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BEFORE THE

ARIZONA NAVIGABLE STREAM ADJUDICATION COMMISSION

IN THE MATTER OF THE NAVIGABILITY OF THE GILA RIVER FROM THE NEW MEXICO BORDER TO THE CONFLUENCE WITH THE COLORADO RIVER, GREENLEE, GRAHAM, GILA, PINAL, MARICOPA AND YUMA COUNTIES, ARIZONA	No. 03-007-NAV **ARIZONA STATE LAND DEPARTMENT'S PROPOSED FINDINGS OF FACTS AND CONCLUSIONS OF LAW REGARDING THE GILA RIVER**

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INTRODUCTION

1. In 1985, Arizona officials first asserted a sovereign interest in Arizona's streambeds. *Land Dep't v. O'Toole*, 154 Ariz. 43, 739 P.2d 1360 (1987).

2. 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.

3. The Arizona Center for Law in the Public Interest 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).

4. The Legislature thereupon enacted states 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.

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

6. 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. 422, 18 P.3d 711 (App. 2001).

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

8. Pursuant to Title 37, Chapter 7, Arizona Revised States, ANSAC conducted a public hearing on the Gila River on November 16 and 17, 2003, and, after post-hearing briefing, found the River to be non-navigable as of February 14, 1912 by unanimous vote.

9. ANSAC issued its Report, Findings and Determination Regarding the Navigability of the Gila River from the New Mexico Border to the Confluence with the Colorado River on January 27, 2009.

10. On April 27, 2010, the Arizona Court of Appeals issued its opinion in the matter of *State of Arizona v. ANSAC*, 1 CA-CV 07-0704 (Lower Salt River), finding that ANSAC had misapplied the Daniel Ball test. The court vacated the judgment of the Superior Court and remanded the matter to ANSAC for further proceedings.

11. ANSAC conducted hearings on the navigability of the River on June 16-20, 2014, August 18-20, 2014, and August 29, 2014.

12. The Gila River (the "River") rises in south-western New Mexico and runs for approximately 500 miles, flowing through the Duncan-Virden Valley, the Safford Valley, and on through the broad valley plain of central Arizona to the River's junction with the Colorado River near Yuma.[1/2] 002, pp. 4-1, 5-5 (ASLD Upper Gila Report); 004, pp. IV-44, VI-1–VI-2, VIII-1 (ASLD Lower Gila Report).

13. The River and its tributaries, which include the Salt, Santa Cruz, San Pedro, San Carlos, San Simon, San Francisco, Agua Fria, and the Hassayampa Rivers, and numerous smaller tributaries, drain 60,000 to 66,000 square miles in southern Arizona, western New Mexico, and northern Sonora, Mexico. 004, pp.VI-1–VI-2, VII-2 (ASLD Lower Gila Report); 002, p. 5-5 (ASLD Upper Gila Report).

14. The River is among the major rivers of the United States, as derived from USGS readings from 1951 – 1980. The River is sixteenth in terms of drainage area, it is 649 miles long, and has a discharge of less than 15,000 cfs. X004-52 (USGS, *Water Fact Sheet*).

15. The lower Gila, especially downstream of its confluence with the Salt, may be the most important river in Arizona. Except for the Little Colorado and Bill Williams, all of the major river systems converge here, making the Gila the primary drainage system for Arizona. The watershed area upstream of Dome is 57,850 sq.m. and includes parts of western New Mexico. The river once provided sustenance for the Pima, then was the lifeline for southern travelers from the East to California, and now is little more than a drainage ditch. X015-16, p. 337 (*Ribbon of Green*).

16. The drainage basin includes 7,000 square miles of timberland, 11,000 square miles of woodland, 45,000 square miles of land without timber, 1,300 square miles of scattered lumber and 300 square miles of open land. 004, p. VI-3 (ASLD Lower Gila Report).

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[1] ASLD's *Arizona Stream Navigability Study for the Upper Gila River: Safford to the State Boundary*, SWCA, Inc., Environmental Consultants, June 1997, (rev. June 2003 by JE Fuller/Hydrology & Geomorphology, Inc.), 002, 6/00/03.

[2] ASLD's *Arizona Stream Navigability Study for the Gila River: Colorado River Confluence to the Town of Safford*, SWCA, Inc., Environmental Consultants, October 1994, (rev. June 2003 by JE Fuller/Hydrology & Geomorphology, Inc.), 004, 6/00/03.

17. The River flows through two major box canyons: the Gila Box on the Upper Gila and the other beginning just below Coolidge Dam on the San Carlos Indian Reservation and continuing almost to Winkelman on the Lower Gila. 002, pp. 4-1, 4-6 (ASLD Upper Gila Report); 004, p. VI-2 (ASLD Lower Gila Report).

18. On the Upper Gila, the Duncan Valley is the primary alluvial area, and on the Lower Gila, the primary alluvial valley areas are: the Safford valley; and the valleys between Winkelman and Kelvin, Florence to the Salt River confluence, and from that confluence to Yuma. 002, pp. 4-6, 4-10 (ASLD Upper Gila Report); 004, p. VII-1 (ASLD Lower Gila Report).

19. Mean annual precipitation within the watershed ranges from 8 - 40 inches and averages approximately 14 inches. 004, pp. VII-2–VII-3 (ASLD Lower Gila Report).

20. Generally, the amount of rainfall increases with altitude. Average rainfall at Yuma is less than three inches, whereas near and among the eastern mountains, rainfall can increase to about 20 inches. 004, p. IV-45 (ASLD Lower Gila Report), citing the United States Geological Service ("USGS") Twelfth Annual Report, 1890-91.

21. Rainfall on the watershed produces two periods of peak flow: summer (between July and October, predominantly linked to monsoonal convective storms); and winter (from November through June, supplied largely by frontal storms, snowmelt, and groundwater storage). 004, p. VII-3 (ASLD Lower Gila Report).

FINDINGS OF FACTS ("FOF")

I. Segmentation

22. In its ordinary and natural condition, the Gila from the New Mexico border to the Colorado River confluence is naturally divided based on its hydrology, geomorphology, geography, and navigability characteristics. Tr. 6/16/14, pp. 122-124, 265 (Fuller).

23. The River flows through alternating reaches of narrow bedrock canyons and broad alluvial river valleys, with a pool and riffle pattern. X020-79, PPT 30-31, 33, 36, 39, 41, 45, 48, 57, 60 (Fuller Nav.); 002, pp. 4-6, 8-5 (ASLD Upper Gila Report); Tr. 6/16/14, p. 122-23 (Fuller).

24. Riffles are areas where the water is shallower and moves faster, and pools are deeper with slower moving water. Tr. 6/16/14, p. 132:9-11 (Fuller).

25. Bedrock canyons occur in the Gila Box, Segment 2, downstream of the Duncan Valley and upstream of Safford; in the San Carlos canyon, Segment 4, downstream of Coolidge dam and upstream of Winkelman; and between Kelvin and the Hayden-Ashurst Dam, the later part of Segment 5. X020-79, PPT 30-31, 33, 36, 39, 41, 45, 48, 57, 60 (Fuller Nav.).

26. The remainder of the River flows in alluvial valleys – areas where alluvium has been deposited by the River. X020-79, PPT 30-31, 33, 36, 39, 42, 45, 48, 57, 60 (Fuller Nav.); Tr. 6/16/14, p. 123 (Fuller).

27. Bedrock canyons have greater topographic confinement, channel stability, and could have more rapids based on the increased confinement of the watercourse. Tr. 6/16/14, pp. 67:21–68:5 (Fuller).

28. In its alluvial sections, the Gila is characterized as a compound channel, which consists of braided flood channels and a sinuous to meandering single thread low flow or primary channel. X035-129 (Huckleberry Decl.).

29. It is the low-flow or primary channel that is considered the typical "wet" part of the river, and the portion of the river upon which boating would be most likely to occur. X035-129 (Huckleberry Decl.).

30. Hydrologically, some segments of the River are gaining segments, and some are losing. X020-79, PPT 30-31 (Fuller Nav.); Tr. 6/16/14, p. 149-50 (Fuller).

31. Some segments had deeper water and more historical use than others. X020-79, PPT 30-31 (Fuller Nav.); Tr. 6/16/14, pp. 122-124, 265:11-24 (Fuller).

32. Segment 7 is distinguished from Segment 8 based on its record of historical boating. Tr. 6/16/14, pp. 253:8-256:13 (Fuller); X020-79, PPT 57 (Fuller Nav.).

33. It is appropriate to segment the Gila River based upon its diverse physical characteristics into 8 segments: Segment 1- New Mexico boundary to Hwy 191 Bridge (the Duncan Valley); Segment 2 – Hwy 191 Bridge to the Dry Canyon Confluence (the Gila Box); Segment 3 – Dry Canyon Bridge to Coolidge Dam (Safford Valley); Segment 4 – Coolidge Dam to Hwy 77 (San Carlos Canyon); Segment 5 – Hwy 77 to Ashurst-Hayden Dam; Segment 6 – Ashurst-Hayden Dam to the Salt River Confluence; Segment 7 – the Salt River Confluence to Dome; and Segment 8 – Dome to the Colorado River Confluence. Tr. 6/16/14, pp. 122-158, 263 (Fuller).

II. Hydrology and Geomorphology

A. Flow

34. Before Anglo-American development, the river was perennial except for very few short stretches where the Pimas and Maricopas had diverted the entirety of the river. The major tributaries were also in a mostly perennial state. X015-6, p. 3-3 (Gookin, *Hydrologic History,* 2000).

35. The climate and the River's natural flow was pretty constant between 1760 and 1860. Tr. 11/17/05, p. 304 (Hjalmarson).

36. Discharge from springs on the Upper Gila in Segments 1 and 2 provided a constant base flow, making the River a perennial gaining stream. 002, p. 4-7 (ASLD Upper Gila Report).

37. Before Roosevelt Dam on the Salt River and the San Carlos Dams were closed, the River was perennial, although variable with the seasons, and included fish populations, beaver, and other small game in a well-developed riparian habitat. 004, p. X-1 (ASLD Lower Gila Report).

38. On the predevelopment River, from the Salt-Gila confluence downstream, the huge amount of groundwater stored in upstream basins that was slowly released during the summer meant that the flow probably did not change much. Tr. 11/17/05, p. 235 (Hjalmarson).

39. Under natural conditions before about 1860, 95% of precipitation replenished groundwater, was temporarily stored and later discharged to streams. 023, p. 11 (Hjalmarson 2002 Rpt.).

40. Hydrologically, some segments of the River are gaining segments, and some are losing. X020-79, PPT 30-31 (Fuller Nav.); Tr. 6/16/14, p. 149-50 (Fuller).

41. There is very little USGS data for the River pre-1900s, after which it was largely depleted and not in its natural condition. X020-79, PPT 136 (Fuller Nav.).

42. Data began to be recorded in 1899 at Coolidge, but for another point, Calva, the collection of data did not begin until 1929. X020-79, PPT 136 (Fuller Nav.).

43. Since USGS data was used as the primary source the calculated ASLD depths of the depleted River shown in Exhibit A are lower than what the depths would have been in 1860. *See* X020-79, PPT 143-151 (Fuller Nav.).

44. Generally, the periods of peak flows on the River are in late winter through spring runoff (December-January through April) and monsoon runoff (August-October). Tr. 6/16/14, pp. 112-116 (Fuller); X020-79, PPT 22 (Fuller Nav.).

45. Various flow estimates exist:

a. Gookin estimates the Lower Gila's predevelopment natural flow upstream of the Salt-Gila confluence at about 500,000 acre feet ("af") (690 cfs)[3] a year; the Salt River's natural flow at 1,250,000 af (1,725 cfs) a year; and the River's natural flow below the location of Gillespie Dam at 1,792,800 af (2,474 cfs). 015-3, pp. 1, 2-23 (Gookin Report).

b. Hjalmarson estimated the River's natural average annual discharge at the Salt-Gila confluence as 2,330 cfs; median annual flow as 1,750 cfs. Base flow was at least 290 cfs and 170 cfs at the River's mouth. 023, pp. 14-15 (Hjalmarson 2002 Rpt.); Tr. 11/17/05, pp. 236-39 (Hjalmarson); *see* Tr. 6/16/14, pp. 222-23 (Fuller); X020-79, PPT 139 (Fuller Nav.).

46. Thompson and Porcello note that pre-development discharge of the Salt River (the Gila's main tributary) has been estimated at 1,250,000 af, and the median annual discharge was 950,000 af. These estimates are based on recorded data with adjustments for results of tree ring studies and estimates of upstream diversions and reservoir evaporation. X004-23, pp. 1-2 (*Predevelopment Hydrology*).

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[3] One cubic foot per second = 723.97 acre feet of water. *See* www.western-water.com.

47. The University of Arizona Experiment Station reported in 1911 that the River's annual flow above the Salt River was 160,000 af. X012-70, p. 56 (*Agricultural Practice*).

48. The mean annual post-statehood flow in Segment 1 is between 190 and 206 cfs; top width is between 26 and 100 feet. X020-79, PPT 143 (Fuller Nav.).

49. The mean annual post-statehood flow rate in Segment 2 is 206 cfs; top width is between 26 and 64 feet. X020-79, PPT 144 (Fuller Nav.).

50. The mean annual post-statehood flow rate in Segment 3 is between 334 and 433 cfs; top width is between 144 and 150 feet. X020-79, PPT 145 (Fuller Nav.)).

51. Segment 4's modern flow is from dam diversions, which are less than the historical flow. X020-79, PPT 146, 167-71 (Fuller Nav.); Tr. 6/16/14, pp. 241-44 (Fuller).

52. The mean annual post-statehood flow rate in Segment 4 is 379 cfs. X020-79, PPT 146 (Fuller Nav.).

53. The mean annual post-statehood flow rate in Segment 5 is 491 cfs. X020-79, PPT 147 (Fuller Nav.).

54. The mean annual post-statehood flow rate in Segment 6 is between 48 and 711 cfs. X020-79, PPT 148 (Fuller Nav.).

55. Estimated historic median base flow rate in Segment 7 is between 290 and 1750 cfs. Tr. 6/16/14, pp. 253-56 (Fuller).

56. The mean annual post-statehood flow rate in Segment 7 is between 30 and 2158 cfs. X020-79, PPT 149-150.

57. Hjalmarson estimated the mean flow in Segment 7 at 2330 cfs. X020-79, PPT 154.

58. The mean annual post-statehood flow rate in Segment 8 is 455 cfs. X020-79, PPT 151.

59. Backwater flow from the Colorado extends approximately 2.5 miles up the Gila. 001-22 (Stantec, *Gila Backwater*).

60. The Salt, a major tributary of the Gila, was perennial before non-Indian settlers arrived. The Gila is related to the hydrology of the Salt because of its role in recharging the groundwater system as well as its direct contribution to the Gila's flow. X004-23, pp. 9-10, 12 (*Predevelopment Hydrology*).

61. Groundwater pumping over the past 100 years took a toll on the River's natural flow and changed it from a gaining stream to a losing stream. Tr. 11/17/05, pp. 257-58 (Hjalmarson).

62. The total reduction in the natural discharge of the Salt and Verde basins due to evaporation from reservoirs and diversions for irrigation is estimated to average 150,000 acre feet per year. X004-23, p. 11 (*Predevelopment Hydrology*).

B. Depth

63. ASLD summarized the depth estimates by the various experts in Exhibit "A", attached hereto. Citations to the record are included on Exhibit "A".

64. ASLD's depleted depth estimates provide a consistent picture of perennial and reliable flow in the Gila with depths sufficient to sustain boats using the River as a highway for commerce. X020-79, PPT 28 (Fuller Nav.).

65. Depleted depth estimates exceed the depths needed for boats to be used as a highway for commerce, including modern and historic canoes, flatboats, and in some segments steamboats. *Compare* Exhibit A, ASLD data with boating depth requirements in X020-80, PPT 76, 116, 117 (Fuller Boating).

66. Mr. Burtell's lowest mean depth reconstruction occurs at Bonita Creek where he lists a mean range of < 1.1-2.5 ft. (X008-2, Table 10 (Burtell Decl.), and Exhibit A), and the low end of that range is still sufficient depth for small boats. X020-80, PPT 76, 116, 117 (Fuller Boating).

67. Historic descriptions generally describe a river consistent with depth estimates. X020-79, PPT 98 (Fuller Nav.).

68. Where the Gila is navigable today in its depleted condition, both Mr. Fuller and Mr. Farmer have testified that depths are sufficient to float small boats such as canoes and that depths in the relevant boating channel are actually deeper than ASLD's rating curves portrays, even in today's unnatural condition. *See generally* Tr. 6/18/14, p. 542-577 (Farmer); Tr. 6/16/14, p. 8-266 (Fuller).

69. ASLD's boatable (rating curves) information is based on USGS gage data on flow frequency, flow rate, hydraulic depth, average velocity, and where available, top width, that generally underestimate historic flows. X020-79, PPT 136-142 (Fuller Nav.); Tr. 6/16/14, pp. 219-23 (Fuller).

C. Channel Configuration

70. Predevelopment, the valley bottoms and uplands were covered with a variety of tall grasses that restrained the floodwaters from torrential storms by allowing the rainfall to soak into the ground. 015-3, pp. 2-20–2-21 (Gookin Report).

71. The Gila was also wide enough for boating, and no party has asserted otherwise. Tr. 6/16/14, pp. 263-265 (Fuller).

72. While some minimal braiding may occur in the low-flow or primary channel in certain parts of the River, the primary channel is without question a single thread channel overall, as attested to by the widely cited expert on the geomorphology of the Gila, Dr. Gary Huckleberry, who did his PhD dissertation on the River (X032-126, p. 18 (Huckleberry Rpt.)), and as attested to by ASLD's hydrologist and boating expert, Jon Fuller, who is the only scientific expert in this case to have actually boated the Gila. X035-129 (Huckleberry Decl.); Tr. 6/16/14, p. 110:2-7 (Fuller).

73. Significant braiding only occurs when the Gila is in flood, which is less than 1% of the time. Tr. 6/16/14, p. 218:1-6 (Fuller); 002, p. 4-33, Table 21 (ASLD Upper Gila Report); 024, p. 78-80 (Hjalmarson Depo.).

74. The navigability of the Gila is not and never was impeded by any significant braiding. Tr. 6/16/14, pp. 110, 202:13-18 (Fuller).

75. Braiding, where it may occur on a river, does not itself prohibit navigation. Tr. 6/16/14, pp. 110 (Fuller); *see also* Tr. 8/19/14, p. 1734:20-25, 1735:1 (Mussetter) (Braided rivers can be navigable and this is consistent with Dr. Schumm's previous testimony).

76. A floodplain is the part of a watercourse that gets covered by flood waters. The floodplain includes a low-flow channel, that is the boating channel. Tr. 6/16/14, pp. 100-101 (Fuller); X020-80, PPT 13, 17, 18 (Fuller Boating).

77. A channel is a conveyance or corridor of surface water that has a bottom and sides in some sort of linear configuration. This low-flow channel is where boating can occur. Tr. 6/16/14, pp. 100-103 (Fuller).

78. Outside of the bedrock canyons, the River's channel is typical of other rivers in dry regions: compound with a single, low-flow meandering channel inserted into a wider braided channel network. Tr. 6/16/14, p. 105 (Fuller).

79. Boating is done in the low-flow portion of the channel, not in the floodplain. Tr. 6/16/14, pp. 100-111 (Fuller); X020-79, PPT 8-18 (Fuller Nav.); X035-129, ¶ 1(b) (Huckleberry Decl.).

80. The configuration of the flood plain has no bearing on a river's navigability. Tr. 6/16/14, pp. 100-111 (Fuller)h; X020-79, PPT 13 (Fuller Nav.).

81. The predevelopment River had a generally smooth parabolic-shaped single meandering channel with some braiding likely, as is typical with all alluvial channels. Tr. 11/17/05, pp. 266-67 (Hjalmarson); (*see also* page 292: "[The River] wants to be kind of a mildly sinuous meandering channel.").

82. The Protohistoric period (ca. A.D. 1450 and 1700) marks the time between the end of the Hohokam and the beginning of the Spanish colonization of the Southwest. Historic descriptions of the area record the presence of Piman-speaking groups that pursued floodwater and small-scale irrigation farming on the active floodplain of the River in Segment 6 and 7. There was a major period of channel cutting and widening between 1020 and 1160. By 1450, the River had returned to its original narrow channel configuration with a fully developed riparian zone and a broad floodplain that was regularly flooded. X015-15, pp. 285, 293 (Waters and Ravesloot, *Landscape Change and Cultural Evolution, Etc.*).

83. Channel changes in the alluvial areas were driven primarily by changes in the frequency of large floods, but human disturbances such as irrigation diversions, dams, exotic vegetation and channelization undoubtedly affected the hydraulics and hydrology of the channel. 004, p. VII-1 (ASLD Lower Gila Report).

84. As a result of diversions, the remaining channels look significantly different than when they were in their ordinary and natural condition. Tr. 6/18/14, p. 724 (Fuller).

85. Although floods have a greater impact on channel morphology than diversions do, both affect reformation of the low-flow channel. Tr. 11/16/05, p. 95 (Huckleberry).

86. After a flood, the low-flow channel will recover if the flow is not diverted from the river. Tr. 6/16/14, p. 118 (Fuller).

87. The River has a single channel which reappears after a flood, or it would if it were still in its ordinary and natural condition. Tr. 6/17/14, p. 477, 480 (Fuller).

88. A big flood can disrupt a channel but over time the channel will recover, unless, as with the Gila in the 1891 flood, the river's flow has been diverted. Tr. 11/17/05, pp. 254-55 (Hjalmarson).

89. To the extent that the River did not heal itself after the major late-19th Century and early 20th Century floods it was because there was not enough flow. Tr. 8/20/14, pp. 1819, 1822 (Mussetter).

90. The absence of low flow means that flood impacts persist; in addition, it affects the ability of native species to compete with non-natural species so invasive species outcompete native species; and changes in sediment budgets lead to braiding and increased deposition of sediment along the river corridors. Tr. 6/16/14, pp. 214-15 (Fuller).

91. The River is in a deteriorated condition: its flow is significantly depleted; invasive species have propagated; fences, dams, channelization, and mining, have all created obstructions that did not exist in the River's ordinary and natural condition. Tr. 6/16/14, pp. 90-91 (Fuller).

92. Once the River's flow began to be substantially depleted, the channel began to change unnaturally due to the consistently decreased flow, including erosion of the channel from decreased large native vegetation like cottonwoods, channel constriction from subsequent invasive non-native vegetation like tamarisk, and an unnatural change in sediment distribution. Tr. 6/16/14, pp. 145, 251, 244 (Fuller).

D. Floods

93. Historically, flooding occurred on the river from about 4,000 years ago to 1,000 years ago; followed by a period of low flood frequency and high channel stability until the 19th century. X015-16, p. 339 (*Ribbon of Green*).

94. By the end of the 19th century, all rivers in the region were experiencing alternative periods of extreme floods and extreme droughts. X015-16, p. 338 (*Ribbon of Green*).

95. Floods occurred periodically on the Upper Gila. 002, p. 5-46 (Table 26) (ASLD Upper Gila Report).

96. Flood-induced widening and braiding within the floodplain occurred in many parts of the alluvial segments of the River after the 1905-06 floods; the widening and braiding that occurred was not typical of the long-term condition of the River. X035-129, 2(c)(d) (Huckleberry Decl.).

97. The River suffered a catastrophic flood in 1833 and another in 1868 in the Florence area, which were larger than the 1905 flood, but the River retained its stable channel. 004, pp. VII-5, VII-14 (ASLD Lower Gila Report); X032-126, p. 8 (Huckleberry Rpt.).

