6-002-017

Salt River
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City of Phoenix
OFFICE OF THE CITY ATTORNEY

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December 11, 1996

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Roderick G. McDougall
City Attorney

Ms. Christina Waddell
Executive Director
Arizona Navigable Stream
Adjudication Commission
1700 W. Washington, Room 404
Phoenix, Arizona 85004

Re: **Submission of Materials for Public Hearing Consideration by ANSAC**

Dear Ms. Waddell:

Enclosed are an original and six copies of a report and accompanying exhibits submitted by the City of Phoenix pursuant to A.R.S. § 37-1126 for consideration by the Commission at its December 17, 1996 hearing to determine the navigability or non-navigability of the Salt River between Granite Reef Dam and the river's confluence with the Gila River. The report is entitled "Historical and Hydrological Analysis of the Salt River With Reference to Navigability-Granite Reef Dam to the Confluence With the Gila River Arizona" and was prepared by City of Phoenix historian Dr. Douglas E. Kupel and hydrologist Thomas Buschatzke. A 3 ½" IBM-compatible disc containing the report minus exhibits is also enclosed. The report and Index of Exhibits, Volume III are in addition to Exhibits 1 through 174 filed by Phoenix with ANSAC in 1994 as Exhibits I and II. Together all of these documents comprise the City of Phoenix filings to be reviewed by the Commission.

Thank you for your attention to this matter.

Respectfully,

M. James Callahan

M. JAMES CALLAHAN
Assistant City Attorney

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Maricopa County, Lower Salt River
03-005-NAV
4/7/03
Evidence Item No. 017

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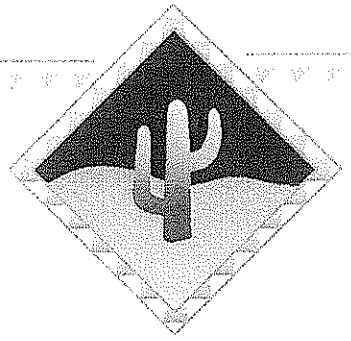



# *HISTORICAL AND HYDROLOGICAL ANALYSIS OF THE SALT RIVER WITH REFERENCE TO NAVIGABILITY*

## *GRANITE REEF DAM TO THE CONFLUENCE WITH THE GILA RIVER, ARIZONA*

*December 6, 1996*

Douglas E. Kupel, Ph.D., Historian
Thomas Buschatzke, Hydrologist

City of Phoenix

ORIGINAL

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Hydrologist

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**(filed separately)**

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Exhibits Listed by Type of Information

# Introduction and Summary

This report examines the historical and hydrological evidence for the navigability of the Salt River from Granite Reef Dam to the confluence of the Gila River. The report concludes that there is no historical or hydrological evidence for a finding of navigability. The Salt River was considered a non-navigable river at the time of statehood. Extensive research to date has failed to uncover any evidence that would revise the contemporary 1912 description of the Salt River as non-navigable.

The report also examines the potential for Salt River navigability. This analysis addresses the question of whether the Salt River was susceptible to navigation or had the potential to be navigated. The report concludes that the Salt River had no navigable potential in 1912.

This report examines the Salt River with regard to the criteria established under House Bill 2589, codified in 1994 as A.R.S. Sections 37-1011 to 1156. These criteria are to be used by the Arizona Navigable Stream Adjudication Commission (ANSAC) to evaluate evidence regarding the navigability of Arizona's rivers and streams. A.R.S. § 37-1128 (B) notes that "[i]f any determination of nonnavigability in a public proceeding exists" then a finding of non-navigability is appropriate, absent clear and convincing evidence to the contrary. A.R.S. § 37-1128 (C) lists two criteria which, if either are present, would result in a finding of non-navigability. A.R.S. § 37-1128 (D) of the 1994 statute lists nine criteria concerning evidence required for a presumption of non-navigability. If any of the nine criteria listed are present, then an advisory finding of non-navigability by ANSAC would appropriately be forwarded to the Arizona Legislature.

Information provided here is intended to present evidence to the Commission which is consistent with statutory requirements defining standards to be used to make findings and recommendations as to whether the Salt River was navigable as of February 14, 1912. The statute narrows the focus in several significant ways regarding the flow regime and physical characteristics of the Salt

River that the Commission must consider in making its determination. The following limitations exist:

- Only the condition of the river on February 14, 1912 or the years immediately preceding that date are pertinent to the determination of navigability. A.R.S. §§ 37-1101(6) and §§ 37-1128(D)(4), (E)(1) and (F).

- An evaluation of the ordinary and natural condition of the river is only to be considered if the flow regime is analyzed so that diversions for irrigation and other beneficial use are excluded. A.R.S. §§ 37-1128 (E)(1) and 37-1128(F).

- Diversions made from the watercourse to irrigate and reclaim land would have been inconsistent with or impediments to navigation. A.R.S. § 37-1128(D)(4).

An examination of the condition of the Salt River must accept those limits for the Commission to consider that evidence. As a consequence analyses which span pre-historic time periods or conditions after February 14, 1912 are not relevant. Likewise, analyses which attempt to hypothetically recreate conditions by ignoring development in the river at or around the time of statehood are also not relevant to the Commission's task.

With regard to A.R.S. § 37-1128(B), this report finds that there are many "public proceedings" in which the Salt River was determined to be non-navigable. Had the Salt River been considered navigable prior to statehood in 1912, there were many opportunities in public proceedings to make such a determination. The historical record is clear that in every instance when such a determination was made in a public proceeding, the finding was that the Salt River was non-navigable.

With regard to A.R.S. § 37-1128(C), this report finds that the Salt River was not used, nor was it susceptible of being used, for both commercial trade and

travel. In addition, this report finds that the Salt River flowed primarily in direct response to precipitation and was generally dry at other times. These conditions are sufficient for a finding of non-navigability.

With regard to A.R.S. § 37-1128(D), this report finds that the Salt River possessed all of the non-navigability criteria listed in the statute. If any one of the criteria are present, the statute deems that fact as sufficient evidence for a finding of non-navigability. Since the Salt River meets all of the criteria of non-navigability established in the statute, a finding of non-navigability is appropriate.

The report was prepared by historian Douglas E. Kupel, Ph.D., and hydrologist Thomas Buschatzke. Both authors are employees of the City of Phoenix. They have been so employed since 1988. In addition to this report, the City of Phoenix has filed three volumes of evidence with ANSAC. Volumes I and II were filed on January 14, 1994, in association with the City's *Notice of Appearance* in ANSAC Cause No. 94-1. Those previously submitted materials consist of 174 exhibits. Volume III of the City's exhibits, covering exhibits numbered 175 to 205, are filed separately from this report.

Dr. Kupel has more than twelve years of experience in the area of water history, dating back to his examination of water control features on the San Xavier Indian Reservation south of Tucson in 1983. Doug Kupel is a historian presently working for the City of Phoenix Law Department, conducting historical research for water rights litigation. He received his doctoral degree from Arizona State University where he completed his dissertation on water history in Phoenix. Dr. Kupel received his master's degree from the University of Arizona where he completed his thesis on the water history of the Tucson area.

Dr. Kupel has conducted extensive research in the area of water history, specializing in Indian water rights and municipal use. He is the author of several reports on the water history of Arizona Indian tribes and municipalities. His historical writings have been published in the academic press, including the Journal of Arizona History, the Public Historian, and Western Legal History. He frequently presents papers on water topics at historical conferences, several of

which have won awards. Dr. Kupel's 1994 resume was filed with the Commission as City of Phoenix Exhibit No. 168; his updated and current resume is filed as Ex. No. 175.

Tom Buschatzke has fifteen years of experience in the area of hydrology and water resources. Tom Buschatzke received his Bachelor of Science degree in geology from the State University of New York at Cortland. He has completed 26 credit hours in the Master's Degree Program in geology at Arizona State University. He has participated in the production of hydrologic studies for the Salt, San Pedro, Verde and Little Colorado Rivers. Tom Buschatzke's resume is filed as Ex. No. 176.

## Evaluation of Navigability Criteria

### A.R.S. § 37-1128(B)

This section of the statute concerns previous determinations regarding the navigability of the Salt River. According to the statute, "any determination" in a previous "public proceeding" that a river or a portion of a river is non-navigable is sufficient to find that the entire river is non-navigable. Perhaps the best example of this for the Salt River is the U.S. District Court for the District of Arizona finding in case no. CIV-72-376 PHX in 1976 that the Salt River serving as the boundary for the Salt River Pima Maricopa Indian Community was a non-navigable river (see submittal #96-002-004-009). This finding in a previous public proceeding is sufficient to find the entire Salt River is non-navigable. However, in addition to this recent consideration of Salt River navigability, there are several earlier public proceedings during which the navigability of the Salt River was specifically addressed.

### Judicial Proceedings

The first category of public proceedings are previous judicial proceedings. The Salt River has been at the center of innumerable lawsuits, primarily concerning water rights. In every lawsuit examined that mentions the navigability of the Salt River, the Salt River has always been described as non-navigable. Since the record is voluminous in this regard, a summary of information excerpted from judicial proceedings and previously filed with ANSAC by the City of Phoenix is listed in Table #1.

| TABLE #1<br>EXCERPTED JUDICIAL PROCEEDINGS PREVIOUSLY FILED WITH ANSAC BY THE CITY OF PHOENIX | |
|---|---|
| **EXHIBIT NO.** | **DESCRIPTION** |
| 6 | "Salt River is an unnavigable stream" (1905) |
| 7 | "Salt River is an unnavigable stream" (1905) |
| 8 | "Salt River is an unnavigable stream" (1905) |
| 9 | "Salt River is an unnavigable stream" (1907) |
| 10 | "Salt River is an unnavigable stream" (1905) |
| 11 | "Salt River is a natural unnavigable stream" (1896) |
| 12 | "Salt River is an unnavigable stream" (1895) |
| 13 | "Salt River is a natural innavigable stream" (1894) |
| 14 | "Salt River, an unnavigable stream" (1898) |
| 15 | "Salt River an unnavigable stream" (1899) |
| 16 | "Salt River, an unnavigable stream" (1898) |
| 17 | "Salt River is an unnavigable stream" (1896) |
| 19 | "Salt River is an unnavigable stream" (1894) |
| 20 | "Salt River is a natural innavigable stream" (1895) |
| 21 | "Salt River is a natural innavigable stream" (1893) |
| 22 | "Salt River, an unnavigable stream" (1893) |
| 23 | "Salt River an unnavigable stream" (1893) |
| 24 | "Salt River, a natural unnavigable stream" (1890) |
| 25 | "Salt River, a natural unnavigable stream" (1890) |
| 26 | "Salt River, an unnavigable stream" (1893) |

(Table #1 Continued)

| TABLE #1<br>EXCERPTED JUDICIAL PROCEEDINGS PREVIOUSLY FILED WITH ANSAC BY THE CITY OF PHOENIX | |
|---|---|
| **EXHIBIT NO.** | **DESCRIPTION** |
| 27 | "Salt River, an unnavigable stream" (1893) |
| 28 | "Salt River, an unnavigable stream" (1893) |
| 29 | "Salt River is an unnavigable stream" (1914) |
| 30 | "Salt River, an unnavigable stream" (1907) |
| 31 | "Salt River is an innavigable stream" (1909) |
| 165 | "Salt River is a natural unnavigable stream" (1892) |

It is evident from the many references listed in Table #1 that the Salt River was clearly considered non-navigable in several independent judicial proceedings prior to and after statehood. These were "public proceedings" within the terms of A.R.S. § 37-1128(B).

The classification of the Salt River as non-navigable was important from a water rights standpoint during the era prior to statehood. The incorporation of language documenting the non-navigable condition of the Salt River in these many public legal proceedings was necessary to demonstrate the importance of water for irrigation of the arid lands of the Salt River Valley. Without water, these lands were valueless. Had the Salt River been navigable, the water would have had importance from a navigation standpoint. While there are many disputes over water rights in the Salt River Valley, including such uses as irrigation, milling, and electrical generation, there are no recorded instances in public judicial proceedings where navigation was described as a potential water use.

The integral relationship between water rights and non-navigability is demonstrated by the "Findings of Fact" written by Judge Edward Kent in the

District Court for Arizona Territory case of W.W. Dobson, et al v. James Johnson and issued in January of 1910 (Cause No. 5842). This particular finding of fact merits quotation at length:

> That the Salt River is an innavigable stream flowing in a general Northeast to Southwest direction through Maricopa County, Arizona, and that all the members of said Utah Irrigating Canal Company are the owners and occupants of lands irrigable from said river, and that all of said lands are naturally arid and unproductive without the application of water thereto by means of irrigation, and when so irrigated are fertile and productive (Ex. No. 31).

Judge Edward Kent used similar language later in 1910, in March, when he issued his decree in the Hurley v. Abbott case. This case, a large water rights case involving thousands of claimants in the Salt River Valley, was a public proceeding which had started in 1905. Five years later, Judge Kent issued his decree. It read, in part, "[e]ntering the Valley from the northeast is the Salt River, a non-navigable stream." This finding by Judge Kent is clearly a significant part of the case, establishing as it does the importance of water in the Salt River for irrigation and not for navigation. The Kent Decree goes on to describe, in great detail, the water rights appurtenant to parcels of irrigated land in the Salt River Valley. The water use described in the Kent Decree includes all of the normal flow of the Salt River, as well as flood and surplus water used directly or subsequently stored and developed behind Roosevelt Dam that was previously lost during floods. Despite this microscopic examination of water use from the Salt River, navigation is not included as a use, nor is any water right created for navigation. The Kent Decree is filed as Ex. No. 177.

**Territorial and County Government Proceedings**

In addition to public judicial determinations, there are other areas where the Salt River was determined non-navigable in public proceedings. Perhaps the most

significant of these concerned the construction of a bridge across the Salt River at Central Avenue in Phoenix. The issue of navigability was a significant one for proponents of the bridge, because if the Salt River was considered navigable construction of the bridge could have an impact on river transportation.

The long process of authorizing construction of a bridge across the Salt River at Phoenix had its origins with an act of the Territorial Legislature. The twenty-fifth Territorial Legislature considered two bridge bills in 1909. The one concerning Phoenix became known as the "general bridge bill" (Ex. No. 140). On March 18, 1909, the Territorial Legislature adopted, and the Governor signed, a bill titled "An Act Relating to the Construction of Bridges Across Non-Navigable Streams Within the Territory of Arizona" (Ex. Nos. 141 and 162). This bill provided that county boards of supervisors could "construct and maintain a bridge across any non-navigable stream within the county represented by said Board."

