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BEFORE THE
ARIZONA NAVIGABLE STREAM ADJUDICATION COMMISSION

IN THE MATTER OF THE NAVIGABILITY OF THE SALT RIVER FROM GRANITE REEF DAM TO THE GILA RIVER CONFLUENCE, MARICOPA COUNTY, ARIZONA	No. 03-005-NAV **ARIZONA STATE LAND DEPARTMENT'S NAVIGABILITY MEMORANDUM**

I. Introduction.

The Arizona State Land Department ("ASLD" or the "State") files this memorandum in response to the Arizona Navigable Stream Adjudication Commission's ("ANSAC" or "Commission") question whether any of the six pending rivers (the Lower Salt River, Upper Salt River, Gila River, Verde River, San Pedro River, and Santa Cruz River) were navigable in their natural and ordinary condition at statehood, as directed by the Court of Appeals in *State ex rel. Winkleman v. Ariz. Navigable Stream Adjudication Comm'n,* 224 Ariz. 230, 229 P.3d 242 (App. 2010). This Commission must, as a matter of law, perform two separate and distinct tasks, it must: (1) analyze each river system on a segment-by-segment basis pursuant to the dictates of *PPL Montana*, LLC v. Montana, 565 U.S. ___, 132 S.Ct. 1216 (2012), something that was not originally required of the parties or the Commission in this matter; and (2) assess the navigability of each segment in the River's ordinary and natural condition prior to the massive diversion of waters for irrigation that began in the mid-to-late nineteenth century, prior to Arizona's statehood. The State previously submitted a Memorandum to ANSAC on January 13, 2012, that recommended how ANSAC should comply with the *Winkleman* decision.[1] *See* Attachment A. On June 8, 2012, the State submitted a Memorandum on the United States Supreme Court's decision in *PPL Montana,* 132 S.Ct. 1215 (2012). *See* Attachment B. In its *PPL Montana* Memorandum, the State recommended segments for the six pending rivers currently at issue before ANSAC. The Salt River was divided previously into two sections: the Lower Salt River and the Upper Salt River. This division is not consistent with the ordinary and natural physical characteristics of this river system, and accordingly the State has recommended different segmentation based on the River's physical characteristics. *See* Attachment C, comparison of reaches with recommended segmentation for the Lower Salt River. This Memorandum, therefore, addresses the Lower Salt River from the Verde River confluence to the Gila River confluence.[2]

As the *Winkleman* Court instructed, ANSAC must determine "what the River would have looked like on February 14, 1912, in its ordinary (i.e., usual, absent major flooding or drought) and natural (i.e., without man-made dams, canals, or other diversions) condition." *State ex rel.*

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[1] The State and the Center for Law in the Public Interest submitted Plaintiffs' Joint Statement of Facts in Support of their Opening Briefs in *State of Arizona v. Arizona Navigable Stream Adjudication Commission, et al.*, Maricopa County Superior Court Case No. LC2006-000413-001DT, October 16, 2006 ("PSOF") (attached hereto and incorporated herein as Attachment D). Also, the State incorporates by reference its previously filed memoranda with ANSAC: *State Land Department's Opening Post-Hearing Memorandum* filed June 9, 2003, and *State Land Department's Response to Opening Post-Hearing Memoranda* filed Aug. 11, 2003.

[2] The Lower Salt River's reach previously began at Granite Reef Dam that is approximately four miles below the Verde River and Salt River confluence.

Winkleman v. Ariz. Navigable Stream Adjudication Comm'n, 224 Ariz. at 241, 229 P.3d at 253; *see PPL Montana, LLC v. Montana,* 132 S.Ct. at 1228 (title navigability determined at statehood based on the "natural and ordinary condition"). The *Winkleman* Court found that the Lower Salt River was "in its natural condition after many of the Hohokam's diversions had ceased to affect the River, but before the commencement of modern-era settlement and farming in the Salt River Valley …." *Winkleman,* 224 Ariz. at 242, 229 P.3d at 254.

The *Daniel Ball* test requires that ANSAC determine the ordinary and natural characteristics of the Lower Salt River, and whether, at statehood, the River was used or was susceptible to being used as a highway for commerce. *Winkleman,* 224 Ariz. at 239, 229 P.3d at 251; *see Utah v. United States,* 403 U.S. 9, 12 (1971); *United States v. Utah,* 283 U.S. 64, 77-81 (1931); *United States v. Holt State Bank,* 270 U.S. 49, 52-53, 56-57 (1926); *The Daniel Ball,* 77 U.S. (10 Wall.) 557, 563 (1870). The River was navigable within the meaning of the federal test because its ordinary and natural physical characteristics could have supported navigation, and because it was actually boated even as it flows were increasingly depleted.

II. The Ordinary and Natural Physical Characteristics of the Lower Salt River Were Sufficient to Support Navigation and Commerce.

The Lower Salt River in its ordinary and natural condition was capable of being used for transportation or commerce. *See United States v. Utah*, 283 U.S. at 82 ("question of . . . susceptibility in the ordinary condition of the rivers, rather than of the mere manner or extent of actual use, is the crucial question. . . . The extent of existing commerce is not the test."); *PPL Montana,* 132 S.Ct. at 1233.

A. The Lower Salt River's Ordinary and Natural Physical Characteristics – Its Hydrology, Hydraulics, and River Conditions – Demonstrate that the River Was Susceptible to Use as a Highway for Commerce.

1. Salt-Verde Confluence to Gila-Salt Confluence Segment.

In its ordinary and natural condition, the Salt River from the Verde River confluence to the Gila River confluence was a contiguous reach (*Arizona State Land Department Rep., Arizona Stream Navigability Study for Salt River: Granite Reef Dam to the Gila River Confluence,* Draft Final Report, 5-1, 7-1 (rev. Apr. 2003) ("ASLD Lower Salt Report") (Evidence Item No. 030) ("E.I. 30"); *Arizona State Land Department Rep., Arizona Stream Navigability Study for the Salt River: Granite Reef Dam to the Confluence of the White and Black Rivers*, Draft Final Report, 4-8, 5-3 (rev. June 2003) ("ASLD Upper Salt Report") (Evidence Item No. 027) ("E.I. 27") with only minor variations in flow (E.I. 30, ASLD Lower Salt Report, 5-8, 7-17, Table 7-13 (citing USGS Water Resources Investigations Report 91-4041, 7-22, Table 7-16) and stream characteristics (E.I. 30, ASLD Lower Salt Report, 7-10, Table 7-7, 7-17, Tables 7-13, 7-14, 7-25, Figure 7-4, 7-26, Table 7-18, 7-23 – 7-26; *see* flow data published in USGS and USRS Water Supply Reports for 1899 through 1950, 10-31 – 10-35). At that time, the River consisted of a relatively straight, slightly sinuous (E.I. 30, ASLD Lower Salt Report, 5-9, 5-10), alluvial (E.I. 30, ASLD Lower Salt Report, 5-1, 5-8; E.I. 27, ASLD Upper Salt Report, 4-8), sand and gravel bedded (E.I. 30, ASLD Lower Salt Report, 5-9; E.I. 26, Schumm Report 6, Figure 1), perennial stream (E.I. 30, ASLD Lower Salt Report, 7-26), and looked much like the existing River does today between the Verde River confluence and Granite Reef Dam (E.I. 27, Upper Salt Report, 4-13, 4-15).[3]

[3] *See* Attachment C, comparison of reaches with recommended segmentation for the Lower Salt River.

There are no known natural obstructions in the Salt River downstream of the Verde River confluence. E.I. 30, ASLD Lower Salt Report, 5-8. The existing river channel abuts a very small bedrock outcrop near the old Arizona Dam site on the north bank just below the Verde River confluence (E.I. 30, Upper Salt Report, 5-6, B-7-B-8, B-28-B-29), but this outcrop caused no significant changes in channel characteristics. E.I. 27, Upper Salt Report, 4-13. Although the River may have encountered a narrow "reef" of bedrock at Granite Reef Dam, the reef had no known impact on the River's navigability characteristics. E.I. 30, ASLD Lower Salt Report, 5-8. Shallow bedrock also occurs near Tempe Butte, but there is no evidence of bedrock outcrops in the river bed that create any kind of obstruction. E.I. 30, ASLD Lower Salt Report, 5-6. Further, there are no named or mapped rapids in the Salt River downstream of the Verde River confluence (E.I. 30, ASLD Lower Salt Report, 5-9, 10-38), although it is possible that there may have been some small riffles that are common to all alluvial streams. E.I. 30, ASLD Lower Salt Report, 5-9.

Natural barriers such as rapids and sandbars may make navigation more difficult, but do not preclude a finding of navigability. *United States v. Utah,* 283 U.S. at 86-87; *Econ. Light & Power Co.*, 256 U.S. 113, 122 (1921) (stating that navigability is not destroyed because a watercourse is interrupted by occasional natural obstructions or portages). Further, natural obstructions do not necessarily require portaging. Each type of obstruction (e.g., sandbar, waterfall, or rapid) as well as the type of boat, its intended use, and the skill of the boater must be examined to determine if portaging is in fact required. *See United States v. Appalachian Elec. Power Co.*, 311 U.S. 377, 404 (1940) (stating that there is no "formula which fits every type of stream under all circumstances and at all times" and "[o]ur past decisions have taken due account of the changes and complexities in the circumstances of a river"). The Lower Salt's physical characteristics differ markedly from those found on the Missouri River; the River has no seventeen-miles-long "Great Falls" with five waterfalls and continuous rapids in between. *See PPL Montana*, 132 S.Ct at 1231. Therefore, the River has no segment that ANSAC could find non-navigable merely due to its physical characteristics.

Detailed topographic maps from 1903 are available for the entire segment of the Lower Salt River (*see* Figure 1). E.I. 30, ASLD Lower Salt Report, 10-38. These maps indicate that the Lower Salt River had a single low-flow channel that was more than 100 feet wide (although the map post-dates many of the oldest canal diversions). E.I. 30, ASLD Lower Salt Report, 7-11, Table 7-8. This low flow channel was set within a mile-wide floodplain that conveyed flood waters during rare major floods. E.I. 30, ASLD Lower Salt Report, 5-9. The 1903 topographic maps indicate that the ordinary, natural low flow channel averaged about 200 feet wide and one to five feet deep. The range in depths estimated from the 1903 topographic maps reflects the natural variation of channel depths of a normal stream in its ordinary and natural condition. *See* Attachment E, topographic maps of the Lower Salt River with channel width measurements.

Figure 1. 1903 topographic map of the Salt River near Phoenix, Arizona.

2. Hydrology.

Flow data for the Lower Salt River were derived primarily from the records and publications of the United States Geological Survey (USGS). E.I. 30, ASLD Lower Salt Report, 10-32 - 10-35. The ASLD was the only party to compile and submit flow data, which included

USGS records. USGS stream flow records are routinely relied on for stream flow and water adjudication studies throughout the United States, and are universally recognized as reliable and objective. E.I. 30, ASLD Lower Salt Report, 7-1, 7-6 – 7-9. The ASLD also submitted flow data based on: (1) direct measurement (E.I. 30, ASLD Lower Salt Report, 7-1, 7-6); (2) direct observations by explorers and early residents (E.I. 30, ASLD Lower Salt Report, 7-1, 7-6 - 7-7); and (3) stream flow reconstructions based on tree-ring data (E.I. 30, ASLD Lower Salt Report, 7-9).

USGS scientists and hydrologists reconstructed average flow conditions in the Salt River study reach using stream gauge records from stations located upstream of the Salt-Verde confluence. E.I. 30, ASLD Lower Salt Report, 7-9, Table 7-5. Thomsen and Porcello (1991) determined an average annual flow rate of 1,690 cubic feet per second ("cfs"), with a median discharge (50% rate on a flow duration curve) of 1,230 cfs. E.I. 30, ASLD Lower Salt Report, 7-9. The Salt River Valley Water Users Association (1957) used gauge records from 1889 to 1953 to estimate a mean annual discharge of 1,773 cfs. E.I. 30, ASLD Lower Salt Report, 7-9. Consideration of only the period from 1889 to 1912 would yield an even higher mean annual discharge of 1,876 cfs, with a normal annual flow range from 402 to 7,183 cfs. E.I. 30, ASLD Lower Salt Report, 7-8. Daily flow measurements taken at the Verde River near McDowell gauge between 1904 and 1924 indicate that the "expected daily flow" for that period was 968 cfs (Atshul, 1987). E.I. 30, ASLD Lower Salt Report, 7-8. In no case was the natural minimum monthly or annual flow rate zero regardless of the severity of any drought condition. E.I. 30, ASLD Lower Salt Report, 7-17, Table 7-13, Table 7-14. These flow data, as summarized in Table 1, represent the best available estimates using different methods of typical, expected flow rates in the Lower Salt River in its ordinary and natural condition.

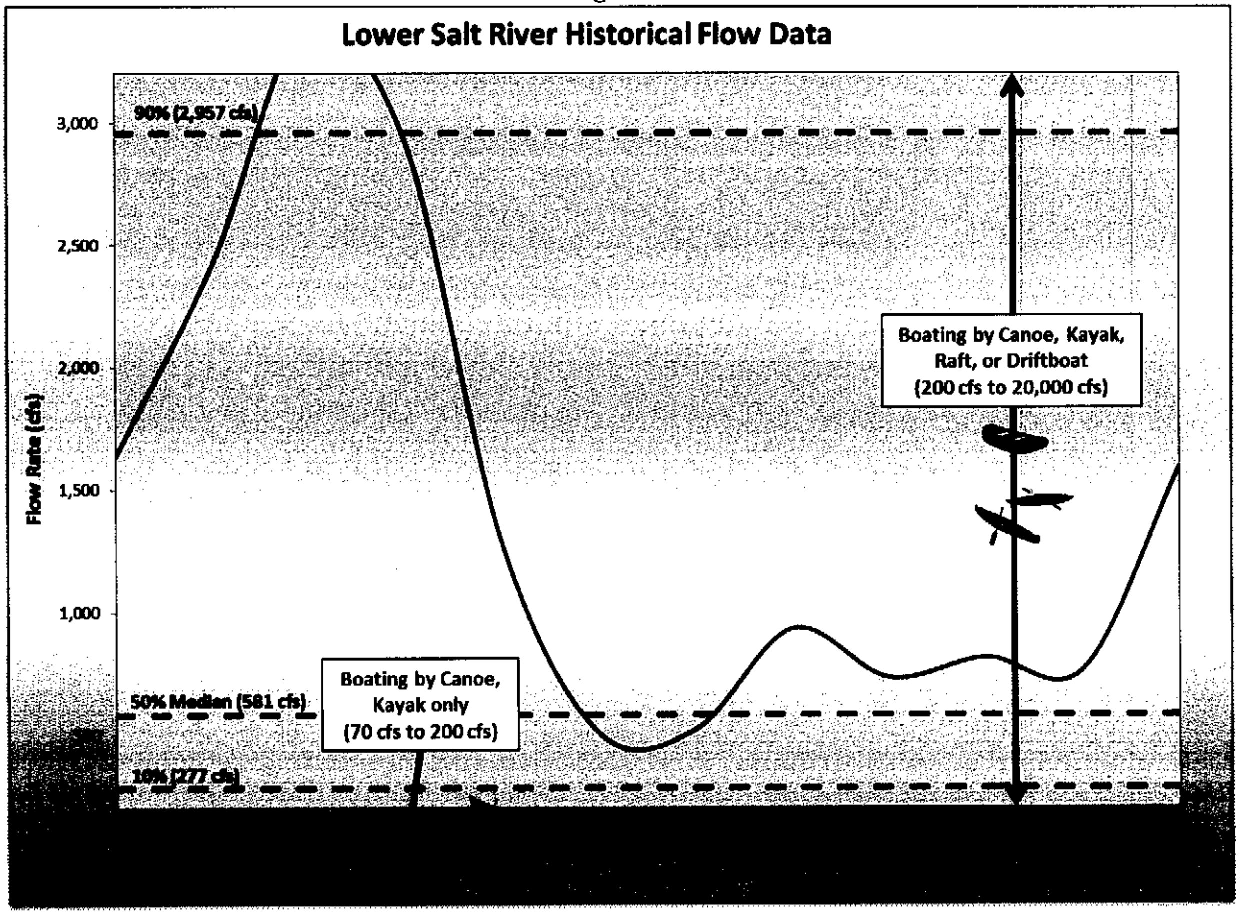
Table 1 Salt River at Granite Reef Dam Flow Statistics Derived from Upstream Gauge Records		
Reference	**Average Annual Flow**	**Median Flow**
Thomsen and Porcello (1991)	1,690	1,230
Salt River Water Users (1957)	1,773	n.a.
Smith and Stockton (1981)	1,265	n.a.
Note: 1,265 cfs is sum of Stockton and Smith's estimates for Salt and Verde using tree-ring records. This does not include drainage area between Verde above Tangle Creek and Salt River above Roosevelt.		

E.I. 30, ASLD Lower Salt Report, 7-9, Table 7-5.

The key aspects of the ordinary and natural flow data in the existing record for the Lower Salt River include the following indisputable facts: (1) as with all natural rivers, there is seasonal fluctuation in the River's natural flow; (2) the River's ordinary and natural seasonal fluctuation occurs within an expected and predictable range; (3) the River experiences periodic floods and droughts: (a) floods on the River are rare and of short duration; flood conditions occur less than 1% of the time, and do not constitute the ordinary and natural condition; and (b) the River never completely dried up, even in the most extreme drought; (4) boatable flow rates occurred more than 95% of the time; and (5) there was no predictable period when non-boatable flood conditions occurred. E.I. 30, ASLD Lower Salt Report, 5-9, 7-17 – 7-18, Table 7-13, Table 7-14, Table 7-15, 7-21 – 7-22, Table 7-16, 7-25 – 7-26, Figure 4, Table 7-18, 8-1, Table 8-1, Appendix D, Historical Salt River Rating Curves.

Figure 2 summarizes the River's ordinary and natural flow data (non-drought, non-flood), and shows its ordinary, seasonal fluctuation by month, as well as 10%, 50% (median), and 90% flow rates. Figure 2 also shows the ranges of flow applicable to different types of boating. These data indicate that the Lower Salt River was ordinarily susceptible to boating throughout the year before its flows were substantially diverted.

Figure 2



Key to Symbols & Data		Gage Data Source:	Gage No. 09498500 SALT RIVER NEAR ROOSEVELT and Gage No. 09508500 VERDE R BLW TANGLE CREEK, ABV HORSESHOE DAM, AZ combined.
	No boating possible		
	Boating by canoes, kayaks	Sources: Min. canoes	
	Boating by all types (canoes, kayaks, rafts, drift boats)	Sources: Max canoes (Douglas Rhodes; Goodyear, AZ (submitted letter to ANSAC on June 15, 2004)); Min Rafts	
	Boating by rafts, drift boats	Source: (above 90% Flow, off-chart)[1]	
	90% Flow	Per stream gage records, 90% of time flow is less than this discharge (2,957 cfs).	
	50% Flow	Median flow rate per stream gage, 50% of time flow is above this discharge (581 cfs).[2]	
	10% Flow	Per stream gage records, 90% of time flow is greater than this discharge (277 cfs).	
	Average monthly discharge as recorded at long-term USGS stream gauging stations.		

Notes:

1. No data on maximum raft boatable rates is in the record. Maximum value set at flood threshold flow rate.
2. USGS Report on Pre-Development Hydrology of Salt River set 50% flow at 1,230 cfs. Gage data reported above likely underestimate actual ordinary and natural flow levels.

E.I. 30, ASLD Lower Salt Report, 5-5, 7-17 – 7-18, Table 7-13, Table 7-15, 7-21, 7-23 – 7-25, 8-1 – 8-2, 8-5, Table 8-4, 10-35, D-1 – D-18; E.I. 27, Upper Salt Report, 5-5, 5-17, Table 12, 5-27 – 5-33, 5-40, 6-1 – 6-2, 8-5, Table 8-4; Upper Salt E.I. 21, Letter from Douglas Rhodes, 6/15/04.

3. Hydraulics.

Rating curves show discharge to stream width, velocity, and depth. E.I. 30, ASLD Lower Salt Report, 7-23. Figure 3 shows the locations and geometry of cross sections used to construct flow rating curves. E.I. 30, ASLD Lower Salt Report, 7-24. Not surprisingly, rating curves (and low flow channel hydraulics) are similar throughout the segment. Maximum main channel depths generally range between one and five feet. E.I. 30, ASLD Lower Salt Report, D1 – D18. The average flow velocities are generally less than three feet per second. E.I. 30, ASLD Lower Salt Report, 7-26. Minimum channel top widths are between 100 and 400 feet. E.I. 30, ASLD Lower Salt Report, 7-26. These values are further corroborated with depths and widths reported by early explorers, cited by contemporary investigators, and as shown on the map in Figure 1. E.I. 30, ASLD Lower Salt Report, 3-14 – 3-15.

Early explorers describe a perennial stream averaging up to 200 feet wide and two to three feet deep, with abundant beaver and fish populations, and dense riparian vegetation along the stream banks. E.I. 30, ASLD Lower Salt Report, 5-9, 7-11.[4] For example, beaver trappers in the 1820's described the River at its confluence with the Verde as affording "as much water . . . as the [Gila]." E.I. 30, ASLD Lower Salt Report, 3-14. Also, members of the U.S. Boundary Commission, surveying this area after the United States acquired it in 1848 and 1853, described the River in 1852 at a point twelve miles up-river from its confluence with Gila as being "two to three feet deep, and both rapid and clear . . . . [and] [we] saw from the banks many fish in its

[4] Early observations of the River are further supported by evidence that the River was fished commercially between 1879 and 1881. E.I. 30, ASLD Lower Salt Report, 3-17. An abundance of fish, some as long as five feet and weighing forty pounds, were reported in the River in the 1880s. E.I. 30, ASLD Lower Salt Report, 3-7; *see* Attachment F (E.I. 30, Lower Salt Report, Appendix H, Figure 3, depicting Salt River fish).

clear waters." E.I. 30, ASLD Lower Salt Report, 3-6, 3-14 – 3-15. These early observations clearly describe a river whose physical condition could support boating.

Table 2 below documents the River's pre-statehood average hydraulic characteristics. E.I. 30, ASLD Lower Salt Report, 7-26, Table 7-18. Comparing the hydraulic characteristics in Table 2 with those for federal boating criteria in Table 3, and with the probable stream characteristics for canoes used at statehood in Table 4 leads to one conclusion: The Lower Salt in its ordinary and natural condition normally exceeded the minimum conditions for boating and, therefore, was susceptible to navigation. *See* E.I. 30, ASLD Lower Salt Report, 8-2, Table 8-2, 8-3, Table 8-3.

Table 2
Hydraulic Characteristics for Pre-Statehood Salt River

Flow Rate (cfs)	Depth (ft)	Velocity (ft/sec)	Top width (ft)
20	0.3	0.5	160
300	1.4	1.3	210
1,400	3.2	2.2	300

Note: 20 - 300 cfs are typical low flows after canal diversions; 300 cfs is minimum monthly flow in pre-statehood records; 1400 cfs is approximately the mean annual flow prior to urbanization.

E.I. 30, ASLD Lower Salt Report, 7-26, Table 7-18

Table 3
Minimum and Maximum Conditions for Recreational Water Boating

Type of Boat	Minimum Condition			Maximum Condition		
	Width	Depth		Width	Depth	Velocity
Canoe, Kayak	25 ft.	3-6 in.		-	-	15 fps
Raft, Drift Boat	50 ft.	1 ft.		-	-	15 fps
Low Power Boating	25 ft.	1 ft.		-	-	10 fps

Source: Cortell and Associates, 1977

E.I. 30, ASLD Lower Salt Report, 8-2, Table 8-2.

