

# TABLES

**TABLE 2-1. WELL WITHDRAWALS FROM THE N AQUIFER SINCE 1965<sup>1</sup>**

PERIOD	PWCC INDUSTRIAL WITHDRAWALS <sup>2</sup>			NAVAJO AND HOPI MUNICIPAL WITHDRAWALS <sup>3</sup>			TOTAL WITHDRAWALS (acre-feet)
	Average Annual (acre-feet)	Total (acre-feet)	Percentage of Total	Average Annual (acre-feet)	Total (acre-feet)	Percentage of Total	
1965-2005	3,453	138,100	63	2,005	80,200	37	218,300
2006-2011	1,255	7,530	30	2,972	17,830	70	25,360
2011	1,390	1,390	31	3,090	3,090	69	4,480
<b>1965-2011</b>	<b>3,368</b>	<b>145,630</b>	<b>60</b>	<b>1,956</b>	<b>98,030</b>	<b>40</b>	<b>243,660</b>

Notes:

<sup>1</sup> Source: Macy and Unema (2014).

<sup>2</sup> From 8 wells completed in the confined portion of the aquifer.

<sup>3</sup> From approximately 70 wells, most of which are completed in the confined portion of the aquifer with a few completed in the unconfined portion. These wells are operated by the Navajo Tribal Utility Authority (NTUA), Bureau of Indian Affairs (BIA), and the Hopi Tribe. Does not include domestic and stock well withdrawals estimated to total less than 1% of the industrial and municipal withdrawals.



**TABLE 2-2. CLAIMED SPRINGS NOT VERIFIED BY ADWR**

UNITED STATES THIRD AMENDMENT CLAIMED INFORMATION					ADWR FINDINGS <sup>2</sup>
Hopi Label	US Label	Name	Use <sup>1</sup>	Claim Verification Method	
S-1-339	S016	Unnamed	C/ D/ S	GNIS Verified	Spring 06-094-04.13X11.05-1 mentioned in NRCE comment is classified as a well in NWIS. May have been a match with GWSI & NWIS Site No. 361603110591101 (01 058-13.19x16.00) but ADWR did not find spring at claimed location.
S-2-21	S0215	Two Headed Snare	C/ D/ S	NRCE Verified	Previously reported as a well; ADWR did not find spring at claimed location (Hopi Preliminary HSR, 2008, Appendix D, Table D-1)..
S-2-23	S0217	Looking Woman	C/ D/ S	HKM Review Verified	ADWR did not find spring at claimed location.(Hopi Preliminary HSR, 2008, Appendix D, Table D-1).
S-2-8	S022	Unnamed	C/ D/ S	HKM Review Verified	ADWR did not find spring at claimed location (Hopi Preliminary HSR, 2008, Appendix D, Table D-1).
S-2-26	S0220	Narrow Neck	C/ D/ S	HKM Review Verified	ADWR did not find spring at claimed location (Hopi Preliminary HSR, 2008, Appendix D, Table D-1).
S-2-10	S024	Blue Moenkopi	C/ D/ S	HKM Review Verified	ADWR did not find spring at claimed location (Hopi Preliminary HSR, 2008, Appendix D, Table D-1).
S-3-28	S032	Many Sheep	C/ D/ S	HKM Review Verified	ADWR did not find spring at claimed location (Hopi Preliminary HSR, 2008, Appendix D, Table D-1)
S-3-227	S037	4M-207	C/ D/ S	Range Use Map Verified	ADWR did not find spring at claimed location (Hopi Preliminary HSR, 2008, Appendix D, Table D-1).
S-3-228	S038	4M-58	C/ D/ S	ADWR Verified	Previously reported as a well; ADWR did not find spring at claimed location. (Hopi Preliminary HSR, 2008, Appendix D, Table D-1).
S-4-343	S0450	Unnamed	C/ D/ S/ IRR	HKM Review Verified	ADWR did not find spring at claimed location (Hopi Preliminary HSR, 2008, Appendix D, Table D-1).
S-4-345	S0452	Unnamed	C/ D/ S/ IRR	HKM Review Verified	ADWR did not find spring at claimed location (Hopi Preliminary HSR, 2008, Appendix D, Table D-1).
S-4-346	S0453	Unnamed	C/ D/ S/ IRR	HKM Review Verified	ADWR did not find spring at claimed location (Hopi Preliminary HSR, 2008, Appendix D, Table D-1).
S-4-350	S0457	Unnamed	C/ D/ S/ IRR	HKM Review Verified	ADWR did not find spring at claimed location (Hopi Preliminary HSR, 2008, Appendix D, Table D-1).
S-4-351	S0458	Unnamed	C/ D/ S/ IRR	HKM Review Verified	ADWR did not find spring at claimed location (Hopi Preliminary HSR, 2008, Appendix D, Table D-1).
S-4-218	S046	3-GS-77-6	C/ D/ S	ADWR Verified	ADWR notes that claim name is believed to be incorrect; claimed location places spring in residential area; ADWR did not find spring at claimed location (Hopi Preliminary HSR, 2008, Appendix D, Table D-1).
S-4-360	S0467	Eagle Nest, Talakwava	C/ D/ S	HKM Review Verified	ADWR did not find spring at claimed location (Hopi Preliminary HSR, 2008, Appendix D, Table D-1).
S-5-209	S0521	1A-82	C/ D/ S	HKM Review Verified	ADWR did not find spring at claimed location (Hopi Preliminary HSR, 2008, Appendix D, Table D-1).
S-6-229	S0633	4M-66	C/ D/ S	ADWR Verified	ADWR did not find spring at claimed location (Hopi Preliminary HSR, 2008, Appendix D, Table D-1).