Subsequent to the territorial legislation and in conformance with its terms, citizens of Maricopa County petitioned their Board of Supervisors for construction of several bridges. These include: "across the Salt River, a non-navigable stream," at the foot of Center Street (later Central Avenue) in Phoenix; "across the Salt River, a non-navigable stream, at Tempe," and; "across the Agua Fria River, a non-navigable stream" (Ex. Nos. 163 and 146 - 148). The Maricopa County Board of Supervisors approved the petition in a public session held on April 20, 1909, and referred the matter to a vote of the citizens of Maricopa County to be held on June 10, 1909.

On June 10, 1909, the voters of Maricopa County approved all three measures by simple majorities, with the following margins:

| | Center Street Bridge | Tempe Bridge | Agua Fria |
|---|---|---|---|
| For | 837 | 717 | 426 |
| Against | 361 | 275 | 349 |

However, since the bridge question had to be passed by a majority vote of all ballots cast in the election, that number being 1490 votes, only the Center Street Bridge measure passed by the necessary number. The Tempe measure fell short of the needed 746 votes by a small number, and the Agua Fria vote was well short.

Subsequent to the election, the Maricopa County Board of Supervisors asked G.P. Bullard, the county attorney, to examine several issues with regard to the bridge vote, including: (1) whether a bridge could be constructed entirely within a municipality (as was the case in Tempe); and (2) whether a majority of the votes cast was needed to pass the measure or if only a simple plurality was needed. Bullard delivered his opinion to the board on May 5, 1909.

The question of navigability was an important part of Bullard's legal opinion on the first of these two questions. Bullard wrote that since the Territorial Legislature called for the construction of a bridge over "any non-navigable stream" the Maricopa County Board was permitted to construct that bridge, even if it was entirely within the Tempe municipal limits. With regard to the second issue, Bullard ruled that the bridge question must receive a majority of all votes cast - thus the Tempe measure was defeated (Ex. No. 178).

County Attorney Bullard specifically examined the navigability of the Salt River in his opinion, since the question of its navigability had an effect on his ruling. Bullard noted: "The proposed bridge is to be constructed over a large water-course, to wit, a large non-navigable stream" (Ex. No. 164). Since the territorial legislation permitted the construction of bridges across non-navigable streams, and since the Salt River was non-navigable, the county was allowed to construct the bridge - even if it was located within the boundaries of a municipality.

Maricopa County proceeded to construct the Center Street (later known as Central Avenue) bridge in due course. It was formally opened to traffic on June 28, 1911. After a brief ceremony on that date, "without fuss or feathers, the bridge was turned over to the people of the Salt River Valley" (Ex. No. 158).

The discussions of navigability with regard to the Central Avenue Bridge took place within several separate arenas, all of which meet the 1994 statutory definition of "a public proceeding" as listed in A.R.S. § 37-1128(B). First and foremost, the 25th Territorial Legislature adopted enabling legislation for Arizona counties to erect bridges across non-navigable streams. Through this act, signed by the Governor, the Arizona Territorial legislature has already made a determination of the navigability of the Salt River. Subsequent to this action, the Maricopa County Board of Supervisors designated in a public proceeding the three bridge questions presented to the voters, all of which describe the Salt and Agua Fria Rivers as non-navigable. The voters of Maricopa County, at an election, voted on the bridge questions in a public proceeding. Each ballot measure clearly indicated to the voters that the Salt and Agua Fria Rivers were non-navigable. Subsequent to the election, the Maricopa County Attorney issued a public ruling that the Salt River was indeed non-navigable.

**A.R.S. § 37-1128(C)(1)**

This criterion concerns whether the Salt River "[w]as not used or susceptible of being used for both commercial trade and travel." There is no historical evidence to suggest that the Salt River was used for commercial trade or travel at the time of statehood in 1912. Historically, the Salt River has been a barrier to transportation, not a corridor of transportation. Prior to statehood private entrepreneurs and government entities went to considerable expense to find ways to cross the obstacle of the Salt River. The use of ferries to cross the river during periods of high water is not considered evidence of commercial trade or travel on the Salt River. The use of ferries to cross the river was a mere adjunct to surface transportation. As land transportation improved, and as more and more water was removed from the Salt River for irrigation, the temporary and occasional use of ferries declined. The last known use of a ferry on the Salt River occurred in 1909, according to information compiled by Elaine Lacy, et. al. and Mona McCrosky (Ex. Nos. 2 and 128).

With regard to the susceptibility of the Salt River for commercial trade or travel, it is clear from the historical record that the river was not susceptible to such

use. The final navigability study issued in December of 1993 by State Land Department contractor CH2M Hill documents a mere sixteen attempts at navigation use of the Salt River (submittal #96-002-001-001; hereafter referred to as SLD navigability study). These attempts ended in failure, or occurred only during flood events.

In contrast to the Salt River, the Colorado River which forms Arizona's border with California was susceptible to navigation and was used for both commercial trade and travel during this same time period. The navigation use of the Colorado is documented in Richard Lingenfelter's book, *Steamboats on the Colorado* (Ex. No. 179). Had the Salt River shared characteristics of navigability with the Colorado River a short distance away, it is clear that Arizonans had both the means and the technology to utilize the Salt River in a similar fashion. There was not sufficient water and flows were too erratic for such a use, and, as a consequence, the Salt River was not used for navigation.

**A.R.S. § 37-1128(C)(2)**

This criterion examines the flow regime of Arizona rivers, finding that streams which flowed only "in direct response to precipitation" and were "dry at all other times" are non-navigable. The Salt River is a typical desert stream in that its flow fluctuates wildly in response to precipitation. This flow regime made it extremely difficult for farmers in the Salt River Valley prior to the construction of water storage dams on the Salt River. Early farmers argued that a storage dam was needed to store water that flowed in response to precipitation. If the water was not stored, it would be "wasted" in the language of the day in that it was lost for a constructive use, i.e., irrigation of farms. Farmers in the Salt River Valley successfully persuaded the Federal government to construct Roosevelt Dam (completed 1911) to store water for use during times when the river was dry.

**Salt River Channel Geomorphology**

The channel of the river at statehood was significantly different than the channel that is visible today. Today's channel is relatively straight, deeply

entrenched due to flooding and flood control efforts, devoid of vegetation, and dry except in times of rainfall or floods. At statehood the river course was also straight but contained numerous sloughs and braiding (branching) in some reaches (see Ex. No. 202). There were phreatophytic trees growing along its banks. These trees can have a significant impact by reducing streamflow in times of low flow depending upon the types and densities of the trees.

Channel braiding can have major consequences regarding potential navigability. The depth of water in a braided channel is less than the depth of water in a non-braided channel. At the same time the forward velocity of flow in braided reaches of a channel is less than the velocity of flow in the unbraided channel as a result of turbulence (Ex. No. 180).

In a braided stream the braided reach has a shallower depth of water moving at a slower speed. Braided reaches of the Salt River would be less likely to contain low flows that support navigability than unbraided stretches of the river, all other factors being equal.

**Magnitude of Streamflow**

The Salt River is typical of a river in an arid environment. The flow in the river varies greatly from month to month and year to year. John Wesley Powell determined that the Salt River had the greatest variability between low and high flows of 29 western rivers he studied (Exhibit 3). There is no constant steady flow rate that one might rely upon when determining if this river is navigable. While hydrologic studies often present average flow rates for the Salt River, reliance on this data is suspect because the use of averages tends to even out the peak flows and the low flows so that it might appear that a constant predictable flow exists in the river. A cursory look at a hydrograph for the Salt River would quickly dispel the notion that the calculation of an average flow is meaningful in understanding how the river really behaves. A hydrograph plots discharge or runoff over a period of time. The Salt River hydrograph (Ex. No. 203) shows that flow in the river varied greatly in the time period prior to statehood. That pattern continued even

after statehood. One can conclude that a wildly fluctuating river would not be a reliable corridor for transportation.

**Use of Average or Median Data**

Median or average flow calculations over a period of time have some utility. When planning to build a reservoir which can capture and store water over a long period of time this data is useful in determining the capacity and type of reservoir needed. For managing a water delivery system one might wish to know the volume of water over the long term that might be expected. However, for determining navigability the use of average data or median data can be misleading. The use of a river for transportation is dependent upon how much flow is in the river on a particular day. The "average" day may never come.

To illustrate the necessity of examining daily flows in the river rather than average flows the following example is provided from recorded stream gauge data:

Salt River at Arizona Dam - 1895

| | | |
|---|---|---|
| Total Runoff measured for 1895 | - | 1,804,000 acft |
| Monthly Runoff, July 1895 | - | 21,540 acft |
| Average Monthly Discharge | - | 2,822 cfs |
| Minimum Recorded Discharge, July 16, 1895 | - | 262 cfs |

(Source: Water Supply Paper 1313 - Ex. No. 183)

These measured data were collected at the USGS gauge for Salt River at Arizona Dam. Throughout this report the term runoff describes a volume of water expressed in acre-feet (acft) and the term discharge describes a rate of flow expressed in cubic feet per second (cfs). If one takes the total runoff for 1895 and converts it to average monthly runoff (by dividing by 12) the result is 150,030 acft. By contrast, the measured runoff for July 1895 is only 21,540 acft. The use of averages in this case results in an overstatement of the July runoff of about 7 times.

The average monthly discharge rate based upon the reported data for 9 months in 1895 is 2822 cfs. This average exceeds the actual reported monthly flow rate for July by 800%. The average flow rate exceeds the reported monthly discharge rate in 5 of the 9 months reported.

If one takes the reported monthly runoff of 21,540 acft and calculates average daily discharge (21,540÷31 days÷1.983 cfs/acft/day) a daily average discharge of 350 cfs would be expected. Actual flow varies greatly from this amount on each day as evidenced by the fact that the daily recorded discharge for July 16, 1895 was only 262 cfs.

One can readily conclude from these examples that the use of average data often results in the appearance of more water in the river than actually exists on a given day.

**Salt River Hydrograph and Average Data**

On a larger scale the hydrograph for combined Salt and Verde River discharge (Ex. No. 203) also shows the problems attendant to using average data to represent daily flow conditions in the river. For the year 1889 Table #2 was created to compare measured monthly runoff to average monthly runoff computed from the total annual runoff. The actual monthly runoff data was taken from the hydrograph.

**TABLE #2**

**MONTHLY AVERAGE RUNOFF vs. ACTUAL - 1889**

| Year | Yearly Runoff acft | Monthly Average Runoff acft | Actual Monthly Runoff acft |
|---|---|---|---|
| 1889 | 1,770,000 | 147,500 | 340K January |
| | | 147,500 | 140K February |

(Table #2 Continued)

| TABLE #2 | | | |
|---|---|---|---|
| MONTHLY AVERAGE RUNOFF vs. ACTUAL - 1889 | | | |
| 1889 | 1,770,000 | 147,500 | 510K March |
| | | 147,500 | 225K April |
| | | 147,500 | 55K May |
| | | 147,500 | 25K June |
| | | 147,500 | 25K July |
| | | 147,500 | 25K August |
| | | 147,500 | 25K September |
| | | 147,500 | 25K October |
| | | 147,500 | 30K November |
| | | 147,500 | 330K December |
| K = 1,000 | | | |

For eight of the twelve months in this example, runoff was less than the average. The remaining years prior to statehood show a similar pattern.

Exhibit No. 204 shows the hydrograph of combined Salt and Verde River runoff with an average annual runoff line added in red. This provides a visual illustration of how the average annual runoff compares to actual monthly runoff. Once again this illustrates that the use of average flows is inappropriate. Averaging makes it appear that more water is flowing in the river because higher flows mask low flows through the averaging method.

One can take this comparative analysis further by looking at measured daily data versus average daily data for the year 1899 and 1901. The measured daily data for these years was previously listed in Exhibit Nos. 198 and 199. These data

can be compared to data reported by the Salt River Project in its hydrograph, Exhibit No. 203. Data from the hydrograph is listed in the following Table #3 in column two. Column three lists average daily discharge computed from column two.

**TABLE #3**

**REPORTED MONTHLY RUNOFF DATA AND COMPUTED AVERAGE DAILY DISCHARGE - 1899**

| Month | Monthly Runoff (acft) | Computed Average Daily Discharge (cfs) |
|---|---|---|
| January | 45,000 | 725 |
| February | 40,000 | 714 |
| March | 45,000 | 725 |
| April | 48,000 | 800 |
| May | 26,000 | 419 |
| June | 22,000 | 366 |
| July | 40,000 | 645 |
| August | 60,000 | 967 |
| September | 25,000 | 416 |
| October | 48,000 | 774 |
| November | 23,000 | 766 |
| December | 20,000 | 322 |

Several points stand out when examining measured daily data versus average daily data. First, the daily data can vary by a large degree in the matter of a few days. For example, in 1899 the combined measured discharge in the Salt River

was 290 cfs on September 4 and 1197 cfs on September 10, less than one week later (Ex. No. 198). This compares to an average discharge of 416 cfs for the month of September. This example illustrates that while rapid fluctuations in flow occurred in the river the use of averaging hydrologic data masks those fluctuations. It would appear from the average flow that between September 4 and September 16 the flow was a constant 416 cfs, when in reality the flow varied from 290 cfs to 1197 cfs.

The variations in flow between the daily average and the actual measured daily flows for the year 1901 are even greater. Table #4 lists the average flow data for the year 1901.

**TABLE #4**

**REPORTED MONTHLY RUNOFF DATA AND COMPUTED AVERAGE DAILY DISCHARGE - 1901**

| Month | Monthly Runoff (acft) | Computed Average Daily Discharge (cfs) |
|---|---|---|
| January | 52,000 | 838 |
| February | 185,000 | 3303 |
| March | 102,000 | 1645 |
| April | 60,000 | 1000 |
| May | 50,000 | 806 |
| June | 28,000 | 466 |
| July | 35,000 | 564 |
| August | 60,000 | 967 |
| September | 28,000 | 466 |
| October | 20,000 | 322 |
| November | 30,000 | 500 |
| December | 31,000 | 500 |

Between January 10 and January 26, 1901 combined Salt River flows varied from 519 cfs to 1693 cfs. Yet, the average daily discharge is 838 cfs. Once again reliance on averages would lead one to the conclusion that a constant reliable flow existed in the river. In reality the flow rate more than tripled between those times.

While use of averages allows for long term trends to be evaluated, those trends are meaningless for determining navigability. Daily fluctuations in flows would have been necessarily considered by anyone contemplating using the Salt River for navigation. While hydrologic records for pre-statehood are incomplete one should not fall into the trap of "completing" the record by substituting averages for actual daily flows. This will lead to erroneous conclusions regarding the ability of the Salt River to support navigation.

