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BEFORE THE ARIZONA NAVIGABLE STREAM ADJUDICATION COMMISSION

In re Determination of Navigability of the San Pedro River	Case No. 03-004-NAV Memorandum regarding the Navigability of the San Pedro River

Defenders of Wildlife, Donald Steuter, Jerry Van Gasse, and Jim Vaaler (collectively, "Defenders") hereby submit their memorandum regarding the navigability of the San Pedro River. For the reasons that follow, Defenders request that the Arizona Navigable Stream Adjudication Commission ("ANSAC") apply the correct legal standard to the evidence both in the existing record and the supplemental evidence submitted upon the reopening of the evidentiary record, and hold that on February 14, 1912, the San Pedro River, from a mile below Lewis Springs to its mouth, was navigable in its ordinary and natural condition.

I. Statement of Facts.

A. The San Pedro Watershed

The San Pedro River is located in southeastern Arizona, with a small portion of the upper watershed extending into Sonora, Mexico. EIN 16,[1] "Arizona Stream Navigability Study for the

[1] Citations to the evidentiary record are identified as Evidence Item Number ("EIN").

San Pedro River: Gila River Confluence to the Mexican Border" prepared by CH2MHill, revised by JE Fuller/Hydrology & Geomorphology, Inc. June 1997 and January 2004 ("State Report") at 5-4. It is aligned principally north-northeast, with an elevation that ranges from 4,260 ft. at the Mexican Border to 1, 920 ft. at its confluence with the Gila River, over a distance of 123 miles. *Id.* The River is typically divided into two reaches. The first reach, the Upper San Pedro, originates in Mexico and flows through Santa Cruz County to "The Narrows," a bedrock constriction located north of Benson, between the foothills of the Rincon Mountains to the west and the Little Dragoon Mountains to the east. *Id.* at 7-1. The second reach, the Lower San Pedro, runs from The Narrows, north to Winkleman where San Pedro flows into the Gila River. *Id.* The important hydrologic characteristics of the San Pedro River that have existed since the predevelopment era are:

- The San Pedro River drained about 696 square miles at the upper end of the study reach and about 4,460 square miles at the lower end. EIN X0013, "NAVIGABILITY ALONG THE NATURAL CHANNEL OF THE SAN PEDRO RIVER (From the border with Mexico to the mouth at the Gila River near Winkleman, Arizona) EXECUTIVE SUMMARY OF ANALYSIS" by Hjalmar W. Hjalmarson, PE, August 20, 2013 ("Hjalmarson Exec. Summary") at p. 2

- The watershed was hydrologically diverse because of the diversity of climate, geology and topography. *Id.*

- The mountainous areas along the east and west sides of the watershed typically received more than 20 inches of precipitation per year. The warm-dry valley area typically received less than 16 inches of precipitation per year. *Id.*

- Precipitation fell during two distinct periods--summer and winter. There was light snow accumulation in the higher mountains with occasional melting to produce spring runoff along the river. Much of the direct runoff for navigation was from the summer rainfall in the mountainous areas. *Id.*

- When rain fell onto the land in the San Pedro River watershed it started moving according to basic principles of hydrology. A portion of the precipitation seeped into the ground to replenish ground water. Some of the water flowed downhill on the land surface as direct runoff and appeared in surface streams that were unaffected by artificial diversions, storage, or other works of man in or on the stream channels. *Id.*

- In the San Pedro River watershed, much of the runoff from storms reached the river channel directly on the land surface via overland flow, flow in rills, creeks and streams. Direct runoff was seasonal because the storms were seasonal and provided runoff for navigation for part of each year. *Id.*

- Under natural conditions the water that replenished the groundwater mostly along the mountain fronts all along the river valley was temporarily stored, and later discharged to the river at springs and seeps. This base runoff was slowly and steadily released from storage during dry periods. Because precipitation, and therefore direct runoff, was seasonal and there are a few months each year with little precipitation, the base runoff provided perennial flow for navigation to the San Pedro River. *Id.*

