

2. It is aligned principally north-northeast, with an elevation that ranges from 4,260 ft. at the Mexican Border to 1,920 ft. at its confluence with the Gila River, over a distance of 123 miles. *Id.*

3. The River is typically divided into two reaches. The first reach, the Upper San Pedro, originates in Mexico and flows through Santa Cruz County to “The Narrows,” a bedrock constriction located north of Benson, between the foothills of the Rincon Mountains to the west and the Little Dragoon Mountains to the east. *Id.* at 7-1. The second reach, the Lower San Pedro, runs from The Narrows, north to Winkleman where the San Pedro flows into the Gila River. *Id.*

4. The important hydrologic characteristics of the San Pedro River that have existed since the predevelopment era are:

- a) The San Pedro River drained about 696 square miles at the upper end of the study reach and about 4,460 square miles at the lower end. EIN X0013, “NAVIGABILITY ALONG THE NATURAL CHANNEL OF THE SAN PEDRO RIVER (From the border with Mexico to the mouth at the Gila River near Winkleman, Arizona) EXECUTIVE SUMMARY OF ANALYSIS” by Hjalmar W. Hjalmarson, PE, August 20, 2013 (“Hjalmarson Exec. Summary”) at p. 2
- b) The watershed was hydrologically diverse because of the diversity of climate, geology and topography. *Id.*
- c) The mountainous areas along the east and west sides of the watershed typically received more than 20 inches of precipitation per year. The warm-dry valley area typically received less than 16 inches of precipitation per year. *Id.*
- d) Precipitation fell during two distinct periods--summer and winter. There was light snow accumulation in the higher mountains with occasional melting to produce spring runoff along the river. Much of the direct runoff for navigation was from the summer rainfall in the mountainous areas. *Id.*
- e) When rain fell onto the land in the San Pedro River watershed it started moving according to basic principles of hydrology. A portion of the precipitation seeped into the ground to replenish ground water. Some of the water flowed downhill on

the land surface as direct runoff and appeared in surface streams that were unaffected by artificial diversions, storage, or other works of man in or on the stream channels. *Id.*

- f) In the San Pedro River watershed, much of the runoff from storms reached the river channel directly on the land surface via overland flow, flow in rills, creeks and streams. Direct runoff was seasonal because the storms were seasonal and provided runoff for navigation for part of each year. *Id.*
- g) Under natural conditions the water that replenished the groundwater mostly along the mountain fronts all along the river valley was temporarily stored, and later discharged to the river at springs and seeps. This base runoff was slowly and steadily released from storage during dry periods. Because precipitation, and therefore direct runoff, was seasonal and there are a few months each year with little precipitation, the base runoff provided perennial flow for navigation to the San Pedro River. *Id.*
- h) Thus, this base runoff was derived from rather constant (steady) groundwater discharge all along the river from the regional and also an alluvial aquifer. The regional aquifer is defined as having recharge zones away from the river, primarily at mountain fronts and along ephemeral channels. The alluvial aquifer along the river was recharged from the regional aquifer and from storm flow (direct runoff). Based on recent environmental isotope data, we know that the composition of base flow was mostly from regional groundwater and also from summer storm runoff that may have been stored as alluvial groundwater—at times for several years. *Id.*; see also EIN X0013, Bisbee Powerpoint Presentation by Hjalmar W. Hjalmarson, PE (“Bisbee PPT”), slide 55 citing Kennedy, J.R., and Gungle, Bruce, 2010, Quantity and Sources of Base Flow in the San Pedro River near Tombstone, Arizona: U.S. Geological Survey Scientific Investigations Report 2010–5200, 43 p.
- i) In the absence of evapotranspiration (ET) along the riparian area the base runoff would have steadily increased along the river throughout an ordinary year. However, the base runoff varied considerably because ET varied seasonally. Large amounts of the rather steady inflowing groundwater to the riparian area were consumed (converted to water vapor) during the summer months. Summer base runoff (roughly represented by Q_{90} , the amount of base runoff equaled or exceeded 90% of the time during a typical year) decreased along the river. Base runoff also varied considerably throughout the year. Hjalmarson Exec. Summary at p. 3-4.

B. The San Pedro River Pre-Development

- 5. In 1986, G. W. Freethey and T. W. Anderson of the U.S. Geological Survey prepared USGS Hydrologic Investigations Atlas HA-664, “Pre-development hydrologic

conditions in the alluvial basins of Arizona and adjacent parts of California and New Mexico,” which calculated predevelopment base runoff for San Pedro River, as well as other southwestern rivers. EIN X0002, USGS HA-664. According to USGS HA-664, during the pre-development times, the entire length of the San Pedro River was perennial *Id.*, Sheet 3; See also Bisbee PPT, slide 37.

6. HA 664 based its conclusions on existing literature, including an earlier map prepared by David E. Brown, Neil B. Carmony and Raymond M. Turner for the Arizona Game and Fish Department, numerical groundwater models, and water budget data compiled by the USGS and other agencies from the early 1900s to about 1940. EIN X0002, USGS HA-664. HA 664 improves upon and supersedes the map by Brown and others.

7. During predevelopment times, alluvial basins typically were hydraulically connected to the river by upward leakage through the floodplain aquifer. The floodplain aquifer consists of river sediment deposited above the valley fill. Bisbee PPT at slide 53.

8. The natural San Pedro was a single meandering channel. *Id.* at slides 102; 106-107. See also EIN X002, Stromberg, J. C. and Tellman, B., 2009, ECOLOGY AND CONSERVATION OF THE SAN PEDRO RIVER: The University of Arizona Press Tucson, (“Stromberg & Tellman”), p. 260 (“Prior to the mid-1800s, the San Pedro River flowed over an unincised surface and had a larger area prone to flooding. It contained a single meandering channel, and marshes were common.”)