**A.R.S. § 37-1128(D)**

**1. No Sustained Upstream and Downstream Trade or Travel.**

There is no evidence of any sustained trade or travel, in either an upstream or a downstream direction, on the Salt River in the years prior to statehood in 1912. The SLD navigability study documents sixteen boating attempts on the Salt River. These repeated, unsuccessful attempts at trade and travel are strong evidence that the residents of the Salt River Valley tried to navigate the Salt River but were unable to do so. The separate attempts show no pattern of sustained use. The boating attempts are in the nature of experiments during times of periodic high water.

The recorded boating attempts took place during floods for the most part. Table #5 correlates the date of the boating attempt and the condition of the river at the time of the incident. The river conditions were documented in the work edited by William D. Sellers, *Arizona Climate* (Ex. No. 181). The comparison indicates that several of the attempts took place during times of high water.

| TABLE #5 | | |
|---|---|---|
| **BOATING ATTEMPTS** | | |
| **DATE OF ATTEMPT** | **EXHIBIT NO.** | **CLIMATE/RIVER CONDITIONS** |
| May 3, 1873 | 85 | No information available |
| June 14-18, 1873 | 86-88 | No information available |
| February 17, 1881 | 89 | No information available |
| November 30-December 3, 1881 | 90-91 | No information available |
| February 14, 1883 | 92 | No information available |
| June 3-6, 1885 | 93-95 | No information available |
| June 8, 1885 | 96 | No information available |
| December 12, 1888 | 97 | No information available |
| January 24, 1889 | 98 | No information available |
| February 18-25, 1895 | 99-100 | No information available |
| February 5, 1905 | 101 | 33 month wet period begins |
| March 24-29, 1905 | 102-103 | Major flood begins on March 20 |
| December 9, 1905 | 104 | Major flood begins on November 28 |
| October 4, 1909 | 105 | No information available |
| June 28, 1910 | 106 | No information available |
| January 30, 1915 | 107 | 35-month wet period begins, flood |

The boating attempts were so infrequent during non-flood times as to be newsworthy. The fact that such attempts took place on the Salt River at all was so unusual that they merited notice in the newspaper. These trips were curiosities. Arizona historian Mona McCrosky noted with reference to the Gila River: "at times their efforts to simply cross it proved as newsworthy as their exploits in traversing its length. Few who chronicled these adventures took desert navigation very seriously, and accounts were often exaggerated and humorous" (Ex. No. 128). With specific reference to the Salt River, Lacey, et. al. note: "The fact that such attempts were recorded in the local newspapers shows that such incidences were rare, often dangerous, and thus newsworthy" (Ex. No. 2).

The number of recorded attempts at boating in the Salt River is very small given the span of time prior to statehood. In comparison to a true navigable river, such as the Colorado, the boating accounts for the Salt River are very few in number. Richard E. Lingenfelter, in his historical examination of river navigation titled *Steamboats on the Colorado*, lists twenty-four steamboats which regularly plied the waters of the Colorado. In addition, Lingenfelter lists twenty-six gasoline boats, fifteen barges, six dredges, and one sloop which navigated the Colorado River. This makes a total of seventy-two named vessels identified for the Colorado. Note that these are just the number of individual vessels identified, and not the number of times the vessels navigated the Colorado. In contrast, for the Salt River, the SLD navigability study identified only sixteen attempts (not vessels). The list of vessels identified by Lingenfelter is included as Ex. No. 179.

Although the SLD navigability study identified sixteen separate attempts to use boats on the Salt River, only two could be considered effective in a downstream direction. No attempts took place in an upstream direction. The first downstream travel attempt occurred in 1873, thirty-nine years prior to statehood and before substantial amounts of water had been removed from the river for irrigation use. The second occurred in 1885, twenty-seven years before statehood. This second attempt was exploratory in nature with a view toward determining if commercial activity was possible. The planned commercial activity never took place, so one is left with the assumption that the result of the exploration was an

understanding that the Salt River was non-navigable for commercial purposes. Of the remaining fourteen attempts, these were: (1) unsuccessful; (2) performed at flood stage; (3) not for commercial purposes; or (4) outside of the Granite Reef to Gila confluence portion of the Salt River. Table #6 provides a list of the sixteen attempts and a brief description of the results.

**TABLE #6**

**DESCRIPTION OF BOATING ATTEMPTS**

| DATE OF ATTEMPT | EXHIBIT NO. | DESCRIPTION |
|---|---|---|
| May 3, 1873 | 85 | Utilized Canal for Portion |
| June 14-18, 1873 | 86-88 | Unsuccessful |
| February 17, 1881 | 89 | No Indication Trip Was Made |
| November 30-December 3, 1881 | 90-91 | No Commercial Purpose, Recreational |
| February 14, 1883 | 92 | No Commercial Purpose, Recreational |
| June 3-6, 1885 | 93-95 | Exploration |
| June 8, 1885 | 96 | Journey Made on Foot |
| December 12, 1888 | 97 | No commercial purpose |
| January 24, 1889 | 98 | Unsuccessful |
| February 18-25, 1895 | 99-100 | Exploration |
| February 5, 1905 | 101 | Flood Stage Rescue |
| March 24-29, 1905 | 102-103 | Flood Stage, No Commercial Purpose, Recreational |
| December 9, 1905 | 104 | Shipwrecked Twice |

(Table #6 Continued)

| TABLE #6<br>DESCRIPTION OF BOATING ATTEMPTS | | |
|---|---|---|
| **DATE OF ATTEMPT** | **EXHIBIT NO.** | **DESCRIPTION** |
| October 4, 1909 | 105 | Very Difficult Journey |
| June 28, 1910 | 106 | Above Granite Reef, Recreational |
| January 30, 1915 | 107 | Flood Stage Rescue |

**2. <u>No Profitable Commercial Enterprise Involving Trade and Travel</u>.**

This portion of the statute implies trade and travel in an upstream or downstream direction. There is no historical evidence that the Salt River was ever used for profitable commercial enterprise involving trade and travel. The occasional experimental use of the river shows that these events were non-commercial in nature. There are simply no records which show any commercial use of the river for trade or travel.

An examination of the Sanborn fire insurance maps for Phoenix and Tempe shows no commercial activity related to river transportation in the Salt River valley. Had the river been navigable, one would expect to find docks, boat ramps, and landings associated with the river in the surrounding communities. An examination of the Sanborn maps indicates there is no historical evidence for these facilities associated with river navigation in the Salt River valley. Beyond these facilities which would be located in close association with a navigable river, outside of the immediate riverside location other navigation-related facilities would be expected in a community with a navigable river. These would include such businesses such as shipyards, naval supply merchants, and naval warehouses. An examination of the Sanborn maps shows there is no historical evidence for these navigation associated businesses in the Salt River Valley (Ex. No. 167).

3. **Vessels Such as Keelboats, Steamboats, or Powered Barges Not Used.**

These three types of vessels were commonly used on navigable rivers in the United States at the time statehood was achieved in Arizona. There is no evidence of these craft being used on the Salt River. Arizona residents were familiar with keelboats, steamboats, and powered barges, and these types of vessels were in contemporaneous use on the Colorado River in Arizona.

4. **Diversions of Water Took Place That Would Be Inconsistent With or Impediments to Navigation.**

Water is the most precious natural resource in the arid environment of Arizona. At the time of statehood, diversions of water for beneficial use frequently consumed the entire flow of the Salt River. With the completion of Roosevelt Dam in 1911, flood flows of the Salt River were captured and stored for later beneficial use. Agricultural use of water from the Salt River has been actively litigated on numerous occasions in the years prior to and since statehood. These numerous court cases, which frequently concern a lack of adequate water for irrigation, have effectively demonstrated that irrigation for the purpose of reclaiming arid desert lands utilized all available water from the Salt River. No historical evidence has been found indicating that any water in the river was allocated to or reserved for navigation purposes.

**Diversions for Desert Land Act Entries**

The criterion of A.R.S. § 37-1128 (D) (4) specifically mentions water diversions under the terms of the Desert Land Act of 1877 as a means to evaluate navigability. The Desert Land Act was of particular importance to Arizona because of the arid conditions present in the state. Under the 1877 act, individuals could file on public lands for $.25 an acre, up to 640 acres. If the individual lived on the land for two years and irrigated the land, the person who filed a Desert Land Act claim could then purchase the land for $1.00 per acre. Because of the difficulties involved with irrigating and farming dry desert lands, only twenty-five per cent of all Desert Land Act entries nationwide were ever finalized. However,

in Arizona, with the extensive development of irrigation works on the Salt River, large numbers of acres were entered utilizing the provisions of the Desert Land Act.

Local historian Earl Zarbin has conducted an extensive study of Desert Land Act entries in the area of Chandler, Arizona. Over 18,000 acres in the Chandler area were patented through the provisions of the Desert Land Act. Dr. A.J. Chandler provided the impetus for the development of the area that now carries his name. Chandler financed the construction of the Consolidated Canal for the purpose of taking water from the Salt River to irrigate lands in the southeast Salt River Valley. The Consolidated Canal was completed in April of 1893. Water diverted from the Salt River, delivered through the Consolidated Canal, was used to reclaim more than 18,000 acres of otherwise arid desert land for farming (see Ex. No. 185)

**Diversions for Federal Reclamation Projects**

The criterion of A.R.S. § 37-1128 (D) (4) makes reference to diversions for Federal reclamation projects as being inconsistent with navigation. The Salt River Valley is home to one of the first reclamation projects created under the provisions of the 1902 reclamation act. Named the Salt River Project after the river of the same name, this reclamation project utilized diversion from the Salt River to irrigate and reclaim arid desert lands.

Prior to the construction of dams on the Salt River for the purpose of storing flood flows for later irrigation use, the Federal government conducted extensive studies of the Salt River. One goal of those studies was to determine if the Salt River could be considered navigable, and its waters thus important for uses in addition to irrigation. In 1894, the War Department received an inquiry regarding the navigability of streams tributary to the Colorado River. The Department's Army Corps of Engineers was responsible for regulating construction on navigable rivers such as the Colorado so that no impediments to travel were created. In response to the inquiry to determine if the construction of dams on the Salt River would impede navigability, Lt. Col. W.H. Benyaurd of the Army Corps of

Engineers determined that the Gila, Salt, and their tributaries "are not navigable waters of the United States." In 1895, the Judge Advocate General of the War Department, in forwarding the Army Corps finding to the Secretary of War, noted "the Gila, Salt and their tributaries are in no sense navigable streams" (Emphasis in original; see Ex. No. 32).

Prior to the construction of Roosevelt Dam, the Federal government needed to "withdraw" (remove from public entry under the Homestead Act or Desert Land Act) many acres of land in the vicinity of the dam and along the Salt and Verde rivers. In 1903, the Director of the US Reclamation Service requested that the Secretary of the Interior withdraw lands in the vicinity of the dam and along the Salt and Verde rivers to allow construction to proceed. The director noted, the land "will be needed for the purpose of dams, power canals, transmission lines, and other irrigation works." It is noteworthy that the description of uses did not include transportation by river navigation (Ex. No. 39).

One of the major concerns for US Reclamation Service engineers during the era of statehood was to establish the amount of acreage that could be successfully irrigated with waters stored behind Roosevelt Dam. In August of 1913 A.A. Jones, Assistant Secretary of Interior, proposed a "Board of Survey" to determine which lands in the Salt River Valley would be eligible to receive water diverted from the Salt River with Roosevelt Dam in place as part of the Federal reclamation project. The Board of Survey completed its work effort in August of 1914. It found that more 180,000 acres of land could be served with the reservoir in place (Ex. No. 186).

The final cost of the initial phase of construction for the Salt River Project was set at over $10 million in 1915. This sum represents a considerable investment on the part of the Federal government to irrigate the 180,000 acres of the Salt River reclamation project. It is also strong evidence that the Federal government considered the Salt River as non-navigable. There is no historical evidence that the Federal government ever expended any funds to improve navigation on the Salt River.

**Diversions for Indian Reservations**

Another navigability criterion listed in A.R.S. § 37-1128 (D)(4) of the 1994 statute concerns diversions of water from Arizona rivers to provide water to Indian reservations. Such diversions are also considered inconsistent with navigability. Waters were diverted from the Salt River for the purpose of irrigating the Salt River Pima-Maricopa Indian reservation.

The Salt River Pima-Maricopa Indian Reservation was created by executive order in 1879. An initial executive order on January 10, 1879, established a very large reservation. This order was subsequently modified on June 14, 1879. The June executive order established the boundaries of the current reservation east of Scottsdale and north of Mesa (Ex. No. 187).

This reservation was home to Native Americans who had traveled from the Gila River Indian Reservation in search of water due to a lack of irrigation water on the Gila River Reservation. As early as 1871, Pima and Maricopa Indians moved off the Gila River Reservation and into the Salt River Valley in search of irrigation water. By the time of statehood in 1912, the Pima and Maricopa Indians had a forty-year history of water use in the Salt River Valley. This use of water diverted from the Salt River for irrigation was recognized in the Kent Decree of 1910. Judge Edward Kent ruled that Indians on the Salt River Reservation were entitled to use 700 miners inches of water (17.5 CFS) from the Salt River (Ex. No. 177).

In later years, well after statehood, the Federal government reaffirmed its commitment to provide irrigation water diverted from the Salt River for the benefit of Indians living on the Salt River Reservation. On June 3, 1935, the United States entered into a contract with the Salt River Valley Water Users Association (SRVWUA - a.k.a. Salt River Project) for the construction of Bartlett Dam on the Verde River. At that time the SRVWUA was in the process of planning this additional water storage dam for the benefit of water users in the Salt River Valley. The Federal government agreed to assume twenty per cent of the cost of

constructing Barlett Dam to provide additional water for use on the Salt River Indian Reservation (Ex. No. 188).

The recognition of Indian water rights in the Kent Decree and the subsequent funding of Bartlett Dam to further guarantee those water rights is ample evidence that water was diverted from the Salt River for use on the Salt River Indian Reservation. This water use, and the expenditures by the Federal government to guarantee those water rights, are inconsistent with the use of the Salt River for navigation. Water in the Salt River was highly valuable for irrigation use on the Indian Reservation. While there is evidence that the Federal government took steps to continue the use of irrigation water on the reservation, there is no historical evidence that the Federal government took any steps to protect or further transportation on the Salt River.

