	9.3	9.8	13.3	15.4	25.3	26.8	17.8 x	16.8	17.5	15.4	10.9 x
2008	9.6	11.7	7.3	8.6	15.4	15.1	19.8 x	29.4	16.0 x	15.9	17.7 x	17.1	20.6
2009	3.3	4.7	3.6	5.7	7.2	10.8	11.1 x	17.1	4.7 x	11.9 x	11.4 x	11.3 x	10.3
2010	9.1	13.5	9.6	11.1	15.7	19.2	19.9	31.8 x	10.4 x	14.0 x	27.9	15.2 x	17.3
1990-2010 Mean	7.6	9.3	8.9	10.8	13.0	15.2	21.0	24.6	20.9	17.8	21.0	16.2	15.5
1994-2010 Mean	6.8	8.3	7.7	10.0	12.2	14.2	20.2	24.0	19.4	16.6	21.0	14.9	14.4
Long-term Mean	7.6	8.3	8.7	11.4	12.4	14.3	20.4	26.0	21.5	18.0	20.8	18.8	16.0
Long-term SD	3.1	3.2	3.2	3.2	3.4	4.1	4.8	6.0	5.2	5.2	6.0	5.7	4.8
Long-term Skew	0.7	1.2	1.0	0.5	0.0	0.0	0.8	0.5	0.2	0.9	0.7	0.7	0.9
Long-term High	15.4	20.3	19.2	21.9	21.3	21.1	37.6	46.7	32.7	33.2	36.6	39.5	34.8
Long-term Low	2.8	2.8	3.6	5.3	4.4	5.7	11.2	10.7	9.6	7.8	9.9	6.9	5.2
No of Years In LT Mean	68	101	81	63	91	64	65	69	54	61	66	99	82

x=year not used in average calculation because one or more months had significant missing data

Table 8 Annual Precipitation (inches) for Selected Reporting Stations in Arizona and New Mexico (1990 – 2010)

(Data Source: Desert Research Institute, Western Regional Climate Center: http://www.wrcc.dri.edu/)

Water Year	Gila River blw Blue Creek, near Virden NM 9432000 (CFS)	Gila River at Kelvin 9474000 (CFS)	Santa Cruz River near Nogales 9480500 (CFS)	Santa Cruz River at Continental 9482000 (CFS)	Salt River at Chrysotile 9497500 (CFS)	Salt River blw Stewart Mtn. Dam 9502000 (CFS)	Granite Creek blw Watson Lake near Prescott 9503300 (CFS)	Del Rio Springs near Chino Valley 9502900 (CFS)	Agua Fria River near Humboldt 9512450 (CFS)	Verde River near Paulden 9503700 (CFS)	Verde River near Camp Verde 9506000 (CFS)	Verde River near Scottsdale 9511300 (CFS)	Agua Fria River near Rock Springs 9512800 (CFS)	Hassayampa River near Morristown 9516500 (CFS)
1990	75.7	116.4	26.3	No data	242.4	544.2	No data	No data	No data	26.6	184.6	217.2	4.8	No data
1991	408.3	505.5	31.6	No data	1117.0	923.9	No data	No data	No data	35.6	409.4	384.5	128.8	No data
1992	520.3	873.8	30.6	12.7	936.3	1852.0	No data	No data	No data	31.1	497.5	696.0	89.4	23.3
1993	745.7	3281.0	60.5	122.6	2091.0	4485.0	No data	No data	No data	215.2	1403.0	2522.0	499.1	220.1
1994	100.2	670.4	3.7	1.0	399.5	839.1	No data	No data	No data	28.4	207.6	333.3	18.1	2.5
1995	563.9	799.4	34.2	11.0	1062.0	1538.0	No data	No data	No data	55.6	699.5	1059.0	147.3	87.7
1996	129.8	634.0	2.1	1.7	183.8	885.1	No data	No data	No data	27.4	164.2	266.1	6.1	0.2
1997	294.8	414.9	1.8	0.8	470.2	781.5	No data	2.1	No data	25.1	252.3	224.5	13.3	6.7
1998	297.0	459.1	11.1	4.9	727.4	594.4	No data	2.0	No data	29.0	514.5	681.1	65.9	17.5
1999	129.3	198.0	11.7	3.8	297.5	510.0	No data	2.0	No data	29.5	212.3	303.0	18.4	6.0
2000	62.7	111.1	3.1	2.3	159.7	429.4	0.2	1.9	No data	22.5	150.3	218.2	3.5	4.0
2001	226.7	383.5	53.3	33.5	526.0	538.4	1.0	1.8	3.7	25.7	232.7	206.3	33.0	13.6
2002	78.3	90.6	1.1	0.5	172.9	435.8	0.1	1.6	4.6	23.2	137.2	265.8	8.3	3.3
2003	78.5	102.8	1.3	1.9	489.3	175.6	1.2	1.5	1.8	27.3	278.2	260.3	26.8	No data
2004	159.6	111.9	0.4	1.5	327.8	295.1	0.2	1.3	4.4	45.7	184.9	160.8	2.8	0.0
2005	507.7	443.4	4.1	10.2	951.7	586.8	26.4	1.3	17.1	192.8	1134.0	1663.0	280.6	107.7
2006	279.6	413.0	10.0	7.6	379.2	802.5	0.6	1.1	3.5	24.0	153.3	202.1	11.3	2.6
2007	197.0	383.4	6.9	7.8	323.5	639.9	0.4	1.1	3.0	23.8	141.8	242.9	3.8	1.5
2008	244.0	398.4	3.1	3.9	927.3	587.4	6.6	1.0	4.9	26.2	449.4	644.6	78.1	6.0
2009	83.9	353.3	0.4	1.2	456.8	868.5	1.2	0.9	6.2	25.4	216.2	329.5	25.3	1.1
2010	328.2	442.0	18.6	8.7	884.3	1223.0	10.9	1.0	7.5	35.2	477.0	765.6	123.5	46.2
1990-2010 Mean CFS	262.4	532.7	15.0	12.5	625.0	930.3	Inc. Data	Inc. Data	Inc. Data	46.4	385.7	554.6	75.6	30.6
1990-2010 Mean AFA	189,951	385,538	10,890	9,052	452,393	673,322	Inc. Data	Inc. Data	Inc. Data	33,615	279,175	401,389	54,738	22,119
1994-2010 Mean CFS	221.2	377.0	9.8	6.0	514.1	690.0	Inc. Data	Inc. Data	Inc. Data	39.2	329.7	460.4	50.9	19.2
1994-2010 Mean AFA	160,138	272,879	7,108	4,357	372,069	499,440	Inc. Data	Inc. Data	Inc. Data	28,390	238,656	333,205	36,873	13,873
Long-Term Mean CFS	211.6	505.4	24.7	21.8	649.9	972.0	4.4	1.5	5.7	43.7	405.2	606.1	80.8	26.5
Long-Term Mean AFA	153,165	365,826	17,856	15,761	470,424	703,495	3,208	1,054	4,096	31,658	293,299	438,677	58,456	19,160
Long-Term Median CFS	152.6	441.8	15.3	8.2	513.1	794.3	1.0	1.4	4.5	28.4	301.4	384.5	29.2	6.0
Long-Term Median AFA	110,415	319,773	11,038	5,942	371,379	574,874	705	1,021	3,252	20,556	218,152	278,299	21,135	4,354
No. Years in LT Average	76	99	82	58	86	70	11	14	10	47	33	49	39	26
Earliest Year of Record	1932	1912	1914	1941	1925	1941	2000	1997	2001	1964	1935	1962	1971	1939
Many gages have years with missing data; Inc. data = incomplete data; CFS = Cubic Feet Per Second														

Table 9 USGS Stream Gaging Data for Selected Gages in the Gila, Salt and Verde River Watersheds (USGS, 2011)

Groundwater Conditions in AMAs

Groundwater conditions have changed in each AMA in response to changing groundwater demands, sources of supply and recharge conditions. The change in groundwater levels have been analyzed in each AMA using annual water level measurement data that are collected by ADWR staff, with supplemental measurement data supplied by the U.S. Geological Survey and by the City of Tucson. Groundwater Site Inventory (GWSI) groundwater data were analyzed over the period from the late 1980s and early/mid 1990s to the mid/ late 2000s. Data were selected for analysis based on the availability of water level measurements for each AMA. Water level changes in each AMA are shown in Figures 3-7. Water level change statistics for each groundwater sub-basin of each AMA are listed in Table 3.

As previously mentioned, the water level change data that are summarized in Table 3 were developed over periods of time covering the last 15 to 20 years. As such, the data may not, in some locations, reflect more recent change trends. For example, the overall trend from 1994 to 2010 in the City of Tucson central well field was characterized by declining water levels. However, water levels have more recently risen in many wells in the Central well field, in response to reduced local pumping that has occurred as a result of the importation groundwater and recovered CAP water pumped from the aquifer system of the Avra Valley. Although there are some areas where the water level change measurements may not reflect recent trends, the data generally reflect both recent and long-term trends for most locations (see Tucson AMA hydrographs, Appendix A).

Phoenix AMA

Water level changes for the period from 1991 to 2008/09 in the Phoenix AMA include areas of significant water level rise and decline (see Table 3 and Figure 3). Hydrographs of wells showing typical water level changes are included in Appendix A. In general, water level trends in the Phoenix AMA were strongly influenced by water use changes related to urbanization and development of agricultural and desert land, and the introduction and use of CAP water for agriculture, municipal and industrial use. Water levels were also impacted by incidental recharge, mainly from agriculture, artificial recharge of CAP water and recharge and direct use of reclaimed water. Reductions in municipal pumping occurred in certain areas where regional land subsidence was a concern. Additionally, water conservation programs and occasional natural recharge events also impacted groundwater conditions in specific areas.

In the western and southwestern portion of the Hassayampa sub-basin water levels rose in areas where non-irrigation district agricultural groundwater pumping had decreased from earlier rates, and in the Tonopah Irrigation District where CAP water deliveries displaced groundwater withdrawals. Water levels rose in the area of the Central Arizona Water Conservation District (CAWCD) Tonopah Desert Recharge Facility, where substantial artificial recharge began in about 2006. Minor water level recoveries were noted in the north central portion of the Hassayampa Plain. In the Hassayampa sub-basin the mean annual water level change rate for 18 wells that showed water level rises was about +1.0 feet/year and the mean annual water level change rate for 17 wells that showed water level declines was -.2 feet/year (Table 3).

In the West Salt River Valley (WSRV) sub-basin, water levels were stable or rose slightly near the Town of Buckeye and declined in eastern portions of the Buckeye and Roosevelt Irrigation Districts (ROOSID). Water levels declined by as much as 30 feet in the northwestern portion of the WSRV near Sun City West, Surprise and El Mirage. Water levels recovered by as much as 100 feet or more to the west and northwest of Luke Air Force Base, in the central and southern Maricopa Water District (MWD) service area. Water level rises in this area reflect the impacts of reduced agricultural pumping and CAP water use, and potential impacts to aquifer storage properties due to historical land subsidence in the area. Water levels recovered by about 10 to 20 feet in areas near the Agua Fria River, east of Sun City, where several artificial recharge facilities have been built over the last several years. In the north-central and northeastern portions of the WSRV water levels have recovered in parts of Peoria, Glendale and Phoenix due to urbanization of agricultural lands, and use of CAP water by these communities. In the southwestern portion of the Salt River Project (SRVWUA) service area, water levels declined by 10 to 30 feet in parts of Avondale, Tolleson and Phoenix. Some wells located near the Salt River showed significant water level rises during 1993 when major flooding occurred. In the WSRV sub-basin, the mean annual water level change rate for the 111 wells that showed rising water levels was about +1.7 feet/year and the mean annual water level change rate for 162 wells that showed water level declines was about -1.0 feet/year (Table 3).

Water levels recovered by about 5 to 15 feet in agricultural areas in the northwestern portion of the Rainbow Valley sub-basin where historic groundwater withdrawals for farming declined. Water levels continued to decline in the southern Rainbow Valley sub-basin near Mobile. In the Rainbow Valley sub-basin, the mean annual water level change rate for 8 wells that showed water level rises was +0.7 feet/year and the mean annual water level change rate for 14 wells that showed water level declines was about -0.6 feet/year (Table 3).

In the Lake Pleasant sub-basin little water level change was noted in a well located about 5 miles south of Lake Pleasant. Further to the east, large water level fluctuations and overall water level rise were observed in one well located in the western portion of the Carefree sub-basin near Cave Creek. Water level recoveries in this area are mainly due to reduced municipal pumping and CAP water use by the Cave Creek Water Company, beginning in the late 1980s. Significant water level recoveries were observed in a well located further east in the sub-basin, near an area where golf course pumping had historically drawn down the aquifer. Water levels recovered by about 100 feet in this area due mainly to the importation of effluent and surface water for golf course irrigation provided by the City of Scottsdale, beginning around 1993. Since 2004, artificial recharge of CAP water in the North Scottsdale USF has also contributed to water level recovery in the Carefree area.

To the southeast, water levels recovered in the southern part of the Fountain Hills sub-basin near Fountain Hills where CAP water use by the Chapparal City Water Company reduced groundwater withdrawals. Recharge of treated effluent also contributed to groundwater level recoveries of about 30 feet since the early 1990s. In the Fountain Hills sub-basin, the mean annual water level change rate for 4 wells that showed water level rises was about +0.4 feet/year and the mean annual water level change rate for the 3 wells that showed water level declines was -2.1 feet/year (Table 3).

Water level declines of about 10 to 20 feet were observed in the northwest portion of the East Salt River Valley (ESRV) sub-basin east of the Anthem area. Water level declines ranging from 10 to 50 feet were noted in several wells monitored in the northern portion of the ESRV sub-basin, north of the CAP canal, where the cities of Phoenix and Scottsdale and some golf courses and other users withdrawal groundwater in excess of local recharge. Water levels rose almost everywhere in the ESRV sub-basin south of the CAP canal in the cities of Phoenix, Scottsdale, Tempe, Mesa and Chandler. In these areas the cities have started to use large quantities of CAP water, and have significantly reduced municipal groundwater withdrawals. In these areas water levels have recovered by about 50 to 100 feet. Additionally, agricultural water demand in this area has been reduced or eliminated because of urbanization of farmland and use of CAP water at GSFs including the Roosevelt Water Conservation District (RWCD), the Salt River Project (SRP).

Significant water level recoveries (greater than 150 feet) have been observed south of the Salt River in east Mesa near the SRP – Granite Reef Underground Storage and Recovery Project (GRUSP), where CAP water and treated effluent from the City of Mesa is recharged. Further to the south, significant water level recoveries ranging from about 100 to about 250 feet also occurred in the Chandler Heights Irrigation District (CHID), Queen Creek Irrigation District (QCID) and New Magma Irrigation District (NMID) areas where farm lands have urbanized and large volumes of CAP water were used in-lieu of groundwater withdrawals for agriculture. It should be noted that the major water level recoveries that occurred in many areas that have used CAP water for agriculture have slowed or stabilized in more recent years. This observation is common among other agricultural areas that have used CAP water for the last 20 years or so. In these areas, the stabilization of water levels may reflect a new temporary equilibrium or balance between overall groundwater pumping and incidental and natural recharge. In the northeastern portion of the ESRV, water level declines of about 30 to 60 feet were observed in the Apache Junction area. Although municipal water providers in the Apache Junction area serve CAP water, the overall demand for groundwater in that area is still in excess of local recharge and steady water level declines continue to occur. In the East Salt River Valley sub-basin, the mean annual water level change rate for 149 wells that showed water level rises was about +4.6 feet/year and the mean annual water level change rate for the 23 wells that showed water level declines was about -1.1 feet/year (Table 3).

Pinal AMA

Water level trends in the Pinal AMA for the period from 1993 to 2008 include areas of significant water level rise and decline (Table 3 and Figure 4). Hydrographs of wells showing typical water level changes are included in Appendix A. From 1993 to 2008, groundwater conditions were significantly affected by CAP water use in agricultural areas where overall agricultural pumpage declined. Groundwater conditions were also significantly impacted by incidental recharge from irrigation water and recharge from Gila River flood events.

In the Eloy sub-basin, water levels generally rose in CAP districts including the Hohokam Irrigation and Drainage District (HOHOKAM) and the Central Arizona Irrigation and Drainage District (CENTRAL). Water levels generally declined outside the CAP service area, including the San Carlos Irrigation and Drainage District (SCIDD), and in other non-irrigation district agricultural areas. Near Florence, in the SCIDD area, most water levels rose in response to the major flood on the Gila River in 1993. However, water levels declined after that time as groundwater withdrawals for agriculture and municipal use were in excess of aquifer recharge. In the Hohokam Irrigation and Drainage District, water levels generally rose by 50 to 100 feet over the last 20 years. However, the significant water level recoveries that were noted in that area during the early years of CAP water use have now generally lessened or stabilized.

Further to the south, in the Central Arizona Irrigation and Drainage District portion of the sub-basin, most water levels generally rose in response to reduced agricultural pumping and CAP water use. Overall water level recovery since the introduction of CAP water in the late 1980’s has exceeded 100 feet in many locations. However, the major recoveries occurred in the early years of CAP use, and typical rises from 1993 to 2008 were generally in the range of 10 to 50 feet. Some areas of Central Arizona Irrigation and Drainage District show water level declines between 1993 and 2008. It is probable that local agricultural or municipal pumping in these areas is responsible for the declines. In the west-central portion of the Eloy sub-basin, water levels generally declined in the Casa Grande area and in the southwestern portion of the SCIDD. Declines in that area ranged from about 10 to 20 feet. In the Eloy sub-basin, the mean annual water level change rate for 314 wells that showed water level rises was about +1.3 feet/year and the mean annual water level change rate for the 175 wells that showed water level declines was about -1.8 feet/year (Table 3).

In the Maricopa-Stanfield sub-basin water levels generally rose in agricultural areas that used CAP water, including the Ak-Chin Indian Reservation (near Maricopa), and in most parts of the Maricopa-Stanfield Irrigation and Drainage District (MARSTAN). Water level recoveries in many parts of the Ak-Chin and the northern portion of the Maricopa Stanfield Irrigation and Drainage District have been in the range of 100 feet since 1993. However, lesser recoveries or declines were observed in the southeastern portion of Maricopa Stanfield Irrigation and Drainage District during that time. Lack of water level recovery in this area may be related to the overall pumping distribution in the sub-basin and also to the significant depth to water that may impact the timing and magnitude of agricultural recharge. In the Maricopa-Stanfield sub-basin, the mean annual water level change rate for 140 wells that showed water level rises was about +3.4 feet/year and the mean annual water level change rate for the 33 wells that showed water level declines was about -1.0 feet/year (Table 3).

Water levels in the Vekol Valley sub-basin have been relatively stable over the last 20 years, mainly due to the lack of development in that sub-basin. In the Vekol Valley sub-basin, the mean annual water level change rate for 3 wells that showed water level rises was about +0.1 feet/year and the mean annual water level change rate for the 9 wells that showed water level declines was about -0.1 (Table 3). Minor water level declines of about 6 to 12 feet were observed in wells located in and near agricultural areas in the northeastern portion of the Aguire Valley sub-basin

Tucson AMA

Water level trends in the Tucson AMA for the period from 1994 to 2010 include areas of significant water level rise and decline (Table 3 and Figure 5). Hydrographs of wells showing typical water level changes are included in Appendix A. From 1994 to 2010 water levels were impacted by several important factors, including: the introduction and use of CAP water in many agricultural areas that replaced or reduced overall agricultural pumping; recharge of CAP water at several artificial recharge facilities; direct use and recharge of reclaimed water; the relatively recent reduction of municipal pumping in the City of Tucson’s central well field due to the importation of groundwater pumped in the Avra Valley; and sporadic increases in natural recharge along the AMAs rivers and streams during years of above average precipitation and runoff.

In the northern Avra Valley about 9 miles north of Red Rock near Durham Wash, water level declines of about 5 to 10 feet were observed for the period from 1994 to 2010. Declines in that area were likely influenced by groundwater pumping in agricultural areas further to the south. In the Kai Farms-Red Rock area just east of Picacho Peak water levels were observed to recover by about 20 to 40 feet due to the introduction of CAP water in that area beginning around 1997 and 1998, recoveries were also influenced by the elimination of large pecan groves in that area during the 2000's. Further to the southeast near Marana, water level recoveries of about 50 to 100 feet were observed in wells located in the Cortaro Marana Irrigation District (CORTMAR) and BKW Farms areas where substantial CAP water was used for agriculture beginning as early as 1993. Water level recoveries in this area were also due to artificial recharge of CAP water at CAWCD and Pima County recharge facilities (High Plains, Lower Santa Cruz Constructed and Avra Valley) located near Marana that began in the late 1990's.

Water level recoveries in the range of 5 to 20 feet were observed over a large portion of the non-irrigation district agricultural land located in the central Avra Valley. Recoveries in these areas were the result of a combination of factors including reduced local agricultural pumping, the regional impacts from artificial recharge and use of CAP water in other agricultural areas. In the central and south-central Avra Valley, water levels rose by 30 to 90 feet, or more, since the late 1990's near the City of Tucson's, Central Avra Valley Storage and Recovery Project (CAVSARP) and Southern Avra Valley Storage and Recovery Project (SAVSARP) recharge sites, where CAP water is recharged. Water level declines of 20 to about 50 feet were observed immediately south of the SAVSARP area where numerous domestic wells withdraw groundwater and the City of Tucson withdraws and recovered CAP water. In the southern Avra Valley, along the US–Mexico border near Sasabe, water levels were observed to decline by about 5 to 15 feet from 1994 to 2010. In the Avra valley sub-basin, the mean annual water level change rate for 98 wells that showed water level rises was about +1.9 feet/year and the mean annual water level change rate for the 33 wells that showed water level declines was about -1.0 feet/year (Table 3).

In the Upper Santa Cruz sub-basin, water levels were observed to decline by about 20 to 100 feet in the Oracle Junction and Oro Valley areas, respectively. Water level declines in these areas are mainly due to groundwater pumping for municipal and industrial users. Rapid water level rises were also observed in some wells in this area reflecting pulses of natural recharge associated with floods along the Canada del Oro Wash. Water level declines were generally observed from the Rillito Narrows area (the narrow gap between the Tucson Mountains and the Tortillitas) to the southeast through most of the metro Tucson area. Declines in this broad area are mainly due to municipal, industrial and minor agricultural pumping. Declines range from about 20 to 40 feet along the Santa Cruz River from the Rillito area to the southwest Tucson area near the junction of Interstate 19 and Interstate 10. Water level declines in the City of Tucson's central well field, near the University of Arizona campus, were in the range of 5 to 15 feet. It should be noted that the overall water level changes (from 1994 to 2010) in many parts of the City of Tucson's central well field do not tell the recent story of water level change in the area. Water levels have generally been rising in much of the central Tucson well field area as local municipal pumping has been reduced since the late 1990s and supplemented with large volumes of recovered CAP water from the Avra Valley.

Water levels have declined by 30 to 50 feet in the Vail area in the eastern part of the Upper Santa Cruz basin as municipal and industrial groundwater demands have grown in the general area. Water levels dropped by 20 to 50 feet or more, in the eastern and northeastern Tucson areas, again reflecting the overall impacts of significant municipal groundwater demands. Wells located along Tanque Verde Wash, Rillito Creek and Sabino Creek showed responses to periodic flood flows.

Near the northeastern corner of the San Xavier Reservation, groundwater levels have recovered substantially due to a combination of reduced municipal, industrial and agricultural pumping (non-Indian and Indian) and to the recent introduction of CAP water used for farming and recharge at the Arroyos recharge facility in the northeastern corner of the Reservation. Further south along most of the eastern boundary of the San Xavier Reservation water levels have recovered by about 50 feet due to a combination of reduced municipal and mining pumping, and to substantial recharge of CAP water at the CAWCD Pima Mine Road Recharge Project. In the Green Valley area, water levels declined by about 50 feet since 1994, due to the combined impacts of agricultural, mining and municipal pumping. In the Upper Santa Cruz sub-basin, the mean annual water level change rate for 78 wells that showed water level rises was about +1.2 feet/year and the mean annual water level change rate for the 450 wells that showed water level declines was about -1.7 feet/year (Table 3).

Santa Cruz AMA

Water level trends in the Santa Cruz AMA for the period from 1987 to 2010 include areas of fluctuating and generally declining water levels along the Santa Cruz River (Table 3 and Figure 6). Hydrographs of wells showing typical water level changes are included in Appendix A. From 1987 to 2010 water levels were impacted by several important factors, including recharge from flood flows on major drainages, recharge of treated effluent released from the Nogales International Wastewater Treatment Plant (NIWWTP), groundwater and surface water withdrawals from agricultural and municipal wells and riparian groundwater demands and drought.

From 1987 to 2010 water levels declined by about 5 to 10 feet in agricultural areas located along Sopari Wash in the western portion of the AMA. Overall water level declines along Sopari Wash may have been caused by a combination of agricultural withdrawals and drought conditions. Water levels along Sopari Wash showed periodic fluctuations that generally correlate with years of higher annual precipitation and probable increased flood recharge.

Water levels generally declined from 1987 to 2010 along the Santa Cruz River from the northern AMA boundary near Amado to the international boundary with Mexico (east of

Nogales). During this time, water level declines along the effluent dominated reach of the Santa Cruz River (from the northern AMA boundary to Rio Rico) ranged from about 15 feet near Amado, no change at Tubac, about 10 feet of decline south of Tumacacori, and less than 10 feet of decline at Rio Rico. The overall decline in water levels along this reach of the Santa Cruz River during this period of time are caused by a combination of factors that include: municipal and agricultural pumping, riparian demands, reduced natural recharge from flood events and reduced effluent recharge due to the effects of effluent induced "clogging layers" developing on the stream bottom. However, hydrographs for many wells along this reach of the Santa Cruz show periodic water level recoveries due to flood events along the Santa Cruz and its tributaries that can contribute significant recharge.

South of Rio Rico, along the Santa Cruz River, water levels are not impacted by effluent flows and were observed to decline about 15 feet in one well located about a mile north of Guevavi Narrows and by about 29 feet at a well located at the City of Nogales – Highway 82 well field. Water levels generally declined in the range of 7 to 10 feet from the Highway 82 well field to the US-Mexico border. Overall water level declines along this reach were caused by a combination of municipal and agricultural pumping, riparian water demand, and reduced recharge from stream flow.

About 4 miles northwest of the City of Nogales, water levels declined by about 20 feet in the City's Portrero Canyon well field. Water level declines in this area are caused mainly by municipal groundwater withdrawals that are in excess of the natural rate of recharge. In the Santa Cruz AMA, the mean annual water level change rate for 6 wells that showed water level rises was about +0.2 feet/year and the mean annual water level change rate for the 42 wells that showed water level declines was about -0.5 feet/year (Table 3).

Prescott AMA

Water level trends in the Prescott AMA for the period from 1994 to 2010 include areas of declining water levels in most of the AMA and significant recovery of water levels in one area where a major change in municipal pumping patterns occurred. (Table 3 and Figure 7). Hydrographs of wells showing typical water level changes are included in Appendix A. From 1994 to 2010, water levels were impacted by several important factors, including: groundwater withdrawals for municipal, agricultural, industrial and domestic uses; recharge from flood flows on major drainages; recharge of treated effluent by the City of Prescott and the Town of Prescott Valley; and drought.

In the northern part of the Little Chino sub-basin north of the Town of Chino Valley, water levels were observed to decline by about 20 to 30 feet over the period from 1994 to 2010. Water level declines in this area were caused mainly by groundwater pumping at the City of Prescott's Chino Valley well field and to agricultural, minor industrial and domestic pumping in the same general area. Historically, groundwater pumping in this area has caused once flowing artesian wells to stop flowing and groundwater discharge at Del Rio Springs to decline. East of Chino Valley, one well located along Granite Creek showed impacts of recharge from sporadic flow events in 1993 and 2005. Further south along Granite Creek near the City of Prescott's Airport Recharge facility, shallow wells showed water level rises due to the combined impacts of recharge from treated effluent at the site and sporadic flood flows on Granite Creek. However, deeper wells that penetrate the confined Lower Volcanic Unit (LVU) basin-fill aquifer in that same area showed declines of over 20 feet during the same time period in response to municipal, agricultural and industrial pumping from this unit.

In the southwestern portion of the Little Chino sub-basin, near Granite Mountain and Williamson Valley Road, water levels were observed to decline by 10 to 60 feet, or more, in wells drilled in basin-fill and/or fractured bedrock formations. Water level declines in this area are primarily due to domestic and small water company pumping. However, prolonged drought that has reduced local natural recharge in the area has likely also contributed to the overall decline. In the Little Chino sub-basin, the mean annual water level change rate for 4 wells that showed water level rises was about +0.9 feet/year and the mean annual water level change rate for the 31 wells that showed water level declines was about -1.4 feet/year (Table 3).

In the northern part of the Upper Agua Fria sub-basin, water levels have recovered by 200 feet, or more, in some deep municipal wells located in the Prescott Valley-Santa Fe well field. Recoveries at the Santa Fe well field are due to the construction and operation of several new municipal wells in the Prescott Valley-North well field, located a few miles to the north in Lonesome Valley. The construction of the new wells has allowed Prescott Valley to balance and optimize pumping operations over its service area. Water level declines in other parts of the Prescott Valley area generally showed declines in the range of 11 to 38 feet. In the northeastern portion of the Upper Agua Fria sub-basin water levels declined by 7 to 10 feet in the Coyote Springs area. Declines in this area were due to a combination of local domestic pumping and potentially to reductions in natural recharge because of drought.

Water level declines were observed in most other portions of the central and northern sections of the Upper Agua Fria sub-basin. However, impacts of sporadic recharge of flood flows on Lynx Creek and the Agua Fria River were observed in the hydrographs of some wells located close to those drainages. The water level of one well located along the Agua Fria River near Dewey rose by about 3 feet from 1994 to 2010. The rise in water level for that well shows evidence of periodic flood recharge and more gradual recovery that may be associated with reductions in local agricultural pumping and artificial recharge from the Town of Prescott Valley's Upper Agua Fria Recharge facility. In the Upper Agua Fria sub-basin, the mean annual water level change rate for 6 wells that showed water level rises was about +0.9 feet/year and the mean annual water level change rate for the 14 wells that showed water level declines was about -14 feet/year (Table 34).

Outside Active Management Areas

The following section provides information on some of the major factors that have impacted hydrologic conditions in planning areas outside AMAs, and provides a framework for the detailed discussion of hydrologic conditions in each planning area that follows.

Municipal, Agricultural, Mining, Thermoelectric-Power and Drainage Water Use

Since 1990, urban and rural populations grew from about 622,000 to about 960,000 in 2010 in Apache, Cochise, Coconino, Gila, Graham, Greenlee, La Paz, Mohave, Navajo, and Yuma counties (Table 5).

In areas outside AMAs, municipal groundwater demand grew roughly in proportion to population growth, increasing from about 130,000 acre-feet/year in 1991 to 180,000 acre-feet/year in 2009 (Table 10). Total agricultural water demand outside AMAs remained relatively constant at about 3.14 million acre-feet/year for the period from 1990 to 2009, with about 2.07 million acre-feet/year being supplied by surface water (mainly Colorado River and Gila River water) and about 1.07 million acre-feet/year being supplied by groundwater. Outside AMAs, groundwater demands for mining decreased from about 80,000 acre-feet/year in 1991 to about 60,000 acre-feet/year in 2009 (Table 10). During the same time period groundwater demand for electric power generation outside AMAs increased from about 34,000 acre-feet/year to 58,000 acre-feet/year. Total agricultural drainage pumping in the Yuma and Wellton-Mohawk areas averaged about 216,000 acre-feet/year from 1991 to 2009.

Groundwater Withdrawals for Irrigation, Municipal, Mining, Thermoelectric-Power, and Drainage Uses in Arizona Outside Active Management Areas 1991-2009 (Acre-Feet) [1]

	Eastern Plateau Planning Area					Western Plateau Planning Area					Upper Colorado River Planning Area					Lower Colorado River Planning Area						Southeastern Planning Area					Central Highlands Planning Area					Statewide Outside AMAs					
Year	Ag	Muni	Mining	Electric Power	Total	Ag	Muni	Mining	Electric Power	Total	Ag	Muni	Mining	Electric Power	Total	Ag	Muni	Mining	Electric Power	Drainage	Total	Ag	Muni	Mining	Electric Power	Total	Ag	Muni	Mining	Electric Power	Total	Ag	Muni	Mining	Electric Power	Drainage	Total
1991	37,000	29,000	4,200	27,500	97,700	9,200	2,400	0	0	11,600	55,000	30,400	17,500	0	102,900	635,200	16,700	300	0	249,000	901,200	271,700	34,400	45,800	6,600	358,500	10,400	16,850	11,200	0	38,450	1,018,500	129,750	79,000	34,100	249,000	1,510,350
1992	36,000	29,000	4,000	29,000	98,000	8,700	2,450	0	0	11,150	51,500	34,600	15,000	0	101,100	607,300	17,200	300	0	190,500	815,300	241,800	34,900	45,350	6,500	328,550	11,300	16,500	11,700	0	39,500	956,600	134,650	76,350	35,500	190,500	1,393,600
1993	36,000	29,000	3,900	29,500	98,400	9,200	2,500	0	0	11,700	54,000	34,100	18,500	0	106,600	628,300	17,950	300	0	85,400	731,950	288,300	34,350	44,700	5,000	372,350	12,200	18,200	11,200	0	41,600	1,028,000	136,100	78,600	34,500	85,400	1,362,600
1994	34,500	30,500	4,200	34,500	103,700	9,600	2,550	0	0	12,150	59,000	36,300	20,500	0	115,800	674,000	18,800	300	0	122,000	815,100	309,900	37,000	47,700	5,900	400,500	11,500	18,900	11,800	0	42,200	1,098,500	144,050	84,500	40,400	122,000	1,489,450
1995	39,000	30,500	4,500	27,000	101,000	9,900	2,600	0	0	12,500	42,200	37,700	20,500	0	100,400	689,700	18,900	300	0	220,500	929,400	279,800	37,150	45,200	5,700	367,850	11,900	19,700	11,800	0	43,400	1,072,500	146,550	82,300	32,700	220,500	1,554,550
1996	21,000	34,000	4,200	29,500	88,700	10,100	2,600	0	0	12,700	48,200	40,400	21,500	0	110,100	657,400	21,000	300	0	209,200	887,900	307,300	39,200	49,800	4,100	400,400	13,200	21,200	12,300	0	46,700	1,057,200	158,400	88,100	33,600	209,200	1,546,500
1997	21,500	34,000	4,300	32,000	91,800	9,500	2,700	0	0	12,200	45,700	41,200	23,500	0	110,400	679,800	21,000	300	0	190,950	892,050	265,800	39,450	49,550	4,600	359,400	12,400	21,400	7,600	0	41,400	1,034,700	159,750	85,250	36,600	190,950	1,507,250
1998	27,500	32,500	4,200	32,000	96,200	9,000	2,750	0	0	11,750	32,700	40,300	20,500	0	93,500	579,800	20,450	300	0	210,700	811,250	265,100	39,200	48,100	5,600	358,000	10,200	20,700	6,200	0	37,100	924,300	155,900	79,300	37,600	210,700	1,407,800
1999	25,500	35,000	4,600	34,000	99,100	10,000	2,950	0	0	12,950	35,200	41,600	22,000	0	98,800	647,600	21,500	300	0	212,500	881,900	245,700	39,050	42,650	5,700	333,100	9,800	21,400	7,200	0	38,400	973,800	161,500	76,750	39,700	212,500	1,464,250
2000	15,500	38,000	4,900	33,000	91,400	10,300	3,100	0	0	13,400	37,200	44,700	23,550	0	105,450	747,800	22,350	300	0	221,300	991,750	353,700	39,850	35,050	6,000	434,600	12,800	22,900	9,200	0	44,900	1,177,300	170,900	73,000	39,000	221,300	1,681,500
2001	13,500	37,000	4,800	37,000	92,300	3,000	3,200	0	0	6,200	35,100	45,700	24,550	1,100	106,450	720,000	16,700	300	0	229,300	966,300	296,800	37,500	25,750	5,500	365,550	15,100	23,600	10,700	0	49,400	1,083,500	163,700	66,100	43,600	229,300	1,586,200
2002	17,000	39,000	4,900	35,000	95,900	3,000	3,300	0	0	6,300	34,200	45,750	16,700	1,600	98,250	740,500	16,900	300	0	239,700	997,400	375,200	39,050	25,500	5,200	444,950	15,600	25,400	9,200	0	50,200	1,185,500	169,400	56,600	41,800	239,700	1,693,000
2003	15,000	38,000	4,700	36,000	93,700	3,100	3,300	0	0	6,400	34,700	46,050	20,500	1,300	102,550	693,700	17,000	300	0	252,500	963,500	428,600	39,200	26,000	6,100	499,900	14,500	25,500	8,700	0	48,700	1,189,600	169,050	60,200	43,400	252,500	1,714,750
2004	10,000	38,000	4,700	36,000	88,700	3,200	3,400	0	0	6,600	37,000	51,050	21,000	1,100	110,150	685,900	22,900	300	4,900	227,500	941,500	373,300	37,850	22,400	5,700	439,250	13,200	27,000	8,900	0	49,100	1,122,600	180,200	57,300	47,700	227,500	1,635,300
2005	8,800	35,000	4,900	36,500	85,200	3,200	3,400	0	0	6,600	31,400	47,150	19,500	850	98,900	667,700	25,100	300	4,400	224,500	922,000	334,400	39,050	21,600	5,800	400,850	14,400	26,400	9,300	0	50,100	1,059,900	176,100	55,600	47,550	224,500	1,563,650
2006	8,700	37,500	1,500	37,000	84,700	2,100	2,000	0	0	4,100	32,200	51,050	16,500	1,300	101,050	688,000	26,300	300	5,400	241,500	961,500	310,400	39,350	26,300	6,200	382,250	13,700	27,300	9,000	0	50,000	1,055,100	183,500	53,600	49,900	241,500	1,583,600
2007	8,800	40,500	1,500	43,000	93,800	2,100	2,000	0	0	4,100	31,700	52,550	19,500	1,900	105,650	729,500	25,950	300	6,700	258,000	1,020,450	320,900	39,850	27,000	6,300	394,050	13,900	27,400	8,800	0	50,100	1,106,900	188,250	57,100	57,900	258,000	1,668,150
2008	7,900	39,500	1,500	43,500	92,400	2,000	2,000	0	0	4,000	31,800	52,350	21,500	1,600	107,250	739,000	25,800	300	7,800	283,000	1,055,900	328,300	37,800	28,600	6,000	400,700	6,800	26,500	7,600	0	40,900	1,115,800	183,950	59,500	58,900	283,000	1,701,150
2009	8,600	35,200	1,700	43,000	88,500	2,000	2,100	0	0	4,100	24,700	49,550	25,700	1,600	101,550	721,100	26,050	300	8,900	236,000	992,350	313,700	39,750	24,400	4,600	382,450	7,100	26,500	6,800	0	40,400	1,077,200	179,150	58,900	58,100	236,000	1,609,350
1991-2009 Average	20,621	34,800	3,853	34,474	93,747	6,274	2,700	0	0	8,974	39,658	43,289	20,447	650	104,045	680,647	20,976	300	2,005	216,003	919,932	311,089	38,103	35,866	5,637	390,695	12,105	22,808	9,432	0	44,345	1,070,395	162,676	69,897	42,766	216,003	1,561,737

Surface Water Withdrawals for Irrigation and Thermoelectric-Power Uses in Arizona Outside Active Management Areas 1991-2009 (Acre-Feet) [1,2]

	Eastern Plateau Planning Area					Western Plateau Planning Area					Upper Colorado River Planning Area					Lower Colorado River Planning Area						Southeastern Planning Area					Central Highlands Planning Area					Statewide Outside AMAs					
Year	Ag	Muni	Mining	Electric Power [2]	Total	Ag	Muni	Mining	Electric Power	Total	Ag	Muni	Mining	Electric Power	Total	Ag	Muni	Mining	Electric Power	Drainage	Total	Ag	Muni	Mining	Electric Power	Total	Ag	Muni	Mining	Electric Power	Total	Ag	Muni	Mining	Electric Power	Drainage	Total
1991	0	0	0	NA	NA	0	0	0	0	0	59,000	0	0	0	59,000	1,929,000	0	0	0	0	1,929,000	136,000	0	0	0	136,000	0	0	0	0	0	2,124,000	0	0	NA	0	2,124,000
1992	0	0	0	NA	NA	0	0	0	0	0	44,500	0	0	0	44,500	1,780,000	0	0	0	0	1,780,000	133,000	0	0	0	133,000	0	0	0	0	0	1,957,500	0	0	NA	0	1,957,500
1993	0	0	0	NA	NA	0	0	0	0	0	59,000	0	0	0	59,000	1,692,000	0	0	0	0	1,692,000	130,000	0	0	0	130,000	0	0	0	0	0	1,881,000	0	0	NA	0	1,881,000
1994	0	0	0	NA	NA	0	0	0	0	0	58,000	0	0	0	58,000	1,911,500	0	0	0	0	1,911,500	120,000	0	0	0	120,000	0	0	0	0	0	2,089,500	0	0	NA	0	2,089,500
1995	0	0	0	NA	NA	0	0	0	0	0	62,500	0	0	0	62,500	1,971,000	0	0	0	0	1,971,000	120,000	0	0	0	120,000	0	0	0	0	0	2,153,500	0	0	NA	0	2,153,500
1996	0	0	0	21,427	21,427	0	0	0	0	0	66,500	0	0	0	66,500	2,111,500	0	0	0	0	2,111,500	103,000	0	0	0	103,000	0	0	0	0	0	2,281,000	0	0	21,427	0	2,302,427
1997	0	0	0	22,364	22,364	0	0	0	0	0	67,500	0	0	0	67,500	1,988,500	0	0	0	0	1,988,500	135,000	0	0	0	135,000	0	0	0	0	0	2,191,000	0	0	22,364	0	2,213,364
1998	0	0	0	25,017	25,017	0	0	0	0	0	61,000	0	0	0	61,000	1,914,500	0	0	0	0	1,914,500	138,000	0	0	0	138,000	0	0	0	0	0	2,113,500	0	0	25,017	0	2,138,517
1999	0	0	0	26,697	26,697	0	0	0	0	0	79,500	0	0	0	79,500	1,918,000	0	0	0	0	1,918,000	116,000	0	0	0	116,000	0	0	0	0	0	2,113,500	0	0	26,697	0	2,140,197
2000	0	0	0	28,709	28,709	0	0	0	0	0	66,000	0	0	0	66,000	1,981,500	0	0	0	0	1,981,500	53,500	0	0	0	53,500	0	0	0	0	0	2,101,000	0	0	28,709	0	2,129,709
2001	0	0	0	27,620	27,620	0	0	0	0	0	63,500	0	0	0	63,500	1,957,500	0	0	0	0	1,957,500	125,000	0	0	0	125,000	0	0	0	0	0	2,146,000	0	0	27,620	0	2,173,620
2002	0	0	0	28,415	28,415	0	0	0	0	0	62,000	0	0	0	62,000	2,028,000	0	0	0	0	2,028,000	68,500	0	0	0	68,500	0	0	0	0	0	2,158,500	0	0	28,415	0	2,186,915
2003	0	0	0	26,284	26,284	0	0	0	0	0	57,500	0	0	0	57,500	1,901,500	0	0	871	0	1,902,371	48,500	0	0	0	48,500	0	0	0	0	0	2,007,500	0	0	27,155	0	2,034,655
2004	0	0	0	27,375	27,375	0	0	0	0	0	69,000	0	0	0	69,000	1,818,000	0	0	135	0	1,818,135	46,500	0	0	0	46,500	0	0	0	0	0	1,933,500	0	0	27,510	0	1,961,010
2005	0	0	0	26,200	26,200	0	0	0	0	0	72,500	0	0	0	72,500	1,792,000	0	0	351	0	1,792,351	117,000	0	0	0	117,000	0	0	0	0	0	1,981,500	0	0	26,551	0	2,008,051
2006	0	0	0	26,660	26,660	0	0	0	0	0	59,500	0	0	0	59,500	1,867,500	0	0	557	0	1,868,057	99,000	0	0	0	99,000	0	0	0	0	0	2,026,000	0	0	27,217	0	2,053,217
2007	0	0	0	27,604	27,604	0	0	0	0	0	70,000	0	0	0	70,000	1,913,500	0	0	899	0	1,914,399	130,000	0	0	0	130,000	0	0	0	0	0	2,113,500	0	0	28,503	0	2,142,003
2008	0	0	0	26,334	26,334	0	0	0	0	0	74,000	0	0	0	74,000	1,829,000	0	0	1,224	0	1,830,224	129,000	0	0	0	129,000	0	0	0	0	0	2,032,000	0	0	27,558	0	2,059,558
2009	0	0	0	NA	NA	0	0	0	0	0	64,000	0	0	0	64,000	1,883,000	0	0	1,130	0	1,884,130	99,500	0	0	0	99,500	0	0	0	0	0	2,046,500	0	0	1,130	0	2,047,630
1991-2009 Average	0	0	0	26,208	26,208	0	0	0	0	0	63,974	0	0	0	63,974	1,904,605	0	0	272	0	1,904,877	107,763	0	0	0	107,763	0	0	0	0	0	2,076,342	0	0	26,480	0	2,102,822

1 Data from USGS Annual Water Use Spreadsheet: Available at http://az.water.usgs.gov/projects/9671-9DW/

2 Data from USBR Reports 1996-2008 Arizona Portion of Colorado River Consumptive Use Reports: Available at http://www.usbr.gov/uc/library/envdocs/reports/crs/az/index.html

Table 10 Groundwater and Surface Water Use By Planning Areas for Irrigation, Municipal, Mining, Thermoelectric-Power and Drainage – Outside Active Management Areas (1991 to 2009)

Climate, Stream Flow

As previously mentioned, annual precipitation varied significantly throughout the state during the 1990s and 2000s and provided a few sporadic years of above average stream flow, but more generally, a sustained period of below average precipitation (drought) with decreased stream flow (see Tables 8, 9 and 11).

Variations and general reductions in annual precipitation over the Colorado River watershed also occurred during the 1990s and 2000s. These variations significantly impacted the runoff to the Colorado River and the storage at Lake Powell and Lake Mead. Fortunately, the combination of large reservoir storage and senior water rights for most of Arizona's mainstem Colorado River water users resulted in no forced reductions in surface water deliveries during the period from 1990 to 2010.

The hydrologic impact of decreased stream flow is highly dependent upon the extent of development of surface water resources on certain watersheds outside AMAs, and the natural recharge provided from surface flow events. Table 11 presents annual stream flow data for selected gages on the Little Colorado, Bill Williams and Virgin River watersheds. In general, most stream gages show very high flows in water year 1993 due to the impact of above average precipitation in late 1992 and 1993. Other years of greater than average annual precipitation and stream flow include 2005 and 2010 (Tables 8 and 11).

Water Year	LCR at Cameron 9402000 (CFS)	LCR at Woodruff 9394500 (CFS)	LCR at Zion Res 9386030 (CFS)	LCR above Lyman Lake 9384000 (CFS)	Big Sandy at Wikieup 9424450 (CFS)	Bill Williams blw Alamo Lake 9426000 (CFS)	Bill Williams River near Parker 9426620 (CFS)	Virgin River at Littlefield 9415000 (CFS)	Beaver Dam Wash at Beaver Dam 9414900 (CFS)
1990	49.9	17.4	4.25	3.76	8.6	9.3	0.928	113.4	No data
1991	172.1	22.3	5.39	16.5	90.6	125.3	89.3	100.3	No data
1992	298	67.6	3.85	26	89.5	127.5	98.9	190.7	No data
1993	821.2	134.7	7.35	44.3	585.8	955.2	850.9	594.1	No data
1994	109.3	12.3	4.38	12.4	8.13	40.4	25.5	182.6	2.6
1995	251.3	25.4	4.41	27.1	152.8	264.9	227.6	492.6	No data
1996	23.5	14.2	2.6	3.26	3.91	27.1	9.46	163.7	2.7
1997	90.6	19.9	2.3	10.9	22.2	19.9	6.41	210.9	2.6
1998	180.6	16.5	1.1	12.9	109.3	30.3	6.8	378.3	5.0
1999	149.7	26.5	1.52	13.9	3.71	33.9	5.3	192.0	2.5
2000	14.1	4.36	1.36	3.55	3.05	24.1	3.24	147.2	2.5
2001	114.5	24.7	1.14	19	48.2	30.7	3.4	149.3	1.9
2002	103	56.5	1.82	3.18	3.29	28.6	2.79	102.6	1.8
2003	56.5	11	0.72	7	10.6	20.8	2.24	116.3	1.6
2004	73	9.84	0.121	9.43	35.1	16.5	4.17	112.8	1.6
2005	393.6	37.4	0.277	20.7	723.1	770.6	644.8	824.8	No data
2006	108.3	36.9	0.229	10	19.3	74.2	51.5	232.9	4.6
2007	153.1	56.3	0.812	10.3	46.8	34.5	17.4	133.3	3.5
2008	284.1	30.5	0.314	24.2	72.2	39.8	8.03	158.2	2.3
2009	74.8	8.34	0	16.4	72.9	49.9	11.3	125.1	2.8
2010	286.6	67.1	0.104	29.6	116.1	111.7	70.3	207.3	3.7
1990-2010 Mean CFS	181.3	33.3	2.1	15.4	106.0	135.0	101.9	234.7	2.8
1990-2010 Mean AFA	131,241	24,118	1,518	11,180	76,694	97,721	73,767	169,864	2,002
1994-2010 Mean CFS	145.1	26.9	1.4	13.8	85.3	95.2	64.7	231.2	2.8
1994-2010 Mean AFA	105,018	19,489	988	9,955	61,765	68,884	46,844	167,320	2,002
Long-Term Mean CFS	220.3	47.2183	6.0	21.3	92.5	135.6	97.68764	239.0	2.8
Long-Term Mean AFA	159,214	34124.6	4,335	15,370	66,824	97,979	70598.85	172,724	1,999
Long-Term Median CFS	180.6	37.15	4.4	15.4	44.6	39.8	9.16	187.2	2.6
Long-Term Median AFA	130,520	26848.3	3,165	11,130	32,232	28,763	6619.932	135,289	1,857
No. Years in LT Average	63	80	35	70	44	41	22	81	15
Earliest Year of Record	1948	1906	1976	1941	1967	1970	1989	1930	1994
Many gages have years with missing data									

Table 11 USGS Stream Gaging Data for Selected Gages in the Little Colorado River, Bill Williams River and Virgin River Watersheds (USGS, 2011)

Groundwater Conditions in Areas Outside AMAs

Groundwater conditions have changed in planning areas outside AMAs in response to changing groundwater demands, sources of supply and recharge conditions. The change in groundwater levels have been analyzed in each planning area using annual water level measurement data that are collected by ADWR staff, with supplemental measurement data supplied by the U.S. Geological Survey. Water level changes in each planning area are shown in Figures (8-11,13,14). Water level change statistics based on the data shown in the figures have been compiled for each groundwater sub-basin in each planning area (Table 3).

The water level change data that are summarized in Table 3 were developed over periods of time covering the last 15 to 20 years. As such, the data may not, in some locations, reflect more recent change trends. Although there are some areas where the water level change measurements may not reflect recent trends, the data generally reflect both recent and long-term trends for most locations (see hydrographs in Appendix A).

Southeastern Planning Area

Water level changes for the period from the late 1980s and early/mid 1990s to the mid/late 2000s in the Southeastern planning area mainly include areas of significant water level decline (Table 3 and Figure 8). Hydrographs of wells showing typical water level changes are included in Appendix A. In general, water level trends in the Southeastern planning area were strongly influenced by groundwater use for agriculture and to a lesser extent municipal, industrial (mainly mining) groundwater use. Drought and natural recharge from occasional flood events also impacted groundwater conditions in specific areas.

In the San Rafael basin, there is some minor domestic and stock pumping. However, groundwater changes from 1987 to 2008 were probably more related to climatic conditions than any other factor. Of the six wells measured in that basin two showed water level rises, with a mean annual rise rate of + 0.1 feet per year and 4 wells showed water level declines with a mean annual decline rate of -0.4 feet/year (Table 3). In the Cienega Creek basin, 19 of 54 wells measured during the period from 1987 to 2005 showed water level rises, with a mean annual rise rate of +0.2 feet/year. The mean annual decline rate for the 33 wells that showed water level declines was -0.3 feet/year. Drought, local recharge and pumping conditions were probably the most significant factors effecting water level conditions in the basin.

In the Sierra Vista sub-basin of the Upper San Pedro basin, water levels declined in 244 of 379 wells that were measured between 1990 and 2007 (Table 3). Water levels generally declined west of the San Pedro River from the US/Mexican border to north of Huachuca City. Declines in that area were mainly due to a combination of municipal and agricultural pumping. Some observed water level declines were probably caused by drought, and some rapid water level recoveries were seen in wells located near the San Pedro River (see Figure 8 and hydrographs). Recharge of reclaimed water at the Sierra Vista USF located about 5 miles east of Sierra Vista contributed to local recoveries in that area. Water level declines in the Sierra Vista area were in the range of -10 to -20 feet. Further north, groundwater levels declined by about -4 feet over the period measured in both the shallow and deep aquifer systems near Kartchner Caverns. Water levels also declined in the Tombstone area. Water level declines in the St. David and Benson areas were mainly due to agricultural and municipal pumping.

There are many flowing wells in the Sierra Vista sub-basin particularly near the San Pedro River. These wells flow naturally due to artesian pressure in the aquifer units that they penetrate. It was not possible to measure the changes in hydrostatic pressure for these wells due to the lack of pressure gauge equipment on these wells. Therefore, most of these wells were shown as having no change in water level for the statistical analysis (Table 3). The mean annual water level decline rate for wells showing declines in the Sierra Vista sub-basin was -0.5 feet/year. Rising water levels were observed in 111 wells that were measured from 1990 to 2007 in the sub-basin. Most wells that showed rises were located near or along the San Pedro River, potentially showing the impacts of recharge from periodic flood events. The mean annual water level recovery rate for the 111 wells in the sub-basin that showed rises over the period of measurement was about 0.3 feet/year (Table 3).

Water Levels in the Allen Flat sub-basin of the Upper San Pedro basin generally declined over the period from (1990 to 2006). Of the 7 wells measured, 6 showed water level declines, with a mean annual decline rate of -0.6 feet/year. One well in the sub-basin had a rise rate of +0.5 feet/year. The mean annual water level decline rate was -0.1 feet/year (Table 3).

Further north in the Mammoth sub-basin of the Lower San Pedro basin, minor water level fluctuations were observed in many wells located along the San Pedro River. These wells exhibit the impacts of local agricultural pumping, drought and periodic recharge to the aquifer from sporadic flow events on the San Pedro River. Overall groundwater pumping for mining was reduced from the early 1990s to the late 2000s in various parts of the Lower San Pedro sub-basin, such as near Oracle, San Manuel, Mammoth, Hayden and Kearney. However, the impacts of these reductions were not easily identified in the wells that were measured and reviewed. Of the 112 wells that were measured in the Mammoth sub-basin, 57 showed rises, with a mean annual water level rise rate of +0.6 feet/year, and 55 wells showed water level declines with a mean annual water level decline rate of -0.6 feet/year.

North of Oracle, water levels declined in 14 of 17 wells measured in the Camp Grant Wash sub-basin. Declines in that sub-basin may be due to the effects of minor domestic pumping and drought. The mean annual water level decline rate for wells showing declines was -0.9 feet/year and the mean annual water level rise rate for the 3 wells that showed recovery during the period studied (1994-2006) was +0.2 feet/year. Two wells were measured in the Dripping Springs Wash basin from 1990 to 2009. The mean annual water level decline rate for these two wells was -0.4 feet/year. Due to the overall lack of development in this basin the water level changes are likely due to climatic conditions. Water levels declined in the two wells that were measured in the Aravaipa basin from 1990 to 2007. The mean annual decline rate for the two wells was -0.1 feet/year. The small decline rate is indicative of the minor groundwater demand in the basin, and may also reflect the impacts of drought.

Water levels in the Douglas basin were significantly impacted by groundwater pumping for agriculture and municipal purposes. Water level declines near Douglas were generally less than -10 feet over the period from 1990 to 2004. Water level declines increased to about -30 to -50 feet in the northern portion of the basin (Figure 8). Of the 272 well measured in the basin, 240 showed water level declines, with a mean annual decline rate of -1.2 feet/year. The mean annual rise rate for the 31 wells that showed water level recoveries was +0.4 feet/year.

In the Willcox basin, water levels declined significantly from 1990 to 2005, mainly due to extensive agricultural pumping and pumping for thermoelectric-power generation near Willcox. Water level declines ranged from less than -10 feet in the southeastern portion of the basin. Declines of up to -90 feet were measured in the south-central portion of the basin and in the range of -20 to -30 feet in the northern portion of the basin (Figure 8). Significant historic and ongoing land subsidence and earth fissuring have been noted in the basin. The subsidence and earth fissures have been caused by long-term groundwater mining and associated water level decline that began in the basin in the 1940s (see hydrographs, Appendix A). ADWR Infrared Synthetic Aperture Radar (INSAR) data indicate current land subsidence rates in some parts of the basin to be up to 7 cm/year (ADWR, 2011). Over the period from 1990 to 2005, 560 of 587 wells measured in the basin showed water level declines. The mean annual decline rate was -2.0 feet/year. The mean annual rise rate for the 27 well that showed rises in the basin was 0.7 feet/year (Table 3).

Groundwater levels in the basin-fill aquifer of the San Bernadino Valley basin generally declined slightly from 1990 to 2007. However, a few wells located in the Chiricahua Mountains in the western portion of the basin showed large water level declines ranging from about -7 to -32 feet (Table 3). Declines in these wells may have been drought related, as total groundwater pumping in the basin is low. Of the 24 wells that were measured in the basin, 17 showed declines with a mean annual decline rate of -0.4 feet/year. Six of the wells measured showed rising water levels, with a mean annual rise rate of 0.1 feet/year. One well showed no change in water level over the period reviewed.

Water levels dropped significantly in most wells in the San Simon Valley sub-basin of the Safford basin from 1987 to 2007 (Figure 8). Water level declines in the San Simon Valley sub-basin were mainly caused by agricultural pumping. However, municipal pumping near Bowie and San Simon also contributed to local declines in those areas. Water levels declined in 201 of 286 wells measured in the San Simon Valley sub-basin from 1987 to 2007. The mean annual water level decline rate was -1.2 feet/year (Table

3). Water levels rose in 85 wells during the measurement period. The mean annual water level rise rate for these wells was +0.3 feet/year.

Water levels dropped slightly in a few wells measured in the Duncan Valley basin over the period from 1990 to 2007. Groundwater conditions in the Duncan Valley basin are mainly affected by variations in Gila River flow and the volume of agricultural pumping. The mean annual water level decline rate for the 5 wells observed to have declining water levels in the basin was -0.2 feet/year (Table 3). The mean annual water level rise rate was +0.1 feet/year for 2 wells measured. Only one well was measured in the Morenci basin from 1990 to 2007. The water level in that well dropped at a rate of -0.6 feet/year. Insufficient water level measurements were available in the Morenci basin to reasonably characterize groundwater level changes on a local or basin-wide basis.

Water level changes for the period from 1990 to 2008 in the Gila Valley sub-basin of the Safford basin ranged from a maximum decline in one well of -11 feet to a maximum rise in another well of about +28 feet. In general, most wells measured were near the Gila River and showed water level changes that were in the range of +/- 5 feet. Of the 14 wells measured over that time period, 6 showed water level rises, with a mean annual water level rise rate of 0.4 feet/year. Seven wells showed water level declines, with a mean annual water level decline rate of -0.2 feet/year (Table 3). Water level changes in the Gila Valley were most generally impacted by groundwater pumping, and incidental recharge from agricultural water use (groundwater and surface water) and natural recharge from normal flow and occasional flood events on the Gila River. Water level change data was available for only one well in the San Carlos Valley sub-basin of the Safford basin for the period from 1992 to 2007. That well showed no change in water level in the Cutter area. However, other wells measured in the area over longer time periods show significant decline in water levels near Cutter due to municipal pumping for the City of Globe (see hydrographs – Appendix A).

Lower Colorado River Planning Area

Groundwater levels declined in four wells measured in the Yuma basin area over the period from 1992 to 2009 due to pumping for agriculture, municipal use and drainage (see Table 3 and Figure 9). Water levels declined by -15 feet along the United States/Mexico border south of Yuma in the 242 Well Field area (Figure 9). Water level declines were also observed in some wells in the Yuma Mesa and Yuma Irrigation District areas. The mean annual decline rate for wells measured in the Yuma basin was -0.4 feet/year (Table 3).

Groundwater levels remained relatively stable in much of the Wellton-Mohawk sub-basin of the Lower Gila basin over the period from 1992 to 2007. Nine of the 20 wells measured over that time period showed water level rises, with a mean annual rise rate of about +0.3 feet/year. Eleven wells showed water level declines, with a mean annual decline rate of -0.4 feet/year (Table 3). Most well measurements showed little overall change in water level in areas along and near the Gila River in the general area of the

Wellton-Mohawk Irrigation and Drainage District. In that area, groundwater levels are mainly impacted by agricultural and drainage pumping and sporadic recharge from occasional flood flows along the Gila. One well north of Dateland showed a water level decline of -51 feet. A few wells in the Hyder area showed water level rises of about +15 feet. Water level rises in the Hyder area may be due to decreased agricultural pumping in the area.

Water levels dropped in 4 of 5 wells measured in the Western Mexican Drainage groundwater basin over the period from 1991 to 2004. Most of these wells were located in the southeastern portion of the basin. Two wells located about 12 to 15 miles northwest of Lukeville showed minor declines (-1 to -2 feet) that may have been drought related. One well in Lukeville had a water level decline of about -12 feet. Most of the water level decline in the Lukeville area was probably caused by municipal and agricultural pumping across the border in Sonoyta, Sonora, Mexico. The mean annual water level decline rate for wells experiencing declines in the Western Mexican Drainage basin was about -0.5 feet/year (Table 3). A water level decline of about -30 feet was measured between 1992 and 2009 in one well located in the Dendora Valley sub-basin of the Lower Gila basin (east of the Hyder area). The water level decline in that well was likely due to agricultural pumping. However, the measurement from the well is not sufficient to infer basin-wide groundwater level change trends.

Further to the northeast, groundwater levels declined significantly in the Gila Bend basin from 1993 to 2008, mainly due to agricultural pumping (Table 3 and Figure 9). During that period, water levels declined in 116 of 124 wells that were measured. The mean annual water level decline rate for those wells was the greatest, on average, of any basin in the state, with a mean annual decline rate of -4.3 feet/year (Table 3). Water levels in the Gila Bend basin are also impacted by recharge from occasional flood flows on the Gila River (see hydrographs, Appendix A) and pumping for thermo-electric and concentrated solar power generation will also be a future factor in some areas.

Water levels in the Harquahala INA showed varying patterns of change over the period from 1993 to 2009 (Figure 9). Several wells in the southeastern portion of the basin in the Harquahala Valley Irrigation District (HVID) area showed water level rises in the +10 to +50 foot range (Figure 9). Several wells in the northern portion of the HVID showed water level declines in the -10 to -30 foot range. Areas of water level recovery and decline in the Harquahala INA were caused by a combination of changing patterns of CAP water use and recharge, and groundwater pumping mainly for agriculture. Of the 27 wells measured in the Harquahala INA over the period from 1993 to 2009, 18 showed water level rises. The mean annual rise rate was +1.4 feet/year. The mean annual decline rate for the 9 wells measured that showed declines was -1.1 feet/year.

Groundwater conditions in the Butler Valley, Ranegras Plain and McMullen Valley basins of west-central Arizona were significantly impacted by agricultural pumping (Table 3 and Figure 9). Water levels declined in all 20 wells measured in the Butler Valley basin from 1990 to 2008. The mean annual water level decline rate for those wells was -1.0 feet/year.

In the Renegras Plain basin, water levels declined in 69 of 89 wells measured between 1988 and 2004. The mean annual decline rate was -0.9 feet/year. Most of the 20 wells that showed water level rises in the Ranegras Plain were located in the northern portion of the basin, where historic pumping levels may have declined slightly from earlier levels. The mean annual water level rise rate for wells showing rises in the Ranegras Plain was 0.3 feet/year.

Water levels declined in 80 of 84 wells measured in the McMullen Valley basin from 1989 to 2004. The mean annual water level decline rate for wells in the McMullen Valley was -2.2 feet/year. Significant land subsidence has been observed and documented in the McMullen Valley due to the historic water level decline (ADWR, 2011). West of the Ranegras Plain basin water levels were observed to decline in 3 wells located in the Quartzite area of the La Posa Plain sub-basin of the Parker basin (Figure 9). Declines in that area are probably due to municipal/domestic or industrial pumping.

Upper Colorado River Planning Area

Groundwater conditions varied in the Upper Colorado River planning area mainly due to the impacts of agricultural, municipal and mining pumping and drought. In some sub-basins of the planning area, there were insufficient water level measurements to reasonably characterize or quantify basin-wide groundwater trends or conditions. However, the measurements that were available provide some insight into local conditions.

In the Skull Valley sub-basin of the Bill Williams basin, groundwater levels rose over the period from 1991 to 2009 in 3 of 7 wells measured (Table 3 and Figure 10). The mean annual water level rise rate was about +0.3 feet/year. The mean annual water level decline rate for the 4 wells that had declining water levels was -1.3 feet per year (Table 3). Water levels declined in 3 of 5 wells measured in the Santa Maria sub-basin of the Bill Williams basin. The mean annual water level decline rate was -0.1 feet/year. The mean annual water level rise rate for the two wells that had rising water levels in the sub-basin was +0.2 feet per/year. Causes of water level change in both the Skull Valley and Santa Maria sub-basins may include changes in local pumping patterns and drought.

Groundwater levels rose in two of three wells measured in the Alamo Reservoir sub-basin of the Bill Williams basin from 1991 to 2009. The mean annual rate of water level rise was +0.1 feet/year, and the mean annual rate of water level decline in the one well that declined was -0.2 feet/year (see Figure 10 and Table 3). Further west in the Clara Peak sub-basin of the Bill Williams basin, water levels recovered by about +6 feet in one well measured at the Planet Ranch over the period from 1991 to 2008 (Figure 10 and Table 3). Water level recoveries in the Planet Ranch area are related to reduced agricultural pumping in recent years and occasional recharge from flood events on the Bill Williams River.

Groundwater levels showed minor fluctuations from 1993 to 2008 in the range of +/- 1 to 4 feet in several wells measured along the Big Sandy River near Wikieup in the Wikieup sub-basin of the Big Sandy basin (Figure 10 and Table 3). Water levels generally declined by a few feet in a few wells located southeast of Wikieup in the area of a well field that provides water for mining operations in Bagdad (see hydrograph UCR6, Appendix A). Groundwater levels generally rose in the northern portion of the sub-basin near I-40, and declined along Truxton Wash near Hackberry (Figure 10). Water level changes in the northern portion of the basin are probably related to variations in local pumping and natural recharge. Of the 37 wells measured in the basin between 1993 and 2008, 21 showed rising water levels with a mean annual rate of rise of +0.4 feet/year, and 16 wells showed water level declines with a mean annual decline rate of -0.5 feet per year (Table 3). To the east in the Fort Rock sub-basin of the Big Sandy basin, groundwater levels rose slightly over the period from 1995 to 2008 in two wells located near I40 in the northeastern portion of the sub-basin. Water levels declined in 4 wells located in the southwestern portion of the sub-basin near Skunk Canyon and Simmons Gulch. Water level declines in that area may be related to local domestic pumping and/or drought (Figure 10). The mean annual water level rise for the sub-basin was +0.2 feet/year and the mean annual water level decline for wells showing declines from 1995 to 2008 was -0.4 feet/year.

Along the Colorado River, water levels rose in one well measured in the Lake Havasu basin by about 25 feet from 1991 to 2009. The recovery in water level in that well may be related to changes in local pumping patterns (Figure 10). Further north along the Colorado River in the Lake Mohave basin, water levels rose by about +23 feet in one well located northeast of Bullhead City, and the water level declined by about -3 feet in one well located southeast of Bullhead City. Water level fluctuations of any significant amount in wells located near the Colorado River in either the Lake Havasu or the Lake Mohave basins are most likely caused by variations in local pumping rather than variations in natural recharge since lake levels for both of these basins are maintained at relatively constant levels compared to the main Colorado River storage reservoirs (Lake Mead and Lake Powell).

Groundwater levels in the Sacramento Valley basin mainly rose over the period from 1990 to 2006 (Table 3). Of the 82 wells that were measured over that time period in the basin, 60 wells showed rising water levels, with a mean annual rise rate of +0.8 feet/year (Table 3 and Figure 10). The annual water level decline rate for the 22 wells that showed declines was -0.5 feet/year. In general, water levels declined slightly in a few wells located near the basin's southwestern outlet to the Colorado River west of Franconia (Figure 10), while water levels recovered significantly in numerous domestic wells located along western flanks of the Hualapai Mountains in the southeastern portion of the basin (Figure 10). Although there is no clear explanation for the water level rises in wells in that area, it is possible that increased natural recharge may have been a contributing factor. Water level rises were generally noted in most other portions of the Sacramento Valley, with a few significant water level declines also noted near some local pumping centers (Figure 10).

In the Detrital Valley basin, water levels rose in 10 wells measured between 1995 and 2006 and declined in 5 wells (Figure 10 and Table 3). The mean annual rate of water level rise was +0.2 feet/year and the mean annual rate of water level decline was -0.8 feet/year. Water level changes were generally within the range of +/- 3 feet for most wells measured in the basin and are reflective of variations in natural recharge and local domestic pumping.

Groundwater levels rose in 26 of 46 wells measured in the Hualapai basin over the period from 1991 to 2006 (Table 3). The mean annual rise rate for those wells was +0.4 feet/year. The mean annual decline rate for the 20 wells that showed declined over that period was -0.9 feet/year. Significant water level declines, ranging from about -20 to -50 feet were observed in and near the City of Kingman's municipal well field (Figure 10). Minor water level recoveries were generally noted further north in the Red Lake area (Figure 10). Small water level declines were observed in several wells located in the Dolan Springs area (Figure 10).

Water levels generally declined over the period from 1995 to 2006 in the Meadview basin basin (Table 3 and Figure 10). Water level declines near Meadview were mainly caused by local pumping. The mean annual water level decline rate for the 7 wells that showed declines in the basin was -1.1 feet/year. Few water levels were available for the Peach Springs basin. One well showed a decline of -1 foot near Truxton over the period from 1995 to 2009 (Figure 3). Another well located in the southeastern portion of the basin showed a rise of about +6 feet.

Western Plateau Planning Area

Groundwater conditions in the Western Plateau planning area were affected by groundwater pumping and variations in natural recharge. However, being one of the least populated areas of the state, impacts from groundwater pumping were generally small. In the Virgin River basin water levels were observed to rise in two wells and decline in a third well that were measured between 1990 and 2009. In the Beaver Dam Wash area water levels water levels rose by about 11 feet in one well due to the combined effects of reduced agricultural pumping in the area and increased natural recharge from occasional flood events on Beaver Dam Wash in 1993, 1995 and 2005 (See Figure 11 and Tables 3 and 11).

A total of 5 wells were measured in the Grand Wash basin (2 wells, from 1991 to 2009), Kanab Plateau basin (2 wells, from 1992 to 2009) and the Shivwits Plateau basin (1 well, from 1992 to 2005). The magnitude of the changes were generally very small, suggesting that these basins probably are, except in a few limited areas, in a state of long-term equilibrium.

Water levels were observed to decline in 5 wells measured in the Wahweap area of the Paria basin, near Page and Lake Powell (Table 3 and Figure 11). Groundwater level changes in this area are very closely associated with changes in the surface water level of

Lake Powell (Figure 12). The mean annual water level decline rate for wells showing declines in the Paria basin for the period 1993 to 2008 was -1.2 feet/year. Groundwater level changes in wells located near Lake Powell appear to lag changes in lake levels by a year or two, depending upon a well's distance from the lake.

Only two water level change measurement pairs were available for the southeastern portion of the Coconino Plateau basin during the period from 1994 to 2009. The water level declines in those wells measured -6 and -11 feet, respectively (Table 3 and Figure 11).

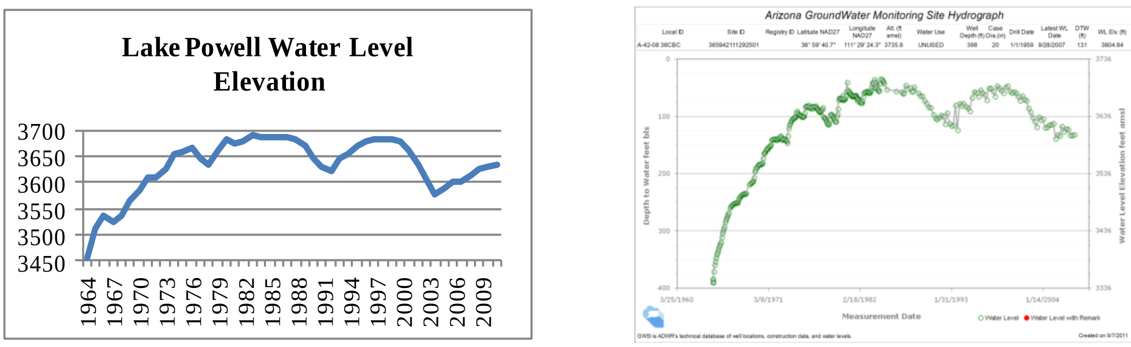

Figure 12 Comparison of Water Levels at Lake Powell and Water Levels in A Nearby Well

Eastern Plateau Planning Area

The Eastern Plateau planning area is composed of a single groundwater basin, the Little Colorado River Plateau basin (Figure 13). Groundwater conditions vary significantly throughout the basin from areas of significant groundwater decline due to groundwater pumping, to areas of little or no change or areas water level recovery. Of the 64 wells that were measured in the basin over the period from 1991 to 2004, 51 wells showed declining groundwater levels, with a mean annual groundwater level decline rate of about -1.4 feet/year (Figure 13 and Table 3). The mean annual water level rise rate for the 12 wells with rising water levels was +.08 feet/year.

Wells demonstrated varying levels of decline in the western portion of the basin in the Fort Valley area and near the City of Flagstaff's Woody Mountain well field (see hydrographs EPA1, EPA3 and Figure 13). Declines in these areas are mainly attributed to domestic and municipal well pumping, respectively. Groundwater levels were also observed to have an overall decline trend in the Lake Mary area, where the City of Flagstaff operates municipal wells. However, recent water level fluctuations in that area may also be influenced by natural recharge when the lakes fill.

In many parts of the Little Colorado River Plateau basin, there is very small groundwater demand. Observed groundwater level fluctuations are generally small and believed to be mainly related to climatic variability influencing natural recharge. For the most part, only small water level changes (mainly declines) were observed in several wells located south of the Navajo Indian Reservation, from the Red Gap Ranch area near Leupp Corner, to the Joseph City area (Figure 13).

Groundwater levels were generally stable in many areas along and north of the Mogollon Rim portion of the Little Colorado River basin, but declined in some wells that were used for municipal, agricultural, or industrial purposes (mainly for thermo-electric power generation and paper manufacturing). Areas that experienced varying levels of water level decline from these factors included Heber, Showlow, Pinetop-Lakeside, Snowflake, Springerville and St. Johns (see Figure 13 and hydrographs EPA27,30,31,35-37).

On the Navajo and Hopi Indian Reservations water levels generally declined due to groundwater pumping for domestic, municipal, agricultural and industrial (mainly coal mining) purposes (Figure 13). Near Tuba City, water levels declined by as much as -27 feet from 1991 to 2004, mainly due to municipal and industrial pumping. Groundwater level declines of over -130 feet were observed near Kayenta (Black Mesa area) where groundwater pumping for a coal slurry pipeline and other coal mining operations and for municipal purpose significantly over-drafted the local aquifer. Water levels also decreased significantly in some comparatively unpopulated areas of the Hopi Reservation and the western Black Mesa drainage area (Figure 13). In some cases, these observations may indicate potential effects of climatic variability and reduced natural recharge. Near Page, water levels declined significantly in some wells that are hydraulically connected to the surface water level of Lake Powell (see hydrographs EPA49,50, Appendix A).

Central Highlands Planning Area

Groundwater levels in the Central Highlands planning area were significantly impacted in some areas by variations in natural recharge and by groundwater pumping. In the Black River, White River and Salt River Canyon sub-basins of the Salt River basin, ADWR measures very few wells, because most are located on Indian lands. In the Salt River Lakes sub-basin, ADWR measured 15 wells between 1991 and 2003. All wells measured during that time period were observed to have declining water levels, with a mean annual rate of water level decline of -2.2 feet/year. All wells measured were in the Globe-Miami and Pinal Creek areas where significant remedial action pumping for the Pinal Creek superfund site contributed to water level declines along Pinal Creek (Figure 14).

In the Tonto Creek basin, water levels rose in 5 of 9 wells measured between 1990 and 2009 (Figure 14 and Table 3). The mean annual rate of water level rise was about +0.4 feet/year. The mean annual water level decline rate for the 3 wells that showed declines was -0.4 feet/year. Water levels generally declined in areas where municipal and industrial pumping exceeded natural recharge, mainly in the northern portion of the sub-basin in the Star Valley/Payson area.

In the Payson area of the Verde Canyon sub-basin of the Verde River basin, groundwater levels declined in 6 of 7 wells measured over the period from 1990 to 2009. The mean annual water level decline rate for the declining wells was -2.4 feet/year. The overall water level change rate for the Payson area for the wells measured by ADWR was in excess of -2 feet/year over the period from 1990 to 2009. However, recent short-term water level trends show many wells with recovering water levels (see hydrographs, CHA3, 6, 7 in Appendix A). The more recent recovery trend in many Payson area wells is believed to be a result of distributing municipal pumping over a broader area, adding well capacity and increased natural recharge in some recent years. Most of the water level decline in the Payson area is associated with municipal, domestic and groundwater remediation pumping and reduced natural recharge in some years having below average annual precipitation. Water levels were observed to rise by about 16 feet in one comparatively shallow well in the Strawberry area (Figure 14). The recent change in water level in that well may be related to changes in local pumping locations and volumes. However, the long-term decline trend for the general area from the 1970s is significant (see hydrograph, CHA8 in Appendix A).

Water levels declined in many areas of the Verde Valley sub-basin of the Verde River basin for the period of 1994 to 2009 (Table 3 and Figure 14). Of the 174 total measurements made during that time period, 138 wells showed water level declines, with a mean annual water level decline rate of -1.2 feet/year. The mean annual water level rise rate for the 33 wells that had rising water levels was +0.6 feet/year. In general, water levels remained stable, or showed only minor overall fluctuations along the Verde River downstream of Camp Verde (Figure 14). Near Cottonwood and Clarkdale, water levels declined by -20 to -40 feet, or more, in many wells. The water level declines in this area are generally due to increased municipal and industrial pumping. Near Lake Montezuma, Rimrock, Red Rock, Sedona and Oak Creek water levels were generally down from 1994 to 2009. Water level declines were variable over this area, ranging from about -1 foot to as much as -56 feet at a well in the Red Rock area. For the most part, water level declines in these areas are due to increased groundwater pumping for municipal, industrial and domestic purposes. It should be noted that, most agriculture in the Verde Valley that is located along or near the Verde River, is mainly supported by surface water diversions from the Verde River. However, some agriculture exists away from the Verde River that is supported by groundwater withdrawals.

Water levels increased in several wells measured in the Belmont-Camp Navajo area. Since municipal groundwater demand has generally grown in that area, it is unclear why water levels have risen. However, some new wells have been drilled in the area that tap a deeper more productive aquifer and demand for groundwater from the shallower aquifer may be less than in the past. Although data are unavailable to confirm this possibility, it is also possible that Camp Navajo may have a lower overall groundwater demand in recent years.

Groundwater conditions in the Big Chino sub-basin of the Verde River basin showed water level rises in 43 of 60 wells measured during the period from 1992 to 2009 (Figure 14 and Table 3). The mean annual water level rise rate was +0.4 feet/year. The mean annual water level decline rate for the 16 wells that showed declines was -0.2 feet/year. One well showed no change. Water levels generally rose in the central portion of the sub-basin along Big Chino Wash in the area of the City of Prescott's-Big Chino Water Ranch. Recoveries in that area are mainly associated with reduced groundwater pumping for agriculture. Some natural recharge from Big Chino Wash flow events may also contribute to the overall rise trend in that area. Water levels in the lower portion of the Big Chino sub-basin showed minor declines in some wells located near Paulden. Water levels were stable in the Williamson Valley portion of the sub-basin (Figure 14).

Minor water level fluctuations were observed in wells located in the Agua Fria and the Upper Hassayampa basins of the Central Highlands planning area (Figure 14). Sporadic natural recharge from flow events on the Agua Fria and Hassayampa rivers may have significant impact on local groundwater conditions. Groundwater use in the Agua Fria basin is approximately equally divided between agricultural and municipal uses, while groundwater demand is primarily for municipal uses in the Upper Hassayampa basin. Three of 6 wells measured over the period from 1991 to 2008 showed water level rises in the Agua Fria basin and three wells showed declines. The annual water level rise and decline rates for the Agua Fria basin were + and – 0.1 feet/year, respectively. Four of five wells measured in the Upper Hassayampa basin showed rising water levels from 1990 to 2008. The mean annual water level rise rate for those wells was 0.1 feet/year (Table 3).

SUMMARY OF WATER LEVEL CHANGES

Inside Active Management Areas

Over the last two decades, many significant changes and events have occurred that have impacted hydrologic conditions within the state's five Active Management Areas. Major factors affecting hydrologic conditions include changes in overall water use (both surface water and groundwater); importation of new surface water supplies; variations in incidental recharge, precipitation and natural recharge; increased use of reclaimed water; water conservation and artificial recharge activities. The collective impact of these factors is directly expressed in water level changes observed in wells and changes in stream runoff and baseflow.

Water level changes for the period from 1991 to 2008/09 in the Phoenix AMA include areas of significant water level rise and decline. In general, water level trends in the Phoenix AMA were strongly influenced by water use changes related to the urbanization and development of agricultural and desert land, and the introduction and use of CAP water for agriculture, municipal and industrial use. Water levels were also impacted by incidental recharge, mainly from agriculture, and from artificial recharge of CAP water and recharge and direct use of reclaimed water. Reductions in municipal pumping in certain areas in response to land subsidence, along with water conservation programs and occasional natural recharge events also impacted groundwater conditions in specific areas.

Water level trends in the Pinal AMA for the period from 1993 to 2008 include areas of significant water level rise and decline. From 1993 to 2008, water levels changes were mainly impacted by factors including: the use of CAP water in agricultural areas where overall agricultural pumpage declined; incidental recharge from deep percolation of excess irrigation water and flood events on the Gila River.

Water level trends in the Tucson AMA for the period from 1994 to 2010 include areas of significant water level rise and decline. From 1994 to 2010, water levels were impacted by several important factors, including: the introduction and use of CAP water in many agricultural areas that replaced or reduced overall agricultural pumping; the recharge of CAP water at several artificial recharge facilities; direct use and recharge of reclaimed water; recent reductions of municipal pumping in the City of Tucson's central well field due to the importation of groundwater and recovered CAP water pumped in the Avra Valley; and sporadic increases in natural recharge from flood flows along the AMA's rivers and streams during years of above average precipitation and runoff.

Water level trends in the Santa Cruz AMA for the period from 1987 to 2010 include areas of fluctuating and generally declining water levels along the Santa Cruz River. From 1987 to 2010, water levels were impacted by several important factors, including: recharge from flood flows on major drainages; recharge of treated effluent released from the Nogales International Wastewater Treatment Plant (NIWWTP); water withdrawals from wells mainly for municipal and agricultural uses; and riparian demands for groundwater; and drought.

Water level trends in the Prescott AMA for the period from 1994 to 2010 include areas of declining water levels in most of the AMA, and significant recovery of water levels in one area where a major change in municipal pumping patterns occurred. From 1994 to 2010, water levels were impacted by several important factors, including: groundwater withdrawals for municipal, agricultural, industrial and domestic uses; recharge from flood flows on major drainages; recharge of treated effluent by the City of Prescott and the Town of Prescott Valley; and drought.

Outside AMAs

Over the last two decades population growth has caused statewide municipal water demand outside AMAs to increase from about 130,000 to 180,000 acre-feet/year (Table 10). Groundwater demands for thermo-electrical power generation outside AMAs also increased from about 34,000 to 59,000 acre-feet since 1991. Groundwater demand for agriculture outside AMAs remained fairly constant at about 1.1 million acre-feet for the last 20 years. Groundwater demand for mining decreased from about 79,000 acre-feet in 1991 to 59,000 acre-feet in 2009 (Table 10). Major factors affecting hydrologic conditions in specific areas include: changes in overall water use and groundwater pumping; variations in incidental recharge; precipitation and natural recharge; increased use of reclaimed water; water conservation; and some limited artificial recharge activities. The collective impact of these factors is directly expressed in water level changes observed in wells and changes in stream runoff and baseflow.

Water level changes for the period from the late 1980s and early/mid 1990s to the mid/late 2000s in the Southeastern planning area included many areas of significant water level decline. Large water level declines observed in the Douglas, Wilcox and San Simon Valley sub-basins of the Safford basin were mainly caused by agricultural pumping. Pumping for thermo-electrical power generation also contributed to water level declines near Willcox. Comparatively minor water level fluctuations were observed in most wells measured in the Gila Valley sub-basin of the Safford basin. This observation suggests that incidental recharge from agricultural irrigation (both from surface water and groundwater sources), and natural recharge from normal surface flow and periodic flood events on the Gila River contributes significant recharge to the sub-basin. Between 1991 and 2009, groundwater pumping averaged about 96,000 acre-feet/year for the basin (Appendix B).

Municipal and pumping near various population centers in the Upper and Lower San Pedro basins contributed to water level declines. Agricultural pumping and miscellaneous industrial pumping also contributed to water declines in those basins. Reductions in groundwater pumping for mining contributed to some water level recoveries in the Lower San Pedro basin. Recharge from periodic flow events on rivers and streams during years of above average annual precipitation contributed to local groundwater recoveries in some areas. Impacts of drought were sometimes difficult or impossible to discern in the water level data that were reviewed. However, relatively slow constant water level declines observed in a few wells located in remote areas where only small groundwater withdrawals occurred are believed to be at least partially drought related. Domestic pumping caused measurable water level declines in some local areas.

Water level changes for the period from the late 1980s and early/mid 1990s to the mid/late 2000s in the Lower Colorado River planning area were mainly caused by groundwater pumping for agricultural irrigation. Groundwater basins in the Lower Colorado River planning area that showed significant declines included Gila Bend, Butler Valley, Renegras Plain, McMullan Valley and the Harquahala INA. The impacts of groundwater pumping were perhaps most clearly seen in the mean annual water level decline rate of over -4 feet/year for the Gila Bend basin where groundwater withdrawals averaged about 268,000 acre-feet/year for the period from 1991 to 2009. In some parts of the Harquahala INA, water levels recovered due to direct use and recharge of CAP water and reduced groundwater pumping. Significant drainage and agricultural pumping occurred in the Lower Gila and Yuma basins during the last 20 years. However, groundwater levels in most parts of those basins showed only minor changes due to the offsetting impacts of incidental agricultural recharge from surface water (Colorado River) and groundwater sources used in those basins. Recharge from sporadic flood events on the Gila River also occurred along some reaches of the river within the planning area.

Water level changes for the period from the late 1980s and early/mid 1990s to the mid/late 2000s in the Upper Colorado River planning area were generally small except near some populations centers. The most significant water level declines in the planning area occurred in Kingman area of the Hualapai Valley basin. Water levels declined in the Meadview area due to relatively small volume municipal and domestic pumping. Water levels showed only minor fluctuations along many rivers and streams. Impacts of drought were generally difficult or impossible to discern from most water level data. Relatively small water level declines were observed in some wells located in the Wikieup area near a well field operated by a mining company that transports the water to the Bagdad area. Water level recoveries, probably caused by reductions in agricultural pumping and periodic recharge from flood events on the Bill Williams River were noted in some wells in the Planet Ranch area. Relatively small water level declines were noted in many areas where there are concentrations of domestic wells. Water levels rose along the southwestern flanks of the Hualapai Mountains in the Sacramento Valley basin where many domestic wells are located. However, at this time, there is no clear explanation for the recoveries in that area.

Water level changes for the period from the early/mid 1990s to the mid/late 2000s in the Western Plateau planning area were generally small. Due to its comparative remoteness, there are very few wells located outside population centers in the planning area. Available data showed some water level recovery in a well located in the Beaver Dam Wash area of the Virgin River basin that was believed to be mainly caused by a combination of reduced agricultural pumping and recharge from periodic flood events on Beaver Dam Wash. In the Paria basin, water levels generally declined in the Wahweap area, reflecting the impacts of water level declines in Lake Powell and also potentially due to impacts of any local pumping. Impacts of drought were generally difficult or impossible to discern from most water level data. However, the declines in lake level and water levels in the Navajo sandstone aquifer that is inter-connected to Lake Powell clearly show the impacts of upper-basin drought as inflows to the lake were reduced below historic rates.

Water level changes of the period from 1991 to 2004 in the Eastern Plateau planning area showed the impacts of agricultural, municipal, industrial, thermo-electrical power generation and mining pumping. On the Navajo and Hopi Indian Reservation portions of the planning area, water levels were observed to decline in Tuba City, Kayenta, Chinle, Oraibi and Keams Canyon areas. A combination of mining and municipal pumping near Kayenta contributed to the largest observed water level declines on reservation lands during the study period. However, it should be noted that due to limited data availability, there were no recent water level measurements for that portion of the planning area. With the recent cessation of some mining related operations that required large volumes of water to be used to operate a coal slurry pipeline, the current water level change rates are probably less than historic rates in that area. On non-reservation lands, water level declines were noted near many communities and farming areas. In general, groundwater demands for agricultural, municipal and industrial purposes were the main causes of observed declines. Significant groundwater consumption for thermo-electrical power generation in the Springerville, St. Johns and Joseph City areas also caused significant water level declines in some wells. Some wells located along major drainages showed some evidence of periodic recharge from sporadic flood events. Impacts of drought were generally difficult or impossible to discern from most water level data.

Water level changes for the period from the late 1980s and early/mid 1990s to the mid/late 2000s in the Central Highland planning area were generally small except near some populations centers. Essentially no data were available for most of the Black River, White River and Salt River Canyon sub-basins of the Salt River basin. Several wells showed significant water level declines in the Globe-Miami area mainly due to remedial groundwater activities at the Pinal Creek Water Quality Revolving Fund (WQARF) site. Water levels declined significantly over the study period in many wells in the Payson area of the Verde Canyon sub-basin of the Verde River basin. Declines in many of those wells are related to municipal, industrial and groundwater remediation pumping in the Payson area. However, some portion of the water level decline is drought related. Recent water level data show stabilization and/or recovery of water levels in many wells.

Groundwater pumping for municipal and industrial purposes has caused significant water level declines in many parts of the Verde Valley sub-basin of the Verde River basin. Groundwater levels show significant declines near most population centers in the sub-basin. However water levels fluctuated only slightly along the Verde River downstream from the Camp Verde area. Evidence of recharge from some flood events is shown in the hydrographs of some wells located along the Verde River and its tributaries. Water levels recovered slightly in most wells located in the middle and upper portions of the Big Chino sub-basin of the Verde River basin. These recoveries may be mainly related to reductions in agricultural pumping in the area, and periodic recharge from sporadic flood events along Big Chino Wash. Water levels were generally stable in the Williamson Valley area of the Big Chino sub-basin. Some intermediate to minor water level declines were observed in several wells located in the lower portion of the Big Chino sub-basin near Paulden. Minor water level changes were observed in wells located along the Agua Fria River and the Hassayampa River in the Agua Fria and Upper Hassayampa basins of the Central Highland planning area. The potential impacts of drought were generally difficult or impossible to discern from most water level data.

AUTOMATED WATERLEVEL MONITORING

The water level data that have been presented in the earlier portion of this report are a subset of the annual, manual water level measurements that have been made for decades by various individuals and organizations throughout the state. These data represent the vast majority of the state's GWSI water level measurements. However, over the last 10 to 15 years these measurements have been supplemented with automated water level measurements made at approximately 120 well sites throughout the state (Figure 15).

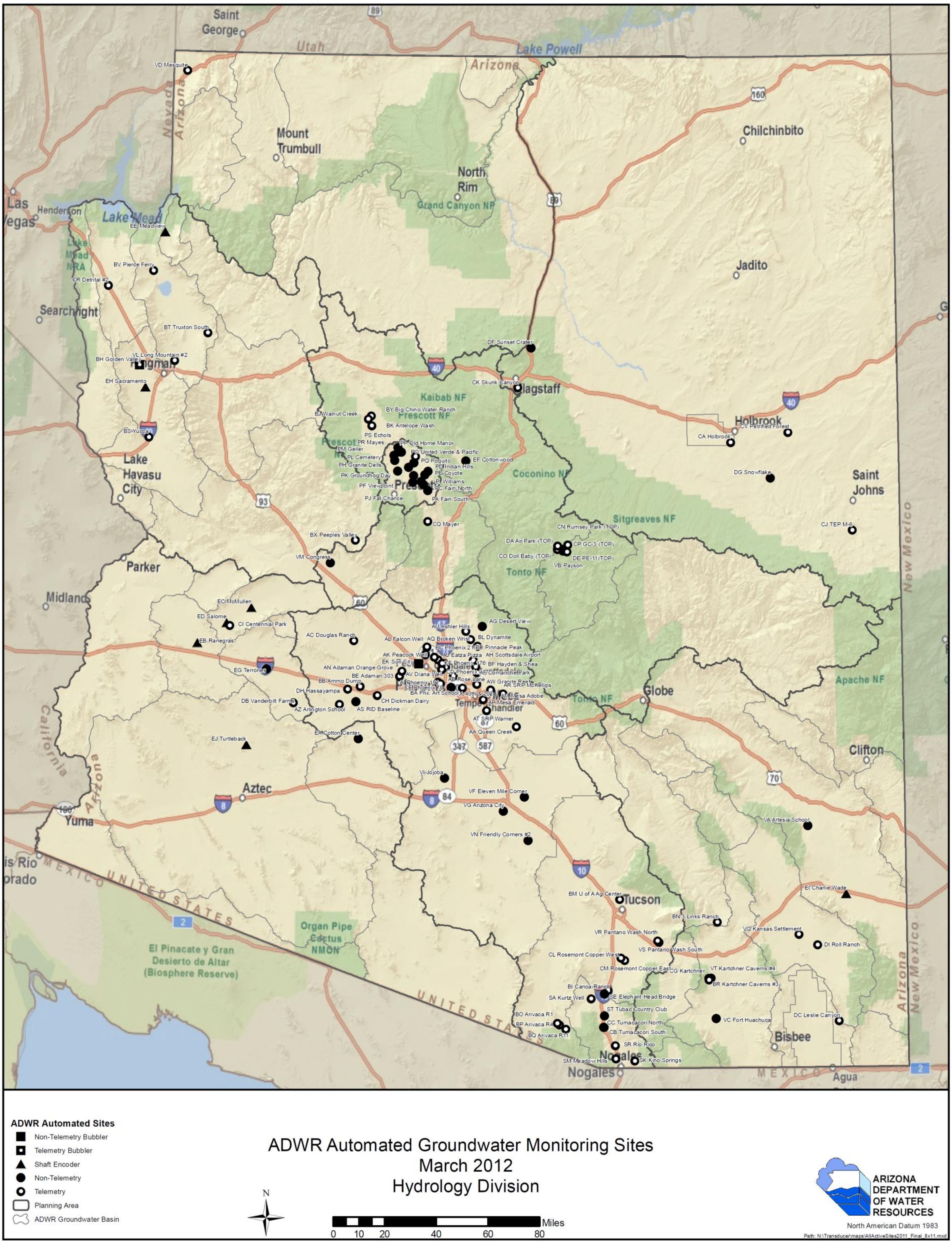

Figure 15 ADWR Automated Water Level Monitoring Locations

Automated water level monitoring in Arizona dates back several decades when a few wells were equipped with "float" devices and chart recorders that recorded a "continuous" record of water level fluctuations in a well. Today ADWR, the USGS, numerous water providers and various other entities and organizations maintain automated water level monitoring sites. The sites are typically equipped with pressure transducers and data loggers. Many sites have radio telemetry equipment to provide near real-time data.

