

**Comprehensive Program Report
FY 2006/07– FY 2010/11**



Prepared for the Pima County Board of Supervisors
Sitting as the
Flood Control District Board of Directors

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By the
Pima County Regional Flood Control District
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1.0 INTRODUCTION

The Pima County Flood Control District (District) was established by the state of Arizona as a special taxing authority responsible for regional flood control under the Arizona Revised Statutes (A.R.S.) Title 48 Special Taxing Districts, Chapter 21 County Flood Control Districts. The District is responsible for providing regional flood prevention programs and flood control services for incorporated and unincorporated areas in Pima County.

1.1 Purpose

This report describes current District programs, services and future plans to provide comprehensive flood and erosion control, protect and restore riparian habitat, and promote increased groundwater recharge along Pima County floodplains. Projects undertaken during FY 2006/07 through FY 2010/11 are emphasized. Information for prior years can be found in previous Comprehensive Program reports, as discussed below.

This report has been prepared to fulfill the requirements of A.R.S. 48-3616, which requires preparing a report at least every five years. In addition, it provides formal documentation of District activities over the past five years.

1.2 Previous Flood Control District Comprehensive Program Reports

The following five reports have been completed: 1979 Comprehensive Status Report; 1990 Comprehensive Program Report; Comprehensive Program Report for FY 1990/91 – FY 1995/96; Comprehensive Program Report for FY 1995/96 – FY 2000/01; and Comprehensive Program Report for FY 2000/01 – FY 2005/06. The 1979 Comprehensive Status Report, completed one year after the District was formed, discussed the status of ongoing flood control projects and identified future needs. The 1990 Comprehensive Program Report was the first comprehensive documentation of District activities. It discussed all aspects of District programs from the District's inception in 1978 through 1990. Subsequent reports have summarized activities conducted during the reporting period. This report represents a change in that it will be prepared to serve as the Floodplain Management Plan per Federal Emergency Management Agency (FEMA) Community Rating System (CRS) requirements as well as state statutory reporting requirements.

1.3 Key Program Areas

District activities can be grouped into three key program areas:

- 1) Floodplain Management Program
- 2) Structural Flood Control Program
- 3) Natural Resources Protection Program

A brief overview of each is presented below. Chapters 5, 6, and 7 of this report provide detailed descriptions of each program area for five fiscal years (FY 2006/07 through FY 2010/11).

1) Floodplain Management Program

This program consists of nonstructural activities intended to: a) prevent existing flooding and erosion problems from getting worse, and b) prevent the creation of new flooding and erosion problems by means other than constructing structural flood control improvements. Program elements include the National Flood Insurance Program (NFIP); Floodplain Regulations; Subdivision and Development Review; Floodprone Land Acquisition Program (FLAP); Flood Warning Program; and Public Information/Education/Awareness activities.

2) Structural Flood Control Program

This program consists of activities intended to reduce flooding and erosion by designing and constructing improvements that will safely convey floodwaters and protect channel banks from erosion. Structural projects are typically a solution in areas that have already been built-out, or where there is important infrastructure that needs to be protected. Projects include bank stabilization, bridges, channelization, levees, regional detention basins, and river parks.

3) Natural Resources Protection Program

This program consists of activities to protect and/or enhance riparian habitat and promote groundwater recharge. In conjunction with the Sonoran Desert Conservation Plan (SDCP), Pima County promotes and supports regional riparian restoration with the intent to recover natural functions within riverine systems. Projects include riparian habitat protection, restoration, and enhancement; protection and mitigation measures implemented through the Floodplain Use Permit (FPUP) process; design and construction of groundwater recharge basins; and encourage use of water harvesting techniques.

These programs further the District's goal of establishing and implementing regulations that go above and beyond the minimum requirements established by the NFIP. By adopting higher regulatory standards the residents of unincorporated Pima County are eligible for significant discounts on flood insurance (10-25%).

1.4 Floodplain Management

The United States had been experiencing escalating disaster assistance costs associated with major floods, prior to the enacting federal floodplain management regulations in 1968. Most of the burden to respond to flood damage and loss was borne by the federal government, and ultimately the general public. In addition, flood insurance was not available to assist property owners who experienced flood damage.

Regulatory management of floodplains began when Congress passed the National Flood Insurance Act of 1968, which created the NFIP. The purpose of the NFIP is two-fold: 1) to reduce future flood damage by regulating development in floodplains; and 2) to enable those living in floodplains to purchase reasonably priced flood insurance. Creation of the NFIP raised the national awareness about flood hazard and reasonable measures that can be taken to reduce flood damage and loss.

Because most watercourses in the Tucson area are dry and flow only when it rains, flood hazards are not the foremost thought in the minds of most Tucson area residents. However, in July 1990 and again in January 1993, the President of the United States declared Pima County a flood disaster area. In 2003, a major wildfire denuded large portions of the Catalina Mountains. In the years that followed, erosion associated with flooding increased and damages were significant and another flood disaster was declared in 2006 due to flooding exacerbated by the fire. Local government agencies such as the District and the incorporated municipalities strive to maintain awareness of flood hazards and work to minimize flood damage and loss of life.

1.5 Flood Control Capital Improvements

Flood control problems along the major watercourses and drainage areas are often regional in nature and require a uniform approach to achieve control of flooding and erosion hazards. In 1978, the state of Arizona recognized the need to establish county flood control districts to address regional flood control problems where:

- watercourses flow from one municipality into another,
- upstream tributaries affect downstream watercourses in another jurisdiction, or
- locations of a flood control improvement provides benefits to more than one jurisdiction.

Due to the interconnectedness of the watercourse system in Pima County, it is often necessary to plan and coordinate the sequencing of major projects so that the benefit will be maximized and flood damage potential reduced in a manner that does not follow jurisdictional boundaries.

Regional flood control improvements are tied to areas within flood hazard zones, which vary by jurisdiction. Factors influencing where capital flood control improvements are needed in jurisdictions include the community's flood damage potential, population, geographical location, total area and the ratio of undeveloped areas, newly developed areas, and older areas developed prior to floodplain management regulations.

In assessing needs and priorities for structural flood control improvements, the District considers repetitive flood damages and the potential for future flood damages. FEMA provides national flood insurance to residents and businesses nationwide. In Pima County, the number of flood insurance policies issued and the dollar value of the insurance provides an indication of potential flood damage costs (see Table 1-1).

**Table 1-1
Current Flood Insurance Coverage in Pima County, FEMA June 30, 2011**

<u>Jurisdiction</u>	<u>Number of Policies</u>	<u>Coverage Value</u>	<u>Premiums</u>	<u>Percent of Policies</u>	<u>Percent of Value</u>	<u>Percent of Premiums</u>
Pima County	2,503	\$ 562,725,100.00	\$1,598,430.00	51.2 %	52.3 %	47.5 %
Town of Marana	246	\$ 66,033,800.00	\$ 115,549.00	5.0 %	6.1 %	3.4 %
Town of Oro Valley	85	\$ 25,348,200.00	\$ 29,709.00	1.7 %	2.4 %	0.9 %
City of Tucson	2,031	\$ 414,927,600.00	\$1,616,599.00	41.5 %	38.6 %	48.0 %
Town of Sahuarita	25	\$ 6,975,000.00	\$ 7,980.00	0.5 %	0.6 %	0.2 %
City of South Tucson	1	\$ 175,000.00	\$ 284.00	0.0 %	0.0 %	0.0 %
TOTAL	4,891	\$1,076,184,700.00	\$3,368,551.00			

The total value of property covered by federal flood insurance in all of Pima County is \$ 1,076,184,700. The City of Tucson accounts for \$414,927,600 in value of coverage, or 38.6% of the total value and the unincorporated area accounts for \$562,725,100 in value of coverage, or 52.3% of the total value. Marana has the third highest potential for damage with a coverage value of \$66,033,800 or 6.1%, a significant decline from the 24% in the prior period.

1.6 Increasing Emphasis on Managing Natural Resources Elements of Floodplains

Floodplain management practices have evolved over the past 30 years from a focused approach on controlling excess stormwater runoff to a more holistic approach. Current practices include managing hydrologic, hydraulic, and sediment transport elements, as well as the plant and animal life, and cultural/historical features of a drainage system.

In the late 1960s and 1970s, traditional floodplain management focused on confining inundation to relatively small areas using channels, levees, and other structural means. In the early 1980s, use of stormwater detention became popular. Detention areas could be constructed for individual lots or building sites, as well as for larger areas. Parks with constructed play facilities, ball fields, and other recreational uses were soon incorporated into the design of larger (regional) detention basins.

In the mid-1980s and continuing today, increased attention has been focused on preserving natural, cultural, and historic resources associated with floodplains. The unique assemblage of plant and animal life found along undisturbed streambeds, as well as natural recharge promotes biological diversity helping to maintain the ecological character of the region. Similarly, historical and cultural features make an area unique, whether there is a buried archaeological site or historical buildings along the banks of a stream.

The District continues to emphasize programs that reduce flood and erosion damage by traditional methods where these methods are needed and appropriate. Consistent with an increasing emphasis nationwide on the importance of natural floodplains to a healthy regional ecosystem, the District has increased its emphasis on and funding of the natural resources protection elements of the floodplain management program.

1.7 Summary of New District Activities for FY 2006/07 – FY 2010/11

Work continues to proceed on several of the 14 bond projects that were approved by the electorate in a Special Bond Election held on May 20, 1997 where a total of \$21.5 million in flood control bond projects was approved. Furthermore, voters approved additional flood control bonds in 2004.

Floodplain and Erosion Hazard Management Ordinance Revisions

There were two major revisions to the Floodplain and Erosion Hazard Management Ordinance (Ordinance) during this reporting period.

In 2005, the Ordinance was revised. Major amendments included the consideration of FEMA Zone Shaded X flood hazard areas and sheet flooding areas as regulatory floodplains, and a revision to the Riparian Classification Maps, which significantly expanded the acreage of riparian habitat subject to the preservation and mitigation requirements. The expansion resulted in the increase in regulated habitat from 26,250 acres to 87,270 acres.

In 2010, the Ordinance was revised to include a new process for compliance enforcement, provisions for regulating critical facilities, an expansion of the definition of what constitutes a floodway, and numerous technical corrections for clarity and consistency.

Technical Policies

During the reporting period, the Chief Engineer authorized numerous technical policies in order to clarify portions of the Ordinance that were ambiguous. These included addressing the applicability of certain analytic methodologies providing direction to ensure consistent and reproducible results of technical tasks and establishing performance and design standards based on the flood characteristics of a particular site. The table below lists those adopted during the reporting period. For those viewing the file electronically, the hotlinks have been retained.

**Table 1-2
Approved and effective Technical Policies**

Technical Policy Number	Name	Effective Date
TECH-003	Minimum Construction Standards for Manufactured Homes (AS)	1/5/09, Rev. 11/24/10
TECH-005	Minimum Requirements for Walls and Fences (BEJ)	11/5/07
TECH-006	Erosion Protection for Fill Pads (AS)	3/23/06, Rev 8/31/09
TECH-008	Minimum Standards for Security Barriers	6/8/06
TECH-009	Design of Landscaping in Basins and Channels	6/13/06
TECH-010	Rainfall Input for Hydrologic Modeling	3/15/07
TECH-011	Permitting Requirements for Accessory Structures (BEJ)	03/03/09
TECH-013	Regulation of Shaded Zone X Classifications (BEJ)	6/19/07, Rev. 12/30/09
TECH-014	Erosion Protection of Stem Wall Foundations (AS)	8/31/09

TECH-015	Acceptable Methods for Determining Peak Discharge (EC)	10/1/07
TECH-016	Hydraulic Model Selection for Floodplain Delineation (EC)	12/1/07
TECH-018	Acceptable Model Parameterization for Determining Peak Discharges (EC)	4/1/11, Rev. 11/16/12
TECH-021	Use of Flood Resistant Materials Below the RFE (BEJ)	3/3/08
TECH-022	Use of Flood Openings or Vents Below the RFE (BEJ)	11/02/09
TECH-023	Allowable Uses of Enclosed Areas with Flood Openings (BEJ)	11/02/09
TECH-027	Protective Measures for Private Vehicular Access (AS) (4 MB file)	5/25/11
TECH-029	Electrical Facilities That Are Considered "Critical Facilities"	12/30/10

Technical Procedures - For Uniform Implementation of Technical or Complex Tasks

Technical Policy Number	Name	Effective Date
TECH-101	Determining BFEs in AE, AH Zones, and other floodplains with detailed studies Base Flood Elevation Calculation Spreadsheet	1/25/06, Rev. 10/11/11
TECH-103	Establishing the Use of Covenants	6/19/07
TECH-106	Ordinance Determination of Applicability	1/25/06
TECH-108	Non-Conforming Use Guidelines	3/3/08
TECH-113	Completion of Elevation Certificates Please see also the following policy memo: Establishing a local datum for Elevation Certificates within Zone A Special Flood Hazard Areas and sheetflow floodplains (PDF format)	5/23/07
TECH-114	Content of Drainage Reports for PDD	11/1/07
TECH-115	Permitting within Regulatory Sheet Flood Areas	11/2/09

District Standards - To Standardize Work Products

District Standards	Name	Effective Date
DS-301	Field Data Collection and Processing Methods (DL)	5/12/2011
DS-302	Ground and Aerial Survey Standards (JS)	5/12/2011
DS-303	Computer Aided Drafting and Design Standards (DL)	5/12/2011

CRS Audit

In March 2005, a FEMA representative of the CRS performed Pima County's five-year audit. The audit is a routine part of the CRS voluntary incentive program, which rates communities participating in the NFIP. For CRS participating communities, flood insurance premium rates are discounted in increments of 5% (a Class 1 community would receive a 45% premium discount, while a Class 9 community would receive a 5% discount, whereas a Class 10 is not participating in the CRS and receives no discount). The

CRS classes for local communities are based on 18 creditable activities, organized under four categories: 1) Public Information, 2) Mapping and Regulations, 3) Flood Damage Reduction, and 4) Flood Preparedness.

During the prior reporting period, Pima County had been a Class 6 community, which is in the top 5% of all participating communities. In 2006, when the audit was completed, it reflected our efforts to increase community awareness and education regarding flood hazards and regulations by upgrading Pima County to a Class 5 community. This meant an additional 5% reduction in insurance rates for all property owners purchasing flood insurance. Currently, Pima County residents receive a 25% discount on flood insurance. Every year, Pima County seeks ways to improve its class rating.

Local Floodplain Mapping

Following the 2006 and 2007 floods, the District began an intensive effort to update floodplain maps for “canyon washes,” which are watercourses that are subject to increased risk of flood damage due to the floodplain being confined from natural or manmade features. This effort supplements broader mapping efforts for large alluvial basins such as the Lee Moore Wash Basin Management Study, which was also conducted during this program period. In 2007, the District conducted an internal Watershed Planning Study to identify needs for budgeting and workload planning purposes. It is our intention that the next Comprehensive Program Report be organized by watershed to better reflect this approach and to provide watershed specific policy and infrastructure guidance.

2.0 ABOUT THE FLOOD CONTROL DISTRICT

2.1 Formation of the District

The state of Arizona passed the Floodplain Management Act of 1973 to comply with federal law. This law authorized the formation of county flood control districts, and the adoption of floodplain areas. On June 5, 1978, the District was organized by the Pima County Board of Supervisors (Board), which also acts as the Board of Directors for the District.

Provisions of the enabling legislation allow incorporated cities and towns to assume responsibility for regulating floodplains within their respective jurisdictions. Accordingly, the City of Tucson and the towns of Oro Valley and Marana have assumed regulatory authority for floodplain management and regulation. The District is responsible for floodplain management throughout the rest of unincorporated Pima County, including the City of South Tucson. In 2006 the Town of Sahuarita adopted their own floodplain management ordinance and assumed floodplain management responsibilities. Lands within the boundaries of national forests, parks and monuments, and Indian Nations are outside of the District’s jurisdiction.

The brisk growth and development in Eastern Pima County has rapidly changed the jurisdictional demographics. In 1978 when the District was first formed, the City of Tucson, the City of South Tucson and the Town of Oro Valley were the only incorporated areas. Since then, the towns of Marana and Sahuarita have incorporated. Table 1-2 provides the current information on population and area with a comparison to the 2000 census data.

**Table 1-2
Population and Area Data for Jurisdictions in Pima County (Source Census/PAG)**

<u>Jurisdiction</u>	<u>Date of Incorporation</u>	<u>2000 Population</u>	<u>2005 Population</u>	<u>2010 Population</u>	<u>Percent Population</u>	<u>2007 Sq. Mi.</u>
Town of Marana	1977	13,556	26,725	34,961	3.5	118
Town of Oro Valley	1974	29,700	39,400	41,011	4.1	35
Town of Sahuarita	1994	3,242	13,990	25,259	2.5	30
City of South Tucson	1938	5,490	5,630	5,652	.6	1
City of Tucson	1877	486,699	529,770	520,116	52.4	400
Unincorporated	NA	305,059	342,120	353,264	35.6	8,789
Pascua Yaqui Tribe	NA			3,484	.4	1.87
Tohono O’odham Nation	NA			8,959	.9	4,341
TOTALS		834,746	957,635	992,706	100.0	13,716

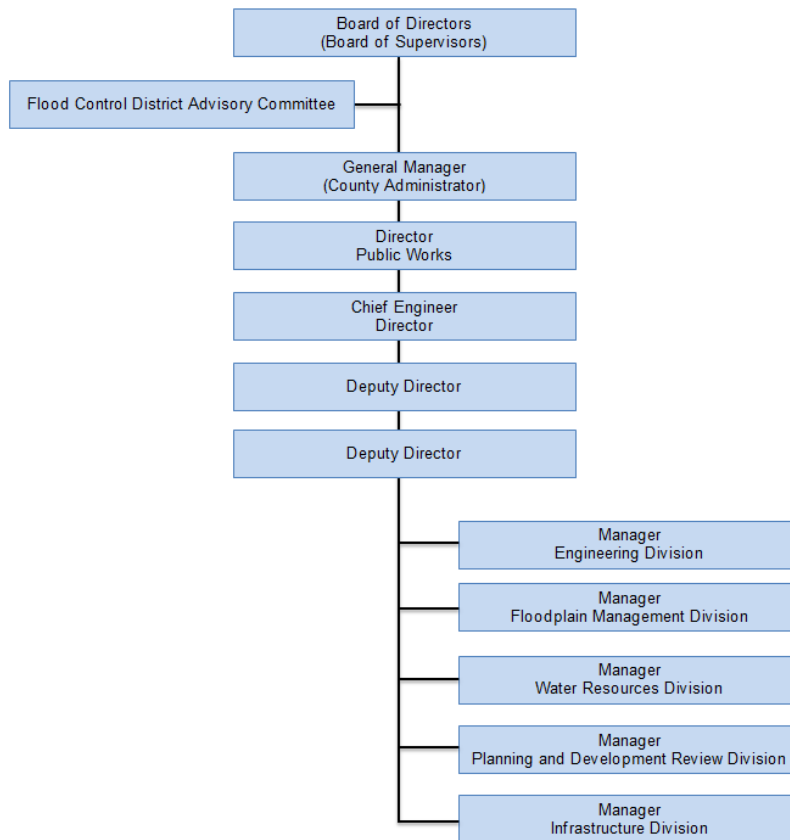
2.2 District Organization

In 2005, the District became an independent regional organization with its separation from the Pima County Department of Transportation and transition to the Pima County Regional Flood Control District. It is budgeted separately as a special taxing district. The District remains part of the Public Works Department. The department Director is the Chief Engineer for the District.

The District is organized by function, which includes five divisions: Engineering, Floodplain Management, Planning and Development, Infrastructure Management, and Water Resources (Figure 2). The strategy behind this reorganization was to better focus on current and future needs of the District in order to enhance customer service and improve flood safety for Pima County residents. The District receives substantial support from the Pima County Department of Transportation, which includes Administrative Support Services, Maintenance Operations, Field Engineering, Real Property, and Technical Services. Further assistance is received from other Pima County departments including Development Services, Environmental Quality, Graphic Services, and the Pima County Attorney’s Office. The District pays for services rendered by Pima County departments through interdepartmental fund transfers from the District to Pima County.

Although District employees are part of the Public Works Department, their positions are funded entirely by District revenues. In FY 2010/11, 60.8 full-time equivalent staff positions were funded. Due to vacancies, there are 54 full-time equivalent positions which is a decrease from 56 as of the last report.

As noted, the Board, sitting as the District’s Board of Directors, governs the District. The Board also hears requests for variances and appeals to the Ordinance. In 1988, the Board formed a 12-member advisory group, the Flood Control District Advisory Committee (FCDAC), to advise the Board on flood and erosion matters, and to increase public participation in the decision-making process. Five members are appointed by the Board (one for each Board member), three are appointed by the City of Tucson, and one each is appointed by the City of South Tucson, and the towns of Oro Valley, Marana and Sahuarita.



2.3 District’s Mission and Goals

Mission

The District’s mission is to protect the health, safety and welfare of Pima County residents by providing comprehensive flood protection programs and floodplain management services. These services emphasize fiscal responsibility, protection of natural resources, and a balanced, multi-objective approach to managing regional watercourses, floodplains and stormwater runoff.

Goals

The District’s goals are to:

- Meet or exceed federal and state requirements for floodplain management including those mandated for participation in the NFIP;
- Minimize flood and erosion damage by regulating development within areas subject to flooding or erosion;
- Minimize damage to public facilities and utilities such as water and gas mains, electric, telephone and sewer lines, and streets located in regulatory flood and erosion hazard areas;
- Encourage the most effective expenditures of public monies for flood protection;

- Maintain flood control facilities;
- Inform the public of floodplain and erosion hazards;
- Encourage the preservation of natural washes, and enhance riparian habitat;
- Protect, preserve and enhance groundwater recharge and water quality; and
- Minimize the need for rescue and relief efforts associated with large floods.

2.4 Regulatory Methods

Several regulatory tools are used to manage activities in flood and erosion hazard areas. These include the Pima County Code and Pima County and District policies and procedures including technical policies and design standards manuals. Ordinances and policies adopted by the Board have the highest regulatory authority. Procedures, technical policies and design standards manuals approved by the District’s Chief Engineer (Director) have the next highest level of authority. Finally, the District has completed several river and basin management studies that contain guidelines and recommendations for areas that experience or are expected to experience flood and/or erosion problems.

The main regulatory tool used by the District is Ordinance No. 2010-FC5, also referred to as Title 16 of the Pima County Code. The Ordinance was developed largely to satisfy minimum federal and state standards governing flood hazard areas, although it also contains numerous standards that are more restrictive than the minimum requirements.

Enforcement of the Ordinance enables Pima County to participate in the NFIP. Establishment of the NFIP was the main driving force behind the development of floodplain management programs across the nation. Programs and activities that go above and beyond the minimum requirements enable the District to participate in the NFIP’s CRS Program, which rewards communities by discounting the cost of flood insurance premiums.