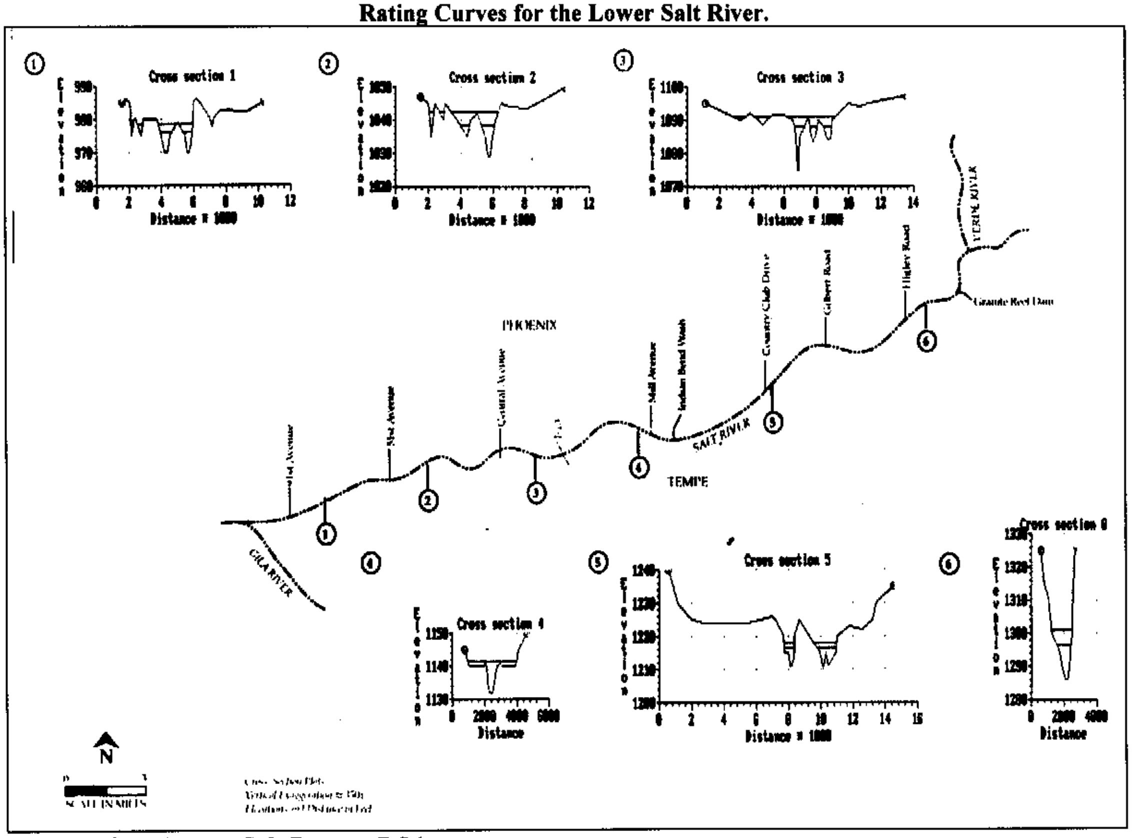
Table 4
Flow Requirements for Pre-1940 Canoeing

Boat Type	Depth
Flat Bottomed (Wood or Canvas)	4 in.
Round Bottomed (Wood or Canvas)	6 in.

Source: Slingluff, J., 1987; E.I. 30, ASLD Lower Salt Report, 8-3, Table 8-3.

E.I. 30, ASLD Lower Salt Report, 8-3, Table 8-3.

Figure 3.
Rating Curves for the Lower Salt River.



E.I. 30, ASLD Lower Salt Report, 7-24.

4. River Conditions.

In its ordinary and natural condition, the Lower Salt River had a consistent geometry that is characterized as a compound channel. E.I. 30, ASLD Lower Salt Report, 5-9. A compound channel consists of a main channel that is inset within a broad floodplain plain. E.I. 30, ASLD Lower Salt Report, iv, 9-1. The main channel conveys the most frequent, reliable stream flow, while the floodplain is only inundated during the largest floods. E.I. 30, ASLD Lower Salt Report, 5-9. This compound channel geometry applied to the entire length of the Lower Salt River. E.I. 30, ASLD Lower Salt Report, 5-1. The slope of the Lower Salt River averaged about 0.2 percent (11 ft/mile). E.I. 30, ASLD Lower Salt Report, 5-10. The bed of the main channel was composed of sand, gravel and cobbles. E.I. 30, ASLD Lower Salt Report, 5-9. The banks of the main channel were lined by trees and other dense riparian vegetation (E.I. 30, ASLD

Lower Salt Report, 5-9) which persisted for some time even after the normal flow had been diverted out of the River. *See* Figure 4 (Salt River in 1926 showing tree-lined, sinuous (single) low flow channel and wide floodplain); *see also* E.I. 30, ASLD Lower Salt Report, 5-9 (noting that because the Hohokam canals were able to be used in modern times channel conditions must have been stable).

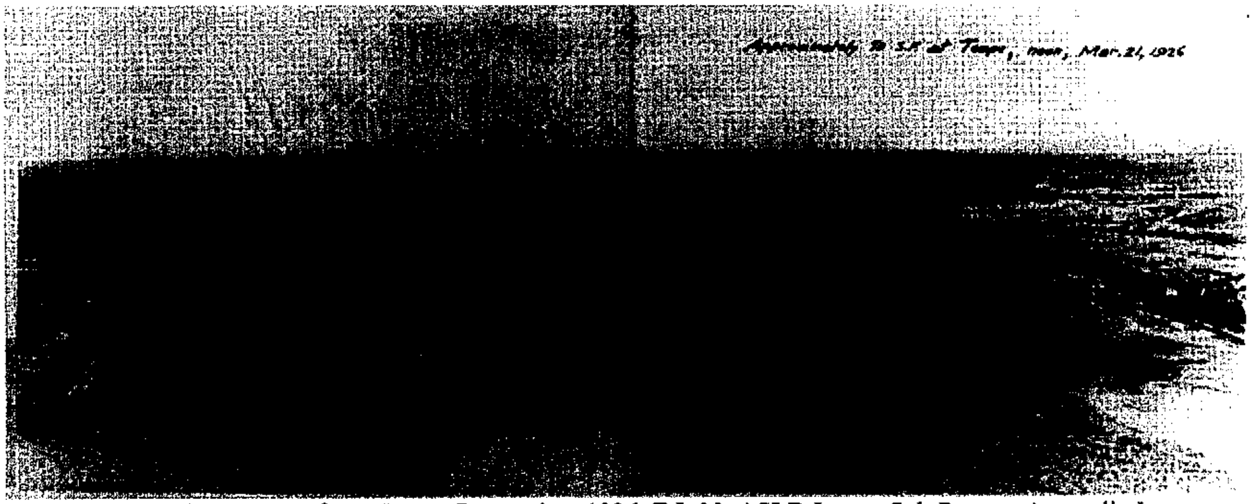


Figure 4. View downstream from Tempe Butte, circa 1926; E.I. 30, ASLD Lower Salt Report, Appendix I.

Like all alluvial rivers, the main channel of the Lower Salt River had the potential to shift during large floods (E.I. 30, ASLD Lower Salt Report, 5-9), although its geometry remained essentially the same (E.I. 30, ASLD Lower Salt Report, 5-9), such that the susceptibility to navigation remained unchanged before and after floods.

B. The Lower Salt River's Ordinary and Natural Physical Characteristics Met Historical Boating Requirements.

The type of boats typically used at statehood were flat-bottomed boats, skiffs, or canvas and wooden canoes. E.I. 30, ASLD Lower Salt Report, 8-3. Historic photographs depict these type of boats. *See* Attachment G, photograph of wooden boat, E.I. 30, ASLD Lower Salt Report, Appendix I, photo documentation. The boats at statehood required a depth of four inches for a flat bottomed (wood or canvas) boat, and a depth of six inches for a round bottomed (wood or canvas) boat. E.I. 30, ASLD Lower Salt Report, 8-3, Table 8-3, Table 4. The Lower Salt River's ordinary and natural condition easily met these boating requirements. *See PPL Montana*, 132 S.Ct. at 1233 ("[e]vidence of recreational use, depending on its nature, may bear upon susceptibility of commercial use at the time of statehood."); *Holt State Bank*, 270 U.S. at 57 ("[e]arly visitors and settlers in that vicinity used the river and lake as a route of travel, employing the small boats of the period for the purpose.").

Navigability does not depend on a particular mode of commerce, the type of boat that is used or that could be used, or on actual use. *United States v. Utah*, 283 U.S. at 76; *see Appalachian*, 311 U.S. at 416 ("personal or private use by boats demonstrates the availability of the stream for the simpler types of commercial navigation."); *Holt State Bank*, 270 U.S. at 56 ("navigability does not depend on the particular mode in which such use is or may be had – whether by steamboats, sailing vessels or flatboats."); *The Montello*, 87 U.S. (20 Wall.) 430, 441-442 (1874) ("[T]he true test of the navigability of a stream does not depend on the mode by which commerce is, or may be conducted . . . . [i]t would be a narrow rule to hold that in this country, unless a river was capable of being navigated by steam or sail vessels, it could not be treated as a public highway."). The Lower Salt in its ordinary and natural condition exceeded the required stream characteristics for historical, low draft boating, thus clearly demonstrating that the River was susceptible to navigation at statehood.

III. The Lower Salt River's Ordinary and Natural Physical Characteristics Were Not Only Sufficient to Support Historic Navigation, The River Was Actually Navigated.

A. Historic Boating Evidence.

Historic use of the Lower Salt River proves that the River was used for trade and travel. Although some of the accounts did not occur when the River was in its ordinary and natural condition, these accounts are even more probative of navigability because they occurred in increasingly depleted flows. *See Winkleman,* 224 Ariz. at 255, 229 P.3d at 243 ("[e]ven if evidence of the River's condition after man-made diversions is not dispositive, it may nonetheless be informative and relevant"). At least sixteen documented accounts of commercial and recreational boating occurred between 1873 to 1910. E.I. 30, ASLD Lower Salt Report, 3-18 – 3-19; *see* Table 5 (Historical Accounts of Boating – Lower Salt River Chart), E.I. 30, ASLD Lower Salt Report, 3-19 – 3-20, Table 3-2, 7-17, Table 7-14, 7-22, Table 7-16. The number of reported accounts is relatively low, because many alternative modes of travel existed (E.I. 30, ASLD Lower Salt Report, 3-17 – 3-18, 9-1), the population of the Salt River Valley was very small (E.I. 30, ASLD Lower Salt Report, 3-9, 3-12 – 3-13, Figures 3-6 – 3-7), and the River's flow was increasingly obstructed and diverted by canals and dams (E.I. 30, ASLD Lower Salt Report, 7-11 – 7-12, Table 7-8). Overall, these reported boating accounts show that the River was used by low draft boats (E.I. 30, ASLD Lower Salt Report, 8-3), in the downstream direction (E.I. 30, ASLD Lower Salt Report, 8-3), in all months of the year (E.I. 30, ASLD Lower Salt Report, 8-3), for both recreation and commercial ventures (E.I. 30, ASLD Lower Salt Report, 8-2 – 8-3).

Table 5
Historical Accounts of Boating – Lower Salt River

Date	Source	Names	Boat Type	Average Flow Rate for Month (cfs)	Flood Year?	Reach	Successful?
1873 (May 3)	Weekly AZ Miner	Not given	Flat boat	1269	No	Hayden Mill to Swilling Canal	Yes
1873 (June 14-28)	Weekly AZ Miner	Charles Hayden	Logs + canoe	501	No	Upper Salt River	No. Log jam in canyons
1881 (11/30-12/3)	Phx Gazette	O'Neill + 2	20'x5' boat	1589	No	Phoenix to Gila River confluence	Yes (on Salt River)
1883	AZ Republican	Meadows + 3		-	No	Granite Reef to Tempe	Yes
1883 (Feb 14)	AZ Gazette	Willcox Andrews	Canvas skiff	2420	No	Ft McDowell to Salt River Valley Canal	Yes
	AZ Gazette	-	Boat	-	No, but high water	Tempe	Yes

Table 5 Historical Accounts of Boating – Lower Salt River							
Date	**Source**	**Names**	**Boat Type**	**Average Flow Rate for Month (cfs)**	**Flood Year?**	**Reach**	**Successful?**
	Fireman (1969)	Unknown	Small boat	-	No	Tempe to Gila River confluence	Yes
1885 (June 3-8)	AZ Gazette	Bunch + 4	18'x5' boat	501	No	Granite Reef to Tempe	Yes
1888 (Dec 12)	Phx Herald	Spaulding Hatfield	Canoe	1589	Yes	Verde River confluence to Phoenix	Yes (re. boating)
1889 (Jan 24)	Tombstone Daily Prospector	Gentry Cox	Large Ferry	1637	Yes	Maricopa Crossing to Gila confluence	Yes (on Salt River)
1890?	Ethnographic, Mesa Free Press	Chandler	Logs	-	Yes	Verde River confluence to Consolidated Canal	Yes
1895 (Feb 18)	Phx Herald	Adams Evans	Boat	2420	Yes	Phoenix to Gila River confluence	Yes
1905 (Dec 9)	AZ Republican	US Reclamation Service	Boat	1589	Yes	Arizona Dam to Consolidated Canal	Yes
1905 (Feb 5)	AZ Republican	Tilzer	Boat	2420	Yes	Salt River @ 7th Street	Yes & No
1905 (March 24)	AZ Republican	Shively	Boat	3420	Yes	Phoenix to Gila River confluence	Yes
1910 (June 28)	AZ Republican	Thorpe Crawford	Rowboat	501	Yes	Granite Reef Dam to South Canal	Yes
1915 (Jan 30)	AZ Gazette		Boat	1637	No	Salt River	Yes

E.I. 30, ASLD Lower Salt Report, 3-19 – 3-20, Table 3-2, 7-17, Table 7-14, 7-22, Table 7-16.

Moreover, at least six ferries operated on the Lower Salt River between Granite Reef Dam and the Gila River between 1860 and 1915. E.I. 30, ASLD Lower Salt Report, 3-25. The ferries varied in size (the largest was 16 x 48 feet), and transported passengers, mail, and large, loaded freight wagons with team. E.I. 30, ASLD Lower Salt Report, 3-27; *see* Figure 5, E.I. 30, ASLD Lower Salt Report, Appendix I, photo documentation.


Figure 5. Photograph of Hayden's Ferry on the Lower Salt River 1895 (E.I. 30, ASLD Lower Salt Report, Appendix I, Photo Documentation).

Ferries operated on the Lower Salt River for periods of at least several months and for as long as half the year, for many years. *See* E.I. 30, ASLD Lower Salt Report, 3-25 (ferries on the Salt and Gila Rivers were an absolute necessity for communication during several months every year), 3-27 (Salt and Gila Ferry in operation from 1884 to 1909), 3-26 (Hayden's Ferry in operation from 1874 to 1909); *see also* E.I. 30, ASLD Lower Salt Report, 3-27 (news account that waters on the Salt River were rising due to warm weather melting the snow illustrates that seasonal, high spring runoff was a predictable and regular occurrence). Periodic navigability is enough to establish navigability for title purposes even if a river is not susceptible to navigation at all seasons of the year or at all stages of the water. *See United States v. Utah,* 283 U.S. at 87 (finding that portions of the Green, Colorado, and San Juan Rivers were navigable because they were useable as highways for commerce during at least nine months of the year); *Holt State Bank,* 270 U.S. at 57 (finding Mud Lake navigable despite occasional "seasons of great drought" during which navigation was difficult); *Alaska v. Ahtna, Inc.* 891 F.2d 1401, 1402 (9th Cir. 1989) (Gulkana River navigable even though frozen six months of the year); *Oregon v. Riverfront Prot. Ass'n,* 672 F.2d 792, 795 (9th Cir. 1982) (McKenzie River found navigable based on seasonal log drives for seventeen years that occurred primarily during three months of each year); *cf PPL Montana,* 132 S.Ct. at 1234 (susceptibility cannot be so brief that it is not a commercial reality). Ferries demonstrate the River's usefulness for "trade and travel;" they establish that the River was actually navigable and further could have floated and easily afforded passage to boats in general use at statehood.[5] *See Utah v. United States,* 403 U.S. at 11 (nine boats sporadically used by ranchers to haul their livestock across the Great Salt Lake demonstrated that the Lake was used as a highway for commerce); *see also* A.R.S. § 37-1101(3) ("highway for commerce" is a corridor within which goods, commodities, or property or transportation of persons occur). If the occasional transport of livestock by their owners across a lake provides a sufficient basis to demonstrate use as a highway for commerce, then the numerous ferries that regularly transported both passengers and goods across the River provides clear proof that the Lower Salt River was used as a highway for commerce. *See Utah v. United States,* 403 U.S. at 11-12.

Specific, historical boating incidents and the prolific use of ferries for decades, demonstrates not only that the Lower Salt River is susceptible to navigability, but also that the River was actually navigated.

B. Modern Boating Evidence and Requirements.

According to *PPL Montana*, in order for present-day use to have a bearing on navigability at statehood, (1) the watercraft must be meaningfully similar to those in customary use for trade and travel at statehood; and (2) the River's post-statehood condition may not be

[5] The number of ferries eventually diminished as the ordinary and natural flow in the River was impounded in reservoirs, diverted to canals, and as bridges over the River were constructed. E.I. 30, ASLD Lower Salt Report, 3-25.

materially different from its physical condition at statehood. 132 S.Ct. at 1233. The criteria for canoes at statehood is not substantially different from the criteria for canoes available today. E.I. 30, ASLD Lower Salt Report, 8-3; *compare* 8-3, Table 8-3 (Flow Requirements for Pre-1940 Canoeing), *with* 8-2, Table 8-2 (Minimum and Maximum Conditions for Recreational Water Boating), and 8-1, Table 8-1 (Minimum Required Stream Width and Depth for Recreation Craft). Although boat-making technology has improved since statehood making boats more durable, the depth of water required (draft) for canoeing has not substantially changed. E.I. 30, ASLD Lower Salt Report, 8-4. With respect to a watercourse's post-statehood condition, the *PPL Montana* Court was concerned that post-statehood improvements in navigability not be used to prove navigability for title purposes. *See PPL Montana,* 132 S.Ct. at 1233-1234. No such concern is necessary here, however, where the River's flows have been consistently depleted since the River was in its ordinary and natural condition.

Extensive recreational boating occurs on the Lower Salt River between the Verde River confluence and Granite Reef Dam. E.I. 27, Upper Salt River Report, 6-6, Table 4.[6] The boating consists of canoes, kayaks, and rafts. E.I. 27, Upper Salt River Report, 6-6, Table 4. Commercial boating on the Lower Salt River is seasonal during dam releases. E.I. 27, Upper Salt River Report, 6-6. Dam release rates are lower than pre-statehood median flow rates. E.I. 30, ASLD Lower Salt Report, 7-7 – 7-9. Examples of commercial boating include day raft trips (E.I. 27, Upper Salt River Report, 6-6), kayaks and canoes (E.I. 27, Upper Salt River Report, 6-6), and tube rentals (Upper Salt Transcript of the hearing held Oct. 20, 2005, Tr. 22-23 (Fuller);

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[6] Based on the Lower Salt's segment now extending approximately four miles above the Granite Reef Dam to the Salt River, Verde River confluence, pertinent information contained in the ASLD's Upper Salt Report is referenced herein.

E.I. 27, Upper Salt River Report, 3-40) (tubing popular enough from Stewart Mountain Dam to the Verde confluence to support at least one commercial outfitter).

IV. Conclusion.

The Lower Salt River evidence demonstrates that the Lower Salt River's ordinary and natural physical characteristics clearly supported navigation and commerce: there was reliable, permanent stream flow at all times, and a median flow rate around 1,200 cfs that corresponds to an average flow depth of approximately three feet, resulting in the River being susceptible to navigation more than 95% of the time. Moreover, actual commercial use and historical boating occurred despite increasingly diminished flows thus proving that the River afforded a useful highway for commerce. The State urges ANSAC to find the Lower Salt River navigable.

DATED: September 7, 2012.

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BEFORE THE
ARIZONA NAVIGABLE STREAM ADJUDICATION COMMISSION

IN THE MATTER OF THE NAVIGABILITY OF THE SALT RIVER FROM GRANITE REEF DAM TO THE GILA RIVER CONFLUENCE, MARICOPA COUNTY, ARIZONA	No. 03-005-NAV **ARIZONA STATE LAND DEPARTMENT'S MEMORANDUM**

On April 27, 2010, the Court of Appeals found that the Arizona Navigable Stream Adjudication Commission ("ANSAC" or the "Commission") misapplied the pertinent test for determining navigability. The Court vacated the superior court's decision affirming ANSAC's decision, and remanded the matter back to ANSAC for further proceedings. *State ex rel. Winkleman v. Arizona Navigable Stream Adjudication Com'n*, 224 Ariz. 230, 229 P.3d 242 (App. 2010) ("*Winkleman*"). At ANSAC's December 14, 2011, meeting, the Commission requested that interested parties submit memoranda with their recommendations on how ANSAC should comply with the *Winkleman* decision. The Arizona State Land Department (the "ASLD" or the "State") submits the following Memorandum in response to ANSAC's request.[1]

[1] The State requests that the Commission delay any action on contested rivers until the U.S. Supreme Court issues its decision in *PPL Montana, LLC v. Montana*, 355 Mont. 402, 229 P.3d 421 (2010), *cert. granted in part & denied in part*, 79 U.S.L.W. 3102* (U.S. June 20, 2011) (No.

The Commission's navigability determination is governed by the federal test of navigability, known as the "*Daniel Ball*" test, that provides as follows:

> [t]hose rivers must be regarded as public navigable rivers in law which are navigable in fact. And they are navigable in fact when they are used, or are susceptible of being used, in their ordinary condition, as highways for commerce, over which trade and travel are or may be conducted in the customary modes of trade and travel on water.

The Daniel Ball, 77 U.S. (10 Wall.) 557, 563 (1870); *see Defenders of Wildlife v. Hull*, 199 Ariz. 411, 420, 18 P.3d 722, 731 (App. 2001) (*Daniel Ball* test correctly paraphrased in A.R.S. § 37-1101(5)). The *Daniel Ball* test requires ANSAC to determine the characteristics of the Lower Salt River in its ordinary and natural condition and whether, at statehood, the River was used or would have been susceptible to use as a highway-for-commerce in that condition. *Winkleman,* 224 Ariz. at 239, 229 P.3d at 251.

In the *Winkleman* decision, the Court of Appeals found that ANSAC failed to evaluate the River's ordinary and natural condition in light of the numerous dams, canals, and other diversions other than Roosevelt Dam. *Winkleman,* 224 Ariz. at 240, 229 P.3d at 252. The Court of Appeals directed ANSAC to determine "what the River would have looked like on February 14, 1912, in its ordinary (i.e., usual, absent major flooding or drought) and natural (i.e., without man-made dams, canals, or other diversions) condition." *Winkleman,* 224 Ariz. at 241, 229 P.3d at 253. The Court found that the River was "in its natural condition after many of the Hohokam's diversions had ceased to affect the River, but before the commencement of modern-era settlement and farming in the Salt River Valley, when some of the Hohokam's diversions were returned to use and other man-made diversions and obstructions began to affect the River." *Winkleman,* 224 Ariz. at 242, 229 P.3d at 254. Thus, the River's natural condition is after the

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10-218). The *PPL* decision could potentially affect application of the federal test in the contested rivers before ANSAC.

Hohokam stopped using the River (in the mid 14th century) to before 1870 when Jack Swilling organized the Swilling Irrigation and Canal Company and started building an irrigation system that began modern-day agricultural development of the Salt River Valley. *See Arizona State Land Department Rep., Arizona Stream Navigability Study for Salt River: Granite Reef Dam to the Gila River Confluence*, Draft Final Report, 3-6, 3-7 (Table 3-1), 3-16 (revised Apr. 2003) (the "ASLD Report") (Evidence Item ["E.I."] 030).[2] Although ANSAC is not limited to considering evidence of the River's natural condition solely from that time period, "that early period should be considered by ANSAC as the best evidence of the River's natural condition." *Winkleman*, 224 Ariz. at 242, 229 P.3d at 254.