**5. Boating or Fishing Was Recreational, Not Commercial.**

Several of the boating attempts could be described as recreational in nature. Table #5 (p. 20 of this report) lists descriptions of all boating attempts by City of Phoenix exhibit number, including recreational boating attempts. The 1881 "Yuma or Bust" expedition is a recreational venture, one that was perhaps less than festive as the crew "busted" and had to push their vessel. The trip by officers from Fort McDowell to the Salt River Canal in 1883 fits the category of a recreational journey. A second trip by Fort McDowell officers in 1888 was also recreational in nature, although it ended in tragedy when Major Spaulding was accidentally killed during a portage around an obstacle to navigation. The 1905 boating attempt by Jacob Shively was clearly a recreational journey. The 1910 boating attempt for the purpose "to enjoy the sensations of going over a route that is seldom frequented" also fits the category of recreational boating.

Several other boating attempts which had exploration as their primary purposes might also be considered to have recreation as a subsidiary purpose. These include Hayden's exploration of log floating possibilities in 1873, the 1885 log floating exploration, the 1895 box canyon exploration, and the 1895 Salt River exploration by four men.

With regard to commercial fishing, there is some evidence that during the early years of Phoenix the Salt River was a source for fish that were sold in the community. This information was compiled by local historian and is contained in an appendix to the 1993 SLD navigability study. Most of the accounts of commercial fishing make reference to the use of "giant powder" (explosives) that were used to kill the fish. The dead fish would then rise to the top of pools of water in the river bed where they could be collected for sale. The Territorial Legislature outlawed this practice in 1881, but the historical information compiled by Mr. Zarbin for the SLD navigability study indicates that it continued illegally until 1885. The most recent reference to the sale of fish uncovered for the SLD navigability study was in 1881. There are more recent references to fishing, but these appear to refer to recreational fishing and gathering of fish trapped in irrigation canals or pools of water caused by low flows in the river. There is no evidence that vessels were ever used for fishing on the Salt River.

## 6. Floatation of Logs Was Not and Could Not Have Been Regularly Conducted for Commercial Purposes.

There is only one fully documented incident of log floating on the Salt River. This attempt was unsuccessful. In June of 1873, Charles Hayden of Tempe explored the upper Salt River in an attempt to locate areas of timber with the idea that logs could then be transported to the Salt River Valley using the river. Hayden found that the river was too narrow to allow the logs to float freely to the valley (Ex. Nos. 86, 87, 88, 108, and 109). It is noteworthy that when Charles Hayden constructed his house, now known as "La Case Vieja" in Tempe, he had all the finished and unfinished lumber for its construction delivered from Prescott by mule team (Ex. No. 161).

The only other historical account that discusses the possibility of floating logs on the Salt River occurred in 1885. During that year a party of men from the Salt River Valley explored the upper reaches of the river with the goal of determining if logs could be floated downstream. The construction of the Phoenix and Maricopa railway, with its associated bridge construction and need for railroad ties, created a demand for lumber during that year. One of the men involved in the

expedition, William Burch, was a sawmill operator who understood the potential business benefits if logs could be successfully delivered to the railroad project by water. Although the explorers believed that logs could be successfully floated, there is no evidence that an attempt to confirm this potential use of the river ever took place. During the trip, the explorer's boat overturned and the group lost all of its provisions, ammunition, and equipment (Ex. Nos. 93-96; Ex. 108).

These two incidents, one in 1873 and the second in 1885, are the only accounts where the use of the Salt River to transport logs was contemplated. There was a heavy demand for timber products in Arizona during the years prior to statehood. The Salt River Valley, being a natural desert area, has little in the way of timber resources. In order to construct buildings and structures, lumber had to be transported across great distances to reach the valley. The construction of large projects such as railroads, bridges, and timber-crib dams required large amounts of lumber. There is no evidence that the Salt River was ever used to transport these massive quantities of wood products. In other parts of the country where demand for lumber was high and timber distant, navigable rivers were used to transport logs to their point of use. This did not occur on the Salt River.

## 7. Bridges, Fords, Dikes, or Other Structures Existed That Were Inconsistent with or Impediments to Navigation.

Through its history the Salt River has been considered an obstacle to transportation, not an avenue of transportation. For that reason several bridges were constructed across the Salt River prior to statehood. These included railroad bridges and vehicular bridges.

An experience of two Phoenix residents underscores the perception of the Salt River as an obstacle to transportation. In 1909, Claude Brower and George Chitwood attempted to cross the Salt River at the Heard Crossing, what they thought was the "usual ford" of the river. Either by miscalculation of the ford's location, or by unusually high water, the two men and their buggy were overturned

by the current. This "close call" convinced the two men that a bridge was needed across the Salt River (Ex. Nos. 135 & 147).

**Fords Are Inconsistent with Navigation**

The presence of established river fords on the Salt River implies that the water was frequently low enough to walk across, either on foot or horseback. There were several such regular fords of the Salt River. The locations of these fords are reproduced in a map prepared by David F. Myrick to accompany his book *Railroads of Arizona, Volume 2.* Myrick shows three fords across the Salt River in 1871: Wilson Crossing, Gray Crossing, and Maricopa (Stage)Crossing. These regular fords, present as early as 1871, are clear indications of the low flow in the Salt River. The Gray Crossing, located due south of Phoenix, later became known as Heard Crossing after Dwight B. Heard acquired the extensive Michael Wormser land holdings south of the river (Ex. No. 189).

**Railroad Bridges as Impediments to Navigation**

The first bridge over the Salt River was constructed in 1887 by the Phoenix and Maricopa Railroad. This was a branch line from the Southern Pacific Railroad main line at Maricopa. The 1887 bridge consisted of two large trestles with three 150' truss spans over the river. The trestle portion of the bridge was constructed of timber piles topped with wooden "bents" that formed an impassable obstacle to any transportation through the trestle portion of the bridge. The bridge was damaged in the flood of February, 1890, but re-constructed and back in service by March of 1890. The Phoenix and Maricopa bridge was destroyed one year later, in the massive flood of February, 1891. A new bridge was constructed by August of 1891, consisting of eight 150' truss spans, with pile and bent trestles on each side of the spans. In 1902 one of these spans failed, but was quickly replaced. Plans for a replacement bridge were announced in the summer of 1903, but construction moved forward slowly because of flood conditions in the Salt River. The new span opened in August of 1905, moved slightly west to improve the alignment of the railroad. The 1905 bridge consisted of two 100' foot spans, five 150' spans, and two 160' foot spans with wooden pile and bent trestles on both approaches. In

August of 1912, plans were announced to replace the trusses with nine thru-trusses of heavier gauge steel. The replacement project was completed in 1913 (Ex. No. 190).

In 1903, a second railroad line was extended across the Salt River. The Phoenix and Eastern Railroad, an affiliate of the Santa Fe Railway, completed a pile and bent trestle bridge across the Salt River in January of that year. This pile and bent bridge would have effectively blocked all navigation on the Salt River, had there been any river navigation. By April of 1903, the Phoenix and Eastern had poured cement piles to support a planned thru-truss bridge. Construction of the steel bridge began on November 30, 1903. Completed in January of 1904, the new bridge consisted of four 200' truss spans and one 150' truss span. Trestle approaches were constructed on either side of the truss portion of the bridge. The new Phoenix and Eastern bridge was damaged in a flood during March of 1905. The railroad quickly put in a temporary trestle bridge across the Salt River, consisting of piles and bents. This construction again blocked any potential navigation on the Salt River. During the summer of 1905, a new steel bridge for the Phoenix and Eastern was constructed to the west of the location of the first steel bridge. This second bridge was damaged during a flood in November of 1905. Subsequently, the Phoenix and Eastern again used a temporary trestle bridge of piles and bents, thus blocking the Salt River from any potential navigation. The temporary bridge was used until November of 1906 when repairs on the damaged bridge were complete (Ex. No. 190).

These extensive and repeated railroad bridge construction efforts across the Salt River were serious impediments to navigation. The pile and bent trestle portions of the bridges, as well as the temporary pile and bent trestles completely crossing the Salt River, would have prevented any vessel from passing upstream or downstream at that location. Had the Salt River been considered a navigable stream, the construction in the river bed would have to conform to the requirements of the Rivers and Harbors Act of 1889 which precluded the placement of any obstacle to transportation in a navigable river. There is no evidence that the construction of railroad bridges across the Salt River were designed to mitigate any impact on river transportation. Instead, the bridges blocked river transportation.

Since there was no river transportation and the river was non-navigable, the bridge engineers did not need to factor river transportation into their plans. There is no evidence that river transportation was considered in the railroad bridge construction plans.

**Vehicular Bridges as Impediments to Navigation**

In addition to railroad bridge construction, the status of the Salt River as an impediment to transportation led to repeated demands for the construction of vehicular bridges across the Salt River. The campaign to construct a bridge at Central Avenue and the Salt River has already been described in an earlier section of this report. The Central Avenue bridge was completed in 1911, blocking any potential river traffic at that location.

Tempe residents also pushed plans for a bridge across the Salt River during the period prior to statehood in 1912. Tempe bridge boosters, disappointed at the narrow defeat of their bridge proposition in the election of 1909, took comfort in an alternate plan for bridge construction. This alternate plan also originated with the Territorial Legislature, which in 1909 had passed enabling legislation for the construction of bridges across non-navigable rivers in Arizona.

The twenty-fifth Territorial Legislature established a state road tax in 1909 and created the office of Territorial Engineer. J.B. Girand was appointed to the position and quickly undertook plans to improve road transportation in Arizona, including a bridge across the Salt River at Tempe. In February of 1911, Girand took his plans for the Tempe bridge to the Territorial Board of Control which approved the plans. Construction began on the Tempe bridge in June of 1911. The construction of the bridge is unusual because prisoners were used as labor on the job. An average force of 250 convicts worked on the bridge from June of 1911 until September of 1913 when the construction project was completed. Known later as the Ash Avenue Bridge, this structure stood across the Salt River until 1990 when it was removed as part of Tempe's Rio Salado project (Ex. No. 191).

The presence of these numerous transportation-related structures within and across the Salt River are inconsistent with navigation and are impediments to navigation. The presence of fords, railroad bridges, and vehicular bridges are strong evidence that the Salt River was an impediment to transportation and not an avenue of transportation.

**Diversion Structures as Impediments to Navigation**

Numerous diversion structures existed at or prior to statehood. These structures varied in size and type of construction from simple rock, brush and timber dams to concrete dams like Granite Reef Dam. These diversion structures impact navigability in two main ways. Their physical presence can act as a barrier to travel especially in low flow periods and these dams diverted flow from the river, to the point of completely drying up the river.

The degree to which these diversion structures acted as physical barriers to travel along the river is difficult to answer especially since few anecdotal references to travel on the river exist. Furthermore, the extent to which these dams create a physical barrier is dependent upon how much water is flowing in the river on any given day. These types of records are scarce especially downstream from Granite Reef Dam.

The impacts of diversions on the susceptibility of navigability is more clear. Effects on Salt River flows from these diversions are detailed in several different documents. Davis reported in 1897 that aggregate canal capacity was in-excess of low flow in the river (Ex. No. 205). Code reported in 1900 that the entire flow of the Salt River was diverted into the Arizona Canal at the Arizona Dam. The Salt River was reported as being dry from the head of the Utah Canal for 6 or 7 miles downstream. After that point irrigation return flow supported flow in the river until Joint Head Dam, which was located at approximately present day 40th St. and the Salt River, where the entire flow was again diverted. This pattern is repeated to some extent below Joint Head Dam where irrigation return flows, groundwater discharge and ephemeral tributaries reinstitute flow in the river. There were additional small canals between Joint Head Dam and the Salt-Gila confluence that

diverted these flows. Diversions of flow which caused stretches of the river to dry up followed by flowing reaches supported by return flows and groundwater discharge is also described in the Kent Decree (Ex. No. 177). This same pattern is described in other documents such as Ex. No. 34, Ex. No. 40, and Ex. No. 192.

It is beyond question that significant reaches of the Salt River were dry and contained no flow at certain times of the year. This evidence supports a conclusion that the river was non-navigable.

## 8. Transportation in the Area Was Normally Undertaken by Methods Other than by Boat.

The relatively flat terrain of the Salt River Valley easily lends itself to land transportation. The lack of natural vegetation and absence of geographic obstacles (with the one exception of the Salt River) offered little incentive for the development of alternative forms of transportation. There is no evidence that transportation was normally undertaken by boat.

In contrast to the lack of evidence for river navigation, there is ample evidence that land transportation was the normal means of moving people and cargo from one place to another in Arizona. Land transportation was of such significance that Arizona's territorial and county governments devoted considerable time and money to the development and improvement of land transportation.

As early as 1864, one year after the creation of the Arizona Territory, the Territorial Legislature authorized private companies to build roads and charge tolls. Two years later, in 1866, the territorial government authorized counties in Arizona to create road districts. Between 1870 and 1885, the territorial government issued $85,000 in bonds for road construction. Just prior to statehood, in 1909, the Territorial Legislature created the office of Territorial Engineer and embarked on a major road construction program. By the time Arizona was admitted to statehood on February 14, 1912, the territory had constructed over 243 miles of highway at an average cost of $2,500 per mile (Ex. No. 193).

The most telling evidence in support of a finding of non-navigability with reference to transportation is the construction of the Apache Trail to the site of Roosevelt Dam at the confluence of Tonto Creek with the Salt River. The construction of the dam in this remote section of the Salt River entailed the movement of large amounts of equipment and large numbers of men. In order to reach the dam site, the Federal government constructed a wagon trail from Mesa to the site of the dam. The construction work started in December of 1903 and was very difficult. Cost estimates for the Apache Trail reached $25,000 per mile. Had the Salt River been a navigable stream at this time, it would have provided a safe and less expensive alternative means of transportation to the site of the dam. Rather than attempt transportation by river, the Federal government laboriously constructed an expensive wagon road which closely paralleled the Salt River to the site of the dam (Ex. No. 37).

## 9. The U.S. Did Not Regulate the River under the Rivers and Harbors Act of 1899.

The most curious aspect of the entire navigability question is the premise that Arizona rivers other than the Colorado were somehow overlooked when it came time to evaluating their navigability during the historic period. In fact, Arizona rivers were examined and found wanting in the area of navigability. The Rivers and Harbors Act of 1899 (30. Stat. 1121) lists many rivers in the United States that were navigable and thus eligible for Federal funding of improvements. The list does not include the Salt River (Ex. No. 194).