Revisions to the Ordinance occur periodically. A decision by the District’s Board of Directors is required for adoption of amendments to the Ordinance.

The most recent amendment occurred in FY 2010/11, when the Ordinance was revised to modify procedures for compliance enforcement, augment the definition of “floodway” to include confined flow areas such as canyon washes and to establish higher standards for critical facilities.

3.0 STORMS AND FLOOD DAMAGE

3.1 Flood Hazard Seasonality: Two Rainy Seasons

In southeast Arizona, rainfall generally occurs during two rainy seasons known as the summer monsoon season and the winter rainy season. Precipitation patterns during each season are distinct.

Summer Storms

Early July typically marks the official start of the monsoon season, which constitutes the first three consecutive days when the dew point averages 54 or higher. In the spring of 2000, the Tucson office of

the National Weather Service (NWS) declared that the monsoon season would occur from June 15th through September 30th. However, the actual start date of the monsoon season occurs only when the dew point criterion is satisfied.

Summer convective rain occurs when there is an influx of moisture from the Gulf of Mexico, areas to the south in Mexico, the Gulf of California, or the Pacific Ocean. When this moist air is exposed to intense surface heating, it rises resulting in cloud formation and rainfall. Summer storms tend to be short and intense, giving rise to the terms “flashy” and flash flooding.

Winter Storms

Winter storms occur when large-scale fronts from the Pacific Ocean pass through. These can be warmer, subtropical systems, which result in rainfall across the area. They can also be cold fronts, which are shifted further south than usual causing snow over the mountains and rain in lower elevations. Winter storms are of longer duration and lower intensity than summer storms. (Hydroclimatological and Paleohydrological Context of Extreme Winter Flooding in Arizona, 1993, Arizona Geological Survey Open-File Report 95-12, House and Hirschboeck, October 1995).

El Niño/La Niña Episodes

Information in this section was obtained from the U.S. Department of Commerce, National Oceanic and Atmospheric Administration (NOAA) website: <http://www.ogp.noaa.gov/enso/>, and the National Weather Service, Tucson website: <http://nimbo.wrh.noaa.gov/Tucson/twc.html> .

- In the early 1990s, El Niño became a household word across the U.S. El Niño is typically viewed as the warm phase of the El Niño – Southern Oscillation (ENSO) System. It is characterized by a weakening of the western trade winds, a warming of sea surface temperatures in the eastern and central equatorial Pacific Ocean, high atmospheric sea level pressures in the western tropical Pacific and Indian oceans, and low sea level pressures in the southeast tropical Pacific Ocean.
- El Niño episodes are accompanied by swings in the Southern Oscillation, which is an inter-annual seesaw in tropical sea level pressures in the southeast tropical Pacific Ocean. El Niño episodes, which occur at intervals of 2-7 years and may last 12-18 months, have global consequences. They result in shifts in tropical rainfall, which affect wind patterns worldwide. This affects the position of monsoons, the jet stream, and storm tracks, which separate warm and cold regions of the earth. The result is unseasonable weather over many areas. Increased understanding of ENSO patterns enables more accurate global and regional climate predictions.
- In Arizona, a strong El Niño episode may result in increased frequency of above-normal precipitation over the state during December through March. It also may result in cooler than normal temperatures during February through April.
- The strong El Niño episode lasting from November 1997 through April 1998 was similar to the conditions in the episode in 1982/83, which was the strongest El Niño of the century. Locally, stories on television and in the newspapers publicized the strength of the El Niño, and raised the possibility of heavy rains and flooding. Although no major flooding occurred, there were

several significant storms during that winter rainy season, and the public's awareness of its effects was heightened.

- La Niña is thought of as the cold phase of the ENSO swings. It is characterized by conditions opposite those of El Niño in the U.S., and its impacts are more clearly seen in winter. In southeast Arizona, effects of La Niña include dryer than normal winters and above average temperatures.
- Local weather patterns of 1999 were strongly influenced by La Niña. The winter of 1998/99 was the fourth driest winter on record followed by the winter of 1999/00. The driest winter on record occurred in 1903/04. In contrast, the summer of 1999 brought a wet monsoon season with 80% of the annual rainfall occurring during the this time, receiving 56% of the annual rainfall in just five days.

3.2 Brief Overview of Historical Flooding

Historical records of flooding in the Tucson area date back to the late 1800s. As one would expect, the frequency of reports of flood damage and loss increased over time as the population of the metropolitan area grew. By the late 1970s, the population in Pima County had grown to almost 500,000. By 2000, that number had risen to nearly 850,000.

When the District was formed in June 1978, the greater Tucson area had recently experienced two presidentially-declared flood disasters, with a third about to take place. It was a busy time for a fledgling flood control agency. During the 16-year period from July 1, 1977 to July 1, 1993, the Tucson area experienced six presidentially-declared flood disasters: October 1977, March 1978, December 1978, October 1983, July 1990, and January 1993. A disaster was also declared during the Aspen Fire in 2003, and in 2006 after severe flooding was exacerbated by the changed watershed conditions due to the Aspen Fire.

October 1983 Flood

The October 1983 flood was the largest flood of record in the Tucson area. In an unusual occurrence, between 6½ to 7½ inches of rain fell across the Tucson basin over a five-day period. Flood and erosion damage was greatest along the Santa Cruz River, with extensive damage incurred on Rillito Creek, Tanque Verde Creek, and Pantano Wash. Damage to public infrastructure was estimated at \$64 million, and four people died in flood related incidents. Due to the magnitude and extent of flooding and related damage, this flood is the one to which subsequent floods have been compared.

January 1993 Flood

During a 14-day period in 1993, January 5th through the 19th, significant rain fell over most of central and southeast Arizona, resulting in flooding along most major watercourses. This flooding was noteworthy for three reasons: 1) although these were the most damaging floods to occur in almost 10 years, no lives were lost and no residential and commercial structures were destroyed, with the exception of some horse barns associated with a businesses along Rillito Creek; 2) the high water levels in the streams lasted almost two weeks, rather than the typical few days; and 3)

according to the U.S. Geological Survey, record-setting volumes of floodwater were discharged along Rillito Creek.

Estimates of damage to public transportation and drainage infrastructure for unincorporated Pima County, the City of Tucson, and the Town of Marana included \$3.4 million in emergency repairs and \$13.9 million for long-term improvements. This compares to an estimate of \$105.7 million in repairs and improvements after the 1983 flood.

By the end of calendar year 1996, flood repairs and improvements initiated in response to the 1993 flood were largely completed. A detailed description of the January 1993 flooding can be found in the January 1993 Floods, Pima County, Arizona, Summary Report (Pima County Flood Control District, July 1993).

RECENT STORMS AND FLOODING

July 2006

The 2006 summer monsoon season turned out to be a record year for rainfall and stream flow in eastern Pima County. The total rainfall received in June, July, and August was 8.6 inches at the Tucson International Airport. This rainfall total is 2 inches above the average rainfall for the same time period.

Rainfall in mid-July created saturated soil conditions in the upper watersheds, especially the Rillito-Tanque Verde-Pantano watershed. In late July, moisture from Tropical Storm Emilia created a period of intense rainfall in eastern Pima County starting on July 27 and ending on July 31, 2006. During this five-day period, rainfall totals ranged between five to 11 inches in the Catalina and Rincon mountains and from one to six inches in the valley, with many locations receiving over 50% of their average annual rainfall.

During this event residential areas were flooded when the Rillito Creek, Rincon Creek, Sabino Creek and many small washes in the Santa Catalina foothills exceeded their capacity. Rain gauges and Doppler radar indicated rainfall amounts of one to two inches in the Tucson valley and up to four to six inches in the mountains during a seven-hour period. The highest intensity measured by an Automated Local Evaluation in Real Time (ALERT) gauge was 2.32 inches in one hour. Stream flow on the Rillito Creek at Dodge Boulevard was the highest flow since measurement began in 1988. The maximum depth at this location was approximately 11.5 feet with a discharge of approximately 39,000 cubic feet per second, exceeding the regulatory 100-year flood peak discharge.

During these storm events, information provided by the ALERT system aided the NWS and emergency teams with their decisions to warn the public of potential flooding. It also aided in their response to emergency situations where people and infrastructure were in danger from the rising floodwaters.

Saturated conditions increased so that each successive day of rainfall increased the amount of runoff. Consequently, by July 31, 2006 over 90% of the rainfall on the Catalina Mountains resulted in runoff. Rainfall on the morning of July 31, 2006 was especially intense over the Tanque Verde Creek Watershed where four to six inches of rainfall occurred between midnight and 7:00 a.m. The NWS estimates that the four-day rainfall event was a 1,000-year event.

The U.S. Geological Survey's (USGS) estimate of the flood peak in the Rillito River is 38,700 cubic feet per second (cfs) and the flood peak on the Santa Cruz River at Continental is 42,000 cfs. By comparison, FEMA's estimate for the 100-year flood on the Rillito River is 32,000 cfs, and the 50-year flood on the Santa Cruz River is 48,000 cfs. The USGS estimates that the flood on the Rillito exceeded the 500-year event.

Flows in many of the mountain front washes exceeded the 100-year event. The most intense flood damage occurred in the Tanque Verde Creek Watershed including Sabino Canyon and other washes along the southern Catalina Mountains where heavy rains on the weekend of July 27 to July 31, 2006 deposited 6.97 to 10.28 inches of rain. For example, the predicted 100-year peak discharge for Bear Canyon Wash is 1,940 cfs and the estimate discharge during the July 31st storm was 2,400 cfs. The 15,700 cfs discharge at Sabino Canyon was estimated to be about a 200-year flood event. A summary of peak discharges is provided in the table below.

**Table 3-1
Table of Discharge Estimates**

Gaging Station Name	Years of Record	Previous Flood Record (cfs)	Date of Previous Record Flood	New Flood of record (cfs) 2006	Recurrence Interval (yrs)
Rincon Creek Near Tucson (09485000)	54	9670	1971	15000	100
Pantano Wash at Tucson (09485450)	28	11000	1983	15900	<50
Sabino Creek near Tucson (0984000)	75	14100	1999	15700	Approx.200
Bear Creek near Tucson (0984200)	16	1400	1978	2400	>100
Tanque Verde Creek at Tucson (09484500)	39	24500	1993	26600	>500
Rillito Creek near Tucson (combined Record)	86	29700	1983	38700	>500

While flood damages were relatively light given the magnitude of the storms and floods, there were some areas where there were significant damages caused by floodwaters and, in some cases, debris flows, including:

- Flooding of 35 residential structures; the most severely damaged were along Rincon Creek;
- Debris flows and rockslides that damaged the Sabino Canyon recreation area, Catalina Highway and Mt. Lemmon Short Road;
- Erosion damage and eight feet of channel bed lowering along the Pantano Wash downstream of Speedway Boulevard; and
- Significant accumulation of sediment and debris in the Rillito River that in one case backed up local drainage into the adjacent Lazy Creek subdivision.

The most unique features of the storms and flooding were the debris flows along the southern Santa Catalina Mountains. The USGS has identified over 435 slope failures and debris flows which occurred in the Santa Catalina Mountains between Esperero Canyon and Soldier Canyon. The Sabino Canyon recreational area was impacted by 36 debris flows. The USGS classified the storm and subsequent debris

flows as an extreme event. The USGS estimates that this magnitude of debris flow activity has not taken place in the Santa Catalina Mountains for at least 2,000 years. In the Sabino Canyon recreational area, the Rattlesnake Canyon debris flow traveled more than two miles downstream to the Sabino Creek. The Soldier Canyon debris flow damaged the Catalina Highway at Milepost 1, the Mount Lemmon Short Road, and some of the surrounding homes.

After the July 2006 flood event, FEMA approved funding for emergency work and repair projects totaling \$8 million for the Santa Cruz River, Rillito River and Pantano Wash. By the end of the reporting period, \$5,325,371 in emergency work was completed to re-establish the flood carrying capacity and stabilize areas eroded during the flood.

The completed emergency repair work includes:

- Debris removal along the Rillito and Santa Cruz River bridges;
- Rillito River sediment removal to restore channel capacity on the Rillito River from I-10 to La Cholla Boulevard and Country Club Road to Alvernon Way;
- Emergency erosion protection on the Pantano Wash upstream of Speedway Boulevard along the Kolb Executive Park, Pantano Townhomes and Mullins Landfill;
- Rillito River at the Campbell Avenue bank protection repair; and
- Tributary repair work for Alvernon Wash at the Rillito River, Lazy Creek at the Rillito River and Nebraska Wash at the Pantano Wash.

The remaining flood repair work includes permanent improvements and erosion control on the Pantano Wash upstream of Speedway Boulevard and repairs along the Santa Cruz River— Continental Ranch Low Flow Channel.

July 30, 2010 Tanque Verde Flood Event

Heavy rain in the Tanque Verde Creek watershed on July 30th caused a flash flood late that night in which Tanque Verde Creek flowed out of the main channel and onto the north overbank, where it flooded approximately two dozen homes in the Forty Niner's Country Club Estates neighborhood and caused other property damage. According to the District's ALERT system precipitation gauges, the total rainfall throughout the upper Tanque Verde watershed during this storm event ranged from 1.26 inches to 3.90 inches with rainfall intensity of up to 3.23 inches/hour were reported in portions of the watershed. Based on observations of the extent of flooding at Forty Niner's, the estimated discharge at the peak of the flood was 12,000 cfs, which is similar to what would be expected during a 25-year flood. The high intensity of the storm over a relatively short duration caused the flood waters to rise and fall quickly, catching many by surprise. A relatively short duration storm also resulted in a flood wave which attenuated as it flowed, resulting in a peak discharge that was approximately 22,000 cfs at Tanque Verde Guest Ranch which is considerably higher than the 12,000 cfs estimated at Forty Niners. The flow was measured to be 45,000 cfs at Sabino Canyon Road.

Even though many homes avoided damage from the flood, sometimes by just a few inches or less, it is important to note that neither the peak discharge nor flood volume of this flood was as high as the anticipated base flood, often called the regulatory flood or 100-year flood, and many homes that were not flooded during this event are expected to be flooded by the base flood.

4.0 FLOOD CONTROL DISTRICT FUNDING

Several methods are used to fund the operation and administration of the District. Revenue sources include a secondary tax levy on real property, general obligation bonds, District bonds, federal and state assistance, developer participation, earned interest income, and miscellaneous revenues. Expenditures include the operating budget (including maintenance activities), the District’s Capital Improvement Program (CIP), and debt service on the bond programs.

This chapter focuses primarily on District finances for FY 2006/07 through 2010/11. Detailed information for previous years can be found in the Flood Control District Comprehensive Program, December 1990, the Pima County Comprehensive Program Report, FY 1990/91 – FY 1995/96, the Pima County Regional Flood Control District Comprehensive Program Report FY 1995/96 – FY 2000/01, and the Comprehensive Program Report FY 2000/01 – 2005/06.

Table 4-1 summarizes revenues and expenditures for the five-year reporting period.

**Table 4-1
Revenues and Expenditures**

Revenues	2006/07	2007/08	2008/09	2009/10	2010/11	Total
FCD Property Tax	\$22,600,000	\$25,300,000	\$25,200,000	\$23,200,000	\$22,200,000	\$118,500,000
Federal Participation	\$ 1,756,203	\$919,982	\$580,329	\$ 40,000	\$ 10,000	\$ 3,306,516
Bond Proceeds	\$ 7,200,000	\$6,900,000	\$6,400,000	\$ 2,700,000	\$ 3,900,000	\$ 27,100,000
Interest Income	\$ 262,725	\$144,884	\$101,280	\$ 35,000	\$ 35,000	\$ 578,989
City Participation	\$ -269,811	\$0	\$0	\$ 0	\$ 0	\$ -269,811
State Participation	\$ 0	\$0	\$0	\$ 4,092	\$ 0	\$ 4,092
Miscellaneous	\$ 387,470	\$0	\$0	\$ 0	\$ 401,731	\$ 789,201
Total Revenues	\$31,936,587	\$33,264,866	\$32,281,609	\$25,979,092	\$26,546,731	\$150,008,985

Expenditures	2006/07	2007/08	2008/09	2009/10	2010/11	Total
Capital Improvements	\$18,826,633	\$23,284,790	\$17,997,300	\$12,306,300	\$ 8,076,500	\$ 80,491,523
Operating Budget	\$14,325,106	\$14,698,771	\$11,051,110	\$10,443,724	\$12,227,360	\$ 62,746,071
PAG	\$ 30,266	\$ 30,266	\$ 30,266	\$ 30,266	\$ 30,266	\$ 151,330
GL Adjustment	\$ 0	\$ 0	\$ 0	\$ 0	\$ 0	\$ 0
Debt Services	\$ 851,395	\$ 807,995	\$ 757,450	\$ 0	\$ 0	\$ 2,416,840
Total Expenditures	\$34,033,400	\$38,821,822	\$29,836,126	\$22,780,290	\$20,334,126	\$145,805,754

4.1 Flood Control District Tax Levy

In April 1978, state legislation authorized the formation of county flood control districts, and provided districts with the authority to levy taxes on real property to pay for administering, constructing and

maintaining flood control systems within each district. The District became operational on July 1, 1978 with the adoption of the first budget for FY 1978/79 and assessment of the Districts tax levy.

Table 4-2 shows the annual valuation, tax rate, tax levy and proceeds for the period FY 2006/07 through FY 2010/11.

**Table 4-2
Flood Control District Tax Levy Rate FY 2006/07 through FY 2010/11**

Fiscal Year	Levy Rate*	Tax Revenue**
2006/2007	0.3735	\$22.6
2007/2008	0.3435	\$25.3
2008/2009	0.2935	\$25.2
2009/2010	0.2635	\$23.2
2010/2011	0.2635	\$22.2

*Per \$100 assessed valuation ** Un-audited dollar amount in millions

Five incorporated municipalities contribute to the Tax Revenue. The following table shows the data and percentage figures for FY 2010/11, broken down by contributor.

**Table 4-3
Flood Control District Tax Contributions by Jurisdiction**

FY 2010/11		
Jurisdiction	FCD Tax \$ Due	Percent
Unincorporated Pima County	\$ 9,540,244	42.45%
City of Tucson	\$ 9,354,209	41.62%
City of South Tucson	\$ 61,251	0.27%
Town of Oro Valley	\$ 1,706,642	7.59%
Town of Marana	\$ 1,270,140	5.65%
Town of Sahuarita	\$ 541,822	2.41%
Total	\$22,474,309	100.00%

4.2 Bonds

On May 20, 1997, Pima County held a special bond election that included funding for specific flood control projects. Its passage enabled the issuance and sale of general obligation bonds, in an amount not to exceed \$21.5 million, to be used for flood control improvements. 1997 Bond projects and funding amounts are shown in Table 4-4. On May 6, 2004, additional flood control bonds were approved and are shown in Table 4-5.

**Table 4-4
May 20, 1997 Bond Projects resulting from Special Bond Election**

Project	Bond Funding
FC-01 Santa Cruz River Bank Stabilization - Grant Rd. to Ft. Lowell Alignment	\$3,500,000
FC-02 Santa Cruz River Bank Stabilization- Valencia Road to Irvington Road	\$4,000,000
FC-03 Lower Santa Cruz River Levee - I-10 to Sanders Road	\$6,000,000
FC-04 Detention/Retention Basin - Mission View Wash	\$1,000,000
FC-05 Urban Drainage Improvements (Earp Wash Detention Basin) - City of Tucson	\$2,000,000
FC-06 Urban Drainage Improvements – City of South Tucson	\$900,000
FC-07 Urban Drainage Improvements - Town of Sahuarita	\$ 500,000
FC-08 Urban Drainage Improvements - Town of Oro Valley	\$ 350,000
FC-09 Drainageway Improvements - Green Valley Drainageway #9	\$ 1,000,000
FC-10 Drainageway Improvements - Continental Vistas, Green Valley	\$ 250,000
FC-11 Fourth Avenue Drainage - Improvements City of South Tucson	\$ 500,000
FC-12 Urban Drainage Improvements - Fairview Ave. and Limberlost Dr.	\$ 500,000
FC-13 Drainage Improvements - Holladay Street and Forrest Avenue	\$ 500,000
FC-14 Drainage Improvements - Tucson Diversion Channel	\$ 500,000
TOTAL	\$21,500,000

**Table 4-5
2004 Bond Projects Resulting from Special Bond Election**

Project	Bond Funding
FC5.01 Floodprone Land Acquisition Program	\$ 5,000,000
FC5.02 Pima County Urban Drainage:	\$ 8,250,000
Littletown Urban Drainage	\$ 250,000
Tanque Verde Creek Lakes of Castle Rock Erosion Protection	\$ 170,000
Green Valley Erosion Control	\$ 1,400,000
FC5.03City of South Tucson Urban Drainage	\$ 1,700,000
FC5.04 Tohono O’odham Nation Urban Drainage	\$ 1,500,000
FC5.05 Pascua Yaqui Tribe Black Wash Flood Control	\$ 1,000,000
FC5.06 Santa Cruz River, Ajo to 29 th Street	\$14,000,000
FC5.07 Santa Cruz River, Grant to Camino del Cerro River Park	\$ 2,700,000
FC5.08 Rillito River Linear Park Alvernon to Craycroft	\$ 3,000,000
FC5.09 Santa Cruz River in vicinity of Continental Ranch	\$ 4,000,000
FC5.10 Cañada del Oro River Park, Thorneydale to Magee	\$ 5,000,000
TOTAL	\$47,970,000

4.3 Federal Assistance

The District aggressively seeks partnerships with other local, state and federal agencies such as the U.S. Army Corps of Engineers (USACOE) to provide funding for capital flood control infrastructure. Between FY 1995-96 and 2000-01, the District received \$1,185,000 in state funding from the Arizona Department of Water Resources (ADWR) and the Arizona Water Protection Fund (AWPF). During the prior reporting period (2001-2005), the District secured \$4,500,000 in federal funding from the Natural Resources and Conservation Services for the construction of Bond Project FC-01: Santa Cruz River Bank Stabilization, Grant Road to Ft. Lowell Road. Table 4-6 provides a summary of federal assistance received by the District during this reporting period. The data shows that federal funding focused on Pantano Wash due to the damage incurred during the 2006 flood.