The fundamental advantage of collecting automated water level data is that short term trends can easily be identified and analyzed. Effects of transient events such as recharge from floods and nearby well pumping that are frequently seen in automated water level monitoring data often go unobserved in annual measurements. Seasonal variations in groundwater conditions related to riparian evapotranspiration, regional pumping or climatic conditions (drought) can be observed and studied. Connections between water levels in aquifers and groundwater discharge to nearby streams and rivers are important relationships that can be quantified by correlating automated water level data and stream gaging data (Figures 16 and 17).

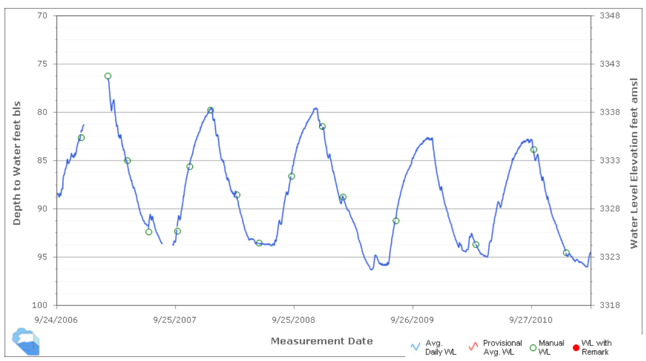

Figure 16 Seasonal Water Table Changes, A(16-03) 36CDC, .5 mile east of Verde River near Cottonwood

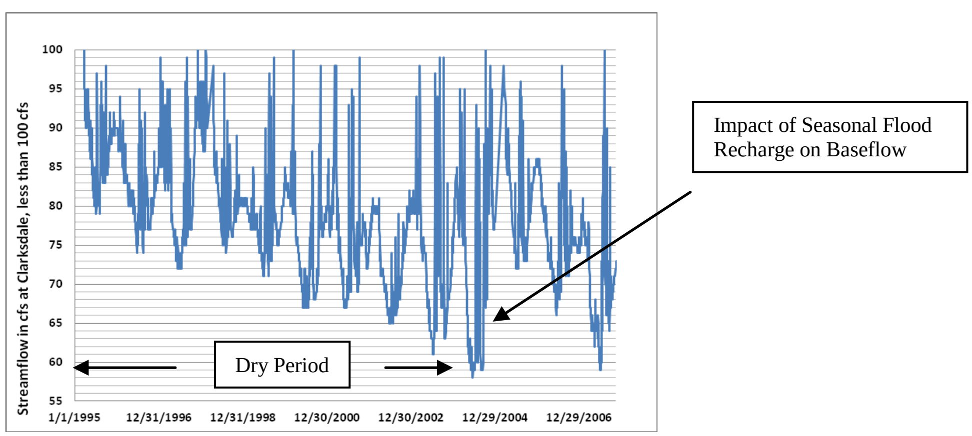

Figure 17 Impact of Flood Recharge in 2004/05 on Clarkdale Baseflow After Dry Period (1995-2004)

The collection of "continuous" automated water level data is seen as an increasing important activity that will provide essential information in many areas of water management and hydrologic data analysis. ADWR's automated water level sites and data may be viewed and downloaded at:

https://gisweb.azwater.gov/waterresourcedata/GWSI.aspx

DROUGHT MONITORING

Drought monitoring is an essential part of Arizona's Drought Preparedness Plan. Arizona's 2011 Drought Preparedness Annual Report may be viewed and downloaded at:

http://www.azwater.gov/azdwr/StatewidePlanning/Drought/default.htm

Historically, much of the focus of drought monitoring involved the collection and analysis of precipitation and streamflow data. In recent years drought monitoring has been expanded to include climatic impacts on the groundwater system, and some specific wells have been officially designated as drought index wells (see Figure 18).

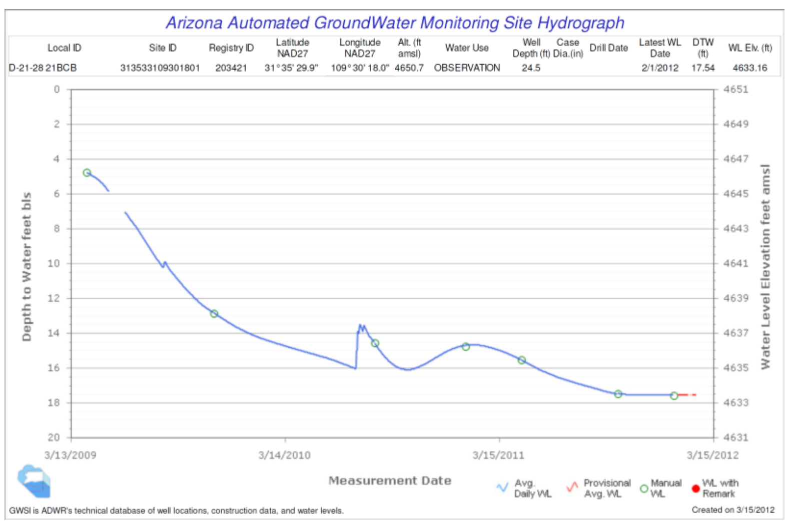

Figure 18 Drought Index Well in the Whitewater Draw Watershed (Southeastern AZ)

As mentioned earlier in this report, it is often difficult to discern the impacts of drought on the groundwater system. Wells for drought monitoring are needed in relatively undeveloped recharge areas where water level fluctuations primarily reflect climatic variation rather than groundwater withdrawals or human-induced recharge (USGS, 2001). In the future it is expected that Arizona will continue to increase its analysis of drought impacts to the groundwater system and add additional wells to the drought monitoring network.

LAND SUBSIDENCE MONITORING

Over the last fifty to sixty years, regional land subsidence has developed in many of Arizona's groundwater basins where fine-grained sediments have compacted as water tables have been drawn down by groundwater pumping. In some areas, such as northwest of the Luke Air Force Base area in the WSRV, land subsidence is estimated to have approached 20 feet since the 1960's (USGS, 1995). Notable land subsidence has also occurred in many other areas, including large parts of the Maricopa-Stanfield and Eloy sub-basins of the Pinal AMA (Schumann and Genualdi, 1986).

Groundwater Basin or Area	Time Period	Years	Observed Subsidence (cm)
McMullan Valley	6/92 – 3/97 2/04 - 2/10	4.7 6.0	Most areas 0- 5cm. Max. 25-29 cm. * Most areas 0- 3cm. Max. 15-20 cm*.
Renegras Plain	6/92 – 3/97 2/04 - 2/10	4.7 6.0	Most areas 0- 1cm. Max. 4-5 cm. * Most areas 0- 1cm. Max. 4-5 cm*.
Harquahala INA	6/92 – 3/97 2/04 - 2/10	4.7 6.0	Most areas 0- 1cm. Max. 4-5 cm. * Most areas 1- 2cm. Max. 4-5 cm*.
Gila Bend basin	2/06 – 4/08	2.1	Most areas .5- 1.5cm. Max. 3-4 cm *
Buckeye area and WSRV	2/06 – 4/08	2.1	Most areas .5- 1.5 cm. Max. 3-4 cm *
Western Metropolitan Phoenix	7/92 – 10/00 3/04 - 9/10	8.3 6.5	Most areas 0- 5cm. Max.15 - 20 cm. * Most areas 0- 2cm. Max.8-10 cm*.
North Phoenix and Scottsdale of ESRV	7/92 – 10/00 3/04 - 2/10	8.3 6.0	Most areas 0- 3cm. Max.12 - 15 cm. * Most areas 0- 2cm. Max.6-9 cm*.
Apache Junction and Hawk Rock of ESRV	5/92 – 4/00 10/04 - 9/10	7.9 4.9	Most areas 0- 5cm. Max.20 - 26 cm. * Most areas 0- 2cm. Max.12-15cm*.
Maricopa-Stanfield sub-basin of Pinal AMA	1/04– 3/10	6.1	Most areas *. Max. 5 - 6 cm.
Pichacho Basin (aka Eloy sub-basin) of Pinal AMA	1/04 – 3/10	6.1	Most areas 1 - .3 cm. Max. 6-8 cm. *
Tucson Metropolitan area	11/93 – 9/00 2/03 - 1/10	6.9 6.9	Most areas 0-4 cm. Max 20-23 cm Most areas 0-4 cm. Max 8-10 cm..
Sahuarita and Green Valley areas	2/09 - 1/10	0.9	Most areas 0-.5 cm. Max 2-3.5 cm
Fort Grant Rd. and Willcox areas	12/06 – 2/11	4.2	Most areas 0-5 cm. Max 25 -30 cm.. *
Kansas Settlement area of Willcox basin	12/06 – 2/11	4.2	Most areas 0-10 cm. Max. 20-30 cm. *
Elfrida area of Douglas basin	12/06 – 2/11	4.2	Most areas 0-4 cm. Max.10-13 cm. *
Bowie and San Simon Valley areas	1/07 – 1/10	3.0	Most areas 0 – 6 cm. Max. 15 -18 cm. *

Table 12 Recent Land Subsidence Rates Monitored by ADWR Using INSAR
(* = Large Areas of INSAR Image Decorrelation (No Data) Due Land Surface Disturbances)

Although significant land subsidence has already occurred in many areas, it is still an ongoing process in many groundwater basins (Table 12). In many of those basins water tables continue to decline due to groundwater overdraft (See Table 3 and Figures 3,4, 5, 8 and 9). However, residual land subsidence has also been observed in some areas where water levels have been observed to rise over the last two decades, for example in the Luke Air Force Base area of the WSRV sub-basin (Figure 3). Current land subsidence rates of .5 to 1 cm/year have been observed in many areas of the State. Rates exceeding 7 cm/year have recently been observed in some parts of the Willcox sub-basin. Figures 19 to 41 are Infrared Synthetic Aperture Radar (INSAR) images of areas of known historic and current on-going, land subsidence.

CONCLUSIONS

Data collected and analyzed over the last two decades show that many of the water management activities and strategies that have been implemented in the State's Active Management Areas have had significant beneficial impact on regional groundwater conditions. The direct use and recharge of CAP water has allowed agricultural, municipal and industrial water users to pump less groundwater. Reduced pumping has contributed to major water level recoveries almost everywhere CAP water has been delivered. However, water level data also indicate that the rate of recovery in many areas where CAP water use has occurred has been substantially reduced in recent years. Direct use and recharge of other surface water resources and effluent, have also contributed to water level recoveries in many areas. Water management activities, including water conservation and effluent reuse, have played important roles in water level stabilization or recovery in some areas.

In many areas of the State (including portions of some AMAs), groundwater pumping significantly exceeds recharge and groundwater declines are occurring. Significant water level declines have been noted in some parts of the Phoenix, Pinal, Tucson and Prescott AMAs. Many of the southeastern and west-central groundwater basins and sub-basins of the state (Douglas, Willcox, San Simon Valley, Gila Bend, McMullan Valley, Renegras Plain, Butler Valley and portions of the Harquahala INA have experienced substantial declines in water levels, mainly caused by agricultural pumping. Groundwater demands for municipal, industrial, mining, thermo-electrical power generation and domestic purposes caused varying degrees of water level decline in areas throughout the state.

Water level data collected in some remote areas of the state, where groundwater withdrawals were minimal sometimes provided evidence of the impacts of drought. However, for the most part, the impacts of drought were difficult or impossible to discern from most water level data. The impacts of periodic recharge from flood events on major rivers and streams were evident in the hydrographs of many wells located along or near water courses.

Analysis of water level data from the last 20 years has confirmed the benefits of conserving water, using and recharging renewable water supplies and reducing groundwater pumping. The analysis has also shown that annual groundwater level declines of greater than -1 to -2 feet/year are common in groundwater basins that are being significantly over-drafted. The largest basin-wide mean annual groundwater level decline rate in the state was over -4 feet/year in the Gila Bend basin.

Recent monitoring data show that regional land subsidence is an on-going process in many groundwater basins of the state. Rates from 0 to 2 cm/year are common in areas undergoing active subsidence. Recent land subsidence rates greater than 7 cm/year have been observed in some parts of the Willcox basin.

This presentation and analysis of hydrologic conditions throughout the State has been possible due to Arizona's significant, long-term commitment to water level and hydrologic data collection. These efforts would not have been possible without the cooperation of the thousands of well owners who have allowed their wells to be measured over the years. The data collected provide an invaluable resource allowing for the assessment of hydrologic conditions and factors contributing to recent trends. The data provide individuals, businesses, water providers and managers, and other decision makers with the information necessary to make informed decisions and choices related to local and regional water resource issues. ADWR believes these data collection efforts are vital and provide the foundation upon which its regulatory and planning programs rest. The budget realities over the past few years have significantly curtailed these activities. In recent decades, these data collection efforts have been the exclusive responsibility of ADWR. We are committed to continuing these efforts as budget permits and are developing a program to leverage the data collection programs of parties and agencies throughout the state to augment our efforts.

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FIGURES

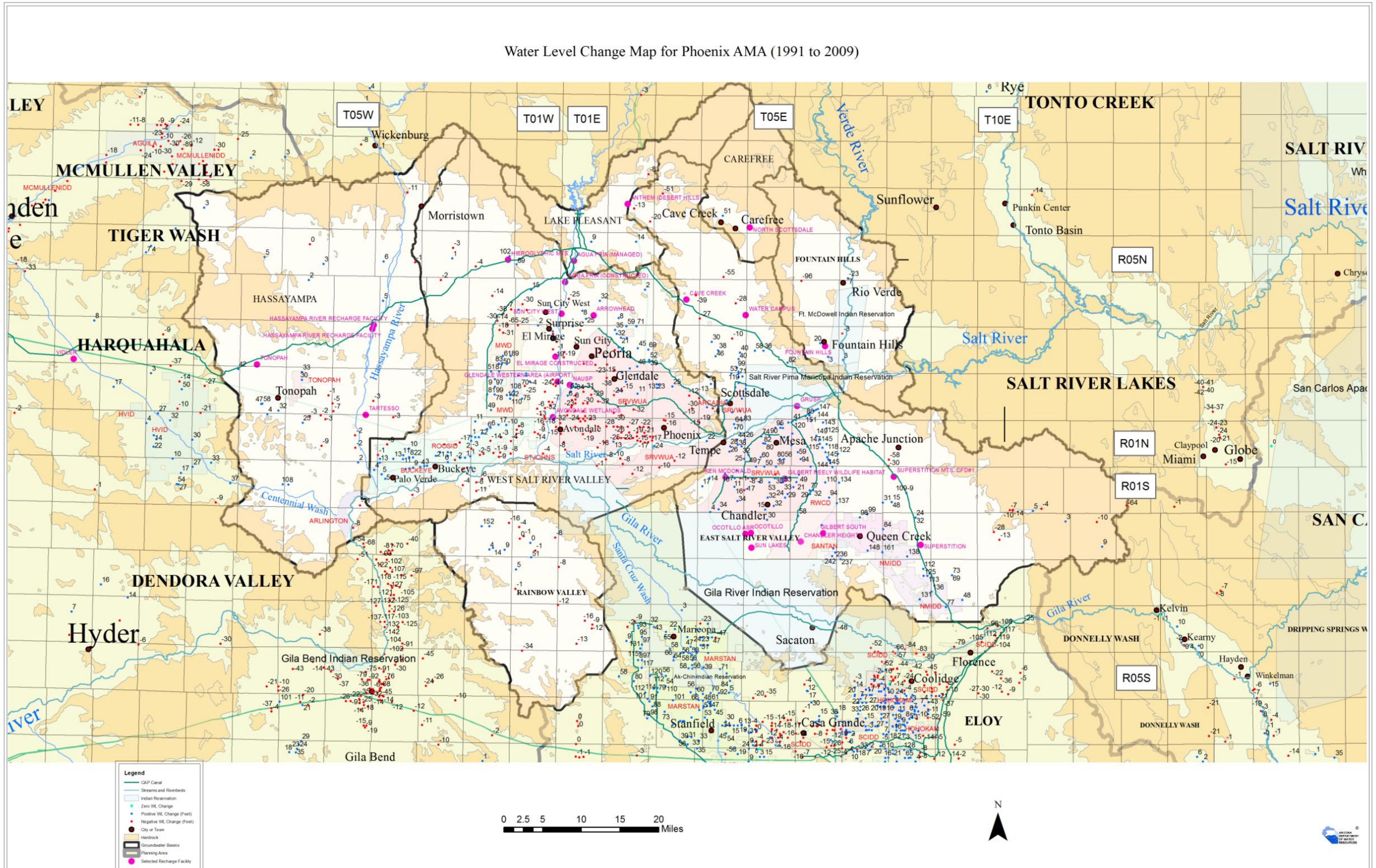


Figure 3 Water Level Change Map for Phoenix AMA (1991 to 2009)

Water Level Change Map for Pinal AMA (1993 to 2008)

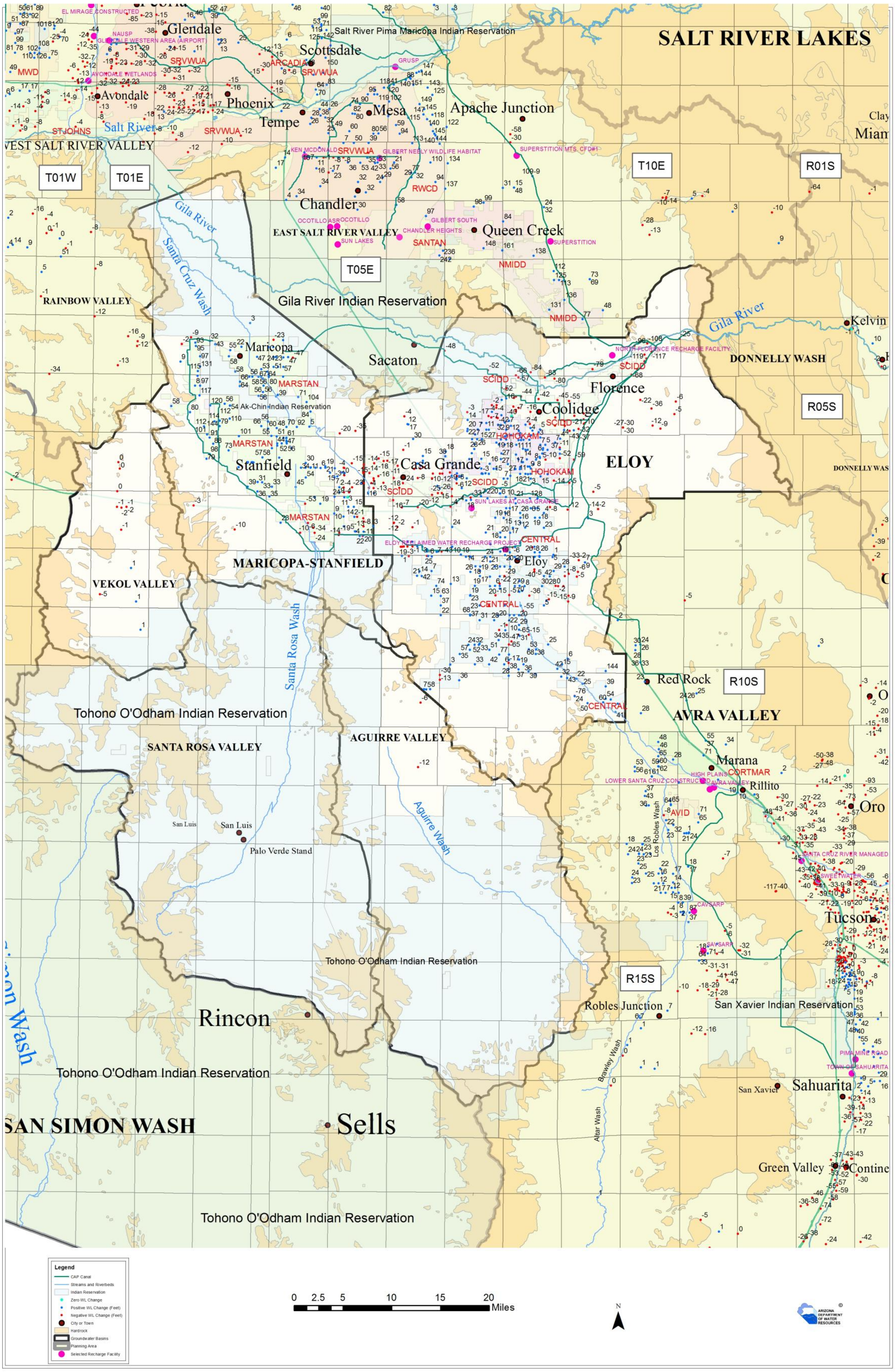


Figure 4 Water Level Change Map for Pinal AMA (1993 to 2008)

Water Level Change Map for Tucsonl AMA (1994 to 2010)

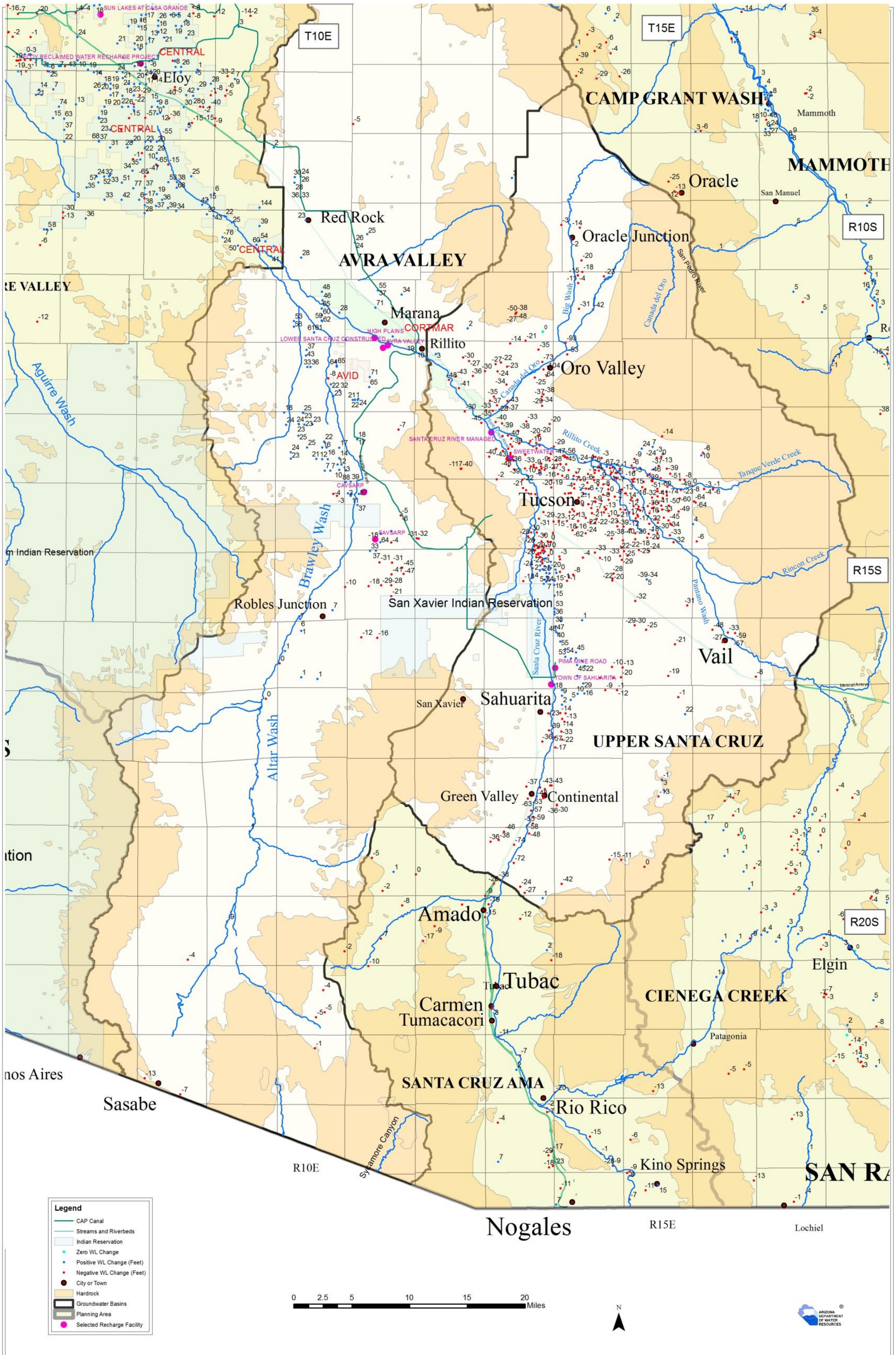


Figure 5 Water Level Change Map for Tucson AMA (1994 to 2010)

Water Level Change Map for Santa Cruz AMA (1987 to 2010)

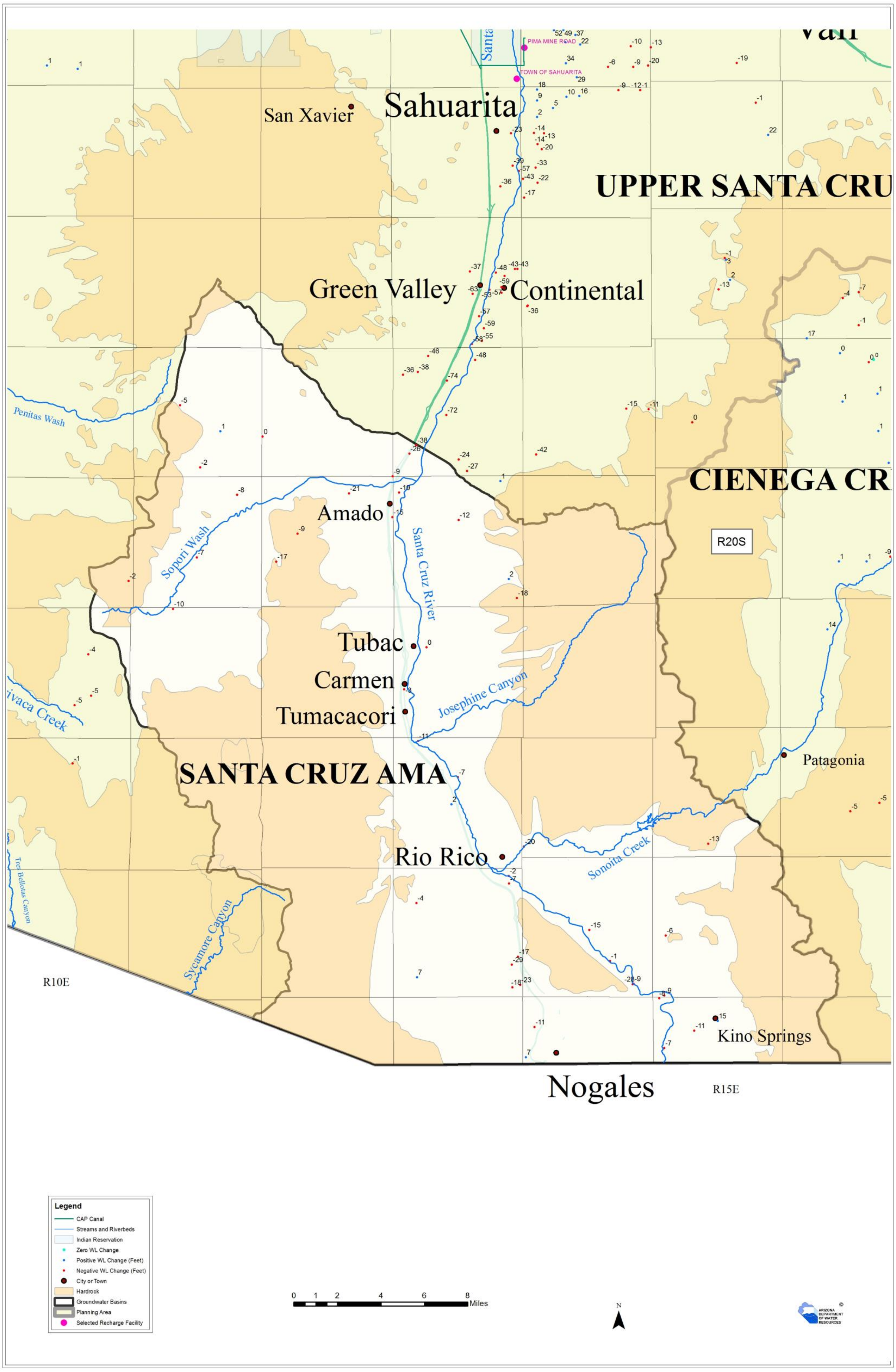


Figure 6 Water Level Change Map for Santa Cruz AMA (1987 to 2010)

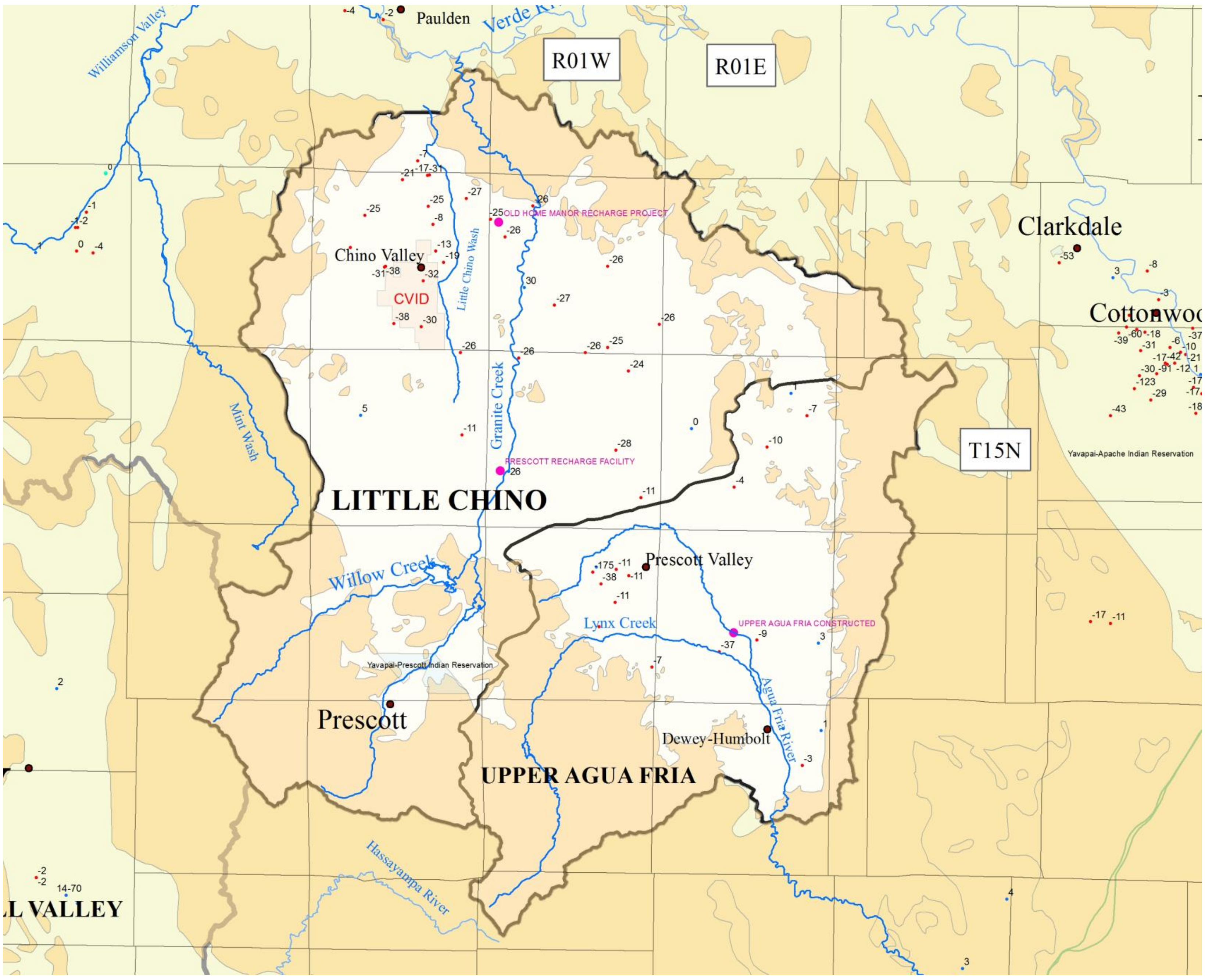


Figure 7 Water Level Change Map for Prescott AMA (1994 to 2010)

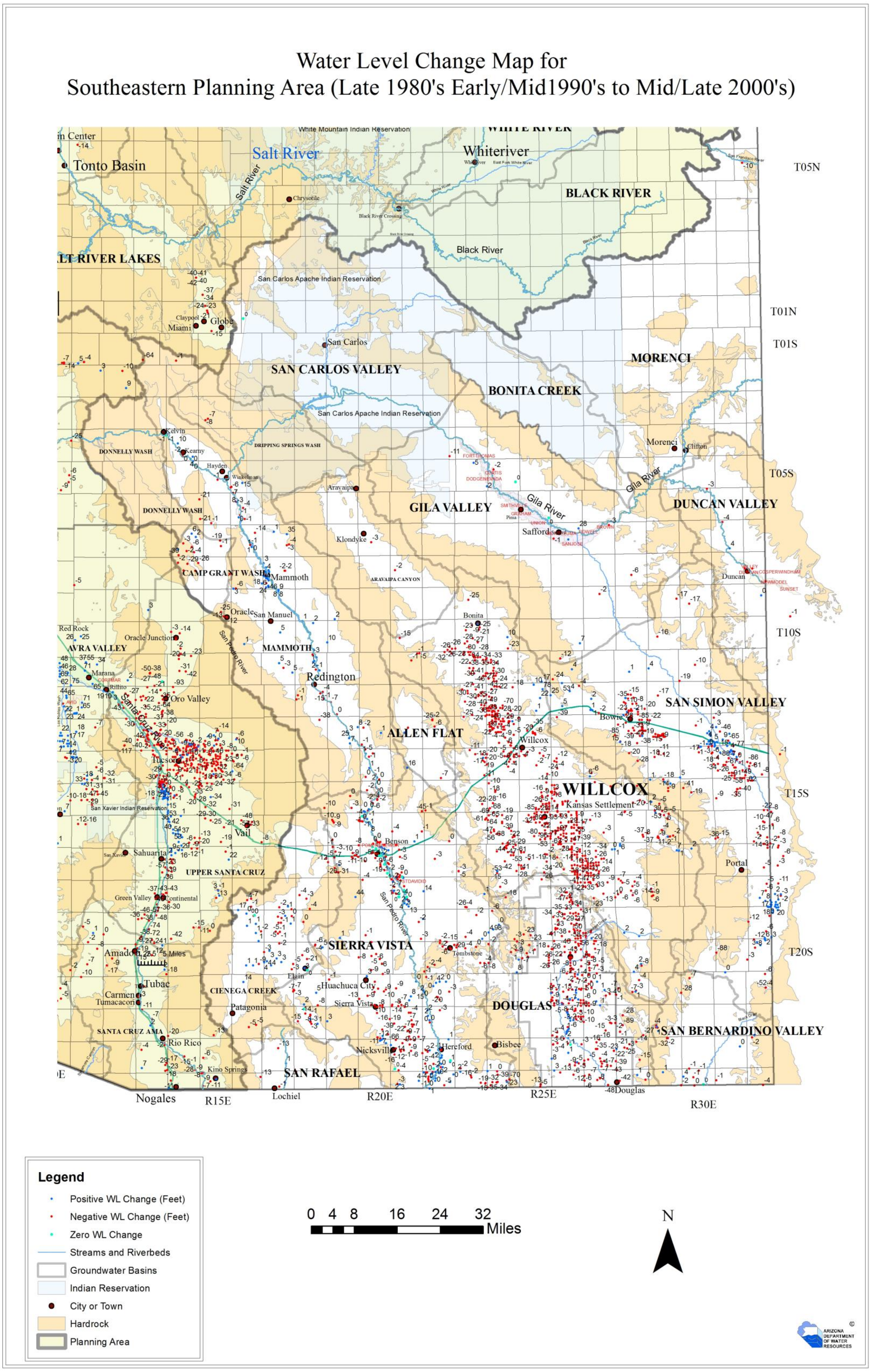


Figure 8 Water Level Change Map for Southeastern Planning Area (Late 1980's Early/Mid 1990's to Mid/Late 2000's)

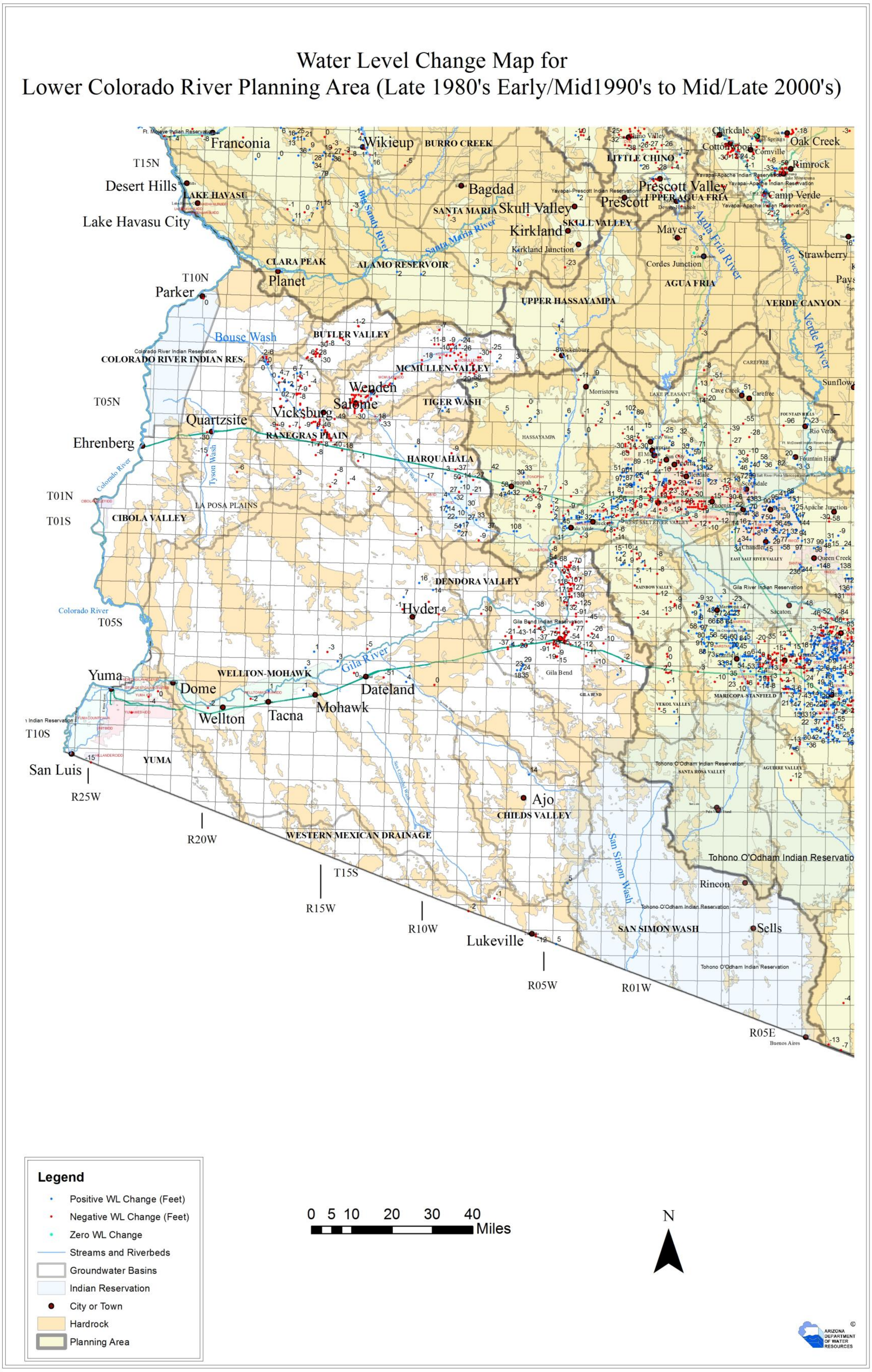


Figure 9 Water Level Change Map for Lower Colorado River Planning Area (Late 1980's Early/Mid 1990's to Mid/Late 2000's)

Figure 10 Water Level Change Map for Upper Colorado River Planning Area (Late 1980's Early/Mid 1990's to Mid/Late 2000's)

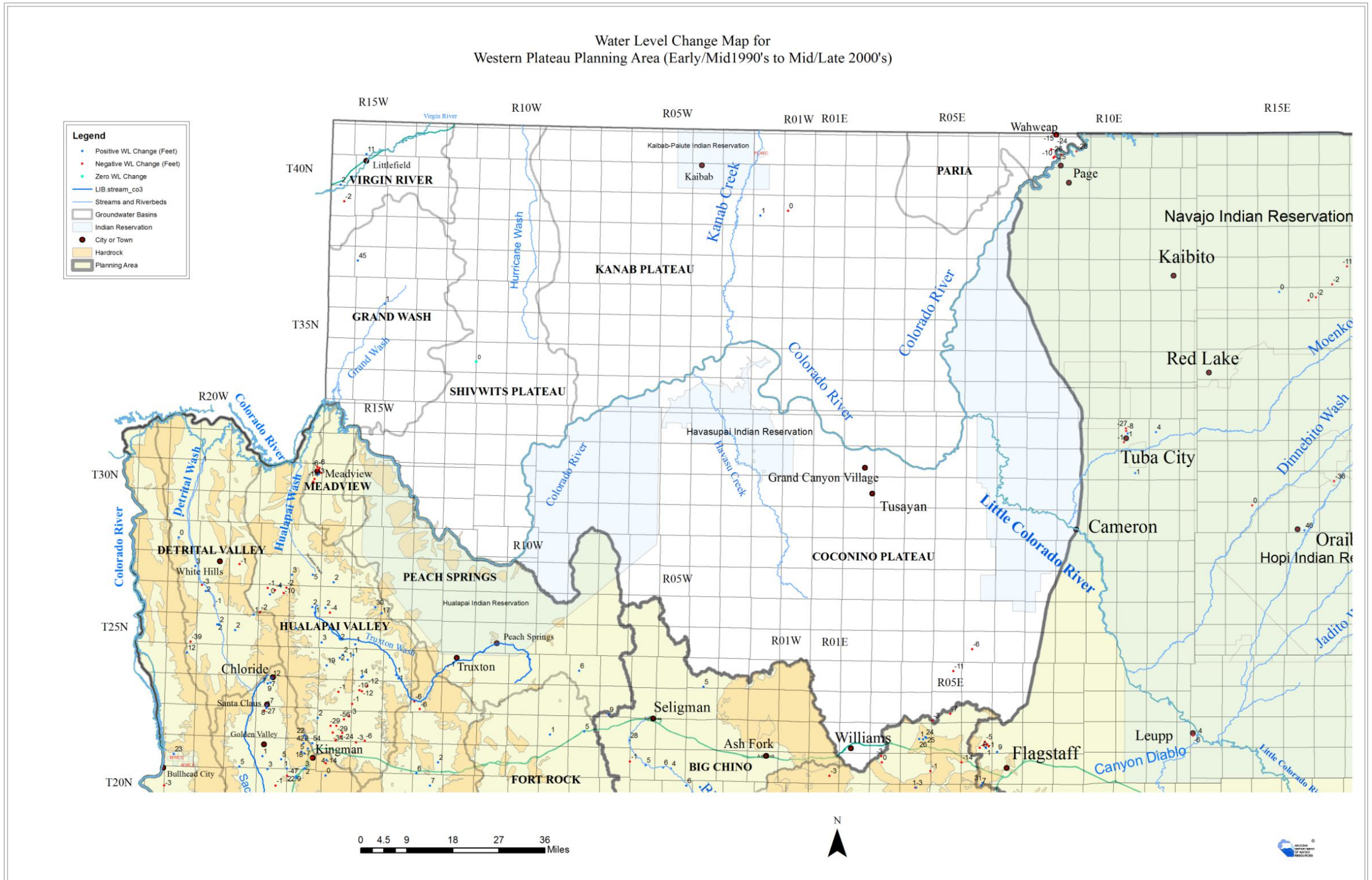


Figure 11 Water level Change Map for Western Plateau Planning Area (Early/Mid 1990's to Mid/Late 2000's)

Figure 13 Water Level Change Map for Eastern Plateau Planning Area (1991 to 2004)

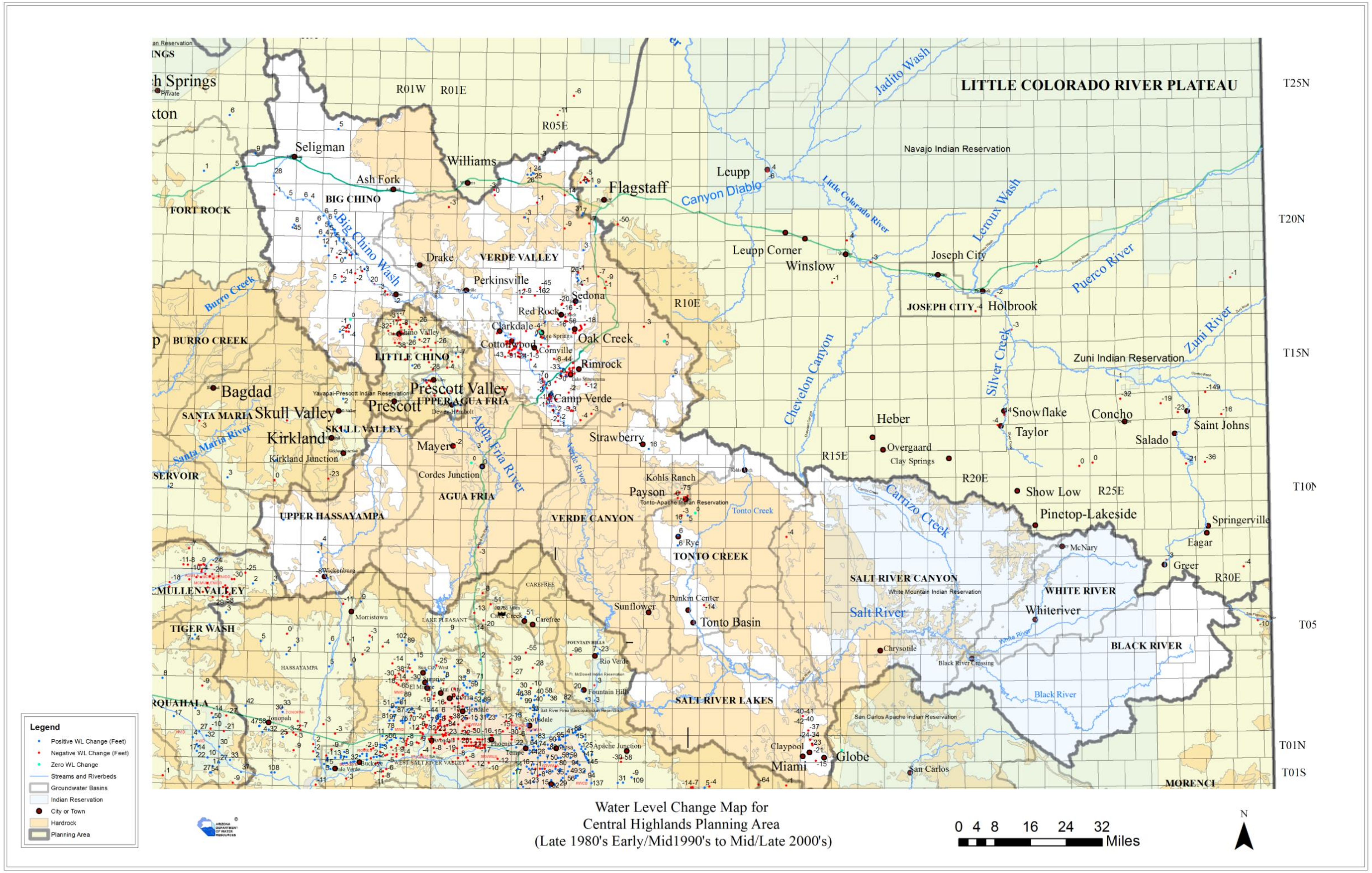


Figure 14 Water Level Change Map for Central Highlands Planning Area (Late 1980's Early/Mid 1990's to Mid/Late 2000's)

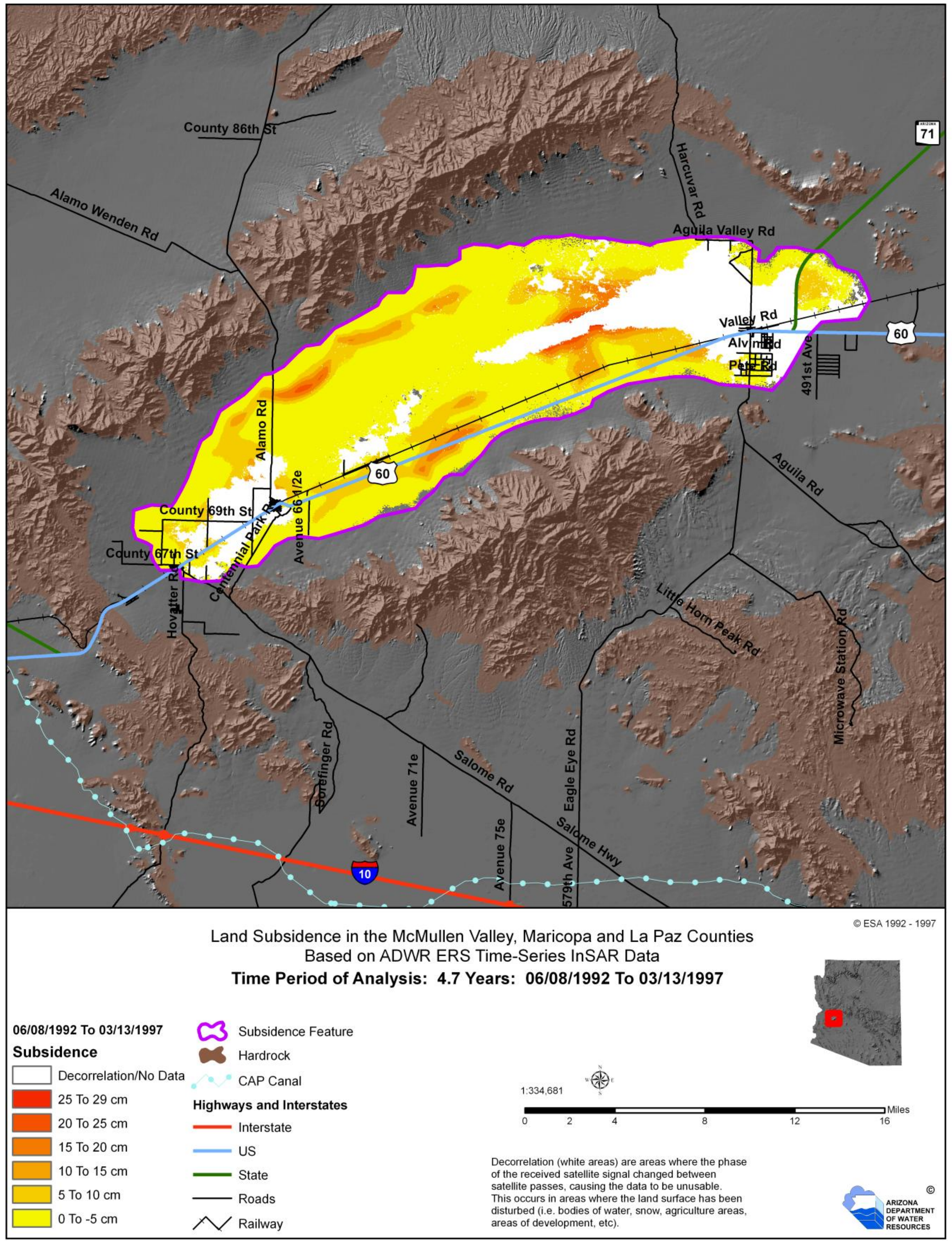


Figure 19 Land Subsidence in McMullen Valley (6/1992 - 3/1997)

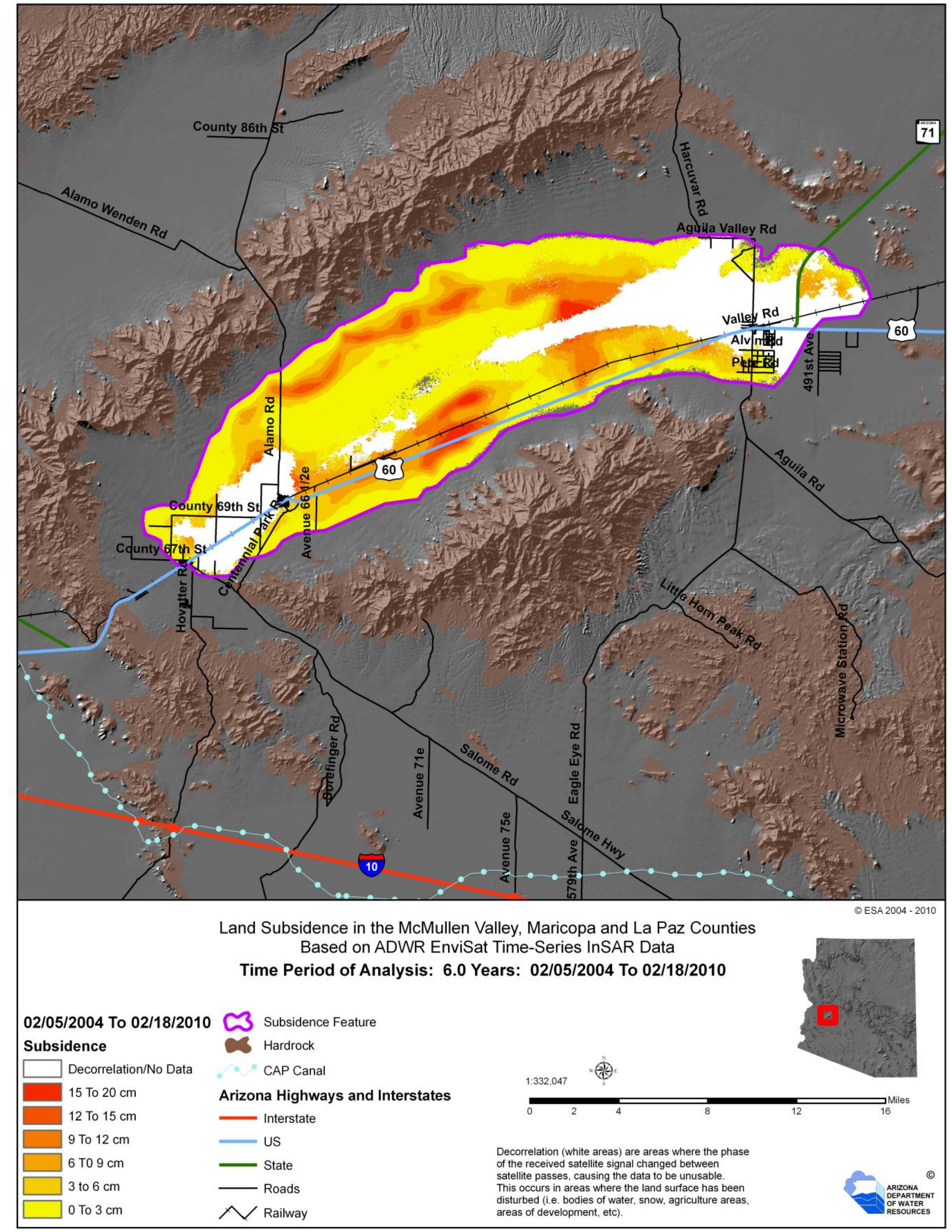


Figure 20 Land Subsidence in McMullen Valley (2/2004 - 2/2010)

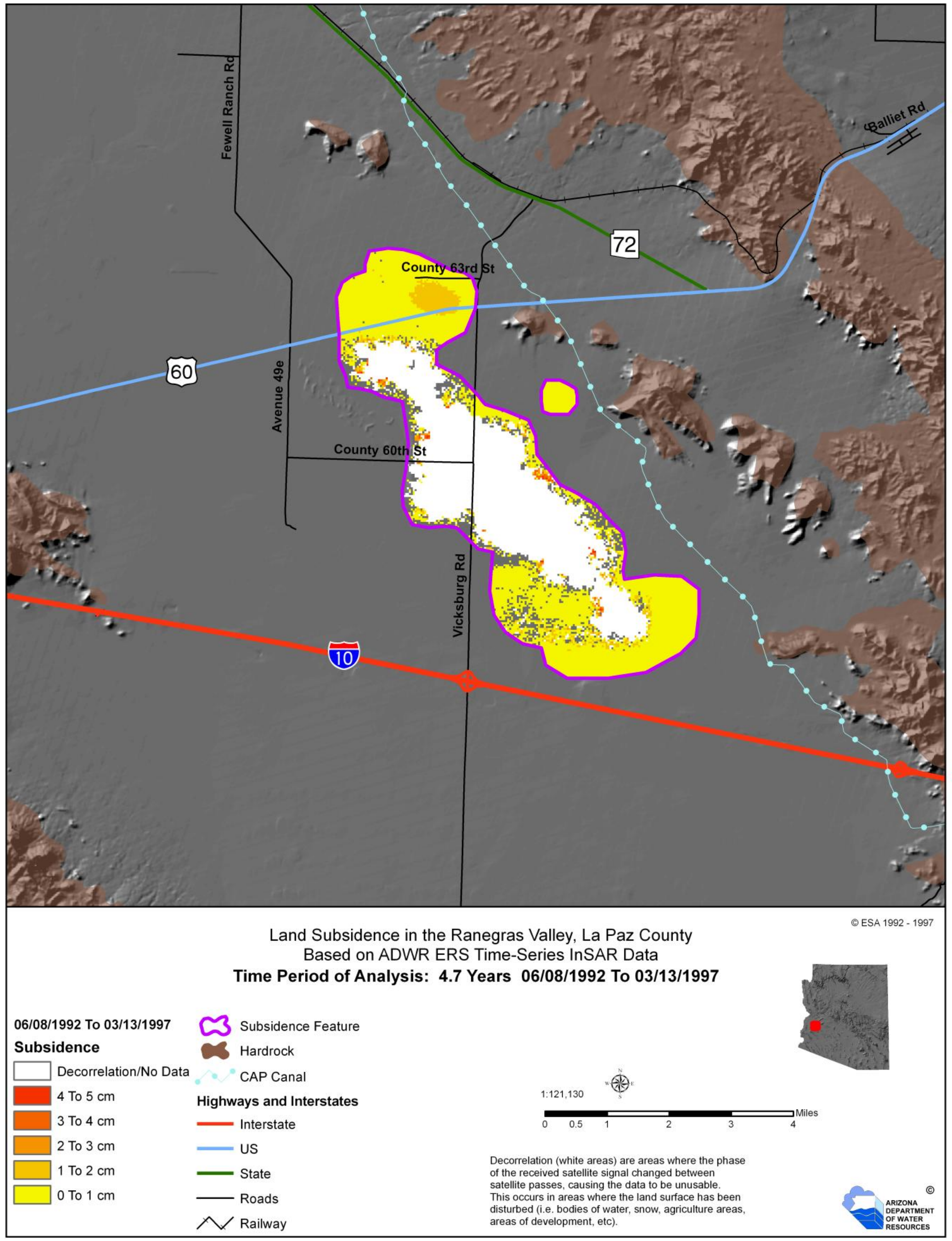


Figure 21 Land Subsidence in Ranegras Valley (6/1992 to 3/1997)

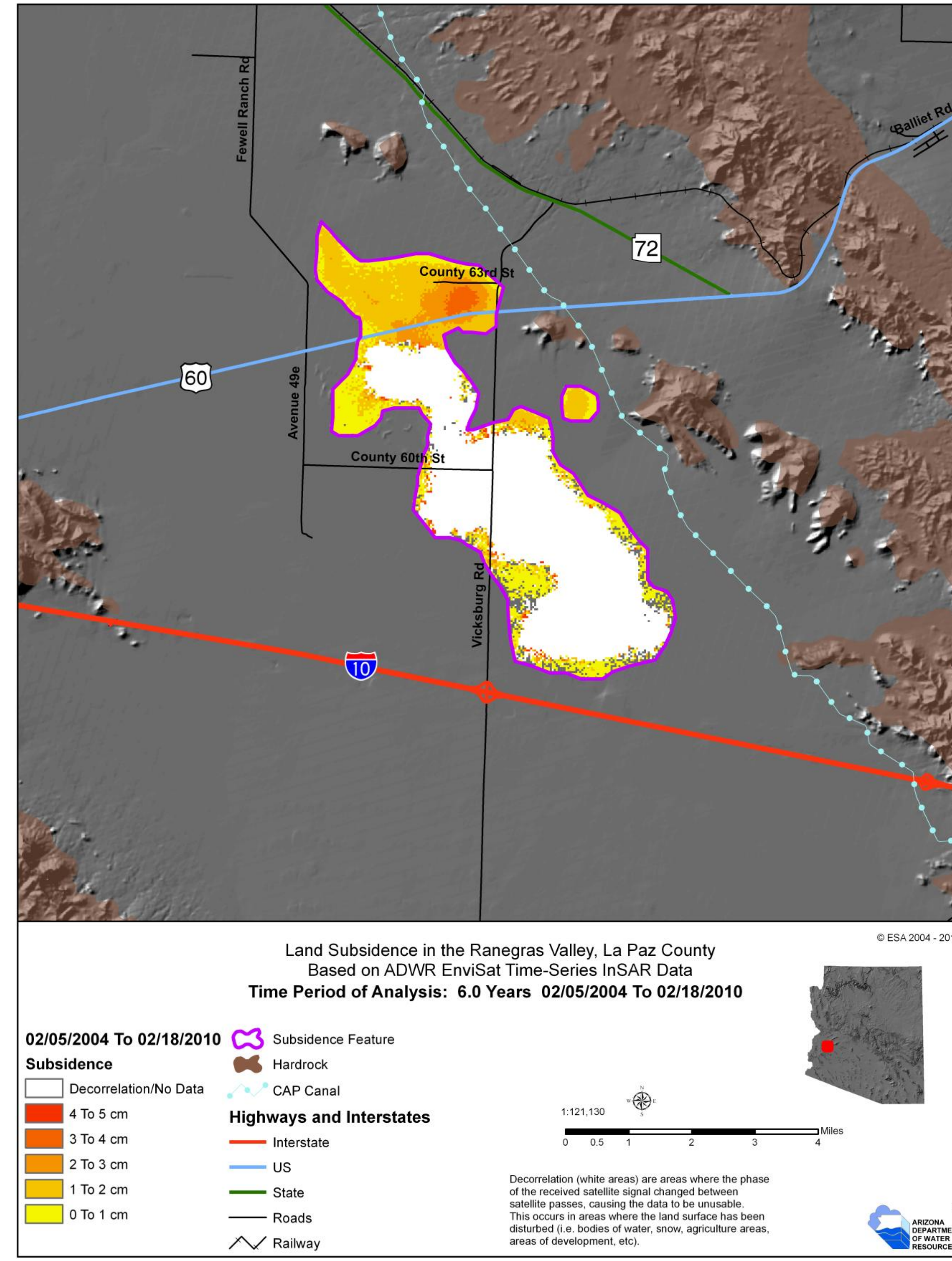


Figure 22 Land Subsidence in Ranegras Valley (2/2004 to 2/2010)

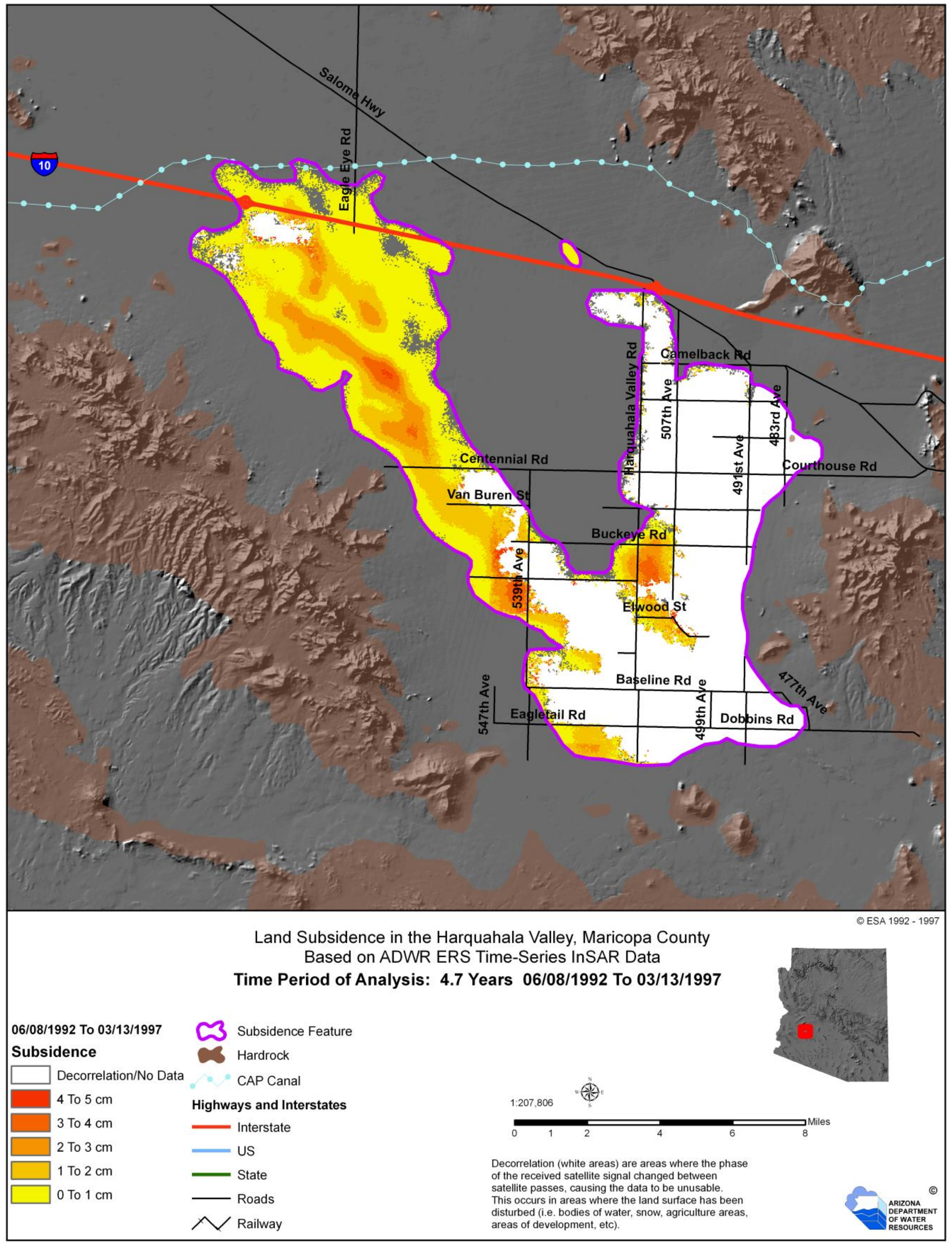


Figure 23 Land Subsidence in the Harquahala Valley (6/1992 to 3/1997)

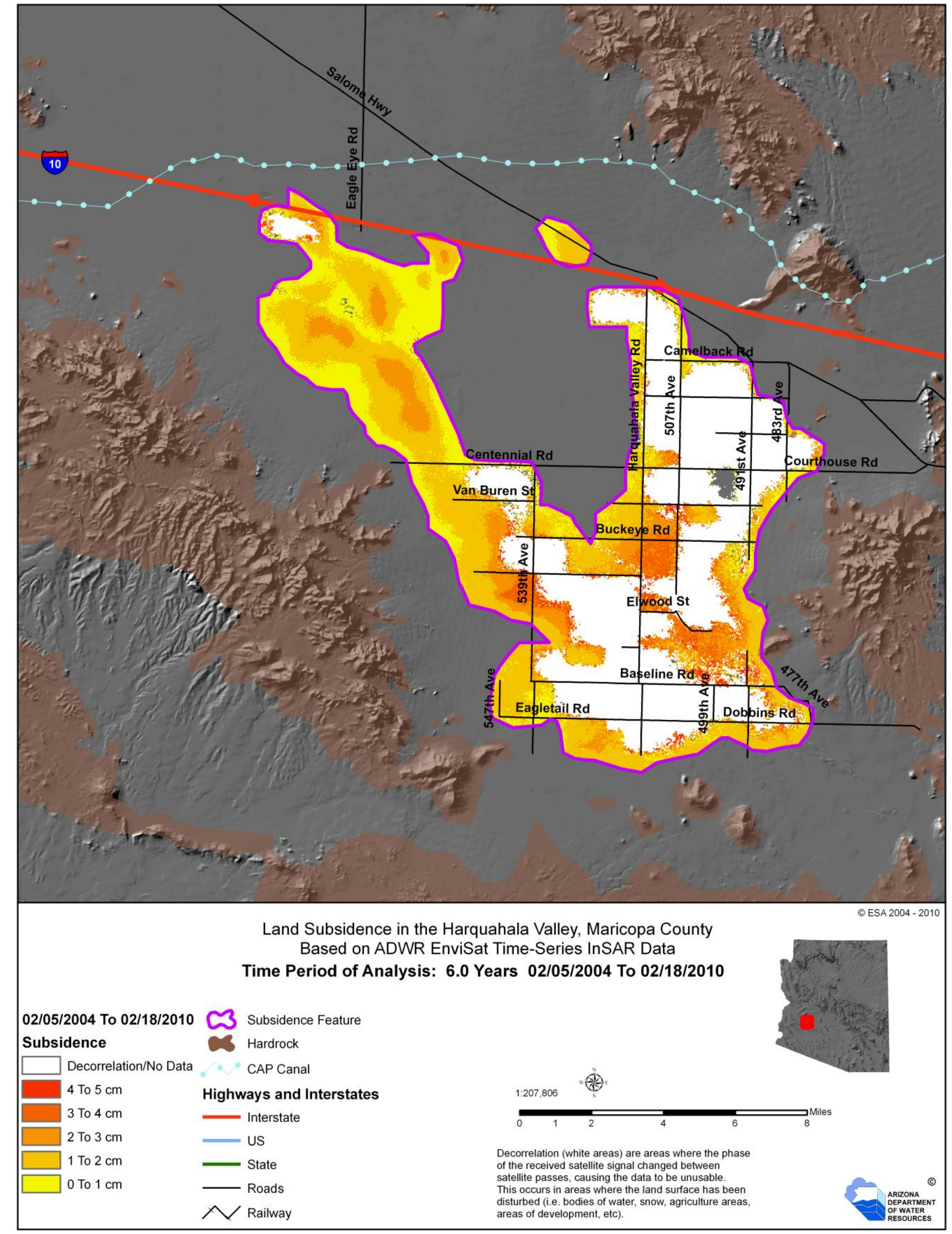


Figure 24 Land Subsidence in the Harquahala Valley (2/2004 to 2/2010)

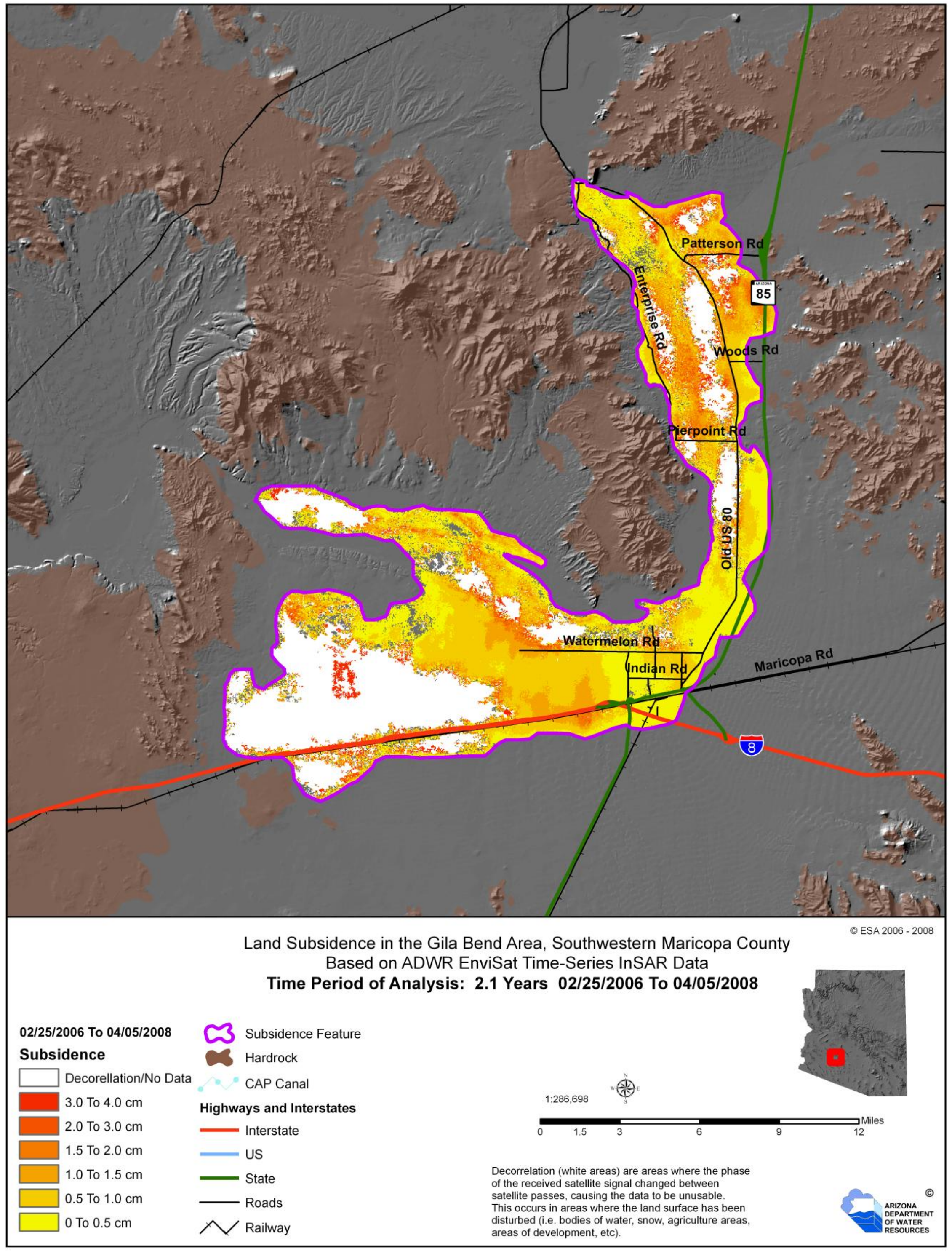


Figure 25 Land Subsidence in the Gila Bend Area (2/2006 to 4/2008)

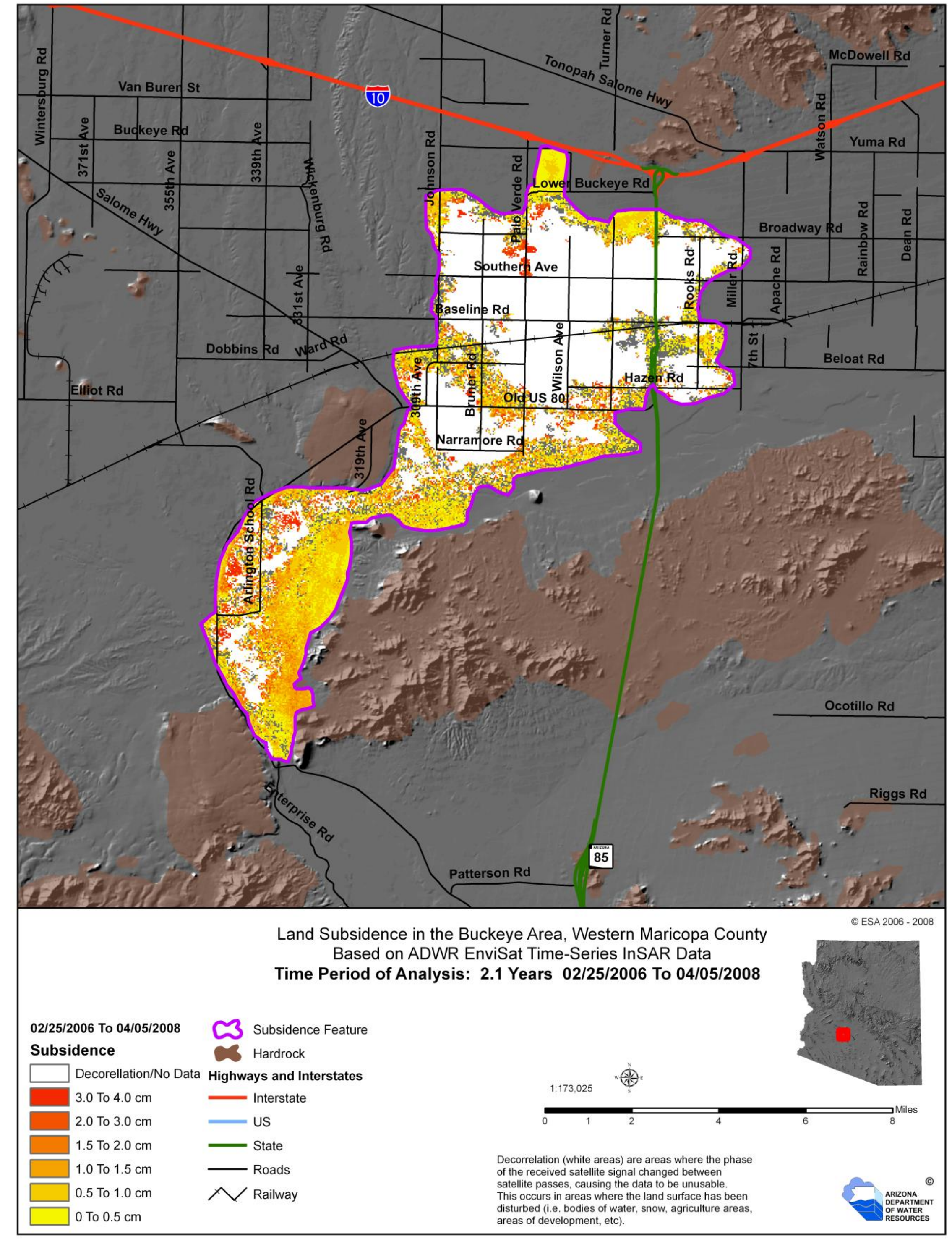


Figure 26Land Subsidence in the Buckeye Area (2/2006 to 4/2008)

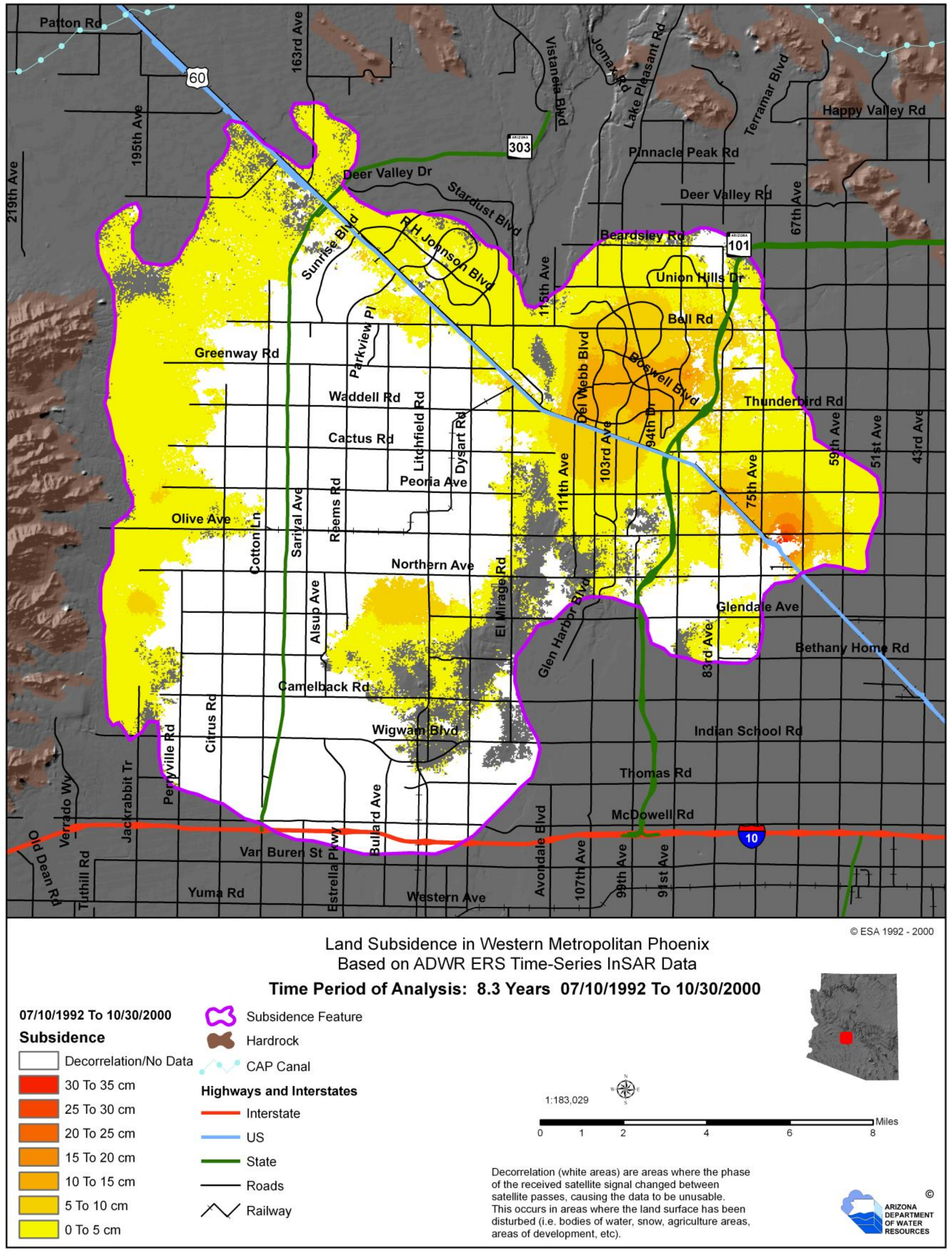


Figure 27 Land Subsidence in Western Metropolitan Phoenix Area (7/1992 to 10/2000)

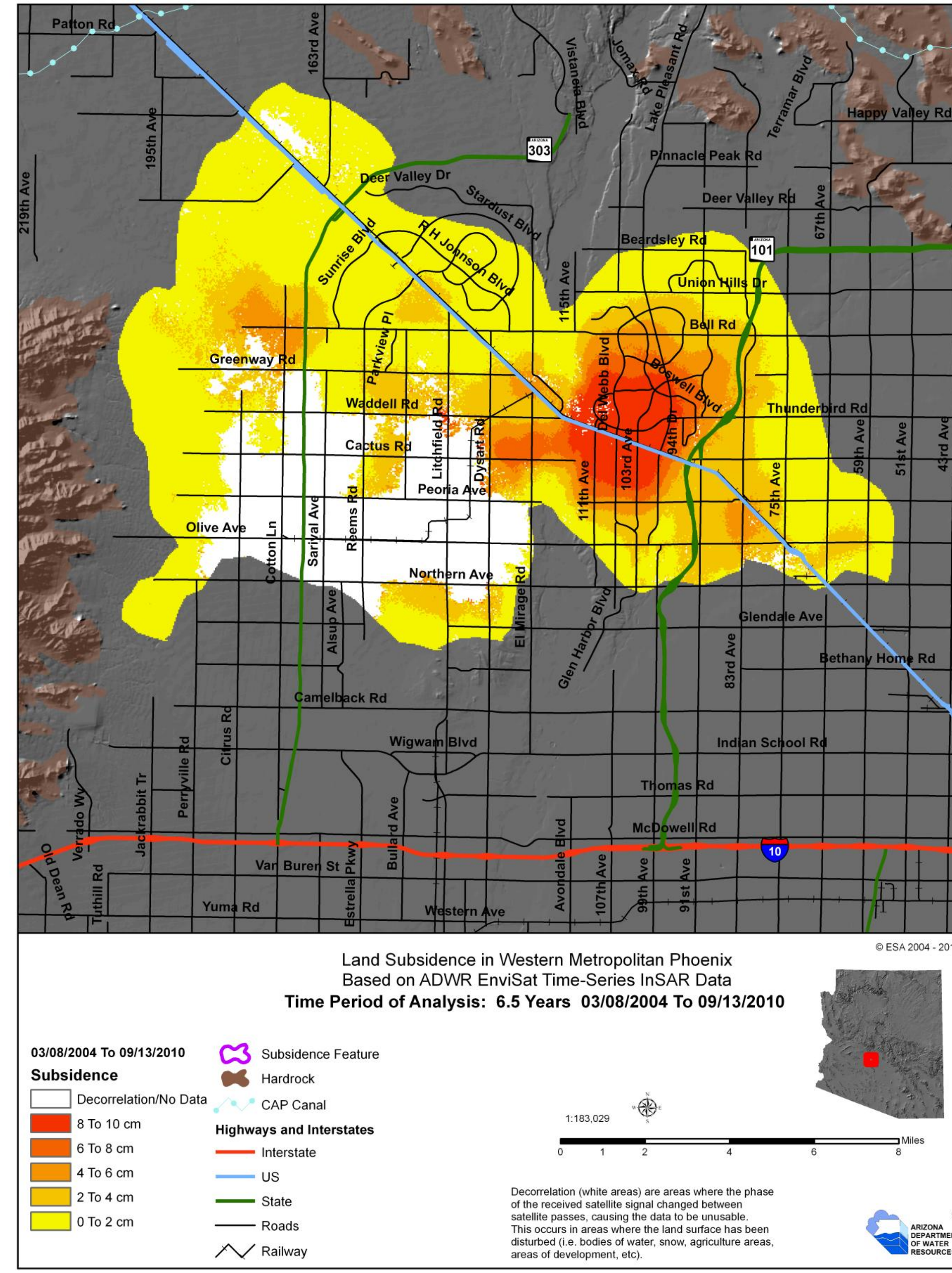


Figure 28 Land Subsidence in Western Metropolitan Phoenix Area (3/2004 to 9/2010)

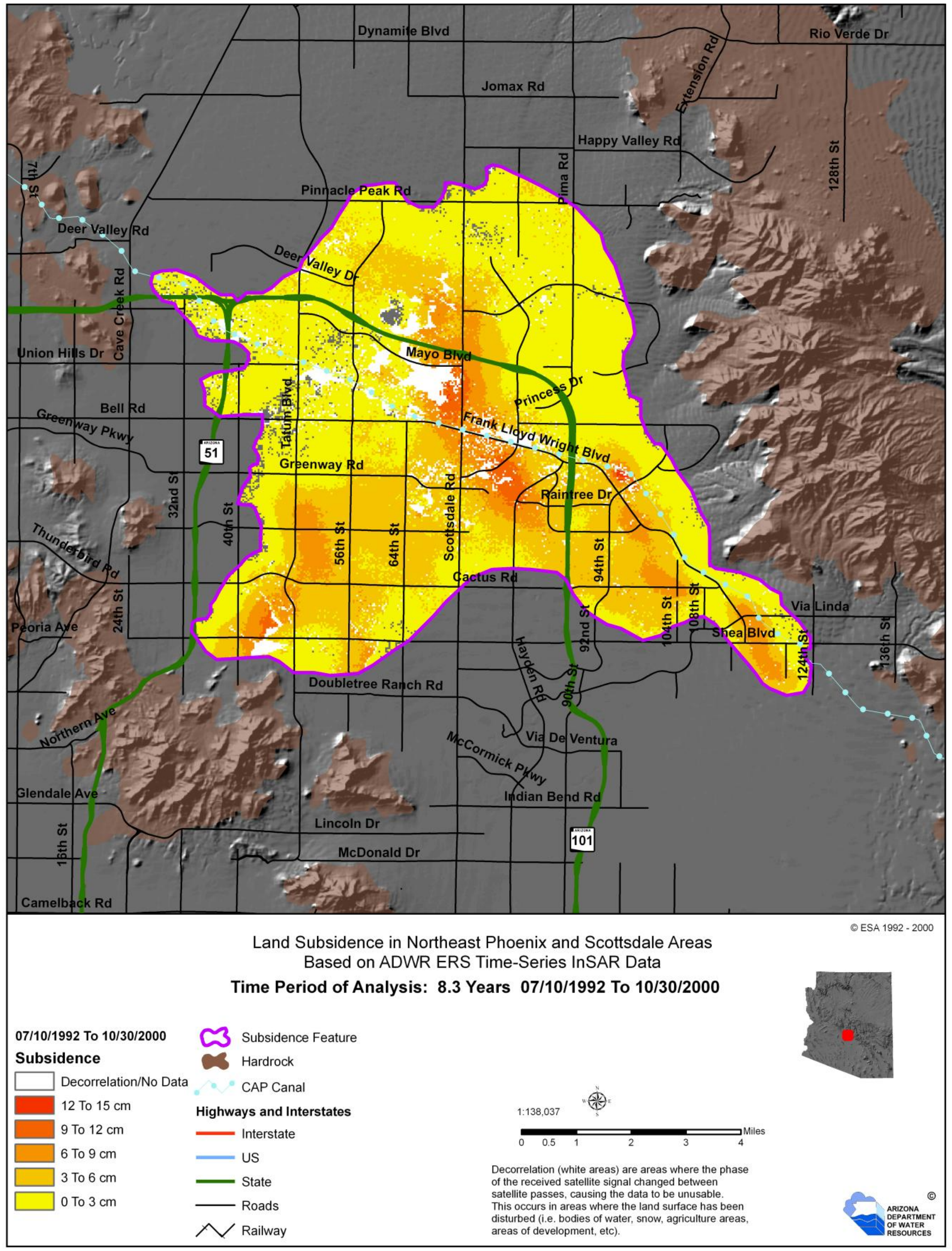


Figure 29 Land Subsidence in Northeast Phoenix and Scottsdale (7/1992 to 10/2000)

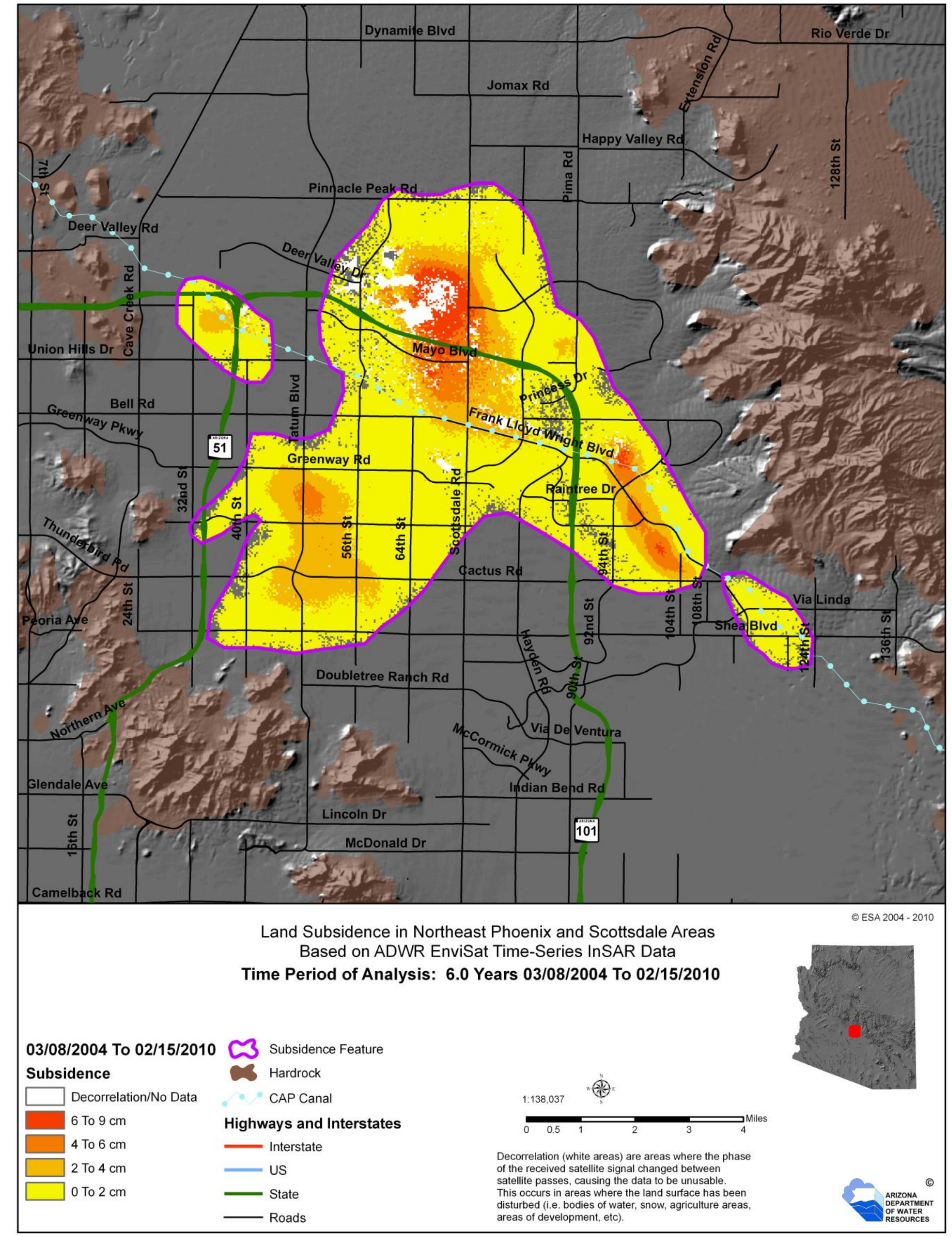


Figure 30 Land Subsidence in Northeast Phoenix and Scottsdale Areas (3/2004 to 2/2010)

