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On January 20, 2004 the attached 8 pages were delivered by Cheryl Doyle of the State Land Department as Section 6 of the Santa Cruz River Report.

George Mehnert, January 26, 2004.

SUMMARY

A.R.S. §37-1101 through §37-1156 specify the procedures and criteria for determining the navigability or non-navigability of watercourses in Arizona. The key findings of the research into the archaeology, history, hydrology, hydraulics, geomorphology, and land use of the Santa Cruz River are presented below in a sequence compatible with the criteria itemized in A.R.S. §37-1128. This information is summarized to support a decision by others regarding the navigability, susceptability to navigation, or non-navigability at the time of statehood of the Santa Cruz River from the confluence with the Gila River to the headwaters.

General Criteria of Non-navigability

A.R.S. §37-1128, C. stipulates that the Arizona Navigable Streams Adjudication Commission (ANSAC) shall find and recommend that a watercourse was non-navigable if, as of 14 February 1912, the watercourse either: 1) was not used or susceptible of being used for both commercial trade and travel; or 2) flowed only in direct response to precipitation and was dry at all other times.

Commercial Trade and Travel

In the case of the Santa Cruz River, archaeological research indicates that the river valley functioned as a communication, transportation, and trade corridor in prehistoric times. The Tucson Basin served as a local node in the Hohokam regional system. Interregional exchange is evident by the presence of Mogollon ceramics from the mountainous regions to the east and by shell artifacts from the Sea of Cortez. Further, the Santa CruzRiver was the line of communication for the dissemination of new types of pottery throughout the northern and southern extremities of the river. No evidence was found to suggest that the early inhabitants of the valley used boats on the river.

In historic times, the Santa Cruz River has been an important transportation route for Native Americans, missionaries and Spanish explorers, colonizers and wanderers, miners and cattleman, and new residents. It was a well established route from the south and the east into present-day Arizona as far as Tucson, providing water, forage, and

food for the traveler. Although the river was an important transportation route, it was not normally used for navigation except for isolated accounts found in the literature. A few instances of boating on the river are reported, but the perennial flow that existed on the river historically was such that it was never regularly navigated.

Hydrologic Characteristics

Historically (circa the 1890's), the upper Santa Cruz River was perennial from its source to Tubac. Climate change since the turn of the century, combined with the extensive groundwater pumping for irrigation and the flow diversion for municipal use that began near the international border during the 1930 to 1950 drought period, resulted in no flow in the channel in Sonora, Mexico, and discontinuous flow in the channel near Nogales, Arizona. The 1913 gage record at Nogales (the earliest in that region), indicates that by the time of statehood, the Santa Cruz River near Nogales was no longer perennial, but instead had continuous flow during the winter and occasional flow during the spring, summer, and fall. The 1913 winter discharge averaged about 15 cubic feet per second (cfs), except for an increase caused by a rainfall event that ranged from 35 to 174 cfs. Based on interpolation of the stage-discharge curve for the Nogales gage plotted from the USGS data measured in 1959, an average winter discharge of 15 cfs in 1913 corresponds to a water depth of approximately 0.3 feet (3.6 inches). A survey of the daily data for the rest of the Nogales record indicates that, during wet years, there were only a few days of no flow recorded in the channel.

The middle Santa Cruz River historically had several springs and cienegas within its channel from Tubac to Tucson. A review of the daily discharge record indicates that there was some semblance of baseflow with an average of about 12 cfs during the fall and winter of 1912-1913 at the Tucson gage. An average daily discharge of 12 cfs corresponds to a water depth of approximately 0.2 feet (2.4 inches) based on interpolation of the stage-discharge curve developed from USGS data measured in 1955. Such continuous flow for months at a time was not seen again in the years that followed, though there were periods of several weeks that experienced continuous or nearly continuous flow during very wet winter seasons.

There is no record indicating that the lower Santa Cruz River ever supported perennial flow. Only the very largest floods were sustained from the headwaters to the confluence with the Gila River, according to the historical record. The Laveen gage recorded nearly year-round flow from its beginning date in 1940 until June 1956, when it began to measure zero flow for weeks ata time. During the 1940 to 1956 period, the daily flow averaged about 3 cfs during low flow conditions and had peaks as high as 5,060 cfs during wet periods. Historically, the Santa Cruz River had a marsh at its confluence with the Gila River near Laveen By 1960, the Santa Cruz River at Laveen was experiencing no flow conditions for months at a time.

Specific Criteria of Non-navigability

A.R.S. §37-1128, D. states that unless there is clear and convincing evidence that a watercourse was navigable, itis presumed, and the Commission shall find and recommend, that the watercourse was nonnavigable if, with respect to the watercourse as of 14 February 1912, any of the following apply:

1. no sustained trade and travel occurred both upstream and downstreamin the watercourse;

   Although the Santa Cruz River was an important transportation and trade route in both upstream and downstream directions, it was not normally used for navigation except for a few isolated accounts found in the literature.

2. no profitable commercial enterprise was conducted by using the watercourse for trade or travel;

   No evidence of navigation of the river for the purpose of commercial trade and travel was found.