98. Large floods might relocate the low-flow channel in a different part of the floodplain but a low-flow channel is reformed as the flood waters recede. X035-129 (Huckleberry Decl.); Tr. 11/16/05, p. 60 (Huckleberry); Tr. 8/19/14, pp. 1725-26 (Mussetter).

99. After the 1890 and 1905 floods, some River segments experienced changes to the flood plain but not to the low-flow boatable channel. Tr. 6/18/14, p. 740 (Fuller); X035-129, ¶2(e) (Huckleberry Decl.).

100. During large flood events, the flood channels of the Gila are widened through powerful and constant erosive water. X035-129 (Huckleberry Decl.); Tr. 6/16/14, p. 107:6-8 (Fuller).

101. The large floods that occurred from 1905 to 1906 certainly affected the alluvial segments of the Gila, causing the River to widen and more braiding to occur within the floodplain, but there is a "high probability" of the re-formation of a more defined low-flow channel that would have occurred prior to statehood, six years after the major floods. X035-129 (Huckleberry Decl.).

102. In any case, any widening and braiding that occurred because of the major floods of 1905 and 1906 that is speculatively still present six years later was not typical of the long term condition of the River, and therefore would not be an assessment of the Gila in its ordinary and natural condition. X035-129 (Huckleberry Decl.).

103. Although boating occurred during flood events, it is not indicative of the ordinary and natural condition of the River nor of the typical boating account and flood boating accounts were not considered by Mr. Fuller in rendering his opinion. Tr. 6/16/14, p. 27-28, 207 (Fuller).

104. The *Arizona Blade-Tribune* reported on March 16, 1912, that the River had run bank-full for 90 consecutive days in 1884, and William Eaton, with a boat measuring four by fourteen feet, cleared $1,500. 004, p. IV-16 (ASLD Lower Gila Report).

105. The ferry business thrived at Florence (Segment 6) and Kelvin (Segment 5) during the time of high water following the 1905 flood until the waters subsided in

May. 016, p. 26 (Tellman Papers). During this time, a number of boats, some large enough to haul tons of freight were in use there. 016, p. 26 (Tellman Papers).

106. The *Arizona Republican* reported in April 1905 that Jack Shivley boated from Phoenix to Gila Bend (in Segment 7), capsizing once but successfully completing the trip. X014-34 (*Arizona Republican*, 4/3/1905). However, he was boating on flood flows. Tr. 6/16/14, pp. 201-2, 207-8 (Fuller).

III. Ordinary and Natural Condition

107. Native American diversions began prior to non-Indian settlement of Arizona, and continued through the modern-day, these Native American diversions were minimal compared to the effect of the modern-era diversions. Tr. 6/18/14, p. 721:8-20 (Fuller).

108. Indian diversions have not been quantified for ANSAC. Tr. 11/16/05, p. 100 (Huckleberry). However, it is likely the Indians along the River were not using a significant amount of water. Tr. 11/17/05, p. 238 (Hjalmarson).

109. Father Pedro Font, with the Don Juan Bautista de Anza expedition, reported that the Indians were diverting water for agriculture in October-November, 1775. Tr. 11/16/05, p. 165-66 (August).

110. Non-Indian settlers arrived in Arizona in large numbers in the 1860s and 1870s and began diverting water from the Salt in significant quantities. X004-23, pp. 1-2 (*Predevelopment Hydrology*).

111. The first of the modern-era diversions affecting the Gila began in the late 1860s, with the construction of Swilling ditch on the Salt River. Tr. 11/16/05, p. 206-207 (Jackson).

112. Non-Indian diversions altered the River's discharge and sediment characteristics and changed the River's morphology. 023, p. 8 (Hjalmarson 2002 Rpt.).

113. Enormous quantities of water were diverted from the Salt and Gila Rivers during the latter 19th century. Tr. 11/17/05, pp. 206-07 (Jackson).

114. In the late 1870s, I.E. Solomon provided the copper mines with charcoal by cutting mesquite trees from the riverbanks, thereby stripping and exposing the land along the River for about 20 miles. Pioneers reconstructed and enlarged Indian canals. X030-117, pp. 50-51, 57-60 (*From Charcoal to Banking*).

115. Euro-American diversions created a water shortage starting around 1886 with the construction of the Ashurst-Hayden dam and Florence Canal. 004, p. VI-1 (ASLD Lower Gila Report).

116. The Ashurst-Hayden diversion dam and Florence Canal, constructed about 15 miles upstream of the Gila River Indian Reservation, aggravated a water shortage on the reservation. 004, p. VI-1 (ASLD Lower Gila Report).

117. On the Lower Gila, irrigation diversions in Pinal County started in 1868. 015 (*Globe Equity Decree*, p. 14). By 1889, the USGS recorded that local farmers were diverting water from the Lower Gila through 450 miles of ditches, delivering water for 220,000 acres along the River. 004, p. IV-62 (ASLD Lower Gila Report).

118. By 1899, on the Upper Gila there were 45 diversions in the Duncan and Safford Valleys (002, p. 7 (ASLD Upper Gila Report)); on the Lower Gila, the United States Geological Survey ("USGS") recorded that 220,000 acres were being irrigated through 420 miles of ditches. 004, p. IV-62 (ASLD Lower Gila Report).

119. The modern-era diversions caused substantial depletions of flow, in some areas eliminating all water in the River. X020-79, PPT 174-87 (Fuller Nav.).

120. In the latter half of the nineteenth century, the River began to dry up as Euro-American settlers planted thirsty crops that were not well suited to a desert climate. 017, pp. 28-29 (August Report).

121. At the turn of the 20th century, the River's watershed experienced considerable vegetation change due to cattle grazing and removal of flood-plain vegetation for agricultural purposes, accelerating runoff with larger peak discharges in main trunk (tributary) streams and creating greater erosion and sediment runoff. 004, pp. VII-10; VIII-15; III-22 (ASLD Lower Gila Report).

122. The U.S. Bureau of Fisheries commissioned Frederick Chamberlain to conduct a survey of fishes in Arizona Territory in 1904. In the Gila River basin, Chamberlain observed failing springs, declining water tables, floodplain incision, and depleted fish populations (in species and in numbers). He attributed the magnitude of the environmental deterioration to the collective abuses of overgrazing and other unwise agricultural practices, the overcutting of forests and woodlands, the pumping of groundwater, mining spillages, and possible climatic change. X004-46, pp. 96-97 (Brown, *Territorial*).

123. What changed most of Arizona's streams was arroyo- or channel-cutting during floods. Many observers consider the destructive flooding that occurred between 1891 and 1915 to be a significant factor causing increased runoff on the overgrazed landscapes. The onset of serious arroyo-cutting in Arizona began about 1881 and continued until about 1909. X004-46, p. 169 (Brown, *Territorial*).

124. Extensive cattle grazing before the 1880's changed the streamflow and started to impact fishes in central Arizona. Cattle grazing and trampling of stream banks increased soil erosion, stream headcutting, and the draining of natural wetlands. X006-6, p. 13 (Mueller, *Lost*).

125. An Arlington ranch man noted that cattlemen, burning the heavy brush on the banks, changed the River's character; this activity destroyed the natural protection and left the soft silty soil exposed to rapid erosion; and the 1890 and 1891 floods helped break down the River's confining banks, interfering with the established equilibrium. X025-116, p. 67 (Ross).

126. The combination of little precipitation and extensive grazing before 1905 caused a deterioration in the vegetation of the valley, which may have made the alluvium more susceptible to erosion. X032-124, pp. G -12-13 (Burkham, *Channel Changes*).

127. Irrigation has diverted water, and removal of forest cover has left the surface unprotected from erosion, causing the streams to become overloaded with sediment. X019, p. 95 (*The Lower Gila Region, Etc.*).

128. Roosevelt Dam on the Salt River was completed in 1912. 004, p. VI-9 (ASLD Lower Gila Report). Water storage behind the Dam had begun in 1909, diverting water from the Salt and Gila Rivers. Tr. 11/17/05, p. 206 (Jackson).

129. By statehood, extensive diversions and impoundments on the Salt River had largely reduced flows downstream of the Salt-Gila confluence in Segments 7 and 8. 004, p. X-2 (ASLD Lower Gila Report); Tr. 11/17/05, p. 206 (Jackson).

130. Other dams were closed after statehood: Gillespie in 1921, Ashurst-Hayden in 1923, Coolidge Dam in 1928, Painted Rock in 1959. 004, pp. IV-20, IV-61–IV-62 (ASLD Lower Gila Report).

131. After statehood, boating was still possible in some reaches of the River during portions of some years. 004, p. X-2 (ASLD Lower Gila Report).

132. It would have been possible to navigate the entire River in a wooden boat in 1912 if the water had been restored. Tr. 6/18/14, pp. 641-42 (Farmer).

133. Irrigation now occurs in the Duncan and Safford Valleys (Segments 1, 3), on the plains west of Hayden to Phoenix (Segment 5, 6), the Buckeye Valley, from Gillespie Dam to Gila Bend, the Dendora Valley (Segment 7); on many of the River's tributaries; and on the San Carlos and Gila River Indian Reservations. 004, pp. VI-3–VI-4 (ASLD Lower Gila Report).

134. The water table, once a few feet below the surface, has dropped hundreds of feet. 004, p. III-22 (ASLD Lower Gila Report). Consequently groundwater is no longer recharging the River. 023, p. 11 (Hjalmarson 2002 Rpt.). Little evidence of the River's natural flow remains. 025, p. 31 (Hjalmarson Notes).

135. The River was in its ordinary and natural condition until the 1860's when agricultural development and diversions began. *See* Arizona State Land Department's Closing Brief on the Navigability of the Gila River for State Title Purposes, Section II(A)(1)

136. Non-navigability experts agree that the River was not in its ordinary and natural condition at the date of statehood. *See* Tr. 8/18/14, p. 1418:12-21 (Littlefield); Tr. 6/20/14, pp. 1157:23–1159:1 (Burtell); Tr. 8/19/14, pp. 1711-13 (Mussetter); Tr. 8/20/14, p. 1787:13–1788:2 (Mussetter).

IV. General Descriptions

137. Historic descriptions of the River vary but generally confirm the hydrologic and geomorphologic evidence that the Gila was navigable at statehood. X020-79, PPT 76-88, 98 (Fuller Nav.).

138. Historical descriptions almost exclusively describe the River with a single low-flow channel. X020-79, PPT 76-88, 98 (Fuller Nav.).

139. Absent diversions, the descriptions typically describe a River from one to four feet deep (although there are certainly deeper areas) and 20 to 150 yards wide. X020-79, PPT 76-88, 98 (Fuller Nav.).

140. Historic accounts are of great value. Tr. 6/20/14, p. 1047 (Burtell).

A. Prehistory and Spanish Exploration

141. Some native tribes have traditional stories that include boats. 016, p. 19 (Tellman Papers).

142. No archaeological evidence exists of such boats, but this is not surprising considering the nature of the materials out of which those boats would have been constructed. X020-80, PPT 60 (Fuller Boating).

143. Native peoples have lived along parts of the River for approximately 12,000 years. 004, pp. III-10, III-12 (ASLD Lower Gila Report).

144. The River played a major role in human settlement patterns and occupational success of the many prehistoric populations along the River. 004, p. III-20 (ASLD Lower Gila Report).

145. The River provided a wide variety of dietary and other subsistence resources, including permanent water and fish as a source of protein. 004, p. III-20 (ASLD Lower Gila Report).

146. Agriculture was the primary use of the River; the Hohokam people diverted water from the River for their crops from approximately 550 A.D. to 1450 A.D. 004, pp. III-21, X-1 (ASLD Lower Gila Report).

147. Indian irrigation took place primarily in Segments 3, 5, 6, 7 and 8. Tr. 6/16/14, p. 161 (Fuller).

148. The Gila River Pimas employed a range of field laterals, ditches, and primary canals to convey irrigation water from the Gila to their crops. This complex technology reflected many centuries of experience with the Gila-Salt River oasis and the streams sustaining it. X015-3, p. 3-1 (*Sonoran Desert Traders*).

149. Some Indian canals had capacity for 240 cfs in hundreds of miles of canals that irrigated tens of thousands of acres. Much of the water flowed back to the river. Some irrigation water percolated into the ground. Tr. 6/16/14, pp. 163-65 (Fuller).

150. On the Upper Gila, Native Americans, principally the Apache, historically used the River. 002, p. 3-3 (ASLD Upper Gila Report).

151. Traditionally, Native Americans used various types of watercraft: the Sioux of the Mid-West used tub-boats or bull-boats; the Hupa of Northern California and Louisiana Indians used dugout canoes; the Haida of Alaska used curved canoes; the Kodiak of Alaska used skin boats, and the Utes of Nevada used reed boats. X004-24 (*Nature and Science*).

152. In a Tohono O'odham Nation creation account, Coyote told Montezuma to build a canoe to enable him to survive a coming flood. Tr. 6/16/14, p. 166 (Fuller); Tr. 6/17/14, pp. 482-83 (Fuller).

153. When Spanish explorers first visited Pimeria Alta, they found Piman Indians dwelling along 150 miles of the prime Gila River bottoms. X015-9, p. 7 (*Once A River*).

154. Early Spanish explorers regarded the River as a reliable watering place for their expeditions, some of which were large and included herds of livestock. X025-116, p. 64 (Ross).

155. Father Kino, in 1698 describes small boats built and used on the River by Native Peoples. X006-9, p. 3 (Hjalmarson Citations).

156. About 6,000 Indians lived on the Gila in 1742. X025-116, p. 66 (Ross).

157. The Spanish named the River "Rio de Las Balsas" (River of Rafts), either because they had to cross the Upper Gila on rafts or because the Indians used wicker baskets to cross it. 002, p. 3-6 (ASLD Upper Gila Report); 016, p. 20 (Tellman Papers); Tr. 6/16/14, pp. 166-7 (Fuller).

158. The Gila River was once called "Rio de los Santos Apostoles." Others, "noting that Indians crossed this river in wicker baskets, called it the "Rio de las Balsas." X025-110 (Granger, *Arizona Names*); X025-111 (USGS, *Geographic Names*).

159. Early observers described the River's well-defined stream, framed by a gallery of native cottonwoods and willows that formed a green ribbon that travelers could trace for hundreds of miles through the desert. 015-3, p. 2-15 (Gookin Report).

B. Trappers

160. Some of the earliest users of the River for trade and travel were trappers, who entered the Southwest in the 1820s. X030-121, p. 5 (Davis Thesis).

161. Records of trappers in early Arizona are rare because the trappers were operating illegally before 1821. X030-121, p. 5 (Davis Thesis); X030-120, p. 8 (Blomstrom, *Fur Trading*).

162. Even after 1821, licenses were difficult to obtain and tariffs were common. X030-120, pp. 3-4 (Blomstrom, *Fur Trading*).

163. Trappers were generally close-mouthed about their activities in Arizona, and most trappers left no written accounts of their expeditions. X030-121, p. 11 (Davis Thesis).

164. After 1821 trading became legal but trapping by non-Mexican citizens remained difficult and in many cases illegal. X030-121, p. 8 (Davis Thesis).

165. Trapping in early Arizona was also dangerous, with threats from Native Americans, bears and other trappers common. James Ohio Pattie estimated that only 16 men out of 116 survived their first years' trapping in the Southwest. X030-121, p. 18 (Davis Thesis).

166. Sante Fe and Taos were the most important market and supply depots for trappers operating in Arizona. X030-121, p. 10 (Davis Thesis).

167. In spite of the Mexican government's and native peoples' opposition, white trappers operated illegally in what is now Arizona, finding plenty of beaver on the River. These trappers included James Ohio Pattie, Ewing Young, William Wolfskill, Michael Robideau, and George Yount. X030-120, pp. 20-26 (Blomstrom, *Fur Trading*); X030-121, p. 10 (Davis Thesis).

168. One of the few trappers to leave a record of their activities in Arizona was James Ohio Pattie. X030-120, p. 9 (Blomstrom, *Fur Trading*).

169. Pattie and his party of beaver trappers trapped their way down the Gila, entering Arizona in December 1824 from New Mexico. Pattie, in early 1825, described the River in Segment 1 as "beautiful, running between banks covered with tall cottonwoods and willows." X006-8, p. 55 (26/122) (Pattie Narrative).

170. On January 1, 1825, Pattie and his party of beaver trappers encountered the San Francisco River in Segment 2 which "carried as much water as the Helay, heading north." X006-8, p. 55 (27/122) (Pattie Narrative).

171. On his second trip down the Gila, in 1826, Pattie's party trapped farther down the River; Pattie described the Gila at the mouth of the Salt River (the border of Segments 6 and 7) as follows:

> We thence returned down the Helay, which is here about 200 yards wide, with heavily timbered bottoms. We trapped its whole course, from where we met it, to its junction with Red River [the Colorado].

X006-8, p. 91 (43/122) (Pattie Narrative).

172. On November 15, 1827, on Pattie's third trip down the Gila, he describes building a dugout canoe to assist with setting traps, and floating down in it as the River was too deep to be forded on horseback. X006-8, pp. 65-66 (Pattie Narrative).

173. Pattie records no difficulty using the dugout on the Gila, and indeed the story seems to be included more to give an account of a taste of typical trapping life, not as a grand adventure. X006-8, pp. 65-66 (Pattie Narrative).

174. In separate expeditions, both Ewing Young and William Wolfskill trapped the Gila prior to 1831. X030-120, p. 20-24 (Blomstrom, *Fur Trading*). Indeed, Mr. Wolfskill likely trapped the Gila several times. X006-8, pp. 65-66 (Pattie Narrative).

> By 1826, parties under Sylvester Pattie, Ewing Young, Michael Robideau, George Yount and others had traversed the course of the Gila to its confluence with the Colorado. In the process, they had discovered and trapped practically every tributary of that river ... Hill estimates of this period that, 'The number of American trappers engaged in the business during this period reached into the hundreds, and the beaver fur that was caught brought the trappers more than a hundred thousand dollars.

Id. at p. 26.

175. By 1832 hundreds of trappers had trapped streams in Arizona. X030-121, p. 10 (Davis Thesis).

176. Based on Mr. Pattie's one account, at least one trapper found the Gila suitable for boating, and indeed used a boat on the River, thus it is entirely logical and probable that other, undocumented trappers did the same thing. 016, p. 21 (Tellman Papers).

177. The Treaty of Guadalupe Hidalgo, which ended the Mexican-American War, was signed on February 2, 1848. 9 Stat. 922 (1850).

178. Some trappers used boats made of horses' hides to boat down the River and sometimes made dugout canoes where they found appropriate wood. 016, p. 21 (Tellman Papers).

179. Traders, trappers, settlers and the military travelled over land to get to Arizona. They arrived by wagon or horseback, so it made no sense to abandon their horses and wagons, build a boat, go west and if trading or trapping work their way back upstream. X020-80, PPT 65-71 (Fuller Boating).

C. Explorers and mapmakers

180. Dragoons led by Col. Stephen Watts Kearny, traveled west from Santa Fe through Arizona; one of their primary missions was to create the first accurate map of the region

between the Rio Grande and the Pacific Ocean. Thus, the unit contained many well-trained topographical engineers. X004-3, p. 25 (Davis, *Man and Wildlife*).

181. Emory estimated the River's flow at about one-half of the Colorado's, and he saw large fish – weighing between 25 and 30 pounds – in the River. 001-18, p. 99 (Tellman, *Arizona's Changing Rivers*).

182. At the Colorado junction, Emory contrasted the "sea-green waters" of the Gila with the "chrome-colored hue of the Colorado." X025-116, p. 66 (Ross).

183. Clyde Ross (the author of USGS 1923 Water Supply Paper 489) states: "By no stretch of the imagination could the present-day mud-laden water of the Gila be considered "sea-green". X025-116, p. 66 (Ross).

184. In 1847, Nathaniel Jones, a member of the Mormon Battalion, made boats from wagons, which held 12 oxen each. X020-79, PPT 117, Segments 6-8 (Fuller Nav.); Tr. 6/16/14, p. 203 (Fuller).

D. Anglo Settlement

185. Stage lines began crossing Arizona in 1857; the San Antonio and San Diego Mail Line traveled through Tucson, up to the Pima Villages (near Sacaton), and Yuma. 004, p. IV-64 (ASLD Lower Gila Report).

186. The Butterfield Overland Mail Route, which could also carry passengers, replaced the San Antonio and San Diego stage in 1858. This line ran through Tucson, Sacaton, Gila Bend, and then continued along the River to Yuma. 004, pp. IV-64–IV-65, Fig. 15 (ASLD Lower Gila Report).

187. By 1863, when Arizona became a territory, Pinkney Tully and Estevan Ochoa began a stage and freight line running from Yuma to Santa Fe. X012-71, p. 452 (*Far Southwest*).

188. Before the coming of the railroads, wagon trains "wound like great serpents over every road and to every town, post, and camp where humanity had found habitation." X012-71, p. 452 (*Far Southwest*).

189. The Civil War interrupted stage line service in Arizona, but service resumed in 1867. 004, p. IV-64 (ASLD Lower Gila Report).

190. The Texas and California Stage Company began operation in 1875, and by 1879 several local stage lines operated within Arizona. 004, p. IV-64 (ASLD Lower Gila Report).

191. Toll road construction began on the Upper Gila in Segments 1 and 2 in the 1880s and 1890s; by the early 1900s, highways suitable for auto traffic were in place. 002, p. 3-25 (ASLD Upper Gila Report).

192. The railroads came into Arizona after the Indian difficulties were under control and new mining discoveries made the territory a more attractive placed. X012-71, p. 462 (*Far Southwest*).

193. Early politicians like Governor Safford had an economic stake in railroads and used their political powers to bring railroads to Arizona. X012-71, p. 458-463; 476 (*Far Southwest*).

194. One of the territorial legislature's first acts was to incorporate six toll roads and two railroad lines, one of which would run down to Guaymas, Mexico. Many of the legislator's had interests in the railroad and toll road companies. X012-71, pp. 440-41 (*Far Southwest*).

195. On the Upper Gila in Segments 1 and 2, railroads between the mines and smelters began around 1878; in 1883-84 the Arizona and New Mexico Railroad line connected Clifton with the Southern Pacific line. 002, p. 3-25 (ASLD Upper Gila Report).

196. In general, it was more convenient for people to travel around the state by railroad or by wagon than by river, because the railroads went where people wanted to go and wagons could go anywhere. Tr. 6/16/14, pp. 54-56 (Fuller); X020-80, PPT 63-73 (Fuller Boating).

197. Mining companies could ship ore more cost-effectively and faster by train or wagon than by river, and trains and wagons could carry more cargo than boats. Tr. 6/16/14, p. 58 (Fuller); Tr. 6/17/14, pp. 312-13 (Fuller); X025-107 (Ridgeway Photo); X021 (SCAT Supp. Evid., photos 3 and 4).

198. On the Lower Gila the Southern Pacific Railroad Company entered Arizona from the west through Yuma; a bridge over the Colorado was built in 1877, and by May 1879 the railroad had reached Casa Grande and by March 1880 Tucson. 004, p. IV-64 (ASLD Lower Gila Report).

199. The population of Arizona began to rise shortly after the railroad came to the State. X020-79, PPT 73 (Fuller Nav.).

200. Competition from the railroads was fierce, and after the railroads arrived, the steamboat industry on the Gila quickly fell apart. *See* X028, pp. xiii, 49, 71, 73, 86 (Lingenfelter, *Steamboats on the Colorado*).

201. A Tucson newspaper reported in 1883 that the Gila had been navigated to the Santa Cruz. The article further stated that the railroad company had "killed all opposition boats in the river, except the up steamers in the Saline stream this side of Phenix [sic]." X004-13 (*Arizona Weekly Citizen*, 6/9/1883).

