



WATER-RIGHT DOCKET

Tumacacori National Historical Park

Docket No: 4

FEDERAL RESERVED RIGHTS

Land History

06-29-1999: Letter to Superintendent, TUMA from Philip Halpenny regarding Water history at Guevavi and Calabasas

Philip Halpenny
3938 East Santa Barbara
Tucson, AZ 85711-4744
(620) 327-7412 Fax: (620) 327-7413 E-mail: wadevco@azstarlink.com



Ms. Ann Rasor
Superintendent
Tumacacori National Historic Park
Post Office Box 67
Tumacacori, AZ 85640

RE: Water history at Guevavi and Calabasas

Dear Ann:

I apologize for sending this so long after we talked, but we have also been extremely concerned about the rush to define all of the water rights in the basin, and have been scrambling to figure out what is going on.

For Guevavi, the photos show the three canals just downstream from the road which goes up the ridge from the river. The USGS 1905 map shows the acequia going up to the ranch. The Deni Seymour map shows the field, some of which may be included within the boundaries. I've marked that field on the airphoto.

For Calabasas, subflow was brought to the surface at Eagan Narrows, which is where the Bridge is which connects to South River Road. Egan (the actual spelling) was an Anglo farmer of the 1880s who farmed in the Calabasas area but had to convey water from upstream in order to do so. I photocopied part of the Rio Rico map which is in the Tubac Historical Society library which shows a "Santa Cruz Diversion Ditch" heading right at the old *visita* site. (Fort Mason and Camp Moore are also marked on this map). Any water supply from the Santa Cruz River for irrigation at or downstream from Calabasas would have been taken off at or above the Calabasas site.

Incidentally, the Roskrige map of the Tumacacori and Calabasas Land Grant shows a cemetery at the toe of Camp Moore. Has anyone checked for it? Next time I am down I'll try to get a look. Also on this map some ruins of Guevavi are shown on the west side of the river.

Also enclosed is a recent speech by the Secretary of the Interior, which I think is important for the upper Santa Cruz. As I imagine you know we worked with him on simplifying the water rights at Guevavi, and in fact it was he who asked that we prove the historical validity of the rights for submission in the General Adjudication. Perhaps you could call him as a witness for Guevavi!

I don't think this is very helpful for you, but it is a start. I think you could make a case for the "cultural landscape" aspect as being dependent on a water supply. Both the garden/field at Guevavi and the orchard at Tumacacori could one day be planted in the original crops if water were available. Let me know if I can help further.

Also enclosed are some materials on the "spring" in the Santa Cruz River bed just east of Tumacacori Mission which Don showed me some time ago. The spring was a water source for the famous Lowe family ranch.

Best wishes,

Phil

Gila 3

Calabasas Hist. Site

EAGAN RESERVOIR (FLOOD CONTROL)

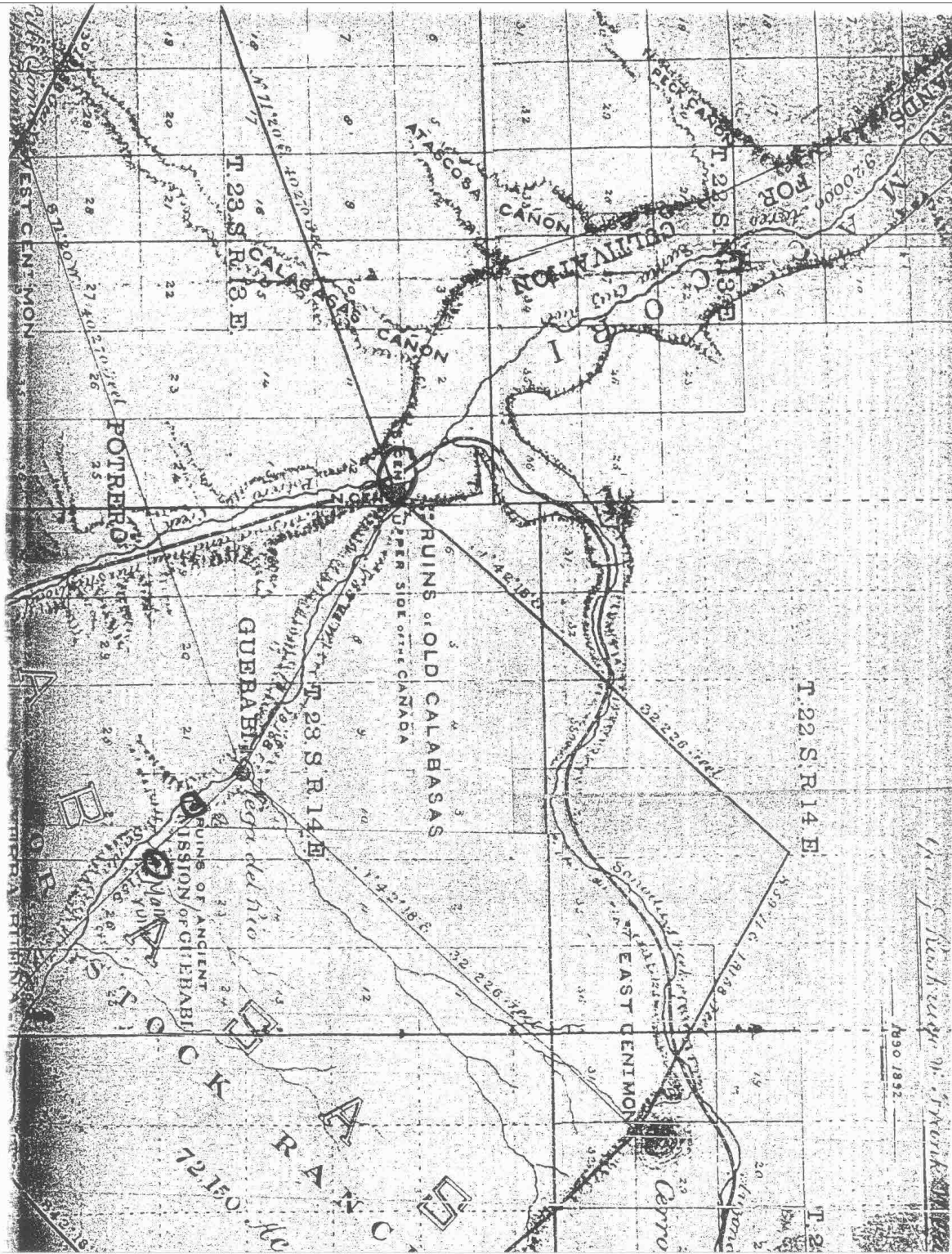
Location and Description of Site

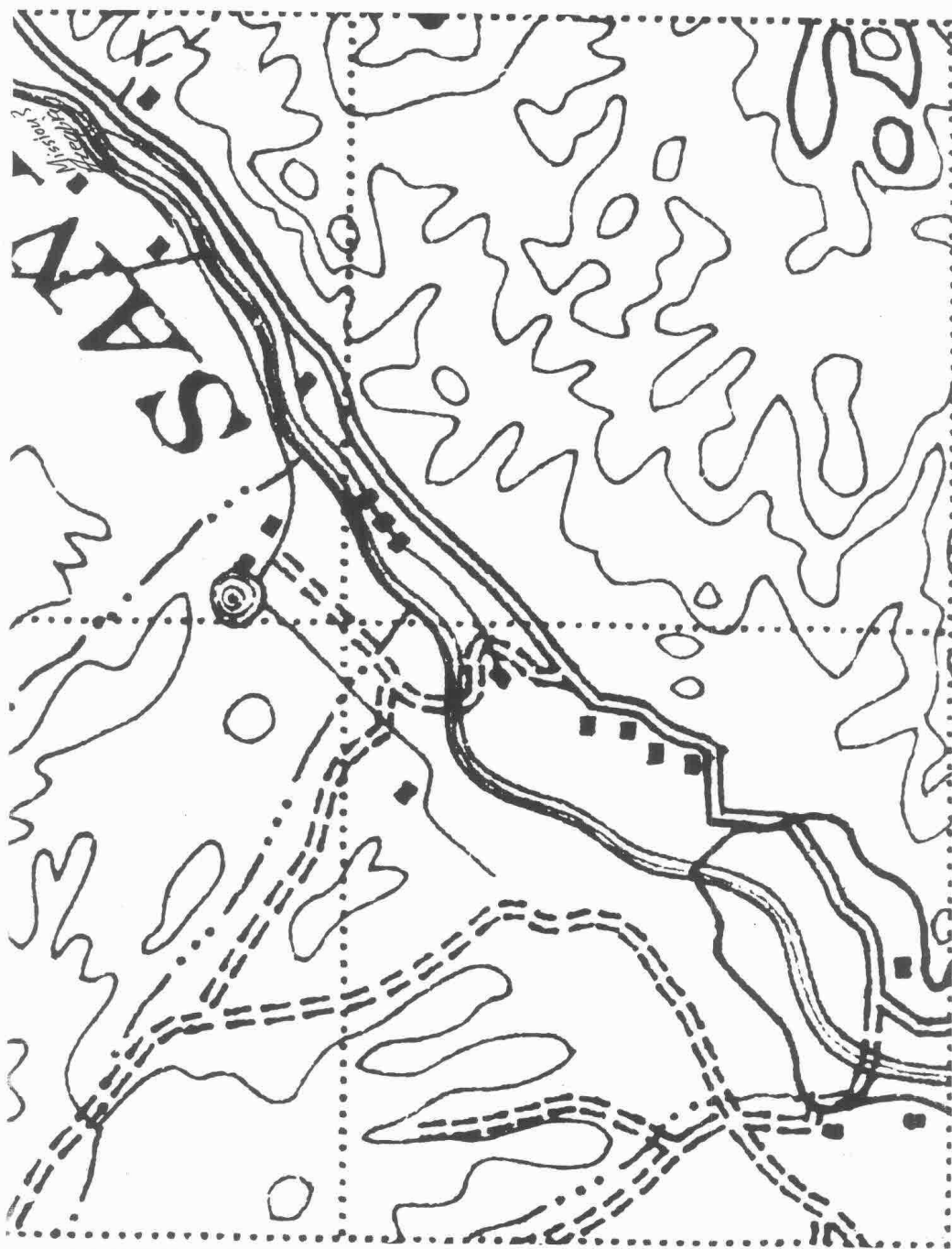
180. Eagan Intake Dam site is on Santa Cruz River, river mile 184, in Santa Cruz County, Ariz. The site is about 2 miles upstream from the mouth of Sonoita Creek and a short distance upstream from Eagan Intake. From Nogales, the site may be reached by automobile via Highway U S 29 to a point $8\frac{1}{2}$ miles north of Nogales, thence northeasterly for $1\frac{1}{2}$ miles along a gravel side road to a point about one-half mile from the dam site. The dam site is in a broad valley between the Tumacacori Mountains on the west and the Patagonia Mountains on the east. Cuates Buttes are $2\frac{1}{2}$ miles north-east of the site and Mount Benedict is approximately $2\frac{1}{2}$ miles southeast. The valley is about 1,050 feet wide 20 feet above stream bed and about 2,070 feet wide at the height of the top of the dam considered, 130 feet above stream bed.