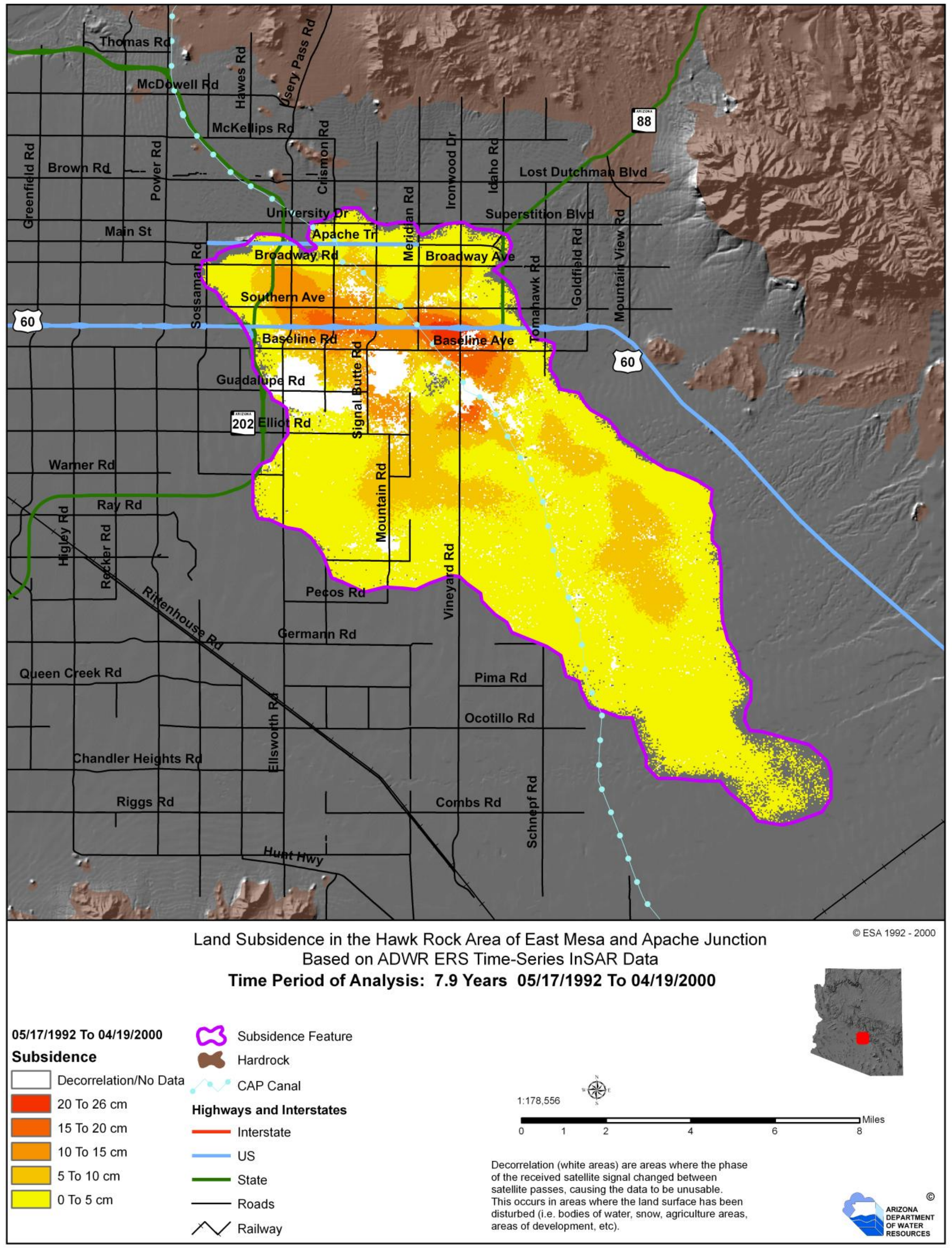


Figure 31 Land Subsidence in the Hawk Rock Area of East Mesa and Apache Junction (5/1992 to 4/2000)

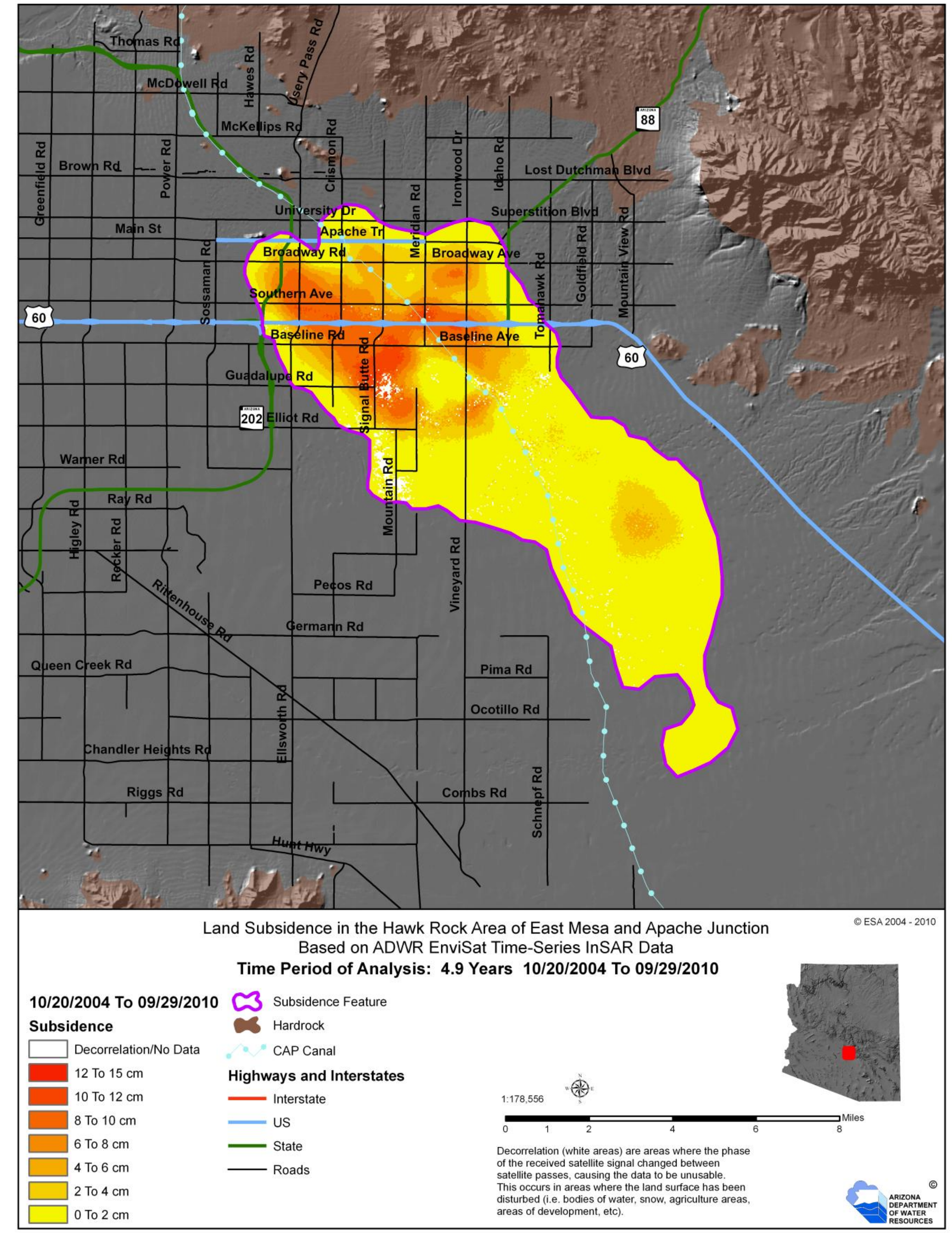


Figure 32 Land Subsidence in the hawk Rock Area of East mesa and Apache Junction (10/2004 to 9/2010)

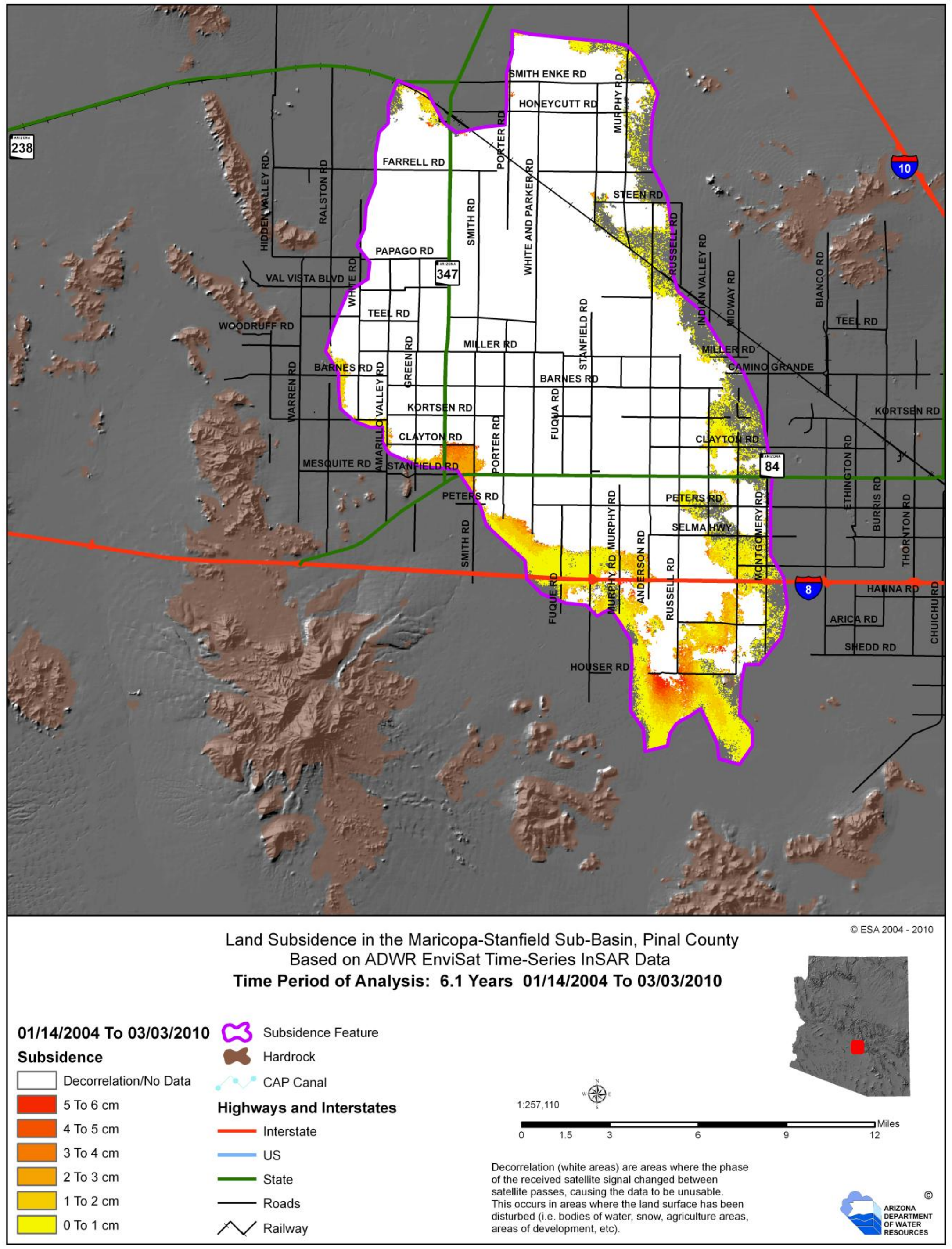


Figure 33 Land Subsidence in the Maricopa-Stanfield sub-basin (1/2004 to 3/2010)

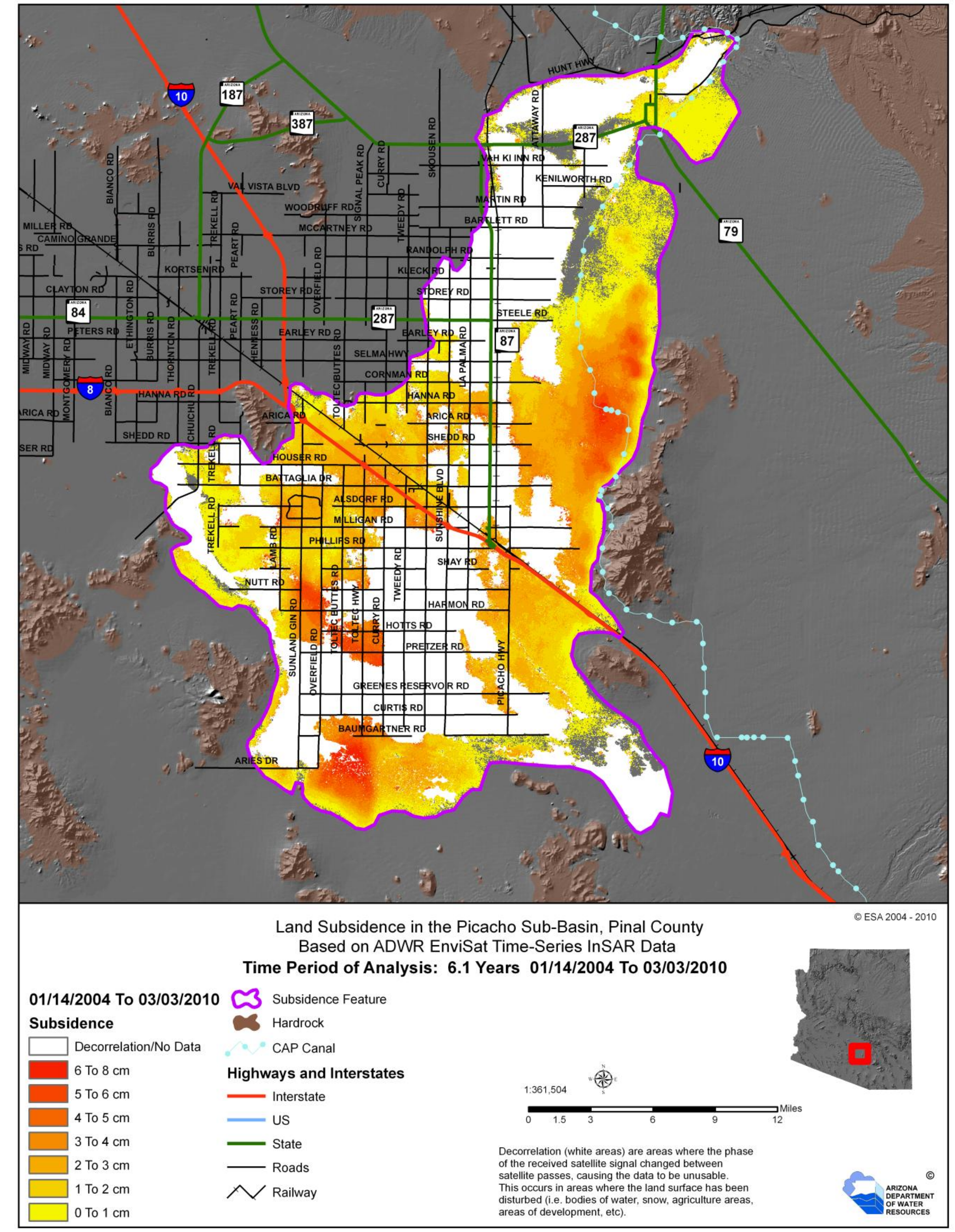


Figure 34 Land Subsidence in the Picacho Basin (1/2004 to 3/2010)

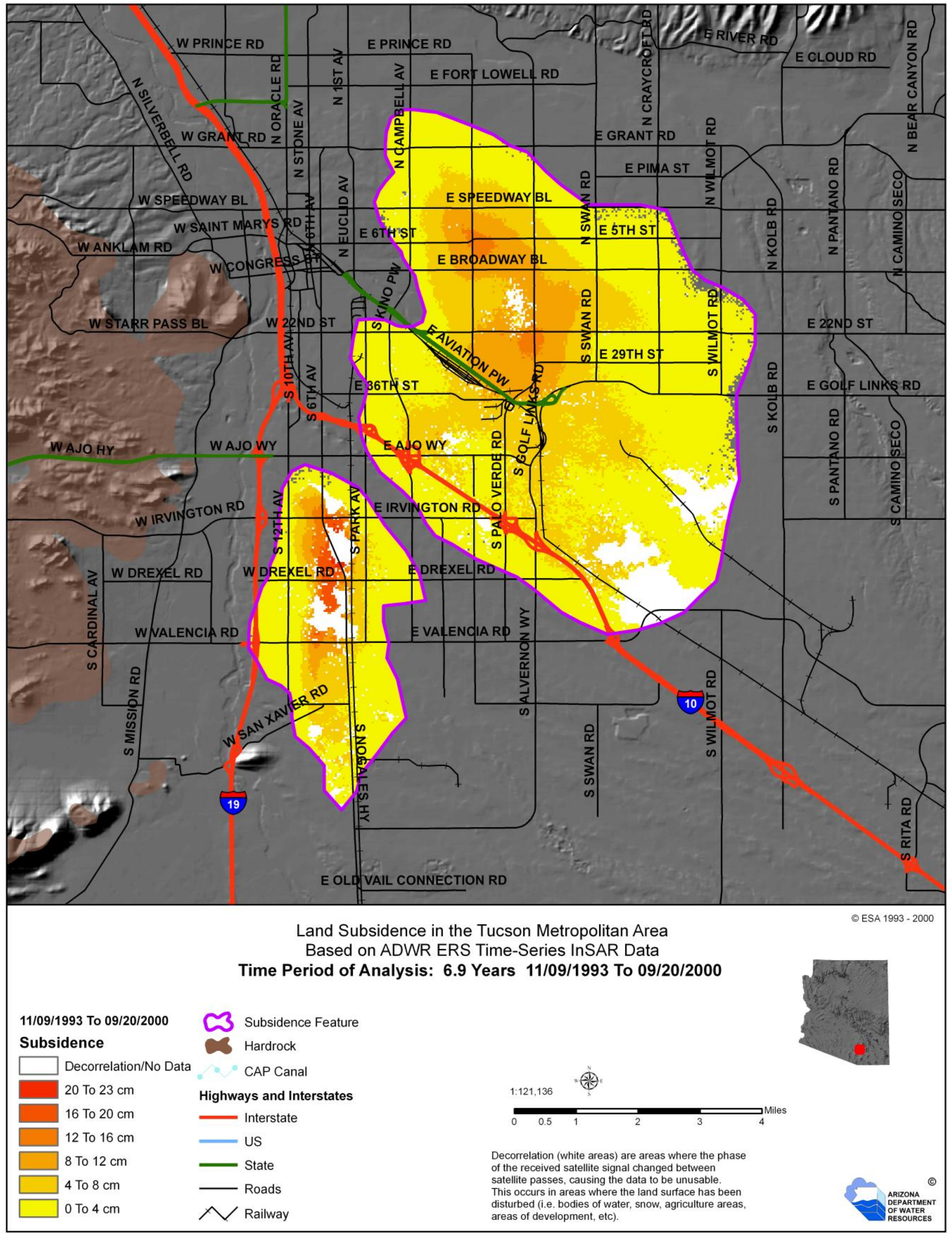


Figure 35 Land Subsidence in the Metropolitan Tucson Area (11/1993 to 9/2000)

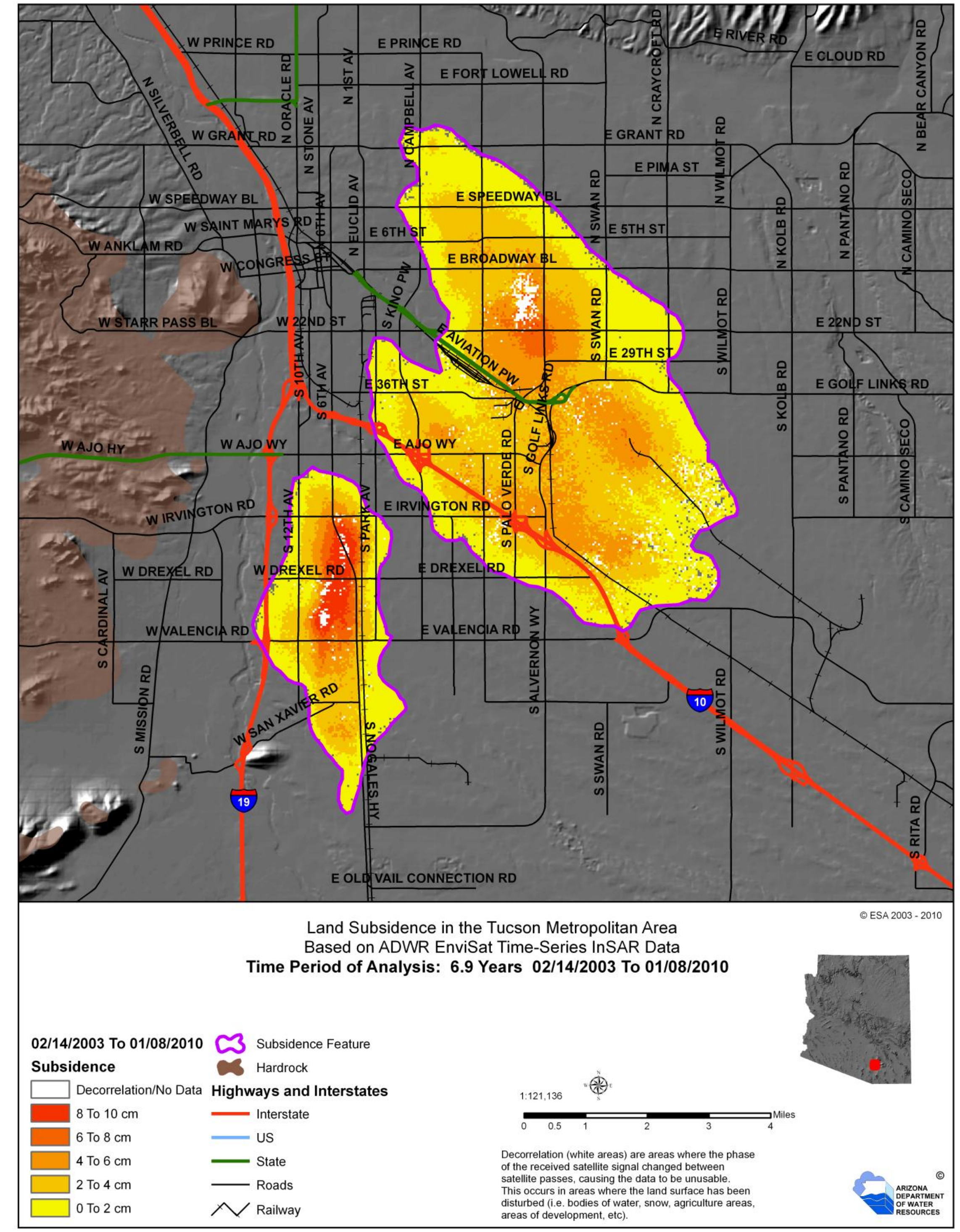


Figure 36 Land Subsidence in the Metropolitan Tucson Area (2/2003 to 1/2010)

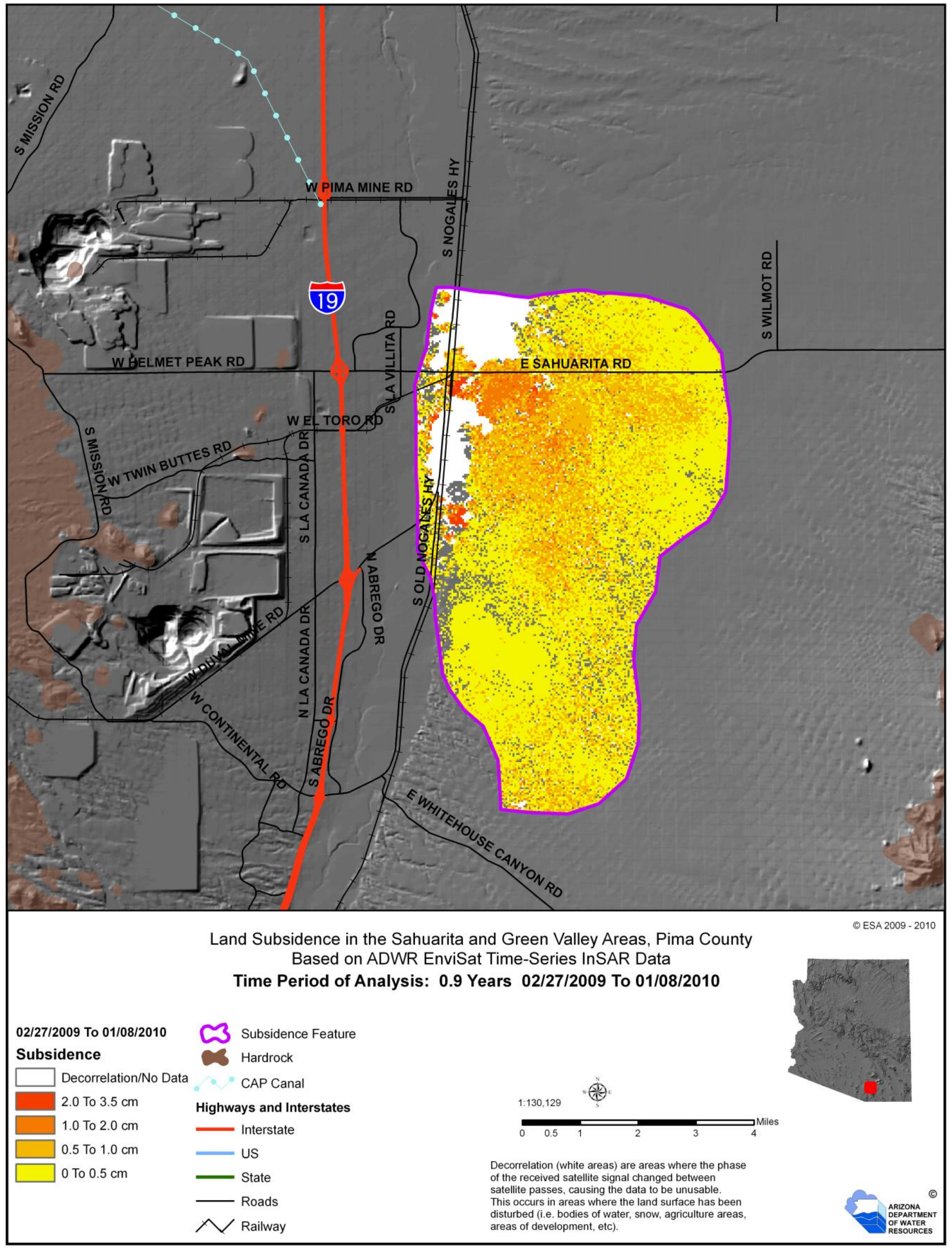


Figure 37 Land Subsidence in the Sahuarita and Green Valley Areas (2/2009 to 1/2010)

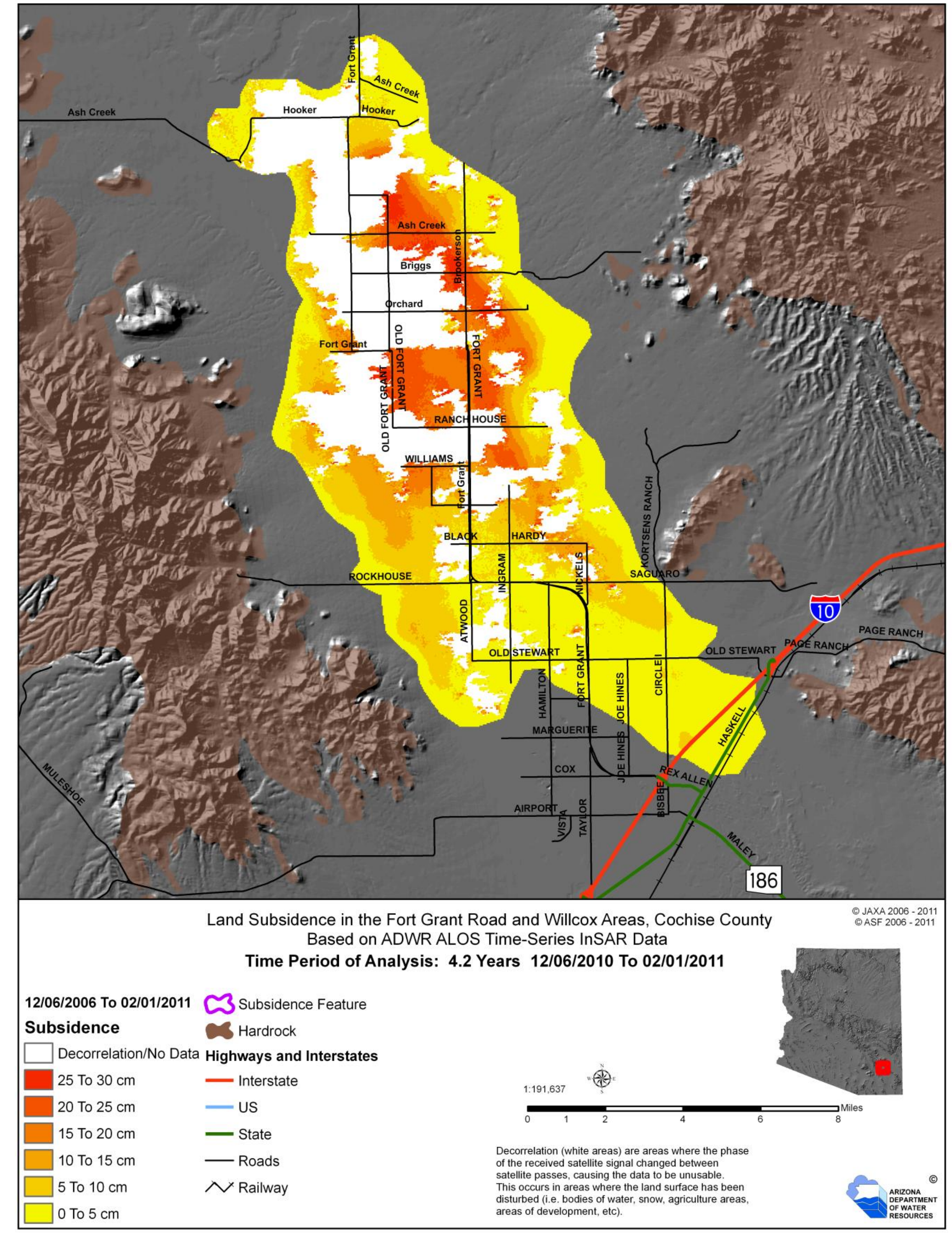


Figure 38 Land Subsidence in the Fort Grant Road and Willcox Areas (12/2010 to 2/2011)

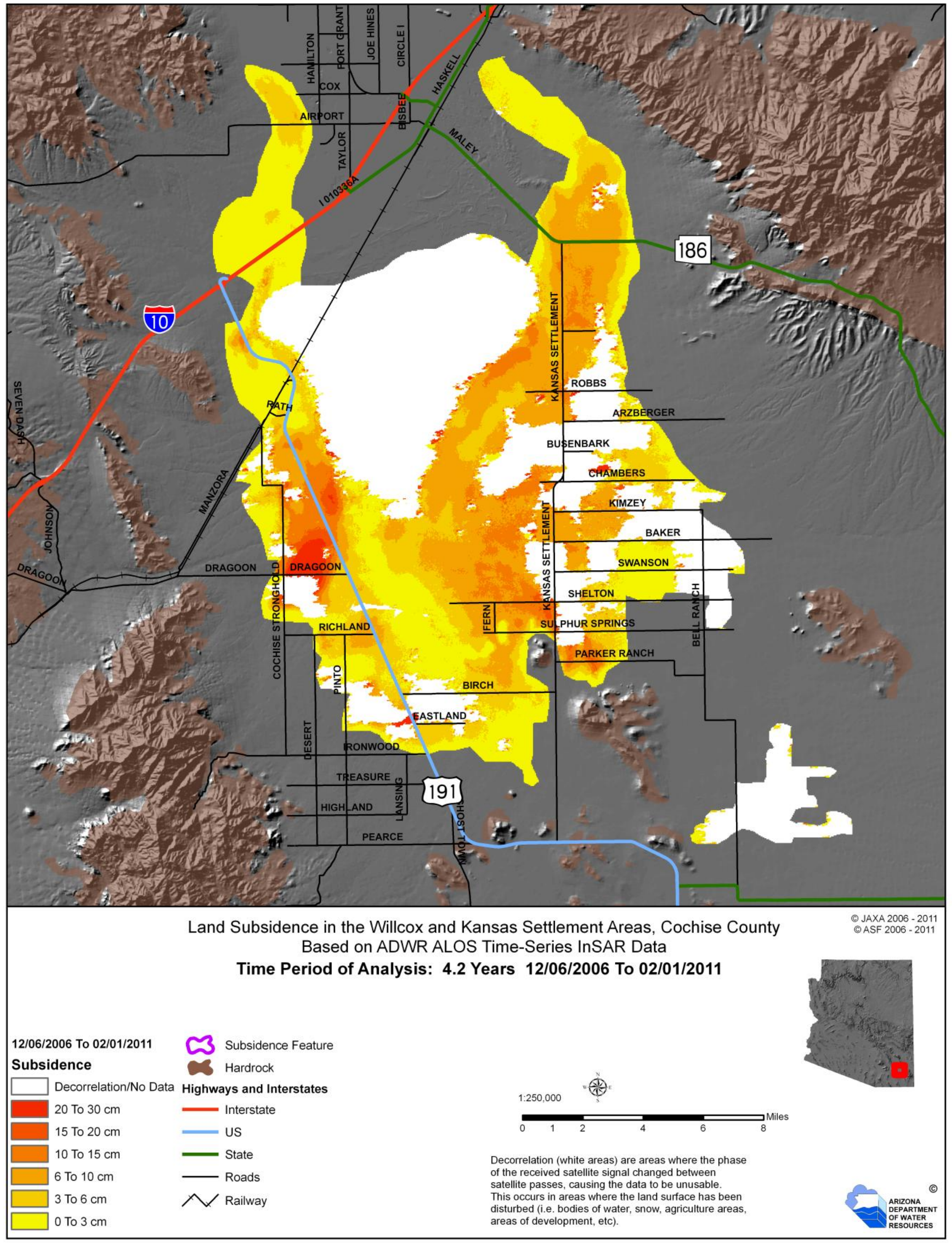


Figure 39 Land Subsidence in the Willcox and Kansas Settlement Areas (12/2006 to 2/2011)

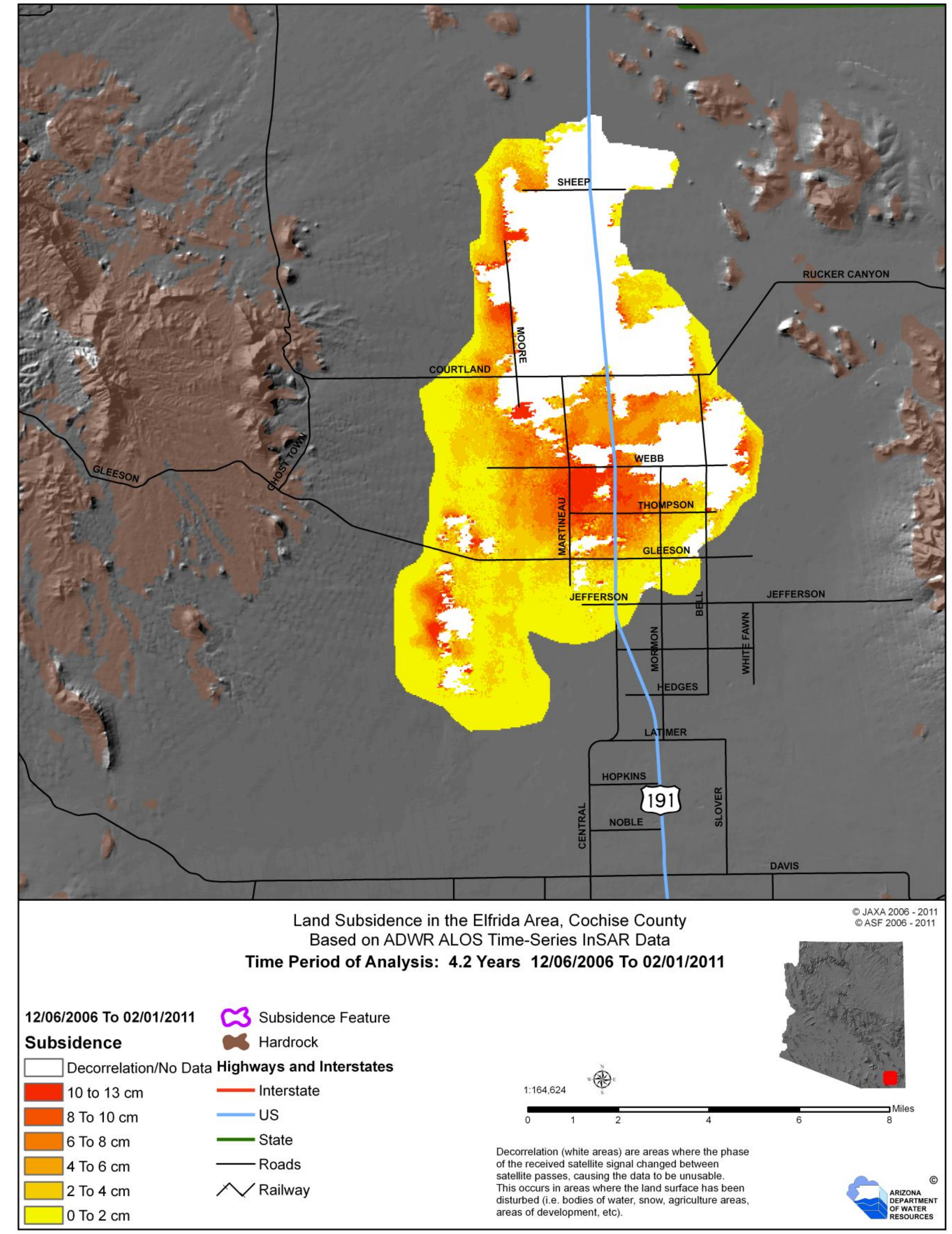


Figure 40 Land Subsidence in the Elfrida Area (12/2006 to 2/2011)

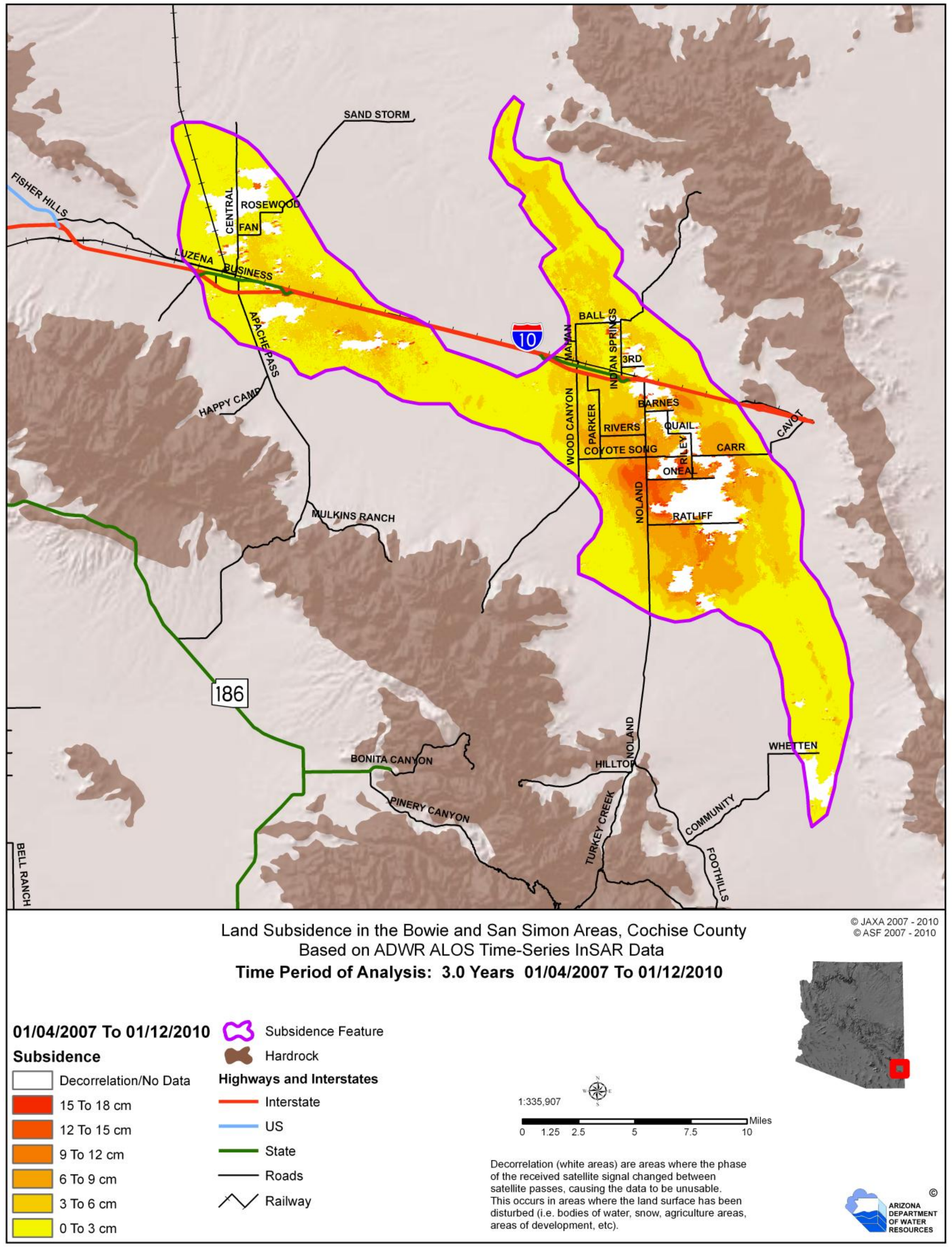
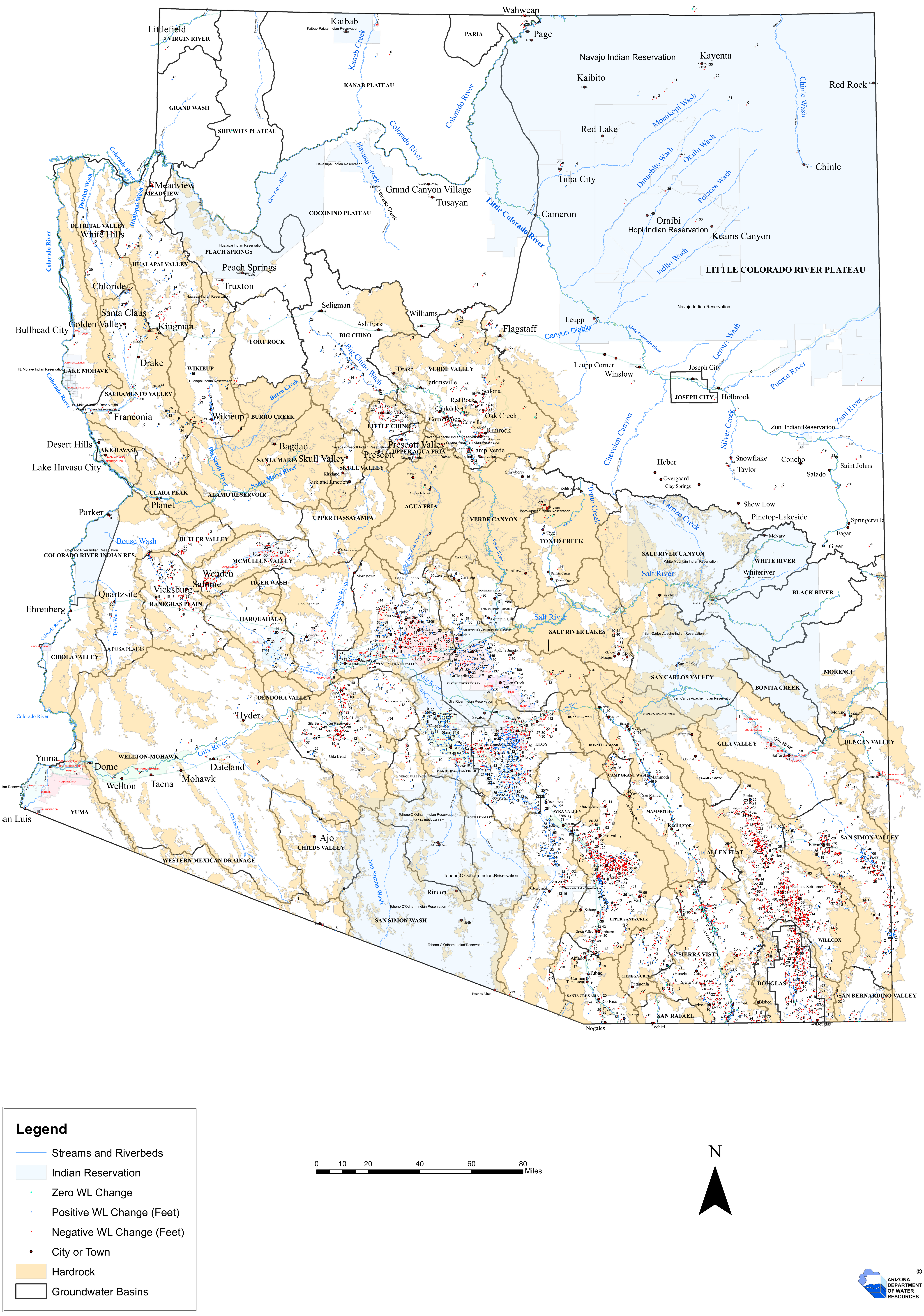


Figure 41 Land Subsidence in the Bowie and San Simon Areas (1/2007 to 1/2010)

Plate 1 - Water Level Change Map for Arizona (Late 1980's Early/Mid1990's to Mid/Late 2000's)



Appendix A - Selected Hydrographs

General Notes Concerning the Hydrographs

The hydrographs presented in this appendix are presented to provide additional insight into the long-term water level changes that have occurred in many areas of the state. The water levels presented in the hydrographs represent the groundwater system's integrated response to all stresses (pumping, recharge, etc.) that impact groundwater conditions in any particular location. In most cases, the hydrographs are annotated with information and interpretations concerning potential causes for the observed water level changes. However, in some cases there were insufficient data, information, and/or local knowledge available to support making such interpretive explanations.

For the most part, the cause and effect explanations provided for the observed water level changes are based on a general knowledge of regional and sometimes local groundwater and surface water use trends, recharge occurrences (anthropogenic and natural) and related hydrologic information. However, due to potential complexity of hydrologic stresses affecting any particular area, it is possible (probably likely) that the interpretations provided may not always include a complete listing of all potential factors that have contributed to the observed changes.

Well Locations

Much of Arizona is divided according to a rectangular coordinate system called the United States System of Surveying the Public Lands, or more commonly, the Public Lands Survey. Through a system of land subdivision based on east-west and north-south lines, land in Arizona is divided into squares called townships, ranges and sections.

Under the Public Lands Survey, all tracts of land are related to one "point" in Arizona. The point is the intersection of an east-west "baseline" and a north-south "meridian." The baseline and meridian meet in Arizona where the Gila and Salt Rivers meet.

The Public Lands Survey divides the land into "townships." A township is a square parcel of land that is six miles on each side. Its location is established as being so many six-mile units, called Townships, north or south of its baseline, and so many six-mile units, called Ranges, east or west of its meridian.

Each township is further divided into 36 parts called "sections." Each section contains 640 acres or one square mile. Because of the Earth's curvature, not all townships are square, not all townships contain 36 sections and not all sections contain 640 acres.

Township, range and section information are commonly used to describe "cadastral or legal" locations of wells Arizona (see next page for more details). In some areas of the state the township, range and section have not been surveyed and the cadastral locations of wells have been estimated and are described with the "UNSURV" label in the GWSI database. Wells located on the Navajo Indian Reservation are described using the Navajo Well Coordinate system. However, these wells are plotted on the map showing wells with hydrographs based upon the wells latitude and longitude.

Legal Description of Well Location

The terms *cadastral location* and *legal description* both refer to a method of locating land according to a rectangular coordinate system commonly known as the Public Lands Survey. Much of Arizona has been mapped according to this system. The initial point of reference was arbitrarily chosen as the confluence of the Gila and Salt Rivers. From this initial point, a north-south *meridian*, and an east-west *baseline*, divide the state into four unequal **quadrants** (A, B, C, D). (Baseline Road in Phoenix is named for our state's baseline. See the map below.)

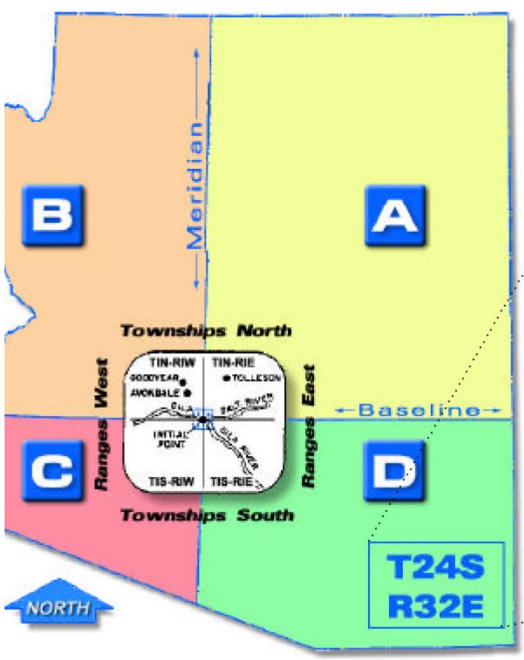
Each quadrant was surveyed and subdivided into congressional *townships*, with each square-shaped township typically six miles on each side, or 36 square miles in all. (Not all townships are exactly the same size due to landform variations and the curvature of the earth.) Beginning at the initial point and the number 1, each township is designated as being so many six-mile units – called **Townships** (capital T) – north or south of the baseline, and so many six-mile units – called **Ranges** – east or west of the meridian. The Township and Range together define a particular township.

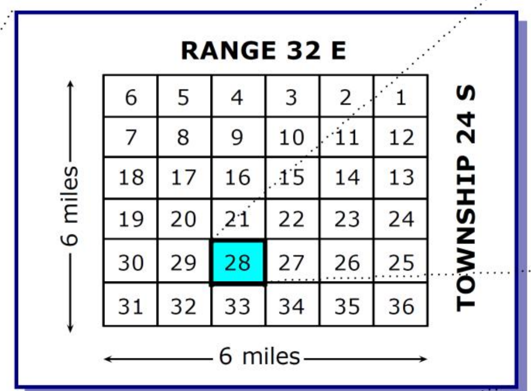
Each township is divided into 36 equal parts called **sections**. Each section is approximately one square mile, about 640 acres. Each 640-acre section can be subdivided into four 160-acre quarters. Each 160-acre quarter is further subdivided into four 40-acre quarters, and each 40-acre quarter is further subdivided into four 10-acre quarters. Each 160-, 40- and 10-acre quarter is designated as the northeast, northwest, southwest, or southeast quarter (a, b, c, d respectively).

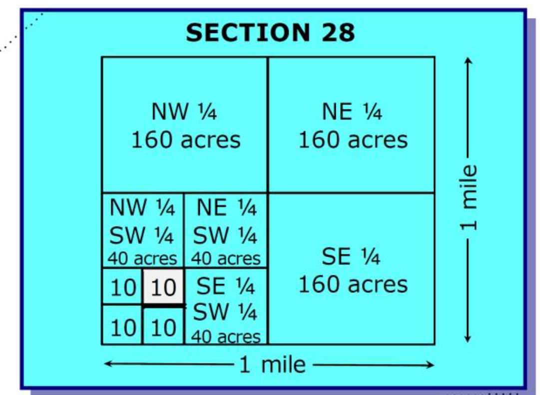
In the example here, the property for a well is in the southeastern-most township in the state, 24 townships south of the baseline, and 32 ranges east of the meridian, i.e., **T24S, R32E**. Within this township, the property lies in Section 28. The 10-acre white area where the well is located is in the southwest 160-acre quarter, then the southwest 40-acre quarter, and finally, the northeast 10-acre quarter. The legal description would be written as follows:

TOWNSHIP (N/S)	RANGE (E/W)	SECTION	160 ACRE	40 ACRE	10 ACRE
24S	32E	28	SW ¼	SW ¼	NE ¼

The cadastral location would be written as follows: **D (24-32) 28 cca**







Township and Range data can be found on U.S. Geological Survey maps, and many metropolitan street atlases.

Planning Area	Planning Area Abbreviation
Phoenix AMA	PHX
Pinal AMA	PIN
Tucson AMA	TUC
Santa Cruz AMA	SCA
Prescott AMA	PRE
Southeastern	SEA
Lower Colorado River	LCR
Upper Colorado River	UCR
Western Plateau	WPA
Eastern Plateau	EPA
Central Highlands	CHA

Planning Areas

Wells With Hydrographs								
PLANNING AREA	PA WELL NUMBER	LABEL	LOCALID	SITEID	LATDEC	LONDEC	UTME	UTMN
PHX	1	PHX1	C-01-05 34ADC1	331751112445701	33.29711	-112.75	337084.7	3685411.6
PHX	2	PHX2	B-02-06 05DAA	333237112530501	33.54436	-112.885	325035.9	3713044.1
PHX	3	PHX3	B-04-05 05ABB	334325112472001	33.72381	-112.79	334176.1	3732786.6
PHX	4	PHX4	C-01-03 06BCB	332223112362201	33.37236	-112.607	350483.0	3693544.9
PHX	5	PHX5	B-04-02 16AAD	334136112273901	33.69308	-112.461	364629.0	3728887.3
PHX	6	PHX6	B-04-02 27DCD	333915112265501	33.65375	-112.449	365597.9	3724529.8
PHX	7	PHX7	A-04-01 34BDD2	333844112144501	33.64591	-112.246	384460.2	3723398.9
PHX	8	PHX8	B-03-02 27AAA	333449112263801	33.58042	-112.444	366025.4	3716391.0
PHX	9	PHX9	A-01-03 18BBC	332600112054801	33.43323	-112.098	397949.7	3699674.1
PHX	10	PHX10	A-03-02 34ADA	333347112080401	33.56378	-112.135	394686.3	3714174.1
PHX	11	PHX11	A-01-03 05BAA	332752112042501	33.4645	-112.074	400206.1	3703100.3
PHX	12	PHX12	C-02-02 27CCC	331307112273001	33.218	-112.46	363940.4	3676218.9
PHX	13	PHX13	D-04-01 28CDD	330239112155201	33.04375	-112.263	382088.5	3656669.8
PHX	14	PHX14	A-05-01 10AAB	334750112142901	33.796	-112.24	385158.4	3740047.4
PHX	15	PHX15	A-06-05 31CCC2	334850111532401	33.814	-111.89	417628.5	3741682.8
PHX	16	PHX16	A-06-04 21DAC	335052111564701	33.84772	-111.946	412444.0	3745486.9
PHX	17	PHX17	A-03-07 30BAD	333447111402901	33.57969	-111.675	437383.7	3715568.8
PHX	18	PHX18	A-03-06 15ABA	333639111433101	33.61072	-111.725	432716.1	3719049.9
PHX	19	PHX19	A-03-04 21CCB2	333507111573301	33.58456	-111.959	410964.7	3716300.9
PHX	20	PHX20	A-03-04 17BAA	333642111580801	33.61128	-111.969	410141.9	3719296.2
PHX	21	PHX21	A-05-04 33DAA	334359111563401	33.73293	-111.943	412648.4	3732749.8
PHX	22	PHX22	A-06-02 15CDB	335134112084301	33.85947	-112.145	394062.3	3746970.6

Wells With Hydrographs								
PLANNING AREA	PA WELL NUMBER	LABEL	LOCALID	SITEID	LATDEC	LONDEC	UTME	UTMN
PHX	23	PHX23	A-03-04 35ADC	333338111544301	33.56367	-111.911	415404.0	3713950.7
PHX	24	PHX24	A-02-04 25CDD	332855111535901	33.48209	-111.9	416423.5	3704902.3
PHX	25	PHX25	A-01-05 29DDA	332346111512801	33.39658	-111.857	420333.3	3695388.9
PHX	26	PHX26	D-01-04 18DBB1	332032111591201	33.34117	-111.987	408182.2	3689345.8
PHX	27	PHX27	A-02-06 28DDB	332903111441901	33.48425	-111.738	431430.7	3705014.7
PHX	28	PHX28	D-01-06 24CCC2	331918111421101	33.32167	-111.703	434560.7	3686976.2
PHX	29	PHX29	D-03-08 13AAA2	331033111282901	33.17589	-111.474	455792.2	3670688.5
PHX	30	PHX30	D-03-08 13AAA2	331033111282901	33.17589	-111.474	455792.2	3670688.5
PIN	1	PIN1	D-05-09 03DAB	330120111242501	33.02253	-111.408	461863.9	3653664.1
PIN	2	PIN2	D-06-09N06DAA	325634111264801	32.94308	-111.447	458246.4	3644871.7
PIN	3	PIN3	D-06-08S04ADD1	325554111305201	32.93042	-111.515	451851.9	3643515.1
PIN	4	PIN4	D-05-07W13CAD	325908111355701	32.98542	-111.593	444614.5	3649650.5
PIN	5	PIN5	D-05-09 18BDD1	325945111275101	32.99589	-111.465	456610.4	3650729.7
PIN	6	PIN6	D-07-08 30CDD	324641111333101	32.77786	-111.558	447711.0	3626599.4
PIN	7	PIN7	D-10-07 08AAA	323442111392101	32.57	-111.65	438469.4	3604573.2
PIN	8	PIN8	D-08-08 10CDD	324405111302501	32.73469	-111.507	452448.8	3621802.5
PIN	9	PIN9	D-06-06 22DDD	325248111421901	32.87981	-111.705	433998.5	3637983.0
PIN	10	PIN10	D-06-05 16DAD1	325357111493301	32.89769	-111.826	422710.5	3640066.6
PIN	11	PIN11	D-07-05 07DDD	324917111513801	32.82128	-111.862	419341.9	3631624.6
PIN	12	PIN12	D-07-04 22DCC	324749111551301	32.79686	-111.938	412193.0	3628975.4
PIN	13	PIN13	D-04-03 20DCD	330332112041401	33.05814	-112.069	400116.5	3658049.7
PIN	14	PIN14	D-05-03 25ADD	325746111595201	32.96222	-111.996	406903.8	3647348.2

Wells With Hydrographs								
PLANNING AREA	PA WELL NUMBER	LABEL	LOCALID	SITEID	LATDEC	LONDEC	UTME	UTMN
PIN	15	PIN15	D-06-01 21DAC	325257112152601	32.88986	-112.257	382403.5	3639602.4
PIN	16	PIN16	D-09-01 13BBD	323900112130201	32.64997	-112.217	385839.3	3612951.4
PIN	17	PIN17	D-10-06 23BCB2	323459111391901	32.54494	-111.723	432090.1	3600882.3
TUC	1	TUC1	D-08-11 31BBB	324157111153101	32.69958	-111.258	475783.0	3617822.9
TUC	2	TUC2	D-09-10 19AAA	323753111204601	32.63206	-111.345	467611.6	3610348.2
TUC	3	TUC3	D-11-11 16CDD2	322805111133101	32.46797	-111.225	478855.7	3592151.0
TUC	4	TUC4	D-12-10 23DAB	322219111172801	32.37136	-111.291	472639.9	3581450.8
TUC	5	TUC5	D-14-11 05CCD1	321404111145401	32.23361	-111.249	476524.2	3566169.0
TUC	6	TUC6	D-15-11 22CCC	320616111125702	32.10444	-111.216	479636.1	3551845.1
TUC	7	TUC7	D-22-08 19DBC	312946111334501	31.49669	-111.561	446684.7	3484597.9
TUC	8	TUC8	D-10-14 29DCA	323139110550801	32.52756	-110.919	507591.3	3598720.9
TUC	9	TUC9	D-12-14 05CCD	322434110562501	32.40953	-110.94	505616.0	3585633.5
TUC	10	TUC10	D-13-13 16CCD	321745111012801	32.29598	-111.024	497698.5	3573069.7
TUC	11	TUC11	D-14-14 05ADB1	321445110554601	32.24622	-110.93	506568.1	3567529.4
TUC	12	TUC12	D-15-15 25DBC2	320533110454901	32.093	-110.763	522332.3	3550586.8
TUC	13	TUC13	D-13-15 34CDB1	321512110480701	32.25333	-110.802	518656.2	3568345.0
TUC	14	TUC14	D-14-13 26DBB	321107110590801	32.18528	-110.986	501361.6	3560784.4
TUC	15	TUC15	D-16-14S06CCD	320335110572701	32.05961	-110.957	504038.1	3546868.4
TUC	16	TUC16	D-18-13 01CDA	315313110580801	31.88694	-110.969	502942.3	3527717.7
TUC	17	TUC17	D-19-13 21BAA	314606111011301	31.76886	-111.02	498151.7	3514629.9
SCA	1	SCA1	D-20-11 21DAA	314024111125301	31.67325	-111.214	479620.0	3504061.7
SCA	2	SCA2	D-20-13 06CBA	314303111032801	31.71703	-111.057	494631.0	3508876.6

Wells With Hydrographs								
PLANNING AREA	PA WELL NUMBER	LABEL	LOCALID	SITEID	LATDEC	LONDEC	UTME	UTMN
SCA	3	SCA3	D-20-13 32BCC	313845111023101	31.64614	-111.043	495943.9	3501025.3
SCA	4	SCA4	D-21-13 06DAA	313747111023901	31.62972	-111.045	495732.4	3499209.0
SCA	5	SCA5	D-22-13 09DA2 UNSURV	313137111004301	31.52636	-111.01	498997.9	3487755.6
SCA	6	SCA6	D-22-13 35DCD UNSURV	312756110584801	31.46556	-110.98	501900.0	3481013.6
SCA	7	SCA7	D-23-14 15CCB1	312523110542801	31.42419	-110.908	508765.1	3476430.0
SCA	8	SCA8	D-23-14 36BCB1	312316110522701	31.38778	-110.874	511964.2	3472400.2
SCA	9	SCA9	D-24-15 18BAD UNSURV	312048110504901	31.34494	-110.849	514321.2	3467662.2
SCA	10	SCA10	D-23-13 36ADB	312316110574801	31.38736	-110.962	503618.3	3472363.2
PRE	1	PRE1	B-17-02S34ABB	344820112272701	34.80481	-112.457	366753.6	3852157.8
PRE	2	PRE2	B-16-02 22DBD	344458112270601	34.74947	-112.452	367122.4	3846020.8
PRE	3	PRE3	B-16-02 11CBB1	344653112264901	34.78068	-112.446	367667.1	3849478.0
PRE	4	PRE4	B-16-02 28DDC	344357112280901	34.73108	-112.469	365498.5	3844007.6
PRE	5	PRE5	B-16-01 20CBD1	344459112232601	34.75	-112.391	372717.4	3846003.3
PRE	6	PRE6	B-15-01 23BAD	344011112200901	34.66972	-112.334	377761.2	3837030.6
PRE	7	PRE7	B-16-01 25DDA	344358112182901	34.73256	-112.309	380167.9	3843962.2
PRE	8	PRE8	B-15-01 19DCD2	343930112235601	34.65911	-112.399	371763.6	3835941.2
PRE	9	PRE9	B-15-01 19DCD1	343930112235301	34.65819	-112.399	371838.7	3835847.7
PRE	10	PRE10	A-15-01 11DDD	344117112130901	34.68814	-112.219	388322.9	3838930.1
PRE	11	PRE11	B-15-02 30DCB	343836112302401	34.64633	-112.507	361916.5	3834665.9
PRE	12	PRE12	B-15-03 13ACC	344147112313201	34.67928	-112.525	360316.6	3838325.9
PRE	13	PRE13	B-14-01 10DDA	343610112203201	34.60297	-112.342	376950.1	3829646.9
PRE	14	PRE14	A-14-01 08BBB	343652112172101	34.61558	-112.289	381863.6	3830971.8

Wells With Hydrographs								
PLANNING AREA	PA WELL NUMBER	LABEL	LOCALID	SITEID	LATDEC	LONDEC	UTME	UTMN
PRE	15	PRE15	B-14-01 25DAC	343343112183801	34.56203	-112.311	379761.8	3825059.4
PRE	16	PRE16	A-14-01 34CCA	343244112150901	34.54578	-112.253	385048.0	3823196.1
PRE	17	PRE17	A-13-01 02CAD	343157112135401	34.53228	-112.231	387017.8	3821662.3
PRE	18	PRE18	A-13-01 12CCC	343050112130901	34.51397	-112.219	388064.0	3819616.3
SEA	1	SEA1	D-23-17 10CBC2	312647110364101	31.44594	-110.611	536926.4	3478892.9
SEA	2	SEA2	D-22-15 12AAD2	313225110453301	31.54028	-110.759	522861.3	3489320.0
SEA	3	SEA3	D-18-17 33ADA	314937110362301	31.82711	-110.606	537249.1	3521165.3
SEA	4	SEA4	D-22-21 34ACC	312832110114901	31.47572	-110.198	576178.4	3482430.8
SEA	5	SEA5	D-21-20 35CDD	313320110165301	31.55578	-110.28	568125.0	3491242.2
SEA	6	SEA6	D-24-22 20BBA	312006110075501	31.33439	-110.135	582291.7	3466805.6
SEA	7	SEA7	D-20-22 11ADB	314239110035301	31.71167	-110.065	588647.3	3508670.7
SEA	8	SEA8	D-18-20 30CAB	315019110203501	31.83851	-110.343	562157.4	3522537.3
SEA	9	SEA9	D-18-19 25DCC	315005110212501	31.83463	-110.356	560917.7	3522098.9
SEA	10	SEA10	D-18-21 06AAB2	315417110140001	31.90486	-110.234	572414.0	3529974.2
SEA	11	SEA11	D-16-20 27BBB	320113110174901	32.02083	-110.298	566342.0	3542772.9
SEA	12	SEA12	D-15-20 10CAB2	320836110172301	32.14361	-110.29	566960.7	3556386.7
SEA	13	SEA13	D-12-19 19BBC	322253110270001	32.38119	-110.449	551840.4	3582624.8
SEA	14	SEA14	D-09-15 35AAD	323644110461201	32.61244	-110.773	521266.8	3608162.9
SEA	15	SEA15	D-08-14 09AAD	324525110534701	32.75689	-110.896	509705.6	3624156.8
SEA	16	SEA16	D-07-20 21BDB	324902110184901	32.81319	-110.308	564750.4	3630614.7
SEA	17	SEA17	D-03-15 29AAB	330858110495101	33.14925	-110.83	515854.3	3667645.0
SEA	18	SEA18	D-23-27 22DDA2	312433109344901	31.40994	-109.58	634987.5	3475728.1

Wells With Hydrographs

PLANNING AREA	PA WELL NUMBER	LABEL	LOCALID	SITEID	LATDEC	LONDEC	UTME	UTMN
SEA	19	SEA19	D-19-26 33CDA	314358109414801	31.73194	-109.695	623602.6	3511278.0
SEA	20	SEA20	D-17-27 31CDD2	315421109380401	31.90625	-109.635	629044.3	3530684.8
SEA	21	SEA21	D-16-25 36AAA	320022109444601	32.00683	-109.745	618539.2	3541705.9
SEA	22	SEA22	D-16-24 21CCC	320119109545001	32.02147	-109.915	602491.4	3543133.5
SEA	24	SEA24	D-24-30 16CCC	312006109180601	31.33469	-109.3	661737.0	3467761.4
SEA	25	SEA25	D-24-30 23BBA2	312003109154601	31.334	-109.263	665227.4	3467723.4
SEA	26	SEA26	D-16-32 21CCB	320051109050601	32.01533	-109.087	680713.3	3543541.4
SEA	27	SEA27	D-12-28 15BCB	322334109285801	32.39347	-109.484	642628.9	3584872.7
SEA	28	SEA28	D-08-32 20ABB	324355109051801	32.72953	-109.089	679062.7	3622718.3
SEA	29	SEA29	A-05-31 17CAA1	334943109055301	33.82675	-109.098	675987.0	3744369.7
SEA	30	SEA30	D-05-30 17ABA	330016109163701	33.00475	-109.277	660991.5	3652938.4
SEA	31	SEA31	D-07-26 22BAB	324855109403301	32.81614	-109.677	623857.4	3631485.9
SEA	32	SEA32	D-07-25 10AAD	325033109460101	32.84217	-109.767	615379.6	3634272.5
SEA	33	SEA33	D-01-16 09CBC UNSURV	332128110432101	33.35764	-110.724	525715.0	3690793.1
LCR	1	LCR1	C-11-24 23BCB	322737114415301	32.46022	-114.698	152318.4	3597294.3
LCR	2	LCR2	C-09-22 17DCA	323840114320101	32.64436	-114.533	168543.6	3617198.1
LCR	3	LCR3	C-08-17 20DCC	324229114014601	32.70786	-114.03	216011.1	3622761.0
LCR	4	LCR4	C-06-12 19BBA	325353113321101	32.89822	-113.538	262570.6	3642683.2
LCR	5	LCR5	C-03-11 31DBB	330725113260201	33.12408	-113.432	273054.2	3667484.0
LCR	6	LCR6	C-11-06 24BDA1	322726112502001	32.45756	-112.839	327158.7	3592447.5
LCR	7	LCR7	C-17-05 17ABC2UNSURV	315702112480401	31.95039	-112.801	329793.9	3536152.7
LCR	8	LCR8	C-04-08 35BDD	330202113032101	33.03356	-113.055	308108.2	3656698.0

Wells With Hydrographs								
PLANNING AREA	PA WELL NUMBER	LABEL	LOCALID	SITEID	LATDEC	LONDEC	UTME	UTMN
LCR	9	LCR9	C-05-03 29AAA	325813112345301	32.97022	-112.581	352212.8	3648911.0
LCR	10	LCR10	C-05-06 17DAD	325920112533201	32.98892	-112.893	323119.4	3651455.4
LCR	11	LCR11	C-03-04 17ADD	331008112410801	33.16868	-112.686	342763.3	3671060.9
LCR	12	LCR12	B-03-21 08ABD	333718114264701	33.62181	-114.446	180299.7	3725373.0
LCR	13	LCR13	B-03-19 29BAB	333445114144601	33.57964	-114.246	198716.5	3720088.1
LCR	14	LCR14	B-04-19 29BCB1	333946114150101	33.66239	-114.25	198644.1	3729282.5
LCR	15	LCR15	B-02-14 10CDC	333121113413001	33.52372	-113.691	250061.3	3712387.2
LCR	16	LCR16	B-05-15 35BDD2	334357113473201	33.73225	-113.792	241344.2	3735773.3
LCR	17	LCR17	B-07-15 02DDC	335823113471501	33.97217	-113.787	242503.8	3762382.8
LCR	18	LCR18	B-08-14 20DAB	340122113440301	34.02286	-113.734	247531.3	3767859.1
LCR	19	LCR19	B-06-13 28DBD2	334955113365201	33.83197	-113.615	258024.0	3746404.0
LCR	20	LCR20	B-07-09 15CDD	335635113110601	33.94317	-113.185	298062.3	3757798.5
LCR	21	LCR21	C-01-08 06CCC2	332148113073401	33.36309	-113.125	302316.2	3693364.4
LCR	22	LCR22	B-01-09 07BCC	332637113134801	33.44294	-113.23	292704.8	3702437.1
LCR	23	LCR23	B-02-09 03BBB	333305113104301	33.55153	-113.178	297761.4	3714379.9
UCR	1	UCR1	B-11-04 18CCC	341714112431801	34.28747	-112.722	341533.1	3795180.3
UCR	2	UCR2	B-13-04 27AB UNSPZ1	342639112394201	34.44425	-112.661	347391.8	3812461.7
UCR	3	UCR3	B-11-08 20ADB	341707113063901	34.286	-113.115	305295.3	3795710.0
UCR	4	UCR4	B-13-09 17BCC	342801113134801	34.46694	-113.23	295174.6	3815992.4
UCR	5	UCR5	B-16-13 21DDD2	344220113364901	34.70647	-113.617	260314.6	3843404.7
UCR	6	UCR6	B-15-13 02DBB	344005113351801	34.66806	-113.588	262826.3	3839084.6
UCR	7	UCR7	B-16-13 36CCC	344040113351001	34.67739	-113.58	263667.9	3840111.4

Wells With Hydrographs								
PLANNING AREA	PA WELL NUMBER	LABEL	LOCALID	SITEID	LATDEC	LONDEC	UTME	UTMN
UCR	8	UCR8	B-23-13 19DCB	352135113423001	35.35983	-113.706	254127.8	3916111.1
UCR	9	UCR9	B-23-13 32ACA	352010113411501	35.33894	-113.687	255791.5	3913740.6
UCR	10	UCR10	B-18-11 28ABA	345509113264501	34.91917	-113.446	276565.7	3866612.5
UCR	11	UCR11	B-22-08 15CCB	351712113065401	35.28	-113.11	307657.8	3906625.3
UCR	12	UCR12	B-21-10 17CCD1	351153113214301	35.19931	-113.361	285068.5	3897516.2
UCR	13	UCR13	B-13-13 07DDB2	342836113391301	34.47714	-113.653	256286.5	3818071.7
UCR	14	UCR14	B-11-11 31BBB1	341531113265801	34.25861	-113.449	274456.4	3793350.5
UCR	15	UCR15	B-11-16 32CDA	341454113565501	34.24847	-113.949	228447.4	3793445.9
UCR	16	UCR16	B-13-20 04ABB1	343007114213101	34.50164	-114.359	191552.9	3822711.1
UCR	17	UCR17	B-21-21 21CBB	351120114320001	35.18969	-114.534	178221.7	3899607.2
UCR	18	UCR18	B-20-22 24DDD	350557114334501	35.09922	-114.562	175255.0	3889651.5
UCR	19	UCR19	B-15-15 15BCB3	343836113493201	34.6435	-113.825	241032.6	3836956.9
UCR	20	UCR20	B-16-19 10CBC	344424114144301	34.73992	-114.246	202764.6	3848815.5
UCR	21	UCR21	B-17-18 12ACB1	345232114084601	34.87597	-114.146	212448.5	3863623.7
UCR	22	UCR22	B-20-17W07BBB1	350814114082001	35.13794	-114.139	213997.8	3892666.7
UCR	23	UCR23	B-21-18 09BBA	351340114125401	35.22772	-114.215	207357.3	3902844.3
UCR	24	UCR24	B-22-18S05DBC	351914114132801	35.32081	-114.225	206808.1	3913198.2
UCR	25	UCR25	B-23-18 04ADB	352451114121001	35.41425	-114.203	209164.5	3923488.7
UCR	26	UCR26	B-30-20 06CAD UNSURV	360105114281101	36.01483	-114.47	187223.3	3990954.3
UCR	27	UCR27	B-26-20 06ACB	354027114273101	35.67179	-114.456	187168.2	3952852.7
UCR	28	UCR28	B-27-19 17AAA	354402114194001	35.73386	-114.327	199059.9	3959340.3
UCR	29	UCR29	B-22-16 28BAD	351554113590701	35.26471	-113.985	228422.6	3906288.1

Wells With Hydrographs								
PLANNING AREA	PA WELL NUMBER	LABEL	LOCALID	SITEID	LATDEC	LONDEC	UTME	UTMN
UCR	30	UCR30	B-22-16E19BAA	351700114014001	35.28286	-114.02	225322.4	3908388.0
UCR	31	UCR31	B-24-15 01BAC	352951113493901	35.49747	-113.828	243517.1	3931693.7
UCR	32	UCR32	B-26-17 35AAA	353610114033501	35.60344	-114.061	222710.2	3944068.8
UCR	33	UCR33	B-27-16 33BAA	354130113595601	35.691	-113.998	228671.2	3953633.6
UCR	34	UCR34	B-26-18 03AAA1	354036114110601	35.67639	-114.185	211720.7	3952532.5
UCR	35	UCR35	B-30-17 23CAB	355828114045001	35.97397	-114.08	222216.9	3985241.0
UCR	36	UCR36	B-30-17 14DCC	355855114043501	35.982	-114.076	222648.2	3986128.0
UCR	37	UCR37	B-24-08 20AAB2	352729113081501	35.45797	-113.137	306048.6	3925741.7
UCR	38	UCR38	B-24-12 09AAD	352904113333401	35.48444	-113.559	267800.5	3929581.0
WPA	1	WPA1	B-36-15 25DCD	362908113505501	36.48553	-113.849	244757.5	4041379.5
WPA	2	WPA2	B-37-15 18DBC	363620113565501	36.60528	-113.949	236254.0	4054932.8
WPA	3	WPA3	B-40-16 34CBC	364912114005601	36.81975	-114.017	230902.3	4078922.2
WPA	4	WPA4	B-40-15 06CDD	365321113572401	36.88931	-113.957	236481.7	4086474.7
WPA	5	WPA5	B-41-15 33CAC	365429113554501	36.90819	-113.929	239023.4	4088508.8
WPA	6	WPA6	B-34-12 24DDA	361942113311701	36.32836	-113.521	273671.5	4023116.3
WPA	7	WPA7	B-40-04 06AAC	365403112452801	36.90106	-112.757	343436.3	4085141.3
WPA	8	WPA8	B-39-01 18DDB	364632112261001	36.77453	-112.435	371961.1	4070608.5
WPA	9	WPA9	A-41-08 14BCA	365723111302801	36.95633	-111.507	454829.9	4089945.4
WPA	10	WPA10	A-42-08 36CBC	365942111292501	36.99464	-111.49	456397.5	4094195.9
WPA	11	WPA11	A-25-06 20ACC	353210111462401	35.53617	-111.773	429943.4	3932573.8
EPA	1	EPA1	A-21-06 35CBA	350924111440101	35.15672	-111.734	433182.4	3890465.3
EPA	2	EPA2	A-22-07 32CBB	351442111410001	35.24489	-111.683	437829.2	3900228.8

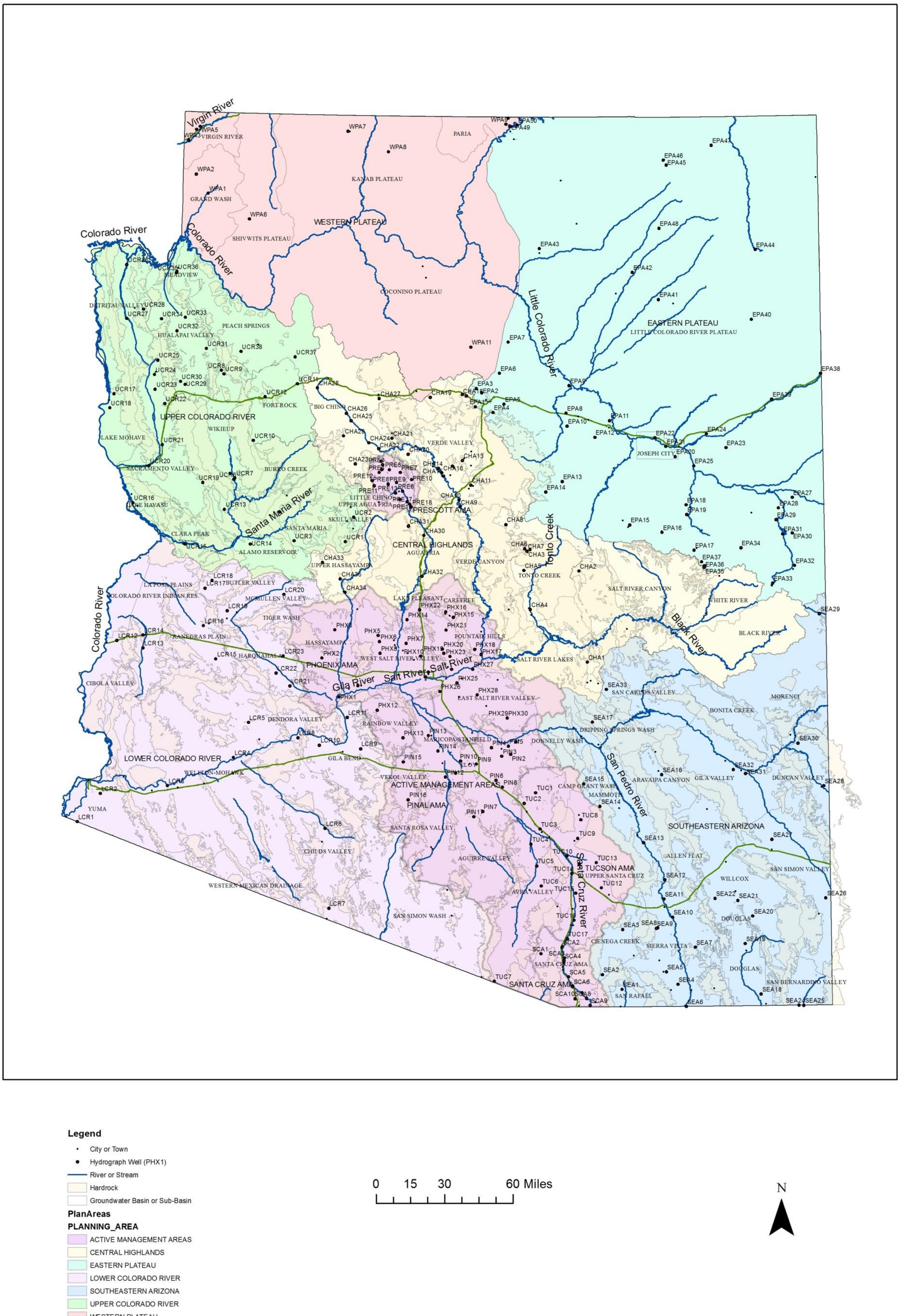
Wells With Hydrographs								
PLANNING AREA	PA WELL NUMBER	LABEL	LOCALID	SITEID	LATDEC	LONDEC	UTME	UTMN
EPA	3	EPA3	A-22-06 23DBC3	351620111433201	35.273	-111.726	433959.9	3903367.9
EPA	4	EPA4	A-20-08 18BBB	350716111354401	35.12119	-111.596	445707.9	3886438.4
EPA	5	EPA5	A-21-08 26DAB	351025111303701	35.17361	-111.51	453533.6	3892217.3
EPA	6	EPA6	A-23-08 21ABA	352214111324601	35.37076	-111.546	450380.5	3914098.2
EPA	7	EPA7	A-25-09 06CCD	353410111284001	35.56969	-111.479	456554.0	3936129.4
EPA	8	EPA8	A-20-12H13CBB	350706111014701	35.11819	-111.03	497301.8	3885952.9
EPA	9	EPA9	05 132-00.32X14.24	351739111001501	35.29346	-111.006	499494.9	3905375.0
EPA	10	EPA10	A-19-12H13BAD	350210111011001	35.0365	-111.023	497947.7	3876881.0
EPA	11	EPA11	A-19-16 06CDB	350417110413301	35.07089	-110.692	528087.0	3880743.9
EPA	12	EPA12	A-18-14 13ABD3	345750110482801	34.96386	-110.808	517548.7	3868857.9
EPA	13	EPA13	A-15-12 15DDC	344058111033101	34.68	-111.059	494631.0	3837670.2
EPA	14	EPA14	A-14-11 09ADC	343655111111201	34.61544	-111.187	482861.2	3830230.5
EPA	15	EPA15	A-12-17 33BDD	342342110322401	34.40583	-110.541	542150.4	3807055.0
EPA	16	EPA16	A-11-19 14ABD	342123110173301	34.35619	-110.293	565064.3	3801673.1
EPA	17	EPA17	A-10-22 30ABA	341429110025201	34.24147	-110.048	587664.0	3789135.8
EPA	18	EPA18	A-13-21 10CDA	343150110063001	34.53056	-110.106	582060.5	3821152.3
EPA	19	EPA19	A-13-21 34DCC2	342811110061201	34.46972	-110.104	582324.2	3814408.4
EPA	20	EPA20	A-17-20 26DBC	345023110111401	34.83932	-110.186	574389.8	3855328.8
EPA	21	EPA21	A-17-20 06ACB	345414110153601	34.90322	-110.26	567607.8	3862375.7
EPA	22	EPA22	A-18-19 17ADC	345736110204201	34.95958	-110.344	559927.7	3868575.7
EPA	23	EPA23	A-17-24 09ABD	345333109474501	34.89263	-109.796	610049.2	3861600.8
EPA	24	EPA24	A-18-23 06CDC2	345901109564001	34.98208	-109.944	596422.2	3871383.7

Wells With Hydrographs								
PLANNING AREA	PA WELL NUMBER	LABEL	LOCALID	SITEID	LATDEC	LONDEC	UTME	UTMN
EPA	25	EPA25	A-16-22 17CCD	344644110024201	34.77919	-110.045	587382.2	3848772.5
EPA	27	EPA27	A-13-29 05BAD	343408109171901	34.56889	-109.289	656993.7	3826370.5
EPA	28	EPA28	A-13-28 29BCD	343015109234801	34.50422	-109.397	647194.2	3819030.1
EPA	29	EPA29	A-12-28 19BAD	342548109250301	34.42975	-109.417	645428.3	3810747.5
EPA	30	EPA30	A-11-29 20ABB	342033109174101	34.34261	-109.294	656932.6	3801255.6
EPA	31	EPA31	A-11-28 22BDD1	342024109220201	34.33853	-109.367	650193.4	3800713.4
EPA	32	EPA32	A-09-29 33BDA	340808109165001	34.13578	-109.28	658546.2	3778357.4
EPA	33	EPA33	A-07-27 01CDB	340135109270001	34.02639	-109.45	643104.7	3765970.7
EPA	34	EPA34	A-10-25 22BBD2	341516109412401	34.25444	-109.69	620620.4	3790949.8
EPA	35	EPA35	A-09-22 36CBB	340752109581701	34.13111	-109.971	594847.9	3776976.3
EPA	36	EPA36	A-09-22 25CCB	340832109581101	34.1425	-109.97	594963.2	3778240.5
EPA	37	EPA37	A-09-22 22AAC	340958109593201	34.16611	-109.992	592914.0	3780838.4
EPA	38	EPA38	A-23-31 33AAB	352119109031601	35.35536	-109.055	676754.6	3913981.2
EPA	39	EPA39	A-21-27 25BBD2	351149109260802	35.19683	-109.436	642399.3	3895806.2
EPA	40	EPA40	17 110-04.68X02.91	354229109345801	35.70819	-109.583	628207.2	3952294.3
EPA	41	EPA41	06 094-03.23X11.05	355023110182701	35.84028	-110.308	562541.0	3966254.4
EPA	42	EPA42	04 075-00.61X16.21 B	360055110304001	36.01417	-110.511	544030.7	3985429.6
EPA	43	EPA43	03 077-13.42X05.86	360953111142401	36.1649	-111.24	478414.0	4002075.4
EPA	44	EPA44	10 071-02.57X06.80	360905109324601	36.15142	-109.546	630792.1	4001518.1
EPA	45	EPA45	08 038-13.27X03.77	364142110141801	36.69526	-110.239	567967.4	4061136.7
EPA	46	EPA46	08 039-00.70X01.57 B	364338110154601	36.72722	-110.263	565855.6	4064663.9
EPA	47	EPA47	08 022-07.34X12.44	364908109525301	36.81955	-109.882	599694.4	4075223.2

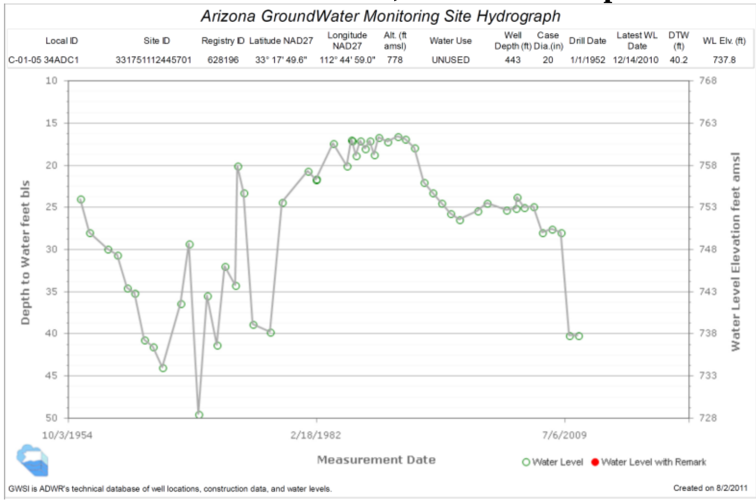
Wells With Hydrographs								
PLANNING AREA	PA WELL NUMBER	LABEL	LOCALID	SITEID	LATDEC	LONDEC	UTME	UTMN
EPA	48	EPA48	04 056-02.82X14.23	361737110180301	36.29359	-110.3	562831.7	4016540.8
EPA	49	EPA49	01 028-12.31X03.98	365631111281701	36.94194	-111.471	458024.7	4088332.9
EPA	50	EPA50	01 028-09.29X03.36	365704111250201	36.95111	-111.417	462852.5	4089327.2
CHA	1	CHA1	A-02-15 07BDD2	333151110520502	33.53083	-110.868	512251.6	3709952.6
CHA	2	CHA2	A-09-14 20ACA	340642110554801	34.11111	-110.93	506430.4	3774283.3
CHA	3	CHA3	A-11-10 35CCC	341447111182501	34.24806	-111.305	471889.8	3789507.3
CHA	4	CHA4	A-06-10 14ABC2	335205111180601	33.86722	-111.302	472097.8	3747280.9
CHA	5	CHA5	A-09-10 20BAA	340654111211201	34.11511	-111.354	467375.3	3774781.0
CHA	6	CHA6	A-11-10 32ACD	341518111205401	34.25408	-111.348	468004.2	3790197.4
CHA	7	CHA7	A-10-10 04DBA	341418111194901	34.23858	-111.33	469584.4	3788467.3
CHA	8	CHA8	A-12-08 22CDA	342427111293401	34.40739	-111.493	454710.3	3807254.6
CHA	9	CHA9	A-13-05 17CAA2	343105111504601	34.51805	-111.846	422312.7	3819728.5
CHA	10	CHA10	A-14-05 32CBB2	343341111511201	34.56144	-111.853	421715.9	3824539.0
CHA	11	CHA11	A-15-05 25DDD	343924111454901	34.65667	-111.763	430052.5	3835038.2
CHA	12	CHA12	A-16-04 15DDC2	344632111541701	34.77603	-111.905	417139.0	3848391.7
CHA	13	CHA13	A-17-05 33ADA1	344850111494801	34.81392	-111.83	424087.4	3852521.3
CHA	14	CHA14	A-16-03 22DCD	344545112005401	34.76192	-112.015	407133.7	3846916.2
CHA	15	CHA15	A-15-03 12ADB1	344250111583401	34.71375	-111.976	410641.2	3841551.9
CHA	16	CHA16	A-16-03 36CDC	344359111591101	34.73361	-111.987	409645.2	3843749.0
CHA	17	CHA17	A-21-05 02ABC3	351409111500302	35.23589	-111.834	424097.3	3899317.1
CHA	18	CHA18	A-21-06 06CCA1	351335111481301	35.22653	-111.804	426793.6	3898278.2
CHA	19	CHA19	A-21-03 09BDC	351253112050001	35.21481	-112.083	401398.7	3897194.7

Wells With Hydrographs								
PLANNING AREA	PA WELL NUMBER	LABEL	LOCALID	SITEID	LATDEC	LONDEC	UTME	UTMN
CHA	20	CHA20	A-17-01 15CDC UNSURV	345057112145201	34.8495	-112.249	385848.1	3856860.9
CHA	21	CHA21	B-18-01 17AAA	345653112223701	34.94936	-112.376	374317.9	3868104.1
CHA	22	CHA22	B-17-02S04DBC1	345301112283701	34.88233	-112.478	364923.7	3860781.4
CHA	23	CHA23	B-16-04 11CAA	344703112392201	34.78417	-112.656	348521.3	3850160.2
CHA	24	CHA24	B-18-03 26BDB1	345507112330901	34.91889	-112.553	358106.7	3864952.0
CHA	25	CHA25	B-19-04 04CAC	350332112413701	35.05861	-112.694	345554.2	3880656.5
CHA	26	CHA26	B-20-04 19CBA	350616112435601	35.1045	-112.732	342121.1	3885800.5
CHA	27	CHA27	B-21-02 14BCC	351207112283701	35.20194	-112.477	365499.6	3896240.0
CHA	28	CHA28	B-22-07W25ADD	351552112572901	35.264	-112.958	321883.9	3903867.2
CHA	29	CHA29	B-18-05W12CBD	345734112445501	34.95953	-112.749	340320.0	3869744.8
CHA	30	CHA30	A-11-02 14CAA	341959112071601	34.33306	-112.121	396868.9	3799459.1
CHA	31	CHA31	A-12-01 27DBA2	342331112142501	34.39176	-112.24	385989.5	3806095.9
CHA	32	CHA32	A-09-02 34DDD	340421112075801	34.07233	-112.133	395474.1	3770548.1
CHA	33	CHA33	B-09-06 05ADD	340908112533801	34.15226	-112.894	325433.9	3780463.7
CHA	34	CHA34	B-07-04 07BCC	335754112430301	33.96494	-112.717	341315.0	3759409.9
CHA	35	CHA35	B-08-05 10DAA	340258112452001	34.04947	-112.756	337933.4	3768834.4

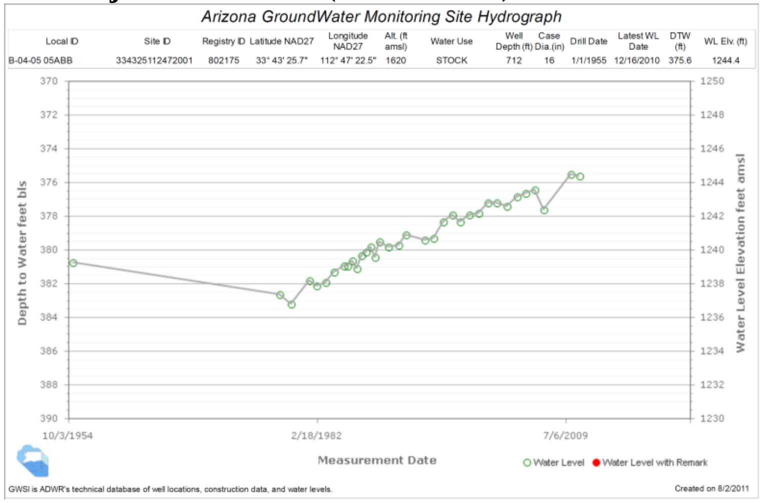
Location of Wells With Hydrographs



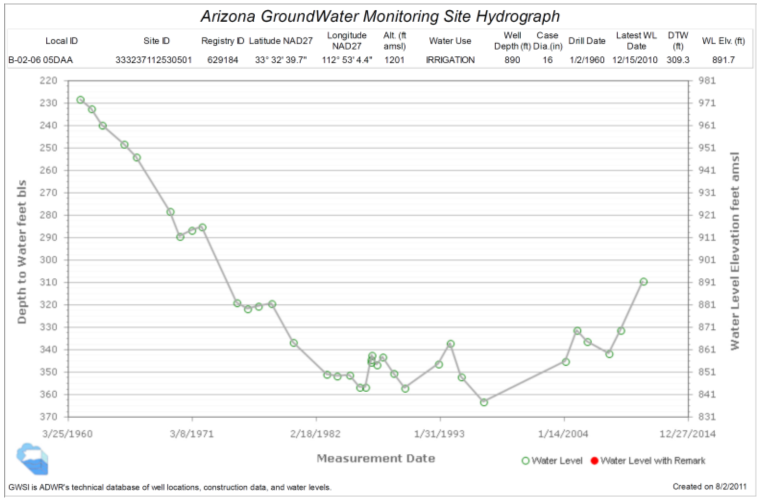
Phoenix AMA Hydrographs
3/19/2012



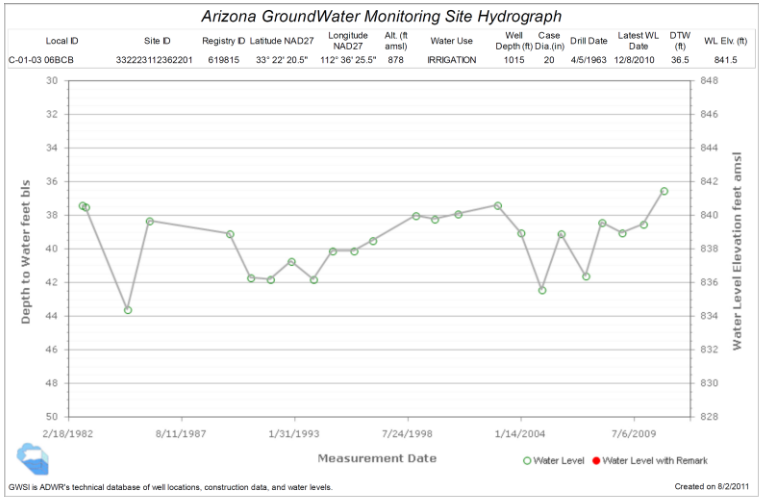
PHX1 -- C-01-05 34ADC1 – Phoenix AMA – Hassayampa sub-basin Arlington ID area near Gila River. Water levels in this area show responses to recharge from sporadic flood events on Gila River.