**Table 4-6
Federal Funding Assistance**

Project Name	Funding Source	FY 2006/07	FY 2007/08	FY 2008/09	FY 2009/10	FY 2010/11	Total
Arroyo Chico	Federal Aid	\$9,380,000	\$ 0	\$ 9,868,00	\$ 400,000	\$5,000,000	\$24,648,000
Cañada del Oro Flood Hazard Mitigation Project (FEMA Grant)	Federal Aid	\$ 87,421	\$385,321	N/A	N/A	N/A	\$ 472,742
Cienega-Empirita Restoration (FLAP)	Federal Aid	\$ 12,998	N/A	N/A	N/A	N/A	\$ 12,998
FC-01 Santa Cruz River: Grant Road to Ft Lowell Road	Federal Aid	\$ 6,511	N/A	N/A	N/A	N/A	\$ 6,511
Pantano Wash: Kolb Executive Park Bank Protection	Federal Aid	N/A	N/A	N/A	\$ 494,375	\$34,810	\$ 529,185
Pantano Wash: Mullins Landfill Bank Protection	Federal Aid	N/A	N/A	N/A	\$ 357,906	\$38,191	\$ 396,097
Pantano Wash: Pantano Townhomes Bank Protection	Federal Aid	N/A	N/A	N/A	\$ 470,039	\$ 3,306	\$ 473,345
Pantano Wash: Speedway to Tanque Verde	Federal Aid	N/A	\$ 55,778	N/A	N/A	N/A	\$ 55,778
	Total Federal Aid	\$9,486,930	\$441,099	\$ 9,868,000	\$ 1722,320	\$5,076,307	\$26,594,656
	Total Other Funding	\$ 89,020	\$139,663	\$ 669,806	\$,434,173	\$1,043,398	\$ 3,096,734
	Grand Total Funding	\$9,575,950	\$580,762	\$10,537,806	\$3,156,493	\$6,119,705	\$29,691,390

The remainder of the CIP that is tax funded is described in Section 6.

5.0 FLOODPLAIN MANAGEMENT PROGRAM

5.1 Overview of Nonstructural Program Activities

This program consists of activities intended to: a) prevent existing flooding and erosion problems from getting worse, and b) prevent the creation of new flooding and erosion problems by means other than constructing structural flood control improvements. To accomplish these goals, the District administers several floodplain management programs that reduce the amount of flood and erosion loss in the community through nonstructural methods. The most important of these is FEMA's NFIP. FEMA designates specific areas as Special Flood Hazard Areas (SFHAs). To participate in the NFIP a community must, at a minimum, enforce FEMA regulations governing activities permitted in SFHAs. Section 5.2 provides more information about the NFIP.

The District also regulates activities in flood and erosion hazard areas identified in accordance with the Ordinance. Although some of these areas have not been mapped by FEMA, they are at risk of flooding and/or erosion. Activities undertaken in any identified flood or erosion hazard area must satisfy the provisions of the Ordinance (see Section 5.3).

In addition to the above, other nonstructural floodplain management program activities include providing flood hazard status information to the public; administering the FPUP program; investigating and responding to drainage complaints; issuing floodplain violation notices; generating reports and studies for specific floodprone areas; administering the FLAP; operating the flood warning system; participating in emergency response and flood preparedness activities; upgrading photographic and topographic mapping; and developing educational programs for the general public, including maintaining and upgrading the District's website. These activities are discussed in more detail in Sections 5.3 through 5.9.

5.2 National Flood Insurance Program

5.2.1 Purpose of the National Flood Insurance Program

Congress established the NFIP in 1968, to provide an insurance alternative to disaster assistance. In exchange for communities assuming responsibility for managing floodplains in accordance with the NFIP, the federal government acting through FEMA makes flood insurance available and provides disaster assistance following presidentially-declared floods.

The establishment of the NFIP transferred floodplain management responsibility from the federal to the local level, and the cost of flood loss from the general taxpayer to the floodplain occupant (FEMA, 1986; Bond, 1987).

The community benefits of participating in the NFIP include the availability of: 1) federally-sponsored flood insurance programs; 2) disaster assistance, including monies for the permanent repair or reconstruction of insurable buildings in special flood hazard area, and relocation monies; and 3) federally-insured loans, such as FHA, VA, and SBA. Flood insurance is required to finance the purchase

of an inhabitable structure located in a flood hazard area with a federally insured loan. It is recommended in all other areas and is available to owners and occupants.

5.2.2 Flood Insurance Studies and Rate Maps

The District works in conjunction with FEMA under the Flood Insurance Study program (FIS) to identify floodprone areas. A key work product of this effort is a set of official maps called Flood Insurance Rate Maps (FIRMs). They are known as FIRM panels and show SFHAs and other relevant hydrological information. Federal, state, and local floodplain management regulations apply to development and other activities that take place in designated SFHAs.

FIRMs have been prepared for most of the major watercourses and many of the smaller watercourses within Pima County. These panels are updated periodically when structural improvements are implemented or when floodplain characteristics are altered due to modifications to channel geometry, or by other new characteristics. The Floodplain Management Section is the local repository for the FIRMs.

Traditionally, these FIRM panels have been produced on paper 25" x 29" wide at 1" = 1000' scale. In FY 1995/96, taking advantage of available digital technology, the Pima County Technical Services Division developed a customized ArcView application utilizing a Geographic Information System (GIS) for use by the Floodplain Management Section. The GIS layer consisted of FIRM SFHA information, hand digitized by Technical Services staff. Labeled the Parcel Query System, it was used by Floodplain Management to promptly confirm the regulatory floodplain status of specific parcels. Once a parcel was located, a paper map of the parcel containing the selected information was generated. Due to the potential error within the hand-digitized FIRM panels, an overlay of the computer-generated map onto the official paper FIRM panel was required in order to verify the regulatory FEMA floodplain limits.

A significant milestone occurred in FY 2010/11 when FEMA re-issued the FIRMs for Pima County. During this process, FEMA identified an issue associated with levees and structures that behaved like levees even though they were not designed to perform like a levee. This issue resulted in the District certifying 6 structures as levees. Other structures, including the Central Arizona Project and the Interstate were not considered levees, even though they act as levees. Significant re-delineation of the floodplain results from this issue. Aside from the levee issue, Pima County was able to use the re-mapping effort to make technical corrections to the FIRMs in many locations throughout Pima County, resulting in a much more precise floodplain that better represents the true flood hazards. The digital FIRM (D-FIRM) data has been integrated into the county's GIS and is used by District staff in such tasks as providing flood status determinations, performing site reviews, and issuing FPUPs.

5.2.3 Revisions to Flood Insurance Rate Maps

The FIRMs necessitate periodic revision, either due to the availability of more accurate data, new development, construction of structural flood control projects, or occurrence of floods that cause dramatic changes in floodplain topography. Changes to the effective FIRMs can be accomplished as a physical map revision, whereby the affected map panels are republished, or a Letter of Map Revision (LOMR), whereby a letter is issued with an attached figure showing the changes.

Changes can also be requested on a parcel basis if a parcel or structure was incorrectly included in an SFHA (i.e., if a small topographic high point didn't show up), and the parcel is actually elevated above the 100-year water surface elevation. In this case, a Letter of Map Amendment (LOMA) may be issued to officially amend the effective NFIP map panel.

The District typically funds the cost of LOMRs for District flood control improvement projects. The private sector is responsible for completing the necessary paperwork to obtain LOMRs for private improvement projects that result in changes to FEMA SFHAs. At the request of property owners, the District generally files LOMAs. See Appendices A and B for a listing of LOMR and LOMA activity within unincorporated Pima County over the past five fiscal years.

5.2.4 Community Rating System Program

In 1990, to provide added incentive for communities to reduce flood loss and to encourage individuals in SFHAs to purchase flood insurance, FEMA introduced the Community Rating System Program (CRS). Although the NFIP regulates new construction in flood hazard areas, there was little incentive to reduce flood damage to existing buildings located in flood hazard areas, manage development in flood hazard areas not mapped by the NFIP, protect new development to a level greater than the minimum NFIP standards, or promote the purchase of flood insurance.

The CRS enables communities to earn points for undertaking various flood control and floodplain management activities that are above and beyond the minimum NFIP requirements. Several Pima County divisions undertake the various activities that must be documented and are coordinated by the District. Annual re-certification is required. If sufficient points are earned, residents of the submitting jurisdiction are eligible for discounts in flood insurance premiums.

Since the CRS program's inception, the District's involvement has resulted in reduced insurance premiums paid by Pima County residents each year. Every community participating in the nationwide program starts as a Class 10, and then gains CRS activity points to improve their class designation to a Class 1. Each designation improvement amounts to a 5% reduction in flood insurance rates. In 2007, Pima County had achieved a Class 5 rating resulting in a 25% annual reduction in insurance rates within SFHAs and 10% in other areas.

Repetitive Loss Area Planning

While Pima County has few properties classified as Repetitive Loss Properties by FEMA, CRS provides points for those communities focusing planning efforts on those additional properties that may have been impacted by the flood that created the repetitive loss. Pima County has two such areas.

RLA1 Tanque Verde Creek at Forty Niners Country Club

These properties are located within the Forty Niners Country Club Estates subdivision which is located along the north bank of the Tanque Verde Creek in the northeastern portion of the Tucson Metropolitan area. The Tanque Verde Creek and local tributaries are the source of flooding for this area.

This subdivision was the subject of extensive study by the USACOE in cooperation with the District during previous reporting periods. The results of the USACOE study was the recommendation that a levee be constructed along the north bank of the Tanque Verde Creek between the creek and the homes within the subdivision to eliminate flooding from the Tanque Verde Creek. The plan also included improvements to local interior drainage within the subdivision. After public meetings were held with area residents, the proposed plan was determined to be unacceptable to the public due to aesthetic considerations and the plan was discontinued due to public pressure against it. However, improvements to the local interior drainage of the subdivision were made which reduced flooding potential from those sources.

12150 East Barbary Coast

This property had losses due to flooding on 1983, 1984, 1990 and 2010. In each case flooding was due to local drainage and overbank flooding from the Tanque Verde Creek associated with monsoon weather patterns. This home is located within FEMA SFHA Zone AE and the floodway. Solutions to the prior flooding identified by the District and USACOE have been rejected by the homeowners association.

12140 East Barbary Coast

This property had losses due to flooding on 1978, 1983, 1984, and 2010. In each case flooding was due to local drainage and overbank flooding from the Tanque Verde Creek associated with monsoon weather patterns. This home is located within FEMA SFHA Zone AE and the floodway. Solutions to the prior flooding identified by the District and USACOE have been rejected by the homeowners association.

RLA2 3720 North Camino Seco

This home was constructed prior to local adoption of floodplain requirements and is therefore uniquely situated. This property had losses due to flooding on July 14, 1990 and again on January 8, 1993. In 1990, the flooding was due to local drainage flooding from Bear Canyon Wash associated with monsoon weather patterns. In 1993, as suggested by the date, flooding was due to unusually heavy winter rains over a period of several days. This home is located within FEMA SFHA Zone AE and is immediately adjacent to or partly within the floodway. The FLAP program is available should this property owner wish to sell. Local requirements limit further development of this property. Similar floods are not expected to impact permitted properties.

5.3 District’s Floodplain Management Regulations

5.3.1 Floodplain and Erosion Hazard Management Ordinance

Activities and developments in the regulatory floodplain are regulated in accordance with the Floodplain and Erosion Hazard Management Ordinance (Ordinance) within unincorporated Pima County. The Ordinance defines regulatory floodplains; assigns responsibility for maintaining updated floodplain maps to the District; specifies uses allowed in floodways and floodplains, building setbacks in erosion hazard areas, when and what type of mitigation is required for disturbing riparian habitat, and standards for manufactured home park and subdivision development; and provides a formalized process for appealing decisions made regarding floodplain matters, and obtaining a variance from the Ordinance.

Administering the Ordinance accomplishes two goals: 1) satisfies FEMA FIS requirements governing activities in federally-mapped flood hazard area; and 2) addresses local issues by regulating activities in locally-designated regulatory flood and erosion hazard areas. Provisions of the Ordinance are more restrictive than the minimum required by the NFIP.

5.3.2 Floodplain Use Permit Program

As specified in the Ordinance, a Floodplain Use Permit (FPUP) must be obtained prior to development in a designated flood or erosion hazard area. “Development” is defined as “any manmade change to improved or unimproved real estates including, but not limited to, buildings or other structures, mining, dredging, filling, grading, paving, fencing, excavating or drilling.” The Ordinance further states that, “...no person shall be exempted from obtaining a FPUP...for any use which diverts, retards or obstructs the flow of water and creates a danger or hazard to life or property in the area.” In essence, the Ordinance restricts uses in the regulatory floodplain and erosion hazard areas.

The most restricted area is the “floodway”, an area that should be kept undeveloped to allow for the passage of the base flood. Structures and most other developments are prohibited in this area. Allowable floodway uses include agricultural, recreational, and accessory residential uses. Sand and gravel excavations are allowed subject to the conditions stated in the Ordinance. FPUPs for sand and gravel operations must be renewed annually.

Most uses are allowed in the floodway fringe (the portion of the regulatory floodplain outside of the floodway), including the placement of buildings, although they are subject to minimum design and construction standards. For any structure designed for human habitation, the quantity (dv^2 or depth times the square of the velocity) must not exceed the value of 18 for more than 30 minutes, and the depth of the surrounding 100-year floodwater must not exceed three feet. In addition, the finished floor elevation must be at least one foot above the water surface elevation of the base flood. Other regulations govern the design of the foundation, the amount and type of any fill used, and measures for protecting the fill; anchoring structures to prevent flotation; locating or flood-proofing service facilities such as electrical and heating; and aligning structures relative to the direction of flow.

The Ordinance also specifies building setbacks from watercourses where approved bank stabilization is not provided in order to allow for the natural lateral migration of the watercourse. The setback marks the edge of the erosion hazard area; it is measured from the top edge of the highest channel bank or the edge of the base floodwater surface elevation, whichever is closer to the channel centerline. Setback distances are based on the magnitude of the 100-year discharge. Provisions are made for considering alternative safe setbacks on a case-by-case basis when justified by a site specific engineering analysis.

5.3.3 Appeals and Variances

In addition to specifying what types of activities and development are allowed in flood and erosion hazard areas, the Ordinance provides a mechanism for appealing any interpretation of the Ordinance, and a process for obtaining a variance from the Ordinance. Historically, variances were sought to place residential structures, typically manufactured homes, in a designated floodway. No variances were requested during this reporting period.

The above is a brief summary of the Ordinance provisions. The reader is referred to the Ordinance for more detailed information. Copies of the Ordinance can be obtained from the District located at 97 E. Congress Street, 3rd Floor.

5.3.4 Other Regulatory Activities

In addition to issuing FPUPs, District staff provides information to the general public about permissible activities in flood hazard areas, and provides information about the flood hazard status of specific properties. Requests for information can be made via letter, fax or on a walk-in basis. The public information counter, also located at 97 E. Congress, 3rd Floor, is open from 8:00 a.m. to 4:30 p.m. weekdays.

Staff also investigates drainage complaints filed by the general public. If the complaint involves a violation of the Ordinance, the property owner is notified and corrective action is requested. When violations of the Ordinance are not corrected to the District’s satisfaction, staff issues a violation notice, and the case may be referred to the Pima County Attorney’s Office for action. Staff often provides technical support to the attorney working on the case and may testify on behalf of the District.

In summary, Floodplain Management staff is forever busy issuing permits and providing floodplain information to the public. Table 5.1 provides data on floodplain management services provided by the District over the past five years.

**Table 5.1
Floodplain Management Workload**

	FY 2006/07	FY 2007/08	FY 2008/09	FY 2009/10	FY 2010/11
FPUPs (Received/Issued)	815/564	1121/854	790/632	660/550	508/402
Drainage Complaints Received	723	636	514	306	467
Floodplain Status Letters Written	4,691	4,363	2,570	2,287	1,781
Counter Service	6,758	7,096	5,382	4,565	3,725

5.4 Studies

The District initiates river and basin management plans and other key studies to identify present and future flood control needs and to implement related land use planning activities on major watercourses and tributary watersheds. The management plans allow the District to move away from reactive “spot” improvements and toward larger-scale long-range improvements.

5.4.1 Lee Moore Wash Basin Management Study

This major basin study was initiated in 2006 to provide hydrology, floodplain delineations and rules of development for several large (213 square miles) predominately undeveloped watersheds located east of the Santa Cruz River, south of I-10, and northwest of the Santa Rita Mountains. It was completed and adopted by the Board in 2009.

5.4.2 Southwest Basin Flood Control Concept Plan

The study area is bounded on the north by Tucson Mountain Park, Herman Road on the south which runs along the northern boundary of the San Xavier Indian Reservation, Sandario Road on the west and the Tucson Mountains to the east. Most of this area lies within the Black Wash watershed. This study was initiated due to projected growth and the fact that much of the area lies within a floodplain. All-weather access is also limited. The concept plan identified potential basin locations as well as areas to be left natural. Perhaps most importantly the study provided discharge rates. The recommendations of this study were incorporated into a detailed study known as the Southwest Infrastructure Plan.

5.4.3 Special Studies Floodplain Reports

The following local studies were conducted during the program period. These used the latest hydraulic and hydrologic modeling techniques, weather records, and topographic conditions to provide updated floodplains, depths and flow rates.

Special Study 46 - Sheet Flood Mapping for Unincorporated Pima County, PCRFC, 8/8/07

Special Study 48 - Hacienda Sol Wash Floodplain Analysis, PC RFCD, 3/14/08 and Floodplain Analysis for an unnamed wash at the Intersection of Hacienda del Sol Road and River Road, PC RFCD, 3/14/08

Special Study 49 - Diamond Bell Ranch Hydrology, Psomas, 10/12/07

Special Study 50 - Floodplain Study for Flecha Caida Ranch Estates #9, Including Portions of Flecha Caida Ranch Estates #1 and #2 and Las Lomas de Catalina, JE Fuller Hydrology & Geomorphology Inc., 4/8/08

Special Study 51 - Floodplain Analysis for Tanuri Wash, PCRFC, 6/2/08

Special Study 52 - Emergency Evaluation Study Report on the July 29, 2003, Flooding in Ajo, Arizona, TetraTech, April 2004. Ajo Flood depth map , PCRFC, 2010

Special Study 53 - Floodplain Mapping of the Woodland Wash and its Tributaries, RFCD, February 2010

Special Study 54 - Floodplain Mapping of the Geronimo Wash and its Tributary, RFCD, February 2010

Special Study 55 - Flecha Caida LOMR Technical Data Notebook, RFCD, 7/15/2010

Special Study 56 - Craycroft Wash Technical Data Notebook for Hydrologic and Hydraulic Mapping of the Craycroft Wash and its Tributary, RFCD, 7/15/2010

Special Study 57 - Old Grandad Tank Technical Data Notebook for Hydrologic and Hydraulic Mapping of the Old Grandad Tank Wash and its Tributary, RFCD, 11/18/2010

Special Study 58 - Wentworth Wash Technical Data Notebook for Hydrologic and Hydraulic Mapping of Wentworth Wash and its Tributary, RFCD, 12/3/2010

Special Study 59 - Castle Rock Wash Technical Data Notebook for Hydrologic and Hydraulic Mapping of Castle Rock Wash and its Tributary, RFCD, 12/3/2010

Special Study 60 - Trails End Wash Technical Data Notebook for Hydrologic and Hydraulic Mapping of Trails End Wash and its Tributary, RFCD, 5/6/2010

Special Study 61 - Picture Rocks Technical Data Notebook for Hydrologic and Hydraulic Mapping, RFCD, 1/14/2011

Special Study 62 - West Speedway Wash Technical Data Notebook for Hydrologic and Hydraulic Mapping, RFCD, 5/6/2010

Special Study 63 - Camino de Oeste Wash Technical Data Notebook for Hydrologic and Hydraulic Mapping, RFCD, 6/30/2010

Special Study 64 - Del Cerro Wash Technical Data Notebook for Hydrologic and Hydraulic Mapping, RFCD, 5/26/2010

Special Study 65 - Roger Wash Technical Data Notebook for Hydrologic and Hydraulic Mapping, RFCD, 5/27/2010

Special Study 66 - Sweetwater Wash Technical Data Notebook for Hydrologic and Hydraulic Mapping, RFCD, 5/26/2010

Special Study 67 - Unnamed Wash 1 Technical Data Notebook for Hydrologic and Hydraulic Mapping, RFCD, 6/17/2010

Special Study 68 - Ventana Canyon Wash and Esperero Wash Technical Data Notebook for Hydrologic and Hydraulic Mapping, JE Fuller Hydrology & Geomorphology, Inc., 9/13/2010

Special Study 69 - Scott's Knob Wash Technical Data Notebook for Hydrologic and Hydraulic Mapping, RFCD, 1/7/2011

Special Study 70 - 12-10 Area Floodplain Mapping, RFCD, 6/3/2003

Special Study 71 - Race Track Wash Technical Data Notebook for Hydrologic and Hydraulic Mapping, RFCD, 7/15/2011

Special Study 73 - Friendly Village Wash Technical Data Notebook for Hydrologic and Hydraulic Mapping, Tetra Tech, Inc., 10/7/2008

Special Study 76 - Campbell Wash Technical Data Notebook for Hydrologic and Hydraulic Mapping, RFCD, 2/21/2011

Special Study 78 - Finger Rock Wash Letter of Map Revision Technical Data Notebook, RFCD, 10/15/2010

5.5 Floodprone Land Acquisition Program

The Floodprone Land Acquisition Program (FLAP) began in 1984, and is funded by bond monies authorized by Pima County voters and by an annual allocation from the District's tax levy. FLAP is an effective nonstructural floodplain management tool that yields a number of community benefits. Some of these include removing residences and structures from vulnerable areas, preserving natural floodplain characteristics and attenuation of downstream flood peaks, providing recreational opportunities, maintaining open space, and protecting groundwater quality and riparian habitat resources. The District administers FLAP solely on a voluntary basis without utilizing its land condemnation authority. Floodprone parcels have been acquired along the Cañada del Oro in Avra Valley, in the southwest along the Black and Brawley washes, and along the Santa Cruz River.

Table 5.2
Floodprone Land Acquisition Program Summary

Fiscal Year	Land Purchased in Acres	Total Cost
FY 2006/07	213.35	\$ 3,489,600
FY 2007/08	191.95	\$ 1,573,600
FY 2008/09	23.93	\$ 678,400
FY 2009/10	872.50	\$ 3,976,100
FY 2010/11	61.11	\$ 61,800

5.6 Flood Warning Program

The Flood Warning Program encompasses the District's Automated Local Evaluation in Real Time (ALERT) flood threat recognition system, along with the District's Flood Response Plan and Flood Hazard Mitigation efforts.

As of FY 2010/11, the ALERT system consists of 93 automatic self-reporting precipitation gauges, 36 stream gauges, five weather stations and four radio repeater stations. The system automatically transmits hydrometeorological data via radio telemetry to the District's base station and to the Tucson office of the NWS. During storm events, District staff evaluates incoming data to monitor changing flood conditions. The NWS also uses the information when issuing flash flood warnings and advisories. The Department of Transportation, Maintenance Operations Division relies on District ALERT data to assist in determining storm-related road closures and the Department of Environmental Quality uses ALERT data for the Pima County National Pollutant Discharge Elimination System (NPDES) monitoring program.