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UNITED STATES THIRD AMENDMENT CLAIMED INFORMATION					ADWR FINDINGS <sup>2</sup>
Hopi Label	US Label	Name	Use <sup>1</sup>	Claim Verification Method	
S-6-248	S0634	4T-519/BM OBS 5	C/ D/ S	HKM Review Verified	ADWR did not find spring at claimed location (Hopi Preliminary HSR, 2008, Appendix D, Table D-1).
S-6-47	S068	2 Sheep	C/ D/ S	HKM Review Verified	ADWR did not find spring at claimed location (Hopi Preliminary HSR, 2008, Appendix D, Table D-1).
S-9-340	S0938	Iskasokpu, Burping Coyote	C/ D/ S	ADWR Verified	ADWR did not find spring at claimed location (Hopi Preliminary HSR, 2008, Appendix D, Table D-1).
S-10-147	S1027	Chief, Monwisva	C/ D/ S	ADWR Verified	ADWR did not find spring at claimed location. (Hopi Preliminary HSR, 2008, Appendix D, Table D-1).
S-10-205	S1032	Skull	C/ D/ S	ADWR Verified	ADWR did not find spring at claimed location (Hopi Preliminary HSR, 2008, Appendix D, Table D-1).
S-10-235	S1037	6H-7	C/ D/ S/ IRR	GNIS Verified	ADWR did not find spring at claimed location. (Hopi Preliminary HSR, 2008, Appendix D, Table D-1)
	S1040	6M-302A	C/ D/ S	NRCE Field Work Verified	Claim name doesn't match 1960's report; ADWR did not find spring at claimed location (Hopi HSR, 2008, Appendix D, Table D-1).
S-10-250	S1045	6-F-1	C/ D/ S	GNIS Verified	ADWR did not find spring at claimed location. (Hopi Preliminary HSR, 2008, Appendix D, Table D-1). No match in NWIS for a well named 06 094-06.58X07.57. Not shown on topo or listed in GNIS.
S-10-251	S1046	6K-305-94	C/ D/ S	Range Use Map Verified	Previously reported as a well; ADWR did not find spring at claimed location. (Hopi Preliminary HSR, 2008, Appendix D, Table D-1).
S-10-309	S1048	Unnamed	C/ D/ S	HKM Review Verified	ADWR did not find spring at claimed location. (Hopi Preliminary HSR, 2008, Appendix D, Table D-1).
S-10-316	S1050	Monowopsa, Owl Corner	C/ D/ S	HKM Review Verified	ADWR did not find spring at claimed location. (Hopi Preliminary HSR, 2008, Appendix D, Table D-1).
S-10-317	S1051	New Water	C/ S	TJ Ferguson Verified	ADWR did not find spring at claimed location. (Hopi Preliminary HSR, 2008, Appendix D, Table D-1).
S-10-318	S1052	Big Water, Wokokova	C/ S/ IRR	HKM Review Verified	ADWR did not find spring at claimed location. (Hopi Preliminary HSR, 2008, Appendix D, Table D-1).
S-10-319	S1053	Sand Water	C/ S/ IRR	HKM Review Verified	ADWR did not find spring at claimed location. (Hopi Preliminary HSR, 2008, Appendix D, Table D-1).
S-10-321	S1055	Many Wind Water, Hucatwebah	C/ D/ S	HKM Review Verified	Claimed site located adjacent to impoundment. Spring maybe dry; ADWR did not find spring at claimed location (Hopi Preliminary HSR, 2008, Appendix D, Table D-1).
	S112	Unnamed	C/ D/ S	NRCE Verified	ADWR did not find spring at claimed location. (Hopi Preliminary HSR, 2008, Appendix D, Table D-1).
S-11-171	S1124	06A-24	C/ S	Range Use Map Verified	ADWR did not find spring at claimed location. (Hopi Preliminary HSR, 2008, Appendix D, Table D-1).
	S1127	07H-27A	C/ D/ S	NRCE Field Work Verified	ADWR did not find spring at claimed location. (Hopi Preliminary HSR, 2008, Appendix D, Table D-1).
	S1131	Unnamed	C/ D/ IRR	TJ Ferguson Verified	ADWR did not find spring at claimed location. (Hopi Preliminary HSR, 2008, Appendix D, Table D-1).