- Thus, this base runoff was derived from rather constant (steady) groundwater discharge all along the river from the regional and also an alluvial aquifer. The regional aquifer is defined as having recharge zones away from the river, primarily at mountain fronts and along ephemeral channels. The alluvial aquifer along the river was recharged from the regional aquifer and from storm flow (direct runoff). Based on recent environmental isotope data, we know that the composition of base flow was mostly from regional groundwater and also from summer storm runoff that may have been stored as alluvial groundwater—at times for several years. *Id.*; *see also* EIN X0013, Bisbee PPT, slide 55 citing Kennedy, J.R., and Gungle, Bruce, 2010, Quantity and Sources of Base Flow in the San Pedro River near Tombstone, Arizona: U.S. Geological Survey Scientific Investigations Report 2010–5200, 43 p.

- In the absence of evapotranspiration (ET) along the riparian area the base runoff would have steadily increased along the river throughout an ordinary year. However, the base runoff varied considerably because ET varied seasonally. Large amounts of the rather steady inflowing groundwater to the riparian area were consumed (converted to water vapor) during the summer months. Summer base runoff (roughly represented by Q_{90}, the amount of base runoff equaled or exceeded 90% of the time during a typical year) decreased along the river. Base runoff also varied considerably throughout the year. Hjalmarson Exec. Summary at p. 3-4.

B. The San Pedro River Pre-Development

Scientists have undertaken numerous studies in an effort to determine what the San Pedro River was like during pre-development times. In 1986, G. W. Freethey and T. W. Anderson of the U.S. Geological Survey prepared USGS Hydrologic Investigations Atlas HA-664, "Pre-development hydrologic conditions in the alluvial basins of Arizona and adjacent parts of California and New Mexico," which calculated predevelopment base runoff for San Pedro River,

as well as other southwestern rivers. EIN X0002, USGS HA-664. According to USGS HA-664, during the pre-development times, the entire length of the San Pedro River was perennial *Id.*, Sheet 3; See also X0013, Bisbee Powerpoint Presentation by Hjalmar W. Hjalmarson, PE ("Bisbee PPT"), slide 37. During that time, alluvial basins typically were hydraulically connected to the river by upward leakage through the floodplain aquifer. The floodplain aquifer consists of river sediment deposited above the valley fill. *Id.* at slide 53.

The natural San Pedro was a single meandering channel. *Id.* at slides 102; 106-107. See also EIN X002, Stromberg, J. C. and Tellman, B., 2009, ECOLOGY AND CONSERVATION OF THE SAN PEDRO RIVER: The University of Arizona Press Tucson, ("Stromberg & Tellman"), p. 260 ("Prior to the mid-1800s, the San Pedro River flowed over an unincised surface and had a larger area prone to flooding. It contained a single meandering channel, and marshes were common.") The morphology was self-formed with few hard rock controls that appear to have had little effect on channel shape. The natural channel was formed in material that was entrained, transported and deposited by the river and tributary streams. Bisbee PPT, slide 104. "Prior to the late 1800s, the San Pedro River was a relatively low-energy, unentrenched fluvial system with extensive marshy reaches or cienegas." EIN X0013 Bisbee Appendix, slide 57, quoting EIN X0002, Cook, Joseph P., 2009, and others, Mapping of Holocene River Alluvium along the San Pedro River, Aravaipa Creek, and Babocomari River, Southeastern Arizona, Arizona Geological Survey, 76 p and 6 maps.

There are several theories on precisely how and when the river channel changed from meandering and slightly incised with extensive marshy reaches with fine sediments of pebbles, sand, silt, clay and evaporate deposition. Bisbee PPT, slide 115 citing Cook, 2009, and others. But the natural channel and floodplain were composed of finer material that commonly consisted

of fine sand, silt, and class with interspersed pebble to gravel beds. Bisbee PPT, slide 116; See also EIN X002 Cook and others, pp. 23, 76, and 6 maps. The presence of dark paleosoils indicates that the pre-development San Pedro had stream flow along its entire reach and there was little channel entrenchment along the river. Bisbee Appendix slides 56-60.