9. The morphology of the San Pedro during predevelopment was self-formed with few hard rock controls that appear to have had little effect on channel shape. The natural channel was formed in material that was entrained, transported and deposited by the river and tributary streams. Bisbee PPT, slide 104.

10. “Prior to the late 1800s, the San Pedro River was a relatively low-energy, unentrenched fluvial system with extensive marshy reaches or cienegas.” EIN X0013 Bisbee Appendix (“Bisbee Appx.”), slide 57, quoting EIN X0002, Cook, Joseph P., 2009, and others, Mapping of Holocene River Alluvium along the San Pedro River, Aravaipa Creek, and Babocomari River, Southeastern Arizona, Arizona Geological Survey, 76 p and 6 maps.

11. There are several theories on precisely how and when the river channel changed from meandering and slightly incised with extensive marshy reaches with fine sediments of pebbles, sand, silt, clay and evaporate deposition. Bisbee PPT, slide 115 citing Cook, 2009, and others. But the natural channel and floodplain were composed of finer material that commonly consisted of fine sand, silt, and class with interspersed pebble to gravel beds. Bisbee PPT, slide 116; See also EIN X002 Cook and others, pp. 23, 76, and 6 maps.

12. The presence of dark paleosoils indicates that the pre-development San Pedro had stream flow along its entire reach and there was little channel entrenchment along the river. Bisbee Appx., slides 56-60.

C. Human Impacts on the San Pedro River

13. The San Pedro River has been affected to some degree by humans for about 300 years and it has been significantly affected at least in part by humans since about 1850. EIN X002, Stromberg & Tellman, p. 259.

1. Irrigation.

14. Accounts of irrigation diversions along the San Pedro River show irrigation was practiced as early as 1697 when the San Pedro Valley was “crisscrossed by irrigation ditches, and had irrigated fields in which cotton, squash, watermelon, beans and corn were growing.” State Report, p. 3-3; See also Bisbee PPT, slides 9 and 19.

15. Indians were irrigating along the river as early as the 1760's (*Id.*) and continued to do so through at least 1919. EIN X0013, Phoenix Powerpoint Presentation by Hjalmar W. Hjalmarson, PE ("Phoenix PPT"), slides 27-32.

16. There have been at least 144 diversions by the Spanish, Mexicans and Caucasians over the past few hundred years. Bisbee Appx. Slide 14. The impact of these human activities such as irrigation diversions, livestock watering at springs, and grazing and herding of cattle became apparent in the 1850s as evidenced by turbid streamflow, channel incision and a couple of accounts of no flow in a short reach of the river. Phoenix PPT slides 24-26.

In 1889, 10 canals were used to divert irrigation water from the San Pedro River and by 1899, 41 canals were used to divert water from the river (Newell. 1901. p. 352-354). The St. David ditch has been diverting water for irrigation since 1881 and the Pomerene Canal has been in use since 1912. In 1939, 4000 acres were being irrigated with surface water from diversions. 2,300 acres of those were served by the St. David and Pomerene Irrigation Districts. In 1968 the St. David and Pomerene Irrigation Districts diverted 6,000 acre-feet of water from the San Pedro River for use on 2,400 acres of farmland.

Bisbee PPT, slide 20, quoting Roeske, R.H. and W.L. WerreII 1971 *Hydrologic Conditions in the San Pedro Valley, Arizona*. U.S. Geological Survey and Arizona Water Commission Bulletin 4, Phoenix, Arizona: Arizona Water Commission, 76 p

17. Historic records, including a 1919 report to Congress, documented that land along the San Pedro River had been continuously irrigated since well before the Gadsden Purchase. Bisbee PPT, slides 27-32.

2. Cattle Grazing

18. Massive cattle grazing and logging in the watershed and along the San Pedro River changed the runoff and sediment yield resulting in widening, down cutting and straightening of the natural meandering river channel. Hjalmarson Exec. Summary, p. 2.

19. From about 1750 to the mid 1800s, before Anglo-American activities, there were large livestock herds in the valley and along the river. According to the US Bureau of Land Management (San Pedro RNCA Cultural Resources) over 60,000 cattle of Mexican settlers reportedly were roaming, wild or otherwise, from 1820-1850. Because cattle typically concentrate within 3 miles of natural waters such as along the San Pedro River, there must have been considerable degradation of natural riparian environment as cattle trampled channel banks. Bisbee PPT, slide 24.

20. “In the early 1800s the Mexican government established land grants for ranching in the upper basin. These ranches were eventually abandoned due to Apache deprivations, but large feral herds remained behind.” Stromberg & Tellman, p. 217-267; see also *id.* at 265 (impacts of cattle on river).

3. Extirpation of Beavers and Draining of the River

21. The explorer James O. Pattie trapped beaver along the San Pedro River between 1824 and 1828. He found the beaver so plentiful, he called the river “Beaver River.” State Report 3-13.

22. In the 1880s area residents removed the beavers and their dams from the San Pedro. EIN 4, Glennon, WATER FOLLIES, Chap. 4, p.52. They also drained the river in places due to concerns regarding malaria. *Id.*

23. Some believe that this removal of beaver played an important role in the entrenchment of floodplains. See Stromberg & Tellman, p. 265-66.

4. Mining

24. According to the State Report, “[m]ining at the Mammoth Mine and San Manuel began in 1881. San Manuel mine used well water for Milling.” State Report, p. 3-22.