Every year significant storm events occur, which prompt more intensive ALERT system monitoring, NWS advisories, road closures and preparation of summary storm reports by District staff. During FY 2006/07, three precipitation and two stream gauges were installed to provide information on storms affecting Arroyo Chico. Three precipitation gauges and one stream gauge were installed to provide information on storms potentially affecting residential structures near Franco Wash at Old Nogales Highway. Two precipitation gauges and two stream gauges were installed to provide enhanced early-warning information on the lower Cañada Del Oro Wash and the Black Wash areas.

During FY 2008/09, one existing site was retrofitted with weather station sensors at the request of the NWS.

Rain Gauge Volunteer Program

Since 1977, the District has operated a system of volunteer weather watchers, known as rain gauge volunteers. Participants in the program are provided with a standardized rain gauge and data sheets to record daily rainfall information. Data about the duration and amount of each storm may be provided, if available. Volunteers submit the data to the District every two months, at which time they are compiled and recorded. Since July 2006, the network has averaged approximately 60 volunteers distributed across the entire metropolitan and outlying areas.

Flood Preparedness

The District, in cooperation with the USACOE, Arizona Department of Water Resources, and other state and local agencies continues working to develop the communication aspect of a statewide flood warning system. District staff participates in the Multi-Agency Task Force committee which provides communication activities between jurisdictions.

5.7 Public Information, Education and Participation Programs

District staff had and continues to develop and disseminate a variety of brochures, advertisements, announcements, presentations and displays that help educate the public and raise awareness of flood hazards within Pima County. Numerous free publications on flood and erosion hazards, floodplain regulations, and information on how to safely develop property within floodprone areas are available in the District's lobby. Toward the end of the prior reporting period, a series of exhibits documenting historical flood events and highlighting flood safety information was put on display near the customer service counter.

During this reporting period, the Board took several actions which broadened the scope of District activities to achieve our goals. First, in the fall of 2007, the Board amended the Comprehensive Plan by adding a Water Resources Regional Plan Policy. This policy and subsequent implementation procedures direct the District to assess the water supply impacts of large projects which require a rezoning or comprehensive plan amendment, and to include this information in staff reports provided to the Planning & Zoning Commission as well as the Board themselves. Then in 2008, the Board unanimously adopted the Sustainable Action Plan for Pima County Operations. Among other goals and action items were those seeking to implement and encourage water harvesting. Furthermore, at the end of the last reporting period the Board adopted Regulated Riparian Habitat Maps to be used by the District in permitting floodprone area development and subsequent implementation of habitat avoidance and impact mitigation planning. In order to implement these directives, the District has expanded its education and outreach materials to include water harvesting and riparian habitat mitigation guidelines,

recommendations and resources. Water harvesting recommendations are being incorporated into design manuals for retention and detention facilities, streetscapes, and landscaping.

The District also utilizes alternate outreach methods such as an annual insert in water bills that focuses on preparing for a flood and public safety while also informing the public about rules of development within floodplains. This mailer reaches over 200,000 residences and is timed to be received immediately prior to monsoon season. In addition, a brochure containing information on protecting property from flood damages and encouraging residents to purchase flood insurance, as well as general information regarding our services and rules is mailed to the owners of every parcel within local and federal floodplains. A second brochure is sent to all owners of property whose property lies within regulated riparian habitat areas; in both cases, the appropriate brochures are sent out to over 9,000 property owners.

District staff also participates in a variety of annual outreach events including multiple Earth Day celebrations, Ted Walker Days at Old Tucson Studios, and the Fiesta Grande Street Fair. Flood awareness, flood preparedness, and safety are major themes of these presentations. Groundwater recharge information, water quality and watershed protection topics are also covered.

As part of its public safety campaign beginning in the FY 1998/99 summer monsoon season, the District worked with local television stations to air three 30-second Public Service Announcements (PSAs) dealing with flash flooding. Prepared by the NWS's Office of Hydrology, the PSAs are made available to eight television stations in the Tucson area. District staff is also currently working with the Tucson Urban Area Security Initiative to update the Alert Emergency Notification System Plan which establishes flood and other emergency response public notice procedures. We expect this system to add direct notification procedures including door-to-door, email, text messaging and telephone notification. This system is dependent upon federal funding which is not assured.

During this time period, the District's website was updated and significantly expanded to include more guidance to the regulated community. Additional educational materials were also added to the website, including information about flood insurance, flood safety, historical flooding and a series of pages dedicated solely for outreach to children. As a part of the outreach to children, a character named Hank Highwater was developed to deliver flood safety messages to younger audiences.

5.8 Photographic and Topographic Mapping

Aerial photography and LiDAR are important tools used to fulfill many of the District's floodplain management directives. Due to the size of Pima County and the footprint of the developed area conventional ground surveys are impractical for developing terrain models and regularly updated LiDAR ground surfaces are essential to ensure accurate floodplain mapping.

The District has partnered with the Pima Association of Governments (PAG) in multiple aerial photo and LiDAR acquisitions between 2006 and 2011. Acquisitions have been designed to provide coverage of the developed areas of Pima County as well as areas where planned development will occur. Projects have been conducted in 2005, 2008 and 2011 capturing aerial photographs and LiDAR data in each occurrence.

Furthermore, the Pima County Assessor's Office with the support from other departments including the District has contracted with Pictometry Corporation to capture oblique aerial imagery that is used by the District to evaluate structures for compliance with floodplain permit regulations. All aerial products are integrated into the County GIS system administered by the Pima County Information Technology Department (ITD).

5.9 GIS and Mapping

The District continues to maintain a significant web presence and has participated in the recent standardization of Pima County websites. Working in conjunction with the Pima County ITD- Geographic Information Systems (GIS), the mapping component of the District's web presence is being modernized to use ArcGIS Server-based map technology.

During the first several years of this reporting period, field inspections and GIS positions were created along with an Infrastructure Management Division. Their main purpose is to develop an integrated land and infrastructure data structure within Pima County's multi-user geo-database environment. This system stores geometry representative of District-maintained properties and related infrastructure. Emphasizing document retrieval and storage the system allows faster access to District records via online maps and documents.

Also in 2007/08, the District created an online Flood Hazard Map service. This service can be used to enter a parcel number or address and then download or print a flood hazard map. This map will include all federal and locally identified flood hazards as well as Pima County regulated riparian habitat.

On October 23, 2008, FEMA announced its intent to discontinue distributing paper maps and initiate the distribution of D-FIRMs. In anticipation of this announcement, the District has been working with FEMA to create a digital GIS library that includes hyperlinks to all map change documents such as LOMRs and LOMAs. In FY 2008/09, the District obtained digital map documents for all of the incorporated communities within Pima County that participate in NFIP. We also made digital map products available in the form of ESRI shape files or AutoCAD files to engineering companies to assist them in preparing map revision applications to FEMA. Conversion of the paper to D-FIRMs facilitated the comparison to recent aerial photography. This enabled District engineers and landowners to work together in submitting more accurate information for FEMA approval. In FY 2009/10, the District created a MapGuide comparison site so that property owners could see how the map changes would impact them. Stakeholder review of these maps continued throughout FY 2010/11 and the D-FIRMs became effective on February 9, 2011.

6.0 STRUCTURAL FLOOD CONTROL PROGRAMS

6.1 Overview

The District's CIP includes both the bond projects listed in Section 4 and non-bond projects. District CIP projects address regional flood and erosion control needs in incorporated and unincorporated areas of Pima County with repetitive flood damages as well as reduce the potential for future flood damages. The District's CIP for FY 2007 to FY 2011 included projects addressing flood and erosion control along the

Santa Cruz River, Cañada del Oro Wash and Pantano Wash. The program also included urban infrastructure improvements to control drainage and repetitive flooding, channel improvements, linear parks, habitat restoration and substantial floodprone land acquisition. While not strictly CIP, the District was also engaged in significant maintenance efforts including removal of massive sediment build up in the Rillito River following the 2006 flood.

Funding

The revenue from the District's tax levy and federal aid from the USACE provide the largest share funding for CIP projects. Revenues from the District's property tax levy typically accounts for 83% of the funding for bond and non-bond flood control capital improvements. Other sources of revenue include General Obligation Bonds (GO Bonds) and state and federal grants.

In fiscal year 1996/97, Pima County voters authorized \$21,500,000 in GO Bonds to fund 14 flood control improvement projects. In 2004, significant funds were approved for urban drainage and FLAP funds along with five individual projects. Non-bonds during the reporting period included 46 projects, which were funded using revenue derived from the District's tax levy, federal funding and other sources.

From the beginning of the reporting period in FY 2005/06 to the end in FY 2010/11, the District's tax levy revenue decreased from 22.6 to 22.2 million dollars annually, and the Board approved rate dropped from .3735 to .2635 per hundred dollars of value.

Projects

A complete listing of CIP projects active between fiscal years 2006/07 through 2010/2011 is provided in Appendix C. This table is presented in descending order by expenditure. Many of the District's projects are constructed in phases due to the complexity of the project, total cost and funding sources. For example, the Arroyo Chico Flood Control Project was a \$31.6 million project with the USACOE, which is intended to relieve flooding along Arroyo Chico and tributary washes in central and downtown areas within the City of Tucson. The project was divided into two phases: Phase I included the construction of the Randolph South Detention Basin, which was completed in 1997 at a construction cost of \$7 million; and Phase II includes construction of four detention basins along the Arroyo Chico upstream of Park Avenue and a new storm drain system for High School Wash. Construction of the second phase was ongoing during the reporting period.

1997 Bond Projects

The 1997 Bond Program included eight flood control improvement projects that were active during the reporting period. Four of these were along the Santa Cruz River:

- FC-01 Santa Cruz River Bank Stabilization from Grant Rd. to Ft. Lowell Road;
- FC-04 Mission View Wash;
- FC-05 Earp Wash Detention Basin –City of Tucson; and
- FC-14 Tucson Diversion Channel Drainage Improvements.

With the exception of the Mission View Wash project these were substantially completed during the last reporting period and expenses were only incurred in FY 2006/07.

The remainder of the 1997 Bond Program identified various urban flood control improvements including projects for:

- FC-02 Santa Cruz River Bank Stabilization Valencia Road to Irvington Road, which has been combined with the Paseo de las Iglesias project;
- FC-03 Lower Santa Cruz River Levee in Marana (completed 2001);
- FC-06 City of South Tucson Urban Drainage (completed 1998)
- FC-07 Sahuarita Drainage Improvements (completed 2005);
- FC-08 Oro Valley (completed 2003);
- FC-09 Green Valley Drainageway #9 (completed 2002);
- FC-12 City of Tucson Fairview Limberlost (completed 2003); and
- FC-13 Holladay/Forrest (Completed 2005).

2004 Bond Projects

The 2004 Bond Program approved by voters included urban drainage projects within unincorporated Pima County, City of South Tucson, the Pascua Yaqui Reservation, and the Tohono O’odham Nation. The voters also approved significant FLAP funds, and the following river parks and flood control projects that were active during the reporting period:

- FC5.02 Urban Drainage Infrastructure
 - Ajo Curley School Detention Basin
 - Ajo Second Avenue Bridge Replacement
 - Columbus Wash Phase II Drainage Improvement
 - Green Valley Erosion Control
 - Littletown Urban Drainage
 - Old Nogales Highway at Franco Wash
 - Old Vail Connection at Franco Wash
 - Tanque Verde Creek Lakes of Castle Rock Erosion Protection
 - Verde Meadows Crest Improvements
- FC5.03 City of South Tucson Urban Drainage
- FC5.04 Tohono O’odham Nation Sells Wash Urban Drainage
- FC5.05 Pascua Yaqui Tribe Black Wash Urban Drainage
- FC5.06 SCR Flood Control, Erosion Control and Linear Park, Ajo to 29th Street
- FC5.07 SCR, Grant Road to Camino del Cerro River Park
- FC5.08 Rillito River Linear Park, Alvernon to Craycroft
- FC5.09 SCR Bank Protection, Continental Ranch
- FC5.10 Cañada Del Oro River Park, Thornydale to Magee

Non-Bond Projects

The Non-Bond Program active during the program period included 46 projects that are funded using revenue derived from the District’s tax levy and other sources including state and federal funding. Along the Santa Cruz River, the non-bond projects included several reaches of bank protection, Paseo de las Iglesias, the Pantano River Bank Stabilization, Rillito River Linear Parks, and substantial acquisitions along the Cañada del Oro Wash.

Six of the non-bond projects are being coordinated with the USACOE with the majority of the funding and expenditures provided directly by the USACOE. In reporting the District’s CIP, the USACOE funding is reported to indicate the magnitude of the CIP effort and the amount of outside funding the District receives to augment local funding. Under the USACOE’s funding programs, the District must pay 50% of the cost for feasibility studies and 35% of the cost for capital

improvements, as well as the cost for right-of-way. Since the USACOE undertakes these studies and construction projects, the District's expenditures do not include the federal match. In the past five years, the USACOE has provided funding for the Arroyo Chico Project, and the District expended matching funds to increase the amount of the capital improvement budget for non-bond projects.

6.2 Bank Stabilization

The District constructs bank stabilization along major watercourses within Pima County where flood and erosion hazards threaten public and private development or infrastructure. Bank stabilization projects along major watercourses typically employ soil cement, which is a mixture of cement and local soil materials. Soil cement is a cost-effective flood and erosion control solution that has many of the strength characteristics of concrete. It also retains much of the appearance and textural quality of a natural riverbank that occurs in an arid landscape. Bank protection projects are often amended with linear parks as they provide a safe and attractive place for this activity. The high degree of public support for these projects is reflected in the District's CIP expenditures during this program period as several significant bank protection and linear parks projects were undertaken with approved bond funds.

6.2.1 Santa Cruz River

The highest expenditure for an individual bank protection project undertaken during the program period was along the Santa Cruz River in the vicinity of continental ranch. The Town of Marana developed plans for bank protection on the west bank of this segment of the Santa Cruz River between the Yuma Mine Wash and Cortaro Road as part of the development of a regional park that was authorized in Pima County's 1997 General Obligation Bond election. The project included the construction of approximately 1.3 miles of soil cement bank protection between Ina and Cortaro roads. Pima County provided bond funding and flood control funds for the park and bank protection, respectively. The District secured all right-of-ways for this project. In addition bank stabilization was undertaken between Grant and Camino del Cerro River Park.

6.2.2 Cañada del Oro Bank Protection and Linear Park

The Cañada del Oro Wash is bank protected from the Union Pacific Railroad on the south bank and from just west of Thornydale on the north bank to the Omni Tucson National Golf Resort. The project provided a river linear park on the south bank between Thornydale Road and the north end of Omni Tucson National Golf Resort plus a paved bike path connection to the Rillito River Park via Thornydale Road. It included a paved pathway on the south bank, landscaping, irrigation, and 6 pedestrian bridges. It also included underpass ramps at Thornydale, Ina Road and Magee Road, a parking node at Magee Road with ramadas and a restroom, a parking easement at Thornydale, as well as a reclaimed water irrigation system.

6.2.2 Pantano Wash

Several bank protection projects were active during this reporting period including, Kolb Executive Park, the Pantano Townhomes, Speedway Boulevard to Tanque Verde Road, and at the Mullins Landfill.

Pantano Wash – Kolb Executive Park Bank Protection

On July 31, 2006 the observed peak flow in Pantano Wash at Broadway Blvd wash measured to be 15,900 cfs. Existing gabion bank protection failed at Kolb Executive Park, threatening to wash the business complex's parking lot and parking structures away. The District provided temporary riprap to stabilize the bank and worked with FEMA to provide a temporary and permanent solution to the failure created by the emergency. The temporary repairs were completed in 2007, while the permanent bank protection solution was designed. The project included removal of the temporary riprap bank protection, stabilizing and coating the existing riprap with an eight-foot thick layer of soil cement bank protection, new handrail, maintenance of road and associated drainage structures. The project was bid and awarded on November 17, 2009. Construction was started on February 2, 2010 and substantially completed by September 1, 2010. Landscaping and handrail were completed by October 2010.

Pantano Wash – Pantano Townhomes Bank Protection

In addition, as a result of the July 31, 2006 event existing rock and rail bank protection failed adjacent to Pantano Townhomes and a TEP tower, threatening to further unravel the bank protection and open the townhomes to erosion.

The District provided temporary riprap to stabilize the bank and worked with FEMA to provide a permanent solution to the failure created by the flood event. Temporary repairs were completed in 2007, while the permanent bank protection solution was being designed. The project included removal of the temporary riprap bank stabilization, stabilizing and coating the existing rock and rail with an 8 foot thick layer of soil cement bank protection, new handrail, maintenance road, and associated drainage structures. The project was bid and awarded on November 17, 2009. Construction was started on February 2, 2010 and substantially completed by September 1, 2010. Landscaping and handrail were completed by October 2010.

Pantano Wash Phase 2- Speedway to Tanque Verde Road: Construction started November 2011 and is anticipated to be completed in September 2012. Project consists of construction of 4,300 linear feet of new soil cement bank protection and paved river park pathways, landscaping, irrigation and a new underpasses at Tanque Verde Road and on the west bank at Speedway Boulevard. The project is located between on the Pantano Wash between Speedway Boulevard and Tanque Verde Road.

During the July 31, 2006 event, existing soil cement bank protection toe was exposed at Mullins Landfill. The District provided temporary riprap to stabilize the toe and worked with FEMA to provide a permanent solution to the potential failure created by the monsoon flood. The temporary repairs were completed in 2007, while the permanent bank protection solution was designed. The project included removal of the temporary riprap toe, extending the toe an additional eight feet below the thalweg, and providing two new grade control structures to reduce the potential for future toe exposure at the landfill. The project was bid and awarded on November 17, 2009. Construction was started on February 2, 2010 and substantially completed by September 1, 2010.

6.2.4 Tanque Verde Creek Lakes of Castle Rock Erosion Protection

The project provided improvements to restore the bank and prevent erosion at Common Area of the Lakes of Castle Rock. The improvements involved installing five weirs constructed of over 600 lineal feet of gabions. The project also diverted the deepest part of the flow away from the north bank. By diverting the flow, the project protects the Castle Rock property and the property immediately downstream owned by Pima County and used by Therapeutic Riding of Tucson (TROT), a non-profit organization. The project worked in tandem with bank protection installed this past spring at TROT to prevent erosion along the north bank at both properties. The project also preserved a large tree that was at least 50 years old and provided habitat for birds of prey.

6.3 Detention Basins

Another structural flood control strategy used by the District is the construction of detention basins. Detention basins are facilities that allow for the temporary storage and measured release or metering out of flood waters. Control of flows exiting a detention basin during a storm event significantly decrease downstream flood peaks, and thereby minimize the potential for inundation in downstream areas.

6.3.1 Tucson Drainage – Arroyo Chico/Tucson Arroyo Project

This \$27.5 million flood control project will protect residents and businesses in downtown Tucson by removing 220 residences from the 100-year floodplain. Working in conjunction with the City of Tucson and the USACOE, the District produced the Tucson Drainage Feasibility Study for reduction of flood damages on the Tucson Arroyo/Arroyo Chico watercourses. With approval of this study by the USACOE, planning began for a series of detention basins located near Park Avenue and Arroyo Chico.

Phase 1 of this project involved the planning and construction of the Randolph South Detention Basin, which was completed in March 1996. Also referred to as the Randolph South Golf Course Detention Basin, the project combines a series of interconnected detention basins designed to blend in with the existing golf course, which is now called Dell Ulrich Golf Course. The project received an Honorable Mention from the American Society of Civil Engineers for Outstanding Project of the Year.

Phase II of this project will entail a series of linked detention basins and other improvements near Park Avenue/Arroyo Chico. The project also calls for the replacement of existing sections of storm drains near the High School Wash and the Tucson Arroyo confluence. Design of Phase II began in March 2001 and was completed in January 2004.

Construction of the Park Avenue Detention Basins includes development of the detention basins, relocating the historical foot bridge, construction of pedestrian/ animal walk-through drainage culverts, elevating the Highland Avenue roadway crossing, re-establishment and expansion of the paved pedestrian and bicycle pathway, replanting of native plants to establish riparian habitat within the basins, and two small community turf areas. The Tucson Unified School District's Cherry Field will become a combination of flood basin and athletic fields with a new locker room/classroom/snack bar building, a new parking lot, a new maintenance building, new field lights, new dugouts, backstops, a batting cage, and built-in bleachers. The project will also include construction of a storm drain under

the Tucson High School football field south to the 3rd Avenue and 8th Street intersection, and enlarging the existing upstream channel from Campbell Avenue to Parkway Terrace with new roadway culvert crossings at Plummer, Olsen, and Norris avenues. Construction began in March 2005 and was substantially completed during 2006/2007.

6.3.2 Ajo Detention Basin

The USACOE constructed the Ajo Detention Basin in the early 1960s to address a number of urban flooding problems. Using Federal Environmental Restoration funds, the District, Pima County Wastewater Management and the USACOE reconstructed the basin to incorporate environmental habitat restoration and flood control features. The restoration element of the project involved 20 acres of wetlands and construction of a 7-acre lake. The lake supports wildlife habitat and supplies water for irrigation needs at Kino Sports Park. Construction began in October 2000 and was substantially complete in 2002.

In 2003 the District started the design phase to make improvements to the Ed Pastor Environmental Restoration Project in response to safety related concerns noted by Pima County Risk Management. Construction began in January 2004 and was completed in July 2004. During 2006/07 the District expended over 2 million dollars to improve the piping of this basin.

6.3.3 Earp Wash Regional Detention Basin

Flood Control Engineering reviewed alternatives to relieve flooding from Earp Wash west of Alvernon Way. This watershed includes residential, mobile homes, businesses and Chaparral Middle School, which were flooded by an unusually heavy localized storm in the summer of 1999. Two detention basins were proposed to reduce the peak discharges from the Earp Wash and mitigate downstream flooding. This project was funded from the May 1997 Bond.

Localized summer monsoon storms in July 1999 created flow depths of 1.5 to 3.0 feet. Residents and businesses between Alvernon Way and Palo Verde Road suffered extensive damage especially from the July 26, 1999 event. This storm produced 1.5 inches of rain, which represented a 25-year storm for this watershed. Flood damage to manufactured homes, storage buildings, heating and cooling systems, loss of access to residents and businesses, and disruption of electrical power resulted in approximately 50 residents requiring emergency shelter.

Subdivision developments upstream of Alvord Road have increased the level of flooding downstream along Earp Wash. The District designed and constructed a detention basin east of Alvernon Way to attenuate peak flows downstream of Alvord Road. The detention basin is situated on a 9.2-acre site located approximately one-half mile north of Valencia Road along the east side of Alvernon Way. The detention basin has reduced the peak flow from 415 cfs to 32.4 cfs and stores approximately 32.5 acre-feet of stormwater.

