

**FEASIBILITY REPORT**

**FOR**

**EL RIO ANTIGUO  
TUCSON, ARIZONA**

**ECONOMIC APPENDIX**

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## INTRODUCTION

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### **Objective:**

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The following presents an economic evaluation of the benefits and costs associated with flood control, habitat restoration, and recreation opportunities along the El Rio Antiguo (Craycroft Road and Campbell Road) segment of the Rillito River located in eastern Pima County, Arizona.

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### **Methodology:**

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The methodology employed for this economic analysis is in accordance with current Principles and Guidelines (ER 1105-2-100) and standard economic practices. In agreement with these standards, benefits and costs will be expressed as annual values using the current 6.125 % interest rate, October 2001 price levels, a 2008 base year, and a 50-year period of analysis. In addition, the environmental restoration analysis will be completed in conformance with IWR Report #95-R-1—Evaluation of Environmental Investments Procedures Manual (May 1995).

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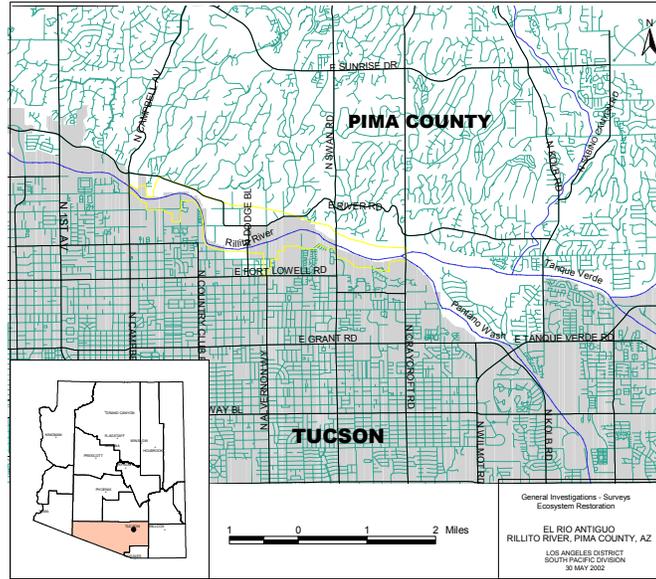
### **Study Area:**

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The Rillito River is located at the northeastern section of the Tucson city limits. The river flows from its beginning at the confluence of Tanque Verde Creek and Pantano Wash approximately 12 miles to the Santa Cruz River. The project area extends along the banks of the river and a short distance up its tributaries between Craycroft Road and Campbell Road for a project length of approximately 4 miles.

**Figure 1: The Rio Antiguo Study Area**



**History:**

The El Rio Antiguo portion of the Rillito River was a perennially watered riparian area of Arizona, with highly productive cottonwoods, willows, and mesquite habitats. These areas were rich in habitat diversity, supporting a wide variety of wildlife species. As the watershed became developed with new homes, industry, and roadways, riparian and upland habitat degraded significantly displacing the last remnants of riparian and upland vegetation once occupying the region.

**Population:**

The El Rio Antiguo study area is included in the Tucson-Pima County Metropolitan Statistical Area (MSA). According to the 2000 Census, the Tucson-Pima County MSA population was 843,746 (16.81% of Arizona population). This population figure for 2000 was 26.5 percent larger than the 666,880 residents in 1990 (18.9% of Arizona Population). During the previous decade, the county and MSA increased by 25.5 percent from 531,443 in 1980. In fact, Tucson-Pima County MSA has been growing at an average annual compound rate of about 2.60 compared to the national average of 1.1 percent. A summary of County and Metro Area Data is shown in Table 1 below.

**Table 1: Population for Tucson-Pima County MSA**

<i>Year</i>	<i>Population</i>
1980	531,443
1990	666,880
2000	843,746

The Pima County population growth illustrated above has been due primarily to net migration into the area. Two main factors contributing to the migration are employment opportunities and the low cost of housing. Because Pima County offers high skilled technical and professional jobs and a diversified occupational base, some people may find the area appealing. Residents also can purchase low cost housing, another lure, that may enhance their quality of living.

**Employment:**

Three primary areas of employment in Pima County are in education, government, and military. First, sources of employment in the educational sector include the University of Arizona, Pima County Community College, and the Tucson Unified School District. Second, government offices offer employment in the state, county, and city level. Third, two military establishments provide further employment opportunities. They are Davis-Monthan Air Force Base and Raytheon Missile Systems Company. All three areas of employment require a higher likelihood of professional and technical skill as well as some collage education that account for some of the 24.70% of professional and technical occupations within Pima County.

This demand for higher paying jobs may account for the reason why Pima County has enjoyed a low employment rate sometimes as much as 1.4 and 1.8 percentage point behind the Arizona and the United States. In 1998, unemployment was 2.7 compared with Arizona at 4.1 and the United States at 4.5. Table 2 shows major employers, employment type, and number of employees within Pima County. Table 3 lists the occupation type and the percentage of employees per occupation type.

**Table 2: Employers, Employment Type, and Number of Employees**

<i>Employer</i>	<i>Employment Type</i>	<i>Number of Employees</i>
University of Arizona	University of Colleges	10,520
State of Arizona	Government	9,694
Davis-Monthan Air Force Base	Military	8,352
Tucson Unified School District	Education	8,187
Raytheon Missiles Systems Co.	Military Manufacturing	7,700
Pima County	Government	7,028
City of Tucson	Government	5,497

**Table 3: Percentage of Employees Divided by Occupation Type**

<i>Occupation</i>	<i>Percentage of Total</i>
Managers & Administrative	6.13
Professional & Technical	24.70
Sales and Related Occupations	11.54
Clerical & Administrative Support	16.75
Service Occupations	20.09
Agriculture, Forestry & Fishing	.55
Production, Maintenance & Material	20.23
Total	100.00

## **Housing Units & The Low Cost Housing:**

To accommodate the population expansion in the area, about 348,508 housing units were constructed in Pima County in 1999. This figure is up from 298,207 in 1990. According to the 1999 American Community Survey Profile for Pima County, Arizona, about 21 percent of the housing stock has been constructed in the past ten years in Pima County. Most of the newer homes, constructed in master planned communities, are reasonably priced compared to other metropolitan areas. The average cost of a new single family home is about \$109,102, and this is a primary factor making the overall cost of living in Pima County among the lowest of major US metropolitan areas.