25. For some time the mine at San Manuel used approximately 22,000 ac-ft annually. Bisbee PPT, Slide 21(citing Barbara Tellman, Richard Yarde & Mary G. Wallace, “Arizona’s Changing Rivers: How People Have Affected the Rivers” (Univ. of Ariz. 1997)(“Tellman, 1997”). This amount of water use was approximately 20% of the pre-development runoff from the San Pedro River watershed. *Id.*

26. The Cananea mine in Mexico also likely impacted the base flow of the San Pedro River. Phoenix PPT, Slides 13-20.

27. “The large copper mining operation in Cananea, Sonora, began in the 1880s. Water came from nearby springs and both surface water and groundwater in both the San Pedro and Rio Sonora watersheds.” EIN X002, Stromberg & Tellman, p. 222.

28. “Pumping in the Cananea region, located in the far southern portion of the watershed, is too far removed to directly impact groundwater in the Sierra Vista sub-basin. However, pumping in this area undoubtedly impacts the baseflow of the river near Cananea.” Phoenix PPT, slide 15, quoting CEC, 1999, Ribbon of Life-An Agenda for Preserving Transboundary Migratory Bird Habitat on the Upper San Pedro River: Commission for Environmental Cooperation, Montreal CAN., 32 p.

D. Changes to the River Channel

29. Starting in the mid 1800s, the San Pedro River channel began to undergo dramatic changes. EIN X005 “Historical Channel Changes on the San Pedro River, Southeastern Arizona, Arizona Geological Survey, Open-File Report 96-15 by Gary Huckleberry (“Huckleberry”), p. 2

30. During the U.S.-Mexico boundary survey of 1851, John Russel Bartlett (1854) noted that the river below St. David contained steep banks approximately 3 m (9 ft) high (Bartlett, 1854) Bartlett further noted that incision limited the ability to irrigate adjacent terraces. Huckleberry p. 8.

31. A few years later, in 1857, Parke noted that the upper San Pedro River was variably incised from a few cm to as much as 5 m (15 ft). Huckleberry p. 8-9.

32. The cumulative archival evidence suggests that the upper San Pedro River was discontinuously entrenched as early as 1850. Huckleberry p. 9.

33. “Rivers like the San Pedro are complex, open systems that adjust channel size, shape, and configuration in response to changes in runoff and sediment yield from drainage basins. Such changes can have multiple causes, and it may not be possible to determine to what degree river metamorphosis is human induced.” Stromberg & Tellman, p. 259.

34. It is apparent from the historical record that many of the geomorphic changes on the San Pedro River are linked to land-use changes (e.g., grazing, deforestation, mining, etc.) within the valley. Huckleberry, p. 2.

35. Even though “it is difficult to quantify the degree to which humans have caused past and present transformations of the San Pedro River,” it is nonetheless true that “[m]any of the geomorphic changes experienced by the San Pedro River during the last 150 years are undoubtedly linked in part to water depletion, overgrazing, deforestation, and introduction of plant species.” Stromberg & Tellman, p. 266-67.

E. Historical Descriptions of the San Pedro River Prior to 1912

36. One of the earliest descriptions of the Upper San Pedro River was from Trapper James Ohio Pattie who visited the River during the 1820’s. Pattie called the San Pedro “Beaver

River” when he trapped it in 1826. Pattie described the river: “Its banks are still plentifully timbered with cottonwood and willow.” Bisbee PPT, slide 32, citing Tellman 1997 at p. 30. According to the State Report, “[Pattie’s] accounts imply perennial streamflow throughout most of the San Pedro River.” State Report, p. 5-9 through 10.

37. In 1846, Phillip St. George Cooke, leader of the Mormon Battalion, described the San Pedro as a marshy beautiful little river with an abundance of fish with “salmon trout” that by some accounts grew up to 3 ft. long. Tellman, 1997 at p. 30.

38. Later, in 1851, J.R. Bartlett, a government surveyor, noted continuous streamflow in the upper San Pedro. State Report 5-10. Bartlett described the river as “two feet deep, and quite rapid.” *Id.* at 3-16.

39. In 1854, J. G. Parke crossed the San Pedro River heading east and stated that “[t]he stream is about eighteen inches deep and twelve feet wide and flows with a rapid current...” State Report 3-17; He also observed “[a]t the Tres Alamos [crossing] the stream is about fifteen inches deep and twelve feet wide and flows with a rapid current...” *Id.*

40. According to an 1857 Report on the U.S. Mexican Boundary Survey, “[t]hroughout the whole course of the San Pedro there are beautiful valleys susceptible of irrigation and capable of producing large crops of wheat, corn, cotton and grapes...” and “the San Pedro is the only branch of the Gila River, coming from the south which furnishes an uninterrupted stream of running water along its whole course.” Phoenix PPT slides 39, 40

41. In 1859, immediately upstream from The Narrows, another engineer Hutton described the river as having a width of approximately 12 feet and a depth of 12 inches. *Id.*

42. In 1864, former Boundary Commissioner Sylvester Mowry described the river as 30 feet wide and two and one-half feet deep. Phoenix PPT, slide 38.

43. When the river was first surveyed by Federal Land Surveyors (Harris) in 1877-79, it appears to have had water throughout its length at the time of the survey (November and December 1879). Phoenix PPT, slides 34, 35

F. Actual Condition of the San Pedro River in 1912

44. By 1912, most of the channel of the San Pedro was entrenched, except along bedrock reaches like The Narrows. State Report, p. 5-15.

45. The channel was braided. *Id.*

46. Frequent flooding in the late 1800s resulted in a channel wider than what was recorded in the survey notes of the 1870's and 1880's. *Id.* at 5-16.

47. It is estimated that at the time of statehood, the width of the channel on the Upper San Pedro averaged between 130 and 260 feet. *Id.* At the time of statehood, the width of the channel between The Narrows and Redington is estimated to have averaged 130 to 260 feet. *Id.* at 5-16. Downstream, the channel was even wider averaging 330 to 650 feet. *Id.*

48. The State Report concludes that at the time of statehood, the Upper San Pedro River near St. David was perennial, with an average annual flow rate of about 50 cfs, and a median flow rate of about 10 cfs. *Id.*

49. The flow rates estimated for the Upper San Pedro correspond to an annual average flow depth of about 1 foot, and a median depth of about 0.5 feet. *Id.* at 7-22.