Ample historical evidence exists in the well-developed record describing the River's ordinary and natural condition in this time frame.[3] For example, in February 1826, James Ohio Pattie described the River at its confluence with the Verde as follows: "It affords as much water at this point as the Helay [Gila] . . . We found it to abound with beavers. It is a most beautiful stream, bounded on each side with high and rich bottoms." ASLD Report 3-14. In 1852, John R. Bartlett of the U.S. Boundary Commission conducted a reconnaissance of the River from its confluence with the Gila to present-day Mesa. ASLD Report 3-14. In July 1852, Bartlett described the River at a point twelve miles up-river from its confluence with Gila as follows:

> The bottom, which we crossed diagonally, is from three to four miles wide. The river we found to be from eighty to one hundred and twenty feet wide, from two

[2] By 1883, farmers were settling in the Valley in large numbers, growing crops and taking their grain to the Hayden Mill. City of Phoenix, E.I. 018, Exhibit 191, 3, *Historic American Engineering Record Report On Ash Avenue Bridge* (1991). By 1888, more than 400,000 acres had been cultivated in the Salt River Valley. ASLD Report 3-7 (Table 3-1).

[3] The Court of Appeals again noted that "'substantial evidence' exists 'from which a factfinder might conclude that [the River] met the applicable standard of navigability at the time that Arizona became a state.'" *Winkleman,* 224 Ariz. at 242, 229 P.3d at 254 (quoting *Hassell v. Ctr. For Law in the Pub. Interest*, 172 Ariz. 356, 363, 837 P.2d 158, 165 (App. 1991)). The Court declined to reweigh the evidence, stating that it was for ANSAC, not the Court, to determine navigability. *Winkleman,* 224 Ariz. at 242, 229 P.3d at 254.

> to three feet deep, and both rapid and clear. . . . The water is perfectly sweet, and neither brackish nor salty, as would be inferred from the name. We saw from the banks many fish in its clear waters, and caught several of the same species as those taken in the Gila. The margin of the river on both sides, for a width of three hundred feet, consists of sand and gravel, brought down by freshets when the stream overflows its banks; and from the appearance of the drift-wood lodged in the trees and bushes, it must at times be much swollen, and run with great rapidity. . . . [A]long the immediate margin of the stream large cottonwood trees grow.

ASLD Report 3-14 – 3-15 (ellipses and brackets in ASLD Report). In June 1868, G.P. Ingalls, a government surveyor, wrote in his field notes that the River was "fordable during six or seven months of the year in sec 29 at the crossing of the Fort McDowell & Maricopa Wells Road." *Assessment of the Salt River's Navigability Prior to And on the Date of Arizona's Statehood, February 14, 1912,* by Douglas R. Littlefield, Ph.D., Littlefield Research Associates, Oakland, California, December 15, 1996, E.I. 016, Exhibit 189, 44 (the "Littlefield Report").

Moreover, probative evidence exists of the River's ordinary and natural physical characteristics. The River's ordinary and natural channel condition included a perennial low-flow channel located within a broader low floodplain; the banks of the River's low-flow channel were lined by riparian vegetation such as cottonwood, seepwillow, and mesquite trees, while less dense vegetation or swampy areas were found in the low floodplain. ASLD Report 5-9. In 1867, the River was a deep and narrow stream with a permanent flow. Littlefield Report, 189 (quoting Odd S. Halseth, who gave a speech entitled "1500 Years of Irrigation History" at a 1947 National Reclamation Association meeting in Phoenix).

Prior to and during early occupation by Euroamerican settlers, the River was perennial, with reliable flow throughout the year. ASLD Report 5-5; Transcript of hearing held before ANSAC on April 7, 2003 (Tr.), 201 (Schumm); City of Phoenix, Exhibit 182, *Predevelopment Hydrology of the Salt River Indian Reservation, East Salt River Valley, Arizona*, Thomsen and

Porcello (1991) ("Thomsen and Porcello"). The State submitted evidence demonstrating that in its ordinary and natural condition, the River's average annual flow was approximately 1,500 cubic feet per second ("cfs"). ASLD Report 7-6 – 7-12; 7-26 – 7-27. This flow rate is further supported by Thomas A.J. Gookin's opinion that the River in its virgin state flowed at 1,541 cfs (Tr. 154-55 (Gookin)), and B.W. Thomsen's, of the U.S. Geological Survey, estimate that the predevelopment average annual flow rate was 1,712 cfs and the median annual flow rate was 1,301 cfs. City of Phoenix, Thomsen and Porcello, 1, 12; ASLD Report 5-5 (Table 5-3), 7-7. Flow duration data derived from United States Geological Survey ("USGS") stream gauges indicate that the predevelopment flow rate was between 300 cfs and 3,000 cfs 90% of the time, and less than 20,000 cfs 99% of the time.[4] ASLD Report 7-17 (Table 7-13). Such conditions are boatable according to federal guidelines. ASLD Report 8-1 – 8-2. In other words, the River's natural and ordinary flow rates produced boatable conditions 99% of the time, meaning there was sufficient water in the River for boating to occur except during a short duration of the largest floods.[5] *See* ASLD Report 8-1 – 8-2; 7-23 – 7-26; 10-31 – 10-35. Also, existing evidence demonstrates that the River's ordinary flow was seasonal; there were regular fluctuations in flow that corresponded to expected periods of storms and snowmelt, and flow rates varied within predictable ranges. ASLD Report 7-17, Table 7-13, 7-14, 7-18, Table 7-15.

The Court of Appeals declined to consider whether ANSAC misconstrued the "highway-for-commerce" component of the *Daniel Ball* test. *See Winkleman*, 224 Ariz. at 242 n.16, 229

[4] Rating curves indicate that the ordinary flow was not swift or turbulent. Average flow depths for the range of flow between 300 cfs and 3,000 cfs were between 1.4 and 3.3 feet, with a maximum velocity of 2.2 feet per second ("fps"). ASLD Report 7-23 – 7-26.

[5] Navigability is not destroyed because a watercourse is interrupted by occasional natural obstructions or portages, nor need navigation be open at all seasons of the year, or at all stages of the water. *Economy Light & Power v. United States*, 256 U.S. 113, 122 (1921); *see United States v. Utah*, 283 U.S. 64, 87 (1931) (predictable seasonal variations in flow do not preclude a finding of navigability).

P.3d at 254 n.16. However, existing evidence supports that the River was actually used as a highway-for-commerce. In 1868, the Marysville Ferry operated a Fort McDowell-Maricopa Road and continued until 1874. ASLD Report 3-25. In May 1873, the *Weekly Arizona Miner* reported that two men brought five tons of wheat in a flat boat from Hayden Ferry down the River to the mouth of the Swilling Canal and then down the canal to Helling & Co's mill. ASLD Report 3-18, 3-19 (Table 3-2). Evidence of actual navigation that occurred on the River after 1870, as the River's flows were increasingly diminished by diversions, is significant and probative of navigability.[6] Further, evidence in the record demonstrates that the River's natural physical characteristics were such that the River was susceptible to navigation after its flows were diminished. Thus, the River was either actually used as a highway-for-commerce, or was at least capable of use as a highway-for-commerce within the meaning of the *Daniel Ball* test.

The Commission should reconsider its prior findings that the River was neither actually navigable nor susceptible to navigation to ensure that its new findings comply with the applicable legal standard.

The Court directed ANSAC to properly apply the ordinary and natural component of the *Daniel Ball* test. Equally important is the Court's insistence that ANSAC "may not begin its determination with any presumption *against* navigability." *Winkleman,* 224 Ariz. at 239, 229 P.3d at 251 (emphasis in original). In reaching its determination, "ANSAC's approach and analysis must be wholly impartial and objective, while utilizing the proper legal test." *Winkleman,* 224 Ariz. at 239, 229 P.3d at 251.

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[6] *See Northwest Steelheaders Ass'n, Inc. v. Simantel*, 112 P.3d 383, 391-393 (Or. Ct. App.) (post-statehood use, by comparable vessels, probative because post-statehood conditions were *less* favorable to navigation than conditions at statehood), *review denied*, 122 P.3d 65 (Or. 2005), *cert. denied*, 547 U.S. 1003 (2006); *Winkleman*, 224 Ariz. at 244, 229 P.3d at 243 ("Even if evidence of the River's condition after man-made diversions is not dispositive, it may nonetheless be informative and relevant.")

Substantial evidence exists clearly demonstrating that the Lower Salt River in its ordinary and natural condition before 1870, was used or was capable of being used as a highway-for-commerce. The Commission should consider the significance of post-1870 use of the River despite decreasing flows in reaching its determination. The Commission also should consider diversions as merely one special factor in the Salt River Valley's development rather than as a condition that precludes a navigability finding, and the River's subsequent limited use as merely a unique circumstance in its overall objective review of the evidence under the *Daniel Ball* test. The ASLD informs the Commission that due to uncertain resources, the ASLD may be restricted in responding, participating or producing additional evidence in the adjudication proceedings.

DATED: January 13, 2012.

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BEFORE THE
ARIZONA NAVIGABLE STREAM ADJUDICATION COMMISSION

IN RE DETERMINATION OF NAVIGABILITY OF THE LOWER SALT RIVER; UPPER SALT RIVER; GILA RIVER; VERDE RIVER; SAN PEDRO RIVER; AND SANTA CRUZ RIVER

No. 03-005-NAV (Lower Salt)
No. 04-008-NAV (Upper Salt)
No. 03-007-NAV (Gila)
No. 04-009-NAV (Verde)
No. 03-004-NAV (San Pedro)
No. 03-002-NAV (Santa Cruz)

ARIZONA STATE LAND DEPARTMENT'S MEMORANDUM REGARDING EFFECT OF UNITED STATES SUPREME COURT'S PPL MONTANA DECISION AND SEGMENTATION OF REMANDED CASES

The Arizona State Land Department ("ASLD" or the "Department") submits the following memorandum in response to the Arizona Navigable Stream Adjudication Commission's ("ANSAC" or "Commission") request for memoranda addressing how the United States Supreme Court's decision in *PPL Montana, LLC v. Montana*, 565 U.S. ___ , 132 S.Ct. 1215 (2012) ("*PPL Montana*") impacts ANSAC's proceedings and determinations. This Memorandum identifies the main issues addressed in *PPL Montana*, and the applicability of that decision to the Commission's proceedings and determinations. Further, the ASLD addresses ANSAC's request for an analysis of the segmentation issue presented in *PPL Montana*.

On February 22, 2012, the U.S. Supreme Court issued a decision in *PPL Montana*, reversing the Montana Supreme Court's ruling that required PPL Montana to pay rent for the use of Montana's riverbeds covered by its hydroelectric dams. The Court's decision addressed discrete segments of otherwise navigable rivers in Montana. The Court ultimately found that the reach of the Missouri River on which the Great Falls and five privately owned hydroelectric dams are located was not navigable for title purposes at Montana's statehood. *PPL Montana*, 132 S.Ct. at 1232. However, the Court did not decide the navigability of the remainder of the Missouri River, or the Madison and Clark Fork Rivers, but left that determination to the Montana Supreme Court. 132 S.Ct. at 1233.

I. NAVIGABILITY MUST BE DETERMINED SEGMENT-BY-SEGMENT

The main holding of the U.S. Supreme Court's *PPL Montana* decision is that a river's navigability must be determined on a segment-by-segment basis.[1] *PPL Montana*, 132 S.Ct. at 1229. The *PPL Montana* Court noted that "practical considerations" supported segmentation of watercourses, and that "[p]hysical conditions that affect navigability often vary significantly over the length of a river." *PPL Montana*, 132 S.Ct. at 1230. The Court noted that "[t]his is particularly true with longer rivers" – like the ones found in Arizona – that traverse through different terrain and climates. *Id.* Changes in a river's physical conditions assist in determining start and end points for segmentation. *Id.* The Court also noted that topographical and geographical features also may assist in identifying appropriate start and end points for

[1] ANSAC's statutes allow ANSAC to examine watercourses in reaches or portions. A.R.S. § 37-1101(11) (definition of "watercourse" is the "main body or a portion or reach" of a river). However, ANSAC's determinations thus far have addressed the rivers as a whole with the exception of the Salt River that was divided into upper and lower reaches.

segmentation. *Id.* The segments at issue in *PPL Montana* were both discrete, as defined by physical features, and substantial. *Id.* at 1231. The Court focused on the Great Falls reach which is not only 17 miles long, but contains distinct drops that include five waterfalls and continuous rapids. *Id.*

The *PPL Montana* Court further acknowledged that there could be a "de minimis exception" to the segmentation approach. *Id.* at 1230. The Court stated that some nonnavigable segments may be "so minimal that they merit treatment as part of a longer, navigable reach for purposes of title under the equal footing doctrine . . . ." *Id.* at 1230. The Court identified considerations related to ownership and title of property "such as inadministrability of parcels of exceedingly small size, or worthlessness of the parcels due to overdivision" as de minimis exceptions. *Id.* at 1231.

There are a number of differences between the rivers in *PPL Montana* and the rivers currently under consideration by ANSAC. For example, the Montana and Arizona rivers have differences in seasonality, e.g., the Montana rivers may freeze in the winter while the Arizona rivers do not. More importantly, there are no waterfalls on any of the Arizona rivers that are of the size found along the Great Falls reach of the Missouri River. Finally, the Supreme Court noted that PPL Montana's expert claimed that man-made dams had made the Montana rivers more navigable compared to their ordinary and natural condition, because the dams tend to reduce flood peaks and moderate seasonal low flows. *PPL Montana*, 132 S.Ct. at 1234. In Arizona, the presence of dams has made the rivers less navigable because the dams tend to remove all or most of the natural river flow.

The Department's reports previously provided to ANSAC for each of these rivers included discussions that divided the rivers into separate reaches. These reach divisions were based on a variety of physiographic, hydrologic, geologic, and geographic factors. Each report was divided into reaches with similar characteristics. The reach designations in the previous ALSD reports were defined based on criteria related to, but somewhat different from, the issues raised in the Montana case. The *PPL Montana* Court's decision outlined several specific navigability criteria that may not have been directly addressed in the previous ASLD reports.

Based on the *PPL Montana* Court's decision and the existing record, ANSAC should consider the following factors in determining segmentation: whether the river is located in a canyon or runs through flats or wide river valleys; the river's flow rate (including tributary inflow and watershed size); the classification of rapids by degree of difficulty; whether the river is a gaining or losing stream; and the river's slope or steepness. Based on those factors, ASLD recommends that ANSAC consider the following river segments.

Table 1. Recommended Stream Segmentation

River	Segment Boundaries (Approximate)	Segment Description
Gila	1 – New Mexico to Gila Box	Extends from New Mexico border through a broad alluvial valley with irrigated farm land. Includes the Town of Duncan and the communities of Sheldon, Apache Grove, York and Guthrie.
	2 – Gila Box	Deep canyon reach that includes the BLM National Conservation Area and is a popular recreational boating route. Significant tributaries (San Francisco, Eagle, Bonita) add flow.
	3 – Gila Box to San Carlos Reservoir	River flows through broad alluvial valley with irrigated farm land. Includes the Towns of Safford, Thatcher, Pima and Fort Thomas, and portions of the San Carlos Indian Reservation. Includes San Carlos Lake.
	4 – San Carlos Canyon	Narrow bedrock canyon located downstream of Coolidge Dam in the Needles Eye Wilderness on the San Carlos Indian Reservation. Extends downstream to near SR77.
	5 – San Carlos Canyon to Ashurst-Hayden Dam	River flows in shallow, moderately wide bedrock canyon past the communities of Winkelman, Hayden, Kearny, and Kelvin, and through the Tortilla Mountains. Significant tributary is the San Pedro River. Segment is used for seasonal recreational boating.

Table 1. Recommended Stream Segmentation		
River	**Segment Boundaries (Approximate)**	**Segment Description**
	6 – Ashurst-Hayden Dam to Salt River Confluence	Extends from the Ashurst-Hayden Dam through the extensively irrigated alluvial valley that includes the Cities of Florence and Coolidge, as well as the Gila River Indian Community. Significant tributary includes the Santa Cruz River (dry).
	7 – Salt River Confluence to Dome	River flows through the western portion of the Salt River Valley and the Phoenix metropolitan area, and is similar in character to the lower Salt River (Segment 5). Some modern recreational boating between Salt River confluence and Gillespie Dam. Significant tributary includes the Hassayampa River. Historical accounts of boating.
	8 – Dome to Colorado	River passes through broad gap in Gila Mountains into Colorado River Valley. Some early records of historical boating upstream to Dome from Colorado River.
Salt	1 – White/Black River Confluence to Apache Falls	Narrow, deep bedrock canyon with remote access, and located within the Fort Apache Indian Reservation. Modern boating is not permitted by the tribe upstream of Apache Falls, but would likely include numerous rapids. Significant tributaries include Carrizo Creek.
	2 – Apache Falls to Sleeper Rapid - Gleason Flat	Segment includes the one of the most frequently boated river segments in Arizona, and is home to several seasonal commercial boating operations. River is located in deep bedrock canyon and includes many named and unnamed rapids. Gleason is largest of "flats" reaches with wide canyon, few rapids and easier access. Significant tributaries include Cibeque and Canyon Creek. Located within the Tonto National Forest, Salt River Canyon Wilderness, and the Fort Apache and San Carlos Indian Communities.
	3 – Sleeper Rapid to Roosevelt Dam - Roosevelt Flat	River continues in deep bedrock canyon, but with fewer and smaller rapids. Located primarily within the Salt River Canyon Wilderness. Includes the large flats area now inundated by Roosevelt Lake. Significant tributaries include Pinal and Cherry Creeks.
	4 – Roosevelt Dam to Stewart Mountain Dam	River in deep bedrock canyon now inundated by backwater from SRP dams. Modern recreational boating on man-made lakes. Records of historical boating pre-date reservoirs.

Table 1. Recommended Stream Segmentation		
River	**Segment Boundaries (Approximate)**	**Segment Description**
	5 – Stewart Mountain Dam to Verde River Confluence	River in moderately deep and wide canyon with few small rapids. Includes the most well used recreational boating reach in Arizona. Located within the Tonto National Forest. Records of historical boating.
	6 – Verde River Confluence to Gila River Confluence	River flows through wide alluvial valley with no natural rapids or obstructions. Includes many of the communities in metropolitan Phoenix, as well as portions of the Salt River Pima Maricopa, Fort McDowell, and Gila River Indian Communities. Records of historical boating and modern boating upstream of Granite Reef Dam and on effluent dominated reaches west of downtown Phoenix.
Verde	1 – Headwaters to Sycamore Creek	Extends from Paulden Dam through steep, rugged canyons with limited but reliable flow. Few instances of modern boating.
	2 – Sycamore Creek to Beasley Flat	River flows through shallow canyons and wide alluvial valleys through Verde Valley, including communities of Perkinsville, Clarkdale, Cottonwood, and Camp Verde. Major tributaries include Oak, Beaver, and West Clear Creeks. Records of historical boating. Extensive modern recreational boating, including annual canoe and kayak race. Some minor rapids.
	3 – Beasley Flat to Verde Hot Springs	River enters deep, narrow bedrock canyon with Wild and Scenic designation. Known as the whitewater reach of the Verde River and is popular modern recreational boating reach, with limited commercial boating. Records of historical boating.
	4 – Verde Hot Springs to Horseshoe Reservoir	River located within several US National Forests and two Wilderness areas. Major tributaries include Fossil Creek and East Verde River. River flows through shallow canyons and narrow alluvial valleys, with small rapids. Popular, but very remote, modern recreational boating reach. Records of historical boating.
	5 – Horseshoe Reservoir to Salt River Confluence	River flows through broader alluvial valleys with some short canyon reaches and few small rapids. Major tributary is Sycamore Creek. Modern recreational boating and historical boating records.

Table 1. Recommended Stream Segmentation		
River	**Segment Boundaries (Approximate)**	**Segment Description**
San Pedro	1 – Mexican Border to Gila River Confluence	River flows in alluvial valley. Flows intermittent or interrupted perennial with very low flow rates. No historical boating record. Modern recreational boating only during floods.
Santa Cruz	1 – Headwaters to Mexican Border	The river is a relatively small stream flowing in broad alluvial valleys, and flows into Mexico. Very low flow rates. No record of historical or modern boating.
	2 – Mexican Border to Marana	Normally dry river in broad alluvial river. Some possibility that some segments had very shallow perennial or intermittent flow. No record of historical or modern boating, except during floods or on effluent discharges from wastewater treatment plants.
	3 – Marana to Gila River Confluence	Historically dry river in broad alluvial valley with no historical or modern boating record.

ASLD recommends that ANSAC reopen the record to allow interested parties to submit evidence on the appropriate segmentation of the Salt, Verde, Gila, San Pedro and Santa Cruz Rivers.

A. <u>Sufficiently Obstructed River Segments That Require Travelers To Portage May Be Nonnavigable</u>

The need to portage may defeat navigability for purposes of establishing state title to a particular segment because it requires transportation over land, not water. *PPL Montana,* 132 S.Ct. at 1231. Portages generally demonstrate "the need to bypass the river segment." *Id.* The Great Falls reach in *PPL Montana* was an undisputed interruption to navigability in that it required overland portage, and the falls had never been navigated. *Id.* at 1232. In *PPL Montana,* Lewis and Clark transported supplies and small canoes approximately 18 miles over land for 11 days or more. *Id.* at 1231. Although there are no portages of similar scale recorded on Arizona rivers, ANSAC must evaluate whether there are stretches of the remanded rivers that consistently required portages, and whether those portages were so minimal that they did not interrupt an otherwise navigable segment of that river.

II. POST-STATEHOOD NAVIGATION EVIDENCE CAN DEMONSTRATE SUSCEPTIBILITY

The U.S. Supreme Court stated that evidence of present-day, primarily recreational boating must be "confined to that which shows the river could sustain the kinds of commercial use that, as a realistic matter, might have occurred at the time of statehood." *PPL Montana,* 132 S.Ct. at 1233. Navigability at statehood concerns "the river's usefulness for 'trade and travel,' not for other purposes." *Id.* Evidence of present-day, primarily recreational use can be valid evidence of susceptibility for navigation at statehood. *Id.* The Court acknowledged that "'[E]xtensive and continued [historical] use for commercial purposes' may be the 'most persuasive' form of evidence, but the 'crucial question' is the potential for such use at the time of statehood, rather than 'the mere manner or extent of actual use.'" *Id.* at 1234 quoting *United States v. Utah,* 283 U.S. 64, 82-83 (1931). To demonstrate susceptibility to navigation, a party seeking to use present-day boating evidence must show whether the watercraft are "meaningfully similar" to those customarily used for trade and travel at statehood; and that the post-statehood condition of the river is not materially different from its physical condition at statehood. *Id.* Thus, in order for evidence of present day use to be meaningful, a river's physical condition could not have changed in ways that "substantially improve its navigability." *Id.* at 1233-34. Dams and diversions on Arizona's rivers made the rivers less susceptible to navigation, not more. Therefore, evidence of modern recreational boating on Arizona rivers may be more relevant to determining susceptibility to navigation than for the Montana rivers.

Based on the *PPL Montana* Court's instruction, ASLD recommends that ANSAC reopen the record to allow interested parties to present evidence regarding the types of watercraft customarily used at statehood and the types of watercraft in use today for recreational boating. ANSAC then must specifically determine the types of watercraft in use at statehood and how those watercraft vary from the watercraft in use today, if at all.