6.3.4 Mission View Wash Regional Detention Basin

Few drainage facilities exist in a portion of the City of Tucson and the City of South Tucson located west of Park Avenue and South of 22nd Street. Most flows in this area are conveyed in the streets, which have insufficient capacity to contain all but the smallest flows resulting in repeated flooding of adjacent commercial and residential properties. This project includes design and construction of a regional detention basin east of Park Avenue and south of 36th Street in order to mitigate downstream flooding. Preliminary design began during 2001; however the height of construction was during this program period as reflected in annual expenditures above. Funds for this project were authorized under the May 1997 Bond Election.

6.4 River Parks

In order to satisfy permit requirements that are part of the Federal Clean Water Act, the District plans and constructs river parks and related features in conjunction with its bank stabilization projects. River parks along the major watercourses have proven to be very popular, meeting important recreation and public open space needs region-wide.

In December 1996, the District completed the River Parks Master Plan to provide the specific guidance and planning needed to further the development of an interconnected river park system. The plan defines various levels of river park development appropriate to the surrounding area, details linkage solutions in areas where existing conditions make river park development difficult and includes design guidelines, and budget and implementation information for the river parks.

6.4.1 Rillito River Linear Park: Alvernon to Craycroft

In 1996, the USACOE and the District completed soil cement bank protection along the Rillito River from Alvernon Way to Craycroft Road. In 2000, the USACOE completed the paved pathway on the north bank, a decomposed granite pathway on the south bank, pedestrian bridges over major washes, and an irrigation supply system. The District's goal then was to enhance the existing vegetation along this reach and provide amenities in the form of additional paved trails, parking and staging areas to improve the quality of this segment of linear park. This portion of the project was funded by the 2004 Pima County Bond Package. While an extensive design concept report was been completed prior to the reporting period, in 2006 the District hired a design consultant and Construction Manager at Risk to complete the development and construction of this project which was completed in 2008.

6.5 Catalina

After the Aspen Fire and significant flooding along the Cañada del Oro Wash through Catalina in the summer of 2003, the District continued acquiring flood damaged and floodprone properties through fiscal year 2004-05. By the end of the fiscal year, the vast majority of property owners (nearly 95%) that lived in homes situated within the floodway of the Cañada del Oro Wash between the Miraval Resort and Catalina State Park and constructed before flood control regulations were adopted, had voluntarily sold their properties to the District. Only four property owners in or immediately adjacent to the floodway elected not to sell to the District. The acquired properties consisted of 67 mostly contiguous

parcels of land sold by 57 owners that totaled nearly 200 acres. Total acquisition and relocation costs for the properties exceeded \$10 million dollars.

As the cleanup process and interim management of the acquired properties progressed during the year, significant efforts were made in the planning and development of a regional park, which was most appropriate for the area. An initial public meeting with the Catalina community in November 2004 indicated a strong desire for local input into the park's planning process; subsequently, the Catalina Regional Park Advisory Committee was assembled by Supervisor Ann Day and a series of meetings were held to formulate a park plan. After numerous meetings and discussions, a concept park plan emphasizing the retention of open space and the cultural character of the area was conceived and presented to the community.

Working closely with the Natural Resources, Parks and Recreation Department, the District began the process to plan for and design the park in accordance with the plan developed by the Advisory Committee. This park area was also integrated into a larger Pima County vision of completing the linear park along the Cañada del Oro Wash from the Pinal County line to the confluence with the Santa Cruz River. Two significant projects were active during this program period along the Cañada del Oro, Thornydale to Magee as well as in the area of the Omni golf course discussed under the bank protection project above.

6.6 Drainageway and Drainage Improvements

6.6.1 Columbus Wash Phase II

This project, undertaken in cooperation with the City of Tucson consisted of constructing a major storm drain between Pima Street and Grant Road.

6.6.2 Pegler Wash at Sotomayor Ranch Levee Improvements

An engineering analysis of the existing levee adjacent to the Sotomayor Ranch Subdivision showed inadequate levee height throughout most of the levee. The existing levee slopes were earthen with some river run rock at the toe of the slope. The bank had suffered some erosion along the face. It was determined that the levee height was to be increased and rock rip rap was to be added to the entire face of the levee. However, concrete at the time was considerably cheaper and the decision was made to surface the levee face with concrete. At the downstream end of the levee, there existed a non-functioning grouted rock grade control structure that was removed and re-constructed out of concrete to an elevation that allowed it to function as it should. As a result of the above work, residents adjacent to the levee were removed from the FEMA floodplain.

6.6.3 Green Valley Erosion Control

The project provided drainage improvements to control flooding and erosion in drainage ways located in Green Valley, Arizona. Drainage improvements were performed in drainage ways 1, 3, 6, 7, 9, 13, 17, 24, and 25. The improvements ranged from filling scour holes with rip-rap and repairing existing structures to the construction of new bank protection and grade control structures. In addition to the improvements, the District also conducted the Green Valley 2010 Drainage Way Evaluations to reassess

the original RS Engineering May 2004 report and to update the maintenance and engineering improvements needed for Green Valley.

6.6.4 Gibson Arroyo Ajo, Arizona

Ajo, Arizona, is an unincorporated community located within Pima County, Arizona, and lies approximately 160 miles west of Tucson. On July 29, 2003, the community of Ajo experienced a severe thunderstorm producing significant rainfall—approximately 1.3 inches of rain in just over one hour. Flooding occurred primarily along the Gibson Arroyo and tributaries located south of the arroyo.

The District quickly responded by providing immediate assistance with clean up and maintenance of streets, bridges, and portions of the Gibson Arroyo. In addition, the District immediately requested and received approval to enter a portion of the Gibson Arroyo owned by Phelps Dodge in order to dredge along an extensive stretch of the channel to provide increased hydraulic capacity.

As part of the District's response, a consultant was hired to provide an emergency evaluation and report on the flooding including new aerial-topographic mapping, a field review of the flooding, data collection, and preparation of preliminary hydrologic and hydraulic analyses. Accordingly, a Master Drainage Plan was developed to recommend specific approaches to address these floodprone areas including the Second Avenue Bridge and southern tributary flooding.

Second Avenue Bridge Replacement

Eyewitness accounts of the July 29, 2003 flood provided ample evidence that debris and sediment effectively blocked the conveyance area of the bridge and increased flooding conditions during the flood event. The bridge is a three-cell structure with a relatively low profile with two pier walls between the cells, which restrict the amount of debris and sediment that can freely pass downstream. Hydraulic modeling of the existing bridge reveals that if the opening were not clogged by debris and sediment the 100-year flow depth at the bridge would be reduced by about 1.3 feet. The District replaced the old bridge in 2005. The new larger bridge is designed and built to provide increased flow capacity and thereby reduce flooding.

Curley School Site Detention Basin

The southern portion of Ajo contains several tributaries to the Gibson Arroyo. This area has poor drainage infrastructure such as private culvert systems that run under residential structures. The most effective way to alleviate the flooding problem is to reduce the peak discharge by storing the flood volume in a flood control basin. The former football field at Curley School is a prime location for the detention basin as this is a sizeable piece of property capable of sustaining a detention basin. Therefore, the planning was initiated in concert with the renovation planned for Curley School. In 2005 the District initiated the design of this project and construction was completed in 2008.

6.7 Flood Control Maintenance Program

6.7.1 Major Watercourse Flood Control Infrastructure Inspection Program

District staff routinely conducts physical field inspections of the District's drainage structures for all major watercourses and regional detention/retention basins. As part of this program, a consolidated

resource base of all construction plans for bank protection, levees, grade control structures and detention/retention basins were compiled. In addition, a cross-referenced filing system for inspection documentation including digital photographs was created for monitoring potential structural failure. Maintenance service requests were prepared for structural maintenance including appropriate permits from the USACE and notification to the U.S. Fish and Wildlife Service.

6.7.2 Operations Division

Infrastructure Management staff inspects, maintains and repairs watercourses and associated improvements that are owned or operated by Pima County or the District. Through IGAs, the District maintains major watercourses, bank stabilization and other improvements within the City of Tucson, and the towns of Oro Valley and Marana.

Tasks include repairing constructed improvements, removing sediment buildup, clearing vegetation and other debris, maintaining drainageway access roads, and grading channels to provide positive drainage.

7.0 NATURAL RESOURCES PROTECTION PROGRAM

7.1 Environmental Protection and Restoration

7.1.1 Watercourse and Riparian Habitat Protection

The Board adopted the Watercourse and Riparian Habitat Protection and Mitigation Requirements as part of the Pima County Ordinance No. 1994-FC2 in July 1994. In July 1998, the Board amended Ordinance 1994-FC-2 so that mitigation requirements would apply to all properties within unincorporated Pima County, not just those entering the rezoning of subdivisions process. Other 1998 changes in the Ordinance language included: 1) disturbance to any hydro/mesoriparian habitat requires a mitigation plan to be approved by the Board; and 2) the trigger for mitigation requirements for xeroriparian classes was changed from 10 percent or one acre of disturbance of the mapped habitat (whichever was less) to any disturbance of 1/3 acre or more now requires a mitigation plan. In 2005 the Board again amended the Ordinance to greatly expand the geographic coverage.

The 2005 Ordinance modifications were written to encourage property owners to avoid disturbing riparian areas, but it does not prohibit development within those areas. If a property owner demonstrates that avoidance of riparian habitat is not possible, then mitigation of affected habitat areas is mandated. Onsite mitigation is preferred since it helps provide continuity of habitat. Offsite mitigation and mitigation banking options are also available as alternative approaches to habitat conservation. Projects impacting Important Riparian Area, Hydro/Mesoriparian Habitat or which involve an in-lieu fee must be approved by the Board. Those impacting Xeroriparian Habitat may be approved by staff.

The Board approved 25 hydro/mesoriparian habitat mitigation plans for individual lot development along Sabino Creek Wash, Tanque Verde Creek, Agua Caliente Wash, Rillito River, East Branch of the

Brawley Wash, Davidson Canyon, Cienega Creek, Mescal Arroyo Wash, Casas Adobe Wash, Citrus Wash and Las Lomitas Wash. Of these all but four were within Important Riparian Area. Owners mitigated 22.96 acres of disturbed mapped habitat.

The Board also approved 10 plans for development plans and plats that impacted 22.32 acres of hydro/mesoriparian habitat along Tanque Verde Creek, Soldier canyon Wash, Ventana Canyon Wash, the Rillito River, Pima Air Museum Wash, Agua Caliente Wash, Rincon Creek and Coyote Creek. Of these all but three were within Important Riparian Area.

The District approved 58 mitigation plans for 99.21 acres of xeroriparian habitat disturbance on individual lots and 160.44 acres disturbed by 42 development plans and plats.

7.1.2 Riverine Environmental Restoration & Water Resources Projects

Environmental restoration capital improvement projects are intended to protect and/or enhance riparian habitat and promote groundwater recharge utilizing a combination of constructing structural improvements and planting native habitat

The following three environmental feasibility studies are being conducted in partnership with the USACE on the Santa Cruz and Rillito River systems. Environmental and riparian objectives include developing a hydrogeomorphic model of the physical, biological and chemical function of wetlands. Existing conditions reports have been submitted to USACE, and staff has conducted public group meetings for input in developing the design alternative. They include:

Santa Cruz River Park: Paseo de las Iglesias Restoration

Working in cooperation with the USACE, City of Tucson, and other stakeholders, the District began a feasibility study in the latter half of the year 2001 to evaluate the possibility of restoring the Santa Cruz River in an area from the Tohono O'odham San Xavier District to downtown Tucson. This study, estimated to cost \$3.6 million, involves ecosystem restoration, flood control improvements, and river park trail development. The USACE has obligated funds in the amount of 50 percent of the total cost for the study; and the District will apply matching funds in both cash and in-kind services. Both feasibility study results and community input favor a mesoriparian restoration approach. Methods being considered to implement a project include a variety of water harvesting features, irrigation, river bank terracing, and reestablishing native trees, shrubs and emergent wetland communities. Restoration alternatives are being analyzed for biologic, hydrologic, and economic costs and benefits.

After soliciting public input, the County endorsed the USACE's recommended plan, which will use a Mesoriparian dominant approach for environmental restoration along the riverbanks and terraces. The recommended alternative includes restored and irrigated mesquite-hackberry bosques on river terraces and floodplain. Watercourse areas will be bordered by mesquite and palo verde woodland and Sonoran desertscrub species. Riverbanks will be laid-back and/or terraced and planted. Water harvesting features will be incorporated. Vegetation will provide improved habitat for native wildlife and a pleasant setting for passive recreation. Numerous viable water sources are under consideration—1.7 MGD (1,900 acft/yr) of irrigation will be needed to accomplish draft design goals. Recreational elements including the Juan Bautista National Historical Trail and other amenities are

being planned. Design of the first phase began in FY 2004/05 and was completed in 2010. The project began construction 2011.

Santa Cruz River: Tres Rios Restoration

The Tres Rios del Norte project is an environmental restoration study being conducted in cooperation with the USACOE, the Town of Marana, and the City of Tucson. The project area covers 18 miles of the Santa Cruz River from Prince to Sanders Road in northern Pima County. This study, estimated to cost \$5.8 million, will include ecosystem restoration; groundwater recharge, flood control improvements, and river park trail development. The USACOE has obligated funds in the amount of 50 percent of the total cost for the study; and the City of Tucson, Town of Marana, and District, working as local co-sponsors, will collectively apply matching funds in both cash and in-kind services. Design began in FY 2004/05 and is remains ongoing.

Proposed restoration efforts in this reach focus on capitalizing on available resources such as stormwater runoff and effluent discharged from the Ina Road and Roger Road wastewater treatment facilities to enhance riparian habitat. Other features include channel stabilization projects, grade control structures to increase infiltration and widen the extent of the shallow groundwater table, a trail system, and connections beneath I-10 and Silverbell Road to provide habitat connectivity between the Tucson Mountains, the Santa Cruz River and the Tortolita Fan area.

El Rio Medio

This study is a cooperative effort by the USACOE, the District and the City of Tucson to provide ecosystem restoration; flood control improvements, river park trail development and water recharge development along the Santa Cruz River between Congress and Prince Road. This study in conjunction with the Paseo de las Iglesias and Tres Rio del Norte studies completes an environmental, hydrological and economic cost and benefit review of the Santa Cruz River within the Tucson metropolitan area. Methods being considered for possible implementation of the project include a variety of water harvesting features, irrigation, river bank terracing, and reestablishment of native trees, shrubs, and riparian communities.

7.1.3 Cienega Creek Natural Preserve

In November 1986, the Board of Directors established Cienega Creek Natural Preserve to conserve riparian habitat, reduce flood peaks, increase groundwater recharge, and prevent unwise and detrimental use of the Cienega Creek floodplain. Establishment of the 4,000-acre preserve marked Pima County's first major effort to protect riparian habitat.

Protection measures have included obtaining a Unique Waters designation and obtaining an In-stream Flow Water Right. The Unique Waters designation prevents the state from issuing permits that might degrade water quality. The In-stream Flow Water Right certificate, the fifth ever issued in the state of Arizona, provides a legal basis for the Board to defend the flows within the preserve from depletion or diversion. Over the past 20 years, the District and others have also worked to reduce the threats of depleting groundwater flows to the creek.

Passive restoration activities include fencing and management to eliminate cattle grazing within most of the preserve, as well as restricting motor vehicle access. In response to the reduced grazing and off-road vehicle activity, grassy and woody riparian vegetation along the stream has increased dramatically.

Active measures to repair land damaged by farming and grazing began in 1996 with the Pantano Jungle Project funded in part by the Arizona Game and Fish Department and the U. S. Fish and Wildlife Service. Specific objectives for the grant-funded portion include increasing the structure and species diversity of native vegetation for the benefit of neotropical migratory birds. In addition, several acres were revegetated as offsite mitigation for impacts to the Santa Cruz River as a result of soil-cement bank protection. This project was completed in 2009.

7.1.4 Bingham Cienega Natural Preserve

This project, completed in the fall of 2001, was a joint effort between the Arizona Water Protection Fund, The Nature Conservancy and the District, to restore 25 acres of historic sacaton grass and woodland tree habitat to former agricultural land along the San Pedro River. In 1989, the District acquired 285 acres of land along the San Pedro River to preserve a natural spring-fed marsh known as Bingham Cienega. Because of the site's remote location and sensitive environment, the District entered into a long-term agreement with The Nature Conservancy to manage the property. The Nature Conservancy volunteers fenced out livestock, and once vegetation began to fill drainage channels, the marsh began to spread. The District has installed a small check dam, which successfully arrested erosion that threatened the marsh.

In 1996, an active restoration project began in the form of prescribed burn of the Cienega and construction of firebreaks. Studies of the Cienega sediments and interviews with the previous owners indicated that fire has been an important ecological process affecting the marsh. The Arizona Water Protection Fund supported the fire management planning and an effort to revegetate abandoned farm fields with grant funding. Three years later, The Nature Conservancy had revegetated 25 acres.

A \$13,500 Heritage Fund Grant was awarded by AGFD to conduct a Hydrology and Vegetation Study. The District contracted with The Nature Conservancy to prepare a groundwater flow model and to study the distribution of plants relative to depth-to-groundwater at the Preserve. A final, comprehensive report was written with recommendations for future similar restoration efforts.

Extended surface flows in the river during the fall of 2006 contributed bringing surface water back to the deciduous woodland and the southern portion of the open marsh. AZ Game and Fish reintroduced Long-fin Dace for mosquito control in early 2007; by late 2008 all surface water was gone again and the site remained dry through 2010.

The exceptional flood events in 2006 also destroyed most of the eastern boundary fence which was then rebuilt. Further interior and boundary fence work, beyond regular annual repair and maintenance, was done in 2007 in conjunction with starting to implement the Fire Response Plan by clearing lanes around the preserve to admit brush trucks and firefighters into the areas identified as needing fire suppression. These lanes require substantial annual maintenance to keep passable.

7.1.5 Cortaro Mesquite Bosque

In 2000, the Arizona Water Protection Fund awarded \$486,640 to the District as a grant to restore 80 acres of riparian habitat on the 100-year floodplain terrace of the lower Santa Cruz River. The project is located adjacent to the Continental Ranch residential community within the Town of Marana. It will include restoration of approximately 73 acres of mesquite bosque and 7 acres of subsurface marsh. Approximately 80 acres of riparian woodland and Sonoran desert scrub will be re-established on the lower Santa Cruz River floodplain. Water harvesting from tributary washes will supplement irrigation for the vegetation. The project will allow passive recreation opportunities such as walking and birding, and serve as open space. A path will connect the project with the Town of Marana's river park path, which will be utilized as a portion of the historic Arizona Anza Trail and eventually connect to other regional trail systems. This project complements other efforts by Pima County Cultural Resources and the Town of Marana at the northern end of the Tucson Mountains to improve habitat conditions, highlight cultural history of the region, and maintain landscape connectivity in a rapidly urbanizing area. A design and planting plan was completed during FY 02/03, and construction began in 2006/2007 and was completed in 2008.

7.1.6 Rillito/Swan Wetlands

The Rillito/Swan Wetlands is an ecosystem restoration project being conducted in partnership with the USACE. The USACE completed a Feasibility Study to determine the costs and benefits of enhancing approximately 60 acres of riparian habitat between Craycroft and Columbus roads along the Rillito River. This project will be partially funded by the USACE's Section 1135, Ecosystem Restoration Program. The Environmental Restoration Report is complete and staff is negotiating with the USACOE for the design of the recommended alternative. Staff conducted a public workshop in an effort to obtain input into the selection of the final design alternative. Following the completion of the feasibility phase, the Board of Supervisors and USCOE signed a Project Cooperation Agreement in fiscal year 2004/05. Construction began in fiscal year 2005/06 and was completed in 2008.

7.2 Sonoran Desert Conservation Plan

The Sonoran Desert Conservation Plan (SDCP) is a large scale planning effort, initiated by the Board. It directed the County Administrator to develop a science-based program to address conservation of both cultural and natural resources in eastern Pima County. The plan contains six major elements: 1) ranch conservation; 2) historic and cultural preservation; 3) riparian restoration, 4) mountain parks, 5) conservation of habitat, biological resources and ecological corridors; and 6) critical and sensitive habitat preservation. Since December 1998, District staff has been closely involved with the riparian restoration element of the plan and has supported the work of the Science and Technical Advisory Team (STAT) and other Pima County departments.

The most important result of the SDCP so far is the effect on the County's Comprehensive Land Use Plan (Plan). The Plan aligns conservation of biological resources in unincorporated Pima County with urban service areas, a big step toward "no adverse impact" floodplain management. The plan also provides a framework for concurrent financing of public infrastructure with development. This is described more fully in the next section.

Much of the new information concerning floodplain resources is summarized in the September 2000 report “Riparian Protection, Management, and Restoration” (available through the SDCP website: <http://www.co.pima.az.us/cmo/sdcp/index.html>)

Since then, a number of important new studies have been completed. One example is the recent report entitled, “Biological Values of the West Branch of the Santa Cruz River” also available on the website. This report helped to inspire the Board to protect one of the most biological intact areas along the Santa Cruz floodplain in Tucson. The study “Pima County Riparian Habitat Mitigation Ordinance: Effectiveness Review” will guide upcoming revisions to our floodplain management regulations.

These reports and over 100 others are available for downloading from the website. They include the following:

- Focus on Riparian Areas
- Environmental Restoration in Pima County in Cooperation with the U. S. Army Corps of Engineers
- Impacts of Unregulated Development at the Community Level
- Floodplain Primer
- Survey and Assessment, Altar Valley
- Altar Valley Watershed Protection
- Comprehensive Plan Update (Adopted)
- Climate Variability in Pima County
- Riparian Protection
- Riparian Mapping
- Prioritization of Streams
- Pima County Watersheds/Watercourses
- Cienega Creek Storm Flow Frequency Analysis
- Historic Occurrence of Native Fish in Pima County
- Suitability Analysis and Representation Goals for Cottonwood-Willow Forest Habitat
- SDCP Riparian Vegetation Mapping and Classification
- Aquatic Vertebrate Conservation in Pima County
- Bingham Cienega Restoration
- Water Resources and the SDCP

7. 3 Comprehensive Land Use Plan Adoption

With the adoption of the Pima County Comprehensive Plan in December 2001, the Board has taken steps to protect the environment and reduce the costs to local taxpayers for future floodplain management. The Plan anticipates continued growth within the human population of Pima County. It establishes growth areas and other land use categories that complement the biological reserve defined through the SDCP.

The Comprehensive Plan targets riparian and aquatic areas for the highest levels of protection. Analysis of habitat loss and land ownership indicates that while riparian habitat is the most imperiled of the local communities, it is the least protected.