50. By statehood, the Upper San Pedro was not in its "natural" condition. Irrigation diversions for Tombstone mining increased during the period around statehood. State Report, p. 5-11. Beaver dams were destroyed and swamps drained to lower the water table. *Id.*

51. On the Lower San Pedro River, at the time of statehood, stream flow was largely intermittent with short reaches of perennial flow (less than 10 cfs). *Id.* at 5-15. Although there

were four gaging stations on the entire San Pedro River around the time of statehood, only one, at Winkleman, was located on the Lower San Pedro. That gaging station operated from April through August 1890 with average monthly flows ranging from 0 cfs to 295 cfs. *Id.* at 7-6.

52. At the time of statehood, the Lower San Pedro had also been significantly impacted by diversions. The USGS reported in 1899 that the lower San Pedro River was dry, due in part to the large number of small canals. *Id.* at 7-6. In 1890, 2700 acres were irrigated on the San Pedro River. *Id.* at 7-6 (Winkleman gage).

53. Human interference with beavers also impacted this part of the river. The extermination of beavers meant that their dams were no longer able to prevent the cutting of a channel. *Id.* at 5-14.

54. Cattle grazing resulted in less grass on the hillsides, which also contributed to greater erosion. *Id.*

55. There was also a general decline in stream flow due, in part, to ground water withdrawals in excess of natural recharge. *Id.* at 7-10.

G. Evidence of Navigation.

56. Evidence of historic navigation of the San Pedro is limited to the possible use of a canoe by James O. Pattie. 8/2/2013 Tr. p. 112, 180.

57. The record contains significant evidence of modern boating on the river. According to a survey conducted for the state, recreational boaters have, at one time or another, boated the entire length of the San Pedro, including the Upper San Pedro. State Report at 8-5.

58. As the Report observes, “modern use of a river reach by canoes probably indicates that canoes could have been used at the time of statehood.” *Id.* at 8-4. Although

modern technology has made modern canoes more durable, the depth of water required for canoeing has not substantially changed. *Id.*

59. Canoes and drift boats were among the boats commonly available and used in 1912. EIN X002, Excerpts of Sears Catalog circa 1912.

H. The Ordinary and Natural Condition of the San Pedro River

60. As discussed above, at the time of statehood, and well before, both the natural hydrology and morphology of the San Pedro River had been significantly altered by human activity. Large cattle herds and numerous stock tanks, as well as diversions for mining, irrigation, and domestic use have, in varying degrees, impacted the stream flow and morphology of the San Pedro River for at least 300 years. EIN X0013, Hjalmarson Exec. Summary, p. 2.

61. Groundwater and surface water removals had resulted in lower flow rates in the San Pedro River than there would be if the River had remained in its ordinary and natural condition. *Id.*

62. Hjalmar (“Win”) W. Hjalmarson, a retired river engineer from the USGS with 51 years of experience with rivers in the Southwestern United States undertook an analysis of the San Pedro to estimate what the river would have looked like had it been in its natural condition in 1912. See Bisbee PPT, Bisbee Appx., Phoenix PPT and Hjalmarson Exec. Summary

63. Mr. Hjalmarson used a systematic three-step procedure that used published, quantifiable data regarding the San Pedro River and extrapolated from that data to determine the flow of the river in its natural condition. Hjalmarson Exec. Summary, p. 1.

64. First, as described in detail in both his Powerpoint presentations and Executive Summary, (EIN X00013) the natural hydrology of the San Pedro was identified and expressed in typical flow-duration curves using various sources of discharge data obtained at sites along the

study reach. Channel geometry was then applied to the flow characteristics using known sediment characteristics of the San Pedro River. This process calculated the width, depth and flow of the natural river. Finally, Mr. Hjalmarson evaluated the navigability of the river using two independent methods used by federal agencies to determine whether a watercourse is capable of being navigated by various water craft. Published information and standard engineering hydraulic, hydraulic geometry and hydrologic methods were used to accomplish each of these three steps. *Id.*

65. To identify the natural hydrology of the river, Mr. Hjalmarson first constructed a flow duration curve (FDC) for the San Pedro River. Hjalmarson Exec. Summary p. 4. In a FDC, stream flow discharges are ranked in decreasing order and plotted on a graph. *Id.*

66. The FDC shows the full range of stream flow in a given river, and also shows the percentage of time that the river's stream flow is at any particular level. *Id.* To determine the shape of the FDC for the San Pedro River, Mr. Hjalmarson used post-development gage data collected at the Tombstone gage. *Id.* Although post-development discharge data are not an accurate measure of the natural stream flow, Mr. Hjalmarson believed that it sufficiently reflected the range and patterns of the San Pedro's stream flow to form the basis of a representative FDC. *Id.*

67. The next step in the process was quantifying pre-development flow so that the representative FDC could be applied to that data. *Id.* To calculate pre-development flow, Mr. Hjalmarson used two independent data sources published by the USGS, predevelopment base

runoff and annual average runoff, at three separate points on the river²: the mouth, the narrows or join, and the Charleston gage. *Id.* at p. 4-8.