202. In 1868 surveys began in Arizona along the Gila to make land available for settlement. X002, p. 28 (Littlefield Rpt.).

203. Land surveyors sometimes recorded the depth and width of watercourses, especially where those watercourses crossed section lines. X002, p. 15 (Littlefield Rpt.) (Federal surveys contain a wealth of information about the nature of [the Gila]).

204. Federal surveys of the area reported the presence along the banks of a lot of cottonwood, brush, and mesquite, indicating a normally stable river. Tr. 11/17/05, p. 251 (Hjalmarson).

205. Federal surveyors sometimes used boats to carry out their surveying duties: in 1890, a surveyor for the Bureau of Land Management wrote the following in his field notes: "I cross my flag in a boat to the right bank." 004, p. IV-25 (ASLD Lower Gila Report). However, at times of high water, the River "becomes almost impassable for boats," as a federal surveyor had noted in 1871. 012, p. 53 (Littlefield 2005).

206. The US Bureau of Land Management periodically published field manuals for government surveyors under the general title, "Instructions to the Surveyors General." The Instructions gave various surveying directions with respect to navigable and non-navigable watercourses. The Instructions do not define "navigable" or "non-navigable". X025-86 through X025-93 (White). "Navigability" in the surveyors' instructions may have referred to interstate commerce, and each surveyor could unquestionably have had his own standard. Tr. 8/18/14, pp. 1437-38 (Littlefield).

207. Although surveyors were usually honest and reliable, survey and patent frauds took place in Arizona and other states. Tr. 8/18/14, pp. 1442-1443 (Littlefield).

208. In 1877, the Gila was described as follows, "For four hundred miles, at low water, the Gila has an average width of about one hundred feet, and a depth of one to two feet." X016-6, p. 38 (Hodge, *Arizona At It Is; or The Coming Country* (1877)).

209. The 1933 Guidebook of the Western United States (a Geological Survey Publication) described the River as follows:

> When [the Gila River] was originally discovered there was a well-defined channel with hard banks sustaining cottonwoods and other trees and plants. The current was swift and deep in places, so that the stream could be navigated by flat boats of moderate size, and it contained sufficient fish to be relied upon as food for many Indians. It was reported also that the water was clear and sea-green, very different from the present muddy stream. Now the Gila River is depositing sediment in its lower part, and its braided course follows many narrow sand-clogged channels. Possibly these changes may be due partly to diverting and damming the water and to an increase of silt caused by the removal of forest and increased grazing in the higher region. Indians irrigated for a very long time. Irrigation was again started in a small way by settlers who came soon after the bimonthly stage line between San Antonio and San Diego was established in 1857.

X006-5, p. 228 (*Guidebook*).

210. Contemporary researchers have agreed with these descriptions. "The Gila River was once a well-defined stream meandering across a Lower Sonoran Desert floodplain with here and there marshes, lagoons, and oxbows. Its gallery forest of native cottonwoods and willows formed a green ribbon that travelers could trace for hundreds of miles throughout the desert. Other living streams – the San Pedro, Santa Cruz, Salt, Agua Fria – added their own waters to the middle Gila." X015-9, p. 7 (*Once A River*).

211. According to the 1870 U.S. census, the population of Arizona was less than 10,000 people-far less than half of these lived along Arizona rivers. X020-80, PPT 61-64 (Fuller Boating).

212. At statehood, there were only 204,000 people living in Arizona and the River was already highly diverted. X025-104 (AZ Census).

213. The Apache wars did not end until 1886, so for much of the historic period, a hostile Native American threat was a reality in terms of settling, using and occupying the River by settlers, traders and trappers. Tr. 6/16/14, p. 168:3-11 (Fuller).

214. Around 1864, about 4,187 white settlers were concentrated in three widely separated areas: the Santa Cruz Valley, which included Tucson and Tubac; along the lower reaches of the Gila and Colorado rivers – Gila City, La Paz, and Fort Yuma; and at Prescott, Wickenburg, and Fort Whipple. An estimated 30,000 Indians were living in Arizona at that time. X012-71, p. 436-37 (*Far Southwest*).

215. The Gila River when first seen by white men presented a very different aspect from that of to-day. It had a well-defined channel with hard banks, on which cottonwoods and other green-leaved plants were growing. The current was swift and deep enough even in comparatively dry portions of the year to make fording difficult, except at a few places, and to float a flat boat of some size. Fish were plentiful enough to be depended on as food throughout the year by a considerable number of Indians. Strangest of all to one who knows the silt-laden waters of the present stream the water of Gila River is reported to have been clear and sea-green. The river had a definite channel with hard banks in 1889. One of the causes, perhaps the principal cause, of the change has been the interference of man with the work of nature. X019 (USGS, *Water Supply Paper 498*, p. 237 (1923)), p. 94.

216. Early transportation on the Upper Gila was by horseback, ox and mule team and stagecoach. 002, p. 3-25 (ASLD Upper Gila Report).

217. European colonization on Gila and Salt Rivers began in 1866 and increased annually. X015-2, p. 6-9 (Dobyns, *Creation and Expansion of the Gila River Indian Reservation*, 2000).

218. After the Civil War, settlers moved to Arizona. By 1869, these newcomers had formed enough settlements upstream from the Gila River Indian Reservation to impact the Reservation's water supply. X015-6, p. 4-1 (Gookin, *Hydrologic History,* 2000).

219. By 1876, water supplies to the Reservation were less dependable than in the virgin state. X015-6, p. 4-6 (Gookin, *Hydrologic History,* 2000).

220. Some of the settlers' canals did not return water to the river, instead wasting the water into the desert. X015-6, p. 4-6–4-7 (Gookin, *Hydrologic History,* 2000).

221. The founding of Safford, Thatcher, Winkelman, Kearny, Florence, Coolidge, Gila Bend, and Wellton, along the River in the late 1870s corresponded with the construction of the railroad; these communities and Yuma became centers for agriculture as irrigation facilities developed. 004, p. VIII-1 (ASLD Lower Gila Report).

222. Congress enacted the Desert Lands 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.

223. The end of the Apache wars of the 1880s removed the last disincentive for settlement, which led to further depletions of the River's flow. Tr. 11/16/05, p. 169 (August).

224. Agriculture became the primary land use along the River from the New Mexico border to the River's confluence with the Colorado. 004, p. VIII-8 (ASLD Lower Gila Report); 002, p. 5-48 (ASLD Upper Gila Report).

225. There was much irrigation in the Mohawk and Palomas districts; it is estimated that 1,000 to 3,000 acres were under cultivation along the Gila in Yuma County in 1897. X025-116, p. 99 (Ross).

226. The second largest irrigated district in Arizona in 1911 was in Graham County on the upper Gila River. It was settled by Mexican colonists in 1874 and later by Mormons in 1879. The river's flow was comparatively regular and fairly adequate to irrigate the area under cultivation. X012-70, p. 11 (*Agricultural Practice*).

227. At Arizona's constitution convention in 1910, the delegates modified traditional common law water rights to fit the needs of a state dependent on irrigation. X012-71, p. 503 (*Far Southwest*).

228. Arizona became a State on February 14, 1912.

V. Boats

A. Boats and Boating on the Colorado

229. Lt. Whipple of the U.S. Army of Corps of Topographical Engineers used an inflatable raft to cross the Colorado River near Fort Mohave sometime before 1853. X004-7, p. 3 of 12 (*History of Rubber Boats*).

230. Nathaniel Galloway designed and developed a boat and boating techniques in the late 19th and early 20th centuries specifically for use on the Colorado River. X004-8 (*'Than The Man*). Photograph of a Galloway boat, 1909. X004-45 (Grand Canyon Boats). Galloway devised a flat-bottomed upturned boat for shallow draft and ease of pivoting. In 1897 he and a fellow trapper ran the entire Colorado River. X004-22 (*If Boats Could Talk*).

231. Bert Loper went down the Green and Colorado Rivers in 1907 in a steel hulled Whitehall boat. X004-22 (*If Boats Could Talk*).

232. Joseph Pouliot of Detroit had four row boats – "cataract boats" - built for a trip down the Colorado River in 1909; Galloway supervised their construction. The boats were 16 ½ feet long, with 4-foot beam, 18" deep; the bottom was covered with a thin iron sheet. X004-27 (*Pouliot Boat*).

233. Photographs from 1911: man with small canvas boat; fishermen with collapsible boat; man carrying a canvas boat; wooden boat with hole on shore and another boat in the background. X004-45 (Grand Canyon Boats).

B. Types of Boats Available Before or Around Statehood

234. Various types of low-draft boats were readily available by 1912: Folding canvas canoes; light canoes; light steel boats; steel hunting and fishing boats; cedar canvas-covered canoes; row boats; cedar canoes. X004-49 (advertisements in *Hunter-Trader-Trapper*, July 1912.)

a. Galloway-style boats were available in Arizona before statehood. X004-45 (Grand Canyon Boats) (1909 Stone expedition photo).

b. Folding canvas boats were available before statehood in Arizona, and were used for commercial purposes. X004-45 (1910 photo of boat and Ellsworth Kolb with photography equipment; 1911 fishermen with folding boat; 1916 Emery Kolb carrying folding boat; 1911 man on shore with canvas boat).

c. Canoes: X004-26 (article on sailing canoeing in *Overland Monthly*, July 1892); X004-1 (Kennebec canoes produced in the early 1900s); X004-49 (advertisement in *Hunter-Trader-Trapper*, July 1912). X004-41 ([and yachts], Stephens, W.P. "Sport in All Kinds of Water Craft . . .," *Country Life*, August 1908).

d. Portable folding boats: X004-37 (*The Manufacturer & Builder*, 1874); X004-51 (King Folding Boat Co. 1880s); X004-22 ("Zee Grant's Folding Kayak" in *If Boats Could Talk*, 1907); X004-32 ("Life Saving Folding Canvas Boat", in *Hunter-Trader-Trapper*, 1908); X004-29 ("Outing With a Portable Equipment," *American Homes and Gardens*, 1911); X004-49 (advertisement in *Hunter-Trader-Trapper*, 1912); X004-34 ("A Back-Yard Wilderness," 1915).

e. Build-it-yourself boats: X004-38 (*The Manufacturer and Builder*, August, 1875); X004-36 ("How to Build a Cheap Boat," 1905); X004-50 (advertisement in

Hunter-Trader-Trapper, 1912). X004-39 (Brinckle, William Draper, "Just a Boat," *Country Life*, July 1909).

f. Mail-Order Boats: X004-44 (canvas boats, 1895 Montgomery Ward and Sears Roebuck catalogs); X004-32 (advertisement in *Hunter-Trader-Trapper*, 1908); X004-31 (Sears Roebuck catalog, 1912).

g. Ducking Boats: X004-42 (pneumatic "boat" with leg cases were available for duck-hunting, *Scientific American*, 1895); X004-35 (ducking boats were generally 14 – 16 feet long, wide and low with extremely shallow draft; lake and river boats have deeper draft and narrower beams, *Holmes*, 1901).

h. Sweepboats or "scows": These appeared on the Salmon River in the 1870s. Such boats were of shallow draft, 16' – 35' long, 5' – 10' wide, with sidewalls of 3-4 feet. X004-30, pp. 30-31 (*Sunk Without a Sound*).

i. Steamboats: X004-25 *(Mountain Boats and Grasshoppers.* Thomas Y. Crowell, 1966 (Selected Pages) describes steamboats on the Missouri in the 19th century).

j. Rowboats: X004-40 (Partridge, W.E., "Rowboats and Boating," *Country Life*, June 1910).

235. Sears and Wards catalogs. 016, p. 32 (Tellman Papers).

236. Except for the steamboats, which were used at the River's lower end up to where Dome is today, the historical accounts are limited to low-draft boats, canoes, and skiffs. Tr. 11/16/05, pp. 63, 79, 85 (Fuller).

237. Generally, the described trips occurred during the fall, winter, and spring months. Tr. 11/16/05, p. 44 (Fuller).

238. Boats were slightly more common in urban areas like Florence/Kelvin. Although they were seldom mentioned in journals or newspapers, they were clearly available for use when needed such as flood rescue, suggesting their general use for hunting and fishing. 016, p. 25 (Tellman Papers).

239. When needed or desired, small boats in Arizona were commonly homemade from lumber or driftwood. 016, pp. 30-31 (Tellman Papers).

240. ASLD's evidence demonstrates that historic canoes and flatboats were similar to modern canoes and flatboats in their design and depth requirements. X020-80, PPT

109-117 (Fuller Boating); Tr. 6/16/14, pp. 43:19-44:6, 85:6-86:6, 88:23-89:4 (Fuller); Tr. 6/18/14, pp. 548:21-549:7 (Farmer).

241. For example, a modern canoe requires a minimum river depth of six inches, and a historic canvas canoe requires a minimum river depth of three inches. X020-80, PPT 116 (Fuller Boating); Tr. 6/16/14, pp. 88:23-89:18 (Fuller).

242. Mr. Fuller and Mr. Farmer both testified that while some historic materials were less durable then some modern materials, the expectations of historic boaters were that they could and would repair boats on the river as necessary. X020-80, PPT 114-115 (Fuller Boating); Tr. 6/16/14, pp. 86:20-88:22 (Fuller); Tr. 6/18/14, pp. 550:22-551:17 (Farmer).

243. ASLD's evidence also demonstrated that manufactured canoes and flatboats as well as home-built canoes and flatboats were both available and used in Arizona at and before the time of statehood. X020-80, PPT 30, p. 46 (Fuller Boating); Tr. 6/16/14, p. 39:6-14 (Fuller).

(i) **Ferries**

244. In April 1884, the *Phoenix Herald* reported that A.J. McDonald was building a large ferry boat (16 by 18 feet) for the Gila and Salt River Ferry Company, which was to be used on the Salt and was of the same dimensions as one that had been sent to the Gila. 004, p. IV-7 (ASLD Lower Gila Report).

245. The *Arizona Sentinel* reported on March 28, 1891, that Straus, Dallman & Co. had put into service a new ferryboat – large enough to carry a loaded six-horse team in safety. 004, p. IV-8 (ASLD Lower Gila Report).

246. By spring 1905, two new ferry boats – the *Mayflower* and the *Rey Del Gila* (20 feet long, six feet wide, and capable of carrying a 3,000 pound load) "entered the thriving ferry boat business." But a hand-driven side propeller boat proved unable to negotiate the River. 004, p. IV-13 (ASLD Lower Gila Report).

247. Ferries also operated on the River after statehood: The *Arizona Blade Tribune* of February 9, 1916, reported that an automobile had slipped off a ferry boat into five feet of water. 004, p. IV 19 (ASLD Lower Gila Report).

248. Ferries crossed the Gila in multiple places until they were replaced with bridges. X020-79, PPT 120 (Fuller Nav.); Tr. 6/16/14, p. 208:8-21 (Fuller).

C. Historical Boats vs. Modern Boats

249. The design of a historical canoe is virtually indistinguishable from the design of a modern canoe; historical boats were generally made out of wood or skins, and fabric in later years; and the weight of historical wooden boats is virtually indistinguishable from the weight of modern plastic boats. Tr. 6/18/14, pp. 549, 597 (Farmer).

250. Depth requirements for modern canoes = half a foot or less; for old-time canvas canoes, less; for drift boats, about a foot; for duck boats, two tenths of a foot; for kayaks, less than half a foot; for rowboats, about a foot. Thus, modern boats are meaningfully similar to boats available at statehood. Tr. 6/16/14, pp. 88-89 (Fuller).

251. Although boat-making technology has improved since statehood, the depth and width of water needed for boating has not substantially changed. 002, p. 6-4 (ASLD Upper Gila Report); Tr. 6/16/14, p. 85 (Fuller). A canoe or kayak needs only six inches to float. Tr. 6/16/14, p. 63 (Fuller).

252. Modern boats are meaningfully similar to boats available at statehood: the draft, depths needed, weight, designs, and physics are essentially the same. Tr. 6/16/14, pp. 43-49, 85-89 (Fuller); Tr. 6/18/14, pp. 548-551, 585, 596-597, 635 (Farmer).

253. Today's plastics, Hypalon, and other sorts of modern materials, are more durable than materials used in historical boats. Tr. 6/16/14, pp. 86-87 (Fuller).

254. In historical times, boaters expected their canvas or wooden boats to have low durability and would take along the necessary repair materials. Tr. 6/16/14, pp. 87-88 (Fuller); X020-80, PPT 115 (showing the Kolb brothers repairing a hole in their wooden boat, the Edith, on the Colorado in December 1911). The Kolb brothers patched the hole with wood and lead and finished their trip. Tr. 6/16/14, p. 88 (Fuller).

255. Some boaters in 1910 found that their boat was too long, so they cut it in half, rebuilt it, and continued their trip down the Colorado. Tr. 6/16/14, p. 88 (Fuller).

256. Lieutenant Joseph Ives stated about Arizona, "[f]or want of tools and materials to construct a raft this would have been difficult, if not an impractical undertaking, had we not been provided with one of Buchanan's portable boats." Tr. 6/16/14, pp. 26:18-27:10, 171:16-19 (Fuller).

257. Canvas and wood boats could be ordered by mail from Sears or Montgomery Ward. Tr. 6/16/14, p. 39:6-14 (Fuller).

258. Historic canoes and flat boats could have easily been utilized with a heavy load of cargo in depths of one foot, based upon their similarity to modern boats. X020-80, PPT 116-17 (Fuller Boating); Tr. 6/16/14, pp. 88:23-90:4 (Fuller).

259. Scattered throughout the record are numerous accounts that show that small boats were available when and where they were needed, sometimes at a moment's notice. *See* X019 (Maricopa Supp.); 021, pp. 16-17 (Jackson PowerPoint); X020-79, PPT 96, 119 (Fuller Nav.); Tr. 6/16/14, pp. 185:20-186:10 (Fuller).

260. Moreover, the evidence also demonstrates that the Gila is not easier to boat now than it was historically. X020-80, PPT 118 (Fuller Boating); Tr. 6/16/14, pp. 90:5-91:2 (Fuller).

261. Far from it: experts in the case generally agree that historically the Gila would have had more water (in in some cases substantially more) but for diversions of its flows. Tr. 6/20/14, p. 1158:5-10 (Burtell); Tr. 8/19/14, p. 1700:3-9 (Mussetter); Tr. 6/19/14, pp. 966:20-967:10, 967:20-25 (Gookin).

262. The additional water would have made the Gila more boatable, not less. Tr. 6/16/14, p. 90:12-16 (Fuller).

D. Modern Boating

263. Generally, modern boating occurs on the River's low-flow channel. Tr. 6/16/14, p. 101 (Fuller).

264. Donald Farmer has boated many Arizona rivers, including the Gila which he has boated for approximately the last 20 years, using inflatable rubber rafts, inflatable cataracts, canoes, plastic kayaks, and inflatable rubber kayaks. Tr. 6/18/14, pp. 543-48, 575 (Farmer).

265. Mr. Farmer owns a 14-foot whitewater canoe with a draft of 1-1/2 to 2-1/2 inches, depending on the load; the canoe can take a load of 700 lbs; a 16-foot canoe with a draft of 1 inch with only himself in it and can float it in 25 cfs (a load of 850 lbs would mean a draw of 2 inches); and an 18-foot canoe that can take 1,300 lbs with a draw of 2-3/4 inches. Tr. 6/18/14, pp. 567-70 (Farmer).

VI. Obstacles and Obstructions

266. Whether something is an obstacle to navigation depends on many factors, including the type of boat, the boater's experience, and the flow rate. X020-80, PPT 78-79 (Fuller Boating); Tr. 6/16/14 pp. 66-67 (Fuller).

267. Examples of potential obstacles to small boats are rapids (Class VI only) and waterfalls (some). X020-80, PPT 78-79 (Fuller Boating); Tr. 6/16/14 pp. 66-67 (Fuller).

268. Potential obstructions that may cause some small difficulties include beaver dams, sand bars, strainers and sweepers, but these are not barriers to navigation. X020-80, PPT 78-79 (Fuller Boating); Tr. 6/16/14 pp. 66-67 (Fuller).

269. Long, continuous, and major rapids could be an obstruction. X020-80, PPT 80 (Fuller Boating); Tr. 6/16/14, p. 68 (Fuller).

270. Rapids are rated on an international scale from I to VI. X020-80, PPT 80 (Fuller Boating); Tr. 6/16/14, p. 68 (Fuller).

271. Unlike the rivers described in *PPL Montana*, the Gila River has no significant obstacles or obstructions that would require portaging and this make the River non-navigable. X020-79, PPT 131 (Fuller Nav.); *see PPL Montana*, 132 S.Ct. at 1223, 1231 (Great Falls reach is 17 miles long with distinct drops including five waterfalls and continuous rapids in between and always required portaging).

272. There are no waterfalls on the Gila, and the rapids are minor and infrequent. *Id.; see also* X020-80, PPT 83, 98 (Fuller Boating); Tr. 6/18/14, p. 566:10-12 (Farmer).

273. There are only 17 Class II rapids and one Class III rapid on the Gila. X012-72 (Gila Maps).

274. There are no Class IV or higher rapids on the Gila. X012-72 (Gila Maps).

275. Mr. Fuller and Mr. Farmer both testified that sandbars are easily avoided. X020-80, PPT 100-102 (Fuller Boating); Tr. 6/16/14, pp. 77:12-78:18 (Fuller); Tr. 6/18/14, pp. 572:12-573:2 (Farmer).

276. The navigable Colorado and Mississippi Rivers are both noted for the number and density of sandbars. X020-80, PPT 101 (Fuller Boating).

277. Sweepers and strainers are fallen trees in the channel or overhanging bank vegetation. X020-80, PPT 103 (Fuller Boating); Tr. 6/16/14, p. 79:1-19 (Fuller).

278. Like beaver dams, strainers and sweepers are, at best, temporary difficulties to boating. Tr. 6/16/14, p. 79:16-19 (Fuller).

279. Sweepers or strainers are not a barrier to navigability and are easily removed or easily avoided. X020-80, PPT 103 (Fuller Boating); Tr. 6/16/14, p. 79:1-24 (Fuller).

280. Submerged trees are hazards that can be encountered on any navigable river. *See* X020-80, PPT 103 (Fuller Boating); Tr. 6/16/14, p. 79:1-19 (Fuller).

281. Sandbars are no problem on the River; if you see one, you just go around it. Tr. 6/16/14, p. 77 (Fuller); Tr. 6/18/14, p. 572 (Farmer).

VII. Wildlife

A. Native Fish.

282. The following big river fish were present in the historical Gila:

a. Colorado pikeminnow ("Colorado River squawfish," "Colorado salmon," "white salmon"), commonly known to reach 40-50 lbs at 3-4 feet; and lengths of 6 feet and weights over 100 lbs were probable. Up-river migrations in late winter-early summer required a water depth of one to two feet. F.M. Chamberlain reported in 1904 that these fish were harvested commercially from at least the lower Salt River. X012-73, pp. 2-3, ¶ 5(a) (Weedman Affidavit).

b. Razorback sucker ("humpback sucker"), averaged 1.5 to 2 feet long and weighed 6-10 lbs, but some grew to 2.5 feet long and weighed 13 lbs. Late winter-early summer migration required a water depth of one to two feet. These fish were eaten by Native Americans and European settlers. F.M. Chamberlain reported in 1904 that suckers were harvested commercially from at least the lower Salt River for sale in adjacent towns. X012-73, p. 3, ¶ 5(b) (Weedman Affidavit).

c. Humpback chub and bonytail chub, averaged one foot long and weighed 3 lbs for adults, with the largest estimated at 1.5 and 4 lbs. X012-73, p. 4, ¶ 5(c) (Weedman Affidavit).