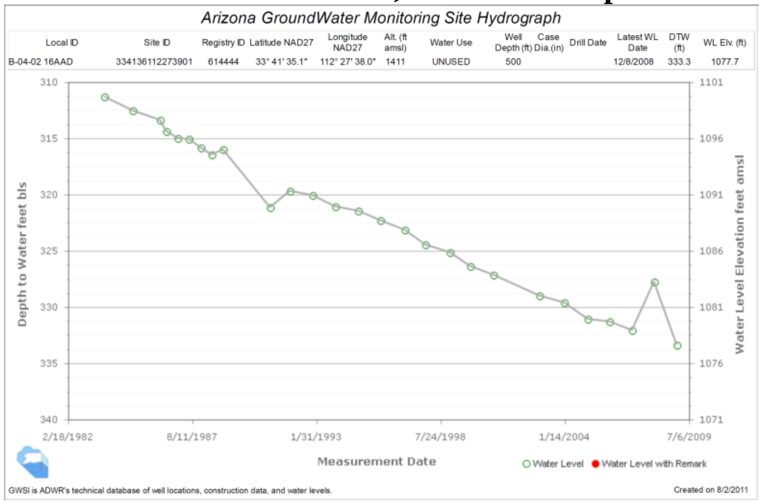
PHX3 -- B-03-05 05ABB Phoenix AMA – Hassayampa sub-basin north Hassayampa Plain area about 7 miles NW of location where CAP canal crosses the Hassayampa River.



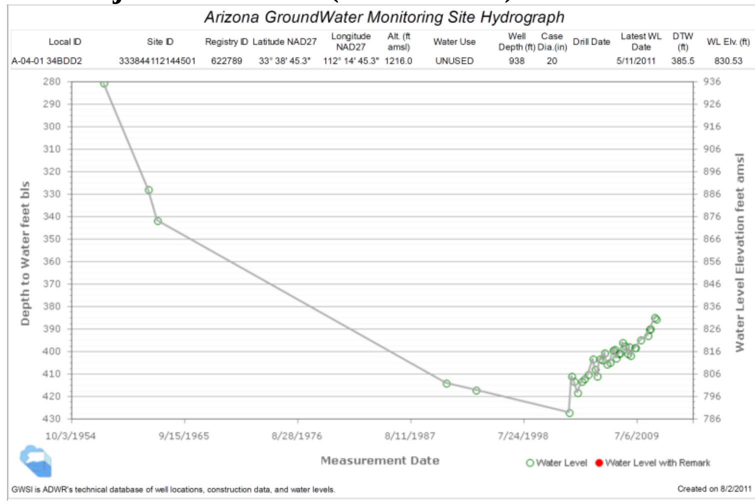
PHX2 -- B-02-06 05DAA – Phoenix AMA – Hassayampa sub-basin Tonopah desert area about 3 miles north of I-10. Historic water level decline due mainly to irrigation pumping in area, recent water level recoveries partially due to recharge at Tonopah Desert Recharge facility.



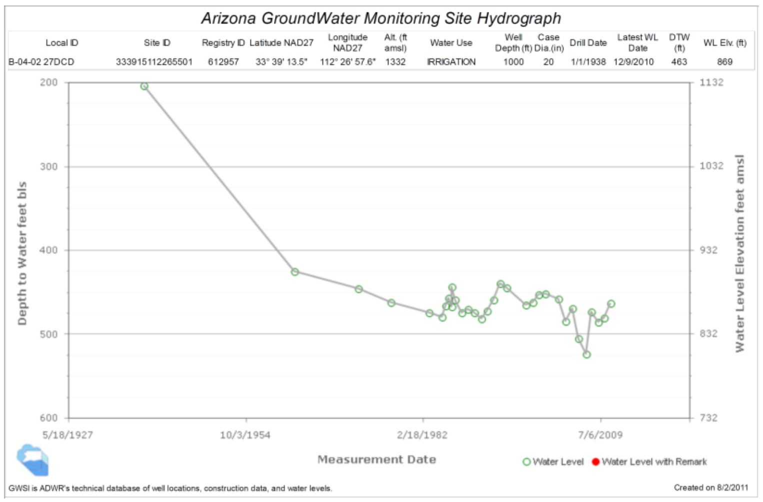
PHX4 -- C-01-03 06BCB – Phoenix AMA – West Salt River Valley sub-basin one mile west of Town of Buckeye.



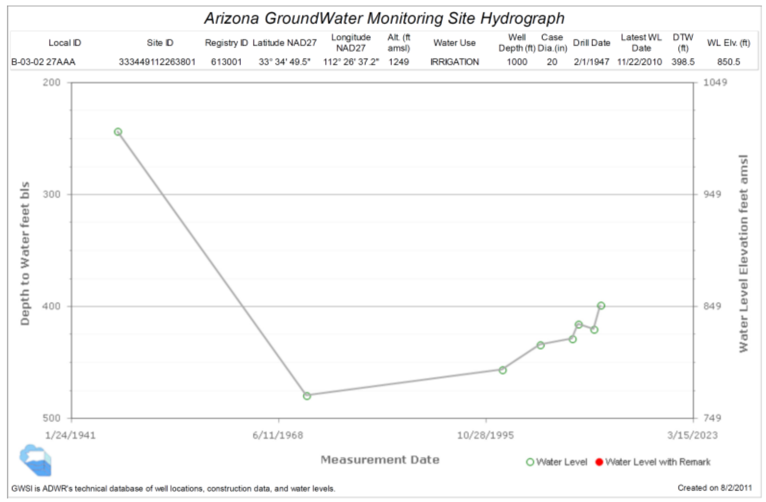
PHX5 -- B-04-02 16AAD Phoenix AMA – West Salt River Valley sub-basin about 2 miles west of McMicken Dam. Historic water level declines due mainly to regional irrigation pumping in WSRV.



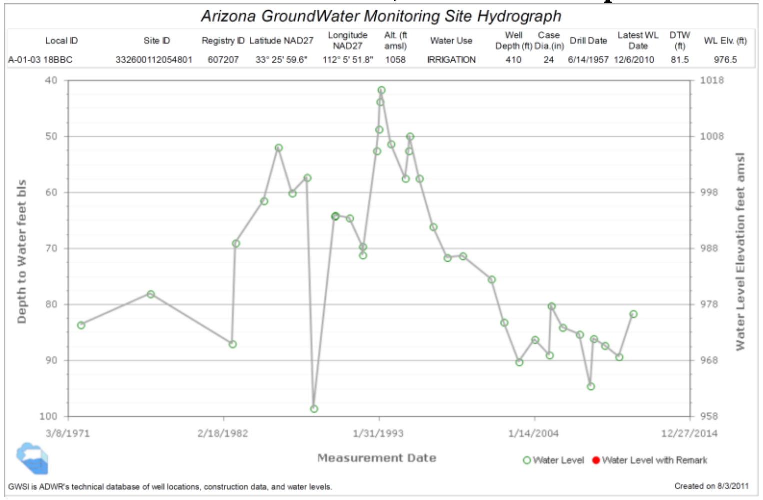
PHX7 -- B-04-01 34BDD2 Phoenix AMA – West Salt River valley sub-basin NE Sun City area. Historic water level declines mainly due to irrigation pumping. Recent water level recoveries due to reduced pumping and artificial recharge projects in area.



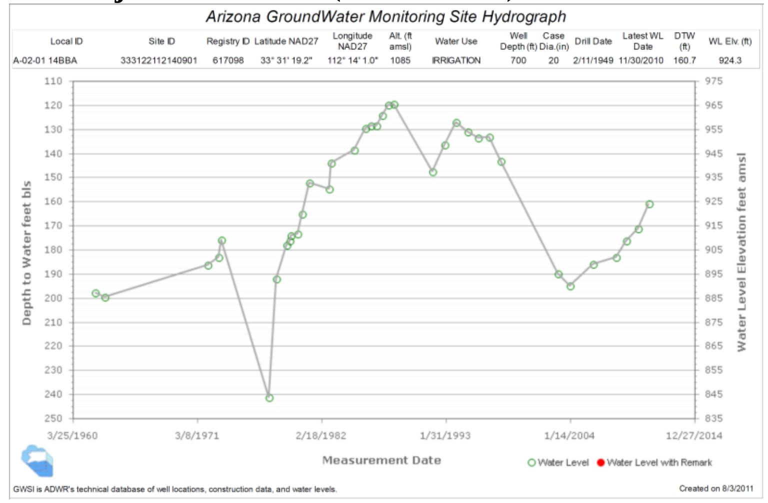
PHX6 -- B-04-02 27DCD Phoenix AMA - West Salt River sub-basin about 5 miles west of Sun City West. Historic water level declines due mainly to regional irrigation pumping in WSRV.



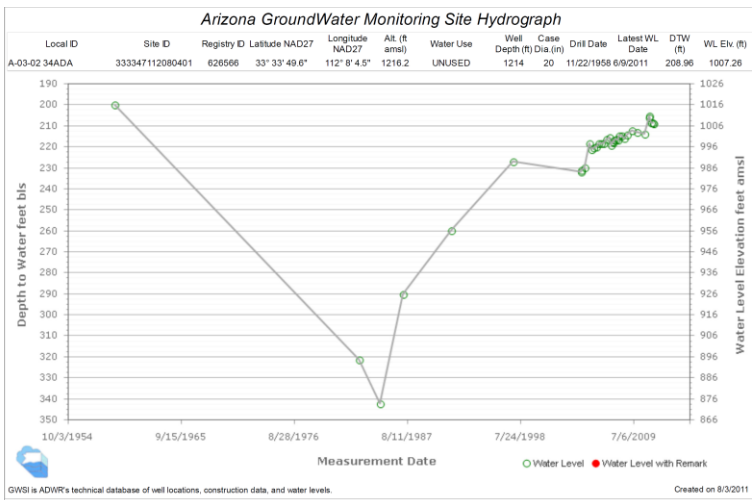
PHX8 -- B-03-02 27AAA Phoenix AMA – West Salt River Valley sub-basin about 5 miles NW of Luke AFB. Historic water level declines due mainly to ag pumping, recoveries due to decreased pumping in area and CAP water use by MWD, and others.



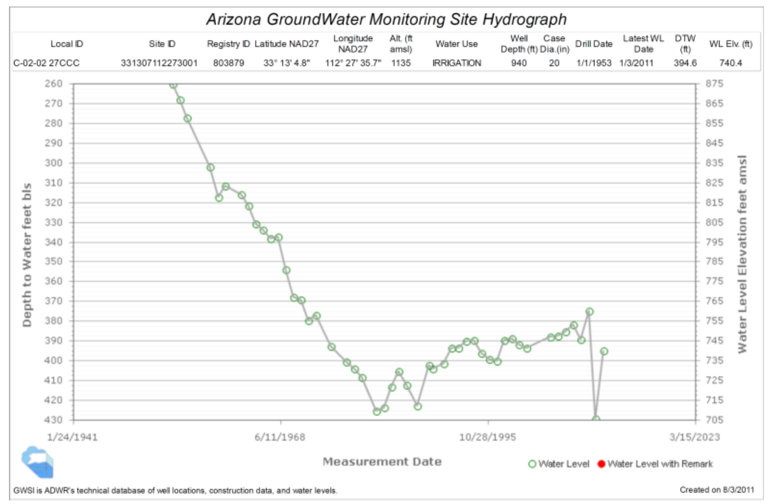
PHX9 -- A-01-03 18BCC – Phoenix AMA – West Salt River Valley sub-basin about 1.5 miles north of Salt River near 19th Avenue. Spikes in water levels circa 1983, 1993 and 2005 reflect recharge from flood events.



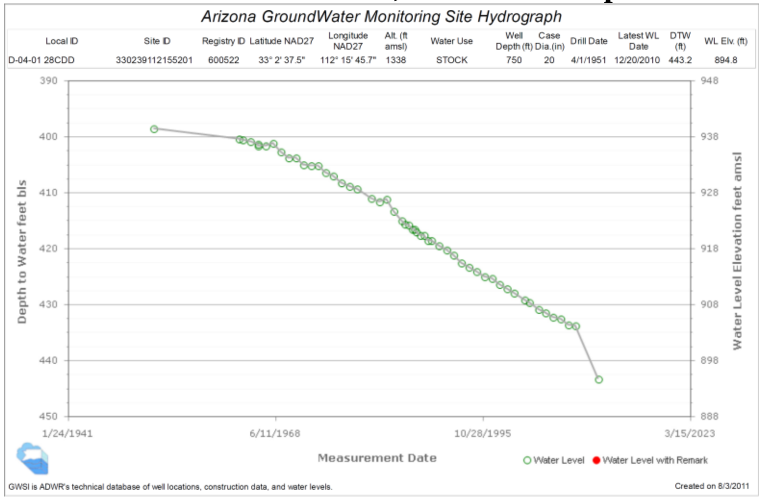
PHX11 -- A-01-03 05BAA Phoenix AMA – West Salt River Valley sub-basin central Phoenix area near Central Ave. and McDowell. Peaks in water levels in 1983 and 1993 due to recharge from flood events on the Salt River.



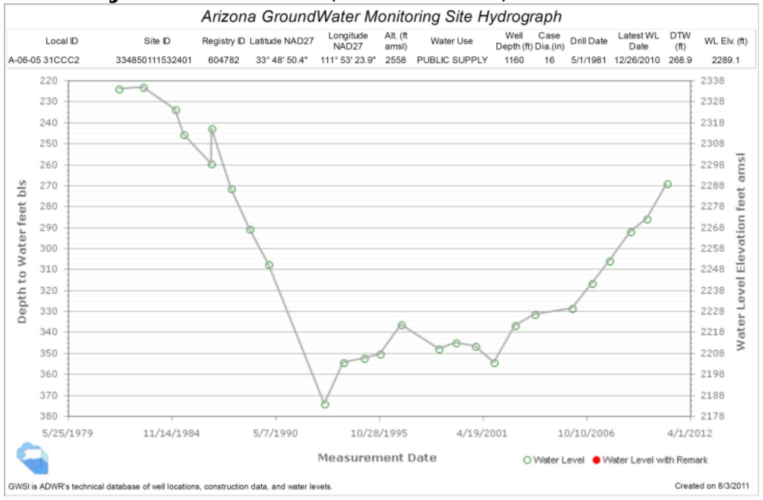
PHX10 -- A-03-02 34 ADA Phoenix AMA – West Salt River Valley sub-basin NW Phoenix/Glendale area. Historic water level declines due to agricultural, municipal and industrial pumping. Recoveries beginning around 1983 due to reduced pumping due to urbanization and introduction of CAP water in mid-late 1980s for some municipal providers.



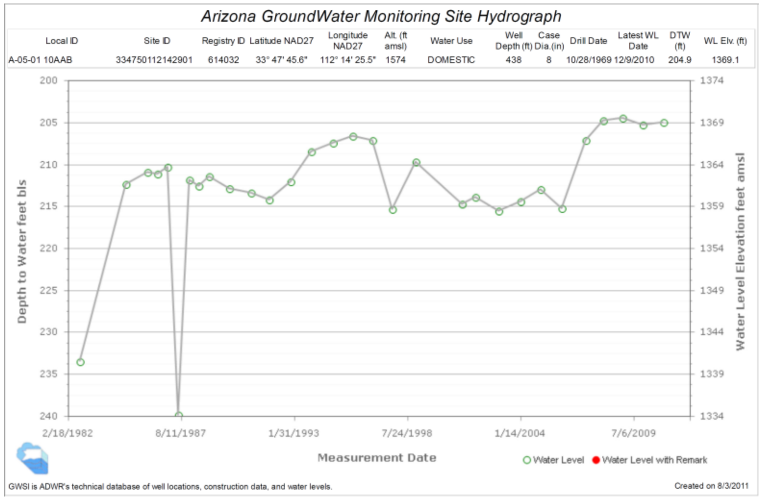
PHX12 -- C-02-02 27CCC Phoenix AMA – Rainbow Valley sub-basin north-central Rainbow Valley 3 miles west of Waterman Wash in agricultural area. Historic declines caused by agricultural pumping. Recovery in water levels due to decreased pumping.



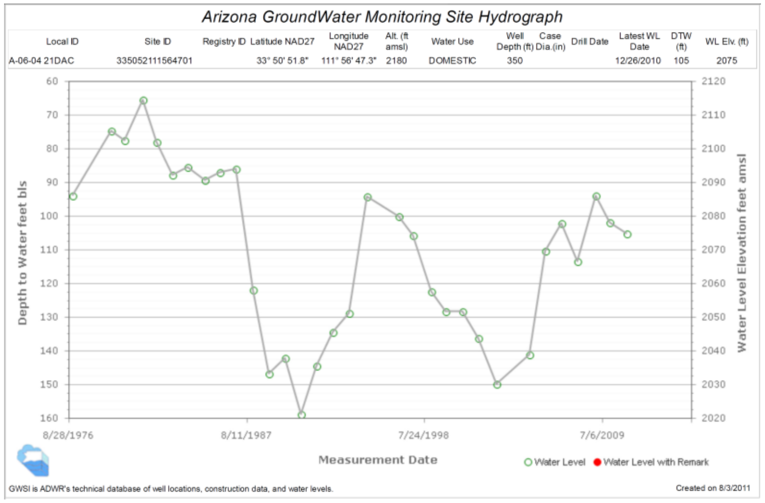
PHX13 -- D-04-01 28CDD Phoenix AMA – Rainbow Valley sub-basin one mile south of Mobile. Water level declines due to pumping in area.



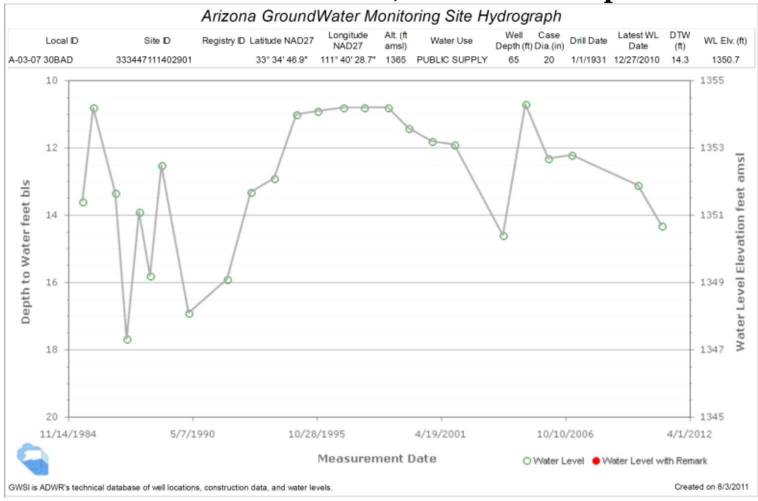
PHX15 -- A-06-05 31CCC2 Phoenix AMA – Carefree sub-basin east Carefree area near Carefree Airport/Desert Mtn. area. Historic water level declines mainly due to municipal, domestic and golf course pumping. Recoveries due to imported surface water that reduced pumping, and some artificial recharge in area.



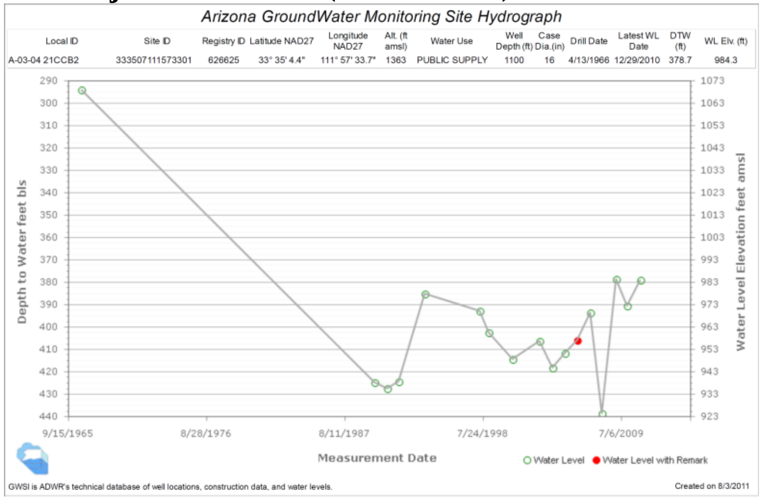
PHX14 -- A-05-01 10AAB – Phoenix AMA – Lake Pleasant sub-basin about 4.5 miles south of Lake Pleasant. Spikes in early years probably reflect pumping levels.



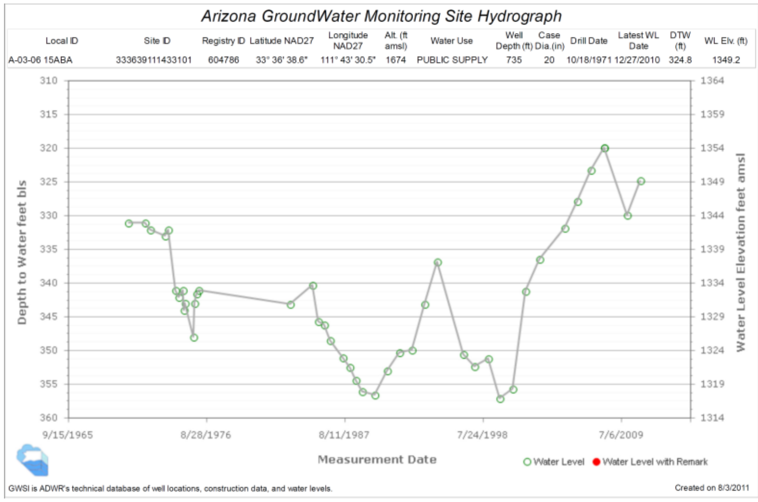
PHX16 -- A-06-04 21DAC Phoenix AMA – Carefree Sub-basin NW Carefree area near Cave Creek. Local recharge events from Cave Creek evident in this hydrograph.



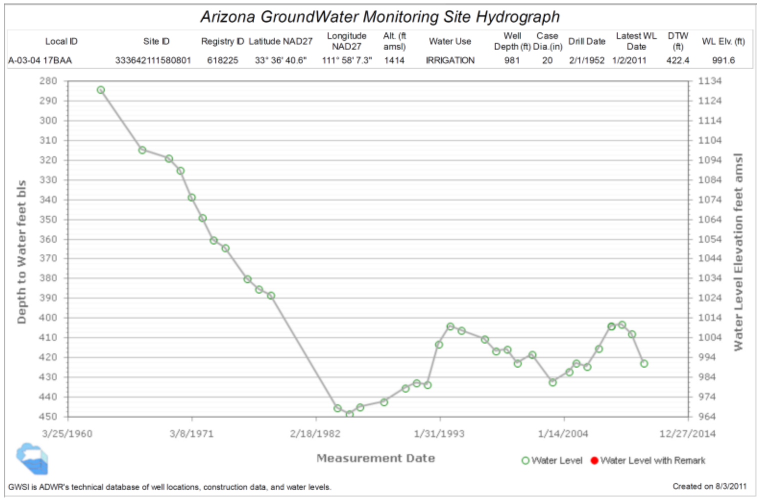
PHX17 -- A-03-07 30BAD Phoenix AMA – Fountain Hills sub-basin about .25 mile west of Verde River on Ft. McDowell Indian Reservation. Peaks in water levels in 1983, 1993 and 2005 probably reflect additional recharge from major flows on Verde River.



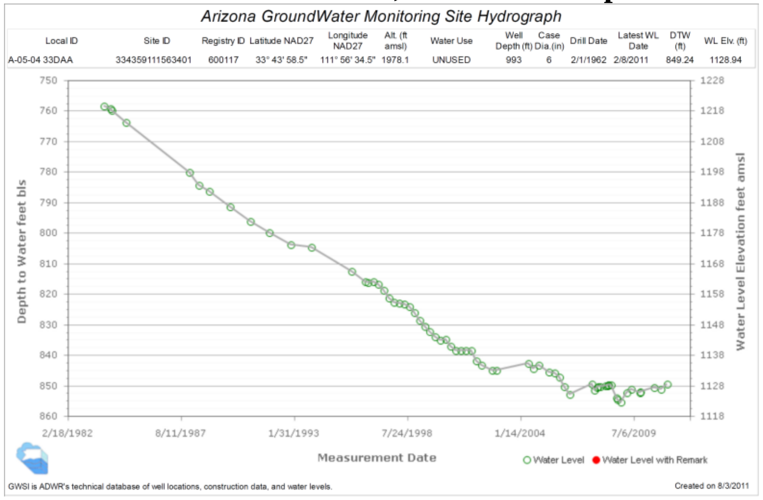
PHX19 -- A-03-04 21CCB2 Phoenix AMA – East Salt River Valley sub-basin southern Paradise Valley area near Shea Blvd. and Indian Bend Wash. Historic water level decline due mainly to municipal and other pumping in area. Water level recovery beginning around 1990 due to reduced pumping in area. Later water level recovery coincident with introduction of CAP water for municipal and industrial use in area..



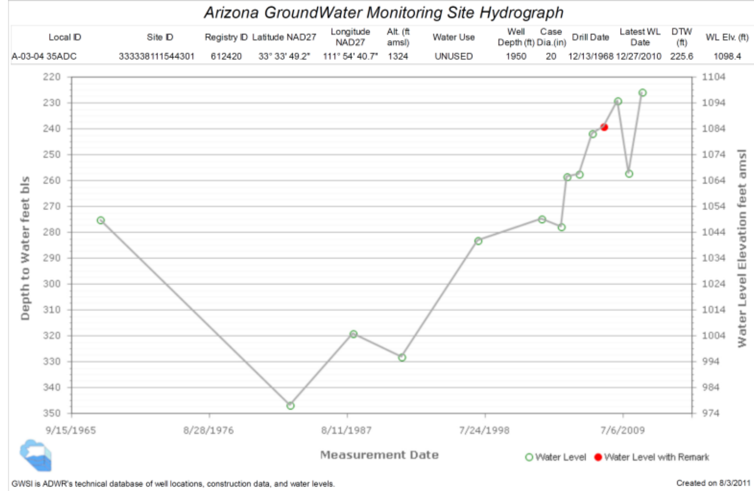
PHX18 -- A-03-06 15ABA Phoenix AMA – Fountain Hills sub-basin about 3 miles west of Verde River. Historic water level declines due mainly to historic pumping in area. Recovery of water level beginning around 1999 due, in part, to introduction of CAP water for municipal uses in basin and recharge and reuse of effluent.



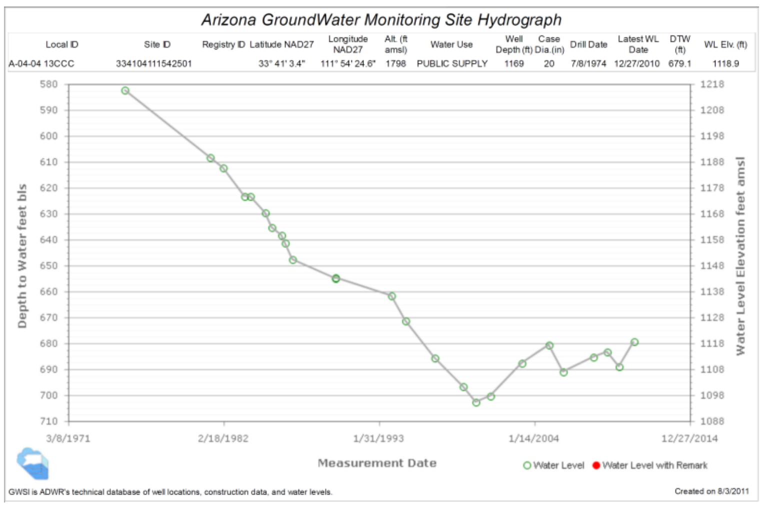
PHX20 -- A-03-04 17BAA Phoenix AMA – East Salt River Valley sub-basin southern Paradise Valley area near Thunderbird and Tatum . Historic water level declines mainly due to municipal pumping in area, water level recovery after about 1983 due to reduced pumping in area in response to subsidence concerns. Later water level recovery coincident with introduction of CAP water for municipal and industrial use in area.



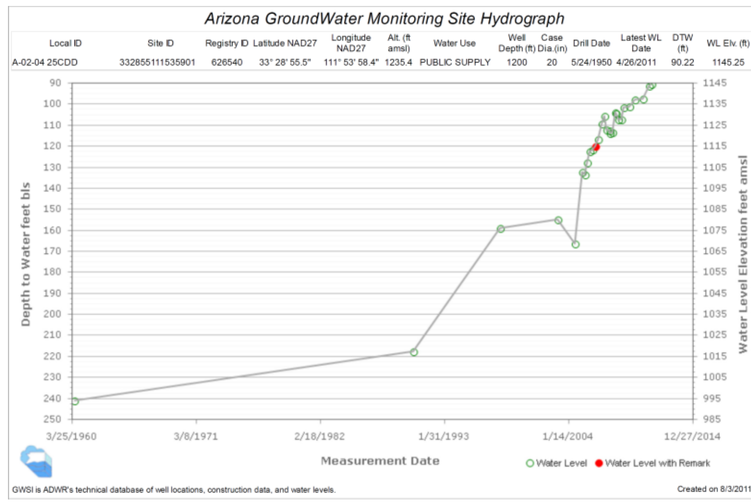
PHX21 -- A-05-04 33DAA Phoenix AMA – East Salt River Valley sub-basin north Paradise Valley area .5 mile north of Jomax and 1 mile west of Scottsdale Rd. Historic declines are mainly caused by municipal and other pumping.



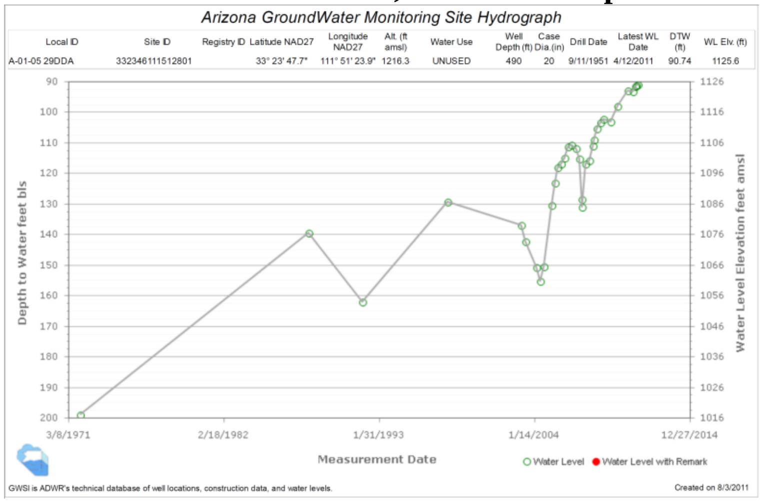
PHX23 -- A-03-04 35ADC Phoenix AMA – East Salt River Valley sub-basin Scottsdale McCormick Ranch area. Historic water level decline caused by municipal and pumping. Water level recovery since early 1980's mainly due to reduced pumping in area. . Later water level recovery also coincident with introduction of CAP water for municipal, and industrial use in general area.



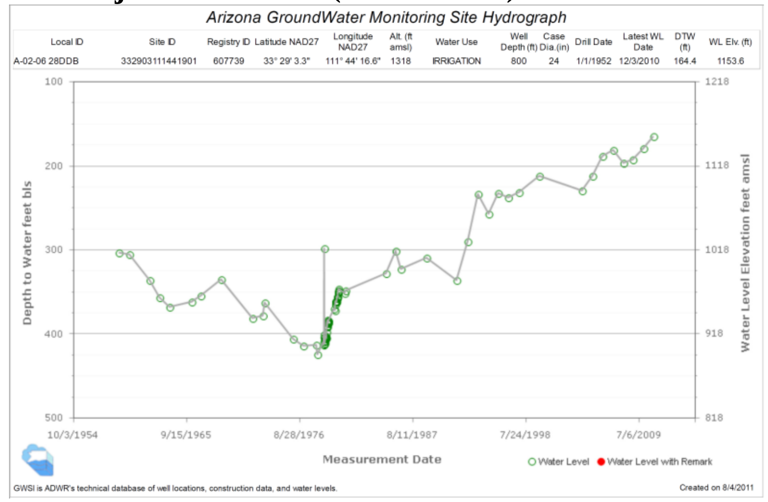
PHX22 -- A-06-02 15CDB Phoenix AMA – East Salt River Valley sub-basin east central Paradise Valley area 1 mile south of Pinnacle Peak road and Hayden. Historic water level declines due to pumping, recovery due to reduced pumping in area.



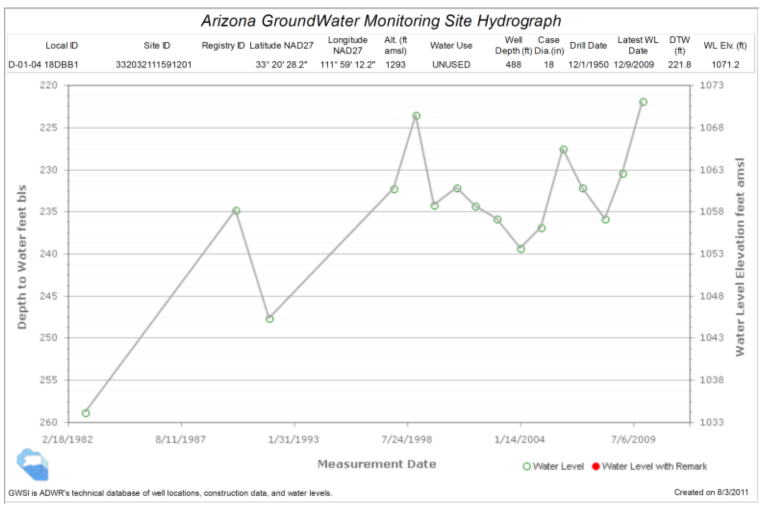
PHX24 -- A-02-04 25CDD Phoenix AMA – East Salt River Valley sub-basin Scottsdale Hayden and Thomas Rd. area. Water level recovery since 1960 mainly due to reduced pumping in area. Later water level recovery also coincident with introduction of CAP water for municipal and industrial use in general area.



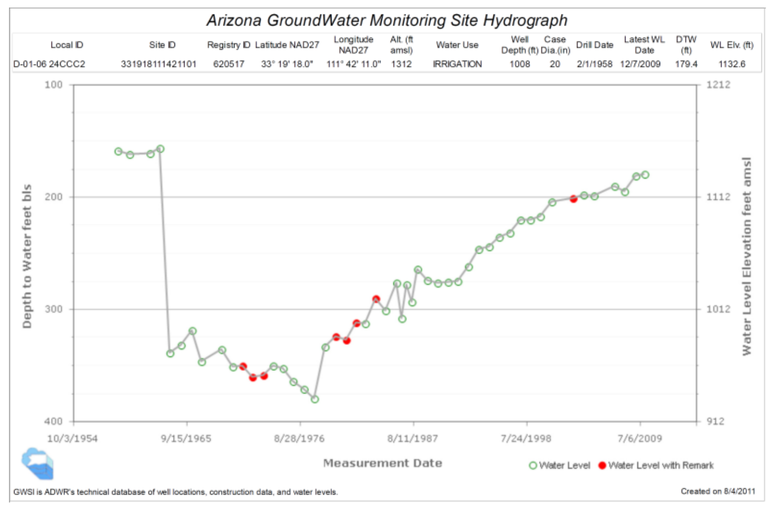
PHX25 -- A-01-05 29DDA Phoenix AMA – East Salt River Valley sub-basin west Mesa area. Water level recovery in area mainly related in overall reduction in pumpage in area. Later water level recovery also coincident with introduction of CAP water for municipal, agricultural and industrial use in general area.



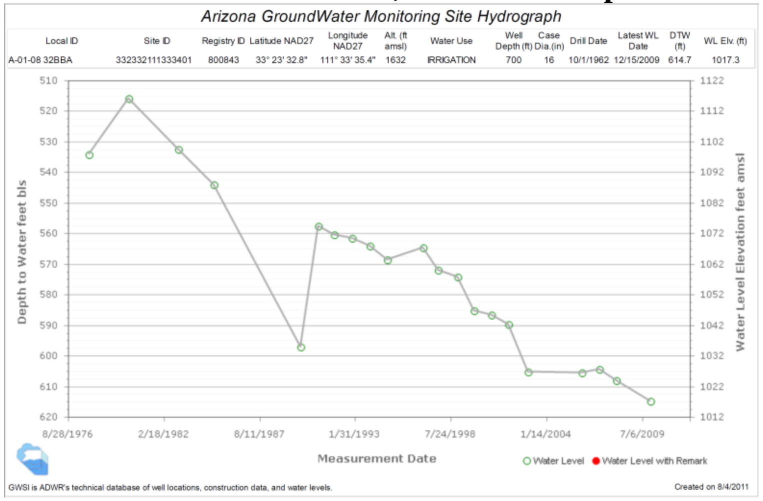
PHX27 -- A-02-06 28DDB Phoenix AMA – East Salt River Valley sub-basin east Mesa area just south of Salt River near GRUSP recharge facility. Recovery in water levels due to decreased pumping in area, flood events on Salt River and recharge at GRUSP. Later water level recovery also coincident with introduction of CAP water for municipal, agricultural and industrial use in general area.



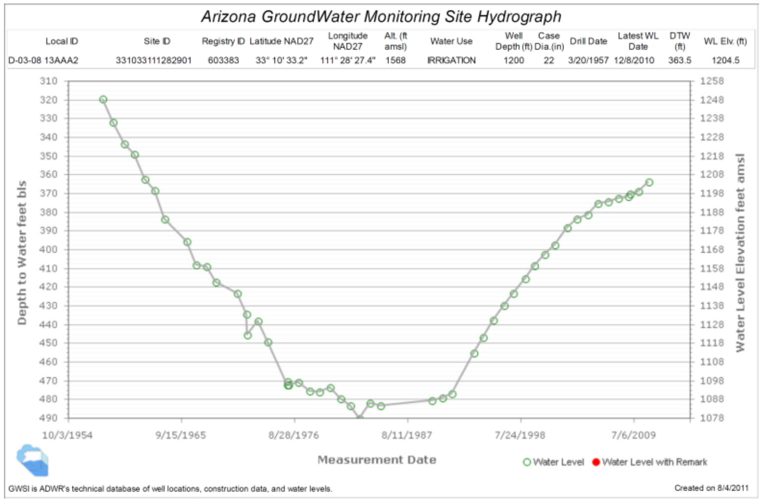
PHX26 -- D-01-04 18DBB1 Phoenix AMA – East Salt River Valley sub-basin Ahwautukee area. Water level recovery in area mainly related in overall reduction in pumpage.



PHX28 -- D-01-06 24CCC2 Phoenix AMA – East Salt River Valley sub-basin east Chandler area near Williams Gateway Airport. Water level recoveries mainly due to decreased pumpage in area. Later water level recovery also coincident with introduction of CAP water for municipal, agricultural and industrial use in general area. Cascading water noted in some measurements.



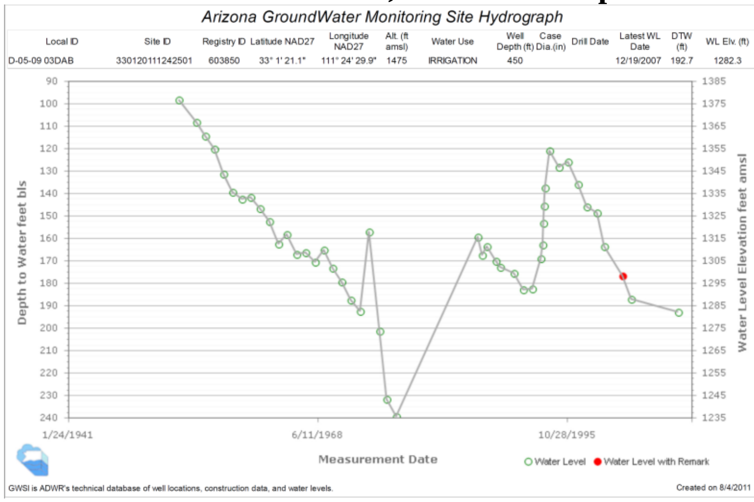
PHX29 -- A-01-08 13AAA2 Phoenix AMA – East Salt River Valley sub-basin Apache Junction area. Local municipal and domestic pumping and regional agricultural pumping main causes of water level declines.



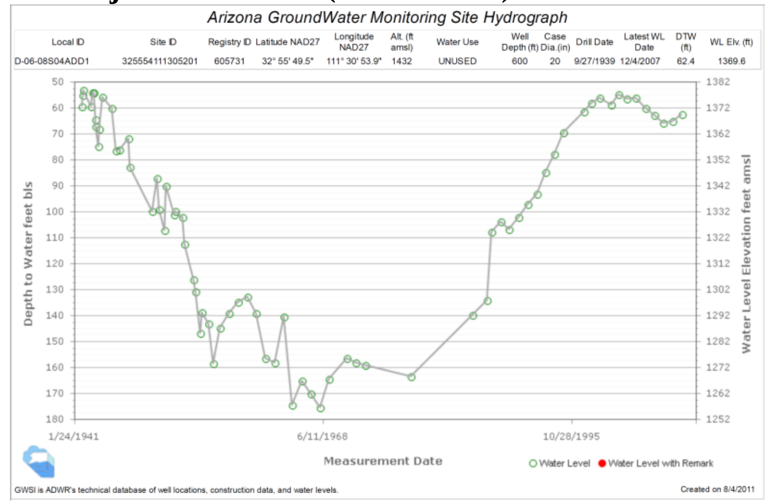
PHX30 -- D-03-08 32BBA Phoenix AMA – East Salt River Valley sub-basin Johnson Ranch and New Magma ID area. Historic water level decline caused mainly by New Magma ID pumping. Water level recovery after about 1990 due to CAP water introduction in New Magma ID.

Pinal AMA Hydrographs

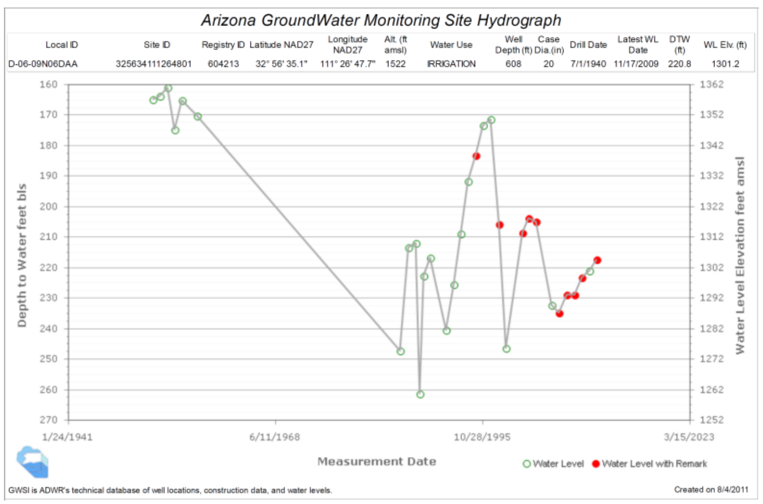
03/19/12



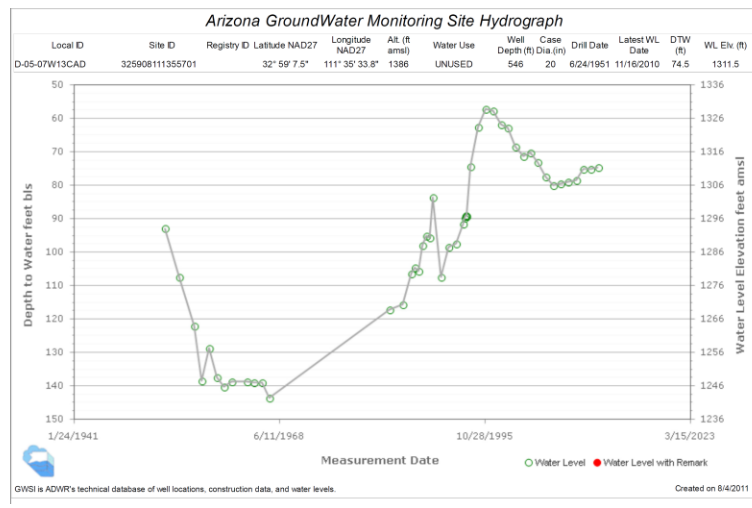
PIN1 -- D-05-09 03DAB Pinal AMA – Eloy sub-basin Florence area about 1 mile south of Gila River (NE San Carlos IDD area). Overall declines in water levels due mainly to agricultural pumping in area. Water level recoveries from increased recharge during major floods on the Gila in 1983 and 1993 are evident.



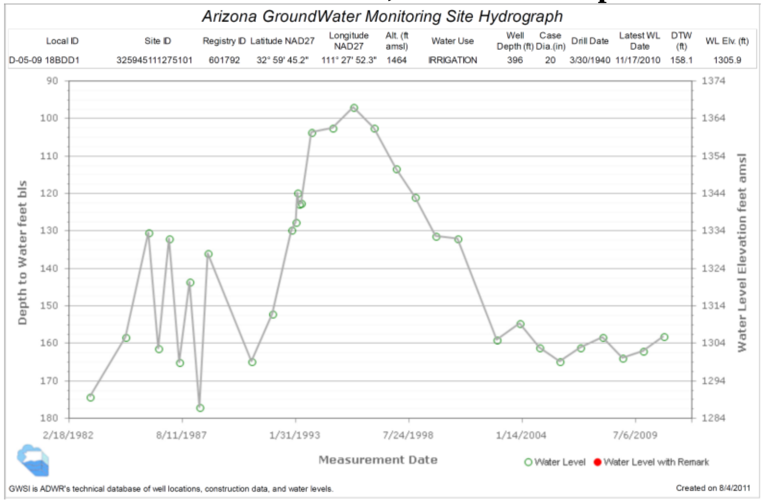
PIN3 -- D-06-08S04ADD1 Pinal AMA – Eloy sub-basin Hohokam IDD area about 3 miles south of Coolidge. Historic declines due to agricultural pumpage. Water level recoveries due to overall reduced pumping in area combined with CAP water importation beginning around 1990.



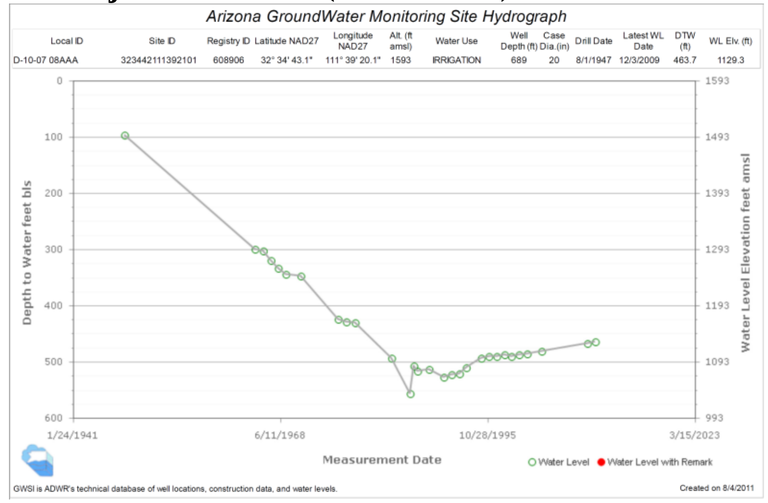
PIN2 -- D-06-09S04ADD1 Pinal AMA – Eloy sub-basin well located along Florence-Casa Grande canal about 3 miles SE of Coolidge (SE Hohokam IDD area). Cascading water noted during many recent measurements. Overall water level declines mainly due to agricultural pumping. Recent water level recovery due to introduction of CAP water in area and overall reduced pumping.



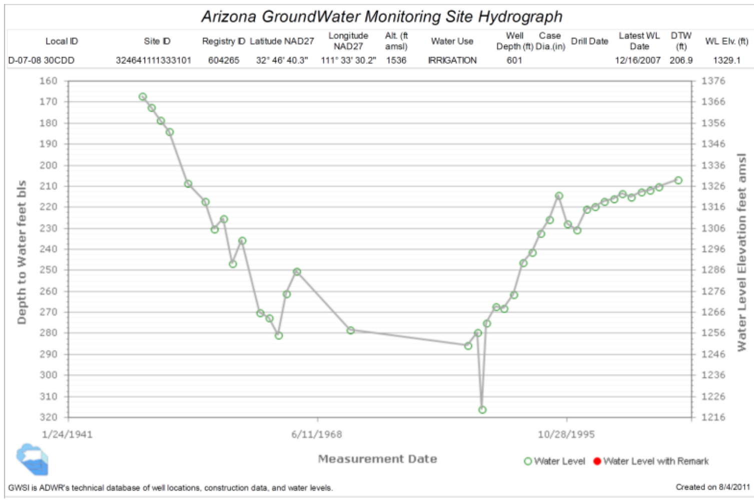
PIN4 -- D-05-07W13CAD Pinal AMA – Eloy sub-basin NW Hohokam IDD area near GRIC. Recent water level recoveries mainly due to reduced pumping and CAP water use. Recharge from 1993 Gila River flood also indicated.



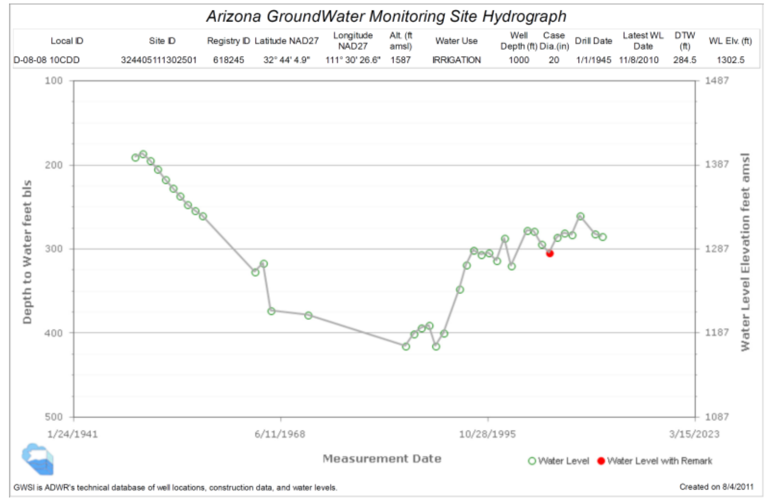
PIN5 -- D-05-09 18BDD1 Pinal AMA – Eloy sub-basin northern SCIDD area near Gila River 1 mile NW of Valley Farms. Water level fluctuations show impacts of flood events on Gila River during 1983 and 1993.



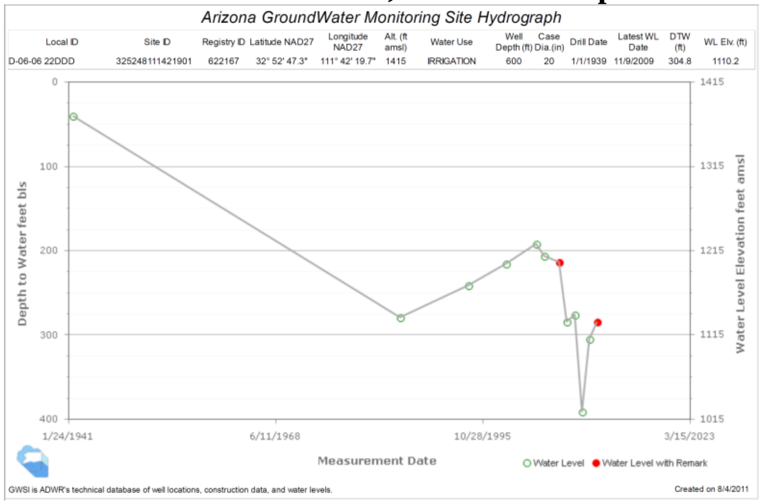
PIN7 -- D-10-07 08AAA Pinal AMA - Eloy sub-basin southern CAIDD about 12 miles south of Arizona City. Stabilization and recovery of water levels due to reduced pumping and CAP water use.



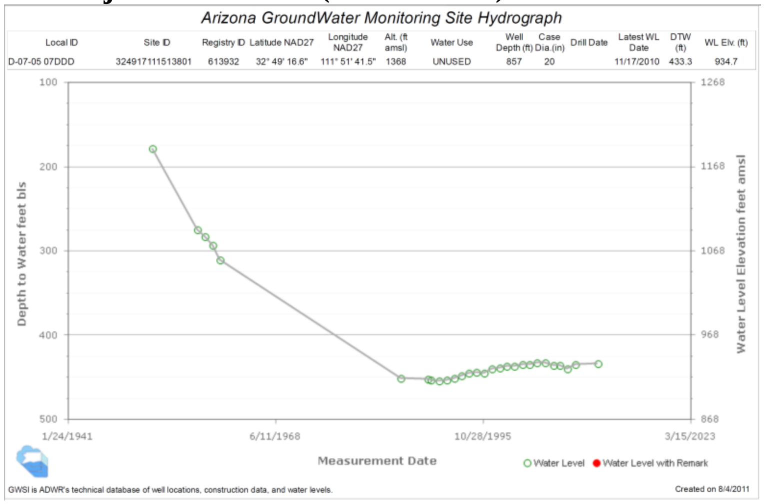
PIN6 -- D-07-08 30CDD Pinal AMA – Eloy sub-basin northern Central Arizona Irrigation and Drainage District (CAIDD) area about 1 mile north of Eloy. Historic water level declines caused by agricultural pumping. Reduced pumping and use of CAP water starting about 1990 have contributed to recent water level recovery.



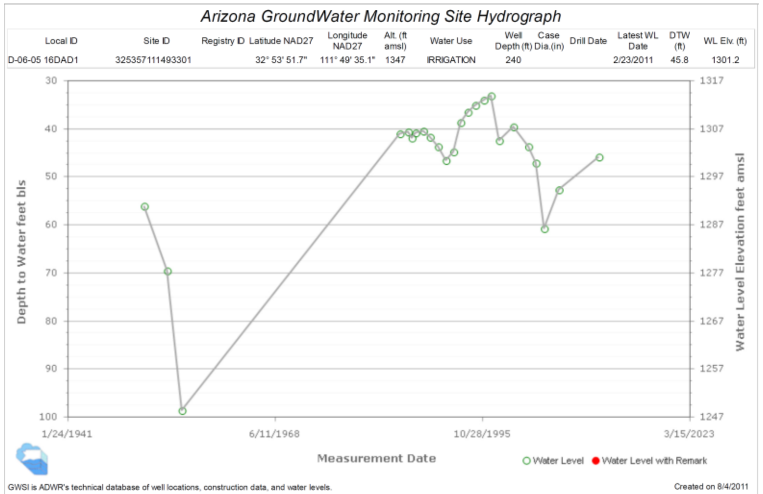
PIN8 -- D-08-08 10CDD Pinal AMA – Eloy sub-basin about 1 mile north of Pichacho. Water level recoveries due to reduced pumping in area combined with CAP water use. Major water level recovery stabilized circa mid 1990's.



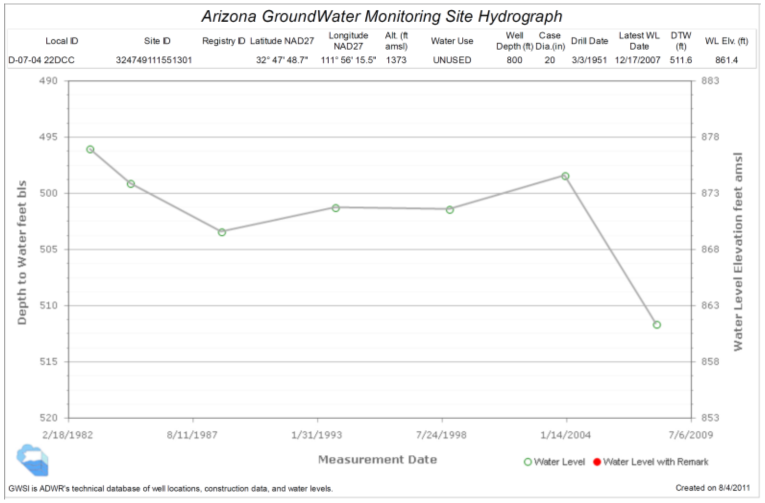
PIN9 -- D-06-06 22DDD Pinal AMA – Eloy sub-basin south-central SCIDD area 1 mile east of Casa Grande. Overall water level declines mainly due to agricultural pumping. Water levels in SCIDD do not show recent recoveries that have been observed in other irrigation districts in Pinal AMA due, in part, to lack CAP water use in SCIDD.



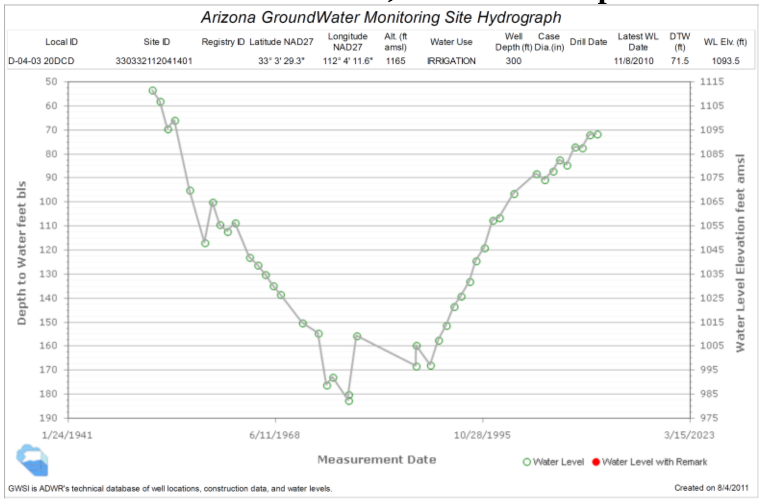
PIN11 -- D-07-05 07DDD Pinal AMA – Maricopa-Stanfield sub-basin southern eastern Maricopa Stanfield Irrigation and Drainage District (MSIDD) area. Stabilization in water levels due to reduced pumping and CAP water use.



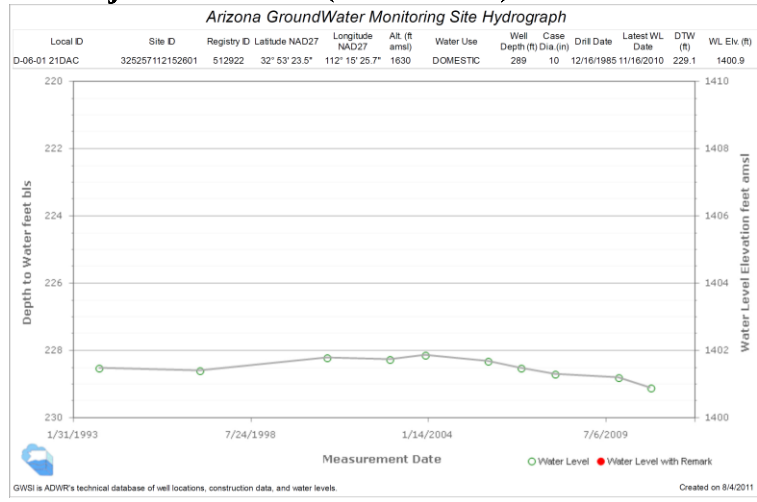
PIN10 -- D-06-05 16DAD1 Pinal AMA – Eloy sub-basin western-most SCIDD area.



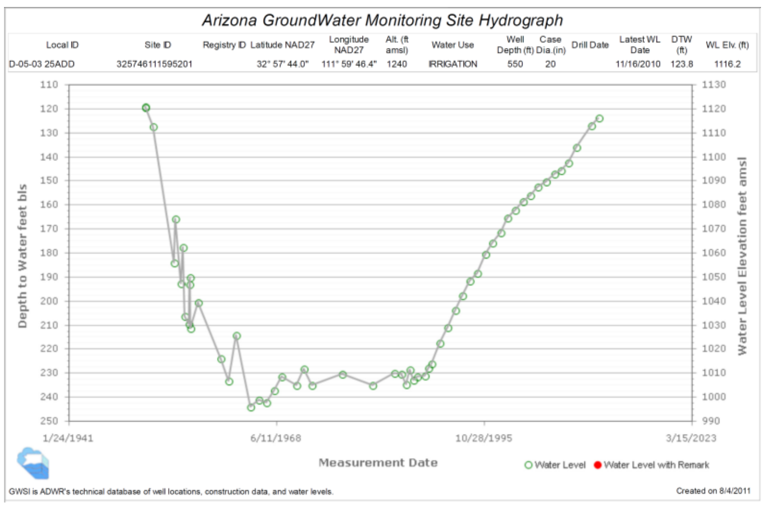
PIN12 -- D-07-04 22DCC Pinal AMA – Maricopa-Stanfield sub-basin southern MSIDD area. Overall water level decline in area due to agricultural pumping.



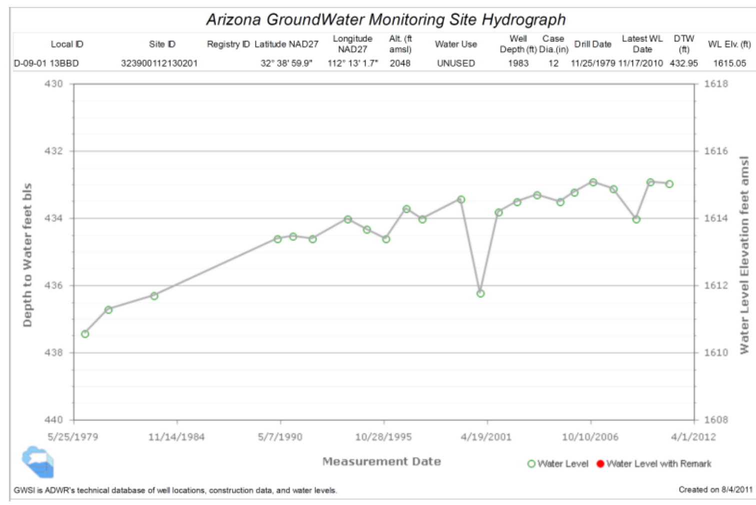
PIN13 -- D-04-03 20DCD Pinal AMA – Maricopa-Stanfield sub-basin MSIDD Maricopa area. Major recovery in water levels in this area correlates to the introduction of CAP water and reduced agricultural pumping.



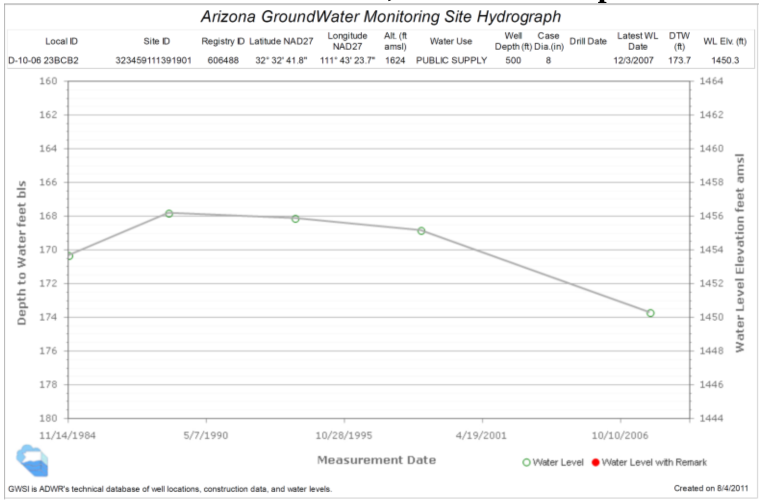
PIN15 -- D-06-01 21DAC Pinal AMA – Vekol Valley sub-basin north-central Vekol Valley. Long-term water level stability in this area reflects lack of development pressures.



PIN14 -- D-05-03 25ADD Pinal AMA – Maricopa-Stanfield sub-basin 7.5 miles SE of Maricopa. Major recovery in water levels in this area correlates to the introduction of CAP water and reduced agricultural pumping.

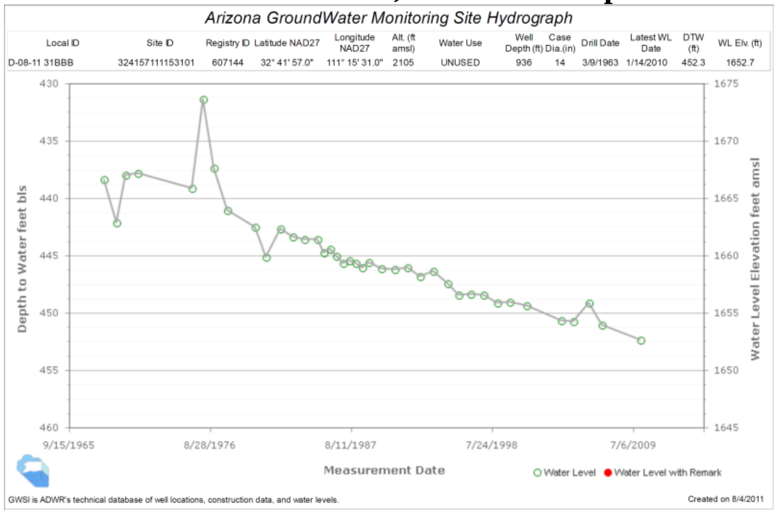


PIN16 -- D-09-01 13BBD Pinal AMA – Vekol Valley sub-basin south-central Vekol Valley. Cause of gradual rise in water levels is uncertain.

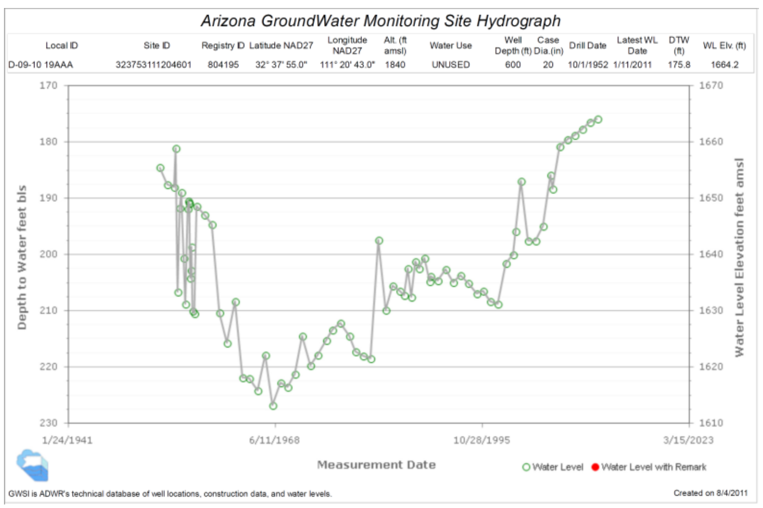


PIN17 -- D-10-06 23BCB2 Pinal AMA – Aguire Valley NE area. Some farming in area but overall minor changes reflect the general lack of development.

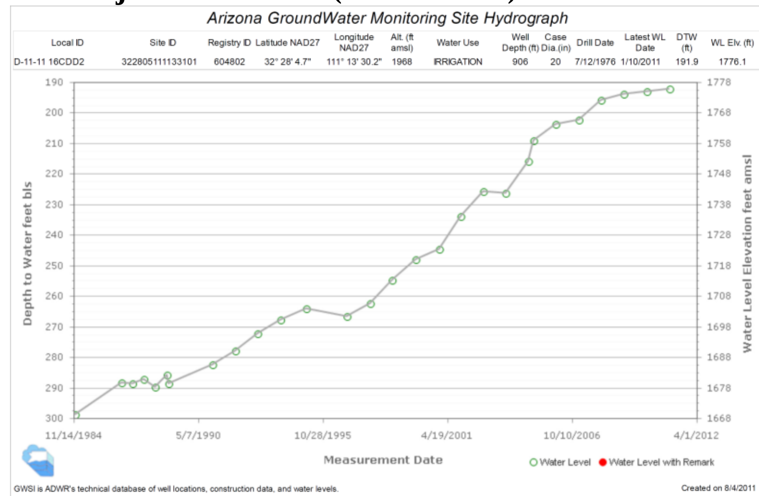
Tucson AMA Hydrographs
03/19/12



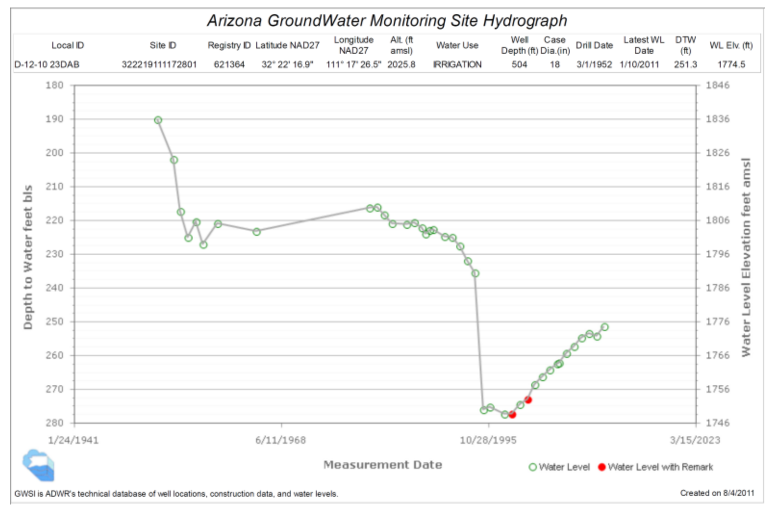
TUC1 -- D-08-11 31BBB Tucson AMA – Avra Valley sub-basin north-central Avra Valley along Durham Wash. Historic water level declines due to agricultural pumping.



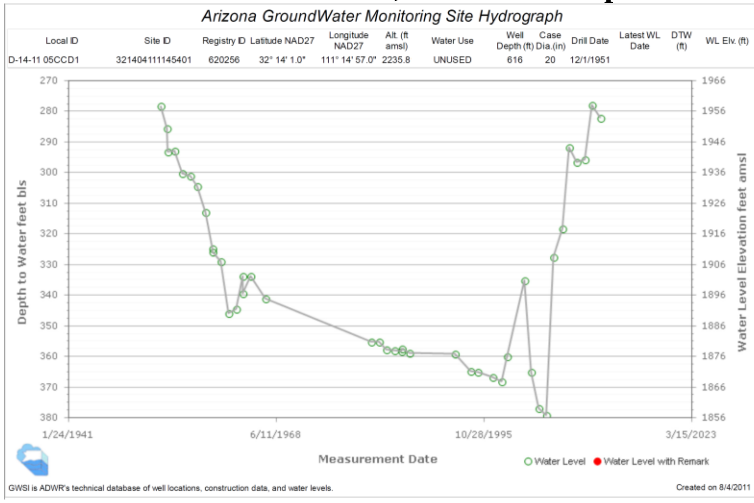
TUC2 -- D-09-10 19AAA - Tucson AMA – Avra Valley sub-basin old agricultural area about 1 mile east of Picacho Peak. Water level recoveries due to a combination of reduced local and regional pumping and more recently, the use of CAP water for agriculture and recharge.. Effluent recharge in Santa Cruz River channel is also contributes to water level recovery.



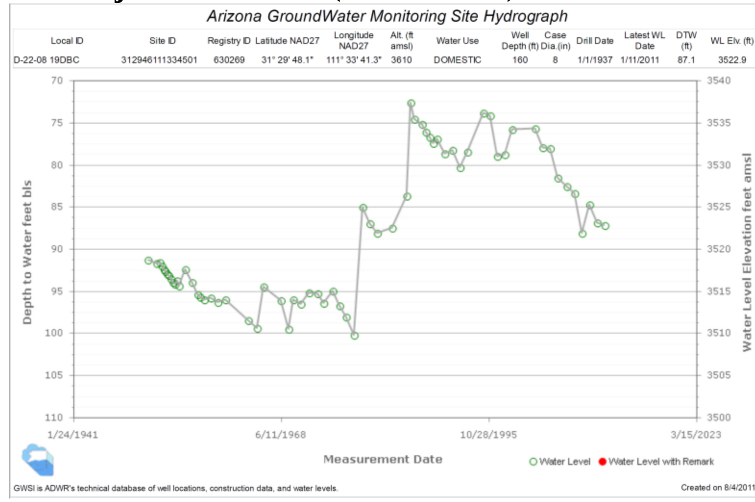
TUC3 -- D-11-11 16CDD2 Tucson AMA – Avra Valley sub-basin about 1 mile NW of Marana. Recovery of water levels in this area due to reduced groundwater pumping and introduction of CAP water for agriculture and artificial recharge during 1990's. Effluent recharge in Santa Cruz River channel also contributes to water level recovery.



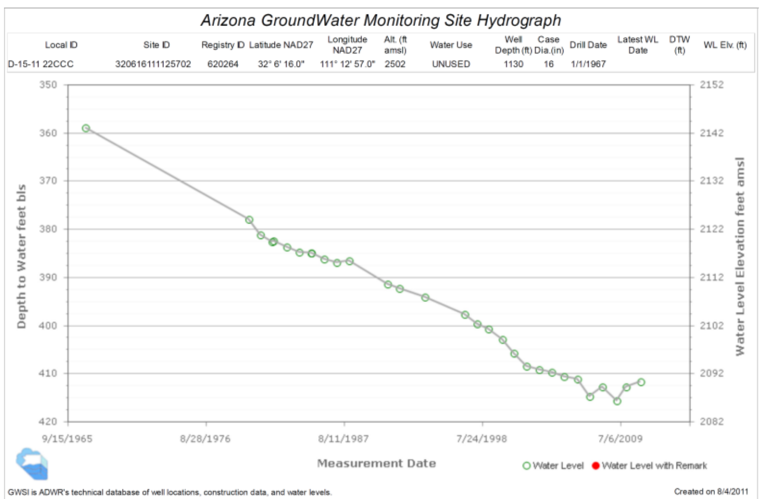
TUC4 -- D-12-10 23DAB Tucson AMA – Avra Valley sub-basin central Avra Valley area about 10 miles south of Marana. Historic water level declines due to agricultural pumping in the area. Recovery in water level beginning in mid-1990's mainly due to reduced pumping and artificial recharge activities in the general area.



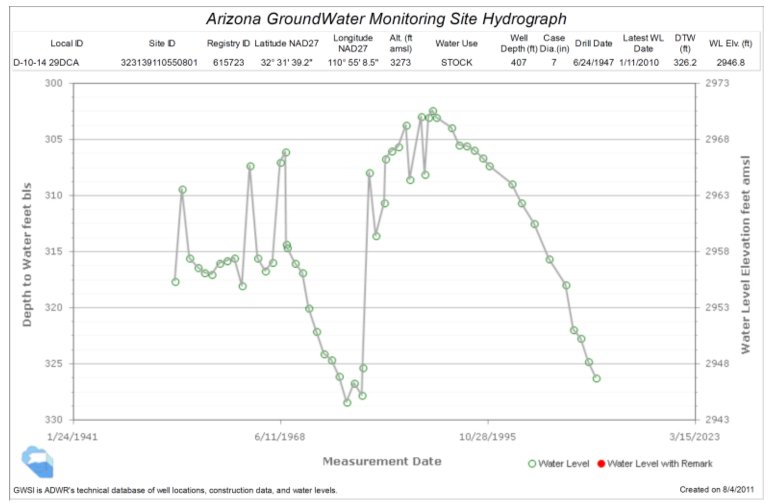
TUC5 -- D-14-11 05CCD1 Tucson AMA – Avra Valley sub-basin south-central Avra Valley near the Central Avra Valley Storage and Recovery Project (CAVSARP). Historic water level declines due to agricultural pumping in area. Major water level recovery beginning circa 1996 due to CAVSARP recharge project.



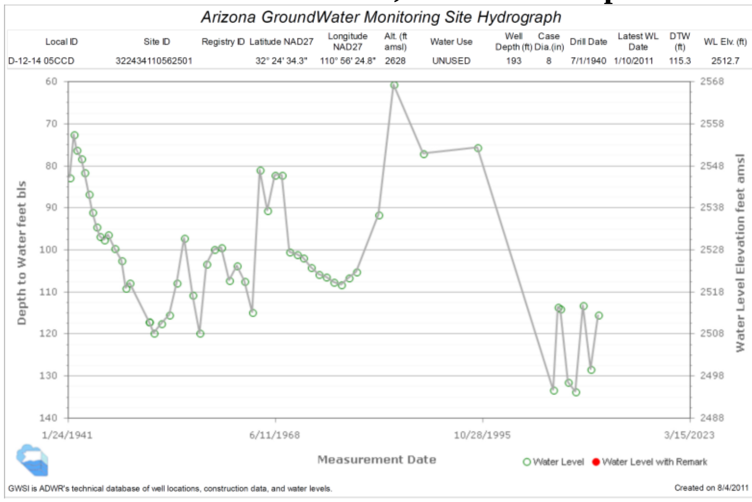
TUC7 -- D-22-08 19DBC Tucson AMA – Avra Valley sub-basin southern Avra Valley about 1.25 miles NW of Sasabe along U.S./Mexico border.



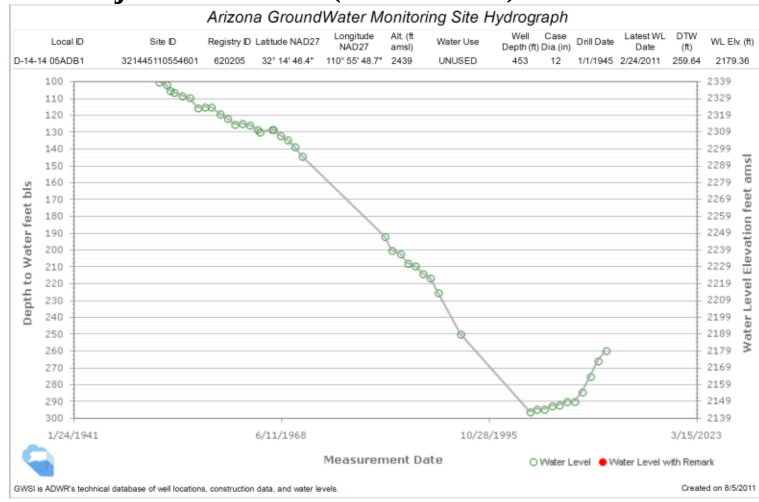
TUC6 – D-15-11 22CCC Tucson AMA - Avra Valley sub-basin south-central area near Sandario Road and Highway 86. Water level declines in this area are from a combination of agricultural pumping in earlier years and municipal and domestic pumping more recently.



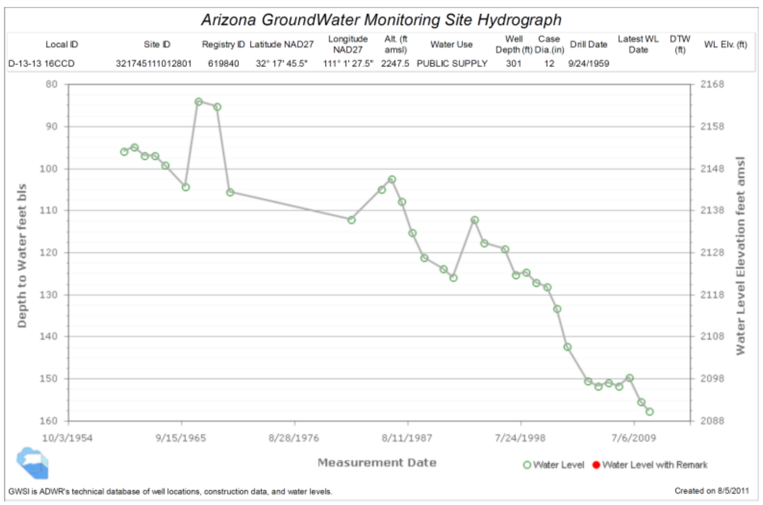
TUC8 -- D-10-14 29DCA Tucson AMA – Upper Santa Cruz sub-basin 2 miles south of Oracle Junction along Big Wash. Major water level recoveries at this well may reflect significant flow events on Big Wash and Canada del Oro (CDO) wash. Recent declines reflect continued impacts of municipal pumping in area.



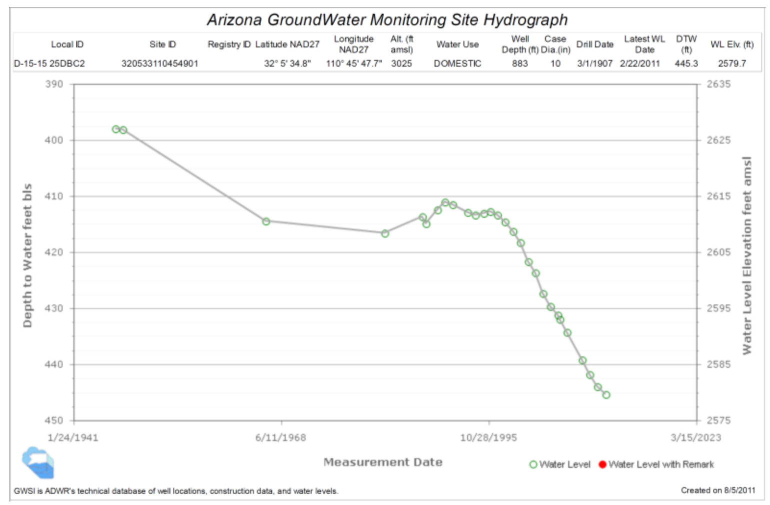
TUC9 -- D-12-14 05CCD Tucson AMA – Upper Santa Cruz sub-basin Oro Valley area. Major water level recoveries at this well may reflect significant flow events on CDO wash. Recent declines reflect continued impacts of municipal pumping in area.



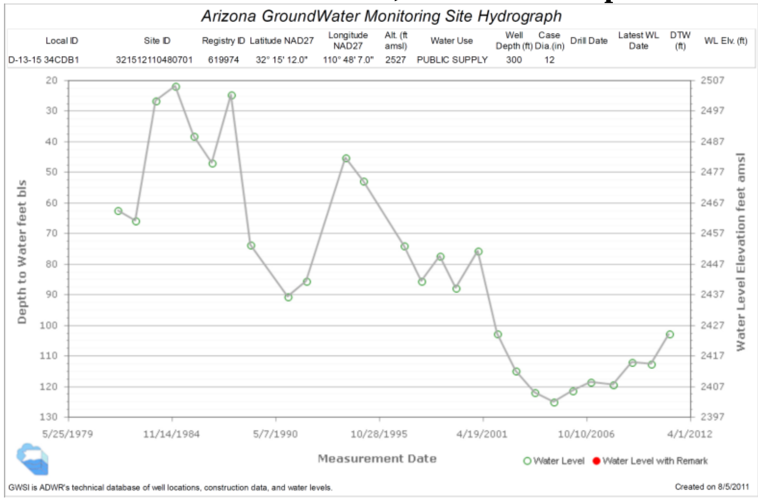
TUC11 -- D-14-14 05ADB1 Tucson AMA – Upper Santa Cruz sub-basin City of Tucson Central Wellfield area about 1 mile NE of UofA. Historic water level declines mainly due to municipal pumping. Recent water level recovery due to reduction in local pumping with increased use of recovered groundwater from the Avra Valley.



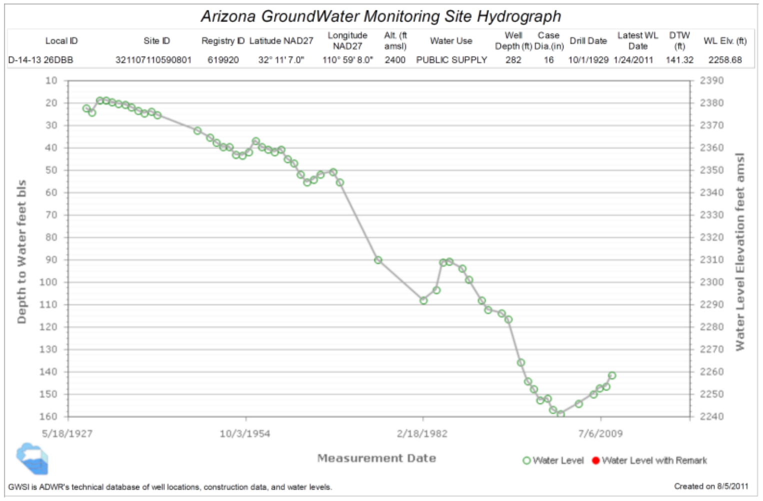
TUC10 -- D-13-13 16CCD Tucson AMA – Upper Santa Cruz sub-basin NW Tucson area near confluence of Rillito Creek and the Santa Cruz River. Water level declines in area due to a combination of agricultural, industrial and municipal pumping.



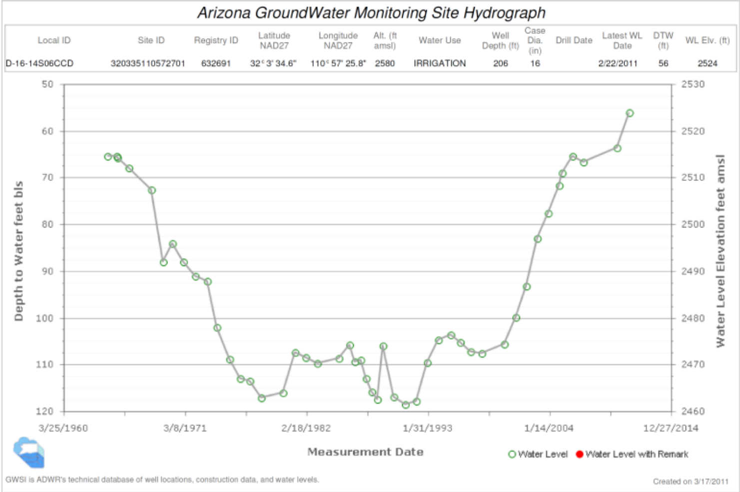
TUC12 -- D-15-15 25DBC2 Tucson AMA – Upper Santa Cruz sub-basin Vail area SE of Tucson near Pantano wash. Municipal and industrial pumping in area have caused water level declines.



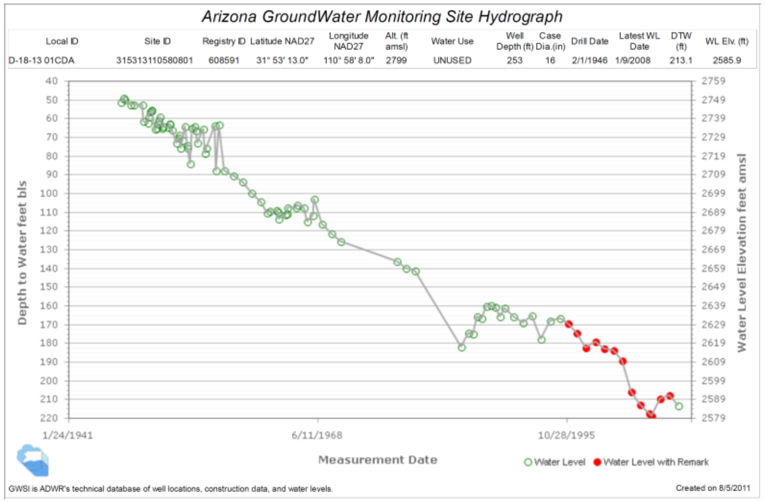
TUC13 -- D-13-15 34CDB1 Tucson AMA – Upper Santa Cruz sub-basin NE Tucson area 1 mile SE of confluence of Tanque Verde Wash and Sabino Creek. Fluctuation in water levels show impacts of recharge from flow events and overall impact of local and regional pumping. Cause of recent water level recovery is uncertain.



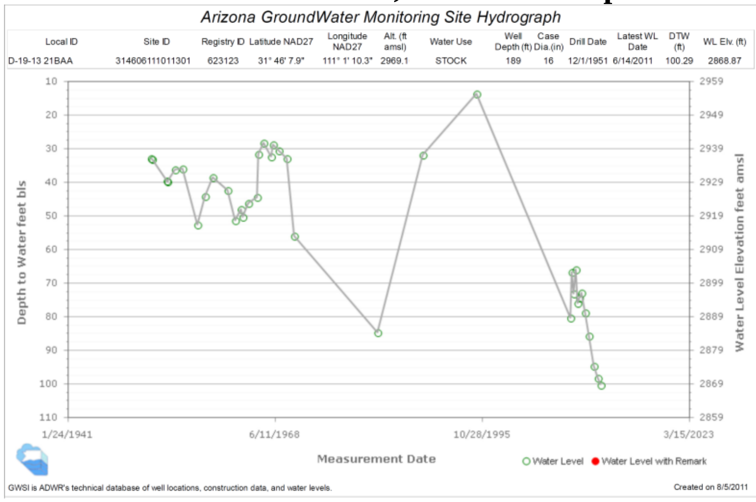
TUC14 -- D-14-13 26DBB Tucson AMA – Upper Santa Cruz sub-basin SW Tucson area near intersection of I10 and I19 near the Santa Cruz River. Historic water level declines caused by a combination of agricultural, municipal and industrial pumping. Reductions in municipal pumping in the general area and the introduction of CAP water for farming on San Xavier Indian Reservation near the San Xavier Mission have also contributed to recent water level recoveries.



TUC15 -- D-16-14S06CCD Tucson AMA – Upper Santa Cruz sub-basin along I19 about 1 mile east of Santa Cruz River about 3.5 miles south of Tucson Airport. Water level recovery due to reduced pumping in area and artificial recharge of CAP water at Pima Mine Road USF. Effluent recharge at Sahuarita USF may also contribute to local recoveries.



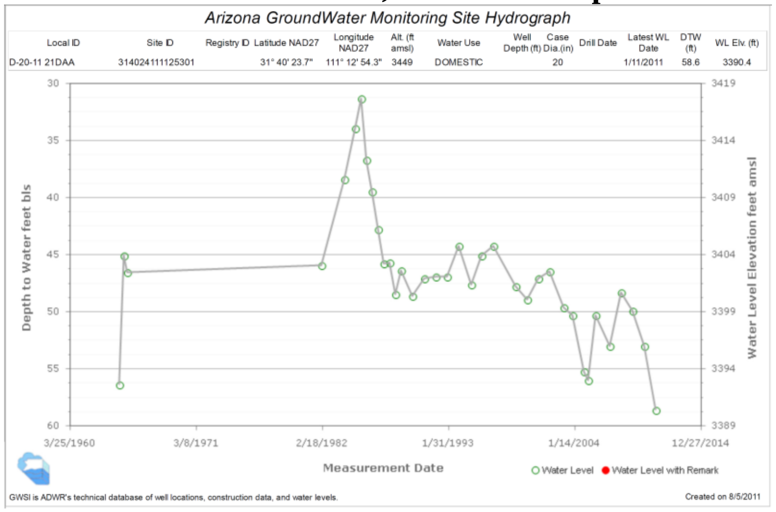
TUC16 -- D-18-13 01CDA Tucson AMA – Upper Santa Cruz sub-basin Green Valley area along the Santa Cruz River. Historic water level declines due to a combination of agricultural, mining and municipal pumping in area. Cascading water noted during many recent water level measurements.



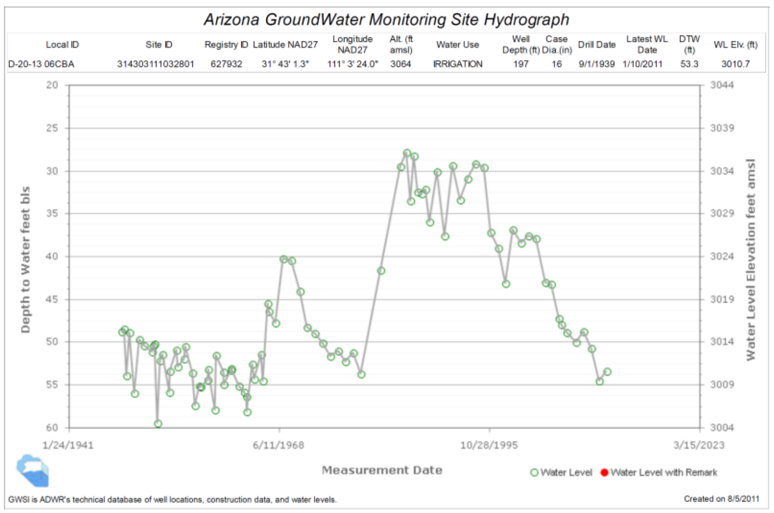
TUC17 -- D-19-13 21BAA Tucson AMA – Upper Santa Cruz sub-basin near confluence of Madera Canyon wash and Santa Cruz River. Water level spike circa 1983 probably related to flood recharge on Santa Cruz River. Overall water level declines may be mainly due to pumping at nearby mines.

Santa Cruz AMA Hydrographs

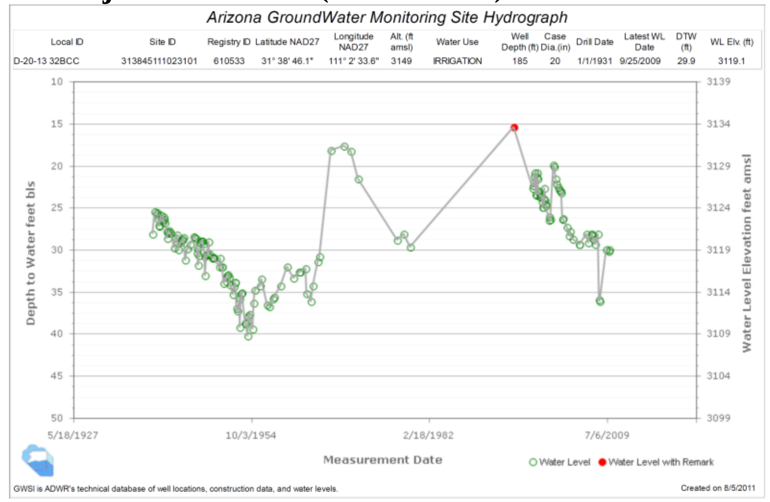
03/19/2012



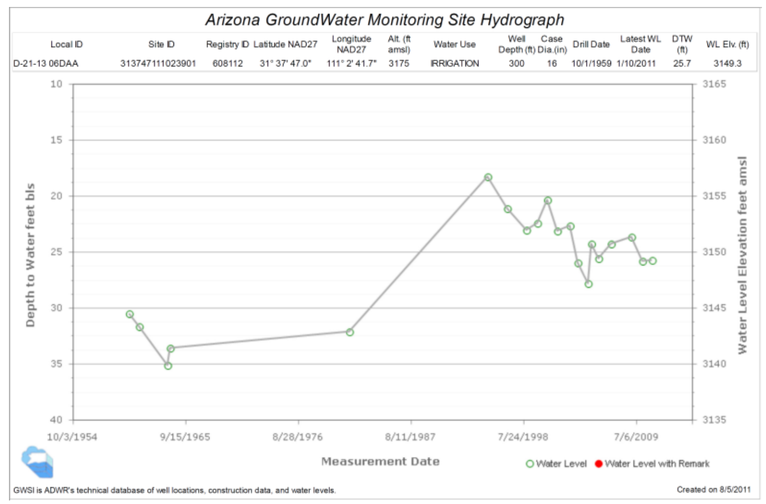
SCA1 -- D-20-11 21DAA Santa Cruz AMA along Sopori Wash. Water level spikeoccurring about 1983 related to flow events on Sopori Wash.



