FINAL REPORT

Pima County Southwest Infrastructure Plan





May 2007

THE SEAL OF PIMA COUNTY ARIZONA

PUBLIC WORKS

Stantec

CLA
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Transmittal

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Reference: Pima County Southwest Infrastructure Plan

Enclosed please find a digital copy of the Final Report for the above referenced planning effort. We are pleased to provide this final deliverable sixteen weeks after beginning our efforts together, and look forward to being of assistance in the future. In a few week's time, we would like to schedule a debriefing and project close-out meeting.

On behalf of the entire consulting team, I would like to thank you and the many Pima County staff who worked tirelessly to help make this achievement a reality.

Should you have any questions, please do not hesitate to contact us.

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Attachment: Pima County Southwest Infrastructure Plan Final Report

c. File

Pima County Southwest Infrastructure Plan

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1.0 Introduction

1.1 PURPOSE

Pima County's Southwest area has been identified by County planners as a potential and strategic growth area. To accommodate population growth, the existing infrastructure must be improved and expanded. The purpose of this Infrastructure Plan is to provide a basis for infrastructure decision-making related to development in the Southwest area. It quantifies the nature, phasing, financial impacts, and funding possibilities for those flood control, parks and recreation, transportation, wastewater infrastructure and other improvements that are necessary to service future saturation growth within the study limits. This fast-tracked plan uses extensive input from the public, identified stakeholders, numerous Pima County departments and staff, the consulting team of Curtis Lueck & Associates and Stantec Consulting, and subconsultant firm JE Fuller Hydrology & Geomorphology.

1.2 PLAN STRUCTURE

The plan includes phased infrastructure plans, estimates of probable cost, and funding analysis outputs. This work will serve to collaboratively develop and evolve an infrastructure planning process suitable for deployment elsewhere in Pima County.

The Plan also summarizes readily available data regarding the provision of other services provided by public, quasi-public, and private agencies. This includes those delivered by the County and others such as fire districts, Tucson Water, Tucson Unified School District, and utility providers.

1.3 LOCATION, AREA, AND BOUNDARY CONDITIONS

The project area is bounded by Tucson Mountain Park to the north, Mission Road to the east, The Tohono O'odham Nation – San Xavier District to the south and Sandario Road to the west.

1.4 BACKGROUND

A study entitled *Southwest Area Plan Development of Public Facilities* (SWAPDPF) was completed by Pima County staff in March 1980. This study followed the County's adoption of the Southwest Area Plan (SWAP) which predicted a dramatic increase in population (42,000 by 2000 and 187,068 at ultimate saturation). The SWAPDPF was done in order to identify what County-provided infrastructure would be needed in order to accommodate this anticipated population growth. It identified infrastructure and facility needs for Flood Control, Parks and Recreation, Planning & Zoning, Transportation and Wastewater Management. This report used the same boundary area described in Section 1.3 above. Following the passage of more than twenty years, the Southwest Infrastructure Plan will provide new insights into the servicing situation and provide a planning tool to guide further development in the area - which continues to experience significant demands for growth. In response to these demands, the comprehensive SWIP initiative was delivered in an accelerated fashion.

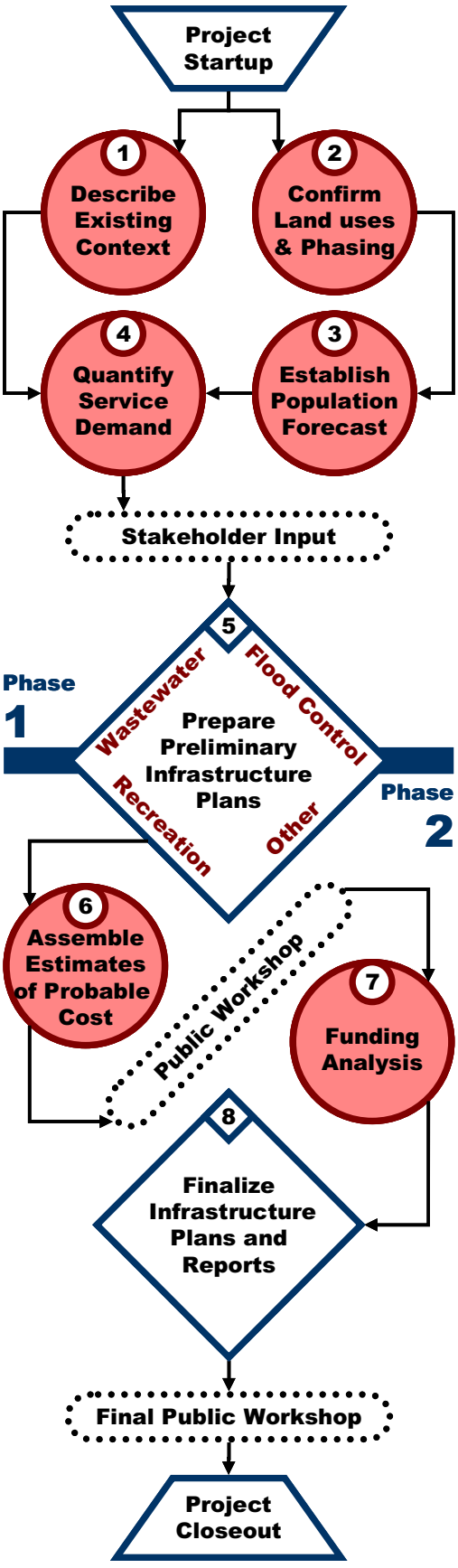
1.5 PLANNING PROCESS

Subsequent to a successful startup period which prepared the groundwork for the SWIP, the infrastructure planning process proceeded in two distinct phases.

In Phase 1, the planning team comprehensively described the existing infrastructure context in the Southwest area and then quantified the future servicing challenges that the proposed land uses and densities pose. Each of the four infrastructure planning area teams (flood control, parks and recreation, transportation, wastewater infrastructure, and "other" services) were responsible for formulating a preliminary infrastructure plan which responded to the challenges which will arise as growth occurs. Phase 1 includes project facilitation, management, and startup followed by five technical tasks (1 – Describe Existing Context, 2 – Confirm Land Uses and Phasing, 3 – Establish Population Forecast, 4 – Quantify Servicing Demands, and 5 – Prepare Preliminary Infrastructure Plans) and a round of strategic and selective stakeholder input.

In Phase 2, the team completed three technical tasks (6 – Assemble Cost Timeline, 7 – Funding Analysis, and 8 – Develop Infrastructure Plan Documentation), planned to conduct two public workshops, and completed the project. Project participants collaboratively developed and finalized timelines which tied the best opinions of probable project costs to a yearly timeline. A funding analysis was then completed which identified options and rendered opinions as to how each candidate project would be best delivered to the end user. This second phase concluded with the development of Infrastructure Plan documentation and final County review and approval of the Southwest Infrastructure Plan. The Final Public Workshop, originally slated to occur after the finalization of the Plan, was deemed redundant given the advanced state of the results which were presented at the first Public Drop-In Workshop and was not held.

The original SWIP planning process is schematically depicted in the graphic to the right.



2.0 Community Involvement

2.1 OVERVIEW

Community involvement was identified early in the process as a very important part of the planning effort. Encouraging public input was a major priority augmented by the involvement of selected major stakeholders early in the planning process. As such, despite an aggressive 17-week schedule that commenced the first week of January 2007 it was decided to provide two opportunities at two different levels, a stakeholder session and a meeting open to the general public. Both meetings would provide opportunities for the public to learn about the project and provide input.

The area has various levels of development and population. Up-zoning to higher densities could conceivably impact current residents and stakeholders in a variety of ways. The interfaces between proposed master-planned communities and the considerable wildcat development and lot-splitting which have occurred in the area were seen as inducing additional needs for public involvement given the fact that there are three current applicants seeking to process Comprehensive Plan Amendments in the area.

Community involvement inputs were also desired regarding cultural resources, and the eventual uses and disposition of State Trust Land, University owned land and large privately owned parcels. In addition, viewpoints were desired from various existing recreational and cultural facilities such as a trap and skeet shooting club, a museum, and other entities.

Involvement from two different Native American entities in the area with large land holdings and enterprises was desired, along with inputs from the regional airport which serves as one of the major employers in the area.

2.2 STAKEHOLDER INPUT SESSION

The first meeting with the major stakeholders was planned to occur early in the process. The stakeholder session had two purposes. The first was to introduce the planning effort and the second purpose was to listen and learn about future plans for the area and also any challenges in the study area.

A list of primary stakeholders including outside service providers, developers, environmental groups, primary employers, land holders or owners, regulatory entities and advisors and others was created. A letter was drafted and sent to the stakeholders along with a project description and a list of sample stakeholder questions. A sample letter including the two attachments and a list of stakeholders are provided in Appendices A and B.

The Stakeholder Input session was held on Thursday, February 1, 2007 from 3:00 pm to 5:00 pm and attracted about 50 stakeholder participants. County Supervisor Sharon Bronson, who represents District 3 and the large portion of the SWIP area, welcomed the stakeholders and briefly explained the reason for the aggressive schedule. Deputy County Administrator John

Bernal then gave a quick overview of the study. Pima County Planning Staff followed with a presentation on the study area. A question and answer session followed. The stakeholders were also invited to participate in one on one follow up meetings with the team members. Stakeholder input is included in Appendix C.

2.3 PUBLIC DROP-IN WORKSHOP

The second opportunity for much wider public involvement in the form of a drop-in style public workshop was conducted on March 22nd, 2007. This workshop coincided with the completion of the draft report documenting the process and results of the Southwest Infrastructure Plan. The timing maximized the benefit of public input by giving people an opportunity to provide comment after learning more about the plan's findings and financial implications.

The workshop consisted of a series of information stations staffed by the project team. Appendix D contains the sign-in sheets and comment cards from the Public Drop-in Workshop.

3.0 The Southwest Infrastructure Plan

3.1 EXISTING CONTEXT IN THE SOUTHWEST

This report section summarizes the results of the existing context assessment which was completed in order to develop a baseline from which to examine future infrastructure.

3.1.1 Current Urbanization Trends

Pima County, at 1 million residents, continues to be one of the fastest growing counties in the country with an estimated 16% increase in population since 2000. Figure EC-1 indicates that in 2006 there were a total of 22 Comprehensive Plan Amendment Requests in Eastern Pima County, five of which (Nos. 2, 12, 14, 16, and 18) were within the SWIP planning boundary. The study area contains two primary natural constraints to development, those being the mountainous areas and large drainage washes which are clearly visible in Figure EC-2. The bulk of the study area is outside of the conservation land system shown on Figure EC-3.

Existing land use maps confirm that many portions of the SWIP area are developed or otherwise committed. Figure EC-4 depicts the primary subdivisions which exist in the area. The County's Comprehensive Land Use Plan, depicted in Figure EC-5, illustrates the current and officially adopted plans for the SWIP area.

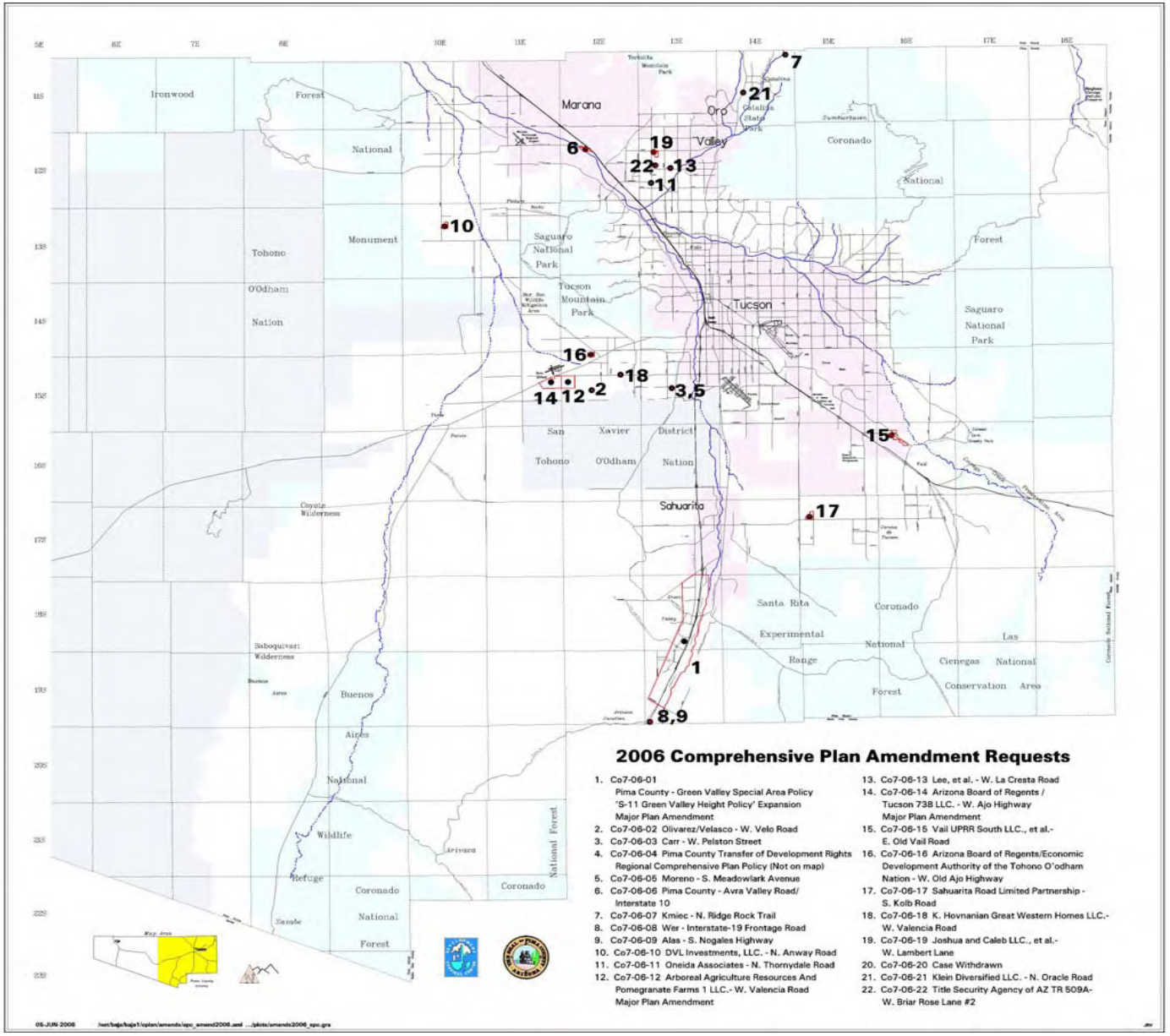
The eastern portion of the study area has been more developed, yet still has considerable infill potential, while the western portion has larger areas of vacant and presumably developable land. Areas along the Ajo Road and Valencia Road Corridors can be expected to have higher densities should flood control and drainage concerns permit.

Land ownership in the area is widespread and diverse, including the federal government, the State of Arizona, Pima County, the Arizona Board of Regents, and Tribal Nations. Many of these owners are anticipated to release all or portions of their property to development.

Historical Permit Activity

Table EC-1 and Figure EC-6 display the recent history of Pima County and the SWIP area in terms of issued permits for single family, townhomes, multi-family, and manufactured homes.

Averaged over the past seven years, 8.0% of the annual 10,854 Pima County permits have been issued within the SWIP area.



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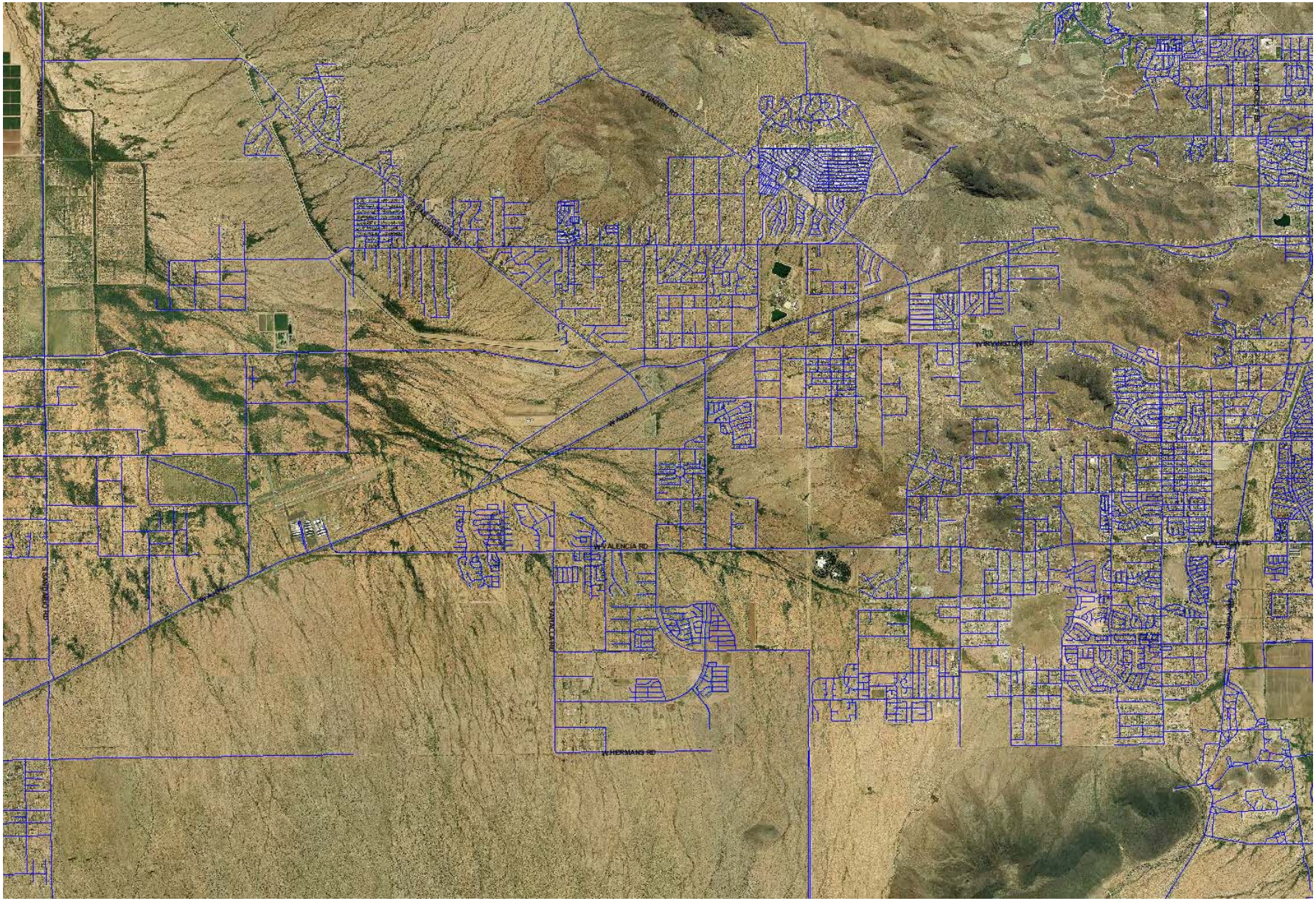
Pima County Public Works
Southwest Infrastructure Plan

Figure No.

EC-1

Title

2006 Comprehensive Plan Amendment Requests



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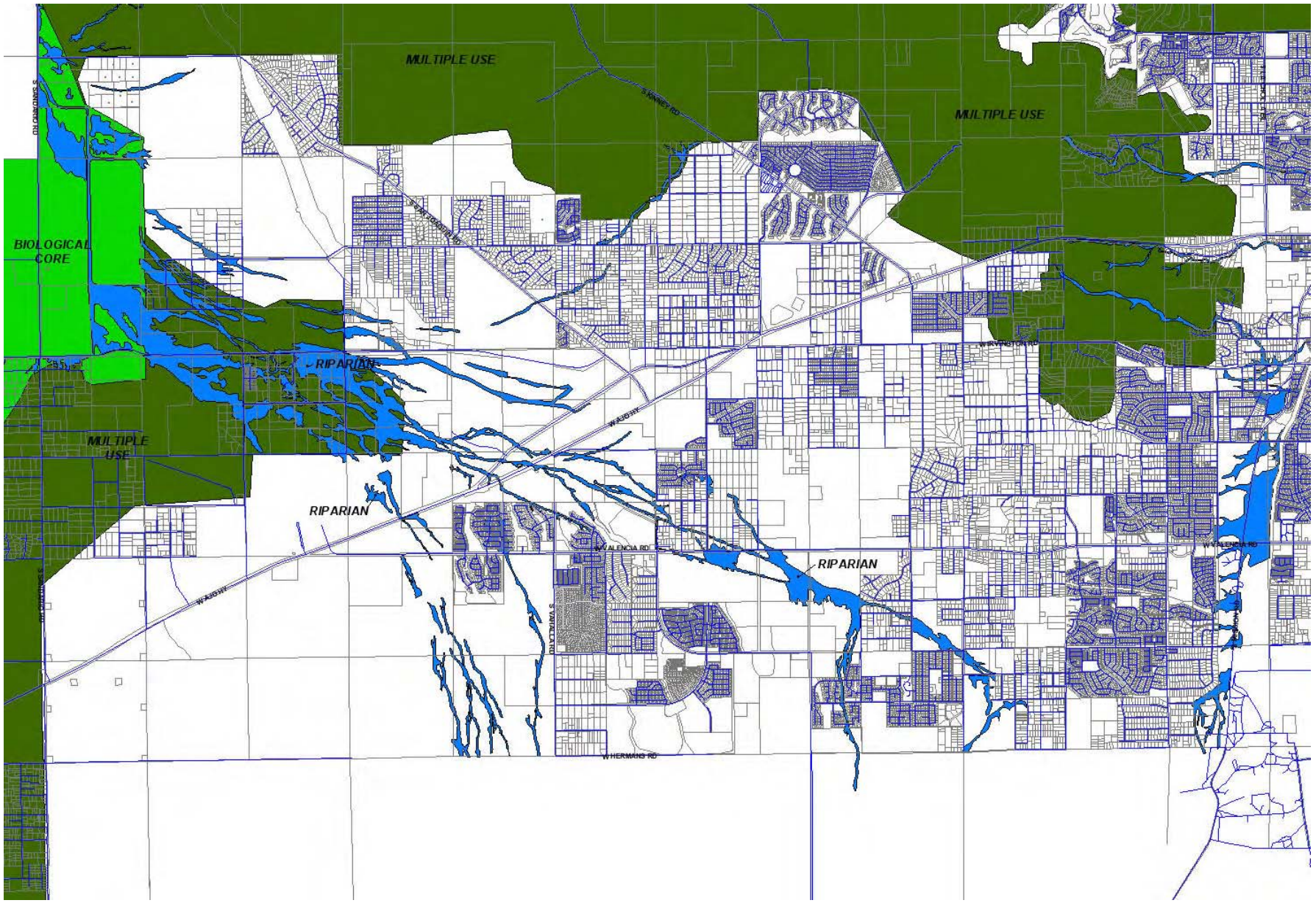
Existing Roadways

Pima County Public Works
Southwest Infrastructure Plan

Figure No.
EC-2

Title
Contextual Aerial Photography of SWIP Area



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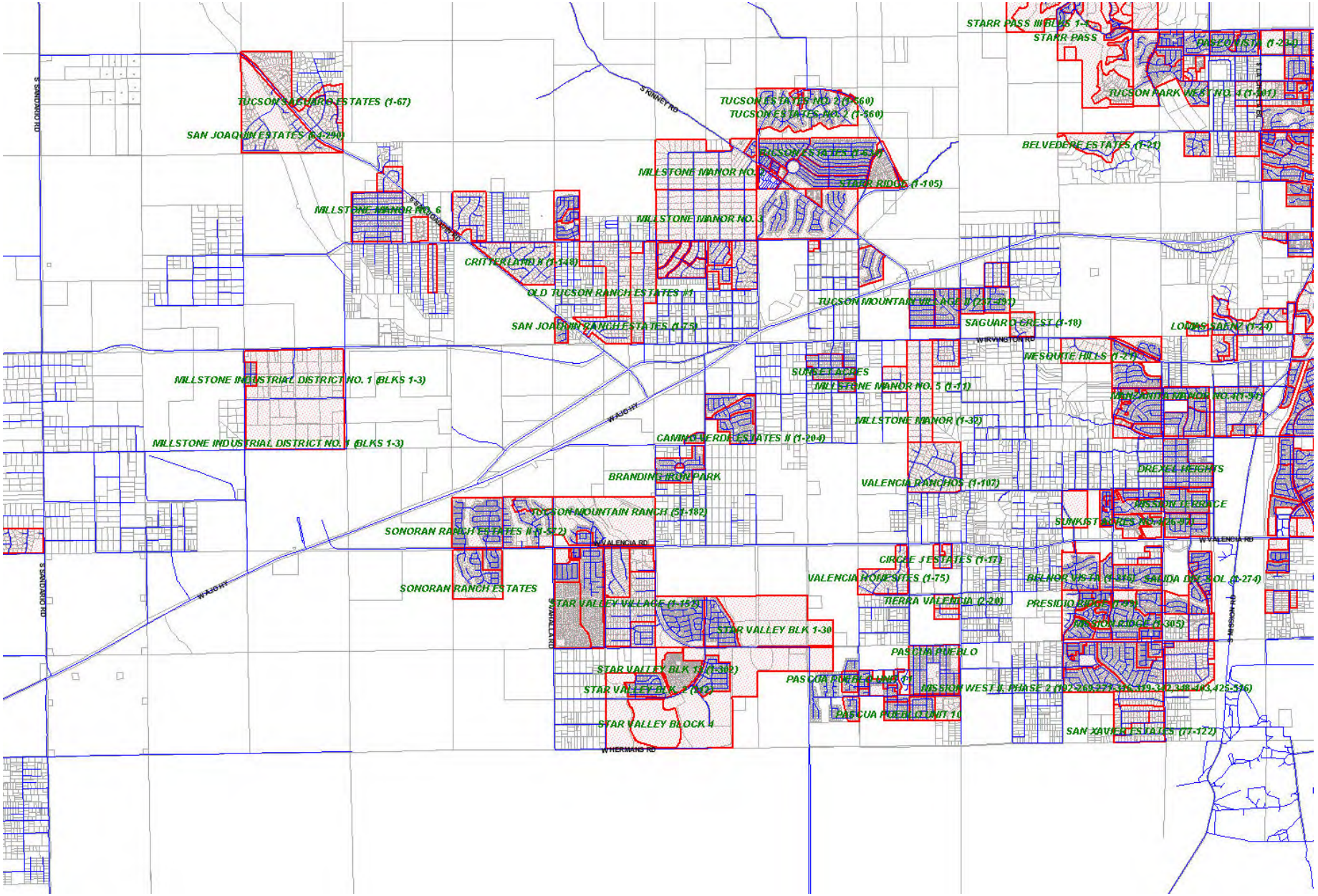
Pima County Public Works
Southwest Infrastructure Plan

Figure No.

EC-3

Title

Conservation Lands System



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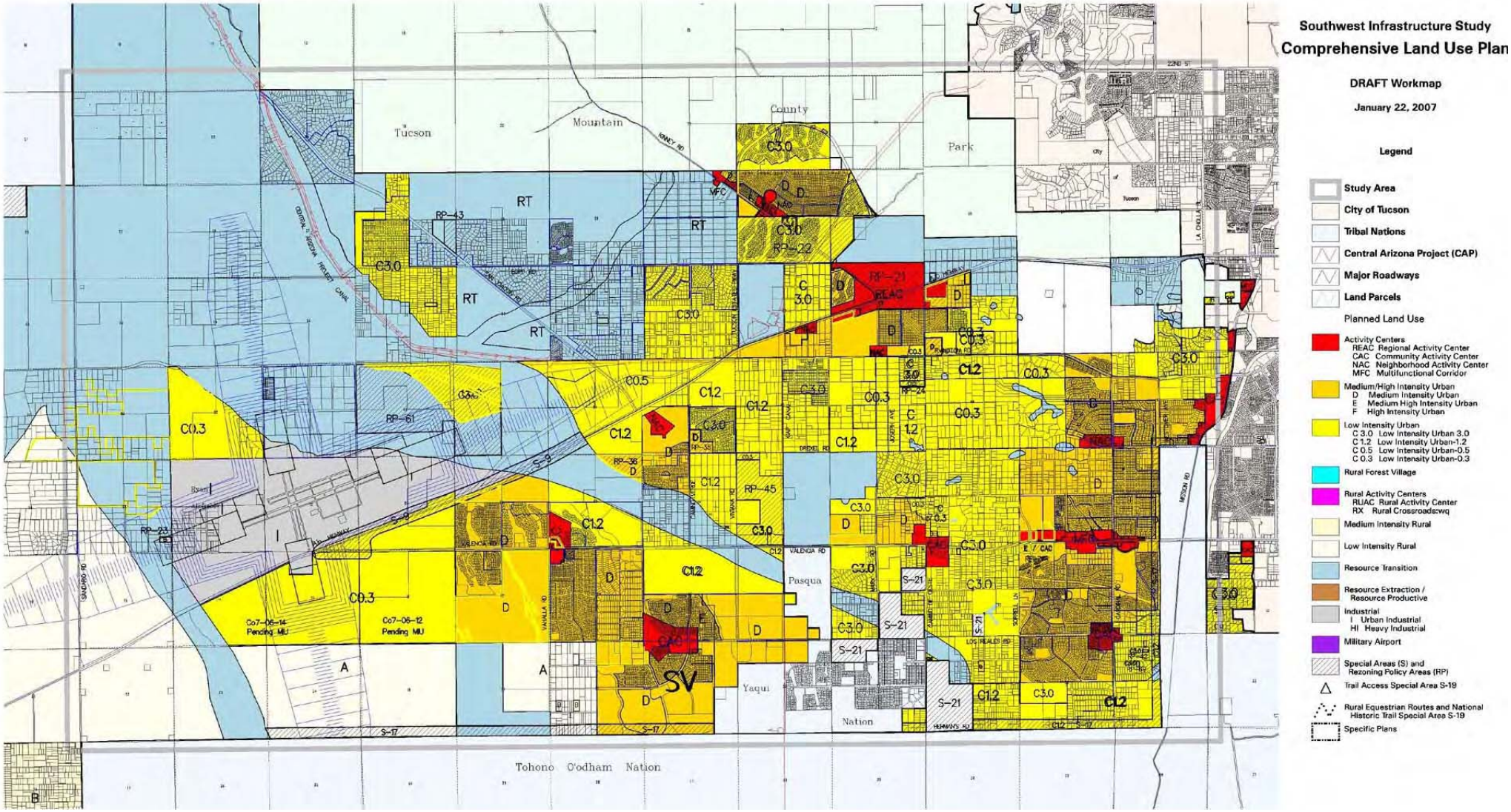
Pima County Public Works
Southwest Infrastructure Plan

Figure No.

EC-4

Title

Existing Subdivisions



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Pima County Public Works
Southwest Infrastructure Plan

Figure No.

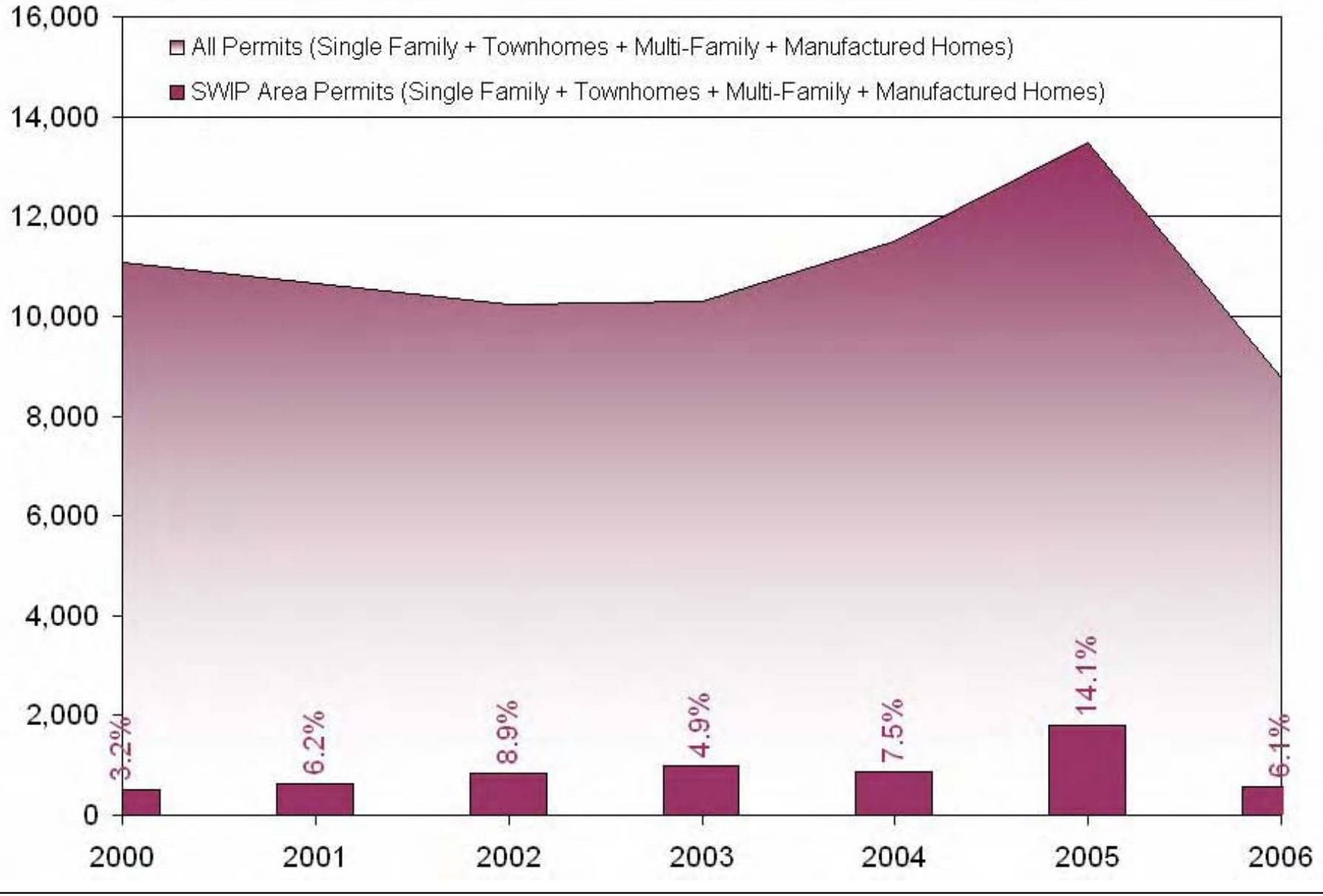
EC-5

Title

Planned Land Uses

Table EC-1 Historical Pima County and SWIP Permit Data

Single Family + Townhomes + Multi-family + Manufactured Homes Permits	*Year*							*Seven Year Average*
	2000	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*	
All Pima County Permits	11,072	10,645	10,234	10,288	11,499	13,482	8,757	10,854
Incorporated Areas	6,978	6,813	6,392	5,919	7,175	7,130	5,144	6,507
Other Areas	4,094	4,456	3,842	4,369	4,324	6,372	3,613	4,439
SWIP Study Area Permits	508	639	827	992	860	1,799	584	887
SWIP Permits - Percentage of Other Areas Total	**12.4%**	**14.3%**	**21.5%**	**22.7%**	**19.9%**	**28.2%**	**16.2%**	**19.3%**
SWIP Permits - Percentage of All Pima County Permits	**4.6%**	**6.0%**	**8.1%**	**9.6%**	**7.5%**	**13.3%**	**6.7%**	**8.0%**



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X.X % SWIP Area Permits as a Percentage of All Pima County Permits

Pima County Public Works
Southwest Infrastructure Plan

Figure No.
EC-6

Title
Historical Pima County and SWIP Permit Data

3.1.2 Natural Drainage Patterns

Watershed Overview

The SWIP study area is comprised of two primary watershed basins. The drainage areas west of Robles Pass include the watersheds tributary to the Black Wash. Drainage areas east of Robles Pass are tributary to the west branch of the Santa Cruz River.

The Black Wash watershed consists of relatively flat topographic terrain along many of the drainage corridors. Overall, the Black Wash watershed is comprised of highly braided channels resulting in broad, shallow, unconfined sheet flooding during storm events. Storm runoff is conveyed primarily from east to northwest via the Black Wash. Along many reaches of the Black Wash there are no discernable channels, only dense vegetation to indicate the natural drainage corridors. The one in 100-year return frequency peak discharge associated with the Black Wash is equal to 26,369 cfs at Sandario Road. This runoff is generated via a 147.21 square mile drainage area with headwaters originating in the Sierrita Mountains.

The drainage areas tributary to the West Branch Santa Cruz River also consists of relatively flat topographic terrain. Within the SWIP boundary, the West Branch Santa Cruz River watersheds are relatively more developed than the Black Wash watersheds and therefore include more flood control structures. Runoff generated within the West Branch Santa Cruz River watersheds is conveyed northerly to the SWIP southern boundary, and easterly within the limits of the study area. The contributing drainage areas south of the study area have a one in 100-year peak discharge rate of 4,225 cfs at Mission Road. This runoff is generated by a 23.15 square mile drainage area. The watersheds originating within the study area generate one in 100-year peak discharge rates along Mission Road which vary from 96 cfs to 2,248 cfs. Runoff is generated by 0.15 square mile and 2.70 square mile watersheds, respectively.

Flood Hazards

Flooding within the Southwest Area has been studied several times; however, defining the one in 100-year return frequency floodplain limits has proven problematic. Many of the drainage corridors do not have sufficient capacity to contain more than the one in 2-year to one in 5-year storms. As a result, flood flows coalesce from one drainage corridor to another making determination of watershed boundaries and concentration points difficult.

In 1989, the Federal Emergency Management Agency (FEMA) adopted a qualitative map of the Black Wash floodplain areas and associated sheet flooding zones. The regulatory floodplain for Black Wash has been mapped as Zone AO which is defined as sheet flooding on sloping terrain with depths of flow ranging from one to three feet. The remainder of the area has been mapped as unnumbered A Zones which are defined as areas with depths of flow of one foot or more. In these unnumbered A Zones, base flood elevations (one in 100-year event water surface elevations) have not been determined.

FEMA Flood Insurance Rate Maps (FIRM) encompassing the Black Wash study area includes Community Panel Nos. 2200, 2225, 2800, 2825, and 2810, all with effective dates of February

8, 1999. Several Letter of Map Revisions (LOMR) have been prepared within the study area; however, these LOMR documents are site-specific and do not have any overall impacts to the existing conditions or drainage characteristics of the Black Wash watershed.

Black Wash has been defined as an administrative floodway by the Pima County Regional Flood Control District through the Black Wash Drainage Analysis and Policy Assessment, as adopted in 1990 by the Pima County Board of Supervisors sitting as the Board of Directors of the Flood Control District.

The Black Wash drainage corridor is predominately natural with ill-defined tributaries that are subject to change during storm events and as a result of development impacts.

The 1990 Southwest Basin Management Study evaluated existing roadways within the study area as well as access issues associated with multiple storm event intervals. Currently, Ajo Highway is the only roadway within the study area that has been designed with culvert crossings to provide some measure of all-weather (passable during a one in 100-year event) access. However, the culverts under Ajo Highway only have capacity to convey the one in 10-year to one in 25-year storm event. There are two existing bridge sections along Ajo Highway associated with the Black Wash and the Snyder Hills Wash watercourses (Ajo Highway – STA 890+25 & STA 950+00). These bridge sections are assumed to convey the one in 100-year storm event and have not been analyzed as part of this study. Numerous roads located within the study area, such as Valencia Road and Camino Verde, are subject to closure due to flood inundation during even a one in 2-year storm event. The undersized culverts and dip sections under Ajo Highway have resulted in significant runoff impoundment as evidenced by increased vegetation south of Ajo Highway and Valencia Road as compared to the north side of Ajo Highway. Impounded floodwaters south of Ajo Highway have the potential to create adverse impacts on adjacent property owners, while the reduction in vegetation north of Ajo Highway contributes to increased flow velocities and decreased soil infiltration capacity.

Central Arizona Project Impacts

Sections of the Central Arizona Project (CAP) canal located within the northern portion of the study area impact the Tucson Mountain Park watersheds that convey runoff westerly to the Black Wash. Similar to the undersized drainage structures along Ajo Highway, the CAP canal impounds stormwater runoff along the upstream side of the canal producing upstream flooding as well as downstream vegetation reduction, increased velocities, and decreased soil infiltration capacity. The CAP canal impacts four significant Tucson Mountain Park watersheds. Stormwater flows are conveyed across the CAP canal via 36-foot concrete flume channels or 72-inch diameter pipe culverts. A fifth Tucson Mountain Park watershed does not appear to be impacted by the CAP canal as the canal has been designed to convey CAP water below the natural flow line of the drainage corridor via an 810-foot long siphon channel. Additional CAP canal impacts are further discussed in a subsequent section of this analysis.

Ryan Airfield Impacts

The issue of flood control facilities in the vicinity of Ryan Airfield was considered. Per Federal Aviation Administration (FAA) Advisory, open bodies of water have the potential to become hazardous wildlife attractants.

These hazardous wildlife attractants should be located a minimum of 5,000 feet from the Airport Operations Area (AOA) for airports that do not include jet activity (piston engines) and 10,000 feet from the AOA for airports that do include jet activity. Currently only piston engine airplanes are active at Ryan Airfield, although Tucson Airport Authority is planning to expand the current facilities to include jet aircraft activity in the near future.

Given the local Sonoran Desert environment and the fact that Pima County design standards aim to ensure that stormwater detention facilities are drained within 24 hours of a storm event, Ryan Airfield should not present flood control limitations associated with future development located in proximity to the runways, taxiways, and aprons.

3.1.3 Wastewater Management Facilities

The SWIP study area is comprised of two separate major sewer basins tributary to two different wastewater treatment facilities. In general, the area to the west part of the study area drains westward to the Avra Valley Wastewater Treatment Facility (WWTF), while the east part of the study area drains northward all the way to the Roger Road Wastewater Treatment Plant (WWTP). Pima County provided direction that the Avra Valley WWTF servicing area was to be the focus of this study, and areas draining to the Roger Road WWTP were not to be scrutinized.

Map W-1 illustrates the existing wastewater collection system. There is a 6,709 acre area in the northwest portion of the study area whose topography eliminates the potential for servicing via gravity sewers. General slopes within the Avra Valley sewer basin ranged from 0.9% to 50%, with an average slope of 2.3% from the northeast, southeast and southwest towards the northwest corner of the study area.

The existing sewer influent enters Avra Valley WWTF via a 24-inch pipe line under Snyder Hill Road. This 24-inch pipe runs about 0.4 miles to the east along Snyder Hill Road and turns 45 degree to the northeast. It becomes a 21-inch to service the northern portions of the Avra Valley WWTF sewer basin. The 24-inch pipe was fed by two major trunk lines (21-inch and 15-inch) under the intersection of Snyder Hill Road and Airline Road. The 21-inch extends to the southeast and turns into 18-inch and then 12-inch sewers to service the southern portions of the existing basin. The 15-inch pipe continues along Snyder Hill Road and ends approximately 1.5 miles to the east.

Avra Valley WWTF is located at 10000 Snyder Hill Road, Tucson, Arizona, which is in the southwest quarter of Section 36, T14S, R11E. The existing Avra Valley WWTF includes a biological nutrient removal oxidation ditch (BNROD) system that was originally designed for an average daily dry weather flow (ADWF) of 1.2 million gallons per day (MGD). The existing unit processes include a 0.288 million gallon flow equalization pond, a 1.33 million gallon oxidation

ditch, two secondary clarifiers, disinfection equipment, sludge storage tanks, sludge loading station, emergency sludge drying facility, effluent reservoir, four percolation ponds, and a spray-field system along the Black Wash.

The sludge is held on site in the sludge holding tanks until it is pumped into and hauled away by tanker trucks. Sludge in the sludge holding tank is aerated for odor control. The tanker trucks haul and discharge the sludge into a designated manhole for conveyance through the sewer system for further processing at Roger Road WWTP.

The existing facility produces Class B+ effluent. The existing facility efficiently treats wastewater to biological oxygen demand (BOD) below 5 mg / l, total suspended solids (TSS) lower than 5 mg / l, and total nitrogen (TN) less than 3 mg / l. The effluent is disposed of via percolation basins, with occasional intermittent irrigation to the spray-field area.

The Avra Valley WWTF will be capable of producing Class A+ effluent following its ongoing expansion to a 4.0 MGD facility. Figure W-1 provides both aerial and ground photographs depicting facility components at the existing Avra Valley WWTF.

Interim Avra Valley WWTF Upgrade

The facility is currently in the process of being upgraded to an interim facility with a capacity of 2.2 MGD. This interim upgrade includes Phase I, which will increase capacity from 1.2 MGD to 1.6 MGD by increasing aeration capacity, and Phase II which will raise capacity from 1.6 MGD to 2.2 MGD by adding an anoxic selector.

Phase I improvements include the installation of four 20-hp floating mechanical aerators, addition of an influent flow meter upstream of the influent pump station, upsizing of the 12-inch influent pipe, installation of control instruments for continuous monitoring and automatic oxic / anoxic cycling, increasing the capacity of return activated sludge (RAS) pumps, and upgrades to the electrical system.

Phase II improvements include improvements to the screening facility, construction of a new anoxic selector, and increasing RAS pumping capacity. The interim upgrade is anticipated to be completed by the end of April 2007. The cost of the interim modifications now underway is estimated to be $2.1 million.

Ryan Airfield Impacts

Currently the Avra Valley WWTF is outside the hazardous wildlife attractant separation distance measured as 5,000 feet from the Air Operations Area (AOA) for airports that do not include jet activity (piston engines). Once jet operations commence and the separation distance expands to 10,000 feet from the AOA, a wildlife hazard management plan will be required by the FAA.

Aerial Photograph

Pima County Public Works
Southwest Infrastructure Plan

Figure No.
W-1

Title
Photographs of Avra Valley Wastewater Treatment Facility

3.1.4 Transportation Facilities

The transportation and roadway sections present an inventory and analysis of existing and planned transportation facilities in the project area which are pertinent to the development of the SWIP. The sections emphasize major routes, including state corridors and local arterials crucial to new development in the study area. For purposes of this study, roads classified as local and collector streets are presumed to be built as part of the on-site improvements, and are not planning or funding considerations in this analysis. There is also a major concern about lack of all-weather access in the study area, particularly in the developable central area. Hydrology and floodplain management are considered in a different chapter of the SWIP.

These sections will also present an inventory of transportation facilities, issues and implications that are pertinent to the development of this plan. These routes have two important functions: to provide internal circulation within the area, and to provide connectivity to social and economic activities in the greater metropolitan area.

3.1.4.1 Roadway Facilities

Jurisdictional Responsibility

State Route 86 (also known as SR 86, Ajo Way or the Ajo Highway) is a State highway operated and maintained by the Arizona Department of Transportation (ADOT). Most other public roads within the study area are the responsibility of Pima County Department of Transportation and a few are within the jurisdictional boundaries of the City of Tucson. There are scattered private streets and some unimproved rural roads that are not maintained by any jurisdiction.

Roadway Functional Classification

There are two primary classification systems for the roadways within the study area. Pima County employs the Major Streets and Scenic Routes (MSSR) Map as a guide to establish rights-of-way for arterials and collector roads. It is also used as an instrument to determine setbacks for these roads and for roads designated as scenic routes.

The 1991 Intermodal Surface Transportation Act required each state to functionally reclassify its public roads and streets; ADOT was assigned to lead Arizona's effort and the most recent update of this classification was approved by FHWA in 2005. The ADOT (state highway) functional classification system characterizes all roadways as either rural or urban, and as arterials or collectors. Definitions for these ADOT functional classifications can be found in the Federal Highway Administration (FHWA) Approved Federal Functional Classification System Guidelines (2005).

According to this system, SR 86 is considered a Rural or Urban Minor Arterial. Other roadways classified as arterials are Cardinal Avenue, Drexel Road, Irvington Road, Los Reales Road (east of Cardinal Road), Mission Road, and Valencia Road (east of Camino de Oeste). All others are classified as rural or urban collectors or not classified by either system.

The City of Tucson also maintains a Major Streets and Routes Map that defines major street classifications, public right of way widths and special routes. Within the City of Tucson limits of the project study area, Mission Road, Ajo Way, Irvington Road and Valencia Road are designated as arterials. Ajo Way and Valencia Road are also designated as Gateway Routes and Mission Road is designated as a Scenic Route.

Map TR-1 shows the existing arterial grid network of the study area. Tables TR-1a and TR-1b contain an inventory of important roads in the study area as well as their classification under the functional classification systems. Recent daily traffic volumes are also provided in the table.

Map TR-1 shows that the arterial grid network is based primarily on east-west travel within the project area. There are few north-south roadways that provide access through and out of the area. Only Sandario Road and Mission Road are north-south roads that continue beyond the project area. SR 86, Valencia Road and Irvington Road are major east-west facilities that provide access to locations well outside the project area.

Average Daily Traffic (ADT)

Map TR-1 and Tables TR-1a and TR-1b also display ADT for major arterial and collector roadways within the study area. This information was gathered from the Pima County Department of Transportation Traffic Engineering website and ADOT's website.

The table also shows the daily capacities of the roadways at level of service (LOS) D. LOS is a measure of effectiveness of the operational efficiency of the roadways. LOS is measured qualitatively like school grades – LOS "A" represents little to no congestion experienced along a roadway possibly due to low volumes and good access control, thus resulting in shorter travel times and driver comfort; LOS "F" represents conditions where drivers experience unacceptable congestion that may be due to high volumes, poor access control and "bottlenecks", resulting in increased travel time, vehicle emissions (due to frequent stops and starts) and driver frustration. LOS B through LOS E represents driving conditions between LOS A and LOS F. The Florida Department of Transportation (FDOT) published planning level volume tables that assist agencies in estimating existing and future LOS conditions on roadways based on their existing or projected daily volumes. Tables TR-1a and TR-1b display the LOS D capacities as LOS D is generally considered the acceptable LOS condition for roadways in urban areas.