283. As of 1878 trout were found in abundance in the headwaters of the Salt and the Gila. As soon as the railroad from Albuquerque to Flagstaff was completed, tourists with fly rods began arriving to "test the waters." X004-46, p. 225 (Brown, *Territorial*).

284. In 1886, there were plenty of fish in the Gila; "they take the hook very well, several Colorado salmon having been caught that weighed 10 pounds each." X004-46, p. 212 (Brown, *Territorial*), quoting from the *Arizona Sentinel*, June 19, 1886.

285. In 1886 it was reported that "Trout [bonytails] 20 inches long and numerous other sorts and sizes of fish are being caught in a lagoon near the [Tacna] school house" on the lower Gila in Segment 7. X004-46, p. 213 (Brown, *Territorial*), quoting from the Arizona Sentinel, June 19, 1886 (brackets are in original).

286. In the pools above Duncan in Segment 1, suckers were plentiful until 1902 and salmon (Colorado pikeminnow) some years earlier. X004-46, p. 110 (Brown, *Territorial*).

287. In 1904, Chamberlain caught sixteen native species of fish during a U.S. Bureau of Fisheries survey of fishes in Arizona Territory, concentrating in the Gila River basin. X004-46, pp. 96-97 (Brown, *Territorial*).

288. By 1904, below the dam that is two or three miles below Safford in Segment 3, there was no sign of fish life. Several years before, when there were pools large enough for people to swim in, fish were abundant in that part of the River; salmon (Colorado pikeminnow) reached 35 pounds, and humpbacks and other suckers were common. X004-46, p. 111 (Brown, *Territorial*).

289. By 1904, the "Sunset" Dam was taking practically all of the water at the lower end of the Gila Box in Segment 2, leaving only a few fish. X004-46, p. 109 (Brown, *Territorial*).

290. Despite diminishing fish populations, in some parts of the River fishing remained a popular sport in the early 20th Century, as noted in certain advertisements:

a. "Catfish are biting freely; one catch of 35 fish was reported in the past week." X004-61 (*Arizona Republican*, 4/8/1905).

b. "The river is down so fishing is easy. April and May are the months the Colorado salmon (pikeminnow) are up the river; a number of medium-sized ones have been caught lately." X004-59 (*Arizona Republican*, 4/28/1906).

c. "Wherever there are deep holes in the Salt, Gila, or Santa Cruz, the fishing is good." Colorado River salmon (pikeminnow), catfish, carp, suckers, Verde trout, were in the rivers. X004-60 (*Arizona Republican*, 5/2/1908)

d. A few Colorado river salmon (pikeminnow) have been caught in the Salt and Gila and good catches have been made of catfish, carp, suckers, and Verde trout. X004-56, X004-57, X004-58 (*Arizona Republican*, 4/10/1908, 4/11/1908, 4/12/1908).

291. Of fourteen introduced species of fish, the common carp had appeared in Arizona rivers by the late 1800s. X007-65, p. 18 (*Native Fishes*).

292. Introduced fish are detrimental to native species, and their introduction can cause native fish to decline both in number of species and in population. X007-65, p. 40 (*Native Fishes*).

293. Historically, squawfish and razorback suckers extended up the River as far as Safford in Segment 3. X007-65, p. 26 (*Native Fishes*).

294. Frederick Chamberlain (of the U.S. Bureau of Fisheries) was told in 1904 that the razorback sucker, squawfish (pikeminnow), and "other suckers" had disappeared from the Gila near Safford in Segment 3 because of toxic effluents from the mines. X007-65, p. 42 (*Native Fishes*).

295. Large species such as the Colorado squawfish and flannelmouth and razorback suckers are no longer found in the River as of 1987 because they require habitats substantially different from current conditions. X007-65, p. 19 (*Native Fishes*).

296. Desert pupfish, which can live in severe conditions, now persist only along shallow margins of the River. X007-65, pp. 30-31 (*Native Fishes*).

B. Beavers.

297. Beaver occupying large rivers generally do not build dams or lodges. X025-101, pp. 43, 63 (Strong, *Beavers*).

298. Beavers who live along large rivers live in bank dens. X025-101, p. 54 (Strong, *Beavers*).

299. Any beaver dams in the main channel of the Gila would likely be destroyed by seasonal high flows; therefore beaver possibly dammed only side or backwater channels of the Gila or created dams in the tributaries. X012-73, p. 2, ¶ 4(g) (Weedman Affidavit).

300. Modern beavers on the Gila are bank-dwellers. Tr. 6/18/14, p. 566 (Farmer).

301. The evidence also shows that there were likely very few, if any, beaver dams on the River. X020-80, PPT 96 (Fuller Boating); Tr. 6/16/14, pp. 75:23–76:14, 190:23–191:25 (Fuller); X025-101, p. 43 (Strong, *Beavers*); Tr. 6/18/14, p. 566:13-23 (Farmer).

302. Even if beaver dams did exist on the main stem of the Gila, beaver dams are temporary obstructions, easily boated over or removed. Tr. 6/16/14, p. 76:8-14 (Fuller); Tr. 6/18/14, pp. 566:24-567:14 (Farmer).

303. Beaver were present in the Gila River system in historical times and were harvested in significant numbers as interstate commerce. They were likely harvested using site-built boats in addition to other methods of trap-setting and pulling. X012-73, p. 2, ¶ 4(f) (Weedman Affidavit).

VIII. Segments

A. Segment 1

304. Segment 1 is in the Duncan Valley and extends from the Arizona/New Mexico border to the upstream end of the Gila Box at the Highway 191 Bridge. Tr. 6/16/14, pp. 124, 131 (Fuller).

305. Stephen W. Kearny's Army of the West traveled down the Gila in 1846, and some of the party made notes: "The Gila at this place is much swollen by the affluence of the three streams just mentioned, and its cross section here is about 70 feet by 4." The three streams were the Prierte (San Francisco), the Azul (Eagle Creek), and San Carlos (Bonita Creek) in Segments 1 and 2. X008-2 (Burtell Decl., Attachment C, Emory, pp. 66-67; Turner, p. 92, n.20). "The River at this point [below Bonita Creek (Segments 1 and 2)] is some 60 yds broad and very rapid and quite deep." X008-2 (Burtell Decl., Attachment C, Griffin, p. 27).

306. Abraham Johnston, of the Kearny party, described the upper Gila (after they had crossed into Arizona in Segment 1), as:

> [A] beautiful mountain stream about thirty feet wide and one foot deep on the shallows, with clear water and pebbly bed fringed with trees and hemmed in by mountains, the bottom not more than a mile wide. The signs of beaver, the bear, the deer, and the turkey, besides the tracks of herds of Indian horses, were plain to be seen on the sand.

X004-3, p. 27 (Davis, *Man and Wildlife*).

307. Also in 1846, Emory described the River in Segment 1 as 50 feet wide and an average of two feet deep. X008-2, Table 1 (Burtell Decl.).

308. William Chamberlain and his party started near the Gila headwaters in what is now Gila National Forest in July (1849). They reported game to be scarce. "However his companions did have success in catching fish in the Gila near the present Arizona-New Mexico boundary [in Segment 1]." Chamberlain described the Gila as follows:

> The banks of the Gila . . . are fringed with cottonwood. At this point it is about 12 yards wide and 18 inches deep, and runs upon the first rock and gravel bed we have seen since leaving Pennsylvania. It is a swift flowing stream of clear, pure water, and abounds in trout, some of which are of a very large size. As soon as we encamp a number of our men prepared themselves with rod and line and went to 'try their luck' amongst these strangers of the finny tribe. They soon returned and reported favorably, having caught enough to supply 'all hands' for both supper and breakfast. Hill Dixon caught one that measured four inches between the eyes and weighed about 30 pounds.

X004-3, p. 47 (Davis, *Man and Wildlife*).

309. "At the Pima villages and above [Segments 1 - 6], the Gila River was a clear, swift little stream in the 1850's. The volume of water tended to be uniform for most of the year, and the river was fordable in most places. During drought periods the river occasionally dried up completely, or was entirely diverted by the Pima Indians for irrigation purposes." X030-121, p. 203 (Davis Thesis).

310. In April 1904, scientist Frederic Morton Chamberlain surveyed the Gila for fish, and described the River about 15 miles above Duncan, in Segment 1, as 10-50 feet wide and two feet deep. X004-46, p. 109 (Brown, *Territorial*).

311. A historical photograph of the River in Duncan Valley shows a wet, single low-flow channel. X020-79, PPT 91 (Fuller Nav.).

312. In modern times, Segment 1 (from the New Mexico line to the beginning of the Gila Box (Duncan Valley)), has perennial flow, some riffles, small rapids, sand and gravel bed; the main channel is sinuous to straight. There are no obstructions and no tributaries. X020-79, PPT 33 (Fuller Nav.); Tr. 6/16/14, pp. 124-25 (Fuller).

313. All the experts who opined on Segment 1 agree it is and was a perennial stream with reliable flow throughout the year. 002, p. 5-32 (ASLD Upper Gila Report); X008-2, p. 5 (Burtell Decl.).

314. Discharge from springs on the Upper Gila in Segments 1 and 2 provided a constant base flow, making the River a perennial gaining stream. 002, p. 4-7 (ASLD Upper Gila Report).

315. Archaeological reconstructions suggest that in the Upper Gila in Segments 1 and 2 streamflow changed little from the 740-1370 A.D. period to the 1800-1979 period. 002, p. 2-23 (ASLD Upper Gila Report).

316. Segment 1 has a compound river channel which consists of a braided flood channel and a sinuous to straight single thread low flow channel where boating would occur. X020-79, PPT 33 (Fuller Nav.); X035-129 (Huckleberry Decl.).

317. There are no rapids or natural obstructions within Segment 1. Tr. 6/16/14, p. 125:9-10 (Fuller); X020-79, PPT 32.

318. There are also no major tributaries to the River within Segment 1. Tr. 6/16/14, p. 125:10-11 (Fuller); X020-79, PPT 33 (Fuller Nav.).

319. In Segment 1, the River valley has an average width of about 300-600 feet, with floodplains that alternate from side to side, as the low-flow channel meanders across the valley bottom. 002, p. 4-6 (ASLD Upper Gila Report).

320. The experts agree that the theoretical historic depth of flow in Segment 1 is between a median of 0.9 (ASLD post-statehood depth) and 1.8 feet (Burtell reconstructed). *See* Exhibit A.

321. A study on the Upper Gila River by Mussetter Engineering shows hydraulic depths at the Virden Bridge site in New Mexico near the Arizona-New Mexico boundary that range between .5 and 4 feet. Of particular interest in this report are the plotted cross sections, which show a single or double low-flow channel (with one channel being clearly deeper) at flows between 60 and 220 cfs. X035-130, pp. C.34-53 (Mussetter 2006).

322. Modern flow depths in Segment 1 are sufficient to support canoes and flatboats 146 days per year (~40% of the time) and canoes alone 329 days per year (~90%) of the time, (X020-79, PPT 158 (Fuller Nav.); Tr. 6/16/14, pp. 225:1-226:4 (Fuller)) historic depths would have been more than sufficient to support trade and travel year round.

323. The loss of flows from significant agricultural diversions has affected the recovery of the natural channel after flooding and has caused the loss of native vegetation and the incursion of invasive species in Segment 1. X020-79, PPT 130, 131 (Fuller Nav.).

324. Mr. Fuller notes in his recent testimony that there has been a fair amount of encroachment into the valley in Segment 1, a loss of native vegetation and an invasion of non-native tamarisk. X020-79, PPT 157 (Fuller Nav.).

325. Between November 1890 and April 1891 two unnamed men boated the entire River from the New Mexico Highlands (above Segment 1) to Yuma (at the end of Segment 8) in a homemade wooden boat. X004-20 (*Tombstone Epitaph*, 4/19/1891). Their purposes were commercial, hunting and trapping. X004-20 (*Tombstone Epitaph*, 4/19/1891). Their boat was lost during a flood and they built a new one and completed their successful journey. X004-20 (*Tombstone Epitaph*, 4/19/1891); X020-79, PPT 109 (Fuller Nav.); Tr. 6/16/14, pp. 198:10-199:5 (Fuller).

326. In 1901 Charles Duvall used a small boat to boat down the Gila. X019, p. 18 (Maricopa Supp.). Mr. Duvall had started his journey at Bear Creek in New Mexico, and had experienced no difficulties by the time he reached Safford, in Segment 1. X019, p. 18 (Maricopa Supp.). He intended to continue his journey down to the junction with the Colorado, but was being forced to boat in canals in the alluvial valley portions of the River because of dams on the River. X019, p. 18 (Maricopa Supp.). Mr. Duvall's purpose was ultimately to travel to Washington State. X019, p. 18 (Maricopa Supp.).

327. No recorded historical boater had difficulty in Segment 1. *See* X020-79, PPT 121-123 (Fuller Nav.); X019, p. 18 (Maricopa Supp.); X004-20.

328. In terms of historical recreational use of the Gila, there is an unconfirmed report that Stanley Sykes boated the entire River in 1909. X025-110, p. 259 (Granger). A statement to this effect is made in Granger's Arizona Names, but no confirming documentation has been found. X025-110, p. 259 (Granger). Mr. Sykes authored an article talking about a winter trip in the 1890's from Phoenix to Yuma, but does not mention a subsequent entire Gila trip. X004-62 (*Coconino Sun*).

329. There is very little modern boating in Segment 1 because of diversions and fences. Tr. 6/16/14, p. 232 (Fuller).

330. A boating guide to the Southwest lists the upper Gila in Segments 1, 2, and 3 as a boatable stream; several books and magazines describe boating trips on the upper River; and a website describes recommended boating conditions for raft, canoe, and kayak use in the Gila Box, claiming that it can be floated all year long by different types of boats according to

the flow rate and season and that it can be canoed between flow rates of 150 cfs and 1,500 cfs. 002, pp. 6-4–6-6 (ASLD Upper Gila Report).

331. In May 1983, M.H. Salmon boated down the entire Segments 1, 2, and 3 at a flow rate ranging from more than 1,000 cfs to about 260 cfs, and he described his trip as "a piece of cake . . . most anyone could have done it had he or she the interest and the time." 002, p. 6-5 (ASLD Upper Gila Report); Tr. 6/16/14, p. 238 (Fuller).

332. Mr. Fuller successfully boated a portion of Segment 1 in February 2014 with 300 pounds of gear in his canoe, including his own weight, and flow rates between 50 and 38 cfs, rates well below even the modern median of 91 cfs. X020-79, PPT 159 (Fuller Nav.); Tr. 6/16/14, p. 234:7-14 (Fuller).

333. Mr. Fuller's field photographs taken on his February 2014 trip show he was able to successfully navigate Segment 1 in his fully loaded canoe. X020-81 (Segments 1 and 2 modern photos).

334. Mr. Fuller also presented this Commission with a Google Earth flyover of Segment 1 which clearly shows a wet, single low flow channel that is boatable even at today's substantially diminished flows. X012-69 (Video Flyover).

335. Today, Segment 1 is rarely boated due to substantial flow removal for irrigation within the Duncan Valley and elsewhere, fences, poor scenery, minimal adventure, and its distance from major urban centers. X020-79, PPT 157 (Fuller Nav.); X020-81 (Segments 1 and 2 modern photos).

B. Segment 2

336. Segment 2 extends through the Gila Box Canyon and Wilderness Area. Segment 2 is located mostly within relatively narrow canyons of the Central Mountain Province. 002, p. 4-6 (ASLD Upper Gila Report).

337. Lt. Emory described the River in Segment 2 as 70 feet wide and 2 feet deep in October 1846. X008-2, Table 1 (Burtell Decl.).

338. Territorial Governor Safford indicated that in places the River in Segment 2 was deep enough that they were forced to swim while crossing it in July-August of 1872. X008-2, Table 1 (Burtell Decl.).

339. Historic photographs from the 1930s show a single thread low-flow channel without any rapids or obstacles in Segment 2. X008-2, Figure 4 (Burtell Decl.), Downstream from near Clifton (August 1930) and Downstream from Bonita Creek (April 1932).

340. Mr. Fuller testified that Segment 2 of the Gila in modern times with depleted flows is boatable year-round and is one of the more popular recreationally boated areas. Tr. 6/16/14, p 134:10-13 (Fuller).

341. Segment 2 (Gila Box, a bedrock canyon) is a perennial with a pool and riffle sequence and some Class II rapids; its channel is sinuous to straight. There are diversions on all of its tributaries – the San Francisco, Eagle Creek, Bonita Creek. X020-79, PPT 36 (Fuller Nav.); Tr. 6/16/14, pp. 132-33 (Fuller).

342. The geomorphology of most of the Upper Gila River in Segment 2 is controlled by bedrock outcrops in the bed or at the margins of these canyons. 002, p. 4-6 (ASLD Upper Gila Report).

343. The average width of the canyons in Segment 2 is about 500 feet, with very narrow floodplain terraces. 002, p. 4-6 (ASLD Upper Gila Report).

344. Segment 2 is perennial, with reliable flow throughout the year. 002, p. 4-7 (ASLD Upper Gila Report).

345. Segment 2 has a pool and riffle pattern, with several minor rapids. X020-79, PPT 36 (Fuller Nav.).

346. Segment 2 runs through bedrock canyons; this distinguishes it from Segment 3. *See* Tr. 6/16/14, pp. 131:25-132:21 (Fuller).

347. There are no major irrigation diversions within Segment 2, but its three major tributaries, the San Francisco River, Eagle Creek and Bonita Creek have been significantly diverted since the 1870s, substantially reducing historic, ordinary and natural flows within this Segment. Tr. 6/16/14, pp. 132:22-133:22 (Fuller); X020-79, PPT 36 (Fuller Nav.); Tr. 6/16/14, pp. 131:25-134:13 (Fuller).

348. The experts agree that the theoretical historic depth of flow was between a median of 1.0 (ASLD post-statehood) and a mean of 2.5 feet (Burtell's reconstructed) (in Segment 2). *See* Exhibit A.

349. Modern flow depths show that Segment 2 is boatable today by canoes and flatboats 183 days per year (~50% of the time) and by canoes 329 days per year (~90% of the time). X020-79, PPT 160-62 (Fuller Nav.).

350. Even non-navigability experts agree that Segment 2 is conducive to recreational boating at certain times of the year. Tr. 6/20/14, pp. 1232-1233 (Burtell).

351. The Chiricahua Apaches, who lived in the area around the Upper Gila in Segments 2 and 3 were known to construct boats make of bull hides stretched over wooden frames for crossing streams. 002, p. 3-5 (ASLD Upper Gila Report).

352. A prospector in a dugout set sail from Clifton (in Segment 2) headed for Florence (in Segment 6) in 1886. X004-12 (*Arizona Silver Belt*, 4/3/1886); X020-79, PPT 118 (Fuller Nav.). He had no problems until "within 15 miles of Riverside [in Segment 5]". X004-12 (*Arizona Silver Belt*, 4/3/1886).

353. An unnamed party set forth from Clifton in Segment 2 headed for Yuma in Segment 8 in 1889. X019, p. 16 (Maricopa Supp.). Except for a portage in the San Carlos Canyon (in Segment 4), the trip was uneventful. X019, p. 16 (Maricopa Supp.). It is not clear if the purposes of the trip were recreational or commercial. X019, p. 16 (Maricopa Supp.).

354. In January – February 1895, W.A. "Amos" Adams and J.W. Evans boated from approximately 35 miles above Solomonville in Segment 2 to Sacaton in Segment 6 in an 18 x 3.5 foot homemade wooden flatboat with a cabin. X014-33 (*Arizona Sentinel*, 3/9/1895); X020-79, PPT 111 (Fuller Nav.); 021, p. 12 (Jackson PowerPoint). After a side trip to Phoenix, Adams and Evans rejoined the Gila at the Salt River confluence (in Segment 6/7) and traveled down to Yuma. X014-33 (*Arizona Sentinel*, 3/9/1895); X020-79, PPT 111 (Fuller Nav.); 021, p. 12 (Jackson PowerPoint).

355. No recorded historic boater had difficulty in Segment 2. *See* X019, p. 16, 18 (Maricopa Supp.); X014-33 (*Arizona Sentinel*, 3/9/1895); X004-20 (*Tombstone Epitaph*, 4/19/1891); X004-12 (*Arizona Silver Belt*, 4/3/1886).

356. In the Gila Box (from U.S. 666 to Bonita Creek) (Segment 2), the River has only a few mild rapids and is "a popular stretch with river runners. Most years it has a rafting season, albeit a short one. Low water boaters are extending this season." X004-2 (*Arizona Rivers and Streams*, 1998).

357. Segment 2 can generally be floated year-round, depending on the flow and type of craft used. Flows range from between 100,000 cfs and 250 cfs. At various times, river rafts, kayaks, canoes, inflatable kayaks and canoes, can be used. X004-5 (*Green Ribbons*).

358. "Inflatable kayak, canoe, and rafting enthusiasts will enjoy an easy to moderate floating adventure in the [Gila Box] canyon." X004-6 (*Paddling Through the Gila Box*).

359. Inflatable boats can be floated in the Gila Box. X004-55 (Carr photos of inflatables).

360. There is frequent modern boating by canoes, kayaks and rafts in Segment 2. X020-79, PPT 162 (Fuller Nav.); Tr. 6/16/14, p. 237 (Fuller).

361. Jon Colby, of Cimarron Adventures & River Co. conducted commercial tours on the Gila (and Salt and Verde Rivers) for seventeen years in flows ranging from about 170-180 cfs to about 3,000 cfs. Tr. 11/17/05, pp. 331-33 (Colby). The company's tours ran from the Gila Box National Riparian Conservation Area downstream of Duncan to just outside Safford (Segments 2 and 3). Tr. 11/17/05, p. 332 (Colby). The boats ranged from eighteen-foot rafts to inflatable kayaks, canoes, and catarafts. Tr. 11/17/05, p. 338 (Colby); Tr. 6/16/14, p. 259 (Fuller); X020-79, PPT 191 (Fuller Nav.).

362. Members of paddling clubs currently boat in Segment 2. 002, p. 6-4 (ASLD Upper Gila Report); Tr. 6/16/14, p. 92 (Fuller).

363. Most boating takes place in the Spring, but Segment 2 is boatable year-around. Tr. 6/16/14, pp. 134:10-20, 225:18-226:13, 237:20-238:12 (Fuller); X020-79, PPT 161, 162 (Fuller Nav.).

364. The Segment 2 Google Earth flyover that Mr. Fuller played for the Commission also shows this Segment of the River as a single, meandering low flow channel with sufficient flow and depth upon which one can float a canoe. X012-69 (Video Flyover).

365. The State's boating expert, Don Farmer, has also boated Segment 2 along its entire course on multiple occasions within the last five years in rubber rafts, catarafts and canoes. Most of his boating trips have been in the Spring with flow rates of 300 cfs to 900 cfs. The range of depths he has experienced are from the shallowest spots in some riffles of about 16 inches to the deepest spots in holes of 20 feet. He has not boated, but has seen the River in the

summertime at low flows and has never seen it dry. He has never had to get out of his boat and portage it because of any obstacle or obstruction. Tr. 6/18/14, pp. 554:7-557:22 (Farmer).

C. Segment 3

366. Segment 3 runs from the end of Gila Box to San Carlos dam, and is located within a deep alluvial valley. X020-79, PPT 39 (Fuller Nav.); 002, p. 4-6 (ASLD Upper Gila Report).

367. In 1867, Chapin, Commander of Camp Goodwin, observed that the Gila was 50 feet wide with an average depth of 2 feet in Segment 3. X008-2, Table 1 (Burtell Decl.).