III. STATE TITLE TO RIVERBEDS MUST BE DETERMINED AT STATEHOOD IN THE RIVER'S ORDINARY AND NATURAL CONDITION

The *PPL Montana* Court confirmed that title navigability must be determined at statehood in a watercourse's "natural and ordinary condition." *PPL Montana,* 132 S.Ct. at 1228. The Court pointed out that the "inquiry depends only on navigation and not on interstate travel." *Id.* at 1229, 1233 (for susceptibility analysis, not only trade and travel must be determined, but also the watercourse's natural and ordinary condition). In *State ex rel. Winkleman v. Arizona Navigable Stream Adjudication Com'n,* 224 Ariz. 230, 240, 229 P.3d 242, 252 (App. 2010) ("*Winkleman"),* the court held that ANSAC failed to evaluate the Lower Salt River's ordinary and natural condition in light of the numerous dams, canals, and other diversions other than Roosevelt Dam. The Court of Appeals directed ANSAC to determine "what the River would have looked like on February 14, 1912 in its ordinary (i.e., usual, absent major flooding or drought) and natural (i.e., without man-made dams, canals, or other diversions) condition." *Winkleman,* 224 Ariz. at 241, 229 P.3d at 253. The *Winkleman* decision is still valid and controlling on ANSAC's determinations and proceedings. Thus, ANSAC must evaluate Arizona's rivers at statehood as if there had been no dams and diversions, and without flood or drought conditions.

The U.S. Supreme Court's note that Montana's long failure to assert title navigability is some evidence supporting the conclusion that the river segments were nonnavigable is not only dicta, but also not persuasive to these proceedings. *PPL Montana,* 132 S.Ct. at 1235. Arizona Courts have long recognized Arizona's valid right and valuable claim to the streambeds beneath its navigable rivers. *Winkleman,* 224 Ariz. at 234, ¶ 2, 229 P.3d 246, ¶ 2 ("In 1985, the State claimed title to the beds of all Arizona watercourses that were navigable when Arizona became a state.").

In conclusion, the United States Supreme Court's *PPL Montana* decision is relevant to the proceedings now before the Commission. ANSAC should examine each watercourse to determine how the watercourse should be segmented, and then whether each of the identified segments is navigable. As stated by the Court, "[a]n analysis of segmentation must be sensibly applied." *PPL Montana,* 132 S.Ct. at 1231. Finally and most importantly, the navigability of each river must be determined based on its own facts. *See United States v. Appalachian Elec. Power Co.*, 311 U.S. 377, 404, 61 S.Ct. 291, 297 (1940) (there is no "formula which fits every type of stream under all circumstances and at all times."). Based on the *PPL Montana* decision, the Department recommends that ANSAC reopen the record for parties to provide evidence and testimony for segmentation purposes and for present-day recreational use for susceptibility purposes.

DATED: June 8, 2012.

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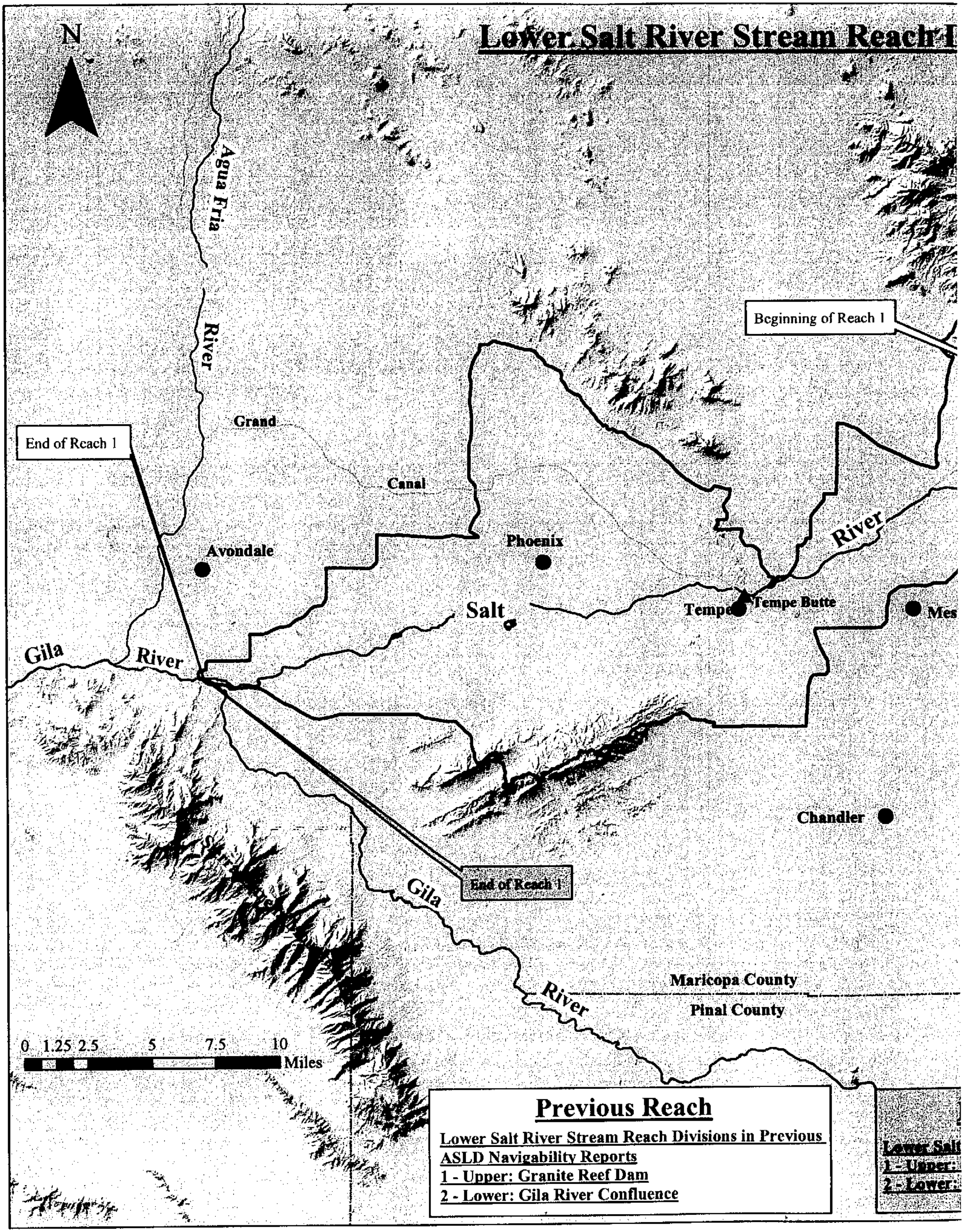

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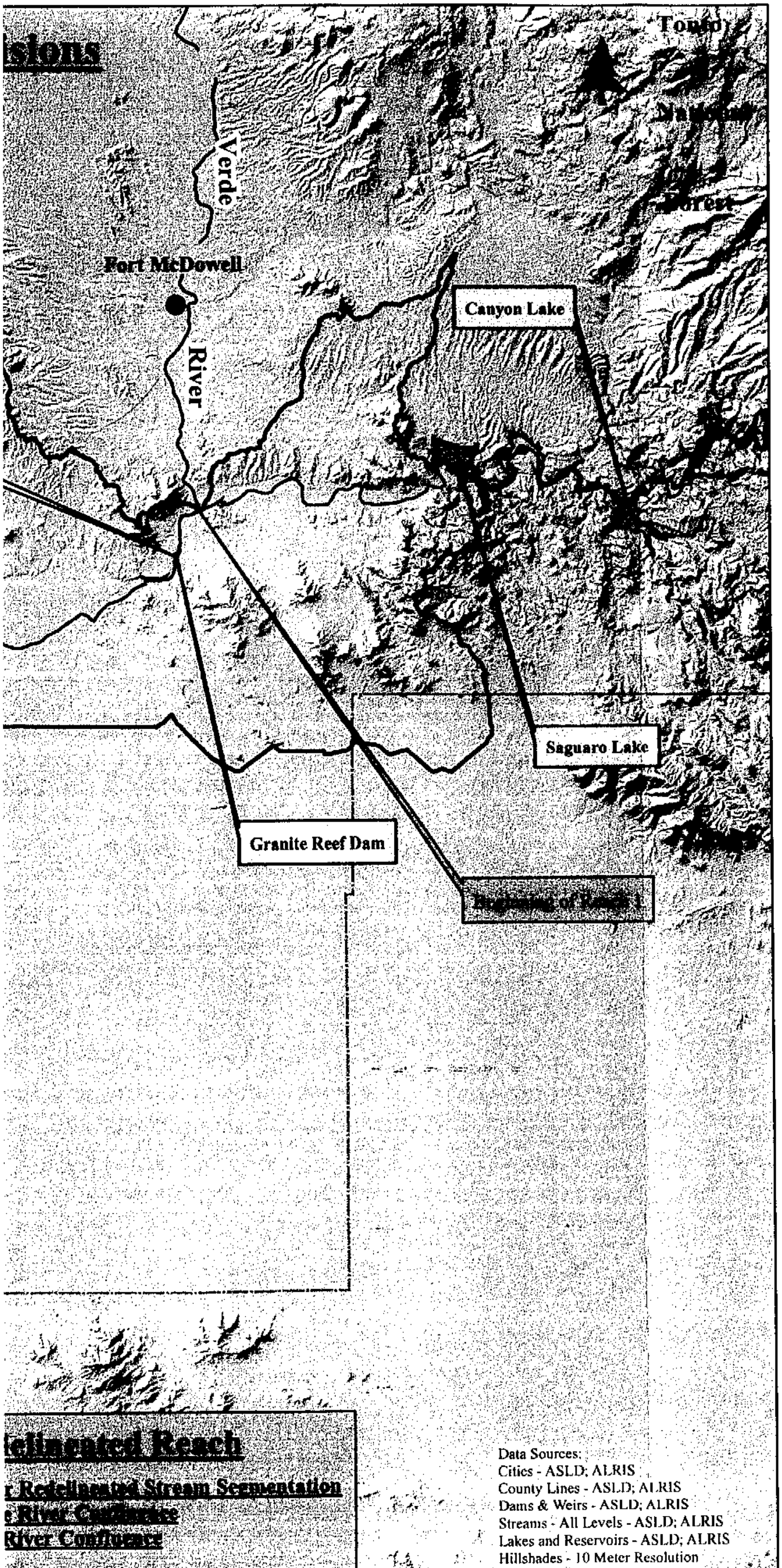
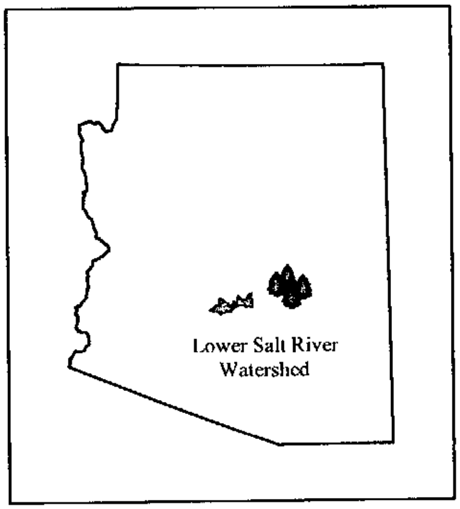
Cheryl Doyle, 8/13/2012



Legend

- Watershed Boundary
- Cities
- Counties
- Agua Fria River
- Gila River
- Verde River
- Salt River
- Granite Reef Dam
- Saguaro Lake
- Canyon Lake



ARIZONA STATE LAND DEPARTMENT 1915

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SUPERIOR COURT

COUNTY OF MARICOPA

STATE OF ARIZONA, acting by and through Mark Winkleman, State Land Commissioner, and the State Land Department, and DEFENDERS OF WILDLIFE, DONALD STEUTER, JERRY VAN GASSE, JIM VAALER, Plaintiffs, v. ARIZONA NAVIGABLE STREAM ADJUDICATION COMMISSION; SALT RIVER PROJECT AGRICULTURAL IMPROVEMENT AND POWER DISTRICT; SALT RIVER VALLEY WATER USERS' ASSOCIATION; ARIZONA STATE UNIVERSITY; CITY OF TEMPE; CITY OF PHOENIX; CITY OF MESA; PHELPS DODGE	Case No: LC2006-000413-001DT **PLAINTIFFS' JOINT STATEMENT OF FACTS IN SUPPORT OF THEIR OPENING BRIEFS** (Assigned to the Honorable Douglas L. Rayes)

CORPORATION; MARICOPA COUNTY; CEMEX CEMENT, INC.; GILA RIVER INDIAN COMMUNITY; HOME BUILDERS ASSOCIATION OF CENTRAL ARIZONA; MARICOPA COUNTY FLOOD CONTROL DISTRICT,

Defendants.

Pursuant to the Court's Order of August 28, 2006, plaintiffs State of Arizona, acting by and through Mark Winkleman, State Land Commissioner, and the State Land Department, and Defenders of Wildlife, Donald Steuter, Jerry Van Gasse, Jim Vaaler, hereby submit the following Statement of Facts in support of their Opening Briefs:

I. Overview of the Geology of the Lower Salt River:

A. The Size and Scope of the Watershed:

1. The Salt River watershed drains about 15,000 square miles of central and eastern Arizona and ranges in elevation from 12,643 feet at Humphrey's Peak north of Flagstaff and 11,590 feet at Mount Baldy near Greer to 930 feet at the Salt-Gila confluence. [1] I.R., E.I. 030, 5-1.

2. Major perennial tributaries to the upper watershed include the White, Black, and Verde Rivers, and Tonto Creek. *Id.*

3. The Lower Salt River study reach that is involved in this adjudication is located entirely within Maricopa County. It extends from Granite Reef Dam (at a gap between the Goldfield and McDowell Mountains), through the southern extension of the Phoenix Mountains at Tempe Butte, to Monument Hill, the northernmost extension of the Sierra Estrella at the Gila River-Salt River confluence - a distance of approximately 37 miles. *Id.*

[1] *Arizona Stream Navigability Study for the Salt River: Granite Reef Dam to the Gila River Confluence*, Draft Final Report, prepared for the Arizona State Land Department ("ASLD"), December 1992 by CH2Mhill SWCA Environmental Consultants, and Revised: September 1996 by JE Fuller/Hydrology & Geomorphology, Inc. and in April 2003 by JE Fuller. Index of Record ("I.R."), Evidence Item ("E.I.") 030.

B. Precipitation.

4. The mountainous areas of the watershed typically receive 20 to 30 inches of rain annually.[2] (Hjalmarson) I.R., E.I. 022, 1.

5. Generally, precipitation occurs during two major seasons: in late summer as intense, localized orographic thunderstorms, and in winter as large-scale cyclonic storms which originate over the Pacific Ocean. I.R., E.I. 030, 7-3. Winter storms account for about 90% of the largest storms. I.R., E.I. 030, 5-4.

C. Historic Flow Patterns.

6. Prior to and during early occupation by Euroamerican settlers, the Lower Salt River (the "River") was perennial, with reliable flow throughout the year. I.R., E.I. 030, 5-5; I.R., B, Tr.[3], 201 (Schumm[4]); I.R., E.I. 018, Ex. 182[5] (Thomsen and Porcello). A perennial stream is a stream which flows year round, non-zero base flow. I.R., E.I. 030, Glossary-11.

7. The River's flows fluctuated seasonally, with higher flows from December through May (I.R., E.I. 030, 7-17 (Table 7-14)) with winter storms producing the largest peak flows (I.R., E.I. 030, 5-4).

8. Sources of runoff included discharge from springs and snowmelt in the upper watershed, storm water runoff, and groundwater discharge. As discussed in more detail below, reservoir impoundments, canal diversions, and groundwater withdrawals over the past 80 years have effectively eliminated low-flow runoff within the study reach. Today, the River flows only in response to local storm water inflows, runoff which passes the irrigation diversions at Granite Reef Dam during periods of high-flow, and effluent

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[2] Hjalmar W. Hjalmarson, PE, *Hydrology Along The Natural Channel of The Salt River (from the confluence with the Verde River to the mouth at the Gila River)*, Hydrologic assessment, prepared for Helm & Kyle, Ltd., February 25, 2003, on behalf of Maricopa County Department of Transportation. I.R., E.I. 022.

[3] Transcript of hearing held before The Arizona Navigable Streams Commission ("ANSAC") on April 7, 2003. I.R., B, Tr. XX (witness).

[4] Stanley A. Schumm, Ph.D., P.G., testifying on behalf of the Salt River Project Agricultural Improvement & Power District and Salt River Valley Water Users' Association ("SRP").

[5] *Predevelopment Hydrology of the Salt River Indian Reservation, East Salt River Valley, Arizona*, B.W. Thomsen and J.J. Porcello, U.S. Geological Survey, Water-Resources Investigations Report 91-4132, Prepared in cooperation with the U.S. Bureau of Indian Affairs, Tucson, November 1991, submitted by the City of Phoenix. I.R., E.I. 018, Exhibit ("Ex") 182.

discharge from the 91st Avenue sewage treatment plant downstream of Phoenix. I.R., E.I. 030, 5-4.

9. Under natural conditions (before Euroamerican settlers arrived in about 1860 and began serious diversions of the River's flow in 1870) less than about five percent of precipitation ran off. I.R., E.I. 022, 1.

10. Available information indicates that prehistoric stream flow rates were similar to those found by early Euroamerican explorers and settlers. I.R., E.I. 030, 2-17.

D. Channel geomorphology.

11. Available information indicates that natural channel conditions probably included a perennial low-flow channel located within a broader low floodplain; the banks of the low-flow channel were lined by riparian vegetation such as cottonwood, seepwillow, and mesquite trees, while less dense vegetation or swampy areas were found in the low floodplain. I.R., E.I. 030, 5-9.

12. The channel conditions described between 1850 to 1910 most likely represent the natural geomorphic condition of the Lower Salt River. *Id.*

13. By 1912, the geomorphology of the River had been impacted by Euroamerican settlement and a period of severe flooding that occurred between 1890 and 1916. *Id.*

14. In its current condition, the River is an ephemeral stream whose natural geomorphology is nearly obscured by urbanization. *Id.*

II. The River in its Natural and Ordinary Condition.

15. **Annual Flow:**

a. In 1893, John W. Powell estimated the River's average annual flow at 2,844 cubic feet per second ("cfs") I.R., E.I. 030, 5-5.

b. ASLD estimates that when the River was in its natural and ordinary condition, its average annual flow was approximately 1,500 cfs. I.R., E.I. 030, 7-6 - 7-12; 7-26 - 7-27. The average flow (mean flow) of a river is determined by dividing the total runoff volume by the time in which that volume was discharged, *i.e.* mean flow is the average rate at which the average yearly flow volume would be discharged. I.R., E.I. 030, Glossary – 10.

c. Thomas A.J. Gookin, a professional hydrologist, reports that the River in its virgin state flowed at 1,541 cfs. I.R., B, Tr., 154-55 [1,125,000 acre feet per year divided by 730].

d. B. W. Thomsen of the U.S. Geological Survey estimates the predevelopment average annual flow rate at 1,712 cfs and the median annual flow rate at 1,301 cfs. I.R., E.I. 018, Ex. 182, 1, 12 [1,250,000 and 950,000 acre feet per year divided by 730, respectively]; E.I. 030, 5-5 (Table 5-3), 7-7, Glossary-10 (median flow rate is the flow rate that is exceeded 50 percent of the time [conversely, the rate is not exceeded 50 percent of the time]).

e. Hjalmar W. Hjalmarson reports the annual flow rate at 1,730 cfs, the median flow rate at 1,310 cfs, and the base flow rate at about 260 cfs. I.R., E.I. 022. The primary source for most discharge information is the United States Geological Survey ("USGS").

16. **Flow Characteristics:**

a. Seasonal Flow Rates: Flow duration data derived from USGS stream gauges indicate that the predevelopment flow rate was between 300 cfs and 3,000 cfs 90% of the time, and less than 20,000 cfs 99% of the time. I.R., E.I. 030, 7-17 (Table 7-13) (citing USGS Water Resources Investigations Report 91-4041 7-22 (Table 7-16)).

b. Flow depths: Flow depths varied seasonally: During the driest summer months, typical flow depths averaged between one and two feet, although there were deeper pools and shallower riffles. Typical winter flow depths were generally greater than two feet. I.R., E.I. 030, 7-10 (Table 7-7), 7-17 (Tables 7-13, 7-14), 7-25, Fig. 7-4, 7-26 (Table 7-18).

c. Rating curves indicate that the ordinary flow was not swift or turbulent. Average flow depths for the range of flow between 300 cfs and 3,000 cfs were between 1.4 and 3.3 feet, with a maximum velocity of 2.2 feet per second ("fps"). I.R., E.I. 030, 7-23 - 7-26. While there was normal seasonal variation in river flow, flows greater than the flooding threshold of 20,000 cfs accounted for less than 1% of the flow for the year in which each flood occurred. *See* flow data published in USGS and USRS Water Supply Reports for 1899 through 1950, listed at I.R., E.I. 030, 10-31 – 10-35.

17. These conditions exceed the minimum stream condition for recreational boating (see I.R., E.I. 030, 8-1 - 8-2).

III. Settlement of the Salt River Valley

A. Hohokam:

18. For more than 1,000 years water from the River has allowed civilizations to flourish in the Salt River Valley. I.R., E.I. 030, 2-1.

19. The Hohokam, who occupied the area from at least about A.D. 250-1450,[6] constructed an irrigation system that extended over 315 miles and included at least ten separate canal systems.

20. Most canals measured 10 to 20 feet wide and were 3 to 12 feet deep with a maximum diversion capacity of about 240 cubic feet per second ("cfs") per canal. I.R., E.I. 030, 2-9 - 2-17.

21. The Hohokam relied on the River's constant and predictable flow to support one of the largest, most complex, irrigation-based societies in prehistoric North America. I.R., E.I., 2-18.

22. The Salt River Valley became one of the most densely populated areas in the prehistoric southwest, sustaining between 80,000 and 200,000 people, with about 140,000 acres under cultivation. I.R., E.I., 2-1, 2-13, 2-17. Thomsen and Porcello estimate the area cultivated as at least 250,000 acres. I.R., E.I. 018, Ex. 182, 6.

23. The River sustained a rich riparian environment, providing the Hohokam with food, fuel, and construction materials. I.R., E.I. 030, 2-13, 2-17.

24. The Hohokam supplemented their diet with fish - including bonytail chub, roundtail chub, Colorado squawfish, razorback sucker, Gila coarse-scaled sucker,

[6] Some estimates place Hohokam residence as early as 300 B.C. I.R., E.I. 018, Ex. 182, 6.

flannelmouth sucker, and Gila mountain sucker - from the River. I.R., E.I. 030, 2-13, 2-17.

25. Archaeologists have speculated that the Hohokam used light boats on their canals. I.R., E.I. 030, 2-18.

B. Euroamerican settlers and statehood:

26. The Salt River Valley was largely bypassed by exploration and development throughout the Spanish, Mexican, and United States Territorial periods, until the 1860s. I.R., E.I. 030, 3-1.

27. **1848:** In 1848, the United States annexed all of the previously Mexican territory north of the Gila River. Treaty of Guadalupe Hidalgo, Feb. 2, 1848, 9 Stat. 922.

28. **1853:** Under the Gadsden Purchase of 1853, the United States acquired land south of the Gila River to the current U.S.-Mexican border. Dec. 30, 1853, 10 Stat. 1031.

29. **1863:** Arizona became a Territory in 1863. Act, Feb. 24, 1863, Ch. 56, 12 Stat. 664.

30. The First Arizona Territorial Legislature adopted the Howell Code, which continued the Mexico's and New Mexico Territory's practice of appropriation as the means of acquiring water rights. Howell's Ariz. Code, ch. 55, sec. 17.

31. The **1864** Arizona Bill of Rights provided that all waters within the State were public. Howell's Ariz. Code, pp. 19-21 (1865).