68. Once he had determined the base runoff and average annual runoff for each of those points, he applied the FDC to the data which allowed him to estimate the full range of natural streamflow at each of the identified points in the river. *Id.*

69. Once he had determined the natural streamflow, the next step in the process was to apply the information about the River's hydrology to its morphology. *Id.* at 9. Mr. Hjalmarson computed channel depth-duration and velocity-duration relations for each of the sites using a technique based on the standard Manning hydraulics equation for open channel flow. *Id.*

70. According to these calculations, the maximum channel depths at the mouth ranged from about 1 foot to over 2.5 feet, with a median depth of 1.5 feet. 80% of the time, the maximum channel depth at the mouth was greater than 1 foot. At the join, the maximum channel depth ranged from slightly less than one foot to over 2.5 feet, with a median depth of 1.4 feet. 80% of the time, the maximum channel depth at the join was greater than 1 foot. Finally, at the Charleston gage, the depths ranged from slightly less than one foot to over 2.5 feet, with a median depth of 1.25 feet. 80% of the time, the maximum channel depth at the Charleston gage was greater than 1 foot. *Id.* at 10.

71. The U.S. Department of Interior has developed two methods of assessing whether instream flows are suitable for boating. Bisbee PPT, slide 138; State Report 8-1 through 8-2.

² Mr. Hjalmarson initially identified the border between the United States and Mexico as a fourth site to analyze, but when his calculations regarding pre-development flow indicated that the natural stream flow at the border was not sufficient to support a finding of navigability, he dropped that site from any further analysis.

72. The method used by the Bureau of Outdoor Recreation Method rates navigability based upon the amount of water discharged and the gradient of the watercourse. Bisbee PPT, slide 140.

73. The second method of evaluating navigability is the Fish and Wildlife Method. *Id.* at 141. The USFW method establishes minimum depth and width requirements for canoes, kayaks, drift boats, row boats and power boats. Bisbee PPT, slide 142.

74. Mr. Hjalmarson's assessment likely understated the amount of flow in the river in its ordinary and natural condition because his approach was consistently conservative, both in the data relied upon and in the approach taken. Hjalmarson Exec. Summary at 11-12.

II. Conclusions of Law.

A. Issue 1: In its Ordinary and Natural Condition, Was the San Pedro River Navigable at the Time of Statehood?

1. State ex rel. Winkleman v. ANSAC

1. In the navigability determination of the Lower Salt River, the Arizona Court of Appeals remanded the matter back to ANSAC because it found that "although ANSAC considered a great deal of evidence concerning the condition of the River, and reviewed evidence from various times before statehood, ANSAC ultimately failed to apply the proper legal standard to the evidence presented." *State ex rel. Winkleman v. Ariz. Navigable Stream Adjudication Comm'n.*, 224 Ariz. 230, 242 p28, 229 P.3d 242, 254 (App. 2010).

2. The Court held that "[b]ecause the proper legal test was not applied, we must vacate the superior court's judgment and remand for ANSAC to consider whether the River would have been navigable had it been in its ordinary and natural condition on February 14, 1912." *Id.* at ¶29.

3. In articulating the proper legal test, the Court instructed that ANSAC is “required 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.” *Id.* at 241 ¶28; 229 P. 3d at 253.

4. The Court of Appeals also provided specific guidance regarding what constituted the “best evidence” of the Lower Salt’s natural condition, and concluded that with respect to that watercourse, “the River could be considered to be 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....” *Id.* at 242 ¶30, 229 P. 3d at 254.

5. Although ANSAC’s earlier determination regarding the San Pedro River was appealed to the Superior Court, the parties agreed to stay that appeal (as well as several others) pending the resolution of the appeal of the Lower Salt River to the Court of Appeals. After the Court of Appeals remanded the Lower Salt matter, the parties all agreed that the stayed appeals should all be remanded as well. Consequently, unlike the adjudication of the Lower Salt River, there is no specific instruction in this case as to what constitutes the “best evidence” of the natural and ordinary condition of this river.

6. In determining navigability for the San Pedro River, the inquiry is two-fold. First, the ANSAC must determine what constitutes the best evidence of the river’s “natural condition,” and second, whether based on that evidence, the river was “used or susceptible to being used...as a highway for commerce, over which trade and travel were *or could have been conducted* in the customary modes of trade and travel on water.” A.R.S. §37-1101(5)(emphasis added). *See also, Defenders of Wildlife v. Hull*, 199 Ariz. 411, 18 P. 3d 722 (App. 2001).

2. The San Pedro River's Natural Condition.

7. In the case of the San Pedro River, the evidence is overwhelming that on the date that Arizona became a state, February 14, 1912, the river was no longer in its natural condition. See Findings of Fact (FOF) ¶¶37-45.

8. Because the river was no longer in its natural condition in 1912, the question that follows is: at what point in time was the river free from human impacts?

9. As set forth above in the findings of facts, the evidence presented to the Commission establishes that humans have been diverting water from the San Pedro River since as early as the 1600s and that diversion has continued to modern times. FOF ¶¶14-17

10. Moreover, human impacts to the river were not limited to diversions. The grazing of livestock and extermination of beaver all impacted the river's morphology. The signs of these impacts, in the form of entrenched banks, were visible as early as the 1850s. FOF ¶¶18-

11. Because the river has not been in its natural condition since at least before the mid-1800s, even the accounts of the river from early explorers around that time frame do not describe it in its "natural condition." FOF ¶¶29-35.

12. Although historic accounts by humans have limited evidentiary value, the sedimentary evidence indicates that in its natural condition the river was stable. FOF ¶12.

13. Mr. Hjalmarson was able to use hydraulic geometry and morphology to model what the river looked like in its natural condition—before humans began diverting its water and impacting its banks. FOF ¶¶65-71.

14. The modeling undertaken by Mr. Hjalmarson uses well-established and accepted scientific methods. His analysis demonstrates that in its natural condition, the San Pedro River, while not a major watercourse, was nonetheless a perennial one. And, from a mile below Lewis

Springs all the way to the mouth, at least 80% of the time, it had a depth of at least one foot, with channel widths from 12 to 47 feet. FOF ¶71.