## **EXISTING CONDITIONS**

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### **Flood Control Analysis:**

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#### **Floodplain Description:**

The area under study for flooding is called the Finger Rock Wash area and is located on the north side of the Rillito River between Valley View Wash to the east and Country Club Road to the west. This area is mostly commingled from floods from both the Rillito River and Finger Rock Wash. However, a small portion exists north east of the wash that floods only from Finger Rock Wash and is not influenced by Rillito flooding. Rillito flooding occurs along the south bank near County Club Road and on the south bank near Dodge Boulevard. Figure 1 shows the general area: it is located in the vicinity where River Road makes a right angle.

#### **Methodology Overview:**

The following items were utilized for the economic assessment of El Rio Antiguo.

##### **Models:**

1. Excel Spreadsheet Model
2. Equivalent Annual Damage Technique

##### **References:**

1. TRW Redi Real Estate Data Base

2. Marshall & Swift Evaluation Manual
3. FEMA Depth Damage Relationships
4. Economic Guidance Memorandum (EGM) 01-03: Generic Depth Damage Relationships

***Field Survey:***

The Finger Rock Wash floodplain was subject to a 100% field survey by hand level. Recorded items included: relative first floor elevation (FFE), structure type, address, the number of structures, class, the number of stories, structure condition, and structure use. Inventoried floodplain structures were categorized as follows.

**Categories:**

1. SFR (Single Family Residence)
2. MH (Mobile Home)
3. MFR (Multiple Family Residence)
  - a. Quadraplex
  - b. Mixed
  - c. Condos
3. Commercial
  - a. Nursery
  - b. Auto Shop
4. Public
  - a. Government
  - b. Religious

***Inventory of Floodplain Structures:***

Because property delineations in the tax assessor’s data are by parcel and not by the number of structures, the individual parcel for residential and non-residential categories may include more than one structure. For example, a residential parcel may include more than one apartment building. Likewise, a non-residential parcel may include more than one office building. For this reason, the number of parcels will be used in this analysis.

**Table 4: Number of Parcels in the Finger Rock Wash Area:**

<i>Category</i>	<i>Number of Parcels</i>
SFR	67

MH	1
MFR	
Quadraplex	1
Mixed	2
Condos <sup>1</sup>	27
Commercial	
Nursery	12
Auto Shop	1
Public	
Government	7
Religious	3
Total	121

<sup>1</sup>The number for condos reflects the number of structures. Each structure may house many condo units.

### ***Value of Structures:***

The total values of structures in the floodplain were estimated using the following methodology.

1. Data from the field survey were imputed into the spreadsheet.
2. Square footage estimates were made based upon TRW Redi Real Estate Data Base.
3. Structure replacement value multipliers were obtained from Marshall & Swift Valuation Service. The multipliers reflected structure type, construction type, and construction quality.
4. Adjustments were made to the multipliers to reflect local and current cost levels for the area.
5. Adjusted square footage multipliers were applied to square footage estimates for each structure

### ***Value of Contents:***

Content values were calculated using the Commercial Content Inventory (CCI) Program developed by Marshall & Swift. To use the program as few as three variables for each business can be input to determine comprehensive equipment and inventory cost estimates. Key inputs include: zip code, square footage, type of establishment, estimated revenue, and the number of employees. Once entered, the program uses an algorithm based on a variety of government, commercial, and proprietary databases.

1. Oxxford Information Technology LTd.'s databases include:
  - a. Financial statements and balance sheets from over 12 million companies

- b. Services and equipment purchases tracked in over 1,100 industries
  - c. Square footage, number of employees, and sales per square foot in six million companies
2. Marshall & Swift / Boeckh's databases include:
- a. Current building cost information for over 150 types of buildings, localized by zip code
  - b. Over 32,000 construction component costs and labor rates, localized by zip code.

Content ratios were then derived as a percentage of corresponding replacement values of structures. The following ratios were applied in Table 5.

**Table 5: Content Ratios**

<i>Category</i>	<i>Structure Type</i>	<i>Ratio</i>
SFR	SFR	0.50
MH	MH	0.50
MFR	Quadraplex	0.50
	Mixed	0.50
	Condo	0.50
Commercial	Nursery	1.07
	Auto Shop	1.07
Public	Government	0.24
	Religious	0.24

Table 6 provides a detail of the total structure value and content value by category.

**Table 6: Structure & Content Values for Finger Rock Wash  
(October 2002 Price Levels)**

<i>Category</i>	<i>Sq. Ft.</i>	<i>Ave Sq. Ft.</i>	<i>Structure Value</i>	<i>Average Structure Value</i>	<i>Content Value</i>	<i>Average Content Value</i>
SFR	161,765	2,414	\$8,353,213	\$124,675	\$4,176,606	\$62,337
MH	3,093	3,093	\$97,192	\$97,192	\$48,596	\$48,596
MFR						
Quadraplex	3,345	3,345	\$132,911	\$132,911	\$66,456	\$66,456
Mixed	12,208	6,104	\$556,944	\$278,472	\$278,472	\$139,236
Condos	261,071	9,669	\$13,209,724	\$489,249	\$6,604,862	\$244,625
Commercial						
Nursery	3,117	260	\$1,050,621	\$87,552	\$1,124,164	\$93,680
Auto Shop	5,179	5,179	\$157,196	\$157,196	\$168,200	\$168,200
Public						

Government	14,971	2,139	\$1,151,041	\$164,434	\$276,250	\$39,464
Religious	9,796	3,265	\$700,762	\$233,587	\$168,183	\$56,061
Total	474,545	3,922	\$25,409,605	\$209,997	\$12,911,789	\$106,709

***Structure & Content Damage Evaluation:***

This section describes the methodology used to compute the damages expected to be sustained in the floodplain area under study.