368. In April of 1904, Frederic Morton Chamberlain Surveyed the Gila for Fish, and observed that below Safford, in Segment 3, even with irrigation diversions, the River was 20 feet wide and three feet deep. X004-46, p. 111 (Brown, *Territorial*).

369. Mr. Weech, in 1879, describes the River in Segment 3 as difficult to cross except at the ford and indicates that it was deep enough that a horse was swept away trying to swim it. X008-2, Table 1 (Burtell Decl.).

370. An 1885 photograph near Ft. Thomas shows a wide single low-flow channel in Segment 3. X020-79, PPT 89 (Fuller Nav.).

371. An 1885 photograph taken near San Carlos in Segment 3 shows a wide single low-flow channel river with the water in the middle close to chest deep on the horses. X021-Photo 1; X020-79, PPT 90 (Fuller Nav.).

372. A May 1909 photo near Geronimo in Segment 3 shows a single thread low-flow channel with perhaps very minor braiding. X020-79, PPT 92 (Fuller Nav.).

373. An 1880 photograph shows a covered wagon and trailer crossing the River near Calva in Segment 3. X008-2, Figure 7 (Burtell Decl.). Mr. Burtell opined that, based upon this photograph, that the River was less than 100 feet wide and 1-2 feet deep. X008-2, p. 7 (Burtell Decl.).

374. A 1932 photo upstream from Calva in Segment 3 shows a braided flow channel. X008-2, Figure 4 (Burtell Decl.).

375. The photo upstream of the Coolidge Dam site and the photo downstream from Blue Creek (July 1931) are also in Segment 3. X008-2, Figure 4 (Burtell Decl.). Despite the fact that the flows shown in these photographs are substantially depleted and after the

damaging floods of 1905-6, these photos generally show a single thread low-flow channel with only minor braiding in Segment 3. X008-2, Figure 4 (Burtell Decl.).

376. Segment 3 (from end of Gila Box to San Carlos Reservoir) was perennial; it has a compound channel pattern, pool and riffle characteristics, sand and gravel bed, sinuous main channel within a broad alluvial valley; its major tributary is the San Carlos River. In spite of invasive plants, there is still a defined low-flow channel. Tr. 6/16/14, pp. 136-40 (Fuller); X020-79, PPT 38-39 (Fuller Nav.).

377. Segment 3 has a pool and riffle pattern, with no rapids. X020-79, PPT 39 (Fuller Nav.).

378. There are no obstacles in Segment 3. X020-79, PPT 39 (Fuller Nav.).

379. The experts agree that the theoretical historic depth of flow was between a median of 0.5 (ASLD post-statehood) and a mean of 2.0 feet (Burtell reconstructed) in Segment 3. *See* Exhibit A.

380. At modern flow depths Segment 3 is boatable by canoes and flatboats 292 days per year (~80% of the time) and by canoes 329 days per year (~90% of the time). X020-79, PPT 164-166 (Fuller Nav.).

381. Mr. Fuller's Google Earth flyover confirms that Segment 3 currently has a pool and riffle pattern, sand and gravel bed, and a sinuous low-flow channel within a broad alluvial valley, much like Segment 1. X012-69 (Video Flyover).

382. In July 1849 the Stanistaus Lasselle party attempted to build rafts to transport an injured member of their party, but were unsuccessful in trying to navigate the low-water with the unwieldy craft. X016-7 (*Gila Trail*).

383. In 1869, troops near Ft. Goodwin found the River deep enough in Segment 3 to need a raft to cross while they swam their stock across. X004-19 (*Weekly Arizona Miner*); X020-79, PPT 118 (Fuller Nav.); X008-2, Table 15 (Burtell Decl.).

384. In 1905, J.E. Carpenter and George W. Todd boated Segment 3 for the purposes of travelling to a hunting site. X019, p. 30 (Maricopa Supp.). Although no launch location was given, they were apparently headed for the hills around San Carlos. X019, p. 30 (Maricopa Supp.).

385. Only the Stani Staus Lasselle party recorded any difficulty boating Segment 3. *See* X016-7 (*Gila Trail*); X004-19 (*Weekly Arizona Miner*); X004-12 (*Arizona*

Silver Belt, 4/3/1886); X019, p. 16, 18, 30 (Maricopa Supp.); X004-20 (*Tombstone Epitaph*, 4/19/1891); X014-33 (*Arizona Sentinel*, 3/9/1895).

386. Today, Segment 3 is rarely boated due to substantial flow removal, diversions, fences, poor scenery, minimal adventure and its distance from major urban centers. X020-79, PPT 166 (Fuller Nav.); Tr. 6/18/14, p. 558:4-13 (Farmer); Tr. 6/16/14, pp. 240-41 (Fuller).

D. Segment 4

387. Segment 4 is perennial and flows within a deep, narrow, bedrock canyon from Coolidge Dam to State Route 77. X020-79, PPT 41-42 (Fuller Nav.).

388. Captain Johnston noted mesquite trees two feet in diameter and cottonwoods generally a foot or more in diameter on the river banks in Segment 4. X008-2 (Burtell Decl., Attachment C, Johnston, pp. 592-93).

389. Segment 4 (canyon downstream of Coolidge Dam to State Route 77 above Winkelman) has Class I, II and perhaps one Class III rapids; it is perennial with a sinuous channel pattern, pool and riffle sequence, and cobbles. X020-79, PPT 41-42 (Fuller Nav.); Tr. 6/16/14, pp. 141-46 (Fuller).

390. The River in Segment 4 has a sinuous single low flow channel pattern with a pool riffle sequence, with a number of small rapids and no major tributaries. Tr. 6/16/14, p. 141:3-21 (Fuller); X020-79, PPT 42 (Fuller Nav.).

391. At least since statehood, the flow through this Segment 4 had been regulated to optimize downstream irrigation. X020-79, PPT 169 (Fuller Nav.).

392. The experts agree that the historic depth of flow in Segment 4 was between a mean of 1.8 (ASLD post-statehood) and a median of 2.7 feet (Burtell reconstructed). *See* Exhibit A.

393. Segment 4 contains the only Class III rapid on the River (Needles Eye Rapid) (X012-72 (Gila Maps)), which unsurprisingly was treated cautiously by some historic river users.

394. Confirming the navigability of Segment 4, two photographs of this Segment (from 1928 and 1994) below Coolidge Dam show the River with a wet, primarily single, sinuous, low-flow channel. X020-79, PPT 93 (Fuller Nav.).

395. The navigability is also confirmed by the Google Earth flyover video (X012-69 (Video Flyover)) and modern photographs of Segments 4 and 5 (X020-83 (Photos Seg. 4-5)).

396. Segment 4's modern flow is from dam diversions, which are less than the historical flow. This segment is boatable perennially by canoe about 90% (329 days of the year) of the time and by flatboat about 70% (256 days of the year) of the time, and historically more often. X020-79, PPT 146, 167-71 (Fuller Nav.); Tr. 6/16/14, pp. 241-44 (Fuller).

397. The unnamed party travelling from Clifton to Yuma in 1889 portaged in this Segment, apparently successfully. There is no record of how long or difficult this portage was. X019, p. 16 (Maricopa Supp.).

398. In January – February 1895, Adams and Evans lined some of the rapids in this Segment. X014-33 (*Arizona Sentinel*, 3/9/1895). Mr. Evans apparently stood on shore letting the boat down by a rope, and Mr. Adams rode in the boat through the rapids. X014-33 (*Arizona Sentinel*, 3/9/1895). At one point the rope broke and Mr. Evans recounts an exciting journey swimming and climbing downriver to where the boat awaited, slightly damaged (the repair took only a few hours) but still afloat and with its watertight compartments intact. X014-33 (*Arizona Sentinel*, 3/9/1895).

399. Only two of the five recorded historic trips had difficulty in Segment 4, and only one trip chose to portage. *See* X004-12 (*Arizona Silver Belt*, 4/3/1886); X019, pp. 16, 18 (Maricopa Supp.); X014-33 (*Arizona Sentinel*, 3/9/1895); X004-20 (*Tombstone Epitaph*, 4/19/1891).

400. Dave Weedman works for the Arizona Game and Fish Department and has boated below the San Carlos reservoir to Winkelman in Segment 4 when performing his fishery surveys, and he knows of others who have boated from below Painted Rock Dam to the Colorado River. Tr. 11/16/05, pp. 211, 219 (Weedman). In a narrow channel, 70 to 80 cfs is enough to float a canoe. Tr. 11/16/05, p. 220 (Weedman).

401. Coolidge Dam to Winkelman (a ten-mile section) in Section 4 "has gentle rapids" suitable for canoes, kayaks and small rafts. The River flows all summer due to dam releases; the boating season lasts from March to August. X004-2 (*Arizona Rivers and Streams*, 1998).

402. Donald Farmer has boated all of Segment 4 in a canoe. This segment has a dam-flow regime with flows of 50-450 cfs. There is no water shallower than six inches, and the average depths are two to four feet. Tr. 6/18/14, pp. 559-60 (Farmer).

403. Other companies have conducted commercial floats below Coolidge Dam in Segment 4. Tr. 11/17/05, p. 334 (Colby). Several websites show boating guides for Segment 4. X020-79, PPT 168 (Fuller Nav.).

E. Segment 5

404. Segment 5 is perennial and extends from SR77 to the Hayden-Ashurst Irrigation Diversion Dam. X020-79, PPT 45 (Fuller Nav.); Tr. 6/16/14, p. 146:4-12 (Fuller).

405. A study of contemporary accounts of Spanish exploration in what was Mexico supports the hypothesis that the friar Juan de la Asuncion traveled up the San Pedro or Santa Cruz River in 1538 and discovered the Gila River (the "River of the Rafts") at its junction with the San Pedro in Segment 5. X004-48, pp. 93-101 (*Juan de la Asuncion*).

406. Frey Marcos de Niza in 1539, Francisco Vazquez de Coronado in 1540, and Father Eusebio Kino and other missionaries in the late 1600s noted that Sobaipuri Indians on the San Pedro River, a major tributary of the Gila in Segment 5, irrigated with extensive acequias. X007-65, p. 8 (*Native Fishes*).

407. A European traveler in 1763 noted that Piman fields were easily irrigated by canals, implying that the River channel in the reach from present-day Ashurst-Hayden Dam to the River's confluence with the Salt (Segments 5 and 6) was stable. 004, pp. VII-4, VII-16 (ASLD Lower Gila Report).

408. After passing the confluence with the San Pedro in Segment 5, Kearny and his party, including Dr. Griffen, traveled down the river through a canyon, and they "crossed the river [riding mules] very frequently which made it disagreeable, in consequence of the depth of the stream our feet and legs got wet." X021-112, p. 210 (*A Doctor Comes to California*).

409. The Journal of Capt. A.R. Johnston, with Kearny's expedition, notes on Nov. 7 that the Gila about 6 miles below the San Pedro, in Segment 5, was 18 inches deep in the shallows, "and canoes might pass down it very readily, and good-sized boats if it were not for the round rocks in its bed." X008-2, Attachment "C", Johnston Journal at 593 (document p. 111) (Burtell Decl.).

410. Emory, in November 1846, commented that the River near Florence in Segment 5 "flows off quietly at the rate of 3 miles an hour into a wide plain." X025-116, p. 65 (Ross).

411. After the signing of the Gadsden Purchase in 1853, the U.S. surveyed the 32nd parallel for the proposed railroad route. Lt. John G. Parke led the surveying party. He noted that the Gila, near the San Pedro in Segment 5 was ordinarily a single channel and occupied the entire bottom of the gorge in places, but side drains created sloughs in seasons of rain or snow melt. He described the River as follows:

> The water was clear and palatable, flowing with a moderate current over an alternating bed of sand, pebbles, and rock. The stream was, in July [1855], about twenty feet wide and twelve inches deep. Its banks were fringed throughout with cotton-wood and willow thickets, with mesquite at the base of the terraces.
>
> Below the gorge . . ., the valley opens out in a broad plain, increasing in width as the Pimas villages are approached. This bottom is covered with dense groves of mesquite, with occasional intervening patches of grass, which, however, become less frequent as the river is descended. [Brackets and ellipses in original]

X004-3, pp. 106, 109 (Davis, *Man and Wildlife*); X030-121, p. 83 (Davis Thesis).

412. A resident of Florence in Segment 5 told the *Arizona Blade-Tribune* in July 1912 that the "normal flow of the Gila River, at Florence, is sufficient . . . to grow [crops] on at least 25,000 acres of land . . . never been, during the 32 years we have resided in Florence, a single year in which said normal flow was not sufficient for that purpose." 004, p. IV-17 (ASLD Lower Gila Report) (brackets and ellipses in original).

413. Photographs taken in 1908 after a massive flood show Segment 5 near Kelvin with some braiding in the low-flow channel. X020-79, PPT 95 (Fuller Nav.).

414. A photo taken in a similar location in Segment 5 in 1915 shows a single thread meandering low-flow channel. X020-79, PPT 94 (Fuller Nav.); Tr. 6/16/14, p. 185:16-20 (Fuller).

415. The River in Segment 5 flows within a moderately deep valley between low mountains and hills, mostly through private lands. *See* X020-79, PPT 45 (Fuller Nav.); Tr. 6/16/14, p. 146:4-12 (Fuller).

416. Segment 5 has a sinuous, low flow channel has a pool and riffle pattern, with a single Class II rapid and no Class III or higher rapids. Tr. 6/16/14, p. 147:2-15 (Fuller); X012-72 (Gila Maps).

417. Segment 5 is distinguished from Segment 6 based on its more reliable flow, confined geometry, and its record of historical and modern boating. *See* Tr. 6/16/14, pp. 146:4-147:25 (Fuller); X020-79, PPT 45, 176, 179 (Fuller Nav.).

418. The only depth information submitted to ANSAC for Segment 5 comes from ASLD, who calculated a median post-statehood depth of 1.3 feet. *See* Exhibit A.

419. Modern flow depths show that Segment 5 is boatable by canoes and flatboats 329 days per year (~90% of the time). X020-79, PPT 172-6 (Fuller Nav.).

420. No recorded historic boater had any difficulty in Segment 5 except for the prospector in 1886, who hit a strainer somewhere in the Segment, which caused his dugout to capsize. X004-12 (*Arizona Silver Belt*, 4/3/1886); Tr. 6/16/14, pp. 204:4-206:4 (Fuller); *see* X019, p. 16, 18 (Maricopa Supp.); X014-33 (*Arizona Sentinel*, 3/9/1895); X004-20 (*Tombstone Epitaph*, 4/19/1891).

421. The stretch from Kelvin to Ashurst-Hayden dam (Segment 5) is boatable with small inflatables. X004-2 (*Arizona Rivers and Streams*, 1998).

422. There is occasional recreational use by canoes and kayaks in Segment 5. X020-79, PPT 173 (Fuller Nav.); Tr. 6/16/14, p. 247 (Fuller).

423. Mr. Farmer has boated in Segment 5 all summer long in the past 15 years. That segment has flows of 700 cfs. Tr. 6/18/14, pp. 562-63 (Farmer).

424. Personnel from the Arizona Game and Fish Department and Bureau of Land Management personnel canoe in Segment 5, carrying out their duties. Tr. 6/16/14, p. 261 (Fuller).

425. The Google Earth flyover for Segment 5 shows the River's flow at 130 cfs, which is below the long-term ordinary and natural flow, but nonetheless navigable. Tr. 6/16/14, pp. 148:1-150:15 (Fuller).

426. There is some recreational use of the River in Segment 5 in small draft boats. Tr. 6/16/14, pp. 247:13-248:8 (Fuller); X020-79, PPT 172-176 (Fuller Nav.).

427. Indeed, as noted above, on February 21, 2014, Mr. Fuller boated Segment 4 into Segment 5 in his 15 foot canoe, at a flow rate of 220 cfs. He was carrying about 500

pounds. The States boating expert, Don Farmer, and his wife also boated in a second canoe. X020-83 (Photos Seg. 4-5); Tr. 6/16/14, pp. 245:1-246:20 (Fuller). They encountered no difficulties and found it very boatable. Tr. 6/16/14, pp. 247:10-11, 18-19, 248:6-8 (Fuller).

F. Segment 6

428. Segment 6 extends from the Ashurst-Hayden Diversion Dam to the confluence with the Salt River. The River in this Segment runs through broad alluvial valleys going past Florence to the Salt River confluence. Segment 6 is often referred to as the Middle Gila River. 004, p. VII-4 (ASLD Lower Gila Report); Tr. 6/16/14, p. 150:15-19 (Fuller); X020-79, PPT 47, 48 (Fuller Nav.).

429. Juan Mateo Manje, in 1694, described the Gila in Segment 6 as carrying "so much water that a ship could be navigated." X004-48, p. 98 (*Juan de la Asuncion*).

430. In 1697, Father Kino traveled extensively along three-fourths of the Gila from 1691 to 1702. 001-18, p. 98 (Tellman, *Arizona's Changing Rivers*). In 1697, Father Kino and Juan Manje described the River as a channel with large cottonwoods supporting irrigation agriculture at the Pima Villages (near modern-day Sacaton in Segment 6). 004, pp. VII-4, IV-1 (ASLD Lower Gila Report).

431. Father Kino, in 1697, noted that the Casa Grande-Blackwater village's main canal in Segment 6 remained very visible with embankments three yards high and six or seven yards wide. Kino described it as a "very great aqueduct." X015-3, p. 3-5 (*Sonoran Desert Traders*).

432. In November 1697, members of the de Escalante party found the River so deep at Snaketown in Segment 6 they had to swim across to examine Hohokam buildings on the other side. 004, p. IV-1 (ASLD Lower Gila Report), citing "Excavations at Snaketown [on the Gila River Indian Reservation]," p. 3; Tr. 11/16/05, p. 165 (August).

433. In 1699, Father Kino also noted that Indians were growing crops by diverting irrigation water from the River and that the River supported an abundance of fish; he stated: "all [the Gila Valley's (Segment 6's)] inhabitants are fishermen, and have many nets and other tackle with which they fish all year." 001-18, p. 98 (Tellman, *Arizona's Changing Rivers*); 004, p. III-21 (ASLD Lower Gila Report).

434. Father Kino noted the "very large cottonwood groves," and in 1744, an observer noted "an abundant growth of [willows] and cottonwood" at the confluence of the Salt

and Gila; this was in the 30-mile reach of the river centered on the Piman villages (Segments 6 and 7). X015-16, p. 337 (*Ribbon of Green*).

435. Members of the de Anza expedition in 1775 traveling from the Casa Grande Ruin to the Colorado River through Segments 6, 7, and 8 in October-November described various reaches of the River as "dry," "half way up his legs," "reaching to the shoulder-blades of the horses," and "very deep and ran very slowly." 004, p. IV-1 (ASLD Lower Gila Report).

436. In 1846, Emory described the River as navigable as far as the Pima Villages in Segment 6 and possibly with small boats at all stages of the water. 012, p. 108 (Littlefield 2005). Although by 1853, Emory described the River as not navigable, he noted that it was a "never failing stream, discharging a large volume of water." 012, p. 108 (Littlefield 2005).

437. Emory commented at a Pima village near the Salt-Gila confluence in Segment 6: "The bed of the Gila, opposite the village, is said to be dry, the whole water being drawn off by the zequias of the Pimas for irrigation; but the ditches are larger than is necessary for this purpose, and the water which is not used returns to the bed of the river with little apparent diminution in its volume," and he wrote that the course of the River is marked by green cottonwoods. X025-116, p. 65 (Ross).

438. George Evans, a Forty-Niner, traveling west described the River in Segment 6 during August 1849 as a "deep, narrow, and rapid stream of warm muddy water, with the banks covered with a dense growth of wild willow and weeds, tall cottonwoods. 001-18, p. 99 (Tellman, *Arizona's Changing Rivers*); X004-3, p. 48 (Davis, *Man and Wildlife*).

439. Other groups of forty-niners also used the River as an alternative to wagon travel. X006-9, pp. 3-4 (Hjalmarson Citations).

440. Early European visitors described the River between the Ashurst-Haydon Diversion Dam and the Salt River (Segment 6) as having a stable, narrow, and relatively deep channel with dense riparian galleries. 004, p. VII-4 (ASLD Lower Gila Report).

441. *The Weekly Arizonian* (Tubac), reported on 4/7/1859 someone's opinion that the Gila at certain stages might be navigated up to the Pimas village (located in Segment 6), and possibly with small boats at all stages of water. X014-51 (*The Weekly Arizonian*).

442. By 1905, years of drought, overgrazing and devastating floods had turned the former well-defined channel in Segment 6 into a bare sandy bed. X015-9, p. 28 (*Once A River*).

443. By 1907, the water regime had been altered, the channel in Segment 6 was broad and unstable, the marshes, and most of the timber had been scoured away by years of floods, and the grasslands had entirely disappeared. X015-9, p. 7 (*Once A River*).

444. The Rev. C.H. Cook who lived among the Pimas in the 1870's reported in about 1911 that the tribe irrigated about 3,000 acres on the Gila River in 1854, below Sacaton in Segment 6. X012-70, p. 12 (*Agricultural Practice*).

445. A 1910 photo of the Gila near Welton Crossing in Segment 6 shows a generally single thread low-flow channel. X002, p. 108 (Littlefield 2013).

446. Before Anglo settlement in the 1860s, the Middle Gila River (Segment 6) had a perennial flow that may have run dry near the Pima Villages on rare occasions. *See* X020-79, PPT 180 (Fuller Nav.); Tr. 6/16/14, pp. 151:13-16, 152:3-10, 252:7-21 (Fuller).

447. Segment 6 has a compound floodplain channel with a pool and riffle, single low-flow channel and a sand and gravel bed. X020-79, PPT 48 (Fuller Nav.).

448. Segment 6 had no rapids. X020-79, PPT 48 (Fuller Nav.).

449. There is essentially no modern boating in Segment 6 as the River upstream has been totally dammed and diverted. Tr. 6/16/14, pp. 251:11-252:6 (Fuller); X020-79, PPT 178 (Fuller Nav.).

450. ASLD estimates that the median natural depth of the River through Segment 6 was 1.5-2.0 feet. *See* Exhibit A. Reconstructed flow depths indicate Segment 6 was navigable by canoes 90% of the time (329 days per year) and by flatboats 90% of the time (329 days per year). X020-79, PPT 180.

451. Although Mr. Gookin provided depth estimates for Segment 6, he admitted that the Mannings "n" values he used were incorrect (*see* X029 (GRIC Supp.)).

452. Other non-navigability experts opined that even Mr. Gookin's "corrected" Mannings "n" values were too low; the low Mannings "n" values would result in lower depth estimates. Tr. 8/19/14, pp. 1743-1745 (Mussetter); X032-123 (Mussetter, *Sediment Erosion*).

453. Segment 6 was navigable for canoes when the river was in its ordinary and natural condition. Tr. 6/19/14, p. 857 (Gookin).

454. Archeological evidence shows Indian use of wooden rafts on the lower Gila in Segments 7 and 8 and perhaps on the middle Gila in Segment 6. Tr. 6/16/14, p. 166 (Fuller).

455. Several accounts of a trip down the Gila by Forty-Niners Howard and his family exist. In one, written by E.H. Howard of Eureka, California, in 1885, has Mr. Howard bringing with him a 16-foot boat, that had first been used on Lake Michigan, for use in his travels to California. He embarked in it at the Pima villages in Segment 6 in September 1849 with his wife and one child, a doctor and a Baptist minister, and reached Yuma in Segments 8 – 250 miles away – in three and one half days. During the voyage a boy was born to Mrs. Howard. X004-14 (W*eekly Citizen*, 7/18/85). Another account has Mr. Howard making two raft-boats out of wagons and sailing them down the Gila. This account reports that the baby born on the trip was a girl. X004-47, pp. 249-51 (Hannum, *Quaker Forty-niner*). Neither account records any difficulty with the trip. X004-14 (*Arizona Weekly Citizen*, 7/18/1885); X004-47, pp. 249-51 (Hannum, *Quaker Forty-niner*).