32. **1865:** Camp (Fort) McDowell was established in 1865. I.R., E.I. 030, 3-6 (Table 3-1).

33. **1867:** Jack Swilling organized the Swilling Irrigation and Canal Company in 1867 and began building an irrigation system. I.R., E.I. 030, 3-6 - 3-7 (Table 3-1). (The Swilling Ditch was located near present-day 48th Street. I.R., E.I. 030, 3-11 (Fig. 3-5)). Thus began the modern-day agricultural development of the Salt River Valley. I.R., E.I. 030, 3-16.

34. **1868:** Phoenix (known then as Pumpkinville) was established in 1868 near where Swilling was building canals. I.R., E.I. 030, 3-7 (Table 3-1).

35. **1874:** Charles Hayden operated a grist mill, powered by water from the River. I.R., E.I. 030, 3-16; I.R., E.I. 031, 1-2. Hayden began taking water through the Tempe Canal for his flour mill in 1874. I.R., E.I. 016, 178.

36. **1877:** Congress enacted the Desert Land Act in 1877. Ch. 107, 19 Stat. 377, 43 U.S.C. §§ 321-339 (1877). The Act's purpose was to provide for the settlement of western lands by appropriating and applying to the land waters from non-navigable streams. The Act does not define "non-navigable" or "navigable."

37. **1883:** By 1883, farmers were settling in the Valley in large numbers, growing crops and taking their grain to the Hayden mill. I.R., E.I. 018, Ex. 191, 3.

38. **1888:** By 1888, more than 400,000 acres had been cultivated in the Salt River Valley. I.R., E.I. 030, 3-7 (Table 3-1).

39. **1912:** Arizona became a State on February 14, 1912.

IV. Condition of the Salt River Before Statehood.

A. Historical Descriptions and Accounts of the River:

40. **1820s:** In the 1820s, beaver abounded on the River, and trappers, such as James Ohio Pattie and Ewing Young, traveled along the River as they trapped. I.R., E.I. 030, 3-6, 3-10. In February 1826, Pattie described the River at its confluence with the Verde as follows: "It affords as much water at this point as the Helay [Gila] . . . We found it to abound with beavers. It is a most beautiful stream, bounded on each side with high and rich bottoms." I.R., E.I. 030, 3-14.

41. **1852:** In 1852, John R. Bartlett of the U.S. Boundary Commission conducted a reconnaissance of the River from its confluence with the Gila to present-day Mesa. I.R., E.I. 030, 3-6. In July 1852, Barlett described the River at a point twelve miles up-river from its confluence with the Gila as follows:

> The bottom, which we crossed diagonally, is from three to four miles wide. The river we found to be from eighty to one hundred and twenty feet wide, from two to three feet deep, and both rapid and clear. . . . The water is perfectly sweet, and neither brackish nor salty, as would be inferred from the name. We saw from the banks many fish in its clear waters,

> and caught several of the same species as those taken in the Gila. The margin of the river on both sides, for a width of three hundred feet, consists of sand and gravel, brought down by freshets when the stream overflows its banks; and from the appearance of the drift-wood lodged in the trees and bushes, it must at times be much swollen, and run with great rapidity. … [A]long the immediate margin of the stream large cotton-wood trees grow." [Ellipses and brackets in ASLD Report.]

I.R., E.I. 030, 3-14-3-15.

42. **1867:** Beaver were still abundant around 1867. I.R., E.I. 030, 3-15. The River was then a deep and narrow stream with a permanent flow.[7] I.R., E.I. 016, 189 (quoting Odd S. Halseth, who gave a speech entitled "1500 Years of Irrigation History" at a 1947 National Reclamation Association meeting in Phoenix).

43. The federal government undertook formal surveys of its recently-acquired lands to prepare the region for orderly occupation by American settlers. I.R., E.I. 016, 11. Surveyors' manuals contained instructions to government surveyors relevant to navigable bodies of water, but neither the instructions nor the applicable federal statute defined "navigable." I.R., E.I. 016, 11 - 25; 43 U.S.C. § 931.

44. **1868:** G.P. Ingalls, a government surveyor, wrote in his field notes in June 1868 that the River was "fordable during six or seven months of the year in sec 29 at the crossing of the Fort McDowell & Maricopa Wells Road." I.R., E.I. 016, 44.

45. **1868:** A few months later, in December 1868, W.F. Ingalls (also a government surveyor and brother of G.P. Ingalls), who was conducting a cadastral survey of the area, described the River as follows:

> Salt River is at this season of the year at least a large stream . . . nor do I think it ever entirely dry. It has moreover a very heavy fall of I should think 12 to 15 feet to the mile which makes it especially valuable for irrigating. I consider this valley, from 6 to 10 miles wide . . . as some of the best agricultural land I have yet seen in the Territory and should

[7] *Assessment of the Salt River's Navigability Prior to And on the Date of Arizona's Statehood, February 14, 1912*, by Douglas R. Littlefield, Ph.D., Littlefield Research Associates, Oakland, California, December 5, 1996. I.R., E.I. 016.

> recommend that it be subdivided at an early day. [Ellipses in ASLD Report.]

I.R., E.I. 030, 3-15; I.R., E.I. 016, 28. Ingalls also noted that the River had timber cottonwoods along its banks. I.R., E.I. 030, 3-15.

46. **1870:** In September 1870, General George Stoneman and John Huguenot Marion crossed the River at Phoenix, noting that the River was the next largest Arizona stream after the Colorado and that the "water was low when our party crossed it, yet it was with some difficulty that we made the trip." I.R., E.I. 016, 171-172.

47. **1877:** Hiram Hodge, author of a guidebook to Arizona, said of the River in 1877: "At low water it is a clear, beautiful stream, having an average width of two hundred feet for a distance of one hundred miles above its junction with the Gila, and a depth of two feet or more." I.R., E.I. 030, 3-15.

48. **1884:** In 1884, the River was described by Wallace W. Elliot & Co. as being capable of irrigating vast stretches of land, and as a clear beautiful stream at low water, having an average width of 200 feet for a distance of 100 miles above its junction with the Gila, and a depth of two feet or more. I.R., E.I. 030, 3-8 (Table 3-1).

B. Dams and Diversions.

49. **1883:** Construction of the Arizona Dam in 1883 (at the approximate location of the later-built Granite Reef Dam) constituted the first major step in diverting the River's entire flow during low-flow periods. I.R., B, Tr., 144 (Gookin[8]).

50. **1891:** By 1891, eleven irrigation diversion canals were in operation on the River: Swilling's Ditch (the Salt River Valley Canal), 1867; Maricopa Canal, 1870; Tempe Canal, 1870; Broadway Canal, 1870; Utah Canal, 1877; Mesa Canal, 1878; Grand Canal, 1878; San Francisco Canal, 1880; Arizona Canal, 1883; Highland Canal, 1888; and Consolidated Canal, 1891. I.R., E.I. 030, 7-11 (Table 7-8).

51. **1892:** The Kibbey decision (*Wormser v. Salt River Valley Canal Co.*, Second Judicial District, Territory of Arizona, County of Maricopa (Mar. 31, 1892), No.

[8] Thomas Allen Jaudon Gookin, registered professional engineer, registered land surveyor, professional hydrologist, testifying on behalf of the Gila River Indian Reservation.

708), which decided rights among various canal companies and water users, noted that there was generally a large volume of water in the River from December through mid-May. I.R., E.I. 016, 177. Judge Kibbey found that by 1892, appropriations from the River had reduced summer supplies to 18,000 miners inches (450 cfs), and that the plaintiffs' appropriations totaled 62,500 mi [1,562.5 cfs]. I.R., E.I. 016, 179.

52. **1897:** By 1897, aggregate canal capacity exceeded the River's low-flow. I.R., E.I. 018, Ex. 205, 55. Water-Supply and Irrigation Papers of the USGS (Department of the Interior), No. 2, 1897, *Irrigation near Phoenix, Arizona*, Arthur Powell Davis. The USGS placed the River's low-flow at 300 cfs. *Id.*

53. **1899:** Gauge records at McDowell for 1899 show that the combined flow of the Salt and the Verde Rivers were perennial at the upstream limit of the study area, with the minimum annual recorded flow during the time period as about 658 cfs in 1899. However, near Phoenix, the USGS reported that "during ordinary seasons all of the water of Salt River is diverted, and at the present time there is a shortage in the summer months." I.R., E.I. 030, 7-6, 7-8 (Table 7-4). Thus, portions of the River were dry by 1899, at least during certain seasons due to man-made diversions. Nevertheless, other portions of the River remained perennial. I.R., E.I. 030, 7-7 - 7-8.

54. **1903:** The Salt River Valley Water Users Association was established in 1903 to represent individual water users in their dealings with the federal government (regarding a water-storage dam under the Reclamation Act of 1902). I.R., E.I. 030, 3-9.

55. **1903:** Construction of Roosevelt Dam (at the confluence of the Salt River and Tonto Creek) began in 1903. I.R., E.I. 030, 3-9; I.R., E.I. 036, 15-18.

56. **1903:** In 1903, the water table was still close to the surface; springs discharged along river banks and farmers drained their land with shallow ditches, providing some flow to the River. I.R., E.I. 030, 7-12. However, the natural covering of the watershed had been impaired by the expansion of farming, cattle, lumber and mining industries, causing run-offs from the watershed to increase to flood dimensions, cutting new channels, and washing out farmers' diversion dams. I.R., E.I. 016, 189 (quoting Halseth).

57. **1908:** Granite Reef Dam, a permanent diversion dam was built to replace the numerous brush dams at canal head gates along the River and was completed in 1908. I.R., E.I. 030, 3-9 (Table 3-1), 3-14; I.R., B, Tr., 235-36 (Roberts[9]). The 1,100 foot concrete dam was designed to divert all the flow in the River. I.R., E.I. 036[10], 18.

58. **1908:** Also in 1908, water began to be stored behind the incomplete Roosevelt Dam. I.R., E.I. 036, 18.

59. **1910:** In 1910, the Kent Decree (*Hurley v. Abbott*, Third Judicial District, Territory of Arizona, County of Maricopa (Mar. 1, 1910), No. 4564) defined the irrigation status of every parcel of land in the Salt River Valley. I.R., E.I. 030, 3-9. The Decree confirmed appropriations that were sufficient to divert all of the River during low flow months. I.R., E.I. 030, 7-10.

60. **1910:** Roosevelt Dam was declared complete in 1910. I.R., E.I. 036, 18.

61. **1911:** At the time of the Dam's dedication in 1911, 500,000 af of water was stored behind the Dam. I.R., E.I. 036, 25; I.R., E.I. 036, 25.

62. **1912:** By 1912, diversions that had begun in the 1870s had reduced flows so that boating, floating logs for potential commercial purposes, or navigation were nonexistent. I.R., E.I. 031, 11-12.[11]

63. **1913:** Reservoir impoundments, canal diversions, and groundwater withdrawal since about 1913 had effectively eliminated low-flow runoff. I.R., E.I. 030, 5-4.

C. **Historical evidence of boating:**

64. **1860-1915:** At least six ferries operated on the River between Granite Reef Dam and the Gila River between 1860 and 1915. In later years, the number of ferries diminished as the ordinary and natural flow was impounded in reservoirs, and diverted to canals, and as bridges over the River were constructed. I.R. E.I. 030, 3-25. Ferries were

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[9] David Roberts, representing SRP.

[10] Slideshow by David Roberts, SRP, 4/07/03 (I.R., E.I. 036).

[11] Dr. August cites to the ASLD Report (I.R., E.I. 030), as follows: 3-17, 3-21, 3-25, 3-28, 5-5, 5-9, 5-10, 7-7, 7-10, 7-20, 7-25, 8-3 - 8-6, 9-2, B-5, B-6.

necessary during several [winter and spring] months of the year. I.R., E.I. 030, 3-26, 7-17 (Table 7-14).

65. **1868 - 1874:** The Marysville Ferry on the Fort McDowell-Maricopa Road began operating in 1868 and continued until 1874. I.R., E.I. 030, 3-25.

66. Generally, there was no shortage of boats in the Salt River Valley. I.R., E.I. 030, 8-3. The types of boats typically used were flat-bottomed boats, skiffs, or canvas and wooden canoes. I.R., E.I. 030, 8-3.

67. **1873:** The *Weekly Arizona Miner* reported in May 1873 that the "Salt River is navigable for small craft as, last week, L. Vandemark and Wm. Kilgore brought five tons of wheat in a flat boat from Hayden Ferry down the river to the mouth of Swilling canal and thence down the canal to Helling & Co's mill." I.R., E.I. 030, 3-18, 3-19 (Table 3-2).

68. **1873:** Charles Hayden attempted to float logs down the River in June 1873 (the River's low-flow time [I.R., E.I. 030, 7-17 (Table 7-14), 7-18]) and to establish a lumber mill in Tempe, but the logs got caught up in the canyons upstream (outside the study reach). I.R., E.I. 030, 3-19 (Table 3-2). However, as the *Weekly Arizona Miner* reported in June 1873, "Mr. Hayden is still sanguine of getting sufficient timber on this side of the canons." I.R., E.I. 030, 3-20.

69. **1874:** Hayden's Ferry was established in 1874 and was used until at least 1909. It was the best known ferry that operated on the River. I.R., E.I. 030, 3-7, 3-25 (Table 3-3).

70. **1881:** In February 1881, two men - Cotton and Bingham - were reported to be preparing to travel from Phoenix to Yuma in an 18-foot, flat-bottomed skiff. I.R., E.I. 030, 3-19 (Table 3-2), 3-20.

71. **1881:** In late November and early December 1881, Bucky O'Neill and two other men tried to boat from Phoenix to Yuma. I.R., E.I. 030, 3-19 (Table 3-2). The men arrived in Yuma six days after leaving Phoenix, although they were forced to wade in the water, pulling their boat, about twelve miles below Phoenix. I.R., E.I. 030, 3-20.

72. **1883:** Jim Meadows and three other men boated the Salt River between Livingstone, near present-day Roosevelt Dam, and Tempe in October 1883. I.R., E.I. 030, 3-19 (Table 3-2). The party encountered trouble in the upper canyons (outside the study reach), but they completed the trip successfully. I.R., E.I. 030, 3-20 - 3-21.

73. **1883:** The *Arizona Gazette* reported in February 1883 that North Willcox and Dr. G.E. Andrews, U.S.A., floated a canvas skiff from McDowell to Barnum's pier on the Salt River Valley Canal and that the "Salt River is a navigable stream and should be included in the Rivers and Harbors appropriation." I.R., E.I. 030, 3-19 (Table 3-2). The only discomfort the party experienced was that it rained during the night while they camped. I.R., E.I. 030, 3-21.

74. **1884:** The *Arizona Gazette* reported in 1884 that the Salt and Gila Ferry Co. was operating downstream of Phoenix, and the Shureman and Singletary ferry operated above the bridge at Tempe. I.R., E.I. 030, 3-25.

75. **1884:** Other ferries operated in 1884. For example, the *Phoenix Herald* wrote that "Jesse Bryant and H.H. Hufstetter have a good and safe ferry running." I.R., E.I. 030, 3-27.

76. **1884:** Ferries were used to haul commercial freight, including passengers, mail, and large loaded freight wagons with team; a man was reported to have had a boat built to haul 60,000 pounds of freight across the River in 1884 at a profit of 12 ½ cents per 100 [wt]. I.R., E.I. 030, 3-26 - 3-28.

77. **1885:** The *Arizona Gazette* reported in June 1885 that William Burch and four other men successfully boated the River in an 18 foot by 5 foot boat from four miles above the Tonto Creek confluence to Phoenix. I.R., E.I. 030, 3-19 (Table 3-2). The men's purpose was to see whether logs could be floated down the River. Although the party encountered some difficulties in the upper canyons (outside the study area), "the undisputed conclusion is that such work [log floating] can be successfully carried on." Along the way, the party caught large quantities of Salt River trout, some weighing eight and ten pounds. The men described the stream as being six to twenty feet deep. I.R., E.I. 030, 3-22.

78. **1888:** The *Phoenix Herald* reported in December 1888 that Major E.J. Spaulding (commandant at Fort McDowell) and Capt. Charles A.J. Hatfield canoed from Fort McDowell on the Verde River to the Mesa Dam on the Salt River, where Major Spaulding accidentally shot and killed himself. I.R., E.I. 030, 3-19, 3-21.

79. **1889:** The *Tombstone Daily Prospector* in January 1889 stated that the Gentry and Cox ferry boat which had been used for years on the Salt River at the Maricopa crossing was floated down the River toward the Gila Bend crossing. However, forty miles below Phoenix (outside the study area), the boat struck a snag and was cut in two. I.R., E.I., 3-19 (Table 3- 2), 3-23, 3-28.

80. **1890-91:** Scott Soliday, research historian at the Tempe Historical Museum, stated that in 1890 or 1891 the *Mesa Free Press* reported that after Fort McDowell was abandoned, A.J. Chandler had logs or sawn timber from the Fort floated down the Verde for use at the head gates of the Consolidated Canal [at Granite Reef Dam]. I.R., E.I. 030, 3-19.

81. **1893:** Ferries on the River were numerous in 1893. I.R., E.I. 030, 3-28.

82. **1895:** The *Phoenix Herald* reported in February 1895 that Amos Adams and G.W. Evans boated from the San Francisco River to Clifton, down the Gila to Sacaton. They then hauled the boat overland to Phoenix, after which they boated down the Salt and Gila Rivers to Yuma. I.R., E.I. 030, 3-19.

83. **1898:** The Haws and Finch Ferry, about three miles above Maricopa Dam began operating in 1884 and was still operating in 1898. I.R., E.I. 030, 3-25, 3-28.

84. **1905:** In February 1905, according to the *Arizona Republican*, a boat was used to rescue the Tilzer family from their home on an island in the River during a flood. I.R., E.I. 030, 3-19, 3-23.

85. **1905:** The *Arizona Republican* reported in March 1905 that Jacob Shively built a boat at the Chamberlain Lumber Co. in Phoenix, intending to float it to Yuma. I.R., E.I. 030, 3-19. Later that month, Shively and his boat were sighted at Arlington and Buckeye and were headed for the Wolfley dam. I.R., E.I. 030, 3-23.

86. **1905:** The *Arizona Republican* reported in December 1905 that engineers from the Reclamation Service of the Department of the Interior traveled by boat from below the Arizona Dam to the head of the Consolidated Canal, encountering some difficulty but completing the trip. I.R., E.I. 030, 3-19, 3-23 - 3-24.

87. **1910:** In June 1910, two men took a rowboat trip from Roosevelt Dam to Granite Reef Dam (and then to Mesa via the South Canal), as the *Arizona Republican* reported in June 1910. I.R., E.I. 030, 3-20 (Table 3-2).

88. **1915:** The *Arizona Gazette* reported in January 1915 that a boat was used to rescue people from the flooded River. I.R. E.I., 030, 3-20, 3-24.

D. Post-Settlement Fishing.

89. **1879-1881:** The River was fished commercially: Articles in the *Phoenix Herald* (May 1879) and in the *Arizona Gazette* (December 1881) mention that fish from the River were supplied for market. I.R., E.I. 030, 3-17.

90. **1879-1881:** The *Phoenix Herald* reported in May 1879 that fish were harvested with the use of "giant powder." Giant powder is an explosive. I.R., E.I. 030, Glossary-8. A bill prohibiting the powder's use to kill fish was enacted in 1881. I.R., E.I. 030, 3-17.

91. **1880:** The *Phoenix Herald* for June 24, 1880, reported that "The restaurants occasionally furnish their boarders with excellent fish caught in Salt River." I.R., E.I. 030, 3-17.

92. **1881:** Fish were still abundant in the River in 1881: The *Phoenix Herald* reported that two boys caught over a hundred pounds of fish in a few hours, and in 1882, the *Arizona Gazette* reported that "a lucky disciple of Izaak Walton" caught a five-pound Colorado River salmon from the River. I.R., E.I. 030, 3-16 - 3-17.

93. **1888-1908:** An abundance of fish, some as long as five feet and weighing as much as 40 pounds, were reported in the River in the 1880s. I.R., E.I. 030, 3-7. However, newspapers reported in 1888, 1892, and 1908, that fish were dying because of diversions from the River. I.R., E.I. 030, 3-17.

E. **Transportation.**

94. **1872:** In 1872, the U.S. Geological Survey sent George M. Wheeler to the West to find reliable river transportation inland for the region's mining products. Wheeler found no avenues of connection with the interior besides the Columbia and Colorado Rivers, and he noted that "river transportation, even in this very American age, loses its great power when pitted against railroads." I.R., E.I. 016, 172-73.[12]

95. **1887:** The Southern Pacific railroad line arrived in Tempe in 1887 and crossed the River on the first bridge in the area near Hayden's Ferry. (The first railroad had come to Arizona - Tucson - from Yuma in 1880.) The Southern Pacific was one of the main contenders for the transportation development of the West, which facilitated regional and national trading. I.R., E.I. 018, Ex.191, 3-5.

96. **1903:** The freight road referred to as the Apache Trail by the Commission (and as the Roosevelt or Tonto road in reports and documents from that era) linked Mesa to the dam site for Roosevelt Dam and was a cost-effective means of supplying the vast quantities of materials and laborers need for the construction.[13] I.R., E.I. 24, 94.

97. Men and materials for construction could either go from the railhead at Globe to the site or up from Mesa. The Globe route was initially favored by the Reclamation Service due to its shorter distance and lower cost. *Id.* at 76.

98. If the people of the Valley would raise the additional money needed to build the Roosevelt road, power transmission cables and telephone lines would follow the road down from the Dam, while foodstuffs and workers would travel up from the Valley to work on the Dam. *Id.*

99. In a pamphlet written for the Salt River Valley Water Users' Association, Joseph H. Kibbey made the case for voting in favor of raising bonds to build the road

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[12] Quoting from George M. Wheeler, et al., *Report on Exploration of the Public Domain in Nevada and Arizona*, House Ex. Doc. 65, 42nd Cong., 2nd Sess., (Washington D.C.: U.S. Government Printing Office, 1872) [LRS Box/File: 8/18], 53.

[13] Earl A. Zarbin, Roosevelt Dam: *A History to 1911* (Salt River Project 1984).

centered on the economic benefits to Valley towns that would be lost if the shorter route to Globe and the railroad there was chosen:

> For the next four years the money expended at Tonto [Roosevelt] for labor and food supplies, both of which can be obtained in the Salt River valley, if not barred by the difficulty and cost of transportation, will exceed $1,500 per day for every business day in the year; $1,000 for labor and $500 for food supply. In other words, if the food supply is obtained from this valley there will be expended here, on that count alone, more than $500 per day; and by locating the employment office here there will be a continual stream of laborers, numbering well up into the thousands, going and coming through the city for several years, each one of whom would leave here more or less cash, and to whom the total wages would exceed $1000 per day. The greater part of wages paid to men engaged in any work is expended where paid or at the city nearest and most convenient to the place of payment. Can we afford to lose the additional capital which would inevitably be put in circulation here.

Id. at 87 (citing the *Arizona Republican* of March 23, 1904).

100. The road also could transport cement from the Roosevelt Dam plant to supply the Valley's growing demand for cement for irrigation ditches, sidewalks and construction, at one-half the market cost of the time. *Id.* Local leaders such as Benjamin Fowler, President of the Water Users' Association, Joseph Kibbey, and hotelman John C. Adams characterized the road as "a proper business move" and said that "building the road was a business proposition, which would increase prosperity." *Id.* at 88.

101. **1905:** Use of the River to haul goods to the construction site also was identified as one of the two options available to bring materials to the work site in 1905 before the main roadway was completed. "There were two ways to get the supplies to the camp: one choice was to send it via pack trains and the other was to haul the goods upriver in a boat. Neither method was appealing, but until the river went down or the Roosevelt road was completed, those were the options." *Id.* at 101.