3. vessels customarily used for commerce on navigable watercourses in1912, such as keelboats, steamboats or powered barges, were not used on the watercourse;

A land speculator portrayed the river at Calabasas (west of Nogales) as capable of floating steamboats in the 1880's. This, however, was pure fiction but gave rise to the belief that surfaces, occasionally even today, that the river was navigated by large ships.

4. diversions were made from the watercourse to irrigate and reclaim land by persons who made entries under the Desert Land Act of 1877, as amended (43 United States Code Sections 321 through 339), any other Federal act or to provide water to lands that are included in a Federal reclamation project or an Indian reservation that would have been inconsistent with or impediments to navigation;

The U.S. Geological Survey Streamgage Summaries report that essentially the entire flow of surface waters from the river were diverted both at the Nogales and Tucson gaging stations by irrigation ditches (USGS 1907,1912). Agricultural water use in the Tubac, Tucson, and San Xavier areas used most of the available surface water and also intercepted groundwater and subsurface flow.

5. any boating or fishing was for recreational and not commercial purposes;

The Santa Cruz River provided water, wood, food, and shelter for the people who lived near it. Early inhabitants supplemented their diet with the fish caught from the river. The perennial waters near San Xavier persisted until 1949, and supported native fish until at least 1937.

During the 1880's, Silver Lake (a manmade lake just south of downtown Tucson on the Santa Cruz River) was a popular recreation area, featuring boating, fishing, and swimming. A paddle boat on the lake was a major attraction. Boating both by rowing and sail was popular in the lake and upstream. Silver Lake

was damaged by a combination of floods in the late 1880's, and finally destroyed in 1890.

Warner Lake was built about one-half mile north (downstream) of Silver Lake by Solomon Warner in 1883-1884. Betancourt and Turner (1990) cited the Arizona Daily Star, 7 June 1888 as reporting up to 500 pounds of fish having been harvested from Warner Lake in 1888 for sale in Tucson. Review of the cited issue of the paper found the only reference to fish to be Tucson's "lakes and ponds are filled with carp, whose rapid growth is wonderful reaching five pounds or more in three years." A noted natural historian in Arizona offered the opinion that it is unlikely that the lake could have supported as much as 500 pounds of fish biomass (Neil Carmony, personal communication, 1996). No evidence of commercial fishing of the Santa Cruz River was found.

6. any flotation of logs or other material that occurred or was possible on the watercourse was not and could not have been regularly conducted for commercial purposes;

   No evidence was found of the river being used to transport goods such as logs.

7. there were bridges, fords, dikes, manmade water conveyance systems or other structures constructed in or across the watercourse that would have been inconsistent with or impediments to navigation;

   During Anglo settlement of the Tucson valley, perennial water was used for irrigation. In the 1880's, two dams were constructed near Tucson to provide water for grain and ore mills. The lakes behind the dams also provided the community with recreational swimming, boating, and fishing. By 1912, the U.S. Geological Survey reported that the entire low flow of the river was diverted at both the Nogales and Tucson gages, making navigation highly unlikely in low flow conditions.

In the lower Santa Cruz River, the construction and subsequent flood damage of Greene's Canal resulted in dramatic geomorphic changes. Before the construction of Greene's Canal in 1910, the river transformed from a relatively deep, well-defined channel to a broad, flat, extensive alluvial plain at a point in the Marana area. Prior to and during the floods of 1914-1915, flood flow had the opportunity to follow routes down the North Branch of the Santa Cruz Wash and McClellan Wash. After the development of the arroyo in the channel of Greene's Canal, subsequent flood flows follow westerly paths away from the main river channel.

8. transportation in proximity to the watercourse was customarily accomplished by methods other than by boat;

The archaeological record contains no evidence to suggest that the early inhabitants of the valley used boats on the river. According to the historical record, at least one major travel route followed the course of the river; however, boating is documented on portions of the Santa Cruz River only on rare occasions and not at all in the lower reach. Transportation in proximity to the river was customarily accomplished by methods other than by boat. Those methods well documented in the record include travel by horseback or freight wagon.

9. the United States did not regulate the watercourse under the Rivers and Harbors Act of 1899 (33 United States Code Sections 401 through 467e).

The Santa Cruz River was not regulated under this Act.

Specific Criteria of Navigability

A.R.S. §37-1128, E. states that in finding whether a watercourse was navigable, the ANSAC shall not consider:

1. waters that had been appropriated for beneficial uses on or before 14 February 1912 as being within the ordinary and natural condition ofthe watercourse;

   By 1910, it was reported that the entire base flow of the Santa Cruz River at both the Mexican border and near the Congress Street bridge in Tucson was diverted for agriculture.

2. the use of ferries to cross a watercourse;

   There are no records of ferry service anywhere on the river. Fords and crossable washes are marked on numerous maps. When the bridges went out during floods, people were stranded and had to wait until the river could be crossed by horse. No evidence of boats being used to cross the river at flood time were found.

3. fishing from the banks of a watercourse;

   Although research indicates that native fish were caught for recreation and for human consumption, no documentation was found as to the manner in which the fishwere caught.

4. uses of the watercourse under flood conditions.

   Most accounts of boating on the river occurred during flood events.

A.R.S. §37-1128, F. states that in finding whether a watercourse was navigable, the Commission shall consider the existence of dams and diversions of water and the impact of other human uses that existed or occurred at the time of statehood as part of the ordinary and natural condition of the watercourse.