Prior to the Rivers and Harbors Act of 1899, the Bureau of the Census published a statistical atlas of the United States. Published in 1898 and compiled from information gathered during the 11th census in 1890, the atlas contains a depiction through the means of notations marked on the navigable rivers of the United States. This depiction is reproduced as "Plate 59" of the statistical atlas. The Colorado is the only Arizona river marked as navigable in 1890. Had other rivers in Arizona been considered navigable, they would have been so designated in 1890. This evaluation took place a full twenty-two years prior to statehood

when diversions for irrigation use were smaller and prior to the construction of dams and bridges which served as impediments to transportation (Ex. No. 195).

At the time of statehood in 1912, the Federal government granted Arizona 10,426,000 acres of land. This figure included lands along the navigable Colorado River. Lands along other Arizona rivers, not considered navigable in 1912, were not included in the amount of land granted to the new state government. The determination of navigable rivers according to the 1899 statute, and the location of lands granted to Arizona in its Enabling Act along those rivers were deliberate and calculated decisions. The Salt River was not somehow overlooked in this deliberative process. It was excluded from consideration because it was considered non-navigable at the time of statehood (Ex. No. 196).

## A.R.S. § 37-1128(E)(1)

Water appropriated prior to February 14, 1912 is not to be counted as flow in the river for purposes of determining navigability according to § 37-1128 E(1). One method to determine how reported river flows might be reduced by appropriated water is to examine the water rights adjudicated in the Kent Decree (Ex. No. 177) and to compare the amount of water appropriated for those water rights to the magnitude of reported flows in the river at that same time. It is necessary to compare appropriations to reported streamflow at a point upstream from the diversion points used to satisfy the Kent Decree rights. This allows one to isolate to the maximum extent possible the impacts on streamflow solely on the basis of these appropriations.

### Impacts of Appropriations on Streamflow

All Class A lands adjudicated in the Kent Decree were assigned priority dates prior to February 14, 1912, so they meet the exclusionary statutory criteria. The decree details where the water was diverted, a rate of continuous flow to be diverted, and a rate of flow to be diverted by each canal system. This data can be used to determine the rate of continuous flow appropriated for diversion at Granite

Reef Dam. This is a reliable data source because it contains adjudicated water rights, diversion points and canal systems that were in use at the time of statehood and few calculations are needed to reduce the data. Additionally, reported flow data is available at Arizona Dam which was located 2.5 miles upstream from Granite Reef Dam (Ex. No. 182), and from studies at the confluence of the Salt and Gila Rivers, which is a short distance further upstream. Flow records are also available from gages on the Salt and Verde Rivers just upstream from their confluence. Use of these data for comparison to appropriations at Granite Reef Dam reduce potential errors from upstream diversions since those diverted flows are inherently accounted for in the measured gaged flows. At the same time, only a small intervening drainage area exists between those measuring points and Granite Reef Dam. Thus, errors are minimized when assuming that flow at Granite Reef Dam is equivalent to flow at Arizona Dam, the confluence of the Salt and Verde Rivers, or the upstream gage sites. Because the statute contemplates reducing river flows by appropriations it is not necessary to determine the extent of actual diversions at Granite Reef Dam.

**Methodology to Determine Appropriations**

The Kent Decree states that the north side canals in the Salt River Valley are served by one integrated system with water being diverted at Joint Head Dam and Granite Reef Dam. Thus the decree recognizes that the appropriation may be entirely satisfied by diversions at Granite Reef Dam. This was the practice when little or no flow existed in the river at Joint Head Dam. On the south side of the Salt River, Granite Reef Dam diverted all of the water to satisfy the southside lands except for the Tempe, Broadway and San Francisco canals. The Broadway and San Francisco canals received their water from the Tempe Canal which had an independent diversion head in the Salt River. In practice, an unspecified amount of water was diverted at Granite Reef Dam, transported through the north side canals, and returned to the river just above the Tempe Canal heading (see Ex. No. 177, Kent Decree.) This was done to reduce seepage losses in the river bed when water was transported or left in the river for diversion at the Tempe Canal head (Ex. No. 205). However, to simplify matters, this analysis assumes that no water is diverted at Granite Reef Dam for delivery to the Tempe Canal head. Likewise,

appropriations for lands served by the Tempe, Broadway and San Francisco canals are removed from the analysis. This assumption makes the analysis a conservative determination of the amount of water appropriated for delivery at Granite Reef Dam. Without this assumption appropriations at Granite Reef Dam would be larger than those calculated in this analysis.

The total flow appropriated for all Class A lands is 1450 cfs continuous flow (58,000 miners inches) (Ex. No. 177). The Tempe, Broadway and San Francisco canals were entitled to 212 cfs. This rate of flow for these three canals was derived from the number of acres of land shown in Table #10 of the Kent Decree and then by applying the decreed rate of 1 miners inch per three and one-third acres of land to those data. This data was then converted to cfs.

**Reduction in Streamflow from Appropriations**

The decreed appropriation of 1450 cfs is reduced to 1238 cfs at Granite Reef Dam by subtracting the 212 cfs appropriated at the Tempe Canal heading. This appropriated flow can then be compared to streamflow data derived by Thomsen and Porcello (Ex. No. 182). They found the median flow at Granite Reef Dam to be 1230 cfs using upstream Salt and Verde gage records for the entire period of record. The median flow is the rate of flow that is expected to occur 50% of the time. These records reflect adjustments made to the record to account for storage reservoirs built on both rivers. The decreed appropriation, 1238 cfs is greater than the expected flow, 1230 cfs, for 50% of the time according to this analysis. The potential for navigability is greatly diminished if the river is dry one-half the time.

Davis reports in 1897 that the low flow of the river is 300 cfs (Ex. No. 205). The decreed appropriation is over four times this amount and thus the river would be completely dry in this case.

Exhibit No. 183 lists discharge data for a gage named Salt River at Arizona Dam. This gage, essentially the dam itself, was located about 2.5 miles above Granite Reef Dam. Monthly mean (average) discharge is reported. For twenty of the reported 43 months flow in the river is exceeded by appropriations. This

equates to 47% of the months reported and compares favorably to the median (50%) flow analysis previously discussed.

While long term records based on the entire hydrologic record are one point of comparison, additional comparisons can be made based on data measured from gages which existed prior to statehood. This type of comparison more closely follows the intent of the statute in directing the Commission to make a determination as of the date of statehood.

Further analysis can be made by looking at gage records for daily discharges and comparing them to appropriations. This is the most accurate comparison because the decreed appropriations are for continuous flow on a daily basis. The use of daily data provides the only true measure of streamflow for navigability determinations as is discussed in more detail elsewhere in this report.

Daily data for Arizona Dam could not be found, however, some daily data for the Salt River at McDowell and the Verde River at McDowell were located. These data reasonably represent flow in the Salt River when combined. These records are combined to estimate flow in the Salt River for comparison purposes with appropriations at Granite Reef Dam and are illustrated on Table #7 and Table #8. Only those data where measurements were reported at both sites appear in these tables.

| TABLE #7 |
| --- |
| 1899 ESTIMATED TOTAL COMBINED SALT AND VERDE DAILY DISCHARGE (cfs) |
| **DATE / CFS** |
| January 15 / 984 |
| January 22 / 723 |
| February 12 / 764 |
| February 28 / 750 |
| March 12 / 781 |

(Table #7 Continued)

| TABLE #7<br>1899 ESTIMATED TOTAL COMBINED SALT AND VERDE DAILY DISCHARGE (cfs) |
|---|
| April 29 / 672 |
| April 30 / 684 |
| June 29 / 300 |
| July 16 / 458 |
| August 22 / 383 |
| September 4 / 290 |
| September 10 / 1197 |
| October 8 / 384 |
| November 30 / 529 |
| December 1 / 596 |
| **Source: USGS Water Supply Paper #38 (Ex. No. 198)** |

| TABLE #8<br>1901 ESTIMATED TOTAL COMBINED SALT AND VERDE DAILY DISCHARGE (cfs) | | |
|---|---|---|
| **DATE / CFS** | **DATE / CFS** | **DATE / CFS** |
| January 10 / 519 | April 2 / 1108 | October 19 / 247 |
| January 26 / 1693 | April 8 / 1204 | October 26 / 319 |
| February 11 / 7117 | April 10 / 1186 | November 2 / 465 |

| TABLE #8 | | |
|---|---|---|
| 1901 ESTIMATED TOTAL COMBINED SALT AND VERDE DAILY DISCHARGE (cfs) | | |
| February 15 / 2881 | April 12 / 1278 | November 9 / 423 |
| February 23 / 9903 | April 13 / 1165 | November 16 / 474 |
| February 25 / 7154 | April 15 / 1184 | November 23 / 433 |
| February 27 / 4958 | June 8 / 476 | November 30 / 374 |
| February 28 / 4281 | June 15 / 464 | December 7 / 437 |
| March 2 / 4460 | June 22 / 253 | December 14 / 459 |
| March 4 / 3339 | June 30 / 180 | December 21 / 379 |
| March 9 / 3468 | July 6 / 137 | December 28 / 406 |
| March 11 / 4852 | July 13 / 111 | December 31 / 388 |
| March 12 / 3833 | July 20 / 113 | |
| March 13 / 3034 | July 27 / 607 | |
| March 14 / 2856 | August 10 / 795 | |
| March 16 / 2246 | August 17 / 842 | |
| March 18 / 2003 | August 31 / 409 | |
| March 19 / 1820 | September 7 / 279 | |
| March 21 / 1593 | September 14 / 302 | |
| March 22 / 1480 | September 25 / 256 | |
| March 27 / 1254 | October 5 / 219 | |
| March 29 / 1108 | October 12 / 291 | |
| **Source: USGS Water Supply Paper #66 (Ex. No. 199)** | | |

For 1899 appropriations exceeded flow in every case. For the year 1901, there were 57 days when measurements were reported for both gage sites. In this year annual runoff was closer to median annual runoff. There were 36 days when appropriations exceeded river flows. Except for April 12, the recorded flows for each day after March 29, 1901 through the end of the calendar year were exceeded by the appropriation.

Likewise, Exhibit No. 200 shows daily flow records for 1902. This year was similar to 1899 in that no days exist in the record when flows exceeded appropriations.

Exhibit No. 201 for the year 1904 shows a majority of days where appropriations exceeded flows. Only the months of July, August and September show daily records where flows exceed appropriations.

**Additional Appropriations**

The preceding analysis was limited to appropriations classified by the Kent Decree as Class A lands. Additional water was appropriated from both the Salt and Verde Rivers for the direct use of flood flows (flow over 1450 cfs) and to establish rights for storage in planned reservoirs.

T.A. Hayden's 1933 report describes these appropriations (Ex. No. 184). Lands which received this water were located under the same canals that served the Class A lands. They were designated in the Kent Decree as Class B and C lands. The Class A lands were also to benefit from these appropriations according to the Decree. An analysis similar to the previous one for Class A lands can be performed for these lands as well. Total appropriated flow for all lands can then be determined. There were approximately 242,000 acres of land within the Salt River Project eligible to receive water (Ex. No. 184).

## Methodology for Determining Additional Appropriations

The Kent Decree lists 151,083 Class A acres. Subtracting these from the total, 242,000 acres, yields 90,917 acres. Applying the Kent Decree diversion rate of 1 miners inch per 3⅓ acres of land and converting to cfs yields 682 cfs. This figure represents an estimate of the additional water needed to supply lands, other than Class A lands, at the Kent Decree water duty and diversion rate. Adding 1238 cfs, calculated previously for Class A lands, to 682 cfs yields a total flow of 1920 cfs.

## Reduction in Streamflow

Once again prior studies can be consulted for streamflow records. Thomsen and Porcello (Ex. No. 182) reported a median flow of 1230 cfs and an average flow of 1690 cfs for the entire prior of record. The SRVWUA in 1957 reported an average flow of 1773 cfs (reported in SLD navigability study; submittal #96-002-001-001). Calculation of average flow from the Salt River Project's hydrograph (Ex. No. 203) for the period 1899-1912 yields a flow of 1876 cfs. The total appropriated flow exceeds all of these estimated streamflows. This is strong evidence that navigability would have been impossible on the Salt River.

# Conclusion

This report presents a historical and hydrological analysis of evidence for conditions consistent with river navigation on the Salt River by a historian and a hydrologist. Both have many years of experience in the study of Arizona's water resources. Twelve separate criteria for navigability established by the Arizona legislature were examined. The report reaches the conclusion that the Salt River fails to possess any criteria supporting a finding of navigability.

Historical evidence suggests that navigation of the Salt River was attempted, but those attempts ended in failure. Contemporary accounts of the Salt River at the time of statehood describe it as a non-navigable stream. Extensive historical research has failed to uncover any evidence that would contradict that contemporary assessment.

Hydrological evidence supports a finding of non-navigability. The river was often dry depending upon the amount of diversions taking place on any given day and the magnitude of river flow on those days. Furthermore, the erratic nature of the river flow would have made reliance on the river for commercial purposes impossible. Likewise, use of the river as a transportation corridor was unlikely because flows in the river would rise to dangerous levels without warning in short periods of time.