3. The San Pedro's Susceptibility to Navigation.

15. The definition of navigability does not require that the watercourse actually have been used for trade or travel, but rather, requires only that it was susceptible to such a use. "The question of ... susceptibility in the ordinary condition of the rivers, rather than of the mere manner or extent of actual use, is the crucial test ... The extent of existing commerce is not the test." *United States v. Utah*, 283 U. S. 64, 82 (1931); *see also, Northwest Steelheaders Ass'n v. Simantel* 199 Ore. App. 471, 112 P.3d 383 (2005), cited with approval in *State ex rel. Winkleman*, 224 Ariz. at 241-42 p28, 229 P.3d at 253-54.

16. The term "highway for commerce" is first found in the definition of "navigable" or "navigable watercourse." The Arizona statute (which codifies federal law) defines both as:

[A] watercourse that was in existence on February 14, 1912, and at that time was used or was susceptible to being used, in its ordinary and natural condition, as a highway for commerce, *over which trade and travel* were or could have been conducted in the customary modes of trade and travel on water.

Ariz. Rev. Stat. §37-1101(5). The statute more specifically defines "highway for commerce" as "a corridor or conduit within which the exchange of goods, commodities or property *or the transportation of persons* may be conducted." Ariz. Rev. Stat. §37-1101(3). Thus, the statutory definition of "highway for commerce" does not require the transport of goods; the transportation of persons alone is sufficient to establish a "highway for commerce."

17. The term "highway for commerce" can be misleading; as the cases make clear, this requirement is satisfied by either trade or *travel* on the river, even if the travel is noncommercial. As the Arizona Court of Appeals explained in *Defenders*,

The federal test has been interpreted to neither require both trade and travel together nor that the travel or trade be commercial. *See Utah*, 403 U.S. at 11 (hauling of livestock across lake even though done by owners and “not by a carrier for the purpose of making money” was enough to support a finding of navigability because “the lake was used as a highway and that is the gist of the federal test”)

199 Ariz. at 416, 18 P.3d at 727.

18. In *Defenders*, the court also rejected the argument that the trade and travel must be both upstream and downstream, or that the travel must be for a profitable commercial enterprise. Rather, the court observed that, “nothing in the *Daniel Ball* test necessitates that the trade or travel sufficient to support a navigability finding need be from a ‘profitable commercial enterprise.’” *Id.* at 422, 18 P. 3d at 733. *See also United States v. Hill*, 248 U.S. 420, 423 (1919) (“commerce has been held to include the transportation of persons and property no less than the purchase, sale and exchange of commodities”) *citing Gibbons v. Ogden*, 9 Wheat 1, 188 (1824).

19. As the Oregon Court of Appeals explained in *Northwest Steelheaders*:

First, with respect to “actual use,” it is not necessary that the historic use made of the river have been either widespread or commercially profitable. “The extent of * * commerce is not the test.” . . . For example, the Court’s most recent application of the *The Daniel Ball* test upheld a determination of the navigability of Utah’s Great Salt Lake based on evidence that the Court described as “sufficient” but “not extensive.”

199 Ore. App. at 389, *quoting Utah v. United States*, 403 U.S. at 11.

20. Further, as the Oregon Court observed, “qualifying travel and trade is not limited to large-scale commercial or multiple passenger vessels of the sort typically engaged in modern commerce.” *Id.* at 390. Navigation by small boats has often been recognized as evidence of navigability. *Block v. North Dakota*, 461 U.S. 273(1983) (“Canoe travel at the time of North Dakota’s statehood represented a viable means of transporting persons and goods.”); *Puyallup Tribe of Indians v. Port of Tacoma*, 525 F. Supp. 65 (W.D. Wash 1981), *aff’d*, 717 F.2d 1251

(9th Cir 1983)(declaring navigability on the basis that “Indians navigated the river with their fishing boats and canoes”).

21. The lack of actual use at statehood as a “highway for commerce” does not defeat a finding of navigability. *See, e.g., United States v. Utah*, 283 U.S. at 83. As the United States Supreme Court noted in that case:

Utah ...is not to be denied title to the beds of such of its rivers...either because the location of the rivers and the circumstances of the exploration and settlement of the country through which they flowed had made recourse to navigation a late adventure, or because commercial utilization on a large scale awaits future demands. The question remains one of fact as to the capacity of the rivers in their ordinary condition to meet the needs of commerce as these may arise in connection with the growth of the population....And this capacity may be shown by physical characteristics and experimentation as well as by the uses to which the streams have been put.

Id. at 83.

22. In considering the issue of “commerce,” it is important to distinguish between cases involving navigability under the Commerce Clause and cases involving navigability for title. In Commerce Clause cases, in order to support federal regulatory jurisdiction over power plants the river must by statute be, or have been, “suitable for use for the transportation of persons or property in interstate or foreign commerce.” 16 U.S.C. §796(8)(2006). No such “interstate or foreign commerce” requirement exists when the issue is navigability for title. *Oregon v. Riverfront Protective Ass’n*, 672 F.2d 792, 795 n. 1 (9th Cir. 1982). As the Arizona Court of Appeals cautioned in *Defenders*, “when discussing navigability, any reliance on judicial precedent should be predicated on a careful appraisal of the purpose for which the concept of navigability is invoked.” 199 Ariz. 729-30, 18 P. 3d at 418-19.

23. As the United States Supreme Court has observed, “[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 Montello*, 87 U.S. (20 Wall) 430, 441 (1874), quoted with approval in *United States v. Utah*, 283 U.S. at 76.