Table TR-1a Road Classification and ADT (Ajo Highway Through Joseph Avenue)

Street	AADT	Existing Daily LOS D Capacity*	Under/Over LOS D Capacity	Juris-diction	No. of Lanes	Speed Limit	Transit Route	Designated Bikeable Facility	FHWA Classification	Pima County MSSSR Classification / ROW
Ajo Highway (SR 86)										
SR 286 to Valencia Road	8,600	15,500	Under	ADOT	2	65	PCRT	Yes	Rural Minor Art	State Route**
Valencia Road to San Joaquin Road	8,400	15,500	Under	ADOT	2	65	PCRT	Yes	Rural Minor Art	State Route**
San Joaquin Road to Kinney Road	15,700	15,500	Over	ADOT	2	55/65	PCRT	Yes	Urban Minor Art	State Route**
Kinney Road to La Cholla Boulevard	34,500	34,200	Over	ADOT	4	55	PCRT	Yes	Urban Minor Art	State Route**
La Cholla Boulevard to Mission Road	36,500	34,200	Over	ADOT	4	45	PCRT	Yes	Urban Minor Art	Gateway (COT)/120'
Bopp Road										
Jerome Avenue to Palant Drive	4,300	13,600	Under	PC	2	45	PCRT	No	Rural Minor Coll	Major Route/150'
Palant Drive to Tucson Estates Parkway	6,900	13,600	Under	PC	2	45	PCRT	No	Urban Collector	Major Route/150'
Tucson Estates Parkway to Kinney Road	6,400	13,600	Under	PC	2	45	No	No	Urban Collector	Major Route/150'
Camino de Oeste										
Tetakusim Road to Valencia Road	8,000	13,600	Under	PC	2	45	No	No	Urban Collector	Major Route/90'
Dakota Street to Irvington Road	1,200	13,600	Under	PC	2	40	No	Yes	Urban Collector	Major Route/90'
Irvington Road to Tucson-Ajo Highway	5,900	13,600	Under	PC	2	35	PCRT	Yes	Urban Collector	Major Route/90'
Camino Verde Road										
Valencia Road to Drexel Road	6,100	13,600	Under	PC	2	45	No	No	Urban Collector	Major Route/90'
Drexel Road to Tucson-Ajo Highway	6,300	13,600	Under	PC	2	45	PCRT	No	Urban Collector	Major Route/90'
Cardinal Avenue										
Hermans Road to Los Reales Road	2,500	13,600	Under	PC	2	40	No	No	Urban Minor Art	Major Route/150'
Los Reales Road to Valencia Road	6,100	13,600	Under	PC	2	35	ST	No	Urban Minor Art	Major Route/150'
Valencia Road to Bilby Road	10,800	13,600	Under	PC	2	30	ST	No	Urban Minor Art	Major Route/150'
Bilby Road to Drexel Road	10,700	13,600	Under	PC	2	30	ST	No	Urban Minor Art	Major Route/150'
Drexel Road to Irvington Road	6,300	13,600	Under	PC	2	30	No	Yes	Urban Minor Art	Major Route/150'
Drexel Road										
Cardinal Avenue to Westover Avenue	9,100	13,600	Under	PC	2	40	ST	Partial	Urban Minor Art	NC
Westover Avenue to Mission Road	12,300	13,600	Under	PC	2	40	ST	No	Urban Minor Art	NC
Gates Pass Road										
Kinney Road to 2.4 Miles East of Kinney Road	2,400	13,600	Under	PC	2	35	No	Yes	Rural Major Coll	Scenic, Major Route/150'
Irvington Road										
Sunset Boulevard to Joseph Avenue	2,900	13,600	Under	PC	2		Partial	No	NC	Major Route/150'
Joseph Avenue to Camino de Oeste	4,800	13,600	Under	PC	2		PCRT	No	NC	Scenic, Major Route/150'
Camino de Oeste to Cardinal Avenue	6,600	13,600	Under	PC	2	30-45	PCRT	Yes	Urban Minor Art	Scenic, Major Route/150'
Cardinal Avenue to Mission Road	7,400	13,600	Under	PC	2	45	PCRT	Yes	Urban Minor Art	Scenic, Major Route/150'
Joseph Avenue										
Bilby Road to Irvington Road	3,700	13,600	Under	PC	2	45	No	No	Urban Collector	Major Route/150'

Notes

* Based on FDOT Capacity LOS
** ROW Varies along SR 86 between 150' and 250'
*** Classified as Urban Collector north of Snyder Hill Road
**** Classified as Urban Collector east of Valhalla Road
NC Not Classified
ST Sun Tran
PCRT Pima County Rural Transit

Pima County Public Works
Southwest Infrastructure Plan

Table No.
TR-1a

Title
Road Classification and ADT

Table TR-1b Road Classification and ADT (Kinney Road Through Valencia Road)

Street	AADT	Existing Daily LOS D Capacity*	Under/Over LOS D Capacity	Juris-diction	No. of Lanes	Speed Limit	Transit Route	Designated Bikeable Facility	FHWA Classification	Pima County MSSSR Classification / ROW
Kinney Road										
Ajo Way to Bopp Road	15,200	13,600	Over	PC	2	45	PCRT	Yes	Urban Collector	Scenic, Major Route/150'
Bopp Road to Tucson Estates Parkway	10,000	13,600	Under	PC	2	45	PCRT	Yes	Urban Collector	Scenic, Major Route/150'
Tucson Estates Parkway to Gates Pass Road	2,300	13,600	Under	PC	2	35	No	Yes	Rural Major Coll	Scenic, Major Route/150'
Gates Pass Road to Mile High Road	3,000	13,600	Under	PC	2		No	Yes	Rural Major Coll	Scenic, Major Route/150'
Los Reales Road										
Sorrel Lane to Cardinal Avenue	9,300	13,600	Under	PC	2	45	ST	Yes	Urban Collector	Major Route/150'
Cardinal Avenue to Mission Road	9,500	13,600	Under	PC	2	45	No	Yes	Urban Minor Art	Major Route/150'
Mark Road										
Los Reales Road to Valencia Road	3,900	13,600	Under	PC	2	45	No	No	Urban Collector	NC
Valencia Road to Bilby Road	3,700	13,600	Under	PC	2	45	No	No	Urban Collector	NC
Mile Wide Road										
0.5 Miles East of Reservation Road to Sandario Road	500	13,600	Under	PC	2	45	No	No	Rural Major Coll	Major Route/150'
Sandario Road to Kinney Road	1,800	13,600	Under	PC	2	50	No	No	Rural Major Coll	Scenic, Major Route/150'
Mission Road										
Pima Mine Road to San Xavier Road	1,300	13,600	Under	PC	2	55	Partial	Yes	Urban Minor Art	Scenic, Major Route/150'
San Xavier Road to Los Reales Road	4,600	13,600	Under	PC	2	45	PCRT	Yes	Urban Minor Art	Scenic, Major Route/150'
Los Reales Road to Valencia Road	9,400	13,600	Under	PC	2	45	PCRT	No	Urban Minor Art	Scenic, Major Route/150'
Valencia Road to Drexel Road	10,800	13,600	Under	PC	2	45	No	No	Urban Minor Art	Scenic, Major Route/150'
Drexel Road to Irvington Road	24,900	29,300	Under	PC	4	45	No	Yes	Urban Minor Art	Scenic, Major Route/150'
Irvington Road to 0.5 miles South of Ajo Way	26,400	29,300	Under	PC/COT	4	45	ST	Yes	Urban Minor Art	Scenic, Major Route/150'
San Joaquin Road										
Ajo Way to Bopp Road	3,000	13,600	Under	PC	2	50	No	No	Rural Major Coll***	Scenic, Major Route/150'
Bopp Road to 0.9 Miles North of Calle Anasazi	1,500	13,600	Under	PC	2	45	No	No	Urban Collector	Scenic, Major Route/150'
Sandario Road				PC						
Ajo Way to San Joaquin Road	2,500	13,600	Under	PC	2	50	No	No	Rural Major Coll	Scenic, Major Route/200'
San Joaquin Road to Mile Wide Road	1,600	13,600	Under	PC	2	50	No	No	Rural Major Coll	Scenic, Major Route/200'
Mile Wide Road to Manville Road	2,700	13,600	Under	PC	2	50	No	No	Rural Major Coll	Scenic, Major Route/200'
Ajo Way to Bopp Road	1,300	13,600	Under	PC	2	50	No	No	NC	Major Route/150'
Valencia Road										
Ajo Way to Camino Verde	5,200	13,600	Under	PC	2	50	No	No	Rural Major Coll****	Scenic, Major Route/200'
Camino Verde Road to Mark Road	12,200	13,600	Under	PC	2	45	No	No	Urban Collector	Scenic, Major Route/200'
Mark Road to Camino de Oeste	18,400	13,600	Over	PC	2	45	No	No	Urban Collector	Scenic, Major Route/200'
Camino de Oeste to Caballo Road	23,000	13,600	Over	PC	2	45	No	No	Urban Minor Art	Scenic, Major Route/200'
Caballo Road to Camino de la Tierra	24,800	13,600	Over	PC	2	45	No	No	Urban Minor Art	Scenic, Major Route/200'
Camino de la Tierra to Cardinal Avenue	29,100	29,300	Under	PC	4	45	ST	Yes	Urban Minor Art	Scenic, Major Route/200'
Cardinal Avenue to Mission Road	41,000	29,300	Over	PC	4	45	ST	No	Urban Minor Art	Scenic, Major Route/200'
Mission Road to 0.5 Miles E. of Mission Road	39,200	29,300	Over	PC	4	45	ST	Yes	Urban Principal Art	Scenic, Major Route/200'

Notes

* Based on FDOT Capacity LOS
** ROW Varies along SR 86 between 150' and 250'
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**** Classified as Urban Collector east of Valhalla Road
NC Not Classified
ST Sun Tran
PCRT Pima County Rural Transit

Pima County Public Works
Southwest Infrastructure Plan

Table No.
TR-1b

Title
Road Classification and ADT

3.1.4.2 Physical Features

The following subsections describe the alignments, cross-sections, access management and planned improvements for five of the major roadways within the study area.

SR 86 (Ajo Highway / Ajo Way)

Existing Alignment: SR 86 is an arterial roadway generally extending along an east-west alignment from near the community of Ajo, Arizona to I-19. Between Ajo, Arizona and La Cholla Boulevard, SR 86 is also called the Ajo Highway. West of La Cholla, it becomes Ajo Way. In addition, west of I-19, the road is under the City of Tucson's jurisdiction. Its eastern terminus is at Alvernon Way. SR 86 provides a direct connection between communities within the Tohono O'odham Nation and Tucson in the south-central area of Arizona. It is also a corridor for access to Rocky Point, Mexico via its intersection with SR 85. Figure TR-1 contains two aerial photographs of Ajo Way.

Speed Limit: The speed limit on SR 86 is 65 mph from west of Sandario to Camino Verde where it is reduced to 55 mph. It continues at 55 mph to La Cholla Boulevard, where it is reduced to 45 mph.

Alternate Modes: Pima County Rural Transit provides service in the project area through their San Xavier, Ajo and Tucson Estate Routes. Buses run on SR 86 via the Ajo Service Area route. This route provides morning service (one bus) from Ajo to Tucson and afternoon return service from Tucson to Ajo. This route runs Mondays, Wednesdays and Fridays. There are no transit stops within the project study area on the Ajo Service Area route – the closest stops are at the Laos Transit Center near the intersection of Irvington Road / 6th Avenue within the City of Tucson, and at Robles Junction, approximately six miles west of Sandario Road.

On the current Tucson Bike Map, SR 86 is designated as a roadway with paved shoulders.

Existing Traffic Control: There is an existing traffic signal on SR 86 at its intersection with Kinney Road. There are other cross streets that are stop controlled at their intersections with SR 86.

Pima County is working with ADOT to develop a State Highway Overlay District ordinance that will better regulate and manage access along State Highways and State Routes that pass through Pima County. This project will address access strategies to and from SR 86 within the project area.

Plans for Improvement: ADOT has an active project to widen SR 86 between Sandario Road and Kinney Road to a four-lane cross section. As part of this widening, there will be traffic signal control added at select intersections and turn restrictions from minor crossroads onto SR 86 to reduce left turn crash potential. The SR 86 / Kinney Road intersection will also be reconstructed as part of this widening project and will be improved based on the future construction of a Wal-Mart shopping center on the northwest corner of the intersection. The developers of the Wal-Mart shopping center will improve sections of SR 86 and Kinney Road

Ajo Way, East of Sandario Road

Ajo Way at La Cholla Blvd.

Pima County Public Works
Southwest Infrastructure Plan

Figure No.
TR-1

Title
SR 86 Ajo Highway / Ajo Way Aerial Photographs

that front the Wal-Mart center as part of a development agreement with Pima County and ADOT.

Valencia Road

Existing Alignment: Valencia Road follows an east-west section line alignment. The western terminus of Valencia Road is at its intersection with SR 86 near Ryan Air Field. Valencia Road continues east through the project area with its eastern terminus just east of Houghton Road on the east side of Tucson. Figure TR-2 contains two aerial photographs of Valencia Road.

Speed Limit: The speed limit on Valencia Road is 50 mph from Ajo Way to Camino Verde where it is reduced to 45 mph and continues with this speed limit to the east end of the project area.

Typical Section: Valencia Road through the study area is a two-lane, undivided road with eight to ten foot shoulders from SR 86 to Camino de Oeste. East of Camino de Oeste, Valencia Road widens to a four-lane divided urban section.

Alternate Modes: Sun Tran provides weekday and weekend service (Routes 27 and 29) on Valencia Road from Camino de la Tierra to the east beyond the eastern limit of the study area. Transit riders can then travel to the Roy Laos Transit Center, where riders can transfer to buses that provide access to most areas Sun Tran serves.

On the current Tucson Bike Map, Valencia Road is designated as a “bike route with striped shoulder” between Camino de la Tierra and Cardinal Avenue. Although not indicated on the Tucson Bike Map, we believe that the planned improvements to Valencia Road between the Ajo Highway and Camino de la Tierra will include the provision of paved, striped shoulders that will increase safety for bicycle travel.

Existing Traffic Control: Traffic signals are located at Mark Road, Camino de Oeste, Cardinal Avenue and Mission Road. Stop signs control access from all other cross streets intersecting Valencia Road.

Plans for Improvement: Pima County has plans to improve Valencia Road to a four-lane divided roadway between Ajo Highway and Mark Road and between Mark Road and Camino de la Tierra. The eastern project is a Pima County bond project (DOT-17) and the western project is a project to be funded through the Regional Transportation Authority (RTA). The proposed improvements consist of upgrading Valencia Road to a four travel lane (two in each direction) roadway, with a two-way continuous left turn lane, six-foot paved shoulders, four-foot graded and landscaped shoulders and Americans with Disabilities Act (ADA) compliant pedestrian pathways. The section from Mark Road to Camino de la Tierra is projected to be completed by summer 2008. The western section from Ajo Way to Mark Road is projected to begin preliminary design in spring 2007. Pima County is currently reconstructing Valencia Road from Mission Road to I-19 (Pima County Bond No. DOT-49) to a six-lane divided urban roadway. This project is scheduled to be complete by summer 2007. The developers of the La Luna

Valencia Road, South of SR 86

Valencia Road, East of Mark Road

Pima County Public Works
Southwest Infrastructure Plan

Figure No.
TR-2

Title
Valencia Road
Aerial Photographs

residential development have an agreement with Pima County to widen a short section of Valencia Road west of the Casino del Sol complex to four lanes.

Sandario Road

Existing Alignment: This two-lane rural road travels in a north-south direction, beginning at SR 86 and continuing north 20 miles to its terminus at Avra Valley Road in the Town of Marana. A section of Sandario Road travels through Saguaro National Park's West Unit. Figure TR-3 contains two aerial photographs of Sandario Road.

Speed Limit: The speed limit on Sandario Road is 50 mph from SR 86 through to the north boundary of the project area.

Typical Section: Sandario Road is predominantly a two-lane undivided rural road with 11-foot lanes and narrow paved shoulders.

Alternate Modes: There are no facilities for alternate modes (transit service, bike lanes) along Sandario Road.

Existing Traffic Control: There are few intersections along Sandario Road. All are un-signalized with stop signs on the cross streets.

Plans for Improvement: There are no existing plans for roadway capacity improvements along Sandario Road. However, there are improvement plans for Sandario Road in Pima County's Development Impact Fee Program.

Kinney Road

Existing Alignment: Kinney Road follows a diagonal alignment, generally from northwest to southeast, beginning at Mile Wide Road within Tucson Mountain Park and continuing southeast to just south of SR 86. Kinney Road provides access to two major tourist attractions in Pima County; Old Tucson Studios and the Arizona-Sonoran Desert Museum. Figure TR-4 contains two aerial photographs of Kinney Road.

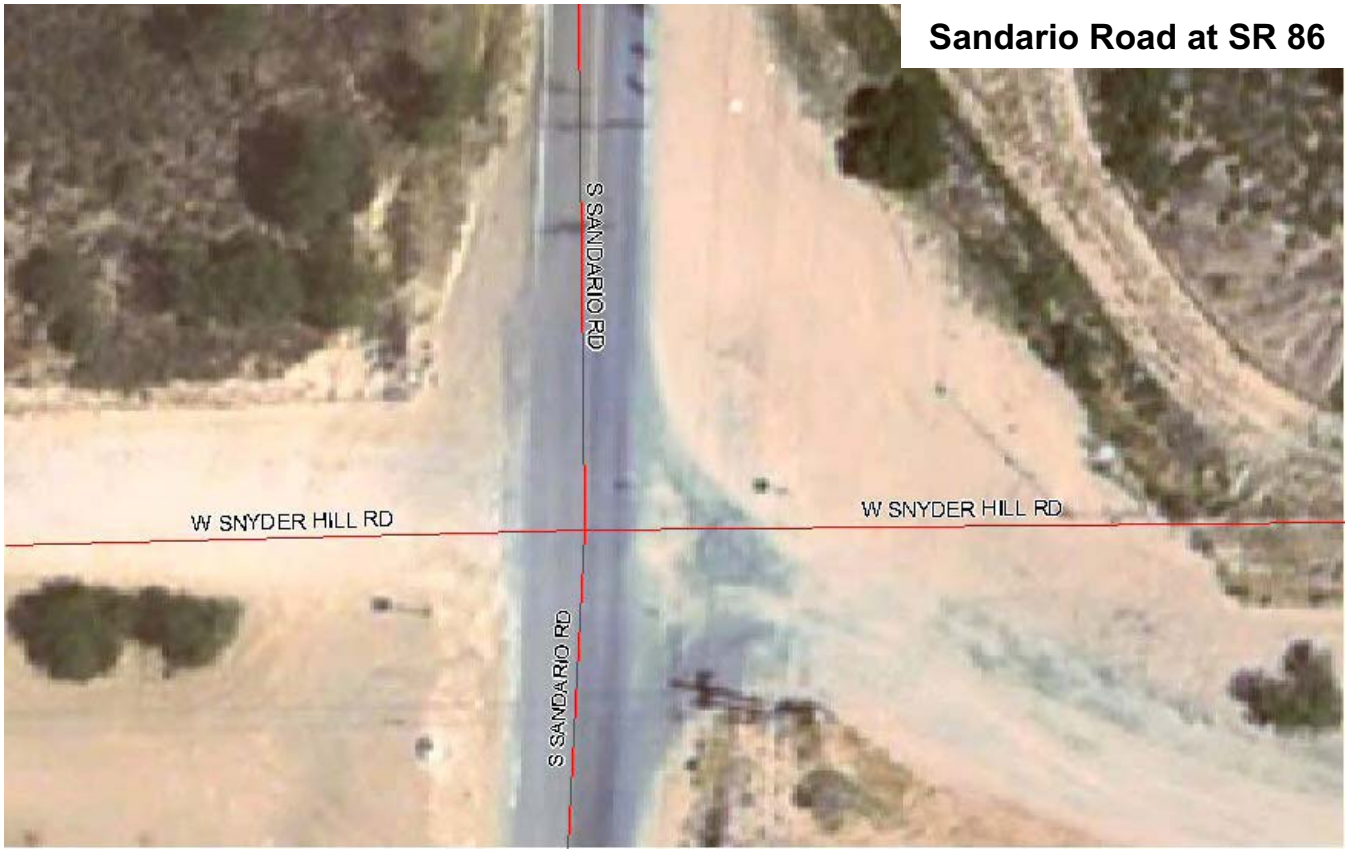
Speed Limit: The speed limit on Kinney Road is 45 mph from SR 86 to Tucson Estates Parkway. Northwest of Tucson Estates Parkway the speed limit is reduced to 35 mph and continues with this speed limit through Tucson Mountain Park.

Typical Section: Kinney Road is a two-lane roadway with narrow shoulders through most of the project area. Kinney Road widens to a three lane section between Naomi Road and Western Way, but narrows down again as it approaches the Tucson Mountain Park Boundary. As Kinney Road approaches Ajo Way, there has recently been substantial residential development which has resulted in minor improvements on Kinney Road.

Alternate Modes: Pima County Rural Transit provides service on Kinney Road via the Tucson Estates Service Area. This route makes eight scheduled trips per weekday to the Laos Transit

Sandario Road at Snyder Hill Road

Sandario Road at SR 86



Pima County Public Works
Southwest Infrastructure Plan

Figure No.
TR-3

Title
Sandario Road Aerial Photographs

Kinney Road at SR 86

Kinney Road at Sarasota Road

Pima County Public Works
Southwest Infrastructure Plan

Figure No.
TR-4

Title
Kinney Road
Aerial Photographs

Center. On Kinney Road the service is provided from Calle Don Miguel, south of SR 86 to Donald Avenue.

On the current Tucson Bike Map, Kinney Road is designated as a "bike route with striped shoulder" between SR 86 and Tucson Mountain Park. It continues as the "Acupuncture Trailhead" in Tucson Mountain Park, one of several designated mountain biking routes within Pima County. Kinney Road is a popular recreational bicycling route with its connection to Gates Pass Road.

Existing Traffic Control: There are traffic signals on Kinney Road at Western Way and at SR 86. Other cross streets are controlled by stop signs. There are no access restrictions for turning movements on Kinney Road.

Plans for Improvement: Pima County has a bond project to widen Kinney Road to a four-lane cross section (DOT-50) from Bopp Road to SR 86. Pima County also has a development agreement with Wal-Mart who plans to build a Super Wal-Mart shopping center on the northwest corner of the SR 86 / Kinney Road intersection. As part of the development agreement, Wal-Mart will construct improvements on Kinney Road and on SR 86. These improvements include turn lanes, drainage improvements and intersection improvements at the SR 86 / Kinney Road intersection.

Mission Road

Existing Alignment: Mission Road is a major urban roadway with a north-south alignment. It provides access from the Green Valley area north into the downtown Tucson area. Mission Road is within the Tucson City Limits from just south of SR 86 to the north. South of SR 86, Mission Road is within the jurisdiction of Pima County, although there is a short segment between SR 86 and Irvington Road that is within the City of Tucson's jurisdiction. Figure TR-5 contains two aerial photographs of Mission Road.

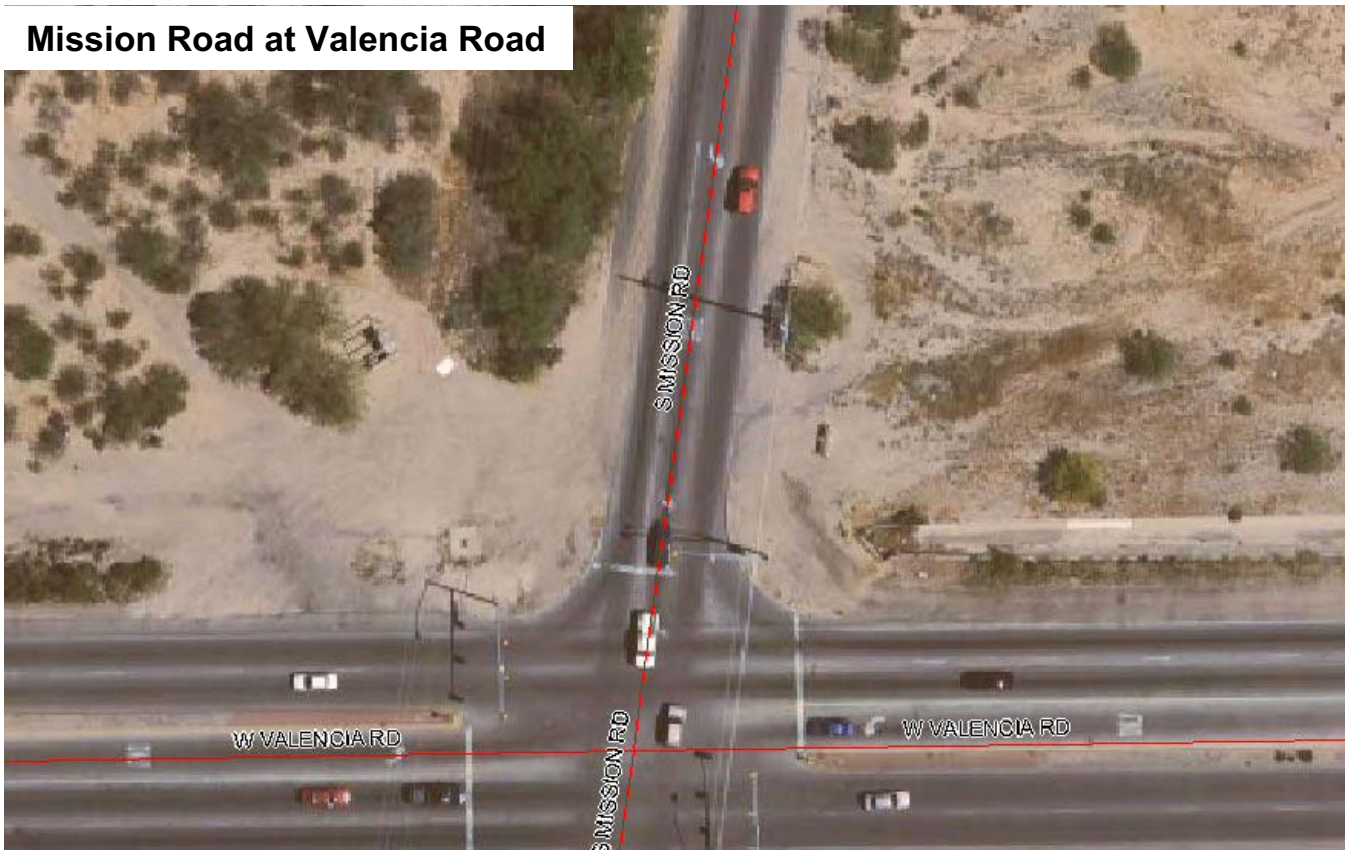
Speed Limit: The speed limit on Mission Road is 55 mph south of San Xavier Road and 45 miles north of San Xavier Road, through the project area.

Typical Sections: Between just south of 36th Street and Drexel Road, Mission Road has an urban four-lane cross section with a raised median, curb and gutter, sidewalks and bike lanes. South of Drexel Road, Mission Road narrows to a two-lane undivided rural road cross section and continues as such to the southern boundary of the study area.

Alternate Modes: Pima County Rural Transit provides service on Mission Road from just south of San Xavier Road to Valencia Road via its San Xavier Access Route. This route provides residents of the San Xavier area with transit access to Tucson employment centers, medical facilities and other activities and services. Ten round trips along this route are provided during the week from the San Xavier area to the Roy Laos Transit Center. Nine round trips are provided on Saturday.

Mission Road at Irvington Road

Mission Road at Valencia Road



Pima County Public Works
Southwest Infrastructure Plan

Figure No.
TR-5

Title
Mission Road Aerial Photographs

On the current Tucson Bike Map, Mission Road is designated as a "bike route with striped shoulder" from Drexel Road north beyond the northern project boundary. South of Los Reales Road, Mission Road is designated on the Bike Map as a "Major Street", which may be appropriate for experienced riders.

Existing Traffic Control: There are traffic signals at 36th Street, SR 86, Irvington Road, Drexel Road, Valencia Road. Access is controlled north of Drexel Road by the raised median, restricting some turns onto Mission Road to right-in, right-out only.

Plans for Improvement: There are no capacity improvement projects planned for Mission Road.

3.1.4.3 Roadway and Intersection Crash Experience

Pima County maintains a database of crash incidences for roadways and intersections on Pima County roadways through their Safety Management System (SMS). The crash information is obtained from traffic crash reports submitted to PCDOT / TED by the Pima County Sheriff's Department. (ADOT also collects reported crash data on ADOT facilities). Pima County recently published their annual Safety Management System (SMS) Report. The current report summarizes crash history on Pima County facilities from January 2003 through December 2005. The SMS data are used to help identify and prioritize traffic safety projects within unincorporated Pima County. Table TR-2 lists the highest five ranked unsignalized intersections, signalized intersections, and roadway segments within the plan area based on their crash history and their ranking in Pima County's SMS priority index[1].

3.1.4.4 Transportation Improvement Plans and Programs

PAG Regional Transportation Plan

The Pima Association of Governments Regional Transportation Plan (RTP) looks at transportation and funding needs today and 20 or more years into the future, identifying transportation solutions and financial strategies. It guides the investment of regional transportation resources in our region's roadway, bus, pedestrian, bicycle, aviation, freight and rail facilities over the next 20 to 30 years. The current long-range transportation plan horizon is the year 2030. The 2030 RTP includes updated growth projections, adjusted proposed project costs, and revised expected revenues. This Plan was adopted by the PAG Regional Council on June 29, 2005 and amended on June 29, 2006.

[1] The priority index for roadway segments and intersections is calculated by adding the rank of each location (based on all Pima County roadway segments and intersections included in the database) for the four statistic groups (crash frequency, crash rate, severity index, and volume). It should be noted that the four crash statistics are treated equally in importance. As a result, no one statistic is given extra weight prior to the summation of the four. Based on this methodology, the lower the priority index, the higher the priority index rank and the more critical the need for corrective action. The highest priority index is "1."

Table TR-2 Highest Five PI Ranked Unsignalized Intersections in Plan Area

Intersection		Volume	3 Year Period - January 2003 to December 2005				
			Crash Frequency	Rate	SI	PI	PI Rank
Bopp Road	Kinney Road	15535	17	1.00	1.80	201	7
Camino Verde	Valencia Road	11462	15	1.20	1.71	252	16
Valencia Road	Westover Avenue (East)	38158	11	0.26	1.80	278	21
Bilby Road	Cardinal Avenue	10994	11	0.91	1.62	292	34
Los Reales Road	Mission Road	11292	12	0.97	1.42	321	43

Table TR-2 Highest Five PI Ranked Signalized Intersections in Plan Area

Intersection		Volume	3 Year Period - January 2003 to December 2005				
			Crash Frequency	Rate	SI	PI	PI Rank
Irvington Road	Mission Road	44065	94	1.95	1.80	48	2
Cardinal Avenue	Valencia Road	42790	86	1.84	1.43	101	14
Mission Road	Valencia Road	50245	19	2.02	1.58	117	21
Mark Road	Valencia Road	19732	38	1.76	1.93	149	29
Camino de Oeste	Valencia Road	25048	46	1.68	1.51	162	33

Table TR-2 Highest Five PI Ranked Roadway Segments in Plan Area

Roadway Segment	From	To	Length	Volume	3 Year Period - January 2003 to December 2005				
					Crash Frequency/Mile	Rate	SI	PI	PI Rank
Los Reales Road	Sorrel Lane	Cardinal Avenue	1.0	9,220	33.00	3.27	1.62	391	15
Valencia Road	Camino Verde	Mark Road	2.0	10,166	18.50	1.66	2.02	391	15
Valencia Road	Camino de Oeste	Caballo Road	0.6	23,955	65.00	2.48	1.46	395	17
Valencia Road	Mark Road	Camino de Oeste	0.5	17,314	58.00	3.06	1.44	418	26
Cardinal Avenue	Los Reales Road	Valencia Road	1.0	8,334	28.00	3.07	1.63	419	28

PAG Transportation Improvement Program (TIP)

The Transportation Improvement Program (TIP), prepared by Pima Association of Governments (PAG), is a five-year schedule and budget of proposed transportation improvements within eastern Pima County. The TIP is typically updated annually through a multi-step process in association with PAG member jurisdictions and other implementing agencies. The TIP addresses regional transportation projects and programs including federal, state and local highways, transit, aviation, ride sharing, bikeways, and pedestrian facilities.

Arizona Department of Transportation Five-Year Transportation Facilities Construction Program

For over a decade, The Arizona Department of Transportation has developed the Five-Year Transportation Facilities Construction Program for highways and airports under the "Priority Programming Law". The law sets guidelines that the department follows in prioritizing projects for the program. This site outlines the key features of the programming process and identifies projects selected for the fiscal years 2007 through 2011.

Pima County Capital Improvement Program

Pima County's Fiscal Year 2007 / 08 to 2011 / 12 Adopted Budget for its Capital Improvement Program (CIP) consists of ten categories: Facilities Management; Transportation; the Flood Control District; Natural Resources, Parks & Recreation; Open Space; Cultural Resources; Neighborhood / Housing Reinvestment; Solid Waste Management; Airports; and Wastewater Management. Transportation is the largest component of the budget for CIP, in terms of expenditures and number of projects.

Pima County Development Impact Fee Program – CIP Projects

In 2003, the Pima County Board of Supervisors adopted Ordinance 2003-40 which modified County Code Chapter 19.03 relating to roadway development impact fees by, in part, establishing new fees for non-residential land uses. The Board of Supervisors originally implemented roadway development fees in 1996, although these fees were for new residential developments only.

The impact fees are based on the projected impact of the land use on the arterial roadway system. By statute, the fees must help fund capital improvements on the arterial system within Pima County. Because roadways classified as local roads and collectors are usually built or improved by the developers of a project, only the roadways that are classified as arterials (minor and major), and those of higher classifications (parkways, freeways) are considered for improvements to be funded by development impact fees.

City of Tucson Capital Improvement Program

The City of Tucson develops and maintains a continuing five year Capital Improvement Program. The current program includes capital projects to be funded between 2007 and 2011.

For this fiscal period, there are no transportation projects within the City of Tucson that are within the plan study area.

The current program does list projects that are to be funded through the Pima County 1997 Highway User Revenue Bond program that are partially within the City of Tucson. One project that is in the plan area, Valencia Road from Mission to Interstate 19 is included in this list. This project is to widen Valencia Road to a six-lane cross section.

Regional Transportation Authority

The Regional Transportation Authority is made up of jurisdictions within a common geographic boundary to identify transportation priorities and design projects to meet regional needs. The RTA focuses on multi-modal transportation planning that supports Pima County, South Tucson, Tucson, Oro Valley, Sahuarita, Marana, the Pascua Yaqui Tribe and Tohono O'odham Nation.

The legislation allows the RTA to request voter approval of a transportation plan and a half-cent transaction privilege tax, or sales tax, to fund it. The tax may be collected over a period of up to 20 years. Revenues from the sales tax are to be spent based on the defined elements in the voter-approved RTA plan.

In May 2006, voters approved a $2.1 billion regional transportation plan with 60 percent voting in favor of the plan and 58 percent voting for the half-cent sales tax. The projects in the plan include roadway improvements, transit improvements, safety improvements and environmental and economic vitality enhancements.

Map TR-2, Planned or Programmed Capacity Projects, shows currently planned transportation improvements, as well as future corridors under consideration.

Tables TR-3a and TR-3b list programmed roadway improvement projects from the PCDOT and PAG Transportation Improvement Programs (TIP), the ADOT Five-Year Construction Program and the PAG RTP and RTA plans. Project numbers are indexed to the numbers shown in Map TR-2.

Table TR-3a Planned and Programmed Roadway Improvements (SR 86 and Valencia Road)

Project	Road	Location	Length	Type of Work	Fiscal Year(s)	Sponsor	Programs / Plans											
							ADOT TFCP	Cost	PAG TIP	Cost	PC CIP	Cost	PC DIFO	Cost	PAG RTP	Cost	PAG RTA	Cost
1	SR 86 / Ajo Highway / Ajo Way	Sandario to Valencia	3.70	Reconstruct and widen to 40 feet.	2020-2030	ADOT									X	$5,000		
2		Sandario to Valencia	3.06	Widen to 4 lanes	2020-2030	ADOT									X	$38,250		
3		Valencia Road to Kinney Road	6.60	Widen to 4 lanes	2010	ADOT	X	$14,400										
4		Valencia Road to Kinney Road	6.60	Widen to 4 lanes	2010	ADOT			X	$17,600								
5		Valencia Road to Kinney Road	6.60	Widen to 4 lanes	2010	ADOT									X	$18,875		
6		Kinney Road Intersection	0.80	Reconstruct intersection and approximately 4,300 feet of roadway to 4-lane divided	2007	ADOT	X	$1,819										
7		Kinney to Mission	4.50	Widen to 6 lanes	2020-2030	ADOT									X	$9,000		
8		Mission to I-19	2.00	Reconstruct and widen to 6 lanes	2020-2030	ADOT									X	$23,150		
9	Valencia Road	Ajo Hwy to Mark	5.75	Widen to 4 lanes	2020-2030	Pima County									X	$41,000		
10		Ajo Hwy to Mark	5.00	Widen to 4 lanes		Pima County							X	$45,000				
11		Ajo Hwy to Mark	5.00	Widen to 4 lanes	2012-2016	RTA											X	$15,057
12		Mt. Eagle Road to Wade Road	1.50	Widen to 4 lanes		Pima County					X	$800						
13		Wade Road to Mark Road	2.50	Widen to 4 Lanes	2011	Pima County			X	$15,056								
14		Wade Road to Mark Road	2.50	Widen to 4 Lanes	2011	Pima County					X	$14,956						
15		Mark to Camino de la Tierra	2.00	Widen to 4 lanes	2007-2010	Pima County									X	$15,700		
16		Mark Road to Camino de la Tierra	2.00	Widen to 4-lane road	2009	Pima County			X	$17,356								
17		Mark Road to Camino de la Tierra	2.00	Widen to 4-lane road	2009	Pima County					X	$13,181						
18		CAP Pipeline to Camino de la Tierra	3.00	Widen to 4 lanes		Pima County							X	$15,708				
19		Mark to Mission	3.30	Widen to 6 lanes	2020-2030	Pima County									X	$25,100		
20		Mission to I-19	1.80	Widen to 6 lanes	2010-2020	Pima County									X	$18,225		
21		Mission to I-19	1.80	Widen to 6 lanes		Pima County							X	$16,200				
22		Mission Road to I-19	1.80	Widen to 6 lanes	2008	Pima County			X	$10,828								
23		Mission Road to I-19	1.8	Widen to 6 lanes	2008	Pima County					X	$4,628						

Notes

Project Plans and Programs

ADOT TFCP = Arizona Department of Transportation
Transportation Facilities and Capital Improvement Program (FY 2007-2011)
PAG TIP = Pima Association of Governments Transportation Improvement Program (FY 2007-2011)
PC CIP = Pima County Capital Improvement Program (FY 2007/08 to 2011/12)
PC DIFO = Pima County Development Transportation Impact Fee Ordinance Project List
(Dollars are shown in 2002 Costs)
PAG RTP = Pima Association of Governments Regional Transportation Plan (2006-2030)
PAG RTA = Pima Association of Governments Regional Transportation Authority Transportation Plan

Funding Amounts Expressed in Thousands of Dollars ($ 000)

Pima County Public Works
Southwest Infrastructure Plan

Table No.
TR-3a

Title
Planned and Programmed Roadway Improvements

Table TR-3b Other Planned and Programmed Roadway Improvements

Project	Road	Location	Length	Type of Work	Fiscal Year(s)	Sponsor	Programs / Plans											
							ADOT TFCP	Cost	PAG TIP	Cost	PC CIP	Cost	PC DIFO	Cost	PAG RTP	Cost	PAG RTA	Cost
24	Camino de Oeste	Calle Torim to Valencia	1.50	Widen to 4 Lanes	2010-2020	Pascua Yaqui									X	$8,500		
25	Drexel Road	Midvale Park to Calle Santa Cruz	0.40	Extend 2 lane roadway with new bridge	2010-2020	City of Tucson									X	$16,750		
26		Mission to I-19	1.55	Widen to 4 lanes divided inc bike lanes & sidewalks	2020-2030	Pima County									X	$17,900		
27	Ignacio Bumea Road (Sheridan/CAP Line Road)	Los Reales to Valencia Road	1.00	Construct new collector road to PY reservation	2010-2020	Pascua Yaqui									X	$5,000		
28	Irvington Road	Ajo Hwy to Joseph Road	1.80	Construct new two-lane roadway		Pima County							X	$7,000				
29		Mission to I-19	1.32	Widen to 6 lanes	2010-2020	Tucson									X	$15,400		
30	Kinney Road	Ajo Way to Bopp Road	0.90	Widen to 4-lane road	2011	Pima County			X	$13,800								
31		Ajo Way to Bopp Road	0.90	Widen to 4-lane road	2011	Pima County					X	$12,089						
32		Ajo Way to Sarasota	0.90	Widen to 4 lanes	2007-2010	Pima County									X	$9,581		
33		Sarasota to Tucson Estates	1.03	Widen to 4 lanes	2010-2020	Pima County									X	$9,100		
34		Ajo to Tucson Estates	1.60	Widen to 4 lanes		Pima County							X	$8,000				
35	Sandario Road	Rudasill to SR 86	13.80	Widen to 4-lane road		Pima County							X	$55,000				
36	Camino Verde	Valencia Road to Ajo Road	1.80	Widen to 4-lane road		Pima County							X	$7,200				
37	San Joaquin Road	Sandario to Calle Cibeque	3.40	Reconstruct new two lane roadway		Pima County							X	$13,600				

Notes

Project Plans and Programs

ADOT TFCP = Arizona Department of Transportation
Transportation Facilities and Capital Improvement Program (FY 2007-2011)
PAG TIP = Pima Association of Governments Transportation Improvement Program (FY 2007-2011)
PC CIP = Pima County Capital Improvement Program (FY 2007/08 to 2011/12)
PC DIFO = Pima County Development Transportation Impact Fee Ordinance Project List
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Funding Amounts Expressed in Thousands of Dollars ($ 000)

Pima County Public Works
Southwest Infrastructure Plan

Table No.
TR-3b

Title
Planned and Programmed Roadway Improvements

3.1.5 Parks, Recreation, and Open Space Facilities

The project study area for the Parks, Recreation and Open Space facilities is generally bounded by Mission Road on the east, Tucson Mountain Park on the north, Sandario Road on the west and the Tohono O'odham Nation on the south. The study area encompasses approximately 80.9 square miles or 51,725 acres of land. The ownership interests throughout the study area include several federal, state, county and municipal agencies, tribal nations, the Arizona Board of Regents and the Tucson Airport Authority. After subtracting 4,434 acres for roads and drainage-ways from the total, approximately 22,092 acres (46.7%) of the study area is privately held; the balance, 25,199 acres (53.2%) is public land. Map PR-1 illustrates land ownership throughout the study area. The extent of publicly owned property is substantial and reflects the high number of interests involved in planning for the future development of the Southwest area. The federal government owns a significant number of the large parcels that present potential opportunities for parks and recreation sites. Residents currently take advantage of the large vacant public parcels for hiking and mountain biking activities.

The study area does include several large regional parks, such as Tucson Mountain Park, Saginaw Hill Regional Park and Robles Pass Trails Park. Tucson Mountain Park and Robles Pass Trails Park offer formal trail systems in natural settings with designated trailheads and parking areas. With over 18,000 acres available to view wildlife, horseback ride, hike and enjoy nature walks, these parks are frequented by residents and visitors alike. Other activities available include target shooting, archery and visiting the Sonora Desert Museum. Saginaw Hill Regional Park has informal trail networks but remains under the ownership of the federal government.

The current development pattern in the study area consists predominately of residential uses with limited commercial along Ajo Highway and Valencia Road. There are approximately 17,250 developed residential parcels with lot sizes ranging from 0.03 to 234.7 acres. The smallest residential parcels are located within a development on Kinney Road. The largest parcels are used for agriculture purposes. The average parcel size is 0.66 acres. The predominant residential development pattern is home sites ranging in size from one acre to five acres. Map PR-2, Existing Land Use, illustrates the current development pattern by land use type and the location of the existing park sites in relation to developed residential parcels.

3.1.5.1 Inventory Results

To plan for future recreational needs, an inventory of existing facilities within the study area was compiled. There are a total of seven parks consisting of neighborhood and district sites within the Pima County park system. Although school sites within the study area do provide additional sources of recreation amenities, these facilities have been excluded from the calculations of existing supply and demand. To include school acreages and facilities would obscure the results of a comparison of Pima County park and recreation amenities to a national standard. Table PR-1 provides an inventory of park sites and the recreational resources available (note the altered status of Lawrence District Park, which is actually a community park); Map PR-3 illustrates the location of each park in the study area.

Table PR-1 Existing and Proposed Park and Recreation Facility Inventory

No.	Park Name	Park Type	Acres	Undeveloped Acres	90' Baseball Fields	60' Softball Fields	Multi-Purpose Open Play	Football / Soccer Fields	Playground	Tennis Court	Volleyball Court	Youth Basketball Court	Individual Family Picnic Area	Group Picnic Area w/ Ramada and Tables	Park Bench	BBQ's	Parking	Restroom	Drinking Fountain	Community Bldg	Swim Pool	BMX Race Track	Trail	Horseshoe Pit
1	Branding Iron Neighborhood Park	N	1.2	0					1			1		1 / 4		1	9	1	1					
2	Ebonee Marie Moody Neighborhood Park	N	6.9	0					1			1	3	2 / 5		7	18	1	2				1	2
3	Vesey Neighborhood Park	N	9.0	0		1		1	1				1	3 / 6		4	28	1	2					1
4	Star Valley Neighborhood Park	N	11.0	0			1		3			1	8	2 / 4	8	4	77	1	2				1	
5	Mission Ridge Neighborhood Park	N	6.7	1	1		1		1			1	6	1 / 2	2	1	5	1	2					
6	Manzanita Pool—Winston Reynolds District Park	D	50.0	0	1	3		2	2	2	2	1	12	6 / 18	7	14	284	2	7	1	1	1		2
7	Lawrence District Park	C	29.1	13	1	2		1	1			1	8	2 / 5	6	6	56	2	7				1	
	Totals		113.8	14	3	6	2	4	10	2	2	6	38	17 / 44	23	37	477	9	23	1	1	1	3	5

Notes

Lawrence District Park was created as larger District Park, however portions of the land were returned to Tucson Unified School District. It retains its original name despite its new status as a Community Park

Pima County Public Works
Southwest Infrastructure Plan

Table No.
PR-1

Title
Existing Park and Recreation Facility Inventory

The seven existing park sites represent a total of 113.8 developed acres. There are a total of 14.0 additional acres at Lawrence District Park and Mission Ridge Neighborhood Park to accommodate future expansion activities. When reviewing Table PR-1 and Map PR-3, it is important to note that:

- Existing park sites in the study area are all south of Ajo Highway, except for the 18,000-acre Tucson Mountain Park that offers only hiking trails
- The park and recreation inventory includes predominately neighborhood parks
- There is one district park, one community park, and no regional parks in the study area
- There are 3 baseball fields, 6 softball fields and 4 soccer fields serving approximately 17,250 residential units
- It is unclear what role private recreation facilities play in augmenting the supply of recreation opportunities for existing residents
- Developed park sites are split equally between Board of Supervisor district boundaries

Branding Iron Neighborhood Park

This park provides a recreation amenity for the residents of the Branding Iron subdivision that border the park. Residents frequently walk to the park to use the basketball court, playground and picnic area with four tables and a ramada. Restrooms and parking are available. The future plans for this park site include a community garden, perimeter fencing, an additional playground for tots (defined as 3 to 5 year olds) with a covering for shade, installing a shade structure over the existing playground, more picnic areas, additional trees, and the addition of decomposed granite for dust control purposes.

Ebonee Marie Moody Neighborhood Park (Cardinal Park)

This facility serves the approximate area east of Mission Road, south of Valencia, north of the Tohono O'odham Nation Boundary and west of Sorrel Lane. Surrounding conditions have residential to the south and west with open space to the north and east. The park features a basketball court, softball field, horse pits, playground equipment, a paved trail and picnic areas. Future park plans include expanding and paving the existing parking area, adding parking lot lighting along Cardinal Avenue, buffering future development (i.e. the proposed Tucson Unified School District bus barn facility) to the north with plant material, adding more security lighting throughout the park, adding more picnic areas and ramadas, covering the playground with a shade structure and installing sideline fencing for the softball field.

Vesey Neighborhood Park

This neighborhood park is located adjacent to Vesey Elementary School and draws residents from a two mile radius. Recreational amenities include a softball field, football / soccer field, playground equipment, individual and group picnic areas, parking, restrooms, and a horseshoe pit. Vesey Neighborhood Park will need new ADA-accessible playgrounds for 3-5 year olds and 5-12 year olds to comply with current national standards. An ADA walking path around the perimeter of the park is also planned. Shade canopies over the playground areas, additional

parking, picnic areas, and possibly a ball field. Security and parking lot lighting are recommended improvements as well. Figure PR-1 contains a photograph of this park.

The State of Arizona and the federal government both own 10-acre parcels adjacent to Vesey Park. These public parcels could be purchased for purposes of expanding the number of ball fields, open play fields, soccer fields and additional amenities to serve the area.

Mission Neighborhood Park

Mission Neighborhood Park is adjacent to Miller Elementary School and frequented by the surrounding residents. The park features are a baseball field, multi-purpose open play area, playground, basketball court, individual and group picnic areas, off-street parking and restrooms. This park currently experiences off-site drainage from the adjacent school property, that causes water damage and erosion, which must be corrected before any additional improvements can be made. One possible solution is an on-site retention basin.

Upon resolution of the drainage problems, plans for a new covered playground should be implemented. Additional facilities that are currently needed include another group ramada, more individual picnic sites, ADA walkways and paths, security and parking lights, and ball field fencing. Figure PR-1 contains a photograph of this park.

Star Valley Neighborhood Park

Star Valley Park is the newest park in the existing system and serves the surrounding residents of Star Valley subdivision. Constructed by the developer on 11.0 acres, this park includes a popular amenity in the form of two dog parks. Three playgrounds, a grass open play area, two group picnic ramadas, picnic tables and a paved pathway provide residents with opportunity to enjoy the outdoors in close proximity to their homes. This park has been fully developed with no room for future expansion.

Lawrence District Park

Lawrence District Park was created as a larger District Park, however portions of the land were returned to Tucson Unified School District. It retains its original name despite its new status as a Community Park.

This park is located adjacent to Lawrence Intermediate School and generally serves the park visitors within a two mile radius. The park has 29.1 acres of developed area and 13.0 acres for future expansion. The park has three baseball / softball fields, a soccer field, playground equipment, individual and group picnic areas, off-street parking, and restrooms. Expansion plans for this park include a community center, a lighted softball field, more landscaping, additional ramadas and picnic areas, another parking lot, security and parking lot lights, and a potential swimming pool. The existing playground should be replaced with ADA accessible playgrounds for 3-5 and 5-12 year olds to comply with national standards. These amenities should also be covered with shade structures when replaced. Figure PR-2 contains a photograph of this park.

Vesey Neighborhood Park

Mission Neighborhood Park

Pima County Public Works
Southwest Infrastructure Plan

Figure No.
PR-1

Title
Photographs of Existing Neighborhood Parks

Lawrence District Park

Winston Reynolds - Manzanita Regional Park

Pima County Public Works
Southwest Infrastructure Plan

Figure No.
PR-2

Title
Photographs of Existing District and Regional Parks

Winston Reynolds - Manzanita Pool District Park

This District Park consists of 50 developed acres and serves a large portion of the study area. The available recreational activities appeal to a wide range of park visitors. These recreational amenities include: tennis courts, volleyball courts, lighted baseball, softball and football / soccer fields, a concession building, a lighted basketball court, playground, picnic areas, BMX track, horseshoe pits, restrooms, and community center with a swimming pool.

Future plans for this District Park involve an upgrade to the ball field lighting system to a more energy efficient one that satisfies the Dark Skies standards and Little League lighting standards. Parks staff would also like to pave the parking area along Nebraska, add more ADA walkways, add more picnic areas, a restroom, and a ramada at the BMX track, install additional ramadas throughout the park, a covered playground by the community center, a trailhead along Irvington Road to access the Tucson Mountain Park trail system, and plant more trees. Decomposed granite should also be added in the planter areas for air quality purposes. The State of Arizona currently owns an 18.3 acre parcel adjacent to the park site that could be purchased for the purposes of expanding the number of soccer / football fields, picnic areas, trails and parking, to name but a few amenities. Figure PR-2 contains a photograph of this park.

3.1.6 Other Public Services and Facilities

In addition to the primary (flood control, wastewater management, transportation, and parks and recreation) services outlined in the Plan numerous other public, quasi-public, and private agencies currently provide other public services and facilities in the Southwest area.

This section of the SWIP document summarizes the data which was collected regarding the current provision of other such services. It is noted that the provided data cannot be guaranteed as to its accuracy and completeness. Map O-1 and O-2 display the location of existing sites and linear facilities.

Fire Districts

Drexel Heights: This fire district currently has four stations located within the study area: No. 1- Camino Verde; No. 2- Mark Road; No. 3- Cardinal Avenue; No. 4- Kinney Road.

Three Points: Three Points Fire Station No. 92 is located on Sandario Road at Camino Lucido. The site occupies 4.68 acres, and is currently the only Three Points station within the study area.

Pascua Pueblo: Currently, one facility exists within the study area. The District has one station, No. 27, located on Calle Torim.

Law Enforcement

Pima County Sheriff: Currently, one Pima County Sheriff's Office substation exists within the study area. The Tucson Estates Substation is located at 5900 Western Way Circle.

Tucson Airport Authority (TAA): Currently, TAA operates one law enforcement facility which is located on West Ajo Way adjacent to Ryan Airfield.

Pascua Yaqui Tribal Police: Currently, one station exists in the Pascua Yaqui Tribe at 4884 N. Tarook.

Pima County Libraries

One public library exists within the study area at present. It is located within the Southwest Alternative Middle School facility at 6855 Mark Rd. The library facility is approximately 2,200 square feet.

School Districts

Tucson Unified School District (TUSD): All existing TUSD facilities are illustrated on Map O-1.

Altar Valley School District: The District currently does not have any facilities located within the study area.

Natural Gas

Southwest Gas: Map O-1 identifies the current location of the existing SWG primary conveyance system. This network consists of high-pressure feeders (operating at 60 pounds per square inch of pressure and greater), as well as existing regulator stations. The typical high-pressure lines range in size from 2 inches to 6 inches in diameter. The primary conveyance system follows the West Ajo Highway alignment from the west to the Drexel alignment, east to Camino Verde, and then north towards Kinney Road.

El Paso Natural Gas: Map O-1 delineates the existing El Paso conveyance system. The primary existing pipeline generally follows the San Joaquin alignment in the northwest part of the study area and extends southeasterly to the eastern limits of the study area. This section of pipeline consists of two lines (one 30-inch and one 26-inch diameter line). Two smaller lines feed off of this main, one 8.625-inch diameter line extending south halfway between the Mark Road and Camino Verde alignments, and one 10.75-inch diameter line extending north in an easement roughly along the Westover Avenue alignment between Mission Road and Cardinal Avenue.

Electrical Power

Southwest Transmission Cooperative (SWTC) and Central Arizona Project (CAP): Both SWTC and CAP currently operate transmission facilities located within the study area. Map O-1 depicts the location of the existing facilities of each entity.

Tucson Electric Power (TEP): The existing TEP primary conveyance system within the study area is depicted in Map O-1, and includes an existing 138 kV transmission line extending northerly from Valencia Road along the west branch of the Santa Cruz to the substation located at Drexel Road.

TRICO Electric: TRICO's primary conveyance system within the study area consists of the overhead and underground lines delineated on Map O-1.

Water

Virtually all of the SWIP study area lies within the Tucson Water service area. The Diablo Water Company serves a relatively small area including the subdivisions of Tucson Mountain Ranch, Diablo Village Estates, and the Caddis Haley Estates. Tucson Water's existing conveyance system is outlined on Map O-2, which depicts existing mains, reservoirs, boosters, production wells and pressure reducing stations.

3.1.7 Ryan Airfield

Ryan Airfield is a 60-year old general aviation reliever airport located at 9698 Ajo Way at the intersection of Ajo Way and Valencia Road. It occupies approximately 1,804 acres and contains three runways. The airfield, which is operated by the Tucson Airport Authority, offers flight instruction, aircraft sales, hangar rentals, charter service, and accommodates various flying clubs. The airport employs approximately 125 employees.

The airfield is experiencing growth, and is currently planning for future expansion in an effort to maintain its ability to serve the city's growing general aviation business. Ryan Airfield has seen a recent increase in the number of helicopters and business jets using the facility. As of mid-2006, thirty companies served over 200 private and 60 training aircraft all using the airfield's three runways. The airfield is developing an Avigation Easement Disclosure Policy for property in the vicinity, particularly along the runway flight paths. Tucson Airport Authority is currently revising its business plan for Ryan Airfield, re-examining its master plan, and also planning a future extension of one of its east / west runways.

3.2 THE PROPOSED LAND USE DEVELOPMENT CONCEPT

Building upon the existing area context and urbanization trends discussed in Section 3.1, the evolution of a new proposed land use development concept was spearheaded by Pima County planning staff. This development concept increases the predicted densities in the planning area over those currently forecast by PAG for the year 2030. This is a direct result of ongoing and proposed developments in the area which present greater densities than those previously envisioned. The proposed land use development concept represents a balanced view, factoring in these new developments while never losing sight of either the physical challenges inherent in the Southwest area or the consideration of those developments which have occurred to date.

3.2.1 Proposed Densities and Population Forecast Scenarios

A systematic review of each developed and undeveloped land parcel within the study area was completed which yielded a re-confirmed range of anticipated densities measured in terms of residences per acre, or RAC. This range consisted of a predicted lower density, medium density, and higher density RAC forecast for each parcel.

Map DC-1 and DC-2 present the proposed densities for the bounding cases – the lower density growth scenario and the higher density growth scenario, respectively. These maps illustrate the forecasted range of densities for both unimproved private parcels (the lighter shade of each color) and parcels which have been developed per the latest County Assessor tax records (the darker shade of each color). Note that “developed” parcels may have been deemed so for tax purposes and may still exist in their raw state. In several areas of the Southwest, extremely low density areas already developed (shown in the yellow shades) will be subdivided in the future to yield low density areas.

17,260 existing dwelling units were identified within the SWIP area using the County’s GIS data.

The proposed RAC figures combined to predict the addition of the following:

- 15,936 dwelling units (a population increase of 43,027) for the lower density scenario
- 28,699 dwelling units (a population increase of 77,487) for the medium density scenario
- 41,439 dwelling units (a population increase of 111,885) for the higher density scenario

The above population figures use a planning assumption of 2.7 persons per dwelling unit.

3.2.2 Development Timeline

The prediction of a development timeline is at best an inexact science given that numerous inherently variable factors combine to result in land being transformed from its raw undeveloped state into an urbanized form. Many of the variables may and will change, altering the foreseen balance of probabilities.

The simplest prediction of the pace of development in the SWIP area would amount to the status quo as measured by the seven-year average number of permits from 2000 through 2006, which would predict 887 permits per year. Given that the proposed SWIP area infrastructure

would enhance prospects in what is already a designated growth area, the most likely development timeline is expected to represent increased activity in the SWIP area.

However, given the need to develop probable estimates for funding requirements and cash flows, a timeline was developed based upon the empirical estimation of which Southwest areas would likely develop sooner than others. Pima County planning staff provided input suggesting which areas would most likely be "first to market" given the pace and locations of ongoing developments in the area. These areas were labeled "fast". A second group of areas labeled "medium" was identified as those being likely to follow the faster "first to market" land development areas, while the third group consisted of all other areas which were assumed to slowly transition from their existing state to an infilled build-out state over the anticipated total development duration of the majority of the subject lands. This third group of areas was labeled "slow".