# INDEX OF CITY OF PHOENIX EXHIBITS COMPILED BY TYPE OF INFORMATION PER *ANSAC* EVIDENCE REVIEW PROCEDURES ADOPTED JUNE 27, 1996

## TECHNICAL STUDIES

| ORIGINAL EXHIBIT # | DESCRIPTION |
|---|---|
| 1 | Memorandum from Director, U.S. Dept. of the Interior Bureau of Land Management received 5/15/64 State Office, Bureau of Land Management, Phoenix, Arizona |
| 2 | A Historical Analysis of Portions of the Salt and Gila Rivers, Arizona prepared by Elaine C. Lacy, dated February, 1987. |
| 3 | An Historical Analysis of the Salt River 1830-1912, Prepared by Barbara Behan, Dated 5/12/88 |
| 34 | Ground Waters of Salt River Valley (24 pages) |
| 164 | Gerald A. Doyle & Associates, Ash Avenue Bridge (HAER No. AZ-29) Photographs, Written and Historical Data. (San Francisco: National Park Service, 1991): Photocopies of Tempe News newspaper article dated April 3, 1908 and May 7, 1909 included in HAER field notes. |
| 180 | Excerpt from Maria Morisawa, 1968: Streams, Their Dynamics and Morphology. McGraw-Hill Book Co. |
| 181 | Excerpt from William D. Sellers, ed., Arizona Climate. University of Arizona. |
| 182 | B.W. Thomsen and J.J. Porcello. 1991. "Predevelopment Hydrology of the Salt River Indian Reservation, East Salt River Valley, Arizona." U.S. Geological Survey Water-Resources Investigations Report 91-4132. |

# INDEX OF EXHIBITS

## VOLUME I

1. Memorandum from Director, U.S. Dept. of the Interior, Bureau of Land Management received 5/15/64 State Office, Bureau of Land Management, Phoenix, Arizona

2. A Historical Analysis of Portions of the Salt and Gila Rivers, Arizona prepared by Elaine C. Lacy, dated February, 1987

3. An Historical Analysis of the Salt River 1830-1912, Prepared by Barbara Behan, Dated 5/12/88

4. Inspection Report of Camp McDowell

5. Personal History of George Robert Finch

6. Hurley v. Abbott - Action to Quiet Title

7. Hurley v. Abbott - Amended Complaint

8. Hurley v. Abbott - Answer of H. Criswell

9. Hurley v. Abbott - Answer and Cross Complaint of United States of America

10. Hurley v. Abbott - Answer of Lou Perkins

11. Consolidated Canal Company v. Tempe Irrigation Canal Company -Answer of Tempe Irrigation Canal Company

12. Consolidated Canal Company v. The Arizona Canal Company, et al.- Complaint dated June 16, 1894

13. Consolidated Canal Company v. The Arizona Canal Company, et al. - Summons and Answer of Defendant M. Wormser

14. The Utah Canal Enlargement and Extension Company v. The Utah Irrigation Ditch Company, et al. - Complaint

15. The Utah Canal Enlargement and Extension Company v. The London Company, et al., Complaint

16. The Consolidated Canal Company v. The Utah Canal Enlargement and Extension Company - Complaint

17. The Consolidated Canal Company v. The Tempe Irrigation Canal Company - Amended Complaint

18. Consolidated Canal Company v. Tempe Irrigation Canal Company -Demmurrer and Answer of Tempe Irrigation Canal Company

19. Consolidated Canal Company v. Arizona Canal Company - Complaint, dated August, 1894

20. M. Wormser v. Charles T. Hayden - Complaint

21. Frank B Austin v. A. J. Chandler, et al., - Complaint

22. A. J. Peters v. The Consolidated Canal Company - Complaint

23. W. S. Johnson, et al. v. The Consolidated Canal Company - Complaint

24. James C. Goodwin v. Granvill H. Oury - Complaint

25. James C. Goodwin v. Granvill H. Oury - Handwritten Complaint

26. C. A. Saylon, et al. v. The Consolidated Canal Company - Complaint

27. A. J. Peters, et al. v. The Consolidated Canal Company - Complaint

28. L. L. Harmon, et al. v. The Consolidated Canal Company - Complaint

29. J. C. Carmichael v. Bill Galbreath and John H. Ivy - Complaint

30. Vernon L. Clark, et al. v. The Bartlett Heard Land and Cattle Company, et al. - Amended Complaint

31. W. W. Dobson, et al. v. James Johnson - Complaint

32. Correspondence form the Department of the Interior, General Land Office, Washington, D.C., dated October 5, 1894 and handwritten notes

33. Correspondence from the Department of the Interior, United States Geological Survey to the Director, United States Reclamation Service, Dated May 14, 1912

34. Ground Waters of Salt River Valley (24 pages)

35. Correspondence from Department of the Interior, United States Geological Survey, Chief Division of Hydro Economics to F. H. Newell, Chief Engineer, U.S. Geological Survey dated April 28, 1904

36. Inspection Report - Salt River Project dated May 19, 1906 to Mr. F. H. Newell, Chief Engineer, U.S.R.S.

37. Volume I, Arizona - Salt River Project Preliminary History (8 pages)

38. Correspondence from Maricopa County Commercial Club to Mr. J. L. B. Alexander, U.S. Attorney, Phoenix, dated March 21, 1908

39. Drafting Div. Files, Correspondence from the Director to the Secretary of the Interior, Washington D.C., report regarding entire canyon of the Salt River, Arizona will need irrigation works

40. Department of the Interior, Office of the Secretary of Reclamation Service, Salt River Project, Water Rights, August 2, 1912 to October 23, 1912 (26 pages)

41. Correspondence from Department of the Interior, United States Indian Service, Klamath Agency, Oregon to Secretary of the Interior, Washington, D.C., dated August 25, 1904

42. National Archives Pacific Southwest Region - Letters sent by Agent, Box No. A013061-114680

43. Handwritten correspondence to Commissioner of Indian Affairs, Washington, D.C. from Claude M. Johnson, dated Pima, Sacaton, July 13th

44. Handwritten correspondence to Commissioner of Indian Affairs, Washington, D.C., from C. W. Crouse, dated Pima, Sacaton, April 15, '90

45. National Archives Pacific Southwest Region, Letters sent by Agent, Box No. 013126 - 114703

46. Handwritten Correspondence to Commissioner of Indian Affairs, Washington, D.C., from C. W. Crouse, dated Pima, Sacaton, June 20, '90

47. Correspondence to Commissioner of Indian Affairs, Washington, D.C. from C. W. Crouse, dated Sacaton, Arizona, March 4, 1891

48. National Archives Pacific Southwest Region, Letters sent by Agent March 16, 1892 to January 3, 1893, Box No. 013126-114703

49. Correspondence to Charles T. Hayden, Tempe, Arizona from C. W. Crouse dated Sacaton, Arizona, June 13, 1892

50. Correspondence to Commissioner of Indian Affairs, Washington, D.C., from C. W. Crouse dated Sacaton, Arizona, July 8, 1892

51. Correspondence to Commissioner of Indian Affairs, Washington, D.C., from United States Indian Service, dated Sacaton, Arizona, August 1, 1892

52. National Archives Pacific Southwest Region, Letters sent to the Office of the Commissioner of Indian Affairs 1896-1905, Box 2

53. Correspondence to Commissioner of Indian Affairs, Washington, D.C. from U.S. Indian Agent dated Pima Agency, Sacaton, Arizona, March 8, 1901

54. National Archives Pacific Southwest Region, Letters sent by Agents January 1, 1904 to May 31, 1906

55. Correspondence to Commissioner of Indian Affairs, Washington, D.C., from Superintendent, Pima Training School, dated Sacaton, Arizona, September 30, 1904

56. Correspondence to Commissioner of Indian Affairs, Washington, D.C., from Pima Training School, dated Sacaton, Arizona, February 25, 1905

57. Correspondence to Commissioner of Indian Affairs, Washington, D.C. from Superintendent, Pima Training School, dated Sacaton, Arizona, March 13, 1905

58. Correspondence to Commissioner of Indian Affairs from Superintendent Pima Training School, dated Sacaton, Arizona, April 10, 1905

59. National Archives Pacific Southwest Region, Letters sent by Agent 8/13/07-9/9/08, Box No. A013061-114680

60. Correspondence to Louis C. Hill, Supervising Engineer, U.S.R.S. from Superintendent, Pima Agency, dated Sacaton, Arizona, September 11, 1907

61. National Archives Pacific Southwest Region, Letters sent by Agent 6/1/06 to 9/15/08, Box No. A013061-114680

62. Correspondence to Commissioner of Indian Affairs, Washington, D.C. from Superintendent, Pima Training School, dated Sacaton Arizona, January 14, 1908

63. Correspondence to Commissioner of Indian Affairs, Washington, D.C. from Superintendent, Pima Training School, dated Sacaton Arizona, July 10, 1908

64. National Archives Pacific Southwest Region, Pima Indian Agency, Misc. Corresp., Box 9

65. Handwritten Correspondence to Mr. P. B. Hughes from Superintendent Pima Training School, dated Sacaton, Arizona, December 14, 1908

66. Handwritten correspondence to Superintendent Indian Schools, Sacaton, AZ from Salt River Agency dated December 21, 1908

67. Handwritten correspondence to Barney from Jim Alexander dated December 21, 1908

68. Handwritten correspondence to Barney from Jim Alexander dated December 22, 1908

69. Report - the project for building a substantial bridge across Salt River at the foot of Central Avenue ( 6 pages)

70. Handwritten correspondence on Fort Hotel letterhead to J. B. Alexander form S. C. Mason, dated 1/23/09

71. Handwritten correspondence to Barney from Jim Alexander, Salt River Pima Agency, dated 1909

72. National Archives Pacific Southwest Region, Pima Indian Agency, Education, Box 8

73. Correspondence to Commissioner of Indian Affairs, Washington, D.C., from Superintendent, Pima Training School, dated Sacaton, Arizona, June 30, 1909

74. National Archives Pacific Southwest Region, Pima Indian Agency 1909-1910, Accounts, Authorities for Purchase & Indian School Support, Box 10

75. Voucher or Claim, Trav. Expenses to H. M. Alexander - $13.00 dated November 30, 1909

76. Voucher or Claim, Trav. Expenses to W. E. Hester, $20.10 dated December 31, 1909

77. National Archives Pacific Southwest Region, Pima Indian Agency, letters to and from the Superintendent, Box 10

78. Correspondence to James B. Alexander, Superintendent Pima Indian School from Acting Commissioner of Indian Affairs dated August 4, 1910

79. Correspondence to Louella Mahancy from Acting Commissioner of Indian Affairs dated August 4, 1910

80. Notice to Civil Service Commission from C. F. Hauke, Second Assistant Commissioner, Office of Indian Affairs, dated July 2, 1910

81. Report of Medical Conditions, Salt River, Arizona dated 1910

82. National Archives Pacific Southwest Region, Phoenix Indian School, correspondence to the Commissioner 1915-1920, Box 6

83. Correspondence to Commissioner of Indian Affairs, Washington D.C., from Superintendent dated February 10, 1916

84. Basis of Settlement of Litigation between Buckeye Irrigation Company and Salt River Valley Water Users' Association (9pp.)

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then overland to Phoenix, then by boat down the Salt, Gila and Colorado

100. Phoenix Daily Herald, February 25 ,1895: letter from boaters (above), describing trip

101. Arizona Republican, February 5, 1905: use of boats to rescue Tilzer family from island in the Salt River during flood

102. Arizona Republican, March 24, 1905: Jacob Shively boats Salt River

103. Arizona Republican, March 29, 1905: Jacob Shively reaches Arlington

104. Arizona Republican, December 9, 1905: engineers use boat to inspect canals.

105. Arizona Republican, October 4, 1909: Jim Meadows recounts boating the Salt between Livingstone and Tempe

106. Arizona Republican, June 28, 1910: two men boat from Roosevelt Dam to Tempe

107. Arizona Gazette, January 30, 1915: use of boats to rescue people from flooded Salt River

108. Arizona Republic, December 22, 1985: historical account of nineteenth-century attempts to float logs down the Salt River

109. Fireman, Bert M., Charles Trumbull Hayden, The Smoke Signal 19, Tucson Corral of the Westerners, Tucson, Arizona (1969:202): account of Hayden's attempt to float logs down the Salt River (see above)

110. Reed, Bill, The Last Bugle Call: A History of Fort McDowell, Arizona Territory, McClain Printing Company, Parsons, West Virginia (1977:140): account of the death of commandant at Fort McDowell in 1881 (see above)

111. Weekly Arizona Miner, December 12, 1868: Governor calls for encouragement for ferries operating on the Gila and Salt

112. Weekly Arizona Miner, February 27, 1874: Hayden's Ferry[1]*

113. The Citizen, February 28, 1874: Hayden's Ferry*

114. Phoenix Daily Herald, August 15, 1881: complaints of exorbitant prices on Gila and Salt River ferries*

115. Phoenix Daily Herald, August 16, 1991: George Luhrs building skiff for the stage company to use to ferry passengers across the Salt River*

116. Phoenix Daily Herald, February 26, 1883: Monihan's Ferry Privilege Act mentioned*

117. Arizona Gazette, February 19, 1884: ferry operated on the Salt*

118. Phoenix Daily Herald, February 19, 1884: raft constructed to cross Salt River*

119. Phoenix Daily Herald, February 19, 1884: McDonald's shop constructed ferry boat for a Mr. Trumbull*

120. Arizona Gazette, March 5, 1884: new freight boat constructed*

121. Phoenix Daily Herald, March 17, 1884: Arizona Stage Company using boats to ferry passengers across the Gila and Salt Rivers, and the Ferry and Bridge Company planning ferries*

122. The Herald, April 11, 1884: Large ferry to be built for Gila and Salt River Ferry Company*

123. Phoenix Herald, March 24, 1884: Ferry running on the Salt River between Phoenix and Maricopa*

124. The Arizona Gazette, April 14, 1884: Mail for Maricopa lost in Salt River*

125. Arizona Gazette, April 21, 1884: Gila and Salt River Ferry*

126. The Herald, May 9, 1884: New ferry working splendidly*

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[1] *Exhibits 112 through 128 will be withdrawn if the Commission grants First American's Motion to Exclude Evidence that is being filed simultaneously herewith.