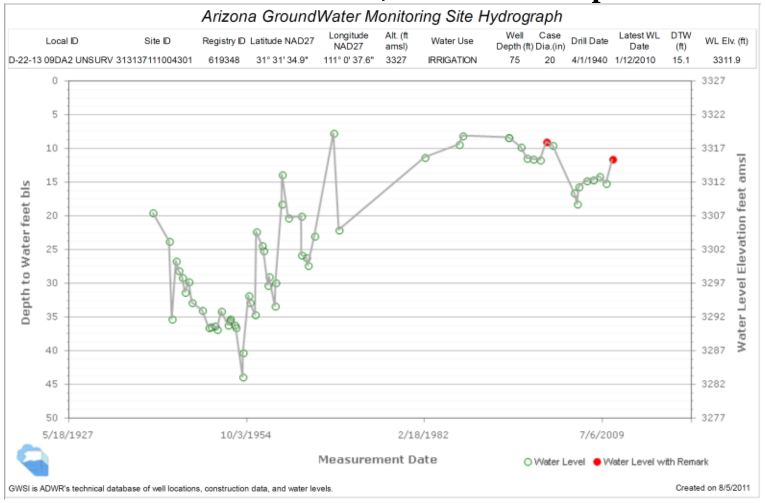
SCA2 -- D-20-13 06CBA Santa Cruz AMA along Santa Cruz River between Arivaca Junction and Amado. Lower water levels during 1940's and early 50's associated with agricultural pumping and drought conditions. Hydrograph shows influence of recharge from major flow events and effluent recharge on the Santa Cruz River. Recent declines mainly attributed to combination of local agricultural and municipal pumping and pumping for mining operations further to the north.



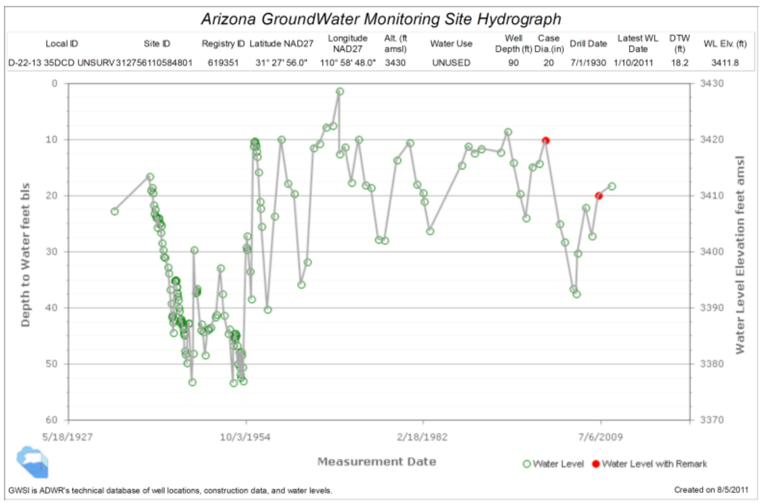
SCA3 -- D-20-13 32BCC Santa Cruz AMA along Santa Cruz River at Chavez Siding. Hydrograph shows influence of recharge from major flow events and effluent recharge on the Santa Cruz River.



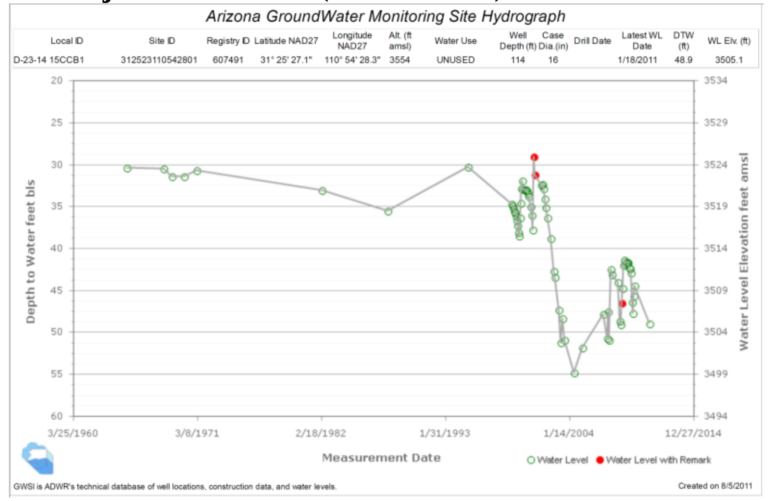
SCA4 -- D-21-13 06DAA Santa Cruz AMA along Santa Cruz River near Tubac. Hydrograph shows influence of recharge from major flow events and effluent recharge on the Santa Cruz River.



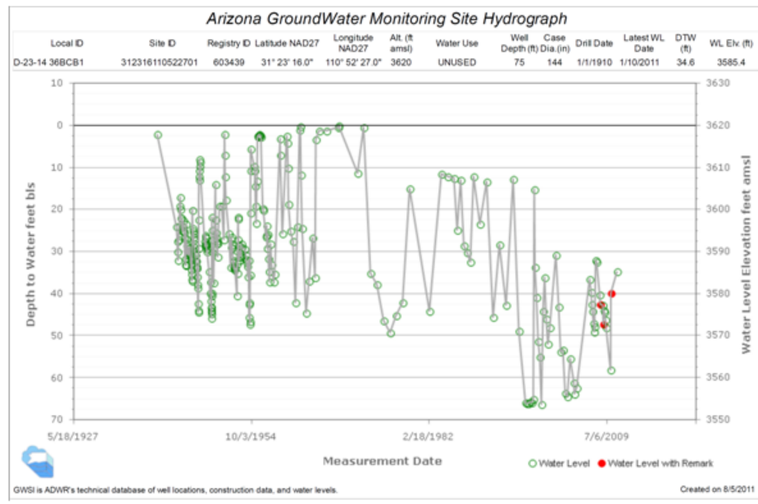
SCA5 -- D-22-13 09DA2(UNSURV) Santa Cruz AMA along Santa Cruz River near Palo Parado interchange. Lower water levels during 1940's and early 50's associated with agricultural pumping and drought conditions. Hydrograph shows influence of recharge from major flow events and effluent recharge on the Santa Cruz River.



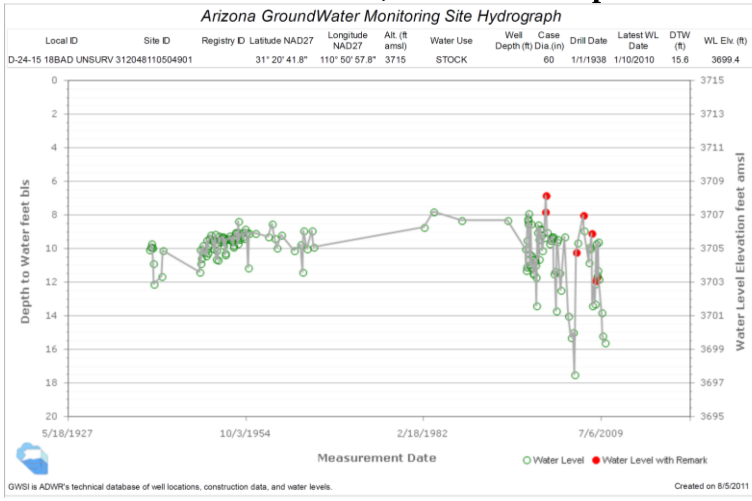
SCA6 -- D-22-13 35DCD(UNSURV) Santa Cruz AMA along Santa Cruz River at Rio Rico. Lower water levels during 1940's and early 50's associated with agricultural pumping and drought conditions. Hydrograph shows influence of recharge from major flow events and effluent recharge on the Santa Cruz River.



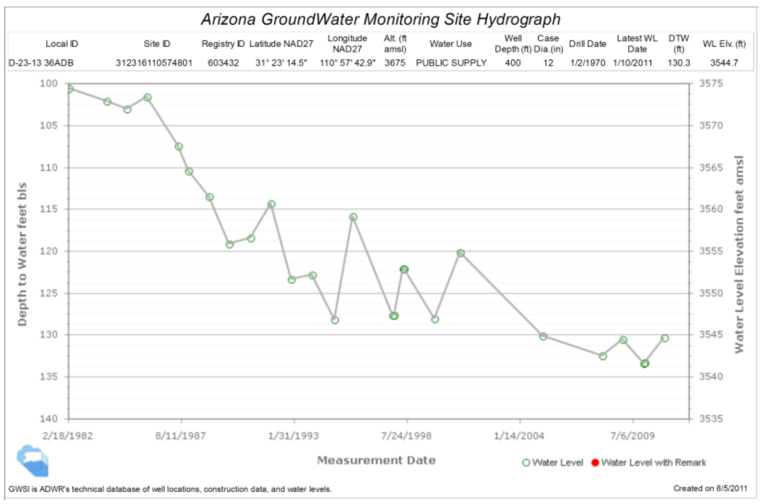
SCA7 -- D-23-14 15CCB1 Santa Cruz AMA along Santa Cruz River at Guevavi Mission. Rapid decline in water level circa 2000 maybe related to new municipal well pumping in area.



SCA8 -- D-23-14 36BCB1 Santa Cruz AMA along Santa Cruz River at Highway 82 wellfield. Water level declines mainly due to municipal pumping and some local agricultural and industrial (golf course) pumping. Water level recoveries associated with recharge from flow events on Santa Cruz River. Lesser recoveries of water levels in more recent years may be related to overall increase in pumping and reduced surface flows on the San Cruz River.



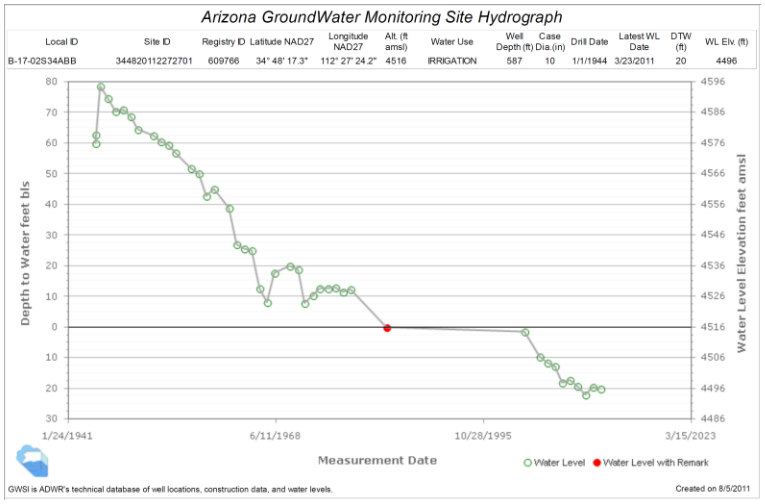
SCA9 -- D-24-13 36ADB Santa Cruz AMA along Santa Cruz River about 1 mile north of the US/Mexico border. Recent fluctuations in water levels reflect impacts of increased climatic variability and increased surface water use in Mexico.



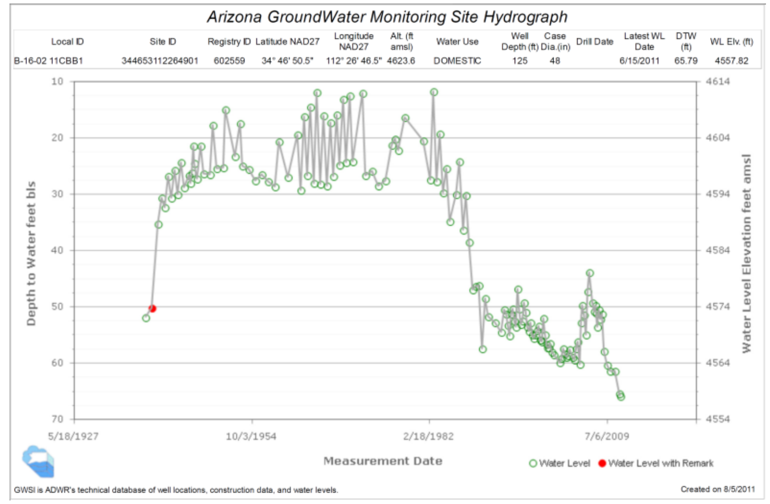
SCA10 -- D-23-13 36ADB Santa Cruz AMA Portero Canyon well field area. Overall water level declines mainly due to local groundwater pumping by the City of Nogales.

Prescott AMA Hydrographs

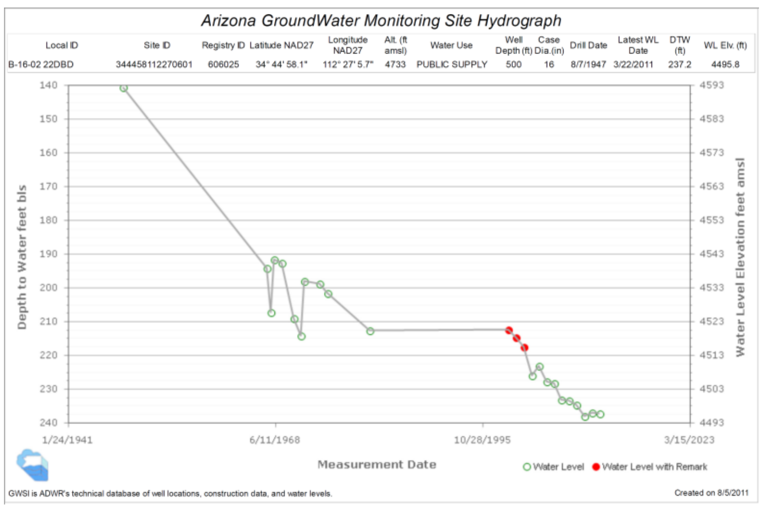
3/19/2012



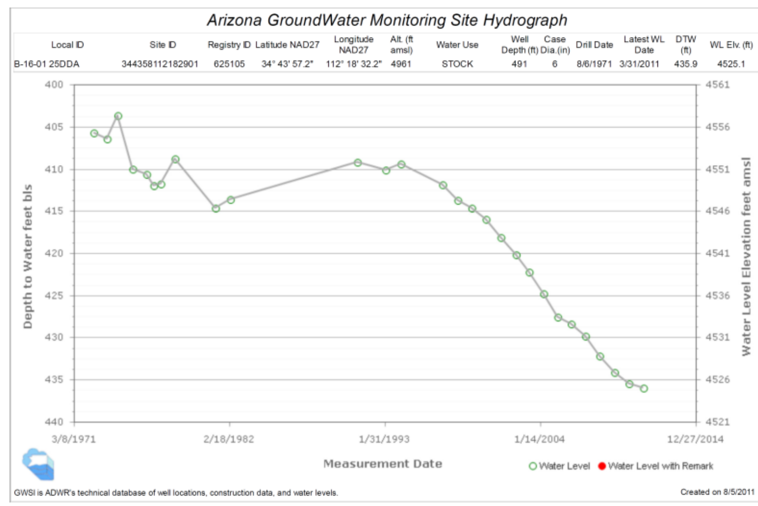
PRE1 -- B-17-02S34ABB Prescott AMA - Little Chino sub-basin about 1.3 miles south of Del Rio Springs. Well was an originally flowing artesian well. Reduction in hydraulic head due to historic irrigation and municipal pumping.



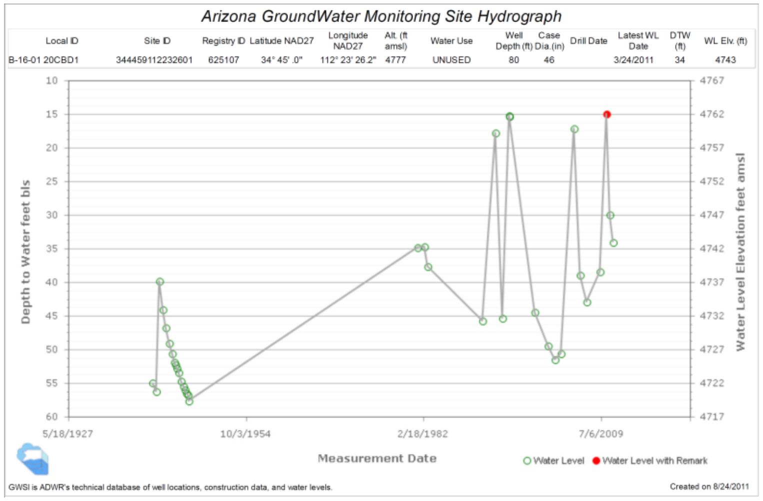
PRE3 - B-16-02 11CBB1 Prescott AMA – Little Chino sub-basin shallow well in agricultural area showing "reverse" water table response due to agricultural recharge. Reductions in agricultural activity (using both groundwater and surface water supplies) in recent years have caused water levels to decline as the incidental recharge has diminished.



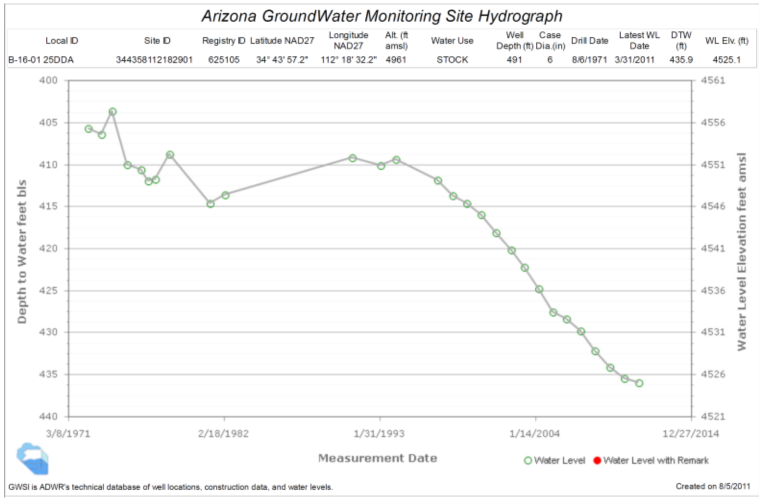
PRE2 -- B-16-02 22DBD Prescott AMA – Little Chino sub-basin southern part of agricultural area. Historic water level declines caused by combination of agricultural and municipal pumping.



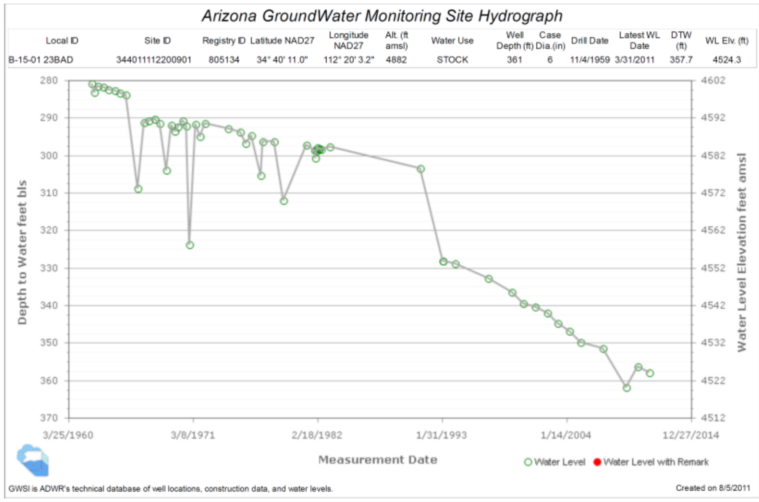
PRE4 -- B-16-02 28DDC Prescott AMA – Little Chino sub-basin southern part of farming area. Historic water level declines caused by combination of agricultural and municipal pumping.



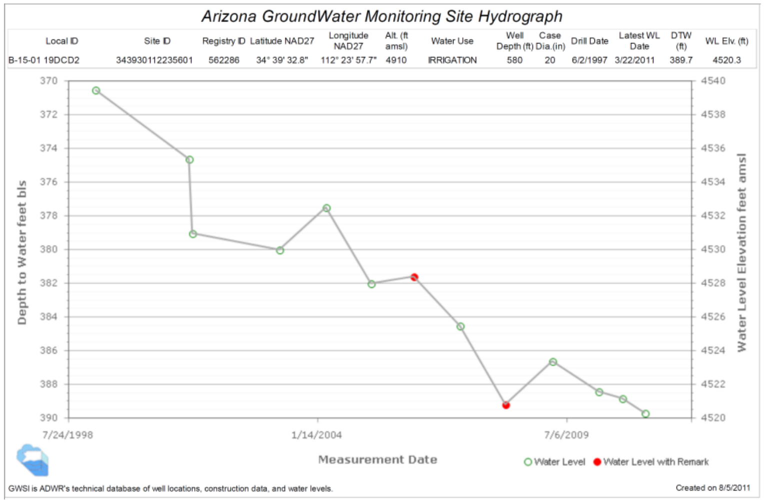
PRE5 -- B-16-01 20CBD1 Prescott AMA – Little Chino sub-basin northern area near Granite Creek. Water levels in well show periodic rises due to flood recharge.



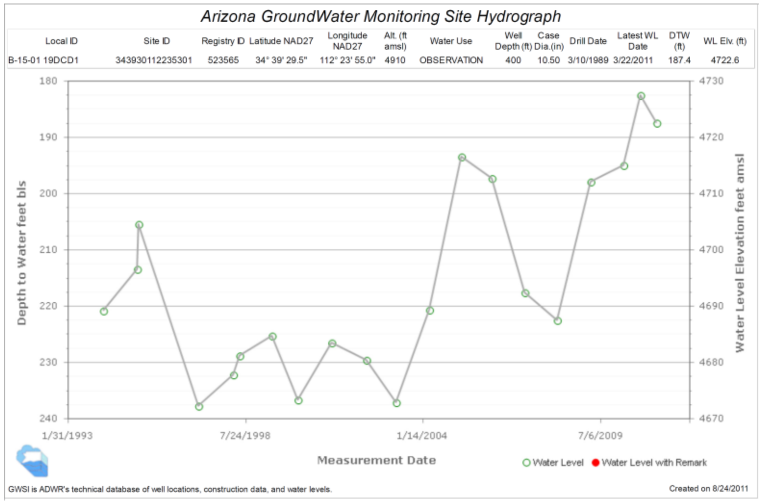
PRE7 -- B-16-01 25DDA Prescott AMA – Little Chino sub-basin NE Lonesome Valley area. Historic water level declines caused by a combination of regional agricultural and municipal pumping and local pumping.



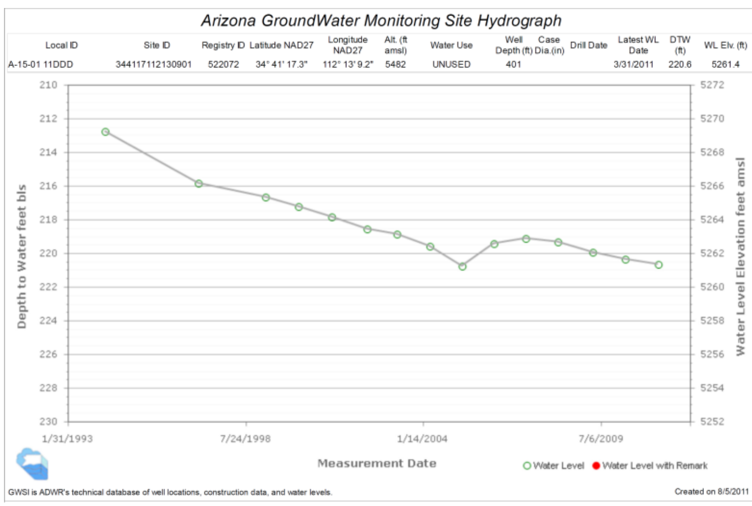
PRE6 -- B-15-01 23BAD Prescott AMA – Little Chino sub-basin southern Lonesome Valley area. Historic water level declines caused by a combination of regional agricultural and municipal pumping and local pumping.



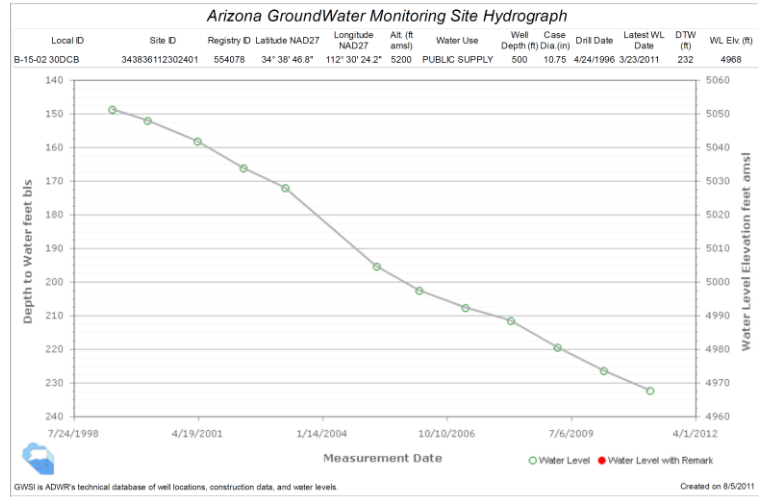
PRE8 -- B-15-01 19DCD2 Prescott AMA – Little Chino sub-basin near airport along Granite Creek. Deep well showing water level declines due to local and regional groundwater withdrawals and little or no evidence of recharge from flood events or from effluent at the nearby City of Prescott Airport Recharge facility.



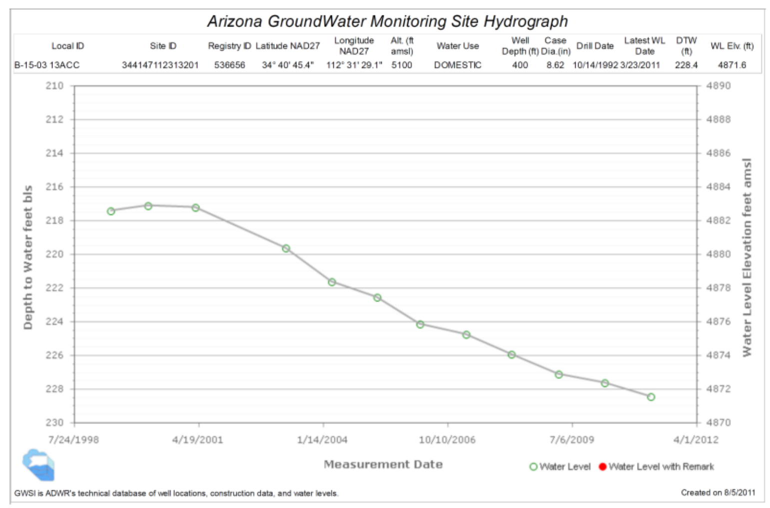
PRE9 -- B-15-01 19DCD2 Prescott AMA – Little Chino sub-basin near airport along Granite Creek. Shallow well showing evidence of flood recharge and recharge of effluent at the nearby City of Prescott Recharge facility.



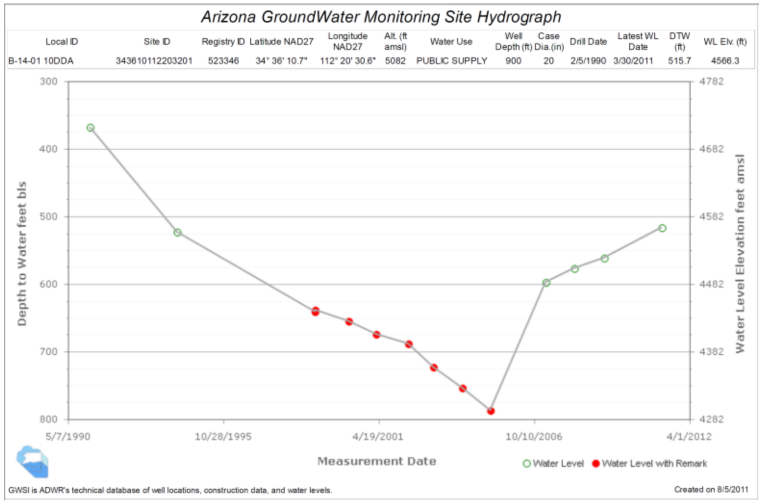
PRE10 -- A-15-01 11DDD Prescott AMA – Upper Agua Fria sub-basin Coyote Springs/Indian Hills area. Water level declines mainly caused by local pumping and possibly local reductions in natural recharge due to drought.



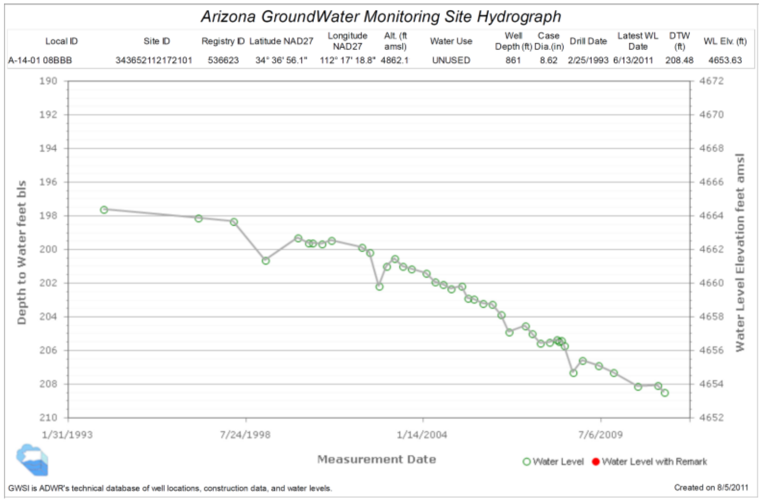
PRE11 -- B-15-02 30DCB Prescott AMA – Little Chino sub-basin near Granite Mountain along Williamson Valley Road. Local domestic and municipal pumping are main cause of water level declines.



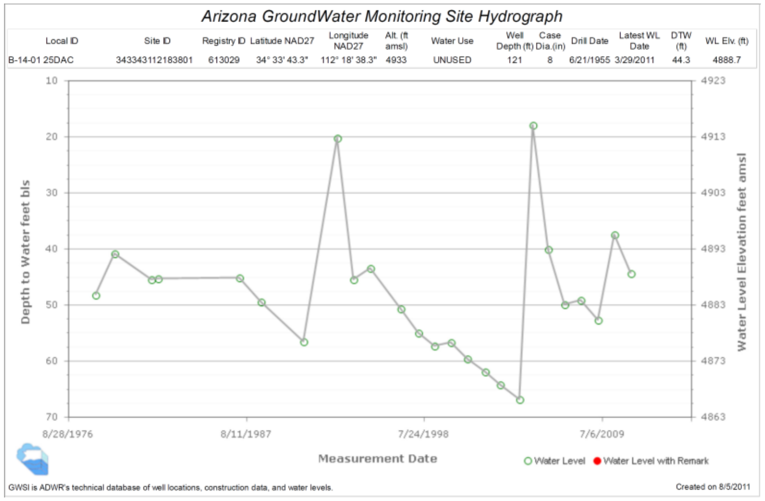
PRE12 -- B-15-03 13ACC Prescott AMA – Little Chino sub-basin SW area near American Ranch. Local domestic and municipal pumping are main cause of water level declines.



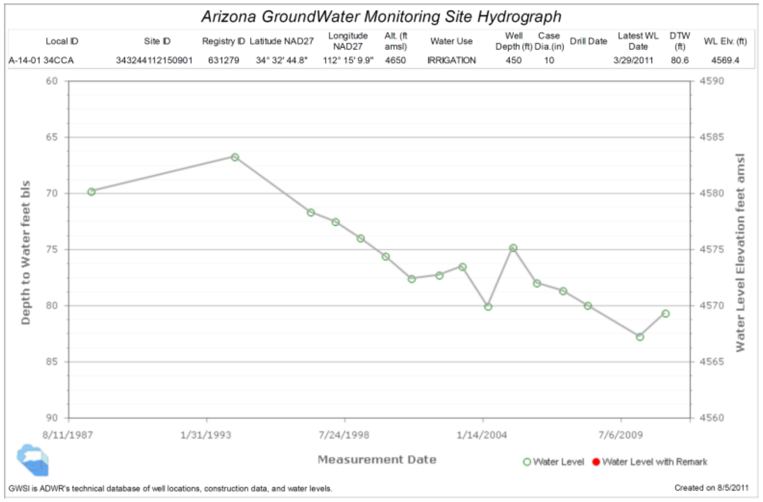
PRE13 -- B-14-01 10DDA Prescott AMA – Upper Agua Fria sub-basin Prescott Valley Santa Fe well field area. Recovery in water levels about 2003 due to reduced pumping with the development of Prescott Valley's "North" well field.



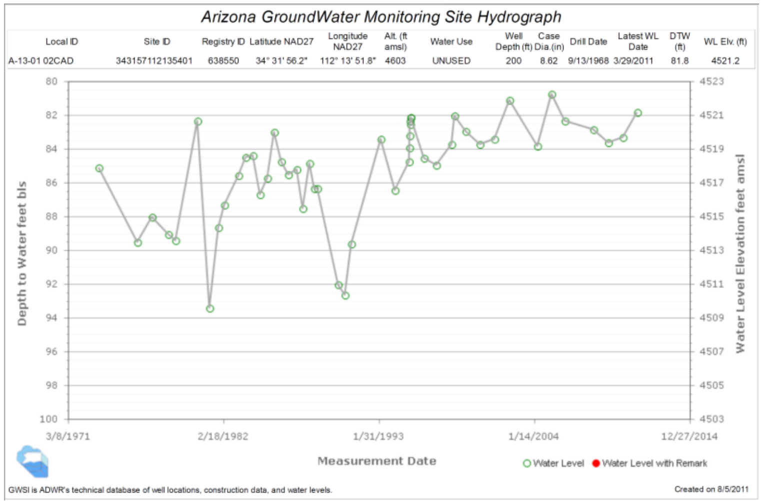
PRE14 -- A-14-01 08BBB Prescott AMA – Upper Agua Fria sub-basin north-central Prescott Valley area. Water level declines due to local and regional pumping.



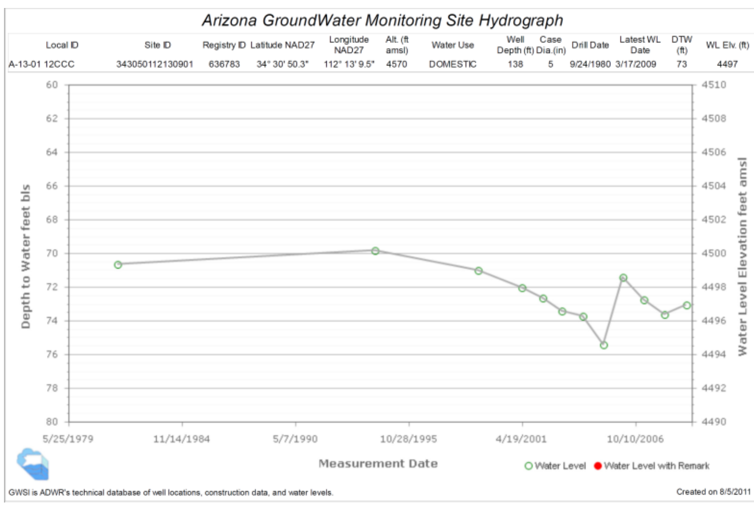
PRE15 -- B-14-01 25DAC Prescott AMA – Upper Agua Fria sub-basin southern Prescott Valley area 1 mile south of Lynx Creek. Water level peaks in 1993 and 2005 correspond to significant flow events along Lynx Creek.



PRE16 -- A-14-01 34CCA Prescott AMA – Upper Agua Fria sub-basin near confluence of Agua Fria River and Lynx Creek.. Water level declines due to local and regional pumping.



PRE17 -- A-13-01 02CAD Prescott AMA – Upper Agua Fria sub-basin about .25 miles east of Agua Fria River near Dewey. Peaks in water levels in 1983 and 1993 correspond to high flow events during those years. Gradual rise trend in water levels may reflect impacts of reduced agricultural activity in general area. Prescott Valley artificial recharge activities may also contribute to recovery trend in more recent years.



PRE18 -- A-13-01 12CCC Prescott AMA – Upper Agua Fria sub-basin east of the Agua Fria River near Humboldt.

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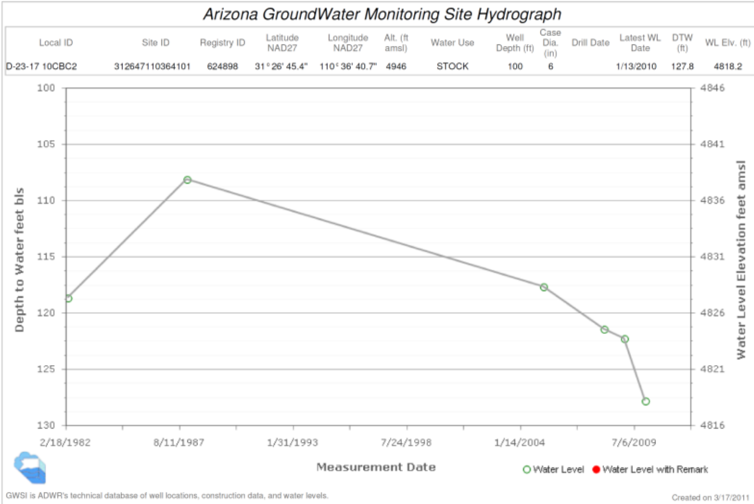
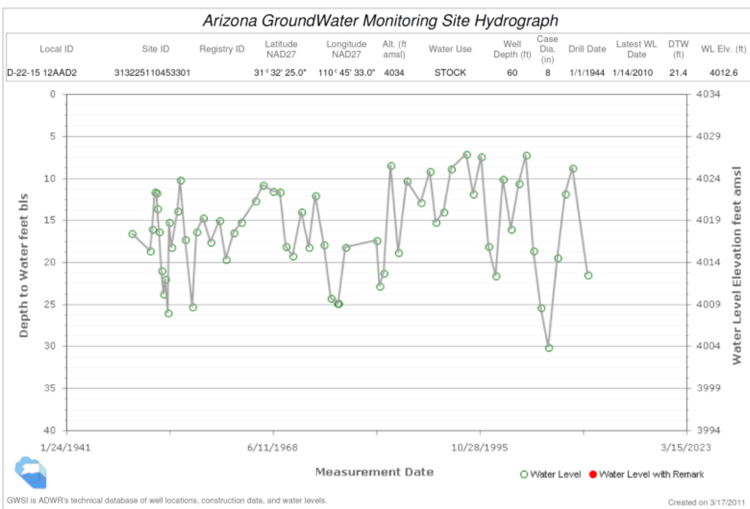
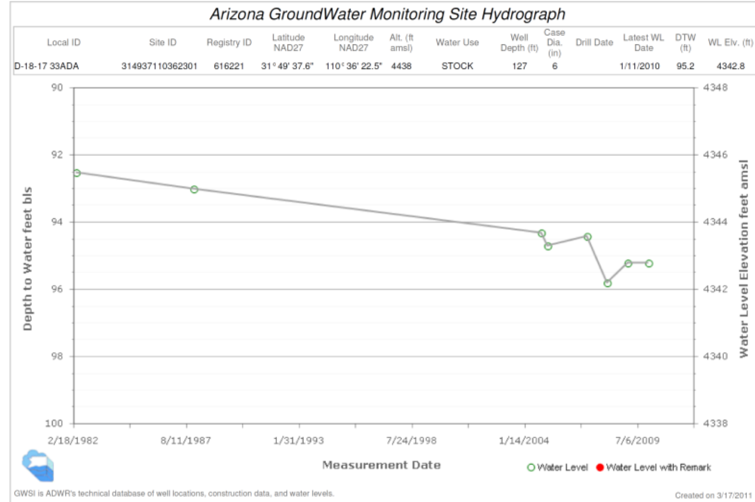


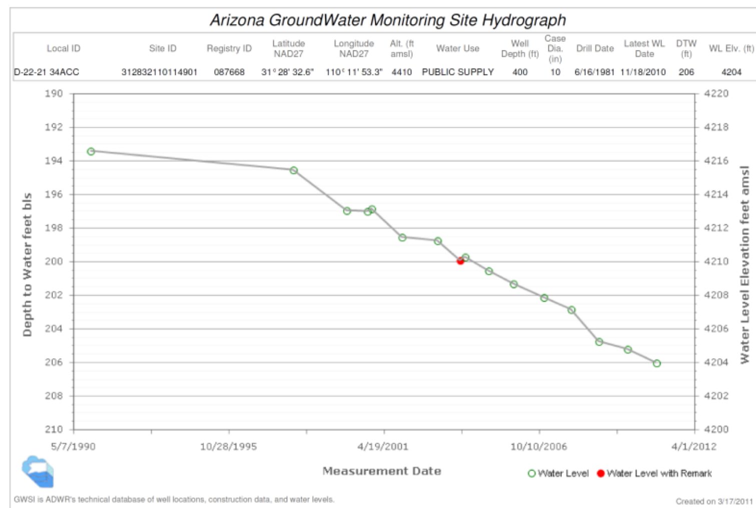
SEA1 -- D-23-17 10CBC2 -- San Rafael basin about 7 miles north of Lochiel and 1 mile west of Santa Cruz River. Water level rise in 1980's correlates with a period of higher stream flow and associated recharge. Declines in recent years may be partially drought related.



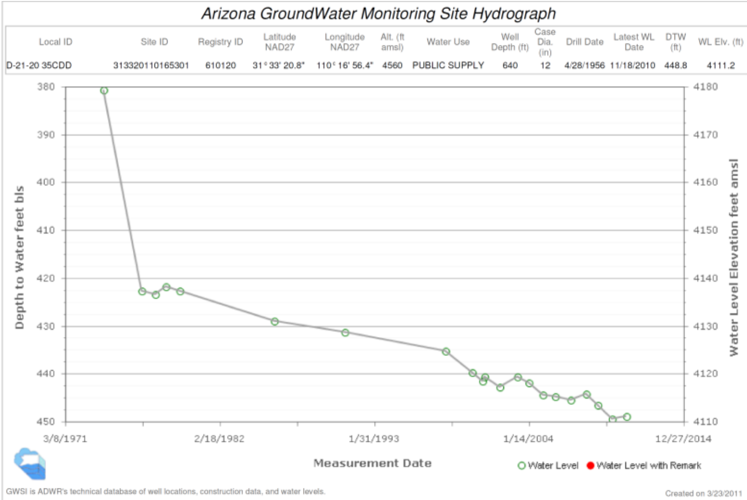
SEA2 -- D-22-15 12AAD2 – Cienega Creek basin near Patagonia and Sonoita Creek. Local pumping variations, stream flow and drought effects during late 1990's and early 2000's may be reflected in water level fluctuations.



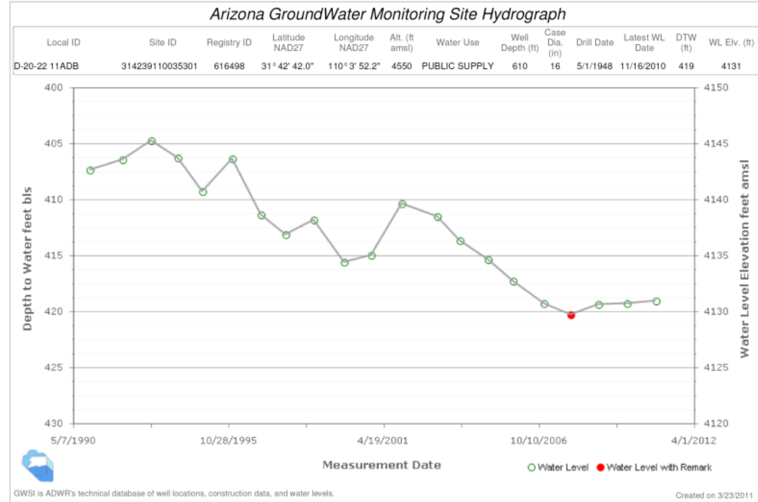
SEA3 -- D-18-17 33ADA – Cienega Creek basin about 10 miles north of Sonoita just west of Cienega Creek. Local pumping and drought effects may be reflected in recent water level trends.



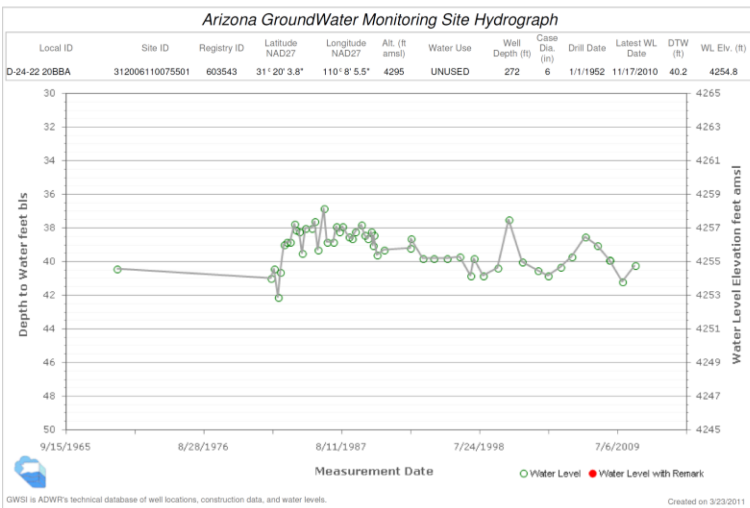
SEA4 -- D-22-21 34ACC – Upper San Pedro basin – Sierra Vista sub-basin about 4 miles NE of Nicksville and 4 miles west of San Pedro River. Mainly impacts of municipal and industrial pumping reflected in water level decline trend.



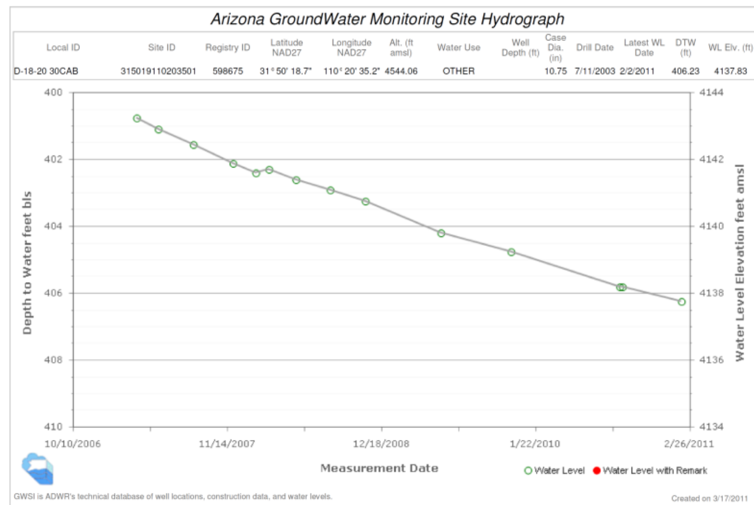
SEA5 -- D-21-20 35CDD – Upper San Pedro basin – Sierra Vista sub-basin in Sierra Vista. Long-term water level decline trend mainly reflects local municipal and industrial pumping impacts.



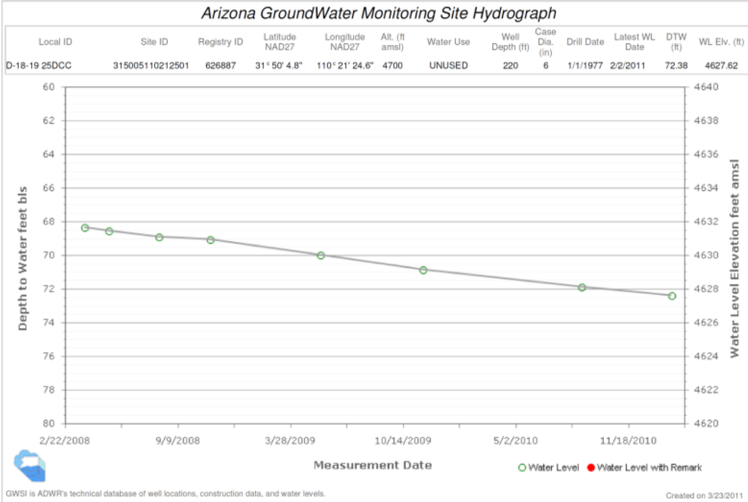
SEA7 -- D-20-22 11ADB – Upper San Pedro basin – Sierra Vista sub-basin in Tombstone. Long-term water level decline trend mainly due to local pumping.



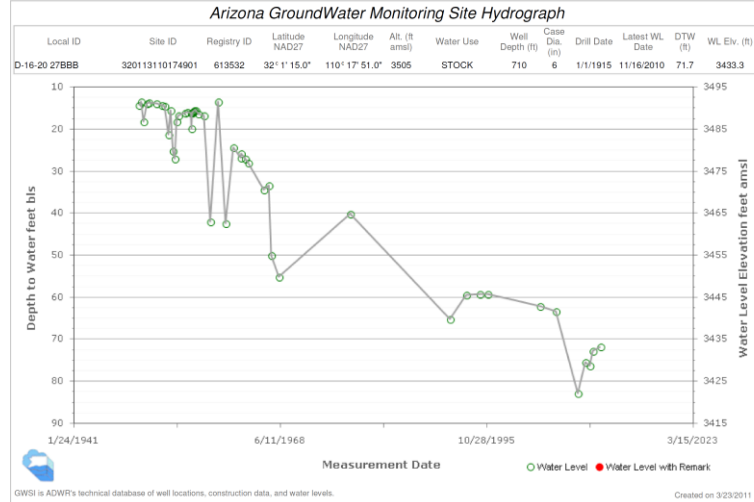
SEA6 -- D-24-22 20BBA -- Upper San Pedro basin – Sierra Vista sub-basin along US/Mexico border 1 mile east of San Pedro River. Spikes in water level in 2001 and 2006 correlate with higher stream flow and associated recharge during those years. Drought impacts may be reflected during decline periods in 2000's.



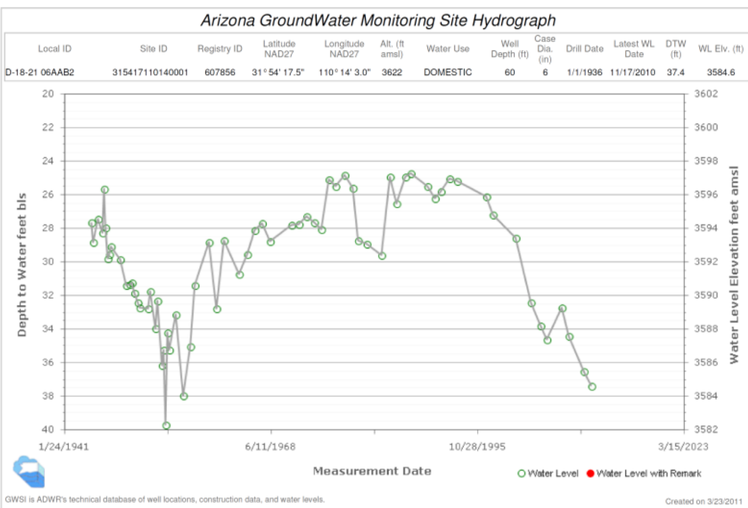
SEA8 -- D-18-20 30CAB – Upper San Pedro basin – Sierra Vista sub-basin at Kartchner Caverns (deep aquifer system). Water level decline trend mainly attributed to regional groundwater pumping.



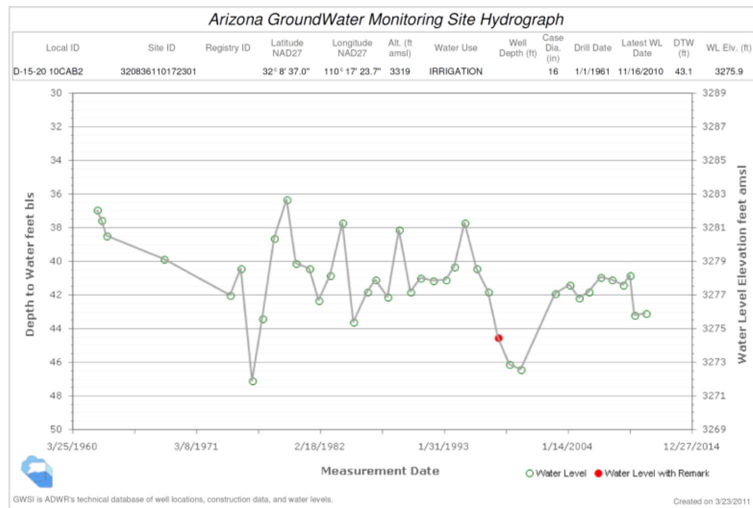
SEA9 -- D-18-19 25DCC – Upper San Pedro basin – Sierra Vista sub-basin at Kartchner Caverns (shallow aquifer system). Water level decline trend mainly due to impacts of local pumping and drought.



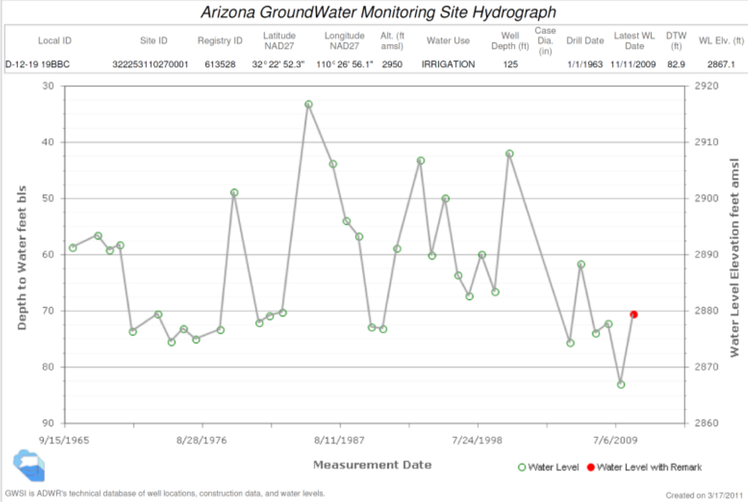
SEA11 -- D-16-20 27BBB – Upper San Pedro basin – Sierra Vista sub-basin about 1 mile NW of Pomerne near San Pedro River. Historic water level decline trend mainly due to agricultural groundwater pumping in area.



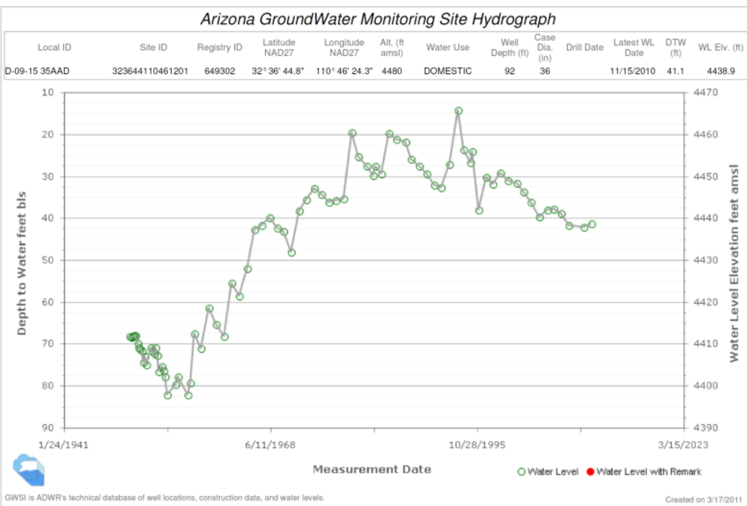
SEA10 --D-18-21 06AAB2 – Upper San Pedro basin – Sierra Vista sub-basin about a mile west of St. David and 1 mile east of the San Pedro River. Water level decline trends in 1940', 50's, 90's and 2000's mainly attributable to agricultural pumping and drought.



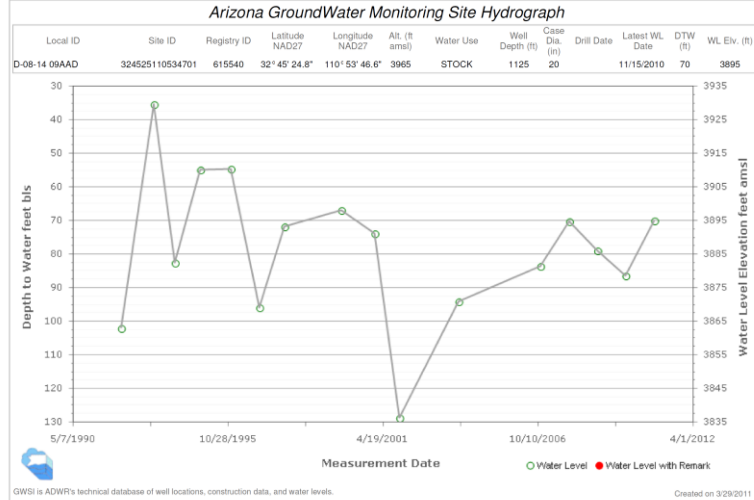
SEA12 -- D-15-20 10CAB2 – Lower San Pedro basin – Mammoth sub-basin about 11 miles SE of Cascabel near San Pedro River. Rapid water level rises followed by longer periods of water level decline reflect impacts of flood events, local pumping and drought beginning in mid to late 1990's to early 2000's.



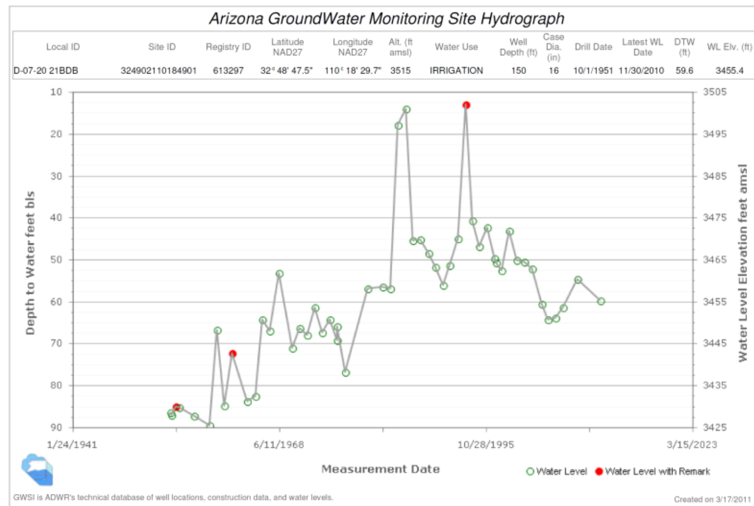
SEA13 -- D-12-19 19BBC – Lower San Pedro basin – Mammoth sub-basin about 4 miles SE of Reddington near the San Pedro River. Rapid water level rises in 1985 and 1993 followed by longer periods of water level decline reflect impacts of flood events, local pumping and drought, in more recent years.



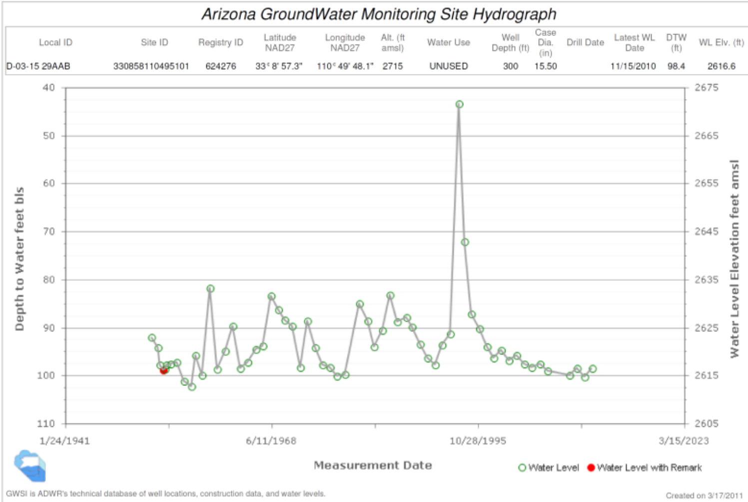
SEA14 -- D-09-15 35AAD – Lower San Pedro basin – Mammoth sub-basin Oracle area. Water level recovery trend beginning in 1957 probably mainly related to reduction and/or shift in local and regional pumping locations.



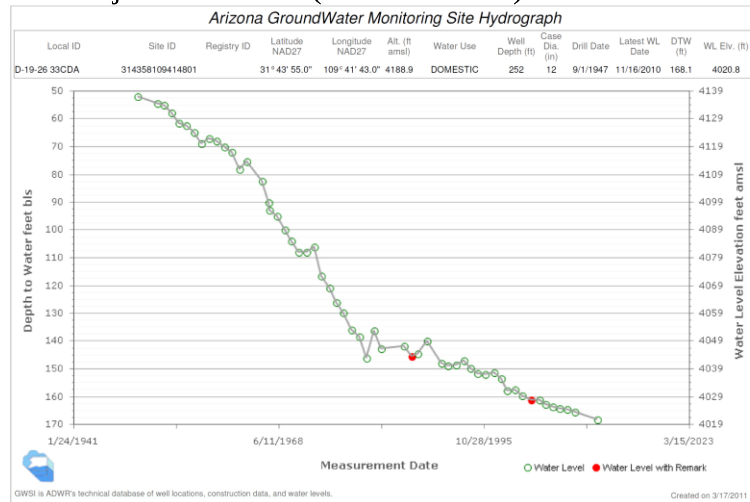
SEA15 -- D-08-14 09AAD Lower San Pedro basin – Camp Grant sub-basin about 3 miles NE of Oak Wells. Effects of drought and local well pumping may be most significant factors impacting water level trend in this well.



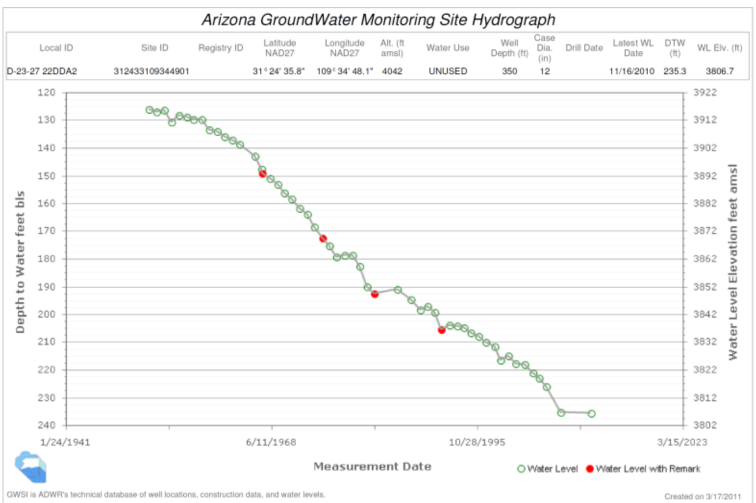
SEA16 -- D-07-20 21BDB – Aravaipa basin – about 2 miles SE of Klondyke along Aravaipa Creek. Peaks in water levels in 1984 and 1993 correlate with high flow events and recharge on Aravaipa Creek.



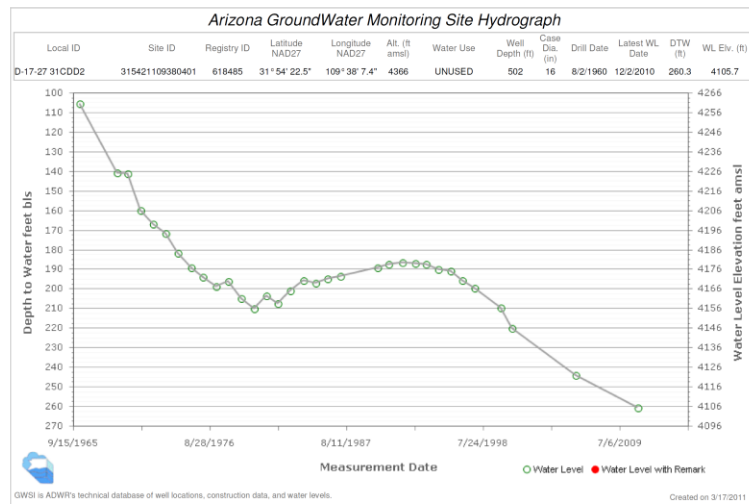
SEA17 -- D-03-15 29AAB –Dripping Springs Wash basin about 7 miles NE of Kelvin. Well located in hardrock area near Dripping Springs Wash. Major peak in1993 probably due to flooding on Dripping Springs Wash.



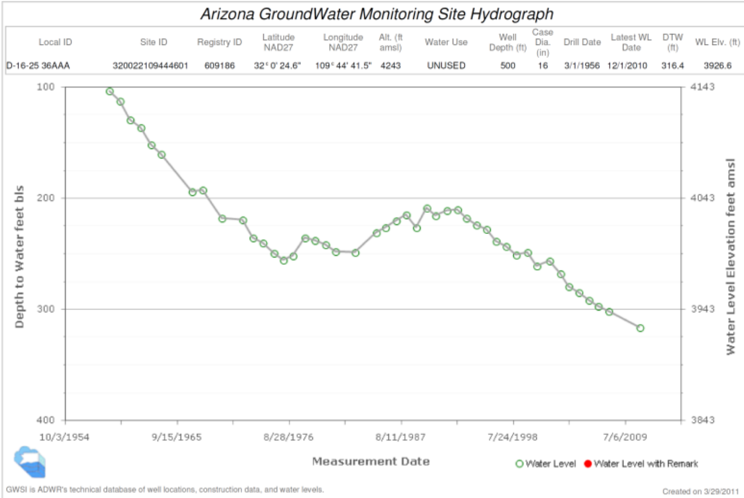
SEA19 -- D-19-26 33CDA – Douglas basin - Douglas INA about 3 miles north of Elfrida. Historic water level decline trend mainly reflects impacts of agricultural pumping.



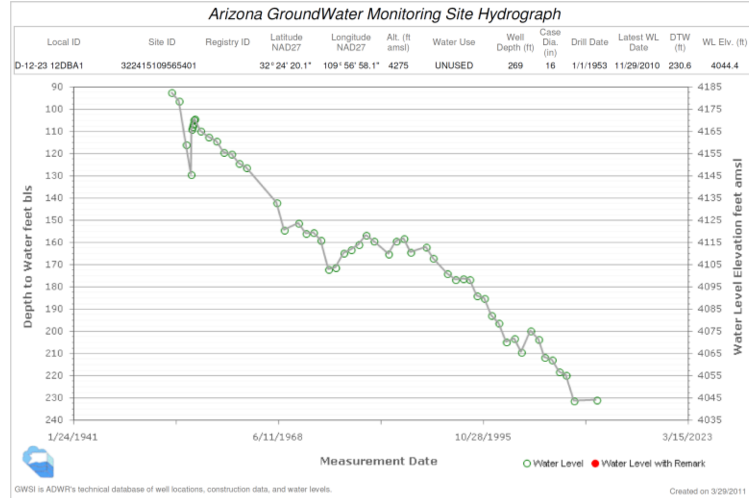
SEA18 -- D-23-27 22DDA2 Douglas basin – Douglas INA about 5 miles NW of Douglas. Historic water level decline trend mainly reflects impacts of agricultural pumping**.**



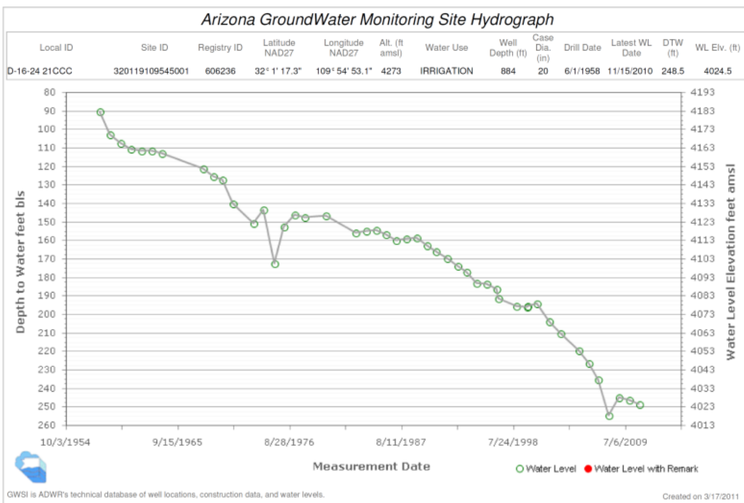
SEA20 -- D-17-17 31CDD2 Willcox basin about 2 miles NE of Sunizona. Long-term decline trend mainly caused by agricultural pumping. Water level recovery from late 1970's to early to mid 1990's due to major basin-wide pumping reductions.



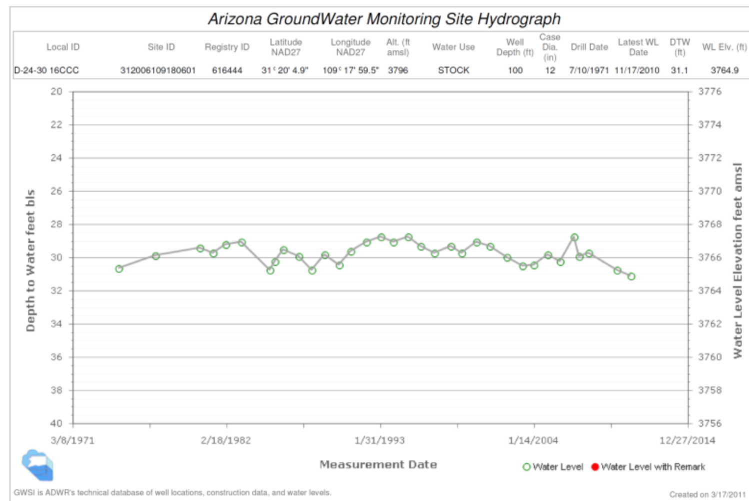
SEA21 -- D-16-25 36AAA Willcox basin about 4 miles south of Kansas Settlement. Long-term decline trend mainly caused by agricultural pumping. Water level recovery from late 1970's to early to mid 1990's due to major basin-wide pumping reductions.



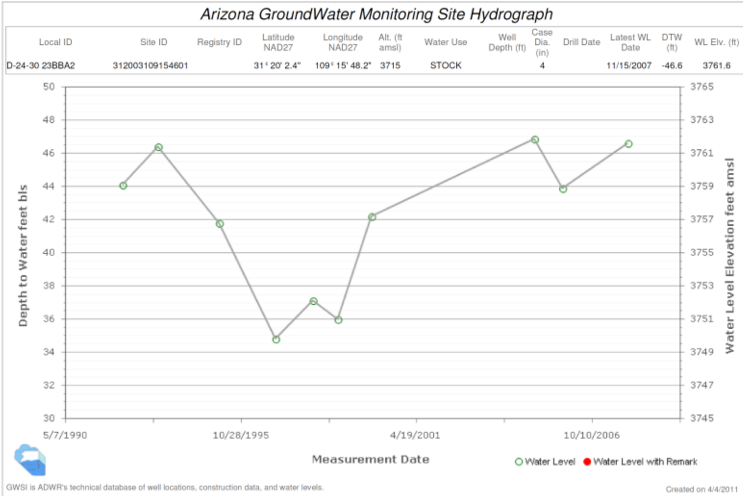
SEA23 -- D-12-23 12 DBA1 – Willcox basin about 12 miles NW of Willcox. Long-term decline trend mainly caused by agricultural pumping. Water level recovery from late 1970's to early to mid 1990's due to major basin-wide pumping reductions.



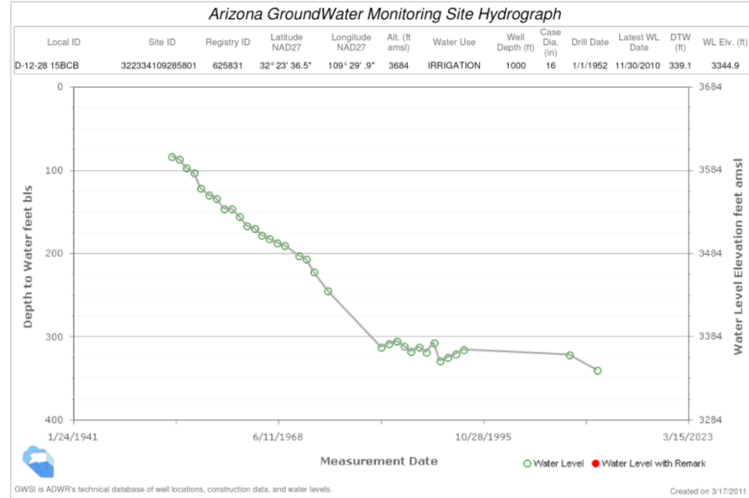
SEA22 -- D-16-24 21CCC Willcox basin about 6 miles NW of Sunsites. Long-term decline trend mainly caused by agricultural pumping.



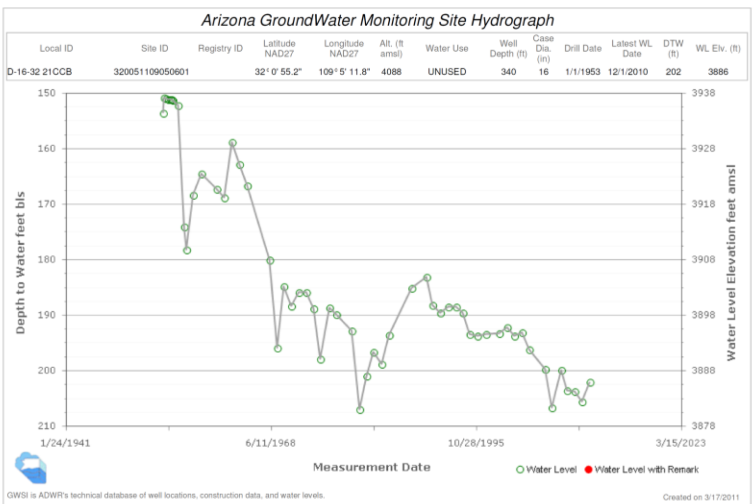
SEA24 -- D-24-30 16CCC – San Bernadino Valley basin on US/Mexican border about 1.75 miles west of San Bernadino NationalWildlife Refuge



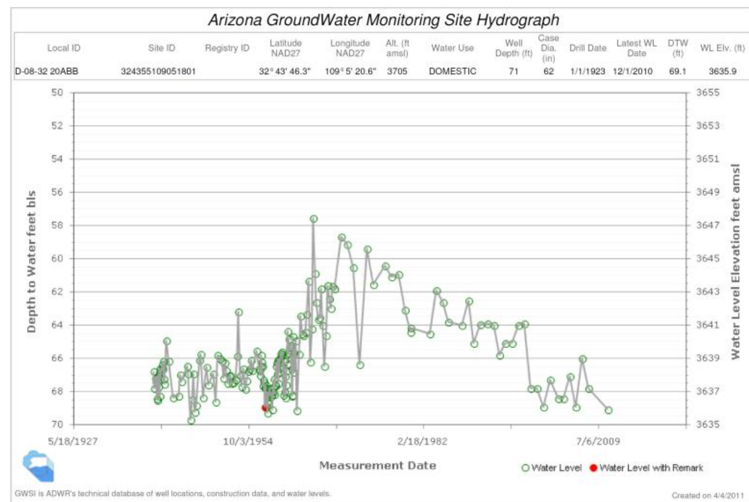
SEA25 -- D-24-30 23BBA2 – San Bernadino Valley basin near San Bernadino National Wildlife Refuge. An artesian well that is measured using a pressure gage.



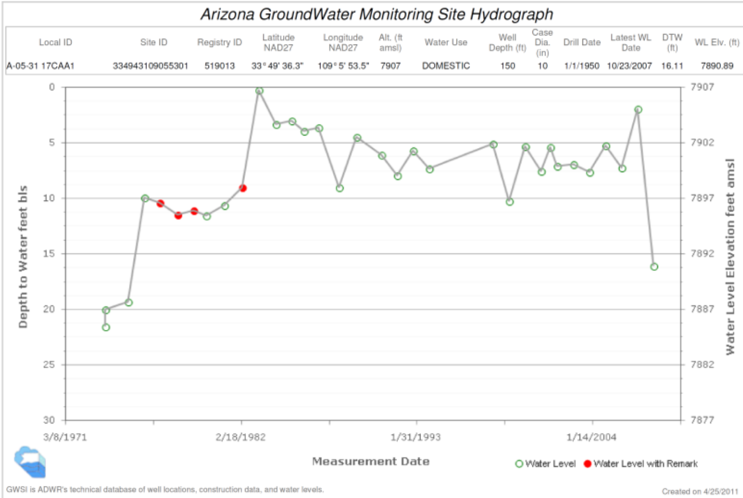
SEA27 -- D-12-28 15BCB -- Safford basin – San Simon Valley sub-basin about 4 miles north of Bowie. Historic water level declines mainly caused by agricultural pumping, period of reduced water level decline, beginning circa 1980, correlates to a period of reduced groundwater pumping in basin.



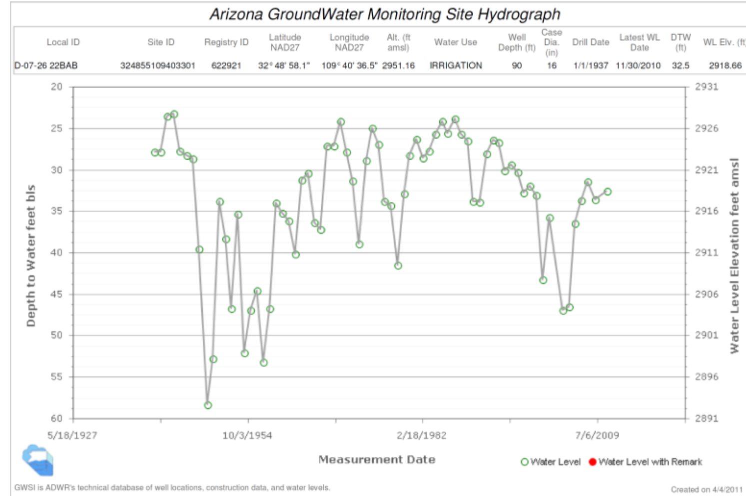
SEA26 -- D-16-32 21CCB Safford basin - San Simon Valley sub-basin about 8 miles NE of Portal and 3 miles west of San Simon River. Historic water level declines mainly caused by agricultural pumping, period of rapid water level recovery beginning circa 1980 correlates to a period of reduced basin groundwater pumping.



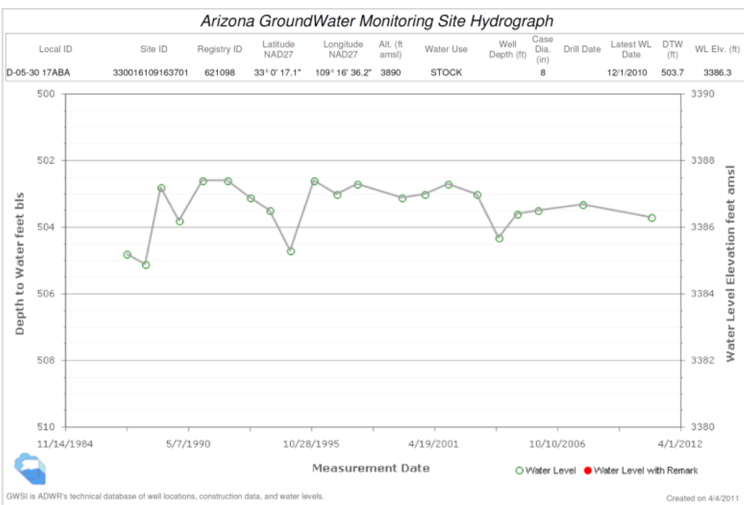
SEA28 -- D-08-32 20ABB - Duncan Valley basin about 1 mile NE of Duncan and .5 mile east of Gila River. Fluctuations and trends in water levels over time mainly reflect impacts of variations in streamflow on Gila River and impacts of agricultural pumping in the basin.



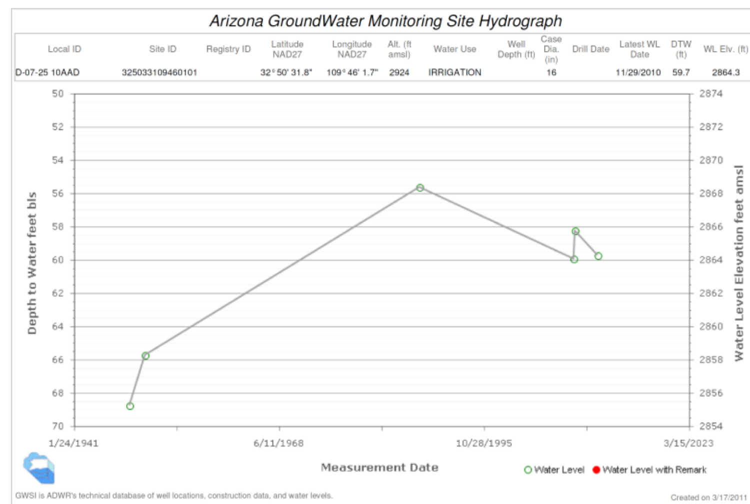
SEA29 -- A-05-31 17CAA1 – Morenci basin about 3 miles SE of Alpine along the San Francisco River. Fluctuations and trends in waterlevels over time mainly due to variations in stream flow and local groundwater pumping.



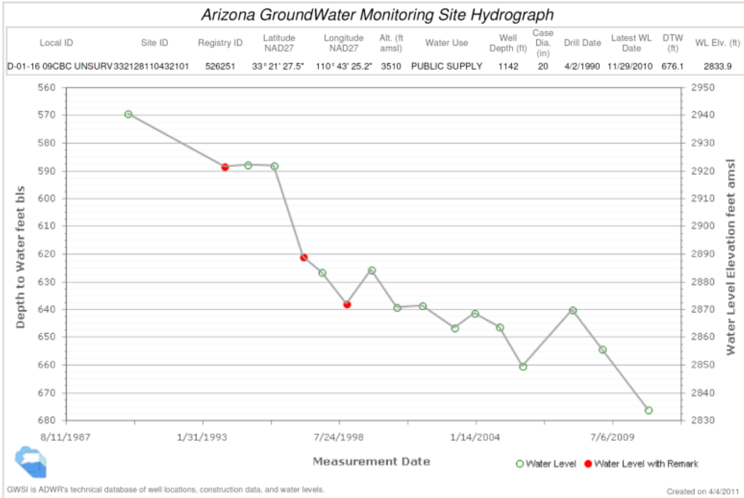
SEA31 -- D-07-26 22BAB – Safford basin – Gila Valley sub-basin about 2 miles SE of Safford and 1.5 miles south of Gila River. Water level trends show impacts of variations in Gila River streamflow and long-term groundwater pumping.



SEA30 -- D-05-30 17ABA – Morenci basin about 3 miles south of Morenci. No significant water level change trends evident in this well

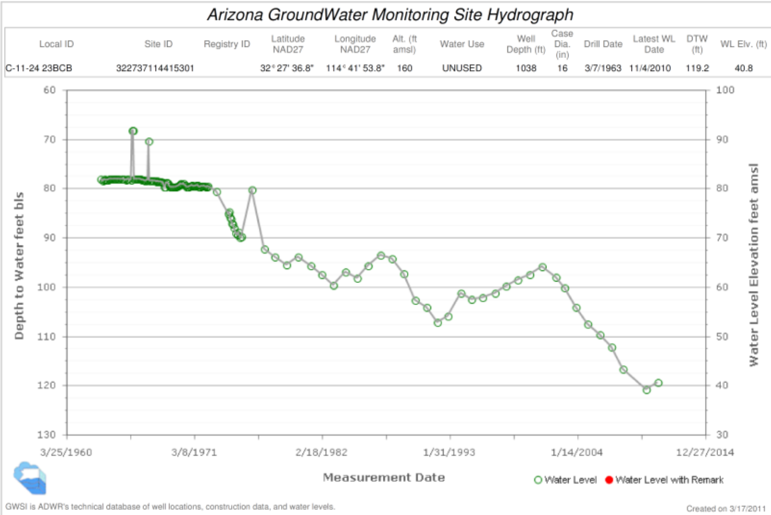


SEA32 -- D-07-25 10AAD -- Safford basin – Gila Valley sub-basin about 2 miles SW of Thacher and 3 miles SW of the Gila River. Water level peak in early 1990's likely related to Gila River flood events.

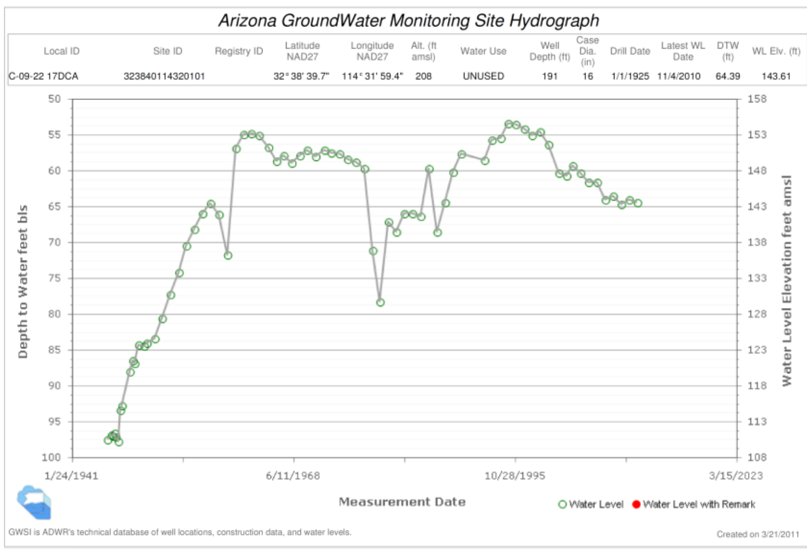


SEA33 -- D-01-16 09CBCUNSURV – Safford basin -- San Carlos Valley sub-basin about 4 miles west of Cutter. Water level decline trend mainly due to local groundwater pumping for public supply for City of Globe.

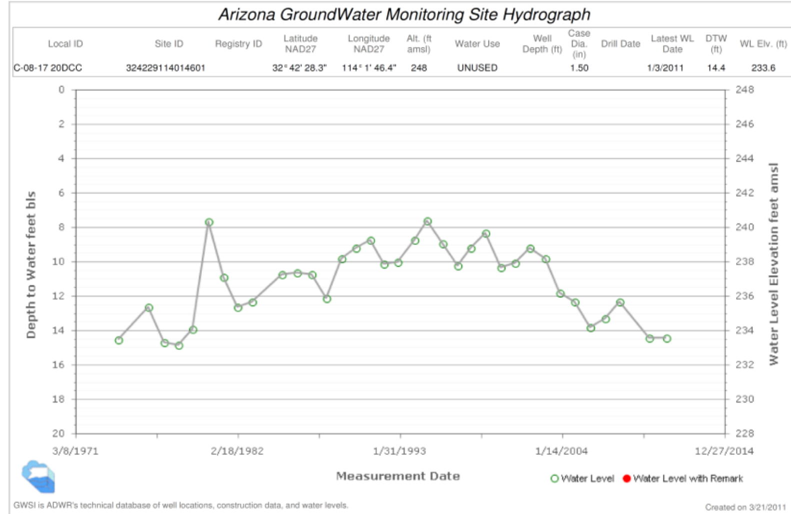
Lower Colorado River Planning Area Hydrographs
3/19/2012



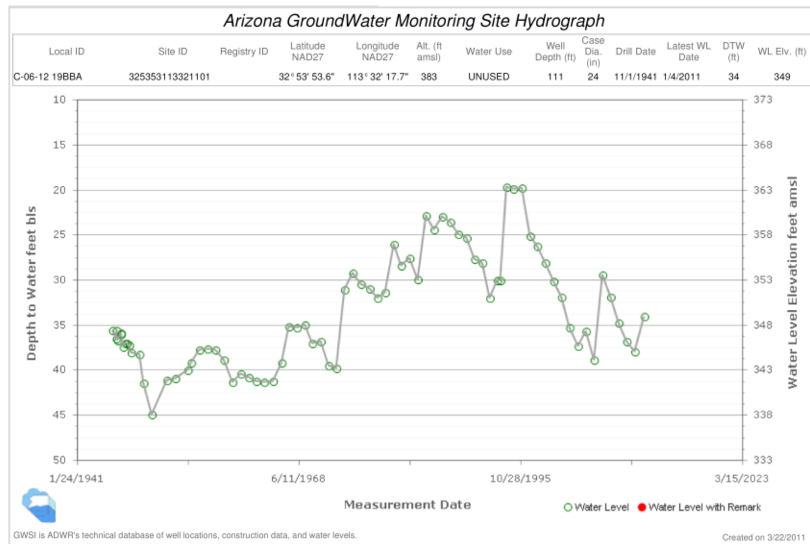
LCR1 -- C-11-24 23 BCB -- Yuma basin – about 5 miles SE of San Luis along US/Mexican Border. Declining water levels due to USBR 242 well field pumping and other regional pumping.



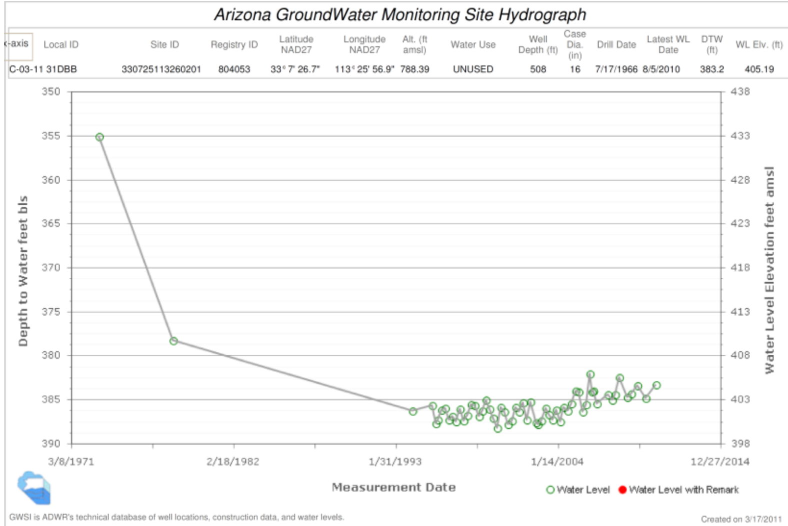
LCR2 -- C-09-22 17DCA Yuma basin – Yuma Mesa area. Rising water levels beginning in 1940's and 50's mainly due to incidental recharge from agricultural irrigation.



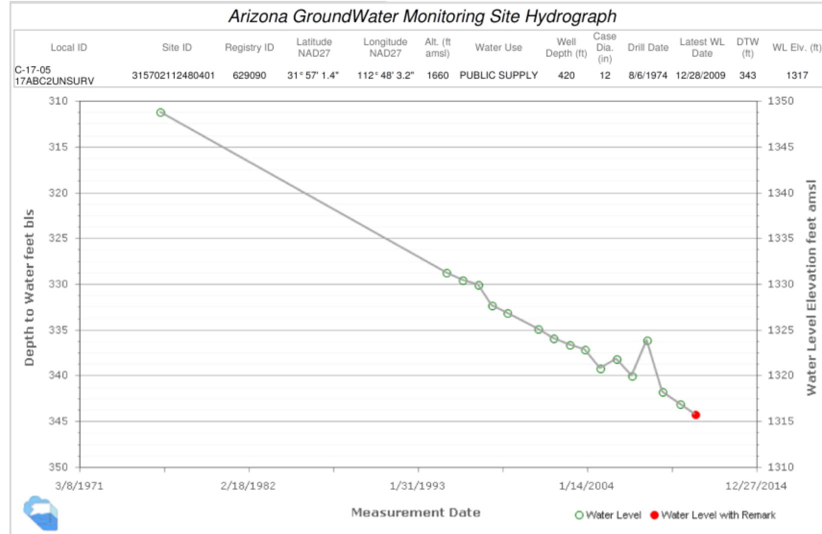
LCR3 -- C-08-17 20DCC -- Lower Gila basin – Wellton-Mohawk sub-basin about 5 miles W of Tacna near the Gila River. Some rapid water level rises reflect recharge from Gila River flood events.



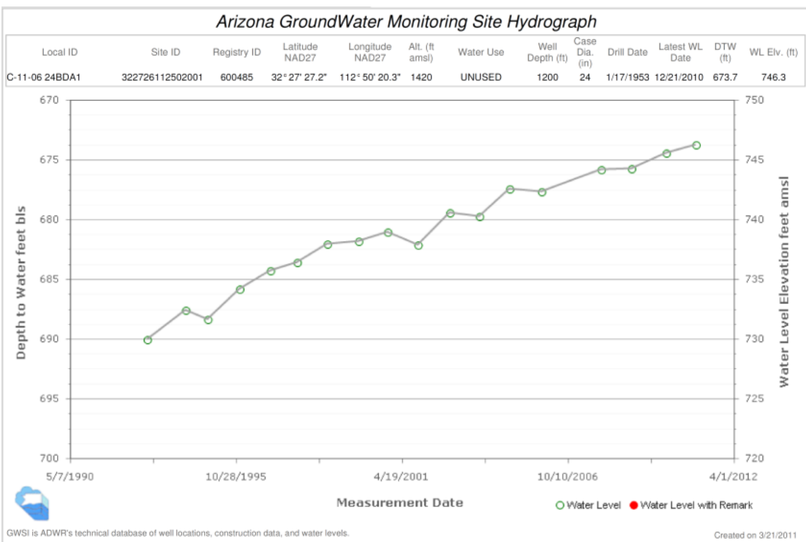
LCR4 -- C-06-12 19BBA Lower Gila basin - Wellton–Mohawk sub-basin about 7 miles north of Dateland near the Gila River. Some rapid water level rises reflect recharge from Gila River flood events.



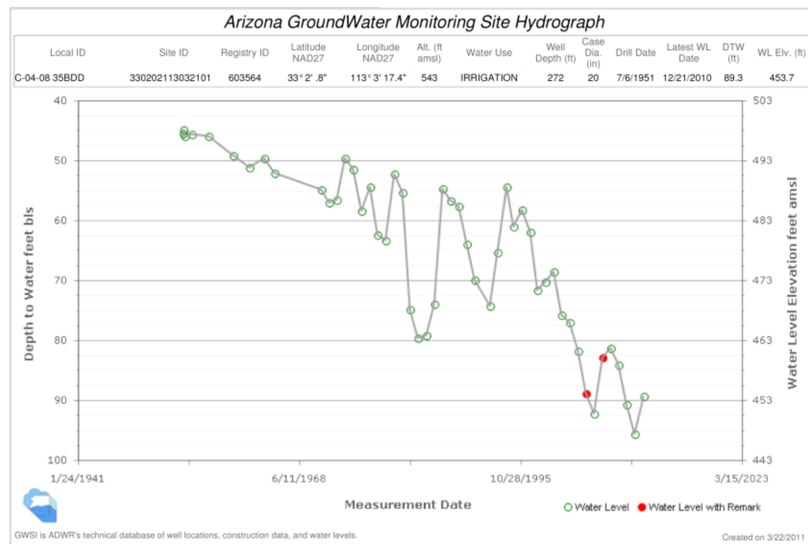
LCR5 -- C-03-11 31DBB -- Lower Gila basin – Wellton – Mohawk sub-basin about 8 miles NW of Hyder. Historic declines in water levels attributed to local agricultural pumping.