181. Alternative sites. - Alternative sites are Harrison Ranch, (Yerba Buena) and Guebabi, 6 and 2 miles, respectively, above the Eagan site. The Harrison Ranch site would be difficult to develop because the reservoir basin probably would extend into Mexico, involving international problems. Owners of the land in the reservoir site object to the project. The Guebabi site would not provide sufficient storage capacity for effective flood control. Dams at sites below the Eagan Intake site on the main stream or on the lower tributaries of Santa Cruz River would provide inadequate flood control or would be too expensive, because of unfavorable topographic and geological conditions or because of the cost of relocating a railroad.

Geology

182. Exploratory work. - Geologic investigation of the dam site was limited to brief examination in the field of surface exposures of bedrock.





1905 U.S.G.S. map (30' Noankers quad)

ENLARGEMENT OF USGS 20' OF UTMATIC QUADRANGLE MAP
GUEVAVI RANCH AREA
SHOWING DIVERSION DITCH, LAKE, AND DELIVERY DITCH TO FIELD



Any or all of these Upper Pinar settlements (and other, yet undiscovered sites) could be Guevavi during various portions of its history. However, the site closest to the mission (AZ EE-9:132 [ASM]) may represent the settlement occupied when the mission was established or during one period of its use. Further research, including systematic collections and excavations at these sites, would go far in verifying their temporal affiliations and addressing the range of questions related to occupation during this period.

THE CANAL SYSTEM

The early documentary record is unclear about the nature of agricultural practices among the early Upper Pima. It is clear, however, that Kino and Manje encouraged many aboriginal groups throughout the Pimeria Alta to forego their nomadic lifestyles and adopt agriculture and irrigate their fields. The Spanish introduced new crops and technologies, as well as livestock. Accounts written by Kino and Manje of Upper Piman settlements from the first half of the 1690s (1695) refer to "crops planted in the floodplain" and "fertile fields and pasture lands," yet it is not until 1697 that irrigation canals are specifically mentioned in the records. Thus, it is unknown whether the Upper Pima on the Santa Cruz and San Pedro practiced floodplain agriculture without irrigation canals, nor is it known when agriculture became the mainstay of Piman subsistence. Winter (1973) found little evidence to suggest that the Gila Pima practiced extensive irrigation agriculture between 1697 and 1701 and argues that agriculture was but one of their many sources of sustenance until later in the eighteenth century.

During the late seventeenth century, references to the cultivation of indigenous crops, including cotton and corn, on the San Pedro and Santa Cruz suggest that the Upper Pina were practicing agriculture. The location of settlements near cultivable floodplains also supports this suggestion. Their consistent placement along wider portions of the floodplain (which would be unsuitable for planting) and near the confluences of tributary streams (where soils would be replenished) provides further evidence for agriculture. Yet the practice of regularly moving settlements is not consistent with investment in major irrigation systems. Settlement shifts would be appropriate, however, if floodplain farming was practiced. Thus, it is possible that settlements may have become more stable once irrigation was adopted, a possibility that seems to be supported by historic maps and references to league distances in documents (see Seymour 1993b).

This question is relevant to Guevavi because a canal system, including a headgate, two main channels of different ages, and possible lateral channels around field areas, skirts the terrace edge along the east or north side of the Santa Cruz adjacent to the early Upper Piman settlement (AZ EE:9:132).

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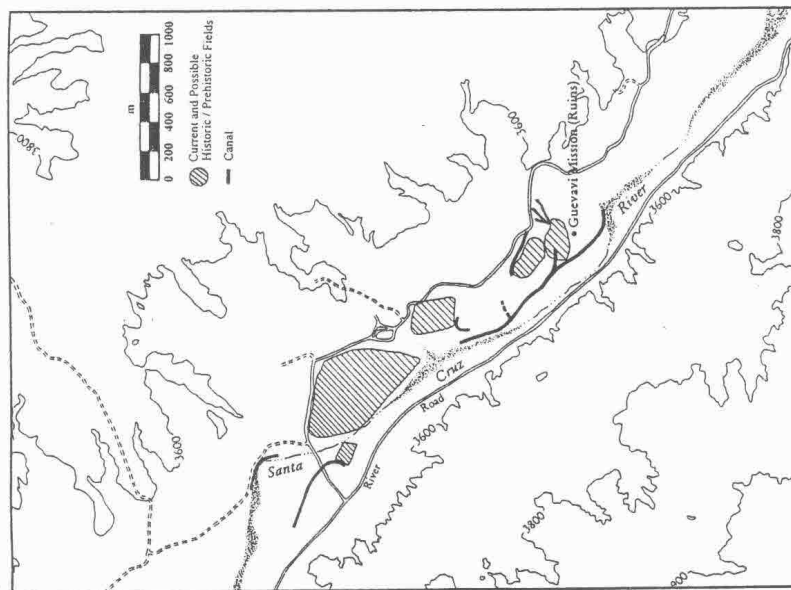
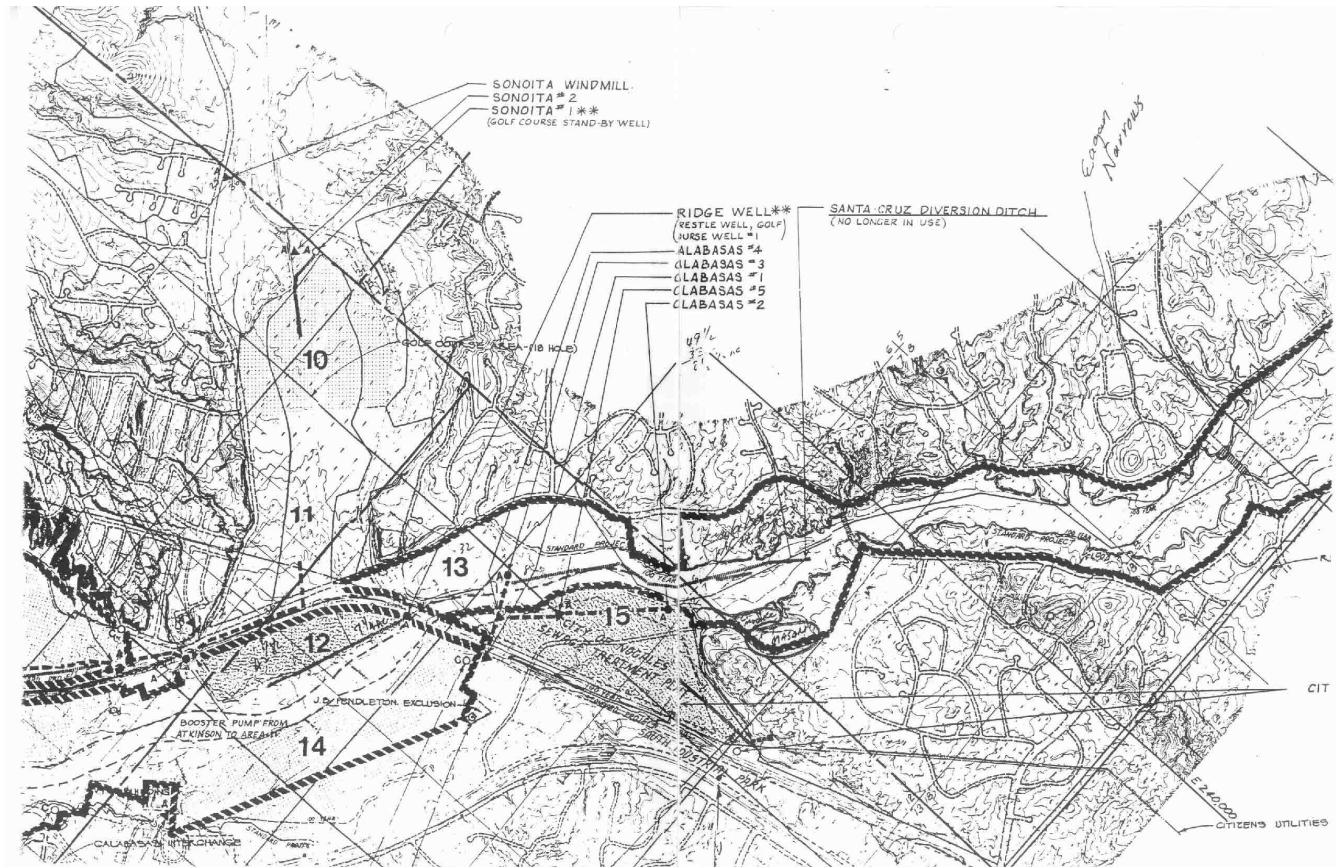