**TABLE 2-2. CLAIMED SPRINGS NOT VERIFIED BY ADWR**

UNITED STATES THIRD AMENDMENT CLAIMED INFORMATION					ADWR FINDINGS <sup>2</sup>
Hopi Label	US Label	Name	Use <sup>1</sup>	Claim Verification Method	
S-11-314	S1132	Unnamed	C/ D	HKM Review Verified	ADWR did not find spring at claimed location. (Hopi Preliminary HSR, 2008, Appendix D, Table D-1). "Spring" 06 093-11.40X12.75-2 mentioned in NRCE comment is classified as a well in NWIS.
S-4-352	S0459	Unnamed	C/ D/ S/ IRR	ADWR Verified	Location listed in Hopi Preliminary HSR, 2008, Appendix D, Table D-1 differs from claimed location.
S-13-249	S139	6-2B-4-8	C/ D/ S	HKM Review Verified	ADWR did not find spring at claimed location. (Hopi Preliminary HSR, 2008, Appendix D, Table D-1).
S-14-252	S1415	6M-38	C/ D/ S	HKM Review Verified	Probably a match with NWIS Well Site No. 353801110265001 (06 113-11.08X08.01). ADWR noted site was reviously reported as a well and did not find spring at claimed location (Hopi Preliminary HSR, 2008, Appendix D, Table D-1).
S-12-327	S1211	Tishepi	C/ D/ S	GNIS Verified	Name (Tishepi Spring) in GNIS database only. Not plotted on any topo. Not in Topo Large. No feature visible in imagery.
S-9-88	S091	Mumurva, Monusva	C/ D/ S/ IRR	QUAD Verified	No spring labeled on topo. GNIS label Mumurva is a populated place name.
S-10-408	S1059	Unnamed	C/ S	ADWR Verified	Spring presence not verified in 2015 ADWR review of Appendix D: Hopi Spring Inventory, maps or imagery
	S1049	Sand	C/ D/ S	Range Use Map Verified	Spring presence not verified in 2015 ADWR review of Appendix D: Hopi Spring Inventory, maps or imagery
	S0945		C/ D/ S/ IRR	NRCE Field Work Verified	Spring presence not verified in 2015 ADWR review of Appendix D: Hopi Spring Inventory, maps or imagery
	S096	Unnamed	C/ D/ S	NRCE Verified	Spring presence not verified in 2015 ADWR review of Appendix D: Hopi Spring Inventory, maps or imagery
	S098	06M-63	C/ D/ S	Range Use Map Verified	Spring presence not verified in 2015 ADWR review of Appendix D: Hopi Spring Inventory, maps or imagery
S-9-324	S0934	Gray, Masiipa	C/ D/ S/ IRR	HKM Review Verified	Spring presence not verified in 2015 ADWR review of Appendix D: Hopi Spring Inventory, maps or imagery
S-9-326	S0936	Songoopa, Sand Grass	C/ S	Range Use Map Verified	Spring presence not verified in 2015 ADWR review of Appendix D: Hopi Spring Inventory, maps or imagery
	S0915	Unnamed	C/ D/ S	Range Use Map Verified	Spring presence not verified in 2015 ADWR review of Appendix D: Hopi Spring Inventory, maps or imagery
S-8-84	S081	JUA-5B-1-332	C/ D/ S	HKM Review Verified	ADWR unable to access claimed spring location (Hopi Preliminary HSR, 2008, Appendix D, Table D-1).
S-5-57	S059	Round Rock	C/ D/ S	HKM Review Verified	ADWR unable to access claimed spring location (Hopi Preliminary HSR, 2008, Appendix D, Table D-1).
S-6-69	S0619	Salt Seep	C/ D/ S	HKM Review Verified	ADWR denied access during field visit (Hopi Preliminary HSR, 2008, Appendix D, Table D-1).
S-4-347	S0454	Unnamed	C/ D/ S/ IRR	HKM Review Verified	Spring presence not verified in 2015 ADWR review of Appendix D: Hopi Spring Inventory, maps or imagery



**TABLE 2-2. CLAIMED SPRINGS NOT VERIFIED BY ADWR**

UNITED STATES THIRD AMENDMENT CLAIMED INFORMATION					ADWR FINDINGS <sup>2</sup>
Hopi Label	US Label	Name	Use <sup>1</sup>	Claim Verification Method	
	S0468A	Spring 1		Field Verification	Spring presence not verified in 2015 ADWR review of Appendix D: Hopi Spring Inventory, maps or imagery
	S0482	Culvert Spring	-	HKM Review Verified	Spring presence not verified in 2015 ADWR review of Appendix D: Hopi Spring Inventory, maps or imagery
	S0515		C/ D/ S	NRCE Verified	Spring presence not verified in 2015 ADWR review of Appendix D: Hopi Spring Inventory, maps or imagery
	S023	Unnamed	C/ D/ S	NRCE Verified	Spring presence not verified in 2015 ADWR review of Appendix D: Hopi Spring Inventory, maps or imagery
S-3-31	S035	Owl	C/ D/ S	HKM Review Verified	ADWR unable to access claimed spring location during field visit (Hopi Preliminary HSR, 2008, Appendix D, Table D-1).
S-2-25	S0219	Side Wash	C/ D/ S	HKM Review Verified	ADWR unable to access claimed spring location (Hopi Preliminary HSR, 2008, Appendix D, Table D-1).
S-14-195	S144	Kalbito #2	C/ D/ S	QUAD Verified	Named as a well on Topo. No spring shown in Topo Large.
S-14-200	S149	Wolf Pass	C/ D/ S	GNIS Verified	Identified in GNIS and shown on topo as Wolf Pass Well. Feature class in GNIS is listed as well.

Notes:

<sup>1</sup> C = cultural; D = domestic; S = stock; IRR = irrigation

<sup>2</sup> Based on ADWR's review of Appendix D: Hopi Spring Evaluation from ADWR's 2008 Preliminary HSR; USGS Topographic Series Maps (Topo Large); National Water Information System (NWIS, USGS Water Data); Geographic Names Information System (GNIS); Topographic Series Maps (USA Topo Maps); USGS Scanned Topos; and ESRI World Imagery and Google Earth imagery.