Using the combination of the proposed RAC figures and the "fast" / "medium" / "slow" area boundaries, the dwelling units expected in the lower density, medium density, and higher density scenarios were found to be distributed as follows:

- The lower density scenario contains 5,098 "fast", 2,591 "medium", and 8,247 "slow" dwelling units for a total of 15,936
- The medium density scenario contains 12,711 "fast", 4,002 "medium, and 11,986 "slow" dwelling units for a total of 28,699
- The higher density scenario contains 20,676 "fast", 5,040 "medium, and 15,723 "slow" dwelling units for a total of 41,439

Timeline Assumptions

Predicting the future pace of development in the SWIP area was founded on the recent development trends which have been observed. Key predictive assumptions included:

- The sum of total annual single family, townhome, multi-family, and manufactured home permits in Pima County will total 10,000. This is roughly 90% of the seven-year average observed from 2000 through 2006
- SWIP area development will take several years to begin in earnest; it was assumed that 887 permits would be issued in the years 2007 through 2009, representing
- "Fast" areas will begin reaching market in 2010
- "Medium" areas will be sequenced to reach market the year after the "Fast" areas have completed their build-out
- "Slow" areas will develop evenly throughout the timeline's build-out duration, from its inception in 2010 to its end

Duration of SWIP Area Build-out

With the predicted dwelling unit counts and timeline assumptions noted above, the sole remaining variable in the SWIP area development timeline model became the duration over which each of the "fast", "medium", and "slow" areas would come to market.

These three durations were adjusted (for each of the lower, medium, and higher density scenarios) to create the development timeline. For each triplet of selected durations, a unique total number of SWIP permits per year could be calculated by the model.

This allowed for the effective control of the selected values, in that the inputs were varied until satisfactory build-out durations and annual permit counts were obtained. For each scenario, the inputs were adjusted to yield an average of +/- 900 annual permits in the SWIP area over the build-out duration. This average was invariably front-end loaded, in that earlier years in the timeline saw more intense development, while latter years saw less intense development.

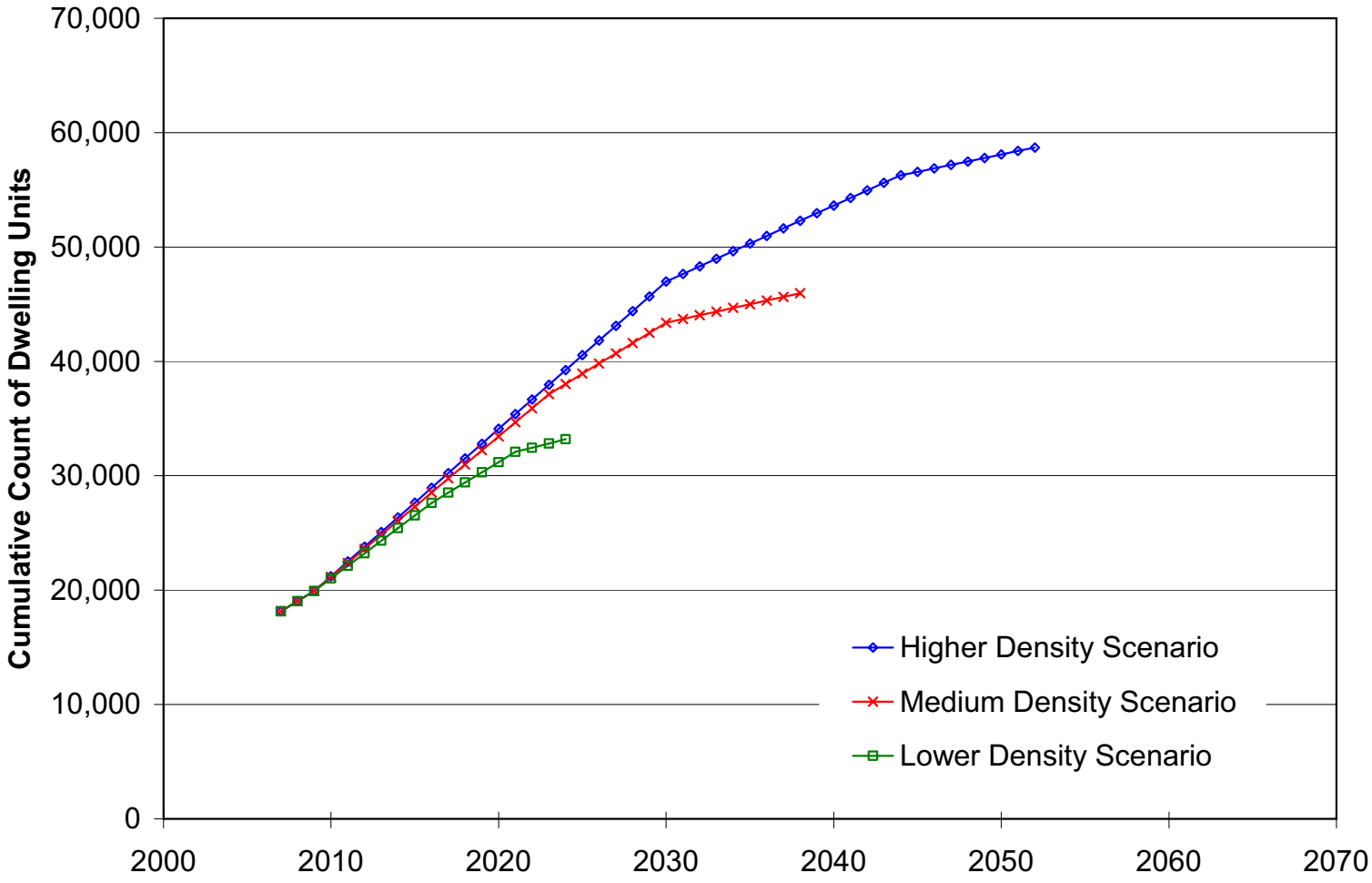
Lower Density Scenario: The selected duration triplet for the lower density scenario was (7, 5, 15) representing a seven year build-out of the "fast" areas, followed by a five year build-out of the "medium" areas, during an ongoing 15 year overall build-out of the "slow" areas. This scenario builds out in the year 2024.

Medium Density Scenario: The selected duration triplet for the medium density scenario was (14, 7, 29) representing a fourteen year build-out of the "fast" areas, followed by a seven year build-out of the "medium" areas, during an ongoing 29 year overall build-out of the "slow" areas. This scenario builds out in the year 2038.

Higher Density Scenario: The selected duration triplet for the higher density scenario was (21, 14, 43) representing a twenty-one year build-out of the "fast" areas, followed by a fourteen year build-out of the "medium" areas, during an ongoing forty-three year overall build-out of the "slow" areas. This scenario builds out in the year 2052.

Figure DC-1 displays the resulting development timelines for each density scenario, showing how the additional anticipated dwelling units cumulatively add to the existing 17,260 dwelling units over time.

Figure DC-2 provides the annual permit volumes expected from the SWIP area for the three density scenarios given the assumptions documented in this section. With these volumes, the SWIP area during its peak development period would be responsible for 11%, 12%, and 13% (for the lower, medium, and higher density scenarios, respectively) of Pima County's assumed annual total of 10,000 permits. On average, however, the SWIP area would contribute 9.0% of Pima County's assumed annual total of 10,000 permits.



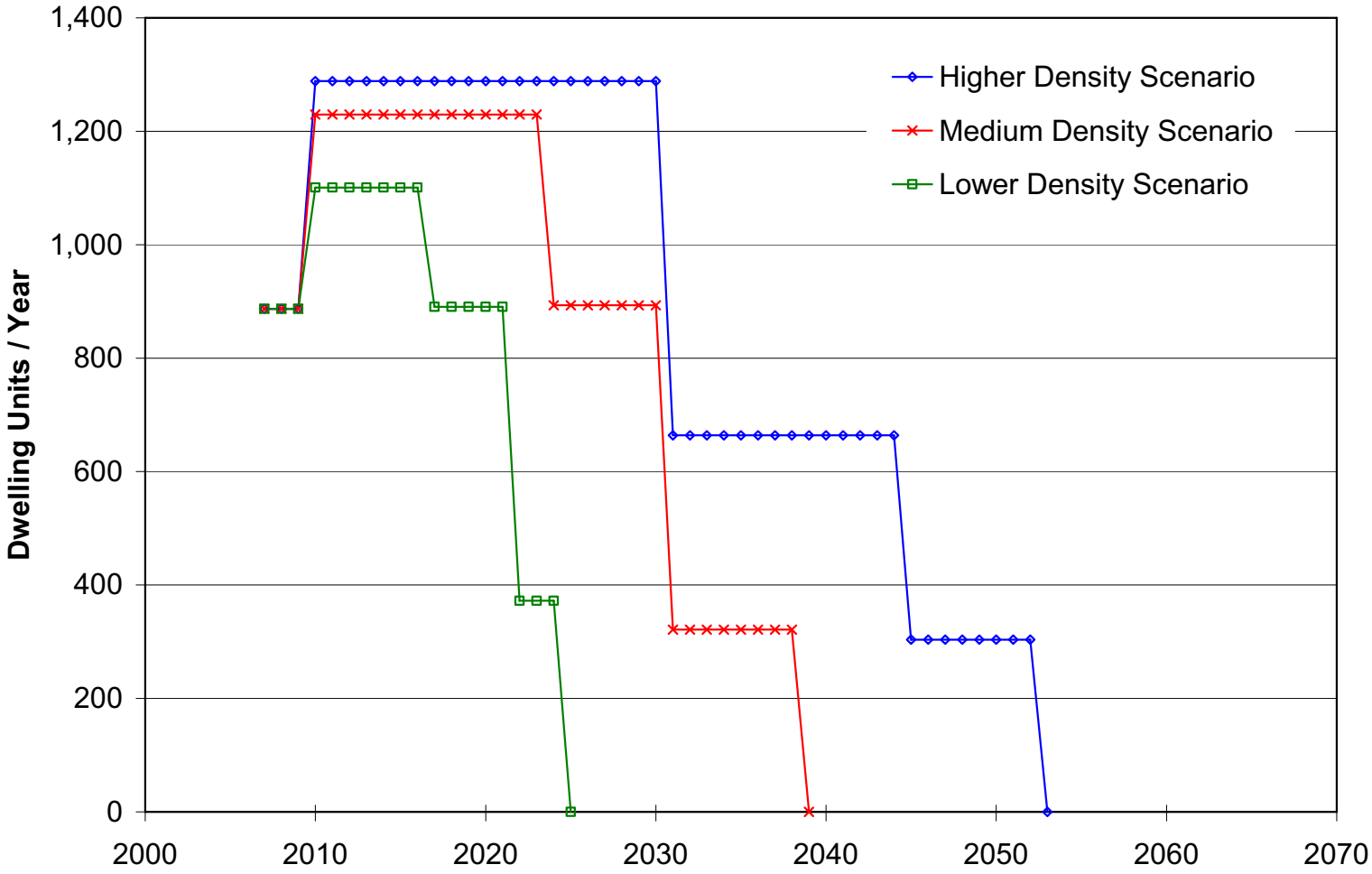
Legend

See Labels Above

Pima County Public Works
Southwest Infrastructure Plan

Figure No.
DC-1

Title
Development Timelines for Three Density Scenarios



Legend

See Labels Above

Pima County Public Works
Southwest Infrastructure Plan

Figure No.
DC-2

Title
Anticipated Pace of Dwelling Unit Permits

3.3 FLOOD CONTROL AND DRAINAGE

The SWIP study area has been investigated numerous times over the past twenty to twenty-five years with respect to hydrologic and hydraulic analyses. Existing studies conducted within the study area range from site-specific drainage reports to basin management studies and documentation surrounding transportation and flood control infrastructure design projects. A partial list of past drainage reports and documents would include:

- Southwest Area Plan Development of Public Facilities
- Tucson Estates Parkway
- Tucson CAP Water Treatment Plant
- Star Valley Master Drainage Plan
- Star Valley Sub-Basin Management Plan
- ADOT Tucson-Ajo Highway Improvement Plans
- Kinney Road Improvement Plans
- Diablo Village Drainage Report
- Milestone Manner #6 Hydrologic and Hydraulic Analysis
- Hydrologic / Hydraulic Report for Mission West I, II, & III
- Southwest Basin Management Study – Phase II
- Drainage Memorandum – HEC-1 models
- Draft Design Concept Report – SR 86 – Continental Road to Kinney Road

The SWIP study area includes two distinct watershed basins. The drainage areas east of Robles Pass are tributary to the west branch of the Santa Cruz River. The drainage areas west of Robles Pass include the watersheds tributary to the Black Wash. The Black Wash watersheds and the west branch of the Santa Cruz River watershed have both been analyzed using the Army Corps of Engineers HEC-1 Flood Hydrograph model.

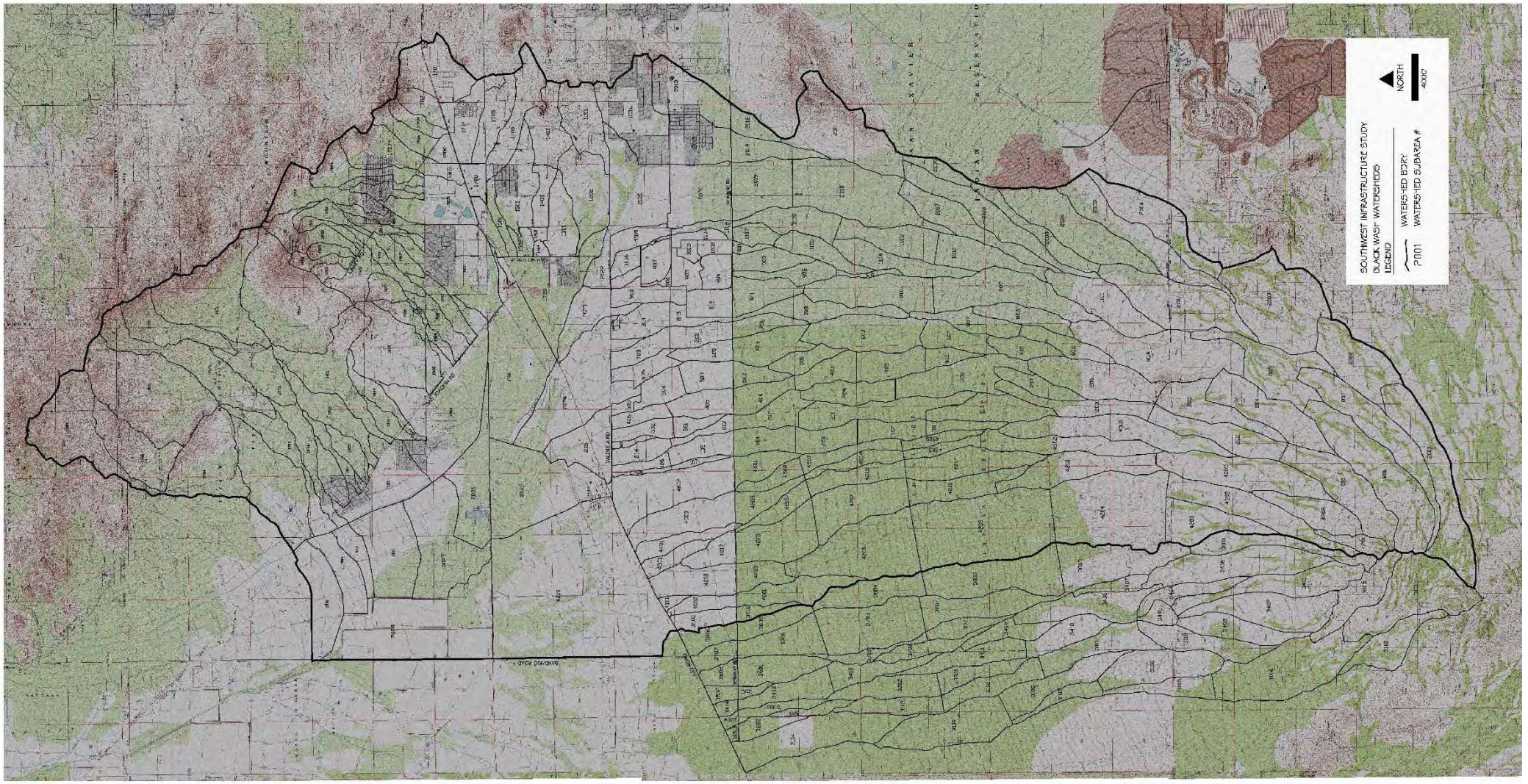
3.3.1 Hydrologic Assessment

Description of HEC-1 Modeling and Assumptions

The HEC-1 model for the watersheds tributary to the west branch of the Santa Cruz River was primarily focused on the concentration points along Mission Road. The HEC-1 model for the watersheds tributary to the Black Wash was primarily focused on the larger tributaries both south and north of Ajo Highway.

Watersheds were delineated using USGS quadrangles supplemented by Pima Association of Governments (PAG) 2005 color aerial photography and PAG 2000, 2002, and 2005 topography where available. The delineated limits of the Black Wash Watershed and the west branch of the Santa Cruz River Watershed are attached as Figures H-1 and H-2, respectively.

Rainfall values were determined from NOAA Atlas 14, Precipitation Frequency Atlas of the United States (2004). Per direction from Pima County, the 90% confidence interval rainfall values were used for all modeling. Areal reduction methods were used for those drainage areas greater than 10 square miles in area. The 3-hour design storm using the TSMS rainfall



Legend

See Above

Pima County Public Works
Southwest Infrastructure Plan

Figure No.
H-1

Title
Black Wash Watershed

Legend

See Above

Pima County Public Works
Southwest Infrastructure Plan

Figure No.
H-2

Title
Watersheds Along Mission Road

distribution described in the Existing Conditions Hydrologic modeling for the Tucson Stormwater Management Study, Phase II, Stormwater Master Plan (1995) was used for modeling all washes except the main branch of the Black Wash. The 3-hour design storm rainfall depths ranged from 3.15 inches to 3.21 inches for the Black Wash and from 3.03 inches to 3.21 inches for the west branch of the Santa Cruz River. The 24-hour design storm, using the SCS Type I rainfall distribution within the Rainfall Frequency Atlas of the United States for Durations from 30 minutes to 24 hours and Return Periods from 1 to 100 years (1961), was used for modeling the west branch of the Santa Cruz River, Black Wash, and other contributing areas greater than 10 square miles in area.

Soil data for the SWIP area was based upon the Soil Survey of Pima County, Arizona, Eastern Part (2003). Soil percentages were determined via importing the soils data into computer aided drafting and geographic information system drawings as overlays superimposed upon the identified watershed delineations.

Rainfall runoff was modeled using the SCS Curve Number method by entering the SCS Curve Number into the HEC-1 model data for each watershed sub-area. Curve Number values were obtained from the Hydrology Manual for Engineering Design and Floodplain Management within Pima County, Arizona (1981). Runoff transformation was modeled using the SCS Unit Hydrograph by inputting watershed sub-area lag times on the HEC-1 UD record. Equation 15.4 of the National Engineering Handbook – Section 4: Hydrology, Natural Resources Conservation Service (1972) was used to determine sub-area lag times.

Hydrograph routing between sub-areas was performed using the 8-point normal depth routing option in HEC-1. The 8-point cross sections were developed based on field investigation and review of the PAG 2005 color aerial photography and topography where available.

3.3.2 Floodplain and Geomorphic Assessment

Hydrologic (HEC-1 Modeling) Summary and Findings

One in 100-year peak discharges for the Black Wash watersheds and the west branch of the Santa Cruz River watersheds are included within Table H-1 and Table H-2, HEC-1 Modeling Results for the Black Wash Watersheds and Mission Road Watersheds, respectively.

West Branch of the Santa Cruz River: The primary offsite watershed associated with the west branch of the Santa Cruz River has a one in 100-year peak discharge of 4,225 cfs at the southern limit of the SWIP boundary. This runoff is generated by a 23.15 square mile watershed with headwaters originating in the Sierrita Mountains. Within the limits of the SWIP study, the west branch of the Santa Cruz River watersheds draining west to east have one in 100-year peak discharges varying from 96 cfs to 2,248 cfs along Mission Road. The contributing drainage areas associated with these watersheds vary from 0.15 square miles to 2.70 square miles, respectively.

Table H-1 HEC-1 Modeling Results for Black Wash Watersheds

Watercourse	*Location*	*Concentration Point*	*Drainage Area (sq. mi.)*	*Peak Flow (cfs)*	*Time of Peak (hrs)*	*Storm Duration (hrs)*	*Rainfall Depth (inches)*
Black Wash	Camino De Oeste	2013	13.76	3,926	13.08	24	110
Black Wash	Sheridan Avenue Alignment	2016	16.20	4,388	13.25	24	4.46
Black Wash	Valencia Road	2021	21.78	5,407	13.58	24	4.46
Black Wash	Ajo Road	2023	29.91	6,857	14.08	24	4.46
Black Wash	Ajo Road	2023A	42.37	9,204	14.00	24	4.36
Black Wash	Ryan Field	2024	59.41	12,577	14.42	24	4.36
Black Wash	Ryan Field	2024A	80.49	16,442	14.33	24	4.36
Black Wash	Snyder Road	2025	82.43	16,643	14.67	24	4.36
Black Wash	Avra Valley WWTP	2026	90.86	18,097	14.67	24	4.36
Black Wash	1 Mile East of Sandario Road	2027	98.29	18,374	14.67	24	4.36
Black Wash	Sandario Road	2028	147.21	26,369	15.25	24	4.36
Ryan Filed West	Snyder Road	4219	30.20	7,900	13.08	24	4.46
Ryan Field East	North End of Ryan Field	215	16.22	4,578	13.17	24	4.46
Old Ajo Road Wash	San Joaquin Road	1810	2.86	1,291	2.33	3	3.13
CAP	Section 31 T14S, R12E	1904	7.65	2,747	2.92	3	3.15
CAP	Section 25 T14S, R11E	1956	5.85	2,071	3.17	3	3.15
CAP	Section 24 T14S, R11E	1974A	5.68	3,099	1.75	3	3.15
CAP	Section 13 T14S, R11E	1985	7.45	4,788	1.67	3	3.15

Table H-2 HEC-1 Modeling Results for Mission Road Watersheds

Watercourse	*Location*	*Concentration Point*	*Drainage Area (sq. mi.)*	*Peak Flow (cfs)*	*Time of Peak (hrs)*	*Storm Duration (hrs)*	*Rainfall Depth (inches)*
West Branch of Santa Cruz River *(by Areal Reduction)*	Mission Road	N210	23.15	4,225	4.58	3	3.03
Unnamed Wash	1000' North of Los Reales	N310	0.81	524	1.75	3	3.21
Unnamed Wash	2,500' North of Los Reales	S320	0.30	181	1.92	3	3.21
Valencia	Valencia Road	N465	2.36	2,126	1.42	3	3.21
Valencia	Mission Road	N470	2.70	2,248	1.58	3	3.21
Unnamed Wash	1550' South of Drexel Road	N510	0.29	177	1.58	3	3.21
Unnamed Wash	600' South of Drexel Road	S520	0.54	365	1.58	3	3.21
Unnamed Wash	Mission and Drexel Road	S530	0.15	96	1.67	3	3.21
Dakota	Mission Road	N640	2.10	1,504	1.67	3	3.21
Unnamed Wash	Mission Road	S690	0.16	132	1.42	3	3.21
Wyoming	Mission Road	N710	1.30	933	1.58	3	3.21
Unnamed Wash	140' North of Mission Place	S840	0.22	359	0.50	3	3.21
Unnamed Wash	260' North of Ohio	S830	0.20	222	0.83	3	3.21
Unnamed Wash	1270' North of Via Ingresso	S850	0.13	271	0.42	3	3.21
Ajo	Mission Road	N810	1.88	1,243	1.42	3	3.21

Black Wash: The Black Wash watershed consists of three primary drainage basins within the SWIP study area as identified by the Black Wash HEC-1 model. The primary drainage basins include the Black Wash drainage corridors located within the central portion of the study area, the Ryan Field drainage corridors located within the western portion of the study area, and the Tucson Mountain Park watersheds located within the northern portion of the study area.

Near the southern limit of the study area, the Black Wash has a one in 100-year peak discharge of 3,926 cfs generated by a 13.76 square mile drainage area (CP2013). Approximately 2 miles downstream, one in 100-year peak discharges increase to 5,407 cfs at Valencia Road (CP2021). The contributing drainage area at this point has increased approximately 8 square miles to 21.78 square miles. At Ajo Highway, several drainage corridors associated with the Black Wash watershed confluence combined to generate a one in 100-year peak discharge of 9,204 cfs (CP2023A). The contributing drainage area at this location is 42.37 square miles. Downstream of Ajo Highway, one in 100-year peak discharges increase to 16,643 cfs at Snyder Road (CP2025), 18,097 cfs at the Avra Valley Wastewater Treatment Facility (CP2026), and 26,369 cfs at Sandario Road (CP2028). The contributing drainage areas associated with these points of concentration increase rapidly as drainage areas associated with the Tucson Mountain Park watersheds and Ryan Field drainage corridors combine with the drainage areas of the Black Wash.

The CAP canal located west of San Joaquin Road impacts the Tucson Mountain Park watersheds. At concentration point CP904, the one in 100-year peak discharge is equal to 2,747 cfs generated by a 7.65 square mile drainage area. Storm runoff is conveyed over the CAP canal via (2) 36-foot wide concrete aqueducts / flumes. West of the CAP canal, peak discharges are decreased to 2,157 cfs (CP1904A) due to runoff being impounded along the upstream side of the canal. Evidence of storm flow impoundment can be seen in the increased amount of vegetation that is present upstream of the concrete aqueducts and flumes.

Concentration point CP1956 has a one in 100-year peak discharge of 2,071 cfs generated by a 5.85 square mile drainage area. Discharges are conveyed across the CAP canal via one 72-inch diameter culvert. Downstream of the CAP canal, the one in 100-year peak discharges are significantly reduced to 317 cfs due to substantial impoundment of runoff upstream of the 72-inch diameter culvert.

The one in 100-year peak discharges at concentration points 1974 and 1976 equal 2,137 cfs and 1,000 cfs, respectively. Storm runoff is conveyed over the CAP canal via two sets of five 72-inch pipe culverts. Attenuated flow is not significant at this location. The downstream concentration point (CP1974A) has a one in 100-year peak discharge of 3,099 cfs.

At concentration point 1985, the one in 100-year peak discharge is equal to 4,788 cfs, generated by a 7.45 square mile drainage area. The CAP canal has been constructed under the natural drainage corridors at this location via an 810-foot long siphon. As a result, no attenuation of runoff occurs at this location.

3.3.3 Recommended Flood Control Alternatives and Unit Costs

Regional Flood Control

Drainage in the SWIP study area is highly complex and is characterized by large areas of sheet flow, braided channels, and coalescing flow between drainage corridors associated with the Tucson and Sierrita Mountains. At present the area includes very few flood control structures. The SWIP study area is a rapidly developing area; therefore, there is both the need and opportunity to provide regional flood control within the SWIP study area consistent with the Sonoran Desert Conservation Plan.

Critical regional flood control elements identified within this study include: multi-use storm attenuation facilities (detention basins), flood control only storm attenuation facilities, engineered channel sections (which collect and convey runoff), natural drainage corridors (also called greenways), and all-weather roadway crossings along major transportation corridors.

3.3.3.1 Regional Detention Basins

Seven regional flood control basins are currently proposed within the SWIP study area. These facilities are located within the southern portion of the study area and upstream of existing and proposed major roadway corridors. Locating the regional facilities as recommended provides maximum benefit within the downstream watershed. The regional basins are proposed as either multi-use facilities or as flood control only features. A table summarizing the characteristics of the seven detention basins is included as Table H-3, Regional Stormwater Detention Basin Facilities. Map H-1 displays their approximate locations.

3.3.3.2 Flood Control Only Storm Attenuation Facilities

Preliminary design parameters associated with the flood control only facilities include the following assumptions:

- Approximately 90 percent of the land area will be available for construction of the flood control facility
- The maximum storage depth will be 5 feet
- The basin invert will be established no lower than the existing downstream elevation in order to preclude complex and / or expensive outlet configurations

Unit costs associated with both the flood control only and multi-use detention basins are based upon the following assumptions:

- Land acquisition at $16,000 / acre
- Earthwork / excavation at $6,500 / acre-foot ($4 / cubic yard)
- Drainage structures / improvements at 10% of earthwork costs
- Design at 15% of construction costs
- Contingencies at 25% of total costs

Table H-3 Regional Stormwater Detention Basin Facilities

Basin	*Location*	*Description*	*Area (acres)*	*Depth (feet)*	*Storage (Acre-Feet)*	*Pre-Basin Discharge (cfs)*	*Post-Basin Discharge (cfs)*	*Flow Attenuation (cfs)*
1	West One-Half of Section 19, T15S, R13E	Pasqui Yaqui Tribe Property, Flood Control Only	92	5	413	3,926	2,948	978
2	Northeast One-Quarter Section 15 & Northwest One-Quarter of Section 14, T15S, R12E	Black Wash Floodway, Flood Control or Multi-Use Facility	218	5	978	5,407*	3,143	2,264
3	Southeast One-Quarter of Section 24, T15S, R12E	Pasqui Yaqui Tribe Property, Flood Control Only	6	5	27	5,407	3,125	2,282
4	Southeast One-Quarter of Section 23, T15S, R12E	Pasqui Yaqui Tribe Property, Flood Control Only	36	5	179	5,407	2,999	2,408
5	Southeast One-Quarter of Section 22 & Southwest One-Quarter of Section 23, T15S, R12E	Pasqui Yaqui Tribe Property, Flood Control Only	72	5	323	1,263	47	1,216
6	West One-Half of Section 20, T15S, R12E	Multi-Use Facility	181	2	323	755, 462, 1345	0	100 Percent
7	North One-Half of Section 13, T15S, R11E	Multi-Use Facility	75	2	130			

Notes

*Assumes Regional Basin 1 has been constructed

Pima County Public Works
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Table No.
H-3

Title
Regional Stormwater Detention Basin Facilities

Detention basins 1, 2, 3, 4, and 5 are currently identified as flood control only facilities. Basins 1, 3, 4, and 5 are located within Pascua Yaqui Tribe property and are included within this study due to the previously successful joint efforts between the Tribe and Pima County Regional Flood Control District to provide flood mitigation within the area.

The area associated with Detention Basin 1 has previously been established at 92 acres. The available acreage for basin construction is therefore 82.8 acres. The one in 100-year peak discharge conveyed through this basin is assumed to be 3,926 cfs (CP2013). Based upon anticipated storage capacity, outflow from Basin 1 would be approximately 2,948 cfs. Peak discharges would be reduced by about 1,000 cfs at this location.

Detention Basin 2 would be located within the Black Wash drainage corridor south of Valencia Road and east of Camino Verde, downstream of Basin 1. This basin would encompass approximately 218 acres of which 196 acres are assumed available for flood control. Assuming Basin 1 is in the ground, the one in 100-year peak discharges entering Basin 2 would be 5,407 cfs. At a storage depth of 5 feet, the proposed basin would provide enough storage to reduce the one in 100-year peak discharge to 3,143 cfs, a reduction of over 2,200 cfs.

The combined effects of Basins 1 and 2 would provide much needed flood control for both existing and proposed development as well as future cost expenditures associated with providing reliable all-weather crossings along Valencia Road and Camino Verde.

Detention Basins 3, 4, and 5 are also located within Pascua Yaqui Tribe property along the alignment of Hermans Road. These three basins would encompass 6 acres, 36 acres, and 72 acres, respectively. All three basins are assumed to be constructed at a depth of 5 feet. Basins 3 and 4 would have the combined affect of reducing the peak discharge being conveyed to Basin 2 of approximately 130 cfs. The one in 100-year peak discharge conveyed to Detention Basin 5 is 1,263 cfs. The outflow from this basin would be approximately 47 cfs, a reduction of 1,216 cfs. This volume of runoff reduction would greatly benefit the existing (and any proposed) developments between Hermans Road and Valencia Road.

3.3.3.3 Flood Control and Park Amenities (Multi-Use Facilities)

Preliminary design parameters associated with multi-use flood control facilities are similar to the flood control only facilities with the exception of flood storage depth. In order to incorporate and accommodate proposed park amenities, the maximum storage depth for multi-use basins is assumed to be limited to 2 feet.

Detention Basins 6 and 7 are identified as multi-use flood control facilities. These basins are planned to incorporate park amenities into the landscaping and contouring of the facilities.

Detention Basin 6 is located within the west one-half of Section 20, adjacent to the north side of Hermans Road. This basin would encompass approximately 181 acres of which 163 acres are assumed available for flood control. This facility would intercept runoff associated with watersheds CP405, CP503, and CP605. One in 100-year peak discharges for these three watersheds are 755 cfs, 462 cfs, and 1,342 cfs, respectively. Based upon a 2-foot storage

depth, Basin 6 would store the entire one in 100-year runoff volume (i.e., no outflow would occur). This basin would therefore provide a significant impact to the downstream watershed for both existing and proposed developments.

Detention Basin 7 would be located within the north half of Section 13 within the proposed Montecito Master Planned Community, just upstream of Ajo Highway. This basin is also proposed to be a multi-use facility; therefore, a 2-foot stormwater storage depth has been assumed within the facility. Based upon preliminary assumptions, the basin would encompass approximately 72 acres of which 65 acres could be available for stormwater mitigation. This facility would intercept runoff from the adjacent upstream watershed as well as discharges conveyed to the basin via Channel Sections 1 and 2. The total one in 100-year peak discharge conveyed into the basin is equal to 4,578 cfs. Per anticipated storage capacity, outflow from Basin 7 would be equal to approximately 4,418 cfs. Discharges could therefore be reduced by approximately 160 cfs at this facility. At the basin outlet, discharges would be conveyed under Ajo Highway via (4) 10-foot by 5-foot existing concrete box culverts.

3.3.3.4 Engineered Collector / Conveyor Channels

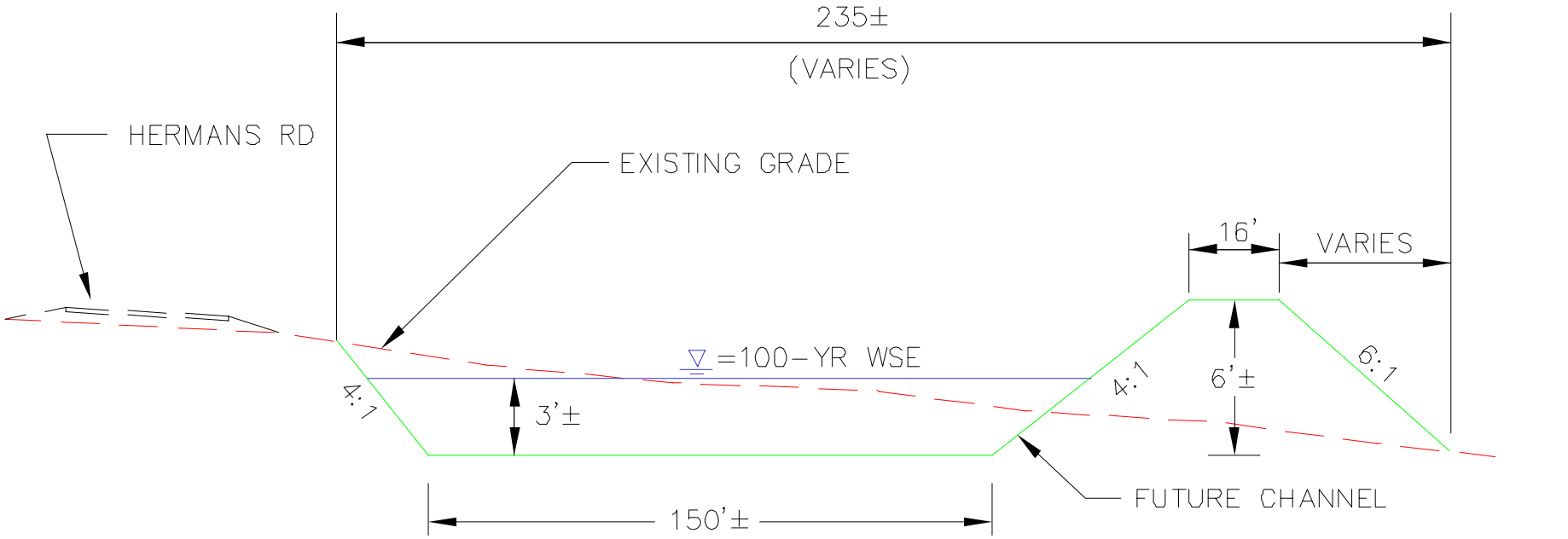
In order to maximize potential benefit associated with Detention Basin 7, approximately 18,500 linear feet of collector / conveyor channel has been proposed to intercept runoff south of Hermans Road. Channel sections have been included as Figure H-3, Channel Section 1, and Figure H-4, Channel Section 2. In addition to maximizing the available storage capacity at Basin 7, the collector / conveyor channel will substantially reduce existing flooding conditions between Hermans Road and Valencia Road.

Preliminary design parameters associated with the collector / conveyor channel include the following assumptions:

- Channel flow targeted at a 3-foot depth in order to avoid “levee” design
- Channel bank slopes at 4 horizontal :1 vertical
- Channel velocity to be held under 10 feet per second
- Channel to be of earthen design to the maximum extent possible to minimize expenditures and annual maintenance costs

Similar to the unit costs associated with the detention basins, unit costs associated with the collector / conveyor channels are based upon the following criteria:

- Land acquisition at $16,000 / acre
- Easements acquired at $4,000 / acre
- Earthwork / excavation at $6,500 / acre-foot ($4 / cubic yard)
- Drainage structures / improvements at 10% of earthwork costs
- Design at 15% of construction costs
- Contingencies at 25% of total costs



1 CHANNEL SECTION

NTS

Legend

See Labels Above

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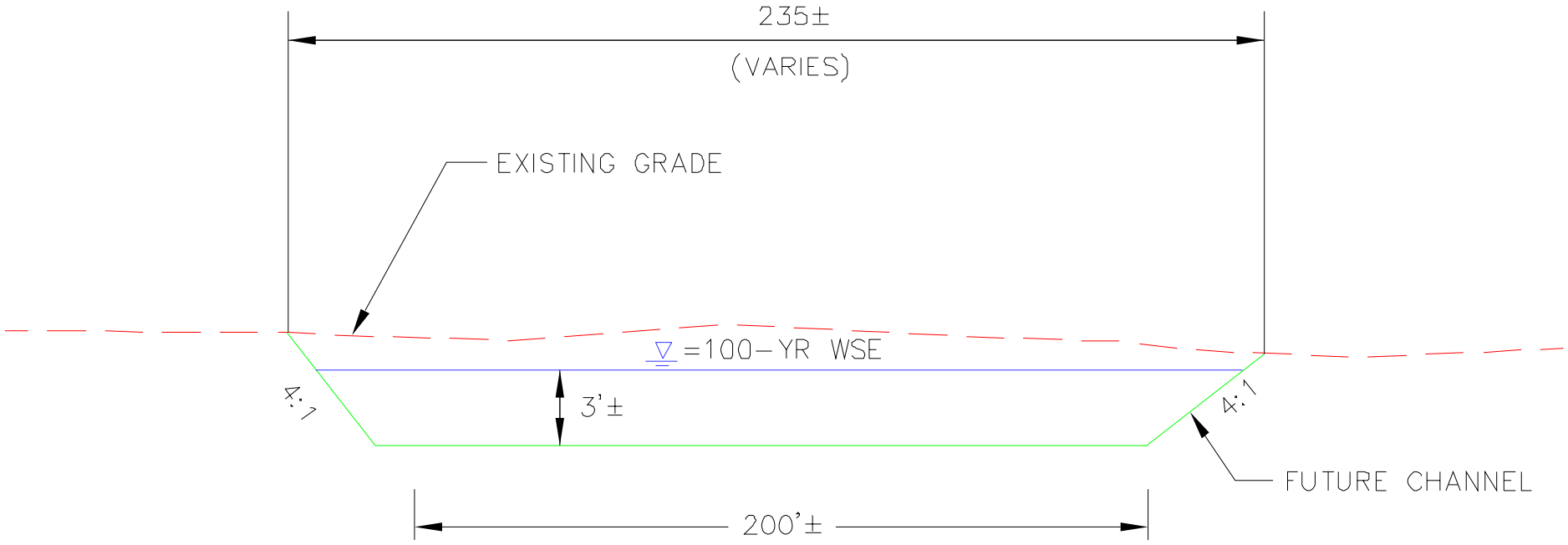
Figure No.
H-3

Title
Channel Section 1



2 CHANNEL SECTION

NTS

Legend

See Labels Above

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Southwest Infrastructure Plan

Figure No.
H-4

Title
Channel Section 2

3.3.3.5 Natural Riparian Flood Corridors

The vast system of braided channels within the Black Wash basin offers the opportunity to provide critical wildlife habitat within the SWIP study area. The existing natural floodplains contain critical riparian habitat and function as a wildlife link between the adjacent mountains and the valley floor.

Hydraulic, biologic, and recreational connectivity can be enhanced via the Sonoran Desert Conservation Plan to create a "Black Wash Greenway." The Black Wash Floodway identified on Map H-1, Proposed Flood Control Facilities, shall serve as the proposed Black Wash Greenway.

The recommended flood control facilities presented within the SWIP are intended to mitigate current flooding conditions, provide critical all-weather access along major transportation corridors, and to the extent possible, preserve the Black Wash drainage corridor in the current natural condition.

Regional detention basins located within the upper portion of the watersheds have been proposed to mitigate current flooding conditions. The basins have been strategically located to intercept discharges within the upper portion of the watersheds, detain / attenuate large volumes of flow, and release reduced peak discharges intro the downstream channels to maintain the natural riparian corridors (i.e., Greenway). The large regional basins presented within this report can provide stormwater detention associated with large infrequent storm events (i.e. at the one in 100-year return frequency level) while allowing flows associated with the more frequent storm events (one in 2-year or one in 5-year) to pass through the storage facility into the natural downstream drainage corridors to enhance vegetation and reduce potential erosion.

The Pima County Regional Flood Control District has been actively acquiring flood-prone lands along the Black Wash. Land purchases have been accomplished through the Flood-prone Land Acquisition Program (FLAP); therefore, Unit Costs associated with maintaining and preserving the primary natural drainage corridors, or Greenways, has not been included within this study.

3.3.3.6 All Weather Access / Major Transportation Corridors

An important element within the SWIP is to provide critical all-weather access at both existing and proposed major transportation corridors. Currently, significant reaches of major roadways are subject to frequent closures following storm events.

The existing and proposed major transportation corridors identified by the SWIP that are recommended to incorporate all-weather roadway crossings include: Ajo Highway, North San Joaquin Road, Valencia Road, Camino Verde, Mark Road, Valhalla Road, Drexel Road, and South San Joaquin Road. Table H-4 contains a summary of the proposed improvements.

Preliminary design parameters associated with all-weather roadway crossings include the following assumptions:

Table H-4 Box Culverts at Proposed Roadway Crossings

Crossing Number	Road, Location (Approximate ADOT Stationing)	Q_{100} (cfs)	Number of Cells	Span (ft), Each Cell	Rise (ft), Each Cell	Length (ft)
1	Ajo Road, Station 632	1,822	5	10	5	110
2	Ajo Road, Station 683	6,606	18	10	5	110
3	Ajo Road, Station 729	1,108	5	10	4	110
4	Ajo Road, Station 795	5,425	15	10	5	110
5	Ajo Road, Station 817	1,971	7	10	4	110
6	Ajo Road, Station 855	1,326	5	10	4	110
7 *	Ajo Road, Station 870	4,849	15	10	5	110
8	Valencia Road	3,900	12	10	5	135
9	Valencia Road	1,781	5	10	5	135
10	Valencia Road	1,379	6	10	4	135
11	Valencia Road	3,748	12	10	5	135
12	Valencia Road	1,370	4	10	5	135
13	Valencia Road	1,316	4	12	4	135
14	Valencia Road	5,407	12	12	5	135
15	San Joaquin Road (north)	1,291	4	10	5	100
16	San Joaquin Road (north)	1,227	4	10	5	100
17	San Joaquin Road (north)	1,692	5	10	5	100
18	San Joaquin Road (north)	1,369	5	10	5	100
19	San Joaquin Road (north)	2,137	6	10	5	100
20	San Joaquin Road (north)	1,000	3	10	5	100
21	San Joaquin Road (north)	4,788	10	10	6	100
22	South Camino Verde	5,400	9	12	7	50
23	South Camino Verde	1,614	5	10	5	50
24	South Camino Verde	1,061	4	10	4	50
25	South Camino Verde	1,123	4	10	5	50
26	South Camino Verde	3,992	12	10	5	50
27 **	Valhalla Road	5703	Bridge	85	***	100
28 **	Valhalla Road	6878	Bridge	100	***	100
29	Valhalla Road	3748	7	12	6	100
30 **	San Joaquin Road (south)	6496	Bridge	100	***	100
31	San Joaquin Road (south)	1614	5	10	5	100
32	San Joaquin Road (south)	1123	4	10	5	100
33	San Joaquin Road (south)	3992	12	10	5	100
34	Drexel Road	3992	12	10	5	50
35	Drexel Road	1123	4	10	5	50
36	South Mark Road	3,926	12	10	5	50
37	Irvington Road	3,273	7	10	6	100
38	Calle Don Miguel	1,000	3	10	5	50

Notes

* Culvert to be built as three structures according to future hydrologic analysis

** Likely bridge crossing (similar to bridge at Ajo Road) downstream on each respective watercourse

*** Height to bridge deck not factored into rise

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Table No.
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Title
Box Culverts at Proposed Roadway Crossings

- Minimum one in 100-year peak discharge of 1,000 cfs used as design threshold
- Standard ADOT reinforced concrete box culverts
- Height of box culverts limited to minimize excessive roadway fill
- 4-foot minimum box culvert height in order to prevent clogging

Unit costs associated with the all-weather roadway crossings are based upon the following assumption:

- No land acquisition costs are needed since they will form part of any transportation design elements during the right-of-way acquisition process
- Earthwork / excavation at $4 / cubic yard
- Drainage structure reinforced concrete box culvert (RCBC) expenditures per linear foot
    - 10' x 4' RCBC @ $1,400 / LF
    - 10' x 5' RCBC @ $1,500 / LF
    - 10' x 6' RCBC @ $1,600 / LF
    - 12' x 4' RCBC @ $1,600 / LF
    - 12' x 5' RCBC @ $1,700 / LF
    - 12' x 6' RCBC @ $1,800 / LF
    - 12' x 7' RCBC @ $1,900 / LF
- Drainage structure (Bridge) expenditures per square foot
    - Span x Length @ $200 / SF
- Design at 15% of construction costs
- Contingencies at 25% of total costs

In addition to providing all-weather access, the box culvert roadway crossings can also play an important role in maintaining critical wildlife linkage between the adjacent mountains and valley floor. Increased urbanization has led to increased interactions with wildlife and resulted in disjointed or fragmented wildlife corridors. Per the Arizona Game & Fish Heritage Fund, a 5-mile long segment of Ajo Highway (Mile Post 154 to 159) has been identified as an area of high wildlife mortality. Incorporating multi-use culvert designs can maintain watershed integrity, wildlife habitat connectivity, and provide cost savings by decreasing wildlife / vehicle collisions. Roadway drainage crossings can include installation of fencing designed to promote wildlife linkage via drainage structures and prevent wildlife from reaching the roadway. Arizona Game & Fish has developed additional guidelines associated with promoting safe wildlife passage through drainage structures.

To provide all weather access, box culverts (sized for the appropriate one in 100-year design flow) are anticipated to be required at all future roadway crossings where the one in 100-year peak discharge exceeds 1,000 cfs.

3.3.4 Project Phasing

The recommended flood control facilities identified during the SWIP analysis include four primary design elements. The first flood control element includes regional detention basins designed to intercept, detain, reduce peak discharges, and direct runoff into natural vegetated channels to enhance riparian habitat and minimize potential downstream erosion. The regional

detention basins have been analyzed as either flood control only basins or as multi-use flood control facilities whereby park amenities will be incorporated into the landscaping and contouring of the facility.

Project phasing for the flood control only facilities (Basins 1, 2, 3, 4, and 5) can be triggered via flood control needs and / or available funding. Construction of the regional detention basins can provide immediate benefits in the form of reduced downstream flooding to both existing and proposed residential and commercial developments, reduced cost expenditures associated with contiguous all-weather roadway drainage crossings, and natural drainage corridor (Greenway) enhancement via the controlled release of runoff and reduction in potential downstream erosion.

Project phasing associated with implementing multi-use flood control facilities is coupled with the phasing of proposed parks within the SWIP study area.

The second flood control element includes the proposed engineered channel (Channel Sections 1 and 2) designed to intercept and convey upstream flows to Detention Basin 7. The engineered channel sections would intercept more flow and convey the runoff to Basin 7 in order to maximize the potential benefit of this multi-use facility. Implementation of the collector / conveyor channel (Channel Sections 1 and 2) will likely be based upon regional flood control needs and / or available funding.

The third element of the flood control plan is to incorporate all-weather crossings along existing and proposed major transportation corridors. All-weather access identified along existing major transportation corridors that are not planned for transportation improvements can be implemented in response to regional flood control needs and / or available funding. All-weather access proposed in conjunction with transportation improvements shall be implemented in conjunction with the Planned and Programmed Roadway Improvements (refer to Tables TR-3a, TR-3b, and TR-4). Potential exceptions to providing all-weather access are the future Valhalla Road corridor between Valencia Road and the Drexel Road extension and the San Joaquin Road extension south to Los Reales. In order to provide all-weather access along Valhalla Road and San Joaquin Road, three bridge sections would likely be required. Should Pima County Regional Flood Control District recognize the need to reduce cost expenditures, the Valhalla Road crossings, at the Black Wash and Snyder Hills Wash, and the San Joaquin Road crossing, at the Black Wash, could include drainage crossings designed for the smaller, more frequent storm events. All-weather access would exist via the Ajo Highway, Valencia Road, and Drexel Road transportation and flood control improvements.

The recommended Planned and Programmed Roadway Improvements include the following 10 project descriptions:

- Ajo Highway – Sandario Road to I-19
- Camino De Oeste connection to Kinney Road
- Joseph Road / Mark Road – extension from Ajo Highway to Los Reales
- Irvington Road – Ajo Highway to Mission Road
- Drexel Road – Ajo Highway to Mission Road
- Valhalla Road – Valencia to Drexel Road
- Valencia Road – Ajo highway to Mark Road
- San Joaquin Road – Ajo Highway south to Los Reales
- San Joaquin Road – Ajo Highway north to Sandario Road
- Los Reales – Extend easterly to I-19

JE Jacobs, J2 Engineering and Environmental Design, and JE Fuller Hydrology and Geomorphology Inc., are under contract with the Arizona Department of Transportation, and are currently investigating the proposed Ajo Highway improvements from Sandario Road to Kinney Road. One in 100 year peak discharges and conceptual box culvert sizing along Ajo Highway are consistent with the current draft studies prepared by the above consultants.

The fourth flood control element is the preservation of the natural drainage corridors, or Greenways, associated with the Black Wash watershed. These Greenways are intended to maintain open space and critical riparian habitat, function as wildlife linkage between mountains and the valley floor, and provide natural flowage corridors for vegetation enhancement and erosion mitigation. Currently, the Pima County Flood Control District is actively acquiring flood-prone lands along the Black Wash through the Flood-prone Land Acquisition Program (FLAP). Project phasing will therefore not impact the preservation of the natural drainage corridors.

3.4 WASTEWATER MANAGEMENT

The purpose of the wastewater management portion of the Southwest Infrastructure Plan is to quantify the impending consequences of proposed land uses in the area by developing a proposed interceptor sewer sizing and conceptual alignment plan. This servicing strategy considered serviceability and conversion issues for areas currently using septic systems. It is noted that the infrastructure sizes, alignments, and locations provided in this report are for planning purposes. Final details must be determined in follow-on preliminary and detailed design stages.

In addition, the study has included Pima County's ongoing and future planned upgrades at the Avra Valley WWTF, and quantified the existing and committed capacity at the plant in light of the demand forecasts posed by the envisioned land uses in its upstream tributary area. Key wastewater treatment issues addressed by this study include effluent discharge issues posed by the receiving water bodies, regulatory constraints and treatment processes, biosolids handling, and opportunities for effluent water re-use.

Opinions of probable capital costs, operation and maintenance (O&M) costs, right of way (ROW) and land acquisition costs, and environmental permitting costs are provided.

3.4.1 Basis of Analysis and Assumptions

Standard Pima County assumptions were used to estimate the sewer flows, including the following conservative assumptions:

- Average wastewater generation for residential development = 85 gallons per capita / day
- Average wastewater generation for commercial development = 1,000 gallons per acre / day
- Average persons per dwelling unit = 2.7
- Peak dry weather flow (PDWF) was calculated as:

PDWF = ADWF x dry weather peaking factor (PF)

where commercial area PF = 2.0, and

where residential area dry weather PF was calculated using the method defined in Arizona Administrative Code Title 18, Chapter 9, E301 4.01 D

If 1,001 < upstream population < 10,000:

$$PF = (6.330 \times p^{-0.231}) + 1.094$$

If 10,001 < upstream population < 100,000:

$$PF = (6.177 \times p^{-0.233}) + 1.128$$

- Peak wet weather flow (PWWF) was calculated as:

  PWWF = PDWF + I & I

  Where extraneous inflow and infiltration (I & I) was estimated as 8% of the PDWF, an assumption carried forward from the previous Avra Valley wastewater collection system basin study

- Wastewater generation at existing and proposed school sites was calculated as:

  Number of students x 20 gallons per student per day

- Casino wastewater generation in the study area (Casino del Sol and Casino of the Sun) were provided by staff from Pima County's Wastewater Management Department, while build-out wastewater flows from other Tohono O'odham and Pascua Yaqui lands were estimated using the number and size of parcels in a given area

The following general design criteria were applied to guide the planning of the pipe system:

- Minimum slope was used to achieve the minimum velocity of 2 feet per second
- Minimize and / or eliminate potential negative impacts on existing structures and customers

For planning purposes, those areas with densities below an assumed cost-effective threshold of 1.33 residences per acre (RAC) were not serviced via traditional gravity sewers.

Triggering flows for any proposed treatment plant expansion were set at 85% of the plant design inflow.

3.4.2 Basis of Existing and Future Sewage Generation Estimates

The volume of wastewater generated by existing developments was roughly estimated using Transportation Analysis Zone (TAZ) data from the Pima Association of Government (PAG). This TAZ data provided population data for both the year 2000 and projected populations at 2030. Current year (2007) population estimates were extrapolated from this 2000 / 2030 dataset assuming a constant linear growth rate.