C. Human Impacts on the San Pedro River

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

1. Irrigation.

Accounts of irrigation diversion along the San Pedro River show irrigation was practiced as early as 1697 when the San Pedro Valley was "crisscrossed by irrigation ditches, and had irrigated fields in which cotton, squash, watermelon, beans and corn were growing." State Report, p. 3-3; See also Bisbee PPT, slides 9 and 19. Indians were irrigating along the river as early as the 1760's (*Id.*) and continued to do so through at least 1919. EIN X0013, Phoenix Powerpoint Presentation by Hjalmar W. Hjalmarson, PE ("Phoenix PPT"), slides 27-32. There have been at least 144 diversions by the Spanish, Mexicans and Caucasians over the past few hundred years. X002, Bisbee Appx. Slide 14. The impact of these human activities such as irrigation diversions, livestock watering at springs, and grazing and herding of cattle became apparent in the 1850s as evidenced by turbid streamflow, channel incision and a couple of accounts of no flow in a short reach of the river. Phoenix PPT slides 24-26.

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

and Pomerene Irrigation Districts diverted 6,000 acre-feet of water from the San Pedro River for use on 2,400 acres of farmland.

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

2. Cattle Grazing

Massive cattle grazing and logging in the watershed and along the San Pedro River changed the runoff and sediment yield resulting in widening, down cutting and straightening of the natural meandering river channel. Hjalmarson Exec. Summary, p. 2. From about 1750 to the mid 1800s, before Anglo-American activities, there were large livestock herds in the valley and along the river. According to the US Bureau of Land Management (San Pedro RNCA Cultural Resources) over 60,000 cattle of Mexican settlers reportedly were roaming, wild or otherwise, from 1820-1850. Because cattle typically concentrate within 3 miles of natural waters such as along the San Pedro River, there must have been considerable degradation of natural riparian environment as cattle trampled channel banks. Bisbee PPT, slide 24. "In the early 1800s the Mexican government established land grants for ranching in the upper basin. These ranches were eventually abandoned due to Apache deprivations, but large feral herds remained behind." EIN X002, Stromberg & Tellman, p. 217-267; see also *id.* at 265 (impacts of cattle on river).

3. Extirpation of Beavers and Draining of the River

The explorer James O. Pattie trapped beaver along the San Pedro River between 1824 and 1828. He found the beaver so plentiful, he called the river "Beaver River." State Report 3-13. However , in the 1880s area residents removed the beavers and their dams from the San Pedro. EIN 4, Glennon, WATER FOLLIES, Chap. 4, p.52. They also drained the river in places

due to concerns regarding malaria. *Id.* Some believe that this removal of beaver played an important role in the entrenchment of floodplains. *See* Stromberg & Tellman, p. 265-66.

4. Mining

Since the late 1800's historic observations of the river channel condition and base flow along the San Pedro in the United States were probably affected by water use by mines. According to the State Report, "[m]ining at the Mammoth Mine and San Manuel began in 1881. San Manuel mine used well water for Milling." State Report, p. 3-22. For some time the mine at San Manuel used approximately 22,000 ac-ft annually. Bisbee PPT, Slide 21(citing Barbara Tellman, Richard Yarde & Mary G. Wallace, "Arizona's Changing Rivers: How People Have Affected the Rivers" (Univ. of Ariz. 1997)("Tellman, 1997"). This amount of water use was approximately 20% of the pre-development runoff from the San Pedro River watershed. *Id.* The Cananea mine in Mexico also likely impacted the base flow of the San Pedro River. Phoenix PPT, Slides 13-20. "The large copper mining operation in Cananea, Sonora, began in the 1880s. Water came from nearby springs and both surface water and groundwater in both the San Pedro and Rio Sonora watersheds." EIN X002, Stromberg & Tellman,, p. 222. "Pumping in the Cananea region, located in the far southern portion of the watershed, is too far removed to directly impact groundwater in the Sierra Vista sub-basin. However, pumping in this area undoubtedly impacts the baseflow of the river near Cananea." Phoenix PPT, slide 15, quoting CEC, 1999, Ribbon of Life-An Agenda for Preserving Transboundary Migratory Bird Habitat on the Upper San Pedro River: Commission for Environmental Cooperation, Montreal CAN., 32 p.