**TABLE 2-3. SUMMARY OF USGS STREAMFLOW DATA COLLECTED ON AND NEAR THE HOPI INDIAN RESERVATION**

GENERAL AREA	STREAM	GAGE NUMBER (location) <sup>1</sup>	CONTRIBUTING DRAINAGE AREA (square miles)	PERIOD OF RECORD	NO. OF DAILY MEAN FLOW MEASUREMENTS <sup>2</sup>	ANNUAL FLOW (acre-feet) <sup>3</sup>				AVERAGE SEASONAL FLOW (as % of annual flow) <sup>4</sup>				TYPICAL FLOW DURATION (% of days each year with flow) <sup>5</sup>	STREAMFLOW REGIME <sup>6</sup>
						Minimum	Median	Mean	Maximum	Winter	Spring	Summer	Fall		
PWCC Leasehold (Upper Moenkopi Wash) <sup>7</sup>	Coal Mine Wash	09401239 (near Shonto)	137	1978-82	1,623	433	775	858	1,365	20.3	9.9	48.5	21.3	60%	Intermittent
	Coal Mine Wash Tributary 1	09401226 (near Kayenta)	0.62	1977-81	1,461	0.0	2.9	24.1	69.5	2.0	4.0	90.1	3.9	3.6%	Ephemeral
	Coal Mine Wash Tributary 2	09401229 (near Kayenta)	0.57	1977-79	730	Not calculated due to short period of record				0.0	0.0	0.0	100.0	1.2%	Ephemeral
Hopi Washes	Dinnebito Wash	09401110 (near Sand Springs)	473	1993-2015	8,206	311	3,070	3,100	7,405	10.4	1.9	75.2	12.5	100%	Perennial
	Jeddito Wash	09400583 (near Jeddito)	147	1993-2005	4,412	14	145	298	1,426	0.0	0.6	88.3	11.1	3.3%	Ephemeral
	Moenkopi Wash	09401250 (near Moenkopi)	1,575	1973-76	1,004	Not calculated due to short period of record				11.3	4.0	75.6	9.0	91%	Intermittent
		09401260 (at Moenkopi)	1,629	1976-2015	14,249	1,376	6,023	6,480	14,117	12.2	4.2	65.8	17.8	79%	Intermittent
		09401265 (at Pasture Canyon Springs)	135	2004-2015	4,140	172	231	226	251	27.6	24.2	22.1	26.1	100%	Perennial
		09401280 (at Moenkopi)	1,904	1926-40	5,206	5,423	10,606	16,870	45,827	7.7	1.7	81.1	9.5	74%	Intermittent
		09401400 (near Tuba City)	2,492	1940-78	9,824	2,185	8,543	10,831	44,573	7.7	1.6	57.7	33.0	65%	Intermittent
		09401500 (near Cameron)	2,662	1953-65	4,141	3,681	6,936	9,988	19,909	5.9	2.8	78.5	12.8	51%	Intermittent
	Oraibi Wash	09400562 (near Tolani Lakes)	635	1995-2013	6,728	50	1,998	2,365	6,559	15.2	0.3	67.4	17.0	10.6%	Ephemeral
	Polacca Wash	09400568 (near Second Mesa)	905	1994-2015	7,895	192	2,541	3,007	9,701	10.9	1.1	73.9	14.1	94%	Perennial
LCR Drainage	Little Colorado River	09401000 (at Grand Falls)	21,068	1925-95	13,750	18,512	160,358	194,601	587,714	38.4	24.4	30.3	6.9	61%	Intermittent
		09402000 (near Cameron)	26,091	1947-2015	25,021	16,987	132,631	153,042	603,062	35.1	24.0	27.7	13.3	62%	Intermittent
		09402300 (near Desert View)	26,972	1990-2015	5,294	204,303	252,881	283,296	436,188	32.1	21.2	28.4	18.3	100%	Perennial

Notes:

<sup>1</sup> Gage locations are shown in Figure 2-6.

<sup>2</sup> Daily Flow Measurements Count thru 12/01/2015

<sup>3</sup> Statistics based on Calendar Year (WY) data

<sup>4</sup> Calculated using average monthly streamflows measured over station's available period of record. Winter season assumed to include months of January, February, and March; spring includes April, May, and June; and so on. Due to rounding, sum of seasonal flows may not equal 100%.

<sup>5</sup> Based on median of daily mean flows calculated over period of record.

<sup>6</sup> For purposes of this HSR, ephemeral flow was assumed if the typical flow duration was less than 10% and intermittent flow was assumed if the flow duration was 10% or greater but less than 100% (perennial).

<sup>7</sup> PWCC = Peabody Western Coal Company.



**TABLE 3-1. SUMMARY OF HOPI TRIBE ADJUDICATION CLAIMS FOR PAST AND PRESENT AND FUTURE WATER USES<sup>1</sup>**

TYPE OF USE	CLAIMED QUANTITIES OF USE <sup>2</sup>							
	1985 Claim		2004 Claim (1st Amendment and 2005 Supplemental Information)		2009 Claim (2nd Amendment)		2015 Claim (3rd Amendment as supplemented)	
	Past and Present (AFA)	Future (AFA)	Past and Present (AFA)	Future (AFA)	Past and Present (AFA)	Future (AFA)	Past and Present (AFA)	Future (AFA)
Domestic, Commercial, Municipal, and Industrial (DCMI)	2,060	7,267	0	11,211	0	9,110	0	9,348
Agricultural (Irrigation)	11,364	76,695	52,206	21,060	21,199	0	102,303 <sup>3</sup>	0
Evaporation from Irrigation Storage	186	9,359	0	2,842	192	0	192	0
Livestock and Water Storage for Stock (Stockponds)	1,504	295	7,961	910	4,886	997	6,184 <sup>3</sup>	1,000
Ceremonial and Subsistence Irrigation	0	0	0	12,546	0	4,977	0	7,385
Mining	2,325	29,120	4,400	1,600	1,236	500	1,255	500
Energy Resources Development	0	0	0	19,000	0	6,000	0	27,100
Tourism	0	0	0	1,594	0	522	0	1,022
Recreation	80	151	139	0	41	0	41	0
Subsurface Mineral Rights	0	0	0	0	0	0	40,295	0
Aesthetic, Cultural and Ecological Flows (Riparian Habitat and Instream Flows)	0	0	0	0	0	0	310 <sup>3</sup>	0
Other (Off Reservation Uses)	0	0	2,366	0	2,366	380	0	0
<b>Subtotals</b>	<b>17,519</b>	<b>122,887</b>	<b>67,072</b>	<b>70,763</b>	<b>29,920</b>	<b>22,486</b>	<b>150,580</b>	<b>46,355</b>
<b>Total Claim</b>	<b>140,406</b>		<b>137,835</b>		<b>52,406</b>		<b>196,935</b>	
	<i>Also claimed is a one-time volume of 91,330 AF for first-time filling for irrigation storage reservoirs, recreational lakes and stockponds from LCR, five washes, and groundwater sources.</i>		<i>Also claimed are one-time volumes of: (1) 15,700 AF for first-time filling for irrigation storage reservoirs; and (2) 2,089 AF for storage and additional future use on Hopi Ranches.</i>		<i>Also claimed are one-time volumes of: 1) 333 AF of storage in reservoirs in Moenkopi Island; 2) a one-time volume of 2,089 AF for storage and additional future use on Hopi Ranches.</i>		<i>Also claimed is 333 AF of storage in reservoirs in Moenkopi Island.</i>	

Notes:

<sup>1</sup> Copies of the 1985, 2004, 2009, and 2015 Hopi adjudication claims are provided in Appendix C of this report.