Figure 4. Canals near Guevavi Mission.

Shows field that may be in property + accequia

reductive



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Tumacacori National Historical Park
P. O. Box 67
Tumacacori, AZ 85640
520-398-2341 x 22
Fax 520-398-9271

Fax Cover Sheet

DATE: June 16, 1999
TO: Bill Hansen, WRD
FROM: Ann Rasor, Superintendent, TUMA
RE: Info on Guevavi and Calabazas

Number of pages including cover sheet: 11

Included are legal descriptions and GMP maps of both sites, legislation from 1990 and an overview from the 1996 GMP. Please let me know if you need more

Thanks for your help

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PUBL. LAW 101-344 (H.R. 2843); August 6, 1990

TUMACACORI NATIONAL HISTORICAL PARK, ARIZONA

An Act to establish the Tumacacori National Historical Park in the State of Arizona.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

Public lands.

SECTION 1. TUMACACORI NATIONAL HISTORICAL PARK.

16 USC 410ss.

(a) **ESTABLISHMENT.**—In order to protect and interpret, for the education and benefit of the public, sites in the State of Arizona associated with the early Spanish missionaries and explorers of the 17th and 18th centuries, there is hereby established the Tumacacori National Historical Park (hereinafter in this Act referred to as the "park").

(b) **AREA INCLUDED.**—The park shall consist of the existing Tumacacori National Monument, together with (1) the ruins of Los Santos Angeles de Guevavi, the first mission in Arizona (consisting of approximately 8 acres) and (2) the Kino visita and rancharia ruins of Calabazas (consisting of approximately 22 acres), each as generally depicted on the map entitled "Boundary Map, Tumacacori National Historical Park", numbered 811/80018, and dated February 1990. The map shall be on file and available for public inspection in the offices of the National Park Service, Department of the Interior.

(c) **ABOLITION OF MONUMENT.**—The Tumacacori National Monument is hereby abolished and any funds available for purposes of the monument shall be available for purposes of the park.

16 USC 481 note.

SEC. 2. ADMINISTRATION.

16 USC 410ss-1.

(a) **IN GENERAL.**—The Secretary of the Interior (hereinafter referred to as the "Secretary") shall administer the park in accordance with this Act and with the provisions of law generally applicable to units of the national park system, including the Act entitled "An Act to establish a National Park Service, and for other purposes", approved August 25, 1916 (39 Stat. 535; 16 U.S.C. 1-4) and the Act of August 21, 1935 (49 Stat. 666; 16 U.S.C. 461-467). The Secretary may acquire lands or interests in land within the boundaries of the park by donation, purchase with donated or appropriated funds, or exchange.

(b) **DONATIONS.**—Notwithstanding any other provision of law, the Secretary may accept and retain donations of funds, property, or services from individuals, foundations, corporations, or public entities for the purpose of providing services and facilities which he deems consistent with the purposes of this Act.

(c) **SEPARATE UNITS.**—The Secretary shall provide for the identification of the Guevavi, Calabazas, and Tumacacori sites as 3 separate units of the park.

(d) **RECOGNITION OF FATHER EUSEBIO FRANCISCO KINO'S ROLE.**—In administering the park, the Secretary shall utilize such interpretative materials and other devices as may be necessary to give appropriate recognition to the role of the Jesuit Missionary Priest, Father Eusebio Francisco Kino, in the development of the mission sites and the settlement of the region.

Approved August 6, 1990.

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DESCRIPTION OF THE PARK

Tumacacori

The Tumacacori Mission is situated in the Santa Cruz River Valley, east of Interstate 19, and adjacent to State Highway 89. It is referred to in this document as "Tumacacori," to distinguish it from the entire Tumacacori National Historical Park, which includes Tumacacori, Calabazas and Guevavi.

Tumacacori was part of a chain of missions, "*visitas*" (*frequently visited places*), and "*presidios*" (*Spanish forts*) in *Pimería Alta* (*the land of the Upper Pima Indians*) established by the Spanish from north-central Sonora, Mexico to San Xavier del Bac near Tucson. In 1701, the native settlement at San Cayetano (de Tumacacori) became a *visita* of Mission Guevavi. Seventy years later, under continued Apache pressure on the missions in *Pimería Alta*, Tumacacori was designated the "*cabecera*" (*head mission*), and Guevavi became a *visita* of Tumacacori. The proximity of Tumacacori to the *presidio* at Tubac made Tumacacori easier to protect than Guevavi.

The primary resources at Tumacacori are the historic structures and excavated ruins of the original Spanish mission. The Spanish influence began with the Jesuits, who built a small chapel on the site, followed by the Franciscans, who supervised the construction of the mission church, *convento*, granary, and the walls which enclosed the historic cemetery and gardens. These historic structures have been rebuilt, restored, and stabilized, and are the focal point of visitor interest.

Equally important, though less visible, are the cultural resources associated with the prehistoric Pima and Tohono O'odham, who farmed irrigated plots of land along the Santa Cruz River for centuries before the arrival of the Spanish. There is still much to learn about the prehistory period.

The Tumacacori museum has been designated as a National Historic Landmark as an outstanding example of mission revival architecture. The associated restroom, garden, and perimeter walls are included in the landmark boundary. One residence is also considered historic based on its locally significant architecture. Tumacacori also has several modern structures, including two residences, the utility garage, and the pump house.

Visitors enter Tumacacori at the Visitor Center, and are invited to tour the museum, and take a self-guided tour of the mission grounds, including a replica mission-era patio garden. Guided interpretive tours are offered on a limited basis.

Calabazas

Calabazas is about three miles south of Tumacacori and is easily accessible from a 2-lane county road. It was founded as a *visita* of Mission Guevavi in the 1750s. It contains the ruins

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of a Franciscan church, and other subsurface ruins. The history of Calabazas extends well beyond the mission period, as the site was used for a sheep ranch in the 1850s, occupied by the United States military in 1856 and again in 1864, and inhabited by squatters until 1917. Calabazas is a National Historic Landmark and property on the National Register of Historic Places.

The ruins are fenced and a metal roof protects a portion of the walls from the elements. There are no visitor facilities at the site.

Guevavi

Mission Guevavi was the first Jesuit church in what is now Arizona. It is approximately seven miles south of Calabazas, or five miles northeast of Nogales and the United States-Mexico border. The site was first visited in January, 1691 by Father Eusebio Francisco Kino. After this initial visit, Kino returned once or twice a year. In 1701, Guevavi was designated the *cabecera*, with *visitas* at Tumacacori, San Luis, and Los Reyes. The Jesuits occupied Guevavi from 1732-1767, followed by the Franciscans from 1768 to 1775. By 1771, Tumacacori was designated the *cabecera*, as it was closer to the *presidio* at Tubac, and by 1775, Guevavi was completely abandoned. Archeological evidence suggests that miners may have occupied some of the mission buildings throughout the 19th century.

Guevavi contains the ruins of a Jesuit church and an extensive array of subsurface resources. Guevavi is a National Historic Landmark and property on the National Register of Historic Places.