24. The fact that a watercourse is not capable of navigation year round is not a bar to a finding of navigability. In *United States v. Utah*, the Supreme Court provided guidance for evaluating whether periodic conditions of navigation-impairing low flow are extensive enough to constitute the “ordinary condition” of a river and, thus, bar a finding of navigability. In comparing the facts before it to cases in which rivers were found nonnavigable, the Court stated,

In each of the cases to which the government refers, it was found that the use of the stream for purposes of transportation was exceptional, being practicable only in times of temporary high waters. In the present instance[,] * * * * [the river’s] susceptibility of use as a highway for commerce was not confined to exceptional conditions or short periods of temporary high water, *but that during at least nine months of each year the river ordinarily was susceptible to such use.*

283 U.S. at 87 (emphasis added).

25. “Navigability based on either actual use or susceptibility to use may be established despite the presence of obstacles to free passage, such as rapids, riffles, or occasional areas of low water requiring portage, so long as the ‘natural navigation of the river is such that it affords a channel for useful commerce.’” *Northwest Steelheaders*, 199 Ore. App. at 484, 112 P.3d at 390 *quoting The Montello*, 87 U.S. (20 Wall) at 441.

26. Navigability does not depend on an absence of occasional difficulties in navigation. *Holt State Bank*, 270 U.S. 49, 56 (1926). *See also United States v. Utah*, 283 U.S. at 84, 86 (noting that conditions created by flood deposits of logs and driftwood “do[] not constitute a serious obstacle to navigation” and that, with respect to shifting sandbars in the river channel, “the mere fact of the presence of such sandbars causing impediments to navigation does not make a river non-navigable”).

27. Expert testimony regarding historic hydrology may be especially probative of a stream's "ordinary" susceptibility at the time of statehood. *Northwest Steelheaders*, 199 Ore. App. at 485, 112 P.3d at 391.

28. In determining whether a watercourse was "susceptible" of navigation, evidence of modern use is appropriately considered. *PPL Montana LLC v. Montana*, 132 S. Ct. 1215, 1233 (2012)(holding that evidence of present-day, primarily recreational boating can be considered provided it is "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."); *see also Winkleman v. ANSAC*, 224 Ariz. at 242 ¶31, 229 P.3d at 254. ("Even if evidence of the River's condition after man-made diversions is not dispositive, it may nonetheless be informative and relevant.").

29. A party seeking to use present-day evidence for title purposes must show: (1) the watercraft are meaningfully similar to those in customary use for trade and travel at the time of statehood; and (2) the river's post-statehood condition is not materially different from its physical condition at statehood or the river has not changed in ways that substantially improve its navigability. *PPL Montana*, 132 S. Ct. at 1233.

30. Although it is possible that James O. Pattie used a canoe on the San Pedro as part of a commercial enterprise, there is no other historical evidence of boating on the San Pedro River. That, however, does not mean that the river would not have been susceptible to navigation in its natural condition. FOF ¶56.

31. The record includes numerous examples of modern day boating using watercraft that are essentially the same as boats that were used at the time of statehood or at least do not require more draft than boats used at the time of statehood. FOF ¶¶57-59.

32. Because the modern day river has significantly reduced flow and, therefore, is less (not more) susceptible to navigation than the river in its ordinary and natural condition would have been at the time of statehood, evidence of modern boating is relevant and supports a finding that a significant segment of the river in its ordinary and natural condition could have been navigated with canoes or drift boats.

33. To evaluate the San Pedro River for navigability, we use two methods developed by the federal government. First, we apply the “Bureau of Outdoor Recreation Method” developed in 1977 for the Bureau of Outdoor Recreation of the U.S. Department of Interior. And second, we use the Fish and Wildlife Service Method, a single cross section technique that is based on a minimum flow recommended for a particular watercraft activity. The USFW method establishes minimum depth and width requirements for canoes, kayaks, drift and row boats.

34. The width and current (velocity) of the San Pedro River flow in its ordinary and natural condition easily meets the standards for navigability. Nearly all of the time, flow width was sufficiently great. Except during large floods, which would not represent the river’s ordinary condition, the flow velocity was sufficiently small for navigability along the San Pedro River.

35. The depth of flow along the San Pedro River limited navigability in the upper reach between the Mexican border and one mile below Lewis Springs. This reach was marginally but not fully acceptable for navigation using the federal standard. Thus, this reach was not susceptible to navigation even in its ordinary and natural condition.

36. About 20% of the time during a typical year, the depth of the natural flow along the San Pedro River also limited navigability in the remaining reach of the River (between one mile below Lewis Springs, located 19 miles north of the border, and the mouth at the Gila River).

In the absence of direct runoff, the summer ET simply consumed a lot of water in the riparian zone reducing the depth to below 1 foot.

37. However, for the remaining 80% of the time, the natural flow for the reach from below the Lewis Springs area to the mouth had sufficient width and depth, and an acceptable velocity for canoeing and kayaking based on the navigability methods of the two federal agencies.

38. The median runoff also supports a finding of navigability for the same reach (from a mile below Lewis Springs to the mouth). During a typical year, 50% of the time, the discharge equaled or exceeded 25 cfs a mile below Lewis Springs, 41 cfs at the Join and 50 cfs at the mouth near Winkleman. The corresponding median depths of flow were 1.2 ft, 1.3 ft and 1.4 ft.

39. Navigability was independent of undesirable conditions such as temporary braiding of the river channel following floods, low flow from severe droughts, beaver dams and flow variability. These characteristics are related to how the River might have been used for navigation rather than its susceptibility to navigation in its ordinary and natural condition.

B. Issue 2: Segmentation.

40. The United States Supreme Court held that a river's navigability must be determined on a segment-by-segment basis. *PPL Montana LLC v. Montana*, 132 S. Ct. 1215 (2012).

41. The Court recognized that “[p]hysical conditions that affect navigability often vary over the length of a river.” *Id.* at 1230.