<sup>2</sup> Quantities are rounded to the nearest 1 AF or AFA.

<sup>3</sup> Water rights claimed amount listed in Hopi Tribe's Supplement to its Third Amended SOC. (See Table 1 - Quantification.) Following are the original 2015 claimed quantities for each use with the supplemental amount shown afterwards in parentheses: Irrigation - 101,121 (1,182); Livestock and water storage for stock (stockponds) - 4,883 (1,301); Aesthetic, Cultural and Ecological Flows - 294 (16).



**TABLE 3-2. SUMMARY OF UNITED STATES ADJUDICATION CLAIMS ON BEHALF OF THE HOPI FOR PAST AND PRESENT AND FUTURE WATER USES<sup>1</sup>**

TYPE OF USE	CLAIMED QUANTITIES OF USE <sup>2</sup>									
	1985 Claim <sup>3</sup>		1994 Claim <sup>4</sup>		2004 Claim (1st Amendment)		2009 Claim (2nd Amendment)		2015 Claim (3rd Amendment)	
	Past and Present (AFA)	Future (AFA)	Past and Present (AFA)	Future (AFA)	Past and Present (AFA)	Future (AFA)	Past and Present (AFA)	Future (AFA)	Past and Present (AFA)	Future (AFA)
Domestic, Commercial, Municipal, and Industrial (DCMI)	4,594	53,102	1,793	5,469	0	11,211	0	9,110	0	8,746
Agricultural (Irrigation)	36,049	361,545	44,187	31,560	49,136	0	21,199	0	28,417	0
Evaporation from Irrigation Storage	1,155	30,367	186	9,359	0	0	0	0	0	0
Livestock and Water Storage for Stock (Stockponds)	4,356	295	4,601	176	8,044	0	3,403	997	3,388	997
Ceremonial and Subsistence Irrigation	0	0	0	0	0	0	0	4,977	0	4,977
Mining	8,449	11,065	8,449 <sup>5</sup>	11,065 <sup>5</sup>	0	3,000	1,236	6,500	1,255	6,500
Energy Resources Development	129	33,072	0	0	0	0	0	0	0	0
Tourism	0	0	0	0	0	0	0	0	0	0
Recreation	2,316	378	80	151	0	0	0	0	0	0
Subsurface Mineral Rights	0	0	0	0	0	0	0	0	0	0
Aesthetic, Cultural and Ecological Flows (Riparian Habitat and Instream Flows)	0	0	0	0	0	0	0	0	294	0
Other (Off Reservation Uses)	0	0	0	0	2,366	556	1,556	902	0	0
<b>Subtotals</b>	<b>57,048</b>	<b>489,824</b>	<b>59,296</b>	<b>57,780</b>	<b>59,546</b>	<b>14,767</b>	<b>27,394</b>	<b>22,486</b>	<b>33,354</b>	<b>21,220</b>
<b>Total Claim</b>	<b>546,872</b>		<b>117,076</b>		<b>74,313</b>		<b>49,880</b>		<b>54,574</b>	
	<i>Also claimed are one-time volumes of: (1) 1,082 AF for filling of recreational lakes; and (2) 330,000 AF for filling of irrigation storage reservoirs.</i>				<i>Also claimed is a one-time volume of 2,089 AF for storage and additional future use on Hopi Ranches.</i>		<i>Also claimed is a one-time volume of 1,837 AF for storage and additional future use on Hopi Ranches.</i>			

Notes:

<sup>1</sup> Copies of the 1985, 1994, 2004, 2009, and 2015 United States adjudication claims on behalf of the Hopi Tribe are provided in Appendix C of this report.

<sup>2</sup> Quantities are rounded to the nearest 1 AF or AFA.

<sup>3</sup> Amounts listed reflect the United States' joint claim on behalf of the Navajo Nation and Hopi Tribe.

<sup>4</sup> Report of Supplemental Water Claims by the United States of America for the Indian Lands in the Little Colorado River Basin. Amounts listed in table reflect the United States' specific (proportional) claim on behalf of the Hopi Tribe.

<sup>5</sup> Amount listed reflects the United States' combined claim on behalf of the Navajo Nation and Hopi Tribe.



**TABLE 3-3. COMPARISON OF HOPI TRIBE AND UNITED STATES ADJUDICATION CLAIMS FOR PAST AND PRESENT AND ADDITIONAL FUTURE WATER USES <sup>1</sup>**

TYPE OF USE	2015 CLAIMED QUANTITIES OF USE					
	Hopi Third Amendment (as supplemented)			United States Third Amendment on behalf of Hopi Tribe		
	Past and Present (AFA)	Future (AFA)	TOTAL (AFA)	Past and Present (AFA)	Future(AFA)	Total (AFA)
Domestic, Commercial, Municipal, and Industrial (DCMI)	0	9,348	<b>9,348</b>	0	8,746	<b>8,746</b>
Agricultural (Irrigation)	102,303	0	<b>102,303</b>	28,417	0	<b>28,417</b>
Evaporation from Irrigation Storage <sup>2</sup>	192	0	<b>192</b>	0	0	<b>0</b>
Livestock and Water Storage for Stock (Stockponds)	6,184	1,000	<b>7,184</b>	3,388	997	<b>4,385</b>
Ceremonial and Subsistence Irrigation	0	7,385	<b>7,385</b>	0	4,977	<b>4,977</b>
Mining	1,255	500	<b>1,755</b>	1,255	6,500	<b>7,755</b>
Energy Resources Development	0	27,100	<b>27,100</b>	0	0	<b>0</b>
Tourism	0	1,022	<b>1,022</b>	0	0	<b>0</b>
Recreation	41	0	<b>41</b>	0	0	<b>0</b>
Subsurface Mineral Rights	40,295	0	<b>40,295</b>	0	0	<b>0</b>
Aesthetic, Cultural and Ecological Flows (Riparian Habitat and Instream Flows)	310	0	<b>310</b>	294	0	<b>294</b>
<b>Total Claim</b>	<b>150,580</b>	<b>46,355</b>	<b>196,935</b>	<b>33,354</b>	<b>21,220</b>	<b>54,574</b>

Notes:

<sup>1</sup> Quantities are rounded to the nearest 1 AF or AFA.