There are no facilities at Guevavi. NPS administrative access is via unsurfaced private roads through Guevavi Ranch. The public does not have access to Guevavi.

PLANNING ISSUES

There are six general planning issues concerning Tumacacori National Historical Park. They were identified at scoping sessions held for park staff and for outside representatives, and from responses to a *Federal Register* notice.

1. **Park Boundary.** Boundary changes need to be considered for all three units of the park in order to adequately protect resources and provide visitor facilities. Extensive cultural resources from the prehistoric and historic periods are known to exist on City of Nogales land outside the Guevavi boundary. With only 7.76 acres, Guevavi may be too small to accommodate visitor or administrative facilities. At Tumacacori, the 1975 Master Plan recommended acquiring not only the land to the north of Tumacacori that was part of the 1978 boundary expansion, but also 2.8 acres to the east. This eastern portion, containing remains of the mission garden and orchard, has not yet been acquired, and requires reconsideration.

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2. Mission Trail. Early Spanish explorers and missionaries established a trail (the "mission trail") which linked the three units of the park with areas to the north and south. This route was traveled by a number of Jesuit missionaries in the 17th century, and in particular Father Eusebio Francisco Kino who established many missions in the Pimeria Alta. The route later traveled by Juan Bautista de Anza in the 18th century followed the mission trail between Calabazas and Tumacacori. The authorized de Anza National Historic Trail will eventually be established and will link Tumacacori and Calabazas. An additional connecting segment would be needed to extend the mission trail along the Santa Cruz River to Guevavi.

Several other government agencies, including the United States Fish and Wildlife Service, the State of Arizona, and Santa Cruz County, have an ongoing interest in trails and recreation along the Santa Cruz River. The planning effort for Tumacacori National Historical Park needs to coordinate proposals for trails with these other agencies and plans.

3. Development

Visitor Facilities. There is a need to consider the types of visitor access and interpretive facilities for both Guevavi and Calabazas. Calabazas is currently easily accessible by automobile. Consideration will need to be given to the development of parking, interpretive trails, and other amenities. Guevavi is small, and currently has only limited administrative access by private roads. Development of access may represent a major difficulty at this area.

Administrative and Maintenance Facilities. There is inadequate office space to accommodate the existing staff. The current maintenance facility is too small to support park operations, and the structure is attached to one of the residences. The 1975 Master Plan proposed construction of new facilities in the northwest corner of the mission, in the area now used for the annual fiesta. This, and other locations for supplementary administrative space, need to be reviewed. Administrative and maintenance space at the two new units also needs to be considered.

Housing. The 1975 Master Plan proposed the removal of the existing houses as vacancies occurred. The houses remain, and their condition continues to decline. The houses occupy a portion of the Indian village area, and their location is consequently inappropriate. The need for park housing, and the appropriate location of this housing, needs consideration in the planning process.

4. Park Operations. With the addition of Calabazas and Guevavi, the staff at Tumacacori National Historical Park is too small to administer, interpret, protect, and maintain the additional resources. Consideration needs to be given to increasing staff

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size to adequately manage the new and existing resources. Methods of incorporating Calabazas and Guevavi into the park's fee collection system need to be explored. An updated *Interpretive Prospectus* is needed.

5. Impacts of Surrounding Land Uses on Park Resources. All three sites have small land areas, are in large part surrounded by private property, and can easily be adversely impacted by adjacent land uses. Traffic noise from Interstate 19, for example, adversely affects the visitor experience at Tumacacori. Both the resources themselves and the visitor experience can potentially be affected by adjacent uses. There is a need for a protection strategy for the future to minimize adverse impacts.

6. Adobe Ruins Preservation. Preservation of the extant adobe ruins is a key concern at all three of the park's units. The GMP needs to ensure that processes are established to accord appropriate priority to ruins preservation and to employ extensive and highly professional analysis in the selection of preservation methods.

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CALABAZAS

EXHIBIT A

ORDER NUMBER: 12,725

That portion of Lot A in Block 211 of Rio Rico Estates Unit No. 10, a subdivision of Santa Cruz County, Arizona, according to the map or plat of record in the office of the County Recorder of Santa Cruz County, Arizona, in Book 3 of Maps and Plats at page 8 more particularly described as follows:

BEGINNING at the Intersection of Pendleton Drive and Avenida Aguas-Calientes as platted in said Rio Rico Estates Unit No. 10;

thence North 38 degrees 37 minutes 37 seconds West, 132.00 feet along the centerline of said Pendleton Drive to a point;

thence South 51 degrees 22 minutes 23 seconds West, 60.00 feet to a point, said point being on the Westerly Right-of-Way of said Pendleton Drive, said point also being the TRUE POINT OF BEGINNING;

thence South 38 degrees 37 minutes 37 seconds East, 214.48 feet along the Westerly Right-of-Way of said Pendleton Drive to a point;

thence South 42 degrees 22 minutes 23 seconds West, 1,115.83 feet to a point;

thence North 20 degrees 38 minutes 01 seconds West, 1,368.73 feet to a point, said point being on the Westerly Lot Line of said Lot A;

thence North 68 degrees 04 minutes 21 seconds East, 588.47 feet to a point, said point being the Westerly Right-of-Way of said Pendleton Drive, said point also being on the circular curve, the radius point of which bears North 51 degrees 27 minutes 37 seconds East, 851.65 feet;

thence Southeasterly 264.50 feet along a circular curve concave to the Northeast and running along the Westerly Right-of-Way of said Pendleton Drive, said curve having a radius of 851.65 feet and a central angle of 17 degrees 47 minutes 40 seconds, to a point of reverse curve, the radius of which bears South 33 degrees 39 minutes 57 seconds West, 1,589.08 feet;

thence continuing Southeasterly 491.10 feet along a circular curve concave to the Southwest and running along the Westerly Right-of-Way of said Pendleton Drive, said curve having a radius of 1,589.08 feet and a central angle of 17 degrees 42 minutes 26 seconds to a point, said point being the TRUE POINT OF BEGINNING.

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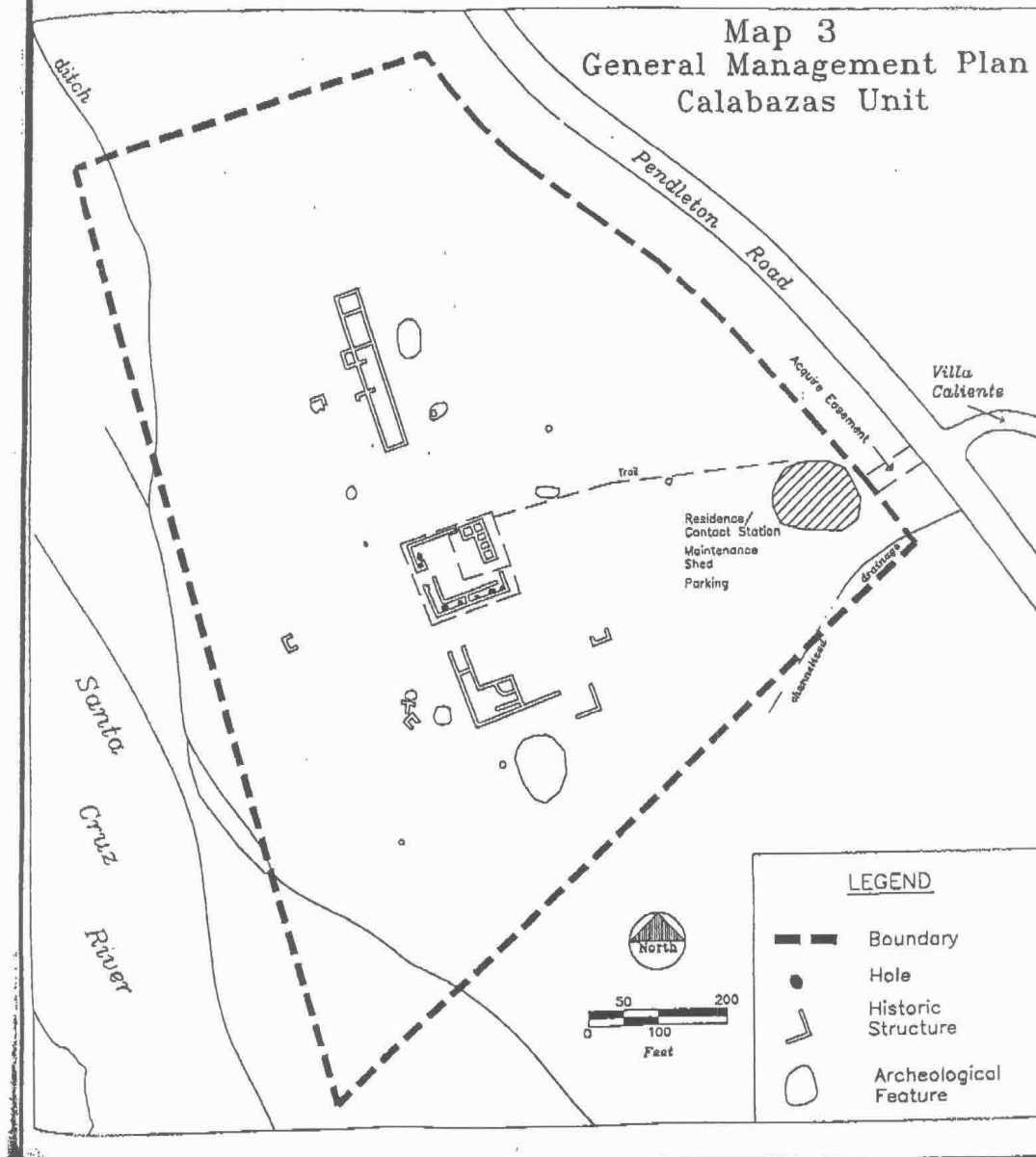


LAWYERS TITLE OF ARIZONA, INC.