456. On November 1, 1849 a 16 foot by 5 ½ foot flatboat arrived in Yuma from the Pima Villages, floating through Segments 6, 7 and 8, carrying three men, a family and baggage. X025-116, p. 66 (Ross).

457. Other Forty-Niners – Lieut. Gully, and Richardson - built a boat at the Pima villages and floated down to Yuma through Segments 6, 7, and 8. X004-17 (*Arizona Weekly Citizen*, 6/20/1896); Tr. 6/16/14, pp. 200-01 (Fuller).

458. In December 1846, members of Col. Cooke's command decided to boat supplies from Segment 6 down to Yuma. X006-9, p. 7 (Hjalmarson Citations); X020-79, PPT 102 (Fuller Nav.); Tr. 6/16/14, pp. 192:2-194:11 (Fuller). Col. Cooke recorded that the River at the point where they launched the craft was 3-4 feet deep and 150 yards wide. X006-9, p. 7 (Hjalmarson Citations). They tied together two wagon beds and lashed cottonwood logs to the wagons. X006-9, p. 7 (Hjalmarson Citations); X020-79, PPT 102 (Fuller Nav.); Tr. 6/16/14, pp. 192:2-194:11 (Fuller); 004, p. IV-2 (ASLD Lower Gila Report). They then filled up this awkward boat and shoved off. X006-9, p. 7 (Hjalmarson Citations); X020-79, PPT 102 (Fuller Nav.); Tr. 6/16/14, pp. 192:2-194:11 (Fuller, citing Corle, 1951); Christiansen and Pattie, 1986. Unsurprisingly, the craft was difficult to steer and ran aground repeatedly on sandbars. X006-9, p. 7 (Hjalmarson Citations); X020-79, PPT 102 (Fuller Nav.); Tr. 6/16/14, pp. 192:2-194:11

(Fuller). Nonetheless, after modification they were able to successfully boat to Yuma. X006-9, p. 7 (Hjalmarson Citations); X020-79, PPT 102 (Fuller Nav.); Tr. 6/16/14, pp. 192:2-194:11 (Fuller); 004, p. IV-2 (ASLD Lower Gila Report); Tr. 11/17/05, p. 208 (Jackson).

459. The ASLD report on the Lower Gila found that Early Euro-American residents floated boats, canoes, logs, rafts, and ferries on the Lower River, and although use was largely dependent on higher seasonal flows, boats were apparently on the River at all times of the year. 004, p. X-1 (ASLD Lower Gila Report).

460. HMT Powell took a heavily loaded boat down, and had some trouble with sand bars, but recommended flat boats below the Pima Villages. X020-79, PPT 117 (Fuller Nav.); Tr. 6/16/14, p. 203 (Fuller).

461. No historical boater recorded any difficulty in Segment 6 except some parties apparently encountered inconvenient sand bars. *See* X019, pp. 16, 18 (Maricopa Supp.); X014-33 (*Arizona Sentinel*, 3/9/1895); X004-20 (*Tombstone Epitaph*, 4/19/1891); X004-14 (W*eekly Citizen*, 7/18/85); X004-47 (Hannum, *Quaker Forty-niner*); X025-116, p. 66 (Ross); X004-17 (*Arizona Weekly Citizen*, 6/20/1896); X020-79, PPT 117 (Fuller Nav.); X006-9, p. 7 (Hjalmarson Citations).

462. In 1905, Jack Henness of Florence rigged up a suspended cable and cage to transport passengers and cargo over the River in Segment 6. The *Arizona Blade Tribune* of March 4, 1905 reported that the cage passed over the *Gila Queen* ferry boat. 004, p. IV-12 (ASLD Lower Gila Report).

463. Mr. Juan Gutierrez, and Ms. Violet White, of Florence (in Segment 6), remembered small ferry boats being used to transport passengers and other supplies for a fee in 1916 and 1917. 004, p. V-4 (ASLD Lower Gila Report).

464. Segment 6 is rarely boated due to damming and diversions. There are in-stream mining, levees, bridges, and invasive species. The cottonwoods and willows are gone, resulting in more than normal erosion of the banks. Tr. 6/16/14, pp. 249-53 (Fuller); X020-79, PPT 179-80 (Fuller Nav.).

465. A cattleman with a contract to supply beef to Fort Huachaca soldiers crossed the Gila at Florence on the steamboat. X004-11 (*Arizona Republican*, 2/12/1905).

G. Segment 7

466. A member of Kearny's party, Dr. Griffen, observed on November 14, 1846, that below the Salt the Gila River (in Segment 7) was about 80 yards wide, three feet deep, and rapid. "We have seen more water fowl in the last two days than we have yet met with on the River – ducks, brant geese and swan." X004-3, p. 29 (Davis, *Man and Wildlife*).

467. About 55 miles below the Salt-Gila confluence in Segment 7, a member of Kearny's party commented: "The River here is some 60 to 80 yards wide – on an average 3 feet deep and rapid." X021-112, p. 214 (*A Doctor Comes to California*).

468. In what is now western Maricopa County (Segment 7), Turner of the Kearny party noted that the Gila was becoming much more like a real river. The width varied from 100 to 150 yards wide, with an average depth of four feet – 'quite deep enough to float a steamboat.' It flowed gently over a sandy bottom, while the banks, in Emory's terminology, were fringed with 'cane, willow, and myrtle.'" X004-3, p. 29 (Davis, *Man and Wildlife*).

469. Lt. Emory in 1846 estimated the population of Pima and Maricopa at about ten thousand people. He stated that "a great deal of the land is cultivated." Near present-day Gila Bend (in Segment 7), he noted that the river's course could readily be discerned from the line of green cottonwood lining its banks, whereas to the west the bottoms were wide, rich, and thickly overgrown with willow, and the river was spread over "a greater surface, about 100 yards wide, and flowing gently over a sandy bottom, the banks fringed with cane, willow, and myrtle." X015-16, p. 337 (*Ribbon of Green*).

470. According to U.S. government documents, in 1846-47, the River was 60-80 yards wide and three feet deep at Gila Bend (in Segment 7), and in 1847-48 it measured 150 yards wide and three to four feet deep. 025, p. 47 (Hjalmarson Notes), citing U.S. Corps of Engineers 1995 study of the River from Gillespie Dam to Yuma (Reconnaissance Report, FCD 0000028).

471. According to the Mormon Battalion's Captain Cook, the River near Gila Bend (in Segment 7) in January 1847 was four or five feet deep and 150 yards wide. X015-1, p. 152 (Corle).

472. Near the present boundary between Maricopa and Yuma Counties in Segment 7, Forty-Niner A.B. Clarke made this observation of the river:

> The river was at this place a quarter of a mile wide. The volume of water at times must be immense, as there is brush and other substances lodged in the mesquites from ten to twenty feet high, through the adjoining plain, over which we have been traveling.

X004-3, p. 44 (Davis, *Man and Wildlife*).

473. Forty-Niner Benjamin Harris observed the River downstream from modern-day Gila Bend in Segment 7 continued to be broad and shallow. Harris noticed that "millions of blue quail inhabited near the water." X004-3, p. 46 (Davis, *Man and Wildlife*). In late June 1849, Benjamin Harris and others of his party of 52, went swimming "since the water was waist-deep." X030-121, p. 151 (Davis Thesis).

474. A mid-1850s illustration shows the River near Gila Bend in Segment 7, apparently about 300 feet wide with tree-lined banks and containing enough water for swimmers; it carries the following inscription: "From: U.S. Pacific Railroad Exploration & Surveys, Explorations for a railroad route from the Mississippi River to the Pacific Ocean—General Report (washington, [sic] D.D. 1983-6), plate VI." 025, p. 7 (Hjalmarson Notes).

475. U.S. government surveyor G. P. Ingalls, described the River near its confluence with the Agua Fria in Segment 7 in June 1868 as "a fine stream" with a rapid current and sandy bottom. 012, p. 30 (Littlefield 2005).

476. Another government surveyor, Solomon Foreman, noted in 1871 that the River north of Gila Bend in Segment 7 "has a smooth lively current." 012, p. 52 (Littlefield 2005).

477. In 1878, federal surveyor Harris noted that the River in the Mohawk Valley near Tacna in Segment 7 "contains an abundance of water which can be used for the irrigation of lands in this township." 012, pp. 44-45 (Littlefield 2005).

478. Surveyor R.C. Powers made a similar comment in January 1883 about there being plenty of water in the River for irrigation, at Township 1 South, Range 2 West, a few miles west of the Gila-Agua Fria confluence in Segment 7. 012, pp. 35-36 (Littlefield 2005).

479. Large galleries of cottonwood trees lined the banks of the River from the Salt confluence towards Yuma (in Segments 7 and 8) as recently as the 1800s. 004, p. VII-6 (ASLD Lower Gila Report).

480. In 1889, Mr. John Montgomery, a rancher described the River between Buckeye and Gillespie Dam, in Segment 7, as having a well-defined channel with hard, sloping banks lined with cottonwood and bushes. The water was clear, was five or six feet deep and contained many fish. X025-116, pp. 66-67 (Ross).

481. "Below the confluence with the Salt River in Segment 7, the Gila widened to about 80 yards, with a depth of three feet (1846). Beyond the great bend the current reached a width of 100-150 yards, with an average depth of four feet. The water flowed gently over a sandy bottom and was occasionally too deep to ford even with a horse. The lower Gila often formed a seasonal chain of lakes, ponds, and lagoons adjacent to the main channel. In the middle of the 19th century the Gila River supported a dense riparian growth along most of its length. Willows and cottonwoods grew on the banks, backed by terraces of mesquites. The river bottoms were also overgrown with tall herbaceous plants, such as sunflowers." X030-121, p. 203 (Davis Thesis).

482. In 1907, government surveyor Hesse described the River in its depleted condition near its confluence with the Agua Fria in Segment 7 as eighteen inches to two feet deep. 012, p. 33 (Littlefield 2005).

483. Mr. Hjalmarson reconstructed natural flows for Segments 7 and 8. Exhibit A; 023, p. 12 (Hjalmarson 2002 Rpt.).

484. Mr. Hjalmarson's flows used with ASLD's corresponding rating curves show depths for Segments 7 and 8 that far exceed the depths needed for small boats and even larger boats such as steamboats. Exhibit A; X020-80, PPT 17, 116-17 (Fuller Boating).

485. Mr. Hjalmarson's flow estimates, used in conjunction with ASLD's depth rating curves for this Segment, show the theoretical historic depth of the Gila through Segment 7 was between 2 ½ and 3 feet. *See* Exhibit A.

486. Segments 7 and 8 were perennial with dominant inflow from the Salt River, no rapids, pool and riffle pattern, sand and gravel streambed, sinuous to straight main flow channel within a broad alluvial valley. Tr. 6/16/14, p. 155 (Fuller); X020-79, PPT 57-62 (Fuller Nav.).

487. Segment 7 (from the Salt confluence to Dome) was perennial with inflow from the Salt. Its other tributaries are the Hassayampa and the Agua Fria which contributed minor flow. It has no rapids, a pool and riffle sequence, sand and gravel bed, and its main flow

channel is sinuous to straight within a broad alluvial valley. X020-79, PPT 56-57 (Fuller Nav.); Tr. 6/16/14, pp. 155-57 (Fuller); *see also* Hjalmarson's estimates of predevelopment hydraulic characteristics of Segments 7 and 8. 023, pp. 19-30 (Hjalmarson 2002 Rpt.); Tr. 11/17/05, pp. 244-45 (Hjalmarson).

488. Segment 7 was a perennial, navigable stream in its ordinary and natural condition. 004, p. VII-6 (ASLD Lower Gila Report).

489. Damming and diversion on the Salt River and its tributaries significantly impacted flow in Segment 7 before statehood. Tr. 6/16/14, pp. 155:7-157:24 (Fuller).

490. The River in Segment 7 runs through a broad, alluvial valley and has a compound floodplain channel pattern with a historically single, sinuous to straight low-flow channel. X020-79, PPT 57 (Fuller Nav.); Tr. 6/16/14, p. 155:15-18 (Fuller).

491. Segment 7 has a sand and gravel bed, with no rapids. X020-79, PPT 57 (Fuller Nav.); Tr. 6/16/14, p. 155:15-18 (Fuller).

492. At these depths, the Gila in Segment 7 would have been easily boated by canoes and flatboats 329 days per year (~90% of the time). X020-79, PPT 184 (Fuller Nav.).

493. Segment 7's flow is now enhanced by outflow from the wastewater plant that contributes about 90 cfs. Tr. 6/16/14, p. 157 (Fuller).

494. Prehistoric peoples used boats to cross and travel along the Lower Gila in Segments 7 and 8. 016, p. 33 (Tellman Papers).

495. An unsigned letter from a traveler at Camp Salvation reported the "expedient of lightening down teams by building small boats on the Gila" had been tried successfully, thereby helping many Gila Trail travelers reach the Colorado. The letter was printed in the *New York Daily Tribune*, 2/18/1850. 004, p. IV-3 (ASLD Lower Gila Report).

496. Other parties of 49ers used the Gila for travel through Segment 7. 021, p. 10 (Jackson PowerPoint).

497. In January 1879, Charles Hamilton, R.W. Jordan and E.R. Halesworth arrived in Yuma after having boated down the Salt River from Phoenix in their home-built skiff. X004-15 (*Arizona Sentinel*, 1/25/1879). Although the purpose of their trip is unknown, they reported that the River in Segment 7 would support commerce in the form of flatboats with a two-foot draw loaded with grain, pumpkins, and other fruits could easily float down to Yuma from Phoenix. X004-15 (*Arizona Sentinel*, 1/25/1879). They experienced a single narrow spot

at Gila Bend (in Segment 7), but otherwise reported no difficulty. X004-15 (*Arizona Sentinel*, 1/25/1879); Tr. 6/16/14, p. 195 (Fuller); X020-79, PPT 105 (Fuller Nav.).

498. A February 1881 river trip by Cotton and Bingham from Phoenix to Yuma was announced in the *Arizona Gazette* for the next day, the trip to be made in an eighteen-foot-long skiff. 004, p. IV-7 (ASLD Lower Gila Report); Tr. 11/17/05, pp. 210-11 (Jackson); Tr. 6/16/14, p. 196 (Fuller); X020-79, PPT 106 (Fuller Nav.).

499. In November 1881, William "Buckey" O'Neil launched a boat in Phoenix headed for Yuma. X020-79, PPT 107 (Fuller Nav.); Tr. 6/16/14, pp. 196:19-197:12 (Fuller); 021, p. 11-12 (Jackson PowerPoint). Apparently his craft was not particularly nimble, as the article reports he and his party had to push it while standing in water up to their knees. X020-79, PPT 107 (Fuller Nav.); Tr. 6/16/14, pp. 196:19-197:12 (Fuller); 021, p. 11-12 (Jackson PowerPoint). There is also some indication that a certain amount of liquor was consumed by the boaters. X020-79, PPT 107 (Fuller Nav.); Tr. 6/16/14, pp. 196:19-197:12 (Fuller); 021, p. 11-12 (Jackson PowerPoint). There is some confusion about whether the trip made it to Yuma or stopped in Gila Bend (in Segment 8). X020-79, PPT 107 (Fuller Nav.); Tr. 6/16/14, pp. 196:19-197:12 (Fuller); 021, p. 11-12 (Jackson PowerPoint). In any event, Mr. O'Neil successfully boated through Segment 7. X020-79, PPT 107 (Fuller Nav.); Tr. 6/16/14, pp. 196:19-197:12 (Fuller); 021, p. 11-12 (Jackson PowerPoint); Tr. 11/17/05, p. 211 (Jackson).

500. In 1890, Frank Burke and George Davis were transporting gold from the Harqua Hala mines (in Segment 7) when their boat overturned near Sentinel (in Segment 8). X019, p. 25 (Maricopa Supp.); Tr. 6/16/14, p. 207 (Fuller).

501. The *Arizona Sentinel* reported on 4/2/1892 that commercial trappers J.K. Day and George Day left Camp Verde in a small boat and trapped beaver and otter on their way down the Verde, Salt, and Gila Rivers to the Colorado – more than 800 miles – in less than six months and that the brothers vowed to repeat the trip the following September. This was their fifth trip. X007-63 (*Arizona Sentinel*, 4/2/1892). They experience no difficulties. *Id.*

502. Sometime in the 1890's, Stanley Sykes and Charlie McLean decided to travel by boat to Yuma from Phoenix. X004-62 (*Coconino Sun*). They built a canvas covered boat and set off. X004-62 (*Coconino Sun*). There was insufficient water on the Salt to support boating because of the irrigation diversions. X004-62 (*Coconino Sun*). However, once they reached the River there was sufficient water to boat. X004-62 (*Coconino Sun*). They overturned

the boat while boating over an irrigation diversion dam, but had no other difficulties on the Gila. X004-62 (*Coconino Sun*).

503. Stanley Sykes and his brother Godfrey built a small, light canvas canoe and made a "rather remarkable voyage down the Salt and Gila Rivers from Phoenix to Yuma" in 1909. X030-118, p. 238 (Sykes, *Westerly Trend*).

504. Gustavus Streitz testified in a case before the General Land Office in 1911 that, in carrying out his duties as county surveyor in 1893, he had used "Dougherty's skiff" to cross the river near present-day Gillespie Dam. Dougherty was a local rancher/farmer, who apparently kept the skiff as part of his ranching equipment. Tr. 11/17/05, pp. 216-20 (Jackson).

505. No historic boater had difficulty in Segment 7, except Sykes and McLean who had difficulty with an irrigation diversion, and Hamilton, Jordan and Halesworth, who hit a narrow spot near Gila Bend. X004-20 (*Tombstone Epitaph*, 4/19/1891); X019, pp. 13, 16, 18, 25 (Maricopa Supp.); X014-33 (*Arizona Sentinel*, 3/9/1895); X004-14 (W*eekly Citizen*, 7/18/85); X004-47 (Hannum, *Quaker Forty-niner*); X004-17 (*Arizona Weekly Citizen*, 6/20/1896); X020-79, PPT 117 (Fuller Nav.); X004-15 (*Arizona Sentinel*, 1/25/1879); X006-9, p.7 (Hjalmarson Citations).

506. Most of the time, the flow was at or near optimum conditions for recreational boating on the Lower Gila in Segments 7 and 8 according to the U.S. Bureau of Outdoor Recreation's 1977 criteria. 023, p. 25 (Hjalmarson 2002 Rpt.).

507. There is not much modern boating in Segment 7 (except for some on the effluent flow). Tr. 6/16/14, pp. 253-4 (Fuller); X020-79, PPT 182 (Fuller Nav.).

508. While the State has offered Mr. Fuller's entire Google Earth flyover in evidence as Exhibit X012-69 (Video Flyover), he did not play the Segment 7 portion during his presentation and testimony before ANSAC because, as he noted in his testimony, there is not a lot of boating in this Segment since it is usually dry due to depletions of the River's flow. Tr. 6/16/14, pp. 253-4 (Fuller); X020-79, PPT 182 (Fuller Nav.).

509. Mr. Fuller did present photographs of his 2003 canoe trip down the effluent fed portion of this Segment from about Buckeye to State Route 85. X020-85 (Fuller Photos). They show this small reach of Segment 7 to have beautiful scenery and a single low-flow channel with overgrown, non-native vegetation. Tr. 6/16/14, pp. 254:20-256:1 (Fuller); X020-85 (Photos Seg. 7).

H. Segment 8

510. Segment 8 (from Dome to the Colorado confluence – about 20 miles) is similar to Segment 7: a pool and riffle sequence, no rapids, sandy bed in a broad alluvial valley, and a sinuous single channel. X020-79, PPT 59-60 (Fuller Nav.); Tr. 6/16/14, pp. 157-59 (Fuller).

511. Government surveyor Martineau found the River so deep in September and October 1890 and more than five chains wide in some places, that it required him to swim to reach the other bank. 012, p. 47 (Littlefield 2005). Martineau's field notes indicate that the River was 12 to 15 feet deep at this point (near Blaisdell and Kinter, west of Dome in Segment 8). Tr. 11/17/05, pp. 106-07 (Littlefield).

512. "Near this river's junction with the Colorado [in Segment 8], the riparian woodland formed a dense jungle two to four miles wide, even more extensive than the similar growth on the larger river. Today, this superb bottomland forest is gone, along with the living Gila River." X030-121, p. 203 (Davis Thesis).

513. Segment 8 is a perennial stream in its ordinary and natural condition with a compound floodplain channel pattern, and a single, sinuous, low-flow channel with a pool and riffle flow pattern, along with a sand and gravel riverbed running through a broad alluvial valley. X020-79, PPT 60 (Fuller Nav.); Tr. 6/16/14, p. 158:5-7 (Fuller).

514. There were no rapids in Segment 8. X020-79, PPT 60 (Fuller Nav.); Tr. 6/16/14, p. 158:5-7 (Fuller).

515. The experts agree that the depth range historically was a median of 2.5-3 feet, (*see* Exhibit A) with a mean depth of 3.1 feet, with an estimated maximum depth of 4.8 feet (in Segment 8). Tr. 11/17/05, p. 244 (Hjalmarson); 023, p. 29 (Hjalmarson PPT).

516. At these depths the Gila would have been boatable by canoes and flatboats 329 days per year (~90% of the time) (in Segment 8). X020-79, PPT 186-189 (Fuller Nav.).

517. In Segment 8, there was historic steamboat use as well as the floating of logs, two additional, significant types of trade and travel use. Tr. 6/16/14, p. 157:14-24 (Fuller).

518. In 1890, Frank Burke and George Davis were transporting gold from the Harqua Hala mines (in Segment 7) when their boat overturned near Sentinel (in Segment 8). X019, p. 25 (Maricopa Supp.); Tr. 6/16/14, p. 207 (Fuller).

519. None of the travelers encountered difficulties in Segment 8, with the exception of Burke and Davis, who apparently overturned their boat near Sentinel (mentioned above) (X019, p. 25 (Maricopa Supp.)) and Hamilton, Jordan and Halesworth who apparently felt that the river was too narrow at one point near Gila Bend (X004-15 (*Arizona Sentinel*, 1/25/1879)). *See* X004-20; X019, p. 18; X014-33; X019, p. 16; X004-14 and X004-47; X004-17; X020-79, PPT 117; X019, p. 13; X006-9, p. 7; 021, p. 10; 021, p. 11; 012, p. 11-12; X004-62; X004-18; X019, p. 15; 004, P. IV-3; X025-116, p. 66; X019, pp. 17, 34; X019, p. 18; X004-15; X004-16; X004-21; X006-1.

520. Logs were once rafted down the Gila to Yuma for use at the prison (for cooking, laundry, and electric lights), but the new prison superintendent had the logs floated down in the swift current, a method that was more efficient. X004-18 (*Los Angeles Herald*, 3/28/1897).

521. Segment 8 was boatable by steamboats approximately 50% of the time. X020-79, PPT 189 (Fuller Nav.).

522. Steamboats on the Gila likely ran up as far as where Dome is today, about 20 miles upstream from Yuma (Segment 8). Tr. 6/16/14, p. 188-9 (Fuller).

523. Gila City was established in 1858-59 on the Gila River when placer gold was discovered there, and George Johnson, who ran steamboats on the Colorado, found himself "over head and heels in business" carrying men and provisions to the diggings. X028, pp. 31, 33 (Lingenfelter, *Steamboats on the Colorado*).