127. Arizona Republican, February 1, 1884: The South Side*

128. The Smoke Signal, 1988: The Great Ferry War of 1905 and Other Adventures on the Gila River, Arizona*

129. Across America: The Great West and Pacific Coast by James F. Rusling, New York: Sheldon & Company 1874

130. "Weak Spots Designated", Arizona Republican, March 16, 1909 (I, 1:3-4)

131. "Partial List of Officials", Arizona Republican, March 18, 1909 (I,1:1-2 & 4:3-4)

132. "$50,000 is Subscribed" Arizona Republican, April 7, 1909 (I, 1:6 & 7:1-2)

133. "Mesa the Battle Ground on Bridge Controversy" Arizona Republican, April 11, 1909 (II, 5:3)

134. "The Road's Condition" Arizona Republican, April 12, 1909 (II, 2:3-4)

135. "Lively Experience in the Salt River" Arizona Republican, April 19, 1909 (II, 3:4-5)

136. "Bridge Election June 10" Arizona Republican, April 21, 1909 (I, 6:2)

137. "Prohibition Again to the Front" Arizona Gazette, (Phoenix), March 1, 1909 (I, 1:5)

138. "Commission Bill is A Law" Arizona Gazette (Phoenix), March 10, 1909 (I, 1:3-4 & 3:3-7)

139. "Opposed to Issues of Bonds" Arizona Gazette (Phoenix), March 11, 1909 (I, 1:1-2)

140. "Pass Bill to Purchase Fair" Arizona Gazette (Phoenix), March 16, 1909 (I, 1:3-4 & 5:3)

141. "Twenty-Fifth Legislature Adjourns at Six Thirty" Arizona Gazette (Phoenix), March 19, 1909 (I, 1:1-4)

142. "All Plans for Harmony Fail" Arizona Gazette (Phoenix), April 6, 1909 (I 6:3-4)

143. "New Petition for Bridge Election" Arizona Gazette (Phoenix), April 7, 1909 (I, 1:3-4)

144. "The Truth About the Bridge" Arizona Gazette (Phoenix), April 14, 1909 (I, 12:3-7)

145. "Salt Crossed at Tempe" Arizona Gazette (Phoenix), April 15, 1909 (I, 7:1)

146. "Bridge Question Before Board Supervisors" Arizona Gazette (Phoenix), April 19, 1909 (I, 1:3)

147. "Exciting Experience at the Heard Crossing" Arizona Gazette (Phoenix), April 19, 1909 (I, 11:3)

148. "Bridge Election Called for June 10" Arizona Gazette (Phoenix), April 20, 1909 (I, 5:4)

149. "More About the Bridge" Arizona Gazette (Phoenix), April 29, 1909 (I, 8:3)

150. "Ideas on the Road Question" Arizona Gazette (Phoenix), April 30, 1909 (I, 11:2-3)

151. "Why You Should Work and Vote for Center Street Bridge" Arizona Gazette (Phoenix), June 7, 1909 (I, 3:6-7)

152. "The Bridge Question" Arizona Gazette (Phoenix), June 8, 1909 (I, 8:1-6)

153. "Battle of the Ballots on Today" Arizona Gazette (Phoenix), June 10, 1909 (I, 1:5)

154. "Safe Majority for the Center Street Bridge" "A Campaign for Tempe Bridge" Arizona Gazette (Phoenix), June 11, 1909 (I, 1:1-2, I, 1:4-5)

155. "No Dismay at Tempe" Arizona Republican, June 12, 1909 (I, 1:1-2)

156. "The Supervisors Accept the Bridge" Arizona Republican, May 31, 1911 (I, 8:1)

157. "The Bridge Formally Accepted" Arizona Republican, June 8, 1911 (I, 6:3)

158. "Dedication of Center Bridge" Arizona Gazette (Phoenix), June 29, 1911 (I, 1:3)

159. "Bridges are Made to be Crossed" Arizona Republican, June 30, 1911 (I, 6:4)

160. "Two Bridge Questions" Arizona Republican, May 5, 1909 (I, 2:1-4)

161. "Trip to Ancient Landmark in Tempe is Interesting Motor Tour" Arizona Gazette (Phoenix), November 5, 1930 (I, 7:3-4)

162. Sessions Laws of the Twenty-Fifth Legislative Assembly of the Territory of Arizona. (Phoenix: Phoenix Printing Co. 1909), pp. 184-185 and pp. 208-211.

163. Minutes of the Maricopa County Board of Supervisors, Book 9, p.p. 18-21 (April 20, 1909) and Book 9, pp. 65-68 (June 21, 1909).

164. Gerald A. Doyle & Associates, Ash Avenue Bridge (HAER N.o. AZ-29) Photographs, Written and Historical Data. (San Francisco: National Park Service, 1991): Photocopies of Tempe News newspaper article dated April 3, 1908 and May 7, 1909 included in HAER field notes.

165. Decree in Case #708, Wormser, et al. vs. Salt River Valley Canal Co., et al.

166. Case #88, Farmers Canal v. Grand Canal. "Complaint," filed September 8, 1879; "Answer" filed October 31, 1879; "Decree and Judgment, filed April 14, 1880.

167. Index to Sanborn Fire Insurance Co. maps for Phoenix and Tempe (dated 1911).

168. Resume of Douglas E. Kupel

169. Resume of John K. Graham

170. Resume of Stanley M. Hordes

171. Resume and SLA Project Experience of Michael E. Zeller

172. Report prepared by John K. Graham, an expert on land title issues, regarding the effect of the federal land patents that were issued with respect to the property that is located within the subject reach of the Salt River. (To be supplied)

173. Report prepared by Stanley M. Hordes, a historian, regarding the results of his research with respect to the actual uses of the Salt River during the period prior to and shortly after Arizona's statehood. (To be supplied)

174. Report prepared by Michael E. Zeller, an expert in hydrology, hydraulics and geomorphology, regarding various flow characteristics of the Salt River and changes in the flow characteristics and its alignment which occurred prior and subsequent to statehood. (To be supplied)

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188. Agreement Between the United States and the Salt River Valley Water Users Association, 1935.

189. Excerpted map from David F. Myrick, Railroads of Arizona, Volume 2.

190. Excerpted map from David F. Myrick, Railroads of Arizona, Volume 2.

191. Historic American Engineering Record report on Ash Avenue Bridge, 1991.

192. Excerpt from Willis T. Lee, 1905. "Underground Waters of the Salt River Valley," USGS Water Supply Paper No. 136 (Washington: Government Printing Office).

193. "Vehicular Bridges in Arizona" National Register of Historic Places nomination, 1987.

194. Excerpt from the Rivers and Harbors Act of 1899 (30 Stat. 1121).

195. Plate 59 from the 1890 Statistical Abstract of the United States (published 1898) showing navigable rivers in the United States.

196. Excerpt from 1971 report, Ownership and Administration of Public Lands in Arizona.

197. Excerpt from W.H. Code, 1900. "Report of Investigations for 1900." U.S. Department of Agriculture, Office of Experiment Stations-Bulletin No. 104. (Washington: Government Printing Office, 1902).

198. Excerpt from 1899, "Surface Water Supply of the U.S. - Colorado River Basin," U.S. Geological Survey Water Supply Paper No. 38.

199. Excerpt from 1901, "Surface Water Supply of the U.S. - Colorado River Basin," U.S. Geological Survey Water Supply Paper No. 66.

200. Excerpt from 1902, "Surface Water Supply of the U.S. - Colorado River Basin," U.S. Geological Survey Water Supply Paper No. 85.

201. Excerpt from 1904, "Surface Water Supply of the U.S.- Colorado River Basin," U.S. Geological Survey Water Supply Paper No. 133.

202. 1904, Salt River Project, Salt River Valley Arizona, Topographic and Irrigation Maps, 1902-1903.

203. Hydrograph of Combined Flow of Salt and Verde Rivers, 1889-1912. Salt River Valley Water Users Association.

204. Hydrograph of Combined Flow of Salt and Verde Rivers, 1889-1912 and Average Flow 1899-1912.

205. Excerpt from A.P. Davis, 1897. "Irrigation Near Phoenix, Arizona." U.S. Geological Survey Water Supply and Irrigation Paper Number 2. U.S. government Printing Office, Washington.

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|---|---|
| 183 | Excerpt from 1954 "Compilation of Records of Surface Waters of the United States through September 1950, Part 9, Colorado River Basin." U.S. Geological Survey Water Supply Paper No. 1313. |
| 184 | Title page from T.A. Hayden. A Study of the Water Supply of the Salt River Project, Arizona Showing the Need of Storage on the Verde River and the Effect of the Over-Developed Verde District, Phoenix, Arizona. August 26, 1933. |
| 191 | Historic American Engineering Record report on Ash Avenue Bridge, 1991. |
| 192 | Excerpt from Willis T. Lee, 1905. "Underground Waters of the Salt River Valley", USGS Water Supply Paper No. 136 (Washington: Government Printing Office). |
| 193 | "Vehicular Bridges in Arizona" National Register of Historic Places nomination, 1987. |
| 196 | Excerpt from 1971 report, Ownership and Administration of Public Lands in Arizona. |
| 197 | Excerpt from W.H. Code, 1900. "Report of Investigations for 1900." U.S. Department of Agriculture, Office of Experiment Stations-Bulletin No. 104. (Washington: Government Printing Office, 1902). |
| 198 | Excerpt from 1899, "Surface Water Supply of the U.S. - Colorado River Basin," U.S. Geological Survey Water Supply Paper No. 38. |
| 199 | Excerpt from 1901, "Surface Water Supply of the U.S. - Colorado River Basin," U.S. Geological Survey Water Supply Paper No. 66. |
| 200 | Excerpt from 1902, "Surface Water Supply of the U.S. - Colorado River Basin," U.S. Geological Survey Water Supply Paper No. 85. |

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| 201 | Excerpt from 1904, "Surface Water Supply of the U.S.- Colorado River Basin," U.S. Geological Survey Water Supply Paper No. 133. |
| 205 | Excerpt from A.P. Davis, 1897. "Irrigation Near Phoenix, Arizona." U.S. Geological Survey Water Supply and Irrigation Paper Number 2. U.S. government Printing Office, Washington. |

PRIOR CASE LAW

| ORIGINAL EXHIBIT # | DESCRIPTION |
|---|---|
| 6 | Hurley v. Abbott - Action to Quiet Title |
| 7 | Hurley v. Abbott - Amended Complaint |
| 8 | Hurley v. Abbott - Answer of H. Criswell |
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| 10 | Hurley v. Abbott - Answer of Lou Perkins |
| 11 | Consolidated Canal Company v. Tempe Irrigation Canal Company - Answer of Tempe Irrigation Canal Company |
| 12 | Consolidated Canal Company v. The Arizona Canal Company, et. al. - Complaint dated June 16, 1894 |
| 13 | Consolidated Canal Company v. The Arizona Canal Company, et. al. - Summons and Answer of Defendant M. Wormser |
| 14 | The Utah Canal Enlargement and Extension Company v. The Utah Irrigation Ditch Company, et. al. - Complaint |

15 The Utah Canal Enlargement and Extension Company v. The London Company, et. al. - Complaint

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18 Consolidated Canal Company v. Tempe Irrigation Canal Company - Demurrer and Answer of Tempe Irrigation Canal Company

19 Consolidated Canal Company v. Arizona Canal Company - Complaint, dated August, 1894.

20 M. Wormser v. Charles T. Hayden - Complaint

21 Frank B. Austin v. A.J. Chandler, et. al. - Complaint

22 A.J. Peters v. The Consolidated Canal Company - Complaint

23 W.S. Johnson, et. al. v. The Consolidated Canal Company - Complaint

24 James C. Goodwin v. Granvill H. Oury - Complaint

25 James C. Goodwin v. Granvill H. Oury - Handwritten Complaint

26 C.A. Saylon, et. al. v. The Consolidated Canal Company - Complaint

27 A.J. Peters, et. al. v. The Consolidated Canal Company - Complaint

28 L.L. Harmon, et. al. v. The Consolidated Canal Company - Complaint

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| 29 | J.C. Carmichael v. Bill Galbreath and John H. Ivy - Complaint |
| 30 | Vernon L. Clark, et. al. v. The Bartlett Heard Land and Cattle Company, et. al. - Amended Complaint |
| 31 | W.W. Dobson, et. al. v. James Johnson - Complaint |
| 165 | Decree in Case #708 Wormser, et. al. vs. Salt River Valley Canal Co., et. al. |
| 166 | Case #88, Farmers Canal v. Grand Canal. "Complaint" filed September 8, 1879; "Answer" filed October 31, 1879; "Decree and Judgment" filed April 14, 1880. |
| 177 | Decision and Decree in Case #4564, Hurley v. Abbott (1910) |

MEDIA REPORTS

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|---|---|
| 85 | Weekly Arizona Miner, May 3, 1873: flat boat with 5 tons of wheat floated down Salt River and Swilling Canal to Hellings Mill |
| 86 | Weekly Arizona Miner, June 14, 1873: Hayden investigating possibility of floating logs down the Salt |
| 87 | Weekly Arizona Miner, June 21, 1873: Hayden unsuccessful |
| 88 | Weekly Arizona Miner, June 28, 1873: Hayden unsuccessful |

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| 89 | Arizona Gazette, February 17, 1881: Cotton and Bingham leave for Yuma in 18-foot skiff |
| 90 | Arizona Gazette, November 30, 1881: Yuma or Bust expedition via Salt River |
| 91 | Arizona Gazette, December 3, 1881: Yuma or Bust expedition, continued |
| 92 | Arizona Gazette, February 14, 1883: officers from Fort McDowell float down to Phoenix |
| 93 | Arizona Gazette, June 3, 1885: exploration of the Salt River Canyon by boat |
| 94 | Arizona Gazette, June 5, 1885: additional accounts of exploration of Salt River Canyon by boat |
| 95 | Arizona Gazette, June 6, 1885: interview with John Meaders, one of the explorers of the Salt River Canyon |
| 96 | Arizona Gazette, June 8, 1885: account of previous exploration of the Salt River Canyon, on foot, circa 1875 |
| 97 | Phoenix Daily Herald, December 12, 1888: commandant of Fort McDowell killed during canoe trip from Fort McDowell to Phoenix |
| 98 | Tombstone Daily Prospector, January 24, 1889: ferry boat floated downstream from Maricopa Crossing to Gila River |
| 99 | Phoenix Daily Herald, February 18, 1895: account of boat trip down the Gila from Clifton to Sacaton then overland to Phoenix, then by boat down the Salt, Gila and Colorado |
| 100 | Phoenix Daily Herald, February 25, 1895: letter from boater (above), describing trip |

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| 101 | Arizona Republican, February 5, 1905: use of boats to rescue Tilzer family from island in the Salt River during flood |
| 102 | Arizona Republican, March 24, 1905: Jacob Shively boats Salt River |
| 103 | Arizona Republican, March 29, 1905: Jacob Shively reaches Arlington |
| 104 | Arizona Republican, December 9, 1905: engineers use boat to inspect canals |
| 105 | Arizona Republican, October 4, 1909: Jim Meadows recounts boating the Salt between Livingstone and Tempe |
| 106 | Arizona Republican, June 28, 1910: two men boat from Roosevelt Dam to Tempe |
| 107 | Arizona Gazette, January 30, 1915: use of boats to rescue people from flooded Salt River |
| 108 | Arizona Republic, December 22, 1985: historical account of nineteenth-century attempts to float logs down the Salt River |
| 111 | Weekly Arizona Miner, December 12, 1868: Governor calls for encouragement for ferries operating on the Gila and Salt |
| 112 | Weekly Arizona Miner, February 27, 1874: Hayden's Ferry |
| 113 | The Citizen, Feruary 28, 1874: Hayden's Ferry |
| 114 | Phoenix Daily Herald, August 15, 1881: complaints of exorbitant prices on Gila and Salt River ferries |
| 115 | Phoenix Daily Herald, August 16, 1991: George Luhrs building skiff for the stage company to use to ferry passengers across the Salt River |