THIS MAP IS TO BE USED ONLY
FOR THE PURPOSES
AND SHALL NOT BE CONSTRUED,
OR BE USED AS A GUARANTEE
OF THE ACCURACY OR
CORRECTNESS OF THE
INFORMATION SHOWN HEREON

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JUN-16-99 WED 10:05 AM

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Exhibit "A"

FONTES Land Surveying Co.
J. Leonard Fontes Jr., R.L.S.

91008-131
July 9, 1991

REVISED LEGAL DESCRIPTION
GUEVAVI MISSION SITE

DOCK 562 PAGE 87

All that portion of the Southwest Quarter of Section 22, Township 23 South, Range 14 East, Gila and Salt River Meridian, Santa Cruz County, Arizona, more particularly described as follows:

COMMENCING at the South quarter corner of said Section 22;

THENCE North 00 degrees 15 minutes 34 seconds West, along the north-south midsection line thereof, 805.40 feet to the northeast corner of that parcel of land known as the Sedgewick Water Gap, recorded in Docket 27 at Page 310, Records of Santa Cruz County, Arizona, being the POINT OF BEGINNING;

THENCE leaving said midsection line North 82 degrees 03 minutes 51 seconds West, along the northerly line of said Sedgewick Water Gap, 280.20 feet to the northwest corner thereof;

THENCE leaving said northerly line North 03 degrees 34 minutes 56 seconds East, 131.42 feet;

THENCE North 47 degrees 51 minutes 20 seconds West, 154.01 feet;

THENCE North 41 degrees 02 minutes 32 seconds West, 159.75 feet;

THENCE North 76 degrees 46 minutes 35 seconds West, 189.85 feet;

THENCE North 27 degrees 39 minutes 00 seconds West, 104.01 feet;

THENCE North 13 degrees 28 minutes 09 seconds East, 167.42 feet;

THENCE North 51 degrees 32 minutes 20 seconds East, 226.68 feet;

THENCE South 66 degrees 54 minutes 14 seconds East, 264.33 feet;

THENCE South 43 degrees 15 minutes 53 seconds East, 379.05 feet to the north-south midsection line of said Section 22;

THENCE South 00 degrees 15 minutes 34 seconds East along said north-south midsection line, 453.32 feet to the POINT OF BEGINNING.

Containing 7.77 acres of land more or less.

4058 E. Harley St. Tucson, Arizona 85712 (602)328-9405

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DOCK 562 PAGE 88

Together with an access easement for ingress and egress within a portion of the Southeast Quarter of Section 22, Township 23 South, Range 14 East, Gila and Salt River Meridian, Santa Cruz County, Arizona, more particularly described as follows:

COMMENCING at the South quarter corner of said Section 22;

THENCE North 00 degrees 15 minutes 34 seconds West, along the north-south midsection line thereof, 805.40 feet to the northeast corner of that parcel of land known as the Sedgewick Water Gap, recorded in Docket 27 at Page 310, Records of Santa Cruz County, Arizona, being the POINT OF BEGINNING;

THENCE continuing North 00 degrees 15 minutes 34 seconds West, along said midsection line, 250.00 feet;

THENCE leaving said midsection line North 89 degrees 44 minutes 26 seconds East, 100.00 feet;

THENCE South 00 degrees 15 minutes 34 seconds East, 895.08 feet to the northerly right-of-way line of that County Road No. 17, known as South River Road as it presently exists;

THENCE North 45 degrees 33 minutes 34 seconds West, along said northerly right-of-way line, 140.69 feet to the north-south midsection line of said Section 22, being and the southeastern corner of said Sedgewick Water Gap parcel;

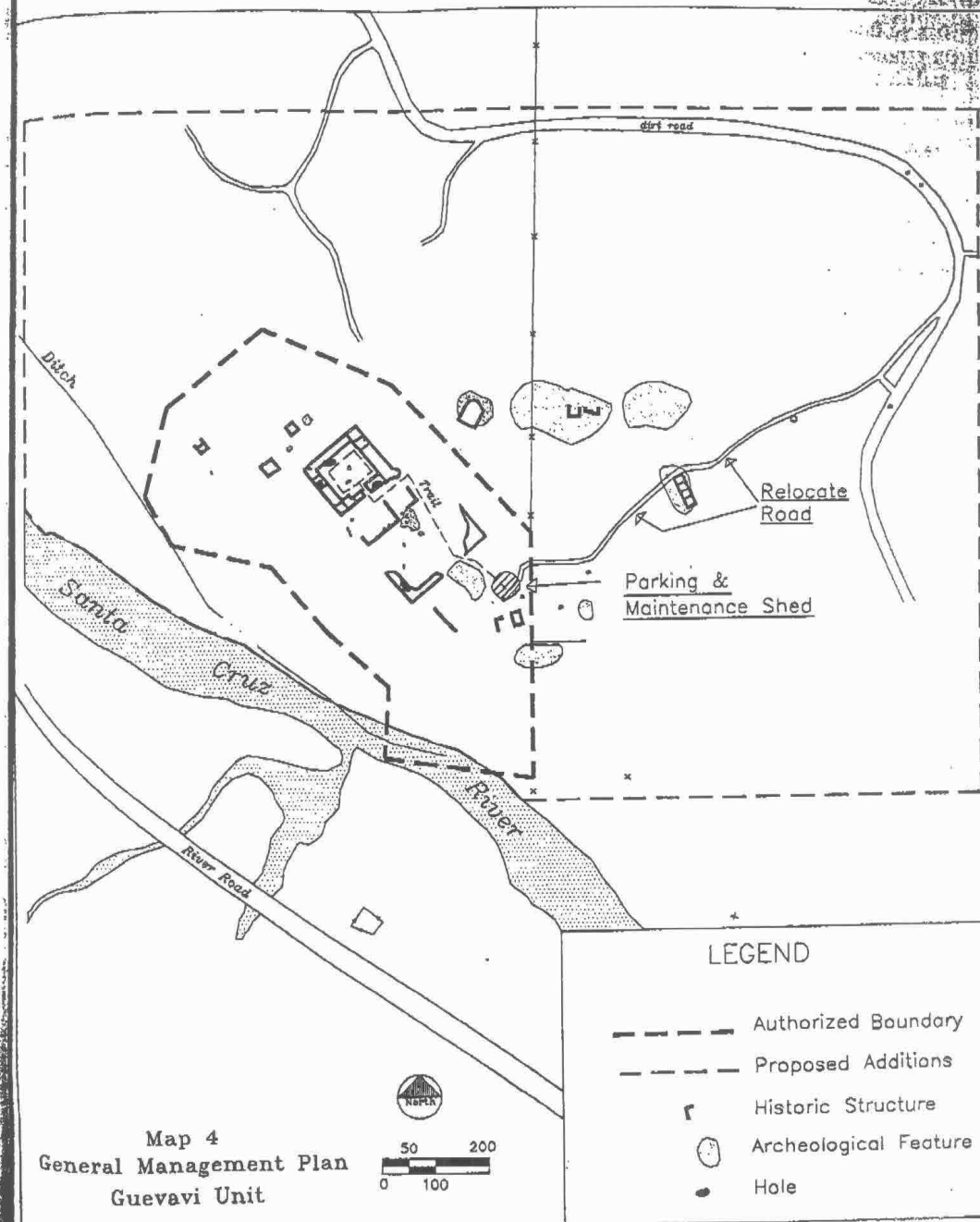
THENCE leaving said northerly right-of-way line North 00 degrees 15 minutes 34 seconds West, along said midsection line, 546.13 feet to the POINT OF BEGINNING.

J. LEONARD FONTES , JR., R.L.S.



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Supporting Hydro Data

DRAFT

Prepared by Jennifer Miller
NPS – WRB
4/11/03

Water Required to Reestablish Historical Orchard in Tumacácori National Historical Park, AZ.

INTRODUCTION

The objective of this report is to quantify the water needed for future consumptive use to reestablish a historical 5-acre orchard at Tumacácori National Park (TUMA) in southern Arizona. The orchard will be comprised of apricot, fig, peach, pear, pomegranate and quince trees.