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

One of the earliest descriptions of the Upper San Pedro River was from Trapper James Ohio Pattie who visited the River during the 1820's. As noted above, Pattie called the San Pedro

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

In 1846, Phillip St. Goerge Cooke, leader of the Mormon Battalion, described the San Pedro as a marshy beautiful little river with an abundance of fish with "salmon trout" that by some accounts grew up to 3 ft. long. Tellman,1997 at p. 30. Later, in 1851, J.R. Bartlett, a government surveyor, noted continuous streamflow in the upper San Pedro. State Report 5-10. Bartlett described the river as "two feet deep, and quite rapid." *Id.* at 3-16. In 1854, J. G. Parke crossed the San Pedro River heading east and stated that "[t]he stream is about eighteen inches deep and twelve feet wide and flows with a rapid current..." State Report 3-17; He also observed "[a]t the Tres Alamos [crossing] the stream is about fifteen inches deep and twelve feet wide and flows with a rapid current...." *Id.* In 1859, immediately upstream from The Narrows, another engineer Hutton described the river as having a width of approximately 12 feet and a depth of 12 inches. *Id.* In 1864, former Boundary Commissioner Sylvester Mowry described the river as 30 feet wide and two and one-half feet deep. Phoenix PPT, slide 38.

E. Actual Condition of the San Pedro River in 1912

By 1912, most of the channel of the San Pedro was entrenched, except along bedrock reaches like The Narrows. State Report, p. 5-15. The channel was braided. *Id.* Frequent flooding in the late 1800s resulted in a channel wider than what was recorded in the survey notes of the 1870's and 1880's. *Id.* at 5-16. It is estimated that at that time, the width of the channel on the Upper San Pedro averaged between 130 and 260 feet. *Id.* At the time of statehood, the

width of the channel between The Narrows and Redington is estimated to have averaged 130 to 260 feet. *Id.* at 5-16. Downstream, the channel was even wider averaging 330 to 650 feet. *Id.*

The State Report concludes that at the time of statehood, the Upper San Pedro River near St. David was perennial, with an average annual flow rate of about 50 cfs, and a median flow rate of about 10 cfs. *Id.* The flow rates estimated for the Upper San Pedro correspond to an annual average flow depth of about 1 foot, and a median depth of about 0.5 feet. *Id.* at 7-22. By statehood, however, it was not in its "natural" condition. Irrigation diversions for Tombstone mining increased during the period around statehood. State Report, p. 5-11. Beaver dams were destroyed and swamps drained to lower the water table. *Id.*

On the Lower San Pedro River, at the time of statehood, stream flow was largely intermittent with short reaches of perennial flow (less than 10 cfs). *Id.* at 5-15. Although there were four gaging stations on the entire San Pedro River around the time of statehood, only one, at Winkleman, was located on the Lower San Pedro. That gaging station operated from April through August 1890 with average monthly flows ranging from 0 cfs to 295 cfs. *Id.* at 7-6. Because the hydrology of the river has not radically changed since 1912, the State Report looks to long term modern gage records, recognizing that the average annual stream flow rates have progressively declined since the 1920s. *Id.* at 7-6. Average annual flow rates at Redington and Winkleman were 45 cfs and 44 cfs respectively. Median flow rates at 1 and 3, cfs. *Id.* Given the lower annual flow rate, the depths in the Lower San Pedro tended to be lower as well. Applying the rating curve to long term gage records, the annual average depth at Redington is 0.5 feet, ranging from 0.3 feet in April, May and June to 0.8 in August. State Report, p. 7-17.