Because TAZ data only extends out to the year 2030, the anticipated SWIP build-out may occur beyond the range of the current TAZ time frame. Future build-out flows were estimated based on the projected land use and population data provided by Pima County Planning Department.

3.4.3 Delineation of Sewer Sub-basins and Sub-areas

The study area within the Avra Valley sewer basin was divided into eight sub-basins numbered 1 through 8 as shown on Map W-3. These sub-basins were defined based on their natural drainage patterns and existing infrastructure. The acreages (constrained within the SWIP boundary limits) of the various sub-basins and notable sub-areas are contained within Table W-1. Given topographic conditions at the SWIP boundary, it may be possible to service additional adjacent areas in the future. One potential servicing expansion to the southwest towards Three Points was considered, however land uses in this area would quickly become constrained by the Conservation Land System (CLS) which forms the backbone of the Sonoran Desert Conservation Plan (SDCP).

Within the study area (but outside the delineated Avra Valley sewer service sub-basins) are three distinct sub-areas which are notable based upon their drainage condition. Their locations and acreages are also shown on Map W-3 and quantified in Table W-1. The 6,709 acre area located in the northwest corner of the study area cannot naturally drain to the Avra Valley WWTF via gravity flow. Given that the proposed growth density in this area is relatively low, on-site septic systems may prove to be the most feasible means of disposing of wastewater generated within this area.

The 8,357 acre area located in the eastern portions of the study area is part of the Roger Road WWTP sewer basin. In addition, on the ridge line between this area and the delineated Avra Valley WWTF sewer basin there is an indeterminate treatment destination area where future wastewater could potentially be directed to either the Avra Valley WWTF or the Roger Road WWTP.

As directed by Pima County, areas outside the specifically delineated Avra Valley WWTF sewer basin were not examined in this Infrastructure Plan. Optimal means of servicing these sub-areas may be studied in subsequent planning projects.

3.4.4 Projected Population and Flow Statistics

The projected populations provided by Pima County planners were used to generate future flow estimates. Three growth scenarios were developed, describing higher density, medium density, and lower density scenarios. The total projected population for each sub-area is listed in Table W-2.

In general, it does not make economic sense to provide public sewer service to subdivisions in which houses are located far away from each other. For the purposes of this planning level effort, only areas where the proposed RAC is higher than 1.33 (e.g. one unit on a lot equal to or larger than 0.75 acres) was considered for public sewer servicing. Based on this assumption, low density areas with a proposed RAC less than 1.33 will be on septic systems and will not contribute wastewater to the public sewer facilities. Table W-2 lists the effective populations who must be serviced by public sewer, the projected flows, and the percentage of the population that are serviced by public sewer. As expected, denser developments lead to higher percentages of the population being serviced by public sewers.

Table W-1 Acreage of Sub-basins and Sub-areas

Sub-basin / Sub-area	*Total Acreage*
1	5,836
2	5,136
3	3,138
4	2,358
5	2,223
6	6,032
7	5,838
8	2,771
Non-serviceable Area (by Gravity to Avra Valley WWTF)	6,709
Area in Roger Road WWTP Sewer Service Basin	8,357
Indeterminate Treatment Destination Area	5,539

Table W-2 Projected Total and Effective Populations for Three Density Scenarios

Sub-basin / Sub-area	Lower Density Scenario			Medium Density Scenario			Higher Density Scenario		
	Total Population	Effective Population	% on Public Sewer	Total Population	Effective Population	% on Public Sewer	Total Population	Effective Population	% on Public Sewer
1	15,312	14,255	93.1%	27,194	26,830	98.7%	39,071	38,652	98.9%
2	10,825	9,967	92.1%	18,430	17,552	95.2%	26,034	24,286	93.3%
3	18,935	17,970	94.9%	22,762	21,587	94.8%	26,589	25,151	94.6%
4	4,273	3,460	81.0%	5,885	3,909	66.4%	7,496	5,632	75.1%
5	5,941	4,506	75.8%	8,059	7,414	92.0%	10,178	9,459	92.9%
6	12,966	9,765	75.3%	15,386	11,222	72.9%	17,806	14,002	78.6%
7	4,065	910	22.4%	6,993	2,967	42.4%	9,921	4,139	41.7%
8	7,906	6,693	84.7%	9,577	8,035	83.9%	11,251	9,385	83.4%
Sub-totals	**80,223**	**67,526**	**84.2%**	**114,286**	**99,516**	**87.1%**	**148,346**	**130,706**	**88.1%**
Non-serviceable Area (by Gravity to Avra Valley WWTF)	1,924	0	0.0%	4,278	0	0.0%	6,597	0	0.0%
Area in Roger Road WWTP Sewer Service Basin	23,140	19,434	84.0%	26,285	21,599	82.2%	29,433	25,475	86.6%
Indeterminate Treatment Destination Area	4,559	881	19.3%	6,710	2,885	43.0%	8,858	4,199	47.4%

Using the methodologies stated in Section 3.5.1, these populations will generate wastewater at the rates predicted on Table W-3. The total predicted influent ADWF flows at the Avra Valley WWTF range from 6.3 MGD for the lower density scenario up to 11.7 MGD for the higher density scenario. Inflows under the medium density scenario and the higher density scenario are higher than previously anticipated inflows to this facility.

3.4.5 Residual Capacity Analysis of Existing Sewers

A computerized hydraulic model was constructed (using GIS-based H2OMap Sewer Pro software) to assess the residual capacity in the backbone network, consisting of those pipes with 12-inch and larger diameters. Map W-1 shows the simulated backbone network system draining to the Avra Valley WWTF servicing area. The pipes are color coded by diameter, with the largest pipe in the system being 24 inches in diameter.

Steady flow estimates of the current ADWF and PWWF were routed through the existing wastewater collection system network. As mentioned earlier, the entire Avra Valley WWTF service area had been divided in to eight sub-basins – to which point flows were assigned at key concentration points. This simplified hydraulic model allowed for an approximate assessment of the current hydraulic conditions and the residual capacity in the existing backbone network. Map W-2 shows the resulting peak flow depths in the backbone network, color coded according to the "d / D ratio" which is calculated by dividing the simulated water depth by the nominal pipe diameter.

Under ADWF conditions many of the reaches are less than 60% full with no surcharges being identified. Under PWWF conditions some reaches saw flow depths approaching 80% of the nominal pipe diameter. One potential bottleneck was identified near the intersection of Valencia Road and Iberia Avenue; however Pima County's Wastewater Management Department had previously identified this bottleneck and is already moving forward with a solution which will resolve this capacity issue.

In summary, for current conditions the great majority of the wastewater collection and conveyance system has enough capacity to handle the existing flow during peak wet weather flow periods. However, the residual capacity in the existing system is not sufficient to accommodate the proposed future flows in all locations.

3.4.6 Proposed Expansion of Conveyance Systems

Maps W-6, W-7, and W-8 display the proposed wastewater conveyance infrastructure plans for the lower, medium and higher density scenarios, respectively. As previously stated, this planning exercise assumed that areas with densities above1.33 RAC would require sewer servicing. These areas are shown as yellow on Maps W-6 through W-8.

It was determined that the existing system is not sufficient to accommodate the entirety of the anticipated future flows. It was assumed that in many cases the conveyance capacity of existing sewers would be augmented through the addition of sewers installed in parallel with existing sewers. These existing pipes which require augmentation are highlighted in red. In

Table W-3 Projected Wastewater Generation Rates

Sub-basin / Sub-area	*Lower Density Scenario*			*Medium Density Scenario*			*Higher Density Scenario*		
	ADWF (MGD)	*PDWF (MGD)*	*PWWF (MGD)*	*ADWF (MGD)*	*PDWF (MGD)*	*PWWF (MGD)*	*ADWF (MGD)*	*PDWF (MGD)*	*PWWF (MGD)*
1	1.314	2.383	2.573	2.383	4.092	4.420	3.388	5.649	6.100
2	0.895	1.662	1.795	1.540	2.724	2.942	2.112	3.637	3.928
3	1.591	2.813	3.039	1.899	3.306	3.570	2.202	3.785	4.088
4	0.307	0.631	0.681	0.345	0.700	0.756	0.492	0.962	1.039
5	0.688	1.377	1.487	0.936	1.809	1.954	1.109	2.104	2.272
6	0.883	1.643	1.775	1.007	1.853	2.001	1.243	2.243	2.423
7	0.077	0.186	0.201	0.252	0.527	0.570	0.352	0.710	0.767
8	0.570	1.096	1.183	0.684	1.292	1.395	0.799	1.486	1.605
Sub-totals	**6.326**	**11.791**	**12.733**	**9.045**	**16.303**	**17.608**	**11.696**	**20.576**	**22.221**
Non-serviceable Area (by Gravity to Avra Valley WWTF)	-	-	-	-	-	-	-	-	-
Area in Roger Road WWTP Sewer Service Basin	1.734	3.05	3.293	1.918	3.343	3.611	2.247	3.865	4.174
Indeterminate Treatment Destination Area	0.080	0.191	0.206	0.250	0.525	0.567	0.362	0.729	0.788

order to service the proposed development in the southwest corner of the SWIP area, a new trunk sewer will be necessary. The proposed trunk, which extends along the West Ajo Highway, is schematically shown on the maps for the purposes of this study. The eventual constructed alignment must be determined through a formal route study. This trunk has been sized to handle wastewater generated in the adjacent yellow-colored areas within the SWIP boundary.

3.4.7 Wastewater Treatment Capacity and Currently Proposed Expansion

Existing Treatment Capacity

The Avra Valley WWTF is a biological nutrient removal oxidation ditch with an ADWF design capacity of 1.2 MGD. The facility is currently in the process of being upgraded to an interim facility with an ADWF capacity of 2.2 MGD.

Proposed Expansion Currently Programmed in CIP

Due to the ongoing and rapid growth in the Avra Valley WWTF service area, Pima County has authorized a proposed plant expansion of 4.0 MGD additional capacity. The new expansion will construct two new parallel 2.0 MGD process trains. The original oxidation ditch was designed and built as a temporary facility. After the 4.0 MGD expansion, the original oxidation ditch will be taken out of service. The County will then have the option of replacing the existing system with a third new process train or converting the new 4.0 MGD ditch system to the Modified Ludzak-Ettinger (MLE) process to create additional capacity.

The improvements providing the additional 4.0 MGD capacity include a new inlet gravity sewer and influent lift station, headworks modifications, two biological nutrient removal oxidation ditches, clarifiers, continuous backwashing deep bed filters, ultraviolet (UV) disinfection, sludge holding basins, sludge thickening equipment, dewatering equipment, means of additional effluent discharge to percolation basins and / or the Black Wash spray fields, and upgrades to the process water, odor control, and electrical systems. Initially, solids will be stored on-site, de-watered to 5% to 6% solids content, and trucked to the Ina Road WPCF for further digestion. Future on-site aerobic digestion may be considered at some point.

The influent lift station and headworks will be designed for an ultimate ADWF flow of 6.2 MGD and a peak flow of 12.0 MGD. Solids handling from both new treatment trains and the existing system will be combined and thickened in an aerated and mixed holding tank prior to aerobic digestion. The sludge will be dewatered and trucked to land application sites. A tertiary filtration area will be planned and basin capacity constructed for ultimate 6.2 MGD. The filtration and ultraviolet disinfection equipment will be sized to treat 4.0 MGD.

This 4.0 MGD expansion is currently programmed within the CIP and is on-going, being delivered through the construction management at risk (CMAR) process. It is anticipated that design efforts will be completed by the middle of April 2007. Construction is expected to begin in July of 2007 and to be completed by early 2009. The estimated total combined cost for the Avra Valley WWTF 4.0 MGD Biological Nutrient Removal Oxidation Ditch (BNROD) Expansion

project delivery is $44,900,000. Included in these costs is the purchase of heavy equipment to operate and maintain the effluent disposal ponds in a proactive manner to maximize their disposal capacity. This amount is being financed through a combination of 2004 Bonds under an amended bond authorization and System Development Funds.

The new Avra Valley WWTF will require four staff for its continuous operation, including one senior operator, two operators, and one mechanic, electrician, or instrument technician craftsman.

3.4.8 Additional Required Treatment Capacity Expansion

Pima County planners developed three SWIP scenarios with varying levels of development intensity. From a wastewater treatment design point of view, the total required treatment capacity at the Avra Valley WWTF for the higher, medium, and lower density scenarios is provided in Table W-4.

Lower Density Scenario

As mentioned above, an expansion adding 4.0 MGD capacity has been programmed into the CIP and is in the process of being delivered. With this 4.0 MGD addition, the Avra Valley WWTF could theoretically treat an ADWF of up to 6.2 MGD, however the original oxidation ditch was designed and constructed as a temporary facility and has already been in operation for an extended period of time. Once the 4.0 MGD addition is finished, it is recommended that this temporary facility be taken out of service. A new facility expansion would then be pursued to provide sufficient treatment capacity to support the lower density scenario ADWF of 6.5 MGD.

Avra Valley WWTF requirements related to this scenario will include maintaining the proposed 4.0 MGD and replacing the existing 2.2 MGD capacity oxidation ditch with an equivalent means of treating 2.5 MGD capacity. Through these additions the Avra Valley WWTF would continue to be capable of producing Class A+ effluent.

Medium Density Scenario

An ADWF capacity of 9.5 MGD will be required to support the population represented by the medium density scenario.

Avra Valley WWTF requirements related to this scenario will include the maintenance of a total capacity of 4.0 MGD from the ongoing expansion, and the construction of an additional 5.5 MGD of ADWF treatment processes capable of producing Class A+ effluent.

Higher Density Scenario

An ADWF capacity of 12.0 MGD will be required should the higher density development scenario transpire.

Table W-4 Total Required Treatment Capacity at Avra Valley WWTF

Scenario and Type of Project	*Lower Density Scenario*	*Medium Density Scenario*	*Higher Density Scenario*
Required Treatment Capacity (MGD)	6.5	9.5	12.0

Avra Valley WWTF requirements related to this scenario will include the maintenance of a total capacity of 4.0 MGD from the ongoing expansion, and the construction of an additional 8.0 MGD of ADWF treatment processes capable of producing Class A+ effluent.

Land Requirements at Avra Valley WWTF

The area required for a plant of a particular capacity depends on numerous factors such as the degree of treatment required, the process to be used, the degree of redundancy necessary, space requirements for ancillary and support facilities, and space requirements for access, circulation, and maintenance.

In general, a 12.0 MGD wastewater treatment facility typically requires ten to thirty-five acres of raw land. In addition, a buffer area between the facility and the adjacent properties is required. According to the provisions of Chapter 9 of the Arizona Administrative Code, minimum setbacks are required from the treatment and disposal components within the wastewater treatment facility to the nearest adjacent dwelling, workplace, or private property. Assuming the existing treatment processes will be used for the future required expansions, the anticipated setback distance is at least 1,000 feet.

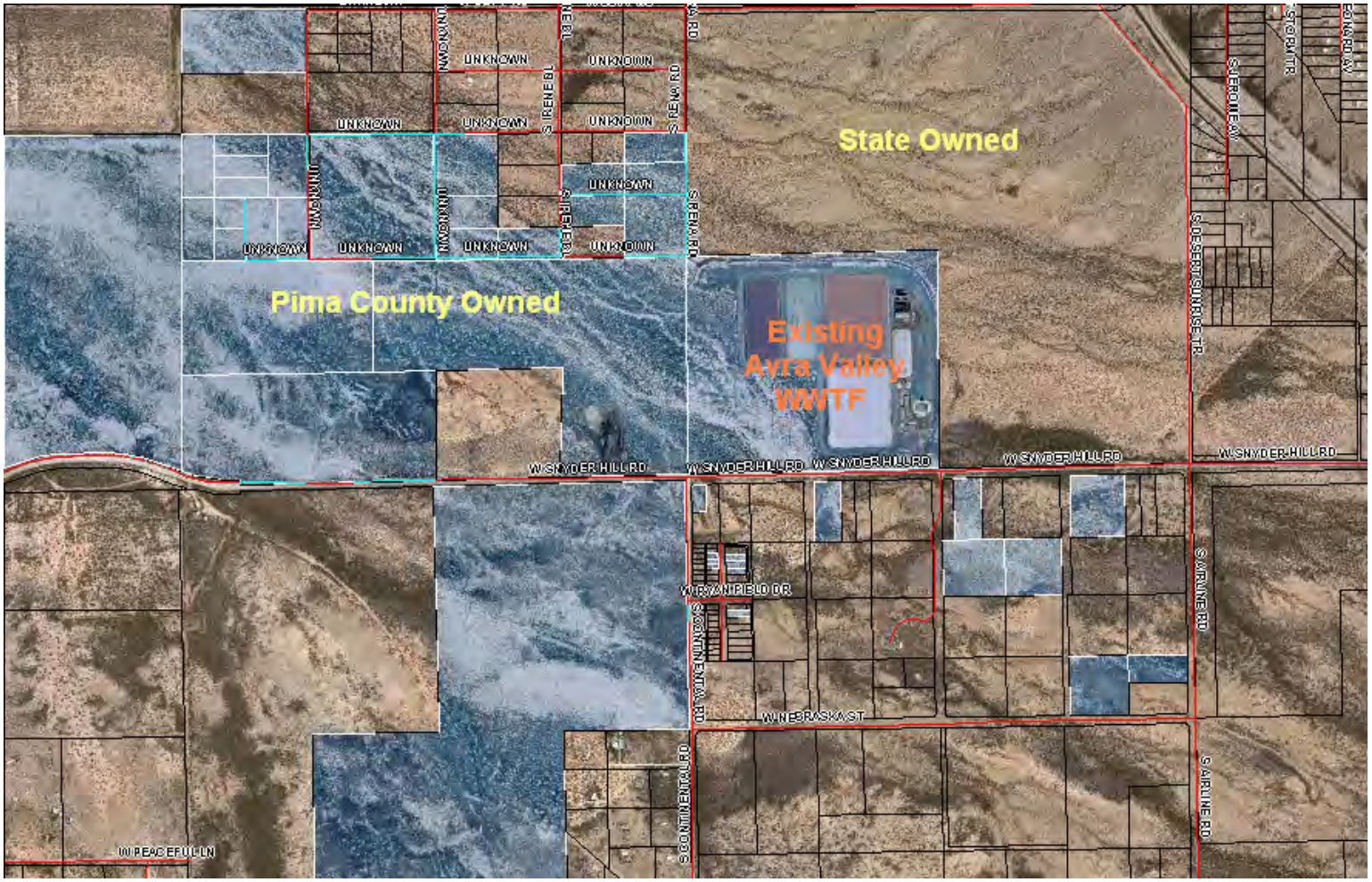
As shown on Figure W-2, the State of Arizona owns 443.87 acre adjacent to the east of the existing Avra Valley WWTF. Pima County itself owns adjacent land parcels to the west of the existing Avra Valley WWTF.

Assuming the adjacent lands currently owned by Pima County are available for wastewater treatment facility expansion, they would be adequate for the largest expansion required in order to support the higher density development scenario.

3.4.9 Effluent Utilization Mechanisms

The amount of effluent to be generated within the SWIP area will depend on the density of the final development. Reviewing the development potential scenarios considered for the sewer basin has resulted in a range of anticipated ADWF from a high of 12.0 MGD for the higher density scenario, to 9.5 MGD for the medium density scenario, and as low as 6.5 MGD for the lower density scenario.

The design of the expanded treatment facility will include the necessary process modifications to produce a Class A+ effluent. Class A+ effluent is wastewater that has undergone secondary treatment, filtration, nitrogen removal, and finally disinfection. The water is also treated with coagulants or polymers to ensure turbidity levels (indicating the particle size distribution and concentration of suspended solids as well as dissolved solids) are 2 nephelometric turbidity units (NTU) or less. The disinfection must be sufficient to ensure that there are no detectable coliform bacteria in four of the last seven daily tests. Class A+ effluent can be used for any type of reuse authorized by the Arizona Department of Environmental Quality (ADEQ). Effluent reuse could include the construction of recreational impoundments that allow partial body contact (including fishing and boating) but not full body contact or swimming.



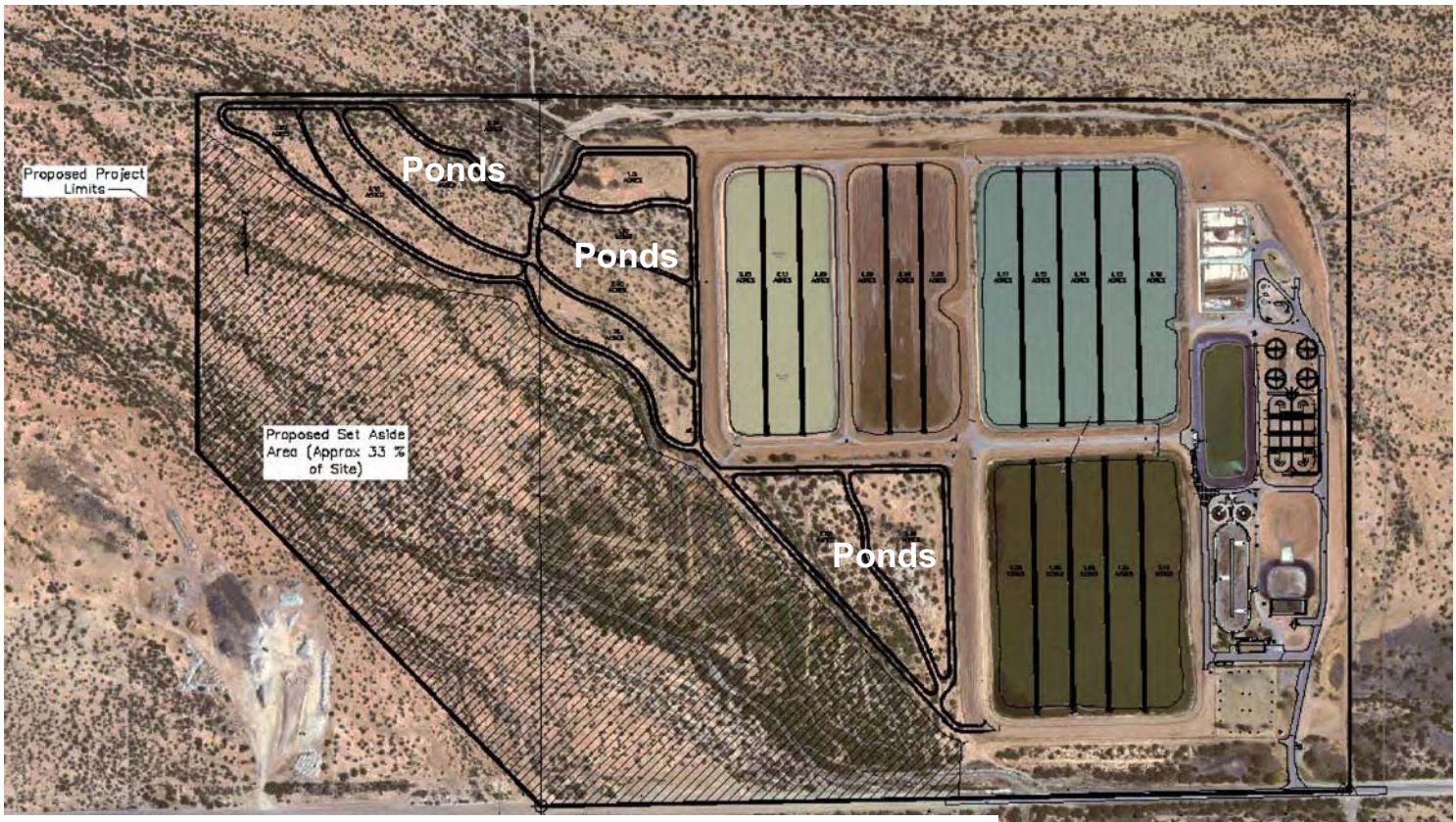
Legend

See Labels Above

Pima County Public Works
Southwest Infrastructure Plan

Figure No.
W-2

Title
Land Ownership in the Vicinity of the Avra Valley WWTF



Proposed Percolation Ponds and Riparian Set-aside Area

"Before"

Plans for Riparian Areas at Black Wash

"After"

"Before"

Plans for Avra Valley WWTF Ponds

"After"

Legend

See Labels Above

Pima County Public Works
Southwest Infrastructure Plan

Figure No.
W-3

Title
Current Effluent Disposal Plans at the Avra Valley WWTF / Black Wash

The current plans for effluent use and disposal at the Avra Valley WWTF include the expansion of the percolation basins for the effluent recharge purposes. The existing and proposed percolation ponds are shown in Figure W-3. This graphic also depicts related improvements proposed as a 2008 Bond Program Project by Pima County Regional Flood Control District. This project, referred to as the Avra Valley / Black Wash Ecosystem Restoration and Groundwater Replenishment initiative, represents capital investments above and beyond those included within the proposed 4.0 MGD Avra Valley WWTF expansion efforts.

Percolation testing for the basins at the Avra Valley WWTF has determined that a reasonable application rate is 0.48 feet per day (as per the Avra Valley WWTF 1.2 MGD to 1.6 MGD Aquifer Protection Permit application). With the consideration of evaporation and rainfall, the higher development density scenario will require approximately 75 acres of net percolation pond area. The existing percolation ponds are not large enough at present to discharge all the effluent from the envisioned 12.0 MGD plant. It will be necessary to plan additional mechanisms and construct a secondary effluent disposal facility.

Depending upon the needs of the Southwest community, effluent waters from the Avra Valley WWTF could also be used for a wide range of potential projects. The Environmental Protection Agency (EPA) has established the following categories for the reuse of wastewater effluent:

- Groundwater Recharge
- Habitat Restoration / Enhancement and Recreational Reuse
- Urban Re-uses
- Agricultural Irrigation
- Industrial Reuse

Among these possible reuse methods, the study area can readily support groundwater recharge, habitat restoration, and urban reuses. There may also be some limited potential for agricultural irrigation and industrial reuse opportunities.

Groundwater Recharge

The current plan for the operation of the Avra Valley WWTF anticipates using groundwater recharge as the principal method of effluent utilization. Recharge will take advantage of the existing facilities and will be the least expensive utilization option.

Habitat Restoration / Enhancement and Recreational Reuse

Habitat restoration / enhancement and the creation of recreational facilities suitable for bird watching, fishing and hiking represent another potential means of effluent utilization in the Southwest planning area. The quality of the water which can be discharged from the Avra Valley facility would be suitable for all of these activities. The area downstream from the exiting treatment facility could provide an ideal and cost effective location for a habitat restoration project.

Urban Re-uses

Widespread distribution of treated effluent for irrigation and commercial uses will require the construction of a separate distribution system. Separate effluent distribution systems are costly to construct, particularly for services extending to individual homes. The SWIP area has over 2,000 acres of parks and proposed parks that could be irrigated with reclaimed water. The limited volume of reclaimed water available after recharge, and the long distances between potential large reuse sites, may limit the distribution of water to major parks and recreational facilities.

Other urban re-uses worthy of consideration include:

- Irrigation of public parks, athletic fields, and school yards, highway medians and landscaped areas around public buildings
- Irrigation of golf courses
- Irrigation of landscaped areas single family and multi family residences, general wash down and other maintenance activities
- Commercial uses such as vehicle washing facilities, window washing, mixing water for pesticides and liquid fertilizers
- Ornamental landscape features such as fountains, reflecting pools and waterfalls
- Dust control and concrete production on construction projects
- Fire protection using stored treated effluent

3.4.10 Project Phasing

To enable the funding analysis component of this project, the timing requirements for SWIP's wastewater management projects were established using wastewater flows calculated directly from the dwelling unit development timeline documented in Section 3.2.2.

For the medium density scenario the construction of an additional 5.5 MGD of ADWF treatment processes capable of producing Class A+ effluent (and an equivalent effluent utilization capacity) will be required. This will be provided in an initial increment of 2.5 MGD, and a second increment of 3.0 MGD.

According to the medium density scenario's development timeline, the 2.5 MGD capacity additions must be online at the beginning of 2018 and the 3.0 MGD capacity additions must be online at the beginning of 2025.

It was assumed that five-year development cycles will be required for Avra Valley WWTF planning, design, and construction. This necessitates the start-up of the two development cycles in 2013 and 2020.

For conservative planning and funding purposes it was assumed that the septic conversions, which in reality will be triggered by emerging patterns of system failures, occur fairly early in the build-out of the SWIP area – between the years 2012 and 2015.

3.5 PARKS, RECREATION, AND OPEN SPACE

3.5.1 Planned Park and Recreation Facilities

Currently, there are no undeveloped park sites owned by Pima County with designs or plans for immediate construction. As discussed earlier, Parks staff has identified necessary improvements at specific parks to address drainage problems, security, ADA compliance, and user group interests such as soccer and Little League baseball. There are also existing public parcels adjacent to both Winston Reynolds-Manzanita District Park and Vesey Neighborhood Park that could be acquired to expand facilities in these two locations. The County also has been working with the federal government to acquire a 77-acre parcel on Valencia Road near Ryan Field for a proposed park site. Discussions are underway on other larger public parcels to address existing demands for park and recreation as well as future growth. The specific parcels for potential planned parks sites in the future will be addressed further in this report.

3.5.2 Park Classification System

The classifications of parks in Pima County are incorporated into this section. Classifications define the basic parameters and guidelines for each type of park within a recreational system. The classifications provide a common, consistent and justifiable framework for planning purposes and seek to ensure the community's needs are fulfilled as the park system is developed. While park acreage is typically used as a general indication of a park's classification, it is not the only factor considered. It is the balance of park size and function that determines the appropriate classification for a particular facility. Facilities that serve a unique and specific function are classified as Special Purpose Parks / Alternative Recreation Areas. Special Purpose Parks are not considered "programmable" parks for purposes of determining level of service. Map PR-4, Park Service Area Boundaries, illustrates the developed residential parcels and their inclusion, or exclusion, within an existing park service area.

Neighborhood / School Parks

A neighborhood / school park is 10.0 acres or less in size, and may occur in conjunction with a school site. Note that the park / recreation area is land exclusive of, and in addition to, the school site itself. Examples of neighborhood parks are cited below in each size category. Please refer to the Pima County Natural Resources, Parks and Recreation Department's *Recreation Area Design Manual* for layout examples of neighborhood parks.

Neighborhood Parks Up to 1 Acre in Size

A neighborhood park of approximately one acre in size is often described as a "pocket park." Examples of neighborhood parks in this size category include Pima County's Branding Iron Park. Minimum amenities for neighborhood parks in this size category include:

- Infrastructure: Water and Electricity
- Linkages to adjacent or nearby trails, linear parks, greenways, etc. (if applicable)
- Signs
- Fencing (as needed)
- Landscaping (trees and other plant materials, preferably native; see Section 10 in the Recreation Area Design Manual for additional information)
- Irrigation
- Turf area: 30% of total park area (exclusive of parking spaces, roads, footprints of restrooms and other structures and other areas committed to non-recreational purposes). Alternate functional recreation area surfacing, including recreation-grade artificial turf, etc., may be acceptable alternatives
- Vehicular barriers (as needed)
- Parking: 1 space per every 20 units, as per the ordinance
- Trash receptacles – a minimum of 1 trash receptacle necessary
- Bicycle Racks: 1 bicycle rack (4 bike capacity) necessary
- Park benches: 1 bench necessary; 2 benches preferable

Recommended and suggested additional features:

- Security lighting
- Public art
- Water fountain

Neighborhood Parks Up to 1.01 – 5 Acres in Size

There are no neighborhood parks in this size category in the study area. Minimum amenities for neighborhood parks in this size category include:

- Infrastructure
- Linkages to adjacent or nearby trails, linear parks, greenways, etc. (if applicable)
- Signs
- Fencing (as needed)
- Landscaping (trees and other plant materials, preferably native; see Section 10 in the Recreation Area Design Manual for additional information)
- Irrigation
- Vehicular barriers (as needed)
- Parking: one space per every 20 units, as per the ordinance
- Trash receptacles: 1-3 acres: 2 receptacles; 3-5 acres: 2 to 4 receptacles
- Bicycle racks: 1-3 acres: 1 rack (4 bike capacity); 3-5 acres: 2 racks (4 bike cap. ea.).

- Water fountain: recommended in 1 to 3 ac. Recreation area; 1 fountain necessary in 3.0-5.0 acre recreation area.
- Restroom: one unisex restroom for recreation areas 3.0-5.0 acres in size
- Turf area: 30% of total park area (exclusive of parking spaces, roads, footprints of restrooms and other structures and other areas committed to non –recreational purposes). Alternate functional recreation area surfacing, including recreation-grade artificial turf, etc., may be acceptable alternatives.
- Outdoor park benches: 1.0-3.0 acres: 2 benches; 3.0-5.0 acres: 4 benches
- Shade structure(s) on concrete pad (choice of vendor and style), 20'x28': 1.0-3.0 acres: 1 structure, minimum 3.0-5.0 acres: 1 structure, minimum
- Picnic tables with benches: 1.0-3.0 acres: 2 tables; 3.0-5.0 acres: 4 tables
- Grills: 1.0-3.0 acres: 2 grills; 3.0-5.0 acres: 3 grills
- Basketball court: 1.0-3.0 acres: recommended only; 3.0-5.0 acres: one half-court basketball court (post-tension slab recommended)
- Playground or fitness equipment: 1.0-3.0 acres: 3 pieces; 3.0-5.0 acres: 1 structure, minimum

Recommended and suggested additional features:

- Security lighting
- Public art
- Water fountain: recommended for recreation areas in the 1.0 to 3.0 size category
- Telephone: recommended in the 3-5 acre recreation area category
- Perimeter walking / jogging path system: rec. for all recreation areas 1.0 to 5.0 acres in size
- Athletic field (baseball / softball): recommended in the 3.0 to 5.0 size category

Neighborhood Parks Up to 5.01 – 10 Acres in Size

Examples of neighborhood parks in this size category include Ebonee Marie Moody (Cardinal) Park, and Mission Ridge Park. Minimum amenities for neighborhood parks in this size category include:

- Infrastructure: Water, Power and Sewer
- Water fountains: 5.0-7.5 acres: 1 fountain; 7.5-10.0 acres: 2 fountains
- Unisex restroom: 5.0-7.5 acres: 1 unisex restroom; 7.5-10.0 acres: 2 unisex restrooms recommended
- Linkages to adjacent or nearby trails, linear parks, greenways, etc.: (if applicable)
- Signs
- Fencing (as needed)
- Landscaping (trees and other plant materials, preferably native)
- Irrigation
- Turf area: 30% of total park area for all recreation areas in the 5.0 to 10 acre size range (exclusive of parking spaces, roads, footprints of restrooms and other structures and other areas committed to non-recreational purposes). Alternate functional recreation

area surfacing, including recreation-grade artificial turf, etc., may be acceptable alternatives
- Vehicular barriers (as needed)
- Parking: one space per every 20 units, as per the ordinance
- Trash receptacles: 5.0-7.5 acres: 4 receptacles; 7.5-10.0 acres: 6 receptacles
- Bicycle racks: 5.0-7.5 acres: 4 racks (4-bike capacity); 7.5-10.0 acres: 6 (4-bike capacity)
- Park Benches: 5.0-7.5 acres: 6 benches; 7.5-10.0 acres: 8 benches
- Security lighting: mandatory for all recreation areas in 5.0-10.0 acres in size
- Shade structure(s) on concrete pad (choice of vendor and style), 20' x 28': 5.0-7.5 acres: 2 structures, minimum; 7.5-10.0 acres: 2 structures, minimum
- Picnic tables with benches: 5.0-7.5 acres: 6 picnic tables; 7.5-10.0 acres: 8 picnic tables
- Grills: 5.0-7.5 acres: 4 grills; 7.5-10.0 acres: 6 grills
- Basketball court: 5.0-7.5 acres: 1 full-court + 1 half-court recommended; 7.5-10.0 acres: 1 full-court + 1 half-court recommended
- Playground and / or fitness equipment: 5.0-7.5 acres: 2 individual components plus one 5-pc multi-use play structure; 7.5-10.0 acres: 2 individual components plus two 5-pc multi-use play structures
- Perimeter walking / jogging path system: 5.0-7.5 acres: provide either 1 baseball / softball field or 1 soccer / football field; 7.5-10.0 acres: provide 1 baseball / softball field and 1 soccer / football field

Recommended and suggested additional features:

- Security lighting
- Public art
- Telephone (5.0-7.5 acre recreational areas)
- Additional basketball court (full or half-court)

Community Parks

Community parks range from 10.01 to 40 acres in size. Lawrence District Park (despite maintenance of its original name) is the sole community park in this size category in the study area. Minimum amenities for neighborhood parks in this size category include:

- Infrastructure: Water, Electricity, Telephone and Sewer
- Water Fountains: 10-20 acres: 3 fountains; 20-40 acres: 5 fountains
- Restrooms: 10.01-20.0 acres: 2 restroom buildings, each with one men's facility (one toilet, one urinal and sink) and one women's facility (two toilets and sink); 20.01-40.0 acres: 3 restroom buildings, each with one men's facility (one toilet, one urinal and sink) and one women's facility (two toilets and sink)
- Linkages to adjacent or nearby trails, linear parks, greenways, etc.: (if applicable)
- Signs
- Fencing (as needed)
- Landscaping (trees and other plant materials, preferably native)
- Irrigation

- Turf area: 20% of total park area for all recreation areas in the 10.0 to 40.0 acre size range (exclusive of parking spaces, roads, footprints of restrooms and other structures and other areas committed to non-recreational purposes). Alternate functional recreation area surfacing, including recreation-grade artificial turf, etc., may be acceptable alternatives
- Parking: one space per every 20 units, as per the ordinance
- Vehicular barriers: (as needed)
- Trash receptacles:10.01-20.0 acres: 10 receptacles; 20.01-40.0 acres: 15 receptacles
- Bicycle Racks: 10.01-20.0 acres: 10 (4 bike capacity); 20.01-40.0 acres: 15 (4 bike capacity)
- Park benches: 10.01-20.0 acres: 10 benches; 20.01-40.0 acres: 15 benches
- Security lighting: mandatory for recreation areas in the 10.0 to 40.0 size category
- Shade structure(s) on concrete pad (choice of vendor and style), 20' x 28': 10.01-20.0 acres: 3 structures; 20.01-40.0 acres: 4 structures
- Picnic tables with benches: 10.01-20.0 acres: 12 picnic tables; 20.01-40.0 acres: 18 picnic tables
- Grills: 10.01-20.0 acres: 8 grills; 20.01-40.0 acres: 14 grills
- Basketball court: 10.0-20.0 acres: 1 full and 1 half-court basketball courts required (post-tension slabs recommended); 20.01-40.0 acres: 2 full-court basketball courts required (post-tension slabs recommended)
- Playground and / or fitness equipment: 10.01-20.0 acres: 4 individual components (play or fitness) plus two 5-pc multi-use play structures; 20.01-40.0 acres: 6 individual components (play or fitness) plus two 5-pc multi-use play structures
- Perimeter walking / jogging path system: 10.01-40.0 acres: mandatory DG or paved perimeter path system
- Athletic fields: 10.01-20.0 acres: 1 baseball / softball field and 1 soccer / football field; 20.01-40.0 acres: 2 baseball / softball field and 1 soccer / football field
- Maintenance building necessary for recreation areas in this size category

Recommended and suggested additional features:

- Public art
- Additional half of full-sized basketball court
- Additional soccer field (strongly recommended)
- Swimming pool
- Community center

District Parks

District parks are typically 40.01 acres to 100 acres in size. There are no parks of this size in the SWIP planning area. Minimum amenities for District parks in this size category include:

- Infrastructure: Water, Power, Telephone (line to site), Sewer
- Water fountains: 6 fountains
- Restroom facilities: 4 restroom buildings or equivalent, each with one men's facility (one toilet, one urinal and sink) and one women's facility (two toilets and sink)

- Linkages to adjacent or nearby trails, linear parks, greenways, etc. (if applicable).
- Signs
- Fencing (as needed)
- Landscaping (trees and other plant materials, preferably native)
- Irrigation
- Turf area: 15% of total park area for all recreation areas in the 40.0 to 100.0 acre size range (exclusive of parking spaces, roads, footprints of restrooms and other structures and other areas committed to non-recreational purposes). Alternate functional recreation area surfacing, including recreation-grade artificial turf, etc., may be acceptable alternatives
- Parking: one space per every 20 units, as per the ordinance
- Vehicular barriers: (as needed)
- Trash receptacles: 15 receptacles minimum
- Park benches: 15 benches minimum
- Security lighting – necessary
- Shade structure(s) on concrete pad (choice of vendor and style), 20' x 28': 5 structures
- Picnic tables with benches: 20 minimum
- Grills: 16 minimum
- Basketball courts: 2 full and 1 half-court basketball court necessary (post-tension slab recommended)
- Play or and / or fitness equipment: 6 individual components (play or fitness) plus three 5-piece multi-use play structures
- Perimeter walking / jogging path system: mandatory DG or paved perimeter path system
- Athletic fields: 3 baseball / softball fields required, plus 2 soccer / football fields
- Maintenance building: necessary
- Swimming pool: necessary
- Community center: necessary

Recommended and suggested additional features:

- Public art
- Additional half or full-size basketball court
- Additional soccer field

Regional Parks

Regional parks exceed 100 acres in size. Regional parks may be urban parks, natural resource parks (i.e. natural open space parks with passive recreation features such as trails), or "hybrid" parks that contain both developed and natural features. Examples include Manzanita Park and Tucson Mountain Park.

Minimum amenities for neighborhood parks in this size category include District Park features plus additional features identified by the developer and the Pima County Natural Resources, Parks and Recreation Department. A tract of high-quality natural open space (i.e. with significant natural resource values) may satisfy the recreation area requirement in all or part.

Recommended Features: Special purpose park, such as an open space area with trails, skate park, equestrian facility, etc.

Linear Parks / Greenways

Linear Parks and Greenways are regional parks or park-like features developed along watercourses and / or major road rights-of-way, and are intended to provide recreation and fitness opportunities, as well as alternate modes of transportation. These facilities are typically developed to the City / County River Park or Divided Urban Pathway Standards. Examples include the Rillito River Park, the Santa Cruz River Park, the Pantano River Park, the Houghton Greenway, and the Camino Loma Alta Greenway, although there are no linear parks / greenways in the study area at the present time.

Minimum amenities for parks in this category include:

- Paved path (12' – 15' in width, per River Park or Divided Urban Pathway Standard)
- Natural surface (DG) path (8'-10' in width, per River Park or Divided Urban Pathway Standard).
- Bridges (if necessary)
- Landscaping (native species)
- Irrigation
- Shade Structure (one structure every one mile); design to be approved by PCNRPR.
- Parking / Staging (public access facilities)
- Water fountain (one fountain every one mile).
- Fencing / railing / post-and-cable or other vehicular barriers as appropriate.
- Signage (as appropriate, consistent with the Regional Greenways Plan)
- Linkages to adjacent or nearby parks, trails, linear parks, greenways, etc.

Optional features: restrooms; park nodes adjoining the corridor with turf and other recreation features.

Special Purpose Parks / Alternative Recreation Areas

Special Purpose Parks are developed to serve a particular community recreational need, such as a skateboard park, a natural-resource based trails park, an equestrian center, a soccer complex, a dog park, an amphitheater or performing arts facility, or an off-highway vehicle park. SPP's can range in size from one-half acre to 640 acres or more, depending on the special purpose. Examples include the BMX track at Pima County's Manzanita Park, the skate park at the City of Tucson's Purple Heart Park and Pima County's Pima Motor Sports Park.

Alternative Recreation Areas are recreation areas designed to complement and serve the special needs of a given residential subdivision project and / or its surrounding area. Examples of Alternative Recreation Areas Include:

A. Active Adult Recreation Area. An Active Adult Recreation Area could be constructed to address the unmet recreation needs of active adults, and might include a community recreation center or club house, park space, and / or a golf course that provides recreational utility considerably beyond golf – for example, a golf course with a system of walking trails around its perimeter combined with a Par Course, adjacent park nodes and other similar features that are directly integrated into its design (golf courses themselves are not eligible for inclusion as recreation areas, and no credit against the standard requirements will be applied for them).
B. Educational Recreation Area. An Educational Recreation Area could be created to take advantage of an opportunity to provide significant educational benefits within a recreational context. Examples of this kind of recreation area might include a night sky / astronomy park, a water resources park (i.e. constructed wetlands with a path system and interpretive exhibits), a passive wildlife observation park with a path system and other features, an archeological park with a path system and interpretive exhibits, a cultural heritage or diversity park, a military veterans memorial park, and / or public art park. All such parks should provide substantial recreational utility along with their educational features.
C. Special Needs Recreation Area. A Special Needs Recreation Area could be developed to provide recreation opportunities for physically challenged members of the community. One example is Pima County's Feliz Paseos Universal Access Open Space and Trails Park, which, when complete, will include an accessible trail system and interpretive exhibits, along with other features.
D. Expanded Capacity Recreation Area. This category of recreation would address unmet needs for expanded hours at an existing or new recreation facility or facilities. Examples might include the construction of an indoor or sun-shielded active recreation area (such as a basketball facility under a ramada-type structure), lighting of amenities such as ball fields, and other similar enhancements that dramatically increase the availability of facilities to the public.
E. Other Opportunities. Pima County recognizes that new and unique types of recreation facilities may be created as time passes, such as technology parks, and is willing to consider proposals that suggest alternative kinds of recreation facilities that may significantly benefit the community and its quality of life. Such proposals must provide value that is either equivalent or greater than the value of the standard requirement.

3.5.3 Park and Recreation Needs Assessment

Measuring demand for parks and recreation involves several factors. The desire on behalf of existing residents to recreate is affected by such factors as access, convenience, weather and temperature, seasonality of a particular activity, or the availability of a particular activity at a local / regional park site. The needs assessment is based upon the following:

- An estimate of current population and its demand for park facilities
- An estimate of the build-out population based on three build-out scenarios and the past average annual growth rate projected over time
- Input from Pima County Natural Resources, Park and Recreation Department staff

Population figures are an important tool for planning recreation facilities and programs. With steady growth in the Tucson area, it is especially important to identify demographic trends so as to seek to ensure the needs of current and future residents are met. According to figures compiled by the US Census Bureau, the 2000 population for the census tracts associated with the study area was 62,650 persons.

It should be noted that the outside limits of the census tract boundaries extend well beyond the study area boundary and a portion of tract 4417 does include a developed area within Tucson's city limits. As a result, census-derived statistics are best seen as general indicators of what is actually transpiring within the SWIP study area itself.

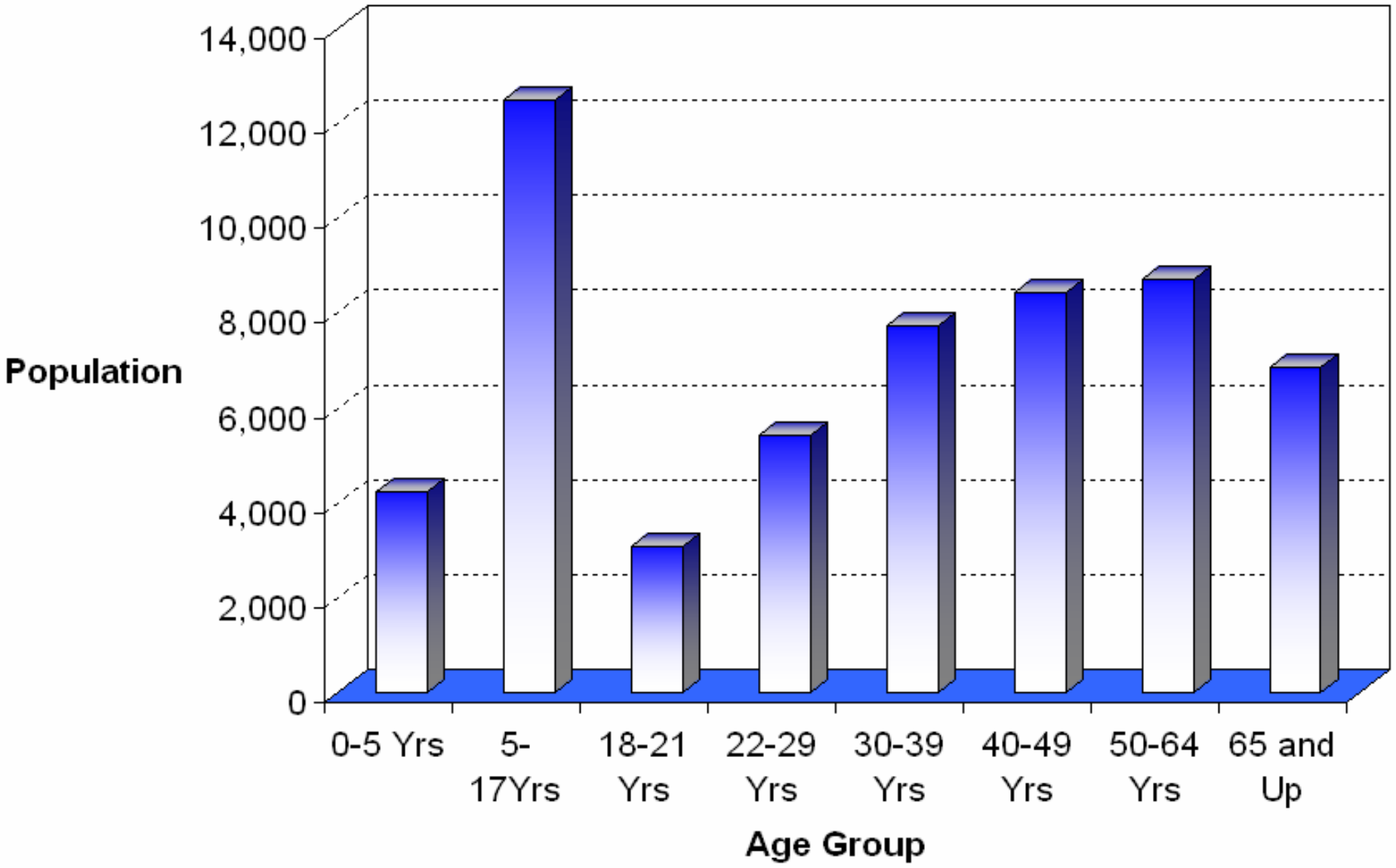
The census data indicates the population increased to 69,973 persons in 2004. This represents an average annual growth rate over the period of 2.9 percent. Table PR-2 identifies the population figures and characteristics by census tract. Map PR-5 and Map PR-6 illustrate the 2004 population per square mile and the concentration of children ages 0-17 in the year 2000 overlaid by census tracts.

Table PR-2 reveals an overall four year average growth rate of 11.6 percent for the census tracts in question. This would not correlate to an equivalent 11.6 percent growth rate in the SWIP area, but does illustrate the growth which is occurring in the vicinity of the area under consideration. There is a variety of population growth rates between census tracts. The four-year rates translate into an average annual growth rate of approximately 1.2 percent to a high of 6.42 percent (excluding the census tract that experienced a decline in population over the time period). The most significant growth occurred in tracts 2605 and 4321 possibly due to the development of a large subdivision or planned development during this time frame since the tract area is comparatively small. These census tracts plus tracts 4312, 4322 and 4311 reflect significant residential development and few vacant parcels. The amount of children, ages 0-17 within these tracts, accounts for approximately 26.6 percent of the total population. Although the total census population does not match the exact current SWIP population, it is suggested that these figures are relevant to the general needs assessment discussion.

To further understand the demographics of the population within the study area, Figure PR-3 identifies the 2000 population by age group. What is evident is that the 5-17 age cohort represents a significantly higher proportion of the total population than the other age cohorts.

Table PR-2 Population and Population Characteristics by Census Tract

Census Tract	*2000 Population*	*2004 Population*	*% Change 2000 to 2004*	*2004 Population per Square Mile*	*Children 0-17 Years (2000)*	*Households (2000)*	*Household Size (2000)*	*Nearest Park Site*
4410	8,214	9145	11.3	65.5	2,293	2,968	2.77	Tucson Mountain Park
4417	8,035	9465	17.7	153.8	1,648	3,231	2.48	Tucson Mountain Park
4404	2,981	3085	3.4	2,142.3	76	1,734	1.72	Tucson Mountain Park
4310	1,234	1187	-3.8	321.7	305	488	2.53	Robles Pass
4319	4,142	4532	9.4	214.5	1,489	1,226	3.38	Vesey, Star, Branding Iron
4311	3,634	3873	6.5	913.4	975	1,186	3.06	Manzanita
4312	5,899	6338	7.4	3,122.1	1,848	1,911	3.08	Manzanita
940900	2,053	2188	6.5	19.6	672	616	3.32	Tohono O'odham
4322	5,132	5633	9.7	2,761.3	1,783	1,536	3.33	Ebonee Marie
4321	3,735	4607	23.3	4,346.2	1,237	1,132	3.28	Mission Ridge
4320	2,771	2932	5.8	852.2	966	842	3.29	Lawrence District
5100	3,315	3680	11.0	1,621.0	1,541	745	4.44	Pascua Yaqui
2605	5,873	7386	25.7	3,312.1	1,897	1,924	2.98	Manzanita
2505	5,632	5922	5.1	6,300.0	1,948	1,884	2.99	Manzanita
Totals	**62,650**	**69,973**	**11.6**		**18,678**	**21,423**		



Pima County Public Works
Southwest Infrastructure Plan

Figure No.
PR-3

Title
Census Tract Demographics

The study area population does not reflect the standard bell curve distribution with the highest concentration of population in the mid-point age groups. Combining the three youngest age groups reveals that the study area's youth (persons 21 and under) make up 1 of every 3 persons. The proportion of the population under 21 years of age is 34.8 percent of the total population, a ratio which exceeds the Pima County figure (30.9 percent). The retired population, ages 65 and up, represents a slightly smaller percentage of the total population in the study area when compared to Pima County's retired population (12.0 percent versus 14.3 percent). In short, there were proportionately more youth and fewer retirees residing in the study area in 2000 than in Pima County as a whole.

Map PR-5 illustrates the population per square mile. As expected, the east side of the study area contains the highest concentration of residents, as compared to the largely undeveloped west side. However, when you examine Maps PR-5 and PR-6 side by side, it becomes evident that some of the more densely populated tracts in terms of persons per square mile are not populated with children ages 0-17. Tract 4404 on the north side of Kinney Road is one of the denser census tracts with a population ranging between 913 – 2,761 persons per square mile; but it falls into the lowest population interval with only 76 children ages 0-17. The median age of the population residing in tract 4404 is 70.7 years. However, the opposite is true of census tract 4410: it contains the lowest population density of 65.5 persons per square mile but the highest number of children ages 0-17 of all tracts within the study area. This localized demographic information will be important when considering the appropriate locations for new parks to serve existing and future development.

In order to estimate population in 2007 for the study area, we used the Pima County Assessor's data for residential dwellings and the PAG estimate of 2.77 persons per household (PPH). According to this information, there are approximately 17,250 residential units within the study area.[2] Using PAG's PPH figure, the estimated population within the study area in 2007 is approximately 47,782 persons.