The report describes the consumptive use of the species being considered to reestablish the orchard and quantifies the water demand of the orchard based on different irrigation methods. The orchard will operate with either a drip (low volume) or border (high volume) irrigation system. The goals are to plan for enough water to meet the orchard demands, and implement an irrigation system that is historically and culturally acceptable, while conserving as much water as possible. This report, in conjunction with estimated future consumptive water use for park facilities, staff and visitors, serves to quantify the future water needs of TUMA. The information will be used in settlement discussions and form the basis for a water rights claim in the Santa Cruz River adjudication.

Consumptive Use Estimates for Orchard Species

Consumptive use can be defined as the “quantity of water absorbed by the crop and transpired or used directly in the building of plant tissue together with that evaporated from the cropped area” (U.S. Bur. of Reclamation, 1962).

Consumptive use estimates were calculated for the six species of fruit trees being considered in the reestablishment of the historic orchard. These six species, which were known to historically exist in the TUMA area (Rasor, 2002), are listed in Table 1.0.

Table 1.0: Tree Species Comprising the Historic TUMA Orchard.

Species	Scientific Name
Apricot	<i>Prunus armeniaca</i>
Fig	<i>Ficus carica</i>
Peach	<i>Prunus persica</i>
Pear	<i>Pyrus communis</i>
Pomegranate	<i>Punica granatum</i>
Quince	<i>Cydonia oblonga</i>

DRAFT

Crop water needs were determined from each crop's estimated evapotranspiration rate. Evapotranspiration (ET) is the "water loss that will occur if at no time there is a deficiency of water in the soil for use of vegetation. (Thornthwaite, 1944). ET is also frequently referred to as consumptive use. The crop factor for adjusting crop evapotranspiration is based on the length of growing season, location, and climate factors. These data were used to compute crop water demand per day and per growing season.

METHODS

ET Estimate

Weather data from 1987 through 2002 for two Arizona Meteorological Network (AZMET) remote stations were used to estimate reference crop evapotranspiration (ET_o). Daily ET_o data were obtained from the AZMET web site for two stations, Marana and Tucson, located near TUMA. Table 2.0 lists characteristics of the two AZMET stations. The AZMET ET_o data are determined using the Penman Equation weather-based model. This equation takes into account a variety of climatic factors for determining ET_o, including solar radiation, temperature, humidity, and wind speed (Brown, no date).

Table 2.0: AZMET Stations used in Estimating ET_o Values.

Station Name	Marana	Tucson
County	Pima (northwestern)	Pima (northeastern)
Location	1.6 km (1 mile) west of I-10 on Trico-Marana Rd. Northwest of intersection of Trico-Marana Rd. & Sanders Rd.	1 km (0.6 miles) northwest of Intersection of Campbell Ave. & Roger Rd
Latitude	32° 27' 40" N	32° 16' 49" N
Longitude	111° 14' 00" W	110° 56' 45" W
Elevation	1972 ft	2339 ft
Soil Texture	silty clay loam	sandy loam
Period of Record	1987 – 2002	1987 - 2002

Source: <http://ag.arizona.edu/AZMET/azdata.htm>

Monthly ET_o values were totaled for both AZMET stations. Mean monthly and daily ET_o values were then calculated from the monthly total ET_o values for each station. Average ET_o per day was determined for each station based on the estimated growing season duration.

According to *Arizona Plant Climate Zones* published by the Cooperative Extension branch of the College of Agriculture and Life Sciences of the University of Arizona, TUMA is located in Zone 3, High Altitude Desert which has a growing season (GS) of 200 to 220 days (Davison, 2003). The maximum length of the growing season for the species listed in Table 1.0 was used in ET calculations in order to provide the most conservative water budget estimate for the TUMA orchard. Growing season length estimates found in FAO Chapter 6, "ET_c, Single Crop

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Coefficient” were also consulted to validate the estimate obtained from *Arizona Plant Climate Zones* (Allen et. al, 1998).

Mean daily ETo values were determined for both AZMET stations using 220 days as the length of the TUMA growing season. The mean daily ETo values for both stations were then averaged to produce a single mean ETo of 7.59 mm/day. The AZMET data used in determining the mean daily ETo value for the growing season in TUMA can be found in Appendix A.

Average ETo can be converted to actual ET for a specific crop using a multiplicative factor known as the crop coefficient (Kc):

$$ET = Kc * ETo$$

ET = water requirement of a given crop in mm/time, e.g. mm/month

Kc = crop factor

ETo = “the reference crop evapotranspiration” in mm/time or PET, e.g. mm/month (Critchley and Siegert, 1991)

Crop coefficients for the species to be planted in the TUMA orchard were estimated from single (time-averaged) values given in the FAO report, “Crop Evapotranspiration: Guidelines for Computing Crop Water Requirements” (Allen et. al, 1998). Table 3.0 lists the time-averaged crop coefficient values used in the calculation of actual crop evapotranspiration rates. Three values of Kc are listed in the table, including an initial, mid and end Kc estimate, which correspond to the each species stage of development. The maximum Kc values listed in Table 4.0 were employed in the calculation of crop actual evapotranspiration rates to assure the water rights claim meets the needs of TUMA.

Kc values for fig, pomegranate and quince trees were unavailable. Therefore the same Kc values for apricots, peaches and stone fruits were used for fig, pomegranate and quince. Stone fruits are also known as drupes with one or more seeds surrounded by fleshy, usually edible tissue and are common in the genus *Prunus* (Whiting, 2000).

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Table 3.0: Single (time-averaged) Crop Coefficients (Kc) for Non-stressed, Well-managed Fruit Tree Crops.

Crop	Description	Kc ini	Kc mid	Kc end
Pears	No ground cover, no frosts	0.60	0.95	0.75
	No ground killing frosts	0.45	0.95	0.70
	Active ground cover, killing frost	0.50	1.20	0.95
	Active ground cover, no frosts	0.80	1.20	0.85
Apricots, Peaches, Stone Fruit*	No ground cover, no frosts	0.45	0.90	0.65
	No ground killing frosts	0.55	0.90	0.65
	Active ground cover, killing frost	0.50	1.15	0.90
	Active ground cover, no frosts	0.80	1.15	0.85

It is important to note that the Kc values listed in Table 3.0 are given for semi-dwarf fruit trees. The maximum height of the semi-dwarf fruit trees will be between 10 and 13 ft (Allen et. al, 1998).

The trees planted in the orchard will most likely be semi-dwarf fruit trees as the orchard will be only about 5-acres in area. By planting semi-dwarf trees, the orchard will be easier to prune and train and trees will fruit earlier. Less fruit per tree will be produced, yet more varieties of fruit trees can be planted. Another advantage of using semi-dwarf trees is that the fruit can be reached without a ladder (Cooperative Extension of the College of Agriculture, University of Arizona, 1998). The calculations performed in this report, including the actual ET calculation, assume semi-dwarf trees will be planted.

RESULTS

I. Actual Crop Evapotranspiration Rates

1) Species: *Pyrus communis* (pear)

$$ET_{\text{pear}} = (Kc_{\text{pear}}) * (ET_o)$$

$$ET_{\text{pear}} = (1.20) * (7.59 \text{ mm/day}) = 9.108 \text{ mm/day}$$

$$\text{Ann } ET_{\text{pear}} = ET_{\text{pear}} * \text{GS}$$

$$\text{Ann } ET_{\text{pear}} = (9.108 \text{ mm/day}) * (220 \text{ days}) = 2004 \text{ mm} = 6.57 \text{ ft/GS}$$

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2) Species: *Prunus armeniaca* (apricot), *Prunus persica* (peach) and other stone fruits, including *Ficus carica* (fig), *Punica granatum* (pomegranate) and *Cydonia oblonga* (quince). The evapotranspiration estimates calculated here will also be used for *Ficus carica* (fig), *Punica granatum* (pomegranate) and *Cydonia oblonga* (quince).

$$ET_{\text{apricot/peach/stone fruits}} = (Kc_{\text{apricot/peaches/stone fruit}}) * (ET_o)$$

$$ET_{\text{apricot/peach/stone fruits}} = (1.15) * (7.59 \text{ mm/day}) = 8.729 \text{ mm/day}$$

$$\text{Ann } ET_{\text{apricot/peach/stone fruit}} = ET_{\text{day}} * \text{GS}$$

$$\text{Ann } ET_{\text{apricot/peach/stone fruit}} = (8.729 \text{ mm/day}) * (220 \text{ days}) = 1920 \text{ mm} = 6.30 \text{ ft/GS}$$

In order to be conservative, Ann ET of 6.57 ft/GS for pear will be used to determine orchard water demand.