The following methodology was employed.

**Procedure:**

1. Estimated first floor elevations were noted during the floodplain inventory.
2. The Hydraulics Section provided average flood depths for the Rillito River, the combined flow area, and the Finger Wash area by event year and cross-section.

**Table 7: Rillito River Flood Depths By Each Event Year and Cross-Section.**

<i>Cross-Section</i>	<i>50 Year</i>	<i>100 Year</i>	<i>500 Year</i>
10.395	0.15	0.77	2.52
10.300	0.00	0.04	1.15
10.205	0.00	0.18	1.91
10.111	0.13	0.55	2.55
10.016	1.89	2.19	3.79
9.852	1.88	2.94	3.37
9.757	0.00	0.00	4.40
9.702	0.00	0.00	2.28
9.640	0.20	0.40	2.56
9.554	0.36	1.08	2.95
9.468	0.52	1.01	2.87
9.381	0.00	1.38	3.05
9.295	0.00	1.54	3.18
9.201	0.00	1.30	3.88
9.096	0.00	1.44	4.32
9.000	0.00	0.65	2.29
8.906	0.00	0.80	3.00
8.811	0.00	1.05	2.93
8.715	0.00	0.52	1.85
8.620	0.00	0.06	1.51
8.525	0.00	0.00	2.71

**Table 8: Finger Rock Wash Flood Depths By Each Event Year and Cross-Section.**

<i>Cross-Section</i>	<i>2 year</i>	<i>5 Year</i>	<i>10 Year</i>	<i>50 Year</i>	<i>100 Year</i>	<i>500 Year</i>
10.395	0.00	0.00	0.00	0.00	0.00	0.00

10.300	0.00	0.30	0.53	0.82	1.02	1.33
10.205	0.22	0.45	0.64	0.92	1.11	1.44
10.111	0.35	0.51	0.69	1.00	1.19	1.53
10.016	0.22	0.41	0.60	0.85	1.02	1.36
9.852	0.24	0.56	0.63	0.82	1.10	1.40
9.757	0.26	0.44	0.56	0.83	1.00	1.36
9.702	0.26	0.49	0.65	0.78	0.93	1.23
9.640	0.29	0.52	0.63	0.82	0.95	1.27
9.554	0.40	0.55	0.63	0.80	0.97	1.31
9.468	0.50	0.72	0.81	0.96	1.16	1.51
9.381	0.51	0.66	0.79	1.00	1.21	1.49
9.295	0.49	0.62	0.73	0.98	1.15	1.54
9.201	0.59	0.73	0.91	1.04	1.21	1.59
9.096	0.48	0.64	0.76	0.97	1.06	1.45
9.000	0.40	0.57	0.68	0.93	1.00	1.40
8.906	0.49	0.67	0.82	1.01	1.20	1.61
8.811	0.60	0.89	1.07	1.37	1.59	1.94
8.715	0.56	0.76	0.92	1.18	1.38	1.77
8.620	0.57	0.70	0.84	1.03	1.24	1.65
8.525	0.66	0.85	1.01	1.28	1.52	1.75

**Table 9: Combined Flow Area Flood Depths By Each Event Year and Cross-Section.**

<i>Cross-Section</i>	<i>2 year</i>	<i>5 Year</i>	<i>10 Year</i>	<i>50 Year</i>	<i>100 Year</i>	<i>500 Year</i>
10.395	0.00	0.00	0.00	0.00	0.00	2.52
10.300	0.00	0.30	0.53	0.82	1.02	1.15
10.205	0.22	0.45	0.64	0.92	1.11	1.91
10.111	0.35	0.51	0.69	1.00	1.19	2.55
10.016	0.22	0.41	0.60	0.85	1.02	3.79
9.852	0.24	0.56	0.63	0.82	1.10	3.37
9.757	0.26	0.44	0.56	0.83	1.00	4.40
9.702	0.26	0.49	0.65	0.78	0.93	2.28
9.640	0.29	0.52	0.63	0.82	0.95	2.56
9.554	0.40	0.55	0.63	0.80	0.97	2.95
9.468	0.50	0.72	0.81	0.96	1.16	2.87
9.381	0.51	0.66	0.79	1.00	1.21	3.05
9.295	0.49	0.62	0.73	0.98	1.15	3.18
9.201	0.59	0.73	0.91	1.04	1.21	3.88
9.096	0.48	0.64	0.76	0.97	1.06	4.32
9.000	0.40	0.57	0.68	0.93	1.00	2.29
8.906	0.49	0.67	0.82	1.01	1.20	3.00
8.811	0.60	0.89	1.07	1.37	1.59	2.93
8.715	0.56	0.76	0.92	1.18	1.38	1.85
8.620	0.57	0.70	0.84	1.03	1.24	1.51
8.525	0.66	0.85	1.01	1.28	1.52	2.71

3. Cross-sections associated with a flood depth for a specific event were selected for each structure in the entire study area, because analysis required all structures to be to their relative cross-section.