F. **Floods and drought.**

102. Severe floods on the River occurred in 1833, 1862, 1869, 1874, 1880, 1893 and 1905. I.R., E.I. 030, 5-9.

103. **1890:** A flood - the first that was measured - occurred in 1890, and it destroyed crops and water-logged bottom lands. I.R., E.I. 030, 3-8 (Table 3-1), 3-15.

104. **1891-92:** A major flood occurred on the River in 1891-92. I.R., E.I. 030, 3-15. This flood undoubtedly adversely impacted channel conditions. I.R., E.I. 030, 5-9.

105. **1905:** A major flood occurred on the River in 1905. I.R., E.I. 030, 3-15. Boats were used to rescue people from the flooded River, as the *Arizona Republic* reported in February 1905. I.R., E.I. 030, 3-19, 3-23.

G. **Actual Flow and Channel Condition of River at Statehood.**

106. **1889:** Direct measurement from gauges existing at the time show that in 1889, the average annual minimum flow of the River at Arizona Dam was 2,656 cfs. I.R., E.I. 030 at 7-7.

107. A federal surveyor in 1899 estimated the River's permanent base flow at 2,000 mi [50 cfs]. I.R., E.I. 016, 51. This was during a time of severe drought. I.R., E.I. 030, 3-9 (Table 3-1) (drought occurred in the Salt River Valley from 1898 to 1904).

108. **1912:** In February 1912, unusually low stream flow supplied from the upper watershed and normal irrigation and other diversions combined to produce reaches of dry or limited flow in the River. I.R. E.I. 030, 7-14, 7-15.

109. **1912:** Even in 1912, estimated streamflow data from various sources indicates an annual runoff of 1,176 cfs and an annual diversion rate of 1,040 cfs. Therefore, the natural stream flow input into the study reach was at least 1,040 cfs. I.R., E.I. 030 at 7-12.

110. **1912:** In 1912, the River had an easily identified low-flow channel, defined by frequent (if not perennial) flow and trees growing along the banks. The low-flow channel tended to shift within the flood plain in response to flood magnitude. The stream pattern was straight with some minor braiding of the low-flow channel. The low-flow

channel had an average width of 360 feet, significantly narrowed from pre-settlement conditions. Narrowing probably occurred in response to the reduction in low-flow discharges caused by irrigation diversions. I.R., E.I. 030, 5-9.

V. Recent events.

111. The River has been boated recreationally, by kayak and canoe, in modern times, mainly during winter months. I.R., E.I. 030, 8-4 - 8-5 (Table 8-4).

112. In 1972, the Salt River Pima-Maricopa Indian Community sued Arizona Sand & Rock Co., the Arizona Department of Transportation, and others, in the United States District Court, District of Arizona, concerning, among other things, the location of its reservation's south boundary on the River. The reservation is in Township 1 North, Range 5 East. For purposes of the lawsuit, all parties agreed that the River was not navigable, and in 1977 the Court entered its judgment based on the parties' stipulation. CIV 72-376 PHX WDM. The Court's judgment involved only those miles within the reservation, and the non-navigability finding included in the judgment was not based on the applicable federal test for determining navigability pursuant to the Equal Footing Doctrine. *Salt River Pima-Maricopa Indian Cmty. v. Arizona Sand & Rock Co.*, D. Ariz. (CIV 72-376-PHX) (Apr. 13, 1977).

113. In 1985, Arizona officials first asserted a sovereign interest in Arizona's streambeds. *Land Department v. O'Toole*, 154 Ariz. 43, 739 P.2d 1360 (App. 1987).

114. The Legislature enacted a law in 1987 substantially relinquishing the State's interest in any such lands. Laws 1987, Ch. 127, § 4, effective April 21, 1987.

115. The Arizona Center for Law filed a lawsuit challenging the legislation, and the court of appeals ultimately found that the legislation violated the public trust doctrine and the Arizona Constitution's gift clause and that navigability—and thus bed ownership—must be determined pursuant to federal law. *Center for Law in the Public Interest v. Hassell*, 172 Ariz. 356, 837 P.2d 158 (App. 1991).

116. The Legislature thereupon enacted statutes establishing the Arizona Navigable Streams Adjudication Commission (ANSAC) and providing for ANSAC to conduct public hearings for all of the watercourses. 1992 Arizona Session Laws, ch. 297.

117. In 1994, as ANSAC began to take evidence on certain watercourses, the Legislature amended the underlying legislation. 1994 Arizona Session Laws, ch. 178.

118. In 2001, the court of appeals struck down the 1994 statutes as inconsistent with the federal test for navigability. *Defenders of Wildlife v. Hull*, 199 Ariz. 411, 18 P.3d 711 (App. 2001).

119. The Legislature once again amended the statutes to comply with the court of appeals' mandate. 2001 Arizona Session Laws, ch. 166, § 1.

120. Pursuant to Title 37, Chapter 7, Arizona Revised Statutes, ANSAC conducted a public hearing on the Lower Salt River on April 7, 2003 in Phoenix and, after post hearing briefing, found the River non-navigable as of February 14, 1912 by unanimous vote. See I.R., B.

121. ANSAC issued its Report, Findings and Determination Regarding the Navigability of the Salt River from Granite Reef Dam to the Gila River Confluence in September 2005. See I.R., A.

122. The State timely filed its Complaint for Judicial Review of Administrative Decision on June 19, 2006.

Respectfully submitted this 16th day of October, 2006.

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Firm State Bar No. 14000

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Arizona Center for Law in the Public Interest

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ORIGINAL of the foregoing hand-delivered
this 16th day of October, 2006 to:

Michael K. Jeanes, Clerk
MARICOPA COUNTY SUPERIOR COURT
101/201 W. Jefferson
Phoenix, Arizona 85003-2205

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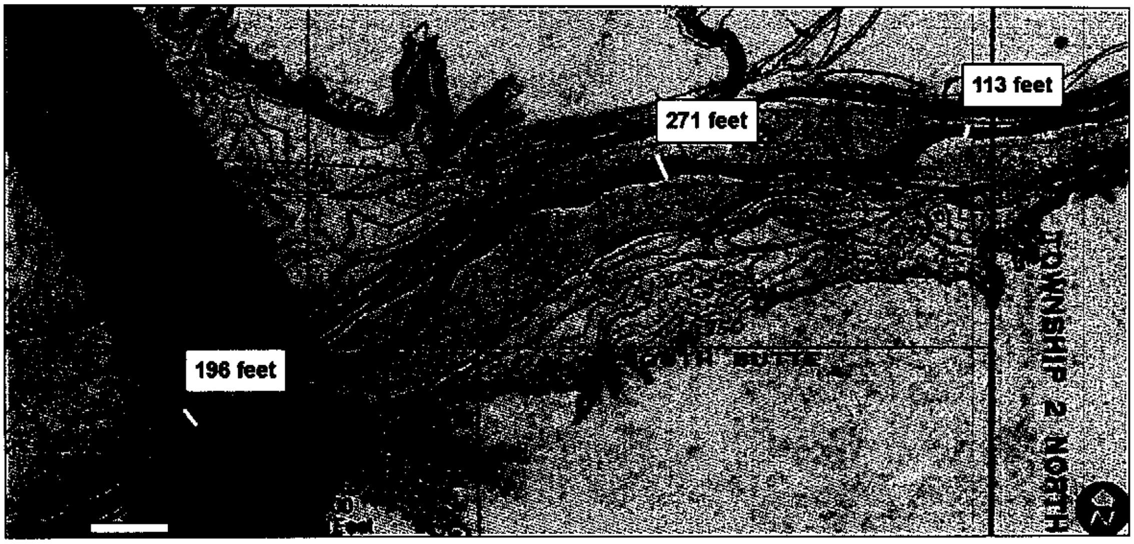
Secretary to Laurie A. Hachtel

ATTACHMENT "E"

Supplemental Information



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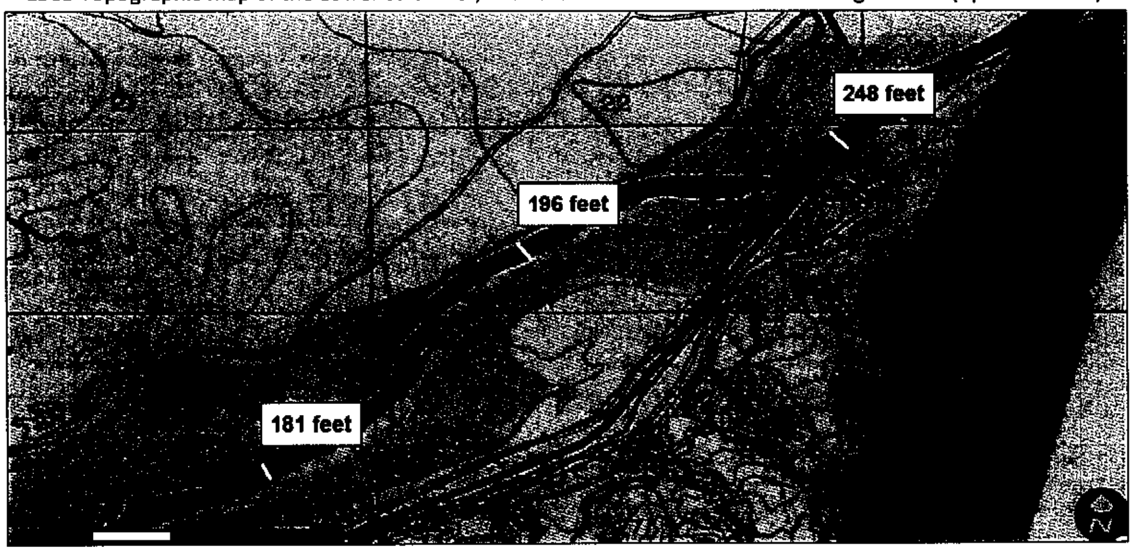

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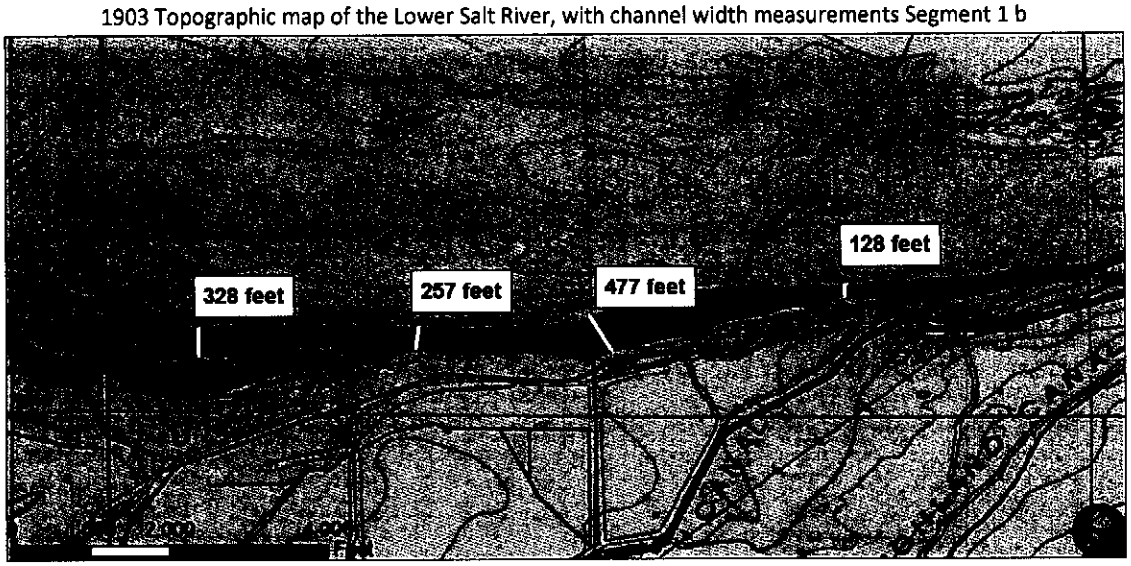

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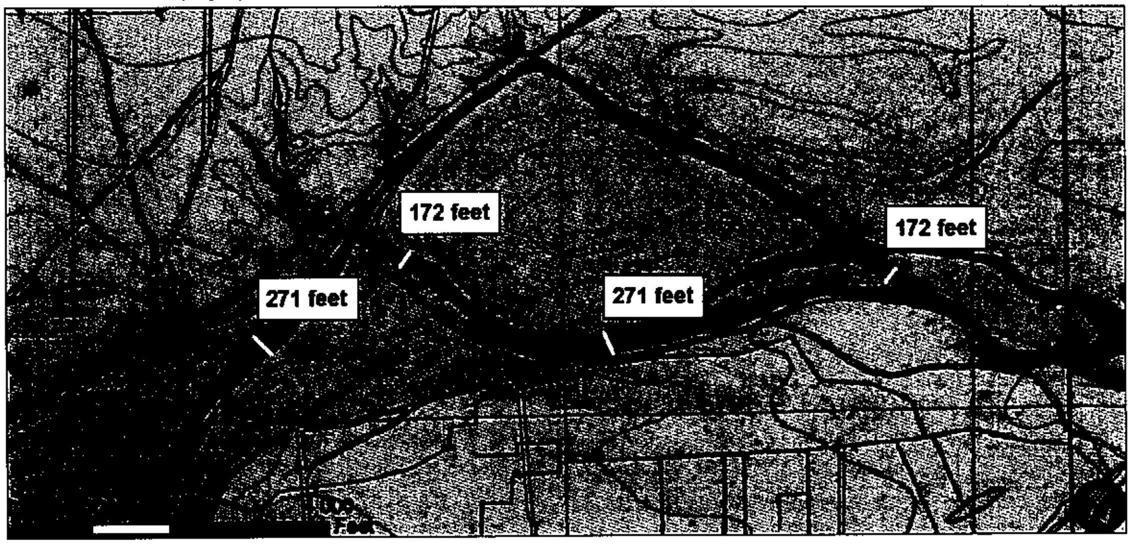

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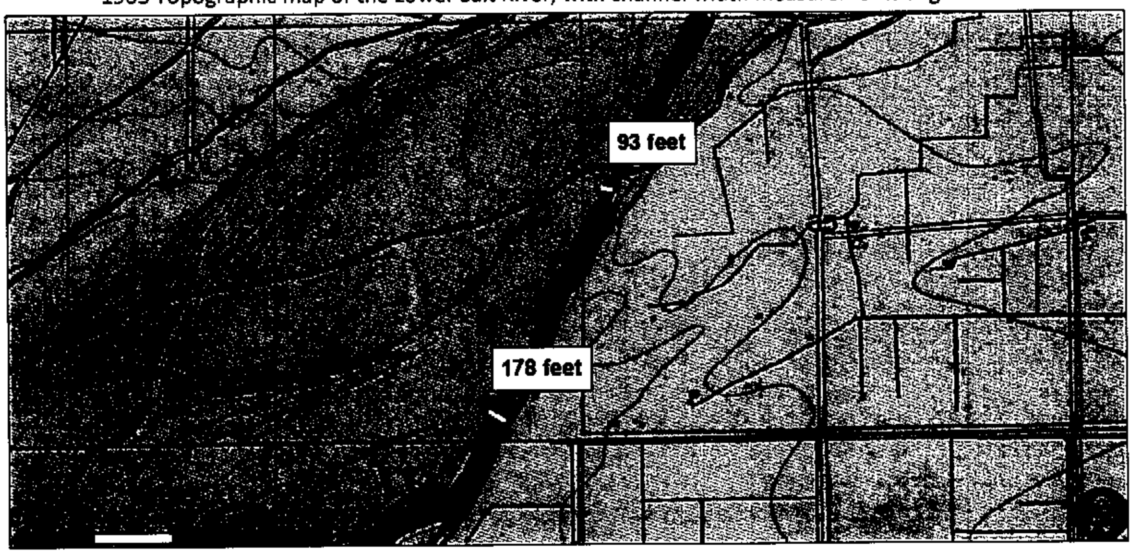

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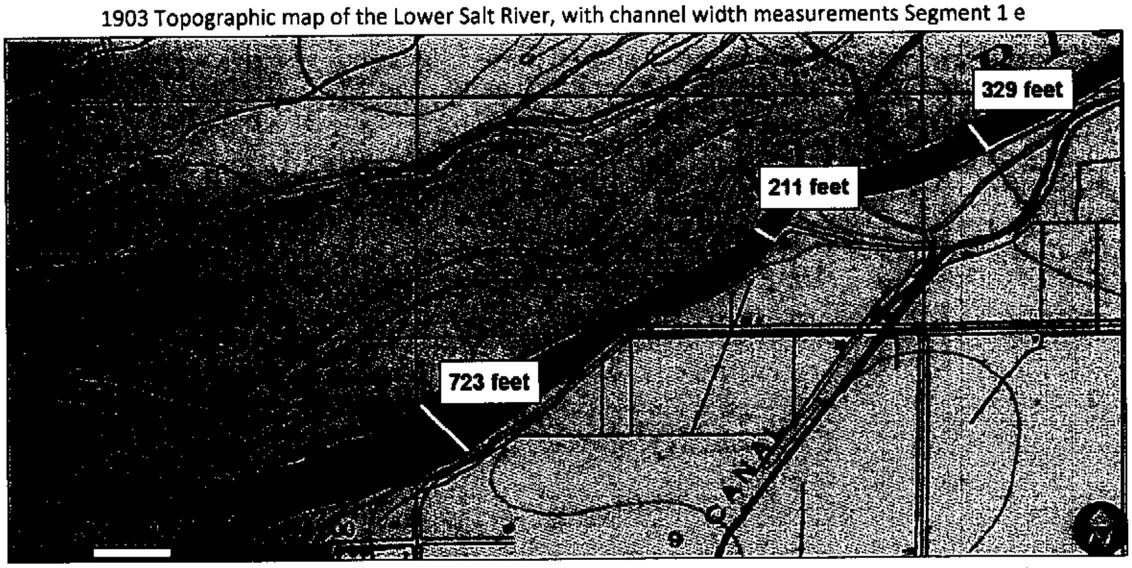

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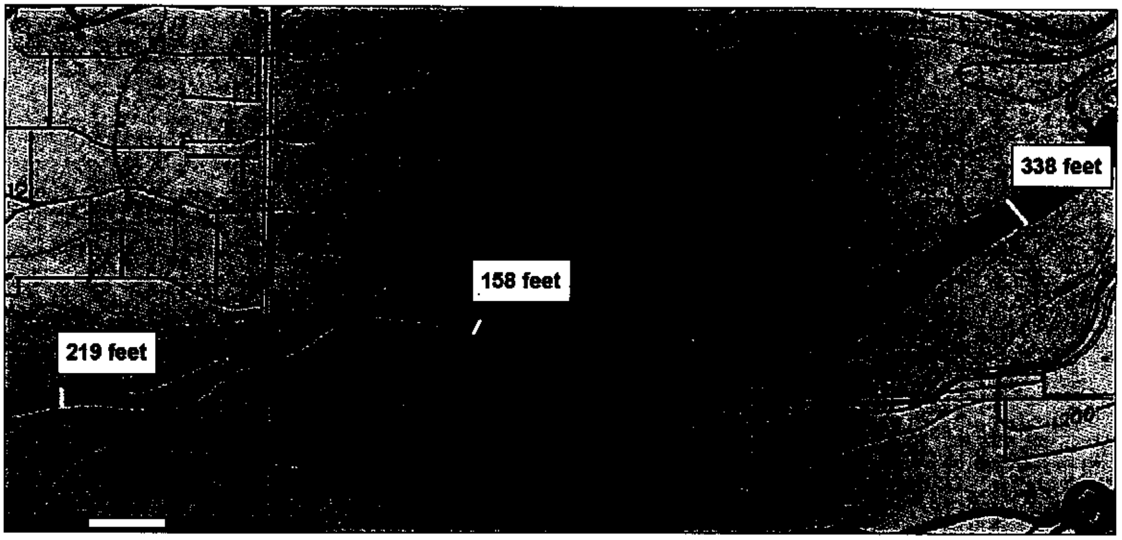

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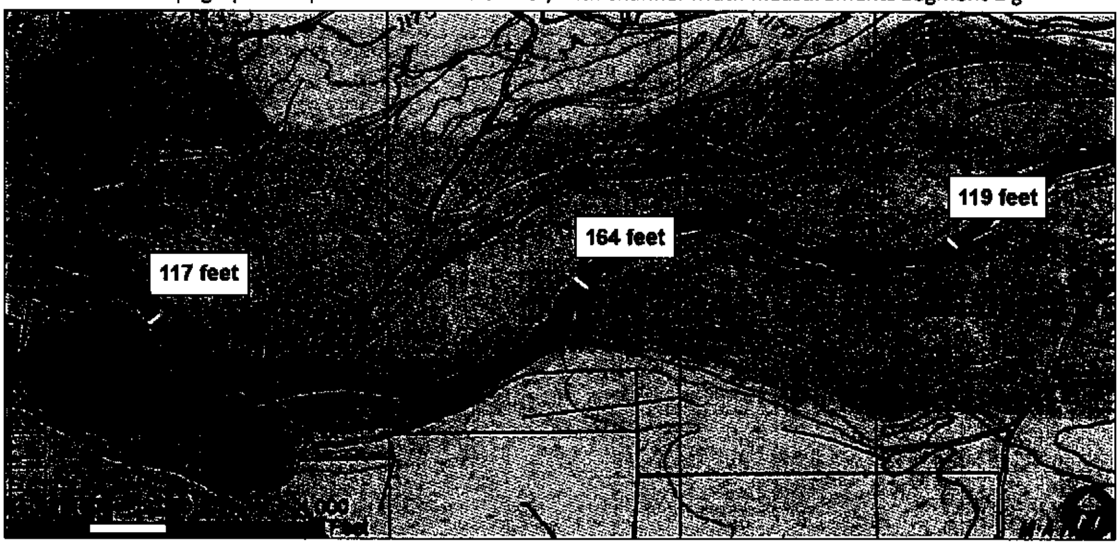

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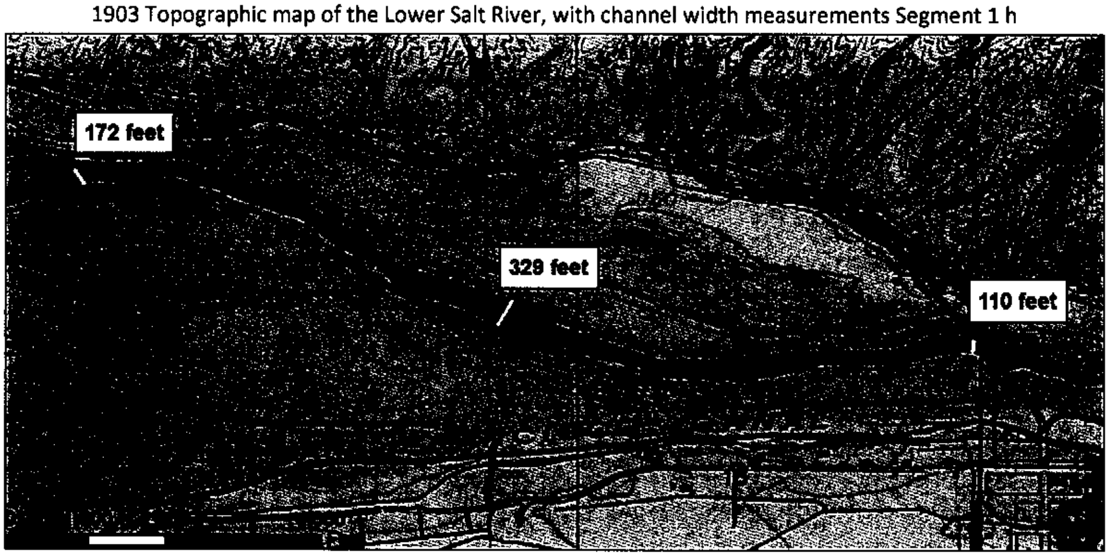