One measure of how well a parks department performs in providing developed park sites for the community is by a park land standard. A standard is the minimum acceptable spatial allocation that has been demonstrated to adequately meet customer needs and preferences. Park and recreation planning was historically based on the practice of communities adopting a uniform national standard of 10 acres of park land per 1,000 population. "This was held to be the goal every community should strive for to have an exemplary park and recreation system."[3] A standard, however, should reflect a community's needs. To assess need, a community needs to conduct resident surveys to accurately gauge participation rates and interest levels in recreation activities. Participation rates and interest levels are used to develop an appropriate park land and recreation amenity standard for a community.

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[2] This number does not include residential units located within the Tohono O'odham Nation or Pascua Yaqui Tribal lands. Exact information is not available on the number of units located at a particular multiple residence location. For purposes of this study, we assumed 100 units at each location.

[3] Mertes, James D., *Parks, Recreation, Open Space and Greenway Guidelines* (1996).

In 2003, Pima County Natural Resources, Parks and Recreation staff adopted the Recreation Area Design Manual to establish park and recreation design standards for new park construction and dedication requirements. Residential developers are required to construct park sites in conjunction with the subdivisions in an amount of land area and amenities based on the number residential units approved for development. Pima County currently requires a minimum of 871 square feet of constructed park land per residential unit for all new construction.[4] This figure translates into a park dedication standard of 8 acres per 1,000 population. To understand the equivalence of 871 square feet per dwelling to approximately 8 acres per 1,000 population, the following conversion equation is presented:

$$\frac{871 \text{ sq.ft.}}{\text{Household}} \times \frac{1 \text{ Household}}{2.77 \text{ People}} \times \frac{1 \text{ Acre}}{43{,}560 \text{ sq.ft.}} = 0.00721 \text{ Acre / People} = 7.21 \text{ Acres / 1,000 People}$$

Based on the 2007 population estimate of 47,782 from existing residential dwelling units multiplied by a park land standard of 8 acres per 1,000 population, the number of acres of developed park land required to satisfy the recreation needs of existing residents is 382.2 acres. According to the park and recreation inventory included in Table PR-1, the seven developed park sites total 113.8 acres. This amount translates into an estimate of 1.13 acres per 1,000 population; significantly lower than the 8-acre standard per 1,000 population. The difference between current developed park land and the County's goal is a shortfall of 268 acres of developed park land. The shortfall is more than twice the amount of current developed park acreage. The difference between existing and needed park land is due to the fact the Recreation Area Demand Manual was not adopted until 2003. Until the document was approved by the Board of Supervisors, residential development was permitted without dedicating park land or constructing physical park improvements. A current shortfall of this magnitude can be appreciated when compared to the County's park area requirements: 268 acres equals the total of 26 neighborhood parks, or six community parks, or three district parks or two regional parks.

The Recreation Area Design Manual also identifies park service area standards. According to the definition on Page 26, "a 'service-area' is the region that is typically served by a recreation area of a given size." Service areas are generally considered guidelines and not strict standards. Map PR-4, Park Service Area Boundaries, illustrates how the existing supply of neighborhood, district and regional parks is distributed throughout the study area. Ideally, park service radii would overlap and no residential areas would be outside a service radius. The service area of the four types of parks within Pima County recreation system is: neighborhood parks, ¼ - ½ mile radius; community parks, 1-2 mile radius; District parks, 2.5 mile radius; and regional parks, 7 mile radius. Map PR-4 shows that the majority of the study area currently lacks service from one or more of the types of parks within the recreation system.

Neighborhood parks over an acre in size provide park and recreation amenities to a population living within a 0.5 mile radius. Based on this service area radius, a neighborhood park is necessary for nearly every concentrated area of residential development, particularly

[4] Pima County Natural Resources, Parks and Recreation Department, *Recreation Area Design Manual* (2003).

subdivisions with small lot sizes. There are many areas that lack this type of recreation amenity and it is visually apparent that a large portion of the 268 acre shortfall in current park land could be made up with the addition of 26 neighborhood park sites.

The residential areas south of Ajo Highway are generally served by Lawrence District Park, which has a 2.5 miles service radius. The area north of Ajo Highway lacks both neighborhood parks and a district park within their service area. A portion of the residential development north of Ajo Highway is served by Manzanita District Park. Residents west of San Joaquin Road generally have to drive several miles to the closest neighborhood or district park site. Residents living north of Ajo Highway and in the more undeveloped western portion of the study area are included in the 7-mile service radius of Tucson Mountain Park.

3.5.4 Future Park Needs Based on Build Out Assumptions

The demand for future park and recreation facilities will depend on the population growth rates for the study area over the next 20 to 50 years. Table PR-2 provides the total growth rates by census tracts between the years 2001 and 2004. Growth in the Tucson area has been steady and there is no indication that trend will change in the near future. Table PR-3 examines the potential shortfall in park land acreages based on our estimate of current population as well as the potential future population based on three assumptions of residential density provided by Pima County. Assuming the land use plan with the mid-range residential dwelling unit per acre figure is adopted by the Pima County Board of Supervisors, the amount of required park land would total approximately 1,220.7 acres. The park land deficiency, assuming no parks are added, would total approximately 1,107 acres. The land use density assumptions greatly impact the amount of park land that will be needed as development within the study area continues. Map PR-7, Residential Density Allocation Model, illustrates the land use densities under the mid-range assumption.

Vacant private land within the study area totals approximately 9,828 acres. The average size of a vacant, private parcel is 1.9 acres; however, there are 33 vacant private parcels with acreages over 50 acres and 13 parcels over 100 acres in size. Large vacant parcels are predominately located in the western portion of the study area. Two of these larger parcels are currently in process seeking approval of a planned unit development on the south side of Valencia Road. Numerous smaller vacant parcels are scattered throughout developed parcels.

There are also significant public land holdings that could be either be sold under public auction to private interests or sold to public entities for identified facilities and infrastructure to serve the area and / or region. Specific public parcels have been identified as future park sites for the purpose of meeting the projected park and recreation demand based on planned growth. All of the subject parcels are owned by the federal government.

Average annual growth varied widely between tracts but the average annual rate overall was 2.9 percent. If we apply the 2.9 percent average annual growth rate to the three population estimates based on Pima County's land use build-out assumptions, the low estimate of future residential dwelling units would build-out between years 2036 and 2037. If the mid-range land use plan were implemented, the build-out scenario would occur in between the years 2047 and

Table PR-3 Park Land Demand for Current and Build-Out Assumptions

Scenario	Total Dwelling Units	Population Estimate	Park Land Acreage Demand	Shortfall of Park Land Acreage
Current Development (2007)	17,250	47,782	382.2	-268.5
Lower Density Scenario	39,559	109,578	876.6	-762.8
Medium Density Scenario	55,088	152,593	1,220.7	-1,106.9
Higher Density Scenario	70,613	195,598	1,564.8	-1,451.0

Notes

Population estimated based on 2.77 persons per household. Park need calculated at 8 acres per 1,000 population. Shortfall of park land acreage at build-out assumes no additional parks are developed

Pima County Public Works
Southwest Infrastructure Plan

Table No.
PR-3

Title
Park Land Demand for Current and Build-Out Assumptions

2048. The high-range land use plan would realize a build-out scenario in approximately 50 years. Table PR-4 lists the build-out population in five year increments based on an average annual growth rate of 2.9 percent over the time period, the projected shortfall in park land based on the Pima County dedication standard and assuming no new parks are constructed.

3.5.5 Recommended Improvements and Costs per Dwelling Unit

The existing public resources throughout the study area offer numerous possibilities for improving the current deficiency in the number of developed park sites. As shown in Table PR-4, the current shortfall is approximately 268 acres. The real need is for additional neighborhood park sites to serve existing residential neighborhoods and for more district parks that offer more active recreation facilities e.g., lighted ball fields and soccer fields. An effort was made to identify 10-acre publicly owned parcels throughout existing residential areas to address the service area gaps for neighborhood parks. Parcels owned by the federal government were targeted to satisfy existing and future park and recreation service demands.

Map PR-7, Residential Density Allocation Model, illustrates the mid-range assumption for residential dwelling units per acre for all parcels within the study area. The Pima County Department of Development Services provided a land use model for the study area that included three land use density alternatives. For planning purposes, all three alternatives and their impact on the demand for park acreage, are shown in Table PR-5. Table PR-5 identifies the current residential development and the future estimates of dwelling units based on a low range, a mid range and a high range density assumption. These assumptions were applied predominately to vacant residential parcels. A majority of the existing residential development will remain at its current developed densities of 0.6 dwelling units per acre.

Table PR-5 allocates the costs for park improvements to the potential dwelling unit count based on the land use assumption. The cost figure per dwelling unit assumes a development cost, excluding land acquisition, of $100,000 per acre. This figure was provided by Pima County Department of Natural Resources, Parks and Recreation. This number is a rough estimate for planning purposes only. It is difficult to estimate park construction costs because the types of improvements in each park vary significantly. In general, district parks cost more than neighborhood parks, and neighborhood parks cost more than park sites left in a natural setting augmented only by trail systems and parking areas. For this reason, an alternate cost of $150,000 per acre has been added to Tables PR-5 and PR-6 for comparative purposes. The higher development cost per acre is more representative of the park construction costs in Pima County. An alternate per dwelling unit figure has been provided. The alternative number assumes all developed parcels and future development share equally in the financial costs of constructing needed park sites. The alternate dwelling unit figures reflect the two cost options for park construction.

It is noted that the Star Valley Phase 2 project will likely be funded with developer contributions.

Map PR-8, Existing and Proposed Park Sites, illustrates the recommended locations for acquiring public land for the purposes of developing additional neighborhood, district and regional park sites. A total of five neighborhood park sites have been identified, all south of Ajo

Table PR-4 Park Land Acreage Shortfall Based on Population Estimates, 2007 - 2055

Year	*Residential Dwelling Units*	*Population Estimate*	*Shortfall of Park Land Acreage*
2007	17,250	47,782	-269
2010	18,974	52,061	-303
2015	21,682	60,060	-367
2020	25,014	69,289	-441
2025	28,858	79,936	-526
2030	33,292	92,218	-624
2035	38,407	106,389	-737
2040	44,309	122,736	-868
2045	51,117	141,595	-1,019
2050	58,972	163,352	-1,193
2055	68,033	188,453	-1,384

Table PR-5 Per Dwelling Unit Costs Based on Land Use Assumptions

Scenario	Dwelling Units[1]	Park Acreage[2]	Park Improvement Costs @$100K/ac Per DU	Park Improvement Costs @$150K/ac Per DU	Alternative Per DU Cost[3] @ $100k per acre	Alternative Per DU Cost[3] @ $150k per acre
Current	17,250	268.5	$1,557	$2,335	$1,557	$2,335
Future Lower Density Range	39,559	494.3	$1,250	$1,874	$1,928	$2,892
Future Medium Range	55,088	838.4	$1,522	$2,283	$2,009	$3,014
Future Higher Density Range	70,613	1182.5	$1,675	$2,512	$2,056	$3,084

Notes

1 - Dwelling unit figures represent existing residential units based on Pima County Assessor's data; future unit figures represent new units at build-out and do not include existing units
2 - Park land demand figures reflect assumption current development (existing residents) will be financially responsible for the cost of eliminating existing park acreage deficiencies. Park land demand figures for the build-out scenarios reflect the adopted standard of 8 ac per 1,000 residents
3 - The per unit cost for park improvements is shared equally among existing and future residents; the amount varies depending on the future land use scenario adopted. Total dwelling unit figures identified in Table PR-3

Table PR-6 Estimated Costs for Additional Park Facilities

Park Name	*Facility Type*	*Map Label*	*Park Type*	*Size (acres)*	*Estimated Cost @ $100k per acre*	*Estimated Cost @ $150k per acre*	*Average Planning and Design Costs (15%)*	*Year*	*Average Construction Costs (85%)*	*Year*
Star Valley Phase 2*	New Facility	P5	District	16	$1,600,000	$2,400,000	$300,000	2009	$1,700,000	2010
To Be Determined	Proposed Park	P7	District	52	$5,186,000	$7,778,000	$972,300	2010	$5,509,700	2011
Ryan Park	In Discussion	P8	District	77	$7,739,000	$11,608,000	$1,451,025	2011	$8,222,475	2012
Tucson Mountain Park	New Facility	P9	District	83	$8,263,000	$12,394,000	$1,549,275	2012	$8,779,225	2013
Tucson Mountain Park Expansion**	Proposed Expansion	P12	Regional	944	$4,720,000	$9,440,000	$1,062,000	2012	$6,018,000	2013
Manzanita Park	Proposed Expansion	P6	District	18	$1,829,000	$2,743,000	$342,900	2014	$1,943,100	2015
Portion of BLM Parcel	New Facility	P3	Neighborhood	17	$1,665,000	$2,498,000	$312,225	2017	$1,769,275	2018
To Be Determined	New Facility	P10	District	240	$24,005,000	$36,007,000	$4,500,900	2021	$25,505,100	2022
Portion of Planned Detention Area	New Facility	P4	Neighborhood	21	$2,122,000	$3,183,000	$397,875	2025	$2,254,625	2026
Saginaw Hill**	New Facility	P11	Regional	529	$2,646,000	$5,293,000	$595,425	2027	$3,374,075	2028
To Be Determined	New Facility	P2	Neighborhood	13	$1,287,000	$1,930,000	$241,275	2029	$1,367,225	2030
To Be Determined	New Facility	P1	Neighborhood	10	$998,000	$1,497,000	$187,125	2031	$1,060,375	2032
Totals				2,020	$62,060,000	$96,771,000	$11,912,325		$67,503,175	

Notes

Land acquisition costs are not included

* Estimated costs may be developer funded

** Estimated costs for the two Regional Parks have been reduced to $5,000 and $10,000 per acre

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Table No.
PR-6

Title
Estimated Phased Costs for Additional Park Facilities

Highway to serve existing residential uses. One of the sites, east of Valhalla Road, is also proposed for a regional flood control facility. Due to the intensity of existing residential uses in the immediate area, a neighborhood park should also be incorporated into the design of any flood control improvements slated for this area. The site is part of an existed platted subdivision that has not been developed and will be dedicated back to Pima County. Another neighborhood park site should be created from a small portion of the property referred to as the "Saginaw Hill" site. Other than Vesey Park and Lawrence District Park, there are no recreation amenities to serve existing residents living in the area of Mark Road, Valencia Road, Irvington Road and Cardinal Avenue.

Locating potential neighborhood park sites north of Ajo Highway proved more challenging. There are a few parcels owned by the federal government, but they are not located in areas that would serve existing residential uses well. One large public parcel that could be acquired for a park site north of Ajo Highway is located off of San Joaquin Road, approximately two miles west of existing residential. The parcel size dictates that it be designated as a future district park.

District parks offer greater numbers of amenities than neighborhood parks as well as athletic fields, and possibly community swimming pools. A total of six (6) publicly owned sites have been identified for future district parks. Saginaw Hill is included as a future regional park site. Since there are environmental issues associated with this parcel, future development as a regional park is considered possible, but not likely in the near term. A 944-acre expansion to Tucson Mountain Regional Park is also planned. The proposed parks are shown on Map PR-8.

The parks included on Map PR-8 total 2,020 acres; however approximately 1,440 acres of the total identified sites are for the two regional parks. Current park demand based on the existing population is 268 acres which could be satisfied by any number of the sites identified on Map PR-8. The demand for parks to accommodate future growth, based on the mid-range dwelling unit per acre assumption, totals 838 acres. The neighborhood and district park sites identified on Map PR-8 and Table PR-6 total 547 acres. Development of all these sites will address the park and recreation needs of the planned growth since the standard adopted by Pima County includes regional park land acreage. Concurrent with Pima County acquiring these parcels from the federal government, park land deficiencies can also be addressed as new development continues. Major projects are planned in the study area and every effort should be made to incorporate larger park sites that include athletic fields, particularly lighted facilities in order to extend usage, in addition to the family oriented play areas and picnic ramadas. The adopted Recreation Area Design Manual provides excellent guidelines to ensure that new development provides its fair share of park and recreation resources to help offset existing deficiencies and fund facilities in existing parks identified by staff and discussed in this report.

3.5.6 Phasing of Park Improvements and Costs

Table PR-6 also contains the currently anticipated phasing of the recommended parks and recreation improvements, as well as the apportionment of total costs into planning / design and construction phases. The improvements are sorted in order of their anticipated year of construction.

3.6 TRANSPORTATION

3.6.1 Special Planning Area

The area near the Ajo Road / Valencia Road intersection is currently the subject of intense planning pressure. Two major development projects are proposed here, and both require amendment to the Pima County Comprehensive Plan. Tucson Airport Authority proposes changes to nearby Ryan Field's master plan. A revised plan could have a direct impact on the types of land uses compatible with current and future airport uses. For example, airfield operations on a new crosswind runway could cause Ajo Highway to be shifted to the south. The amount and location of the shift, if any, would have an effect on the private developments' opportunities and constraints. TAA proposes to amend its master plan in the near future and is working with the developers, ADOT, and Pima County on that plan.

Realignment of Ajo Highway is not likely to appreciably increase construction costs beyond the costs of improving it in-place. This is because the existing two-lane facility has little apparent value in reconstructing the corridor from a two-lane rural route to an urban multi-lane state highway. The current right-of-way could be exchanged for new right-of-way for a future realignment. Due to the uncertainty of the future development in this area and the nominal impact on roadway reconstruction costs, it is designated a Special Planning Area in this study. Continuing coordination between the private parties and public agencies will likely continue beyond the completion of this study. The results will be reflected in Pima County's Comprehensive Plan update for the Southwest Area.

3.6.2 Recommended Transportation Projects

The following section describes the recommended projects that will increase motor vehicle capacity on roadways within and through the project area. These projects are not included in existing plans or programs, and funding for these improvements has not been identified in any other planning document.

The projects listed in Table TR-4, shown in Map TR-3 and described below will provide for additional east-west lanes and additional lanes for north-south travel. The addition of these projects will not meet the expected needs for a fully built-out area based on the existing developable area.

1 - SR 86: Upgrading to a Higher Classification Roadway.

Although Valencia Road has been projected to be a more essential east-west roadway in the project area in previous transportation planning studies, SR 86 will operate more efficiently than Valencia Road in the future if limited access considerations are included in its future design. The SWIP recommends that SR 86 be upgraded to an Urban Principal Arterial FHWA classification, and that it eventually have a six-lane cross section with a limited number of driveways and access points between Sandario Road and Mission Road. Because there is much committed development on Valencia Road, it would be difficult to upgrade Valencia Road to a similar functional classification and this is why SR 86 is recommended for this classification.

Table TR-4 Recommended Transportation Projects

Map I.D.	Project Description	Project Length (miles)	No. of Lanes	Added Lane Miles	Estimated Total Costs
n / a	Current Projects Requiring Additional Funding				$80,041,000
1	a) Ajo Highway - Widen two additional lanes[1]	14.50	2	29	$57,420,000
	b) Ajo Highway - Three grade separations at locations to be determined	N/A		N/A	$60,000,000
2	Camino de Oeste - New 2-lane connection to Kinney Road (Wal-Mart)	1.00	4	4	$7,920,000
3	Joseph Road / Mark Road - Widen to 4 lanes from Ajo Highway to Los Reales	3.70	4	14.8	$29,304,000
4	Irvington Road - Extension and widening; Ajo Highway to Mission Road (4 lanes)	4.00	4	16	$40,000,000
5	Drexel Road - Extension and widening; Ajo Highway to Mission Road (4 lanes)	7.00	4	28	$60,000,000
6	Valhalla Road - Extension from Valencia Road to Drexel Road (2 lanes)	1.00	2	2	$3,960,000
7	Valencia Road - Widen to 6 lanes from Ajo Highway to Mark Road[2]	5.75	4	23	$45,540,000
8	San Joaquin Road - Extension south of Ajo Highway to Los Reales (4 lanes)	3.80	4	15.2	$30,096,000
9	San Joaquin Road - Widen to 4 lanes from Ajo Highway north to Sandario	7.30	4	29.2	$57,816,000
10	Los Reales - Construct 4-lane arterial from San Joaquin to I-19	6.10	4	24.4	$48,312,000
11	Public Transit Service - Capital Costs	N/A		N/A	$19,063,000
12	Travel Demand Management Program - 4 Carpool Lots at Locations to be Determined	N/A		N/A	$5,200,000
13	a) Interchange I-19 at Drexel[3]	N/A		N/A	$10,000,000
	b) Interchange I-19 at Los Reales[3]	N/A		N/A	$10,000,000
	c) Interchange Auxiliary Lanes / Capacity	5.25	2	10.5	$20,790,000
	Totals	**59.40**		**196.1**	**$585,462,000**

Average Total Project Cost per Lane Mile	**$1,980,000**
New EDUs in Benefit Area	**28,699**
Estimated Costs Per EDU	**$20,400**

Notes

1 - Propose 6 lane parkway from Sandario Road to Kinney and 8 lanes from Kinney to I-19. Ajo Highway data assumes that ADOT is funding construction of all other Ajo Highway improvements and these costs do not need to be included in this tabular summary

2 - Calculation for Project No. 7 on Valencia Road assumes that roadway will widen from 4 lanes to 6 lanes and that only 2 new lanes will be constructed. Calculations for all other projects assume that the entire new roadway will be constructed

3 - Assumes $40M for each interchange with a 25% cost allocation to the SWIP area

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Table No.
TR-4

Title
Recommended Transportation Projects

Table TR-4 separates this recommended improvement into two components; 1 a) is the widening and upgrading to a higher classification and 1 b) estimates the provision of three grade separations on SR 86 to limit access to and from this roadway.

2- Camino de Oeste to Kinney Road: New Road north of SR 86)

This connection was originally considered when a large retail development on the northwest corner of SR 86 / Kinney Road was proposed. This roadway would provide direct access from a new intersection on Kinney Road, north of SR 86 to the intersection of SR 86 / Camino de Oeste which is about ½ mile east of Kinney Road. The new intersection on Kinney Road would provide direct access to the retail development on the west side of Kinney Road. This new connection would reduce projected traffic congestion at the SR 86 / Kinney Road intersection and would connect through an area zoned for commercial uses. A study would need to determine whether it should be a two or four lane road.

3 - Joseph Road / Mark Road: Widen to 4 Lanes from SR 86 to Los Reales Road

These connections would provide a continuous route from Kinney Road north of SR 86 to Los Reales Road. Kinney Road would need to be realigned on its approach to Irvington Road to connect with Joseph Road which continues south to its connection with Mark Road. This north-south route would provide access to the expanded east-west corridors along SR 86, Irvington Road, Drexel Road and Valencia Road.

4 - Irvington Road Extension and Widening to 4 Lanes: SR 86 to Mission Road

This connection would complete a connection from SR 86 to Irvington and would provide access to residential areas within the study area and allow for another east-west connection to I-10. The road would be a four-lane facility.

5 - Drexel Road Widening and Extension: SR 86 to Mission Road

This connection would provide another east-west access through the project that could ultimately provide access to I-19 via a new traffic interchange. This connection would require a location report to establish the best route in order to minimize impacts to the surrounding topography as there are several hills along the current projected alignment. Right of way for this project should allow for a four-lane roadway.

6 - Valhalla Road Extension: Valencia Road to Drexel Road

This would be a new north-south connection which would provide access from projected residential uses to either Drexel Road or Valencia Road. Because this would be in the vicinity of a high level of development, it would provide a “relief valve” for traffic on Valencia Road as it would connect to Drexel Road.

7 - Valencia Road: Widen to 6 Lanes from SR 86 to Mark Road

Current plans and programs have Valencia Road as a six-lane road from Mark Road to the east. Because of the potential development activity in the project area, Valencia Road may need to be widened to six lanes west of Mark Road through to its connection with SR 86. Although Valencia Road has been envisioned as a "parkway" which would constrain direct access onto Valencia Road, it may be difficult to reclassify this roadway due to the number of committed developments requiring specific access locations onto Valencia Road. However, the amount of developable land in the vicinity of the intersection of Valencia Road and SR 86 would seem to require the consideration of Valencia Road to a six lane facility beginning at SR 86 and continuing east.

8 - San Joaquin Extension South of SR 86 to Los Reales Road

This connection would directly connect the Star Valley master planned community area south of Valencia Road to SR 86. The alignment would be from the current Wade Road to north of Irvington Road. This connection would be a four-lane facility which would serve the Star Valley area.

9 - San Joaquin Road: Widen to 4 Lanes from SR 86 north to Sandario Road

This connection would provide access to Sandario Road from SR 86 along a northwest / southeast alignment. This alignment would enhance the corridor from northwest Pima County and the Town of Marana to the project area, and would also act as a bypass route to I-10 for travelers wishing to avoid travel on the freeway through the downtown area. Drivers traveling south on this route could access I-19 following a turn onto SR 86, or could continue south on the San Joaquin Road extension (see project #8) to connect to I-19 via Drexel Road or Valencia Road.

10 - Los Reales Road Extension from Current Terminus near Camino Verde to I-19

Los Reales Road would be widened to a four lane road. This project would go through a section of the Pascua Yaqui Nation jurisdictional area. This connection would make complete a continuous corridor from Sandario Road to San Joaquin Road to Wade Road and then Los Reales Road.

11 – Public Transit Service – Capital Costs

New routes provided in the SWIP area would connect to existing transit service within the Sun Tran area. Facilities for the necessary storage and maintenance of the rolling stock would also be required. These services and projects would be planned and programmed by the City of Tucson's SunTran program. Partial funding would be generated by the SWIP's transit element and transferred to the City of Tucson through an intergovernmental agreement.

12- Travel Demand Management Program – 4 Carpool Lots at Locations to be Determined

Four lots for park-and-ride and carpool uses would be constructed at locations to be determined. The lots would each have 200 parking spaces and could be implemented as part of roadway projects.

13 – I-19 Traffic Interchanges (Drexel and Los Reales)

New traffic interchanges would be constructed on I-19 for new connections at Drexel Road and Los Reales Road. Additionally, capacity and access improvements would be added on I-19, such as auxiliary lanes. Tables TR-4 separates these into three projects labeled 13 a), 13 b) and 13 c).

3.6.3 Project Phasing

Growth in the study area will need to have new and expanded arterial roadways to carry traffic to activity centers in the urban area as well as within the SWIP area. Capacity projects include widening current routes, building new routes, and improving intersections of arterial roadways.

The recommended transportation projects can be implemented in a prototypical seven year development cycle. This is in addition to the planning process, which can take three or more years. The first two years of the cycle are for planning and route location, and are assigned 5% of the total project cost. The third through fifth years are for project design, permitting, and clearances, and are assigned 15% of project costs. The final two years are for construction, using 80% of project capital costs. Therefore, for a project that needs to be in-place at 2020, the cycle would begin no later than 2013. Table TR-5 provides a phasing plan for the implementation of the recommended transportation projects. Note that the projects from TR-4 have been re-ordered in Table TR-5 by their anticipated finish years.

Table TR-5 Phasing Plan for Transportation Projects (Ordered by Finish Year)

Map I.D.	Project Description	Estimated Total Costs	Planning Cost (5%)	Start Year	Design Cost (15%)	Start Year	Construction Cost (80%)	Start Year	Finish Year
2	Camino de Oeste - New 2-lane connection to Kinney Road (Wal-Mart)	$7,920,000	$396,000	2008	$1,188,000	2010	$6,336,000	2013	2015
3	Joseph Road / Mark Road - Widen to 4 lanes from Ajo Highway to Los Reales	$29,304,000	$1,465,200	2010	$4,395,600	2012	$23,443,200	2015	2017
6	Valhalla Road - Extension from Valencia Road to Drexel Road (2 lanes)	$3,960,000	$198,000	2010	$594,000	2012	$3,168,000	2015	2017
8	San Joaquin Road - Extension south of Ajo Highway to Los Reales (4 lanes)	$30,096,000	$1,504,800	2010	$4,514,400	2012	$24,076,800	2015	2017
4	Irvington Road - Extension and widening; Ajo Highway to Mission Road (4 lanes)	$40,000,000	$2,000,000	2015	$6,000,000	2017	$32,000,000	2020	2022
5	Drexel Road - Extension and widening; Ajo Highway to Mission Road (4 lanes)	$60,000,000	$3,000,000	2015	$9,000,000	2017	$48,000,000	2020	2022
7	Valencia Road - Widen to 6 lanes from Ajo Highway to Mark Road[2]	$45,540,000	$2,277,000	2015	$6,831,000	2017	$36,432,000	2020	2022
9	San Joaquin Road - Widen to 4 lanes from Ajo Highway north to Sandario	$57,816,000	$2,890,800	2015	$8,672,400	2017	$46,252,800	2020	2022
11	Public Transit Service - Capital Costs	$19,063,000	$953,150	2015	$2,859,450	2017	$15,250,400	2020	2022
12	Travel Demand Management Program - 4 Carpool Lots at Locations to be Determined	$5,200,000	$260,000	2015	$780,000	2017	$4,160,000	2020	2022
13	a) Interchange I-19 at Drexel[3]	$10,000,000	$500,000	2015	$1,500,000	2017	$8,000,000	2020	2022
	c) Interchange Auxiliary Lanes / Capacity	$20,790,000	$1,039,500	2015	$3,118,500	2017	$16,632,000	2020	2022
	b) Interchange I-19 at Los Reales[3]	$10,000,000	$500,000	2020	$1,500,000	2022	$8,000,000	2025	2027
1	a) Ajo Highway - Widen two additional lanes[1]	$57,420,000	$2,871,000	2020	$8,613,000	2022	$45,936,000	2025	2027
	b) Ajo Highway - Three grade separations at locations to be determined	$60,000,000	$3,000,000	2020	$9,000,000	2022	$48,000,000	2025	2027
10	Los Reales - Construct 4-lane arterial from San Joaquin to I-19	$48,312,000	$2,415,600	2020	$7,246,800	2022	$38,649,600	2025	2027
n / a	Current Projects Requiring Additional Funding	$80,041,000	Costs Evenly Distributed from 2010 to 2029						2029
	Totals	**$585,462,000**	**$25,271,050**		**$75,813,150**		**$404,336,800**		

Average Total Project Cost per Lane Mile	**$1,980,000**
New EDUs in Benefit Area	**28,699**
Estimated Costs Per EDU	**$20,400**

Notes

1 - Propose 6 lane parkway from Sandario Road to Kinney and 8 lanes from Kinney to I-19. Ajo Highway data assumes that ADOT is funding construction of all other Ajo Highway improvements and these costs do not need to be included in this tabular summary

2 - Calculation for Project No. 7 on Valencia Road assumes that roadway will widen from 4 lanes to 6 lanes and that only 2 new lanes will be constructed. Calculations for all other projects assume that the entire new roadway will be constructed

3 - Assumes $40M for each interchange with a 25% cost allocation to the SWIP area

Pima County Public Works
Southwest Infrastructure Plan

Table No.
TR-5

Title
Phasing Plan for Transportation Projects

3.7 OTHER SERVICES

As possible, other service providers in the SWIP area provided their currently anticipated future servicing plans. These plans are continuously evolving, and are provided for general information purposes. Changing contextual conditions, development patterns and timelines, customer preferences, governmental and regulatory processes, and funding availability (among other variables) may considerably alter the plans as described below.

3.7.1 Future Plans for Other Services

Fire Districts:

Drexel Heights: A new facility located within Block 14 of Star Valley, near Wade and Los Reales, is currently in the engineering phase of development. It would be desired by the District if a station could be located within the Pomegranate development along West Valencia Road. This would be dependent upon the population growth within the area.

Three Points: The Fire District owns approximately 5.69 acres located at the northwest corner of West Ajo Highway and Sandario Road, which will be developed by the District if the population growth justifies. A 29.67-acre site located in the northeast corner of West Ajo Highway and Sandario Road, currently owned by the Arizona Board of Regents, may also be considered a potential future site within the five to ten year plan.

Pima County Libraries

The most immediate need according to Tucson-Pima Public Library Administration is to replace this existing facility with a larger facility of at least 15,000 square feet. This need has been included in the County's 2008 Bond Election Proposal. The administration recommends a 3-mile service area for new library facilities. Considering the projected growth in the area, library administration anticipates the need for land to accommodate at least two new facilities planned for a minimum of 15,000 square feet with potential expansion to 20,000 square feet. The administration anticipates the vicinity of the Ajo / Valencia intersection as an ideal location for a future facility. Location within a master-planned community, such as those currently in the planning stages in the western region of the study area may also be considered as ideal locations. Pima County staff indicated that these needs could be partially met with the inclusion of a library in the proposed government service center discussed below.

Pima County Government Service Center

Pima County has developed a conceptual template and plan for government service centers / complexes / campuses intended for outlying areas such as Picture Rocks, Vail, and the Catalina area. One such government service center has been assumed for the SWIP area, containing a library, Sheriff's sub-station, and community center. The cost for this project is estimated at $19,000,000 based upon recent estimates for the Vail project.

School Districts

Tucson Unified School District (TUSD): Although recent building permit data reflects a downward trend, this will change as planned developments increase permit activity over the coming years. Using typical student generation rates, the District anticipates 1,500 new students (district-wide) per year over, at least, the next few years. Many of the schools that will be experiencing an increase in the number of students are already in an over-capacity situation.

New legislation designed to equalize school funding limits the District's ability to construct schools for new development. Given that voter-approved bonds are no longer used for school construction, decisions regarding new construction fall within the authority of the School Facilities Board (SFB). The SFB does not provide funding for new facilities until every school within the district is filled to capacity based upon SFB standards. In virtually every case, these standards lead to schools that are considered too small by TUSD standards, as well as school staff and parents of children attending the schools. Additionally, the available capacity is typically not located in areas experiencing new development.

In the past ten (10) years, TUSD has constructed two elementary schools in the areas west of Mission Road. An existing bond program will provide one additional middle school, one elementary school, and additions to other existing schools. According to preliminary TUSD studies, the District will still need to provide at least one other additional elementary school, and numerous additions to existing facilities. Map O-1 also depicts vacant TUSD-owned properties which are likely to be used for future school facility development.

The cost of a new school facility ranges from $15,000 to $27,000 per student depending upon the grade-level of the facility. Additions to existing facilities typically cost between $5,000 and $9,000 per student assuming the common areas in the facility have remaining capacity. These figures translate to approximately $10,000 per housing unit for new facilities, and $3,500 per housing unit for facility additions.

TUSD is also planning a new "green" transportation facility near the southeast corner of Valencia Way and Cardinal Ave. It will be designed to initially accommodate up to 62 compressed natural gas (CNG) vehicles, and may also be used for alternative fuel related engineering magnet classes and vocational and technical education curricula. The facility is expected to serve as a model of energy efficiency and low impact design. The goal is for the facility to meet LEED™ Silver specifications.

Altar Valley School District: The district anticipates the need for two new school facilities in the area, likely by the year 2010 or 2011. It anticipates that these facilities will be necessitated by the development of currently planned master-planned communities. The School Facilities Board projects new home occupancies within the school district to total approximately 1,470 by 2014. Although the school district currently does not own land for school site development within the study area, it is likely that a K-8 school facility designed to initially accommodate 350 to 400 students will be constructed within the proposed Montecito development along Valencia Road. There is potential for such facility to expand in order to accommodate up to 850-900 students.

Natural Gas

Plans for future high-pressure feeder expansion by SWG were not available at the time of this study. Similarly, El Paso Natural Gas is currently planning for additional pipelines and facilities within the study area; however, plans were not yet available at the time of this study.

Electrical Power

Southwest Transmission Cooperative (SWTC) and Central Arizona Project (CAP): At the time of this study, plans for new CAP facilities were not available. SWTC's proposed 115 kV lines and substations are illustrated on Map O-1. Also of relevance is a SWTC 345 kV substation just outside the study area, which is required to supply electrical power to the area.

Tucson Electric Power (TEP): TEP is evaluating corridor options along Valencia Road from the existing line at the West branch of the Santa Cruz westwards towards a proposed substation on the south side of the West Ajo Highway across from the Ryan Airfield. This is shown on Map O-1. A proposed substation is also being evaluated for a site on the south side of West Ajo Highway near its intersection with Irvington Road. Another proposed corridor under evaluation is located along the east side of Sandario Road from beyond the northern boundary of the study area extending south to Snyder Hill Road, and west Snyder Hill Road. TEP is also evaluating a proposed corridor extending north from approximately Irvington Road and generally west of the La Cholla Boulevard alignment to beyond the northern boundary of the study area.

TRICO Electric: The SWTC substations serve TRICO loads. At the time of this study plans for the new TRICO distribution facilities were not available.

Water

Tucson Water's Capital Improvement Projects are illustrated on Map O-2. This map contains currently planned 5-year and 10-year projects and anticipated dates of construction.

4.0 Opinions of Probable Cost

4.1 OVERVIEW OF PROBABLE COSTS

The provided opinions of probable cost are based on the following assumptions:

- Project capital costs are provided for planning purposes only in the form of 2007 dollar "probable estimates" which include all project components and necessary contingencies for non-described items
- Stated opinions of probable capital costs will probably each range anywhere from +/- 50% to +/- 20% of declared capital costs. The overall program of projects will aggregate these costs, some of which will be over-estimates and some of which will be under-estimates resulting in a total approximating the sum of the "probable estimates"
- Operation and maintenance (O&M) items are not capital expenditures and are mentioned for informational uses only – they have not been rolled up in any summary numbers since they are handled on a yearly basis by the tax revenue derived operating budgets of the County
- Existing facilities are in operable and good to excellent condition - no capital costs are included for rehabilitation due to potential deteriorated conditions of the facilities

4.2 FLOOD CONTROL AND DRAINAGE COSTS

Opinion of probable costs has been analyzed as either stormwater conveyance and attenuation facilities or roadway drainage structures.

4.2.1 Stormwater Attenuation and Conveyance

Seven regional flood control basins have been proposed within the SWIP study area. The stormwater facilities are located on public lands, private lands, and Pascua Yaqui Tribal lands. The regional stormwater basins are anticipated to be either multi-use facilities or flood control only facilities. Within the SWIP study, land acquisition costs associated with the regional facilities has been assumed at $16,000 per acre, regardless of current ownership. Regional Basins 1, 2, 3, 4, and 5 are proposed as flood control only facilities; therefore, design, construction, maintenance, and operations of these facilities will lie with the Pima County Regional Flood Control District. Regional Basins 6 and 7 will likely include multi-use facilities incorporating various park amenities; therefore, design, construction, maintenance, and operations will likely rest with both the Regional Flood Control District and the Pima County Parks & Recreation Department. Opinion of probable costs for the seven regional detention basins has been estimated at approximately $40,000,000. Probable costs associated with the regional stormwater basins are included as Table H-5, Probable Capital Costs for Stormwater Attenuation and Conveyance.

Table H-5 Probable Capital Costs for Stormwater Attenuation and Conveyance

Facility	*Land Acquisition/ Rights-of-Way* [1]	*Easements* [2]	*Earthwork/ Excavation* [3]	*Drainage Structures* [4]	*Design (15%)*	*Contingencies (25%)*	*Total*
Basin 1[5]	$1,472,000	N/A	$2,684,500	$268,500	$663,800	$1,272,200	**$6,361,000**
Basin 2	$3,488,000	N/A	$6,357,000	$635,700	$1,572,100	$3,013,200	**$15,066,000**
Basin 3[5]	$96,000	N/A	$175,500	$17,600	$43,400	$83,100	**$415,600**
Basin 4[5]	$576,000	N/A	$1,163,500	$116,400	$278,400	$533,600	**$2,667,900**
Basin 5[5]	$1,152,000	N/A	$2,099,500	$210,000	$519,200	$995,200	**$4,975,900**
Basin 6	$2,896,000	N/A	$2,099,500	$210,000	$780,800	$1,496,600	**$7,482,900**
Basin 7[6]	$1,200,000	N/A	$845,000	$84,500	$319,400	$612,200	**$3,061,100**
Channels (Sections 1 & 2)	$1,360,000	$28,000	$2,119,000	$211,900	$553,600	$1,061,100	**$5,305,600**
Total	**$12,240,000**	**$28,000**	**$17,543,500**	**$1,754,600**	**$4,730,700**	**$9,067,200**	**$45,336,000**

Notes

Basins 1 and 2 are included within the Pima County 2008 Draft Bond Program Project Requests
Results include flood control costs only
1 - Based on $16,000 / acre
2 - Based on $4,000 / acre
3 - Based on $6,500 / acre-foot ($4 / cubic yard)
4 - Estimated at 10% of Earthwork/Excavation (includes potential inlets/outlets, structures, rip-rap, erosion control)
5 - Pascua Yaqui Tribe property
6 - Private property

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Title
Costs for Stormwater Attenuation and Conveyance

Land Acquisition for Drainage Corridors

Land acquisition has been divided into lands purchased for riparian habitat preservation (natural drainage corridors) and lands purchased for engineered flood control structures (collector / conveyor channel).

Natural / Riparian Flood Corridor: The complex networks of braided channels throughout the Black Wash basin offer both the opportunity to provide critical wildlife habitat and connectivity as well as formation of a flood control corridor similar to a designated floodway (Greenway). Currently, the Pima County Regional Flood Control District is in the process of acquiring flood-prone lands adjacent to the Black Wash. Land purchases have been achieved via the Flood-prone Land Acquisition Program (FLAP); therefore, land acquisition costs associated with preserving the Black Wash drainage corridors, or Greenways, has not been included within this section.

Engineered Collector / Conveyor Channel: Approximately 18,500 linear feet of collector / conveyor channel has been proposed to intercept discharges within the upstream portion of the study area. The proposed collector channel would be located along the southern boundary of Section 19, T15S, R12E, and a portion of Section 24, T15S, R11E (Hermans Road alignment). The downstream conveyor channel would be located along the western boundary of Section 19 and would convey peak discharges associated with the one in 100-year storm to Regional Basin 7.

The proposed collector / conveyor has been conceptually designed with the intent of minimizing drainage expenditures associated with rip-rap, soil cement, concrete, or other channel armoring techniques. However, due to potential one in 100-year peak discharges ranging between 4,500 cfs to 6,000 cfs, “structural” channel treatment alternatives are anticipated at critical channel segments such as points of runoff interception, channel bends, and channel confluences.

Land acquisition associated with the 18,500 linear foot channel has been assumed at $16,000 / acre. It has also been assumed that a 16-foot maintenance easement may also be required along the length of the drainage way; therefore, acquiring an easement adjacent to the drainage way has been assumed at $4,000 / acre. Similar to regional stormwater facilities, probable costs for earthwork / excavation has been established at $6,500 / acre-foot, drainage structure costs at 10% of earthwork / excavation costs, design costs at 15% of earthwork costs, and contingencies at 25% of total costs. Probable costs associated with Channel Section 1 and 2 have been calculated at approximately $5,300,000. Opinion of probable costs associated with Channel Section 1 and 2 are included within Table H-5, Probable Capital Costs for Stormwater Attenuation and Conveyance.

4.2.2 Roadway Drainage Crossings

Reinforced Concrete Box Culverts (RCBC)

The complex drainage network consisting of braided channels and large areas of sheet flooding throughout the Black Wash watershed results in frequent road closures of many major roadways including Valencia Road and Camino Verde. Providing all-weather access along the major transportation corridors, both existing and proposed, is an essential element of the SWIP.

Major transportation corridors, both existing and proposed, identified as requiring all-weather crossings include: Ajo Highway, North San Joaquin Road, Valencia Road, Camino Verde, Mark Road, Valhalla Road, Drexel Road, and South San Joaquin Road. As previously noted, a potential exception is Valhalla Road between Valencia Road and the Drexel Road extension. The crossings at the Black Wash and Snyder Hills Wash could potentially be designed for smaller, more frequent storm events.

No land acquisition needs are assumed for the proposed all-weather drainage crossings. Land acquisition requirements are assumed part of transportation design element (rights-of-way).

Currently, Ajo Highway is the only transportation corridor that includes roadway crossings that provide some measure of all-weather access. However, the existing culverts have capacity to convey approximately the 10-year to 25-year storm events. Within the SWIP study, thirty-eight roadway crossings have been identified as either new or improved drainage structures. New or improved drainage structures have been conceptually designed to convey the one in 100-year storm event. A one in 100-year peak discharge of 1,000 cfs was the minimum threshold for all-weather access consideration.

The all-weather crossings recommended within this study are primarily grouped to coincide with the proposed transportation roadway improvements.

Ajo Highway: Roadway improvements along Ajo Highway include a six lane parkway from Sandario Road to Interstate-19. For this transportation segment, seven drainage structures are identified as having one in 100-year peak discharges of 1,000 cfs or greater and require new or improved drainage crossings. Note that there are two bridge sections on Ajo Highway over the Black Wash and Snyder Hills Wash that are assumed “all-weather” and have therefore not been analyzed within this study. Probable costs associated with the seven Ajo Highway new or improved drainage structures have been projected at $16,500,000.

Opinions of probable costs associated with the roadway drainage crossings are included within Table H-6, Probable Capital Costs for Roadway Drainage Crossings.

Valencia Road: A second transportation improvement element is the Valencia Road widening from Ajo Highway to Mark Road. Along this roadway segment, seven points of concentration have been identified as having one in 100-year peak discharges of 1,000 cfs or greater and require drainage structure crossings. The proposed drainage crossing vary from four 10’ x 5’ RCBC’s (Q_{100}=1,370 cfs) to twelve 12’ x 5’ RCBC’s (Q_{100}=5,407 cfs). Probable costs associated

Table H-6 Probable Capital Costs for Roadway Drainage Crossings

Crossing Number	Description	Earthwork & Excavation	Drainage Structures	Design (15%)	Contingency (25%)	Total
1	(5) 10' x 5' x 110' RCBC's	$4,100	$825,000	$124,400	$238,400	**$1,191,900**
2	(18) 10' x 5' x 110' RCBC's	$14,700	$2,970,000	$447,700	$858,100	**$4,290,500**
3	(5) 10' x 4' x 110' RCBC's	$3,300	$770,000	$116,000	$222,300	**$1,111,600**
4	(15) 10' x 5' x 110' RCBC's	$12,300	$2,475,000	$373,100	$715,100	**$3,575,500**
5	(7) 10' x 4' x 110' RCBC's	$4,600	$1,078,000	$162,400	$311,300	**$1,556,300**
6	(5) 10' x 4' x 110' RCBC's	$3,300	$770,000	$116,000	$222,300	**$1,111,600**
7	(15) 10' x 5' x 110' RCBC's	$12,300	$2,475,000	$373,100	$715,100	**$3,575,500**
8	(12) 10' x 5' x 135' RCBC's	$12,000	$2,430,000	$366,300	$702,100	**$3,510,400**
9	(5) 10' x 5' x 135' RCBC's	$5,000	$1,012,500	$152,600	$292,500	**$1,462,600**
10	(6) 10' x 4' x 135' RCBC's	$4,800	$1,134,000	$170,800	$327,400	**$1,637,000**
11	(12) 10' x 5' x 135' RCBC's	$12,000	$2,430,000	$366,300	$702,100	**$3,510,400**
12	(4) 10' x 5' x 135' RCBC's	$4,000	$810,000	$122,100	$234,000	**$1,170,100**
13	(4) 12' x 4' x 135' RCBC's	$3,900	$864,000	$130,200	$249,500	**$1,247,600**
14	(12) 12' x 5' 135' RCBC's	$14,500	$2,754,000	$415,300	$796,000	**$3,979,800**
15	(4) 10' x 5' x 100' RCBC's	$3,000	$600,000	$90,500	$173,400	**$866,900**
16	(4) 10' x 5' x 100' RCBC's	$3,000	$600,000	$90,500	$173,400	**$866,900**
17	(5) 10' x 5' x 100' RCBC's	$3,700	$750,000	$113,100	$216,700	**$1,083,500**
18	(5) 10' x 5' x 100' RCBC's	$3,700	$750,000	$113,100	$216,700	**$1,083,500**
19	(6) 10' x 5' x 100' RCBC's	$4,500	$900,000	$135,700	$260,100	**$1,300,300**
20	(3) 10' x 5' x 100' RCBC's	$2,200	$450,000	$67,800	$130,000	**$650,000**
21	(10) 10' x 6' x 100' RCBC's	$8,900	$1,600,000	$241,300	$462,600	**$2,312,800**
22	(9) 12' x 7' x 50' RCBC's	$5,600	$855,000	$129,100	$247,400	**$1,237,100**
23	(5) 10' x 5' x 50' RCBC's	$1,900	$375,000	$56,500	$108,400	**$541,800**
24	(4) 10 x 4' x 50' RCBC's	$1,200	$280,000	$42,200	$80,900	**$404,300**
25	(4) 10' x 5' x 50' RCBC's	$1,500	$300,000	$45,200	$86,700	**$433,400**
26	(12) 10' x 5' x 50' RCBC's	$4,500	$900,000	$135,700	$260,100	**$1,300,300**
27	Potential Bridge Site	$1,500	$1,700,000	$255,200	$489,200	**$2,445,900**
28	Potential Bridge Site	$1,500	$2,000,000	$300,200	$575,400	**$2,877,100**
29	(7) 12' x 6' x 100' RCBC's	$7,500	$1,260,000	$190,100	$364,400	**$1,822,000**
30	Potential Bridge Site	$1,500	$2,000,000	$300,200	$575,400	**$2,877,100**
31	(5) 10' x 5' x 100' RCBC's	$3,700	$750,000	$113,100	$216,700	**$1,083,500**
32	(4) 10' x 5' x 100' RCBC's	$3,000	$600,000	$90,500	$173,400	**$866,900**
33	(12) 10' x 5' x 100' RCBC's	$8,900	$1,800,000	$271,300	$520,100	**$2,600,300**
34	(12) 10' x 5' x 50' RCBC's	$4,500	$900,000	$135,700	$260,100	**$1,300,300**
35	(4) 10' x 5' x 50' RCBC's	$1,500	$300,000	$45,200	$86,700	**$433,400**
36	(12) 10' x 5' x 50' RCBC's	$4,500	$900,000	$135,700	$260,100	**$1,300,300**
37	(7) 10' x 6' x 100' RCBC's	$6,200	$1,120,000	$168,900	$323,800	**$1,618,900**
38	(3) 10' x 5' x 50' RCBC's	$1,400	$225,000	$34,000	$65,100	**$325,500**
	Total	**$200,200**	**$44,712,500**	**$6,737,100**	**$12,913,000**	**$64,562,800**

Notes

Land acquisition costs assumed to be part of transportation design/concept element costs

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Title
Costs for Roadway Drainage Crossings

with the seven drainage structures proposed along Valencia Road have been estimated at $16,500,000.

Camino Verde: Camino Verde has not been identified as a transportation improvement element within the SWIP; however, the approximate two-mile segment of road from Ajo Highway south to Valencia Road experiences significant flooding following storm events. Five drainage crossings have been identified where one in 100-year peak discharges are equal to 1,000 cfs or greater. All-weather access can be provided via structures ranging from 4-10' x 4' RCBC's to 9-12' x 7' RCBC's. One in 100-year peak discharges vary from 1,061 cfs to 5,400 cfs, respectively. Opinion of probable cost associated with the Camino Verde drainage improvements are estimated at $3,900,000.

Drexel Road: Drexel Road is proposed to be widened and extended from Ajo Highway to Mission Road. In conjunction with this transportation improvement element, two drainage crossings are proposed for critical all-weather access. The two drainage crossings with one in 100-year peak discharges in excess of 1,000 cfs will include 4-10' x 5' RCBC's to convey 1,123 cfs and 12-10' x 5' RCBC's to convey 3,992 cfs. Opinion of probable cost for the Drexel Road drainage crossings is approximately $1,700,000.

Valhalla Road Extension: A fifth transportation improvement element is the Valhalla Road extension between Drexel Road and Valencia Road. Three points of concentration have been identified as having one in 100-year peak discharges of 1,000 cfs or greater. The one in 100-year peak discharges range from 3,748 cfs to 6,878 cfs. The proposed Valhalla Road extension will traverse the Black Wash and Snyder Hills Wash; therefore, two of the three crossings will likely require bridge sections similar to the bridges at Ajo Highway (just downstream of the Valhalla Road extension). Potentially, the two bridge crossings could be omitted and replaced with less expensive crossings designed to convey the smaller, more frequent storm events, if directed by the Pima County Regional Flood Control District. Probable cost associated with a seven-cell RCBC and two bridge sections along Valhalla Road are estimated at $7,000,000.

San Joaquin Road: Widening San Joaquin Road from Ajo Highway north to Sandario Road is also proposed within the transportation improvements. Along this roadway corridor, one in 100-year peak discharges of 1,000 cfs or greater have been identified at seven drainage crossings. One in 100-year peak discharges vary from 1,000 cfs to 4,788 cfs. Probable cost associated with seven all-weather RCBC's along San Joaquin Road are estimated at $5,200,000.

San Joaquin Road is also proposed to be widened and extended south to Los Reales Road. Four points of concentration have been identified as having one in 100-year peak discharges of 1,000 cfs or greater. In order to meet all-weather access, three box culvert crossings and one potential bridge crossing has been proposed. The proposed bridge crossing will traverse the Black Wash. Note that the bridge crossing could be omitted and substituted with a less expensive crossing designed to convey smaller more frequent storm events if opted for by the Pima County Regional Flood Control District. One in 100-year peak discharges vary from 1,123 cfs (4-10' x 5' RCBC's) to 6,496 cfs (potential bridge location). The San Joaquin Road probable cost associated with four all-weather crossings are estimated at $4,000,000.

Other Drainage Crossings: In addition to the roadway crossings identified above, three other drainage crossings have been proposed in conjunction with transportation improvements or critical all-weather access points. One proposed crossing is on Mark Road just north of the Los Reales alignment. Currently, the one in 100-year peak discharge at this location is 3,926 cfs. 12-10' x 5' RCBC's are proposed at this crossing to provide all-weather access. A second drainage crossing improvement is at Irvington Road, between Ajo highway and Sunset Boulevard. 7-10' x 6' RCBC's are proposed at this location to convey the one in 100-year peak discharge of 3,273 cfs. The third drainage crossing is located along Calle Don Miguel, west of Camino De Oeste. The one in 100-year peak discharge at this location is 1,000 cfs. 3-10' x 5' RCBC's can provide all-weather access at this location. Probable costs associated with the Mark Road, Irvington Road, and Calle Don Miguel drainage crossings are estimated at $1,300,000, $1,600,000, and $325,500, respectively.

Design Considerations / Contingencies

Opinion of probable costs relating to design and engineering of the stormwater conveyance system, stormwater attenuation facilities, and roadway drainage crossing structures has been estimated at 15% of the construction costs. Due to the conceptual level of the SWIP study, 25% contingencies have been assumed in conjunction with the proposed flood control facilities.

4.3 WASTEWATER MANAGEMENT COSTS

Costs have been broken down into wastewater treatment and collection / conveyance categories. All of the planning-level purpose costs presented herein are present values as of the year 2007.