<sup>2</sup> The Hopi also claim 333 acre-feet for filling two reservoirs in the Moenkopi Island.



**TABLE 4-1. ANNUAL GPCD RATES FOR COMMUNITY WATER SYSTEMS IN THE LITTLE COLORADO RIVER PLATEAU BASIN IN NAVAJO COUNTY<sup>1, 2</sup>**

Facility	GPCD			
	2006	2007	2008	Annual Average
City of Winslow	154	247	238	213
City of Holbrook	133	135	137	135
Sun Valley Utilities	168	162	124	151
Joseph City Utility	NF	NF	NF	NA

Notes:

<sup>1</sup> Based on water pumped from wells or diverted from streams. Does not include effluent reuse.

GPCD is calculated by dividing demand (in gallons) by 365 and by the population served by the system.

<sup>2</sup> (ADWR, 2009)

NF = Not Filed



**TABLE 4-2. CLAIMED IRRIGATED ACREAGE  
NOT VERIFIED BY ADWR**

HOPI TRIBE THIRD AMENDED SOC (AS SUPPLEMENTED) CLAIMED INFORMATION		ADWR FINDINGS <sup>1</sup>	
Hopi (GIS) Field Label	Hopi (GIS) Field Acres	2015 Field Verification ID <sup>2</sup>	Acreage Not Verified
19	11.51	19-66	7.18
		19-65	4.32
23	52.14	23-133	52.11
31	21.62	31-183	5.63
		31-180	0.60
		31-182	0.26
73	6.83	73-866	2.48
75	6.13	75-880	6.13
91	304.45	91-956	7.30
92	183.51	92-963	139.65
102	73.00	102-988	72.96
124	25.49	124-1133	3.98
137	39.48	137-1187	2.90
140	79.84	140-1265	35.09
171	5.46	171-1545	0.21
173	133.64	173-1660	9.91
176	73.64	176-1683	0.31
178	8.32	178-1745	2.16
181	1.31	181-1769	0.19
183	8.25	183-1830	0.31
183	8.25	183-1832	0.21
184	501.87	184-1866	1.80
187	7.91	187-2151	1.42
188	138.86	188-2181	60.36
		188-2180	15.47
189	1.98	189-2208	0.96
194	122.69	194-2431	0.32
206	18.06	206-2481	9.25
207	4.12	207-2484	0.16
208	30.66	208-2496	0.36
211	27.51	211-2563	22.89



Table 4-2

**TABLE 4-2. CLAIMED IRRIGATED ACREAGE  
NOT VERIFIED BY ADWR**

HOPI TRIBE THIRD AMENDED SOC (AS SUPPLEMENTED) CLAIMED INFORMATION		ADWR FINDINGS <sup>1</sup>	
Hopi (GIS) Field Label	Hopi (GIS) Field Acres	2015 Field Verification ID <sup>2</sup>	Acreage Not Verified
214	114.11	214-2586	24.57
		214-2592	4.96
8	4.77	8-30	4.77
12	284.56	12-37	5.60
		12-40	0.53
21	118.64	21-76	4.06
22	2,932.19	22-123	8.59
24	49.71	24-134	49.67
32	278.99	32-387	0.83
33	107.88	33-497	0.03
		33-498	0.01
58	8.44	58-749	3.57
60	1.00	60-762	0.65
		60-761	0.02
92	183.51	92-960	1.39
94	164.00	94-973	3.85
		94-971	0.78
104	12.75	104-997	0.32
111	2.42	111-1064	0.99
117	4.75	117-1097	0.52
124	25.49	124-1123	0.31
137	39.48	137-1198	3.51
		137-1212	1.36
138	11.17	138-1226	0.25
140	79.84	140-1258	0.25
145	32.28	145-1303	11.01
168	7.36	168-1534	0.43
		168-1513	0.29
		168-1517	0.23



**TABLE 4-2. CLAIMED IRRIGATED ACREAGE  
NOT VERIFIED BY ADWR**

HOPI TRIBE THIRD AMENDED SOC (AS SUPPLEMENTED) CLAIMED INFORMATION		ADWR FINDINGS <sup>1</sup>	
Hopi (GIS) Field Label	Hopi (GIS) Field Acres	2015 Field Verification ID <sup>2</sup>	Acreage Not Verified
173	133.64	173-1661	0.002
176	73.64	176-1728	0.46
		176-1690	0.20
		176-1729	0.19
		176-1684	0.01
		176-1725	0.003
178	8.32	178-1741	0.43
		178-1740	0.12
		178-1742	0.02
180	2.11	180-1756	0.26
		180-1758	0.16
		180-1759	0.11
181	1.31	181-1767	0.18
		181-1765	0.01
		181-1767	0.01
182	82.59	182-1801	1.61
184	501.87	184-1864	0.68
		184-1921	0.40
		184-1867	0.09
188	138.86	188-2172	4.74
		188-2185	3.68
		188-2181	0.34
		188-2164	0.33
		188-2189	0.09
		188-2195	0.06
		188-2196	0.03
192	26.11	192-2231	0.06
		192-2232	0.001
194	122.69	194-2267	0.46
		194-2263	0.28
198	5.64	198-2455	1.08