At the time of statehood, the Lower San Pedro had also been significantly impacted by diversions. The USGS reported in 1899 that lower San Pedro River was dry, due in part to the

large number of small canals. *Id.* at 7-6. In 1890, 2700 acres were irrigated on the San Pedro River. *Id.* at 7-6 (Winkleman gage). Human interference with beavers also impacted this part of the river. The extermination of beavers meant that their dams were no longer able to prevent the cutting of a channel. *Id.* at 5-14. And cattle grazing resulted in less grass on the hillsides, which also contributed to greater erosion. *Id.* There was also a general decline in stream flow due, in part, to ground water withdrawals in excess of natural recharge. *Id.* at 7-10.

F. Evidence of Navigation.

Evidence of historic navigation of the San Pedro is limited to the possible use of a canoe by James O. Pattie. 8/2/2013 Tr. p. 112, 180. However, the record contains significant evidence of modern boating on the river. According to a survey conducted for the state, recreational boaters have, at one time or another, boated the entire length of the San Pedro, including the Upper San Pedro. State Report at 8-5. As the Report observes, "modern use of a river reach by canoes probably indicates that canoes could have been used at the time of statehood." *Id.* at 8-4.

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

As discussed above, at the time of statehood, and well before, both the natural hydrology and morphology of the San Pedro River had been significantly altered by human activity. Large cattle herds and numerous stock tanks, as well as diversions for mining, irrigation, and domestic use have, in varying degrees, impacted the stream flow and morphology of the San Pedro River for at least 300 years. EIN X0013, Hjalmarson Exec. Summary, p. 2. Groundwater and surface water removals had resulted in lower flow rates in the San Pedro River than there would be if the River had remained in its ordinary and natural condition. *Id.* Therefore, in order to determine the "ordinary and natural condition" of the river, it is necessary to eliminate the effect of those impacts.

Win Hjalmarson, a retired river engineer from the USGS with 51 years of experience with rivers in the Southwestern United States undertook such an analysis for the San Pedro. See EIN X0013, Bisbee PPT, Appendix PPT, Phoenix PPT and Hjalmarson Exec. Summary. Mr. Hjalmarson used a systematic three-step procedure that used known, quantifiable data regarding the San Pedro River and extrapolated from that data to determine the flow of the river in its natural condition. First, as described in detail in both his Powerpoint presentations and Executive Summary, the natural hydrology of the San Pedro was identified and expressed in typical flow-duration curves using various sources of discharge data obtained at sites along the study reach. Channel geometry was then applied to the flow characteristics using known sediment characteristics of the San Pedro River. This process calculated the width, depth and flow of the natural river. Finally, Mr. Hjalmarson evaluated the navigability of the river using two independent methods used by federal agencies to determine whether a watercourse is capable of being navigated by various water craft. Published information and standard engineering hydraulic, hydraulic geometry and hydrologic methods were used to accomplish each of these three steps.

To identify the natural hydrology of the river, Mr. Hjalmarson first constructed a flow duration curve (FDC) for the San Pedro River. Hjalmarson Exec. Summary p. 4. In a FDC, stream flow discharges are ranked in decreasing order and plotted on a graph. *Id.* The FDC shows the full range of stream flow in a given river, and also shows the percentage of time that the river's stream flow is at any particular level. *Id.* To determine the shape of the FDC for the San Pedro River, Mr. Hjalmarson used post-development gage data collected at the Tombstone gage. *Id.* Although post-development discharge data are not an accurate measure of the natural

stream flow, Mr. Hjalmarson believed that it sufficiently reflected the range and patterns of the San Pedro's stream flow to form the basis of a representative FDC. *Id.*

The next step in the process was quantifying pre-development flow so that the representative FDC could be applied to that data. *Id.* To calculate pre-development flow, Mr. Hjalmarson used two independent data sources published by the USGS, predevelopment base runoff and annual average runoff, at three separate points on the river[2]: the mouth, the narrows or join, and the Charleston gage. Once he had determined the base runoff and average annual runoff for each of those points, he applied the FDC to the data which allowed him to estimate the full range of natural streamflow at each of the identified points in the river. *Id.* p. 4-8.