4.3.1 Future Treatment and Conveyance System Unit Costs

Unit costs for future wastewater treatment and conveyance system components include:

- An acceptable and proven "rule of thumb" unit cost ranging from $12.50 to $15.00 per gallon of treated ADWF was used to estimate capital costs for new treatment facilities
- Environmental permitting costs was estimated as 1% of the capital costs
- The assumed unit costs for various sizes of pipes were (assuming an average depth of cover of ten feet) 12-inch diameter at $149 / foot, 15-inch diameter at $155 / foot, 18-inch diameter at $161 / foot, 24-inch diameter at $183 / foot, 30-inch diameter at $213 / foot, and 36-inch diameter at $243 / foot.

4.3.2 Probable Costs for Conveyance System

The existing conveyance system must be both expanded (strategically extended in length to reach and service new growth areas) and augmented (by twinning pipes along existing backbone sewers alignments) to support the various levels of anticipated future growth. Pima County staff members have indicated that the costs associated with expanding and augmenting new trunk sewers to support private developments are and will be paid in the entirety by private developers through various means.

As such, Pima County is only responsible for costs spent to remedy capacity and / or condition deficits in the existing sewer network. With the existing network meeting the demands of current flows, no conveyance costs are anticipated to accrue to Pima County. The identified bottlenecks could be investigated in detail to examine whether or not a surgical O&M based improvement is warranted.

Two capital costs are provided for each growth scenario. One cost reflects the needs to expand the backbone, or trunk sewer conveyance system, into new service areas while the other cost reflects the augmentation needs related to twinning existing trunk sewers. Table W-5 displays these costs.

4.3.3 Probable Costs for Septic System Conversions

This study identified three potential areas for conversion of existing septic field systems to gravity sewer servicing. The locations of these areas are shown on Map W-4. For Location 1 (T14S, R12E, Section 30) and Location 2 (T15S, R12E, Section 2), current development densities are higher than the minimum threshold suitable for continued servicing with septic field systems. The conversion to gravity sewer servicing for these two areas will be contingent upon an emerging trend of septic field failures. For Location 3 (T14S, R12, Section 34), the current

Table W-5 Probable Capital Costs for Conveyance System

Scenario and Type of Project	*Lower Density Scenario*		*Medium Density Scenario*		*Higher Density Scenario*	
	New Trunks	*Augmented Trunks*	*New Trunks*	*Augmented Trunks*	*New Trunks*	*Augmented Trunks*
Capital Costs	$4,949,000	$9,208,000	$5,914,000	$14,184,000	$5,990,000	$15,705,000
Annual Operation and Maintenance Costs	$24,000	$54,100	$25,900	$81,700	$25,900	$85,000

development density is low enough to justify continued use of septic field systems. However, under the higher density growth scenario, this area should transition to gravity sewer servicing. The probable costs associated with these conversion projects are presented in Table W-6. The costs include the probable connection costs, septic system closure costs, and construction costs to collect wastewater from the existing lots and convey it to the nearest interceptors.

4.3.4 Probable Costs for Required Treatment Capacity

Under the proposed 4.0 MGD expansion, the tertiary filtration and disinfection systems will be equipped to handle an ADWF of 4.0 MGD and produce Class A+ effluent.

PCWMD has included within its CIP documents a capital budget of $44,900,000 for the currently proposed 4.0 MGD expansion, equivalent to a treatment unit cost of $11.23 per gallon. These existing funds are notably excluded from the probable SWIP costs, however the probable SWIP costs and subsequent financial analysis contain an additional funding allowance related to this project to reflect the higher assumed treatment unit costs which range from $12.50 to $15.00 per gallon of treated ADWF.

As shown in Table W-4, a total capacity of 6.5 MGD is required to support the lower density scenario, while a total capacity of 9.5 MGD is required to support the medium density scenario, and a total capacity of 12.0 MGD is anticipated for the higher density scenario. Opinions of probable capital costs for these scenarios are listed in Table W-7 along with probable operations and maintenance (O&M) costs.

Assuming the land currently owned by Pima County adjacent to the existing Avra Valley WWTF can be used for the future expansion, no cost components for land acquisition are required.

As indicated by Pima County staff, treatment capacity expansion costs will be derived from connection fees, while O&M costs will be paid by user fees.

4.3.5 Probable Costs for Effluent Disposal

The probable costs for effluent utilization were developed based on three options. The first option assumed 100% of the treated effluent is recharged using on-site percolation ponds. The second option used a combination of percolation ponds and riparian restoration. The third option maximized urban re-uses in combination with either percolation or both percolation and habitat restoration. Under option three, three major regional parks were included. Table W-8 outlines the anticipated capital and O&M costs for the proposed effluent utilization scheme, while Table W-9 provides additional details for the urban re-uses in particular.

Table W-6 Probable Capital Costs for Septic System Conversions

Locations	*1*	*2*	*3*
	T14S, R12E, Section 30	T15S, R12E, Section 2	T14S, R12, Section 34
Capital Costs	$5,947,000	$4,347,000	$2,903,000

Notes

Locations 1 and 2 converted under all development scenarios

Location 3 only converted under Higher Density development scenario

Pima County Public Works
Southwest Infrastructure Plan

Table No.
W-6

Title
Probable Capital Costs for Septic System Conversions

Table W-7 Probable Capital Costs for Wastewater Treatment

Scenario	*Lower Density Scenario*	*Medium Density Scenario*	*Higher Density Scenario*
Capital Costs	$37,200,000 - $53,400,000	$75,000,000 - $98,800,000	$106,600,000 - $136,600,000
Annual Operation and Maintenance Costs	$3,227,000	$4,716,000	$5,957,000

Notes

Assumes probable treatment costs will range from $12.50 to $15.00 per treated gallon

Costs do not include the $44,900,000 which has been allocated to the 4.0 MGD expansion from the 2004 Bond Program

Existing oxidation ditch was designed as a temporary facility which needs to be eventually replaced

Pima County Public Works
Southwest Infrastructure Plan

Table No.
W-7

Title
Probable Capital Costs for Wastewater Treatment

Table W-8 Probable Capital Costs for Effluent Utilization

Option One: Use Percolation Ponds Only

Effluent Disposal Mechanism	*Cost Type*	*Lower Density Scenario (6.5 MGD)*	*Medium Density Scenario (9.5 MGD)*	*Higher Density Scenario (12.0 MGD)*
Groundwater Recharge	Capital	**$2,389,000**	**$5,370,000**	**$7,855,000**
	Annual O&M	**$48,000**	**$107,000**	**$157,000**

Option Two: Use Habitat Restoration and Percolation Ponds

Effluent Disposal Mechanism	*Cost Type*	*Lower Density Scenario (6.5 MGD)*	*Medium Density Scenario (9.5MGD)*	*Higher Density Scenario (12.0 MGD)*
Groundwater Recharge	Capital	$0	$2,389,000	$5,370,000
	Annual O&M	$0	$48,000	$107,000
Habitat Restoration: 140 Acres	Capital	$3,000,000	$3,000,000	$3,000,000
	Annual O&M	$170,000	$170,000	$170,000
Capital Costs Sub-totals		**$3,000,000**	**$5,389,000**	**$8,370,000**
Annual O&M Costs Sub-totals		**$170,000**	**$218,000**	**$277,000**

Option Three: Use Urban Re-use Together with either Percolation or Habitat Restoration

Effluent Disposal Mechanism	*Cost Type*	*Lower Density Scenario (6.5 MGD)*		*Medium Density Scenario (9.5 MGD)*		*Higher Density Scenario (12.0 MGD)*	
		Percolation	*Habitat Restoration*	*Percolation*	*Habitat Restoration*	*Percolation*	*Habitat Restoration*
Groundwater Recharge	Capital	$2,389,000	$0	$5,370,000	$2,389,000	$7,855,000	$5,370,000
	Annual O&M	$48,000	$0	$107,000	$48,000	$157,000	$107,000
Habitat Restoration: 140 Acres	Capital	$0	$3,000,000	$0	$3,000,000	$0	$3,000,000
	Annual O&M	$0	$170,000	$0	$170,000	$0	$170,000
Urban Re-use	Capital	$1,400,000	$1,400,000	$6,900,000	$6,900,000	$6,900,000	$6,900,000
	Annual O&M	$128,000	$128,000	$318,000	$318,000	$318,000	$318,000
Capital Cost Sub-totals		**$3,789,000**	**$4,400,000**	**$12,270,000**	**$12,289,000**	**$14,755,000**	**$15,270,000**
Annual O&M Cost Sub-totals		**$176,000**	**$298,000**	**$425,000**	**$536,000**	**$475,000**	**$595,000**

Notes

Lower Density Scenario does not produce enough effluent to irrigate all the proposed major park sites, therefore the largest park site was selected

Existing percolation ponds have a reliable or firm area of 25.6 acres - this accounts for one of the large ponds (13.8 acres) being temporarily offline or otherwise out of service

Table W-9 Details of Probable Capital Costs for Urban Re-uses

Project Components	*North San Joaquin Road Site (5.0 MGD)*	*South Ryan Park Site (2.0 MGD)*	*Valencia and Mark Site (2.5 MGD)*	*Total for Three Sites*
Transport Treated Effluent to Site	$1,400,000	$1,750,000	$2,650,000	$5,800,000
Provide On-site Storage	$550,000	$250,000	$300,000	$1,100,000
Capital Costs Sub-totals	$1,950,000	$2,000,000	$2,950,000	$6,900,000
Annual O&M Costs	$128,000	$60,000	$130,000	$318,000

4.3.6 Summary of Wastewater Capital Costs

Table W-10 provides a summary of the SWIP-related wastewater capital projects to be funded by Pima County (that is, developer-borne conveyance costs have been omitted), which depending upon the density scenario represents a range of total approximate cost between $49,883,000 and $165,067,000 in today's dollars.

This wastewater capital cost cannot be divided by the number of anticipated connections and compared to the current connection fee which spreads a wide variety of system-wide wastewater management costs over the entire Pima County wastewater system operation. The current connection fee is currently increasing via a series of four 6% increases from $178.89 per fixture unit equivalent to $213.06 per fixture unit equivalent between December 31, 2006 and January 2008.

Table W-10 Summary of Pima County Funded SWIP-Related Wastewater Capital Costs

Project Type	*Cost Type*	*Lower Density Scenario*	*Medium Density Scenario*	*Higher Density Scenario*
Wastewater Treatment (Avra Valley WWTF Upgrades)	Capital	$37,200,000 - $53,400,000	$75,000,000 - $98,800,000	$106,600,000 - $136,600,000
Effluent Utilization	Capital	$2,389,000 - $4,400,000	$5,370,000 - $12,289,000	$7,855,000 - $15,270,000
Potential Septic System Conversions	Capital	$10,294,000	$10,294,000	$13,197,000
Opinion of Total Probable Wastewater Costs		$49,883,000 - $68,094,000	$90,664,000 - $121,383,000	$127,652,000 - $165,067,000

Notes

Treatment costs vary with assumed unit cost per treated gallon as per Table W-7

Effluent utilization costs vary with solution selected as per Table W-8

Capital costs to increase conveyance system capacities as required will accrue to land developers and do not enter into Pima County's Capital Improvement Plans

Pima County Public Works
Southwest Infrastructure Plan

Table No.
W-10

Title
Summary of Wastewater Management Capital Costs

4.4 PARKS AND RECREATION COSTS

Table PR-6 lists information on location, name, park type and the range of estimated construction costs for the proposed future park site sizes. The total predicted cost for just over 2,000 acres of new and / or expanded parks ranges between $62,060,000 and $96,771,000.

4.5 TRANSPORTATION COSTS

Prior sections contained Table TR-4, which provided a summary of the transportation capital projects to be funded, which represents a total approximate cost of $585,462,000 in 2007 dollars. Similarly, Table TR-5 provided a further level of detail by breaking down project costs into their development cycle components.

Table TR-5a consolidates a number of overlapping projects, summarizes and updates the project information from Tables TR-3a and TR-3b, and documents the composition of the $80,041,000 in funding which is estimated to be required for current projects.

4.5.1 Basis of Transportation Unit Costs

For these proposed transportation capital projects, an average total project cost per lane mile of $1,980,000 was used based on a review of costs of twenty-one recently completed roadway projects in Pima County, including right-of-way and planning and design project costs.

Table TR-6 contains the collected cost per lane mile statistics for these projects. This average total project cost was applied to each project and multiplied by the number of lane-miles to be constructed or reconstructed. With the exception of the Valencia Road project (Project No. 7), the calculations of costs for the roadway projects assume that the entire new roadway will be constructed. For the Valencia Road project, the assumption is that the roadway will go from four lanes to six lanes and that only two new lanes will be constructed.

4.5.2 Transportation Costs per EDU

An equivalent dwelling unit (EDU) is the amount of traffic impact created by a single family home. The approximate and preliminary fee per EDU (assuming the presence of 28,699 EDU in the SWIP area under the medium density scenario) is $20,400 per EDU. For reference purposes, the County's current fee per EDU is $4,400.

Table TR-5a Additional Funding Required for Planned and Programmed Projects

Project	*Component*	*Description*	*Sponsor*	*Cost*	*Funding*									
					County HURF Bonds	*County HURF*	County DIF	RTA	Other	ADOT	City of Tucson	Pascua Yaqui	Unspecified	*Additional SWIP Funding Required*
Valencia Road - Ajo Highway to Mark Road														
	Ajo Highway to Mt. Eagle Road	Widen to 4 lanes	Pima County	$14,000			$14,000							
	Mt. Eagle Road to Wade Road	Widen to 4 lanes	Pima County	$16,000			$16,000							
	Wade Road to Mark Road	Widen to 4 lanes	Pima County	$20,000				$15,056					$4,944	$4,944
Project Subtotal				**$50,000**	**$0**	**$0**	**$30,000**	**$15,056**	**$0**	**$0**	**$0**	**$0**	**$4,944**	**$4,944**
Valencia Road - Mark Road to Camino de la Tierra		Widen to 4 lanes	Pima County	$20,498	$5,800	$2,364	$9,204		$3,130					
Valencia Road - Mark Road to Mission Road		Widen to 6 lanes	Pima County	$25,100									$25,100	$25,100
Valencia Road - Mission Road to I-19		Widen from 4 to 6 lanes	Pima County	$18,225	$5,726	$34			$5,068				$7,397	$7,397
Ajo Highway - Sandario Road to Valencia		Widen to 4 lanes	ADOT	$34,000									$34,000	
Ajo Highway - Valencia to Kinney Road		Widen to 4 lanes	ADOT	$17,600						$17,600				
Ajo Highway - Kinney Road to Mission Road		Widen to 6 lanes	ADOT	$18,000									$18,000	
Ajo Highway - Mission Road to I-19		Widen to 6 lanes	ADOT	$65,000									$65,000	
Camino de Oeste - Calle Torin to Valencia		Widen to 3 lanes	Pascua Yaqui	$8,500									$8,500	$8,500
Ignacio Bumea Road - Los Reales to Valencia		Build new 2 lane roadway	Pascua Yaqui	$5,000									$5,000	
Drexel Road - Mission Road to I-19														
	Drexel Road - Mission Road to I-19	Widen to 4 lanes	Pima County	$17,600									$17,600	$17,600
	Midvale Park to Calle Santa Cruz	New 2 lane road + bridge	Tucson	$16,500									$16,500	$16,500
Project Subtotal				**$34,100**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$34,100**	**$34,100**
Irvington Road - Ajo Way to Joseph Road		New 2 lane road	Pima County	$25,100	$7,000			$7,000						
Kinney Road - Ajo Way to Tucson Estates														
	Ajo Way to Bopp/Sarasota Road	Widen to 4 lanes	Pima County	$22,000	$3,800		$10,000		$6,400	$1,800				
	Sarasota to Tucson Estates	Widen to 4 lanes	Pima County	$9,010									$9,010	
Project Subtotal				**$31,010**	**$3,800**	**$0**	**$10,000**	**$0**	**$6,400**	**$1,800**	**$0**	**$0**	**$9,010**	**$0**
Totals				**$352,133**	**$22,326**	**$2,397**	**$49,204**	**$22,056**	**$14,598**	**$19,400**	**$0**	**$0**	**$211,051**	**$80,041**

Notes

Funding Amounts Expressed in Thousands of Dollars ($ 000)

Pima County Public Works
Southwest Infrastructure Plan

Table No.
TR-5a

Title
Additional Funding Required for Planned and Programmed Projects

Table TR-6 Recently Completed Roadway Project Costs

Project	Project Costs			Total Lane Miles Constructed	Cost per Lane Mile		
	Total Costs	Total Costs w/o ROW	Construction Costs Only		Total Costs	Total Costs w/o ROW	Construction Costs Only
River Road: First to Campbell Ave	$21,968,507	$17,095,349	$14,746,402	6.4	$3,411,259	$2,654,557	$2,289,814
Sunrise Drive: Swan to Craycroft	$15,305,331	$14,965,744	$12,820,665	4.8	$3,215,406	$3,144,064	$2,693,417
River Road: La Cholla Blvd. to La Cañada Dr.	$4,629,489	$4,611,461	$4,481,095	5.0	$925,898	$922,292	$896,219
River Road: Campbell to Alvernon	$21,951,230	$14,222,327	$10,782,403	10.0	$2,195,123	$1,422,233	$1,078,240
Alvernon: Fort Lowell to River	$7,857,753	$7,510,316	$5,878,123	2.6	$2,976,422	$2,844,817	$2,226,562
Skyline: Chula Vista to Campbel	$22,790,509	$21,931,903	$16,865,541	12.0	$1,899,209	$1,827,659	$1,405,462
Ajo: Country Club to Alvernon	$6,758,819	$6,533,369	$5,399,746	5.4	$1,251,633	$1,209,883	$999,953
Wetmore/Ruthrauff Rd: La Cholla-Fairview	$24,773,760	$16,749,448	$13,795,287	7.2	$3,440,800	$2,326,312	$1,916,012
River Road: Thornydale Road to Shannon Road	$9,253,622	$9,020,480	$8,507,877	5.5	$1,676,381	$1,634,145	$1,541,282
River Road: Shannon to La Cholla	$4,947,274	$4,939,434	$4,502,743	3.6	$1,374,243	$1,372,065	$1,250,762
Thornydale Road: Orange Grove to Ina	$3,052,353	$3,039,339	$2,769,576	1.2	$2,543,628	$2,532,783	$2,307,980
Thornydale: Ina to Cortaro Farms	$16,772,469	$14,657,919	$12,931,776	8.0	$2,096,559	$1,832,240	$1,616,472
Catalina Highway: Tanque Verde Road to Houghton	$9,038,915	$8,502,117	$6,061,445	6.4	$1,407,931	$1,324,317	$944,150
Sabino Canyon at Kolb	$6,402,049	$5,728,732	$5,201,897	2.0	$3,201,025	$2,864,366	$2,600,949
Pistol Hill Road: Colossal Cave to Old Spanish Trail	$1,712,613	$1,687,635	$1,563,907	4.2	$407,765	$401,818	$372,359
Valencia Road: South 12th Avenue Intersection	$1,262,212	$1,210,451	$1,030,344	1.6	$788,883	$756,532	$643,965
S. 12th Avenue: Los Reales Road to Lerdo Road	$6,890,131	$6,833,437	$4,812,743	3.6	$1,913,925	$1,898,177	$1,336,873
La Cholla: River to Magee	$25,081,311	$22,534,327	$18,516,036	18.0	$1,393,406	$1,251,907	$1,028,669
Golf Links Road: Bonanza Ave. to Houghton Rd.	$2,701,282	$2,641,040	$2,128,416	2.1	$1,298,693	$1,269,731	$1,023,277
Shannon Road: Ina to Magee	$7,669,166	$6,964,673	$6,025,947	3.6	$2,130,324	$1,934,631	$1,673,874
First Avenue: River Rod to Orange Grove	$15,227,125	$14,458,880	$13,231,096	7.6	$2,003,569	$1,902,484	$1,740,934
Average Costs per Lane Mile					**$1,978,670**	**$1,777,477**	**$1,504,154**
Average Costs per Lane Mile (Rounded)					**$1,980,000**	**$1,800,000**	**$1,500,000**

4.6 SUMMARY OF COSTS PER DWELLING UNIT

Table C-1 summarizes the total costs for each considered infrastructure type and also provides the expected range of probable costs per undeveloped dwelling unit in each growth scenario.

The total cost ranges from $826.3 million to $976.2 million, while the probable costs per undeveloped dwelling unit drop from a high of $55,172 for the lower density scenario to a low of $21,817 for the higher density growth scenario.

Table C-1 Summary of Proposed Pima County Funded SWIP-Related Infrastructure Costs

Infrastructure / Service Type	*Lower Density Scenario*	*Medium Density Scenario*	*Higher Density Scenario*
Wastewater Management	$49,883,000 - $68,094,000	$90,664,000 - $121,383,000	$127,652,000 - $165,067,000
Transportation	$585,462,000		
Parks and Recreation	$62,060,000 - $96,771,000		
Flood Control and Drainage	$109,899,000		
Other Services	$19,000,000		
Opinion of Probable Costs	**$826,304,000 - $879,226,000**	**$867,085,000 - $932,515,000**	**$904,073,000 - $976,199,000**
Total Dwelling Units per Scenario	**33,196**	**45,959**	**58,699**
- Developed Dwelling Units per Scenario	**17,260**	**17,260**	**17,260**
= Undeveloped Dwelling Units per Scenario	***15,936***	***28,699***	***41,439***
Probable Cost per *Undeveloped Dwelling Unit*	**$51,851 - $55,172**	**$30,213 - $32,493**	**$21,817 - $23,558**

5.0 Funding Analysis

Land development in Arizona is planned and approved by local municipal and county governments in accordance with Arizona state statutes. Urban infrastructure serving new development is provided by myriad entities including school districts, fire districts, local government, public and private utilities.

There is often a significant time lag between land development and the arrival of the majority of a developed area's infrastructure. During this interim period newly developed areas' infrastructure demands can stress or even exceed local capacities. As a result, maintenance on existing infrastructure may be deferred to create financing for new infrastructure projects. The result for a region's finances can be a constant struggle between its need for infrastructure to catch up to land development and the need to maintain existing infrastructure. This struggle can result in an overall deterioration in the quality of life for existing and future residents.

The intent of this study is to recommend viable strategies for the Southwest area to develop concurrently with infrastructure improvements, and to establish a template for concurrency planning throughout the County.

Tables FA-1a and FA-1b outline Pima County's total 2006/07 adopted existing revenue sources, as well as sources of funding for the adopted Capital Funds Project for 2006/07. This data was obtained from *Pima County FY 2006/2007 Adopted Budget* pages 5-8 and 5-21.

5.1 PROBLEM IDENTIFICATION

The SWIP area financial analysis models the infrastructure categories and capital requirements in response to the population forecasts. The challenge is to determine the optimal funding strategy that meets the needs of Pima County residents, Southwest Infrastructure Plan (SWIP) residents specifically, and enables and encourages potential developers to invest in the SWIP area. The model presented here only examines the financial impacts of infrastructure development. The model allows Pima County to determine the financial impact of policy decisions. The model does not determine policy, but should be used as a tool in policy setting and decision making in conjunction with other political, social, and environmental factors.

5.1.1 Methodology

The methodology focuses on solving the infrastructure needs of the SWIP area based upon three primary forms of input:

- Project parameters
- Policy constraints
- Growth assumptions

The medium density scenario's growth assumptions were held constant throughout this funding analysis.

Table FA-1a Existing Sources of Revenue

Revenue Source	*2006 / 07 as Adopted*	*% of Plan*
Charges for Services	$430,412,081	37.3%
Taxes	$350,439,566	30.3%
Intergovernmental	$299,571,012	25.9%
Memo Revenue	$20,000,000	1.7%
Licenses & Permits	$19,705,867	1.7%
Miscellaneous	$18,101,949	1.6%
Interest	$9,422,527	0.8%
Fines and Forfeits	$6,904,517	0.6%
Special Assessment	$291,456	0.0%
Totals	**$1,154,848,975**	100.0%

Table FA-1b Existing Sources of Capital Funding

Funding Source	*2006 / 07 Amount*	*% of Plan*
Bond Proceeds	$91,747,504	58.8%
Operating Transfers	$28,947,600	18.6%
Charges for Services / Impact Fees	$17,407,915	11.2%
Intergovernmental	$11,881,420	7.6%
Interest	$4,176,652	2.7%
Miscellaneous	$1,740,695	1.1%
Totals	**$155,901,786**	100.0%

Notes

Taken from:

Pima County FY 2006/2007 Adopted Budget pages 5-8 and 5-21

Each project was defined by four parameters:

- Capital cost in 2007 dollars
- Start date or population trigger
- Design and construction durations
- Capital financing sources

Where capital costs were assigned a range of values to reflect an uncertainty of probable costs, the simple mid-point of the range was utilized, assuming it to be the most likely capital cost.

Each project was defined in relation to its project parameters which are constrained on a macro level by policy, fiscal constraints and growth assumptions. Once all of the project parameters were selected, a corresponding solution set was generated. By adjusting different aspects of the projects' parameters, the outputs change to create a new and different solution set. These project parameters can be adjusted in conjunction or independently.

5.1.2 Key Financial Model Assumptions

Growth Funds Growth

The SWIP study area will be treated as if it were its own tax district, with a self funding structure generating those financial resources required to support future infrastructure growth. In other words, the area's residents will create an asset base for borrowing, and a tax base for debt servicing. In the financial model, this translates into a zero base assumption – currently no one lives in the undeveloped portions of the SWIP area, hence there are no taxable assets nor are there any pre-existing liabilities. This is referred to as the growth funds growth assumption.

Population Drives Taxable Asset Base

The only driver of taxable property was population. It was assumed that the SWIP area and the rest of Pima County will have identical ratios of net secondary taxable assets at $6,974 per person. The assumed population density of the SWIP area was 2.7 people per equivalent dwelling unit (EDU). All dollar amounts are shown in real 2007 dollars. No cost escalation or time value of money assumptions were made.

Balance Sheet Approach to Capital Finance

The model utilized a balance sheet approach for capital finance, matching the demand for capital from infrastructure projects with viable sources. Projects were treated as finished capital assets that were funded through a series of singular, year-end financing events. It was assumed that by staying within its statutory financing limits, Pima County will always have the operating cash flow (tax revenue, fees, utility rates, agency funding) to service all outstanding debt. It was also assumed that bonds can be issued in precise dollar amounts as required with zero transaction costs.

Ongoing cash flow items that would appear on an income statement or statement of change of financial position, such as operating activities, revenue streams, debt servicing, etc., were ignored. The model does not allow for accumulated budget surpluses or annual deficits that could have an effect on balance sheet activities – "saving up" for an asset was not allowed.

In reality, there will be timing issues, meaning that Pima County will likely have to provide bridge financing and leverage short-term borrowing or "save up" by accumulating surpluses to meet actual cash flow requirements. It was assumed that these short term cash flow issues will be dealt with during the normal course of Pima County's financial activities and are outside the scope of this project.

Of particular interest to the SWIP area is the potential for a Community Finance District (CFD). A CFD allows developers to issue bonds while leveraging County interest rates - typically lower than commercial interest rates - in order to advance capital funding to the County for off-site infrastructure. The developer carries and finances the debt which is secured by the CFD and its assets. Since the developer carries the debt and debt servicing burden, these bonds do not affect the County's debt capacity. This allows early access to development impact fees and reduces the County's bridge financing requirements.

A comparison between capital financing events and cash flow events is shown in Table FA-2.

Sources of capital funding can be described by two dimensions:

- Source of the capital funds
- Ownership of the capital asset

The way these two dimensions interact defines the nature of the capital funding strategy as illustrated in Table FA-3a.

Capital Financing Options

The model allowed for five sources of capital funding as shown in Table FA-3b.

Assumptions for Presented Solution Set

The presented solution set which follows uses the capital financing assumptions shown in Table FA-3c.

Basis of Capital Project Timelines

The recommended capital project timelines were formed on the basis of adequately meeting service needs arising from the proposed medium density population forecast. In scheduling and phasing projects, it was assumed that funding constraints (if any) would not impact project timelines.

Table FA-2 Comparison Between Capital Financing and Cash Flow Events

Balance Sheet or Capital Finance Events	*Income Statement or Operations Cash Flow Events*
Bond Issue	Bond Release or Buy-back
	Property Tax Collection
	Debt Servicing Costs
	Bond Transaction Costs
Development Impact Fee	Not Applicable
Community Finance District (CFD)	
Federal / State Government Grants	Federal / State Operating Grants or Programs
Connection Fees	Utility Rates
Public Donations	User Fees
	Fines and Penalties
Private Sector Investment / Privatization	Not Applicable
Public-Private Partnership for Finance	Public-Private Partnership for Operations

Table FA-3a Dimensions of Capital Funding

Ownership of Asset	*Source of Capital Funding*	
	Public	Private
Private	Some P3's User Fees	Privatization
Public	Bonds Connection Fees Grants Donations	Development Impact Fees Community Financing Districts Some P3's

Table FA-3b Five Model Options for Capital Funding

Capital Financing Option	*Description*
Bonds	Bonds reflect the variety of debt vehicles that Pima County can engage in. As a general rule, the total debt is limited to 15% of the area's assessed full cash value. Bonds will be typically presented as General Obligation Bonds (GOB), although certain asset classes are allowed to have specialty bonds with their own - typically lower - debt limits
Development Impact Fees	Fees levied against developers to fund off-site infrastructure. This category includes CFDs
Agency Funding	Capital funds provided by levels of government other than Pima County, such as state or federal funding
Private	Pima County would engage a corporation to construct and own an infrastructure asset along with the rights to charge citizens for the use of that asset. An example of this would be a toll road or natural gas utility company. This category includes private donations, community fund raising and one-time connection fees directed at end users
Special Purpose Bonds	Pima County can issue three types of special purpose bonds: Regional Flood Control Bonds, Highway Bonds (supported by HURF revenues) and Sewer Revenue Bonds

Table FA-3c Capital Funding Assumptions for Presented Solution Set

Infrastructure Asset Class or Category	*Source of Capital Funding*					Totals
	General Obligation Bonds (GOB)	*Development Impact Fees*	*Agency Funding*	*Private*	*Special Purpose Bonds*	
Transportation	0%	4%	66%	0%	30%	**100%**
Flood Control	54%	46%	0%	0%	0%	**100%**
Other / Facilities	100%	0%	0%	0%	0%	**100%**
Parks and Recreation	18%	82%	0%	0%	0%	**100%**
Wastewater Management	0%	0%	0%	0%	100%	**100%**

5.2 FINANCIAL ANALYSIS AND RESULTS

There is a wide range of possible solution sets to the capital funding issues for Pima County. A solution set is defined as all of the variables, assumptions and constraints that culminate into a given solution. This analysis and report examines several options and presents one particular solution set illustrated by a series of graphs. The presented solution set is for illustrative purposes only and is not the ideal solution. The presented solution set is only one of many possible viable solutions. The creation of additional alternatives will be discussed at the end of the section.

5.2.1 Pima County Debt Capacity

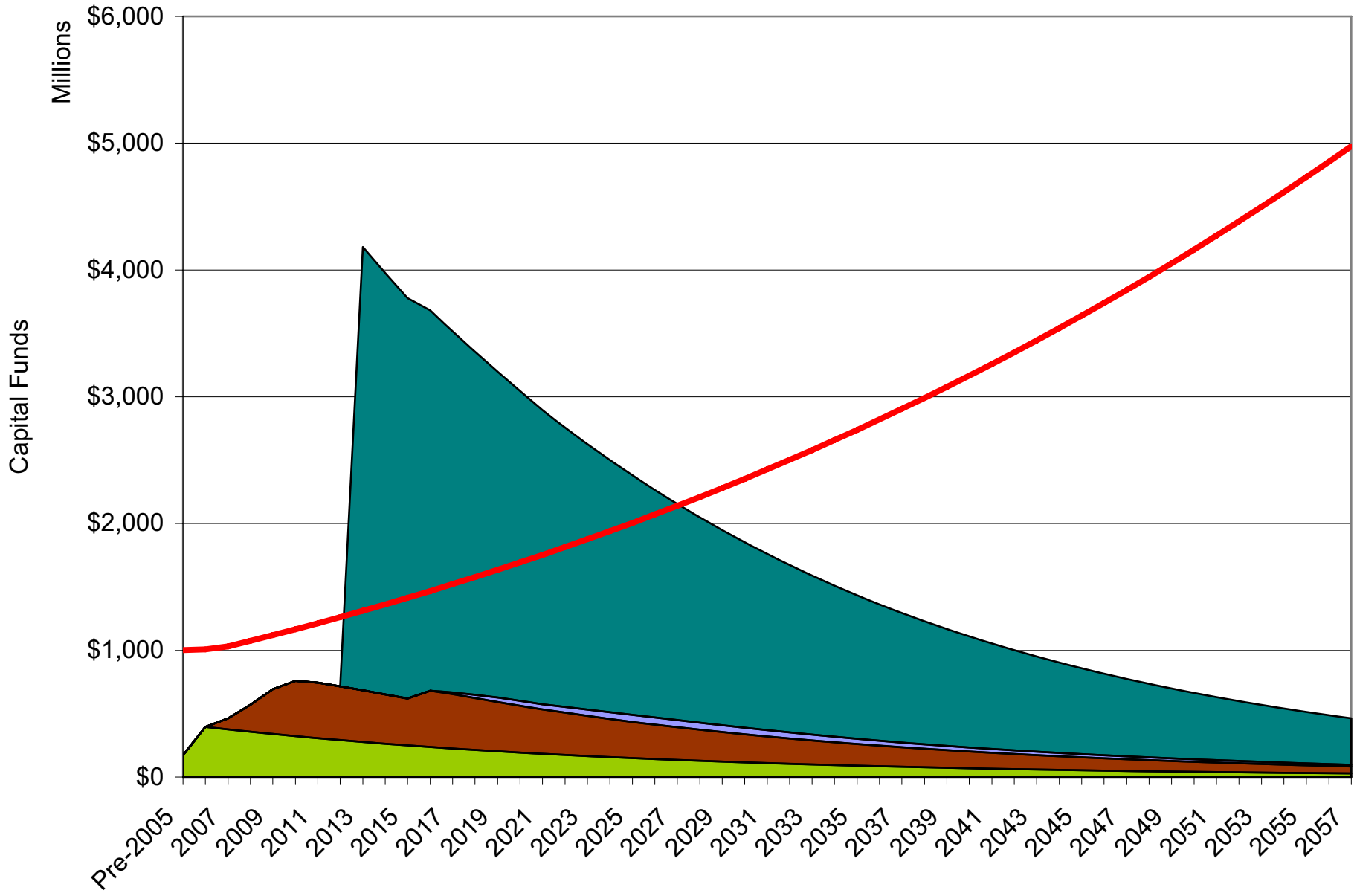
Figure FA-1 illustrates Pima County's total debt capacity, including all completed, current and proposed bonds as well as all the bonds required for the presented SWIP infrastructure development solution set. All debt has a twenty year amortization schedule. It is assumed that Pima County's operating budget will not only service the interest portion of the debt but also retire 5% of the original principal annually. Note that Figure FA-1 is the only graph that relates to the whole of Pima County.

Pima County's 2007 General Obligation Bonds (GOB) debt capacity is approximately $1.075 B which is 15% of the current Net Secondary Assessed Valuation of $6.8 B. There are asset categories that have different, typically lower, debt maximums. There are three types of special purpose bonds (Regional Flood Control Bonds, Transportation Bonds, and Sewer Revenue Bonds) which are detailed in Table FA-4 along with CFD Bonds. It should be noted that special purpose bonds are not mutually exclusive to General Obligation Bonds.

It is noted here that the County has sufficient debt capacity to finance all of its completed, current and proposed SWIP area bonds identified in the presented solution set. The smallest difference between proposed debt and debt capacity occurs in 2013, at a difference of approximately $406 million. This analysis does not factor in the demand for bonding from other areas of Pima County.

It should be noted that the complete list of proposed candidate projects for the 2008 bond program has a total of almost $3.5 billion. Pima County will not have $3.5 billion of debt capacity until the year 2043. It is assumed that this proposed list of projects will be significantly rationalized during the 2008 bond program selection process to keep within Pima County's debt capacity limits.

This graph indicates that should the working assumption of growth funds growth be altered, additional funding options exist. The extent of these options is unknown as there are likely other demands on Pima County's debt capacity beyond the information shown and the limited time horizon of the proposed bonds. Even if the SWIP area utilized the entire debt capacity of Pima County, additional sources of funding would be required.



Legend

- Candidate Projects for Bonding
- SWIP GOB
- Bonds- Current
- Bonds- Completed
- Funding Ceiling (Bond Limits)

Pima County Public Works
Southwest Infrastructure Plan

Figure No.
FA-1

Title
Pima County
Total Debt Capacity

Table FA-4 Details of Special Purpose Bonds

Type of Special Purpose Bond *	*Limits*	*SWIP Model Notes*
Regional Flood Control Bonds	5% of Net Secondary Assessed Value Usable for Flood Control Only	Will Not Be Used in the Model
Transportation Bonds	Transportation Project Only Limited by Revenue Supported by HURF Funding	Model Does Not Forecast Transportation Revenue
Sewer Revenue Bonds	Wastewater Projects Only No Statutory Limits Funded by Sewer User Fees	

Notes

* *Community Finance Districts (CFDs) can also issue bonds against assets such as projected assessments, taxes or revenue streams. These instruments are not considered Pima County Debt and have no impact on Pima County's debt capacity. Therefore Pima County does not have a limit to the amount or extent that this form of financing. CFDs are treated by the SWIP Funding model as a form of Development Impact Fee.*

5.2.2 Debt Capacity of SWIP Area

Figure FA-2 shows the assumed population growth of the SWIP area, which is the only assumed driver of taxable assets and hence overall debt capacity. In keeping with the growth funds growth assumption, only incremental population growth after 2007 enables debt capacity. Each person within the SWIP area is associated with the same $6,974 of net secondary assessed (taxable) assets as individuals in Pima County.

5.2.3 Capital Funding Sources

Each individual project has its own capital funding sources, however projects within a given infrastructure category will tend to have similar funding allocations. Figure FA-3 shows the weighted average capital funding mechanisms for each infrastructure category in the provided solution set. The presented (and many of the possible solution sets) will have wastewater projects 100% funded by special purpose bonds, i.e. sewer revenue bonds.

5.2.4 Annual and Cumulative Capital Requirements

Figure FA-4 shows the annual SWIP area capital project funding requirements by asset class and year. The wave of capital investment in the SWIP area is clearly evident as it peaks in the year 2020.

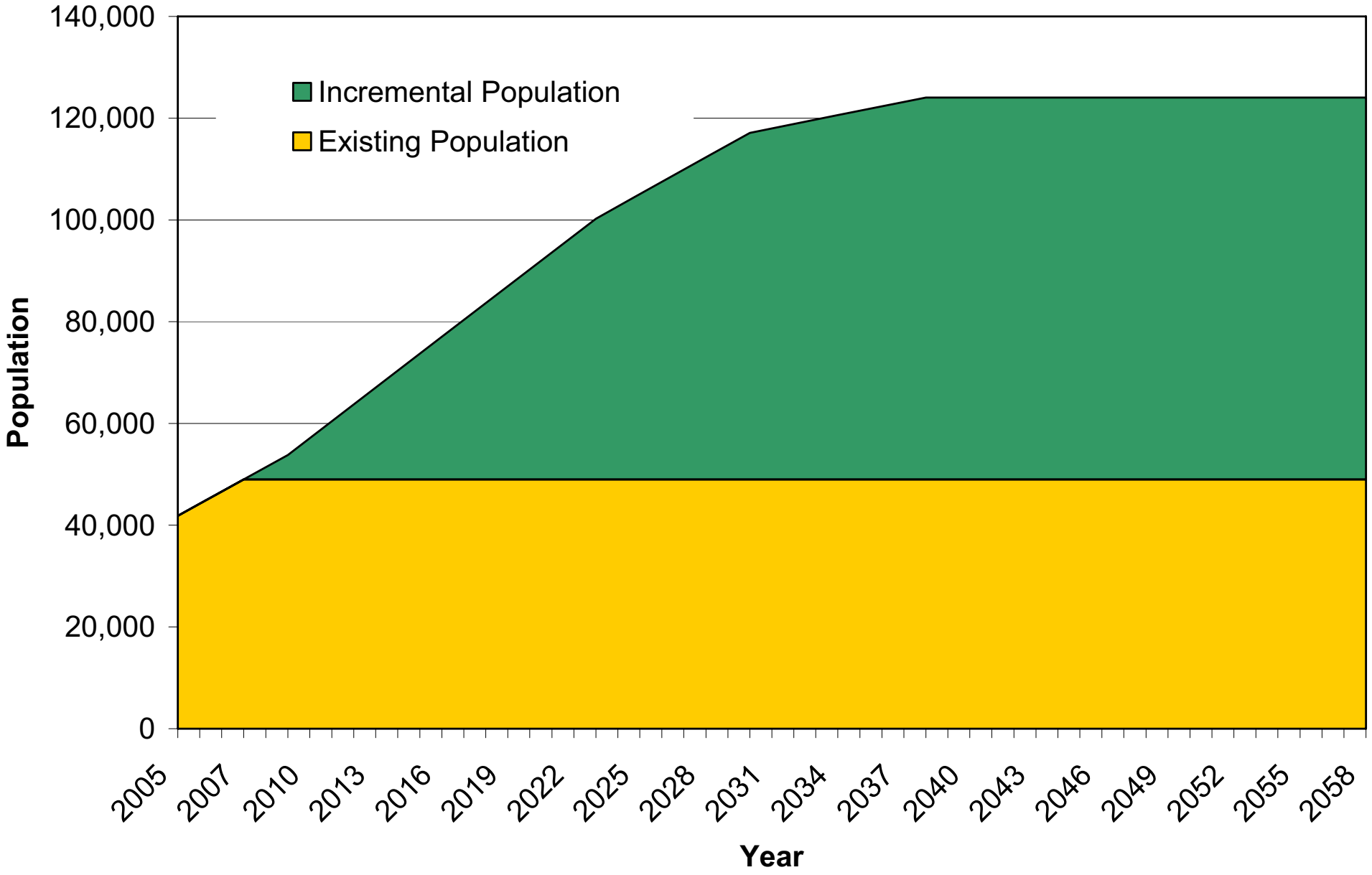
Figure FA-5 displays the cumulative capital requirements by asset class for the SWIP area. Transportation consumes over 60% of the capital funding, with the remaining 40% split relatively evenly between wastewater management, parks and recreation, and flood control.

5.2.5 SWIP Capital Financing by Source vs. GOB Debt Capacity

Figure FA-6 shows the current value of SWIP area derived capital financing requirements by source. It should be noted that debt is assumed to be retired at a rate of 5% per year, hence its declining balance is compared to the other four sources. Debt is shown in this manner so it can be related to the debt capacity of the SWIP area, which changes over time. This graph clearly shows that over 80% of the required funding in the presented solution set comes from development impact fees. The magnitude of the required capital financing greatly exceeds the SWIP area's debt capacity.

5.2.6 Current GOB Values by Asset Category vs. GOB Debt Capacity

Figure FA-7 shows the current value of bonds outstanding and the assets that they funded against the debt capacity of the SWIP area. In order to stay within the SWIP area's debt capacity under the growth funds growth assumption, the total GOB requirements must stay under the red line at all times. This graph shows that under the current presented solution set the majority of GOB debt is used to finance flood control projects.



Legend

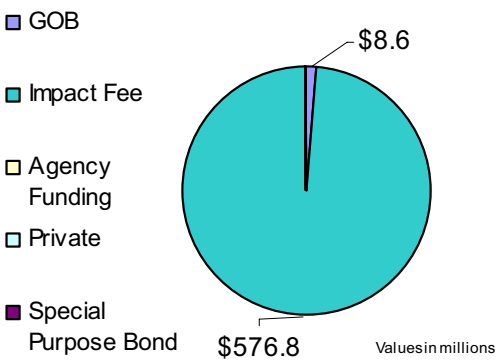
See Labels Above

Pima County Public Works
Southwest Infrastructure Plan

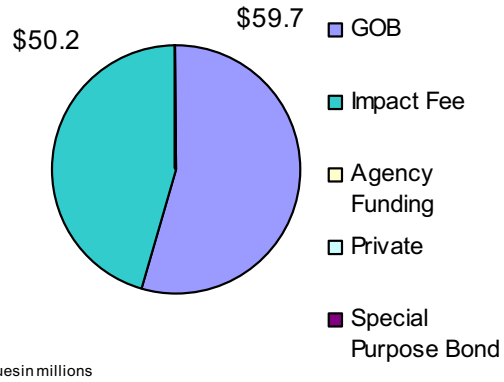
Figure No.
FA-2

Title
Assumed Population Model for Funding Analysis

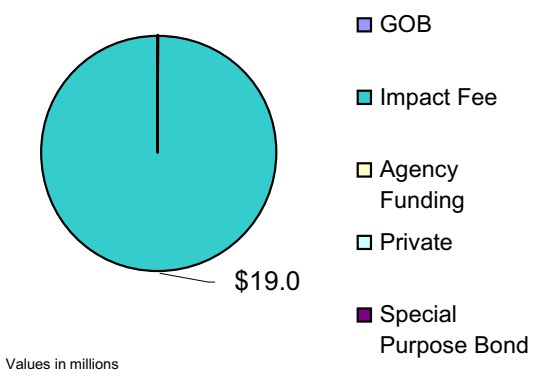
Transportation



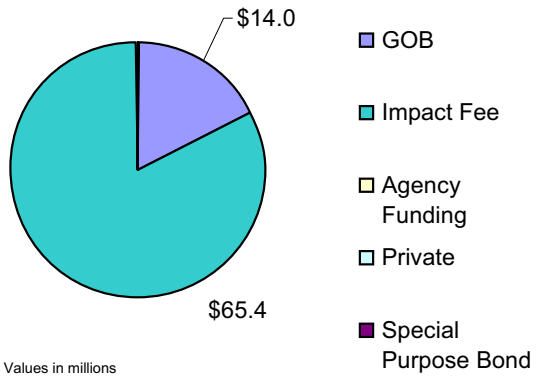
Flood Control



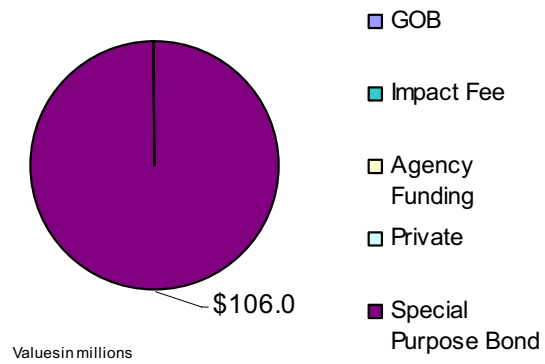
Other / Facilities



Parks and Recreation



Wastewater



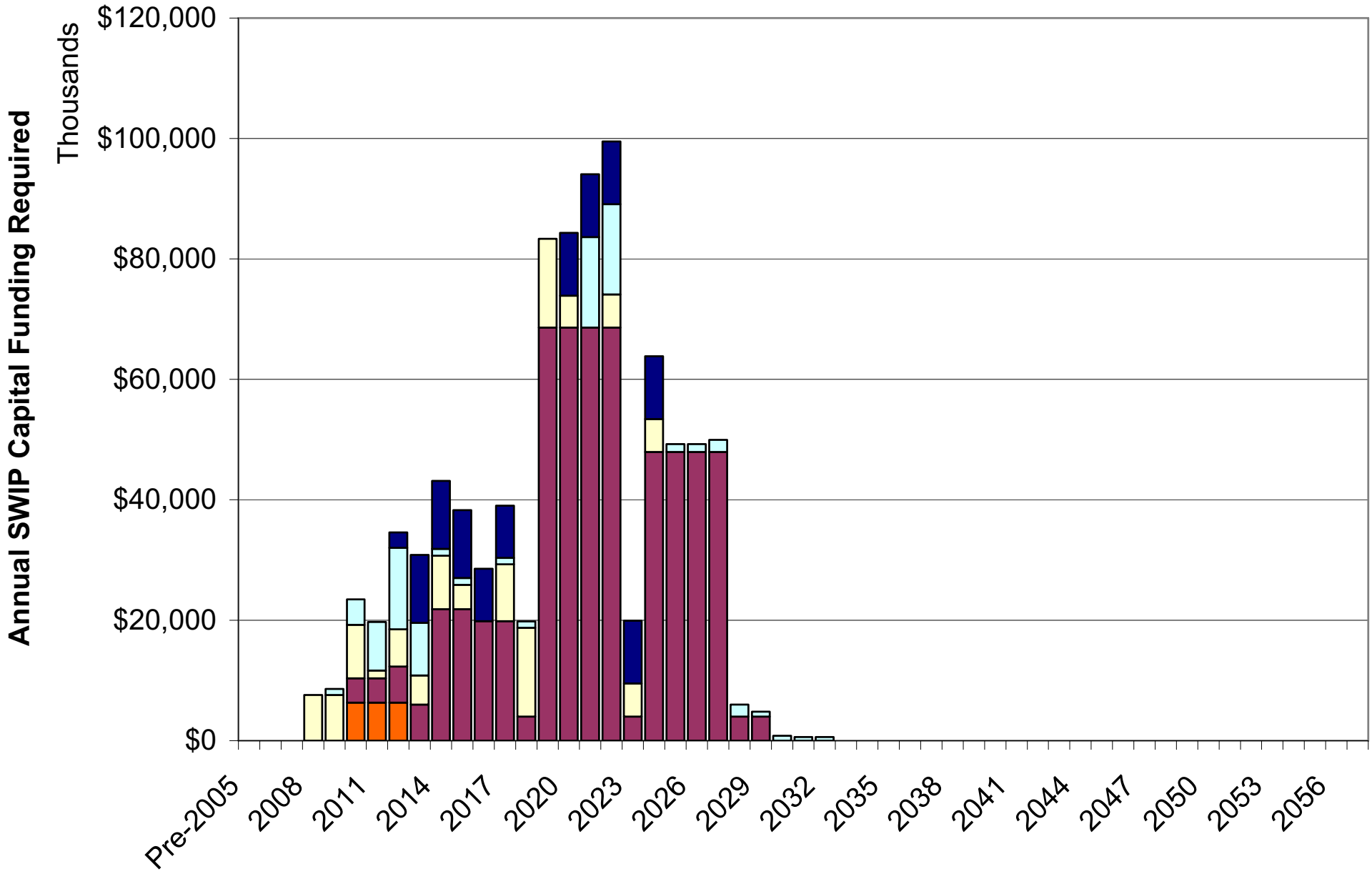
Legend

See Labels Above

Pima County Public Works
Southwest Infrastructure Plan

Figure No.
FA-3

Title
Weighted Average Capital Funding Mechanisms of Presented Solution Set



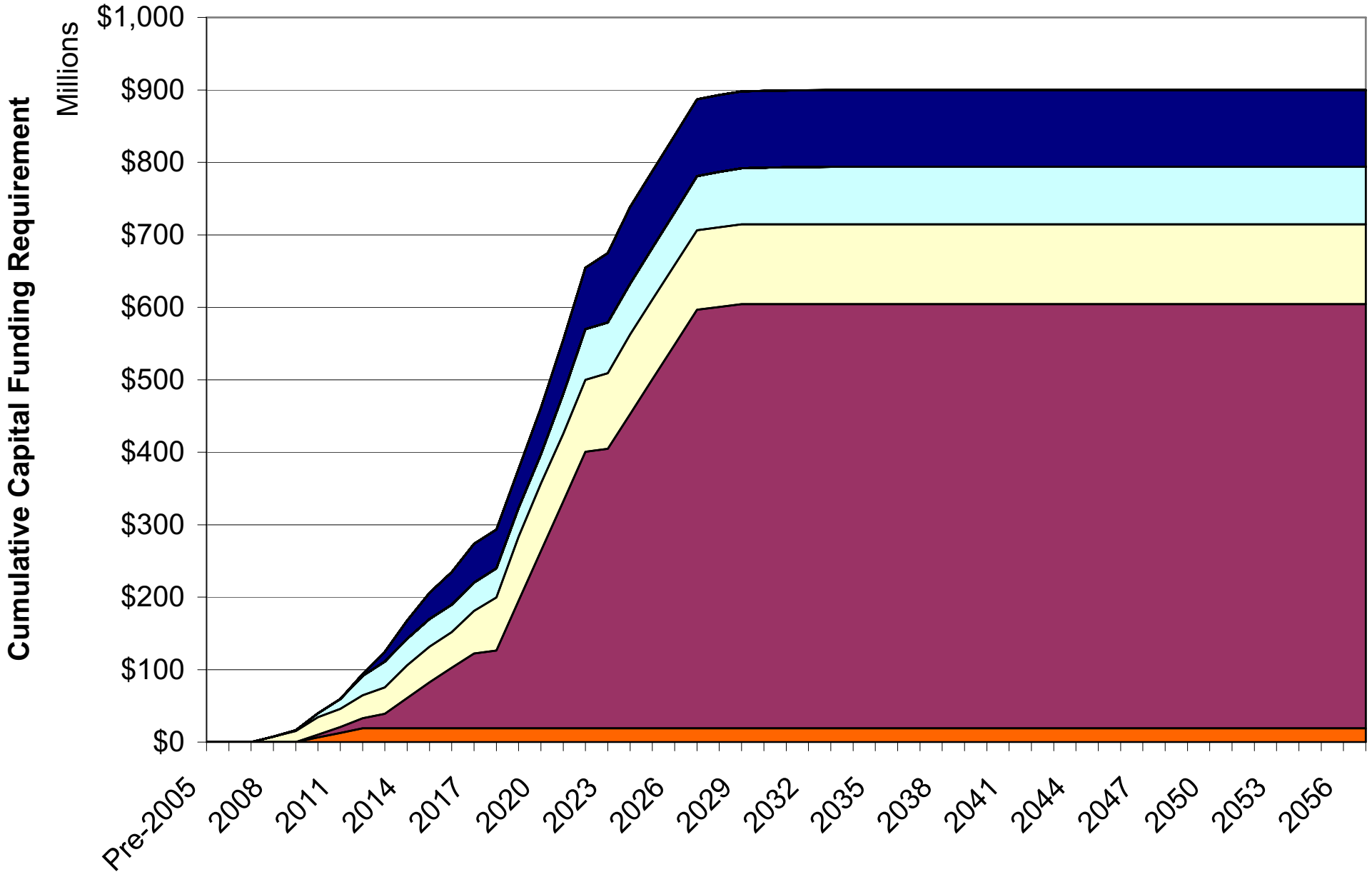
Legend

- Wastewater Management
- Natural Resources, Parks and Recreation
- Regional Flood Control District
- Transportation
- Other / Facilities