Because of their biological value, the Plan has been revised to protect mesoriparian and riparian linkage areas at a minimum of 95 percent of their current level, including all riparian linkage areas delineated by the Science Team within the biological reserve. These are identified as Important Riparian Area on the Regulated Riparian Habitat Maps adopted by the Board in 2005. These standards will reduce the development pressure on floodplains.

New rezonings and specific plan requests approved within the Conservation Lands System (CLS) will need to conform to the intensity that is appropriate to protect biological resources. Specific percentages for conservation of non-riparian areas will require leaving 30 to 80 percent of the land in a natural condition. These standards will encourage a more compact urban footprint.

Plans for development located within floodplains that propose densities or uses consistent with urban land use intensity categories shall be regarded as inconsistent with County policy, unless the development plan removes the area from flooding hazards. Other new policies reduce the placement of utilities, including sewers, along watercourses, and discourage the development of areas remote from urban infrastructure.

7.4 Water Resources and Recharge Projects

The District's Water Resource Program includes efforts directed toward managing surface water and groundwater to benefit the health of the land and the sustainability of human enterprise.

The District joined with Pima Association of Governments and Pima County Technical Services to complete the first detailed and comprehensive inventory of the streams and springs in Pima County. Our studies found that Pima County, outside the Tohono O'odham Nation, has 66 perennial stream reaches and 120 intermittent stream reaches on 57 different streams. At least 257 springs exist in Pima County. Many reaches of stream flow and some of the largest springs were not previously identified by any agency.

In addition, we identified one hundred potential shallow groundwater sites, and 23 have their boundaries delineated. Shallow groundwater areas support lush riparian environments and are exceptionally sensitive to groundwater pollution.

These new data are available in the County's GIS library and on the SDCP Map Guide website located at: <http://www.dot.co.pima.az.us/cmo/sdcpmaps/>

In addition, the District and PAG completed a number of scientific and water policy reports about groundwater and surface water resources in Pima County. The following reports are available to the public at: <http://www.co.pima.az.us/cmo/sdcp/index.html>.

- Springs in Pima County
- GIS Coverages of Perennial Streams, Intermittent Streams and Areas of Shallow Groundwater
- Water Usage Along Selected Streams in Pima County
- Groundwater Level Changes in the Tanque Verde Valley
- Water Resources in Pima County
- Lower Cienega Source Water
- Bingham Cienega Source Water

The District lacks authority to make most water resource decisions, but Pima County does have authority to regulate land use over much of the landscape. The District continues to work with other Pima County departments, the Arizona Department of Water Resources, and federal agencies to connect land use and land management decisions with water resource impact analysis. Specific areas of collaboration have included the golf course ordinance, evaluation of the Plan amendments, and input into ADWR management plans.

The District can maximize the potential for effective solutions to landscape-level issues, including water supply issues, through partnerships with other agencies and citizens. Staff has developed and disseminated educational materials about the location and relationship between aquifer and riparian areas to the general public and other agencies. Staff participates or funds collaborative research and education efforts with federal land management agencies and local communities. For instance, the District has sponsored development of groundwater models for remote areas having groundwater-dependent riparian areas, such as Arivaca, the San Pedro River, and the lower Cienega basin. In addition, the District monitors the availability of surface water and groundwater at various sensitive riparian areas in the County, and prepares annual summaries of total runoff along gauged streams.

7.4.1 Northwest Replenishment Program/ Lower Santa Cruz Replenishment Project

In 1996, the District completed an interagency evaluation of the feasibility of recharge along the Santa Cruz River downstream of Avra Valley Road and the Cañada del Oro Wash downstream of Catalina State Park. The feasibility study resulted in the eventual construction of the Lower Santa Cruz Replenishment Project. This project is a joint effort to store Central Arizona Project (CAP) water underground for eventual recovery during times of drought.

The project consists of three groundwater recharge basins, located south of the main channel of the Santa Cruz River that is used to recharge CAP Water Replenishment Project (Figure 9). Earthen materials excavated from the basins were put to use in the Lower Santa Cruz River Levee Project, described in the Structural Programs section, thus resulting in a cost savings to the public. Construction of the basins was completed in May 2000, and the Central Arizona Water Conservation District began recharging CAP water in June 2000 for a variety of clients including the Arizona Water Banking Authority, Metropolitan Water District, and Town of Marana.

7.4.2 Northwest Replenishment Program/Marana High Plains Effluent Recharge Project

The Marana High Plains Effluent Recharge project is a two-year pilot project to investigate the feasibility of using treated effluent to enhance riparian habitat while recharging the groundwater aquifer. Treated effluent is diverted from the Santa Cruz River and recharged in a series of constructed basins. The pilot project will evaluate issues such as the rate of recharge, groundwater quality effects, and enhancing the value of the facility with vegetated side slopes and basin bottoms (Figure 10).

This project is a two-year pilot to investigate the feasibility of using treated effluent to enhance riparian habitat while recharging the groundwater aquifer. Construction of the facility has been completed and recharge is began in summer 2003. The water diverted from the Santa Cruz River nourishes the densest riparian patch along the effluent-dominated Santa Cruz River. Additional plantings of native trees and

shrubs adjacent to the recharge basins broaden and extend the riparian corridor. This multipurpose project is partially funded by the Arizona Water Protection Fund and is operated in conjunction with the Town of Marana and the Cortaro- Marana Irrigation District. Stormwater harvesting is also used on the site, along with fencing to restrict cattle. The District utilizes a Surface Water Right owned by Cortaro- Marana Irrigation District to divert effluent from the Santa Cruz River; such flows maintain a lush riparian area along an “oxbow channel” of the river. The AWPf grant was used to inventory wildlife and vegetation, and funded trail construction, and vegetation in and around the recharge basins.

Modifications made to correct initial operational problems and enhance the facility’s recharge capacity may allow up to 750 acre-feet per year. Noticeable environmental benefits were observed as a result of the additional vegetation and wetland environment including breeding activity by residential songbirds and use by migratory waterfowl and wading birds. Establishment of vegetation at the site appears successful.

8.0 SUMMARY OF THE DISTRICT’S COMPREHENSIVE PLAN

8.1 Overview of Comprehensive Plan

Floodplain management and flood protection is a continuous process requiring a comprehensive plan to provide flood hazard mitigation, address existing needs in developed areas, plan for future development and changes in land uses, and provide an emergency response and preparedness plan to respond to severe weather, flooding and other natural disasters. Long-range planning is a necessary part of the District’s Comprehensive Plan for floodplain management strategies, resource protection, and Capital Improvement Program. Additionally, regular updates and review of the Comprehensive Plan are necessary to address changes in environmental regulations, manmade and natural impacts to watersheds, and Pima County’s dynamic and growing community.

8.2 Hazard Mitigation Planning

Natural hazard mitigation planning is the process of identifying and implementing programs to reduce or eliminate the loss of life and property damage that may result from natural hazards such as floods. Through the Disaster Mitigation Act of 2000, the federal government has established criteria for state and local governments to develop a community-based hazard mitigation plan for natural and manmade disasters. Pima County, with assistance from the Arizona Department of Emergency Management, has begun the development of a Hazard Mitigation Plan for Pima County. The basic steps for mitigation planning include:

Organization of Resources. For state and local communities, the initial focus is gathering resources including identifying the necessary technical expertise and community agencies in hazard mitigation.

Assess Risks. The characteristics and potential consequences of natural hazards need to be identified and the potential risks and damages estimated.

Develop a Mitigation Plan. Determination of priorities and structural and nonstructural approaches to avoid or minimize damages with the development of a formalized hazard mitigation plan and strategy for implementation of the plan.

Implementation of the Plan and Monitoring of Progress. Implementing specific mitigation projects, adopt land use regulations to avoid future hazards, periodic evaluation of the effectiveness of the plan, and project improvements and regulations in reducing or avoid damages and loss from natural hazards. The Department of Emergency Services and Homeland Security is the agency responsible for coordination with local, state and federal agencies for hazard mitigation and emergency response. The District provides the local technical expertise for flood and erosion hazards.

Through annual reports and 5-year comprehensive reports, the District has been formally reporting and evaluating flood hazard mitigation strategies. These hazard mitigation strategies include floodplain management, riparian habitat protection, and capital flood control improvements.

8.3 Floodplain Management

Floodplain Management includes; nonstructural programs such as regulation of land use in floodplains, developing watershed plans, river and basin management studies to improve delineation of flood hazards and avoid future risks, expanding public information on flood hazards, and floodprone land acquisitions.

8.3.1 Floodplain Regulations

The Ordinance provides goals and objectives to guide nonstructural activities, regulate land use and reduce the potential for future flood damages. The Ordinance and associated standards and guidance are reviewed annually for consistency with land development patterns and the NFIP.

8.3.2 Watershed Planning

Watershed plans are developed as strategic floodplain management tools to address the unique physical and hydrological characteristics of each watershed and major watercourse. The goal of watershed planning is to control the impact of urbanization within each watershed to minimize the potential for increased flood peaks and erosion that may occur with urbanization. Watershed plans provide guidance for acquisition of floodprone land, protection of natural conditions in upper watersheds, urban stormwater controls and detention, riparian protection, and control of soil erosion. Watershed studies include topographic and aerial mapping to allow for improved identification of flood and erosion risks and to prepare improved floodplain mapping. Within an urbanizing watershed, basin management plans address the need for stormwater detention to minimize the potential for increased flood peaks with development. During the program period the District conducted a Watershed Planning Study to aid in guiding basin studies. Since the District's initial participation in the CRS, we have indicated that planning shall be on a basin by basin basis, and that plan updates shall be coordinated in this manner. Such coordination and phasing is required due to the large geographic area, and unique floodplain characteristics associated with Sonoran desert basin and range geomorphology. As development proceeds in watersheds in which FEMA maps have not been developed this is epically critical.

Furthermore as noted elsewhere in this report development itself, fires and floods have altered floodplains which require restudy.

8.3.3 Public Education

Public education and awareness of potential severe storm and flood hazards is a vital component of our floodplain management strategy. Education includes addressing issues on the NFIP for homeowners and businesses; educating professionals in real estate, building and manufactured housing; and educating citizens on storm and flood hazards including safety tips about entering flooded washes.

8.3.4 Floodprone Land Acquisition

Since 1984, the District has been active in acquiring floodprone land in upper watershed areas such as Cienega Creek and the Santa Cruz River at Canoa as a means of preserving the natural floodplain functions including overbank floodwater storage. This program also provides a cost effective means of removing residents from floodprone areas where structural flood control options are not available. The program also provides protection of riparian areas and natural stream channels that controls the potential for erosion hazards within watershed areas.

8.4 Resource Protection

8.4.1 Riparian Habitat

Protection of riparian habitat is an essential part of managing watersheds and watercourses. Vegetation along stream banks and in the overbank serve to slow the flow of floodwaters, encourages the infiltration of floodwaters, and stabilizes soil against erosion. The vegetation in the overbank allows floodwaters to spread out over the floodplain reducing the velocity of the floodwaters and detain floodwaters as overbank flood storage reducing the peak flood flow. Reducing the flow velocity and providing a wide expanse for floodwaters to spread encourages infiltration and groundwater recharge, which also reduces the volume of floodwaters and peak flood flow. Bank erosion and soil loss are critical concerns in Pima County; most property damage occurs from erosion rather than flooding. Preserving the natural vegetation stabilizes the stream banks and reduces the velocity of the floodwaters, which further aids in preventing erosion. Furthermore, riparian preservation retains nutrient recharge, as well as contaminant dispersal and attenuation functions of floodplains. Protection of the natural riparian habitat is provided through land use regulations in the Ordinance, acquisition of floodprone land to preserve riparian habitat, erosion control and the management of water resources to maintain the environment necessary for healthy riparian vegetation.

8.4.2 Sonoran Desert Conservation Plan

Since the adoption of the SDCP and the CLS, important riparian areas along the major watercourses and other streams have been identified for protection. The District has assisted in the development of updated riparian mapping of Pima County's resources and will be revising the Ordinance to be aligned

with the land use plan of the SDCP, and the updated and more detailed mapping of riparian habitat in Pima County. In concert with the SDCP, the District will continue technical studies and evaluations of habitat and water resources for the preservation and protection of riparian habitat in Pima County.

8.5 Capital Improvements

Since inception, the District has commenced with capital improvements to reduce the risk of flood damages to private and public improvements and to respond to flood damages in a manner that provides flood mitigation as well as restoration. The District develops both an annual and a 5-Year Capital Improvement Program to address the needs within each jurisdiction or geographical area. Projects are developed based on recommendations from watershed plans and available funding. Variables considered in developing the District's CIP include:

- Previous Flood Damages. Priority is given to projects that address previous flood damages and areas subject to repetitive flooding and drainage problems.
- Regional Programs. The District's projects and programs are regional and provide countywide benefits.
- Downstream Benefits. The District has developed master management plans for the major watercourses and watersheds to reduce the hazards from flooding and erosion that also consider downstream impacts and benefits.
- Evolving Urban Edge. The District has constructed a significant amount of bank stabilization and flood control improvements in existing urban and growth areas. The projects in existing urban areas mitigate flooding problems in areas developed prior to floodplain management regulations and improvements in the growth areas, and evolving urban edge, help the communities avoid future flood hazards.

8.6 Summaries and Concluding Statement

Flood hazard mitigation, floodplain management, resource protection and flood control capital improvements are the fundamental elements of the District's Comprehensive Program. Implementation of this Comprehensive Program and each element will be evaluated on an annual basis. An annual report, the 5-Year Comprehensive Report and the District's annual Community Rating System re-certification are all a part of this annual evaluation and review with ADWR and FEMA. Annually, the District will review:

- The Comprehensive Program,
- Any floods that occurred during the previous year,
- Land use changes and regional needs,
- Progress made towards implementing each element of the plan, and
- Plan goals and objectives, and implementation requirements.

As appropriate to address changing conditions and community needs, new projects and programs will be established and implemented.

APPENDICES

Appendix A

Approved LOMR Lists for FY2006/07 – FY 2010/11

Date	Number	Panel Number(s)	Affected Wash and/or Floodplain	PC	TU	MA	OV	SA
03/31/2011	11-09-1772P	1605K	Unnamed Wash 1 - from approx. 370' upstream to approx. 740' upstream of the confluence with the Santa Cruz River			X		
03/24/2011	11-09-1773P	1616K	Sweetwater Wash - right overbank from approx. 300' upstream of the confluence with the Santa Cruz River to approx. 1450' upstream		X			
01/27/2011	10-09-3332P	1644K, 1645K	Flecha Caida Wash - from approx. 1830' downstream of Swan Rd. to just downstream of Paseo del Bac; -AND- Unnamed Tributary to Flecha Caida Wash - from the confluence to approx. 2950' upstream of Flecha Caida Wash	X				
01/24/2011	10-09-3256P	1616K, 1618K	Roger Wash - from approx. 1620' downstream of Silverbell Rd. to approx. 3370' upstream of El Moraga Rd.	X	X			
01/24/2011	10-09-3002P	1605K	Unnamed Wash 1 - from approx. 570' downstream of Silverbell Rd. to approx. 1460' upstream of Waycross Rd. (Pima County & Marana)	X		X		

12/23/2010	10-09-3045P	1618K, 1619K	Camino de Oeste Wash - from approx. 2200' downstream of Silverbell Rd. to just upstream of Goret Rd. (Pima County & City of Tucson)	X	X			
11/22/2010	10-09-2797P	1616K	Del Cerro Wash - from approx. 360' downstream of Silverbell Rd. to approx. 1580' upstream of Placita Rico (Pima County & City of Tucson)	X	X			
11/02/2010	10-09-2793P	1616K, 1618K	Sweetwater Wash - from the confluence with Santa Cruz River to approx. 2600' upstream of Camino Nuestro (Pima County & City of Tucson)	X	X			
10/06/2010	10-09-3454P	1040K	Cañada del Oro - from approx. 1340' to approx. 2120' upstream of La Cañada Dr.				X	
09/30/2010	10-09-3453P	1610K	Cañada del Oro - from just upstream of Magee Rd. to approx. 350' upstream	X				
09/30/2010	10-09-3451P	1039K, 1040K	Cañada del Oro - from approx. 3990' to approx. 3690' downstream of N. 1st Ave.				X	
09/13/2010	09-09-2406P	1655K, 1663K, 1665K	Ventana Canyon Wash - from the confluence of Tanque Verde Wash to approx. 8450' upstream of Ventana Canyon Dr.	X				

09/09/2010	10-09-2498P	1518K, 1619K	Trails End Wash - from approx. 1220' downstream of Silverbell Rd. to approx. 6120' upstream (Pima County & City of Tucson)	X	X			
09/08/2010	10-09-2567P	1619K	West Speedway Wash - from approx. 2800' downstream of Silverbell Rd. to approx. 1300' upstream of Shannon Rd.		X			
09/07/2010	10-09-3129X	1605K	Santa Cruz River - from approx. 2190' to approx. 1720' downstream of Ina Rd - corrections to BFEs for LOMR issued 09- 09-0233P			X		
09/03/2010	09-09-0233P	1605K	Santa Cruz River - from approx. 200' downstream of Cortaro Rd. to approx. 4500' upstream of Ina Rd.	X		X		
07/13/2010	10-09-1751P	2233K, 2234K	Naylor Wash - from approx. 80' upstream of Alvernon Way to just upstream of Columbus Blvd		X			
05/24/2010	10-09-1281P	1020K, 1040K	Cañada del Oro Wash - from just downstream of N. La Cañada Dr. to approx. 4075' downstream (Pima County & Oro Valley)	X			X	
05/17/2010	10-09-1312P	1039K	Unnamed Wash - from approx. 50' downstream of Camino Torero to approx. 300' upstream of El Conquistador Way				X	

04/19/2010	08-09-1800P	1040K, 1045K	Big Wash - from approx. 0.08 miles upstream of confluence with CDO Wash to just downstream of Tangerine Rd. Bridge				X	
04/15/2010	09-09-0492P	2239K	Airport Wash - from approx. 50' downstream of Fontana Ave. to approx. 90' downstream of Valencia Rd.		X			
02/24/2010	09-09-1217P	3415K, 3905K	Santa Cruz River (above Pima Mine Rd.) - from approx. 9300' downstream of Continental Rd. to approx. 3200' downstream -AND- Unnamed Tributary - from the mouth to approx. 5700' upstream of mouth					X
01/26/2010	09-09-0980P	1025K	Wild Burro Wash - from approx. 500' upstream of Dove Mountain Blvd to approx. 5100' upstream			X		
01/19/2010	08-09-1811P	0445K, 0465K, 1020K, 1035K, 1039K, 1040K, 1045K, 1610K	Cañada del Oro Wash - from approx. 0.15 miles upstream to approx. 19.03 miles upstream of the mouth (Pima County, Oro Valley & Marana)	X		X	X	
01/14/2010	09-09-2404P	2270K	Rincon Vista Middle School - unnamed tributary to west split of Civano Wash - from approx. 500 ft upstream of the confluence with the west split of Civano		X			

			Wash to approx. 2100 feet upstream					
11/20/2009	09-09-0020P	1610K, 1617K	Pegler Wash - from W. Orange Grove Rd to approx. 3300' downstream of W. Orange Grove Rd. (Pima County & City of Tucson)	X	X			
03/19/2009	09-09-0301X	1015K, 1020K, 1025K	Cañada Agua West Alluvial Fan - approx. 2300' upstream of Tortolita Rd. to approx. 200' downstream of Moore Rd. (Pima County & Marana)	X		X		
03/02/2009	08-09-1520P	2270K	Unnamed Tributary to West Split of Civano Wash - from the confluence with the West Split of Civano Wash to approx. 2100' upstream			X		
02/24/2009	09-09-0300X	1015K, 1020K, 1605K	Cañada Agua East Alluvial Fan - from approx. 250' upstream of Frontage Rd. to approx. 200' upstream of Camino Del Norte (Pima County & Marana)	X		X		
02/12/2009	09-09-0691X	1610K	Nanini Wash - from just downstream of W. Lavery Dr. to just downstream of Orange Grove Rd.	X				

02/11/2009	09-09-0539X	2200K, 2225K	Black Wash Tributary and Unnamed Tributaries to Black Wash - approx. 1000' downstream to approx. 300' upstream of Iberia Ave	X				
02/09/2009	08-09-1560P	1637K, 1645K	Camino Real Wash - from the confluence with Rillito Creek to approx. 3500' upstream of River Rd. (Pima County & City of Tucson)	X	X			
01/30/2009	09-09-0529X	1637K	Campbell Wash - approx. 700' upstream of River Rd to approx. 2150' upstream	X				
01/23/2009	08-09-1317P	2875K	Esmond Station Wash - from approx. 2000 ft upstream of Rita Rd to approx. 2800 ft upstream (Empire Heights)		X			
12/19/2008	08-09-1616P	1610K	Pegler Wash - from Orange Grove Rd. to just upstream of LaCholla Blvd. (Friendship Villas)	X				
10/23/2008	08-09-0473P	1630K, 1636K, 1637K	Friendly Village Wash - from just upstream of Stone Loop Rd. to approx. 9700' upstream -AND- Tributary to Friendly Village Wash - from the confluence with Friendly Village Wash to approx. 4200' upstream (Pima County and City of Tucson)	X	X			

09/29/2008	08-09-1756X	1630K, 1636K	Pima Wash - from the mouth of Pima Wash to a point approx. 4900' upstream of Christie Dr. (Pima County & City of Tucson)	X	X			
08/25/2008	08-09-0540P	SUPERSEDED BY 09-09-0691X (02/12/09)	Nanini Wash - from just downstream of W. Lavery Dr. to just downstream of Orange Grove Rd.	X				
08/11/2008	08-09-0968P	SUPERSEDED BY 09-09-0529X (01/30/09)	Campbell Wash - approx. 700' upstream of River Rd to approx. 2150' upstream	X				
07/21/2008	08-09-0454P	SUPERSEDED BY 08-09-1756X (09/29/08)	Pima Wash - from the mouth of Pima Wash to a point approx. 4900' upstream of Christie Dr. (Pima County & City of Tucson)	X	X			
05/23/2008	08-09-0001P	1644K	Columbus Wash - Grant Rd. to Blackledge Dr.		X			
05/04/2008	07-09-1087P	2253K	Alamo Wash - from approx. 270' downstream of Wilmot Rd. to approx. 50' upstream of Calle Betelgeux		X			
03/26/2008	08-09-0341P	2200K	Unnamed Tributary to Black Wash - approx. 700' upstream to approx. 2000' upstream of Valencia Rd. (Caddis Haley Estates Subdivision)	X				
03/25/2008	08-09-0709X	2245K, 2850K	Unnamed Tributary to Rodeo Wash - approx. 2000' upstream of Valencia Rd to approx. 6400' upstream (Rancho Valencia Phase 3)	X				