524. Steamboats operated on the Colorado until 1908, but their use diminished after the railroad reached the river in 1877. X004-33, p.8 (Muther, *Paddle-wheelers*).

525. For a time, there was competition between two rival steamer companies on the Gila, carrying men and provisions to Gila City (a few miles from Dome) involving the steamer Arno and another steamship in Segment 8. X028-13, p. 31-33 (Lingenfelter, *Steamboats on the Colorado*).

526. The Steamboat Uncle Sam was employed on the Colorado River in 1852-53. X028-13, p. 163 (Lingenfelter, *Steamboats on the Colorado*).

527. The Uncle Sam was a sidewheeler, 65 feet long, with a 16 foot beam and a capacity of 40 tons. X028-13, p. 163 (Lingenfelter, *Steamboats on the Colorado*).

528. The Uncle Sam apparently regularly travelled "some distance" up the Gila in search of firewood during her one year of service. X004-15 (*Arizona Sentinel*, 1/25/1879).

529. In 1858, George Johnson bought the steamboat Explorer, which had operated on the Colorado, and put it to work hauling firewood on the Gila in Segment 8. X004-33, p. 6 (Muther, *Paddle-wheelers*).

530. In 1864 the Steamboat *Explorer* sank on the Colorado after coming out of the Gila, where she had also been engaged transporting firewood. X006-1 (Robertson, *Yuma*); X028-13 (Lingenfelter, *Steamboats on the Colorado*) (cover shows the *Explorer*).

531. In 1894 the owners of the Steamer Aztec created a destination five miles up the Gila in Segment 8, and transported up to three loads of passengers a night. X019, pp. 17, 34 (Maricopa Supp.). The Aztec was a sternwheeler 62 feet long, with a 21 foot beam and a capacity of 50 tons on 20 inches of water. X028-13, p. 86 (Lingenfelter, *Steamboats on the Colorado*).

532. The *Tombstone Epitaph* reported in May of 1894 that steamboat excursions up the Gila "are the rage". X004-21 (*Tombstone Epitaph*).

533. In 1897 the Schooner McCord also reportedly went upriver on the Gila to transport firewood in Segment 8. X019, p. 18 (Maricopa Supp.).

534. Finally, the Steamboat *Retta* took a commercial excursion up the Gila in Segment 8 with children on board in June, 1901. X004-16 (*Arizona Sentinel*). The *Retta* was a 36 foot long, 6 foot beam paddle wheel boat. X028-13, p. 95 (Lingenfelter, *Steamboats on the Colorado*).

535. Apparently the residents of Yuma travelled upriver in Segment 8 on more than just steamboats, in 1890 residents were urged to boat the "Gila Laguna." X019, p. 15 (Maricopa Supp.).

536. Although Mr. Lingenfelter, author of *Steamships on the Colorado*, opined that steamboat travel up the Gila was rare, (X008-3, p. 3-4 (Lingenfelter Aff.)) it appears from the record, and Mr. Lingenfelter's own book (X028-13, p. 31-33 (Lingenfelter, *Steamboats on the Colorado*)) that travel on the Gila was regularly conducted to seek firewood, haul cargo and people and for pleasure excursions.

537. Mr. Lingenfelter claims that steamboat use on the Gila was solely on Colorado River backwater, but this contradicts his own work and the evidence in the record on

backwater that indicates that the backwater reached no more than 2.5 miles up the Gila (001-22, (Stantec Report)).

538. The Dome ferry was a medium flatboat. X004-53 (photo showing car on ferry).

539. Most of the time, historic flow in Segment 8 was at or near optimum conditions for recreational boating according to the U.S. Bureau of Outdoor Recreation's 1977 criteria. 023, p. 25 (Hjalmarson 2002 Rpt.).

540. There is very little modern boating in Segment 8 because the water has been diverted. Tr. 6/16/14, p. 256 (Fuller); X020-79, PPT 187-189 (Fuller Nav.).

CONCLUSIONS OF LAW

IX. The Public Trust and Equal Footing Doctrines

541. In 1985, the State of Arizona began asserting ownership claims to the beds of navigable Arizona watercourses based on the "public trust doctrine." *See Arizona Center for Law in the Public Interest v. Hassell*, 172 Ariz. 356, 359, 837 P.2d 158, 161 (App. 1991) ("*Hassell*").

542. Under the public trust doctrine, States in their capacities as sovereigns hold title to the beds under navigable waters, as a "high prerogative trust . . . a public trust for the benefit of the whole community." *Hassell*, 172 Ariz. at 359, 837 P.2d at 161; *see also PPL Montana, LLC v. Montana*, 132 S.Ct. 1215, 1226 (2012) ("*PPL Montana*"). *Hassell* described the doctrine in general terms:

> A state's title to lands under navigable waters "is a title different in character from that which the State holds in lands intended for sale . . . . It is a title held in trust for the people of the State that they may enjoy the navigation of the waters, carry on commerce over them, and have liberty of fishing therein freed from the obstruction or interference of private parties."

172 Ariz. at 364, 837 P.2d at 166, quoting *Illinois Cent. R.R. v. Illinois*, 146 U.S. 387, 452, 13 S.Ct. 110, 118 (1892).

543. The public trust doctrine originated under English common law, where the Crown held title to the riverbed and soil of tidal waters and the public retained the right of passage and the right to fish in the stream. *PPL Montana*, 132 S.Ct. at 1226-27. With respect to non-tidal inland waters, riparian landowners retained title to the center of the stream and the exclusive right to fish, but the public retained the right of water passage. *Id.*

544. After the American Revolution, courts deemed the tidal rule of navigability previously adopted from England ill-suited to the United States because of its vast number of inland rivers upon which navigation could be sustained. The public trust doctrine was extended to navigable inland watercourses as well. *Hassell*, 172 Ariz. at 359, 837 P.2d at 161.

545. Under the equal footing doctrine, the United States Supreme Court held that the principles of the public trust doctrine followed by the original 13 states applied to States later admitted to the Union because all States are coequal sovereigns under the U.S. Constitution. *PPL Montana*, 132 S.Ct. at 1227-28. On the day in which individual states enter the Union, title

to the lands under territorial navigable watercourses is transferred from the federal government to the newly-established state government. *Id.*

546. "A key justification for sovereign ownership of navigable riverbeds is that a contrary rule would allow private riverbed owners to erect improvements on the riverbeds that could interfere with the public's right to use the waters as a highway for commerce." *PPL Montana*, 132 S.Ct. at 1230.

547. Because the U.S. Constitution itself is the basis for granting a state's title to these lands, any questions of navigability for determining state riverbed title are governed by federal law. *PPL Montana*, 132 S.Ct. at 1227; *Defenders of Wildlife v. Hull*, 199 Ariz. 411, 420, 18 P.3d 722, 731 (App. 2001) ("*Defenders*" or "*Hull*").

548. Thus, when Arizona achieved the Constitutional status of a state on February 14, 1912, it acquired title to the lands below high-water mark in all navigable watercourses within its boundaries. *Hassel*, 172 Ariz. at 360, 837 P.2d at 162.

X. The Daniel Ball Test

549. The basic formulation of the federal law test used for title navigability is set forth in *The Daniel Ball*, 77 U.S. 557, 563, 19 L. Ed. 999 (1870):

> Those 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.

This test has been further defined in many subsequent federal and state cases.

550. *The Daniel Ball* test has been used to assess both navigability for title under the equal footing doctrine – the issue in this Gila River adjudication – and navigability for other federal regulatory authority issues such as federal interstate navigability. *PPL Montana*, 132 S.Ct. at 1228-29. The test is not applied in the same manner for all cases. For example, for title purposes the test is applied based on the ordinary and natural condition of the waterway. In contrast, for federal regulatory authority over interstate waters, the test may be applied based on the potential for navigability if improvements are made. *Id.*

551. When considering the precedential value of cases, the context in which a navigability determination is made must be considered, but "a case applying the *Daniel Ball* test provides guidance." *State of Alaska v. United States*, 754 F.2d 851, 854 (9th Cir. 1985).

Compare PPL Montana, 132 S.Ct. at 1233 (citing the commerce clause navigability case *United States v. Appalachian Elec. Power Co.*, 311 U.S. 377, 416, 61 S.Ct. 291, 303 (1940) to explain how evidence of recreational use bears upon susceptibility in a title navigability case), *with PPL Montana*, 132 S.Ct. at 1231-32 (stating that using the Court's decision in *The Montello* regarding portages is not controlling because *The Montello* was deciding whether a river was a navigable water of the United States and portages are treated differently when the issue is navigability for title purposes).

XI. Prior Proceedings on Navigability

552. Until 1985, Arizona had only asserted a public trust ownership claim under the equal footing doctrine to the bed of the Colorado. *Land Dep't v. O'Toole*, 154 Ariz. 43, 46, 739 P.2d 1360, 1363 (App. 1987) (*"O'Toole"*).

553. In 1985, the State of Arizona proposed asserting a public trust ownership claim under the equal footing doctrines to the beds of all navigable Arizona watercourses other than the Colorado River. *O'Toole*, 154 Ariz. at 44, 739 P.2d at 1361. This proposal prompted a declaratory judgment claim which was dismissed by the Arizona Court of Appeals in *O'Toole* as inappropriate because the State had not yet asserted ownership of the beds of navigable watercourses. *Id.* at 47, 739 P.2d at 1365.

554. In a response to the State's ownership claim, the Legislature enacted House Bill 2017 in 1987. 1987 Ariz. Sess. Laws, ch. 127 ("1987 Act"). The 1987 Act was a blanket quitclaim of any public trust land interests the State may have to the beds of all watercourses other than the Colorado, Gila, Salt, and Verde Rivers. *Id.* In addition, the 1987 Act set forth a process for which record title holders who had land in the beds of the Gila, Salt, and Verde Rivers could obtain quitclaim deeds with the payment of a small fee in order to "compensate this state for relinquishing the claim in those areas where the state's claim may be more viable." *Id.; see also Hassell*, 172 Ariz. at 360, 837 P.2d at 162.

555. The Arizona Center for Law in the Public Interest ("ACLPI") challenged the constitutionality of multiple parts of the 1987 Act, including the $25 per acre quitclaim fee for which any record titleholder of lands in or near the beds of the Gila, Salt, or Verde Rivers could obtain a quitclaim deed and relinquished the State's equal footing interest in such lands, as well as the part in the 1987 Act that provided that every State land patent issued henceforth will

convey the State's equal footing interest in the patented land. *Hassell*, 172 Ariz. at 360-61, 837 P.2d at 162-63.

556. The Arizona Court of Appeals in *Arizona Center for Law in the Public Interest v. Hassell* reversed the trial court's ruling and found the 1987 Act violated the public trust doctrine and the gift clause of the Arizona Constitution, article IX, § 7. *Hassell*, 172 Ariz. at 371, 837 P.2d at 173.

557. The public trust and gift clause analysis was reached because the court found that "appellants submitted substantial evidence from which a factfinder might conclude that portions of rivers and streams other than the Colorado met the applicable standard of navigability at the time that Arizona became a state." *Hassell*, 172 Ariz. at 363, 837 P.2d at 165; *see also Hull*, 199 Ariz. at 416, 18 P.3d at 727.

558. In reaching its decision, the court stated it must give public trust dispensations "a close look" and that "there is no unfairness or immorality in a state's pursuit of ownership claims based on the equal footing doctrine, even claims that have lain dormant for decades." *Hassell*, 172 Ariz. at 369, 837 P.2d at 171. Because the State has fiduciary obligations to maintain the public trust, the State must have a "systematic investigation and evaluation of each of the state's claims" before disclaiming its interest in any of Arizona's watercourse bedlands. *Id.* at 370, 837 P.2d at 172.

559. Responding to *Hassell*, the legislature established the Arizona Navigable Stream Adjudication Commission ("Commission") in 1992. 1992 Ariz. Sess. Laws, ch. 297 ("1992 Act"). The five-member Commission was to be appointed by the Governor, and was to gather information from the investigative efforts of the State Land Department, as well as hold its own public hearings. The Commission would then issue a final administrative determination of navigability or non-navigability for each watercourse. This administrative adjudication would be subject to judicial review. *See* A.R.S. §§ 37-1121 to -1129 (1993).

560. After the Commission began taking evidence, in 1994 the legislature made significant changes to the statutes governing the Commission ("1994 Act"). The changes made the Commission a fact-finding, legislative advisory committee rather than an adjudicatory body. In addition, the Commission was restricted to using specifically enumerated evidence, and certain presumptions of non-navigability were established. *See* 1994 Ariz. Sess. Laws, ch. 278. The 1994 Act made it almost impossible for an Arizona watercourse to be determined navigable,

instead of supporting Arizona's right to these lands as public trust holdings. *Hull*, 199 Ariz. at 426, 18 P.3d at 737.

561. In 1998, legislation was passed declaring that many of Arizona's watercourses were non-navigable and disclaiming all rights and title of the State to those waterways. *See* Ariz. Sess. Laws 1998, Ch. 43, § 2.

562. The Arizona Court of Appeals in *Hull* struck down the legislation stating that the 1994 Act it was based on was inconsistent with *The Daniel Ball* standard for determining navigability. *Hull*, 199 Ariz. at 426, 18 P.3d at 737. The court stated:

> We find that the particularized assessment necessitated by *Hassell* was neither performed in accordance with the applicable federal law nor done in a manner consistent with the public trust doctrine. When this assessment is so abrogated, public trust land may be forfeited. Potential forfeiture of the watercourse bedlands in S.B. 1126, by being functionally identical to the outright disclaimer of H.B. 2017 in *Hassell*, is a violation of the public trust doctrine and the Arizona Constitution's gift clause.

Id. at 427-28, 18 P.3d at 738-39.

563. In response to the *Hull* decision, in 2001 the legislature revised the statutes by reinstating the Commission as the adjudicatory body and eliminating the additional statutory requirements deemed invalid. *See* 2001 Ariz. Sess. Laws, ch. 166, § 1. The 2001 legislation, A.R.S. §§ 37-1101 through 37-1156, now governs the Commission in making its findings with respect to the Gila River.

564. On January 27, 2009, the Commission issued its report finding that the Gila River was non-navigable. *See* Report, Findings and Determination Regarding the Navigability of the Gila River from the New Mexico Border to the Confluence with the Colorado River.

565. The Defenders of Wildlife, Donald Steuter, Jerry Van Gasse, and Jim Valler filed a judicial appeal of the Commission's 2009 decision, *Defenders of Wildlife, et al. v. Arizona Navigable Stream Adjudication Comm'n*, Case No. C20073884. The parties agreed to stay the proceedings of that case until the resolution of the appeal of the Commission's Lower Salt River non-navigable determination in the case *State of Arizona, acting by and through Mark Winkleman, State Land Commissioner, and the Arizona State Land Department v. Arizona Navigable Stream Adjudication Comm'n, Maricopa County Superior Court Case No. LC2006-000413-001DT.*

566. The Arizona Court of Appeals issued its opinion on the Lower Salt River non-navigability determination in 2010. *State ex rel. Winkleman v. Arizona Navigable Stream Adjudication Comm'n*, 224 Ariz. 230, 229 P.3d 242 (App. 2010) ("*Winkleman*"). The court of appeals vacated the superior court's judgment that upheld ANSAC's administrative determination that the Lower Salt River was non-navigable, and the case was remanded for further proceedings consistent with the decision. *Id.* at 245, 229 P.3d at 257.

567. In reaching its decision in *Winkelman*, the court of appeals determined that the Commission did not apply the proper legal standard because it did not sufficiently consider "*both* the River's ordinary condition *and* its natural condition in determining its navigability." (Original emphasis). *Id.* at 242, 229 P.3d at 254. In addition, although the court did not substitute its judgment for that of the Commission, it did agree with the *Hassell* court that "substantial evidence exists from which a factfinder might conclude that [the Lower Salt River] met the applicable standard of navigability at the time that Arizona became a state . . ." *Winkelman*, at 242, 229 P.3d at 254.

568. Based upon the court of appeals' opinion in *Winkleman*, all parties agreed that the stayed appeals for all of the Commission's decisions that were pending, including the Upper Salt, Gila, Verde, Santa Cruz, and San Pedro, should be remanded to the Commission as well, for reconsideration consistent with the appellate opinion.

569. The Commission heard testimony and received evidence on the Gila River's navigability in the Summer of 2014, as a result of the remand.

XII. Overview of Commission's Role

570. The Commission is charged with determining whether a particular watercourse was navigable at statehood, and for any watercourse deemed navigable, to identify the public trust values of that watercourse. A.R.S. § 37-1128.

571. Commission members must be unbiased and must not have interests affected by the Commission's determination. A.R.S. § 37–1121(B). The Commission may not begin its determination with any presumptions against navigability. *Winkleman*, 244 Ariz. at 239, 229 P.3d at 251.

572. To make its determination of navigability or nonnavigability, "the Commission shall receive, review and consider all relevant historical and other evidence

presented to the commission by the state land department and by other persons . . . ." A.R.S. § 37-1123.

573. The Commission's determination as to navigability of the Gila River must stand on its own facts. *U.S. v. State of Utah*, 283 U.S. 64, 87, 51 S.Ct. 438, 445 (1931). Comparisons with other rivers do not aid a contention of navigability or nonnavigability. *Id.*

574. "If the preponderance of the evidence establishes that the watercourse was navigable, the commission shall issue its determination confirming that the watercourse was navigable." A.R.S. § 37-1128.

575. If the Commission finds a watercourse navigable, it shall, in a subsequent proceeding, determine the public trust values associated with that watercourse, A.R.S. § 37-1128(B), those "public trust values" being defined as commerce, navigation and fishing, A.R.S. § 37-1101(9).

576. A navigable watercourse is defined in A.R.S. § 37-1101, which is a codification of *The Daniel Ball* test:

> 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.

577. Arizona Revised Statutes § 37-1101 also defines "highway of commerce" as:

> [A] corridor or conduit within which the exchange of goods, commodities or property or the transportation of persons may be conducted.

XIII. Burden of Proof

578. Arizona Revised Statutes § 37-1128(A) states "[i]f the *preponderance of the evidence* establishes that the watercourse was navigable, the commission shall issue its determination confirming that the watercourse was navigable." (Emphasis added). This burden of proof standard is consistent with the holdings of Arizona court decisions on navigability. *See O'Toole*, 154 Ariz. at 46 n.2, 739 P.2d at 1363 n.2; *Hassell,* 172 Ariz. at 363 n.10, 837 P.2d at 165 n.10; *Hull*, 199 Ariz. at 420, 18 P.2d at 731; *Winkleman*, 244 Ariz. at 238-39, 229 P.3d at 250-51.

579. That burden of proof lies with the proponents of navigability, who must prove navigability by a preponderance of the evidence. *Winkleman*, 224 Ariz. at 239, 229 P.3d at 251.

580. "The preponderance of the evidence standard requires that the fact-finder determine whether a fact sought to be proved is more probable than not." *Kent K. v. Bobby M.*, 210 Ariz. 279, 284, 110 P.3d 1013, 1018 (2005) (cited by *Winkleman*, 224 Ariz. at 239, 229 P.3d at 251). The risk of error is shared equally between the parties involved, meaning that while the burden is on one party, no presumption is made for either party and thus error is shared. *Id.*

581. This is in contrast to the clear and convincing evidence standard that requires "the thing to be proved is highly probable or reasonably certain." *Id.* (citation omitted). The clear and convincing standard reflects a heightened standard of proof by placing a heavier burden upon one party to prove its case to a reasonable certainty, and there is a larger margin for error for the unburdened party. *Id.* The two standards can lead to quite different results. *Id.*

582. In perhaps the most easily understood language, the Arizona Supreme Court defined the preponderance of the evidence standard in *Hewett v. Indus. Comm'n* as the following:

> Preponderance of the evidence means such evidence as when weighed with that opposed to it has more convincing force, and from which it results that a greater probability is in favor of the party upon whom the burden rests. It does not necessarily depend upon the number of witnesses; it merely means that the testimony which points to one conclusion appears to the trier of facts to be more credible than the testimony which points to the opposite one. The capacity of the submitted testimony to enforce belief on the arbiter to whom it is submitted it (sic) the touchstone of preponderance as applied to the testimony of witnesses.

72 Ariz. 203, 209, 232 P.2d 850, 854 (1951).

583. As stated above in the *Overview of the Commission's Role*, while the burden is on the navigability proponents to meet the preponderance of the evidence standard, the court of appeals in *Winkleman* underscored that ANSAC may not begin its determination with any presumptions against navigability. 244 Ariz. at 239, 229 P.3d at 251. "Instead, ANSAC's approach and analysis must be wholly impartial and objective, while utilizing the proper legal test. *See generally* A.R.S. § 37-1121(B) (requiring that members of ANSAC be unbiased and not have interests affected by the Commission's determination) . . . ." *Id.*

XIV. Segmentation

584. "To determine title to a riverbed under the equal-footing doctrine, this Court considers the river on a segment-by-segment basis to assess whether the segment of the river, under which the riverbed in dispute lies, is navigable or not." *PPL Montana*, 132 S.Ct. at 1229. *See also United States v. Utah*, 283 U.S. at 77, 51 S.Ct. at 441.

585. "[S]hifts in physical conditions provide a means to determinate appropriate start points and end points for the segment in question. Topographical and geographical indicators may assist." *Id.* at 1230.

586. The U.S. Supreme Court has *not* stated that because a river has natural segment indicators, some of those segments must be non-navigable. *Id.* at 1229-30.

587. Where the Court has segmented a river because certain segments were navigable and others non-navigable, the non-navigable segments had obvious and substantial obstacles to navigation. *See PPL Montana*, 132 S.Ct. at 1223 (finding 17-mile segment of the Missouri river called the "Great Falls reach" non-navigable because of five waterfalls with heights of 87, 19, 48, 7, and 26 feet and continuous rapids in between); *United States v. Utah*, 283 U.S. at 80, 89-90 (finding 36-mile segment of the Colorado River non-navigable where it has "a long series of high and dangerous rapids").

588. The Commission finds the segmentation submitted by the State is consistent with the U.S. Supreme Court's suggestion that rivers may be naturally segmented and should be examined as such. *See* FOF 33. The Commission also finds each and every Gila River segment is navigable for the reasons contained herein.

XV. Rivers Must Be Examined In Their Ordinary and Natural Conditions

589. The Arizona Court of Appeals in *Winkleman* determined that the test for navigability requires the Commission to assess navigability based on "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) conditions." 224 Ariz. at 241, 229 P.3d at 253.

590. The court of appeals stated that both words "ordinary" and "natural" have specific and distinct meanings. *Id.* at 241, 229 P.3d at 253. The ordinary condition of a river is when the river is not in a drought condition and not in an exceptional condition in times of temporary high water, but rather the ordinary condition is the normal, usual condition of the

river. *Id.* at 241, 229 P.3d at 253. The natural condition of a river would be a river untouched by civilization, without purposeful interference, wild. *Id.* at 241, 229 P.3d at 253.

591. In *Winkleman*, the court of appeals stated that the natural condition of the Lower Salt River is "before the Hohokam people arrived many centuries ago and developed canals and other diversions that actively diverted the River." *Id.* at 242, 229 P.3d at 254. The Court acknowledged, however, that "little if any historical data exists from that period" and that Hohokam diversions "disappeared through non-use over the centuries" so that by the 1800s, the River had "largely reverted to its natural state." *Id.* The Court found, therefore, that "the River could be considered to be in its natural condition after many of the Hohokam's diversions has ceased to affect the River, but before the commencement of modern-era settlement and farming in the Salt River Valley. . . ." This corresponds to a date range for the natural condition of the Salt River of the beginning of the 1800's to the first major diversion on the Salt River, roughly the mid-1860s. SOF

592. The Ninth Circuit has held that it is appropriate to use a date range for evidence that corresponds to a period when a river is in its ordinary, unimproved condition. *State of Or. By & Through Div. of State Lands v. Riverfront Prot. Ass'n*, 672 F.2d 792, 795 (9th Cir. 1982).