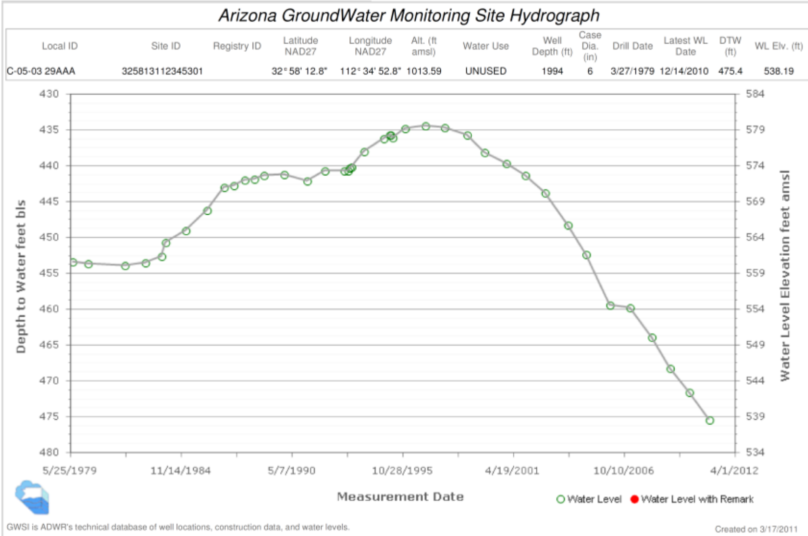
LCR7 -- C-17-05 17ABC2UNSURV – Western Mexican Drainage basin about 4 miles north of Lukeville. Historic declines in water levels due to local area municipal pumping, and some agricultural pumping in Mexico.



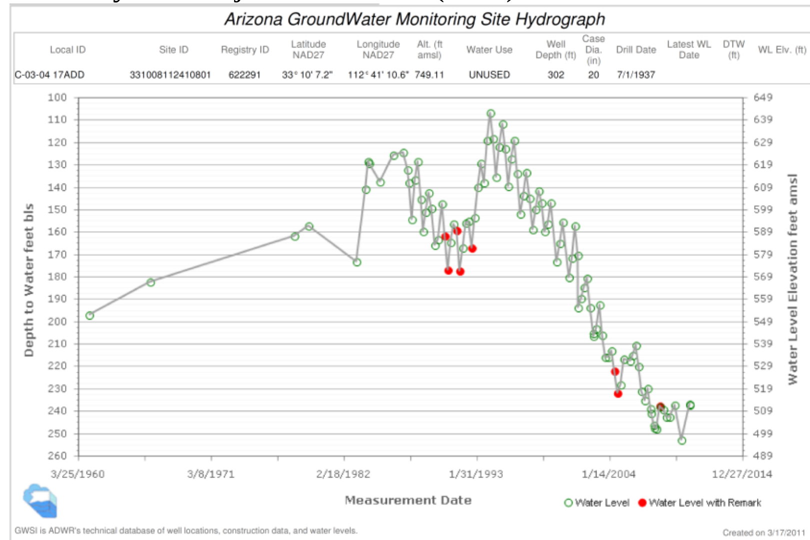
LCR6 -- C-11-06 24BDA1 – Lower Gila basin – Childs Valley sub-basin 5 miles north of Ajo. Cause of long-term water level recovery trend uncertain, but possibly related to reduced pumping in general area.



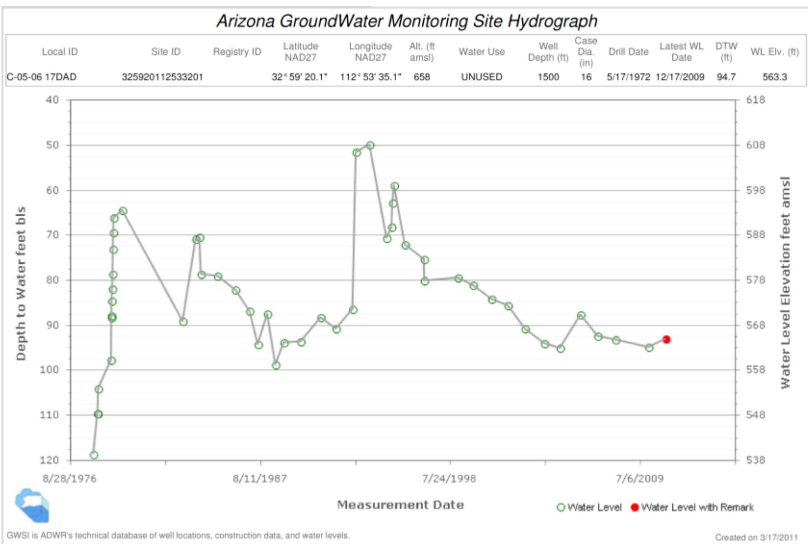
LCR8 -- C-04-08 35BDD – Lower Gila basin – Dendora Valley sub-basin 17 miles east of Hyder near the Gila River. Historic declines in water levels due to local agricultural pumping. Rapid water level rises 1980's and 1990's mainly due to recharge from Gila River floods.



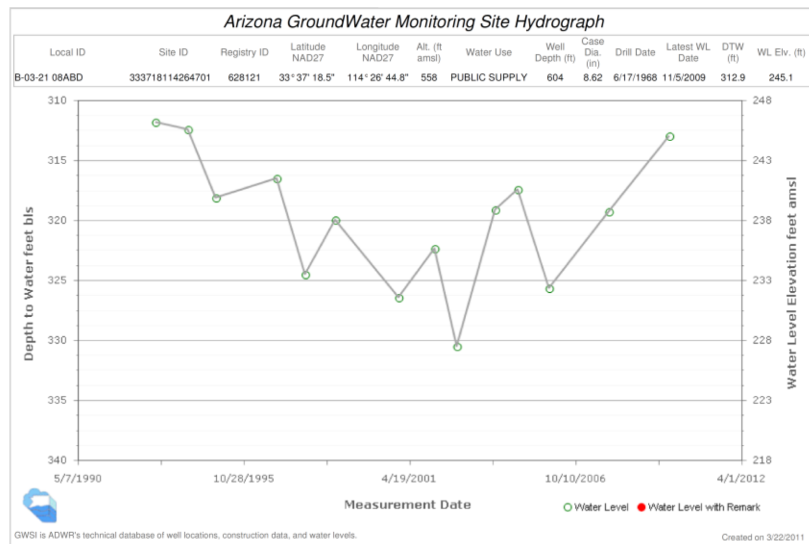
LCR9 -- C-05-03 29AAA -- Gila Bend basin - about 7 miles east of Gila Bend. Increases in water levels in 1980's and 1990's are probably due to recharge from Gila River flood events. Significant declines in water levels since early 1990's mainly due to regional agricultural irrigation pumping.



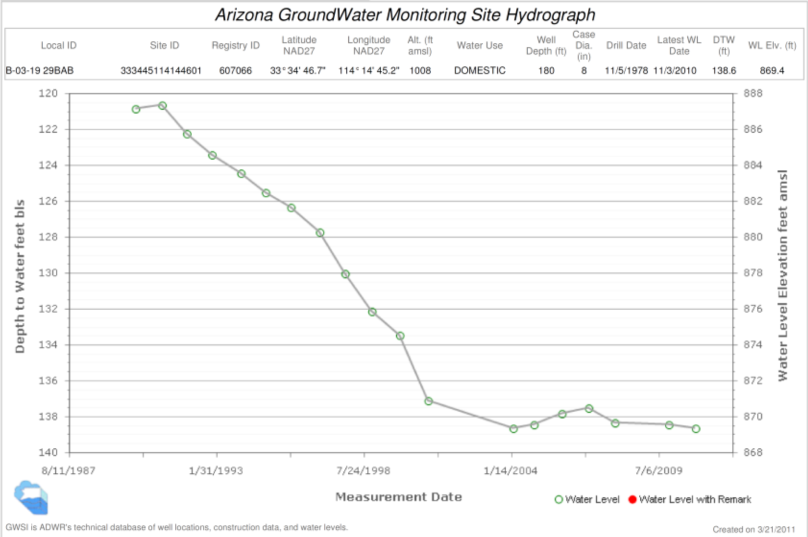
LCR11 -- C-03-04 17 ADD – Gila bend basin. – about 8 miles N of Gila Bend along Gila River. Rapid increases in water levels in 1980's and 1990's are due to recharge from Gila River flood events. Declines in water levels since early 1990's mainly due to irrigation pumping.



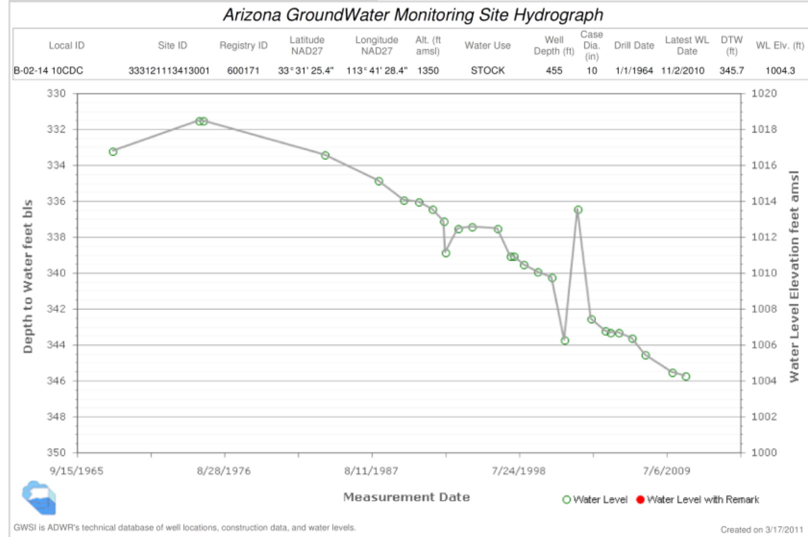
LCR10 -- C-05-06 17DAD – Gila Bend basin -- 5 miles north of Theba in the Paloma Ranch area near the Gila River. Rapid increases in water levels in 1980's and 1990's are due to recharge from Gila River flood events. Declines in water levels since early 1990's mainly due to irrigation pumping.



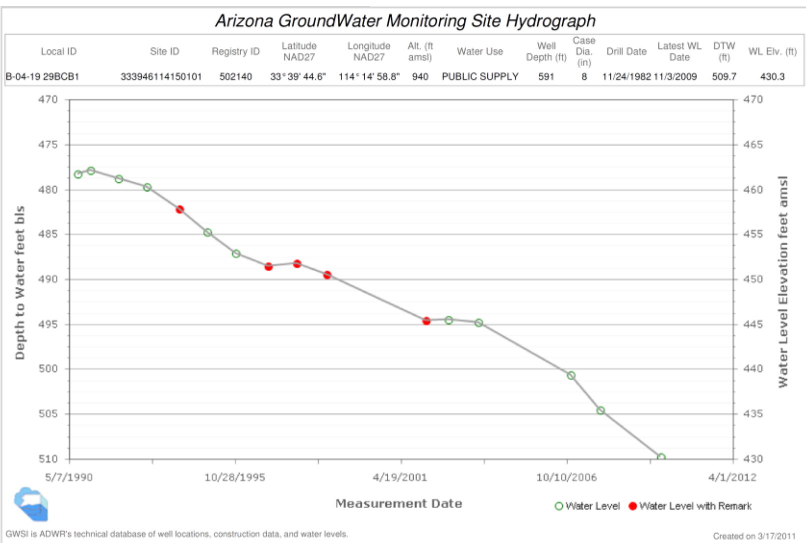
LCR12 -- B-03-21 08ABD – Parker basin – Cibola Valley sub-basin about 5 miles east of Ehrenberg.



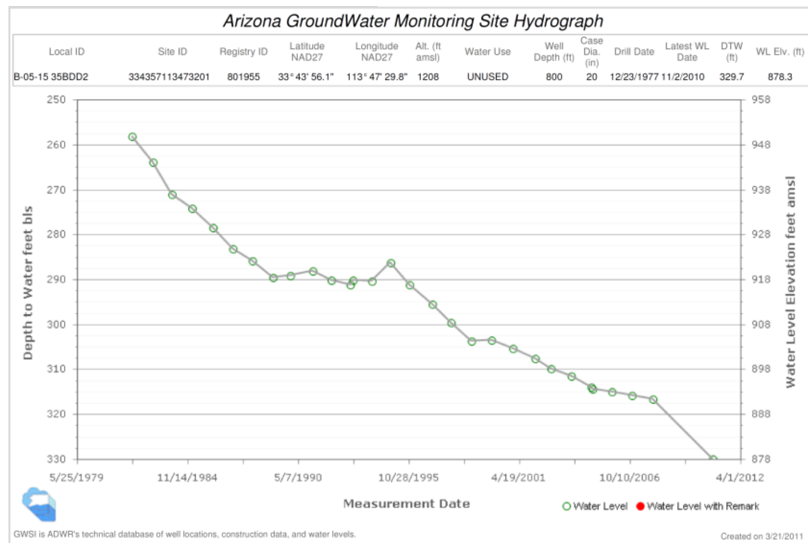
LCR13 -- B-03-19 29BAB – Parker basin - La Posa Plain sub-basin about 1 mile west of Quartzite. Local area municipal and domestic pumping main cause of historic water level decline. Cause of stabilization after 2001 maybe due to shift or reduction in nearby pumping.



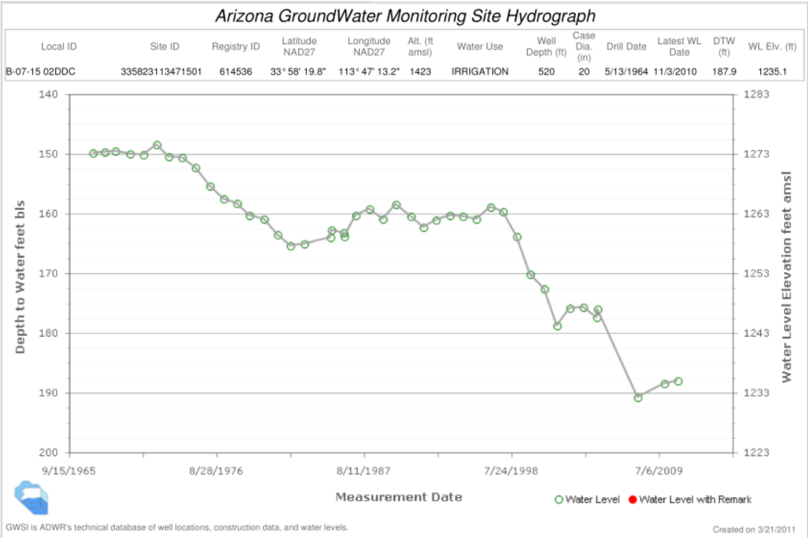
LCR15 -- B-02-14 10CDC – Ranegras Plain basin south-central area. Historic water level decline trend mainly due basin-wide agricultural pumping.



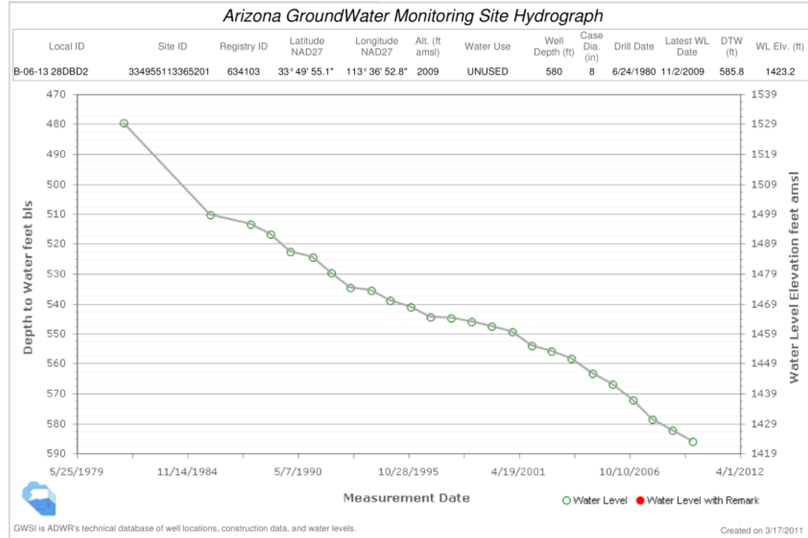
LCR14 -- B-04-19 29BCB1 – Parker basin – La Posa plain sub-basin about 6 miles south of Quartzite. Local pumping is probable main cause of water level decline trend.



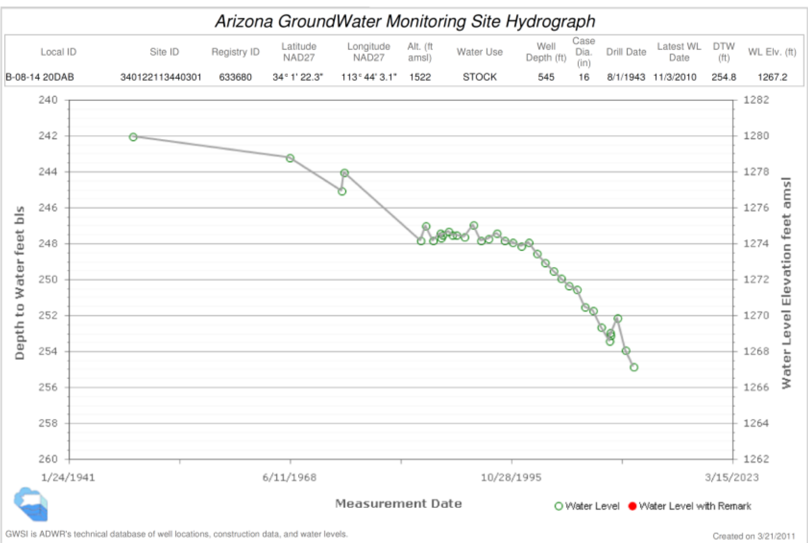
LCR16 -- B-05-15 35BDD2 – Ranegras Plain basin about 5 miles west of Vicksberg. Historic water level decline trend mainly due basin-wide agricultural pumping.



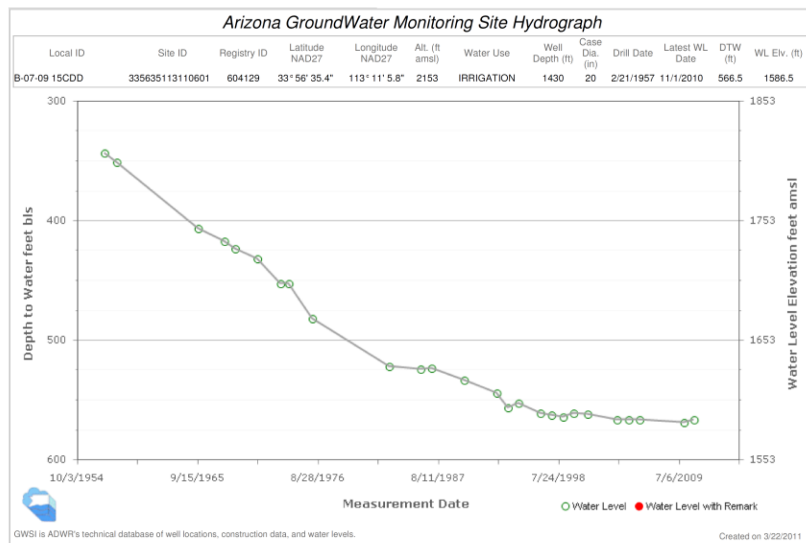
LCR17 -- B-07-15 02DDC -- Butler Valley basin SW agricultural area of valley. Historic and recent water level declines mainly caused by basin-wide agricultural irrigation pumping.



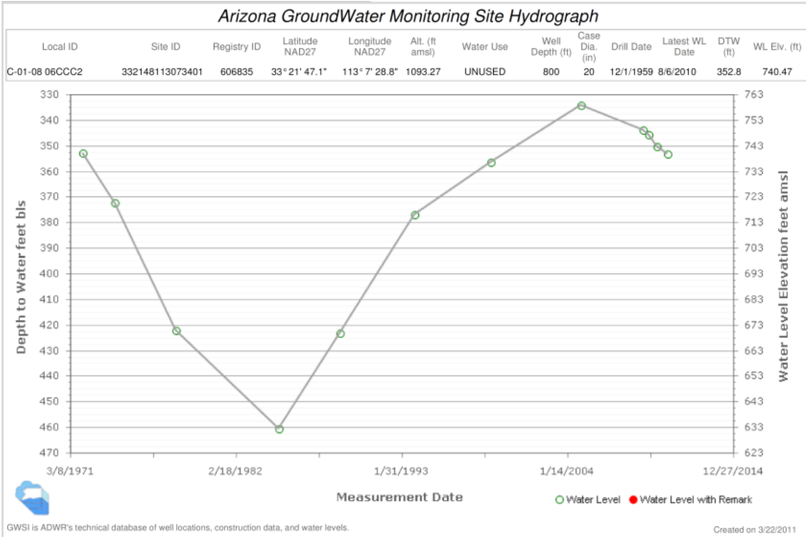
LCR19 -- B-06-13 28DBD2 – McMullen Valley basin about 4 miles west of Wenden. Historic and recent water level declines mainly caused by basin-wide agricultural irrigation pumping.



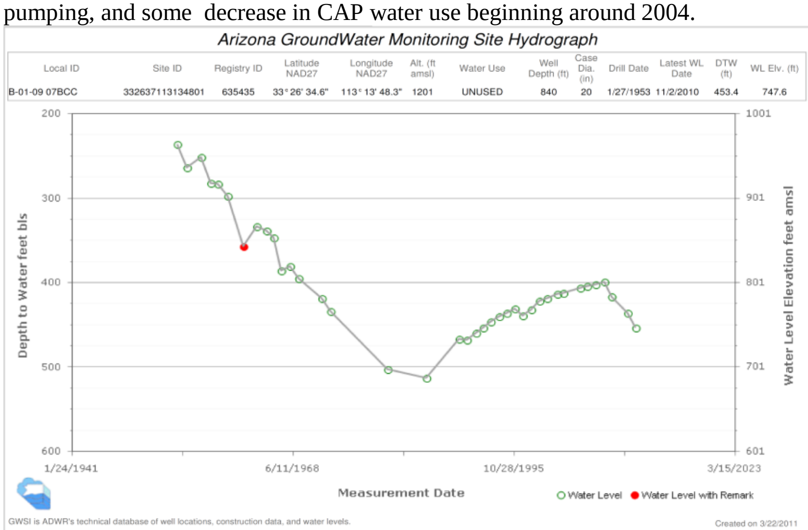
LCR18 -- B-08-14 20DAB – Butler Valley basin central Butler Valley. Historic and recent water level declines mainly caused by basin-wide agricultural irrigation pumping.



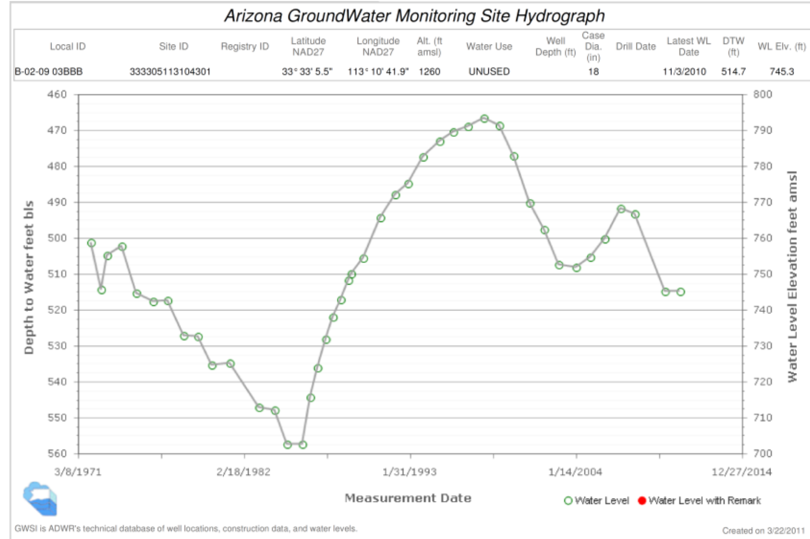
LCR20 - B-07-09 15CDD – McMullen Valley basin NE McMullen Valley. Historic and recent water level declines mainly caused by basin-wide agricultural irrigation pumping.



LCR21 -- C-01-08 06CCC2 – Harquahala INA east-central Harquahala basin. Historic water level declines due to basin-wide agricultural pumping. Water level recovery trend beginning circa 1984 due to reduced pumping and introduction of CAP water in 1988. Recent declines (circa 2005) reflect overall increase in basin pumping, and some decrease in CAP water use beginning around 2004.

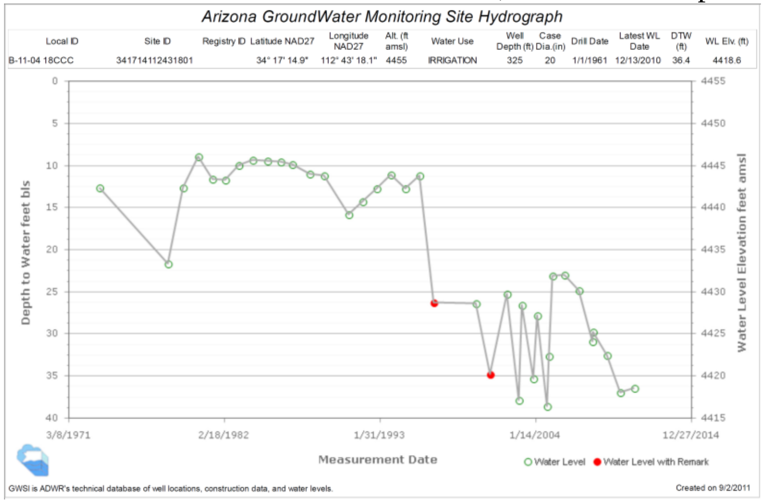


LCR22 -- C-01-09 07BCC Harquahala INA south-central Harquahala basin. Historic water level declines due to basin-wide agricultural pumping. Water level recovery trend beginning circa 1984 due to reduced pumping and introduction of CAP water in 1988. Recent declines (circa 2005) reflect overall increase in basin pumping, and some decrease in CAP water use beginning around 2004.

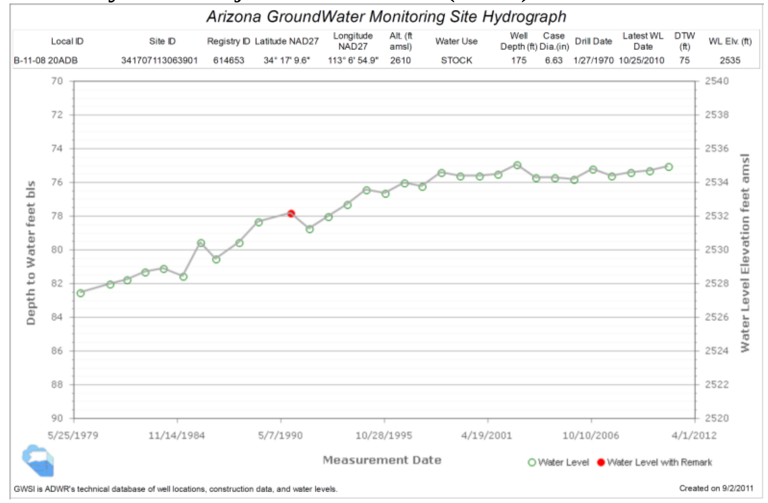


LCR23 -- B-02-09 03BBB Harquahala INA about 10 miles east of Centennial. Historic water level declines due to basin-wide agricultural pumping. Water level recovery trend beginning circa 1984 due to reduced pumping and introduction of CAP water in 1988. Recent declines (circa 2005) reflect overall increase in basin pumping, and some decrease in CAP water use beginning around 2004.

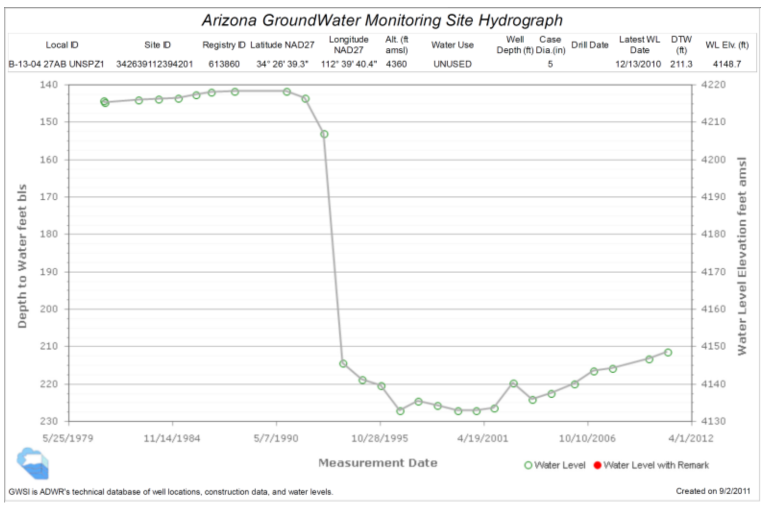
Upper Colorado River Planning Area Hydrographs
03/19/2012



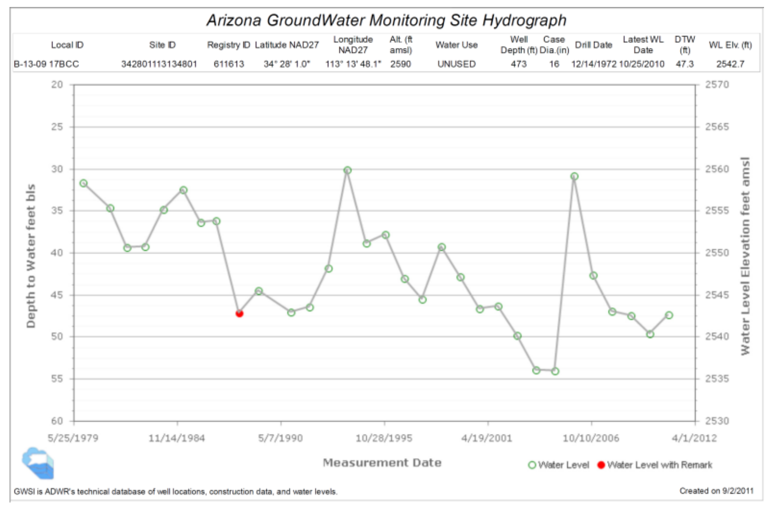
UCR1 -- B-11-04 18CCC Bill Williams basin, Skull Valley sub-basin about .5 mile north of Peeple's Valley. Decline in water level in mid 1990's may be related to local groundwater pumping and(or) drought.



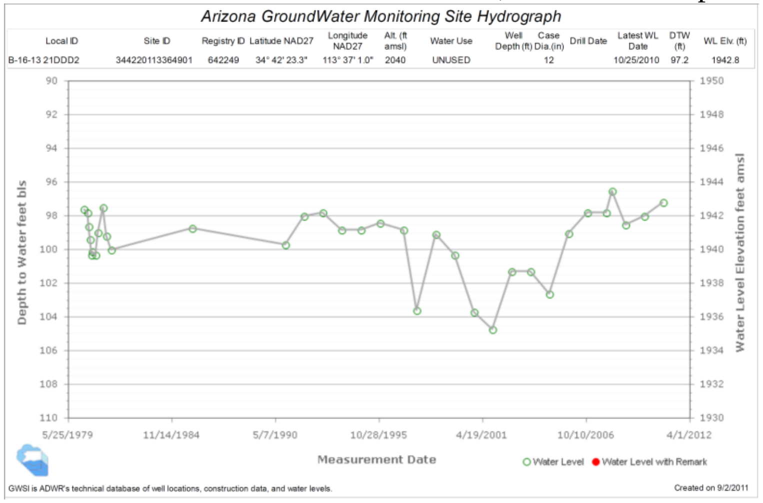
UCR3 -- B-11-08 20ADB Bill Williams basin, Santa Maria sub-basin southern portion of sub-basin. Rising water level trend may reflect reduced local pumping or increase in local natural recharge.



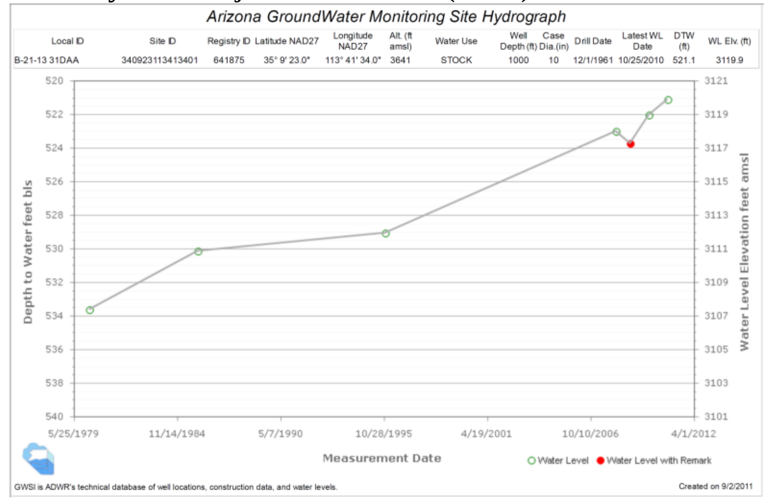
UCR2 -- B-13-04 27AB UNSPZ1 Bill Williams basin, Skull Valley sub-basin about 3.5 miles NE of Kirkland Junction. Rapid decline in water level in mid-1990's probably related to increase in local groundwater pumping.



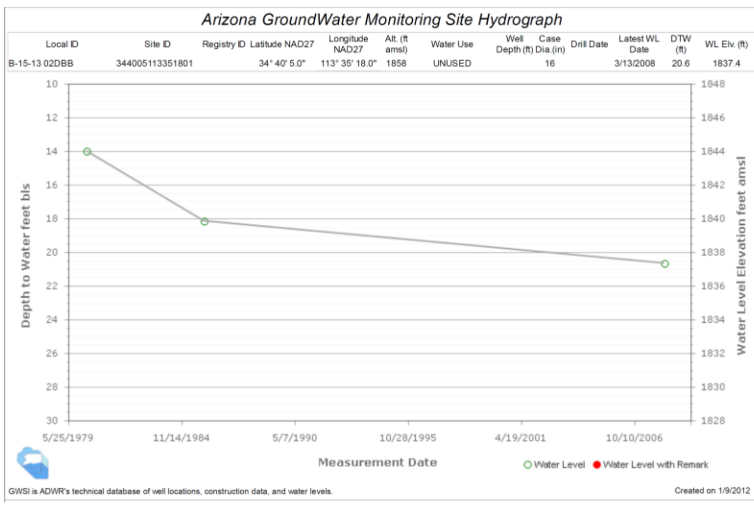
UCR4 -- B-13-09 17BCC Bill Williams basin, Santa Maria sub-basin along Bridle Creek. Water level fluctuations may reflect impact of recharge from various stream flow events on Bridle Creek.



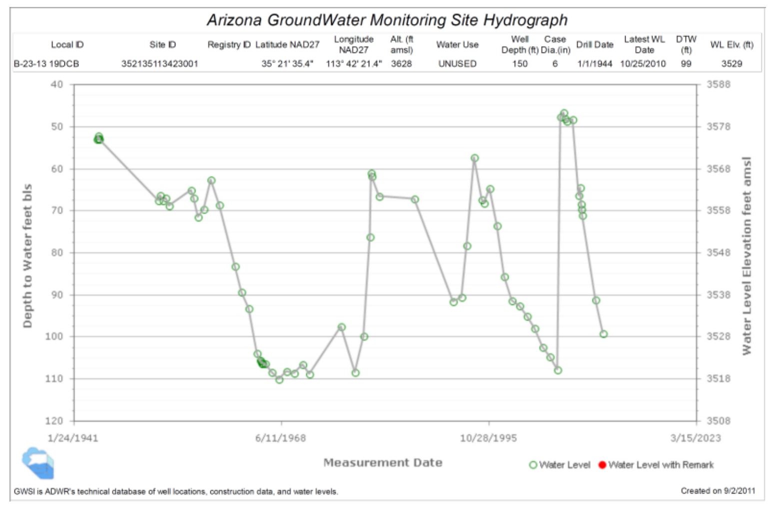
UCR5 -- B-16-13 21DDD2 Big Sandy basin, Wikieup sub-basin about .75 miles west of Big Sandy River at Wikieup.



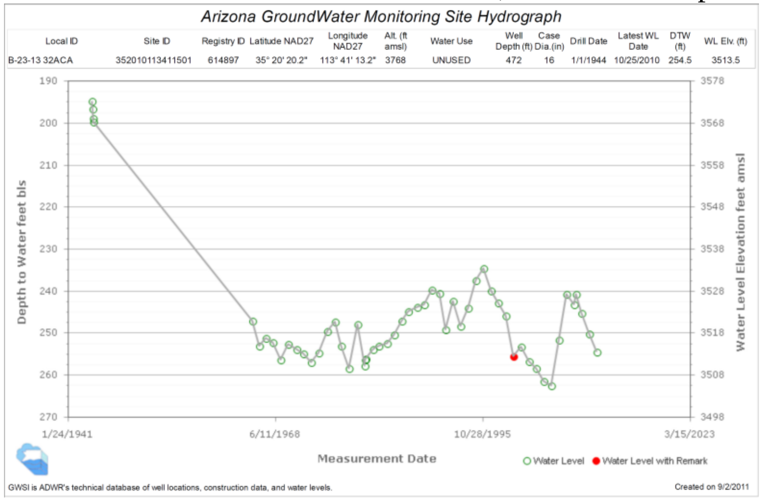
UCR7 -- B-21-13 31DAA Big Sandy basin, Wikieup sub-basin in Round Valley area, northern portion of sub-basin near intersection of I40 and US93. Cause of recovery trend uncertain, possibly related to reduced local pumping.



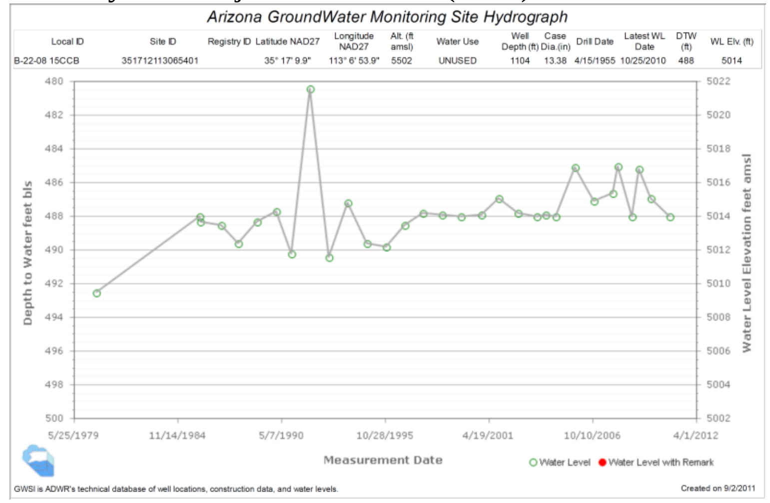
UCR6 -- B-15-13 02DBB Big Sandy basin, Wikieup sub-basin about 2.5 miles SE of Wikieup, about .25 mile west of Big Sandy River. Bagdad mine well field area, overall decline in water level mainly related to pumping for mining operations.



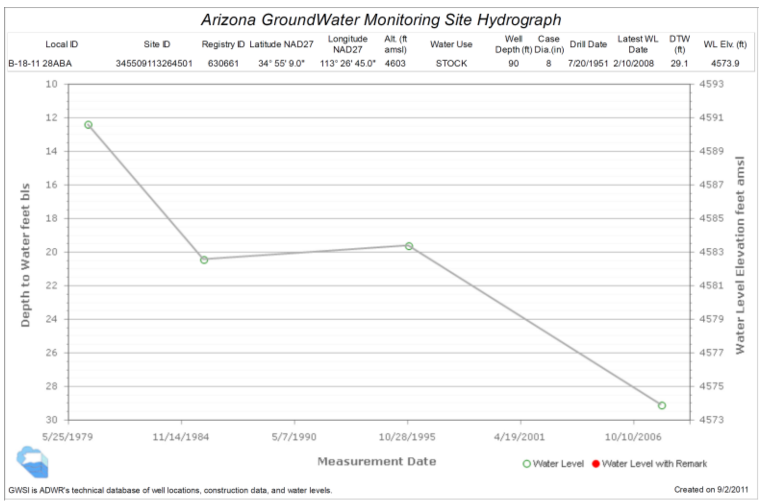
UCR8 -- B-23-13 19DCB Big Sandy basin, Wikieup sub-basin near confluence of Hackberry Wash and Truxton Wash 1 mile SE of Hackberry Junction. Fluctuation in water levels probably due to combination of periodic recharge from flood events and local pumping.



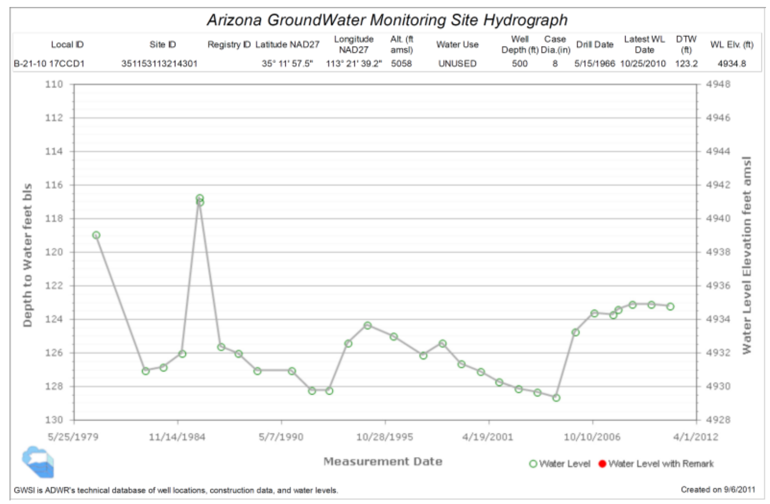
UCR9 -- B-23-13 32ACA Big Sandy basin, Wikieup sub-basin about 3.2 miles SE of Hackberry along Hackberry Wash. Early decline in water level before 1960's probably related to local pumping.



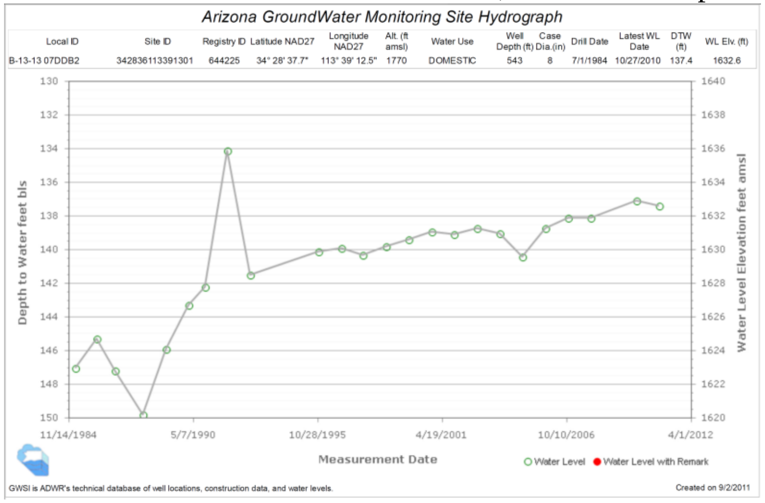
UCR11 -- mB-22-08 15CCB Big Sandy basin, Fort Rock sub-basin about 1 mile north of I40, and about 28 miles SW of Seligman.



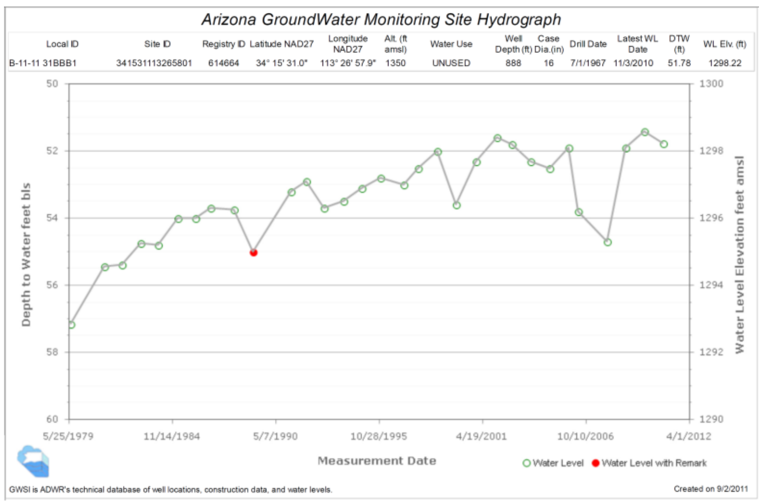
UCR10 -- B-18-11 28ABA Big Sandy basin, Fort Rock sub-basin, SW portion of sub-basin in Skunk Canyon/Simmons Gulch area.



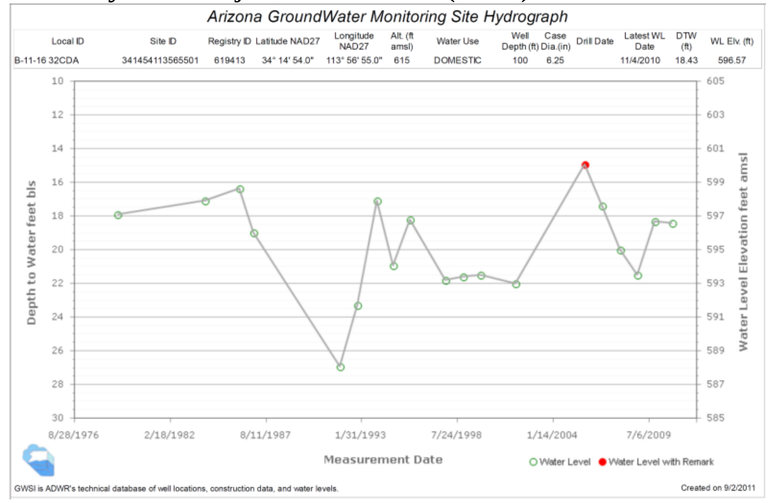
UCR12 -- B-21-10 17CCD1 Big Sandy basin, Fort Rock sub-basin.



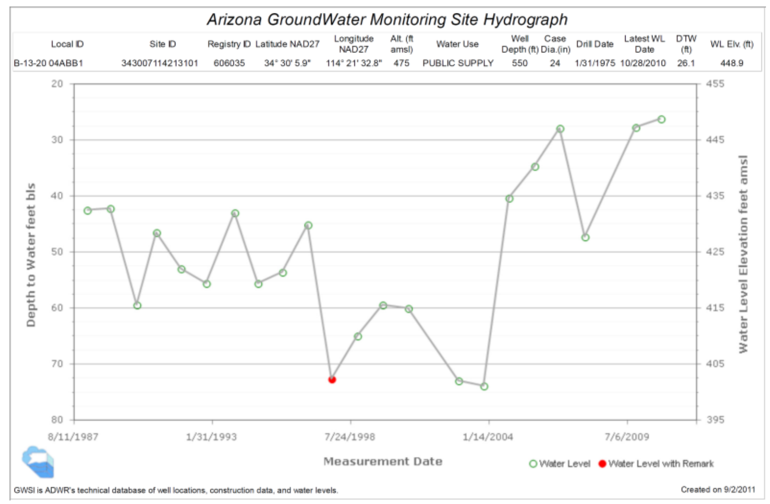
UCR13 -- B-13-13 07DDB2 Bill Williams basin, Alamo Reservoir sub-basin about 1.8 miles west of Big Sandy River at Signal.



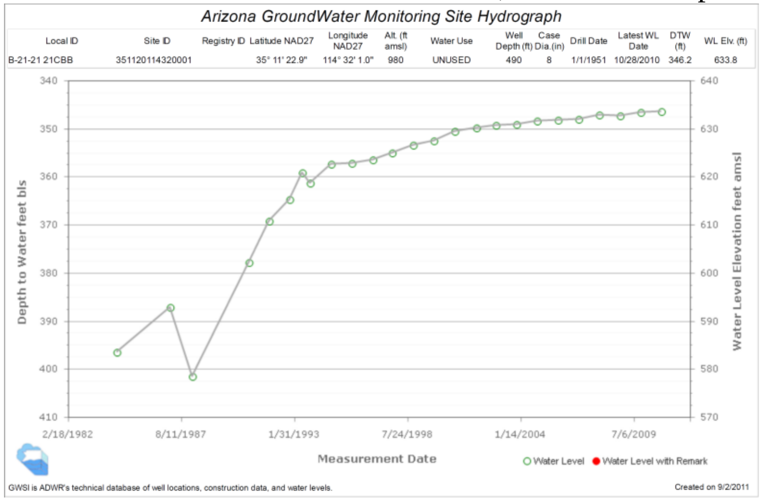
UCR14 -- B-11-11 31BBB1 Bill Williams basin, Alamo Reservoir sub-basin about 7 miles east of Alamo Reservoir along Bill Williams River.



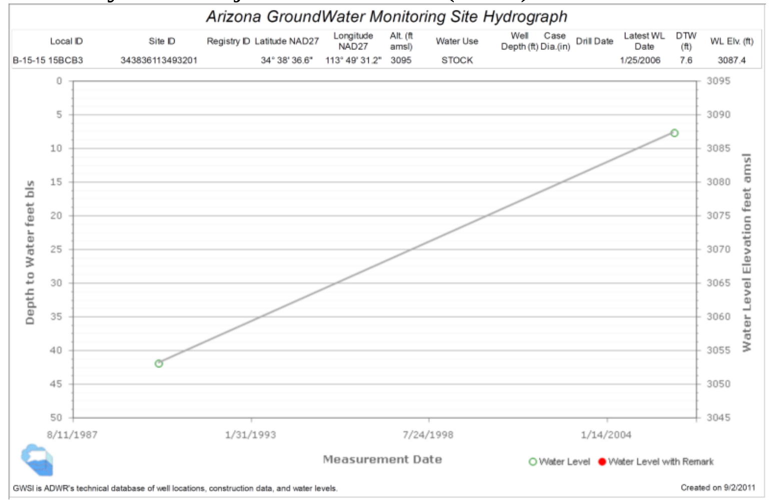
UCR15 -- B-11-16 32CDA Bill Williams basin, Clara Peak sub-basin along Bill Williams River at Planet Ranch. Overall water level rise since early 1990's due to reduced agricultural pumping. Fluctuations in water levels reflect impacts of recharge from periodic flood flows on Bill Williams River.



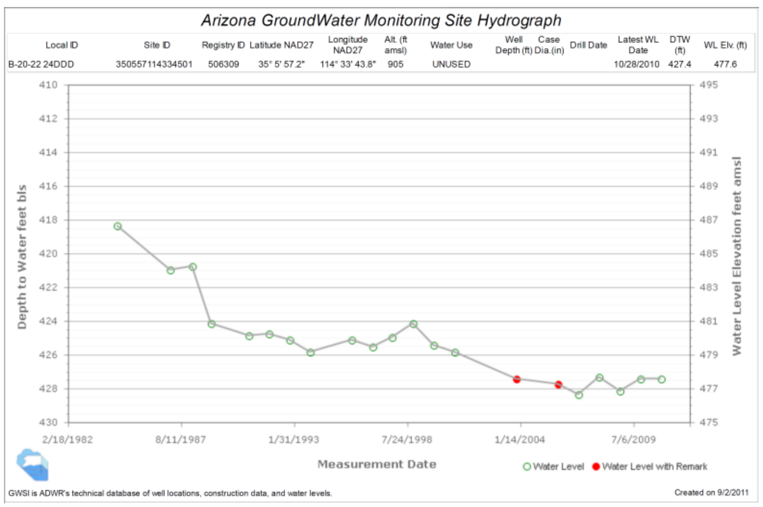
UCR16 -- B-13-20 04ABB1 Lake Havasu basin at Lake Havasu, about 2.2 miles north of London Bridge. Water level fluctuations mainly due to variations in local pumping.



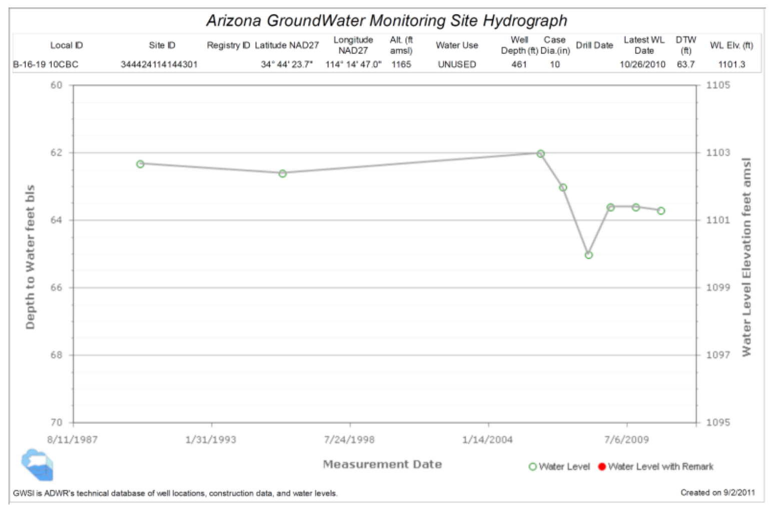
UCR17 -- B-21-21 21CBB Lake Mohave basin 2 miles east of Colorado River, 3.5 miles NE of Bullhead City. Water level recovery in this area may be related to a shift or a reduction in local pumping.



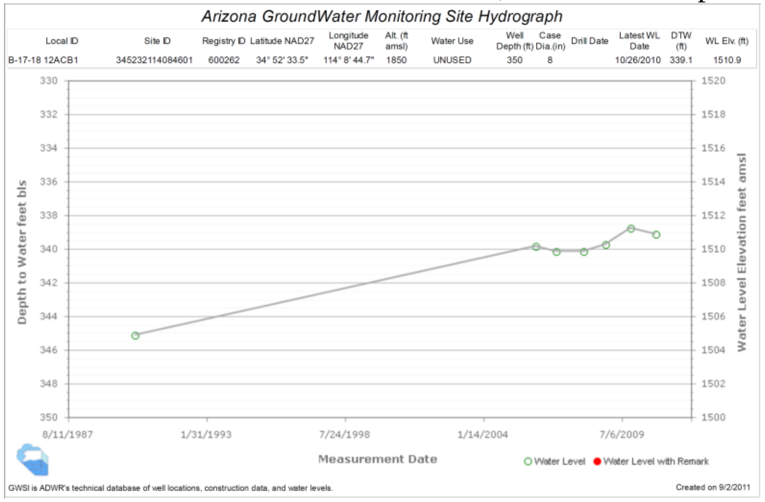
UCR19 -- B-15-15 15BCB3 Sacramento Valley basin SE portion of basin along mountain front of Haulapai Mountains. Many wells in this area show similar levels of water level recovery during the last 20 years. Cause of water level recovery in this general area is uncertain.



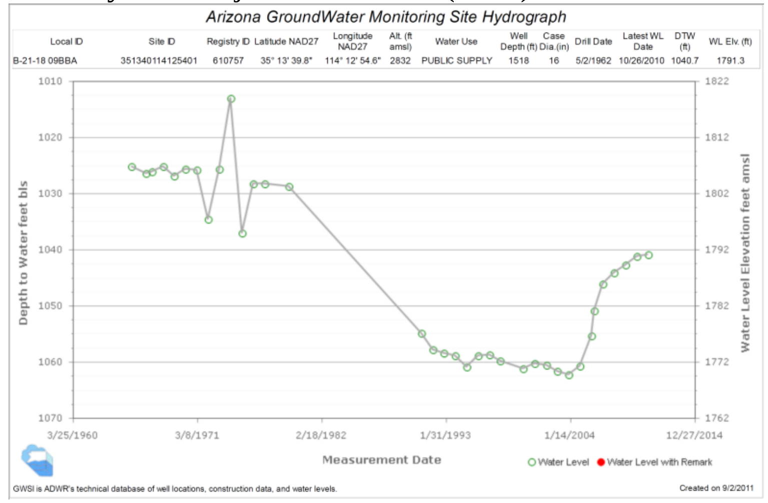
UCR18 -- B-20-22 24DDD Lake Mohave basin about 4.5 miles due east of Big Bend on Colorado River near Riviera.



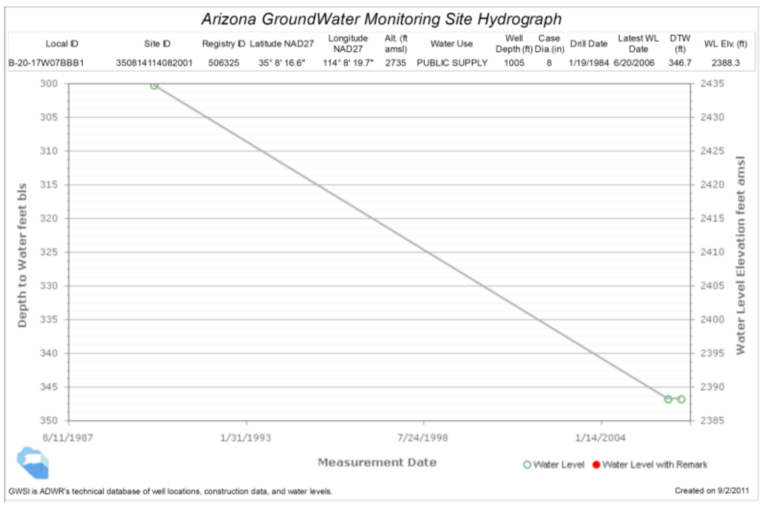
UCR20 -- B-16-19 10CBC Sacramento Valley basin along Sacramento Wash at Franconia.



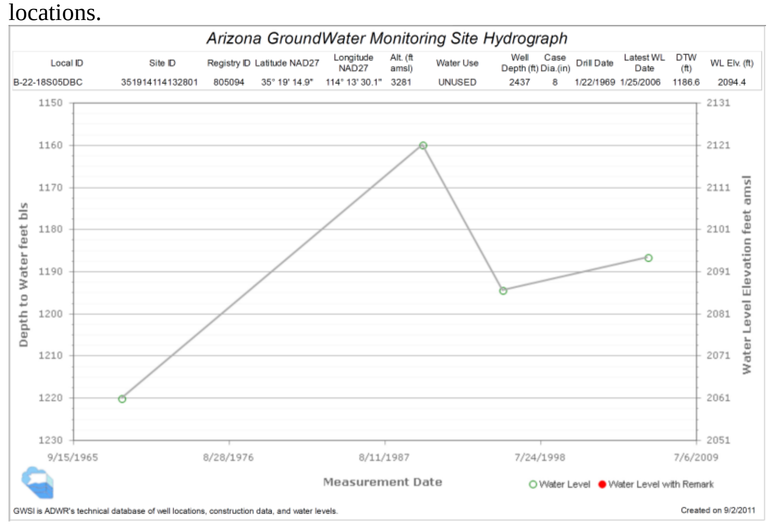
UCR21 -- B-17-18 12ACB1 Sacramento Valley basin at Yucca.



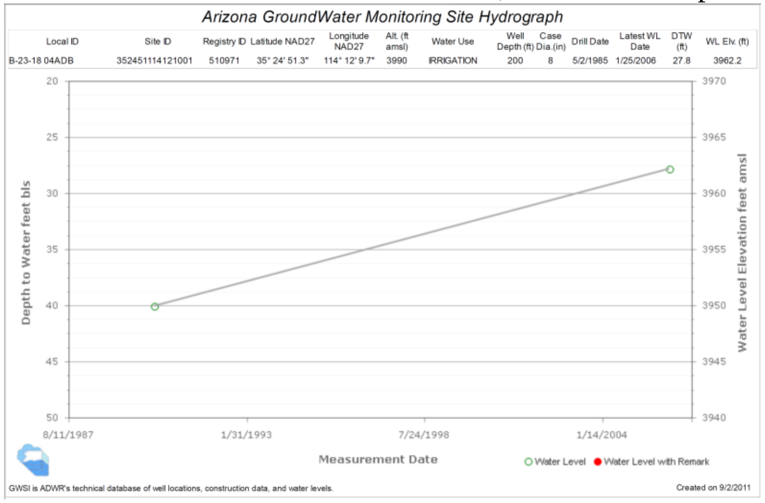
UCR23 -- B-21-18 09BBA Sacramento Valley basin northern part of basin in Golden Valley area. Historic water level declines due to groundwater pumping. Recovery in water levels since 2005 may be related to changes in local pumping locations.



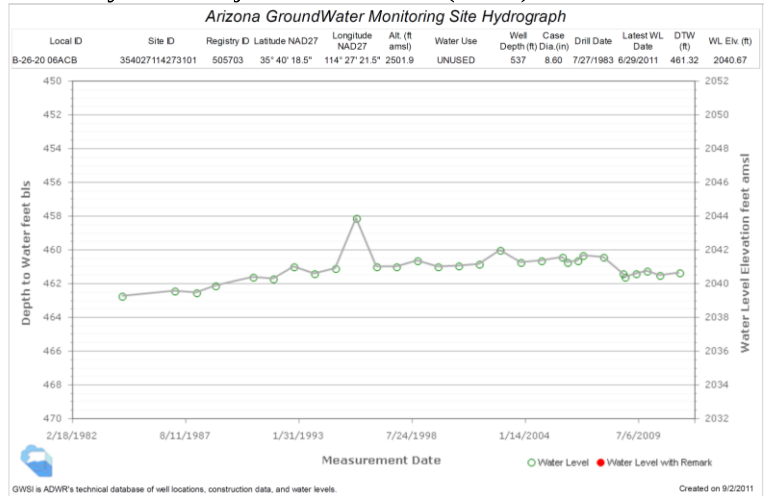
UCR22 -- B-20-17N07BBB1 Sacramento Valley basin at Walnut Creek development west of Kingman. Local pumping main cause of observed decline.



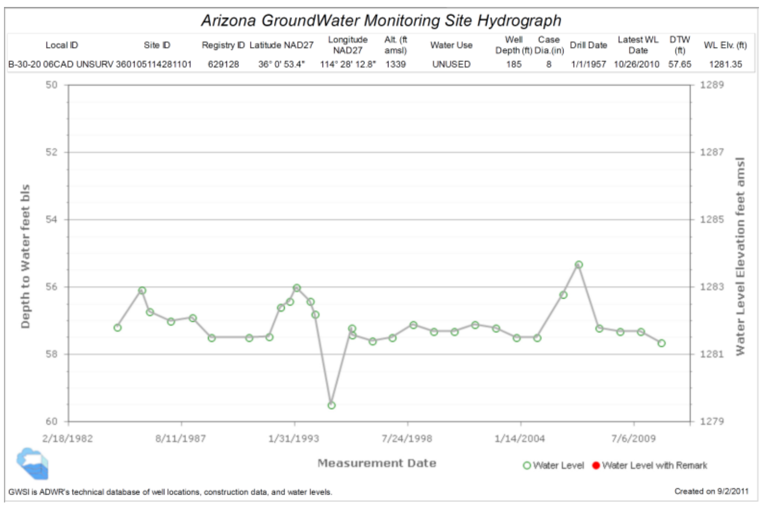
UCR24 --B-22-18 18S05DBC Sacramento Valley basin northern portion of basin about 1 mile south of Santa Claus and 3 miles west of Mineral Park Mine.



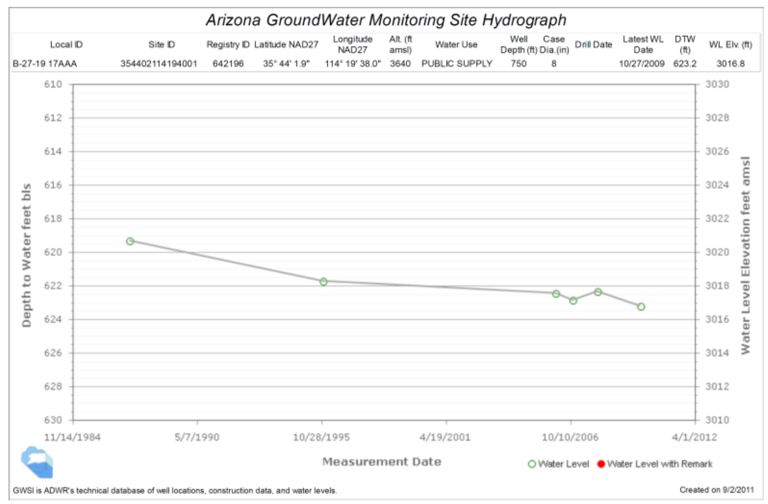
UCR25 -- B-23-18 04ADB Sacramento Valley basin northern portion of basin at Chloride.



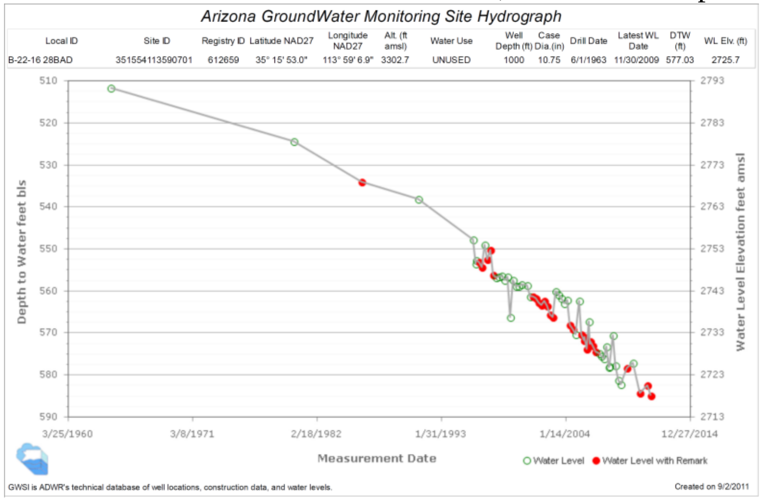
UCR27 -- B-26-20 06ACB Detrital Valley basin central part of basin near Detrital Wash.



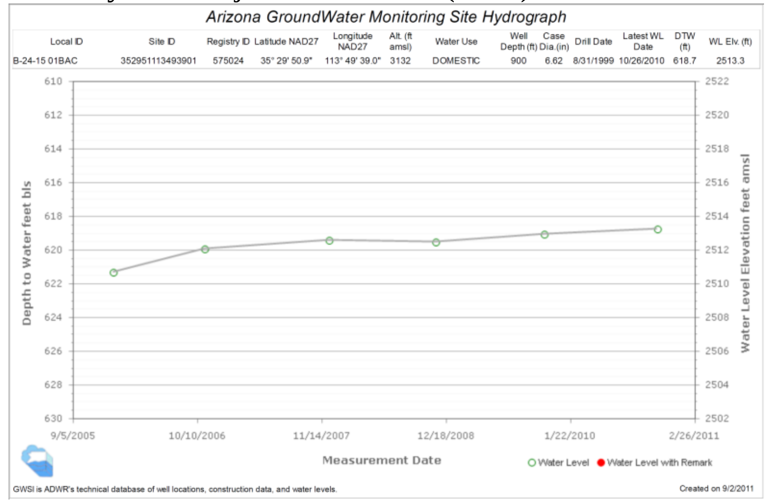
UCR26 -- B-30-20 06CAD UNSURV Detrital Valley basin northern portion of basin along Detrital Wash at AZ268.



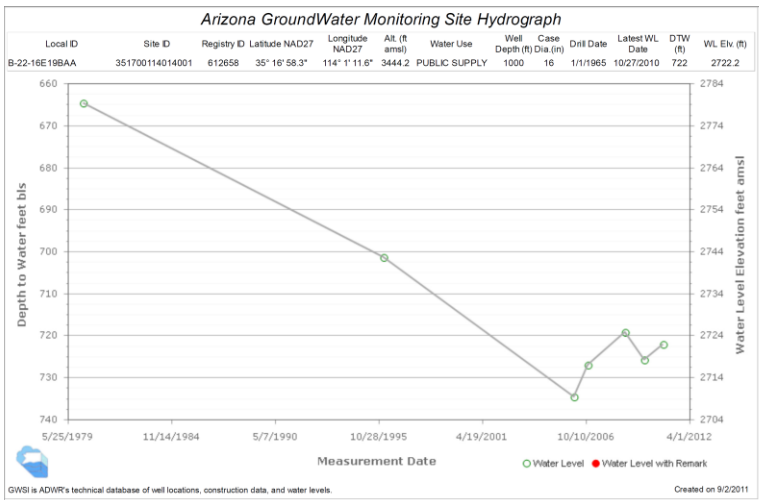
UCR28 -- B-27-19 17AAA Detrital Valley basin near White Hills.



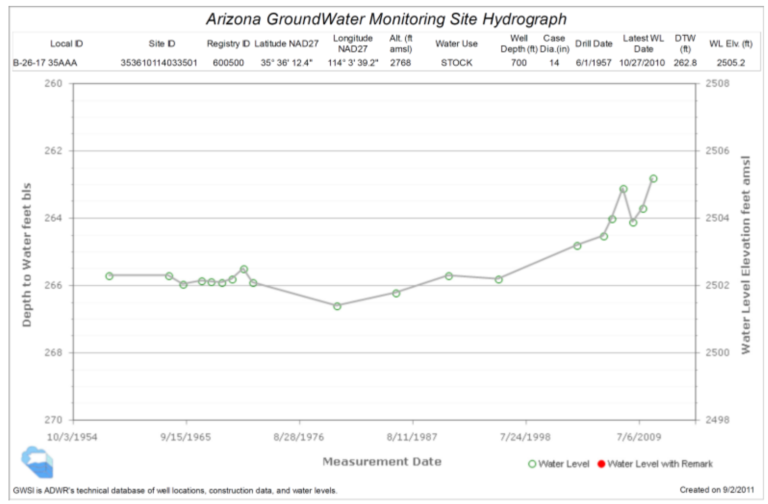
UCR29 -- B-22-16 28BAD Hualapai Valley basin NE Kingman area. Historic water level declines mainly due to municipal and industrial groundwater pumping in area.



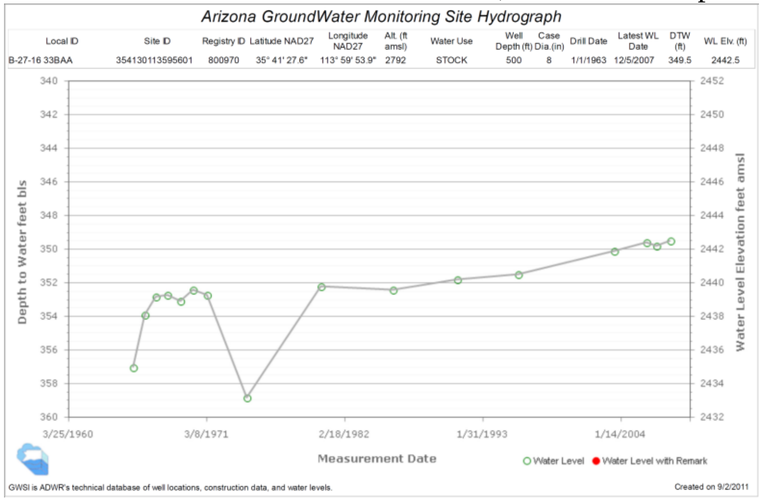
UCR31 -- B-24-15 01BAC Hualapai Valley basin sand dune area along Truxton Wash 6 miles NW of Antares.



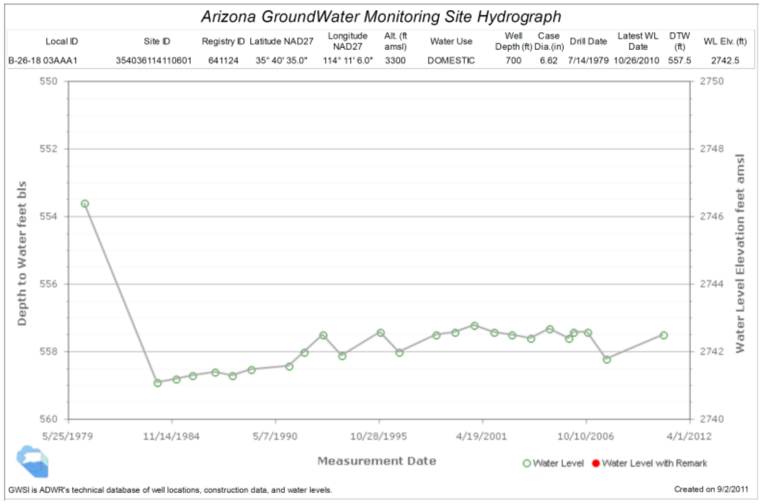
UCR30 -- B-22-16 E19BAA Hualapai Valley basin in Kingman municipal well field area. Historic water level declines caused mainly by municipal pumping.



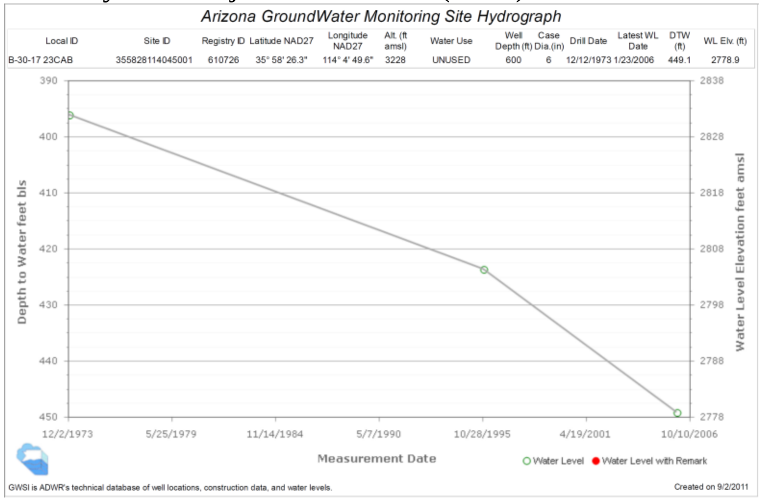
UCR32 -- B-26-17 35AAA Hualapai Valley basin, central portion of basin about 2 miles south of Red Lake.



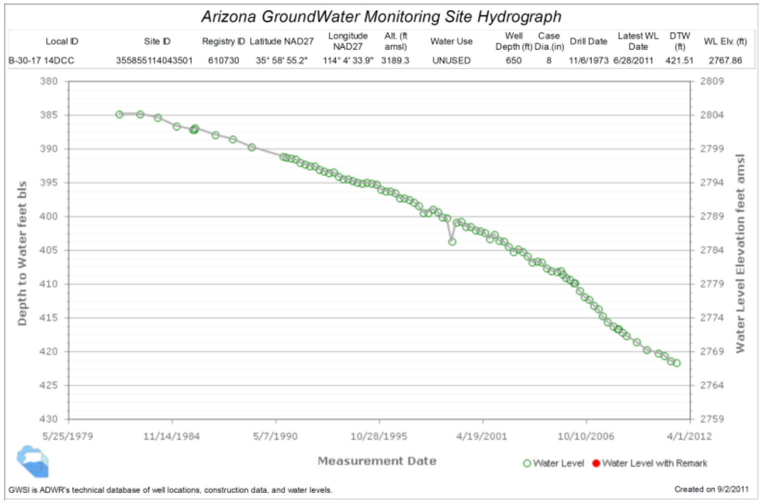
UCR33 -- B-27-16 33BAA Hualapai Valley basin NE Red Lake area.



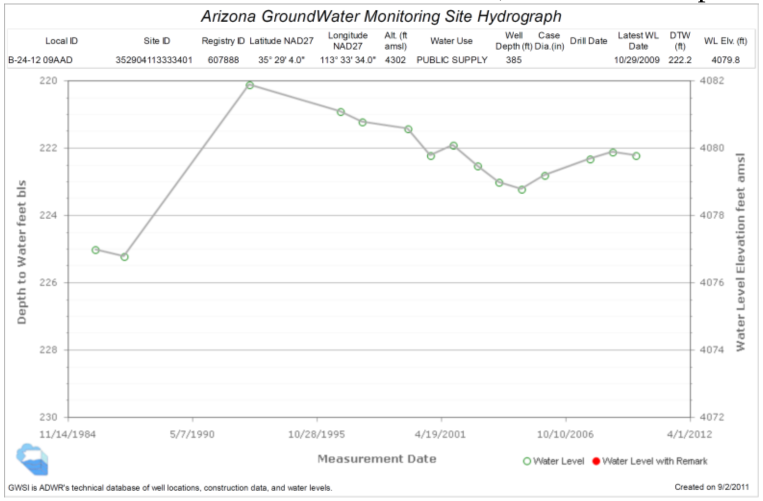
UCR34 -- B-26-18 03AAA1 Hualapai Valley basin, west central portion of basin 4 miles west of Red Lake and 7 miles NE of Dolan Springs.



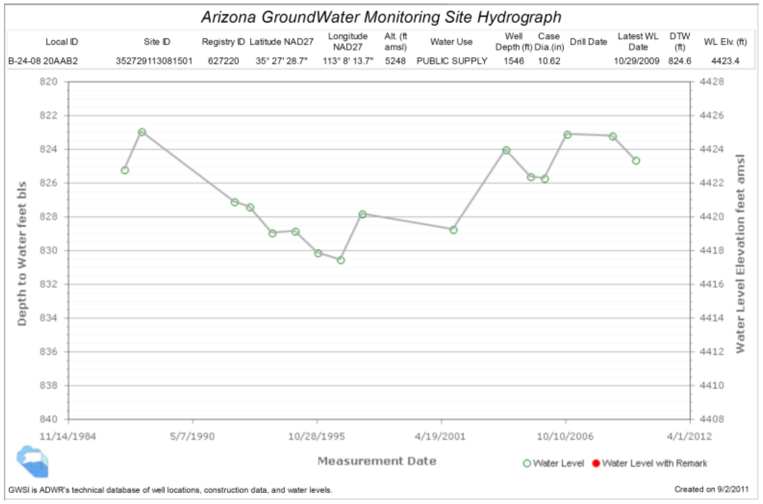
UCR35 -- B-30-17 23CAB Meadview basin at Meadview. Overall water level decline due to local pumping.



UCR36 -- B-30-17 14DCC Meadview basin at Meadview. Overall water level decline due to local pumping.

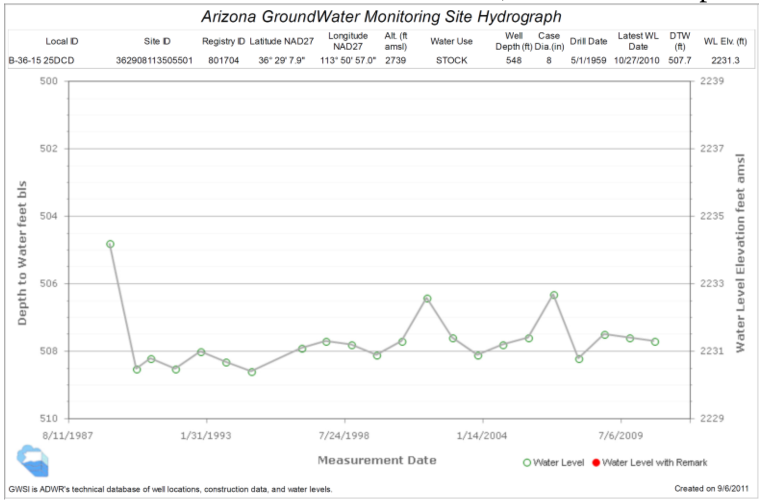


UCR37 -- B-24-08 20AAB2 Peach Springs basin Aubrey Valley area.

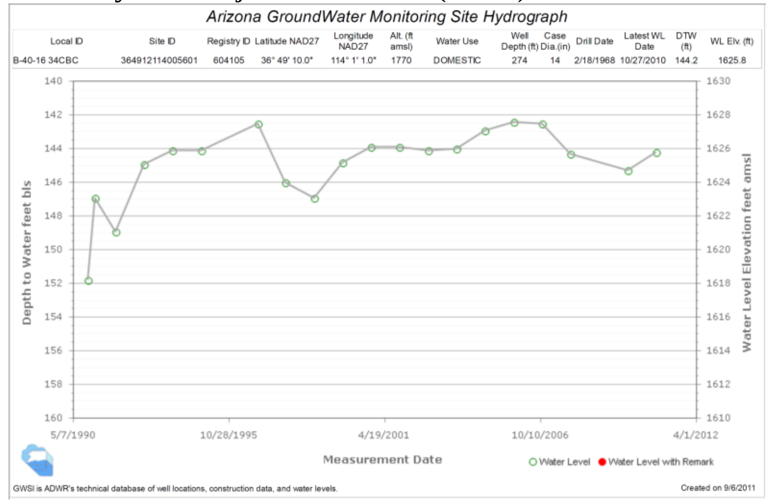


UCR38 -- B-24-12 09AAD Peach Springs basin near Truxton.

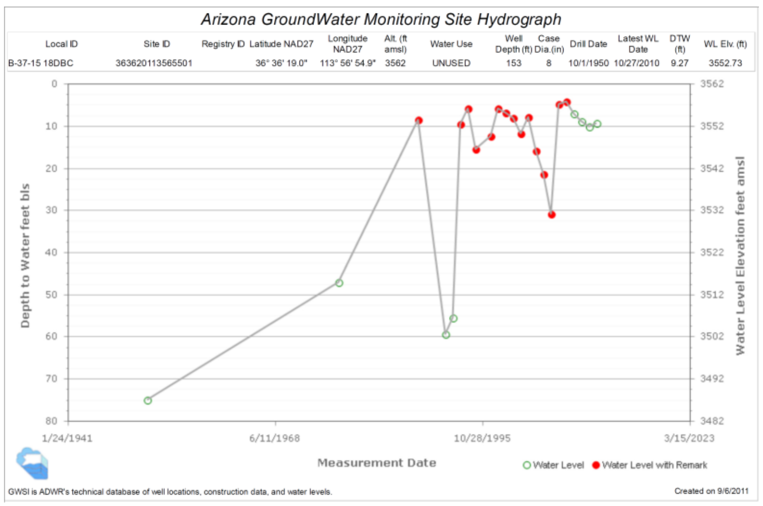
Western Plateau Planning Area Hydrographs
3/19/12



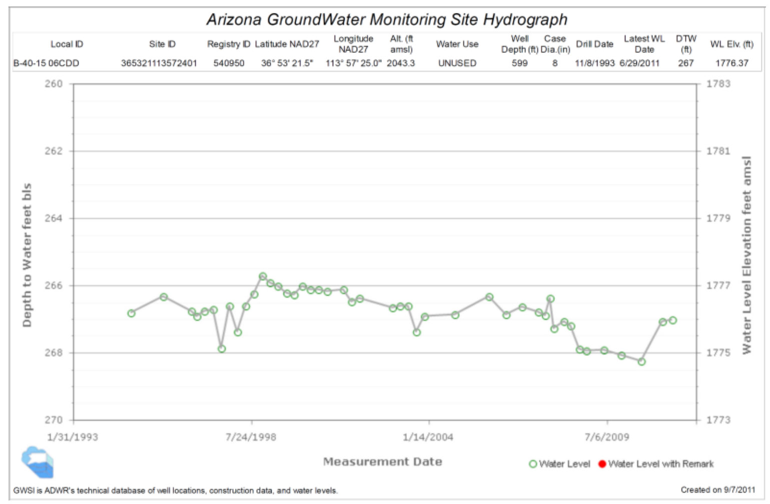
WPA1 -- B-36-15 25DCD Grand Wash basin along Grand Wash about 22 miles NE of Lake Mead at Grand Wash Bay.



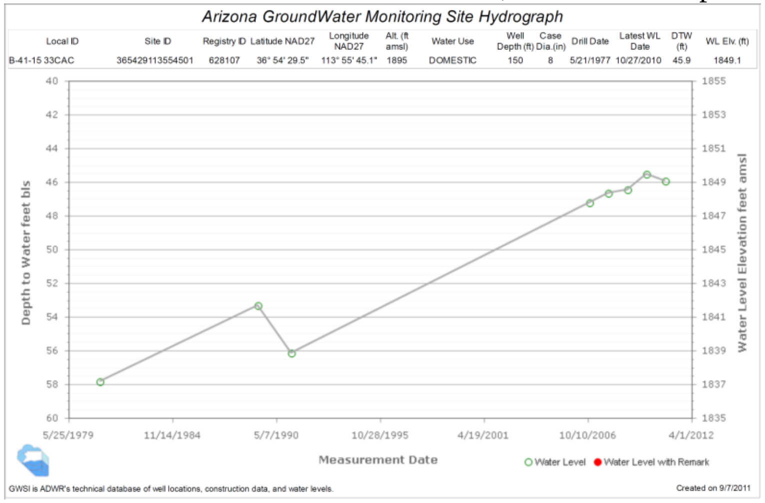
WPA3 – B-40-16 34CBC Virgin River basin about 1 mile north od Virgin River and about 3 miles east of Mesquite, Nevada.



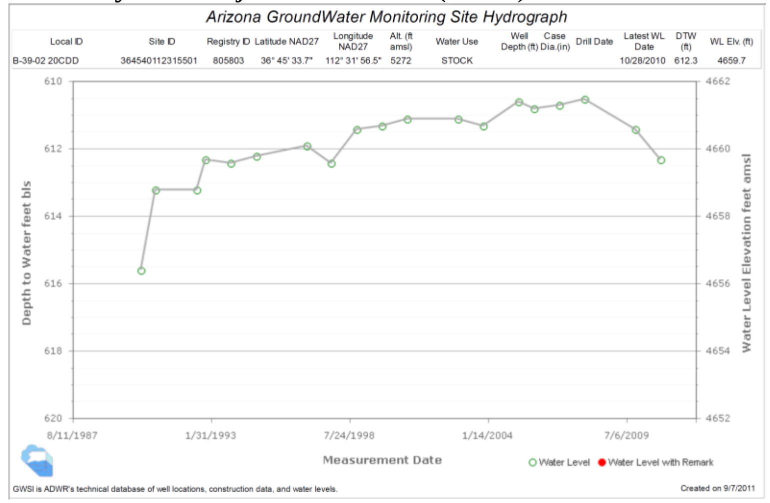
WPA2 -- B-37-15 18DBC Grand Wash basin located near Cottonwood Wash. B-40-16 34CBC Virgin River basin about 1 mile north of Virgin River and about 3 miles east of Mesquite, Nevada.



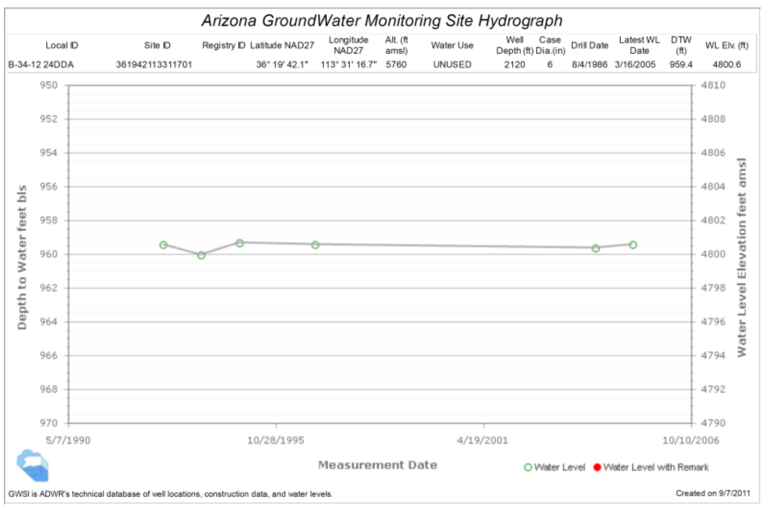
WPA4 -- B-40-15 06CDD Virgin River basin about 2 miles west of confluence of Beaver Dam Wash and the Virgin River.



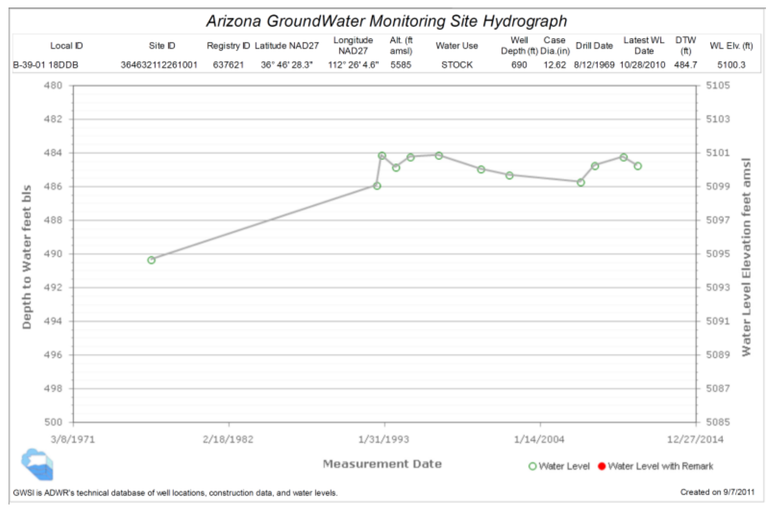
WPA5 -- B-41-15 33CAC Virgin River basin along Beaver Dam Wash at Beaver Dam, Arizona. Water level rises since early 1990's reflected the combined effects of reduced agricultural pumping in area and recharge from major floods on Beaver Dam Wash.



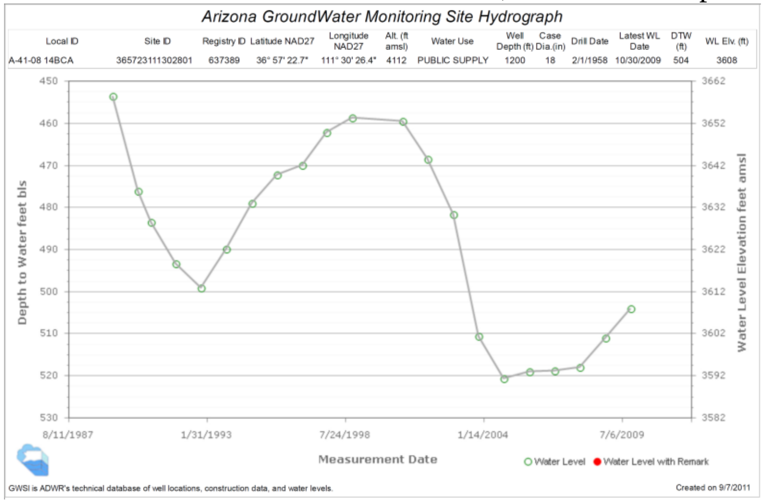
WPA7 -- B-40-04 06AAC Kanab Plateau basin about 1 mile NW of Kaibab.



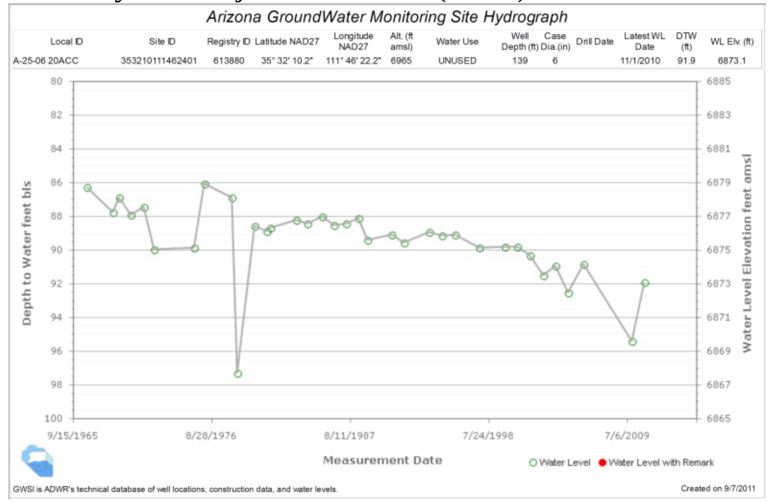
WPA6 -- B-34-12 24DDA Shivwitz Plateau basin about 6 miles north of Parashant Canyon.



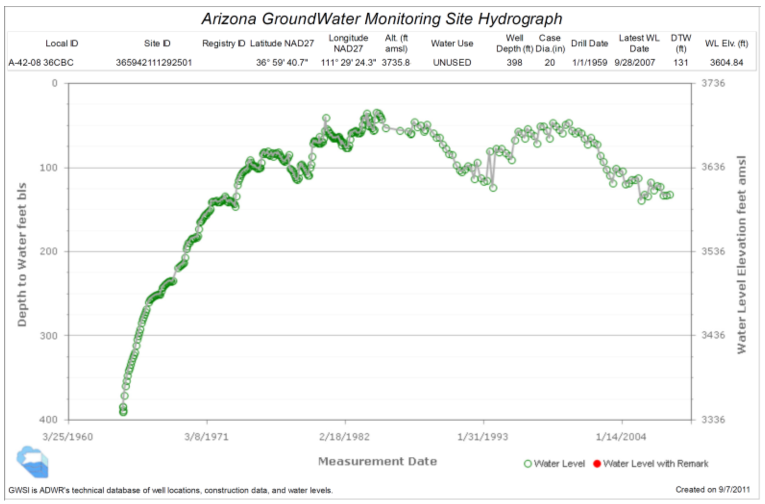
WPA8 -- B-39-01 18DDB Kanab Plateau basin about 13 miles NW of Jacob Lake.



WPA9 -- A-41-08 14BCA Paria basin about 4 miles NW of Page, about .8 mi west of Lake Powell. Water level correlates to changes in level of Lake Powell.



WPA11 -- A-25-06 20ACC Coconino Plateau basin about 22 miles SE of Valle.



WPA10 -- A-42-08 36CBC Paria basin at Wahweap .5 miles south of Arizona/Utah border on Lake Powell. Significant water level rise shows impact of original filling of Lake Powell and the direct hydrologic connection between water in the lake and water in nearby aquifer.

Eastern Plateau Planning Area Hydrographs
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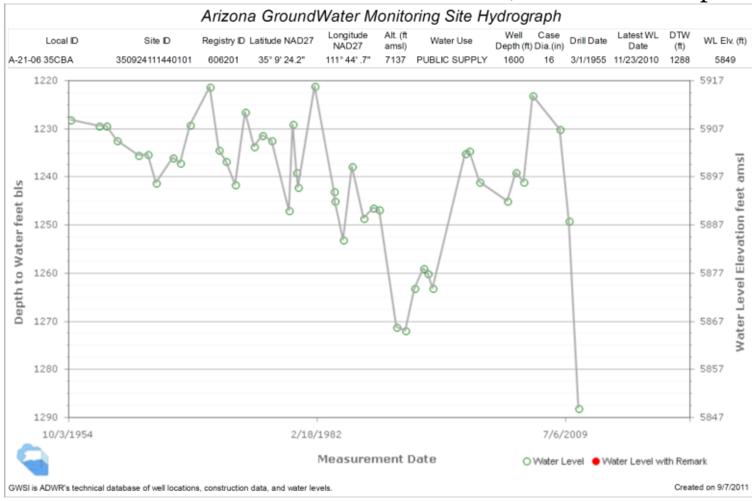
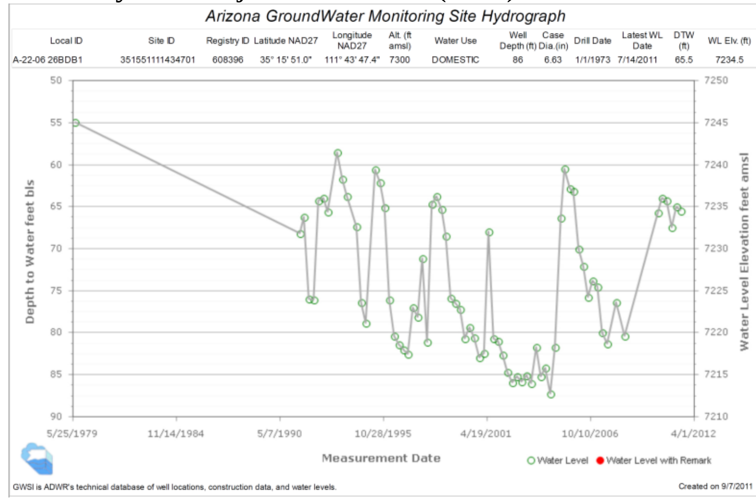
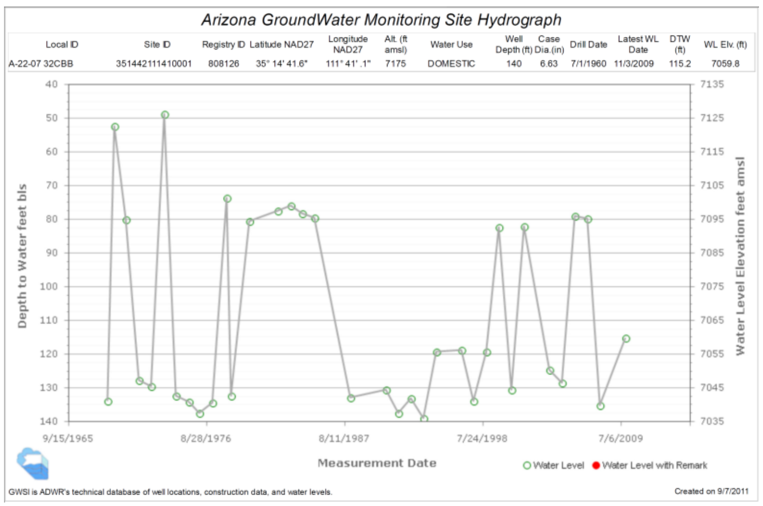


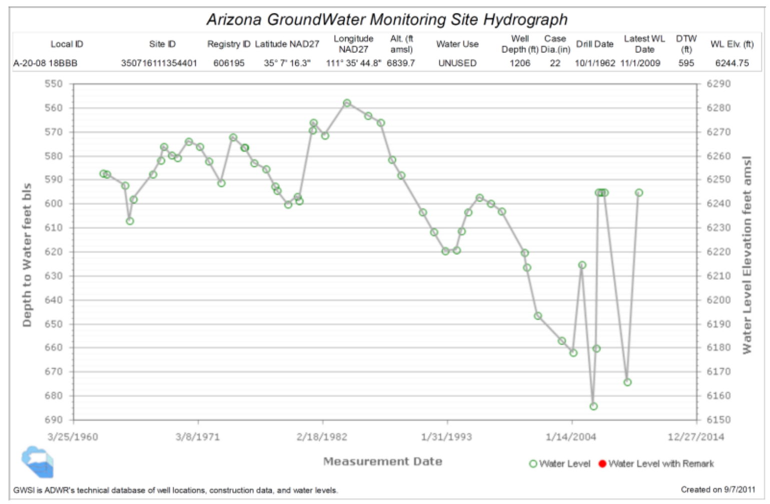
EPA1 -- A-21-06 35CBA Little Colorado River Plateau basin City of Flagstaff Woody Mountain well field. Overall water level declines caused by municipal pumping.