03/25/2008	08-09-0442P	2265K, 2855K	Julian Wash - from just downstream of Kolb Rd. to just upstream of Wilmot Rd. (La Estancia de Tucson)		X			
01/28/2008	07-09-1858P	2200K	Black Wash Tributary - from Valencia Rd. to approx. 2500' downstream of Valencia Rd. (Sonoran Ranch Estates II subdivision)	X				
01/15/2008	07-09-1857P	2262K	Atterbury Wash - just upstream to approx 1100' upstream of Stella Rd (Lakeside Ridge subdivision)		X			
12/13/2007	07-09-1759P	SUPERSEDED BY 09-09-0300X (02/24/09)	Cañada Agua East Fan - approx 250' upstream of Frontage Rd to approx 200' upstream of Camino del Norte (Pima County & Marana)	X		X		
10/30/2007	07-09-1051P	SUPERSEDED BY 08-09-0709X (03/25/08)	Unnamed Tributary to Rodeo Wash - approx. 2000' downstream to approx. 6400' upstream of Valencia Rd	X				
10/29/2007	08-09-0051P	SUPERSEDED BY 09-09-0539X (02/11/09)	Black Wash Tributary and Unnamed Tributaries to Black Wash - approx. 1000' downstream to approx. 300' upstream of Iberia Ave	X				
09/27/2007	07-09-0990P	1610K, 1617K	Nanini Wash - confluence to approx. 6700' upstream of Rillito Creek	X				

08/22/2007	07-09-1305P	2243K, 2239K	Rodeo Wash - approx. 375' downstream of Country Club Dr to approx. 300' upstream of Campbell Ave.		X			
08/03/2007	07-09-1088P	1020K	La Cholla Wash - approx. 3150' downstream to just upstream of Lambert Lane -AND- Wash B - confluence with the La Cholla Wash to just upstream of Lambert Ln -AND- Wash D - confluence with the La Cholla Wash to approx. 650' upstream of Owl Head Pl.				X	
07/05/2007	06-09-BA80P	1015K, 1025K	Ruelas Canyon Alluvial Fan - approx. 14,000' downstream to just downstream of Dove Mountain Blvd			X		
06/29/2007	07-09-1167P	1035K	Big Wash - approx. 5000' upstream to approx. 7200' upstream of Rancho Vistoso Blvd. (Pima County & Oro Valley)	X			X	
06/04/2007	07-09-0707P	2233K, 2234K	Arroyo Chico - just downstream of Alvernon Way to just downstream of Swan Rd.		X			
04/30/2007	06-09-BH08P	2225K	Unnamed Tributaries to Black Wash - just upstream to approx. 1500' upstream of S. Kinney Rd. (Desert Meadows)	X				
04/26/2007	06-09-BB43P	0960K	Santa Cruz River - approx. 5500' downstream to approx. 2050' upstream of Trico-	X				

			Marana Rd					
03/21/2007	07-09-0603P	1020K	Unnamed Wash - approx. 1600' downstream to approx. 100' upstream of Tangerine Rd. (Sunset Canyon Estates)				X	
02/28/2007	07-09-0551P	1643K	Alvernon Wash - approx. 1200' downstream of Blacklidge Dr. to approx. 350' upstream of Flower St.		X			
02/26/2007	07-09-0762X	0980K	Santa Cruz River - 1600' upstream to approx. 10,600' upstream of Trico-Marana Rd.			X		
01/26/2007	06-09-BA36P	2262K	Kinneson Wash - approx. 1000' downstream to approx. 1300' upstream of Escalante Rd (Villa Escalante)		X			
12/13/2006	07-09-0432X	2830K	El Vado Wash - Missiondale Rd. to S. 12th Ave. (2)	X				
12/01/2006	06-09-B818P	1610K	Unnamed Tributary to Massingale Wash - just upstream of Thornydale Rd to just downstream of Cortaro Farms Rd (Cortaro Crossing)	X				
11/22/2006	06-09-BG63P	2830K	El Vado Wash - just upstream of Corona Rd to approx. 200' upstream of 6th Ave.	X				

11/16/2006	06-09-BC54P	1015K	Prospect Canyon Alluvial Fan - just downstream to approx. 1350' downstream of Dove Mountain Blvd.			X		
10/26/2006	06-09-BD84P	0960K, 0970K	Santa Cruz River - 1600' upstream to approx. 10,600' upstream of Trico-Marana Rd. (Pima County & Marana)	X		X		
07/06/2006	05-09-A090P	1663K	Pantano Wash - approx. 1000' upstream to approx. 3700' upstream of Craycroft Rd. -AND- Tanque Verde Wash - approx. 1700' upstream to approx. 5900' upstream of Craycroft Rd. (Pima County & Tucson)	X	X			

Appendix B

Approved LOMR lists for FY 2005/06 – FY 2010/11

Type of LOMC	Date	Panel No.	Structure/Property	Address	PC	TU	MA	OV	SA	ST
LOMA	10/14/2010	2257K	Structure	10048 E. El Poso Tr.		X				
LOMR-F	07/06/2010	1039K	Structure	10050 N. Plaza de Corrida				X		
LOMR-F	07/06/2010	1039K	Structure	10056 N. Plaza de Corrida				X		
LOMR-F	07/06/2010	1039K	Structure	10062 N. Plaza de Corrida				X		
LOMR-F	07/06/2010	1039K	Structure	10068 N. Plaza de Corrida				X		
LOMR-F	07/06/2010	1039K	Structure	10074 N. Plaza de Corrida				X		
LOMA-OAS	03/23/2010	1040K	Structure	10130 N. Inverrary Pl.				X		
LOMA-OAS	03/23/2010	1040K	Structure	10131 N. Inverrary Pl.				X		
LOMA	02/09/2010	1040K	Structure	10327 N. Fair Desert Dr.				X		
LOMA-OAS	03/23/2010	1040K	Structure	10384 N. Fair Mountain Dr.				X		
LOMA-OAS	03/23/2010	1040K	Structure	10392 N. Fair Mountain Dr.				X		
LOMA	10/19/2010	1040K	Structure	1040 W. Saddlehorn Dr.				X		
LOMA	10/19/2010	1040K	Structure	1050 W. Saddlehorn Dr.				X		
LOMA-OAS	03/23/2010	1039K	Structure	10762 N. Peninsula Ct.				X		
LOMA-OAS	03/23/2010	1040K	Structure	1141 W. Wild Dune Ln.				X		
LOMA-OAS	03/23/2010	1040K	Structure	1151 W. Wild Dune Ln.				X		
LOMA	10/12/2010	1039K	Structure	120 W. Oro Valley Dr.				X		
LOMA	10/12/2010	1040K	Structure	120 W. Oro Valley Dr.				X		
LOMR-FW	06/26/2008	2280K	Structure	12320 E. Barbary Coast Rd.	X					
LOMA	10/12/2010	1039K	Structure	133 W. Oro Valley Dr.				X		
LOMA	08/17/2010	1025K	Area	14417 N. Sunset Gallery Dr.			X			
LOMA - OAS	02/02/2010	1035K	Structure	14635 N. Desert Sage Ln.	X					
LOMA	07/22/2008	0955K	Structure	14700 N. Aguirre Rd.	X					
LOMA - OAS	02/02/2010	1035K	Structure	14705 N. Desert Sage Ln.	X					
LOMA - OAS	01/19/2010	1035K	Structure	15158 N. Ironwood Tree Rd.	X					
LOMR-F	12/07/2006	1636K	Property	1598 W. Gentle Brook Tr.	X					
LOMA	10/21/2010	1039K	Structure	160 W. Oro Valley Dr.				X		
LOMA	10/21/2010	1040K	Structure	160 W. Oro Valley Dr.				X		
LOMA	09/24/2009	2251K	Property	1610 N. Sahuara Ave.		X				
LOMR-F	12/07/2006	1617K	Property	1624 W. Gentle Brook Tr.	X					
LOMR-F	12/07/2006	1636K	Property	1624 W. Gentle Brook Tr.	X					
LOMR-F	12/07/2006	1617K	Property	1626 W. Gentle Brook Tr.	X					
LOMR-F	12/07/2006	1636K	Property	1626 W. Gentle Brook Tr.	X					
LOMR-F	12/07/2006	1617K	Property	1628 W. Gentle Brook Tr.	X					
LOMR-F	12/07/2006	1617K	Property	1630 W. Gentle Brook Tr.	X					
LOMA - OAS	01/28/2010	1610K	Structure	1631 W. Calle Concordia	X					

LOMR-F	12/07/2006	1617K	Property	1644 W. Gentle Brook Tr.	X					
LOMR-F	12/07/2006	1617K	Property	1650 W. Gentle Brook Tr.	X					
LOMA	08/31/2010	4400K	Structure	17100 E. Yucca Ash Farm Rd.	X					
LOMR-F	12/07/2006	1617K	Property	1713 W. Gentle Brook Tr.	X					
LOMR-F	12/06/2007	1020K	Structure	1719 W. Wimbledon Wy.				X		
LOMR-F	12/07/2006	1617K	Property	1721 W. Gentle Brook Tr.	X					
LOMR-F	12/07/2006	1617K	Property	1722 W. Gleaming Moon Ln.	X					
LOMA	07/22/2008	1610K	Structure	1801 W. Rudasill Rd.	X					
LOMA	07/12/2006	1610K	Structure	1820 W. Placita del Lobo	X					
LOMA	07/14/2006	1610K	Structure	1830 W. Placita del Lobo	X					
LOMA	07/14/2006	1610K	Structure	1831 W. Placita del Lobo	X					
LOMA	07/14/2006	1610K	Structure	1840 W. Placita del Lobo	X					
LOMR-F	12/06/2007	1020K	Structure	1857 W. Wimbledon Wy.				X		
LOMR-F	12/06/2007	1020K	Structure	1868 W. Wimbledon Wy.				X		
LOMR-F	12/06/2007	1020K	Structure	1869 W. Wimbledon Wy.				X		
LOMR-F	10/26/2010	2280K	Structure	1917 N. Wentworth Rd.	X					
LOMA	02/25/2010	1619K	Structure	1950 W. Water St.		X				
LOMA - OAS	11/19/2009	1637K	Property	2232 E. Camino Rio	X					
LOMA - OAS	11/19/2009	1637K	Property	2247 E. Camino Rio	X					
LOMA - OAS	06/12/2008	2253K	Property	227 S. Busch Pl.		X				
LOMR-F	08/17/2006	2257K	Property	2280 N. Roanna Ct.	X					
LOMR-F	08/17/2006	2280K	Property	2280 N. Roanna Ct.	X					
LOMR-F	08/17/2006	2257K	Property	2285 N. Roanna Ct.	X					
LOMR-F	08/17/2006	2280K	Property	2290 N. Roanna Ct.	X					
LOMR-F	08/17/2006	2257K	Property	2295 N. Roanna Ct.	X					
LOMA	04/24/2007	1643K	Structure	2323 E. Mitchell St.		X				
LOMA	04/16/2009	1643K	Structure	2519 E. Richards Pl.		X				
LOMA - OAS	11/09/2009	1644K	Property	2638 N. Orchard Ave.		X				
LOMA	12/08/2009	1610K	Structure	2712 W. Placita del Huerto	X					
LOMA	01/08/2009	2233K	Structure	2814 E. 17th St.		X				
LOMR-F	01/18/2011	1616K	Structure	3822 N. Wild Life Dr.	X					
LOMA	11/09/2010	2226K	Structure	385 N. Main St.		X				
LOMA - OAS	08/28/2007	2810K	Property	4000 W. Tetakusim Rd.	X					
LOMA-OAS	02/25/2011	1665K	Property	4009 N. Flaming Sky Pl.	X					
LOMA-OAS	02/25/2011	1665K	Property	4017 N. Flaming Sky Pl.	X					
LOMA-OAS	02/25/2011	1665K	Property	4025 N. Flaming Sky Pl.	X					
LOMA-OAS	02/25/2011	1665K	Property	4033 N. Flaming Sky Pl.	X					
LOMA-OAS	02/25/2011	1665K	Property	4041 N. Flaming Sky Pl.	X					
LOMA-OAS	02/25/2011	1665K	Property	4049 N. Flaming Sky Pl.	X					
LOMA	10/27/2009	2210K	Property	406 N. Shantel Dr.		X				
LOMA-OAS	02/25/2011	1665K	Property	4077 N. Calle Bartinez	X					

LOMA-OAS	02/25/2011	1665K	Property	4089 N. Calle Bartinez	X					
LOMA-OAS	02/25/2010	1643K	Structure	4091 N. San Simeon Rd.						
LOMA-OAS	02/25/2010	1644K	Structure	4091 N. San Simeon Rd.	X					
LOMA-OAS	02/25/2011	1665K	Property	4095 N. Calle Bartinez	X					
LOMA-OAS	02/25/2011	1665K	Property	4101 N. Calle Bartinez	X					
LOMA-OAS	02/25/2011	1665K	Property	4107 N. Calle Bartinez	X					
LOMA-OAS	02/25/2011	1665K	Property	4113 N. Calle Bartinez	X					
LOMA - OAS	03/22/2011	1645K	Structure	4115 N. Avenida del Cazador	X					
LOMA-OAS	02/25/2011	1665K	Property	4119 N. Calle Bartinez	X					
LOMA - OAS	02/04/2010	1035K	Structure	4121 E. Wilds Rd.	X					
LOMA-OAS	02/25/2011	1665K	Property	4125 N. Calle Bartinez	X					
LOMA-OAS	02/25/2011	1665K	Property	4131 N. Calle Bartinez	X					
LOMA-OAS	02/25/2011	1665K	Property	4137 N. Calle Bartinez	X					
LOMA-OAS	02/25/2011	1665K	Property	4143 N. Calle Bartinez	X					
LOMA-OAS	02/25/2011	1665K	Property	4149 N. Calle Bartinez	X					
LOMA-OAS	02/25/2011	1665K	Property	4155 N. Calle Bartinez	X					
LOMA	07/02/2008	1665K	Structure	4161 N. Calle Vista Ciudad	X					
LOMR-FW	05/28/2009	1630K	Structure	420 E. Deone Ln.	X					
LOMA-OAS	02/25/2011	1665K	Property	4261 N. Red Sun Pl.	X					
LOMA-OAS	02/25/2011	1665K	Property	4271 N. Red Sun Pl.	X					
LOMA-OAS	02/25/2011	1665K	Property	4281 N. Red Sun Pl.	X					
LOMA-OAS	02/25/2011	1665K	Property	4291 N. Red Sun Pl.	X					
LOMA	10/08/2009	1635K	Structure	4342 E. Coronado Dr.	X					
LOMA-OAS	03/13/2008	1637K	Property	4349 N. 4th Ave.		X				
LOMA-OAS	03/13/2008	1637K	Property	4351 N. 4th Ave.		X				
LOMR-F	02/25/2010	1615K	Structure	4433 N. Lightning Ridge Tr.	X					
LOMA-OAS	03/23/2010	1039K	Structure	460 E. River Walk Dr.				X		
LOMA	03/29/2011	1616K	Structure	4604 N. Lost Horizon Dr.	X					
LOMR-FW	07/21/2006	1670K	Structure	4625 N. Palisade Dr.	X					
LOMR-F	01/18/2011	1616K	Structure	4650 N. Placita Rico	X					
LOMA - OAS	09/14/2010	1665K	Structure	4738 N. Placita Ventana del Rio	X					
LOMA-OAS	09/14/2010	1665K	Structure	4746 N. Placita Ventana del Rio	X					
LOMA-OAS	09/23/2010	1665K	Structure	4754 N. Placita Ventana del Rio	X					
LOMA - OAS	04/20/2010	1637K	Property	4767 N. Via Entrada	X					
LOMA - OAS	10/16/2008	1605K	Structure	4894 W. Sunset Rd.	X					
LOMA	10/22/2009	1605K	Property	4900 W. Didion Dr.	X					
LOMA	10/22/2009	1605K	Property	4906 W. Didion Dr.	X					
LOMA	10/22/2009	1605K	Property	4912 W. Didion Dr.	X					
LOMA	10/22/2009	1605K	Property	4918 W. Didion Dr.	X					
LOMA	10/22/2009	1605K	Property	4924 W. Didion Dr.	X					
LOMA	10/22/2009	1605K	Property	4930 W. Didion Dr.	X					

LOMA	10/22/2009	1605K	Property	4936 W. Didion Dr.	X					
LOMA	10/22/2009	1605K	Property	4944 W. Didion Dr.	X					
LOMA	10/22/2009	1605K	Property	4950 W. Didion Dr.	X					
LOMA	10/22/2009	1605K	Property	4956 W. Didion Dr.	X					
LOMA	10/22/2009	1605K	Property	4962 W. Didion Dr.	X					
LOMA	10/22/2009	1605K	Property	4968 W. Didion Dr.	X					
LOMA	10/22/2009	1605K	Property	4974 W. Didion Dr.	X					
LOMA	10/22/2009	1605K	Property	4982 W. Didion Dr.	X					
LOMA	10/22/2009	1605K	Property	4988 W. Didion Dr.	X					
LOMA	10/22/2009	1605K	Property	4994 W. Didion Dr.	X					
LOMA	06/17/2008	1637K	Structure	5000 N. Campbell Ave.	X					
LOMA	10/22/2009	1605K	Property	5000 W. Didion Dr.	X					
LOMA	10/22/2009	1605K	Property	5006 W. Didion Dr.	X					
LOMA	10/22/2009	1605K	Property	5012 W. Didion Dr.	X					
LOMA	10/22/2009	1605K	Property	5018 W. Didion Dr.	X					
LOMA	10/22/2009	1605K	Property	5024 W. Didion Dr.	X					
LOMA	10/22/2009	1605K	Property	5030 W. Didion Dr.	X					
LOMA	10/22/2009	1605K	Property	5050 W. Didion Dr.	X					
LOMA	10/22/2009	1605K	Property	5056 W. Didion Dr.	X					
LOMR-F	12/07/2006	1617K	Property	5119 N. Clifed River Dr.	X					
LOMR-F	12/07/2006	1617K	Property	5127 N. Clifed River Dr.	X					
LOMR-F	12/07/2006	1617K	Property	5135 N. Clifed River Dr.	X					
LOMR-F	12/07/2006	1617K	Property	5143 N. Clifed River Dr.	X					
LOMR-F	12/07/2006	1617K	Property	5151 N. Clifed River Dr.	X					
LOMR-F	12/07/2006	1617K	Property	5159 N. Clifed River Dr.	X					
LOMR-F	12/07/2006	1617K	Property	5167 N. Clifed River Dr.	X					
LOMA	07/28/2009	1645K	Structure	5200 N. Pontatoc Rd.	X					
LOMA	09/03/2009	1644K	Property	5213 E. Woodspring Dr.		X				
LOMA	09/03/2009	1644K	Property	5213 E. Woodspring Dr.		X				
LOMA	09/14/2010	1665K	Structure	5297 N. Sunset Shadows Pl.	X					
LOMA	09/14/2010	1665K	Structure	5500 N. Barrasca Ave.	X					
LOMA-OAS	03/23/2010	1040K	Structure	551 W. Summer Rain Dr.				X		
LOMA	09/14/2010	1665K	Structure	5524 N. Mica Mountain Dr.	X					
LOMR-FW	09/14/2010	1665K	Structure	5556 N. Mica Mountain Dr.	X					
LOMA-OAS	03/23/2010	1040K	Structure	561 W. Summer Rain Dr.				X		
LOMA	03/09/2010	2225K	Area	5615 S. Joseph Ave.	X					
LOMA-OAS	03/23/2010	1040K	Structure	571 W. Summer Rain Dr.				X		
LOMA-OAS	03/23/2010	1040K	Structure	581 W. Summer Rain Dr.				X		
LOMA	11/07/2006	1663K	Structure	6044 E. Country Club Vista Dr.	X					
LOMA	01/25/2011	1605K	Property	6058 W. Millay St.			X			
LOMA	01/25/2011	1605K	Property	6060 W. Millay St.			X			

LOMA	01/25/2011	1605K	Property	6062 W. Millay St.			X			
LOMA	01/25/2011	1605K	Property	6064 W. Millay St.			X			
LOMA	01/25/2011	1605K	Property	6066 W. Millay St.			X			
LOMA	01/25/2011	1605K	Property	6068 W. Millay St.			X			
LOMA	01/25/2011	1605K	Property	6070 W. Millay St.			X			
LOMA	01/25/2011	1605K	Property	6071 W. Millay St.			X			
LOMA	01/25/2011	1605K	Property	6072 W. Millay St.			X			
LOMA	01/25/2011	1605K	Property	6073 W. Millay St.			X			
LOMA	01/25/2011	1605K	Property	6074 W. Millay St.			X			
LOMA	01/25/2011	1605K	Property	6075 W. Millay St.			X			
LOMA	01/25/2011	1605K	Property	6076 W. Millay St.			X			
LOMA	01/25/2011	1605K	Property	6078 W. Millay St.			X			
LOMA	01/25/2011	1605K	Property	6079 W. Millay St.			X			
LOMA	01/25/2011	1605K	Property	6080 W. Millay St.			X			
LOMA	01/25/2011	1605K	Property	6082 W. Millay St.			X			
LOMA	01/25/2011	1605K	Property	6084 W. Millay St.			X			
LOMA	01/25/2011	1605K	Property	6086 W. Millay St.			X			
LOMA	01/25/2011	1605K	Property	6090 W. Millay St.			X			
LOMA	01/25/2011	1605K	Property	6092 W. Millay St.			X			
LOMA	01/25/2011	1605K	Property	6094 W. Millay St.			X			
LOMA	09/21/2010	1655K	Structure	6264 N. Whaleback Pl.	X					
LOMA-OAS	03/23/2010	1039K	Structure	628 E. River Walk Dr.				X		
LOMR-FW	09/14/2010	1655K	Structure	6320 N. Whaleback Pl.	X					
LOMR-FW	09/14/2010	1655K	Structure	6350 N. Whaleback Pl.	X					
LOMA	09/14/2010	1655K	Structure	6381 N. Whaleback Pl.	X					
LOMA-OAS	03/23/2010	1039K	Structure	642 E. River Walk Dr.				X		
LOMA - OAS	06/12/2008	2253K	Structure	649 S. Harvard Ave.		X				
LOMA	03/17/2009	1610K	Property	6505 N. La Cholla Blvd. (Lot 1)	X					
LOMA	03/17/2009	1610K	Property	6505 N. La Cholla Blvd. (Lot 2)	X					
LOMA	03/17/2009	1610K	Property	6505 N. La Cholla Blvd. (Lot 3)	X					
LOMA	03/03/2009	1610K	Structure	6751 N. Placita Ariel	X					
LOMA	10/13/2009	1635K	Structure	6820 N. Columbus Blvd.	X					
LOMR-F	04/01/2011	2226K	Property	685 & 699 W. Congress St.		X				
LOMR-F	04/01/2011	2228K	Property	685 & 699 W. Congress St.		X				
LOMR-F	03/24/2011	1663K	Structure	6905 E. Cloud Rd.	X					
LOMA	09/14/2010	1665K	Structure	6971 E. Calle Tabara	X					
LOMA	09/14/2010	1665K	Structure	6974 E. Rivercrest Rd.	X					
LOMA	09/14/2010	1665K	Structure	6985 E. Camino Namara	X					
LOMR-FW	09/23/2010	1665K	Structure	7001 E. Rivercrest Rd.	X					
LOMR-F	04/01/2011	2226K	Property	710 & 795 W. Congress St.		X				
LOMA	09/14/2010	1665K	Structure	7217 E. Crystal Mist Dr.	X					