4. Inundation depths for each structure were determined by subtracting the first floor elevation from the appropriate average flood depth. These flood depths were assigned to their representative cross-section.
5. Structure and content damages were estimated as a percentage of total structure and content values. The percentages, provided by the FEMA and the Economic Guidance Memorandum (EGM) 01-03: Generic Depth-Damage Relationships, vary according to structure type and inundation depth.

The following table details total structure and content damages by event for existing without project conditions.

**Table 10: Total Estimated Damages by Event Year and Structure Type**

<i>Reach</i>	<i>Residential</i>			<i>Nonresidential</i>		<i>Total</i>
	SFR	MH	MFR	Commercial	Public	
<b>Structure</b>						
5 Yr	\$219,025	0	0	0	\$32,812	\$251,837
10 Yr	\$518,415	0	\$74,630	\$140,783	\$141,514	\$875,342
50 Yr	\$973,632	0	\$102,199	\$192,789	\$220,825	\$1,489,445
100 Yr	\$1,335,013	0	\$1,061,097	\$192,789	\$300,417	\$2,889,316
500 Yr	\$2,345,798	\$42,735	\$2,596,549	\$429,734	\$474,552	\$5,889,368
EAD						\$228,564
<b>Content</b>						
5 Yr	\$132,396	0	0	0	\$6,147	\$138,542
10 Yr	\$313,370	0	\$45,112	\$117,588	\$26,512	\$502,582
50 Yr	\$570,686	0	\$59,593	\$157,720	\$40,625	\$828,624
100 Yr	\$788,207	0	\$626,356	\$157,720	\$55,536	\$1,627,819
500 Yr	\$1,316,799	\$12,951	\$1,450,861	\$339,020	\$85,297	\$3,204,928
EAD						\$128,253
Total EAD						\$356,817

**Table 11: Total Estimated Damages by Event Year For Rillito River, Finger Rock Wash, & Combined Area**

	Rillito River	Finger Rock Wash	Combined Area
<b>Structure</b>			
5 Yr	\$0	\$172,650	\$79,187
10 Yr	\$0	\$555,991	\$319,351
50 Yr	\$64,923	\$774,030	\$650,492
100 Yr	\$1,029,480	\$867,824	\$992,011
500 Yr	\$2,569,877	\$1,108,367	\$2,211,124
EAD	\$22,466	\$119,873	\$86,225
<b>Content</b>			
5 Yr	\$0	\$99,201	\$39,342
10 Yr	\$0	\$305,439	\$197,142
50 Yr	\$36,563	\$411,410	\$380,650
100 Yr	\$606,257	\$452,567	\$568,996
500 Yr	\$1,446,793	\$564,496	\$1,193,639
EAD	\$12,889	\$65,411	\$49,954
<b>Total EAD</b>	<b>\$35,355</b>	<b>\$185,284</b>	<b>136,179</b>

**Emergency Response Damages:**

Due to the limited amount of information available concerning emergency response costs along the Rillito River, estimates will be based on an estimate derived in the January 1993 Flood Damage Summary Report written by the Pima County Department of Transportation and Flood Control District. In the report, Pima County has provided limited information on the emergency response cost to residents as they evacuate, relocate and, reoccupy their residence during a flood event. Based on the experience of residents who were flooded in the 1993 flood, the temporary relocation cost was approximately \$1,400 per resident. This number was applied to the number of residences in the 500-year floodplain and was used along with a non-damaging frequency of slightly higher than a 2-year event to perform equivalent annual damages. The equivalent annual damages (EAD) to residents due to flooding along Finger Wash are \$30,631.

**Traffic Damages:**

Typically, expected annual traffic damages are estimated based upon delineations of floodplain areas with inundation levels exceeding one foot and durations of flooding. However, Hydrology and Hydraulics used a quasi-steady state method in computing overflows. This method does not allow for a means to estimate durations of flooding by flooding event; therefore, traditional methods of computing traffic damages will not be used. Instead, traffic damages are estimated as a single event assuming traffic flow will be disrupted for a day no matter what the duration.

According to this analysis, the flooded areas could cause temporary closures of River Road between Country Club road and Valley View Wash. River Road carries 20,200 vehicles per day near Dodge Boulevard. Detour miles approximate 1.5 miles. This equates to 30,300 total detour miles traveled for one closure day. At a detour speed of 20 miles per hour, the time involved is 1,515 hours per closure. Using a traffic delay cost of \$7.06 per hour, potential damage resulting from delays is \$19,695 per year. In addition, vehicle operation cost can be derived from total detour miles. At an operation cost of 0.144 cents per mile, the potential damage is \$4,363. Annual traffic delay cost and vehicle operation cost equals \$1,463 at an interest rate of 6.125 %.

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### **Hydrogeomorphic Methodology (HGM) Analysis:**

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#### **Hydrogeomorphic Methodology Description:**

The methodology used to assess the environmental conditions of the Rillito River, both current and those expected to prevail in the event no project is ever undertaken, will be the Hydrogeomorphic Methodology approach to assessing wetland functions. The HGM approach was developed by scientists at the Engineering Research and Development Center (ERDC) under its wetlands research program. This approach extends beyond the ecological processes that lead to wetland and their inherent properties and characteristics.

Under this approach, wetland functions are measured in terms of functional capacity. The concept is based on the inherent biological processes that impact the traits we associate with natural ecosystems. The functional capacity of a wetland is dynamic and is based on a model that defines the relationship between many ecosystem interactions.

A quantitative estimate of functional capacity for a wetland is the Functional Capacity Index (FCI). The ideal goal of the FCI is to quantify and produce an index that reflects functional capacity at the site. The results of the FCI analysis can be quantified based on a standard from zero to one. Zero represents low functional capacity and one represents high functional capacity for the wetland.