Table 4-2

**TABLE 4-2. CLAIMED IRRIGATED ACREAGE  
NOT VERIFIED BY ADWR**

HOPI TRIBE THIRD AMENDED SOC (AS SUPPLEMENTED) CLAIMED INFORMATION		ADWR FINDINGS <sup>1</sup>	
Hopi (GIS) Field Label	Hopi (GIS) Field Acres	2015 Field Verification ID <sup>2</sup>	Acreage Not Verified
202	25.51	202-2471	22.83
204	0.68	204-2473	0.49
		204-2475	0.18
205	4.03	205-2478	3.92
208	30.66	208-2511	0.04
		208-2512	0.02
		208-2510	0.002
210	49.53	210-2553	0.66
214	114.11	214-2571	0.40
215	80.16	215-2611	5.21
<b>Total</b>			<b>650.06</b>
UNITED STATES THIRD AMENDED SOC CLAIMED INFORMATION		ADWR FINDINGS <sup>1</sup>	
United States Field ID	United States (GIS) Field Acres	2015 Field Verification ID	Acreage Not Verified
OID: 1763; Field #914, SENE	4.61	D-224	4.61
OID: 1764; Field #914, SWNW	3.59	D-225	3.59
OID: 2544; Field #736, NWNW	1.72	A-528	1.72
<b>Total</b>			<b>9.93</b>

Notes:

<sup>1</sup> Based on ADWR's 2015 composite aerial photo interpretation and verification analysis.

<sup>2</sup> During its 2008 analysis of claimed acreage for the Preliminary Hopi HSR, ADWR merged smaller fields prior to analysis. In 2015, the Hopi provided ADWR with the merged fields in support of their claimed acreage, which ADWR unmerged prior to analysis. ADWR may report multiple fields as being "not verified" for a single field claimed by the Hopi.



**TABLE 4-3. REVISED SUPPLEMENTAL IRRIGATION DEMAND (SID)  
ESTIMATES FOR AGRICULTURE ON THE HOPI INDIAN RESERVATION**

Hopi and United States Irrigation Class <sup>1</sup>	ADWR Irrigation Class	Lower Limit (ft/yr)	Upper Limit (ft/yr)	Average (ft/yr)
Perennial and Spring	Modern	2.06	2.7	2.38
Seasonal, Range and Native	Traditional	0.36	0.98	0.67

Notes:

<sup>1</sup> Irrigation classes found in the Hopi and United States Second Amended SOCs.



**TABLE 4-4. CALCULATION OF WATER DUTIES**

<b>ADWR Irrigation Class</b>	<b>Irrigation Conveyance Efficiency</b>	<b>On-farm Efficiency</b>	<b>Overall Efficiency</b>	<b>Average SID (AF/Acre)</b>	<b>Water Duty (AF/Acre)</b>
Modern	85%	65%	55%	2.38	4.33
Traditional	90%	80%	72%	0.67	0.93



**TABLE 4-5. NET ANNUAL SURFACE WATER EVAPORATION**

STATION	GROSS MEAN ANNUAL SURFACE WATER EVAPORATION (INCHES)		MEAN ANNUAL PRECIPITATION (INCHES)	NET ANNUAL SURFACE WATER EVAPORATION (INCHES)	NET ANNUAL SURFACE WATER EVAPORATION (FEET)
Tuba City	Lower bound	67.47	6.47	61.00	5.1
	Upper bound	80.20	6.47	73.73	6.1
Keams Canyon	Lower bound	63.50	9.94	53.56	4.5
	Upper bound	75.08	9.94	65.14	5.4



**TABLE 4-6. HISTORIC ACCOUNTS OF THE NUMBER OF HOPI LIVESTOCK <sup>1</sup>**

YEAR	SHEEP AND GOATS	CATTLE, HORSES, AND OTHERS	REFERENCE	YEAR	SHEEP AND GOATS	CATTLE, HORSES, AND OTHERS	REFERENCE
1775	All villages had an "abundance of sheep" and "some cattle" with more cattle and a "good herd of horses" at Orabi.		Adams (1963)	1890	22,500	5,000	CIA (1890)
late 1770s	Few hundred head		John (1966)	1891	8,000	500	Clemmer (1995)
1780	300 sheep and a few horses, mostly at Walpi; no cattle.		Twitchell (1918)	1892	8,000	500	Clemmer (1995)
1782	All pueblos had herds of sheep, horses, burrows and cows.		Whitely (2004)	1893	2,000		Clemmer (1995)
1852	Raised goats, sheep, and some burrows but "scarcely any horses and mules".		Schoolcraft (1854)	1895	8,000	500	Clemmer (1995)
1858	Large flocks of sheep near Mishongnovi		Ives (1861)	1901	55,500 <sup>2</sup>	1,325 <sup>2</sup>	McIntire (1968)
1870	Small flocks of sheep		CIA (1870)	1902	20,000	1,365	Clemmer (1995)
1872	Depleted sheep herds due to drought; used goat's milk		CIA (1872)	1917	25,000		Whitely (2004)
1878	5,000	500	CIA (1878)	1929	21,700	8,100	Hoover (1930)
1879	5,000	500	CIA (1879)	1930	20,511 <sup>3</sup>		Whitely (2004)
1880	5,000	500	CIA (1880)	1937	11,519 <sup>4</sup>	12,780 <sup>4</sup>	McIntire (1968) and Nagata (1970)
1881	10,600	705	CIA (1881)	1938	17,812	3,448	Page (1938)
1882	10,600	1,584	CIA (1882)	1943	13,627	2,200	McIntire (1968)
1884		1,750	CIA (1884)	1945	23,627 <sup>5</sup>		Day (1945)
1885	6,000	510	CIA (1885)	1950	6,992	3,369	McIntire (1968)
1886	25,000	1,200	CIA (1886)	1960	9,619		Whitely (1988)
1887	21,500	16,050	CIA (1887)	1961	6,060	2,270	Arizona Commission of Indian Affairs (1961)
	25,000		Clemmer (1995)	1964	6,090	2,520	McIntire (1968)
1888	16,500	930	CIA (1888)	1965	6,600	1,000	Clemmer (1995)
	18,000		Clemmer (1995)	1973	2,056 <sup>5,6</sup>		Smitherman (1973)
1889	6,000	6,750	CIA (1889)	1980	1,000	8,500	Clemmer (1995)
	6,000		Clemmer (1995)	1981	1,000		Whitely (1988)