Pima County Public Works
Southwest Infrastructure Plan

Figure No.
FA-4

Title
Annual SWIP Capital Funding Requirements by Asset Class



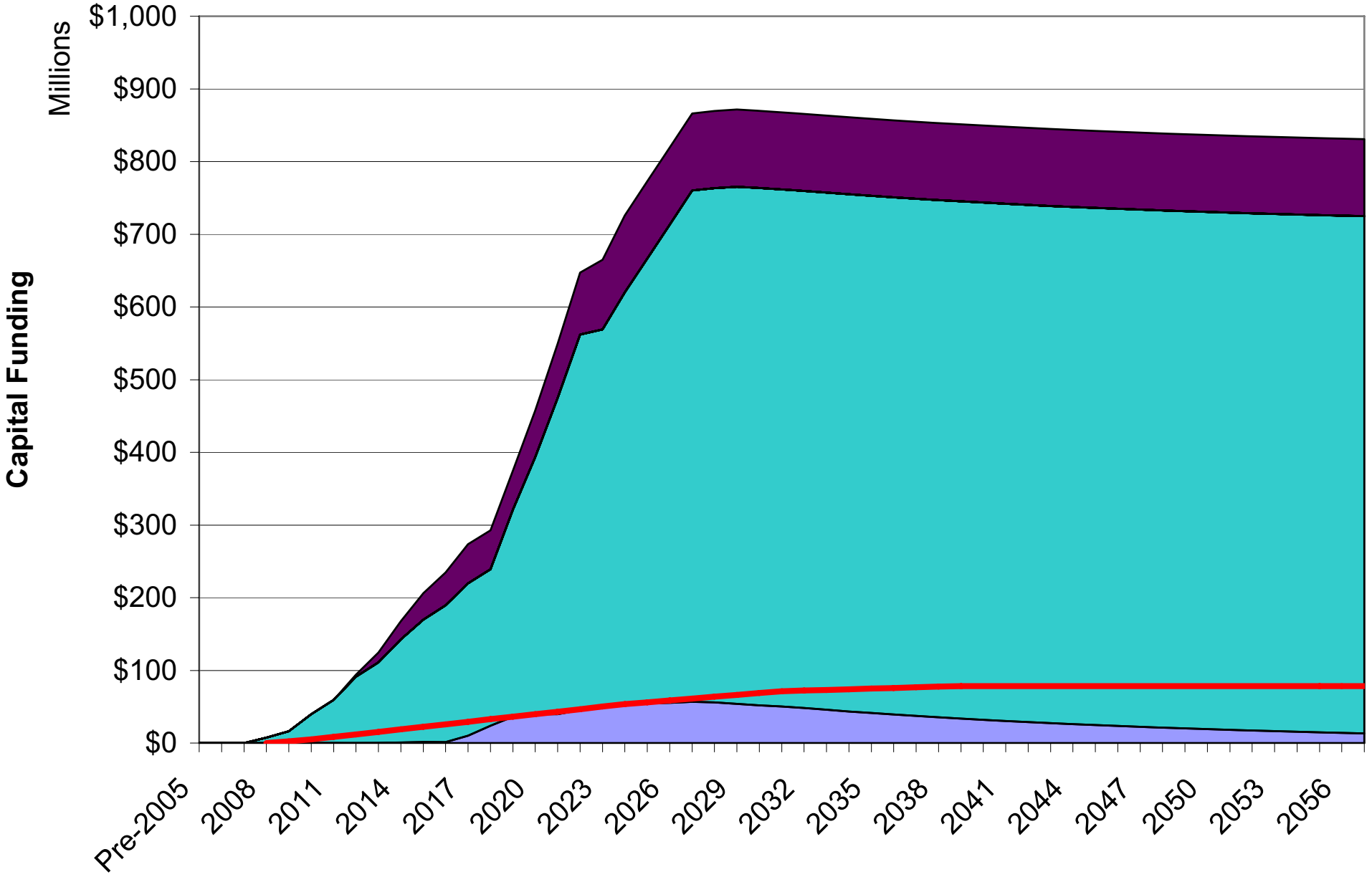
Legend

- Wastewater Management
- Natural Resources, Parks and Recreation
- Regional Flood Control District
- Transportation
- Other / Facilities

Pima County Public Works
Southwest Infrastructure Plan

Figure No.
FA-5

Title
Cumulative Capital Requirements of SWIP Area



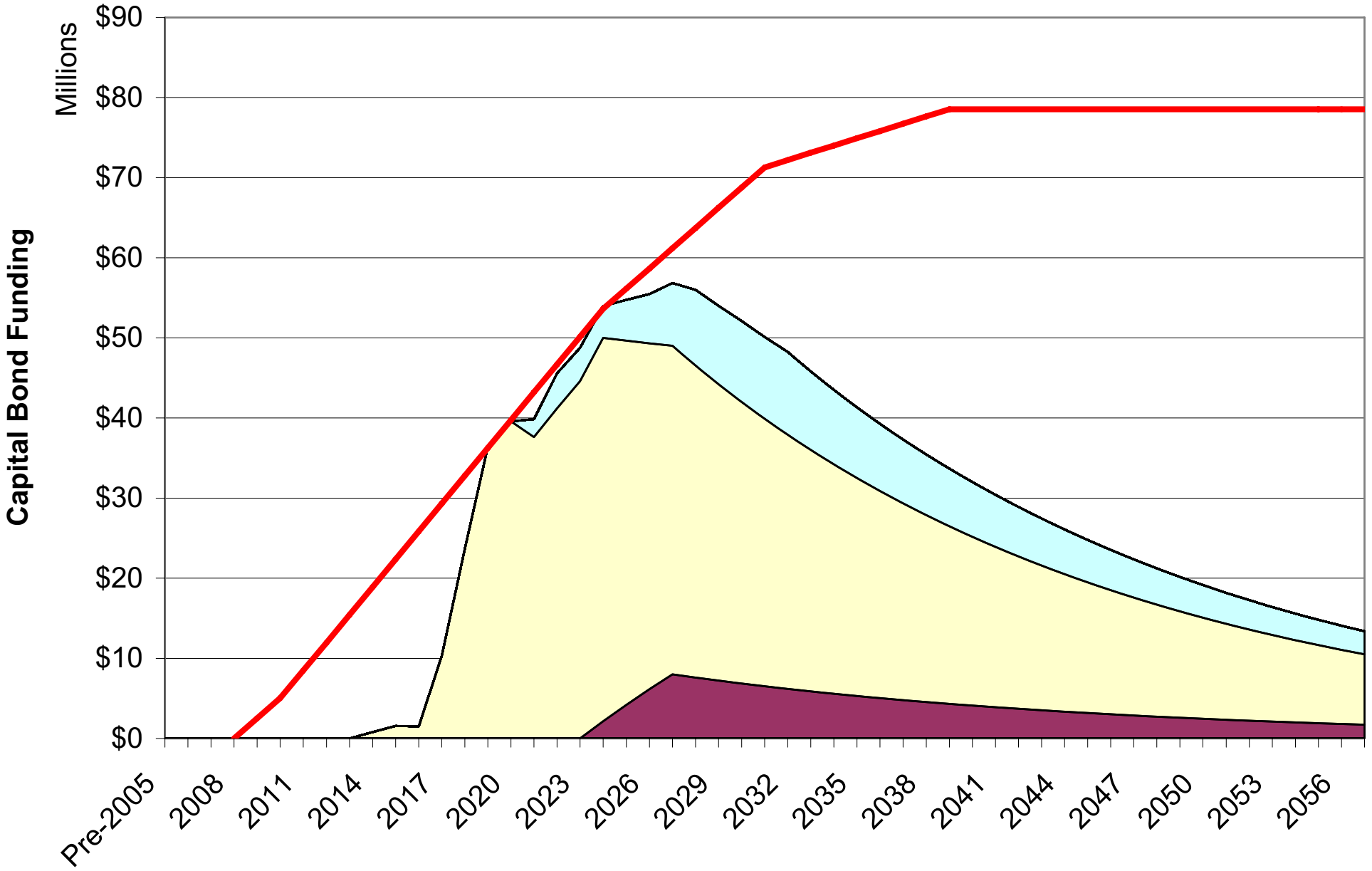
Legend

- SWIP Special Purpose Bonds
- SWIP Private
- SWIP Agency Funding
- SWIP Impact Fees
- SWIP GOB
- Funding Ceiling (Bond limits)

Pima County Public Works
Southwest Infrastructure Plan

Figure No.
FA-6

Title
Capital Financing Sources vs. GOB Debt Capacity



Legend

- Wastewater Management
- Natural Resources, Parks and Recreation
- Regional Flood Control District
- Transportation
- Other / Facilities

Pima County Public Works
Southwest Infrastructure Plan

Figure No.
FA-7

Title
SWIP GOB Values by Asset Category vs. Debt Capacity

5.2.7 Bond Ceiling Surplus and/or Deficit

Figure FA-8 shows the SWIP area's surplus (or deficit) debt capacity for the presented solution set. In order to comply with the assumptions, a solution set that includes a deficit is not acceptable. In order to create a viable solution set, any non-zero annual debt capacity deficit needs to be eliminated by adjusting project parameters, operating constraints, or assumptions. Ideally these adjustments would level the peaks and troughs of the graph and thereby effectively utilize the area's debt capacity over a longer period of time. This graph clearly shows that the presented solution set is viable, however it should be noted that a viable solution set may not indicate the optimal solution set.

5.2.8 Additional Discussion of Flood Control Funding

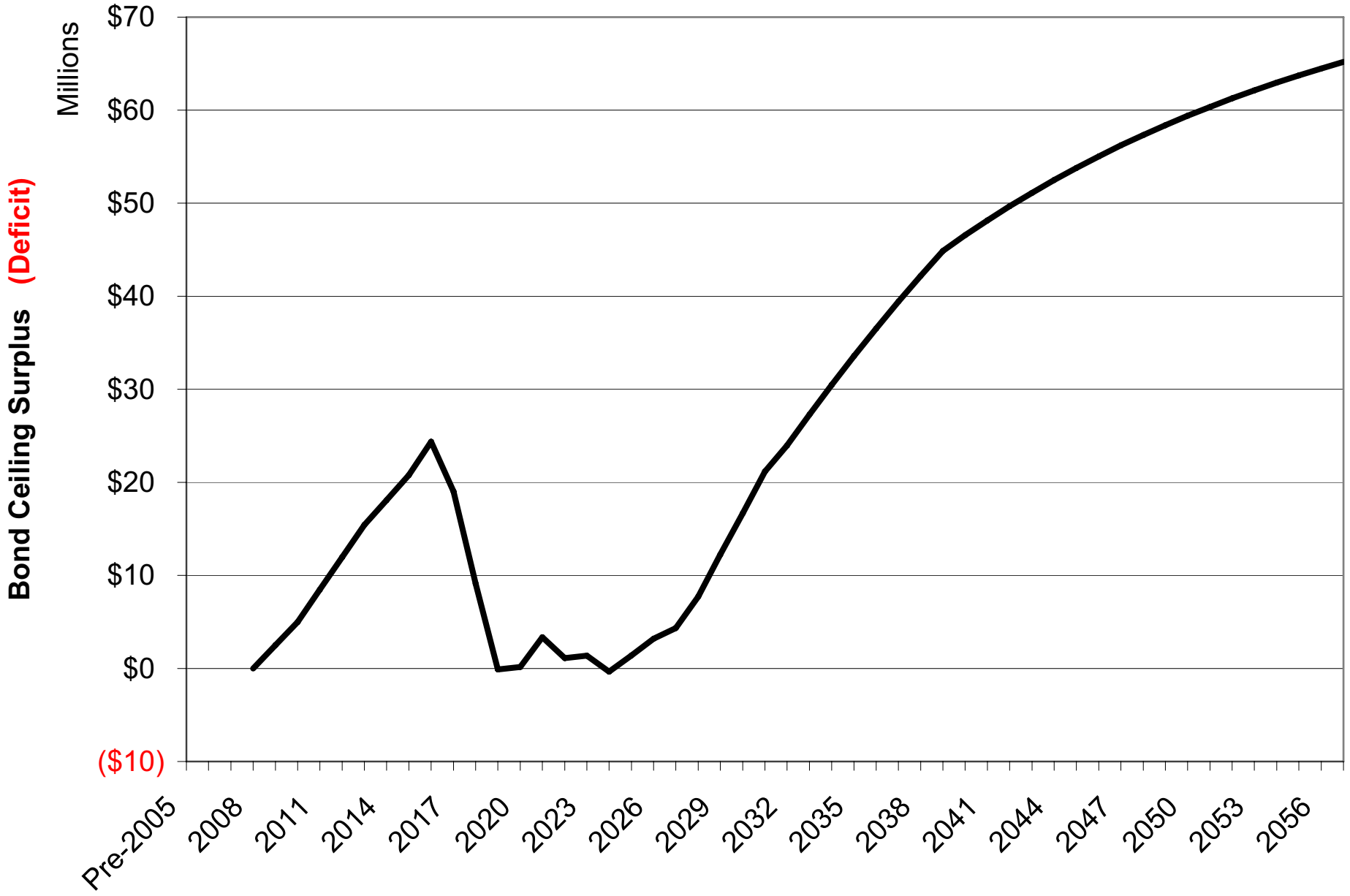
Regional Flood Control District revenues are primarily generated through property tax levy along with general obligation bonds authorized by the electorate. In addition, the District may receive financial assistance from state and federal agencies to plan, design, and construct capital improvements. The primary funding mechanism for proposed flood control improvements identified within the SWIP study would therefore be the county wide property tax levy and optional general obligation bond sales.

Another potential funding source option is to assign flood control facility costs to new development within the SWIP study area. Flood control costs would be assigned to new development based upon an equivalent demand unit (EDU). One EDU is equal to 1 new dwelling unit. Utilizing a medium density growth scenario, approximately 28,699 dwelling units are anticipated to be added to the area at build-out. Through these EDU's, additional funding could be obtained by assigning costs evenly to all future 28,699 dwelling units.

A third potential funding source, not currently adopted by Pima County, would assign flood control improvement costs to only those future dwelling units receiving benefit from a particular flood control structure (i.e., stormwater basin, engineered channel, etc.). This funding mechanism would require a much greater level of study in order to adequately identify EDU subsets in addition to the evenly distributing EDU funding process.

Flood control facilities proposed/identified within the SWIP study include stormwater conveyance elements (collector/conveyor channels), stormwater attenuation elements (detention basins), and roadway drainage crossings (bridge or box culvert crossings).

Stormwater conveyance and stormwater attenuation typically benefit existing and proposed developments located within the watershed incorporating the flood control improvement. Proximity to a flood control structure may also determine potential benefit. That is, property owners located nearer to a flood control structure will be accorded greater benefit from the facility or structure than a property owner located substantially downstream. Funding mechanisms associated with stormwater conveyance and stormwater attenuation would typically be addressed via property tax levy and/or general obligation bonds. However, based upon the proposed densities and population forecast, additional funding could be obtained through the application of EDU's to all new development. Also, since engineered channels and



Pima County Public Works
Southwest Infrastructure Plan

Figure No.
FA-8

Title
General Obligation Bond Ceiling Surplus or (Deficit)

detention basins tend to be regional with respect to benefit received, the drainage improvements could also be funded by an additional EDU subset whereby only those property owners receiving benefit from the flood control improvement would be assessed.

5.2.9 Additional Discussion of Transportation Funding

Pima County uses transportation revenues to fund its annual capital budget as well as its operations and maintenance budget. Highway User Revenue Fund (HURF) and the non-HURF Vehicle License Tax (VLT) revenues are the largest sources of recurring County transportation funds. HURF and VLT funds are the almost exclusive source for annual operating expenses and will continue to be the primary source.

The following discussion focuses first on historical and identified future transportation fund sources for transportation. The next section describes Pima County transportation funding specifically allocated to projects within the SWIP study area.

5.2.9.1 Historical and Identified Future Transportation Capital Project Funding

The data in this section is based upon information provided by the County's Capital Improvement Program Division. The database used includes all completed capital projects and all projects active in the Fiscal Year 2007 – 2012 CIP. The data base begins with Fiscal Year (FY) 1998 and includes projected funding for active projects through FY 2013 and beyond. This database does not include transportation projects that are scheduled to become active in FY 2013 or later. The information is inclusive enough to provide a good general overview of County transportation capital funding sources.

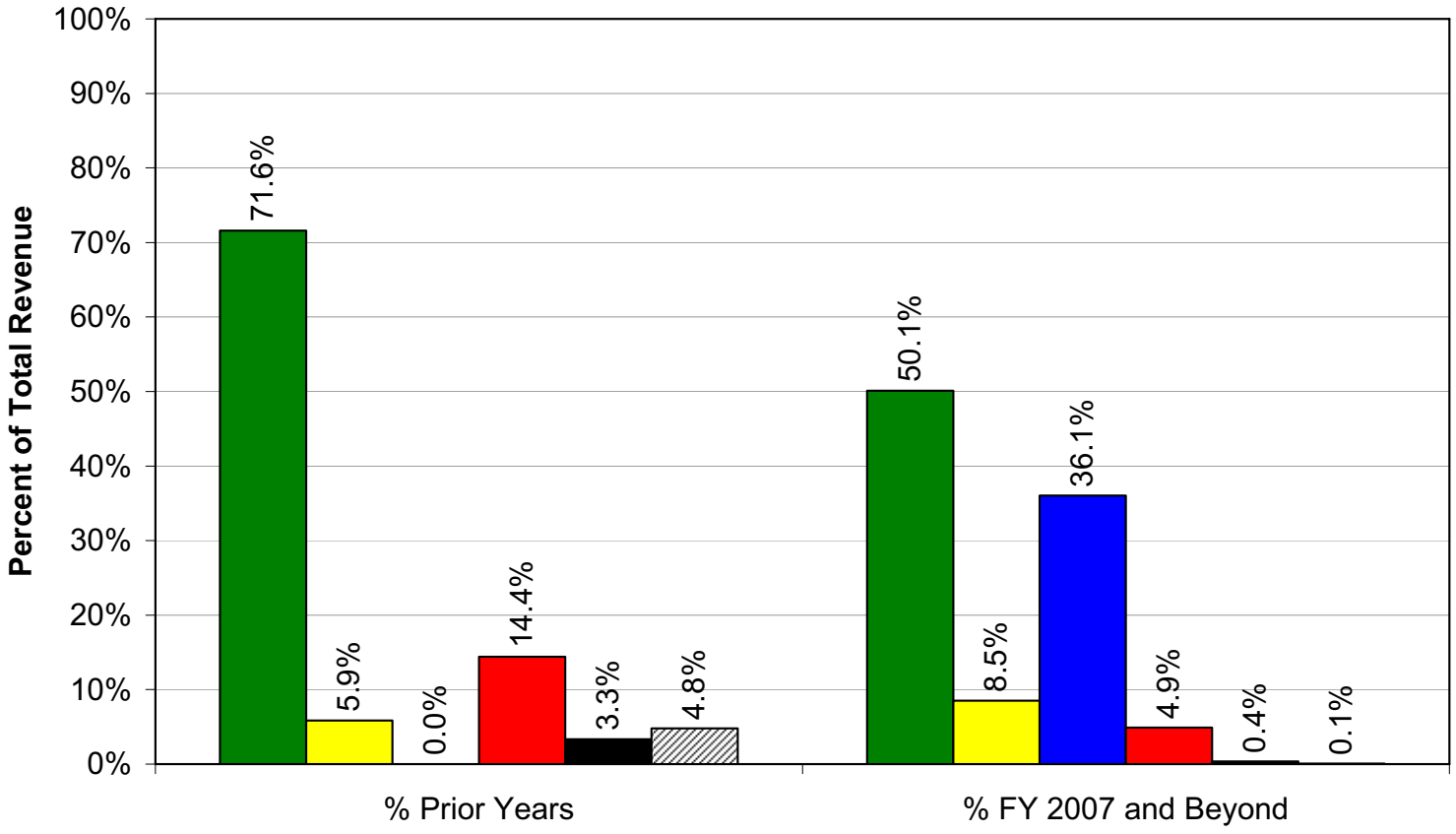
Table TR-7 summarizes this data. For completed and active County capital projects, it shows that total projected funding is $1.1 billion. In a period defined as "prior years" (that is, between FY 1998 and 2006) $364.8 million was expended. Another $351.4 million is scheduled for expenditure in the 5-Year CIP and $357.4 million will be expended in the years beyond FY 2013.

Figure TR-6 presents Pima County transportation capital expenditures by funding source percentages. Figure TR-6 distinguishes between "prior years" and the period following FY 2007 in order to highlight the impact of Regional Transportation Authority (RTA) funding on County transportation funding sources.

Prior to voter approval of the RTA plan and its associated sales tax, HURF revenues accounted for 71.6% of County transportation capital funding. From FY 2007 onward, HURF funds will account for 50.1% and RTA funds 36.1% of County transportation capital funds.

Table TR-7 Pima County Transportation Capital Funding Sources

Funding Source	*Prior Years*	*FY 2007 - 2012*	*FY 2013 and Beyond*	*Total*
HURF Revenues	$261,142,163	$217,471,871	$137,603,579	$616,217,613
Impact Fees / Improvement Districts / Private	$21,356,771	$42,093,049	$18,369,123	$81,818,943
RTA Funding		$65,178,826	$190,389,000	$255,567,826
Federal	$52,569,284	$23,692,000	$11,004,000	$87,265,284
State	$12,184,646	$2,544,343	$0	$14,728,989
Miscellaneous	$17,502,002	$447,524	$0	$17,949,526
Totals	364,754,866	351,427,613	357,365,702	1,073,548,181



Legend

- HURF Revenues
- Impact Fees / Improvement Districts / Private
- RTA Funding
- Federal
- State
- Miscellaneous

Pima County Public Works
Southwest Infrastructure Plan

Figure No.
TR-6

Title
Pima County Transportation Capital Funding Sources

HURF Revenues

Pima County receives allocations from the Highway User Revenue Fund (HURF) and from a sub-allocation of Vehicle License Taxes (VLT) transferred to Arizona counties for transportation purposes. In FY 2006, Pima County received $43.3 million in HURF funds and $13.7 million in non-HURF VLT funds. Since FY 1998, Pima County has received a total of $424.0 million in HURF and VLT funds. The County uses these revenues to fund the annual operating budget, debt service on HURF Revenue Bonds, and transfers of HURF funds to the capital budget (referred to as "County HURF" in the County's CIP).

In the years prior to FY 2007, HURF Revenue Bonds (47.1%) and County HURF (16.5%) accounted for a combined 63.6% of all transportation capital expenditures, but the relative importance of these two funding sources will decline over time as shown on Figure TR-7. In the "prior years," HURF Revenue Bonds accounted for 47.1% of total transportation funds, but that will decline to 30.6% in the period of FY 2007 to 2012, and to 13.2% in FY 2013 and beyond. The 1997 HURF Revenue Bond Program identified fifty-seven projects to be constructed with these funds and when the program is completed, there is no current indication that Pima County would seek voter approval for a second HURF Revenue Bond package.

Impact Fees

Pima County collects transportation development impact fees in ten benefit areas. As of November 2006, the County has collected $74 million in impact fees, completing twelve projects, with six projects currently under construction and eleven in design.

The County's current CIP data base shows a total of $54.1 million in impact fees scheduled for expenditure from FY 2007 onwards: $35.7 million in the period FY 2007 – 2012 and $18.4 million for FY 2013 and beyond.

5.2.9.2 Funding Sources for Identified SWIP Transportation Improvements

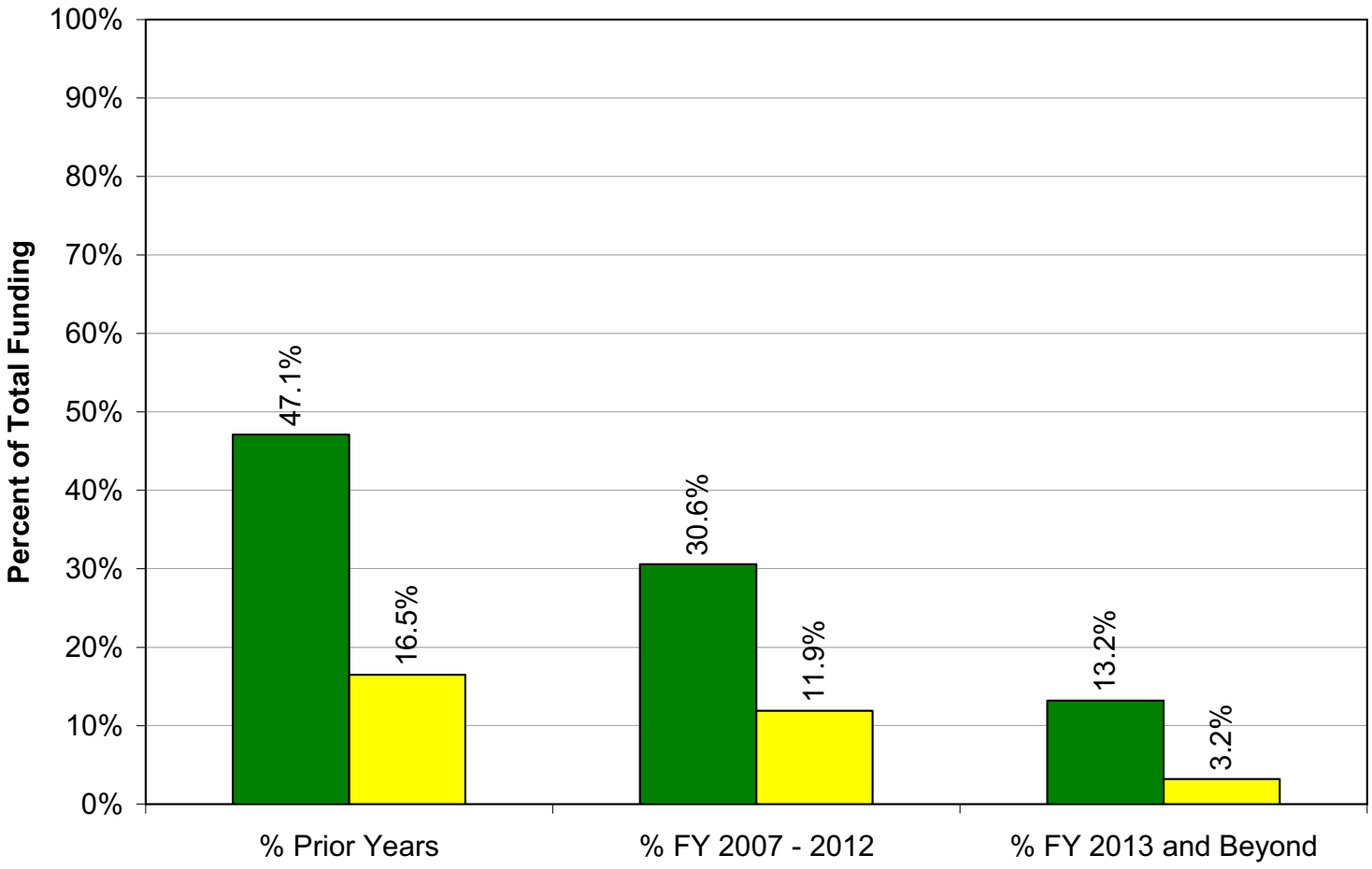
The County's FY 2007 – 2012 CIP lists four projects active in the SWIP study area. Table TR-8 contains summary data for these four projects and indicates that three of the projects are HURF Revenue Bond projects and the fourth is an RTA project.

A total of $89.1 million is scheduled for these four projects; $45.1 million for the RTA project and the remainder for the HURF projects. Three of the projects are on Valencia Road and the fourth is on Kinney Road.

The largest single funding source is County HURF, at $32.4 million, with $30.0 million allocated to the RTA Valencia Road project, with an additional allocation of Urban HURF (12.6% funds) of $8.2 million for a combined allocation of $40.6 million.

Impact Fees ($12.5 million) and a Developer Contribution ($5.1 million) are the second largest funding sources with a combined $17.6 million.

HURF Revenue Bonds account for $15.4 million and RTA funds for another $15.1 million.



Legend

HURF Revenue Bonds County HURF

Pima County Public Works
Southwest Infrastructure Plan

Figure No.
TR-7

Title
HURF Revenue Bond and County HURF Portions of Transportation Funding

Table TR-8 Transportation Funding for Active Projects in SWIP Area

Project	*HURF Revenue Bonds*	*County HURF*	*Impact Fees*	*Developer Contribution*	*Urban HURF*	*RTA Funds*	*Other*	*Totals*
DOT-17: Valencia Road, Mark Road to Camino de la Tierra	$5,800.00	$2,363.80	$9,204.00		$3,130.00			$20,497.80
DOT-49: Valencia Road, Mission Road to Interstate-19	$5,726.00	$33.60			$5,033.00		$35.20	$10,827.80
DOT-50: Kinney Road, Ajo Highway to Bopp Road	$3,800.00	$0.20	$3,327.60	$5,125.30			$500.00	$12,753.10
RTA #21: Valencia Road, Ajo Highway to Mark Road		$30,000.00				$15,056.00		$45,056.00
Totals	**$15,326.00**	**$32,397.60**	**$12,531.60**	**$5,125.30**	**$8,163.00**	**$15,056.00**	**$535.20**	**$89,134.70**

Notes

Funding Amounts Expressed in Thousands of Dollars ($ 000)

Pima County Public Works
Southwest Infrastructure Plan

Table No.
TR-8

Title
Transportation Funding for Active Projects in SWIP Area

The County lists several other Impact Fee projects that are not included in the FY 2007 – 2012 CIP. These projects, in the Avra Valley Benefit Area, are:

- Sandario Road: Rudasill Road to Ajo Highway
- Camino Verde: Valencia Road to Ajo Highway
- Irvington Road: Joseph Road to Ajo Highway
- San Joaquin Road: Sandario Road to Calle Cibeque

5.2.9.3 SWIP Transportation Funding Summary

The Transportation element of the SWIP identifies transportation capacity improvements of $585.5 million to support development in the study area: $80 million to augment funding for current projects, $305 million to County Roads and $117.5 million to Ajo Highway, $40 million for I-19, $24 million for travel demand management projects, and $19 million for public transit service. All of these proposed capacity improvements will need an identified funding source. However, County HURF Revenue Bonds and RTA funding are not available, because they are project-specific allocations that do not include these projects.

County HURF revenues are constrained by the overall demand placed upon County HURF for operations and debt service, as well as capacity improvement needs elsewhere in the community.

Other HURF revenues, federal funds, or state funds have never been major source of County transportation capital funding and are subject to competition among the PAG member jurisdictions for allocation.

The only fund sources over which Pima County has implementation authority are impact fees and development exactions. We recommend the County consider creating a new benefit area for the SWIP, with a benefit area plan that includes previously identified development impact fee projects and includes all of the newly identified capacity projects.

The County should collaborate with ADOT on options for getting impact fee revenues and / or developer contributions allocated to the additional improvements to Ajo Highway, and with the City of Tucson for transit services and roadway projects within their corporate limits. Note that the city limits may change through annexation prior to build-out of the study area.

5.3 FUNDING CONCLUSIONS

This initial solution set presented meets the challenge of determining a funding strategy to meet the needs of Pima County residents, SWIP residents, and potential developers. This solution set is not necessarily the ideal or final recommended solution set. In order to develop the most desired solution set stakeholders would have to have a direct say in its creation.

5.3.1 Developer Impact Fees per Equivalent Dwelling Unit

A range of Developer Impact Fees per Equivalent Dwelling Unit (EDU) was identified under three simple scenarios:

Scenario 1: This scenario has 100% of off-site infrastructure is financed through impact fees. The highest possible impact fee is presented in this scenario.

Result: 100 % Development Impact Fee per EDU of $31,353

Scenario 2: In this scenario Pima County funds 100% of the wastewater capital requirements through sewer revenue bonds and issues general obligation bonds up to the SWIP area's maximum GOB debt capacity in the year 2024. The remaining capital requirements are funded by development impact fees. The year 2024 is the final year of GOB funded capital requirements under the provided solution set.

Result: Maximized 2024 SWIP GOB Debt & Sewer Revenue Bond with balance from Development Impact Fee per EDU of $25,790

Scenario 3: Is the presented solution set which includes a combination of general obligation bonds, special purpose bonds, agency funding, and development impact fees.

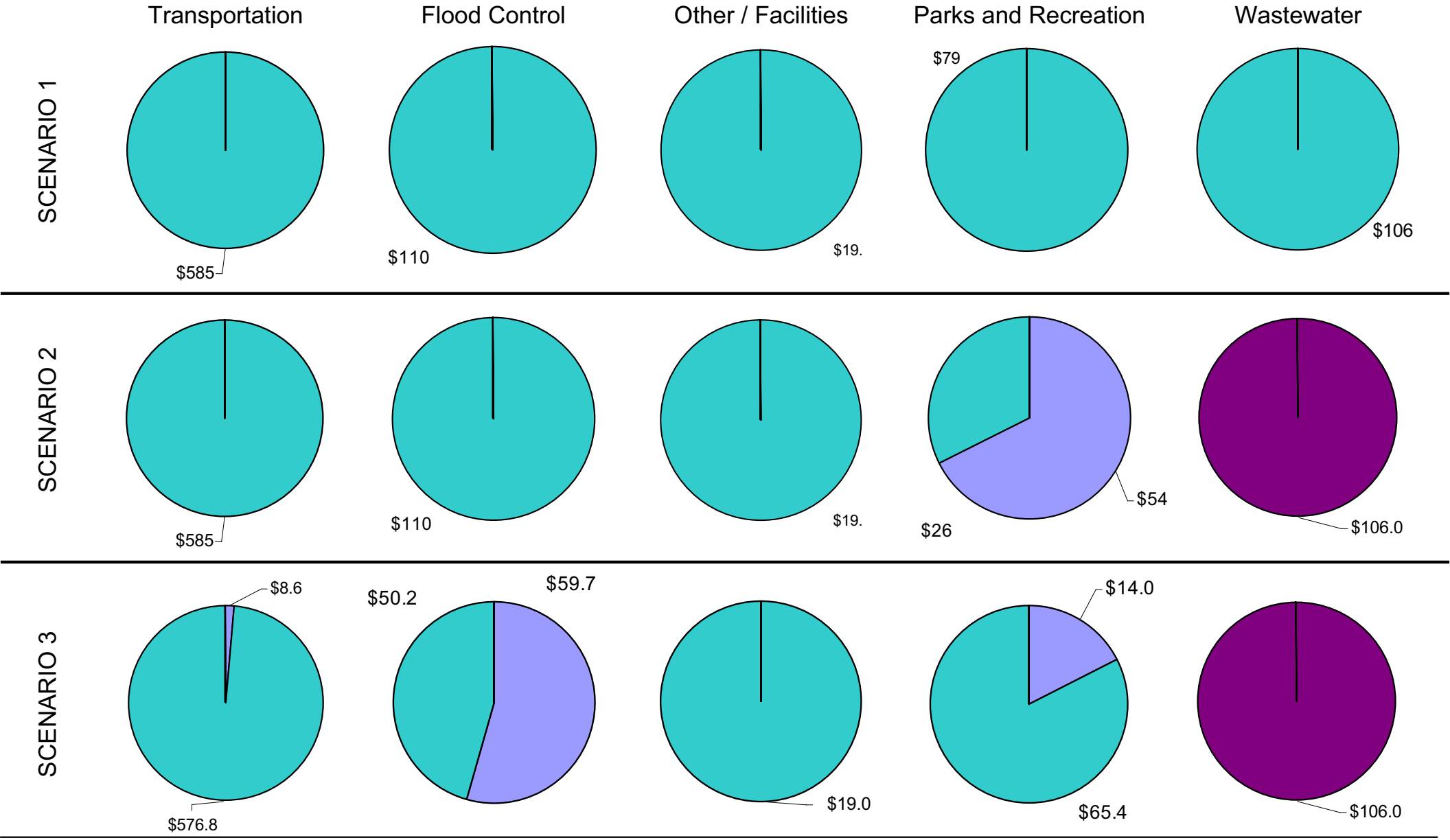
Result: Presented Solution Set mandates a Development Impact Fee per EDU of $24,791

The presented solution set for Scenario 3 has not been subjected to exhaustive alternative and sensitivity analysis and is therefore not necessarily the optimal solution set.

The primary difference between Scenario 1 and Scenario 2 is the issuance of GOB Debt for 68% of the parks and recreation capital funding, and the use of sewer revenue bonds instead of impact fees for wastewater management capital funding.

The primary difference between Scenario 2 and Scenario 3 is the partial optimization of the utilization of Pima County's debt capacity with respect to time. For instance, in Scenario 2 once the debt capacity in 2024 is reached no additional GOB debt is issued even though Pima County's debt capacity continues to grow after this year. Scenario 3 issues debt periodically both before 2024 and after 2024.

Figure FA-9 summarizes the key input assumptions for Scenario 1, 2, and 3.



Legend

- GOB
- Impact Fee
- Agency Funding
- Private
- Special Purpose Bond

Note

Values in Millions

Results are Weighted Averages

Pima County Public Works
Southwest Infrastructure Plan

Figure No.
FA-9

Title
Summary of Funding Analysis Input Assumptions

Comparison to Currently Collected Fees

The approximate rates of currently collected development impact related fees per EDU in Pima County by asset category are:

- $4,400 for Transportation
- $5,113 for Wastewater Management
- $0 for Regional Flood Control District
- $1,597 for Natural Resources, Parks and Recreation
- $0 for Other / Facilities

These figures and total of $11,110 per EDU are approximate for 2007/2008 because certain fees are in the middle of a series of rate increases; others vary with the consumer price index; actual costs vary by EDU nature; some fees are provided in lieu; and some fees are paid according to connection fee formulas.

Capital Costs per Equivalent Dwelling Unit

The predicted capital costs per SWIP EDU by asset category are:

- $20,400 for Transportation
- $3,881 for Wastewater Management
- $3,829 for Regional Flood Control District
- $2,767 for Natural Resources, Parks and Recreation
- $662 for Other / Facilities

This demand for capital funding of $31,353 per SWIP EDU is nearly three times greater than the currently collected fee amount per EDU.

The total number of EDUs for the SWIP area upon complete build-out of the medium density scenario is 28,699. The benefiting area for wastewater management is comprised solely of newly serviced customers connected to the sewer network draining to the Avra Valley WWTF, and amounts to 27,318 new EDUs upon build-out.

Note that due to the differences between total EDUs and the number of wastewater EDUs, the actual cost per EDU will vary slightly and totals will not always match.

As mentioned previously in Section 4.3.6, the predicted wastewater capital cost per SWIP EDU of $3,881 cannot be compared to the current approximate impact fee rate of $5,113 per EDU which includes a wide variety of system-wide wastewater management costs related to the entire Pima County wastewater system operation.

6.0 Implementation Process

In addition to the preceding technical outputs, many project process-related lessons were learned during the completion of the SWIP activities. This report section documents these recommended process improvements and describes the tasks which should come next in the ongoing SWIP implementation.

6.1 RECOMMENDED PROCESS IMPROVEMENTS

6.1.1 Benefit of Comprehensive Planning

The SWIP effort is a significant step toward comprehensive regional planning within the Southwest area. This study also recognizes the inherent overlap between various disciplines such as transportation, wastewater management, parks and recreation, and flood control. Identifying related infrastructure components early in the process is critical to strategic growth planning.

It is highly recommended that this infrastructure plan be regularly updated every five years; with future investments this report and outputs can continue to be useful living documents.

To the best abilities of the participants, the SWIP effort has identified locally optimal solutions. Pima County should consider conducting similar comprehensive studies for other major identified development areas within Pima County using comparable planning criteria. Eventually, a master infrastructure plan for the entire County would be created yielding an interactive decision-making model capable of determining the best County-wide development and infrastructure servicing strategies.

Coordination of Population Projections and Timelines

SWIP population projections and timelines necessarily deviated from existing PAG population projections on the basis of observed developments and data derived from a land use and development intensity / phasing model developed by Pima County's Planning Department. Given the rapid project schedule, these new SWIP area assumptions were not reviewed and agreed upon with PAG.

Given that there is an agreement between PAG and local utility agencies (such as PCWMD and Tucson Water) to use PAG population projections to develop conforming and compatible long-term infrastructure servicing plans, the anticipated deviations should be discussed by Pima County and PAG. Collaborative outputs could then be shared with other local utility agencies for their planning purposes.

6.1.2 Project Management Improvements

Three Week Rolling Schedule

The three week rolling schedule was an unqualified success which allowed for several significant schedule alterations without affecting the overall progress. This progress management mechanism should be used on all fast-track planning processes. In combination with the short 30-minute weekly project leader meetings, the three week rolling schedule helped deliver the SWIP project on time by regularly monitoring, identifying, and resolving potential schedule delay issues.

Decision Log

The decision log was applied primarily as a project management tool, and proved very effective in the documenting of decisions made by the team, particularly those decisions made early in the project. The decision log was not successfully deployed at the technical task level. Decision logs may be used more if the responsibility for the maintenance of the decision log was split up amongst the various technical team leads. Each team would have their own decision log and the team leads would then have the responsibility of tracking the important decisions made within their group and then sending their team's decision log to the project leaders on a weekly basis for dissemination.

Buzzsaw Project Collaboration Site

The online Buzzsaw site created for the SWIP project proved to be an effective platform for sharing information. Stronger efforts to utilize the joint authorship and document creation collaboration abilities of Buzzsaw would have aided in the preparation of the pre-draft, draft, and final reports.

Dedicated Project FTP Site / GIS File Management

The permanent internet FTP site created for the SWIP project was useful, particularly for sharing excessively large digital files. In hindsight, this platform should have become the data warehouse, online presence, and single source of truth for the SWIP project's numerous GIS files. This project used many digital documents from different sources that could have been more easily managed had they been kept in one dedicated location. It is suggested that the dedicated project FTP site contain an "in" and "out" box for digital data. Project participants would load inbound materials to the "in" box while produced output documents would be shared via the "out" box. This would help prevent cross-contamination between old and new document versions.

Document Production

The pre-draft, draft, and final report document inputs from the numerous authors proved difficult to assemble, edit, and revise. It is recommended that future comprehensive planning efforts place more emphasis on the early establishment of common document formats and procedures.

Stakeholder Meetings

The SWIP stakeholder meetings were somewhat ineffective at information gathering and proved to be venues better used in the sharing of information. Understandably, several private stakeholders seemed hesitant to share or reveal their project information in a group setting. Individual stakeholder meetings are recommended as they will likely prove more effective in gathering information. These individual stakeholder meetings should be limited in number (wherever possible) to one initial meeting and one follow-up meeting if necessary. A concerted effort should be made on the behalf of the participants to exchange information as early and as efficiently as possible. Allowances for extenuating circumstances and additional meetings should be anticipated within project timelines and budgets.

Contact Lists

The project contact lists should be categorized into primary and secondary contacts. The SWIP project created and used a comprehensive contact list however it may be possible that some individuals received excessive emails sent to the entire contact list. This may result in email fatigue; with the end result being individuals may not take the time to open each email thus increasing the chances for a communications failure.

Meeting Calendar

A calendar established at the beginning of the project, showing all the regularly scheduled meetings and who is invited, would help improve attendance of the meetings and eliminate any question of who should be attending. Other invitees can always be added.

6.2 NEXT STEPS

6.2.1 Capital Project Funding

The model allows three methods for adjusting variables to create a viable solution set. These variables need to be adjusted in a manner that meets the needs of Pima County residents, SWIP residents specifically, and enables and encourages potential developers to invest in the SWIP area. The optimal solution set can only be created through the active engagement of all stakeholders. Changes can be made by adjusting any or all of the following parameters:

- Recommended list of projects
- Project scope and estimated cost
- Project start date
- Project duration
- Capital financing sources
- Policy constraints

The model tracks capital funding by individual projects, which are defined by four parameters: desired start dates; known costs; construction duration; and capital financing source(s). Since each project is a portion of the solution set, adjusting these four project parameters for each project may provide a more viable or optimal solution set.

Should these adjustments not produce a viable solution set, the operating constraints of the model should be reviewed such as the growth funds growth policy.

Tasks

It is recommended that the consultant team present the fully functioning model to Pima County financial policy officials to ensure understanding, provide validation, and advise on any modifications.

It is recommended that a working session with Pima County leadership be scheduled to adjust model parameters, operating constraints and assumptions. With minor adjustments, the model can accommodate live feedback with instant verification of the validity of a given solution set.

The final recommended task is to review and adjust SWIP area's growth assumptions. The model's population growth curve triggers all infrastructure project start dates. It would be advisable to examine each viable solution set under a variety of population and growth assumptions.

6.2.2 Flood Control Implementation

This SWIP effort has inventoried existing drainage infrastructure and identified future improvement requirements based upon proposed land uses and a medium density growth pattern of 28,699 additional new dwelling units at full build-out.

The majority of the proposed roadway drainage crossings will likely be designed and constructed in conjunction with planned transportation improvements. However, there are several proposed drainage crossings located along roadway corridors that have not been recommended for transportation improvements. In these instances, the current transportation surface may be sufficient to accommodate future growth, yet the existing roadway corridor does not meet all-weather access requirements.

Implementation of the various flood control improvements recommended within the SWIP study will be impacted by various aspects. The first component is project timing. Consideration must be given to determine which projects can be planned, designed, and constructed congruently with transportation improvements and which projects should be planned, design, and constructed independently from other public works projects. Similarly, project lead time must also be considered. For the purpose of this study, flood control project lead time has been assumed at approximately two years. That is to say, the majority of the flood control facilities (engineered channels, detention basins, and all weather roadway crossings) are assumed operational within a two year period from planning stage through construction completion.

Available funding and potential funding mechanisms is another critical aspect to project implementation. As previously noted, additional studies will be warranted to determine: what projects can or should depend on revenues generated through property tax levy and / or general obligation bonds, what projects can be targeted for alternative funding sources such as assigning flood control costs evenly to new development within the SWIP study area (EDU's), or, what projects can implement special assessments whereby flood control costs are assigned only to those dwelling units that are accorded benefit from a particular drainage improvement. The later option has not been adopted by Pima County. However, this funding concept is currently being investigated in conjunction with other regional flood control projects within Pima County.

Tasks

Introduce all of the projects identified in the SWIP (along with their timeline and funding sources) into the capital planning process and relevant documents.

Complete a southwest area basin management study which would include detailed flood plain delineations, identify floodplain management criteria and regulations, other associated flood control alternatives and development guidelines.

Specialized studies consisting of comprehensive plans or rezoning requests will likely be required to ensure that growth is being administered and implemented consistent with the SWIP recommendations. Other project considerations that may require additional studies and / or

analyses may include: responses to community input / involvement, adapting to large scale developer driven master planned communities, potential changes in jurisdictional boundaries, and coordination with other public works or tribal jurisdictions.

6.2.3 Wastewater Management Project Implementation

This study quantified the impending consequences of the proposed land uses in the study area by developing a proposed interceptor sewer sizing and alignment plan. In addition, this study has refined Pima County's ongoing and future planned upgrades at the Avra Valley WWTF and evaluated the potential effluent utilization mechanisms.

A computerized hydraulic model was constructed to assess the residual capacity in the backbone network, consisting of those pipes with 12-inch and larger diameters. In general, the great majority of the wastewater collection system has enough capacity to handle the existing flow during peak wet weather flow periods. However, the residual capacity in the existing system is not sufficient to accommodate the proposed future flows in many locations. For the three growth scenarios, those reaches in the backbone system requiring capacity augmentation have been determined for planning purposes. A new interceptor is proposed to service the development in the southwest corner of the study area.

The current Avra Valley WWTF is a biological nutrient removal oxidation ditch with a design capacity of 1.2 MGD. The facility is in the process of being upgraded to an interim facility with a design capacity of 2.2 MGD. Pima County has also authorized a proposed plant expansion of 4.0 MGD capacity to replace the 2.2 MGD oxidation ditch. The ultimate capacities required to support the three potential growth scenarios are 6.5 MGD, 9.5 MGD and 12.0 MGD, respectively.

Three potential effluent utilization mechanisms were evaluated. They are: groundwater recharge, habitat restoration, and urban re-uses. The cost of re-uses varies depending on which mechanism to use.

Tasks

As the southwest area defined in this study continues to develop, the following tasks are proposed from a wastewater management point of view:

- Include all of the wastewater management projects identified in the SWIP (along with their timeline and funding sources) in current CIP planning documents
- Confirm the ongoing validity of the assumed medium density growth scenario and timeline
- Confirm the preferred effluent utilization mechanisms
- Use the SWIP documents and products including the proposed timeline to guide the area developments through the permitting process
- Systematically monitor actual wastewater flow rates from the identified sub-basins (and the total flows influent to the Avra Valley WWTF) as growth occurs to validate key assumptions and trigger necessary infrastructure plan updates

- Use the SWIP as a guide to acquire those necessary development-based funding contributions for collection system expansion
- Allocate the funds required for the treatment facility expansions and septic system conversions in accordance with the anticipated timeline

6.2.4 Parks and Recreation Project Implementation

Given the 268-acre shortfall in current park land, and the identified recommendation to ultimately add over 2,000 acres of new park lands, Pima County should pursue the creation of additional park sites to serve the existing and proposed SWIP area residents.

Tasks

Introduce all of the parks and recreation projects identified in the SWIP (along with their prioritized timeline and funding sources) into the capital planning process and relevant documents.

Pursue the acquisition of public land suitable for new neighborhood park sites as recommended.

Undertake a community needs assessment by conducting resident surveys to accurately gauge participation rates and interest levels in recreation activities. Once identified, participation rates and interest levels would be used to develop an appropriate park land and recreation amenity standard for the community.

6.2.5 Transportation Project Implementation

This section describes the procedures and strategies necessary to effectively implement the transportation projects identified for the SWIP study area. Several factors must be considered, such as project timelines and lead time, funding sources and their availability, jurisdictions and jurisdictional boundary changes, project planning and design, coordination with other public works, and community input, to name only a few. Similar to the other infrastructure addressed in the SWIP, this section describes capital improvements only, and not long term operations and maintenance which are programmed and funded separately.

The project list also provides new and expanded capacity beyond that which is needed to cure current deficiencies. Existing deficiencies are resolved by projects that are already planned and programmed, and these are excluded from the project listing. The study also assumes that collector and local streets within the study area will be built as a condition of land development. Therefore these lower classification streets are not addressed by the SWIP transportation element.

When planned and programmed in a systematic manner, capital project implementation will be a major long-term effort for County staff. Implementation need not be onerous, however, because many of the projects will have a long lead time. This is because land development in the area is expected to continue for many years. This will allow enough time to deliver projects

when they are needed if the planning studies and engineering design efforts occur well in advance of construction and funding is available when needed.

The transportation system operates as a complex multimodal, multi-jurisdictional network, which the public expects to operate efficiently. The SWIP identifies several projects that are not owned by Pima County, but are equally necessary to support development in the study area. Some projects are in Tucson and others are along ADOT corridors. Line-haul transit service and carpool facilities are also identified, and these are not typical County services. This adds an additional level of complication for project funding, but is not problematic for scheduling since many projects will be coordinated through the Regional Transportation Plan.

All of the jurisdictions, including the Tribal governments, have similar planning processes that include long range planning and capital improvement programming. These existing processes will become the foundation for implementing all of the transportation projects identified by the SWIP. However, the current planning processes tend to view individual infrastructure elements, and yet the SWIP identifies overlap between infrastructure, such as transportation and flood control. This is being adequately addressed through Pima County's integration of capital project programming activities, which may be placed in Development Services or the Public Works Department. Alternatively, the County might consider establishing an infrastructure oversight committee, similar to several other rapidly growing jurisdictions.

6.2.5.1 Arterial Capacity Projects

Growth in the study area will need to have new and expanded arterials to carry traffic to activity centers in the urban area as well as within the Southwest area. Capacity projects include widening current routes, building new routes, and improving intersections of arterial roadways.

For the purposes of this study a prototypical seven year development cycle was used. This is in addition to the planning process, which can take three or more years. The first two years of the cycle are for planning and route location, and are assigned 5% of the total project cost. The third through fifth years are for project design, permitting, and clearances, and are assigned 15% of project costs. The final two years are for construction, using 80% of project capital costs. Therefore, for a project that needs to be in-place at 2020, the cycle would begin no later than 2013.

Tasks

Include all of the projects identified in the SWIP (along with their timeline and funding sources) on the PAG Long Range Plan; begin the project planning and design according to the SWIP schedule; enter into inter-governmental agreements (IGA's) with ADOT, City of Tucson, the Pascua Yaqui Tribe, and the San Xavier District on a project-specific basis and as appropriate. New corridors should be added to the Major Streets and Routes Plans of the jurisdictions.

Roadway Widening: Widening current routes beyond what is already planned is identified for many existing corridors, including SR 86 and Valencia Road. These improvements provided most of the new capacity, at the least cost.

Intersection Improvements and Signalization: There are few signalized intersections in the study area, and this will change as the area grows in population and density. All of the arterial intersections will need to be signalized and the costs are included in the roadway capital unit costs.

Corridor Extensions: Extension of existing corridors is identified for several routes, including Drexel, Irvington, Los Reales, Camino de Oeste, and San Joaquin Road. In many cases, additional right-of-way will be needed. The right-of-way should be reserved with development and acquired well in advance of construction. This is one of the primary purposes of the Major Streets and Routes plans.

Interchanges and Freeway Capacity: New interchanges will be needed for connecting Drexel Road and Los Reales extensions to I-19. ADOT also suggests including service lanes along the mainline to help weaving movements associated with the new interchanges. These costs are identified in the project listing. Implementation would be through partial funding by the SWIP, made available to ADOT for I-19 improvements via the State Transportation Improvement Program, or STIP.

6.2.5.2 New Arterial Roadways

New Arterial Corridors

No completely new arterial corridors are planned for the Southwest Area. Instead, expansion and extension of current alignments are identified.

New Traffic Interchanges

Two new interchanges are identified for I-19, which would be partially funded by the SWIP and implemented by ADOT.

Additional Freeway Capacity

Mainline capacity is not include as a funded element, although cost sharing of auxiliary lanes is included for implementation by ADOT.

6.2.5.3 Alternate Modes – Public Transit

Public transit is an important and necessary service in urban and suburban areas. It should never be considered just an amenity, or purely a social service. Transit provides an alternative for those who do not drive or have a vehicle available, and can replace a second or third vehicle in a household. Transit is particularly important to lower income communities, such as the study area, and to evolving communities where transit can help support mixed–use development. Viable transit also can support homeownership though innovative mortgage programs which consider household costs savings attributable to alternate modes.

The SWIP identifies funding necessary for transit service connection to the urban area and for vehicle storage and maintenance. These services and projects would be planned and

programmed by the City of Tucson's SunTran, through their short-range and long-range transit program. Partial funding would be generated by the SWIP's transit element, and transferred to the City through an intergovernmental agreement.

Funding for transit service expansion is not currently available, and state law does not authorize use of impact fees or transit capital or operating expenses. Funding would be provided through a per-rooftop development exaction, estimated at $664, which covers capital equipment such as new coaches and storage / maintenance facilities.

Tasks

Establish a discrete SWIP Transit Funding Element; create and enter into an IGA with the City of Tucson for SWIP Transit service extension; and coordinate transit service extension, transit center, and maintenance facility with SunTran staff.