The FCI can be applied using functional capacity units (FCUs). This unit is a measure of environmental output or the ability of a wetland to perform a certain function and is calculated by multiplying the FCI by the area of the wetland. Because FCUs are not in monetary terms, it is not possible to develop a benefit-cost ratio. Instead, a program called IWR Plan will be used to combine FCUs with associated costs to determine cost effective solutions.

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### **Recreation Analysis:**

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For the purpose of this analysis, local parks within the study area will be surveyed to better understand existing recreation. The Rillito River Park will be added to this list and discussed in detail because a portion of it exists within the Rio Antiguo study area. In the future, other separate parks within the study area will be linked or in close proximity to

the Rillito River Park. The development of these future parks and restored recreational areas along the Rio Antiguo can be supported through a discussion of recreational demand and the unit day value method. (See addendum for a list of County and City Parks in the Pima County/Tucson metropolitan area.)

### **Parks Within Study Area:**

The following shows the names of parks in close vicinity to the Rillito River in the El Rio Antiguo study area (Campbell Avenue to Craycroft Road).

*Fort Lowell Park*--Fort Lowell Park is located at 2900 N. Craycroft Road and is a metro park. It has adult baseball, soccer, softball, and multiple uses fields. Courts include racquetball, tennis, and volleyball. There is also a swimming pool, playground, picnic areas with BBQ grills and ramadas, and an exercise course and center. Facilities include public restrooms, concessions, and drinking fountains. The area of the park is 58.94 acres.

*La Madera Park*--La Madera Park is located at 2700 E. La Madera Drive and is classified as a neighborhood park. It has restrooms, drinking fountains, basketball court, multiple use field, and playground. For picnicking, the park has ramadas and BBQ grills. The area of the park is 5.19 acres.

*McCormick Park*--McCormick Park is located at 2950 N Columbus Boulevard and is a community park. It has a baseball fields, restrooms, a recreation center, an exercise course, a basketball court, a multiple use field, an amphitheater, picnic sites, a playground, a ramada, and BBQ grills. This community park is about 17.97 acres in area.

*North Central Park*--North Central Park, a community park, is located at 3861 N Cactus Boulevard. The park is 38.65 acres.

*Murphey Multi-Use Field*--Murphey Multi-Use Field is located at 4550 N Camino Escuela. The park offers baseball, softball, and soccer fields. The park also has water fountains.

*George Mehl Foothills District Park*--George Mehl Foothills District Park is located at 4001 E River Road. This park offers baseball and soccer fields, restrooms, a playground, and ramadas.

### **Rillito River Park:**

One more park, the Rillito River Park, runs through the entire El Rio Antiquo study area and services the City of Tucson market area. The Rillito River Park starts at the confluence of Tanque Verde Creek and Pantano Wash at Craycroft Road and ends at the confluence of the Santa Cruz River. It is located north east of the City of Tucson. Even though the park functions as a complete River Park, it took years to complete as each segment was constructed. The segment from Campbell Avenue to Flowing Wells Road

was completed in 1987. This section of River Park includes Childrens Memorial Park, an exercise course, and multiple use trails for pedestrians, equestrians, and bicyclist. The segment from Flowing Wells Road to La Cholla Boulevard was completed in 1993 and includes pedestrian and bicycle trails, rest rooms, parking, and an art project. Recently, La Cholla to Interstate 10, a two miles extension, was completed along with a two miles extension of the Rillito River Park to the east. Together, the segments connect to form 11.2 miles of river park.

The overall goal of the park is to establish a continuous river trail that will link up to a system of trails (some not yet developed) along the Santa Cruz River, Rillito River, Tanque Verde Creek, Pantano Wash, and Canada del Oro Wash.

The benefits of this river park include:

1. the development of a continuous interconnected corridor networking the metropolitan area
2. the creation of a portion of a region-wide trail system that will integrate with other established and integrated trails
3. the opportunity to maintain and enhance wildlife corridors
4. the implementation of multi-objective management for floodplain, visual, recreational, natural, and cultural resources
5. the establishment of a cohesive sense of regional distinction
6. the creation of educational and interpretive opportunities
7. the enhancement of property values, economic development, and tourism
8. the encouragement of alternative modes of transportation that can reduce vehicular use and air pollution in the community

Table 12 lists visitation figures for the Rillito River Park by month for two years, 1999 and 2000. The Pima County Parks and Recreation Department provided this data. It was collected through the use of a laser counting device located at different points. The visitation figures are calculated at three points along the Rillito River Park.

The data shows attendance figures increased for the Rillito River Park from 1999 to 2000 with the exception of the Rillito River Park at Children’s Memorial Park (a separate park located along the Rillito River Park). One possible explanation for the increase in attendance for Rillito River Park might be due to the recent enhancement of the Rillito River Park. Possibly, individuals have chosen to recreate along the larger improved Rillito River Park.

**Table 12: Attendance Figure for the Rillito River Parks**

<i>Month</i>	<i>Rillito Park Cambell Avenue</i>		<i>Rillito Park Children’s Memorial Park</i>		<i>Rillito Park 1<sup>st</sup> Avenue</i>	
	1999	2000	1999	2000	1999	2000
January	2,478	5,173	20,332	12,473	9,936	8,790
February	1,598	5,470	14,957	15,359	10,748	11,961

March	1,014	7,789	14,394	17,857	7,729	10,236
April	7,243	3,208	24,057	Broken	1,613	12,699
May	1,562	6,704	11,718	6,889	4,309	4,341
June	7,979	6,486	2,694	5,754	2,193	4,696
July	2,041	2,991	8,266	2,268	2,701	3,464
August	2,873	4,204	8,209	4,240	4,086	3,236
September	111	4,847	7,361	7,771	5,708	5,511
October	1,626	6,327	11,838	Broken	Broken	6,327
November	542	2,798	7,683	4,391	1,098	5,790
December	8,331	9,030	13,623	19,621	10,284	7,331
Totals	37,398	65,027	145,132	96,623	60,405	84,382
Average		51,212		120,877		72,393

Future river parks are planned for Tanque Verde Creek and Pantano Wash. Design work has been completed for sections of River Park along Canada del Oro from Thornydale Rd. to Magee Rd., along Tanque Verde Creek from Sabino Canyon to Tanque Verde Rd. and along Pantano Wash from Tanque Verde Rd to Golf Links Rd. Together the Santa Cruz, Rillito, Tanque Verde Creek, and Pantano Wash river parks will function as one large unified trail system.