Fruit Tree Spacing

It is recommended that semi-dwarf pear trees be planted at least 12 feet apart and at 16-feet apart for semi-dwarf peaches and apricots (Schalau, 2000). Sixteen feet is assumed to be the minimum spacing requirement for all the fruit trees to be planted in the TUMA orchard. The number of trees to be planted on the 5-acre TUMA orchard can be calculated as follows.

$$\text{Total number of trees} = [(43,560 \text{ ft}^2/1 \text{ ac}) * (5 \text{ acres})] / (16 \text{ ft} \times 16 \text{ ft}) = 851 \text{ trees}$$

Therefore, TUMA could plant approximately 850 trees on 5-acres.

II. IRRIGATION ANALYSES

There are six types of irrigation systems commonly used today. These systems include border, furrow, sprinkler, sub-irrigation and trickle (NRCS, 2001). Each type of irrigation system has a unique system efficiency percentage based on its design and water application mechanisms. In the subsequent analyses the water requirements for border and drip irrigation systems were calculated. Border irrigation involves controlled surface flooding, usually in divided strips of the crop acreage, whereas trickle irrigation is a slow application of water on or beneath the soil surface by drip emitters strategically placed near the plants (NRCS, 2001).

According to Ed Martin, an irrigation expert with the University of Arizona Agricultural Extension Service, once consumptive use has been established, irrigation system efficiency estimates are the only parameter needed to determine the actual amount of water applied. By dividing the consumptive use estimate by irrigation efficiency (%), AE, the amount of water that needs to be applied to the 5-acre area can be computed (Martin, 2000).

$$ET_{\text{pear}} = 6.57 \text{ ft}$$

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Efficiency of point source drip irrigation system = 85% (Martin, 2003)

Efficiency of surface border irrigation system = 75% (Martin, 2003)

Therefore, for point source drip systems, the actual amount of water applied can be calculated as follows:

$$\begin{aligned}(6.57 \text{ ft water})/.85 &= 7.73 \text{ ft water} \\ 7.73 \text{ ft water} * 5 \text{ acres} &= 38.7 \text{ acre-ft/yr}\end{aligned}$$

Therefore, about 39 acre-feet of water would be applied through drip emitters located on or beneath the soil surface around the fruit trees.

For surface border irrigation systems, the actual amount of water applied can be calculated as follows.

$$\begin{aligned}(6.57 \text{ ft water})/.75 &= 8.76 \text{ ft water} \\ 8.76 \text{ ft water} * 5 \text{ acres} &= 43.8 \text{ acre-ft/yr}\end{aligned}$$

Therefore, about 44 acre-feet of water would be applied through a border irrigation system where strip of the planted acreage would be flooded.

CONCLUSIONS

Based on the findings of this report, it is recommended that TUMA claim 45 acre-ft of water per year in the Santa Cruz Adjudication to reestablish the historical orchard. This value should provide adequate water for the park and an opportunity to decide at a later date whether to use border or drip irrigation systems.

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References

1. Al-Kaisi, M.M. and I. Broner, 1992. "Irrigation: Crop Water Use and Growth Stages." Crop Series No. 4.715. Colorado State University, Cooperative Extension. 4 p.
2. Allen, Richard, Luis Pereira, Dirk Raes and Martin Smith, 1998. *Crop Evapotranspiration: Guidelines for Computing Crop Water Requirements*, *FAO Paper* 56. Chapter 6, ETc – Single Crop Coefficient (Kc). 36 p.
3. Brown, Paul W., no date. "AZMET Computation of Reference Crop Evapotranspiration." University of Arizona. <http://ag.arizona.edu/azmet/et2.htm>.
4. Brown, Paul, 2000. *Basics of Evaporation*, Turf and Irrigation Management Series 1. University of Arizona, Cooperative Extension.
5. Critchley, Will and Klaus Siebert, 1991. *A Manual for the Design and Construction of Water Harvesting Schemes for Plant Production*, *FAO Paper*. Chapter 2: Soil and Water Requirements. 14 p.
6. Davison, Elizabeth, 2003. "Arizona Plant Climate Zones." Cooperative Extension, College of Agricultural and Life Sciences, University of Arizona. 3 p. <http://ag.arizona.edu/pubs/garden/az1169.pdf>.
7. Martin, Ed, 2000. *Determining the Amount of Irrigation Water Applied to a Field*. Arizona Water Series No. 29. Agricultural Cooperative Extension of the University of Arizona. Tucson, AZ. 3 p.
8. Martin, Ed, 2003. Email correspondence. Irrigation Expert, University of Arizona Agricultural Cooperative Extension Service. Tucson, AZ.
9. Natural Resources Conservation Service (NRCS), 2001. *Farm Irrigation Rating System (FIRS) for New Mexico*. Technical Notes, Agronomy – 62. Albuquerque, NM. 4 p.
10. Rasor, Anne, 2002. Park Superintendent. Tumacácori National Historical Park, AZ.
11. Richardson, M.L., S.D Clemmons and J.C. Walker, 1979. *Soil Survey of Santa Cruz and parts of Cochise and Pima Counties, Arizona*. National Cooperative Soil Survey.
12. Schalau, Jeff, 2000. *Selecting and Orchard Site and Planting Fruit Trees*. *Backyard Gardner*. Arizona Cooperative Extension. 2 p. <http://ag.arizona.edu/yavapai/anr/hort/byg/archive/orchardsite.html>.
13. Snyder, R.L., M. Orang, S. Maytac, and S. Eching, 2001. *Crop Coefficients*. Regents of University of California. 18 p.

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http://lawr.ucdavis.edu/coopextn/biometeorology/evapotranspiration/CropCoef/crop_coef_ficients.htm.

14. Stein, Larry A., C. G. Lyons and J. Lipe, 1999. *Home Fruit Production: Stone Fruit (Peaches, Nectarines, Plums, Apricots and Almonds)*. Horticulture Extension of Texas A&M University. <http://aggie-horticulture.tamu.edu/extension/homefruit/stone.stone.html>.
15. Tan, C.S. and R.E.C. Layne, 1990. Irrigation Scheduling for Fruit Crops. Agriculture Canada, Research Station, Harrow. <http://www.gov.on.ca/OMAF/English/crops/facts/90-069.htm>.
16. Taylor, Glenn 'Cat,' no date. *Planting and Early Care of the Peach Orchard*. Oklahoma Cooperative Extension Service. OSU Extension Facts F-6244. 4 p. <http://pearl.agcomm.okstate.edu/hort/fruits/f-6244.pdf>
17. Thornthwaite, C. W., 1944, in Report of committee on transpiration and evaporation: *Am. Geophys. Union Trans.*, 25-5, 683-693.
18. United States Bureau of Reclamation, 1962. *Use of water on Federal irrigation projects*: Denver, Colo., U.S. Bur. Reclamation, 79 p.
19. University of Arizona, Cooperative Extension of the College of Agriculture, 1998. *Arizona Master Gardener Manual*.
20. Whiting, Dave, 2000. *Dave's Garden* web site. <http://davesgarden.com/terms/go/876>
21. Wilson, Robert, 2003. Email correspondence. Soil Science Specialist, Arizona. United States Department of Agriculture.

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Future Consumptive Water Use For Tumacacori National Historic Park, Arizona

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May 10, 2002

Introduction

The objective of this report is to estimate the quantity of water needed for future consumptive use purposes at Tumacacori National Historic Park (TUMA). Future water needs are estimated for the year 2051, a 50-year projection. This report is prepared in support of water right claims and settlement discussions in the Upper Santa Cruz River Adjudication in Arizona.

In 1987, the Department of Justice, on behalf of the National Park Service, filed a claim for appropriative water rights for three wells at TUMA. The claim was for enough water to supply the visitor center "which accommodates 60,000 visitors annually". The 1987 claim did not quantify the amount of water necessary for visitors, staff, and restoration of the historical orchard at TUMA. Limited water meter data are now available, allowing for a reexamination of present and future water needs at TUMA.

Projection – Method and Analysis

The methodology employed in estimating TUMA's future water needs is first to determine the Park's current water use and then to apply an appropriate growth rate to that use for a period of 50 years. A 50-year projection is considered reasonable based upon available data and the NPS's mandate to manage the park in perpetuity. Irrigation water to restore the historical orchard will be added to the projected future water use.

Current Water Use

Annual Park water use records were obtained for December 1996 – July 1999 from Ann Rasor, Superintendent at TUMA. Water is used primarily by visitors and supporting staff. The park has one residence that is currently occupied by 3 people and an interpretive garden (¼ acre) that is watered using a drip irrigation system. Current water use is estimated by averaging annual water use values for 1997 and 1998. Annual water use values for the years 1996 and 1999 are incomplete and

were not used. Table 1 shows annual water use data and the computation of the current water use of 0.24 acre-feet per year.

Table 1. Annual Water Use at Tumacacori National Historic Park, 1996–1999.