Once he had determined the natural streamflow, the next step in the process was to apply the information about the River's hydrology to its morphology. *Id.* at 9. Mr. Hjalmarson computed channel depth-duration and velocity-duration relations for each of the sites using a technique based on the standard Manning hydraulics equation for open channel flow. *Id.* According to these calculations, the maximum channel depths at the mouth ranged from about 1 foot to over 2.5 feet, with a median depth of 1.5 feet. 80% of the time, the maximum channel depth at the mouth was greater than 1 foot. At the join, the maximum channel depth ranged from slightly less than one foot to over 2.5 feet, with a median depth of 1.4 feet. 80% of the time, the maximum channel depth at the join was greater than 1 foot. Finally, at the Charleston gage, the depths ranged from slightly less than one foot to over 2.5 feet, with a median depth of 1.25 feet. 80% of the time, the maximum channel depth at the Charleston gage was greater than 1 foot. *Id.* at 10.

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

Mr. Hjalmarson also explained that he believed that his assessment likely understated the amount of flow in the river in its ordinary and natural condition because his approach had been consistently conservative, both in the data relied upon and in the approach taken. *Id.* at 11-12.

II. Legal Discussion.

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

1. State ex rel. Winkleman v. ANSAC

In determining whether the San Pedro River was navigable at the time statehood, it is appropriate to begin with a discussion regarding the Court of Appeals' decision regarding the Lower Salt River and how the directives set forth by the Court in that Opinion should inform the proceedings for other rivers. *State ex rel. Winkleman v. Ariz. Navigable Stream Adjudication Comm'n,* , 224 Ariz. 230, 229 P.3d 242 (App. 2010). Significantly, in the case of the Lower Salt River, the Court remanded the matter back to ANSAC because it found that "although ANSAC considered a great deal of evidence concerning the condition of the River, and reviewed evidence from various times before statehood, ANSAC ultimately failed to apply the proper legal standard to the evidence presented." *Id.* at 242 ¶28, 229 P.3d at 254. The Court held that "[b] ecause the proper legal test was not applied, we must vacate the superior court's judgment and remand for ANSAC to consider whether the River would have been navigable had it been in its ordinary and natural condition on February 14, 1912." *Id.* at ¶29.

In articulating the proper legal test, the Court instructed that ANSAC is "required to determine what the River would have looked like on February 14, 1912, in its ordinary (i.e. usual, absent major flooding or drought) and natural (i.e. without man-made dams, canals, or other diversions) condition." *Id.* at 241 ¶28, 229 P. 3d at 253. The Court also provided specific guidance regarding what constituted the "best evidence" of the Lower Salt's natural condition,

and concluded that with respect to that watercourse, "the River could be considered to be in its natural condition after many of the Hohokam's diversions had ceased to affect the River, but before the commencement of modern-era settlement and farming in the Salt River Valley...." *Id.*at 242 ¶30, 229 P. 3d at 254.

Although ANSAC's earlier determination regarding the San Pedro River was appealed to the Superior Court, the parties agreed to stay that appeal (as well as several others) pending the resolution of the appeal of the Lower Salt River to the Court of Appeals. After the Court of Appeals remanded the Lower Salt matter, the parties all agreed that the stayed appeals should all be remanded as well. Consequently, unlike the adjudication of the Lower Salt River, there is no specific instruction in this case as to what constitutes the "best evidence" of the natural and ordinary condition of this river. Therefore, in determining navigability for the San Pedro River, the inquiry is two-fold. First, the ANSAC must determine what constitutes the best evidence of the river's "natural condition," and second, whether based on that evidence, the river was "used or susceptible to being used...as a highway for commerce, over which trade and travel were *or could have been conducted* in the customary modes of trade and travel on water." A.R.S. §37-1101(5)(emphasis added). *See also, Defenders of Wildlife v. Hull,* 199 Ariz. 411, 18 P. 3d 722 (App. 2001).