**Future Recreation Facilities:**

The City of Tucson has planned for the development of four parks along or near the El Rio Antiguo segment of the Rillito River. Most will be linked to the main Rillito River Park and will create a network of recreational experience areas. They are:

*Campbell Alvernon Linear Park: (2002-2003)*

Location: Rillito River

Size: 2-mile extension

Features: The Park will have irrigation, a bike and walking path, and landscaping.

*Rillito Park at River Bend: (built during River Road alignment)*

Location: North side of the River between Country Club Road and Alvernon Way.

Size: 43.8 acres

Features: Work will include development of a community of equestrian facilities, equestrian staging areas, and internal equestrian trails. Other features include caretakers quarters, administration buildings, art gallery, passive turf areas, ramadas, restrooms, picnic areas, maintenance buildings, orchards, and parking.

*Rillito Park at Columbus Boulevard District Park: (2003-2005)*

Location: Columbus Boulevard near the Rillito River

Size: Unknown

Features: The Park will have ball-fields, walking path, jogging area, off leash dog area, playground, and picnic area.

*North Central Natural Resource Park: (2002, first phase)*

Location: Tucson Boulevard north of Price Road

Size: 55 acres

Features: The park will have a small parking area, informal turf areas, trail systems, picnic facilities, playground, staging areas, and natural vegetation.

### **Recreation Demand:**

Many factors contribute to make the proposed riparian habitat area along the El Rio Antiguo study area attractive in terms of recreation potential and unmet demand. They include:

1. *Recreation Experience*--Proposed general recreation activities for the study area include trails for hiking, biking, jogging. Horseback riding is also available at the park and is considered a high quality activity. These activities are the fastest growing activities throughout Arizona according to the Arizona Trails 2000 document. Throughout Arizona walking and hiking ranks at 78% annually followed by bicycling at 36% and jogging at 28%. Horseback riding ranks at 13%. All activities rank higher than the national average except for jogging. Nationally, walking ranks at 67%, hiking at 33%, bicycling at 31%, jogging at 70%, and horseback riding at 8%. Among the activities identified, most have significant unmet demand.
2. *Availability of Opportunity*--In the past demand for trail opportunities was fulfilled by the County's many back trails. But, as the County continues to grow, the demand has increased for urban trails and other recreation opportunities close to home. The proposed facilities along the El Rio Antiguo study area will provide opportunity for many urban individuals to recreate close to their homes, work, and downtown. Currently, several parks exist within an hour of travel time and a few exist within 30 minutes travel time for most urban individuals living in Tucson, but only one river park trail system exist which will provide a unique availability. According to Arizona Trails 2000 published under the authority of the Arizona State Parks Board, the number one reason given by trail users for preferring a particular area is its proximity to home (56%).
3. *Carrying Capacity*--As previously discussed, Pima County has experienced rapid population growth. Pima County's MSA population is 843,746 at year 2000 and is expected to reach 1,518,000 by year 2025—a difference of 674,254 over 25 years. With this increase in population comes and increased demand for recreational facilities proposed for this study. At present, facilities at the park are adequate to conduct activities and promote public health and safety at the park but as population grows the need for more facilities may grow.
4. *Accessibility*--According to 43% of the Arizona Trails 2000 survey respondents, loss of access to trails is the top three most important issues facing trails today. This is not the case for the facilities that are easily and quickly accessible to the public. There are also several crossroads that intersect the study area. This

provides a park area in high demand with considerable access not only by automobile but also by pedestrians.

5. *Environmental*--As demonstrated earlier, there are several recreation areas located in the study area. Of these parks, there are no significant thriving riparian areas. The Rillito River Park has pockets of riparian vegetation but remain significantly degraded and is not considered to be a thriving habitat for plants and animals. Other parks in the area have dessert terrain and are not in riparian areas. This lack of riparian habitat is expected to result in significant unmet recreational demand.

According to County and City officials with the Park and Recreation Department the use of population based standards represents one of the most widely used methods for assessing community demand and the need for open space and recreation. This is attributed to the fact that they are easily understood and convenient. Such standards are considered most useful as a means for determining whether the supply of recreational resources is lacking behind demand that is supported by population growth. These standards also aid in supporting visitation data. The City of Tucson Parks and Recreation Department describes national standards for park type (ie. mini park, neighborhood park, community park, metro park, and regional park). The National Recreation and Parks Association (NRPA) set these standards. They are compared to current service levels and set by the City of Tucson for the Core/Mid City region and the Edge/Future City region. The following tables summarize this data.