LOMA	09/14/2010	1665K	Structure	7223 E. Crystal Mist Dr.	X					
LOMA	04/20/2001	2233K	Structure	725 S. Tucson Blvd.		X				
LOMA	04/20/2001	2233K	Structure	725 S. Tucson Blvd.		X				
LOMR-F	07/06/2010	1039K	Structure	728 E. Camino Diestro				X		
LOMA	01/25/2011	1605K	Property	7311 N. Thoreau Dr.			X			
LOMR-F	07/06/2010	1039K	Structure	732 E. Camino Diestro				X		
LOMR-F	07/06/2010	1039K	Structure	736 E. Camino Diestro				X		
LOMA - OAS	02/04/2010	1610K	Structure	7385 N. Camino de la Tierra	X					
LOMA-OAS	03/23/2010	1040K	Structure	739 W. Annandale Wy.				X		
LOMR-F	07/06/2010	1039K	Structure	740 E. Camino Diestro				X		
LOMR-F	07/06/2010	1039K	Structure	744 E. Camino Diestro				X		
LOMA-OAS	03/23/2010	1040K	Structure	745 W. Annandale Wy.				X		
LOMA-OAS	03/23/2010	1040K	Structure	751 W. Annandale Wy.				X		
LOMA	01/25/2011	1605K	Property	7520 N. Clemens Wy.			X			
LOMA	01/25/2011	1605K	Property	7552 N. Bradstreet Dr.			X			
LOMA-OAS	03/23/2010	1040K	Structure	757 W. Annandale Wy.				X		
LOMA-OAS	03/23/2010	1040K	Structure	763 W. Annandale Wy.				X		
LOMA-OAS	03/23/2010	1040K	Structure	775 W. Annandale Wy.				X		
LOMA-OAS	03/23/2010	1040K	Structure	781 W. Annandale Wy.				X		
LOMR-F	07/06/2010	1039K	Structure	787 E. Camino Corrida				X		
LOMA-OAS	03/23/2010	1040K	Structure	787 W. Annandale Wy.				X		
LOMR-F	07/06/2010	1039K	Structure	789 E. Camino Corrida				X		
LOMR-F	07/06/2010	1039K	Structure	791 E. Camino Corrida				X		
LOMR-F	07/06/2010	1039K	Structure	793 E. Camino Corrida				X		
LOMA-OAS	03/23/2010	1040K	Structure	793 W. Annandale Wy.				X		
LOMR-F	07/06/2010	1039K	Structure	794 E. Camino Corrida				X		
LOMR-F	07/06/2010	1039K	Structure	795 E. Camino Corrida				X		
LOMR-F	07/06/2010	1039K	Structure	796 E. Camino Corrida				X		
LOMR-F	07/06/2010	1039K	Structure	797 E. Camino Corrida				X		
LOMR-F	07/06/2010	1039K	Structure	798 E. Camino Corrida				X		
LOMA-OAS	03/23/2010	1040K	Structure	803 W. Annandale Wy.				X		
LOMR-F	04/01/2011	2228K	Property	809 W. Congress St.		X				
LOMR-F	04/01/2011	2226K	Property	809 W. Congress St.		X				
LOMA-OAS	03/23/2010	1040K	Structure	831 W. Annandale Wy.				X		
LOMA	01/25/2007	2258K	Structure	833 S. Desert Steppes Dr.		X				
LOMA - OAS	02/03/2009	2200K	Structure	8469 W. Benidorm Loop	X					
LOMA-OAS	03/23/2010	1040K	Structure	849 W. Annandale Wy.				X		
LOMA-OAS	03/23/2010	1040K	Structure	855 W. Annandale Wy.				X		
LOMR-F	04/01/2011	2226K	Property	855 W. Congress St.		X				
LOMA-OAS	03/23/2010	1040K	Structure	861 W. Annandale Wy.				X		
LOMA-OAS	03/23/2010	1040K	Structure	867 W. Annandale Wy.				X		

LOMA-OAS	03/23/2010	1040K	Structure	877 W. Annandale Wy.				X		
LOMA-OAS	03/23/2010	1040K	Structure	883 W. Annandale Wy.				X		
LOMA-OAS	03/23/2010	1040K	Structure	889 W. Annandale Wy.				X		
LOMA-OAS	03/23/2010	1040K	Structure	895 W. Annandale Wy.				X		
LOMA	06/19/2007	1670K	Structure	8951 E. Bears Path Rd.		X				
LOMA-OAS	03/23/2010	1040K	Structure	901 W. Annandale Wy.				X		
LOMA	10/22/2009	1605K	Property	9018 N. Lattimore Ln.	X					
LOMA	11/21/2006	2232K	Structure	903 N. Desert Ave. Unit A		X				
LOMA	11/21/2006	2232K	Structure	903 N. Desert Ave. Unit B		X				
LOMA	11/21/2006	2232K	Structure	903 N. Desert Ave. Unit C		X				
LOMA	11/21/2006	2232K	Structure	903 N. Desert Ave. Unit D		X				
LOMA	11/21/2006	2232K	Structure	904 N. Desert Ave. Unit A		X				
LOMA	11/21/2006	2232K	Structure	904 N. Desert Ave. Unit B		X				
LOMA	11/21/2006	2232K	Structure	904 N. Desert Ave. Unit C		X				
LOMA	11/21/2006	2232K	Structure	904 N. Desert Ave. Unit D		X				
LOMA	11/21/2006	2232K	Structure	905 N. Venice Ave. Unit A		X				
LOMA	11/21/2006	2232K	Structure	905 N. Venice Ave. Unit B		X				
LOMA	11/21/2006	2232K	Structure	905 N. Venice Ave. Unit C		X				
LOMA	11/21/2006	2232K	Structure	905 N. Venice Ave. Unit D		X				
LOMA-OAS	03/23/2010	1040K	Structure	907 W. Annandale Wy.				X		
LOMA	11/21/2006	2232K	Structure	913 N. Desert Ave. Unit A		X				
LOMA	11/21/2006	2232K	Structure	913 N. Desert Ave. Unit B		X				
LOMA	11/21/2006	2232K	Structure	913 N. Desert Ave. Unit C		X				
LOMA	11/21/2006	2232K	Structure	913 N. Desert Ave. Unit D		X				
LOMA-OAS	03/23/2010	1040K	Structure	913 W. Annandale Wy.				X		
LOMA	11/21/2006	2232K	Structure	914 N. Desert Ave. Unit A		X				
LOMA	11/21/2006	2232K	Structure	914 N. Desert Ave. Unit B		X				
LOMA	11/21/2006	2232K	Structure	914 N. Desert Ave. Unit C		X				
LOMA	11/21/2006	2232K	Structure	914 N. Desert Ave. Unit D		X				
LOMA	11/21/2006	2232K	Structure	915 N. Venice Ave. Unit A		X				
LOMA	11/21/2006	2232K	Structure	915 N. Venice Ave. Unit B		X				
LOMA	11/21/2006	2232K	Structure	915 N. Venice Ave. Unit C		X				
LOMA	11/21/2006	2232K	Structure	915 N. Venice Ave. Unit D		X				
LOMA-OAS	03/23/2010	1040K	Structure	919 W. Annandale Wy.				X		
LOMA - OAS	01/28/2010	1610K	Structure	9190 N. Rancho Feliz Dr.	X					
LOMA	11/21/2006	2232K	Structure	923 N. Desert Ave. Unit A		X				
LOMA	11/21/2006	2232K	Structure	923 N. Desert Ave. Unit B		X				
LOMA	11/21/2006	2232K	Structure	923 N. Desert Ave. Unit C		X				
LOMA	11/21/2006	2232K	Structure	923 N. Desert Ave. Unit D		X				
LOMA	11/21/2006	2232K	Structure	924 N. Desert Ave. Unit A		X				
LOMA	11/21/2006	2232K	Structure	924 N. Desert Ave. Unit B		X				

LOMA	11/21/2006	2232K	Structure	924 N. Desert Ave. Unit C		X				
LOMA	11/21/2006	2232K	Structure	924 N. Desert Ave. Unit D		X				
LOMA	11/21/2006	2232K	Structure	925 N. Venice Ave. Unit A		X				
LOMA	11/21/2006	2232K	Structure	925 N. Venice Ave. Unit B		X				
LOMA	11/21/2006	2232K	Structure	925 N. Venice Ave. Unit C		X				
LOMA	11/21/2006	2232K	Structure	925 N. Venice Ave. Unit D		X				
LOMA-OAS	03/23/2010	1040K	Structure	925 W. Annandale Wy.				X		
LOMA	11/21/2006	2232K	Structure	933 N. Desert Ave. Unit A		X				
LOMA	11/21/2006	2232K	Structure	933 N. Desert Ave. Unit B		X				
LOMA	11/21/2006	2232K	Structure	933 N. Desert Ave. Unit C		X				
LOMA	11/21/2006	2232K	Structure	933 N. Desert Ave. Unit D		X				
LOMA	11/21/2006	2232K	Structure	934 N. Desert Ave. Unit A		X				
LOMA	11/21/2006	2232K	Structure	934 N. Desert Ave. Unit B		X				
LOMA	11/21/2006	2232K	Structure	934 N. Desert Ave. Unit C		X				
LOMA	11/21/2006	2232K	Structure	934 N. Desert Ave. Unit D		X				
LOMA	11/21/2006	2232K	Structure	935 N. Venice Ave. Unit A		X				
LOMA	11/21/2006	2232K	Structure	935 N. Venice Ave. Unit B		X				
LOMA	11/21/2006	2232K	Structure	935 N. Venice Ave. Unit C		X				
LOMA	11/21/2006	2232K	Structure	935 N. Venice Ave. Unit D		X				
LOMA-OAS	03/23/2010	1040K	Structure	935 W. Annandale Wy.				X		
LOMA	11/21/2006	2232K	Structure	944 N. Desert Ave. Unit A		X				
LOMA	11/21/2006	2232K	Structure	944 N. Desert Ave. Unit B		X				
LOMA	11/21/2006	2232K	Structure	944 N. Desert Ave. Unit C		X				
LOMA	11/21/2006	2232K	Structure	944 N. Desert Ave. Unit D		X				
LOMA	11/21/2006	2232K	Structure	945 N. Venice Ave. Unit A		X				
LOMA	11/21/2006	2232K	Structure	945 N. Venice Ave. Unit B		X				
LOMA	11/21/2006	2232K	Structure	945 N. Venice Ave. Unit C		X				
LOMA	11/21/2006	2232K	Structure	945 N. Venice Ave. Unit D		X				
LOMA	11/21/2006	2232K	Structure	953 N. Desert Ave. Unit A		X				
LOMA	11/21/2006	2232K	Structure	953 N. Desert Ave. Unit B		X				
LOMA	11/21/2006	2232K	Structure	953 N. Desert Ave. Unit C		X				
LOMA	11/21/2006	2232K	Structure	953 N. Desert Ave. Unit D		X				
LOMA	11/21/2006	2232K	Structure	954 N. Desert Ave. Unit A		X				
LOMA	11/21/2006	2232K	Structure	954 N. Desert Ave. Unit B		X				
LOMA	11/21/2006	2232K	Structure	954 N. Desert Ave. Unit C		X				
LOMA	11/21/2006	2232K	Structure	954 N. Desert Ave. Unit D		X				
LOMA	11/21/2006	2232K	Structure	955 N. Venice Ave. Unit A		X				
LOMA	11/21/2006	2232K	Structure	955 N. Venice Ave. Unit B		X				
LOMA	11/21/2006	2232K	Structure	955 N. Venice Ave. Unit C		X				
LOMA	11/21/2006	2232K	Structure	955 N. Venice Ave. Unit D		X				
LOMA	11/21/2006	2232K	Structure	963 N. Desert Ave. Unit A		X				

LOMA	11/21/2006	2232K	Structure	964 N. Desert Ave. Unit A		X				
LOMA	11/21/2006	2232K	Structure	964 N. Desert Ave. Unit B		X				
LOMA	11/21/2006	2232K	Structure	964 N. Desert Ave. Unit C		X				
LOMA	11/21/2006	2232K	Structure	964 N. Desert Ave. Unit D		X				
LOMA	11/21/2006	2232K	Structure	965 N. Venice Ave. Unit A		X				
LOMA	11/21/2006	2232K	Structure	965 N. Venice Ave. Unit B		X				
LOMA	11/21/2006	2232K	Structure	965 N. Venice Ave. Unit C		X				
LOMA	11/21/2006	2232K	Structure	965 N. Venice Ave. Unit D		X				
LOMR-F	04/01/2011	2226K	Property	no situs address (Mission District Blk 3)		X				

Appendix C
Capital Improvement Projects
FY 2006/07 – FY 2010/11

Project Name	FY 2006/07	FY 2007/08	FY 2008/09	FY 2009/10	FY 2010/11	Total
Floodprone Land Acquisition Program	\$3,509,508	\$1,360,123	\$167,643	\$3,212,745	\$610,343	\$8,860,362
FC-04 Mission View Wash	\$297,262	\$1,228,831	\$6,447,577	\$439,263		\$8,412,933
Arroyo Chico Detention Basin (USACOE)	\$268,155	\$3,187,261	\$478,868	\$2,619,992	\$492,799	\$7,047,075
FC5.02 Columbus Wash Phase II Drainage Improvement	\$0	\$6,400,600	\$98	\$0	\$0	\$6,400,698
FC5.09 Santa Cruz River Bank Protection in vicinity of Continental Ranch	\$4,637,619	\$850,262	\$240,339	\$59	\$0	\$5,728,279
FC5.08 Rillito River Linear Park, Alvernon to Craycroft	\$707,399	\$576,140	\$3,776,469	\$11,849	\$0	\$5,071,857
FC5.10 CDO Wash Bank Protection & Linear Park: Omni Golf Course	\$146,142	\$620,811	\$3,182,094	\$159,008	\$0	\$4,108,055
FC5.10 Cañada del Oro River Park, Thornydale to Magee	\$82,934	\$405,563	\$348,771	\$332,345	\$2,133,747	\$3,303,360
Pantano Wash:Speedway to Tanque Verde	\$0	\$55,778	\$381,934	\$1,280,847	\$942,167	\$2,660,726
FC5.07 Santa Cruz River, Grant Road to Camino del Cerro River Park	\$107,168	\$177,541	\$163,706	\$70,977	\$1,572,769	\$2,092,161
Ajo Detention Basin Piping Improvement	\$2,075,608	\$3,960	\$0	\$0	\$0	\$2,079,568
San Xavier Estates Drainage Improvements	\$2,071,159	\$0	\$0	\$0	\$0	\$2,071,159
Santa Cruz River: Paseo de Las Iglesias Restoration (USACOE Study)	\$197,253	\$467,562	\$460,113	\$183,816	\$506,209	\$1,814,953
FC5.01 Floodprone and Riparian Land Acquisition	-\$19,897	\$213,539	\$510,559	\$763,332	\$57,309	\$1,524,842
Diablo Village Regional Detention Basins	\$739	\$1,451,918	\$0	\$0	\$0	\$1,452,657

Cortaro Mesquite Bosque	\$47,310	\$1,290,969	\$46,939	\$0	\$0	\$1,385,218
FC5.03 City of South Tucson Urban Drainage	\$181,947	\$220,183	\$526,063	\$435,156	\$13,117	\$1,376,466
FC5.02 Green Valley Erosion Control	\$685,760	\$422,408	\$35,139	\$9,145	\$159,180	\$1,311,632
FC5.02 Ajo - Curley School Detention Basin	\$325,722	\$965,239	\$8,427	\$0	\$0	\$1,299,388
Various Additional Mt Lemon Projects	\$1,020,596	\$48,319	-\$48,320	\$0	\$0	\$1,020,595
Urban Drainage	\$0	\$0	\$0	\$159,241	\$807,866	\$967,107
Santa Cruz River Watershed Study	\$0	\$0	\$185,935	\$175,823	\$596,322	\$958,080
Highland Wash	\$363,038	\$592,642	\$0	\$0	\$0	\$955,680
Camino Verde Box Culvert	\$95,265	\$635,156	\$746	\$0	\$0	\$731,167
Pantano Wash: Kolb Executive Park Bank Protection	\$0	\$0	\$98,772	\$560,393	\$64,914	\$724,079
Pantano Wash: Pantano Townhomes Bank Protection	\$0	\$0	\$103,455	\$523,264	\$74,433	\$701,152
Agua Caliente Wash at Tanque Verde Road	\$31,867	\$572,972	\$77,096	\$17,157	\$0	\$699,092
Pantano Wash Watershed Study	\$0	\$0	\$165,200	\$168,376	\$211,811	\$545,387
Rillito/Swan Wetlands (USACOE)	\$410,132	\$79,857	\$30,268	\$0	\$0	\$520,257
Pantano Wash: Mullins Landfill Bank Protection	\$0	\$0	\$85,219	\$391,989	\$38,191	\$515,399
Tres Rios del Norte (USACOE Study)	\$46,688	\$237,597	\$54,275	\$159,045	\$9,641	\$507,246
Pegler Wash (Sotomayer) Levee Improvements	\$0	\$456,993	\$10,697	\$0	\$0	\$467,690
Santa Cruz River Continental Ranch Remediation	\$49,945	\$124,694	\$20,919	\$222,316	\$21,273	\$439,147
FC5.05 Pascua Yaqui Tribe Black Wash Urban Drainage Flood Control Improvements	\$36,500	\$9,842	\$225,917	\$133,558	\$0	\$405,817
FC5.02 Ajo - Second Avenue Bridge	\$404,142	\$0	\$0	\$0	\$0	\$404,142

Cañada del Oro Flood Hazard Mitigation Project (FEMA Grant)	\$142,304	\$245,658	\$426	\$0	\$0	\$388,388
Navajo Wash: Oracle Rd. to Mountain Ave.	\$335	\$267,083	\$0	\$0	\$0	\$267,418
FC5.04 Tohono O'Odham Nation Urban Drainage	\$229,552	\$0	\$0	\$0	\$0	\$229,552
FC5.02 Littletown Urban Drainage	\$212,628	\$0	\$0	\$0	\$0	\$212,628
Oro Valley Valle Del Oro	\$0	\$0	\$211,450	\$0	\$0	\$211,450
TV Creek:Sabino Canyon to Craycroft (USACOE)	\$95,689	\$48,461	\$0	\$0	\$0	\$144,150
El Rio Medio (USACOE Study)	\$42,750	\$54,017	\$30,065	\$813	\$3,982	\$131,627
Carmack Wash at Shannon Road	\$0	\$119,800	\$0	\$0	\$0	\$119,800
Green Valley Drainageway #7 Erosion	\$0	\$0	\$0	\$118,540	\$231	\$118,771
Santa Cruz Levee Improvements	\$0	\$0	\$100,151	\$0	\$0	\$100,151
FC5.02 Old Nogales Hightway at Franco Wash	\$84,012	\$0	\$0	\$0	\$0	\$84,012
Carmack Wash Channel Erosion	\$0	\$0	\$0	\$4,017	\$73,917	\$77,934
FC-14 Tucson Diversion Channel Drainage Improvements	\$64,611	\$0	\$0	\$0	\$0	\$64,611
Westover Avenue Inlet and Drainage Improvements	\$42,598	\$0	\$0	\$0	\$0	\$42,598
Cienega-Empirita Restoration (FLAP)	\$40,873	\$0	\$0	\$0	\$0	\$40,873
West Branch / 36th Street Grade Control	\$0	\$0	\$0	\$1,789	\$32,379	\$34,168
El Corazon de los Tres Rios Del Norte	\$0	\$0	\$0	\$0	\$34,083	\$34,083
FC5.06 Santa Cruz River Flood Control, Erosion Control and Linear Park, Ajo to 29th St	\$0	\$0	\$15,684	\$8,666	\$1,100	\$25,450
FC-05 Earp Wash Detention Basin - City of Tucson	\$24,800	\$0	\$0	\$0	\$0	\$24,800

FC5.02 Verde Meadows Crest Improvements	\$22,008	\$0	\$0	\$0	\$0	\$22,008
Santa Cruz Right-of-Way: Franklin to Prince	\$0	\$0	\$21,164	\$0	\$0	\$21,164
FC-01 Santa Cruz River: Grant Road to Ft Lowell Road	\$12,773	\$0	\$0	\$0	\$0	\$12,773
FC5.02 Tanque Verde Creek Lakes of Castle Rock Erosion Protection	\$3,405	\$1,809	\$2,750	\$2,262	\$299	\$10,525
Canoa Ranch Flood Control (FLAP)	\$7,487	\$0	\$0	\$0	\$0	\$7,487
Tucson Diversion Channel	\$4,758	\$0	\$0	\$0	\$0	\$4,758
FC5.02 Old Vail Connection at Franco Wash	\$4,729	\$0	\$0	\$0	\$0	\$4,729
West Branch Jail Erosion	\$0	\$0	\$0	\$3,370	\$0	\$3,370
Green Valley Drainage Way 6 Repairs	\$0	\$0	\$0	\$0	\$2,476	\$2,476
Columbus Wash Phase II Drainage Improvements	\$586	\$970	\$0	\$0	\$0	\$1,556
Oro Valley Flood Control District Drainage	\$1,486	\$0	\$0	\$0	\$0	\$1,486
Canoa Ranch Flood Berm	\$1,050	\$0	\$0	\$0	\$0	\$1,050
Cañada del Oro Floodplain Acquisitions	\$863	\$0	\$0	\$0	\$0	\$863
Los Nino Park / Sewer Line Channel Erosion	\$0	\$0	\$0	\$828	\$0	\$828
Carmack Wash - Magee Road (Planning Only)	\$101	\$0	\$0	\$0	\$0	\$101
Rillito River: Campbell Avenue to Alvernon Way	\$59	\$0	\$0	\$0	\$0	\$59
La Cholla and Magee Land Exchange	\$49	\$0	\$0	\$0	\$0	\$49
FC5.02 Urban Drainage Infrastructure Program	\$0	\$0	\$0	\$0	-\$897	-\$897
Grand Total	\$18,819,467	\$23,394,558	\$18,166,608	\$12,169,981	\$8,459,661	\$81,010,275