2. The San Pedro River's Natural Condition.

In the case of the San Pedro River, the evidence is overwhelming that on the date that Arizona became a state, February 14, 1912, the river was no longer in its natural condition. Thus, the question that follows is: at what point in time was the river free from human impacts? The evidence presented to the Commission establishes that humans have been diverting water from the San Pedro River since as early as the 1600s and that diversion has continued to modern

times. Moreover, human impacts to the river were not limited to diversions. The grazing of livestock and extermination of beaver all impacted the river's morphology. The signs of these impacts, in the form of entrenched banks, were visible as early as the 1850s. Thus, the accounts of the river from early explorers around that time frame do not describe it in its "natural condition."

Although historic accounts have limited evidentiary value, the sedimentary evidence indicates the river was stable. Consequently, Mr. Hjalmarson was able to use hydraulic geometry and morphology to model what the river looked like in its natural condition—before humans began diverting its water and impacting its banks. The modeling undertaken by Mr. Hjalmarson uses well-established and accepted scientific methods. His analysis demonstrates that in its natural condition, the San Pedro River, while not a major watercourse, was nonetheless a perennial one. And, from a mile below Lewis Springs all the way to the mouth, at least 80% of the time, it had a depth of at least one foot, with channel widths from 12 to 47 feet.

3. The San Pedro's Susceptibility to Navigation.

The definition of navigability does not require that the watercourse actually have been used for trade or travel, but rather, requires only that it was susceptible to such a use. "The question of ... susceptibility in the ordinary condition of the rivers, rather than of the mere manner or extent of actual use, is the crucial test ... The extent of existing commerce is not the test." *United States v. Utah*, 283 U. S. at 82; *see also, Alaska v. Ahtna*, 891 F.2d 1401, 1404-1405 (9th Cir. 1989). The term "highway for commerce" is first found in the definition of "navigable" or "navigable watercourse." The Arizona statute (which codifies federal law) defines both as:

> [A] watercourse that was in existence on February 14, 1912, and at that time was used or was susceptible to being used, in its ordinary and natural condition, as a

> highway for commerce, *over which trade and travel* were or could have been conducted in the customary modes of trade and travel on water.

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

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

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

199 Ariz. at 416, 18 P.3d at 727. In *Defenders*, the court also rejected the argument advanced by the Salt River Project and Phelps Dodge that the trade and travel must be both upstream and downstream, or that the travel must be for a profitable commercial enterprise. Rather, the court observed that, "nothing in the *Daniel Ball* test necessitates that the trade or travel sufficient to support a navigability finding need be from a 'profitable commercial enterprise.'" *Id.* at 422, 18 P. 3d at 733. *See also United States v. Hill,* 248 U.S. 420, 423 (1919) ("commerce has been held to include the transportation of persons and property no less than the purchase, sale and exchange of commodities") *citing Gibbons v. Ogden,* 9 Wheat 1, 188 (1824).

As the Oregon Court of Appeals explained in *Northwest Steelheaders Ass'n v. Simantel* 199 Ore. App. 471; 112 P.3d 383 (2005):

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

Id. at 389, *quoting Utah v. United States,* 403 U.S. at 11. Further, as the Oregon Court observed, "qualifying travel and trade is not limited to large-scale commercial or multiple passenger vessels of the sort typically engaged in modern commerce." *Id.* at 390. Navigation by small boats has often been recognized as evidence of navigability. *Block v. North Dakota,* 461 U.S. 273(1983) ("Canoe travel at the time of North Dakota's statehood represented a viable means of transporting persons and goods."); *Puyallup Tribe of Indians v. Port of Tacoma,* 525 F. Supp. 65 (W.D. Wash 1981), *aff'd,* 717 F.2d 1251 (9th Cir 1983)(declaring navigability on the basis that "Indians navigated the river with their fishing boats and canoes").

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

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

Id. at 83.