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| 116 | Phoenix Daily Herald, February 26, 1883: Monihan's Ferry Privilege Act mentioned |
| 117 | Arizona Gazette, February 19, 1884: ferry operated on the Salt |
| 118 | Phoenix Daily Herald, February 19, 1884: raft constructed to cross Salt River |
| 119 | Phoenix Daily Herald, February 19, 1884: McDonald's shop constructed ferry boat for a Mr. Trumbull |
| 120 | Arizona Gazette, March 5, 1884: new freight boat constructed |
| 121 | Phoenix Daily Herald, March 17, 1884: Arizona Stage Company using boats to ferry passengers across the Gila and Salt Rivers, and the Ferry and Bridge Company planning ferries |
| 122 | The Herald, April 11, 1884: Large ferry to be built for Gila and Salt River Ferry Company |
| 123 | Phoenix Herald, March 24, 1884: Ferry running on the Salt River between Phoenix and Maricopa |
| 124 | The Arizona Gazette, April 14, 1884: Mail for Maricopa lost in Salt River |
| 125 | Arizona Gazette, April 21, 1884: Gila and Salt River Ferry |
| 126 | The Herald, May 9, 1884: New ferry working splendidly |
| 127 | Arizona Republican, February 1, 1884: The South Side |
| 130 | "Weak Spots Designated", Arizona Republican, March 16, 1909 (I, 1:3-4) |

131 "Partial List of Officials", Arizona Republican, March 18, 1909 (I, 1:1-2 & 4:3-4)

132 "$50,000 is Subscribed" Arizona Republican, April 7, 1909 (I, 1:6 & 7:1-2)

133 "Mesa the Battle Ground on Bridge Controversy" Arizona Republican, April 11, 1909 (II, 5:3)

134 "The Road's Condition" Arizona Republican, April 12, 1909 (II, 2:3-4)

135 "Lively Experience in the Salt River" Arizona Republican, April 19, 1909 (II, 3:4-5)

136 "Bridge Election June 10" Arizona Republican, April 21, 1909 (I, 6:2)

137 "Prohibition Again to the Front" Arizona Gazette, (Phoenix), March 1, 1909 (I, 1:5)

138 "Commission Bill is A Law" Arizona Gazette (Phoenix), March 10, 1909 (I, 1:3-4 & 3:3-7)

139 "Opposed to Issues of Bonds" Arizona Gazette (Phoenix), March 11, 1909 (I, 1:1-2)

140 "Pass Bill to Purchase Fair" Arizona Gazette (Phoenix), March 16, 1909 (I, 1:3-4 & 5:3)

141 "Twenty-Fifth Legislature Adjourns at Six Thirty" Arizona Gazette (Phoenix), March 19, 1909 (I, 1:1-4)

142 "All Plans for Harmony Fail" Arizona Gazette (Phoenix), April 6, 1909 (I, 6:3-4)

143 "New Petition for Bridge Election" Arizona Gazette (Phoenix), April 7, 1909 (I, 1:3-4)

144 "The Truth About the Bridge" Arizona Gazette (Phoenix), April 14, 1909 (I, 12:3-7)

145 "Salt Crossed at Tempe" Arizona Gazette (Phoenix), April 15, 1909 (I, 7:1)

146 "Bridge Question Before Board Supervisors" Arizona Gazette (Phoenix), April 19, 1909 (I, 1:3)

147 "Exciting Experience at the Heard Crossing" Arizona Gazette (Phoenix), April 19, 1909 (I, 11:3)

148 "Bridge Election Called for June 10" Arizona Gazette (Phoenix), April 20, 1909 (I, 5:4)

149 "More About the Bridge" Arizona Gazette (Phoenix), April 29, 1909 (I, 8:3)

150 "Ideas on the Road Question" Arizona Gazette (Phoenix), April 30, 1909 (I, 11:2-3)

151 "Why You Should Work and Vote for Center Street Bridge" Arizona Gazette (Phoenix), June 7, 1909 (I, 3:6-7)

152 "The Bridge Question" Arizona Gazette (Phoenix), June 8, 1909 (I, 8:1-6)

153 "Battle of the Ballots on Today" Arizona Gazette (Phoenix), June 10, 1909 (I, 1:5)

154 "Safe Majority for the Center Street Bridge" "A Campaign for Tempe Bridge" Arizona Gazette (Phoenix), June 11, 1909 (I, 1:1-2, I, 1:4-5)

155 "No Dismay at Tempe" Arizona Republican, June 12, 1909 (I, 1:1-2)

156 "The Supervisors Accept the Bridge" Arizona Republican, May 31, 1911 (I, 8:1)

157 "The Bridge Formally Accepted" Arizona Republican, June 8, 1911 (I, 6:3)

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| 158 | "Dedication of Center Bridge" Arizona Gazette (Phoenix), June 29, 1911 (I, 1:3) |
| 159 | "Bridges are Made to be Crossed" Arizona Republican, June 30, 1911 (I, 6:4) |
| 160 | "Two Bridge Questions" Arizona Republican, May 5, 1909 (I, 2:1-4) |
| 161 | "Trip to Ancient Landmark in Tempe is Interesting Motor Tour" Arizona Gazette (Phoenix), November 5, 1930 (I, 7:3-4) |
| 178 | "Two Bridge Questions" Arizona Republican , May 5, 1909 (I, 2: 1-4). |

## HISTORY BOOKS

| ORIGINAL EXHIBIT # | DESCRIPTION |
|---|---|
| 37 | Volume I, Arizona - Salt River Project Preliminary History (8 pages) |
| 109 | Fireman, Bert M., Charles Trumbull Hayden, The Smoke Signal 19, Tucson Corral of the Westerners, Tucson, Arizona (1969:202): account of Hayden's attempt to float logs down the Salt River (see above) |
| 110 | Reed, Bill, The Last Bugle Call: A History of Fort McDowell, Arizona Territory, McClain Printing Company, Parsons, West Virginia (1977:140): account of the death of commandant at Fort McDowell in 1881 (see above) |
| 128 | The Smoke Signal, 1988: The Great Ferry War of 1905 and Other Adventures on the Gila River, Arizona |

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|---|---|
| 129 | Across America: The Great West and Pacific Coast by James F. Rusling, New York: Sheldon & Company 1874 |
| 162 | Session Laws of the Twenty-Fifth Legislative Assembly of the Territory of Arizona. (Phoenix: Phoenix Printing Co. 1909), pp. 184-185 and pp. 208-211 |
| 179 | Excerpt from Richard D. Lingenfelter, Steamboats on the Colorado. University of Arizona Press. |
| 185 | Earl Zarbin, "Dr. A.J. Chandler, Practitioner in Land Fraud," 36: Journal of Arizona History: 173-188. |
| 186 | Excerpt from Karen L. Smith, The Magnificent Experiment. University of Arizona Press, 1986. |

DRAWINGS

| ORIGINAL EXHIBIT # | DESCRIPTION |
|---|---|
| 189 | Excerpted map from David F. Myrick, Railroads of Arizona, Volume 2. |
| 190 | Excerpted map from David F. Myrick, Railroads of Arizona, Volume 2. |
| 195 | Plate 59 from the 1890 Statistical Abstract of the United States (published 1898) showing navigable rivers in the United States. |
| 202 | 1904, Salt River Project, Salt River Valley Arizona, Topographic and Irrigation Maps, 1902-1903. |
| 203 | Hydrograph of Combined Flow of Salt and Verde Rivers, 1899-1912. Salt River Valley Water Users Association. |

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| 204 | Hydrograph of Combined Flow of Salt and Verde Rivers, 1899-1912 and Average Flow 1899-1912. |

ARCHIVAL DOCUMENTS

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|---|---|
| 4 | Inspection Report of Camp McDowell |
| 32 | Correspondence from the Department of the Interior, General Land Office, Washington, D.C., dated October 5, 1894 and handwritten notes |
| 33 | Correspondence from the Department of the Interior, United States Geological Survey to the Director, United States Reclamation Service, Dated May 14, 1912 |
| 35 | Correspondence from Department of the Interior, United States Geological Survey, Chief Division of Hydro Economics to F.H. Newell, Chief Engineer, U.S. Geological Survey dated April 28, 1904 |
| 36 | Inspection Report - Salt River Project dated May 19, 1906 to Mr. F. H. Newell, Chief Engineer, U.S.R.S. |
| 38 | Correspondence from Maricopa County Commercial Club to Mr. J.L.B. Alexander, U.S. Attorney, Phoenix, dated March 21, 1908 |
| 39 | Drafting Div. Files, Correspondence from the Director to the Secretary of the Interior, Washington D.C., report regarding entire canyon of the Salt River, Arizona will need irrigation works |
| 40 | Department of the Interior, Office of the Secretary of Reclamation Service, Salt River |

Project, Water Rights, August 2, 1912 to October 23, 1912 (26 pages)

41 Correspondence from Department of the Interior, United States Indian Service, Klamath Agency, Oregon to Secretary of the Interior, Washington, D.C., dated August 25, 1904

42 Nation Archives Pacific Southwest Region - Letters sent by Agent, Box No. A013061-114680

43 Handwritten correspondence to Commissioner of Indian Affairs, Washington, D.C., from Claude M. Johnson, dated Pima, Sacaton, July 13th

44 Handwritten correspondence to Commissioner of Indian Affairs, Washington, D.C., from C.W. Crouse, dated Pima, Sacaton, April 15, '90

45 National Archives Pacific Southwest Region, Letters sent by Agent, Box No. 013126-114703

46 Handwritten correspondence to Commissioner of Indian Affairs, Washington, D.C., from C.W. Crouse, dated Pima, Sacaton, June 20, '90

47 Correspondence to Commissioner of Indian Affairs, Washington, D.C. from C.W. Crouse, dated Sacaton, Arizona, March 4, 1891

48 National Archives Pacific Southwest Region, Letters sent by Agent March 16, 1892 to January 3, 1893, Box No. 013126-114703

49 Correspondence to Charles T. Hayden, Tempe, Arizona from C.W. Crouse dated Sacaton, Arizona, June 13, 1892

50 Correspondence to Commissioner of Indian Affairs, Washington, D.C., from C.W. Crouse dated Sacaton, Arizona, July 8, 1892

51 Correspondence to Commissioner of Indian Affairs, Washington, D.C., from United States

Indian Service, dated Sacaton, Arizona, August 1, 1892

52 National Archives Pacific Southwest Region, Letters sent to the Office of the Commissioner of Indian Affairs 1896-1905, Box 2

53 Correspondence to Commissioner of Indian Affairs, Washington, D.C. from U.S. Indian Agent dated Pima Agency, Sacaton, Arizona, March 8, 1901

54 National Archives Pacific Southwest Region, Letters sent by Agents January 1, 1904 to May 31, 1906

55 Correspondence to Commissioner of Indian Affairs, Washington, D.C., from Superintendent, Pima Training School, dated Sacaton, Arizona, September 330, 1904

56 Correspondence to Commissioner of Indian Affairs, Washington, D.C., from Pima Training School, dated Sacaton, Arizona, February 25, 1905

57 Correspondence to Commissioner of Indian Affairs, Washington, D.C. from Superintendent, Pima Training School, dated Sacaton, Arizona, March 13, 1905

58 Correspondence to Commissioner of Indian Affairs from Superintendent Pima Training School, dated Sacaton, Arizona, April 10, 1905

59 National Archives Pacific Southwest Region, Letters sent by Agent 8/13/07-9/9/08, Box No. A013061-114680

60 Correspondence to Louis C. Hill, Supervising Engineer, U.S.R.S. from Superintendent, Pima Agency, dated Sacaton, Arizona, September 11, 1907

61 National Archives Pacific Southwest Region, Letters sent by Agent 6/1/06-9/15/08, Box No. A013061-114680

62 Correspondence to Commissioner of Indian Affairs, Washington, D.C. from Superintendent, Pima Training School, dated Sacaton, Arizona, January 14, 1908

63 Correspondence to Commissioner of Indian Affairs, Washington, D.C. from Superintendent, Pima Training School, dated Sacaton, Arizona, July 10, 1908

64 National Archives Pacific Southwest Region, Pima Indian Agency, Misc. Corresp., Box 9

65 Handwritten correspondence to Mr. P.B. Hughes from Superintendent Pima Training School, dated Sacaton, Arizona, December 14, 1908

66 Handwritten correspondence to Superintendent Indian Schools, Sacaton, Arizona from Salt River Agency dated December 21, 1908

67 Handwritten correspondence to Barney from Jim Alexander dated December 21, 1908

68 Hand Handwritten correspondence to Barney from Jim Alexander dated December 22, 1908

69 Report - the project for building a substantial bridge across Salt River at the foot of Central Avenue (6 pages)

70 Handwritten correspondence on Fort Hotel letterhead to J.B. Alexander from S.C. Mason, dated 1/23/09

71 Handwritten correspondence to Barney from Jim Alexander, Salt River Pima Agency, dated 1909

72 National Archives Pacific Southwest Region, Pima Indian Agency, Education, Box 8

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| 73 | Correspondence to Commissioner of Indian Affairs, Washington, D.C., from Superintendent, Pima Training School, dated Sacaton, Arizona, June 30, 1909 |
| 74 | National Archives Pacific Southwest Region, Pima Indian Agency 1909-1910, Accounts, Authorities for Purchase & Indian School Support, Box 10 |
| 75 | Voucher or Claim, Trav. Expenses to H.M. Alexander - $13.00 dated November 30, 1909 |
| 76 | Voucher or Claim, Trav. Expenses to W.E. Hester, $20.10 dated December 31, 1909 |
| 77 | National Archives Pacific Southwest Region, Pima Indian Agency, Letters to and from the Superintendent, Box 10 |
| 78 | Correspondence to James B. Alexander, Superintendent Pima Indian School from Acting Commissioner of Indian Affairs dated August 4, 1910 |
| 79 | Correspondence to Louella Mahancy from Acting Commissioner of Indian Affairs dated August 4, 1910 |
| 80 | Notice to Civil Service Commission from C.F. Hauke, Second Assistant Commissioner, Office of Indian Affairs, dated July 2, 1910 |
| 81 | Report of Medical Conditions, Salt River, Arizona dated 1910 |
| 82 | National Archives Pacific Southwest Region, Phoenix Indian School, correspondence to the Commissioner 1915-01920, Box 6 |
| 83 | Correspondence to Commissioner of Indian Affairs, Washington D.C., from Superintendent dated February 10, 1916 |

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| 84 | Basis of Settlement of litigation between Buckeye Irrigation Company and Salt River Valley Water Users' Association (9pp.) |
| 163 | Minutes of the Maricopa County Board of Supervisors, Book 9, pp. 18-21 (April 20, 1909) and Book 9, pp. 65-68 (June 21, 1909) |
| 167 | Index to Sanborn Fire Insurance Co. maps for Phoenix and Tempe (dated 1911) |
| 187 | January 10, 1879, and June 14, 1879, Executive Orders establishing the Salt River Pima-Maricopa Indian Reservation. |
| 188 | Agreement Between the United States and the Salt River Valley Water Users Association, 1935. |
| 194 | Excerpt from the Rivers and Harbors Act of 1899 (30 Stat. 1121). |

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