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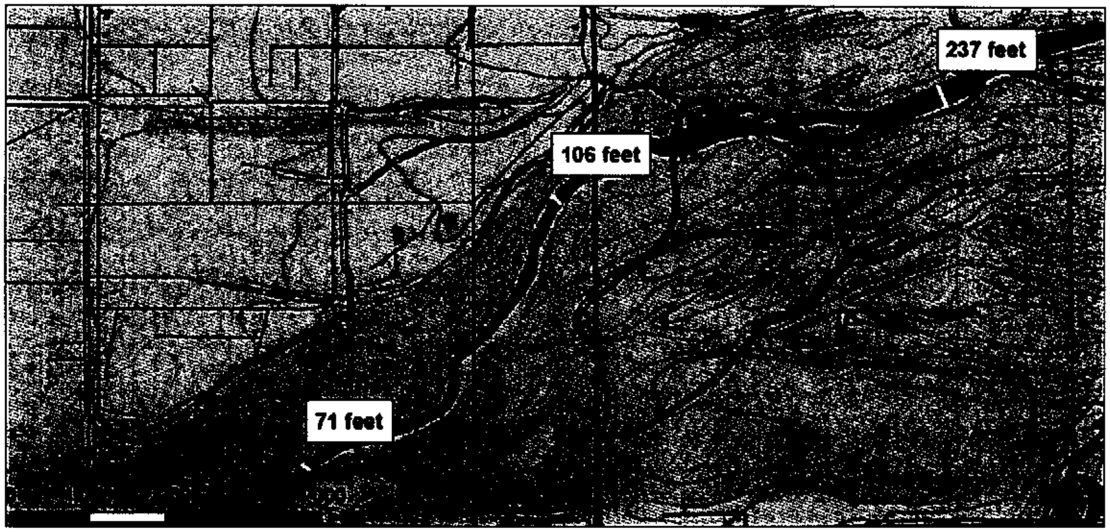

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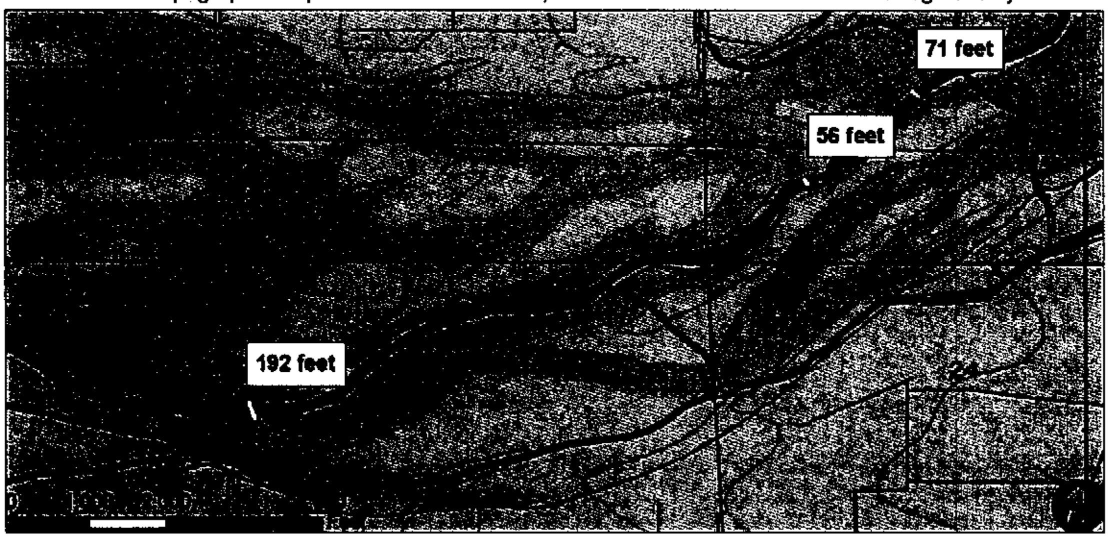

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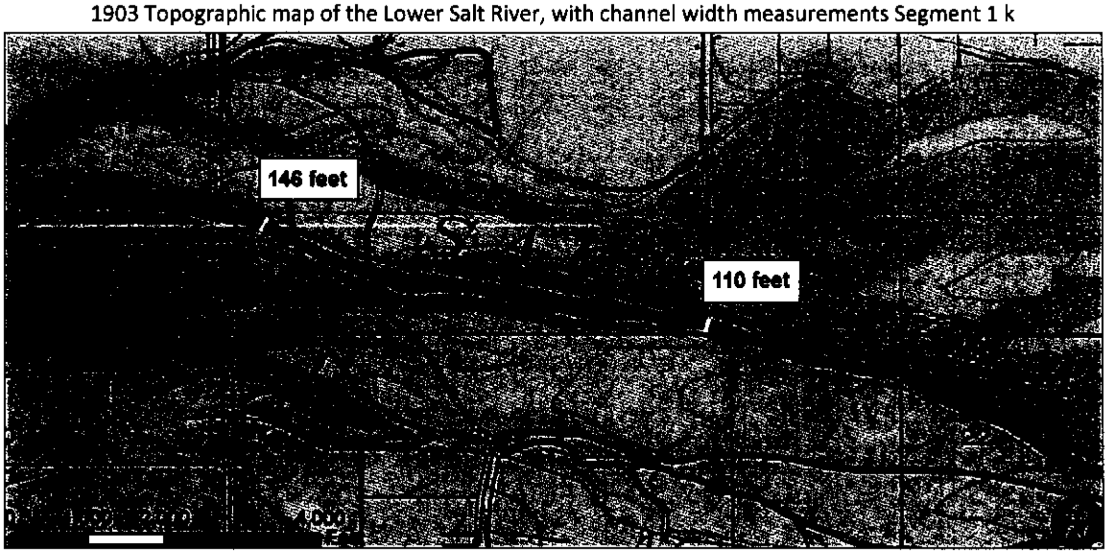

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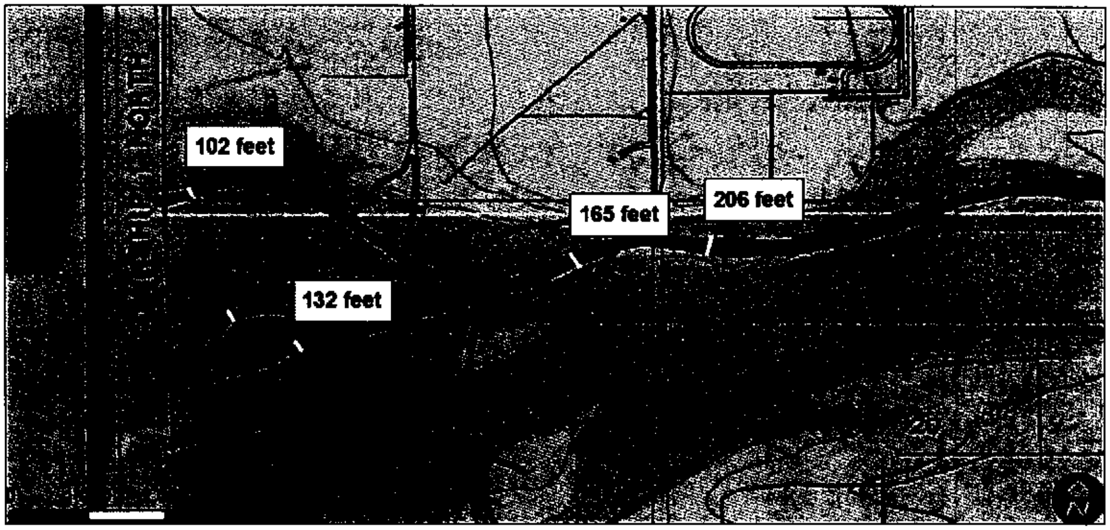

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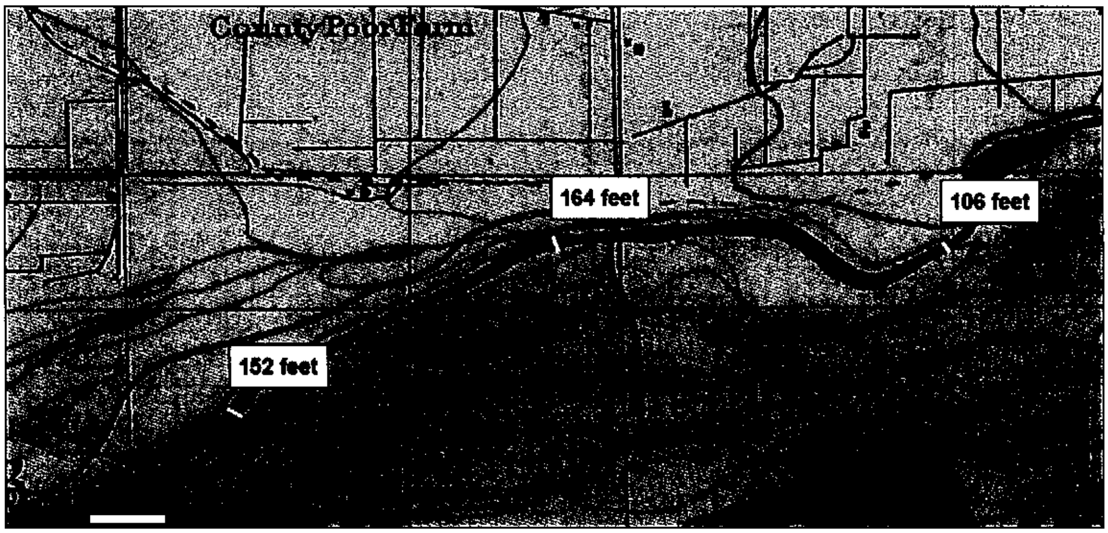

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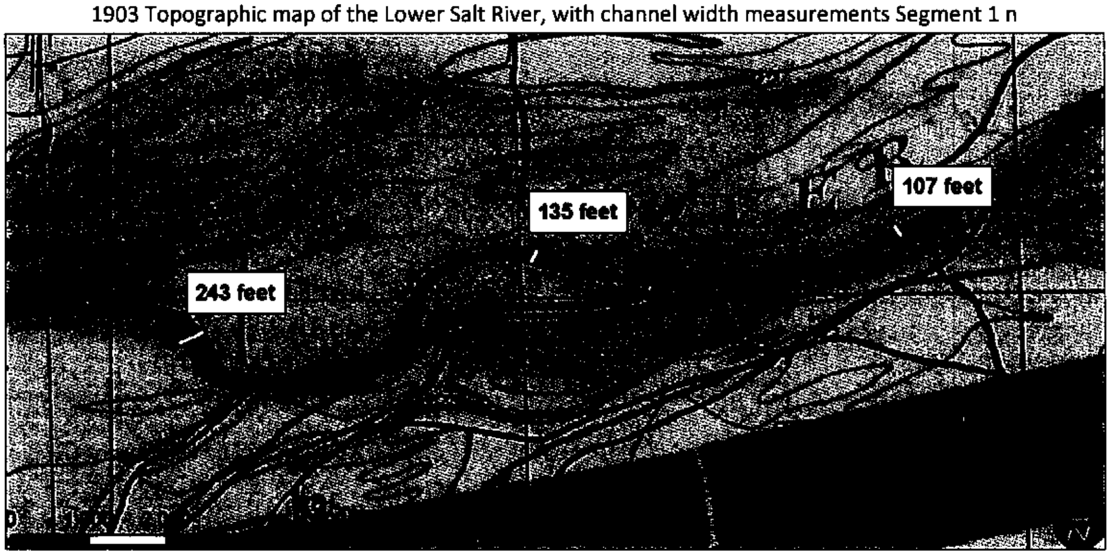

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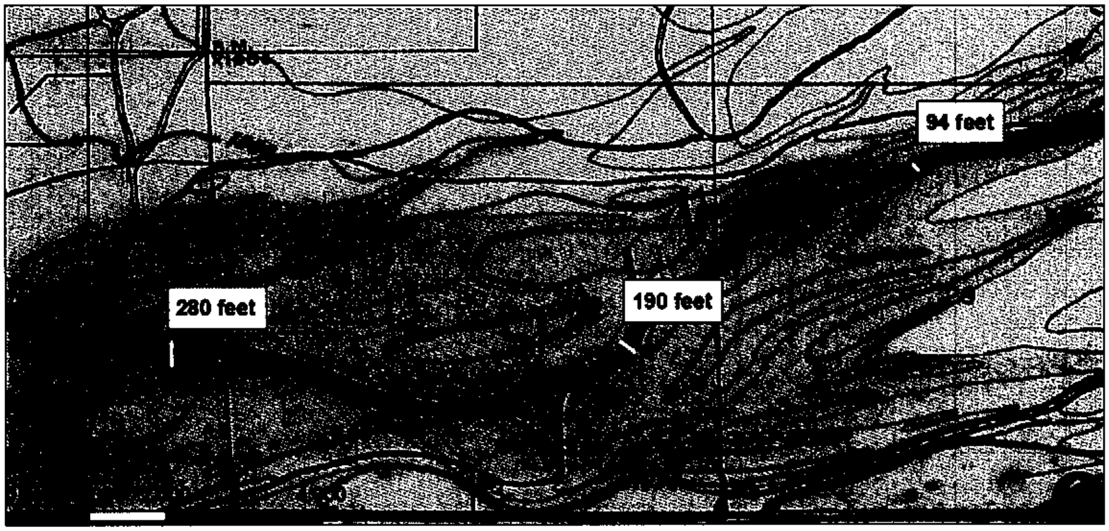

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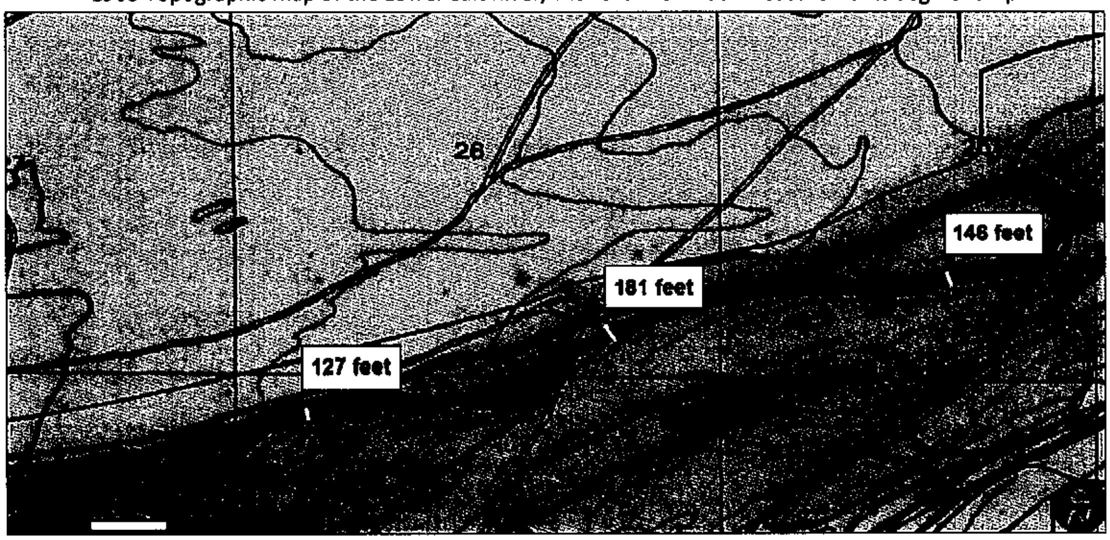

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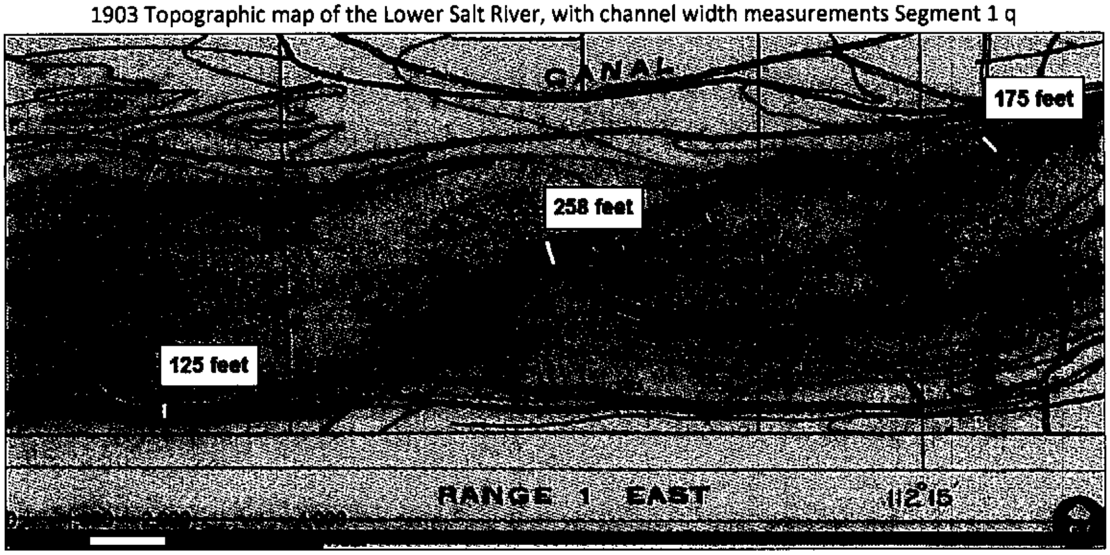

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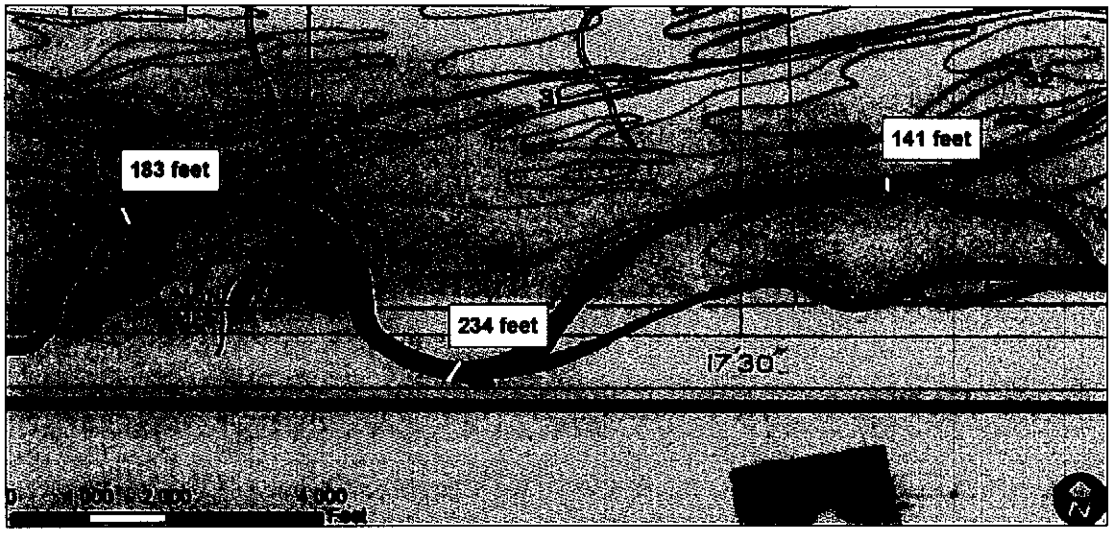

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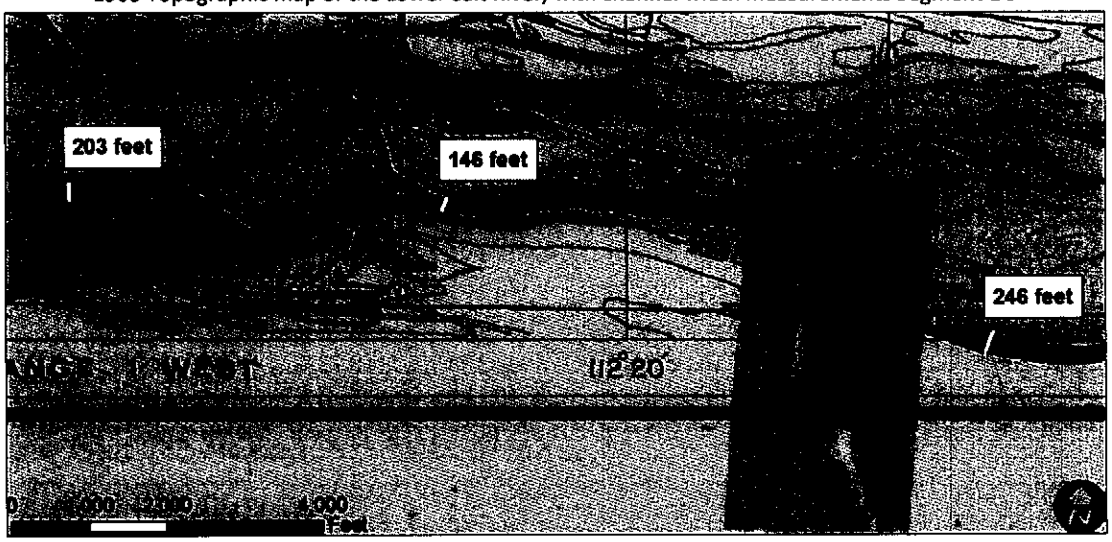

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ATTACHMENT “F”

Appendix H

Pueblo Grande Publication 15

Pueblo Grande Museum

Profiles No. 15

A River Ran Through It

Introduction

The Salt River Valley, where the modern Phoenix metropolitan area is today, has attracted people with its resources for thousands of years. The resource that dominated this area is the Salt River, which was a perennial stream until the early 20th century, and offered water to support a rich and varied riparian ecosystem. Upstream stretches of the Salt River are still perennial, but most of the river is impounded by dams and is regulated through pipes and canals to provide a reliable supply to a thirsty metropolitan area.

Riparian ecosystems are communities of plants and animals that are dependent upon continuous supplies of water. Most riparian species are found only along natural watercourses such as rivers, springs and streams. Riparian ecosystems can also develop in areas where the ground water is perched high enough to allow the roots of riparian plants access to water. In these cases there is no visible surface flow, only underground flow. Occasionally marshes or (cienegas) develop when the subterranean water reaches the surface at springs and seeps. Precipitation runoff stored in bedrock tanks (tinajas), farm ponds and cattle tanks can supply water to thirsty riparian communities.

During the Hohokam period (A.D. 1 - A.D. 1450), the Salt River provided water to the prehistoric people for agricultural and other domestic uses. Hohokam farmers, like subsequent historic and modern farmers, diverted river water into canals and into their gardens. Thousands of hectares (area of land measuring 100 m x 100 m) were under cultivation during both the prehistoric and historic periods. Agriculture irrigated by Salt River water is still a major economic activity in this area, with cotton, alfalfa and various vegetable crops being grown. Controlling the river for at least part of the year enabled farmers to feed an ever increasing population. As the modern population increased, more water was needed to irrigate cleared land to accommodate agricultural demands. Soon most of the water was diverted and the riparian forest community that grew along the river was greatly reduced. In many areas the river channel has been modified, moved, lowered or lined, and water flows through the Phoenix metropolitan section of the Salt River only during periods of unusually heavy rain or snow melt on the watershed.

What was the Salt River like when the Hohokam lived in the Salt River Valley? To answer this question archaeologists and environmental historians use biological specimens collected during archaeological excavations, guided by early historic records, to piece together a picture of the Salt River Valley at about A.D. 1200.

The Salt River Valley Environment, Circa A.D. 1200

Recent archaeological excavations in the Salt River Valley have recovered thousands of biological specimens from Hohokam sites that give archaeologists data to help them reconstruct the prehistoric riparian environment. Examples of cottonwood, willow, mesquite, arrowweed, cane wood charcoal, and cattail pollen are commonly collected. All of these species possessed important economic benefits to the Hohokam and it can be assumed that these species were grown and collected from the area under study.