593. All parties agreed that the court of appeals decision in the Lower Salt proceedings could assist the parties in the Gila proceedings. *State of Arizona, et al. v. Arizona Navigable Stream Adjudication Commission et al.*, Maricopa Superior Court No. LC2009-000779-001 DT, pg. 4 ("Gila River Appeal Proceedings").

594. The court of appeals would likely find the natural condition of the Gila also corresponds to a date range of the beginning of the 1800's to the first major diversion on the Salt River, roughly the mid-1860s. The Gila River has a similar Native American settlement history to the Salt River, and the first of the modern-era diversions affecting the Gila was the same first diversion that affected the Salt.

XVI. Time Period of Considered Evidence

595. Arizona Revised Statutes § 37-1123(A) directs the Commission to review all available evidence, and the court of appeals has stated that "all evidence should be examined during navigability determinations and no relevant facts should be excluded." *Winkleman*, 224 Ariz. at 243, 229 P.3d at 255, citing *Hull*, 199 Ariz. at 425, 18 P.3d at 736.

596. Although all evidence should be considered, "[e]vidence from 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. As stated above, a court would likely find that the "early period" for the Gila was from the early 1800's to the mid-1860s, and thus the best evidence of the condition of the Gila falls within that date range. "[E]vidence of the River's condition after obstructions caused a reduction in its flow is likely of less significance than evidence of the River in its more natural condition, and may in fact have 'minimal probative value,'. . . ." *Winkleman*, 224 Ariz. at 243, 229 P.3d at 255.

597. While the condition of the river is best assessed with evidence from the river's ordinary and natural condition, evidence received and considered after statehood is relevant upon the issue of the susceptibility of the rivers to use as highways of commerce at the time of statehood. *U.S. v. State of Utah*, 283 U.S. 64, 82, 51 S.Ct. 443 (1931) ("*State of Utah*"). *See also PPL Montana*, 132 S.Ct. 1215, 1233 (2012).

598. Generally, when ANSAC believes evidence has any reliability, ANSAC is charged with determining the "relevance and weight to be afforded the evidence. . . ." *Winkleman*, 242 Ariz. at 243, 229 P.3d at 255.

XVII. The Test for Navigability Is A Disjunctive Test Met With Actual Or Susceptible Use

599. The test for navigability is a disjunctive test where *either* actual use or susceptibility to use for travel and trade at the time of statehood can be shown to meet the test:

> Those rivers . . . 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. 557, 563 (emphasis added).

600. In *United States v. Utah*, the Court explained why it used a disjunctive test that includes the susceptibility standard instead of solely relying on actual use. 283 U.S. 64, 83, 51 S. Ct. 438, 443-44 (1931):

> "[A]s the title of a state depends upon the issue, the possibilities of growth and future profitable use are not to be ignored. Utah, with its equality of right as a state of the Union, is not to be denied title to the beds of such of its rivers as were navigable in fact at the time of the admission of the state 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, the multiplication of activities, and the development of natural resources. And this capacity may be shown by physical characteristics and experimentation as well as by the uses to which the streams have been put."

See also PPL v. Montana, 132 S.Ct at 1233 ("True, river segments are navigable not only if they were used but also if they were susceptible of being used . . . .") (internal quotations omitted).

601. The evidence for the Gila River shows *both* actual use and susceptibility to use as a highway for commerce, and therefore the navigability test is more than sufficiently satisfied. *See* FOF 304-540.

XVIII. Actual Use of The River

602. The first articulation of what constitutes actual use comes from *The Daniel Ball*, where the U.S. Supreme Court stated that rivers are actually used when they are "highways for commerce, over which trade and travel are...conducted in the customary modes of trade and travel on water." 77 U.S. at 563.

603. In *The Montello*, the U.S. Supreme Court expounded on their previous decision and made it clear that the actual use test is broad and inclusive of many uses:

> [T]he true test of navigability of a stream does not depend upon the mode by which commerce is, or may be, conducted, nor the difficulties attending navigation. . . . It 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.

20 Wall. 430, 441, 22 L. Ed. 391 (1874), *quoted with approval in United States v. Utah*, 283 U.S. at 76, 51 S. Ct. at 441; *see also U.S. v. Holt State Bank*, 270 U.S. 49, 56, 46 S.Ct. 197, 199 (1926).

604. Controlling courts consistently use the broad and inclusive standard for actual use, set forth as precedent in *The Montello*, when reviewing evidence for navigability. *See Utah v. United States*, 403 U.S. 9, 12, 91 S. Ct. 1775, 1777, (1971) (finding sufficient actual use on lake where use was "sporadic and their careers were short" because that "does not detract from the basic finding that the lake served as a highway and it is that feature that distinguishes between navigability and non-navigability"). *See also State of Alaska v. United States*, 754 F.2d 851, 854 (9th Cir. 1985) ("We recognize that navigability is a flexible concept and [e]ach

application of [the *Daniel Ball* test] . . . is apt to uncover variations and refinements which require further elaboration. For this reason, we have liberally construed the phrase customary modes of trade and travel on water, taking into account transportation methods in use at the time of statehood.) (internal quotation marks and citations omitted.").

605. The *only* limitations for the actual use test are that the mode of transport be common at the time of statehood, used to conduct trade and travel on the river, and that the river be used as a highway for commerce. *See United States v. Utah*, 283 U.S. at 76, 51 S.Ct. at 441; s*ee also PPL Montana*, 132 S.Ct. at 1233. No court has ever held that a river is navigable only if it sustains upstream travel.

A. Mode of Transport

606. Qualifying actual use is not limited to large scale vessels because both the U.S. Supreme Court and the Ninth Circuit Court of Appeals have recognized the importance of small boats like canoes as valuable transports of people and goods. *See The Montello*, 20 Wall. at 441 (finding fur trade which utilized canoes evidence of a navigation on a channel for useful commerce); *Econ. Light & Power Co. v. United States*, 256 U.S. 113, 117, 41 S. Ct. 409, 410, 65 L. Ed. 847 (1921) (finding actual use where Desplaines river was used by the kinds of craft common to early fur-trading days, including canoes); *State of Alaska v. Ahtna, Inc.*, 891 F.2d 1401, 1403, 891 F.2d 1401, 1403 (9th Cir. 1989) (finding lower Gulkana navigable where actual use at statehood was by hunters and fishermen using 16 to 24 ft boats); *see also Nw. Steelheaders Ass'n, Inc. v. Simantel*, 112 P.3d 383, 389-90 (2005) (finding John Day river navigable and stating "qualifying travel and trade is not limited to large-scale commercial or multiple passenger vessels of the sort typically engaged in modern commerce" because "courts have recognized the relevance of the historic role of small boats to transport goods in volumes that might seem insignificant by modern standards.").

607. It is also not necessary that the actual use be for the purpose of making money. *Utah v. United States*, 403 U.S. 9, 11, 91 S.Ct. 1775, 1776 (1971) (finding the Great Salt Lake navigable where boats were used from time to time to haul cattle and sheep from the mainland to one of the islands, not by a carrier for the purpose of making money).

608. Where actual use has not been deemed sufficient for proving navigability, boats were dragged instead of floated, *PPL Montana*, 132 S.Ct. at 1233 (*citing United States v.*

State of Oregon, 295 U.S. 1, 20-21, 55 S. Ct. 610, 618, (1935)), and small craft could be used only at high water, *The Montello*, 87 U.S. 430, 442, 22 L. Ed. 391 (1874).

Actual use on the Gila is far from sporadic. *See* FOF (Historic Boating) 325-326, 352-354, 383-384, 455-460, 495-504, 520, 522-538; *see also* FOF (Boating Percentages) 322, 349, 380, 396, 419, 450, 492, 516, 521.

B. Highway of Commerce

609. The river is used as a highway of commerce if it is "a corridor or conduit within which the exchange of goods, commodities or property or the transportation of persons may be conducted." A.R.S. § 37-1101(3). The statutory definition does not require the transport of goods; the transportation of persons alone is sufficient to establish a "highway for commerce."

610. The U.S. Supreme Court has held that the "gist of the federal test" is whether a watercourse was or can be used as a highway for commerce. *Utah v. United States*, 403 U.S. 9, 11, 91 S.Ct. 1775, 1776 (1971). The details of the operations are largely irrelevant as long as the basic finding is that the watercourse can serve as a highway. *Id.* In *Utah v. United States*, evidence that owners hauled their livestock across the Great Salt Lake was sufficient to meet the highway for commerce requirement. *Id.*

611. The Ninth Circuit in *State of Alaska v. United States,* 754 F.2d at 854, attempted to further clarify the highway of commerce element of *The Daniel Ball* test stating "the central theme remains the movement of people or goods from point to point on the water." In *State of Alaska*, the court found no showing of the use of a river as a highway of commerce because floatplanes did not fall within the meaning of using a river as a highway or channel. 754 F.2d at 855.

612. The Arizona Court of Appeals has interpreted "highway for commerce" under the federal test to "neither require both trade and travel together nor that the travel or trade be commercial." *Hull*, 199 Ariz. at 421, 18 P.3d at 733 (citing *Utah v. U.S.*, 403 U.S. at 11, 91 S.Ct. at 1776). Additionally, the Arizona Court of Appeals has stated "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.

613. The Gila River was actually used as a "highway for commerce" under the federal test for navigability at statehood, even though the water had at that time been largely diverted. *See* FOF 325-326, 352-354, 383-384, 455-460, 495-504, 520, 522-538.

XIX. Susceptibility to Navigation

614. While the actual use of the Gila as a highway for commerce is well documented and is sufficient for a navigability determination, the Commission also finds the Gila navigable based on its susceptibility to navigation.

615. The U.S. Supreme Court has consistently held that for title navigability determinations "[t]he question of that susceptibility in the ordinary condition of the rivers, rather than of the mere manner or extent of actual use, is the crucial question." *United States v. Utah*, 283 U.S. at 82, 51 S.Ct. at 443, *also quoted in PPL Montana*, 132 S.Ct. at 1233. It is the susceptibility of rivers to use as a highway of commerce that is the "true criterion of the navigability of a river, rather than the extent and manner of that use" because the susceptibility is the fact that affords the public right of control over navigation on the river. *United States v. State of Utah*, 283 U.S. at 83, 51 S.Ct. at 443 (internal citations omitted). "The extent of existing commerce is not the test." *Id.* at 82, 51 S.Ct. at 443.

616. The U.S. Supreme Court has recognized that susceptibility is the appropriate test when rivers are located in areas of the country "where conditions of exploration and settlement explain the infrequency or limited nature of such use . . . ." *State of Utah*, 283 U.S. at 82, 51 S.Ct. at 443. "[A state] is not to be denied title to the beds of such of its rivers as were navigable in fact at the time of the admission of the state 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." *Id.* at 83, 51 S.Ct. at 443-44, *cited with approval in Winkleman*, 224 Ariz. at 241, 229 P.3d at 253.

617. A lack of commercial traffic is not a bar to a conclusion of navigability "where personal or private use by boats demonstrates the availability of the stream for the simpler types of commercial navigation." *Appalachian Elec. Power Co.*, 311 U.S. at 416, 61 S. Ct. at 303; *PPL Montana*, 132 S.Ct. at 1233. "Evidence of recreational use, depending on its nature, may bear upon susceptibility of commercial use at the time of statehood." *PPL Montana*, 132 S.Ct. at 1233.

618. Arizona, including the Gila River area, was one of the last territories in the West to be settled. *See* FOF 211- 212, 214. Roads and rails were better available options than transportation on an increasingly diverted river. *See* FOF 196. Still, the evidence shows

significant personal and private use of the Gila, including commercial use. Consistent with U.S. Supreme Court precedent, the Commission finds the evidence shows the Gila in its ordinary and natural condition was susceptible to use as a highway for commerce.

A. Physical Characteristics

619. "The capacity of the rivers in their ordinary condition to meet the needs of commerce . . . may be shown by physical characteristics and experimentation as well as by the uses to which the streams have been put." *United States v. Utah*, 283 U.S. at 83, 51 S.Ct. at 444; *see also FPL Energy Maine Hydro LLC v. F.E.R.C.*, 287 F.3d 1151, 1156 (D.C. Cir. 2002) (finding Messalonskee a navigable water of the United States based solely on three non-commercial, non-recreational test canoe trips and the physical characteristics of the Messalonskee).

620. A finding of navigability based on actual evidence of current boating that shows "navigability-in-fact" is entirely consistent with U.S. Supreme Court law. *See United States v. Utah*, 283 U.S. at 76, 51 S.Ct. at 441 (navigability depends on "the fact, if it be a fact, that the stream in its natural and ordinary condition affords a channel for useful commerce").

621. Extensive study of the physical characteristics of the Gila River and *actual* experimentation by scientific experts boating on the depleted River today in low draft boats clearly demonstrates that the Gila River is and was susceptible for use as a highway of commerce at statehood, in its ordinary and natural condition, when the River had substantially more water. *See* FOF 325-326, 352-354, 383-384, 455-460, 495-504, 520, 522-538.

B. Modern Use

622. "Evidence of present-day use may be considered to the extent it informs the historical determination whether the river segment was susceptible of use for commercial navigation at the time of statehood." *PPL Montana*, 132 S. Ct. at 1233.

623. Present-day use includes recreational use. *Id.* Present-day recreational use may be used if it "shows the river could sustain the kinds of commercial use that, as a realistic matter, might have occurred at the time of statehood." *Id.*

624. In order for present-day use to be considered, it must also meet two specific criteria: "(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 poststatehood condition is not materially different from its physical condition at statehood." *Id.*

625. Modern watercraft must not "permit navigability where historical watercraft would not, or if the river has changed in ways that substantially improve its navigability, then the evidence of present-day use has little or no bearing on navigability at statehood." *Id.*

626. "Modern recreational fishing boats, including inflatable rafts and lightweight canoes or kayaks, may be able to navigate waters much more shallow or with rockier beds than the boats customarily used for trade and travel at statehood." *Id.* at 1234.

627. The Commission finds that evidence of modern day recreational use shows that the Gila River is susceptible to navigability in its ordinary and natural condition at statehood, as a highway of commerce. Modern recreational use has occurred on the Gila River. *See* FOF 329, 360, 386, 402, 422, 449, 507, 540. All experts that have boated any river, including the Gila River, have testified that the boats used today are meaningfully similar to boats that were commonly used at statehood. *See* FOF 250-255. As stated *supra* ¶ 606, many courts, including the U.S. Supreme Court, have recognized that canoe use shows a river is used or susceptible for use as a highway of commerce, sustaining trade and travel.

628. The Commission finds that boating with meaningfully similar boats on a deteriorated and depleted river is excellent evidence that boating could also occur on the Gila River in its ordinary and natural condition.

XX. Obstacles

629. The U.S. Supreme Court has consistently held that occasional obstructions and small portages do not defeat navigability.

630. In *Econ. Light & Power Co*, the Court stated that "[n]avigability, in the sense of the law, is not destroyed because the water course is interrupted by occasional natural obstructions or portages; nor need the navigation be open at all seasons of the year, or at all stages of the water." 256 U.S. at 122, 41 S. Ct. at 412. The Court found that the Desplaines River had "a rapid, and in places shallow water with boulders and obstructions, yet these things do not affect its navigable capacity. . . ." *Id.* at 118, 41 S.Ct. at 411.

631. In *United States v. Utah*, the Court stated that a river may still be navigable in fact "although its navigation may be encompassed with difficulties by reason of natural barriers, such as rapids and sand-bars." 283 U.S. at 86-87, 51 S.Ct. at 445. The Court found that the presence of sandbars causing impediments to navigation does not make a river

nonnavigable. *Id.* at 86, 51 S.Ct. at 445. The Court also found that evidence of navigability is valid if not confined to "exceptional conditions or short periods of temporary high water. . . ." *Id.* at 87, 51 S.Ct. at 445.

632. Finally, in *PPL Montana*, the Court was faced with deciding the navigability of the Great Falls reach of the Missouri River, which consisted of a 17-mile segment with five waterfalls with heights of 87, 19, 48, 7, and 26 feet and continuous rapids in between. 132 S.Ct. at 1223. The segment required Lewis and Clark to portage their boats and supplies around the reach over the course of at least 11 days. *Id.* at 1231. The Court ultimately, and for good reason, found the Great Falls reach non-navigable. *Id.* at 1232. While the Court's determination of navigability was limited to the record before it, the Court did opine that "the law might find some nonnavigable segments so minimal that they merit treatment as part of a longer, navigable reach . . . ." *Id.* at 1230. In addition, the Court appeared to establish that a day-long portage is the minimum threshold length for a non-navigability determination based on a portage. *Id.* at 1231.

633. The Ninth Circuit, also a controlling court for ANSAC's decision, has held that occasional obstacles do not defeat navigability. *State of Or. By & Through Div. of State Lands v. Riverfront Prot. Ass'n*, 672 F.2d at 795 (9th Cir. 1982). A river "need not be without difficulty, extensive, or long and continuous." *Id.* The court found the McKenzie river navigable where log drives were difficult due to uncontrollable flooding, too little rain that caused gravel bars, boulders, and shoals, and conditions that might create obstacles that take a log moving crew three or four days to overcome. *Id.*

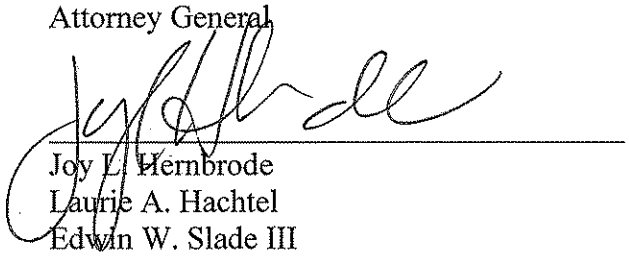
634. The Commission finds that the Gila River is not limited in its navigability by obstacles. There are no natural obstructions on the Gila. *See* FOF 317, 339, 378, 389, 416, 448, 487, 514. There are no rapids in most segments and minor rapids in others. *See* FOF 317, 339, 378, 390, 416, 448, 487, 514.

XXI. Determination of Navigability

635. Based upon the evidence submitted, the controlling federal and state law, and the guiding law, the Commission finds that the Gila River was both used and susceptible to use for navigation in its ordinary and natural condition on or before February 14, 1912. The Gila River is "navigable" as defined by the Arizona Revised Statutes and case law.

DATED: January 23, 2015.

MARK BRNOVICH
Attorney General



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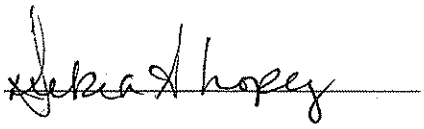

EXHIBIT "A"

Table 1

Comparison of Expert's Theoretical Depths[1] (feet) In Natural (nat.) and Not Natural (not nat.) Conditions of the River

Segments[2]	**1**			**2**		**3**			**4**	**5**	**6**			**7**		**8**	
Gage[3]	Virden	York	Clifton	Clifton	Bonita Ck	Solomon	Ashurst	Calva	Coolidge Dam	Kelvin	Below Kelvin	Olberg	Above Salt Confluence	Laveen	Buckeye	Dome	Yuma
ASLD[4]	0.9 (**not** nat.)	--	1.0 (**not** nat.)	1.0 (**not** nat.)	--	1.3 (**not** nat.)	--	< 0.5 (**not** nat.)	2.7 (**not** nat. mean)[5]	1.3 (**not** nat.)	--	1.5-2.0 (nat.)[6]	--	2.5-3.0 (nat.)[7]	1.0-3.0 (nat.)[8]	2.5-3.0 (nat.)[9]	--
Burtell[10] (nat)	<1.7-1.8	<1.6	<2.0	<2.0	1.1-2.5	<2.0	<2.0	<1.8	<1.8-2.0	--	--	--	--	--	--	--	--
Gookin[11] (nat)	--	--	--	--	--	--	--	--	--	--	0.55 (error)	--	0.74 (error)	--	--	--	--
Hjalmarson[12]	--	--	--	--	--	--	--	--	--	--	--	--	--	2.5-3.0	--	--	2.5-3.0
Summary of Opinions[13]	**0.9-1.8**	**1.6**	**1.0-2.0**	**1.0-2.0**	**1.1-2.5**	**1.3-2.0**	**<2.0**	**0.5-1.8**	**1.8-2.7**	**1.3**	**0.55 (error)**	**1.5-2.0**	**0.74 (error)**	**2.5-3.0**	**1.0-3.0**	**2.5-3.0**	**2.5-3.0**

[1] These are just theoretical depths and should be used in conjunction with historical and modern accounts of the river.
[2] Segmentation based on ASLD segments.

[3] At some locations actual USGS gages exist, at other locations, experts used gage data from a different location to estimate that specific location's depth.
[4] Where indicated "not nat." ASLD's hydraulic depths are based on flows from post-statehood gage readings, when the river was largely depleted and was not in its ordinary and natural condition; ordinary and natural condition depths would be deeper. X020-79, PPT 136, 143-151.

[5] ASLD did not calculate a median flow, but did calculate a mean flow. X020-79, PPT 146 (Fuller). This would be slightly higher than an expected median in depleted, not ordinary and natural conditions.

[6] ASLD did not calculate a median flow rate at Olberg but did calculate depths based on various flows. X020-79, PPT 148 (Fuller). Olberg is nearby Gookin's "Below Kelvin" location, and as Gookin was the only expert to calculate median flow in that area, Gookin's median flow rate was used with ASLD's corresponding depth range. X009 ("Summary" table).

[7] ASLD did not calculate a median flow at this location, but did calculate depths based on various flows. X020-79, PPT 149 (Fuller). Hjalmarson was the only expert to calculate median flow in the area of Laveen (below the Salt River confluence). 023, p. 12 (Hjalmarson 2002 Rpt.). His flow rate was used with ASLD's corresponding depth range.

[8] ASLD did not calculate a median flow at this location, but did calculate depths based on various flows. X020-79, PPT 150 (Fuller). The entire range calculated is listed.
[9] ASLD did not calculate a median flow at this location, but did calculate depths based on various flows. X020-79, PPT 151 (Fuller). Hjalmarson was the only expert to calculate median flow in the area of Dome (Yuma). 023, p. 12 (Hjalmarson 2002 Rpt.). His flow rate was used with ASLD's corresponding depth range.

[10] Burtell's hydraulic depths are reconstructed maximum mean depths for the natural condition of the river. X008-2, p. 17, Table 10 (Burtell Decl.).

[11] Gookin reconstructed natural depths. X009 ("Summary" table). Gookin admitted that he miscalculated depths. Tr. 6/18/14, pp. 763-766 (Gookin). ASLD's expert Jon Fuller testified that Gookin's depths were low due to the use of an incorrect n-value of 0.02 instead of 0.035, a 75% percent difference. Tr. 6/17/14, pp 507-509 (Fuller). Robert Mussetter, an expert for the proponents of non-navigability, also testified that Gookin's depths are low based on an incorrect n-value. Tr. 8/19/14, pp. 1743-1745 (Mussetter).

[12] Hjalmarson reconstructed depths at two points: just below the confluence with the Salt (ASLD's Laveen) and at the mouth of the Gila (ASLD's Yuma). 023, p. 12 (Hjalmarson 2002 Rpt.).

[13] This summary does not necessarily reflect comparable depths because some depths are for the not natural condition of the river and some depths are for natural reconstructed depths.