42. In determining the navigability of the San Pedro River, this Commission must undertake the same approach. It would be contrary to well-established federal law to find an

entire river “nonnavigable” simply because portions of the river were not susceptible to navigation, when others clearly were.

43. According to the modeling by Mr. Hjalmarson, from the U.S./Mexico border to approximately a mile below Lewis Springs, the maximum depth of the river in its natural condition most likely would not have been susceptible to navigation. Therefore, the river should be segmented at that point.

III. Conclusion.

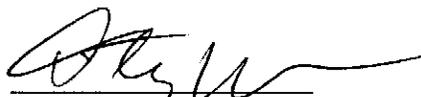
44. The evidence presented demonstrates that a significant segment of the San Pedro River meets the Arizona and federal standards of navigability. Evidence of navigability includes the early perennial flow of the river, historic descriptions of the river, the sedimentary evidence in the river banks, the modeled width and depth of the river in its natural condition, incidents of modern boating, and established flow requirements for actual navigation.

45. In its natural condition, the San Pedro’s depth of flow from one mile below Lewis Springs to the mouth would have exceeded the depths required for canoes, kayaks, drift boats, row boats and rafts for nearly 80% of the time (or 9.6 months) during an ordinary year.

46. When the objective evidence is evaluated using the appropriate standard, it is clear that at the time of statehood, that portion of the San Pedro River from a mile below Lewis Springs to the mouth was, in its natural and ordinary condition, susceptible for use as a highway for commerce, over which trade and travel could have been conducted in the customary modes of trade and travel on water.

Respectfully Submitted this 27th day of September, 2013.

ARIZONA CENTER FOR LAW
IN THE PUBLIC INTEREST
2205 E. Speedway Blvd.
Tucson, Arizona 85719



Joy E. Herr-Cardillo
Timothy M. Hogan

ORIGINAL AND SEVEN COPIES of the foregoing
Hand delivered this 27th day of
September, 2013, to:

Arizona Navigable Stream Adjudication Commission
1700 W. Washington
Room B-54
Phoenix, AZ 85007

COPY of the foregoing mailed this 27th day of
September, 2013, to:

Fred Breedlove
Squire Sanders (US) LLP
1 East Washington St, Ste 2700
Phoenix, AZ 85004
Attorneys for ANSAC

John B. Weldon, Jr.
Mark A. McGinnis
Salmon, Lewis & Weldon, Plc
2850 E. Camelback Rd., Ste 200
Phoenix, AZ 85016-4316
*Attorneys for the Salt River Project Agricultural Improvement
And Power District and Salt River Valley Water User's Association*

Cynthia M. Chandley
L. William Staudenmaier
Snell & Wilmer
400 East Van Buren
Phoenix, AZ 85004-2022
Attorneys for Freeport-McMoRan Copper & Gold, Inc.

Sean Hood
Fennemore Craig, P.C.
2394 E. Camelback, Suite 600
Phoenix, AZ 85016-3429
Attorneys for Freeport-McMoRan Copper & Gold, Inc.

Laurie Hachtel
Joy Hernbrode
Attorney General's Office
1275 West Washington Street
Phoenix, AZ 85007-2297
Attorneys for State of Arizona

Joe P. Sparks
The Sparks Law Firm
7503 First Street
Scottsdale, AZ 85251-4201
Attorneys for San Carols Apache Tribe, et al

Steven L. Wene
Moyes Sellers & Sims
1850 N. Central Ave., Ste 1100
Phoenix, AZ 85004

Cynthia S. Campbell
Law Department
City Of Phoenix
200 W. Washington Street, Ste 1300
Phoenix, AZ 85003-1611
Attorneys for City of Phoenix

William H. Anger
Engelman Berger, P.C.
3636 N. Central Avenue, Ste 700
Phoenix, AZ 85012
Attorneys for City of Mesa

Charles L. Cahoy
Assistant City Attorney
City Attorney's Office
CITY OF TEMPE
21E. Sixth St, Ste 201
Tempe, AZ 85280
Attorneys for City of Tempe

Michael J. Pearce
Maguire & Pearce, LLC
2999 N. 44th Street, Ste 630
Phoenix, AZ 85018-0001
*Attorneys for Chamber of Commerce
And Home Builders' Association*

Carla Consoli
Lewis & Roca
40 N. Central Ave
Phoenix, AZ 85004
Attorneys for Cemex

James T. Braselton
Mariscal, Weeks, McIntyre & Friedlander, P.A.
2901 N. Central Ave, Ste 200
Phoenix, AZ 85012-2705
Attorneys for Various Title Companies

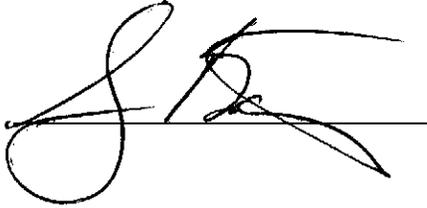
Thomas L. Murphy
Linus Everling
Gila River Indian Community Law Office
Post Office Box 97
Sacaton, AZ 85147
Attorney for Gila River Indian Community

Sandy Bahr
202 E. McDowell Rd, Ste 277
Phoenix, AZ 85004
Sierra Club

Sally Worthington
John Helm
Helm, Livesay & Worthington, Ltd.
1619 E. Guadalupe, Ste 1
Tempe, AZ 85283
Attorneys for Maricopa County

David A. Brown
Brown & Brown Law Offices
128 E. Commercial, PO Box 1890
St Johns, Arizona 85936

Susan B. Montgomery
Robyn L. Interpreter
MONTGOMERY & INTERPRETER, PLC
4835 E. Cactus Rd., Ste. 210
Scottsdale, AZ 85254

A handwritten signature in black ink, appearing to be a stylized representation of the initials 'SM' or 'SL'. The signature is written over a horizontal line.