Cottonwood, willow and mesquite trees are indicator plants for a riparian forest ecosystem at the elevation found in the Salt River Valley. Tree species such as ash, juniper, sycamore and pine were also recovered at Salt River sites, but these trees grow at higher elevations. It is assumed that these species were driftwood washed down during a flood. This phenomena still occurs on the upper, unregulated stretches of the Salt River. However, driftwood was probably an important source of wood for the Hohokam.

Cattails and cane are usually found rooted in submerged soil or very moist banks within shallow protected areas, like sloughs, oxbows, or lagoons. These areas are marshy or swampy and generally have relatively slow river current flowing through them. Cattail, cane and arrowweed provide excellent cover and substrate for a number of animal species as well as raw material for artifacts and houses. Whereas cattail and cane prefer emergent soils, arrowweed grows better in drier soil.

Cottonwood and willow trees generally grow along the streamside and can tolerate wet soil. Even through they can tolerate some variability in soil moisture they do best when their roots are firmly placed within the groundwater portion of the stream. Adjacent to the cottonwood - willow forest and in drier soil, mesquite trees dominate. (See Figure 1.) More tolerant to moisture variability than either cottonwood or willow, they grow bigger, more arborescent and produce more fruit when their roots are within the groundwater level. Mesquite that depends solely upon rainfall for moisture, is smaller and bushy. They do produce fruits but not in the quantities of those mesquites growing along the river. The fruits, mesquite pods, were probably the most important wild food resource for the Hohokam and other native peoples where they occur in exploitable numbers.

Early historic records reinforce what we have learned from the archaeological data. On January 1, 1852, Boundary Commissioner John Russell Bartlett recorded his impressions of the Salt River Valley at about 19 km (12 miles) above the confluence of the Salt and Verde Rivers.

The bottom, which we crossed diagonally, is from three to four miles wide. The river we found to be from eighty to one hundred and twenty feet wide, from two to three feet deep, and both rapid and clear. In these respects it is totally different from the Gila, which, for the two hundred miles we had traversed its banks, was sluggish and muddy, ... The water is perfectly sweet, and neither brackish nor salt, as would be inferred from the name. We saw from the banks many fish in its clear waters, and caught several of the same species as those taken in the Gila. The margin of the river on both sides, for a width of three hundred feet, consists of sand and gravel, brought down by freshets when the stream overflows its banks; and from the appearance of the drift-wood lodged in the trees and brushes, it must at times be much swollen, and runs with great rapidity. The second terrace or bottom-land, varies from one to four miles in width, and is exceedingly rich ... At present it is covered with shrubs and mezquit [sic] trees, while along the immediate margin of the stream large cotton-wood trees grow (Bartlett 1854, 2:240-241; see Hine 1968:Plate 37 for Bartlett's sketch of the Salt and riparian vegetation farther upstream near its confluence with the Verde River and Four Peaks in the background). (See Figure 2.)

Other surveyors and explorers recorded similar impressions. In 1868 a cadastral survey was conducted to establish township/range and section lines for part of central Arizona. During the project George and Wilfred Ingalls reported large numbers of cottonwood and willow trees with occasional stands of arrowweed along the river. Flanked on both sides of the river were mesquite bosques (forest).

Today, the total riparian forest in the Salt River Valley is only a small percentage of what was present during the prehistoric and historic periods. A few vestige tracts with willow, cottonwood, arrowweed and cattail can be found where the water table is perched high enough for their roots, or where irrigation, seepage, or runoff occur regularly.

The area south of the Pueblo Grande platform mound, known as the Park of Four Waters, still supports a small mesquite bosque, one of the last remnants of the great mesquite bosque that existed in the Salt River Valley. Lowered water tables, land clearing and development have eliminated most opportunities for mesquite and other riparian species to grow in the Phoenix metropolitan area.

Zoological remains, such as bones, teeth, and scales, from archaeological sites can provide insight into environmental conditions. Beaver, muskrat, cottonrat, raccoon, fish, frogs, mud turtles, ducks, geese, and coot are all animals that depend upon open water for their survival, and have been recovered from Salt River Valley archaeological sites. Hohokam hunters collected many of these species for food and artifacts, though some undoubtedly ended up in the sites by accident.

The presence of beaver and their dams along the Salt River helped create a landscape where cane and cattail flourished. Beaver dams slow water velocity and form quiet pools where soil is trapped. Besides making places for plants to grow, fish, insects, turtles, and frogs find the beaver pools ideal habitats. In addition, beaver dam areas offer opportunities for water to infiltrate down through the sediments and contribute to groundwater flow.

James Ohio Pattie, beaver trapper and explorer, visited the Salt River Valley in 1826 and recorded in his diary the following:

It [Salt River] affords as much water as the Helay [sic] [Gila]. In the morning on the first of February, we began to ascend Black River [Salt River]. We found it to abound with beaver. It is a most beautiful stream, bound on each side with high and rich bottoms (Pattie 1833:91).

Bird life along the Salt River was quite varied. Riparian ecosystems generally provide a good habitat for birds of all kinds. Today the riparian forest along the Salt River upstream from the metropolitan area supports most of the species recorded in the Salt River Valley during the last 100 years. Various herons, flycatchers, tanagers, orioles, finches, ducks, kingfishers, raptors, owls and shore birds normally associated with coastal areas are seasonally present. Occasionally, examples of all of the above birds can still be seen in the Phoenix area, particularly at the Phoenix Zoo, which attracts thousands of native birds each year.

Frank Hamilton Cushing, archaeologist and ethnologist, visited the Salt River Valley in 1887. In February of that year he recorded the following:

This was the first specimen of the superb white crane so common in the Salado [Salt] and Gila valleys I have seen. We learned later that it was their habit to roost in certain tall cottonwood trees down in the river bottom not far from our camp. They, with numerous wild ducks, wild geese and even occasional pelicans were a feature of this desert region. (Cushing n.d. [Actually 1892]. Cited by Ackerly 1989:34).

The white crane mentioned by Cushing was probably the Great Egret, which is still a common winter visitor on the Salt and Gila Rivers.

Phoenix area birdwatchers can still come up with impressive lists of native birds found locally. The composition of species is different now and the life styles have been adjusted to meet new feeding and competition strategies brought about by exotic vegetation and the drying of the river. Fortunately, the native birds still present show how remarkably resilient they are in adapting to novel environmental challenges.

Mud turtles and several kinds of frogs were present in the slow moving backwaters of the Salt River. These animals' preferred habitat consists of open areas of slow moving water with plenty of plant cover, i.e. algae, cattail and cane, to hide from predators, and to feed and stay cool during hot weather.

Modern visitors and inhabitants of the Phoenix area might find it incredible that the Salt River once supported at least ten species of fish. Fish, like the Gila topminnow and most suckers, prefer slow moving protected water, but squawfish, bonytail chub and razorback suckers tolerate fast moving currents. All these fish are exquisitely adapted for survival during

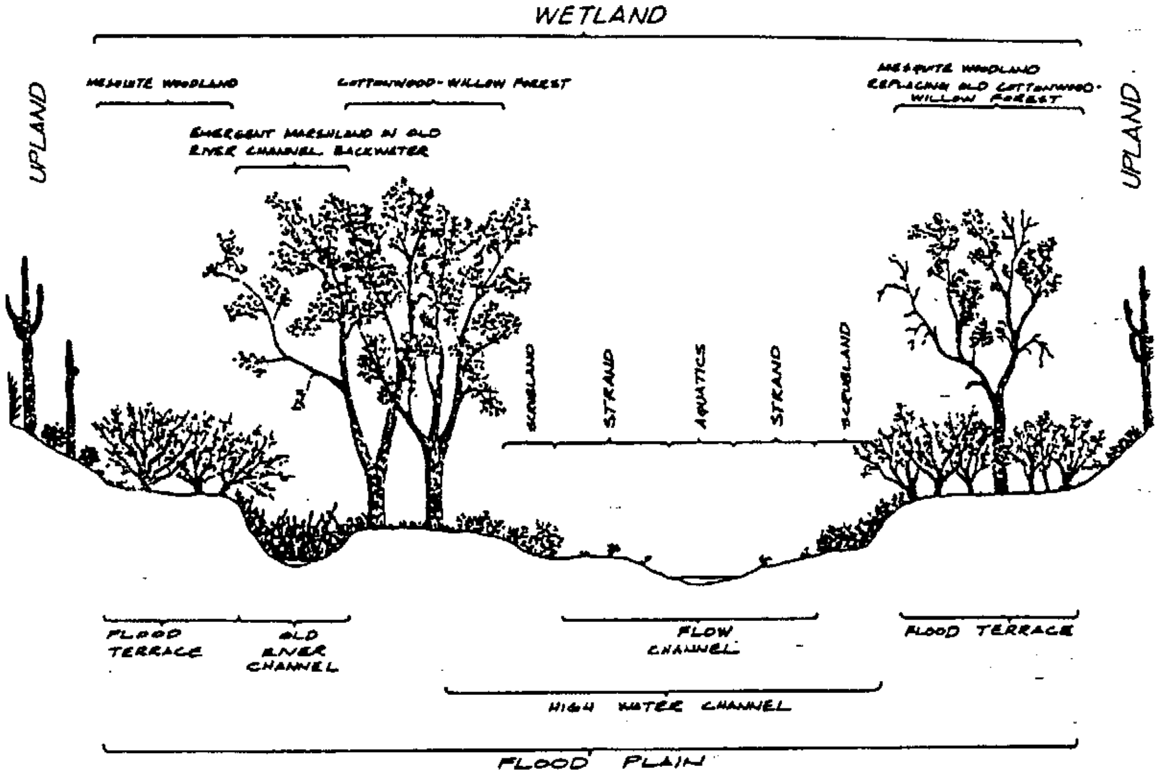


Figure 1. Semi-diagrammatic Representation of Riparian Communities in Warm Temperate to Subtropical Habitats of the American Southwest. (Brown 1994)

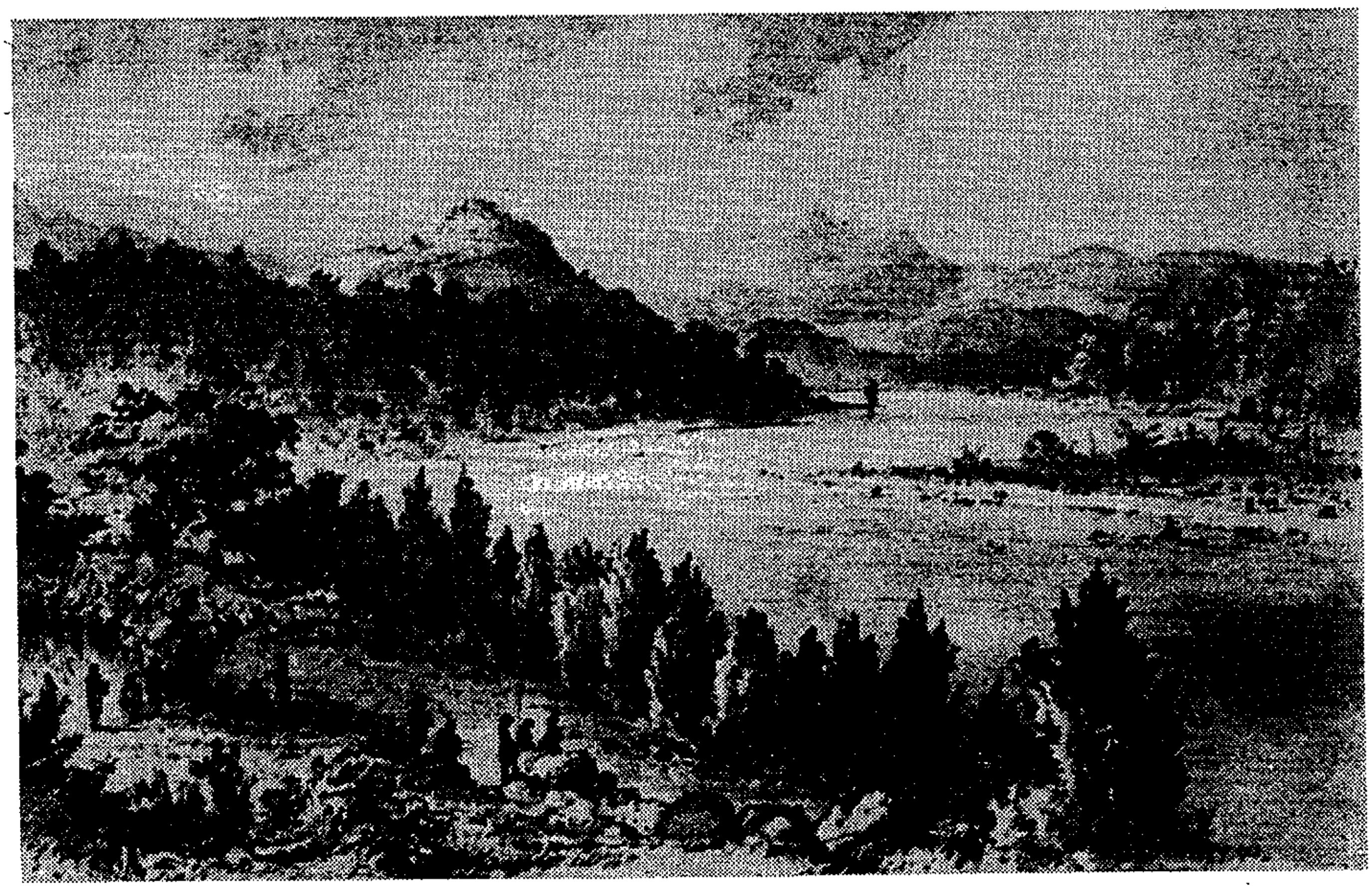
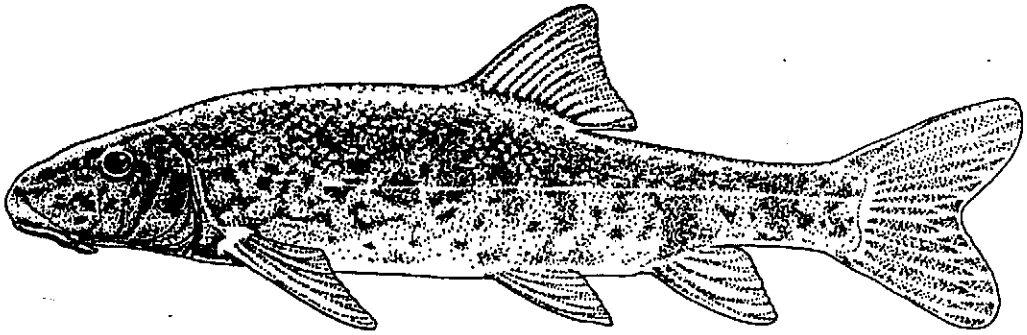
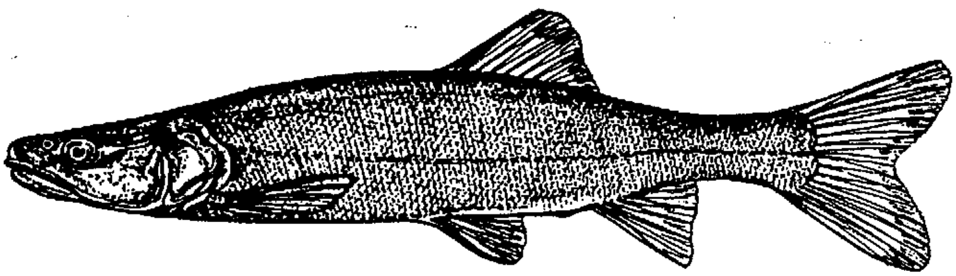


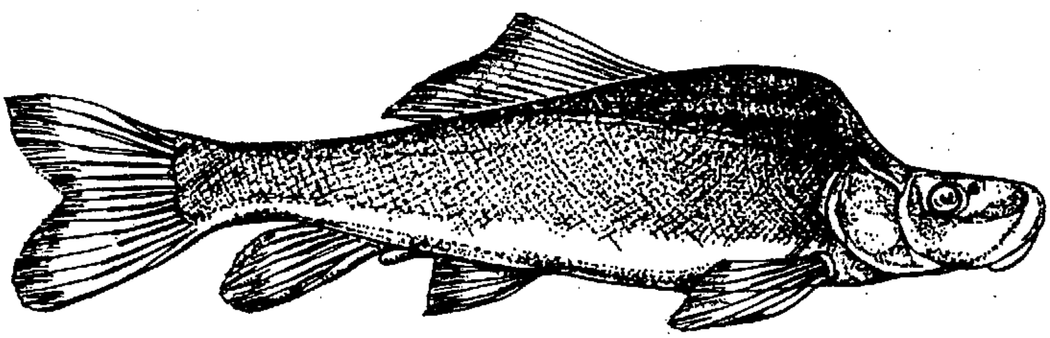
Figure 2. On the Salinas [Salt], North of the Gila, New Mexico. (Pencil and wash by John Russell Bartlett, 1854; Hine 1968)



Pantosteus clarki, Desert Mountain Sucker. Maximum length 12 inches or 30.5 cm. Courtesy of the artist, Randy Babb, and the Arizona Game and Fish Department.



Ptychocheilus lucius, Colorado Squawfish. Maximum length 70.9 inches or 1.8 m. Drawing courtesy of the artist, Mary Hirsch.



Xyrauchen texanus, Razorback Sucker. Maximum length 29.5 inches or 75 cm. Drawing courtesy of the artist, Mary Hirsch.

Figure 3. Some Salt River Fish.

extreme fluctuations in water velocity and quality. Bonytail chub and razorback suckers evolved a special body form, a muscular hump on their backs between their eyes and dorsal fin, which houses muscles for swimming and navigating through fast current and boulder covered river bottoms. Varied environmental conditions like shallow sand and gravel lined riffles, beaver ponds with submerged aquatic and terrestrial plants, or fast moving spring flood waters all provided these fish critical habitat.

Native peoples, like the Hohokam of Pueblo Grande, as well as historic explorers and settlers caught and ate fish from the Salt River. During the spring many species of squawfish would swim upstream in schools to spawn, thus the common name Colorado River salmon. (The squawfish is actually a minnow that can grow to nearly 2 meters or about 6 feet long.) Large schools of squawfish and suckers often got caught in shallow streams and canals and were simply scooped out by hand or, as one account states, with pitchforks and placed in baskets for delivery on wagons. During the last century and until 1910, a commercial fertilizer business was developed from the easy availability of these species of fish.

On June 14-22, 1864, chronicler F.A. Cook, while on one of the King Woolsey's expeditions, reported of the Salt River, near its confluence with Tonto Creek:

We made a willow drag and caught about 200 fish. The largest ones looked very much like Cod but had no teeth, and would weigh from 10 to 20 lbs. This kind of fishing was new to many of us but was very fine sport for we had to go into the river and in some places it was up to our necks but the weather is very hot and the waters warm. (Reeve 1949:104)

June 21
Made 4 or 5 hauls with our willow drag & caught about fifty fish all suckers, but very sweet. I think the best I ever tasted. Perhaps it is because we have no meat for we have nothing but flour & coffee.

June 22
For the past five or six days about half our living has been fish. Our only trouble is that we have not got lines strong enoug[h] for the large fish which weigh from 10 lbs. to 40 lbs., neither can we catch many of them in our willow drag. (Reeve 1949:104)

Cook may have not been exaggerating when he reports fish weights from 10 to 40 pounds (4.5 to 18.2 kg). Squawfish of 1.8 m in length weighing about 45 kg (about 100 lbs.) have been reported. Razorback sucker specimens have been recorded to be around .75 m long and weigh up to 5 or 6 kg (11-32 lbs.). (See Figure 3.)

In addition to fish, the Salt River had a varied molluscan community. California floater clams, fingernail clams and assorted snails have been recovered from local archaeological sites and can be found on the surface of abandoned Hohokam canals. The most interesting of the clams is the California floater clam. Once abundant throughout the southwest, today it is only found in a few localities. The clam, which grows up to 7 cm (2.75 inches) across, has a parasitic larval stage. Glochidia, larval clams, infect the gills of fish until they become adults and begin to produce their valves (shells). At this stage they fall to the river bottom and continue to grow. Being quite edible, they are found in archaeological sites and historic river otter middens.

All rivers have periods when the water flow is so great that the river floods its banks and washes out great quantities of soil and vegetation. This situation results in the modifications of stream course, depth and species diversity. Fortunately areas such as oxbows and other isolated areas offer protection for many species that can easily recolonize modified areas. These species have evolved to cope with seasonal variations in flow by living in various habitats. Paleo-stream flow reconstructions, using tree ring data, indicate several episodes of severe flooding and drought conditions occurred on the Salt River drainage.

Hohokam Perceptions of their Environment

The Hohokam left behind a rich legacy of artifacts that provide clues about how they viewed their environment. Stone, shell and ceramic fetishes, and painted pottery vessels indicate various kinds of animals were important to them. From about the Snaketown through Sacaton Phases (ca. 650 - 1150) animal depictions were quite common on Red-on-buff pottery. Most notable in references to water are the numerous illustrations of waterbirds (particularly herons), turtles, and occasionally fish. Hohokam petroglyphs found in nearby mountains illustrate herons. Terrestrial animals such as quail, deer, big-horn sheep, lizards, and snakes are represented and doubtlessly possessed some cultural significance. Some archaeologists believe the portrayal of water animals signifies religious significance to water; perhaps the creation of art forms with water associated animals was part of a ritual that would help invoke supernatural assistance in delivering ample supplies of water. The Hohokam, who had thousands of kilometers of canals and about just as many hectares of farm land under cultivation, had a substantial investment in the land. Too many droughts would leave their civilization in despair.

People tend to integrate different facets of their culture. Cultural traits such as art, religion, economics, architecture, and social status become reflections of each other. We do not need to look back too far in Western European history to see how major religions influenced art, politics and architecture. The great cathedrals of Europe are a good example of this behavior. The Hohokam probably expressed their culture in a similar manner.

Conclusion

There is no doubt that the Salt River was a perennial stream supporting a dynamic riparian ecosystem during the Hohokam period. The presence of various plant and animal remains in Hohokam sites indicates that these ancient people were part of this ecosystem. Based upon biological remains, the Salt River was variable in flow and velocity, and able to support a variety of species. Fast moving current can be demonstrated by the driftwood recorded in the archaeological and historic records. Fish capable of living in fast flowing current, such as squawfish, roundtail and razorback sucker, also demonstrate this phenomenon. However, much of the time the Salt River was slow moving and shallow, allowing beavers, muskrats and various emergent vegetation, cane, and cattail to become established. Beaver dams helped create quiet pools where other forms of wildlife forage and seek shelter. Sucker fish, Gila topminnow, clams, snails, wading birds and many other species find this habitat essential to their survival.

The Hohokam also found the river with its varied habitats essential. The riparian ecosystem provided water, food, fuel and material for shelter. Some habitats were crucial enough to expand their range into new areas. Constructing thousands of kilometers of canals created new riparian zones throughout the Salt River Valley. Active only part of the year, these new zones provided additional riparian resources, in addition to water for irrigation. Water was the glue that held Hohokam civilization together. It linked communities and provided avenues of communication. It is no surprise that many archaeologists speculate the Hohokam abandonment of Salt River was influenced by changes in the river itself. Either too much or not enough water would change the dynamics of their system enough to disrupt their society.

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Title: Boating on Salt River
Location: Arizona Historical Foundation, Hayden Library, Arizona State University
Number: G-554
Description/Comments: Published as "At the Junction of the Verde and the Salt" in Beasley, Al (editor), 1908, *Twentieth-Century Phoenix, Illustrated*, Phoenix, Arizona, p. 4.