Date	Yearly Pumping (gal)	Yearly Pumping (AF)
Dec. 1996	4,864	0.02
1997	73,891	0.23
1998	83,526	0.26
Jan/July 1999	43,450	0.13
AVG (97,98)	78,709	0.24

Future Water Needs for Visitors and Staff

In order to make a conservative estimate of future water needs at TUMA, a growth rate of 2.5 percent was applied to the estimated current water use. Appendix A describes the rationale for its selection as an appropriate growth rate. Applying the compound annual growth rate of 2.5 percent per year using Equation 1 to current water use of 0.24 acre-feet per year for 50 years yields a projected water need in the year 2051 of 0.83 acre-feet per year.

$$A = P(1 + R)^N \quad \text{Eq. 1}$$

A = Future Consumptive Water Use After N Years at R rate
P = Existing Water Use (0.24)
R = Rate (0.025)
N = Number of years (50)

Future Water Needs for the Acequia and Orchard

TUMA would like to restore the historical orchard (General Management Plan, 1996) and a small portion of the historical acequia to recreate a 19th century cultural landscape. The Park would like to restore 5 acres of the historical orchard; 4 of which are contained within the existing park boundaries. The other acre is currently located on the Binney property (south) that the Park hopes to acquire in the near future. Peach, fig, quince, pomegranate, apricot, and pear trees would be planted and maintained in the orchard. TUMA is also considering restoring a small portion of the historical acequia and would like to secure enough water to interpret its use. If restored, TUMA would likely install some sort of recirculating pump-back system to minimize water use. Irrigation needs of the orchard are estimated below:

One-half an acre-foot of water is assumed to be required for the recirculating pump-back system for the acequia.

Total Future Water Needs

It is estimated the x acre-feet of water will be required per year to restore and maintain the orchard and the historical acequia.

Conclusion

It is recommended that the NPS amend our claim filed in the Upper Santa Cruz River Adjudication for Tumacacori National Historic Park. The claim should amended to indicate a future consumptive water use of ?? acre-feet per year.

APPENDIX A

Determination of a Regional Growth Rates for Projecting Future Water Needs at Tumacacori National Historic Park, Arizona

Because park water use is partially a function of park visitation, historic visitation data were examined to determine a reasonable growth rate for estimating future water use at Tumacacori National Historic Park (TUMA). Unfortunately methods of counting Park visitors have not been consistent over time and visitation numbers have had large swings making estimates of growth rates at individual parks difficult. For this reason, regional growth rates were determined for a number of National Park units in southeastern Arizona.

Compound annual growth rates were computed for three National Park units (TUMA, Chiricahua NM, and Saguaro NP) for the period 1952 through 2001, for Coronado National Memorial for 1955 through 2001, for Ft. Bowie National Historic Site for 1969 through 2001, and for total National Park unit visitation for 1952 through 2001. Visitation records for Coronado National Memorial and Ft. Bowie National Historic Site began in 1955 and 1969, respectively. Visitation data for TUMA is shown in Table 1. Growth rates for park units in the area, including TUMA, were computed and are shown in Table 2. Compound annual growth rates range from 0.2 percent per year at TUMA to 5.1 percent per year at Cornado National Memorial and Saguaro National Park, with a nationwide growth rate of 3.6 percent for a 50-year period. The median growth rate for the five regional parks is 2.37.

TUMA does not demonstrate similar growth rates as other parks in the region. In fact, visitation has been relatively flat over the last 50-years, with large increases in visitation between 1971 and 1979. ANN - IS THIS A RESULT OF COUNTING CHANGES?? Even if one were to assume that visitation was as high as 80,000 people (the historical high) in 2001 when computing the compound annual growth rate, the growth rate would still only be 1.2 percent per annum. Due to flat growth rate at TUMA and potential counting differences it appears a growth rate of 2.5 percent would be considered reasonable and conservative for estimating future visitation and water use.

Table 1. Recreation Visits for Tumacacori, 1952-2001.

Year	No. Visitors	Year	No. Visitors
1952	44262	1977	74000
1953	45884	1978	76558
1954	41800	1979	59013
1955	47200	1980	54996
1956	50700	1981	59422
1957	56400	1982	58290
1958	58100	1983	57922
1959	59800	1984	58260
1960	53800	1985	58022
1961	56300	1986	60117
1962	55200	1987	63327
1963	54400	1988	60311
1964	55600	1989	61912
1965	56100	1990	63945
1966	50500	1991	58269
1967	49500	1992	52951
1968	63000	1993	53363
1969	60000	1994	66097
1970	63700	1995	57711
1971	68700	1996	62206
1972	68380	1997	58713
1973	78200	1998	58853
1974	71000	1999	56189
1975	78700	2000	53706
1976	80300	2001	49570

I-19 completed

Cycle nature of tourists (cold, nice up north)

w/ riparian area more recreational

Table 1. Park Visitation and Compounded Annual Growth Rates for Tumacacori National Historic Park, Chiricahua National Memorial, and Saguaro National Park, 1952-2001, Coronado National Memorial, 1955-2001, Ft. Bowie, 1969-2001, and the Nationwide Averages, 1952-2001.

	Tumacacori NHP	Coronado NM (1955)	Chiricahua NM	Saguaro NP	Ft. Bowie NHS (1969)	National Visitation
1952	44,262	7,300	23,541	60,466	800	47,379,438
2001	49,570	89,107	75,824	725,874	8,858	279,873,926
CAGR	0.23	5.13	2.37	5.10	4.93	3.62

CAGR = Compound Annual Growth Rate in Percent per Year
 = $(\text{Visitation in last year} / \text{Visitation in first year})^{1/n} - 1) * 100$

Park Visitation Report

Tumacacori NHP Summary for Jan-Dec, All Years				
Totals:	Year	Recreation Visits	Non-Recreation Visits	Total Visits
	1979	59,013	0	59,013
	1980	54,996	0	54,996
	1981	59,422	0	59,422
	1982	58,290	0	58,290
	1983	57,922	0	57,922
	1984	58,260	0	58,260
	1985	58,022	0	58,022
	1986	60,117	0	60,117
	1987	63,327	0	63,327
	1988	60,311	0	60,311
	1989	61,912	0	61,912
	1990	63,945	0	63,945
	1991	58,269	-0.089	0
	1992	52,951	-0.091	0
	1993	53,363	0.008	0
	1994	66,097	0.239	0
	1995	57,711	-0.127	0
	1996	62,206	0.078	0
	1997	58,713	-0.056	0
	1998	58,853	0.002	0
	1999	56,189	-0.045	0
	2000	53,706	-0.044	0
	2001	49,570	-0.077	0

1.26 gal/visitor
1.42 gal/visitor

New Park Visitation Report
Return to Home Reports Page

10 yr avg → -0.0113 or -1.13%
Compound → -0.007 or -0.66%

Tumacacori

Water usage from November 26, 1996 to April 16, 2002 is 448031 gallons.

Records of monthly water use were kept from 11.26.96 until 5.10.99 and break down as follows:

Dec. 1996	(11.26.96 – 12.30.96) = 4864 gals	
Jan. 1997	(12.30.96 – 01.31.97) = 4099	
Feb.	(01.31.97 – 03.03.97) = 4250	
Mar.	(03.03.97 – 03.31.97) = 5492	
Apr.	(03.31.97 – 04.26.97) = 4999	
May	(04.26.97 – 05.25.97) = 5108	
Jun.	(05.25.97 – 06.28.97) = 10795	
Jul.	(06.28.97 – 07.27.97) = 7787	
Aug.	(07.27.97 – 08.23.97) = 5650	
Sept.	(08.23.97 – 09.30.97) = 10186	
Oct.	(09.30.97 – 10.24.97) = 5854	
Nov.	(10.24.97 – 11.30.97) = 6245	
Dec.	(11.30.97 – 12.27.97) = 3426	→ 73,891 - 1997
Jan. 1998	(12.27.97 – 01.24.98) = 4834	
Feb.	(01.24.98 – 02.21.98) = 6194	
Mar.	(02.21.98 – 03.29.98) = 8461	
Apr.	(03.29.98 – 04.26.98) = 5595	
May	(04.26.98 – 05.31.98) = 8745	
Jun.	(05.31.98 – 06.29.98) = 8691	
Jul.	(06.29.98 – 07.25.98) = 8633	
Aug.	(07.25.98 – 08.23.98) = 4738	
Sept.	(08.23.98 – 09.30.98) = 10441	
Oct.	(09.30.98 – 10.26.98) = 4920	
Nov.	(10.26.98 – 12.05.98) = 8067	
Dec.	(12.05.98 – 12.28.98) = 4207	→ 83,526 - 1998
Jan. 1999	(12.28.98 – 02.07.99) = 6186	
Feb.	(02.07.99 – 03.07.99) = 4923	
Mar.	(03.07.99 – 04.06.99) = 3697	
Apr.	(04.06.99 – 05.10.99) = 9786	
May/June/July	(05.10.99 – 07.12.99) = 18858	

*TUHA fax
520 398-9271*

Docket Information

Number of Documents in Docket 34

Documents Dated from 6/16/1999 to 4/11/2003

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