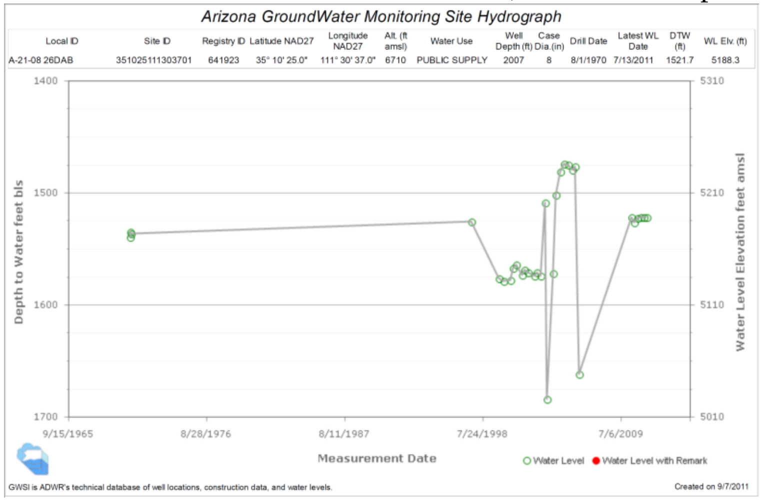
EPA3 -- A-22-06 23BDB1 Little Colorado River Plateau basin central Fort Valley area. Overall water level decline mainly due to historic domestic pumping in area.



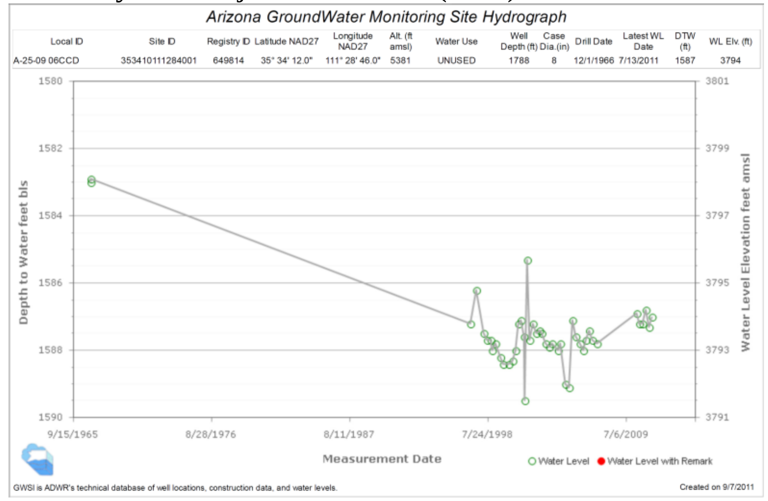
EPA2 -- A-22-07 32CBB Little Colorado River Plateau basin along Rio de Flag about 3.7 miles NW of Flagstaff. Significant water level rises (spikes) may correspond to runoff and recharge events on Rio de Flag.



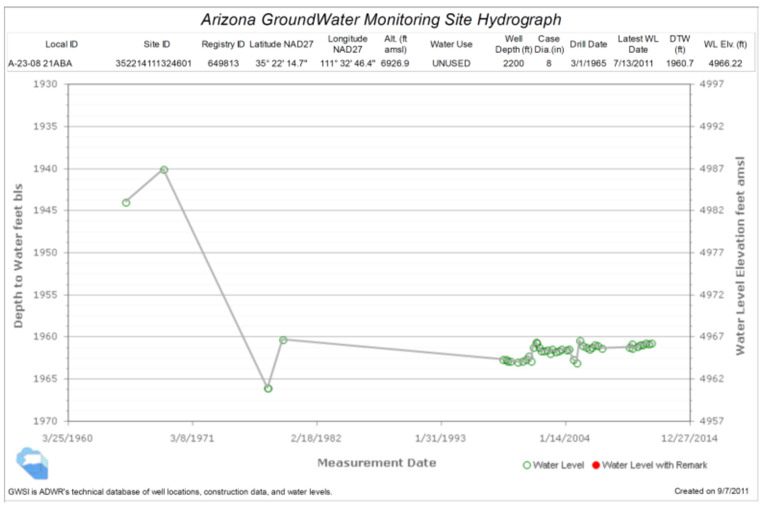
EPA4 -- A-20-08 18BBB Little Colorado River Plateau basin about 1 mile NW of Lake Mary along Walnut Creek. Historic declines mainly due to municipal pumping.



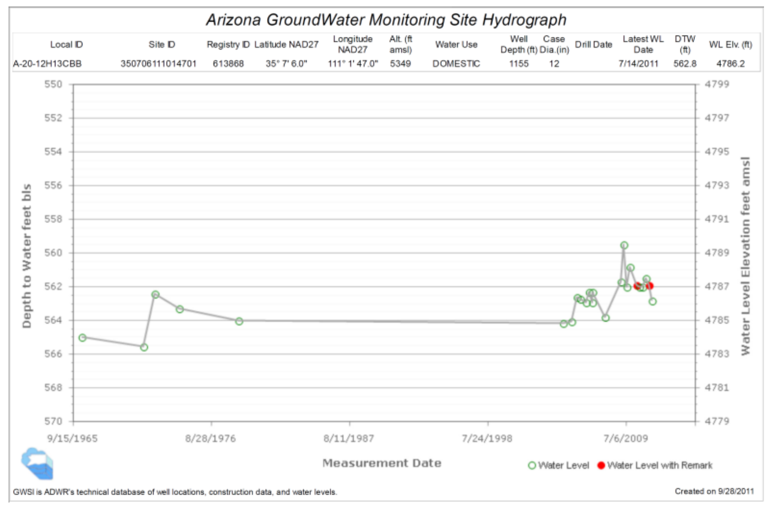
EPA5 -- A-21-08 26DAB Little Colorado River Plateau basin at Walnut Canyon National Monument.



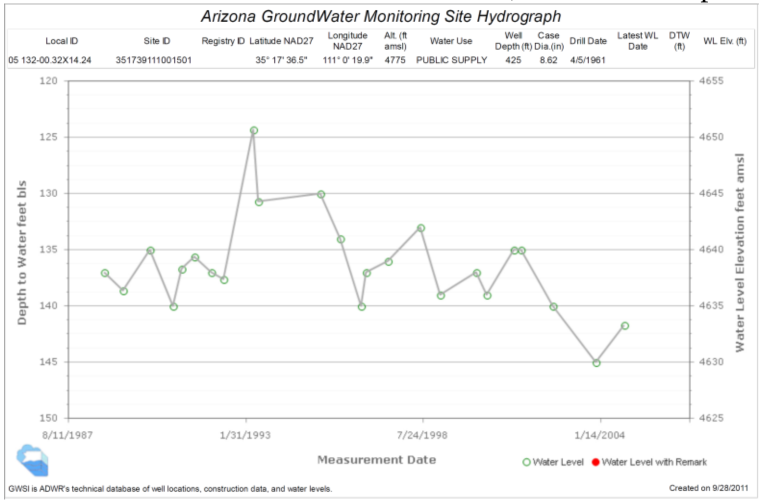
EPA7 -- A-25-09 06CCD Little Colorado River Plateau basin Wupatki National Monument Magnetic Mesa area.



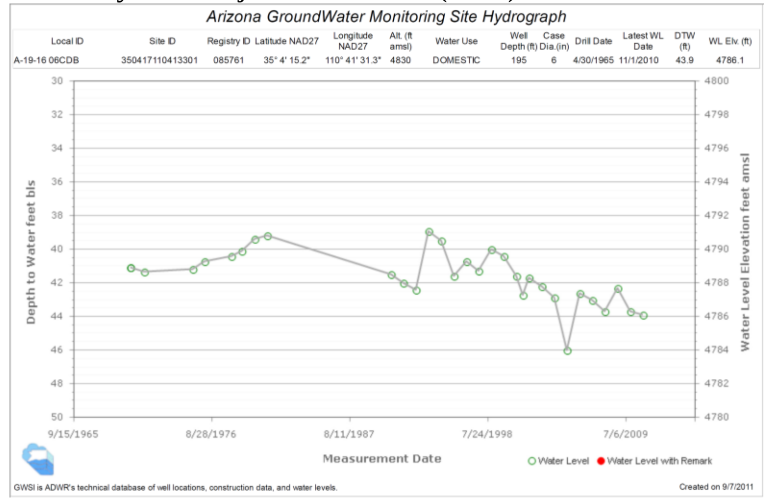
EPA6 -- A-23-08 21ABA Little Colorado River Plateau basin Bonito Park area about .75 mile west of Sunset Crater National Monument.



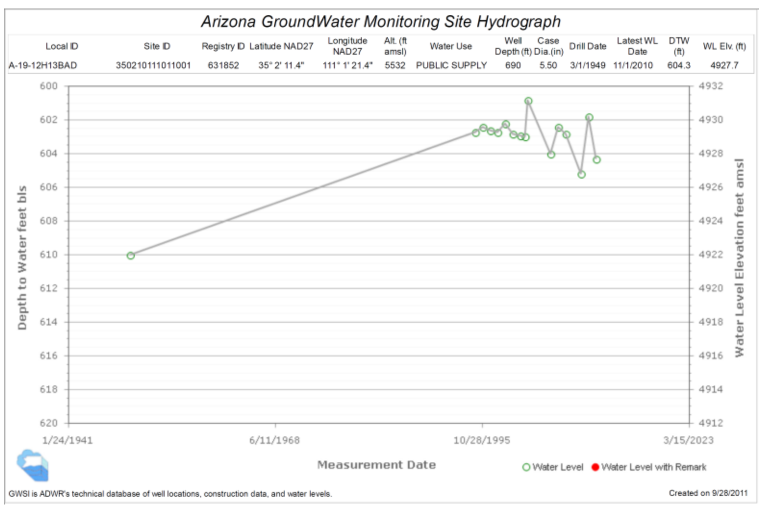
EPA8 -- A-20-12 H13CBB Little Colorado River Plateau basin at I40 Sunshine interchange, Red Gap Ranch area.



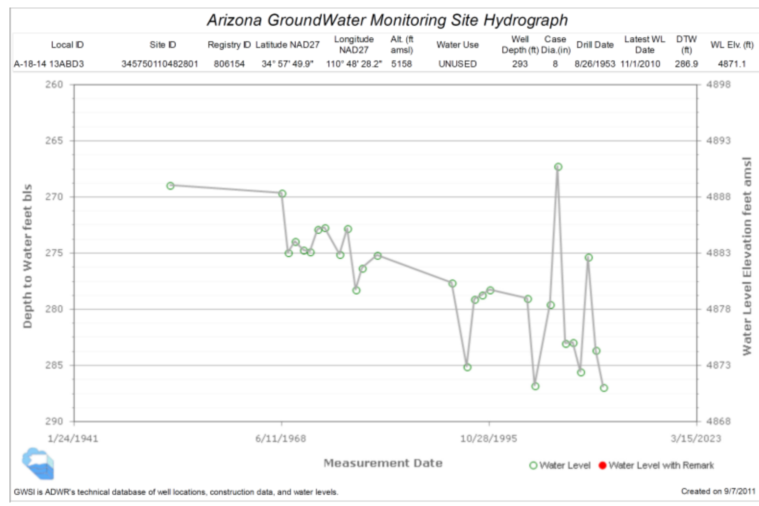
EPA9 -- 05 132-00.32X14.24 Little Colorado River Plateau basin at Leupp.



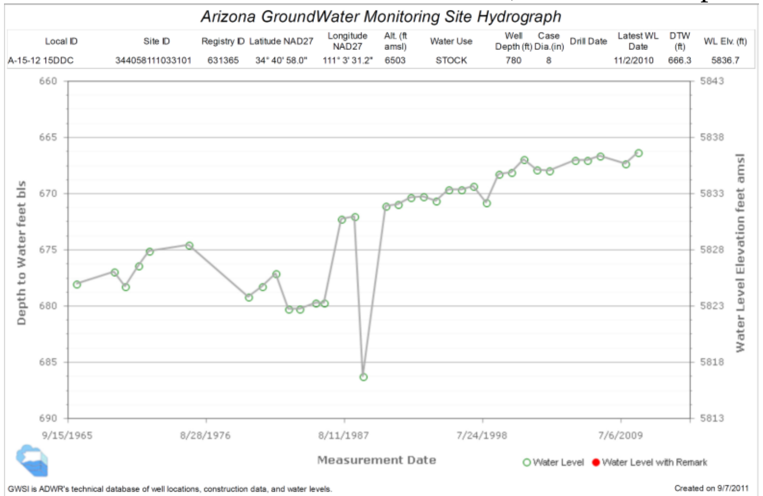
EPA11 -- A-19-16 06CDB Little Colorado River Plateau basin about 3 miles NW of Winslow and .75 miles west of Little Colorado River. Minor declines in recent years may be partly drought related.



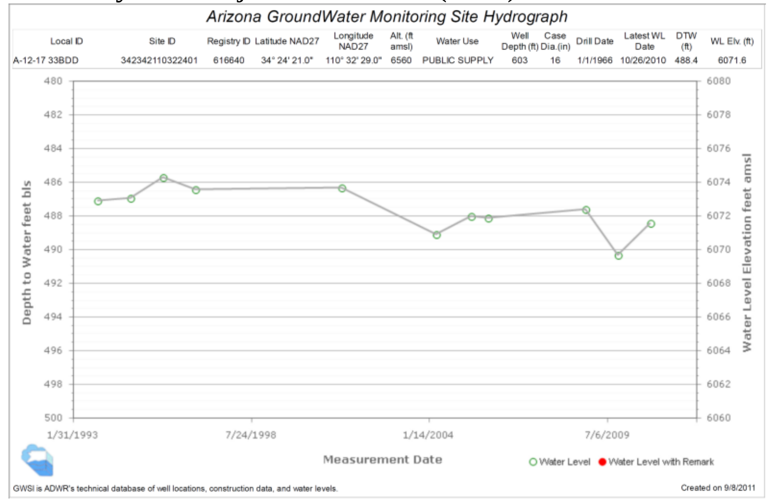
EPA10 -- A-19-12H13BAD Little Colorado River Plateau basin at Meteor Crater.



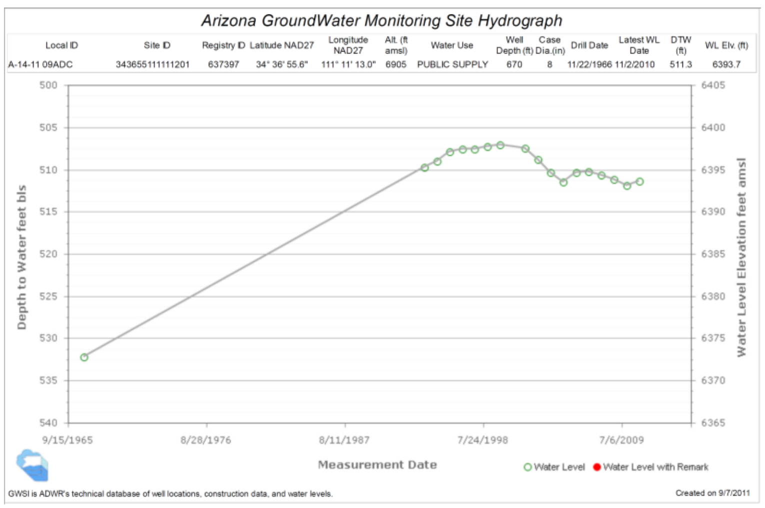
EPA12 -- A-18-14 13ABD3 Little Colorado River Plateau basin Winslow municipal well field area about 7.5 miles SW of Winslow. Historic water declines due to municipal pumping.



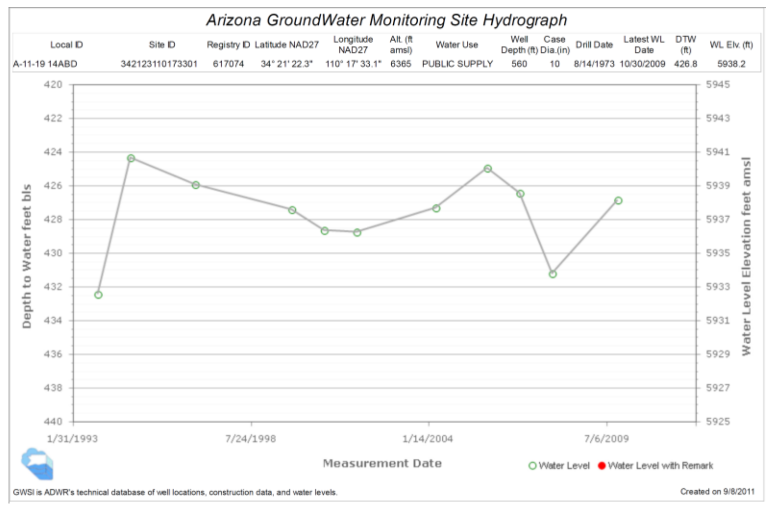
EPA13 -- A-15-12 15DDC Little Colorado River Plateau basin Jack's Canyon area 4 miles north of East Clear Creek. Water level recovery trend may be related to changes in local pumping locations and/or volumes.



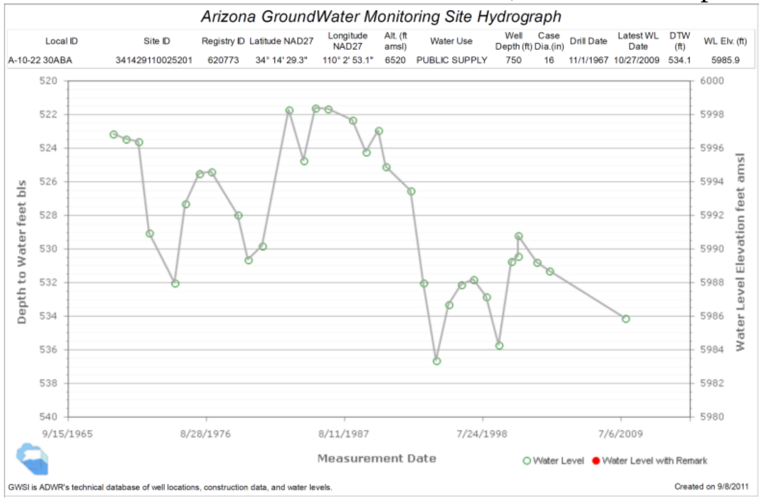
EPA15 -- A-12-17 33BDD Little Colorado River Plateau basin Overgaard area.



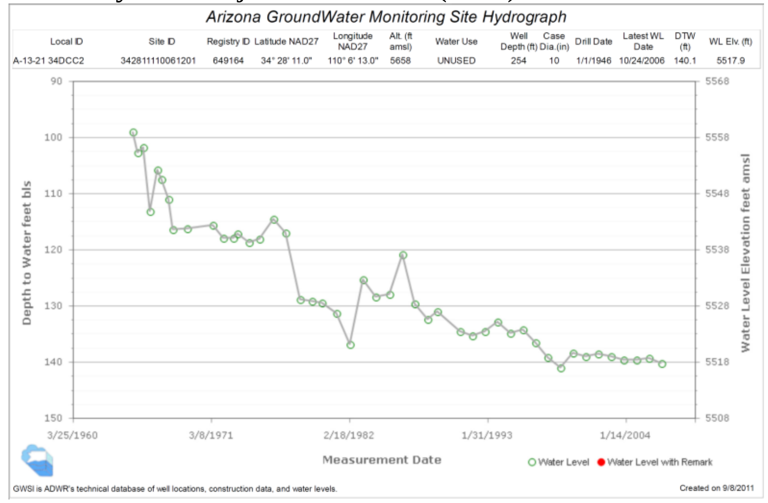
EPA14 -- A-14-11 09ADC Little Colorado River Plateau basin 4 miles north of Blue Ridge Reservoir. Water level recovery between 1960's and 1990's may be related to changes in local pumping locations and/or volumes.



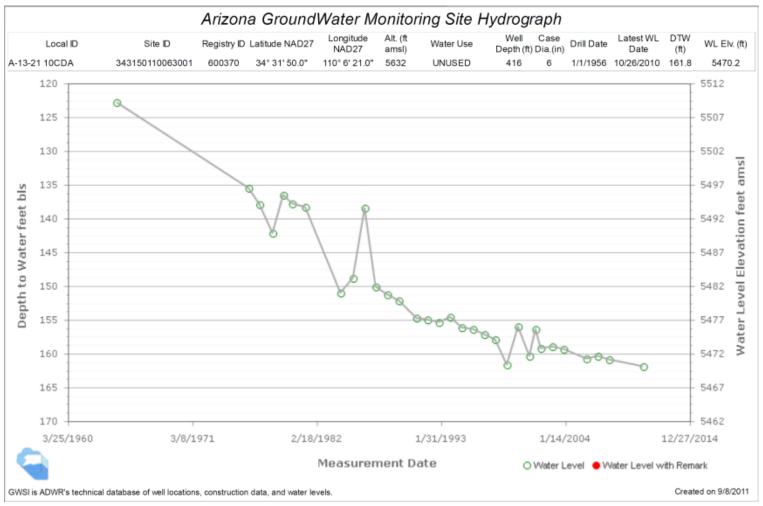
EPA16 -- A-11-19 14ABD Little Colorado River Plateau basin Clay Springs area.



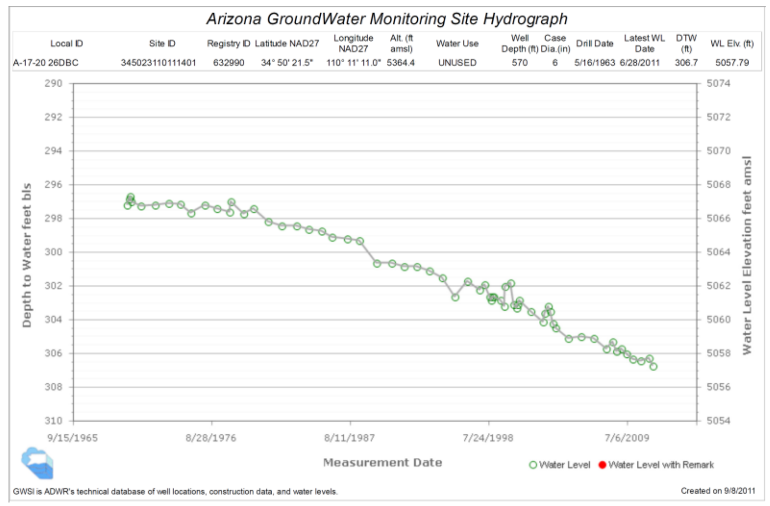
EPA17 -- A-10-22 30ABA Little Colorado River Plateau basin Showlow area. Climate and local pumping are probably the main factors contributing to historic water level trend.



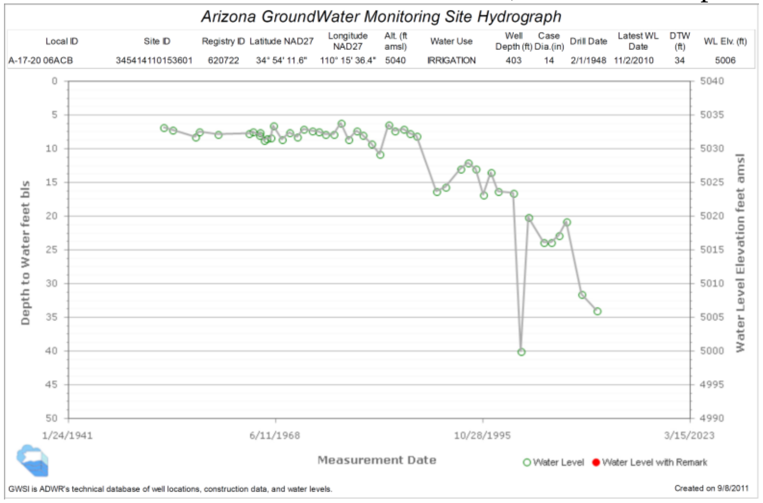
EPA19 -- A-13-21 34DCC2 Little Colorado River Plateau basin Taylor area. Historic water level decline trend due to local agricultural and municipal pumping.



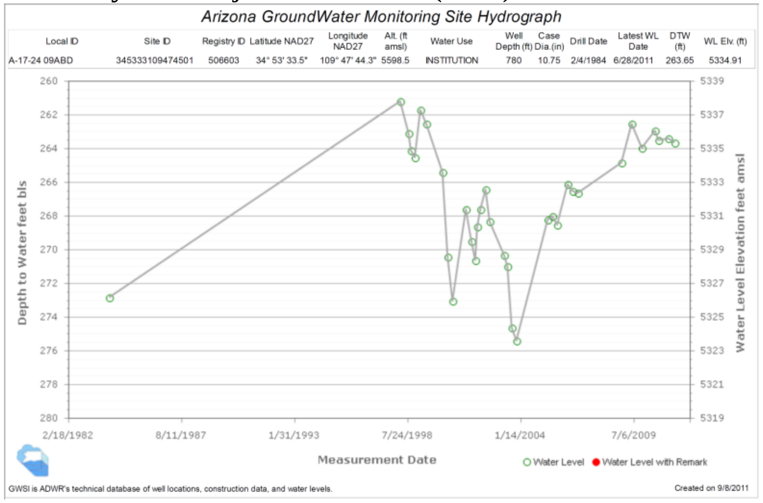
EPA18 -- A-13-21 10CDA Little Colorado River Plateau basin about1.5 miles NW of Snowflake. Historic water level decline trend mainly due to local agricultural and municipal pumping.



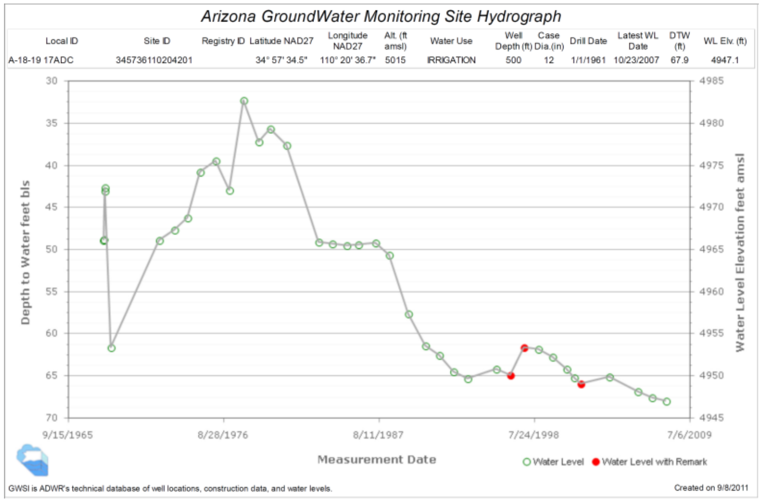
EPA20 -- A-17-20 26DBC Little Colorado River Plateau basin – Joseph City INA about 4.5 miles south of Holbrook. Historic water level declines mainly caused by agricultural and power plant pumping.



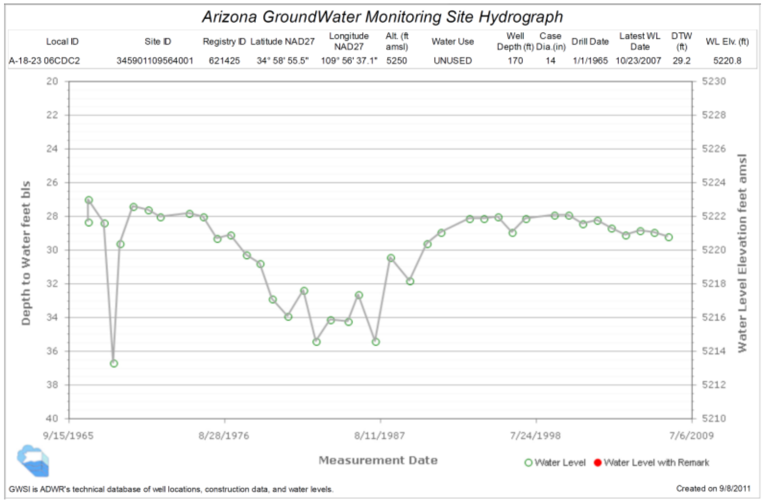
EPA21 -- A-17-20 06ACB Little Colorado River Plateau basin between Holbrook and Joseph City along the Little Colorado River. Historic water level decline trend related to agricultural and power plant pumping.



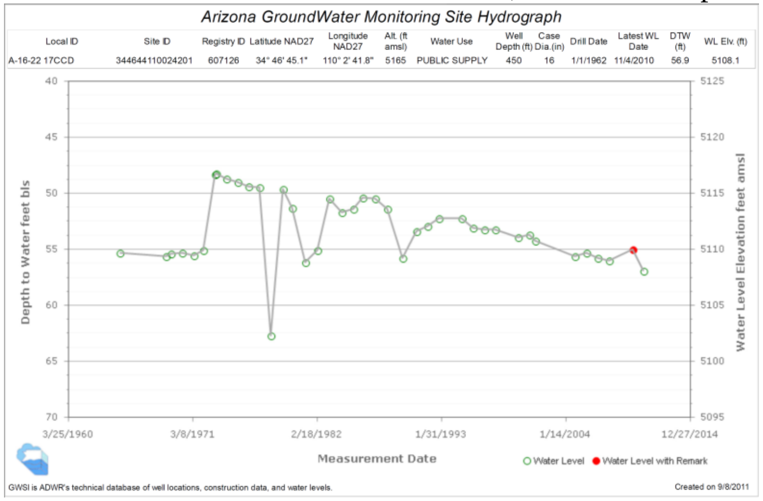
EPA23 -- A-17-24 09ABD Little Colorado River Plateau basin Petrified Forest National Park, Agate Bridge area.



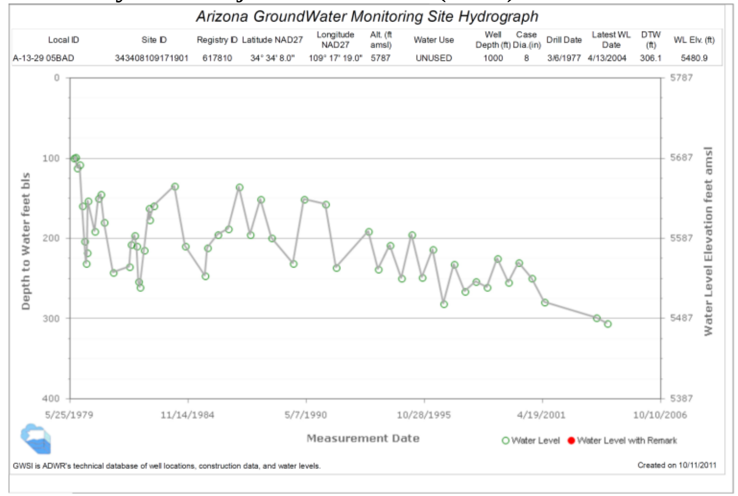
EPA22 -- A-18-19 17ADC Little Colorado River Plateau basin – Joseph City INA at Joseph City. Historic water level decline trend related to agricultural and power plant pumping.



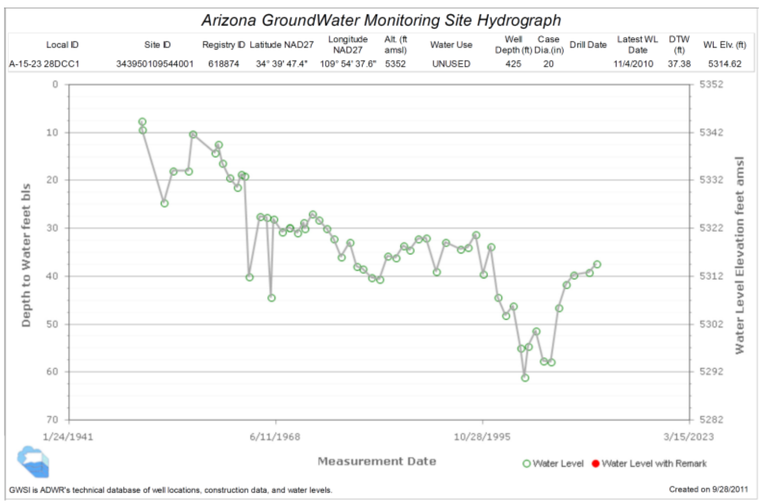
EPA24 -- A-18-23 06CDC2 Little Colorado River Plateau basin Goodwater area near confluence of the Little Colorado River and Lithodendron Wash.



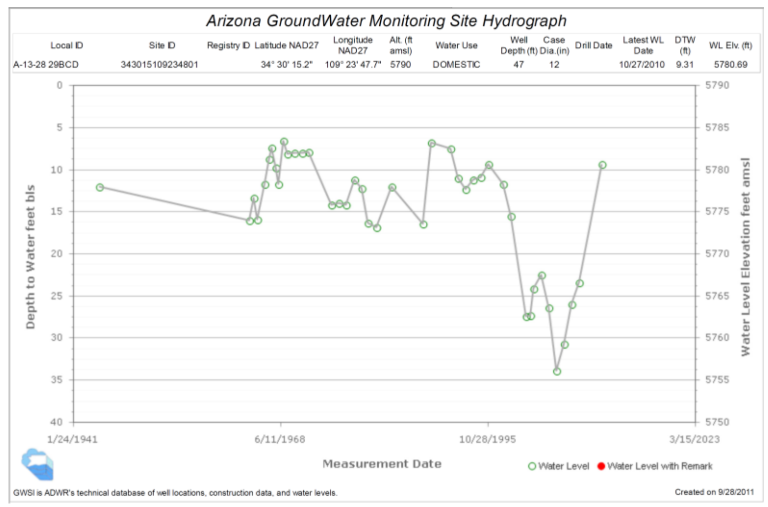
EPA25 -- A-16-22 17CCD Little Colorado River Plateau basin Woodruff area on the Little Colorado River.



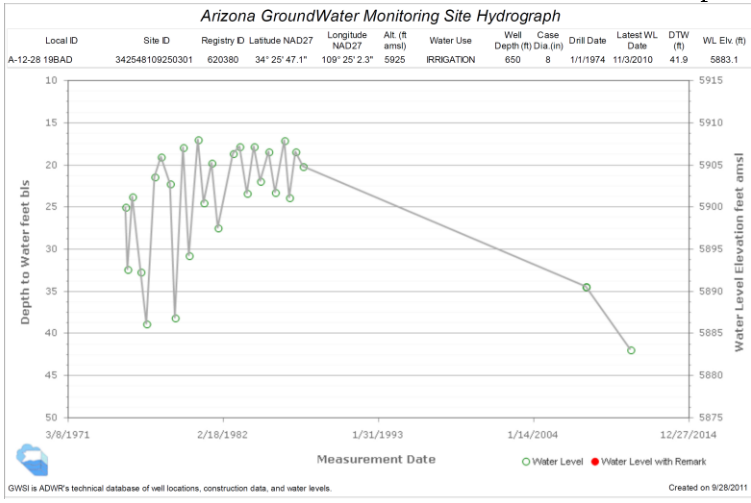
EPA29 -- A-13-29 05BAD Little Colorado River Plateau basin about 7 miles NE of St. Johns water level declines mainly caused by power plant pumping.



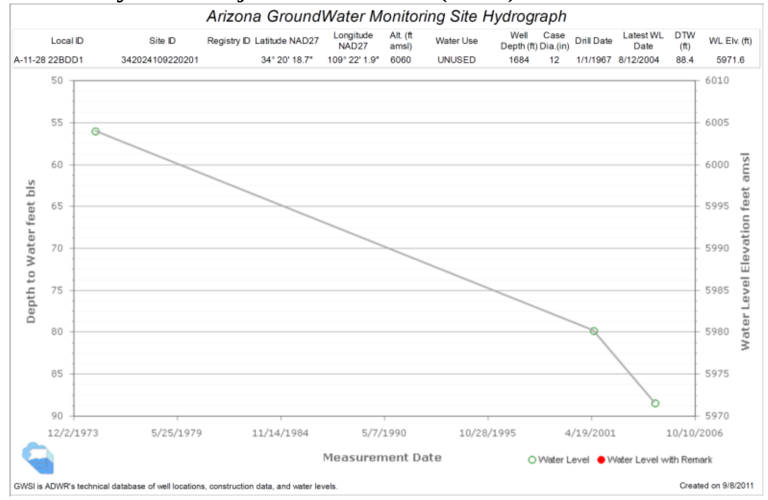
EPA26 -- A-15-23 28DCC1 Little Colorado River Plateau basin along West Hay Hollow Draw 2.5 miles west of Knoll Tank on the Little Colorado River. Historic water level decline mainly related to agricultural pumping.



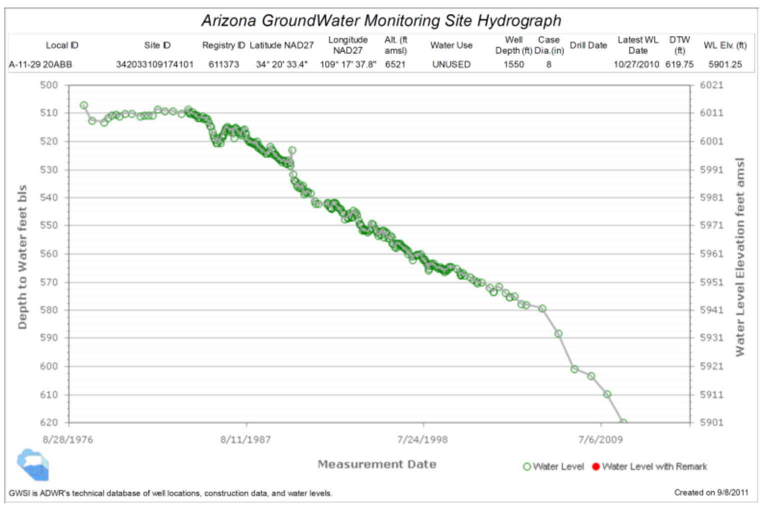
EPA30 -- A-13-28 29BCD Little Colorado River Plateau basin about 2 miles west of St. Johns.



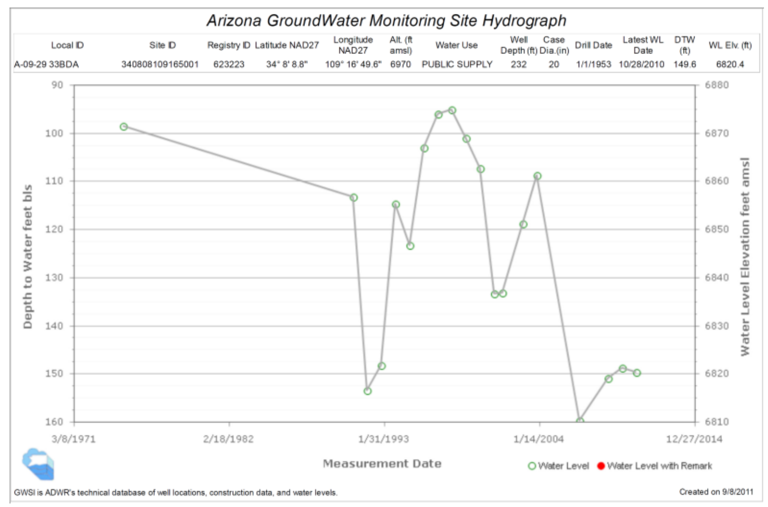
EPA29 -- A-12-28 19BAD Little Colorado River Plateau basin at Salado near Salado Spring and the Little Colorado River. Historic water level declines mainly from agricultural and power plant pumping.



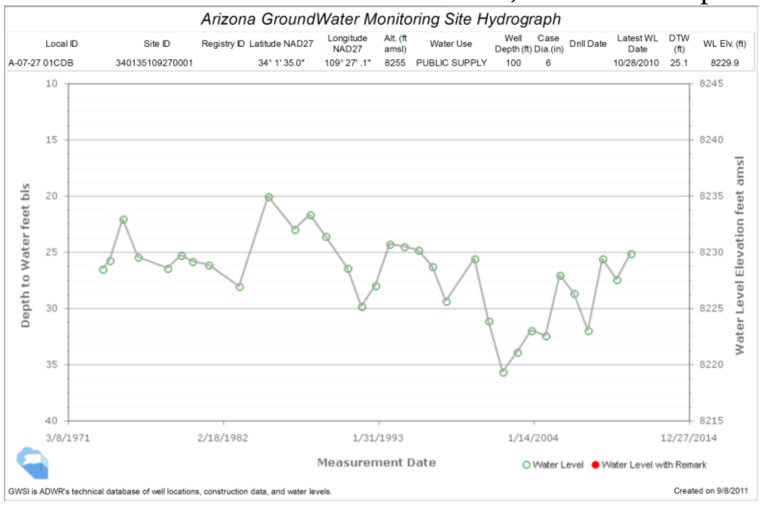
EPA31 -- A-11-28 22BDD2 Little Colorado River Plateau basin about .5 miles west of Lyman Lake Historic water level declines caused mainly from agricultural and power plant pumping.



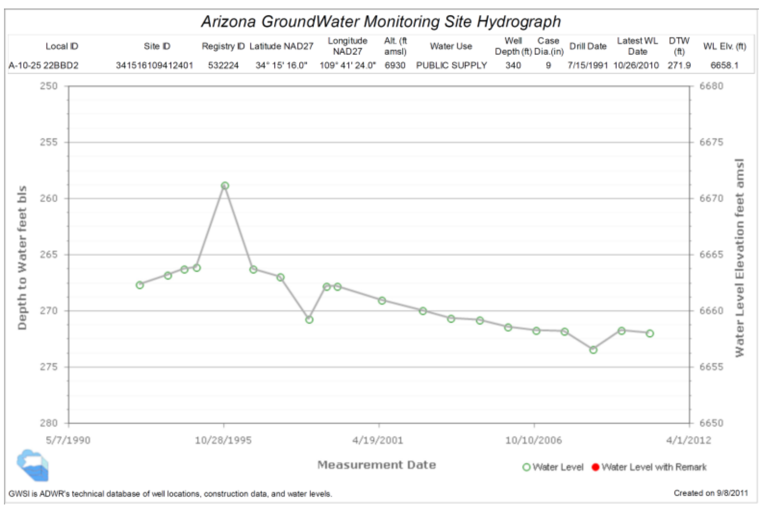
EPA30 -- A-11-29 20ABB Little Colorado River Plateau basin about 2.5 miles east of Lyman Lake. Historic water level declines mainly caused by power plant pumping.



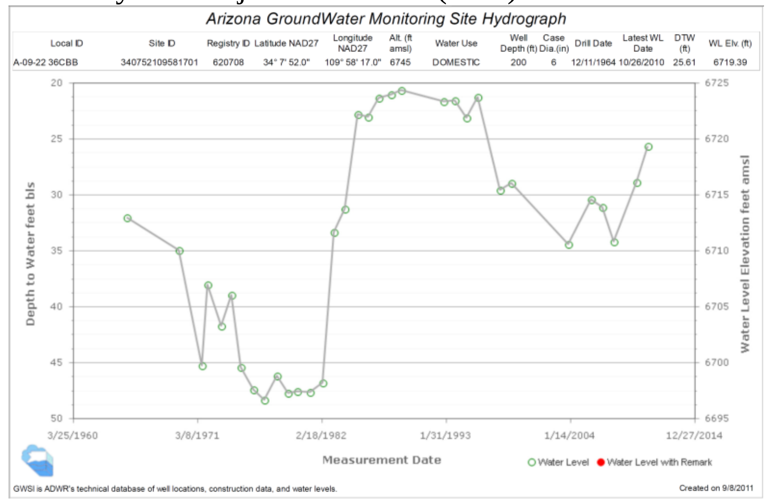
EPA32 -- A-09-29 33BDA Little Colorado River Plateau basin Sprinerville area about .5 mile SW of Nutrioso Creek. Climatic and local pumping are main factors contributing to historic water fluctuations in this well.



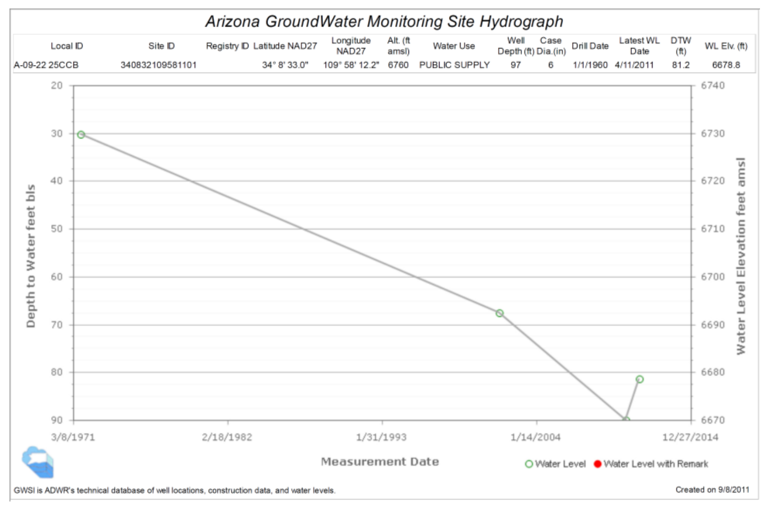
EPA33 -- A-07-27 01CDB Little Colorado River Plateau basin at Greer near headwaters of the Little Colorado River.



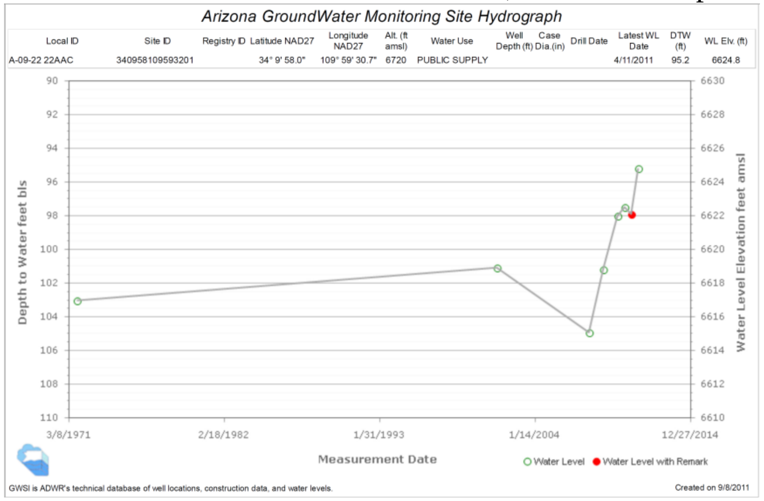
EPA34 -- A-10-25 22BBD2 Little Colorado River Plateau basin at Vernon.



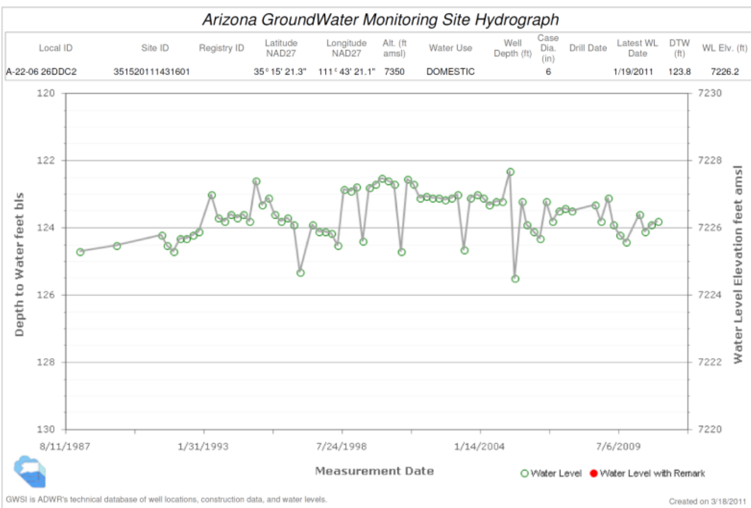
EPA35 -- A-09-22 36CBB Little Colorado River Plateau basin south Lakeside-Pinetop area near Walnut Creek. Variability in historic water levels mainly due to changes in local pumping distributions and climatic factors.



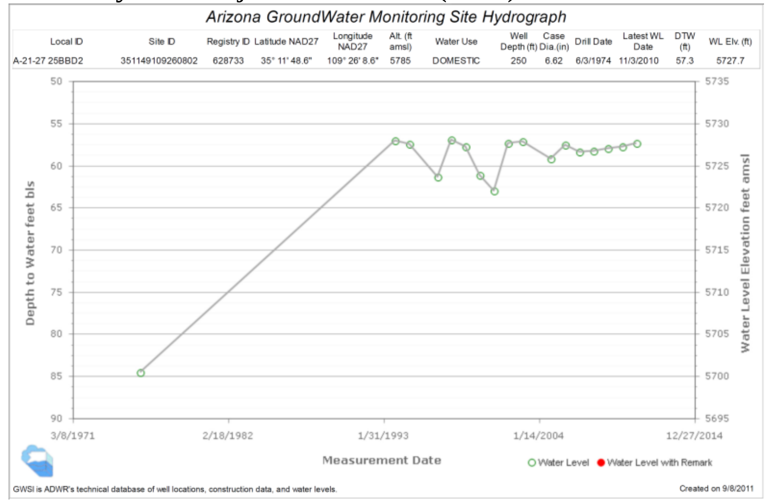
EPA36 -- A-09-22 25CCB Little Colorado River Plateau basin Pinetop-Lakeside area. Historic water level declines mainly caused by combination of municipal and golf course pumping.



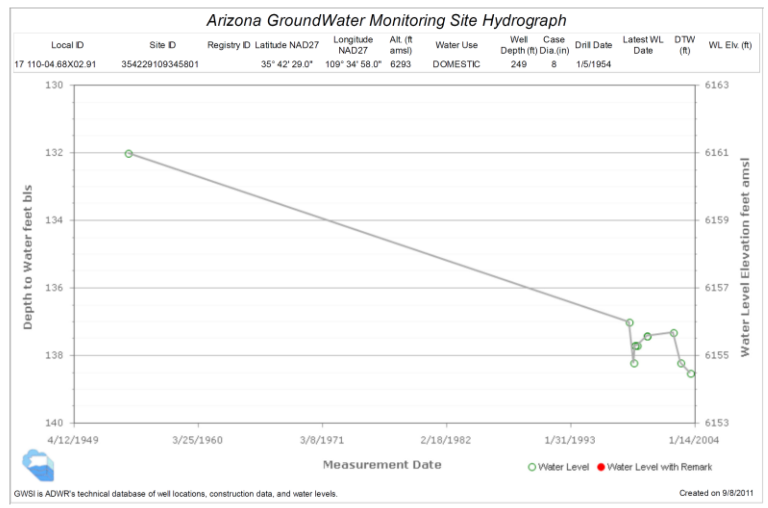
EPA37 -- A-09-22 22AAC Little Colorado River Plateau basin at Lakeside. Recent rise in water level may be a response to a reduction and/or redistribution of local pumping



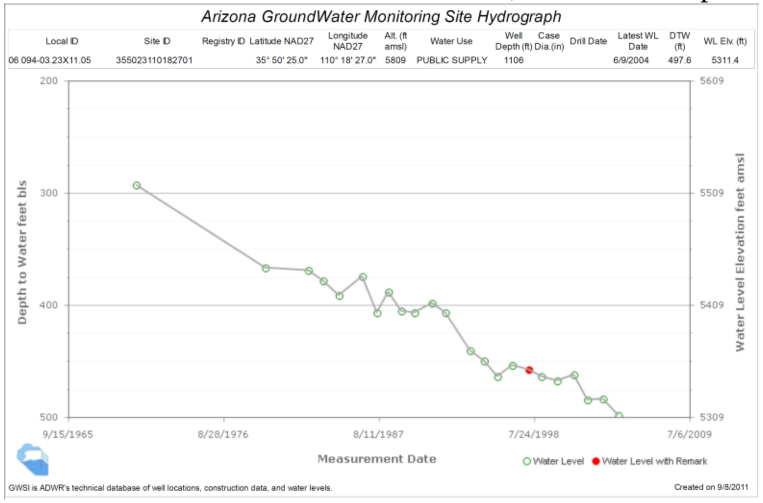
EPA38 -- A-23-31 33AAB Little Colorado River Plateau basin at Lupton on the Puerco River about .5 mile from the Arizona-New Mexico border.



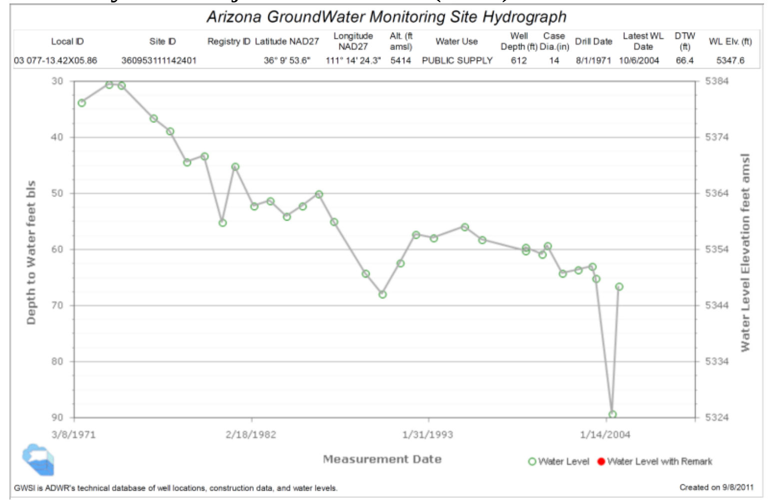
EPA39 -- A-21-27 25BBD2 Little Colorado River Plateau basin at Chambers.



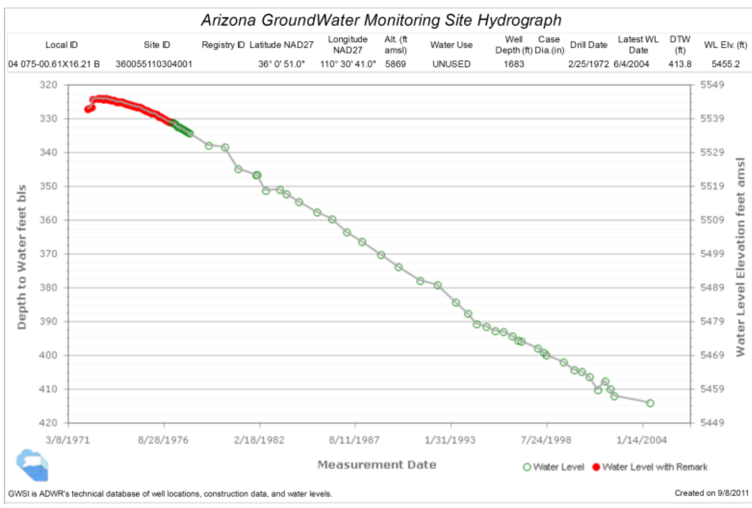
EPA40 -- 17 110-04.68X02.91 Little Colorado River Plateau basin about 2 miles west of Ganado.



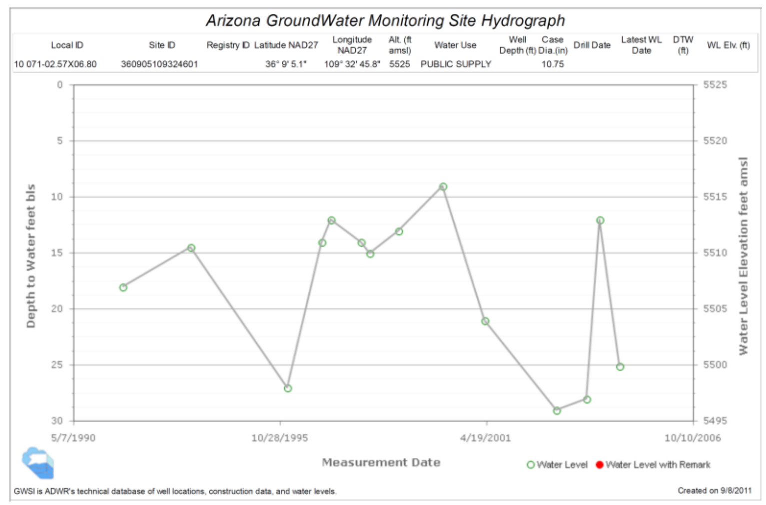
EPA41 -- 06 094-03.23X11.05 Little Colorado River Plateau basin Keams Canyon area. Historic water level decline mainly due to a combination of local pumping and pumping for Black Mesa coal mining activities further to the north.



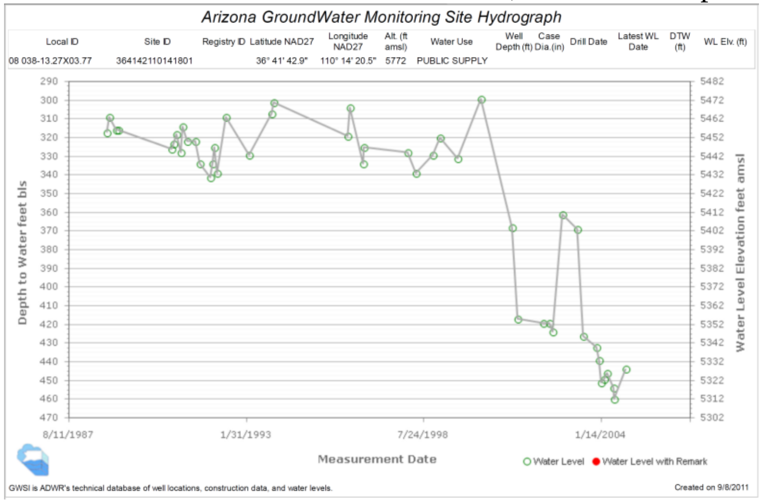
EPA43 -- 03 077-13.42X05.86 Little Colorado River Plateau basin about 2 miles north of Tuba City. Historic declines mainly due to municipal pumping.



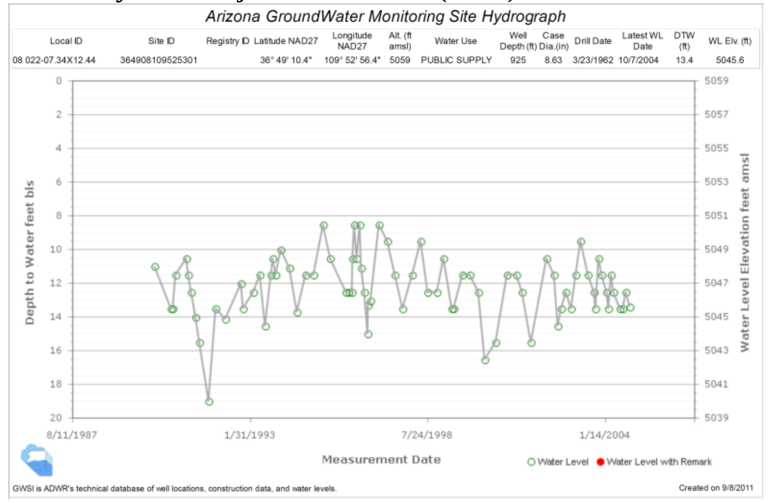
EPA42 -- 04 075-00.61X16.21B Little Colorado River Plateau basin along Orabi Wash about 11 miles NE of Orabi Ky Kotsmovi. Historic water level decline mainly due to local pumping and pumping for coal mining activities in Black Mesa area.



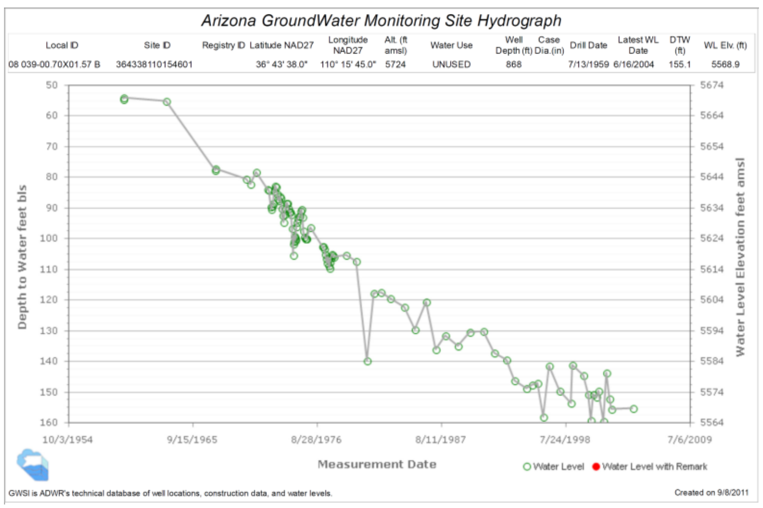
EPA44 -- 10 071-02.57X06.80 Little Colorado River Plateau basin along Sand Wash at Chinle in Canyon de Chelly area.



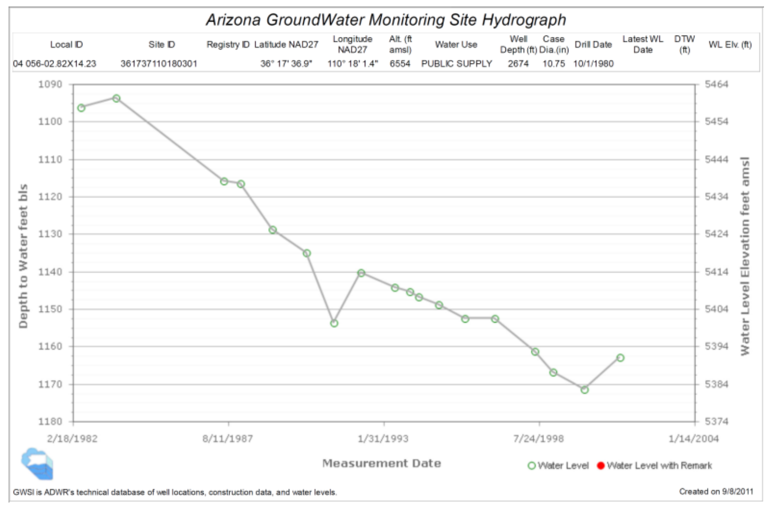
EPA45 -- 08 038-13.27X03.77 Little Colorado River Plateau basin about 2.3 miles SE of Kayenta. Historic water levels declines mainly due to industrial (for coal mining) and municipal pumping.



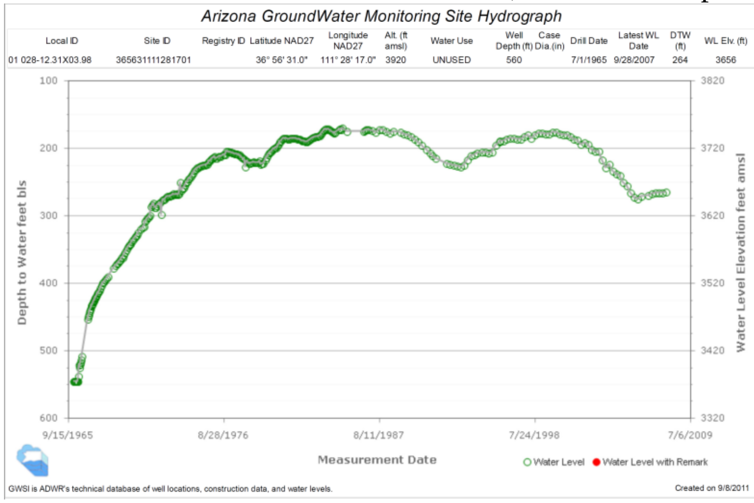
EPA47 -- 08 022-07.34X12.44 Little Colorado River Plateau basin about 2.5 miles SW of Dennehotso.



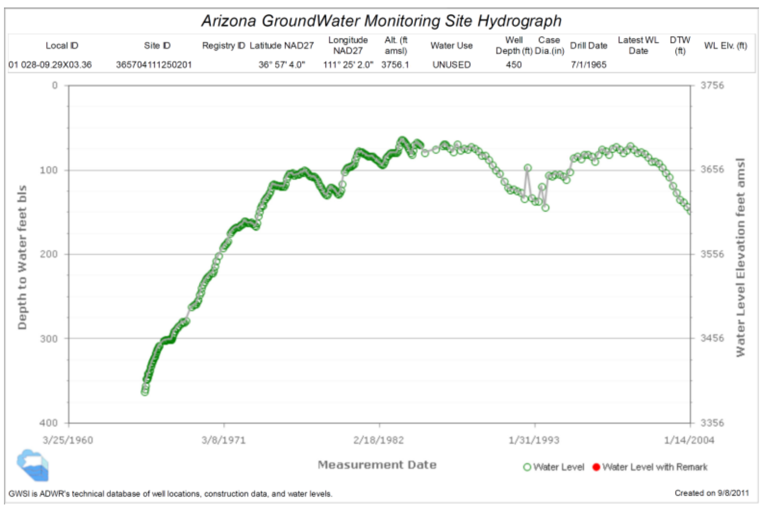
EPA46 -- 08 039-00.70X01.57B Little Colorado River Plateau basin at Kayenta. Historic water levels declines mainly due to industrial (for coal mining) and municipal pumping.



EPA48 -- 04 056-02.82X14.23 Little Colorado River Plateau basin near East Fork of Dinnebito Wash Forest Lake Chapter House. Historic water level declines due to a combination of local and regional pumping.



EPA49 -- 01 028-12.31X03.98 Little Colorado River Plateau basin Page area about .7 mile NE of Glen Canyon Dam. Water level rise closely follows filling and lowering of water levels at Lake Powell.



EPA50 -- 01 028-09.29X03.36 Little Colorado River Plateau basin near Page at Antelope Point on Lake Powell. Water level rise closely follows filling and lowering of water levels at Lake Powell.

Central Highlands Planning Area Hydrographs
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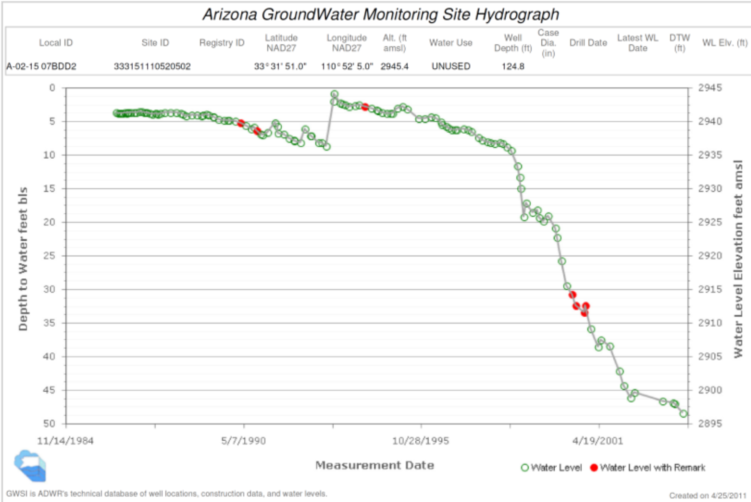
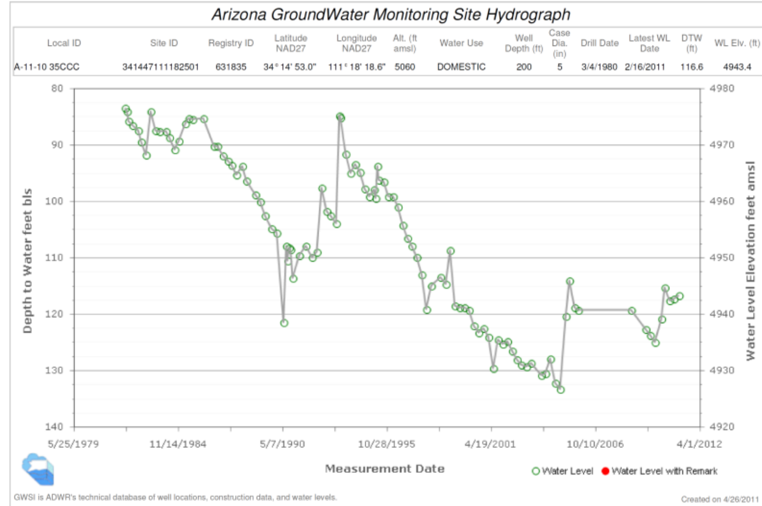
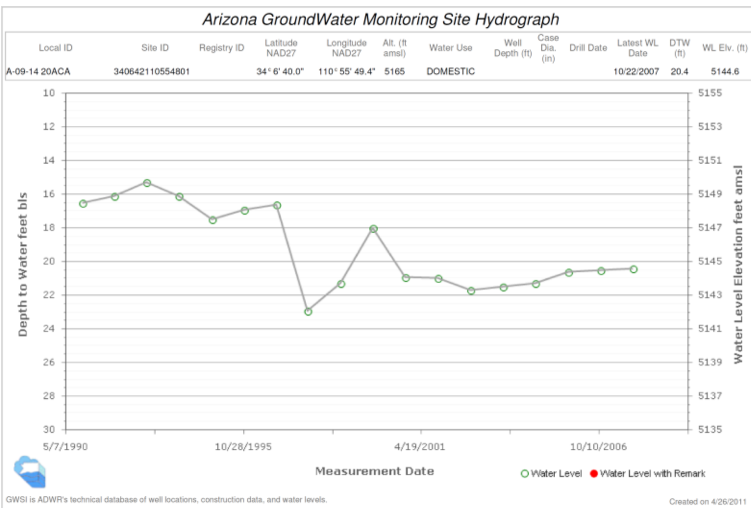


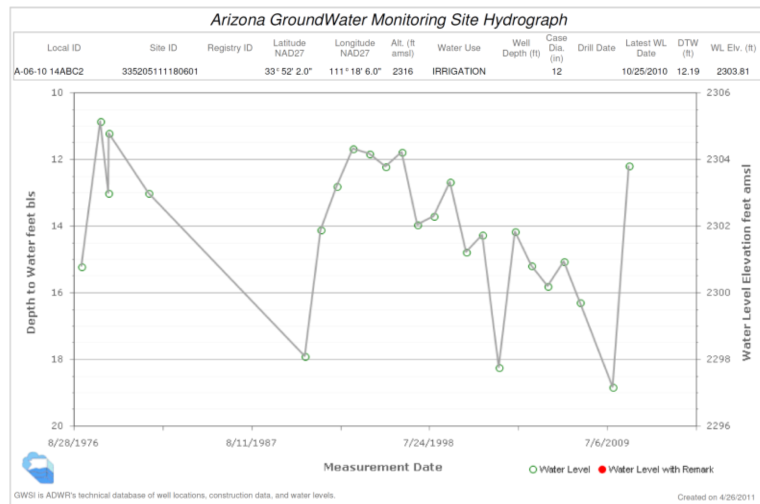
CHA1 -- A-02-15 07BDD2 Salt River Lakes basin located on Pinal Creek 8 miles north of Claypool. Major decline in water level around 1998 mainly related to Pinal Creek WQARF site remediation pumping.



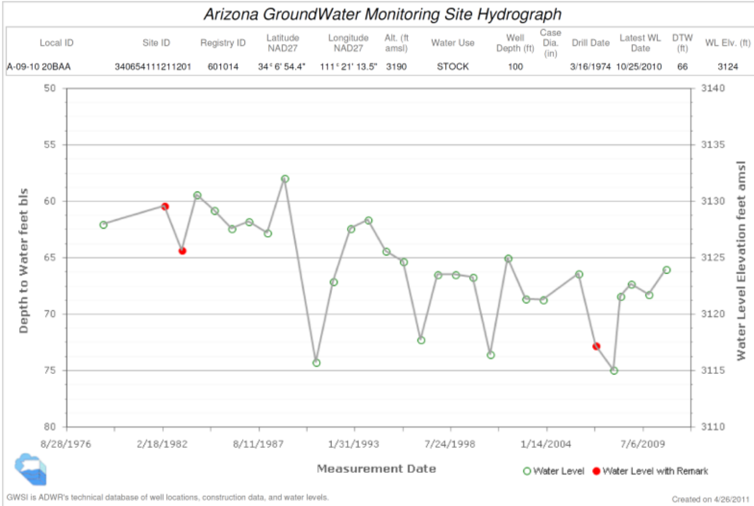
CHA3 -- A-11-10 35CCC Tonto Creek basin, east Payson area. Long-term decline inwater levels mainly due to local pumping. Stabilization in water levels after 2005 maybe due to redistribution of pumping.



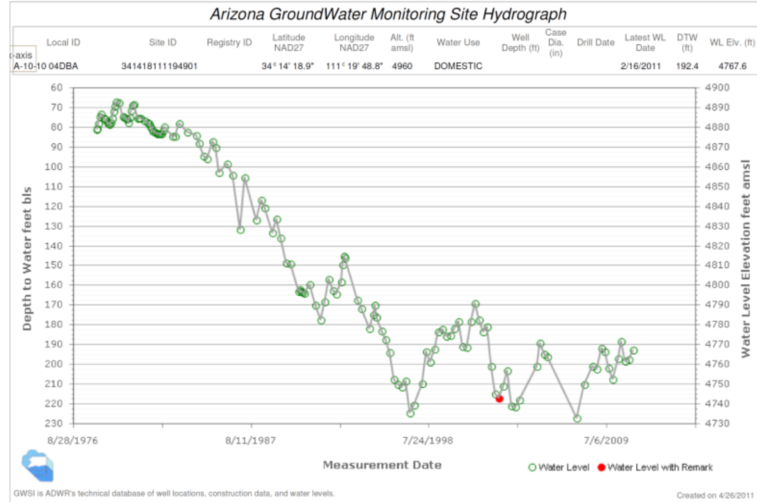
CHA2 -- A-09-14 20ACA Salt River Canyon basin 2 miles northeast of Young.



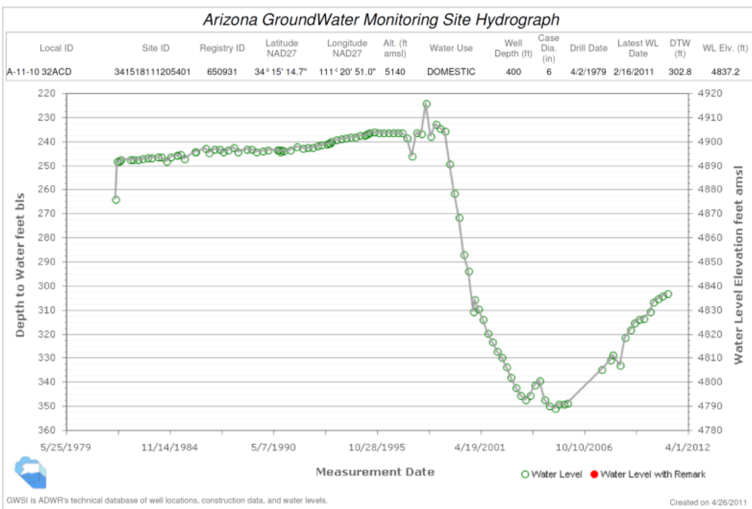
CHA4 -- A-06-10 14ABC2 Tonto Creek basin along Tonto Creek 1 mile south of Punkin Center. Fluctuations in water level reflect variations in stream recharge and local groundwater withdrawals.



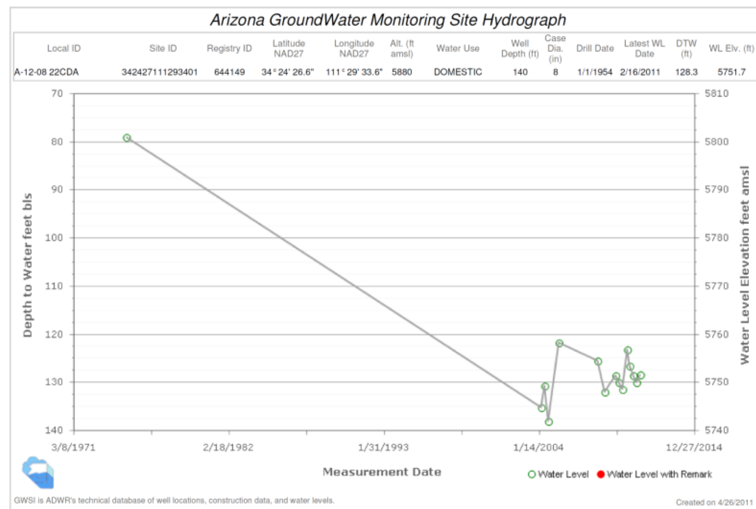
CHA5 -- A-09-10 20BAA Tonto Creek basin at Rye.



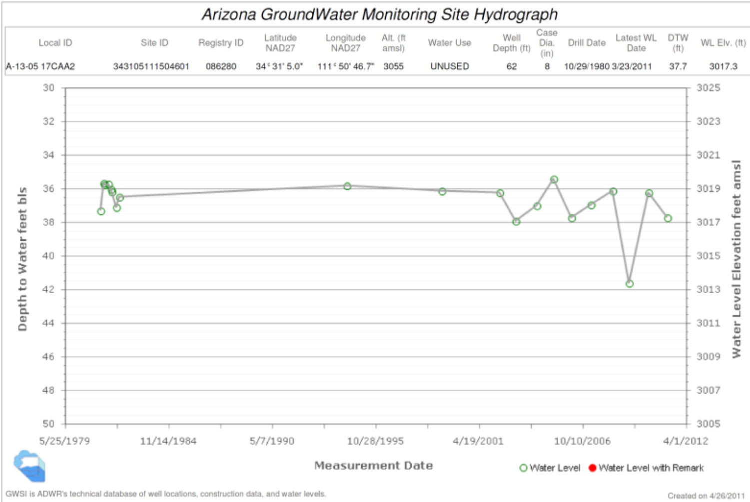
CHA7 -- A10-10 04DBA Verde River basin – Verde Canyon sub-basin central Payson area. General decline in water levels due to increased pumpage in area. Fluctuations in water levels related to variations in natural recharge and pumpage.



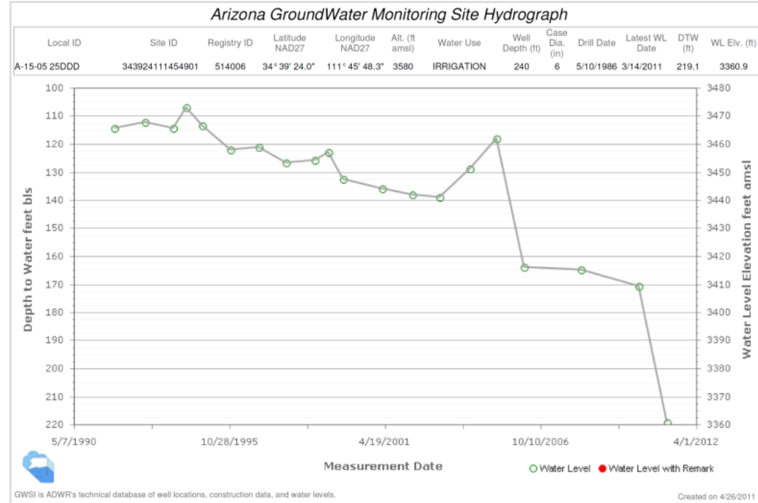
CHA6 -- A-11-10 32ACD Verde River basin - Verde Canyon sub-basin NW Payson Airport area. Major water level decline beginning in late 1990's related to increased pumpage in area, recovery beginning around 2005 may be climate related as well as due to reduction in local area pumping.



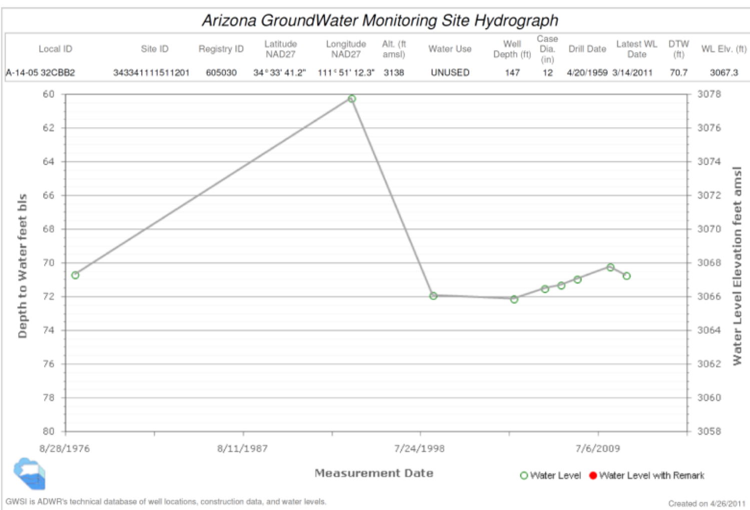
CHA8 -- A-12-08 22CDA Verde River basin – Verde Canyon sub-basin Strawberry area well in shallow aquifer system. Water level declines from 1970's to 2004 mainly due to local pumpage.



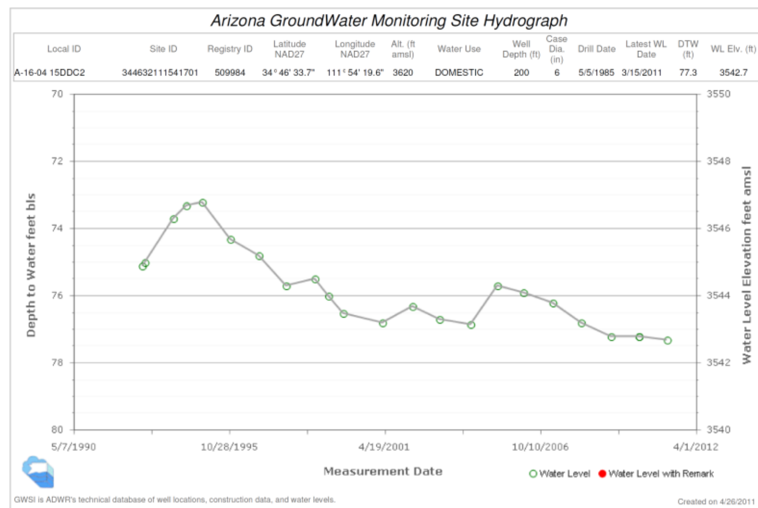
CHA9 -- A-13-05 17CAA2 Verde River basin – Verde Valley sub-basin near Verde River about 4 miles south of Camp Verde.



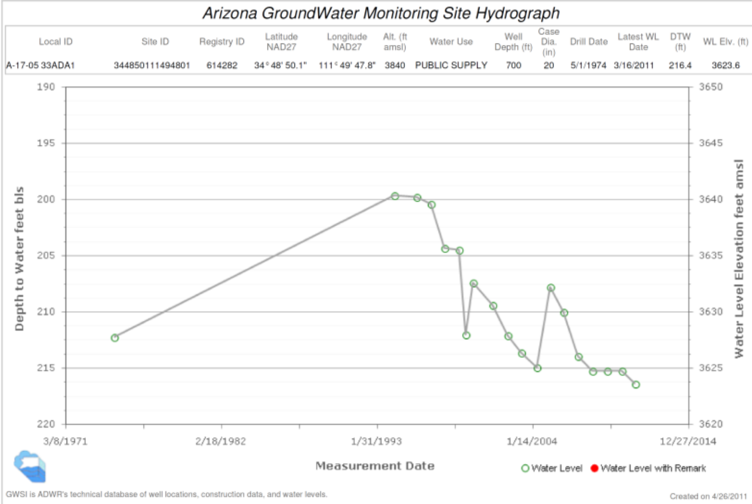
CHA11 -- A-15-05 25DDD Verde River basin – Verde Valley sub-basin 2 miles NW of Rimrock. Historic water level declines are mainly from municipal pumping in area.



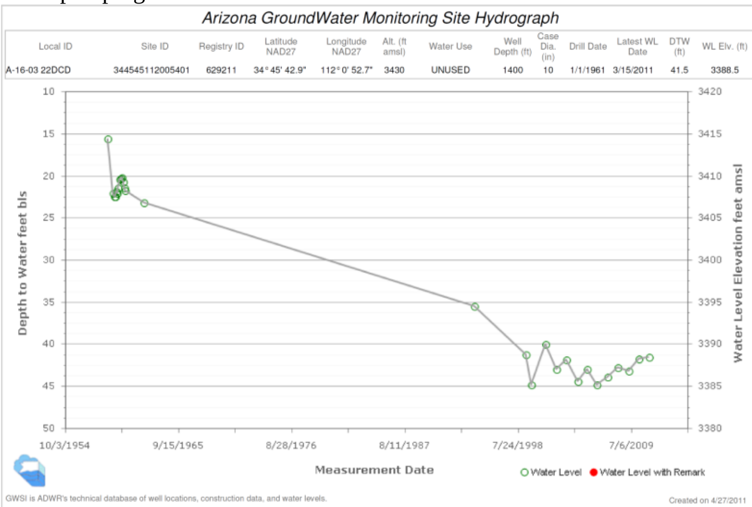
CHA10 -- A-14-05 32CBB2 Verde River basin – Verde Valley sub-basin along Verde River at Camp Verde. Peak circa 1994 related to recharge from major flows in 1993.



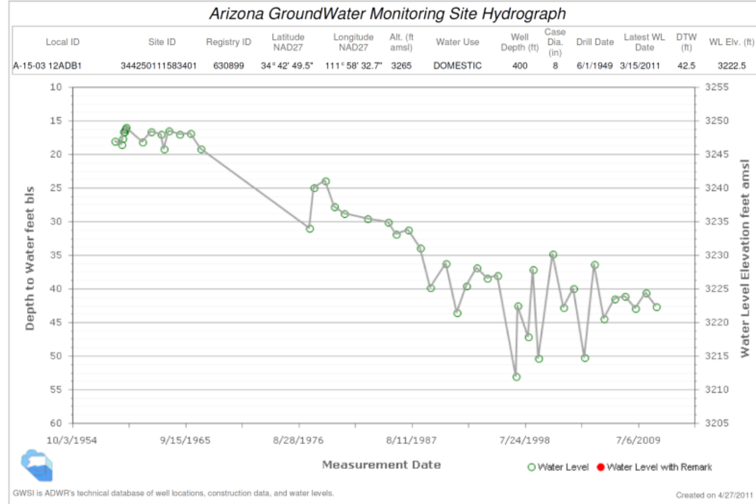
CHA12 -- A-16-04 15DDC2 Verde River basin – Verde Valley sub-basin along Oak Creek in Page Springs area. Peak circa 1993 related to recharge from major flows.



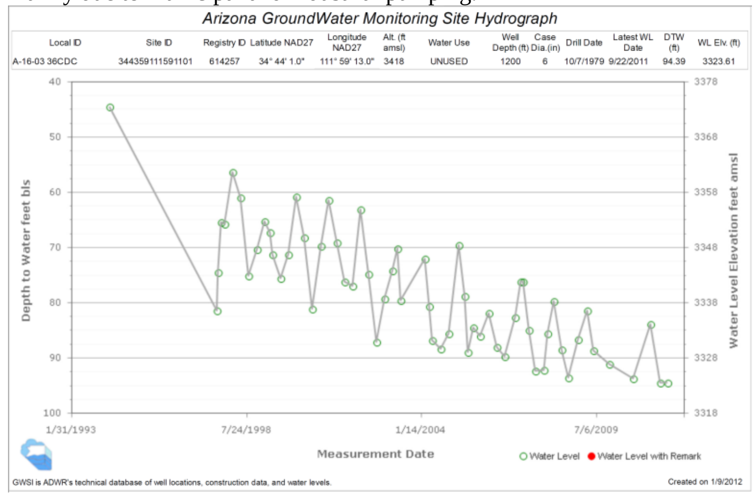
CHA13 -- A-17-05 33ADA1 Verde River basin – Verde Valley sub-basin 1.2 miles SW of Red Rock along Oak Creek. Rise in water levels in 1993 and 2005 are related to flood recharge. Overall decline in water levels since 1993 mainly due to local pumping.



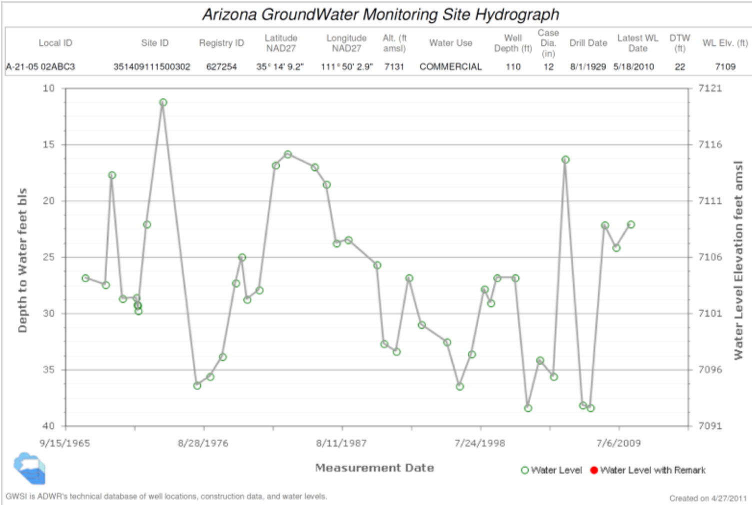
CHA14 -- A-16-03 22DCD Verde River basin – Verde Valley sub-basin Clarkdale area about .5 mile east of Verde River. Overall water level declines related to groundwater pumping. Evidence of significant flood recharge not apparent from available data.



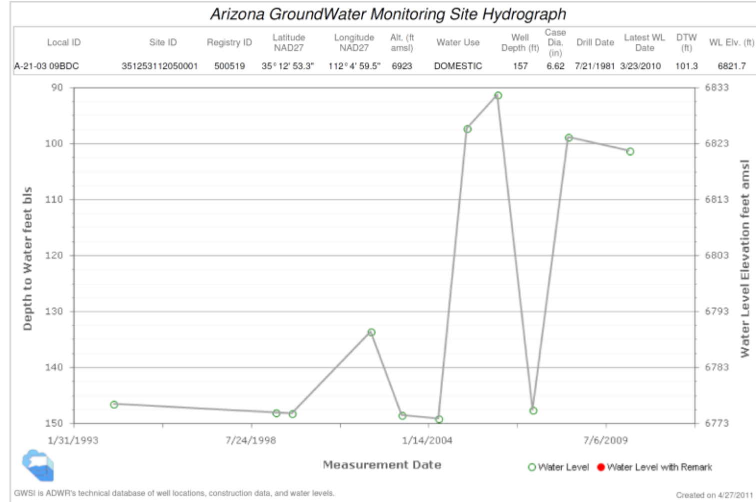
CHA15 -- A-15-03 12ADB1 Verde River basin – Verde Valley sub-basin Cottonwood area about .5 mile north of Verde river. Overall water level decline mainly due to municipal and industrial pumping.



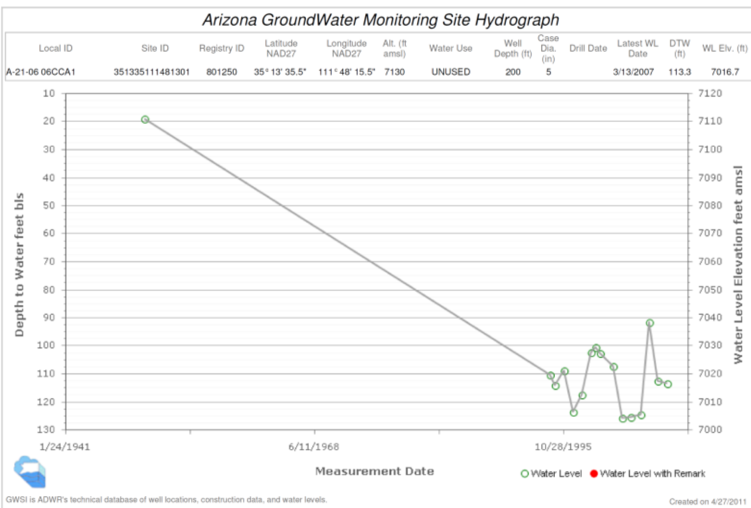
CHA16 -- A-16-03 36CDC Verde River basin – Verde valley sub-basin Cottonwood area about .5 mile east of Verde River. Overall water level declines related to groundwater pumping. Initial high water level measured circa 1994 caused by recharge from major flood event in 1993. This record shows some seasonality in water level measurements because several manual measurements are taken each year. Declining trend mainly related to increased pumping in area.



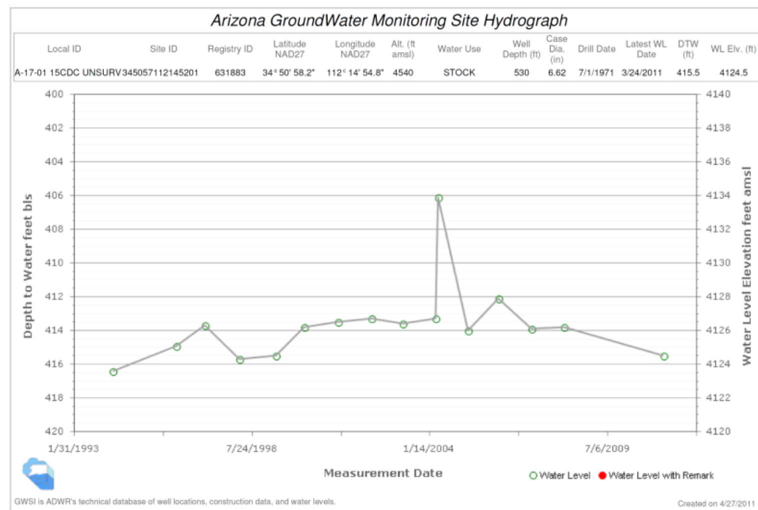
CHA17 -- A21-05 02ABC3 Verde River basin – Verde Valley sub-basin Belmont-Camp Navajo area, shallow aquifer system. Historic water level fluctuations due to variations in local recharge and pumping.