Finally, in considering the issue of "commerce," it is important to distinguish between cases involving navigability under the Commerce Clause and cases involving navigability for title. In Commerce Clause cases, in order to support federal regulatory jurisdiction over power

plants the river must by statute be, or have been, "suitable for use for the transportation of persons or property in interstate or foreign commerce." 16 U.S.C. §796(8)(2006). No such "interstate or foreign commerce" requirement exists when the issue is navigability for title. *Oregon v. Riverfront Protective Ass'n*, 672 F.2d 792, 795 n. 1 (9th Cir. 1982). Again, as the Arizona Court of Appeals cautioned in *Defenders,* "when discussing navigability, any reliance on judicial precedent should be predicated on a careful appraisal of the purpose for which the concept of navigability is invoked." 199 Ariz. 729-30, 18 P. 3d at 418-19. In sum, when the issue is navigability for title purposes, there is no requirement that the watercourse was actually used for commerce or any commercial activity. It is sufficient to show simply that the watercourse was susceptible to use for travel.

Although it is possible that James O. Pattie used a canoe on the San Pedro as part of a commercial enterprise, there is no other historical evidence of boating on the San Pedro River. That, however, does not mean that the river would not have been susceptible to navigation in its natural condition. Indeed, the record includes numerous examples of modern day boating using watercraft that are essentially the same as boats that were used at the time of statehood. This evidence alone suggests that the river, prior to the modern day diversions and reduced flow, could have been navigated with canoes or drift boats.

As part of his assessment, Mr. Hjalmarson evaluated the San Pedro River for navigability. In doing so, he used two methods developed by the federal government. First, he applied the "Bureau of Outdoor Recreation Method" developed in 1977 for the Bureau of Outdoor Recreation of the U.S. Department of Interior. And second, he used the Fish and Wildlife Service Method. This latter is a single cross section technique that is very simple to use and is based on a minimum flow recommended for a particular watercraft activity. The USFW

method establishes minimum depth and width requirements for canoes, kayaks, drift and row boats. And as Mr. Hjalmarson found, all of these minimum requirements are met along nearly all of the San Pedro River in its natural and ordinary condition.

His specific findings regarding the navigability characteristics of the San Pedro are as follows:

- The width and current (velocity) of the San Pedro River flow easily met the standards for navigability. Nearly all of the time flow width was sufficiently great. Except during large floods, the flow velocity was sufficiently small for navigability along the San Pedro River.

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

- According to Mr. Hjalmarson's assessment, about 20% of the time during a typical year, the depth of the natural flow along the San Pedro River also limited navigability in the remaining reach of the River (between one mile below Lewis Springs, located 19 miles north of the border, and the mouth at the Gila River). In the absence of direct runoff, the summer ET simply consumed a lot of water in the riparian zone reducing the depth to below 1 foot.

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

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

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

Hjalmarson Exec. Summary, pp. 10-11.

B. Issue 2: Segmentation.

The United States Supreme Court held that a river's navigability must be determined on a segment-by-segment basis. *PPL Montana LLC v. Montana,* 132 S. Ct. 1215 (2012). The Court recognized that "[p]hysical conditions that affect navigability often vary over the length of a river." *Id.* at 1230. In determining the navigability of the San Pedro River, this Commission must undertake the same approach. It would be contrary to well-established federal law to find an entire river "nonnavigable" simply because portions of the river were not susceptible to navigation, when others clearly were.

As Mr. Hjalmarson has opined, although he applied his model to the entire reach of the San Pedro, he determined that from the U.S./Mexico border to approximately a mile below Lewis Springs, the maximum depth of the river in its natural condition most likely would not have been susceptible to navigation. Therefore, he recommended segmenting the San Pedro at that point. 6/7/2013 Tr. p. 25.

III. Conclusion.

Ample relevant, persuasive evidence demonstrates that a significant segment of the San Pedro River meets the Arizona and federal standards of navigability. Evidence of navigability includes the early perennial flow of the river, historic descriptions of the river, the sedimentary evidence in the river banks, the modeled width and depth of the river in its natural condition, modern boating, and established flow requirements for actual navigation. When the objective evidence is evaluated using the appropriate standard, it is clear that at the time of statehood, that portion of the San Pedro River from a mile below Lewis Springs to the mouth was, in its natural and ordinary condition, susceptible for use as a highway for commerce, over which trade and travel could be conducted in the customary modes of trade and travel on water. We therefore urge the ANSAC to find that segment of the San Pedro navigable at statehood.

Respectfully Submitted this 13th day of September, 2012.

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