Notes:

- <sup>1</sup> Summarized from Andersen (2008).
- <sup>2</sup> Presumably includes District 6 and the entire Joint Use Area (JUA); the latter consists of Hopi and Navajo Partitioned Lands. Hopi sheep herding in Moenkopi Area was "virtually nonexistent" (Nagata, 1970).
- <sup>3</sup> Hopi also grazed 1,300 sheep and 300 cattle on the Moenkopi Plateau and Coal Mine Mesa (Nagata, 1970).
- <sup>4</sup> Reference indicated that counts seem high. Nagata (1970) reported that the Hopi also grazed 100 sheep, 300 cattle, and 40 horses on the Moenkopi Plateau and Coal Mine Mesa.
- <sup>5</sup> Sheep units.
- <sup>6</sup> Counts limited to the JUA.



**TABLE 4-7. RECENT LIVESTOCK INVENTORIES ON THE HOPI INDIAN RESERVATION <sup>1</sup>**

YEAR	DISTRICT 6				HOPI PARTITIONED LANDS				MOENKOPI AREA			
	Cows	Sheep	Horses	Total AUs <sup>2</sup>	Cows	Sheep	Horses	Total AUs <sup>2</sup>	Cows	Sheep	Horses	Total AUs <sup>2</sup>
1984	4,824	882	226	5,329 <sup>3</sup>	1,533		23	1,562				
1985	2,566	595	206	2,972								
1991									341 <sup>4</sup>			341
1992									365 <sup>4</sup>			365
1997					1,932	1,668	152	2,539				
2003	2,396	0	111	2,535								
2004	2,166	90	15	2,207								
2005	1,945	63	21	1,987								
2006	1,574	24	14	1,598								

Notes:

<sup>1</sup> Inventory data sources include Bell and Norstog (1985), Hopi (2008a and 2008c), and Talashie (1985).

<sup>2</sup> Animal Units (AUs) are calculated by the Hopi (1998) as follows:

4 Sheep/Goat = 1 AU

1 Cow/Cattle = 1 AU

1 Horse/Burro = 1.25 AU

<sup>3</sup> Of the 5,329 AUs counted in District 6 during 1984, 278 grazed in unfenced farmed areas, 2,442 grazed in fenced farm areas, and 2,609 grazed on unfarmed rangeland (Bell and Norstog, 1985).

<sup>4</sup> Inventories were provided by the Hopi in sheep units and converted to cows and AUs by ADWR.



**TABLE 4-8. CLAIMED IMPOUNDMENTS NOT VERIFIED BY ADWR<sup>1</sup>**

<b>UNITED STATES THIRD AMENDMENT CLAIMED INFORMATION</b>					
<b>Hopi Label</b>	<b>Site ID</b>	<b>Use</b>	<b>Verification Method</b>	<b>Surface Area (acres)</b>	<b>Capacity (acre-feet)</b>
FC-I0962	I0962	STOCK	USGS Quad Map	2.552	5.161
FC-I0968	I0968	STOCK	USGS Quad Map	1.715	3.281
UNC-O-10/ FC-I0976	I0976	STOCK	2007 COLOR AERIAL PHOTO VERIFIED	0.142	0.192
UNC-O-12/ FC-I1254	I1254	STOCK	2007 COLOR AERIAL PHOTO VERIFIED	0.105	0.136
UNC-D-08/ FC-I1252	I1252	STOCK	2007 COLOR AERIAL PHOTO VERIFIED	0.103	0.133
UNC-M-29/ FC-I0630	I0630	STOCK	2007 COLOR AERIAL PHOTO VERIFIED	0.057	0.068
UNC-M-30/ FC-I0631	I0631	STOCK	2007 COLOR AERIAL PHOTO VERIFIED	0.039	0.044
<b>TOTALS</b>				<b>4.713</b>	<b>9.015</b>

Notes:

<sup>1</sup> Based on ADWR's review of 2007 Color NAIP imagery, ESRI World Imagery, and ESRI USA Topo Maps.



**TABLE 5-1. PROPOSED WATER RIGHT ATTRIBUTES FOR PAST AND PRESENT WATER USES  
ON THE HOPI INDIAN RESERVATION**

TYPE(S) OF USE	LEGAL BASIS	WATER SOURCES	POINTS OF DIVERSION	PLACES OF USE	PRIORITY DATES	QUANTITY OF USE (AFA)
Agricultural (Irrigation)	Legal basis of the claims is a matter for decision by the LCR adjudication court, and is beyond the scope of this HSR	Groundwater and surface water	Throughout the Reservation	District 6	Unresolved matter pending before the Court	6,129
				Hopi Partioned Lands (HPL)	Unresolved matter pending before the Court	2,442
				Moenkopi Island	Unresolved matter pending before the Court	1,754
Evaporation from Irrigation Storage				Moenkopi Island	Unresolved matter pending before the Court	192
Livestock and Water Storage for Stock (Stockponds)				District 6	Unresolved matter pending before the Court	1,391
				Hopi Partioned Lands (HPL)	Unresolved matter pending before the Court	1,749
				Moenkopi Island	Unresolved matter pending before the Court	27
Mining				Hopi Partioned Lands (HPL)	Unresolved matter pending before the Court	1,255
Recreation				Hopi Partioned Lands (HPL)	Unresolved matter pending before the Court	13
Aesthetic, Cultural and Ecological Flows (Riparian Habitat and Instream Flows)		Moenkopi Island	Unresolved matter pending before the Court	294		
Subsurface Mineral Rights	Unresolved legal matter	Unresolved legal matter	Unresolved legal matter	Unresolved legal matter	Undetermined	
<b>TOTAL</b>						<b>15,246</b>