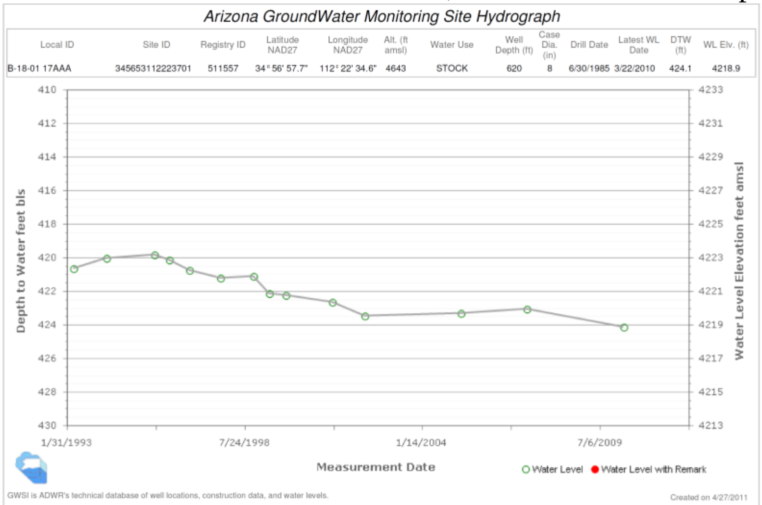
CHA19 -- A-21-03 09BDC Verde River basin – Verde Valley sub-basin about 7 miles SEof Williams large increases in water level circa 2005 maybe related to local increases in natural and/or stream flow recharge.



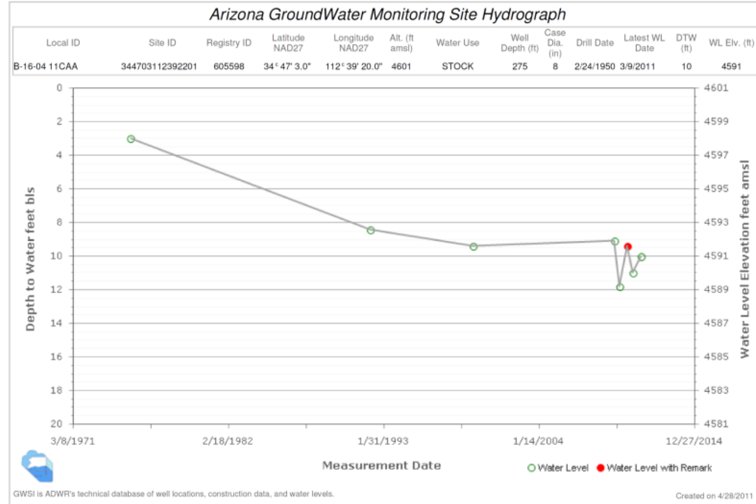
CHA18 -- A-21-06 06CCA1 Verde River basin – Verde Valley sub-basin Belmont – Camp Navajo area.. Historic declines mainly related to Camp Navajo and other local pumping.



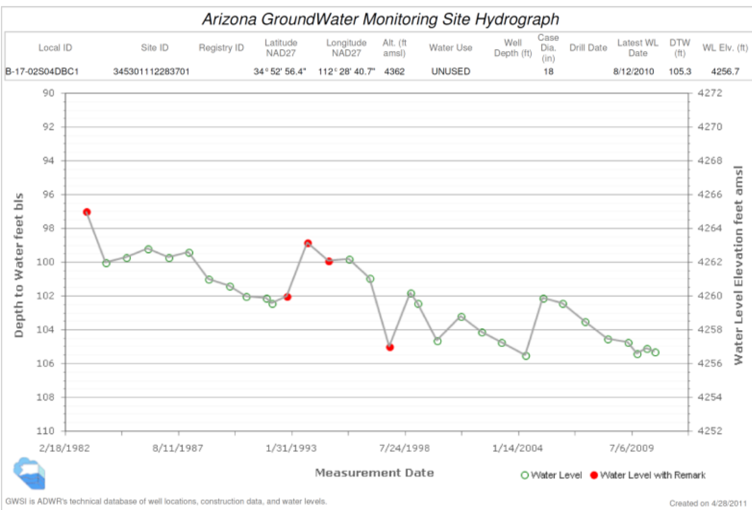
CHA20 -- A-17-01 15CDCUNSURV Verde River basin – Verde Valley sub-basin about 5 miles SW of Perkinsville. Peak in 2005 maybe related to local increases in natural and/or stream flow recharge that year.



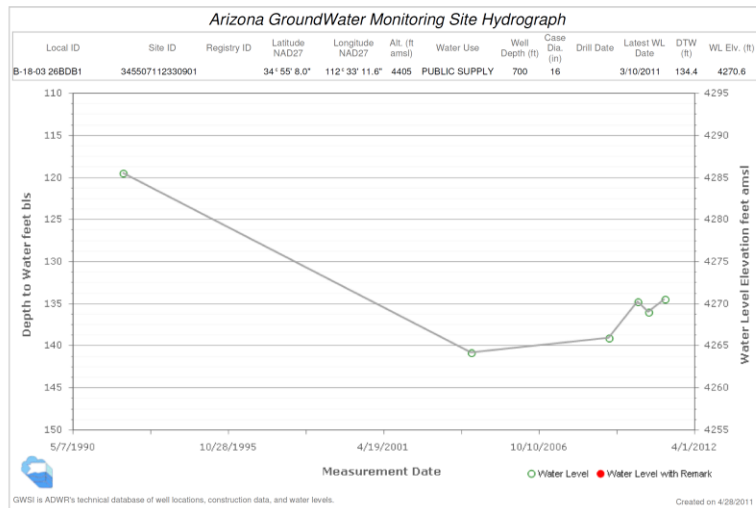
CHA21 -- B-18-01 17AAA Verde River basin – Verde Valley sub-basin about 3 miles south of Drake.



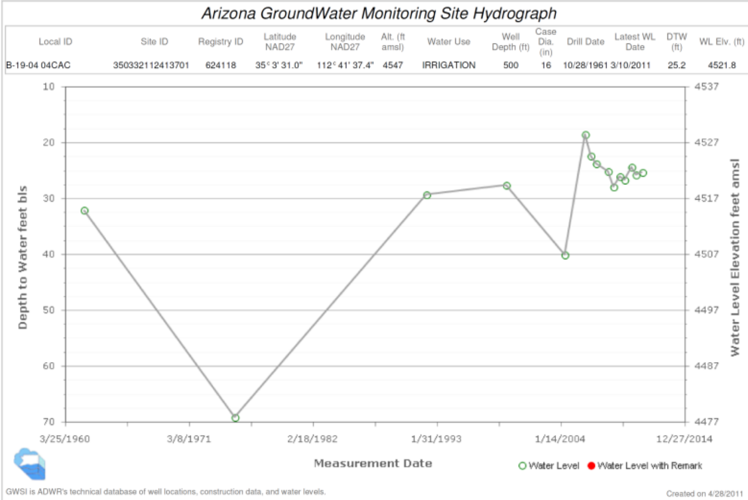
CHA23 -- B-16-04 11CAA Verde River basin – Big Chino sub-basin southern Williamson Valley area.



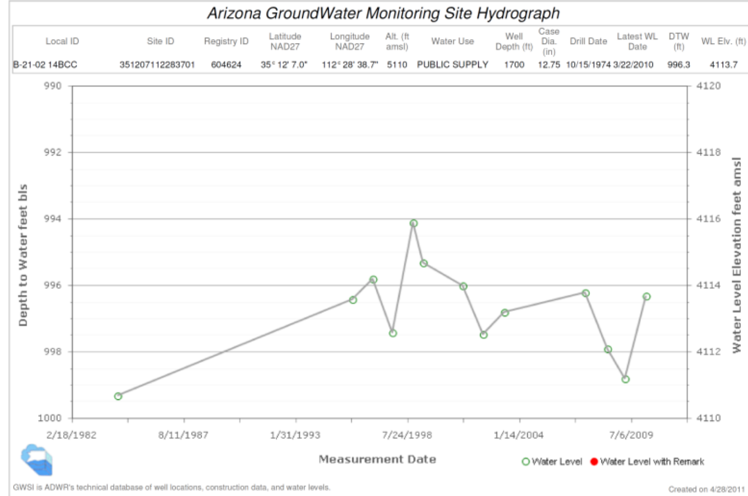
CHA22 -- B-17-02S04DBC1 Verde River basin - Big Chino sub-basin about 2 miles west of Paulden. Overall water level decline trend probably mainly due to local and regional pumping. Water level peaks circa 1993 and 2005 maybe recharge related.



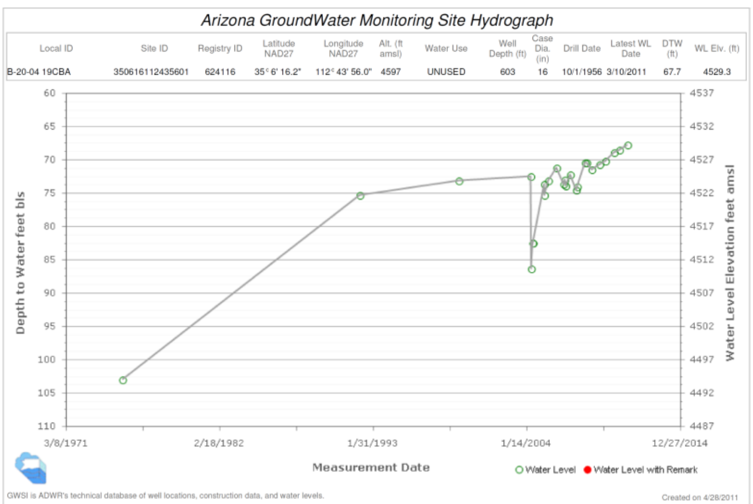
CHA24 -- B-18-03 26BDB1 Verde River basin – Big Chino sub-basin about 5 miles NW of Paulden along Big Chino Wash. Overall drop in water level probably mainly due to local agricultural pumping.



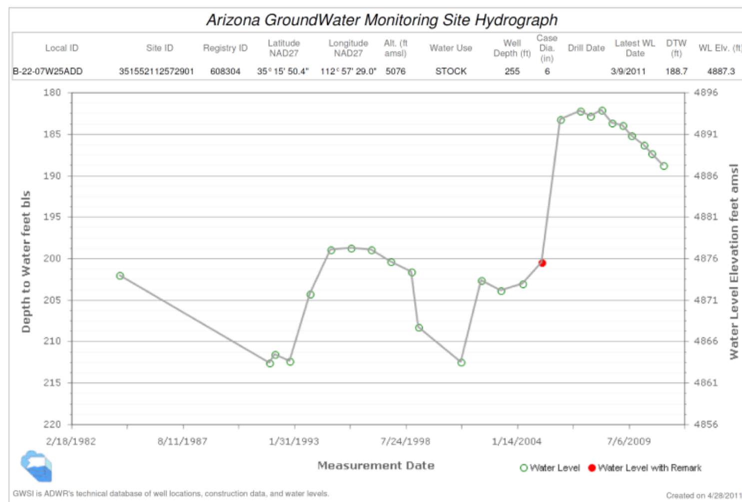
CHA25 -- B-19-04 04CAC Verde River basin – Big Chino sub-basin at southern end ofCity of Prescott - Big Chino Water Ranch. Water level decline from early 60's to 1971 related to irrigation pumping. Later water level recoveries show impacts of reduced pumping and potential recharge along Big Chino wash.



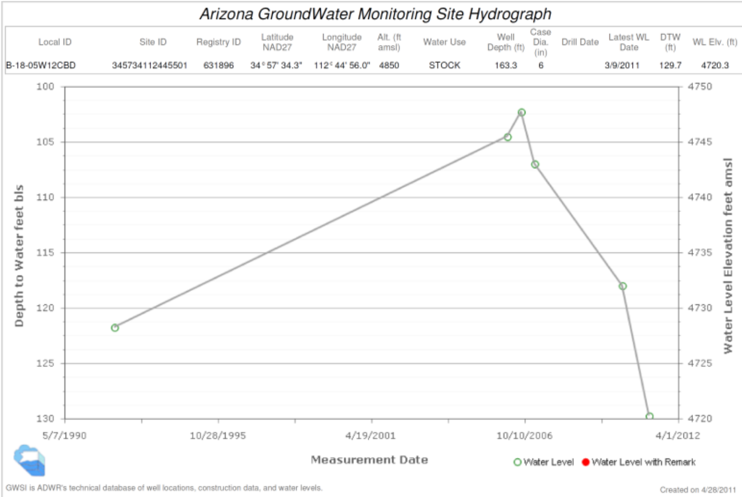
CHA27 -- B-21-02 14BCC Verde River basin – Big Chino sub-basin Ash Fork area.



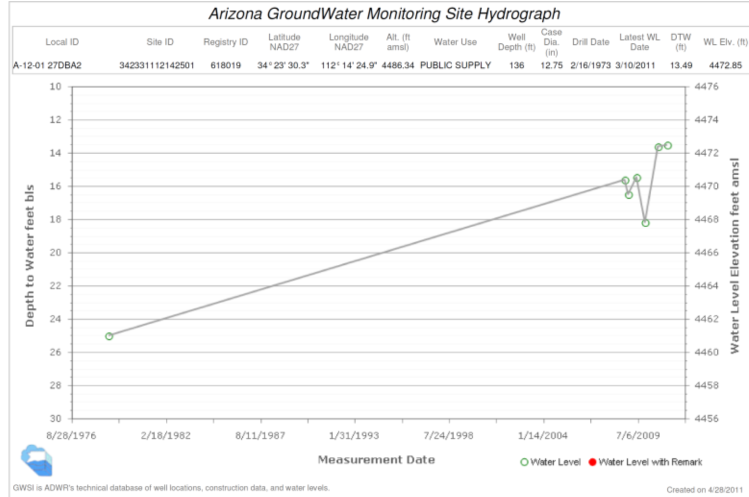
CHA26 --B-20-04 19CBA Verde River basin – Big Chino sub-basin at northern end of City of Prescott – Big Chino Water Ranch near confluence of Partridge Creek and Big Chino Wash. Overall water level recovery mainly due to reductions in pumping, and potential recharge from flow events on Big Chino Wash.



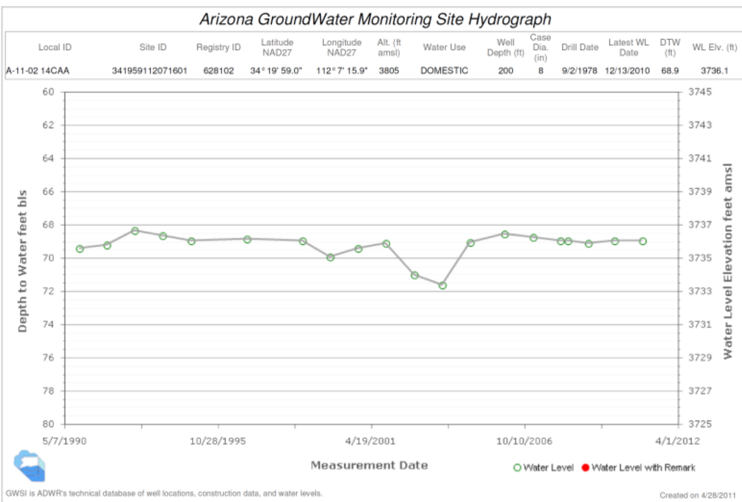
CHA28 -- B-22-07W25ADD Verde River basin – Big Chino sub-basin 6 miles SW of Seligman. Cause of significant recovery in water level after about 2000 is uncertain, but may be related to changing local pumping locations and/or volumes.



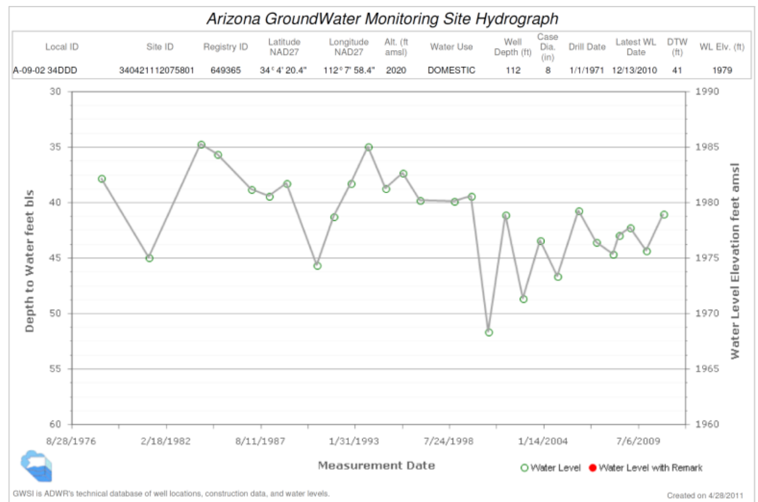
CHA29 -- B-18-05W12CBD Verde River basin – Big Chino sub-basin about 7 miles west of Big Chino Wash along Walnut Creek. Significant recent water level declines may be drought related.



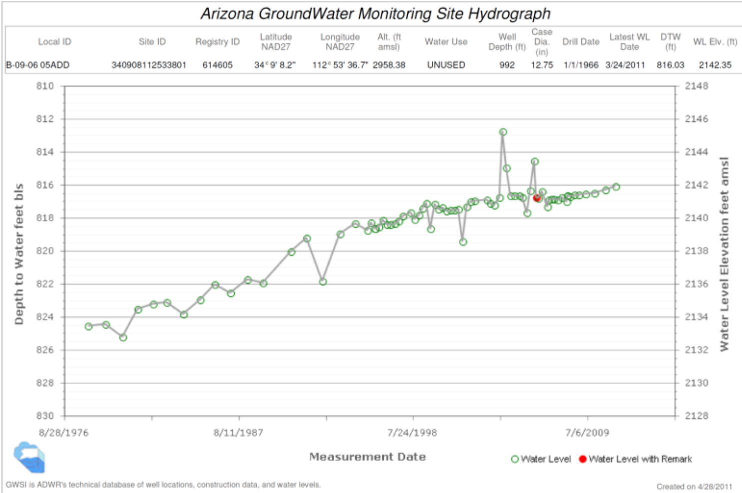
CHA31 -- A-12-01 27DBA2 Agua Fria basin Mayer area.



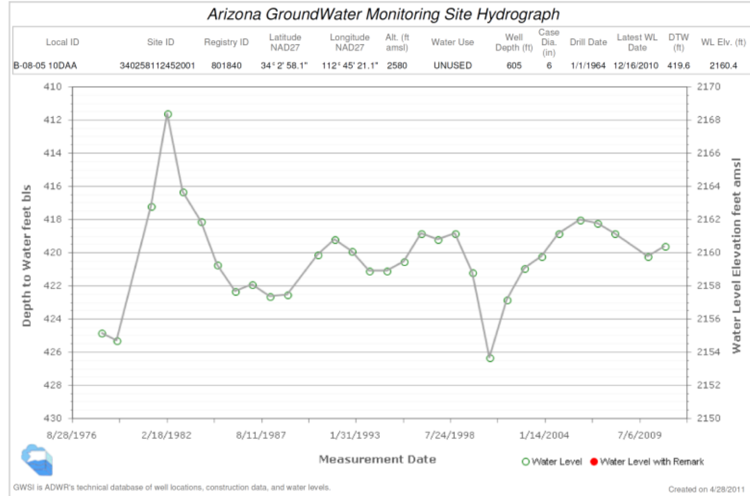
CHA30 -- A-11-12 14CAA2 Agua Fria basin Cordes Junction area.



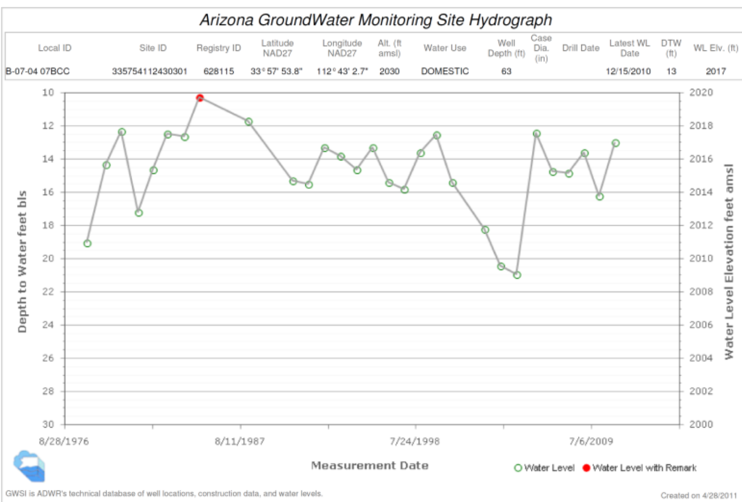
CHA32 -- A-09-02 34DDD Agua Fria basin Black Canyon City area.



CHA33 -- B-09-06 05ADD Upper Hassayampa Basin about 3 miles SW of Congress. Cause of water level rise trend in this well is uncertain.



CHA35 -- B-08-05 10DAA Upper Hassayampa basin 1 mile west of Hassayampa Riverand about 5.5 miles north of Wickenburg.



CHA34 -- B-07-04 07BCC Upper Hassayampa basin Wickenburg area near Hassayampa River. Water level fluctuations show impacts of flow events and recharge from Hassayampa River.

APPENDIX B

General Notes on Arizona Groundwater Basin Water Use Data:

Most data From USGS and USBR Spreadsheet

Data from USGS Annual Water Use Spreadsheet: Available at http://az.water.usgs.gov/projects/9671-9DW/

Data from USBR Reports 1996-2008 Arizona Portion of Colorado River Consumptive Use Reports: Available at http://www.usbr.gov/uc/library/envdocs/reports/crs/az/index.html

Values shown as 300 acre-feet/year are reported as < 300 acre-feet/year by USGS

Summary of Water Groundwater Use for SE Planning area basins 1991-2009

1991 - 2009 Agricultural Pumping (Acre-Feet) In Southeastern Arizona Planning Area (Data From USGS and ADWR Arizona Water Atlas)

Basin	Aravaipa Canyon	Bonita Creek	Cienega Creek	Donnelly Wash	Douglas[1]	Dripping Springs Wash	Duncan Valley	Lower San Pedro	Morenci	Safford	San Bernadino Valley	San Rafael	Upper San Pedro	Willcox	Total
1991	0	0	1,000	0	31,000	0	7,200	12,500	0	79,000	0	0	17,000	124,000	**271,700**
1992	0	0	1,000	0	34,000	0	5,300	12,500	0	60,000	0	0	17,000	112,000	**241,800**
1993	0	0	1,000	0	32,500	0	6,300	12,500	0	91,500	0	0	16,500	128,000	**288,300**
1994	0	0	1,000	0	36,500	0	5,900	12,500	0	108,000	0	0	16,000	130,000	**309,900**
1995	0	0	1,000	0	30,000	0	4,800	12,500	0	91,500	0	0	16,000	124,000	**279,800**
1996	0	0	1,000	0	37,500	0	9,300	12,500	0	106,500	0	0	15,500	125,000	**307,300**
1997	0	0	1,000	0	39,500	0	6,300	12,000	0	64,500	0	0	15,500	127,000	**265,800**
1998	0	0	1,000	0	37,000	0	5,600	11,000	0	67,500	0	0	15,000	128,000	**265,100**
1999	0	0	1,000	0	32,500	0	6,700	10,500	0	76,000	0	0	15,000	104,000	**245,700**
2000	0	0	1,000	0	39,000	0	13,500	9,700	0	142,000	0	0	14,500	134,000	**353,700**
2001	0	0	1,000	0	41,500	0	7,900	8,900	0	72,500	0	0	13,000	152,000	**296,800**
2002	0	0	1,000	0	47,500	0	11,500	8,200	0	129,000	0	0	12,000	166,000	**375,200**
2003	0	0	1,000	0	54,500	0	15,500	7,500	0	161,000	0	0	9,100	180,000	**428,600**
2004	0	0	1,000	0	48,500	0	8,600	6,800	0	149,000	0	0	8,400	151,000	**373,300**
2005	0	0	1,000	0	40,500	0	7,200	6,100	0	90,500	0	0	7,100	182,000	**334,400**
2006	0	0	1,000	0	48,000	0	7,200	3,200	0	80,500	0	0	4,500	166,000	**310,400**
2007	0	0	1,000	0	45,000	0	3,900	3,300	0	80,000	0	0	4,700	183,000	**320,900**
2008	0	0	1,000	0	52,000	0	5,300	3,000	0	64,500	0	0	4,500	198,000	**328,300**
2009	0	0	1,000	0	46,000	0	8,700	4,200	0	104,000	0	0	4,800	145,000	**313,700**
1991-2009 Average	**0**	**0**	**1,000**	**0**	**40,684**	**0**	**7,721**	**8,916**	**0**	**95,658**	**0**	**0**	**11,900**	**145,211**	**311,089**

1991 - 2009 Municipal Pumping (Acre-Feet) In Southeastern Arizona Planning Area (Data From USGS and ADWR Arizona Water Atlas)

Basin	Aravaipa Canyon	Bonita Creek	Cienega Creek	Donnelly Wash	Douglas[1]	Dripping Springs Wash	Duncan Valley	Lower San Pedro	Morenci	Safford	San Bernadino Valley	San Rafael	Upper San Pedro	Willcox	Total
1991	300	2,800	450	300	5,500	300	650	2,500	900	3,100	300	300	14,500	2,500	34,400
1992	300	2,800	500	300	5,400	300	650	2,400	950	3,100	300	300	15,000	2,600	34,900
1993	300	2,200	500	300	4,800	300	650	2,500	1,000	3,200	300	300	15,500	2,500	34,350
1994	300	2,400	500	300	6,000	300	600	2,500	1,100	3,300	300	300	16,500	2,600	37,000
1995	300	3,200	500	300	5,200	300	650	2,500	1,100	3,400	300	300	16,500	2,600	37,150
1996	300	3,300	500	300	7,000	300	700	2,600	1,000	3,400	300	300	16,500	2,700	39,200
1997	300	3,300	550	300	6,000	300	700	2,600	1,000	3,500	300	300	17,500	2,800	39,450
1998	300	3,300	550	300	6,000	300	750	2,400	1,000	3,400	300	300	17,500	2,800	39,200
1999	300	3,300	550	300	6,000	300	800	2,400	1,000	3,400	300	300	17,500	2,600	39,050
2000	300	3,300	550	300	5,800	300	1,000	2,500	1,000	3,500	300	300	18,000	2,700	39,850
2001	300	3,300	600	300	5,000	300	600	2,400	1,300	3,200	300	300	17,000	2,600	37,500
2002	300	3,200	600	300	5,600	300	650	2,500	1,300	3,400	300	300	17,500	2,800	39,050
2003	300	3,200	600	300	6,400	300	600	2,300	1,200	3,200	300	300	17,500	2,700	39,200
2004	300	3,200	600	300	5,100	300	550	2,300	1,600	3,200	300	300	17,000	2,800	37,850
2005	300	3,300	600	300	5,300	300	550	2,300	1,700	3,500	300	300	17,500	2,800	39,050
2006	300	3,300	600	300	5,500	300	550	2,300	1,600	3,700	300	300	17,500	2,800	39,350
2007	300	3,400	600	300	5,600	300	550	2,300	1,900	3,600	300	300	17,500	2,900	39,850
2008	300	3,500	600	300	5,000	300	600	2,300	1,600	3,500	300	300	16,500	2,700	37,800
2009	300	3,000	600	300	6,000	300	550	2,600	1,700	4,000	300	300	17,000	2,800	39,750
1991-2009 Average	**300**	**3,121**	**555**	**300**	**5,642**	**300**	**650**	**2,432**	**1,261**	**3,400**	**300**	**300**	**16,842**	**2,700**	38,103

1991 - 2009 Mining Pumping (Acre-Feet) In Southeastern Arizona Planning Area (Data From USGS and ADWR Arizona Water Atlas)

Basin	Aravaipa Canyon	Bonita Creek	Cienega Creek	Donnelly Wash	Douglas[1]	Dripping Springs Wash	Duncan Valley	Lower San Pedro	Morenci	Safford	San Bernadino Valley	San Rafael	Upper San Pedro	Willcox	Total
1991	0	0	300	0	0	0	0	30,000	14,500	700	0	0	0	300	45,800
1992	0	0	300	0	0	0	0	31,500	12,500	750	0	0	0	300	45,350
1993	0	0	300	0	0	0	0	29,500	14,000	600	0	0	0	300	44,700
1994	0	0	300	0	0	0	0	32,000	14,500	600	0	0	0	300	47,700
1995	0	0	300	0	0	0	0	31,000	13,000	600	0	0	0	300	45,200
1996	0	0	300	0	0	0	0	32,500	16,000	700	0	0	0	300	49,800
1997	0	0	300	0	0	0	0	30,500	18,000	450	0	0	0	300	49,550
1998	0	0	300	0	0	0	0	28,500	18,500	500	0	0	0	300	48,100
1999	0	0	300	0	0	0	0	23,000	18,500	400	0	0	0	450	42,650
2000	0	0	300	0	0	0	0	16,000	18,000	450	0	0	0	300	35,050
2001	0	0	300	0	0	0	0	16,000	8,800	350	0	0	0	300	25,750
2002	0	0	300	0	0	0	0	17,000	7,600	300	0	0	0	300	25,500
2003	0	0	300	0	0	0	0	16,000	9,100	300	0	0	0	300	26,000
2004	0	0	300	0	0	0	0	15,000	6,400	400	0	0	0	300	22,400
2005	0	0	300	0	0	0	0	14,500	6,000	500	0	0	0	300	21,600
2006	0	0	300	0	0	0	0	18,000	7,400	300	0	0	0	300	26,300
2007	0	0	300	0	0	0	0	14,000	12,000	400	0	0	0	300	27,000
2008	0	0	300	0	0	0	0	16,000	8,400	3,600	0	0	0	300	28,600
2009	0	0	300	0	0	0	0	16,500	3,900	3,400	0	0	0	300	24,400
1991-2009 Average	**0**	**0**	**300**	**0**	**0**	**0**	**0**	**22,500**	**11,953**	**805**	**0**	**0**	**0**	**308**	35,866

1991 - 2009 Thermoelectric Power Generation Pumping (Acre-Feet) In Southeastern Arizona Planning Area (Data From USGS and ADWR Arizona Water Atlas)

Basin	Aravaipa Canyon	Bonita Creek	Cienega Creek	Donnelly Wash	Douglas[1]	Dripping Springs Wash	Duncan Valley	Lower San Pedro	Morenci	Safford	San Bernadino Valley	San Rafael	Upper San Pedro	Willcox	Total
1991	0	0	0	0	0	0	0	0	0	0	0	0	0	6,600	6,600
1992	0	0	0	0	0	0	0	0	0	0	0	0	0	6,500	6,500
1993	0	0	0	0	0	0	0	0	0	0	0	0	0	5,000	5,000
1994	0	0	0	0	0	0	0	0	0	0	0	0	0	5,900	5,900
1995	0	0	0	0	0	0	0	0	0	0	0	0	0	5,700	5,700
1996	0	0	0	0	0	0	0	0	0	0	0	0	0	4,100	4,100
1997	0	0	0	0	0	0	0	0	0	0	0	0	0	4,600	4,600
1998	0	0	0	0	0	0	0	0	0	0	0	0	0	5,600	5,600
1999	0	0	0	0	0	0	0	0	0	0	0	0	0	5,700	5,700
2000	0	0	0	0	0	0	0	0	0	0	0	0	0	6,000	6,000
2001	0	0	0	0	0	0	0	0	0	0	0	0	0	5,500	5,500
2002	0	0	0	0	0	0	0	0	0	0	0	0	0	5,200	5,200
2003	0	0	0	0	0	0	0	0	0	0	0	0	0	6,100	6,100
2004	0	0	0	0	0	0	0	0	0	0	0	0	0	5,700	5,700
2005	0	0	0	0	0	0	0	0	0	0	0	0	0	5,800	5,800
2006	0	0	0	0	0	0	0	0	0	0	0	0	0	6,200	6,200
2007	0	0	0	0	0	0	0	0	0	0	0	0	0	6,300	6,300
2008	0	0	0	0	0	0	0	0	0	0	0	0	0	6,000	6,000
2009	0	0	0	0	0	0	0	0	0	0	0	0	0	4,600	4,600
1991-2009 Average	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**5,637**	5,637

1991 - 2009 Total Groundwater Pumping Per Basin (Acre-Feet) In Southeastern Arizona Planning Area (Data From USGS and ADWR Arizona Water Atlas)

Basin	Aravaipa Canyon	Bonita Creek	Cienega Creek	Donnelly Wash	Douglas[1]	Dripping Springs Wash	Duncan Valley	Lower San Pedro	Morenci	Safford	San Bernadino Valley	San Rafael	Upper San Pedro	Willcox	Total
1991	300	2,800	1,750	300	36,500	300	7,850	45,000	15,400	82,800	300	300	31,500	133,400	358,500
1992	300	2,800	1,800	300	39,400	300	5,950	46,400	13,450	63,850	300	300	32,000	121,400	328,550
1993	300	2,200	1,800	300	37,300	300	6,950	44,500	15,000	95,300	300	300	32,000	135,800	372,350
1994	300	2,400	1,800	300	42,500	300	6,500	47,000	15,600	111,900	300	300	32,500	138,800	400,500
1995	300	3,200	1,800	300	35,200	300	5,450	46,000	14,100	95,500	300	300	32,500	132,600	367,850
1996	300	3,300	1,800	300	44,500	300	10,000	47,600	17,000	110,600	300	300	32,000	132,100	400,400
1997	300	3,300	1,850	300	45,500	300	7,000	45,100	19,000	68,450	300	300	33,000	134,700	359,400
1998	300	3,300	1,850	300	43,000	300	6,350	41,900	19,500	71,400	300	300	32,500	136,700	358,000
1999	300	3,300	1,850	300	38,500	300	7,500	35,900	19,500	79,800	300	300	32,500	112,750	333,100
2000	300	3,300	1,850	300	44,800	300	14,500	28,200	19,000	145,950	300	300	32,500	143,000	434,600
2001	300	3,300	1,900	300	46,500	300	8,500	27,300	10,100	76,050	300	300	30,000	160,400	365,550
2002	300	3,200	1,900	300	53,100	300	12,150	27,700	8,900	132,700	300	300	29,500	174,300	444,950
2003	300	3,200	1,900	300	60,900	300	16,100	25,800	10,300	164,500	300	300	26,600	189,100	499,900
2004	300	3,200	1,900	300	53,600	300	9,150	24,100	8,000	152,600	300	300	25,400	159,800	439,250
2005	300	3,300	1,900	300	45,800	300	7,750	22,900	7,700	94,500	300	300	24,600	190,900	400,850
2006	300	3,300	1,900	300	53,500	300	7,750	23,500	9,000	84,500	300	300	22,000	175,300	382,250
2007	300	3,400	1,900	300	50,600	300	4,450	19,600	13,900	84,000	300	300	22,200	192,500	394,050
2008	300	3,500	1,900	300	57,000	300	5,900	21,300	10,000	71,600	300	300	21,000	207,000	400,700
2009	300	3,000	1,900	300	52,000	300	9,250	23,300	5,600	111,400	300	300	21,800	152,700	382,450
1991-2009 Average	**300**	**3,121**	**1,855**	**300**	**46,326**	**300**	**8,371**	**33,847**	**13,213**	**99,863**	**300**	**300**	**28,742**	**153,855**	390,695

[1] Includes Douglas INA

Surface Water Diversions

Basin	Safford
1991	136,000
1992	133,000
1993	130,000
1994	120,000
1995	120,000
1996	103,000
1997	135,000
1998	138,000
1999	116,000
2000	53,500
2001	125,000
2002	68,500
2003	48,500
2004	46,500
2005	117,000
2006	99,000
2007	130,000
2008	129,000
2009	99,500
1991-2009 Average	107,763

Summary of Water Groundwater Use for LCR Planning area basins 1991-2009

1991 - 2009 Agricultural Pumping (Acre-Feet) In Lower Colorado River Planning Area (Data From USGS and ADWR Arizona Water Atlas)

Basin	Butler Valley	Gila Bend	Harquahala INA	Lower Gila	McMullen Valley	Parker	Ranegras Plain	San Simon Wash	Tiger Wash	Western Mexican Drainage	Yuma	Total
1991	0	237,000	2,000	164,000	76,000	3,200	29,000	4,000	0	0	120,000	635,200
1992	0	213,000	3,000	164,000	73,000	2,400	27,000	3,900	0	0	121,000	607,300
1993	0	233,000	6,800	161,000	74,500	1,000	29,000	4,000	0	0	119,000	628,300
1994	2,200	248,000	16,000	169,000	80,500	1,000	31,000	4,300	0	0	122,000	674,000
1995	4,500	256,000	19,500	169,000	80,000	1,000	32,000	3,700	0	0	124,000	689,700
1996	2,300	238,000	29,000	158,000	81,000	1,000	32,500	3,600	0	0	112,000	657,400
1997	8,900	255,000	21,000	162,000	81,000	1,000	31,500	4,400	0	0	115,000	679,800
1998	9,900	203,000	18,000	142,000	72,000	1,000	29,500	3,400	0	0	101,000	579,800
1999	11,000	228,000	23,000	157,000	78,500	1,000	32,500	3,600	0	0	113,000	647,600
2000	9,500	294,000	27,500	171,000	86,000	1,000	34,000	3,800	0	0	121,000	747,800
2001	9,900	285,000	23,000	159,000	89,000	1,000	30,000	4,100	0	0	119,000	720,000
2002	10,500	294,000	42,000	146,000	90,000	1,000	31,000	4,000	0	0	122,000	740,500
2003	9,400	294,000	27,500	127,000	91,500	1,000	28,500	3,800	0	0	111,000	693,700
2004	9,100	285,000	46,500	121,000	94,000	1,000	27,000	3,800	0	0	98,500	685,900
2005	9,800	287,000	43,500	118,000	81,000	1,000	27,500	3,900	0	0	96,000	667,700
2006	14,500	289,000	65,500	115,000	71,000	1,000	29,000	1,000	0	0	102,000	688,000
2007	13,000	291,000	78,000	126,000	70,000	1,000	29,500	1,000	0	0	120,000	729,500
2008	11,000	314,000	85,000	133,000	64,500	1,000	27,500	1,000	0	0	102,000	739,000
2009	6,100	325,000	85,500	133,000	63,000	1,000	26,500	1,000	0	0	80,000	721,100
1991-2009 Average	**7,453**	**266,789**	**34,858**	**147,105**	**78,763**	**1,189**	**29,711**	**3,279**	**0**	**0**	**111,500**	**680,647**

1991 - 2009 Municipal Pumping (Acre-Feet) In Lower Colorado River Planning Area (Data From USGS and ADWR Arizona Water Atlas)

Basin	Butler Valley	Gila Bend	Harquahala INA	Lower Gila	McMullen Valley	Parker	Ranegras Plain	San Simon Wash	Tiger Wash	Western Mexican Drainage	Yuma	Total
1991	300	700	300	1,900	2,700	2,700	300	0	300	300	7,200	16,700
1992	300	700	300	1,800	2,700	2,700	300	0	300	300	7,800	17,200
1993	300	750	300	1,800	2,800	2,800	300	0	300	300	8,300	17,950
1994	300	700	300	1,800	3,100	3,100	300	0	300	300	8,600	18,800
1995	300	700	300	1,800	3,100	3,100	300	0	300	300	8,700	18,900
1996	300	700	300	1,900	3,200	3,200	300	0	300	300	10,500	21,000
1997	300	700	300	1,900	3,200	3,200	300	0	300	300	10,500	21,000
1998	300	650	300	1,900	3,200	3,200	300	0	300	300	10,000	20,450
1999	300	700	300	1,900	3,200	3,200	300	0	300	300	11,000	21,500
2000	300	700	300	2,000	3,300	3,300	350	0	300	300	11,500	22,350
2001	300	750	300	2,100	3,200	3,200	350	0	300	300	5,900	16,700
2002	300	750	300	2,100	3,300	3,300	350	0	300	300	5,900	16,900
2003	300	750	300	1,900	3,500	3,500	350	0	300	300	5,800	17,000
2004	300	750	300	1,800	3,900	3,900	350	0	300	300	11,000	22,900
2005	300	750	300	1,700	3,800	3,800	350	0	300	300	13,500	25,100
2006	300	750	300	1,700	3,900	3,900	350	0	300	300	14,500	26,300
2007	300	700	300	1,600	3,800	3,800	350	0	300	300	14,500	25,950
2008	300	750	300	1,800	3,600	3,600	350	0	300	300	14,500	25,800
2009	300	800	300	1,800	3,700	3,700	350	0	300	300	14,500	26,050
1991-2009 Average	**300**	**724**	**300**	**1,853**	**3,326**	**3,326**	**326**	**0**	**300**	**300**	**10,221**	**20,976**

1991 - 2009 Mining Pumping (Acre-Feet) In Lower Colorado River Planning Area (Data From USGS and ADWR Arizona Water Atlas)

Basin	Butler Valley	Gila Bend	Harquahala INA	Lower Gila	McMullen Valley	Parker	Ranegras Plain	San Simon Wash	Tiger Wash	Western Mexican Drainage	Yuma	Total
1991	0	0	0	0	0	0	0	0	0	0	300	300
1992	0	0	0	0	0	0	0	0	0	0	300	300
1993	0	0	0	0	0	0	0	0	0	0	300	300
1994	0	0	0	0	0	0	0	0	0	0	300	300
1995	0	0	0	0	0	0	0	0	0	0	300	300
1996	0	0	0	0	0	0	0	0	0	0	300	300
1997	0	0	0	0	0	0	0	0	0	0	300	300
1998	0	0	0	0	0	0	0	0	0	0	300	300
1999	0	0	0	0	0	0	0	0	0	0	300	300
2000	0	0	0	0	0	0	0	0	0	0	300	300
2001	0	0	0	0	0	0	0	0	0	0	300	300
2002	0	0	0	0	0	0	0	0	0	0	300	300
2003	0	0	0	0	0	0	0	0	0	0	300	300
2004	0	0	0	0	0	0	0	0	0	0	300	300
2005	0	0	0	0	0	0	0	0	0	0	300	300
2006	0	0	0	0	0	0	0	0	0	0	300	300
2007	0	0	0	0	0	0	0	0	0	0	300	300
2008	0	0	0	0	0	0	0	0	0	0	300	300
2009	0	0	0	0	0	0	0	0	0	0	300	300
1991-2009 Average	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**300**	**300**

1991 - 2009 Thermoelectric Power Generation Pumping (Acre-Feet) In Lower Colorado River Planning Area (Data From USGS and ADWR Arizona Water Atlas)

Basin	Butler Valley	Gila Bend	Harquahala INA	Lower Gila	McMullen Valley	Parker	Ranegras Plain	San Simon Wash	Tiger Wash	Western Mexican Drainage	Yuma	Total
1991	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0	0	0	0	0	0
1996	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	0	0	0	0	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0	0	0	0	0	0
2001	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0
2003	0	0	0	0	0	0	0	0	0	0	0	0
2004	0	0	0	4,900	0	0	0	0	0	0	0	4,900
2005	0	0	0	4,400	0	0	0	0	0	0	0	4,400
2006	0	0	0	5,400	0	0	0	0	0	0	0	5,400
2007	0	0	0	6,700	0	0	0	0	0	0	0	6,700
2008	0	0	0	7,800	0	0	0	0	0	0	0	7,800
2009	0	0	0	8,900	0	0	0	0	0	0	0	8,900
1991-2009 Average	**0**	**0**	**0**	**2,005**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2,005**

1991 - 2009 Total Groundwater Pumping Per Basin (Acre-Feet) In Lower Colorado River Planning Area (Data From USGS and ADWR Arizona Water Atlas)

Basin	Butler Valley	Gila Bend	Harquahala INA	Lower Gila	McMullen Valley	Parker	Ranegras Plain	San Simon Wash	Tiger Wash	Western Mexican Drainage	Yuma	Total
1991	300	237,700	2,300	165,900	78,700	5,900	29,300	4,000	300	300	127,500	652,200
1992	300	213,700	3,300	165,800	75,700	5,100	27,300	3,900	300	300	129,100	624,800
1993	300	233,750	7,100	162,800	77,300	3,800	29,300	4,000	300	300	127,600	646,550
1994	2,500	248,700	16,300	170,800	83,600	4,100	31,300	4,300	300	300	130,900	693,100
1995	4,800	256,700	19,800	170,800	83,100	4,100	32,300	3,700	300	300	133,000	708,900
1996	2,600	238,700	29,300	159,900	84,200	4,200	32,800	3,600	300	300	122,800	678,700
1997	9,200	255,700	21,300	163,900	84,200	4,200	31,800	4,400	300	300	125,800	701,100
1998	10,200	203,650	18,300	143,900	75,200	4,200	29,800	3,400	300	300	111,300	600,550
1999	11,300	228,700	23,300	158,900	81,700	4,200	32,800	3,600	300	300	124,300	669,400
2000	9,800	294,700	27,800	173,000	89,300	4,300	34,350	3,800	300	300	132,800	770,450
2001	10,200	285,750	23,300	161,100	92,200	4,200	30,350	4,100	300	300	125,200	737,000
2002	10,800	294,750	42,300	148,100	93,300	4,300	31,350	4,000	300	300	128,200	757,700
2003	9,700	294,750	27,800	128,900	95,000	4,500	28,850	3,800	300	300	117,100	711,000
2004	9,400	285,750	46,800	127,700	97,900	4,900	27,350	3,800	300	300	109,800	714,000
2005	10,100	287,750	43,800	124,100	84,800	4,800	27,850	3,900	300	300	109,800	697,500
2006	14,800	289,750	65,800	122,100	74,900	4,900	29,350	1,000	300	300	116,800	720,000
2007	13,300	291,700	78,300	134,300	73,800	4,800	29,850	1,000	300	300	134,800	762,450
2008	11,300	314,750	85,300	142,600	68,100	4,600	27,850	1,000	300	300	116,800	772,900
2009	6,400	325,800	85,800	143,700	66,700	4,700	26,850	1,000	300	300	94,800	756,350
1991-2009 Average	**7,753**	**267,513**	**35,158**	**150,963**	**82,089**	**4,516**	**30,037**	**3,279**	**300**	**300**	**122,021**	**703,929**

LCR Surface Water For Agricultural Uses

Basin	Gila Bend	Harquahala INA	Lower Gila	Parker	Yuma	Total
1,991	70,000	35,000	435,000	664,000	725,000	1,929,000
1,992	88,000	21,000	369,000	611,000	691,000	1,780,000
1,993	66,500	27,500	285,000	630,000	683,000	1,692,000
1,994	76,000	52,500	357,000	708,000	718,000	1,911,500
1,995	57,000	103,000	377,000	696,000	738,000	1,971,000
1,996	78,000	113,500	400,000	748,000	772,000	2,111,500
1,997	69,500	116,000	410,000	666,000	727,000	1,988,500
1,998	74,500	78,000	393,000	625,000	744,000	1,914,500
1,999	72,500	55,500	365,000	631,000	794,000	1,918,000
2,000	48,000	62,500	388,000	663,000	820,000	1,981,500
2,001	63,500	107,000	389,000	622,000	776,000	1,957,500
2,002	55,000	97,000	415,000	654,000	807,000	2,028,000
2,003	45,500	67,000	394,000	643,000	752,000	1,901,500
2,004	50,500	32,500	369,000	620,000	746,000	1,818,000
2,005	55,500	44,500	349,000	614,000	729,000	1,792,000
2,006	62,500	70,000	384,000	642,000	709,000	1,867,500
2,007	59,000	61,500	388,000	640,000	765,000	1,913,500
2,008	48,500	34,500	383,000	630,000	733,000	1,829,000
2,009	70,000	37,000	371,000	669,000	736,000	1,883,000
1991-2009 Average	**63,684**	**63,974**	**380,053**	**651,368**	**745,526**	**1,904,605**

LCR Planning Area Drainage Pumping (Acre-Feet/Year)

Year	Lower Gila Basin	Yuma Basin	Yuma 242	Total
1991	145,000	73,000	31,000	**249,000**
1992	116,000	51,000	23,500	**190,500**
1993	9,000	69,500	6,900	**85,400**
1994	50,000	53,000	19,000	**122,000**
1995	122,000	86,000	12,500	**220,500**
1996	120,000	83,000	6,200	**209,200**
1997	91,500	99,000	450	**190,950**
1998	98,500	107,000	5,200	**210,700**
1999	95,500	113,000	4,000	**212,500**
2000	110,000	107,000	4,300	**221,300**
2001	108,000	119,000	2,300	**229,300**
2002	119,000	118,000	2,700	**239,700**
2003	115,000	125,000	12,500	**252,500**
2004	106,000	98,000	23,500	**227,500**
2005	111,000	85,500	28,000	**224,500**
2006	104,000	99,000	38,500	**241,500**
2007	113,000	94,000	51,000	**258,000**
2008	120,000	105,000	58,000	**283,000**
2009	106,000	84,500	45,500	**236,000**
1991-2009 Average	**103,132**	**93,132**	**19,739**	**216,003**

Summary of Water Groundwater Use for UCR Planning area basins 1991-2009

1991 - 2009 Agricultural Pumping (Acre-Feet) In Upper Colorado River Planning Area (Data From USGS and ADWR Arizona Water Atlas)										
Basin	Big Sandy	Bill Williams	Detrital Valley	Hualapai Valley	Lake Havasu	Lake Mohave	Meadview	Peach Springs	Sacramento Valley	Total
1991	0	18,500	0	0	0	36,500	0	0	0	55,000
1992	0	18,500	0	0	0	33,000	0	0	0	51,500
1993	0	18,500	0	0	0	35,500	0	0	0	54,000
1994	0	18,500	0	0	0	40,500	0	0	0	59,000
1995	0	4,200	0	0	0	38,000	0	0	0	42,200
1996	0	4,200	0	0	0	44,000	0	0	0	48,200
1997	0	4,200	0	0	0	41,500	0	0	0	45,700
1998	0	4,200	0	0	0	28,500	0	0	0	32,700
1999	0	4,200	0	0	0	31,000	0	0	0	35,200
2000	0	4,200	0	0	0	33,000	0	0	0	37,200
2001	0	3,100	0	0	0	32,000	0	0	0	35,100
2002	0	3,200	0	0	0	31,000	0	0	0	34,200
2003	0	3,200	0	0	0	31,500	0	0	0	34,700
2004	0	5,500	0	0	0	31,500	0	0	0	37,000
2005	0	5,400	0	0	0	26,000	0	0	0	31,400
2006	0	2,700	0	0	0	29,500	0	0	0	32,200
2007	0	2,700	0	0	0	29,000	0	0	0	31,700
2008	0	2,300	0	0	0	29,500	0	0	0	31,800
2009	0	2,200	0	0	0	22,500	0	0	0	24,700
1991-2009 Average	**0**	**6,816**	**0**	**0**	**0**	**32,842**	**0**	**0**	**0**	39,658

1991 - 2009 Municipal Pumping (Acre-Feet) In Upper Colorado River Planning Area (Data From USGS and ADWR Arizona Water Atlas)										
Basin	Big Sandy	Bill Williams	Detrital Valley	Hualapai Valley	Lake Havasu	Lake Mohave	Meadview	Peach Springs	Sacramento Valley	Total
1991	300	0	300	4,400	12,500	11,000	300	300	1,300	30,400
1992	300	0	300	5,400	13,000	13,500	300	300	1,500	34,600
1993	300	0	300	5,400	13,500	12,500	300	300	1,500	34,100
1994	300	0	300	6,000	14,500	13,000	300	300	1,600	36,300
1995	300	0	300	6,300	15,000	13,500	300	300	1,700	37,700
1996	300	0	300	7,000	15,500	15,000	300	300	1,700	40,400
1997	300	0	300	6,900	16,000	15,500	300	300	1,600	41,200
1998	300	0	300	6,800	15,000	15,500	300	300	1,800	40,300
1999	300	0	300	7,500	14,500	16,500	300	300	1,900	41,600
2000	300	0	300	8,200	16,000	17,500	300	300	1,800	44,700
2001	300	0	300	8,000	16,500	18,000	300	300	2,000	45,700
2002	300	0	300	8,500	16,500	17,500	300	350	2,000	45,750
2003	300	0	300	8,300	17,000	17,500	300	350	2,000	46,050
2004	300	0	300	8,400	19,000	20,000	300	350	2,400	51,050
2005	300	0	300	9,100	13,500	21,000	300	350	2,300	47,150
2006	300	0	300	8,800	15,500	23,000	300	350	2,500	51,050
2007	300	0	300	9,000	17,000	22,500	300	350	2,800	52,550
2008	300	0	300	9,200	17,000	22,000	300	350	2,900	52,350
2009	300	0	300	8,600	17,000	20,000	300	350	2,700	49,550
1991-2009 Average	**300**	**0**	**300**	**7,463**	**15,500**	**17,105**	**300**	**321**	**2,000**	43,289

1991 - 2009 Mining Pumping (Acre-Feet) In Upper Colorado River Planning Area (Data From USGS and ADWR Arizona Water Atlas)										
Basin	Big Sandy/Bill Williams	Bill Williams	Detrital Valley	Hualapai Valley	Lake Havasu	Lake Mohave	Meadview	Peach Springs	Sacramento Valley	Total
1991	16,000		0	300	300	300	0	300	300	17,500
1992	13,500		0	300	300	300	0	300	300	15,000
1993	17,000		0	300	300	300	0	300	300	18,500
1994	19,000		0	300	300	300	0	300	300	20,500
1995	19,000		0	300	300	300	0	300	300	20,500
1996	20,000		0	300	300	300	0	300	300	21,500
1997	22,000		0	300	300	300	0	300	300	23,500
1998	19,000		0	300	300	300	0	300	300	20,500
1999	20,500		0	300	300	300	0	300	300	22,000
2000	22,000		0	300	300	300	0	300	350	23,550
2001	23,000		0	300	300	300	0	300	350	24,550
2002	15,000		0	300	300	300	0	300	500	16,700
2003	19,000		0	300	300	300	0	300	300	20,500
2004	19,500		0	300	300	300	0	300	300	21,000
2005	18,000		0	300	300	300	0	300	300	19,500
2006	15,000		0	300	300	300	0	300	300	16,500
2007	18,000		0	300	300	300	0	300	300	19,500
2008	20,000		0	300	300	300	0	300	300	21,500
2009	20,000		0	300	300	300	0	300	4,500	25,700
1991-2009 Average	**18,711**		**0**	**300**	**300**	**300**	**0**	**300**	**537**	20,447

1991 - 2009 Thermoelectric Power Generation Pumping (Acre-Feet) In Upper Colorado River Planning Area (Data From USGS and ADWR Arizona Water Atlas)

Basin	Big Sandy	Bill Williams	Detrital Valley	Hualapai Valley	Lake Havasu	Lake Mohave	Meadview	Peach Springs	Sacramento Valley	Total
1991	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0	0	0	0
1996	0	0	0	0	0	0	0	0	0	0
1997	0	0	0	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0	0	0	0
2001	0	0	0	0	0	0	0	0	1,100	1,100
2002	0	0	0	0	0	0	0	0	1,600	1,600
2003	0	0	0	0	0	0	0	0	1,300	1,300
2004	0	0	0	0	0	0	0	0	1,100	1,100
2005	0	0	0	0	0	0	0	0	850	850
2006	0	0	0	0	0	0	0	0	1,300	1,300
2007	0	0	0	0	0	0	0	0	1,900	1,900
2008	0	0	0	0	0	0	0	0	1,600	1,600
2009	0	0	0	0	0	0	0	0	1,600	1,600
1991-2009 Average	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**650**	650

1991 - 2009 Total Groundwater Pumping Per Basin (Acre-Feet) In Upper Colorado River Panning Area (Data From USGS and ADWR Arizona Water Atlas)

Basin	Big Sandy	Bill Williams	Detrital Valley	Hualapai Valley	Lake Havasu	Lake Mohave	Meadview	Peach Springs	Sacramento Valley	Total
1991	16,300	18,500	300	4,700	12,800	47,800	300	600	1,600	102,900
1992	13,800	18,500	300	5,700	13,300	46,800	300	600	1,800	101,100
1993	17,300	18,500	300	5,700	13,800	48,300	300	600	1,800	106,600
1994	19,300	18,500	300	6,300	14,800	53,800	300	600	1,900	115,800
1995	19,300	4,200	300	6,600	15,300	51,800	300	600	2,000	100,400
1996	20,300	4,200	300	7,300	15,800	59,300	300	600	2,000	110,100
1997	22,300	4,200	300	7,200	16,300	57,300	300	600	1,900	110,400
1998	19,300	4,200	300	7,100	15,300	44,300	300	600	2,100	93,500
1999	20,800	4,200	300	7,800	14,800	47,800	300	600	2,200	98,800
2000	22,300	4,200	300	8,500	16,300	50,800	300	600	2,150	105,450
2001	23,300	3,100	300	8,300	16,800	50,300	300	600	3,450	106,450
2002	15,300	3,200	300	8,800	16,800	48,800	300	650	4,100	98,250
2003	19,300	3,200	300	8,600	17,300	49,300	300	650	3,600	102,550
2004	19,800	5,500	300	8,700	19,300	51,800	300	650	3,800	110,150
2005	18,300	5,400	300	9,400	13,800	47,300	300	650	3,450	98,900
2006	15,300	2,700	300	9,100	15,800	52,800	300	650	4,100	101,050
2007	18,300	2,700	300	9,300	17,300	51,800	300	650	5,000	105,650
2008	20,300	2,300	300	9,500	17,300	51,800	300	650	4,800	107,250
2009	20,300	2,200	300	8,900	17,300	42,800	300	650	8,800	101,550
1991-2009 Average	**19,011**	**6,816**	**300**	**7,763**	**15,800**	**50,247**	**300**	**621**	**3,187**	104,045

SW Used for AG

Basin	Lake Mohave
1991	59,000
1992	44,500
1993	59,000
1994	58,000
1995	62,500
1996	66,500
1997	67,500
1998	61,000
1999	79,500
2000	66,000
2001	63,500
2002	62,000
2003	57,500
2004	69,000
2005	72,500
2006	59,500
2007	70,000
2008	74,000
2009	64,000
1991-2009 Average	72,500

Summary of Water Groundwater Use for WP Planning area basins 1991-2009

1991 - 2009 Agricultural Pumping (Acre-Feet) In Western Arizona Planning Area (Data From USGS and ADWR Arizona Water Atlas)							
Basin	Coconino Plateau	Grand Wash	Kanab Plateau	Paria	Shivwits Plateau	Virgin River	Total
1991	0	0	1,500	0	0	7,700	9,200
1992	0	0	1,500	0	0	7,200	8,700
1993	0	0	1,500	0	0	7,700	9,200
1994	0	0	1,500	0	0	8,100	9,600
1995	0	0	1,500	0	0	8,400	9,900
1996	0	0	1,500	0	0	8,600	10,100
1997	0	0	1,500	0	0	8,000	9,500
1998	0	0	1,500	0	0	7,500	9,000
1999	0	0	1,500	0	0	8,500	10,000
2000	0	0	1,500	0	0	8,800	10,300
2001	0	0	1,000	0	0	2,000	3,000
2002	0	0	1,000	0	0	2,000	3,000
2003	0	0	1,000	0	0	2,100	3,100
2004	0	0	1,000	0	0	2,200	3,200
2005	0	0	1,000	0	0	2,200	3,200
2006	0	0	1,100	0	0	1,000	2,100
2007	0	0	1,100	0	0	1,000	2,100
2008	0	0	1,000	0	0	1,000	2,000
2009	0	0	1,000	0	0	1,000	2,000
1991-2009 Average	**0**	**0**	**1,274**	**0**	**0**	**5,000**	6,274

1991 - 2009 Municipal Pumping (Acre-Feet) In Western Arizona Planning Area (Data From USGS and ADWR Arizona Water Atlas)							
Basin	Coconino Plateau	Grand Wash	Kanab Plateau	Paria	Shivwits Plateau	Virgin River	Total
1991	350	300	850	300	300	300	2,400
1992	350	300	900	300	300	300	2,450
1993	350	300	950	300	300	300	2,500
1994	400	300	950	300	300	300	2,550
1995	400	300	1,000	300	300	300	2,600
1996	400	300	1,000	300	300	300	2,600
1997	400	300	1,100	300	300	300	2,700
1998	450	300	1,100	300	300	300	2,750
1999	450	300	1,300	300	300	300	2,950
2000	500	300	1,400	300	300	300	3,100
2001	500	300	1,500	300	300	300	3,200
2002	500	300	1,600	300	300	300	3,300
2003	500	300	1,600	300	300	300	3,300
2004	500	300	1,700	300	300	300	3,400
2005	500	300	1,700	300	300	300	3,400
2006	500	300	300	300	300	300	2,000
2007	500	300	300	300	300	300	2,000
2008	500	300	300	300	300	300	2,000
2009	500	300	300	300	300	400	2,100
1991-2009 Average	**450**	**300**	**1,045**	**300**	**300**	**305**	2,700

1991 - 2009 Mining Pumping (Acre-Feet) In Western Plateau Planning Area (Data From USGS and ADWR Arizona Water Atlas)							
Basin	Coconino Plateau	Grand Wash	Kanab Plateau	Paria	Shivwits Plateau	Virgin River	Total
1991	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0
1996	0	0	0	0	0	0	0
1997	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0
2001	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0
2003	0	0	0	0	0	0	0
2004	0	0	0	0	0	0	0
2005	0	0	0	0	0	0	0
2006	0	0	0	0	0	0	0
2007	0	0	0	0	0	0	0
2008	0	0	0	0	0	0	0
2009	0	0	0	0	0	0	0
1991-2009 Average	**0**	**0**	**0**	**0**	**0**	**0**	0

1991 - 2009 Thermoelectric Power Generation Pumping (Acre-Feet) In Western Plateau Planning Area (Data From USGS and ADWR Arizona Water Atlas)

Basin	Coconino Plateau	Grand Wash	Kanab Plateau	Paria	Shivwits Plateau	Virgin River	Total
1991	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0
1996	0	0	0	0	0	0	0
1997	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0
2001	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0
2003	0	0	0	0	0	0	0
2004	0	0	0	0	0	0	0
2005	0	0	0	0	0	0	0
2006	0	0	0	0	0	0	0
2007	0	0	0	0	0	0	0
2008	0	0	0	0	0	0	0
2009	0	0	0	0	0	0	0
1991-2009 Average	**0**	**0**	**0**	**0**	**0**	**0**	0

1991 - 2009 Total Groundwater Pumping Per Basin (Acre-Feet) In Western Plateau Planning Area (Data From USGS and ADWR Arizona Water Atlas)

Basin	Coconino Plateau	Grand Wash	Kanab Plateau	Paria	Shivwits Plateau	Virgin River	Total
1991	350	300	2,350	300	300	8,000	11,600
1992	350	300	2,400	300	300	7,500	11,150
1993	350	300	2,450	300	300	8,000	11,700
1994	400	300	2,450	300	300	8,400	12,150
1995	400	300	2,500	300	300	8,700	12,500
1996	400	300	2,500	300	300	8,900	12,700
1997	400	300	2,600	300	300	8,300	12,200
1998	450	300	2,600	300	300	7,800	11,750
1999	450	300	2,800	300	300	8,800	12,950
2000	500	300	2,900	300	300	9,100	13,400
2001	500	300	2,500	300	300	2,300	6,200
2002	500	300	2,600	300	300	2,300	6,300
2003	500	300	2,600	300	300	2,400	6,400
2004	500	300	2,700	300	300	2,500	6,600
2005	500	300	2,700	300	300	2,500	6,600
2006	500	300	1,400	300	300	1,300	4,100
2007	500	300	1,400	300	300	1,300	4,100
2008	500	300	1,300	300	300	1,300	4,000
2009	500	300	1,300	300	300	1,400	4,100
1991-2009 Average	**450**	**300**	**2,318**	**300**	**300**	**5,305**	8,974

Summary of Water Groundwater Use
for EP Planning area basins 1991-2009

1991 - 2009 Agricultural Pumping (Acre-Feet) In Eastern Plateau Planning Area (Data From USGS and ADWR Arizona Water Atlas)	
Year	**Little Colorado River Plateau[2]**
1991	37,000
1992	36,000
1993	36,000
1994	34,500
1995	39,000
1996	21,000
1997	21,500
1998	27,500
1999	25,500
2000	15,500
2001	13,500
2002	17,000
2003	15,000
2004	10,000
2005	8,800
2006	8,700
2007	8,800
2008	7,900
2009	8,600
1991-2009 Average	**20,621**

1991 - 2009 Municipal Pumping (Acre-Feet) In Eastern Plateau Planning Area (Data From USGS and ADWR Arizona Water Atlas)	
Year	**Little Colorado River Plateau[2]**
1991	29,000
1992	29,000
1993	29,000
1994	30,500
1995	30,500
1996	34,000
1997	34,000
1998	32,500
1999	35,000
2000	38,000
2001	37,000
2002	39,000
2003	38,000
2004	38,000
2005	35,000
2006	37,500
2007	40,500
2008	39,500
2009	35,200
1991-2009 Average	**34,800**

1991 - 2009 Mining Pumping (Acre-Feet) In Eastern Plateau Planning Area (Data From USGS and ADWR Arizona Water Atlas)	
Basin	**Little Colorado River Plateau[1]**
1991	4,200
1992	4,000
1993	3,900
1994	4,200
1995	4,500
1996	4,200
1997	4,300
1998	4,200
1999	4,600
2000	4,900
2001	4,800
2002	4,900
2003	4,700
2004	4,700
2005	4,900
2006	1,500
2007	1,500
2008	1,500
2009	1,700
1991-2009 Average	**3,853**

1991 - 2009 Thermoelectric Power Generation Pumping (Acre-Feet) In Eastern Plateau Planning Area (Data From USGS and ADWR Arizona Water Atlas)

Basin	Little Colorado River Plateau[1]
1991	27,500
1992	29,000
1993	29,500
1994	34,500
1995	27,000
1996	29,500
1997	32,000
1998	32,000
1999	34,000
2000	33,000
2001	37,000
2002	35,000
2003	36,000
2004	36,000
2005	36,500
2006	37,000
2007	43,000
2008	43,500
2009	43,000
1991-2009 Average	**34,474**

1991 - 2009 Total Groundwater Pumping Per Basin (Acre-Feet) In Eastern Plateau Planning Area (Data From USGS and ADWR Arizona Water Atlas)

Basin	Little Colorado River
1991	97,700
1992	98,000
1993	98,400
1994	103,700
1995	101,000
1996	88,700
1997	91,800
1998	96,200
1999	99,100
2000	91,400
2001	92,300
2002	95,900
2003	93,700
2004	88,700
2005	85,200
2006	84,700
2007	93,800
2008	92,400
2009	88,500
1991-2009 Average	**93,747**

1991 -2009 Surface Water (Acre-Feet) Use For Navajo Generating Station Electrical Power Generation (Data From USBR Consumptive Use Reports)

Year	Little Colorado River Plateau	Total
1991	NA	NA
1992	NA	NA
1993	NA	NA
1994	NA	NA
1995	NA	NA
1996	21,427	21,427
1997	22,364	22,364
1998	25,017	25,017
1999	26,697	26,697
2000	28,709	28,709
2001	27,620	27,620
2002	28,415	28,415
2003	26,284	26,284
2004	27,375	27,375
2005	26,200	26,200
2006	26,660	26,660
2007	27,604	27,604
2008	26,334	26,334
2009	NA	NA
1991-2009 Average	26,208	26,208

Summary of Water Groundwater Use for CH Planning area basins 1991-2009

1991 - 2009 Agricultural Pumping (Acre-Feet) In Central Highlands Planning Area (Data From USGS and ADWR Arizona Water Atlas)						
Basin	Agua Fria	Salt River	Tonto Creek	Upper Hassayampa	Verde River	Total
1991	1,200	1,000	1,000	0	7,200	10,400
1992	1,300	1,000	1,000	0	8,000	11,300
1993	1,400	1,000	1,000	0	8,800	12,200
1994	1,300	1,000	1,000	0	8,200	11,500
1995	1,400	1,000	1,000	0	8,500	11,900
1996	1,500	1,000	1,000	0	9,700	13,200
1997	1,400	1,000	1,000	0	9,000	12,400
1998	1,100	1,000	1,000	0	7,100	10,200
1999	1,100	1,000	1,000	0	6,700	9,800
2000	1,500	1,000	1,000	0	9,300	12,800
2001	1,600	1,000	1,000	0	11,500	15,100
2002	1,600	1,000	1,000	0	12,000	15,600
2003	1,500	1,000	1,000	0	11,000	14,500
2004	1,200	1,000	1,000	0	10,000	13,200
2005	1,400	1,000	1,000	0	11,000	14,400
2006	1,800	1,000	1,000	0	9,900	13,700
2007	1,900	1,000	1,000	0	10,000	13,900
2008	1,700	1,000	1,000	0	3,100	6,800
2009	1,900	1,000	1,000	0	3,200	7,100
1991-2009 Average	**1,463**	**1,000**	**1,000**	**0**	**8,642**	12,105

1991 - 2009 Municipal Pumping (Acre-Feet) In Central Highlands Planning Area (Data From USGS and ADWR Arizona Water Atlas)						
Basin	Agua Fria	Salt River	Tonto Creek	Upper Hassayampa	Verde River	Total
1991	950	3,100	1,400	2,100	9,300	16,850
1992	1,000	3,000	1,400	2,100	9,000	16,500
1993	1,100	3,300	1,600	2,200	10,000	18,200
1994	1,200	3,200	1,600	2,400	10,500	18,900
1995	1,300	3,200	1,800	2,400	11,000	19,700
1996	1,300	3,500	1,800	2,600	12,000	21,200
1997	1,400	3,500	1,900	2,600	12,000	21,400
1998	1,500	3,400	1,800	2,500	11,500	20,700
1999	1,600	3,200	1,900	2,700	12,000	21,400
2000	1,700	3,400	2,100	2,700	13,000	22,900
2001	1,700	3,300	2,200	2,400	14,000	23,600
2002	1,800	3,300	2,200	2,600	15,500	25,400
2003	1,800	3,300	2,300	2,600	15,500	25,500
2004	1,800	4,100	2,400	2,700	16,000	27,000
2005	1,800	4,100	2,500	2,500	15,500	26,400
2006	1,800	4,000	2,500	3,000	16,000	27,300
2007	1,800	4,200	2,700	2,700	16,000	27,400
2008	1,800	4,100	2,500	2,600	15,500	26,500
2009	1,800	4,100	2,500	2,600	15,500	26,500
1991-2009 Average	**1,534**	**3,542**	**2,058**	**2,526**	**13,147**	22,808

1991 - 2009 Mining Pumping (Acre-Feet) In Central Highlands Planning Area (Data From USGS and ADWR Arizona Water Atlas)						
Basin	Agua Fria	Salt River	Tonto Creek	Upper Hassayampa	Verde River	Total
1991	0	10,000	0	0	1,200	11,200
1992	0	10,500	0	0	1,200	11,700
1993	0	10,000	0	0	1,200	11,200
1994	0	10,500	0	0	1,300	11,800
1995	0	10,500	0	0	1,300	11,800
1996	0	11,000	0	0	1,300	12,300
1997	0	6,500	0	0	1,100	7,600
1998	0	5,000	0	0	1,200	6,200
1999	0	6,000	0	0	1,200	7,200
2000	0	8,000	0	0	1,200	9,200
2001	0	9,500	0	0	1,200	10,700
2002	0	8,000	0	0	1,200	9,200
2003	0	7,400	0	0	1,300	8,700
2004	0	7,700	0	0	1,200	8,900
2005	0	8,100	0	0	1,200	9,300
2006	0	7,800	0	0	1,200	9,000
2007	0	7,600	0	0	1,200	8,800
2008	0	6,500	0	0	1,100	7,600
2009	0	5,500	0	0	1,300	6,800
1991-2009 Average	**0**	**8,216**	**0**	**0**	**1,216**	9,432

1991 - 2009 Thermoelectric Power Generation Pumping (Acre-Feet) In Central Highlands Planning Area (Data From USGS and ADWR Arizona Water Atlas)						
Basin	Agua Fria	Salt River	Tonto Creek	Upper Hassayampa	Verde River	Total
1991	0	0	0	0	0	0
1992	0	0	0	0	0	0
1993	0	0	0	0	0	0
1994	0	0	0	0	0	0
1995	0	0	0	0	0	0
1996	0	0	0	0	0	0
1997	0	0	0	0	0	0
1998	0	0	0	0	0	0
1999	0	0	0	0	0	0
2000	0	0	0	0	0	0
2001	0	0	0	0	0	0
2002	0	0	0	0	0	0
2003	0	0	0	0	0	0
2004	0	0	0	0	0	0
2005	0	0	0	0	0	0
2006	0	0	0	0	0	0
2007	0	0	0	0	0	0
2008	0	0	0	0	0	0
2009	0	0	0	0	0	0
1991-2009 Average	**0**	**0**	**0**	**0**	**0**	0

1991 - 2009 Total Groundwater Pumping Per Basin (Acre-Feet) In Central Highlands Planning Area (Data From USGS and ADWR Arizona Water Atlas)						
Basin	Agua Fria	Salt River	Tonto Creek	Upper Hassayampa	Verde River	Total
1991	2,150	14,100	2,400	2,100	17,700	38,450
1992	2,300	14,500	2,400	2,100	18,200	39,500
1993	2,500	14,300	2,600	2,200	20,000	41,600
1994	2,500	14,700	2,600	2,400	20,000	42,200
1995	2,700	14,700	2,800	2,400	20,800	43,400
1996	2,800	15,500	2,800	2,600	23,000	46,700
1997	2,800	11,000	2,900	2,600	22,100	41,400
1998	2,600	9,400	2,800	2,500	19,800	37,100
1999	2,700	10,200	2,900	2,700	19,900	38,400
2000	3,200	12,400	3,100	2,700	23,500	44,900
2001	3,300	13,800	3,200	2,400	26,700	49,400
2002	3,400	12,300	3,200	2,600	28,700	50,200
2003	3,300	11,700	3,300	2,600	27,800	48,700
2004	3,000	12,800	3,400	2,700	27,200	49,100
2005	3,200	13,200	3,500	2,500	27,700	50,100
2006	3,600	12,800	3,500	3,000	27,100	50,000
2007	3,700	12,800	3,700	2,700	27,200	50,100
2008	3,500	11,600	3,500	2,600	19,700	40,900
2009	3,700	10,600	3,500	2,600	20,000	40,400
1991-2009 Average	**2,997**	**12,758**	**3,058**	**2,526**	**23,005**	44,345

APPENDIX C

ADWR HYDROLOGIC MONITORING PROGRAM

Arizona Department of Water Resources Groundwater Data Collection Program:

Program Overview, Current Challenges and Potential Opportunities for Data Sharing

INTRODUCTION

This appendix provides information on the Arizona Department of Water Resources (ADWR) water level data collection program, program challenges and potential opportunities for cooperation and data sharing.

GENERAL BACKGROUND ON USES AND USERS OF WATER LEVEL DATA

Groundwater level measurements are the most fundamental hydrologic data that are collected by the Arizona Department of Water Resources ADWR. Water level data provide information on changing groundwater storage conditions, and reflect the impacts of varying natural and anthropogenic stresses on the aquifer. While every user of water level data may have their own specific area of interest and use for the data, the underlying need and value of the data is substantial.

ADWR uses water level data extensively for various monitoring activities, regulatory permitting, hydrologic analysis and modeling, long-term planning and decision making. ADWR's groundwater data are also used by a wide range of individuals and organizations, including: other government agencies; hydrologists; water managers; environmental specialists; consultants; academic researchers; water providers; farmers; ranchers; developers; businesses; land owners; well owners and the general public.

HISTORY OF WATER LEVEL DATA COLLECTION IN ARIZONA

Prior to the establishment of ADWR in 1980, the U.S. Geological Survey (USGS) collected most of the water level data in the state. After 1980, the ADWR Hydrology/ Basic Data Unit assumed the responsibility of collecting water level data in most areas of the state (with the main exception of Tribal lands). The ADWR Basic Data Unit was patterned after similar data collection units in the United States Geological Survey (USGS). In establishing the Basic Data Unit, ADWR adopted all data collection protocols from the USGS, including field inventories, water-level measurements, water quality sampling, and discharge measurements. This enables the data that ADWR collects to have full compatibility with all USGS historical data as well as other state agencies that adopt the Collection of Basic Record (CBR) Program from the USGS.

ADWR GROUNDWATER LEVEL MEASUREMENTS

One of the primary types of hydrologic data collected by ADWR is groundwater level data. ADWR's groundwater data collection program currently consists of two main activities: annual manual water level measurements made by Department field personnel at approximately 1,700 GWSI "Index" well sites located throughout the state, and automated water level measurements made at about 120 statewide well sites equipped mainly with pressure transducer, data logger and radio telemetry equipment (Figure 1).

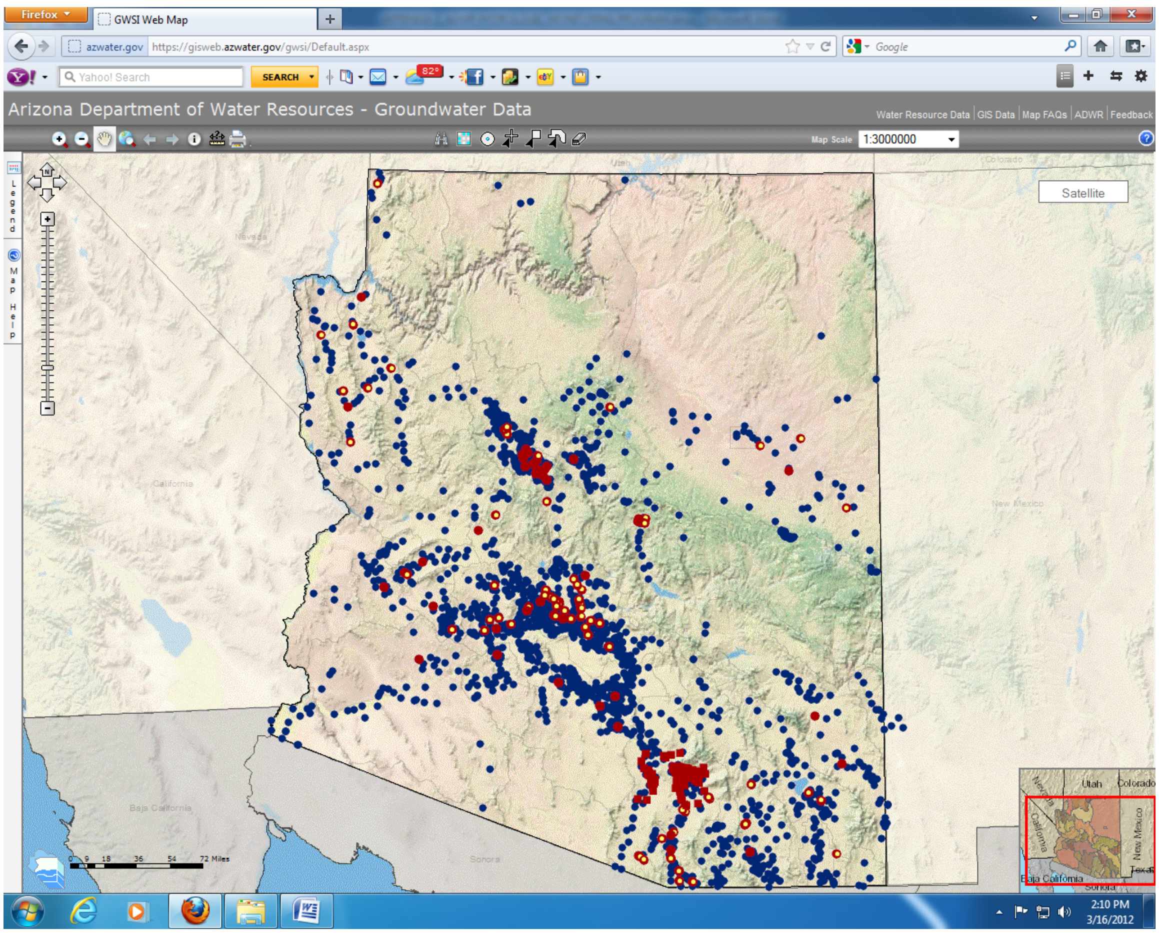


Figure 1 **Location of ADWR GWSI "Index" wells and Automated Groundwater Level Monitoring Sites**

Automated Sites

These sites utilize groundwater monitoring devices that automatically record water levels on a predefined time schedule. The Department uses both real-time (satellite-linked) and non-real-time automated recording systems. ADWR currently has 118 active automated well sites, of which 75 well sites are on telemetry or real-time systems. Water level data are collected and transmitted to the Department daily using a satellite link. These data are also downloaded at the well site for data validation purposes quarterly. During these quarterly visits, site maintenance is performed and a manual depth to water measurement is made to adjust transducer readings, if needed. ADWR currently has 43 non-telemetry groundwater monitoring well sites in its network.

Manual (Conventional) Methods

Manual data are collected by the use of electric sounders or steel tapes. ADWR takes a discrete measurement of these wells at specified schedules (usually only one measurement per year).

Index Lines

Index lines are groups of wells that are visited once each year by ADWR field staff and measured manually with a device called a sounder. Typically, index wells are visited once each year by ADWR field staff to obtain a long-term record of ground water level fluctuations. The index well network allows ADWR to monitor specific hydrologic factors statewide. About 1,700 wells are measured annually through the index line program. Department field staff also make quarterly or semi-annual measurements at a number of special monitoring networks of index wells located in the Big Chino basin, Coconino Plateau and Little Colorado River basins, the Payson area and in the Santa Cruz Active Management Area.

ADWR's network of index wells consists of both automated sites and wells that are measured by manual "conventional" methods. For the wells measured manually, ground water level data are collected using electric sounders or steel tapes that allow ADWR to take a discrete measurement on specified schedules (usually only one measurement per year). Water-level measurements are generally collected during the winter months when water demand is less and aquifer conditions are not as stressed. Data are recorded and uploaded into the Department's Ground Water Site Inventory (GWSI) database.

Basin Sweeps

Until recently, ADWR also conducted basin sweeps in one or two groundwater basins per year, where several hundred to as many as 1,500 to 2,000 additional water level measurements were made. A basin sweep is an intensive effort within a groundwater basin to measure as many wells as practicable in order to provide a comprehensive picture of the groundwater system. For example, in the Phoenix AMA there were about 2,200 wells measured every five years. The resulting water level data support a number of water management and hydrology programs and activities, as well as cities, private utilities, consultants, and private individuals.

Basins sweeps were reduced in FY2010 and eliminated in FY2011 due to significant budget cuts that resulted in the reduction of over 50 percent of the Field Services staff in the last two years. In 2010, ADWR field personnel made about 2,000 water level measurements. By comparison, the average number of annual water level measurements that were made from 2000 to 2009 was about 3,600. The major reduction in water level data collection capability is a significant concern to ADWR and to the groundwater community as a whole. The data are highly valued and widely used by many hydrologists, consultants, researchers, water managers and planners, business people and the general public.

ADWR Groundwater Site Inventory (GWSI) Database

The ADWR Groundwater Site Inventory (GWSI) database is the main repository for statewide groundwater data regarding wells and springs. The GWSI consists of field verified data collected by trained personnel from the ADWR Hydrology Division and/or the U.S. Geological Survey. This information is continually being updated by ongoing field investigations and through the statewide network of water level and water quality monitoring sites.

GWSI contains spatial and geographical data, owner information, well construction and well log data, and historic groundwater data including water level, water quality, well lift and pumpage records. As of July, 2011, the ADWR-GWSI database contains about 204,000 water levels that have been collected at over 43,000 individual well sites throughout the state. Information on specifically designated Automated and Index Groundwater Monitoring Sites are maintained. Other well sites are added to GWSI over time, generally through ADWR basin sweeps and other water resource investigations.

ADWR has made significant strides in increasing access and the utilities of its databases, including GWSI. The data are available to the general public from its website at:

https://gisweb.azwater.gov/waterresourcedata/GWSI.aspx

The public has full search privileges and can access the data by well identification number, well location, or through a GIS interface. Implementation of this system has greatly increased the public's access to this valuable data and saved the Department significant resources by largely eliminating the need to manually provide this data.

Other Sources of Groundwater Level Data to GWSI

Over the years, many individuals and organizations have collected water level data that are also recorded in ADWR's Groundwater Site Inventory (GWSI) water level database (Table 1). Both manual and automated groundwater level data have been provided to the Department since the inception of ADWR GWSI. Over the years, ADWR has accepted water level data from certain entities that follow established USGS and ADWR procedures and protocols for site establishment and site description, data collection, data entry and data quality assurance and quality control (see USGS, 2011). Entities that have provided data to ADWR that meet these standards include the USGS, the USBR, the City of Tucson and a few others.

In the future, ADWR hopes to obtain additional reliable water level data from other entities that own and operate wells, such as water providers (cities, towns and water companies), irrigation districts, industrial groundwater users, domestic well owners, etc. The Department also wants to capture some water level data that is currently submitted to the Department in hard copy format or in electronic formats that cannot be readily linked or referenced to the GWSI database.

Table 1 Sources of Groundwater Level Measurements (1901-2011) Recorded in ADWR Groundwater Site Inventory (GWSI) Database (as of 7/1/2011)

Year	Total	ADWR	AZGS	USGS	USBR	CONSULTANT	DRILLER	GEOLOGIST	LOGS	NEW MEXICO OFFICE OF THE STATE ENGINEER	OTHER	OTHER REPORTED	OWNER	REPORTING AGENCY	UNDETERMINED
	32			29											3
1901	1			1											
1904	1											1			
1914	1			1											
1915	8			8											
1917	6			6											
1923	3			2										1	
1924	8			2	1								2	3	
1925	3			2									1		
1926	6			4									2		
1927	16			14									2		
1928	18			14			1	1					2		
1929	34			22			1	6					4	1	
1930	42			17				20				1	4		
1931	125			29			1	89				1	5		
1932	143			27				112					4		
1933	105			23				78					4		
1934	158			30				124				1	3		
1935	142			38				92					6	6	
1936	109			43			1	52				1	4	8	
1937	196			47				140					2	7	
1938	201			47				143					2	9	
1939	852			657				182					4	9	
1940	1392			1078			2	299					4	9	
1941	1540			1223				300					5	12	
1942	929	1		725				184				1	3	15	
1943	820			577				227					1	15	
1944	931			700				214					2	15	
1945	1001			683				299					1	18	
1946	1801	1		1503			2	278					3	14	

Table 1 Sources of Groundwater Level Measurements (1901-2011) Recorded in ADWR Groundwater Site Inventory (GWSI) Database (as of 7/1/2011)

Year	Total	ADWR	AZGS	USGS	USBR	CONSULTANT	DRILLER	GEOLOGIST	LOGS	NEW MEXICO OFFICE OF THE STATE ENGINEER	OTHER	OTHER REPORTED	OWNER	REPORTING AGENCY	UNDETERMINED
1947	1138	1		808			1	320						8	
1948	1254	2		876				367				2	1	6	
1949	1602			1199			2	389				1		10	1
1950	1446			1089			1	347						8	1
1951	1471	1		1136			9	317				1		6	1
1952	2254			1719			4	524						7	
1953	2474	2		1964			2	504						1	1
1954	2729	2		2152				573						2	
1955	2327			1683				637		5			1		1
1956	2484			1927				553					2	2	
1957	2661			2068				582		2			5	4	
1958	1722	1		1271				441		6		1	2		
1959	1735			1250			1	470		7		2	1	2	2
1960	1808			1235				553		7				13	
1961	2197	2		1662	6		4	507		15		1			
1962	3489	2		2789	38		1	644		4			1	10	
1963	3205	2		2217	317		1	656		5				7	
1964	2601	1		1809	75		5	703		4			1	1	2
1965	2535			1558	145			819		9			1	2	1
1966	3566	8		2610	165		2	757		6			1	15	2
1967	2635	4		1850	143			633		4				1	
1968	2450			1599	121		2	706		16			1	4	1
1969	2071	2		1448	102		4	497		14			1	3	
1970	1833	1		1307	79		3	422		13	1		4	2	1
1971	2048	3		1458	191		4	369		16	1		2	4	
1972	2231	4		1517	402		6	256	2	14		2	5	22	1
1973	2337	3		1634	74		3	217	1	14		1	8	380	2
1974	1982	7		1686	72		1	181	6	14	2		10	3	
1975	2254	2		1937	73			211	3	13	1		6	6	2
1976	2135	4		1731	76		1	206	74	16	1		3	17	6

Table 1 Sources of Groundwater Level Measurements (1901-2011) Recorded in ADWR Groundwater Site Inventory (GWSI) Database (as of 7/1/2011)

Year	Total	ADWR	AZGS	USGS	USBR	CONSULTANT	DRILLER	GEOLOGIST	LOGS	NEW MEXICO OFFICE OF THE STATE ENGINEER	OTHER	OTHER REPORTED	OWNER	REPORTING AGENCY	UNDETERMINED
1977	2389	9		1918	82	18		249	82	15	1	1	4	9	1
1978	2878	127		1891	110	2	1	235	240	29	1		1	240	1
1979	3869	287		1828	74	4		179	281	15			1	1200	
1980	2357	780		941	76	2		49		54			1	453	1
1981	3034	1348		1379	70	5		8		10	5	1	1	207	
1982	3471	2516		862	70	2		5		4			4	8	
1983	2001	856	2	1046	73	3		1		5			3	12	
1984	4998	3890		1015	65	13				7			4	4	
1985	3185	1956		1166	6	15	1			35			4	2	
1986	4025	2660		1315	25	16				5			2	2	
1987	5269	4208		986	24	15				6		2	26	2	
1988	4507	3900		510	23	15				8	7		41	3	
1989	3073	2363		595	24	15				7	6		59	3	1
1990	5166	4639		370	24	15				6		2	108	2	
1991	4068	3657		271	23	9				7	4	1	93	3	
1992	3290	2782		235	154	9				6			101	3	
1993	5051	4608		266	25	15				7			127	3	
1994	4660	4294		223	28	15	2			6	1		85	6	
1995	3893	3507		223	28	12				7			114	2	
1996	2432	1902		288	26	16	1			5			192	2	
1997	4672	4139		326	24	11				6	1		163	2	
1998	5184	4644		361	23	17				6			130	3	
1999	4455	3921		334	24	13				5			155	3	
2000	2974	2420		329	24	11		1		7			179	3	
2001	3735	3209		331	24	5				6			158	2	
2002	3053	2529	1	290	24	4				6		3	195	1	
2003	4266	3640		338	29	3				4		1	250	1	
2004	4465	4114		134	25	2				4		2	183	1	
2005	4095	3974		96	23		1					1			
2006	3303	3160		120	20	2								1	

Table 1 Sources of Groundwater Level Measurements (1901-2011) Recorded in ADWR Groundwater Site Inventory (GWSI) Database (as of 7/1/2011)

Year	Total	ADWR	AZGS	USGS	USBR	CONSULTANT	DRILLER	GEOLOGIST	LOGS	NEW MEXICO OFFICE OF THE STATE ENGINEER	OTHER	OTHER REPORTED	OWNER	REPORTING AGENCY	UNDETERMINED
2007	3940	3891		24	22								3		
2008	3055	3036		12	1		1						4	1	
2009	2915	2902		6	2						1		4		
2010	1999	1991		6									2		
2011	776	775		1											
Total 1901-2011	203801	98690	3	76777	3375	284	72	17928	689	492	33	31	2523	2872	32
1980-2010	116591	97436	3	14398	1029	260	6	64	0	229	25	13	2391	735	2
Ave 1980-2010	3761	3143	2	464	34	10	1	13		9	4	2	82	27	1
Ave 1980-1989	3592	2448	2	982	46	10	1	16		14	6	2	15	70	1
Ave 1990-1999	4287	3809		290	38	13	2			6	2	2	127	3	
Ave 2000-2009	3580	3587		286	38	13	2	1		6	2	1	134	3	

ARIZONA'S CURRENT CHALLENGE IN WATER LEVEL DATA COLLECTION AND OPPORTUNITES FOR DATA SHARING

Collecting water level data has never been a simple activity. Physical challenges may include significant back-road driving to remote well sites, dealing with the hazards of "Africanized" bees, snakes, inclement weather and heat. Programmatic challenges include obtaining and maintaining current well owner information, monitoring permissions and access. In an effort to minimize the impacts of the cutbacks and prepare for the future the Department wishes to supplement (but not replace) the state's current water level data collection efforts with data that are collected by other individuals and organizations.

ADWR is beginning the process of evaluating the feasibility of incorporating supplemental water level data collected by outside entities into its databases. The Department has identified several fundamental activities that it will conduct this feasibility study. The activities include:

1. Assess the sources of outside water level data that are currently submitted to the Department in the form of: annual water use reports from non-exempt well owners in AMAs and Community Water Systems outside AMAs; monitoring reports from recharge facilities and other ADWR permitted activities; miscellaneous hydrologic reports submitted to support Assured and Adequate Water Supply physical availability demonstrations; Drillers' Logs; completion reports and pump test reports; Adjudication Well Inventories; Colorado River Depletion study as well as other groundwater level data collected by BOR and USGS in support of Colorado River activities; all databases developed in support of the Rural Water Studies; and other miscellaneous hydrologic reports.

2. Estimate scope of effort and potential requirements necessary to identify, extract, store and verify existing hard-copy and electronic water level data already submitted to Department.

3. Assess IT and other support and resources required to modify existing water level and well information Well Registry (Wells55) databases, and to develop or modify online data submittal programs to allow for the efficient automated capture and storage of new water level data from customers or co-operators.

4. Assess IT and other support and resources necessary to upgrade ADWR GWSI database to make it fully-compliant with USGS NWIS database and USGS-Arizona GWSI database.

5. Survey well owners, well operators, cities, towns and water providers, consultants, other natural resource related agencies, etc. to determine:

    - Who collects water level data?
    - Where, when, why and how are water level data collected?
    - What type(s) of equipment are used to collect water level data?
    - Are automated water level measurements made?
    - What procedures and protocols are followed to collect water level data?
    - Ask what types of uses would be appropriate for water level data that have been collected by different entities using various methods of data collection and quality control (such as regulatory, non-regulatory, general informational, etc.).
    - How often are water level data collection equipment calibrated?
    - What types of calibration methods are used?

- What type of training is given to staff making water level measurements?
- What type of site inventory has been performed on wells (up to USGS standards?)
- Are wells registered with ADWR and/or are wells already inventoried into GWSI?
- Are measurement data currently reported to ADWR or any other agency?
- If Yes, to question above, in what format are data submitted to ADWR?
- Are there security concerns associated with providing data or well information?
- Would entity be willing to collect water level data and submit data to ADWR following prescribed USGS protocols and data formats?
- Would entity be willing to share their water level data with others?
- Other(s)?

6. Estimate initial and regular operational costs to develop, operate and maintain a potential supplemental water level data collection, storage and data retrieval and reporting program. Including an On-Line Submittal System.

Plan of Action

At this time, ADWR is investigating items 1 and 2 on the list above and has recently conducted the survey discussed in item 5. Early in 2012, ADWR compiled the results of the survey and published the information on its website. ADWR also plans to discuss the results with stakeholders. The results of the survey will give ADWR a better understanding of the amount and quality of the data that might be collected from such a program and also provide a better understanding of the potential resource requirements necessary to develop, operate and maintain such a system. Having this knowledge will be essential to chart future program development with the goal of leveraging the data collection efforts of others while maintaining and enhancing the utility and integrity of our current data collection program.