**Table 13: Park Type, Standard Park Size, and Service Radius**

<i>Park Type</i>	<i>Park Size</i>	<i>Service Radius</i>
Mini Park	0-1 acre	¼ mile
Neighborhood Park	1-15 acres	½ mile
Community Park	15-40 acres	1 mile
Metro Park	40-200 acres	2 ½ miles
Regional Park	>200 acres	7 miles

**Table 14: Recreation Demand**

<i>Facility Type</i>	<i>Current Ratio</i>	<i>National Guidelines</i>	<i>COT</i>	
			<i>Core/Mid-City</i>	<i>Edge/Future City</i>
Mini Park <sup>1</sup>	.01 ac/1,000	N/A	N/A	N/A
Neighborhood Park	1.1 ac/1,000	2.5 ac/1,000	2.5 ac/1,000	2.5 ac/1,000
Community Park	1.0 ac/1,000	3.0 ac/1,000	3.0 ac/1,000	3.0 ac/1,000
Metro Park	3.0 ac/1,000	N/A <sup>2</sup>	3.0 ac/1,000	3.5 ac/1,000
Regional Park	1.3 ac/1,000	2.0 ac/1,000	1.0 ac/1,000	2.0 ac/1,000
Total	5.9 ac/1,000	10.0 ac/1,000	9.5 ac/1,000	11.0 ac/1,000

<sup>1</sup>N/A was placed in the row of cells for mini park because the City of Tucson Park and Recreation Department no longer plans to construct this type of park therefore any acre per population guideline is no longer applicable.

<sup>2</sup>There are no national guidelines for metro park, so this guideline is not applicable.

As the above data indicates, the current ratio of acres per 1,000 population is lower in most cases than the National and City Guidelines. A lack of sufficient recreation resources exists for all the types of parks except for metro and regional parks. Currently,

existing metro parks have met population needs in the core/mid-city area but not the edge/future city region. Regional parks have also met demand for the core/mid city area but not the edge/future city. Unless a significant number of recreation facilities are built, the projected population growth (2010) will make the existing deficit and surplus of parks depending on facility types become lower.

**Table 15: Additional Park Facilities Needed to Achieve Guidelines**

<i>Facility Type</i>	<i>COT Core/Mid-City 2010</i>	<i>COT Edge/Future City 2010</i>	<i>Total 2010</i>	<i>Existing 2001</i>	<i>Needed to Fill Demand 2010</i>
Mini Park	N/A	N/A	N/A	5 acres	N/A
Neighborhood Park	1,041 acres	366 acres	1,408 acres	515 acres	893 acres
Community Park	1,250 acres	439 acres	1,689 acres	504 acres	1,185 acres
Metro Park	1,250 acres	513 acres	1,762 acres	1,450 acres	312 acres
Regional Park	417 acres	293 acres	709 acres	619 acres	90 acres
<b>Total</b>	<b>3,957 acres</b>	<b>1,611 acres</b>	<b>5,568 acres</b>	<b>3,093 acres</b>	<b>2,480 acres</b>

<i>Multi-Use Path</i>	<i>27.77 miles</i>	<i>9.76 miles</i>	<i>37.53 miles</i>	<i>10.00 miles</i>	<i>27.53 miles</i>
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Table 15 shows an estimate of the number of acres needed by 2010 to meet anticipated population needs. The estimated number of park acres needed to fill demand by 2010 is 2,480. Also, an estimate of 27.53 miles of multi-use path is needed by 2010 to meet anticipated population growth.

**Unit Day Value Method:**

For this analysis the unit day value (UDV) method is used for the economic evaluation of the recreational features along the El Rio Antiquo study area. The method uses administratively set dollar values to determine the worth of recreational experiences and calculates the value of recreation. This value is an approximation of the area under the site demand curve or otherwise known as willingness to pay. To obtain this value you must first select specific points from a range of values provided in Planning Principles, and Guidelines (ER-1105-2-100). A table of criteria and point values is shown below:

**Table 16: Criteria and Point Values**

<i>Criteria</i>	<i>Key Variable</i>	<i>Range of Point Values</i>
Recreation Experience	Number of key activities	0-30
Availability of Opportunity	# of similar opportunities nearby	0-18
Carrying Capacity	Adequacy of facilities for activities	0-14
Accessibility	Ease if access to and within site	0-18
Environmental	Esthetic quality of site	0-20
<b>Total</b>		<b>0-100</b>

Second, point values for existing conditions are calculated and converted into equivalent dollar amount. Based upon the total number of points assigned, the equivalent dollar amount is obtained. UDV's for 2002 can range from \$2.90 to \$8.69 per recreation day. This dollar amount is the value per visit of unit day value. Third, the value is multiplied by the annual number of visitors to get an estimate of annual recreation value. The procedure is repeated for with project conditions.

***Evaluation of the El Rio Antiquo Study Area:***

Point values for the existing Rillito River Park of which a portion is located within the El Rio Antiquo study area are estimated. These numbers do not consider any possible future expansion of the park and are assigned using information described earlier in this report under the recreation demand section of this report.

**Table 17: Point Values for Without Project Conditions**

<i>Recreation Criteria</i>	<i>Value Range</i>	<i>Point Values</i>
Recreation Experience	0-30	12
Availability of Opportunity	0-18	3
Carrying Capacity	0-14	6
Accessibility	0-18	8
Environmental	0-21	2
Total		31

The point values described above are totaled and converted into equivalent a UDV amount. The total point value from Table 17 is 31 for the five recreational criteria. The equivalent UDV amount for 31 points is \$4.45. This UDV amount represents how much a visit to the park is worth in dollar amount for the without project condition.

To calculate the recreational value for without project conditions, the UDV is multiplied by annual visitation. Average annual visitation to the park at Campbell Avenue (see Table 10) is 51,212. (The other visitation figures for 1<sup>st</sup> Avenue and Children's Memorial Park are not used because they are outside of the study area.) The product of the UDV and average annual visitations equals \$227,893.

## ADDENDUM

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### **Existing Recreational Resources:**

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The following presents the primary recreation facilities within Pima County/Tucson metropolitan area.

#### National Parks (Tucson Metropolitan Area):

- Coronado National Forest
- Saguro National Park
  - Rincon Mountain District
  - Tucson Mountain District
- Santa Catalina Ranger District
  - Pusch Ridge Wilderness
  - Rincon Mountain Wilderness

#### State Parks (Tucson Metropolitan Area):

- Catalina State Park

#### BLM Lands (Tucson Metropolitan Area):

- Empire-Cienega Conservation Area

#### County Parks:

- |   |                               |
|---|-------------------------------|
| • Augie Acuna Los Ninos Neighborhood Park | • Southeast Regional Park     |
| • Cienega Creek Natural Preserve          | • Coronado Middle School Park |
| • John A Valenzuela Community Center      | • Emily Gray Jr. High School  |

- George Mehl Foothills District Park
- McDonald District Park
- Lew Sorensen Tanque Verde Center
- Kino Veterans Memorial Community Center and Sports Complex
- Kino Teen Center
- Old Spanish Trail Bicycle and Hiking Trail
- Thomas Jay Regional Park
- Murphey Multi-Use Field
- Rillito River Park
- Roy P. Drachman- Agua Caliente Regional Park
- Arthur Pack Regional Park
- Casas Adobes Neighborhood Park
- Catalina Neighborhood Park and Recreation Center
- Children's Memorial Neighborhood Park
- Denny Dunn Neighborhood Park
- Feliz Paseos
- Flowing Wells Jr. High School
- Linda Vista Neighborhood Park
- Meadowbrook Neighborhood Park
- Overton Arts Center
- Pegler Recreation Area
- Picture Rocks Community Center and District Park
- Richardson Neighborhood Park
- Rillito Vista Neighborhood Park and Recreation Center
- Sunset Point Neighborhood Park
- Ted Walker District Park
- Wildwood Neighborhood Park
- Branding Iron Neighborhood Park
- Cardinal Neighborhood Park
- Centro Del Sur Community Center
- Lawrence District Park
- Mission Ridge Neighborhood Park
- Paseo De Los Arboles Commemorative Park
- Paseo De Lupe Eckstrom (Tucson Diversion Channel)
- Santa Cruz River Park
- Southwest Community Center
- Three Points Veterans Memorial Neighborhood Park
- Vesey Neighborhood Park
- Winston Reynolds-Manzanita District Park
- Ajo Regional Park
- E.S. "Bud" Walker Neighborhood Park
- Gibson Neighborhood Park
- Palo Verde Neighborhood Park
- Anamax Neighborhood Park and Recreation Center
- Continental Community Center
- Kay Stupy-Sopori Neighborhood Park
- Tucson Mountain Park
- Sahuarita District Park and Cienega Creek Natural Preserve
- Tortolita Mountain Park
- Colossal Cave Mountain Park
- Joan M. Swetland Community Center

## City Parks:

- Christopher Columbus Park
- Sentinel Peak Park
- Case Park
- Fort Lowell Park
- Golf Links Sports Complex
- Greasewood Park
- Houghton Park
- Jacobs Park
- John F. Kennedy Park
- Kino & 36<sup>th</sup> St. Park
- Lakeside (Charles Ford) Park
- Lincoln Park
- Gene C. Reid Park
- Rodeo Park
- Santa Cruz River Park
- Morris K Udall Park
- Valle Allegre Park
- Freedom Park
- Himmel Park
- Juhan Park
- Mansfield Park
- McCormick Park
- Mission Manor Park
- Joaquin Murrieta Park
- North Central Park
- Jesse Owens Park
- Palo Verde Park
- Michael Perry Park
- Purple Heart Park
- Rodeo Grounds
- San Juan Park
- Santa Rita Park
- Sunnyside Park
- 20/30 Park
- Alvernon Park
- Balboa Heights Park
- Bravo Park
- Catalina Park
- Cherry Avenue Park
- Connor Park
- Country Club Annex Park
- De Anza Park
- Desert Aire Park
- Desert Shadows Park
- Eastmoor Park
- El Presidio Plaza Park
- El Pueblo Park
- Escalante Park
- Francisco E. Esquer Park
- Estevan Park
- Fiesta Park
- Stefan Gollob Park
- Groves Park
- Hoffman Park
- Don Hummel Park
- Iron Horse Park
- Jacinto Park
- Harriet Johnson Park
- La Madera Park
- La Mar Park
- Linden Park
- Menlo Park
- Mesa Village Park
- Military Plaza Park
- Miracle Mile Manor Park
- Mirasol Park
- Mitchell Park
- Oaktree Park
- Ormsby Park
- Oury Park
- Parkview Park
- Pinecrest Park
- Pueblo Gardens Park
- Rodeo Wash Park
- Rolling Hills Park
- Santa Rosa Park
- Sears Park
- Swan Park
- Swanway Park
- Tahoe Park
- Terra Del Sol Park
- James Thomas Park
- Toumey Park
- Veinte De Agosto Park
- Villa Serena Park
- Vista Del Prado Park
- Vista Del Pueblo Park
- Vista Del Rio Park
- Wilshire Heights Park
- Harold Bell Wright Park

- Amphitheater High School
- Amphitheater Middle School
- E.C. Nash Elementary School
- Flowing Wells High School
- Pima Community College
- Sunnyside High School
- Booth-Fickett Middle School
- Catalina High School
- Cholla High School
- Doolen Middle School
- Jefferson Park Elementary School
- John B. Wright Elementary School
- Magee Middle School
- Manzo Elementary School
- Palo Verde High School
- Richey Elementary School
- Rincon High School
- Rollin Gridley Middle School
- Sahuaro High School
- Santa Rita High School
- Townsend Middle School
- Tucson Magnet High School
- Utterback Middle School
- Vail Middle School
- Manuel Valenzuela Alvarez Park
- Cherokee Avenue Park
- El Tiradito Wishing Shrine
- Garden of Gethsemane
- Jardin Cesar Chavez Park
- Mariposa Park
- Riverview Park
- San Augustine Park
- Seminole Park
- Street Scene Park
- Sunset Park
- Verdugo Park