6.2.5.4 Alternate Modes – Travel Demand Management Facilities

These facilities (such as park-and-ride lots and carpool lots) help encourage carpool formation and support transit utilization; both of which reduce the demand for roadway construction to serve the study area. The plan includes four facilities with an average of 200 parking spaces each for a total of 800 spaces. Their location is subject to further planning and analysis. They could be implemented as part of roadway projects and may be eligible for funding with development impact fees if so structured. The estimated cost per new dwelling unit would be $181. Alternatively, a development exaction of $181 per rooftop would be required for the capital costs.

Tasks

If the travel demand management facilities are not included on roadway projects, establish a discrete SWIP HOV Funding Element; include the projects in the PAG RTP and TIP; and coordinate their location and design elements with PAG's travel demand management office.

APPENDICES

Appendix A

APPENDIX A:

STAKEHOLDER INVITATION WITH ATTACHMENTS

COUNTY ADMINISTRATOR'S OFFICE

PIMA COUNTY GOVERNMENTAL CENTER
130 W. CONGRESS, TUCSON, AZ 85701-1317
(520) 740-8661 FAX (520) 740-8171

C. H. HUCKELBERRY
County Administrator

January 26, 2007

Mr. Carl Russell
Pascua Yaqui Tribe
7474 S. Camino de Oeste
Tucson, AZ 85757

Subject: Stakeholders Session for Pima County Southwest Infrastructure Plan

Dear Mr. Russell,

Pima County Public Works Administration and the consultant team of Stantec and Curtis Lueck & Associates are pleased to announce the initiation of the Pima County Southwest Infrastructure Plan. This project will quantify the nature, phasing, financial impacts, and funding opportunities for the flood control, recreation, transportation, wastewater infrastructure, and other services necessary to accommodate future growth within the Southwest Area. The planning area encompasses approximately 71 square miles and is generally bounded by Tucson Mountain Park to the north, Mission Road to the east, the Tohono O'odham Nation / San Xavier District to the south, and Sandario Road to the west.

The project has an aggressive 17-week schedule that commenced the first week of January 2007. To complete the plan on time, the effort will leverage extensive input from Pima County agencies as well as important stakeholders within the planning area. One of our priorities is encouraging public input. We believe it is in the best interest of the County to involve selective stakeholders early in the planning process. To that end, we would greatly appreciate your involvement and active participation at a stakeholder's session. The date and time is:

Date: Thursday, February 1, 2007
Time: 3:00 p.m. to 5:00 p.m.
Location: County-City Public Works Building, 201 N. Stone Avenue, Basement Conference Room C
RSVP to: Carol Anton, (520) 740-6442

It would be most helpful if you could bring any information which describes your future plans related to this area. The stakeholder session has two purposes. The first is to introduce the planning effort. The second purpose is to listen to your input. We want to know about your plans for and challenges in the study area. Attached to this letter is information about the study effort and some questions that may help you determine what materials or data to bring.

There will be a second opportunity for a much wider public involvement in the form of a drop-in style public workshop in Week-12 (March 2007). This workshop will coincide with the completion of the first draft of the

Southwest Infrastructure Plan. The timing will maximize the benefit of public input by giving people an opportunity to provide comment after hearing about the plan's findings and financial implications.

If you have any questions or need more information, please feel free to call me at (520) 740-8480.

Sincerely,

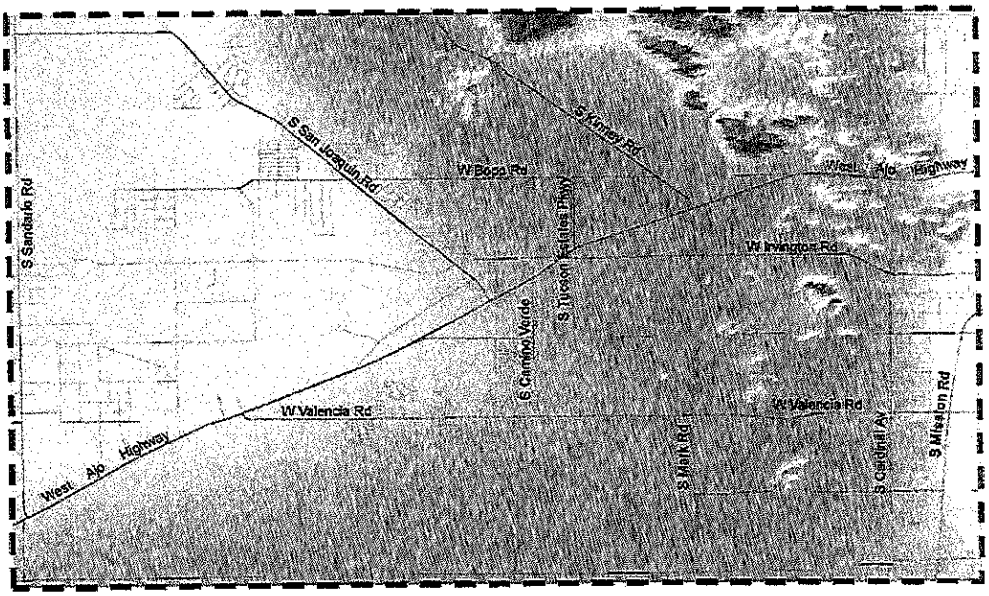
Nanette M. Slusser

Nanette M. Slusser
Assistant County Administrator for Policy-Public Works

Attachment

Cc: The Honorable Richard Elías, Chairman, Pima County Board of Supervisors, District 5
The Honorable Sharon Bronson, Member, Pima County Board of Supervisors, District 3
C.H. Huckelberry, County Administrator
John M. Bernal, Deputy County Administrator, Public Works

Southwest Infrastructure Plan



Pima County's Southwest Infrastructure Plan will provide a basis for infrastructure decision-making related to development in the southwest area. It will quantify the nature, phasing, financial impacts, and funding possibilities for those flood control, parks and recreation, transportation, wastewater infrastructure and other improvements that are necessary to service future saturation growth within the study limits. The project area is generally bounded by Tucson Mountain Park to the north, Mission Road to the east, the Tohono O'odham Nation - San Xavier District to the south and Sandario Road to the west. The plan will leverage extensive input from Pima County agencies, as well as consultants Curtis Lueck & Associates and Stantec Consulting.

The Plan will summarize readily available data regarding the provision of other services provided by public, quasi-public, and private agencies. This will include those delivered by the County (libraries, Sheriff and other public safety aids, community resources services, solid waste management, etc.) and others such as fire districts, Tucson Water, Tucson Unified School District, and utility providers.

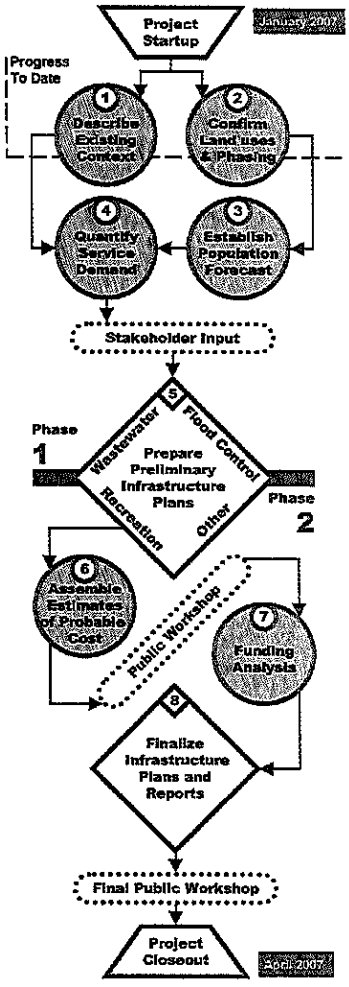
In addition to envisioned products (phased infrastructure plans, estimates of probable cost, and funding analysis outputs), this work will serve to collaboratively develop and evolve an infrastructure planning process suitable for deployment elsewhere in Pima County.

In Phase 1, the planning team will comprehensively describe the existing infrastructure context in the Southwest area and then quantify the future servicing challenges that the proposed land uses and densities will pose. The team will then formulate a preliminary infrastructure plan that responds to the challenges that may arise as growth occurs.

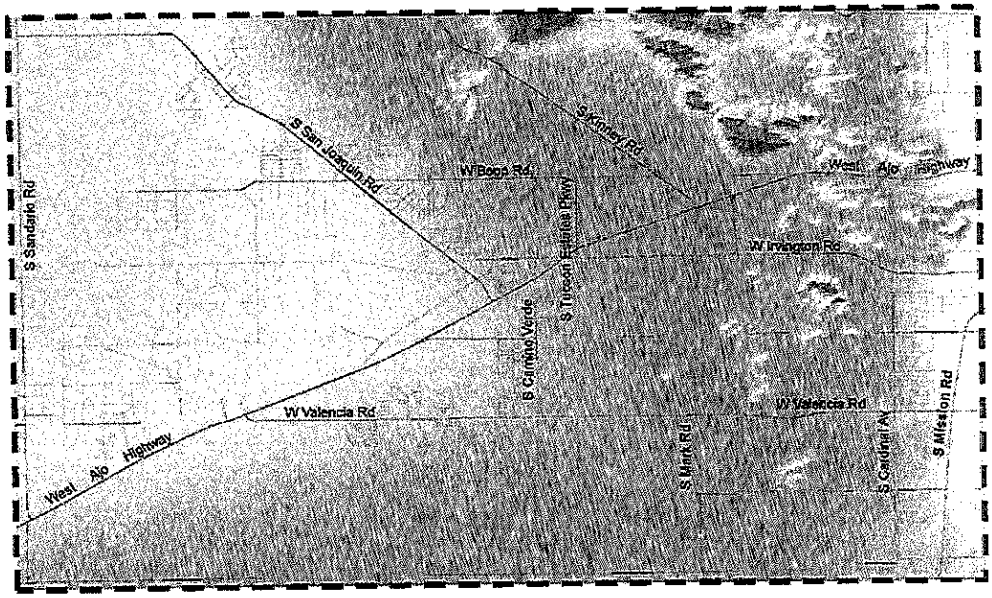
In Phase 2, the project participants will develop opinions of probable project costs to a 20-year timeline. A funding analysis will then be completed that will identify options and render opinions as to how each candidate project is best delivered. The project will conclude with the development of Infrastructure Plan process documentation and County approval.

The process began in January 2007 and both phases are due to be completed by the end of April 2007.

For further information, please contact Nanette Slusser, Assistant County Administrator, Public Works Policy, Nanette.Slusser@pw.pima.gov, phone: (520) 740-8055.



Southwest Infrastructure Plan



Stakeholder Participation Questions

- What are the key opportunities and challenges for your agency in the area?

- Do you have plans to develop land in the area?

- Do you have plans to purchase or sell land in the area?

- Do you have infrastructure or facility plans for the area?

- Do you have data or maps that should be shared with the project team?

- How will development in this area impact you?

Appendix B

APPENDIX B: STAKEHOLDER LIST

Lee Bachman, President
Tucson Trap & Skeet Club
7800 W. Old Ajo Highway
Tucson, AZ 85735

Melanie Florez, District Intpr.
Saguaro National Park
3693 S. Old Spanish Trail
Tucson, AZ 85730

John W. Williams, Fire Chief
Three Points Fire District
11200 S. Sierrita Mountain Road
Tucson, AZ 85736

Elaine Zielinski, Director
Bureau of Land Management
222 N. Central Avenue
Phoenix, AZ 85004

Michael Hein, City Manager
City of Tucson
P.O. Box 27210
Tucson, AZ 85726

Sue Keith, Administrative Dir.
ADEQ
400 W. Congress
Tucson, AZ 85701

Vacant, Executive Director
Audubon Society
300 E. University Blvd.
Tucson, AZ 85705

Kevin Tomkiel, Principal
Pomegranate Development Co.
1820 E. River Road
Tucson, AZ 85716

Mark Schwirtz, CEO/Gen. Mgr.
Trico Electric
8600 W. Tangerine Road
Marana, AZ 85653

Mercy Valencia, Acting Asst VP
Real Estate Administration
1125 N. Vine, #103
Tucson, AZ 85721

David V. Modeer, Director
Tucson Water
310 W. Alameda
Tucson, AZ 85701

Clarence Dupnik, Sheriff
Pima County Sheriff's Department
1750 E. Benson Highway
Tucson, AZ 85714

Sue Clark, President
Pima Trails Association
P.O. Box 35007
Tucson, AZ 85740

Sid Wilson, General Manager
Central Arizona Project
10900 W. Twin Peaks Road
Marana, AZ 85653

Caroline Campbell, Executive
Coalition for Sonora Desert Pro.
738 N. 5th Avenue, Suite 214
Tucson, AZ 85705

Greg Gentsch, District Engineer
Arizona Department of Trans.
1221 S. 2nd Avenue
Tucson, AZ 85713

Herminia Frias, Chairwoman
Pasqua Yaqui Nation
7474 S. Camino de Oeste
Tucson, AZ 85746

Juanita Homer, Director
Tohono O'Odham Behav. Hlth.
P.O. Box 810
Sells, AZ 85634

James Pignatelli, CEO/President
Tucson Electric Power Company
P.O. Box 711
Tucson, AZ 85702

Kathryn Skinner, Prog. Engineer
Tucson-Pima County Bicycle
Advisory Committee
201 N. Stone, 3rd Floor
Tucson, AZ 85701

Roger Pfeuffer, Superintendent
TUSD
1010 E. 10th Street
Tucson, AZ 85719

Katrina Heineking, General Mgr.
Sun Tran
4220 S. Park Avenue
Tucson, AZ 84714

Gary Hayes, Executive Director
Regional Transportation Auth.
177 N. Church Avenue, Suite 405
Tucson, AZ 85701

Kenneth Seasholes, Area Director
Central AZ Water Convs. Dist.
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Tucson, AZ 85701

Doug Roe, Superintendent
Altar Valley School District
10105 S. Sasabe Road
Robles, AZ

Michelle Muench, Acting Mgr
Arizona State Land Department
177 N. Church, Suite 1100
Tucson, AZ 85701

Gary Hayes, Executive Director
Pima Association of Governments
177 N. Church Avenue, Suite 405
Tucson, AZ 85701

Joe Snell, CEO
TREO
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Tucson, AZ 85701

Carol Edwin, Area Manager
Bureau of Reclamation
6150 W. Thunderbird Road
Glendale, AZ 85603-4001

Doug Chappell, Chief
Drexel Heights Fire District
5030 S. Camino Verde
Tucson, AZ 85735

Kristy Bradford, Head Librarian
Nanini Branch Library
7300 N. Shannon Road
Tucson, AZ 85741

Mercy Valencia, Asst. VP
University of Arizona
1125 N. Vine Ave. Suite 103
Tucson, AZ 85721

Carl Russell, Director
Pascua Yaqui Tribe
7474 S. Camino de Oeste
Tucson, AZ 85757

Appendix C

APPENDIX C:

INPUT FROM STAKEHOLDER SESSIONS

SAN XAVIER DISTRICT
OF THE
TOHONO O'ODHAM NATION
2018 WEST SAN XAVIER ROAD • TUCSON, ARIZONA 85746
TELEPHONE: (520) 573-4000 • FAX: (520) 573-4089

March 20, 2007

Ms Nanette Slusser
Assistant Pima County Administrator
Public Works Policy
130 W. Congress, 10th Floor
Tucson, Arizona 85701

Dear Ms Slusser:

The San Xavier District of the Tohono O'odham Nation would like to officially state its opposition to Pima County's "Southwest Infrastructure Study" proposal to extend Los Reales Road west from Interstate 19 to Mission Rd. The San Xavier District has opposed any concept of this road extension to the west for several years now at both ADOT and PAG Meetings.

The San Xavier District prefers to keep its rural nature intact, and opposes any project, which would bring additional traffic and the potential for trespassers and vandalism onto the District. Any extension of Los Reales Road west would inevitably cross over and through the San Xavier Cooperative Farm Land. The San Xavier Cooperative has long opposed any roads in this area since it could mean the loss of hundreds of acres of farm fields, which have been in the Farm plans now since the 1950's. Recently the Bureau of Reclamation has been working with the San Xavier Cooperative Association to ready these fields for future crops, and has expended at least $50 million dollars in the process.

The San Xavier District would have stated its opposition earlier to such a road proposal, however it only became aware of the ongoing "Southwest Infrastructure Study" at the recent March 15 ADOT I-19 Widening Agency Scoping Meeting.

The San Xavier District is willing to participate in any future discussions or meetings on this topic should the need arise. If you have any questions, please contact Mark Pugh, Principal Planner, San Xavier District Planning Department at 573-4076.

Sincerely,

Austin G. Nunez, Chairman
San Xavier District

Cc: Michael Bends, SXD Planning Administrator
Mark C. Pugh, SXD Principal Planner
Bill Worthy, SXCA Farm Manager
Sally Pablo, President, SXCA Farm Board
Julie Pierson. SXCA Board Member

Vivian Juan-Saunders
Chairwoman

Vacant
Vice Chairman

TOHONO O'ODHAM NATION
P.O. Box 837 Sells, Arizona 85634
Telephone (520) 383-2028 Fax (520)383-3379

April 5, 2007

Ms. Nanette Slusser
Assistant Pima County Administrator
Public Works Policy
130 W. Congress, 10th Floor
Tucson, Arizona 85701

Dear Ms. Slusser;

I have become aware that Pima County has a Infrastructure Study that proposes to extend Los Reales east to Interstate 19. I have been informed that Chairman Austin Nunez of the San Xavier District has written you a letter stating their opposition of the idea of this proposal. With That I would like to say the Tohono O'odham Nation stands by San Xavier District's opposition. We do agree this will mean the loss of hundreds of acres of farmland and that it would bring unwanted traffic, through the District boundaries.

Michael Bends, San Xavier District Planning Administrator has found out, not all the correct people have been contacted to let us voice our opinions.

In the future please contact the San Xavier District Chairman, which you have already been in contact with or my office for any related issues that concern the Tohono O'odham Nation, at the above contact information. Thank you for your time.

Sincerely;

Vivian Juan-Saunders, Chairwoman
Tohono O'odham Nation

MONTECITO
COMMUNITIES

February 13, 2007

Ms. Alice Templeton
Stantec Consulting, Inc.
201 North Bonita Avenue
Tucson, Arizona 85745-2999

Re: Sendero Pass Development Options

Dear Alice:

Thanks for taking the time to meet with me on Friday to talk about the future development of the Ajo/Valencia region generally and the Sendero Pass project specifically. As we discussed on Friday, Montecito feels that this area is the future hub from I-19 to Three Points and we would like to work with the county to incorporate our ideas into the Southwest Regional Infrastructure study.

I have attached 3 graphics which show some of the preliminary draft concepts that we are looking at for our community and this region. We would like to share our draft concepts with you, but we need to make sure that these preliminary draft concepts remain internal to your consultant team and that it is understood that these are preliminary draft concepts are subject to change as Montecito goes through the planning and zoning process for Sendero Pass. The preliminary draft concepts include a regional core for southwest Tucson which conceptually may include joint use facilities such as a library, a school, a fire department, a religious institution, a day care center, an aquatic center, commercial and office space, and regional detention basin.

Montecito is confident that working with the County will produce a joint benefit for the school district and students, our community, and the entire region. I would also like to set up a meeting for February 22nd to sit down with your team and go over these preliminary draft concepts and to discuss financing ideas for this regional core. Please let me know what time you are available to meet.

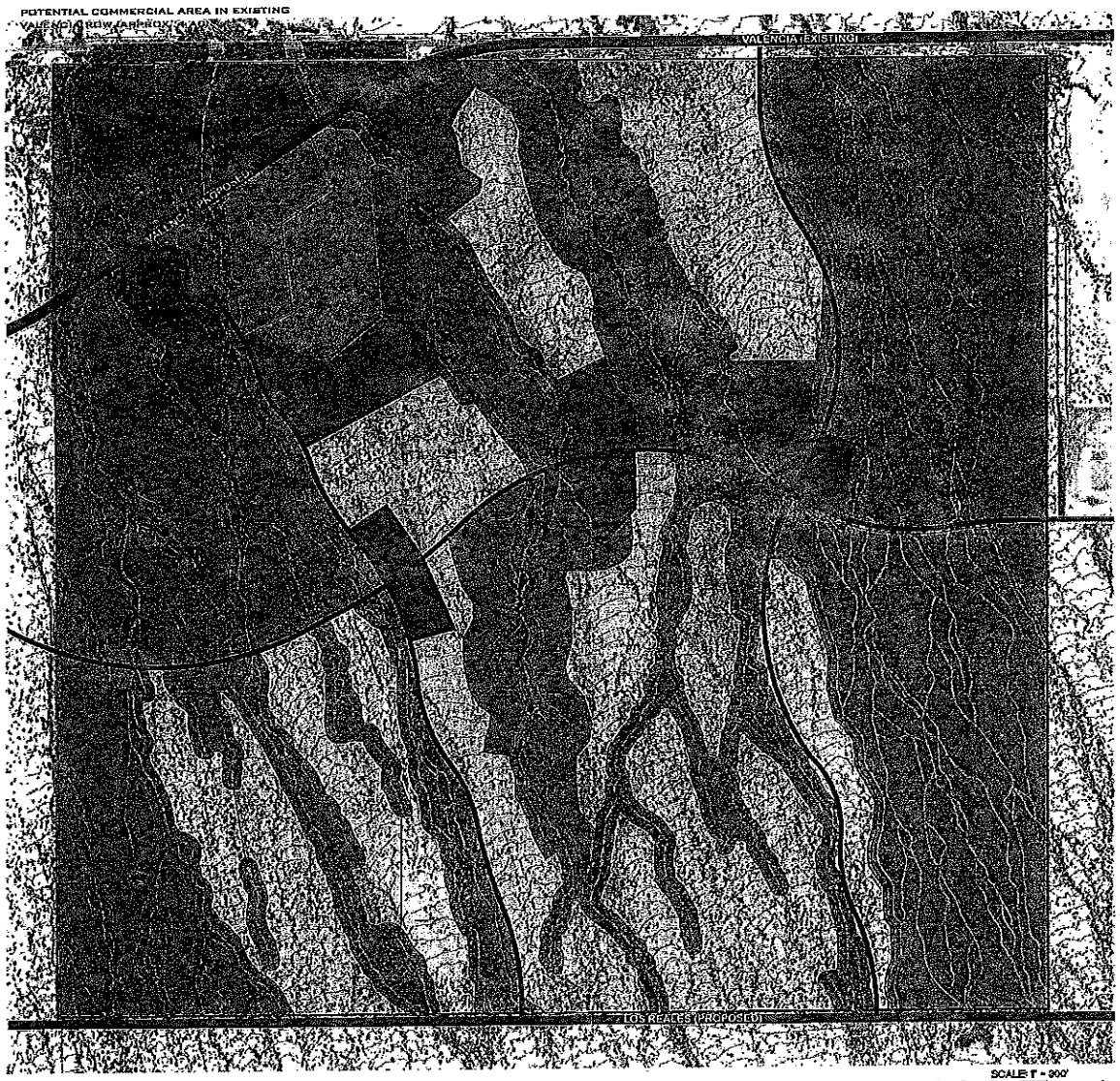
Sincerely,

Dave Larson
Project Manager
Montecito Communities

6600 W Charleston Blvd, Suite 120
Las Vegas, NV 89146
Office (702) 798-5111 Facsimile (702) 892-7784
www.montecitocompanies.com

MIXED DENSITY CONCEPT

POMEGRANATE FARMS



LAND USE MAP

north

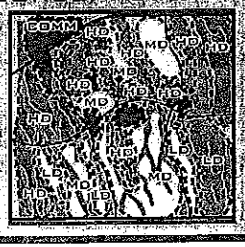
SCALE 1" = 900'

0' 150' 300' 600'

LEGEND

	RESIDENCES/ ACRE (RAD)	TOTAL ACRES (MINUS 25% ROADS, OPEN SPACE, ETC.)	UNITS
ROAD/ARTERIAL			
ROAD/COLLECTOR			
ZERO LOT LINE/ PATIO HOMES/ DETACHED SMALL LOT	5 RAD	11.0 AC	550
TOWNHOMES	10 RAD	78 AC	780
1/4-1/2 AC LOT SINGLE FAMILY HOMES	2-4 RAD (3 RAD AVG.)	23 AC	69
APARTMENTS/ CONDOMINIUMS	16-24 RAD (20 RAD AVG.)	18 AC	360
CONSERVATION LOTS/ CUSTOM HOMES	1/3-1/2 RAD (1/3 RAD AVG.)	35 AC	114
MIXED USE/ LIVE/WORK UNITS/ "MEZCNS DE LOS CURIOS"	8 RAD	5 AC	40
		TOTAL UNITS: 1,913	
COMMERCIAL		60 AC	
GOVERNMENT COMPLEX		9 AC	
CORRIDOR		5 AC	
PARK / COMMUNITY CENTER		12 AC	
NATURAL OPEN SPACE			

CONCEPT DIAGRAM



DEVELOPMENT TYPES ARE MIXED THROUGHOUT THE SITE

HIGHER DENSITY DEVELOPMENT TYPES ARE LOCATED ADJACENT TO NATURAL OPEN SPACE CORRIDORS, PROVIDING RELIEF FROM THE DENSE DEVELOPMENT. LOW DENSITY DEVELOPMENT IS LOCATED WITHIN THE SOUTHERN HALF OF THE SITE, BUFFERED FROM MAJOR ARTERIALS, RYAN AIRFIELD AND COMMERCIAL DEVELOPMENT.

OPEN SPACE, IN THE FORM OF PRESERVED WASHES, MULTI-USE DETENTION AREAS AND PARKS, IS INTEGRATED WITH ALL DEVELOPMENT TYPES.

POMEGRANATE DEVELOPMENT

1920 E. River Rd., Suite 110
Tucson, AZ 85718
520.577.9444
520.577.5411 fax
www.pomegranatedevelopment.com
GROWING COMMUNITIES TOGETHER

The Acacia Group

TUCSON TRAP AND SKEET CLUB FUNCTIONS

Tucson Trap and Skeet Club was incorporated as an Arizona non-profit corporation on April 12, 1948. The following is an encapsulated view of what various activities the club supports.

1. The club has installed, in conjunction with a matching grant from the Arizona Game and Fish Department, an Olympic Skeet field for Olympic Skeet practice. We provide free use of the field for Emily Blount, a shooter who is on the USA Olympic Team. We also have a 14-year-old junior, Jimmy Gibson, who is training with Emily and has applied to the Olympic committee for acceptance into the Olympic Developmental Team.

2. The Scholastic Clay Target Program for youth shooters is hosted by the club for all junior shooters in southern Arizona. On staff are volunteer instructors who have been trained and certified by the State of Arizona as youth shotgun instructors. Arizona Game and Fish Department provides free use of shotguns, limited free ammunition, and subsidizes the cost of clay targets for youth shooting. The club offers free use of the range facilities with a nominal charge to AZ Game & Fish for target and labor costs. The National Rifle Association and Arizona Game and Fish Department have awarded grants to obtain automatic trap machines for youth shooting. The club hosted the Arizona SCTP Commissioners Cup Tournament as well as SCTP State Fun Shoots. Commissioner Cup winners in Trap and Sporting Clays tournaments proceeded on to the National Tournaments.

3. Boy Scout and 4-H members use the facility at nominal cost for attainment designations.

4. Tucson Trap and Skeet Club is a member of the Amateur Trapshooting Association, member number 04055. The club hosts many ATA affiliated tournaments during the year that attract All-American shooters. The week long tournaments are as follows:
    a. ATA Spring Satellite Grand American
    b. ATA Autumn Satellite Grand American
    c. Arizona State Tournament on a rotating basis
    d. Winter Chain Trapshoot
    e. Fun in the Sun Trapshoot

    The club also hosts monthly weekend ATA registered tournaments. SCTP shooters use the trap fields at a nominal cost.

5. The club is a member of the National Skeet Shooting Association. The club hosts major skeet tournaments that also attracts All-American

shooters. The Old Pueblo is a well-known and attended tournament as well as hosting the Arizona State Skeet Tournament on a rotating basis. The club hosted the 2005 US Skeet Open. SCTP junior shooters use the skeet fields at a nominal cost.

6. The club is a member of the National Sporting Clays Association. The 2006 Arizona State Sporting Clays Tournament was hosted by our club and many out of state as well as in state All-American shooters attended. Monthly registered sporting clays tournaments are also offered. SCTP junior shooters use the course at a nominal cost.

7. We provide our facility free of charge to the Arizona Game and Fish Department for the Hunter Safety Course.

8. We host the shotgun portion of the Senior Olympics

9. The club sponsors the annual Mike Gains Charity Shoot, which all proceeds go to Muscular Dystrophy Association.

10. We have sponsored the Paralyzed Veterans of America annual benefit shoot for the last several years..

11. We have hosted the annual Police-Fire games shotgun portion for their annual event.

12. We sponsor summer leagues that consists of junior, lady, and general teams.

13. The club offers regular operating hours for members and the public to practice trap, skeet, five stand, and sporting clays.

Our club, being a non-profit entity, puts every penny above operating costs back into the facility making improvements everyone can benefit from. We have many dedicated people who volunteer their time and resources for the betterment of the facility and promotion of the sport. Everyone contributes to furthering gun safety education and helps to ensure safe practices are enforced at all times.

Sport Shooting Advisory Committee
Final Report
Recommendations

The Sport Shooting Advisory Committee, as appointed by the Pima County Administrator, and approved by the Pima County Board of Supervisors, respectfully submits the following report and recommendations for improvements to shooting sports facilities at Southeast Regional Park and recommendations related to shooting range asset protection in Pima County.

The Sport Shooting Advisory Committee is comprised of nine members representing various shooting sports interests. The members are Anita Kellman, Pima County Parks and Recreation Commissioner, Jon Baker, Executive Director, Pima County Fair Grounds, Lee Bachman, President Tucson Trap and Skeet Club, Debbie Ferns, Shooting Instructor and Author, Bill Perkins, NRA Range Technical Team Advisor, John Whiteside, Director, Pima County 4-H Shooting Sports Project, Anthony Chavez, Coordinator, Statewide Shooting Range Program, Arizona Game and Fish Department, Larry Audsley, Southern Arizona Sportsman's Alliance and Rick Holder, President, Desert Archers.

The charge of the Committee is to discuss and make recommendations to the Pima County Administrator, the Pima County Board of Supervisors, the Pima County Parks and Recreation Commission, and the Pima County Natural Resources, Parks & Recreation Department on planning and implementing improvements and expansion of the Southeast Regional Shooting Park consistent with the 2004 Bond Program and to plan for future improvements and expansion consistent with the public's desire and demand for sport shooting activities.

Throughout the various meetings of the Committee, **shooting range protection** was identified as a critical priority for both public and private shooting ranges. Failure to adequately protect the long-term viability of local shooting ranges will result in economic loss, loss of educational, training and recreational opportunities for sportsmen and law enforcement, and increased pressure on public lands, via "wildcat" shooting, which will result in closures of public lands to shooting, environmental degradation, and safety hazards further exacerbating shooting conflicts and issues around the Tucson area.

The Committee recommends that Pima County identify and pursue various strategies, legislative agenda items, and ordinances designed to protect buffer zones around shooting facilities from residential encroachment, protect shooting ranges from environmental liabilities and administrative actions, whenever "Best Management Practices" are followed, seek legislative solutions such as the Florida Shooting Range Protection Act and to assist in administrative issues to resolve "Catch 22" issues such as prohibiting or restriction of harvesting, reclamation and recycling of lead shot at shot gun facilities when the temporary harvesting does not meet Pima County dust standards.

The Committee recommends that the following measures and strategies be employed and pursued to protect the shooting range assets of Pima County and other shooting facilities, public and private, within Pima County in the following areas:

1. Zoning
2. Legislation
3. Administrative Actions
4. Acquisition of Buffers
5. Bond Funded Improvements to Upgrade Future Development at Southeast Regional Park Shooting Facility to "Best" as Recommended by the Sport Shooting Advisory Committee

The Advisory Committee met six times to develop recommendations. Each shooting sports representative prepared recommendations for their respective shooting discipline and interest, for both present and future development at the Southeast Regional Park Shooting Facility.

The shooting sports priorities at Southeast Regional Park Shooting Facility were identified by the committee as:

1. Development and Construction of the Shooting Sports Education Center
2. Completion of the Main Range
3. Development and Construction of the Clay Target Range
4. Development and Construction of the Archery Range
5. Development and Construction of RV Facilities

The Advisory Committee recommends that Phase 2 development should include priorities 1-4, as identified. The committee felt that rifle, muzzleloaders, small bore, pistol, shot gun and archery interests should all benefit from improvements during the Phase 2 expansion, and that future funding should be sought to bring all shooting venues to the "Best" level as identified by the committee below.

The Advisory Committee selected a process of identifying Good, Better and Best models for each shooting venue. The committee understood that any one venue may move from good to better or better to best depending on available funding or costs of the desired features from one model to another.

Each model would begin with a basic "Good" facility, continuing to build towards a "Better" facility and recognizing that the goal is to create a "Best" facility. Each stage of development requires building towards the next goal, without creating a situation where existing development must be demolished to make way for new construction. The recommendations for future development at Southeast Regional Park Shooting Range are as follows:

It has been a pleasure to serve on this committee and for the benefit of shooters, hunters and archers and our communities.

Tucson Airport Authority
7005 South Plumer Avenue
Tucson, Arizona 85706
Telephone (520) 573-4870
Fax (520) 573-8006

TUCSON
AIRPORT AUTHORITY

TUCSON AIRPORT AUTHORITY
FACSIMILE TRANSMISSION

DATE: April 20, 2007

TO: C. H. Huckleberry
Nannette Slusser

FAX: 740-8171

FROM: Jill Merrick
Vice President, Planning and Development

PAGE COUNT (INCLUDING THIS PAGE): (3)

SUBJECT: Review Comments
Draft Southwest Infrastructure Plan

To: Nannette
Sent
4/20/07

Tucson Airport Authority
7005 South Plumer Avenue
Tucson, Arizona 85706
Telephone 520-573-8100
Fax 520-573-8008
www.tucsonairport.org

TUCSON
AIRPORT AUTHORITY

April 20, 2007

C. H. Huckelberry
County Administrator
Pima County Governmental Center
130 W. Congress
Tucson, AZ 85701-1317

RE: Review Comments – Draft Southwest Infrastructure Plan

Dear Mr. Huckelberry:

Thank you for the opportunity to provide input on the draft Southwest Infrastructure Plan. The Tucson Airport Authority (TAA) recognizes the need for this concurrency planning and offers our full support for this effort. We also wish to extend a thank you for your support of Ryan Airfield activities. In addition to the information previously submitted to staff, we intend to provide you with a summary of short and long term development plans, an overview of air traffic activities, and an associated land use Compatibility Map for Ryan Airfield in early May. In the meantime, specifically regarding review of the draft Southwest Infrastructure Plan, TAA has concerns with two proposals addressed in the Draft Plan that are in proximity to Ryan Airfield. The concerns include the Detention Basin 7 proposed in section 3.3.3.3, Flood Control and Park Amenities (Multi-Use Facilities) and the expansion for the Avra Valley Wastewater Treatment Facility as proposed in section 3.4, Wastewater Management.

TAA's concern is that the two proposed projects will create wildlife hazards. Open bodies of water have the potential to attract wildlife that may present a hazardous condition to aviation activity if allowed to enter an airport's approach and departure airspace and the airport's air operations area. The FAA Advisory identifies retention/detention ponds and wastewater treatment facilities as hazardous wildlife attractants. The Advisory stipulates hazardous wildlife attractants are to be located a minimum of 5,000 feet from an airport's area of operation for airports that do not have jet activity and 10,000 feet for airports with jet activity.

Detention Basin 7, proposed in section 3.3.3.3 Flood Control and Park Amenities (Multi-Use Facilities), is located in direct alignment with the crosswind runway at Ryan Airfield and within the 5,000-separation (piston aircraft) and the 10,000-separation (jet aircraft) areas as defined in the FAA Advisory. TAA's primary concern is the placement of a hazardous wildlife attractant adjacent to the end of a runway. TAA requests that the detention basin be located outside the flight tracks of the crosswind runway and a minimum of 10,000 feet from Ryan Airfield to comply with the required 10,000-foot separation area.

Please note that the separation between hazardous wildlife attractants and Ryan Airfield Area of Operation will increase from 5,000 feet to 10,000 feet with the introduction of jet

activity. TAA is planning for jet aircraft activity at Ryan Airfield in the near future. Any wildlife attractant (poorly drained areas, detention/retention ponds, roosting habitats, landscaping, putrescible waste disposal, wastewater treatment plants, agriculture, surface mining, wetlands) located closer that 10,000 feet will require the development and implementation of a Wildlife Hazard Management Plan which can become a very complex and expensive undertaking. Moreso, for the safety of aircraft activity, TAA requests all planned potential wildlife attractants meet the designated separation requirements of an airport served by jet aircraft which is the 10,000 feet or greater separation distance.

Secondly, the Avra Valley Wastewater Treatment Facility is currently located outside of the 5,000-foot separation area from Ryan Airfield. However, TAA is concerned that proposed expansion plans may increase areas of standing water that will encroach upon the 5,000-foot separation area. Again, if the wastewater facility encroaches into the 5,000-foot separation area, FAA will require the development and implementation of a Wildlife Hazard Management Plan.

Again, thank you for the opportunity to provide input on the Southwest Infrastructure Plan. If you have any questions regarding the comments above, please contact me at (520) 573-4851 or Dennis Cady at (520) 573-5115.

Sincerely,

Jill Merrick
Vice President
Planning and Development

cc: Bonnie Allin, President/CEO
Dennis Cady, Director of Planning
Scott Driver, Director of Ryan Airfield
Nanette Slusser, Pima County, Assistant County Administrator
File

Appendix D

APPENDIX D:

SIGN-IN SHEETS AND COMMENT CARDS FROM 3/22/2007 PUBLIC WORKSHOP

Southwest Infrastructure
SIGN-IN SHEET
March 22, 2007

Name	Name
Artemio Hoyos	Bob Sears
Carl Russell	Mary Beth Savel
Vince Vasquez	Devon Vaughn
David Carson	Jamie Kay
Dennis Krahn	Anne Wagner
Dempsey Helms	
Pauline Bradway	Donald Collins
	Andrew Meyer
	Dennis Cady
Mark C. Pugh	Cris Hamilton
Jimmie O. Williamson	Mary Rodin
Dale Booth	
Mary Hamilton	
Horacio Figueroa	

Comment Form

Your comments are important to us. Please let know your thoughts and concerns on any of the project you saw here today.

I would hope that all (or most stakeholders) have an opportunity to review the draft report before approval of a Final.

It would have been nice if all the infrastructure concerns would have been addressed years ago……..especially before all the "scattered" development…..but this study is a great start to play catch up.

You may mail comments to
201 N. Stone 3rd floor
Tucson, Arizona 85701
ATTN: Community Relations Office
Or Fax them into
(520) 838-7537
Thank you

PUBLIC WORKS
pima county

Comment Form

Your comments are important to us. Please let know your thoughts and concerns on any of the project you saw here today.

Thanks for the info and the time & efforts to display the planning efforts and measures. Water, wastewater and transportation departments must be complemented on a fine job. Everyone was very polite and helpful.

Thank you!

You may mail comments to
201 N. Stone 3rd floor
Tucson, Arizona 85701
ATTN: Community Relations Office
Or Fax them into
(520) 838-7537
Thank you

PUBLIC WORKS
pima county

Comment Form

Your comments are important to us. Please let know your thoughts and concerns on any of the project you saw here today.

Pascua Yaqui Tribal gov't would like to see the boards on:

Flood Control

Waste Water

Density

Transport

and have someone explain them.

Carl Russell

You may mail comments to
201 N. Stone 3rd floor
Tucson, Arizona 85701
ATTN: Community Relations Office
Or Fax them into
(520) 838-7537
Thank you

PUBLIC WORKS
pima county

Comment Form

Your comments are important to us. Please let know your thoughts and concerns on any of the project you saw here today.

I am working on a study for ADOT – The Southwest Regional Transportation Profile Study.

I would like to receive a copy of the draft report.

Mary Rodin

Kimley – Horn Associates

Thank you!

You may mail comments to
201 N. Stone 3rd floor
Tucson, Arizona 85701
ATTN: Community Relations Office
Or Fax them into
(520) 838-7537
Thank you

PUBLIC WORKS
pima county

Comment Form

Your comments are important to us. Please let know your thoughts and concerns on any of the project you saw here today.

Presentation was extremely well done! Excellent charts- everything clearly marked. We need Valencia improved sooner than 2012 – 2016 from Mark Road to Ajo Highway. It would be nice to have a speaker and have question and answer aired to all in attendance. Maybe at the next meeting?

You may mail comments to
201 N. Stone 3rd floor
Tucson, Arizona 85701
ATTN: Community Relations Office
Or Fax them into
(520) 838-7537
Thank you

PUBLIC WORKS
pima county

Comment Form

Your comments are important to us. Please let know your thoughts and concerns on any of the project you saw here today.

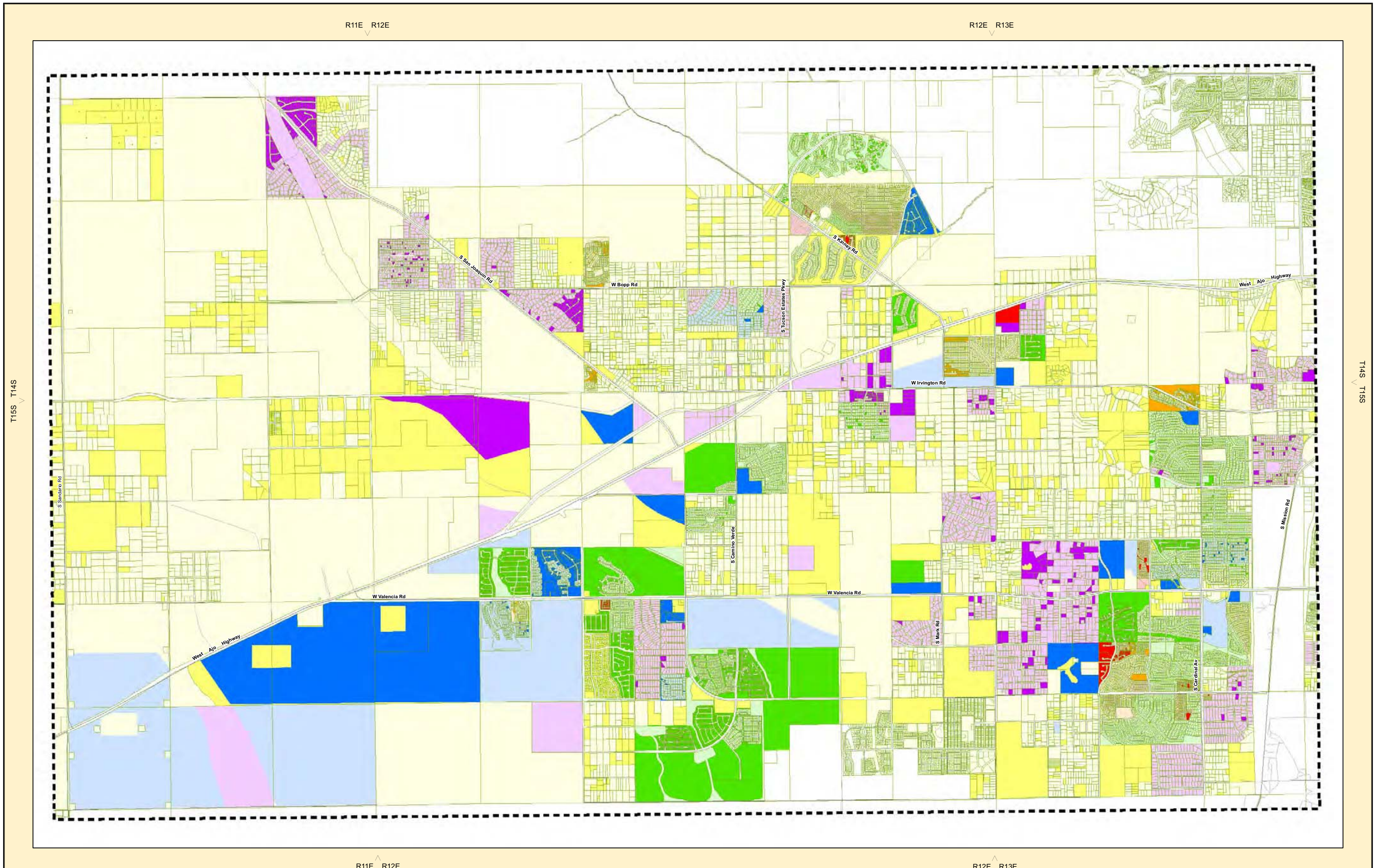
Informative. Some things need better explanation or more informed Stantec people.

Please keep me informed of future drafts, hearings, or reports.

D. Booth

You may mail comments to
201 N. Stone 3rd floor
Tucson, Arizona 85701
ATTN: Community Relations Office
Or Fax them into
(520) 838-7537
Thank you

Appendix E



Map DC-1
Density Assumptions for Low Growth Scenario

Unimproved Private Parcel
(Shaded) Developed Parcels per Assessor's Tax Records, Jan 2007

Density Assumptions for Low Growth Scenario

- Up to 0.6 RAC
- Greater than 0.6 to 1.0 RAC
- Greater than 1.0 to 2.0 RAC
- Greater than 2.0 to 4.0 RAC
- Greater than 4.0 to 6.0 RAC
- Greater than 6.0 RAC
- Southwest Infrastructure Plan Boundary

Pima County Regional Flood Control District

Southwest Infrastructure Plan

Pima County Index Map

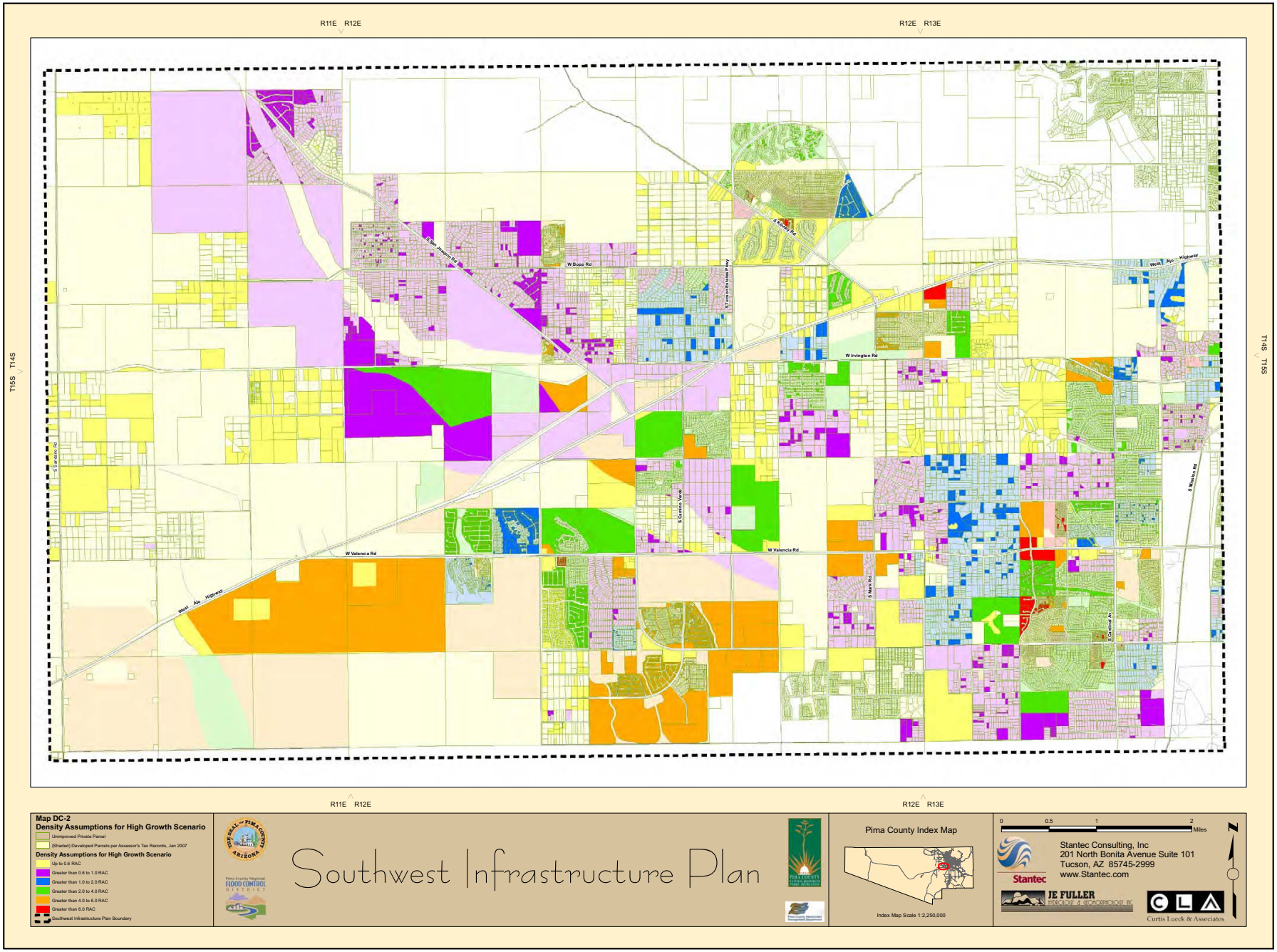
Index Map Scale 1:2,250,000

0 0.5 1 2 Miles

Stantec Consulting, Inc
201 North Bonita Avenue Suite 101
Tucson, AZ 85745-2999
www.Stantec.com

JE Fuller Hydrology & Geomorphology, Inc

Curtis Lueck & Associates



Map DC-2
Density Assumptions for High Growth Scenario

- Unimproved Private Parcel
- (Shaded) Developed Parcels per Assessor's Tax Records, Jan 2007

Density Assumptions for High Growth Scenario

- Up to 0.6 RAC
- Greater than 0.6 to 1.0 RAC
- Greater than 1.0 to 2.0 RAC
- Greater than 2.0 to 4.0 RAC
- Greater than 4.0 to 6.0 RAC
- Greater than 6.0 RAC
- Southwest Infrastructure Plan Boundary

Southwest Infrastructure Plan

Pima County Index Map

Index Map Scale 1:2,250,000

0 0.5 1 2 Miles

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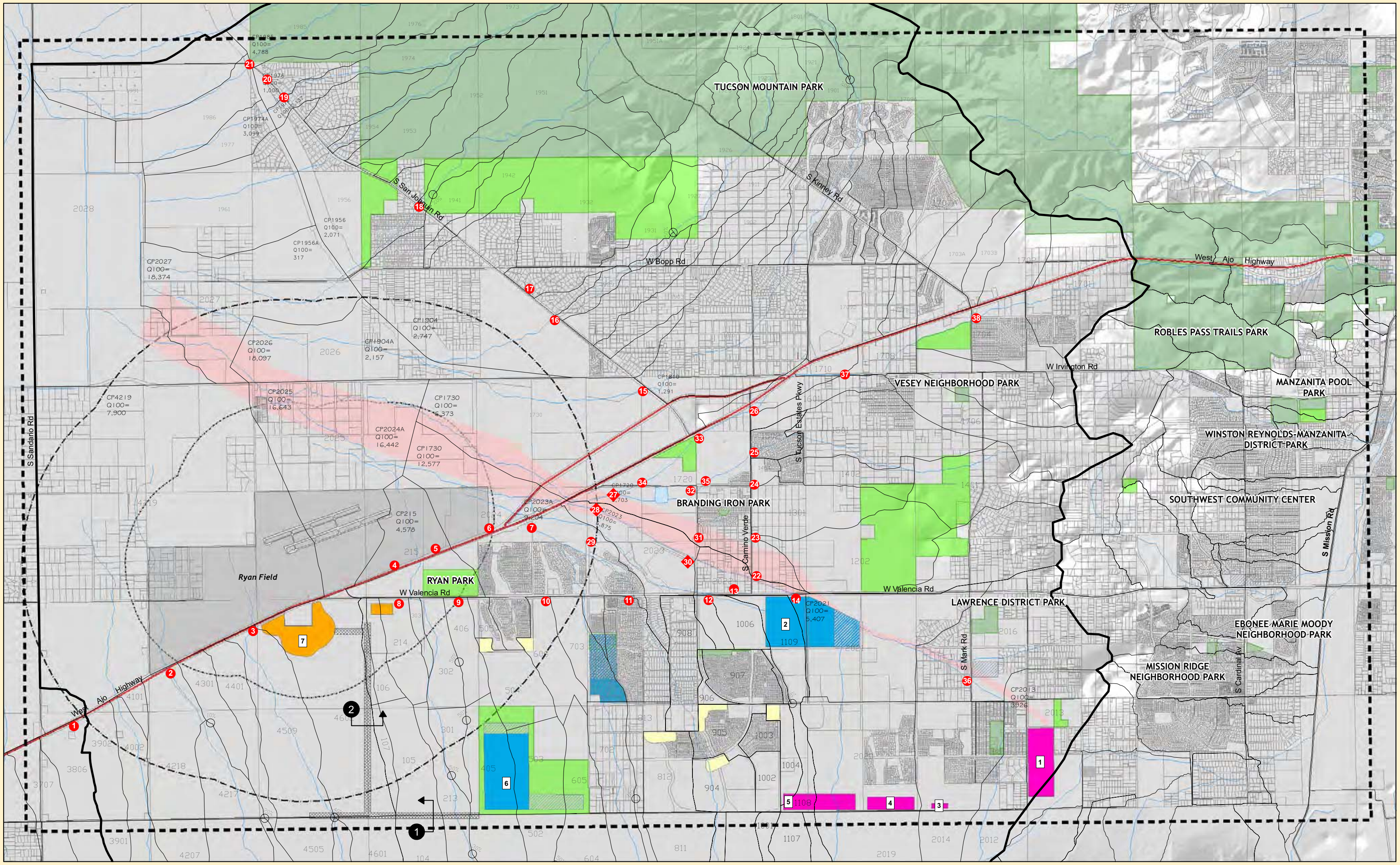
Tucson, AZ 85745-2999
www.Stantec.com

Stantec
JE FULLER
Curtis Lueck & Associates

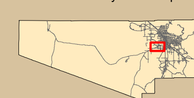


Map H-1
Proposed Flood Control Facilities

- Subbasin Boundary
- HEC-1 Model Boundary
- Proposed Drainage Corridor
- Existing Pima County Maintained Detention Basin
- Purchase Priorities for Regional Flood Control Facilities
- Proposed Detention Basin (Flood Control Only)
- Proposed Detention Basin (Multi-Use Facility)
- Private Flood Control Facilities
- Basin Number
- Proposed Park
- Existing Park
- Black Wash Floodway
- Pima County Parcel
- Southwest Infrastructure Plan Boundary
- New or Improved Drainage Culvert Road Crossing
- Probable New Bridge Crossing
- Hazardous Wildlife Attractants Seperation Distance - 5,000' (Piston Aircraft)
- Hazardous Wildlife Attractants Seperation Distance - 10,000' (Jet Aircraft)

Southwest Infrastructure Plan

Pima County Index Map



Index Map Scale 1:2,250,000

0 0.5 1 2 Miles

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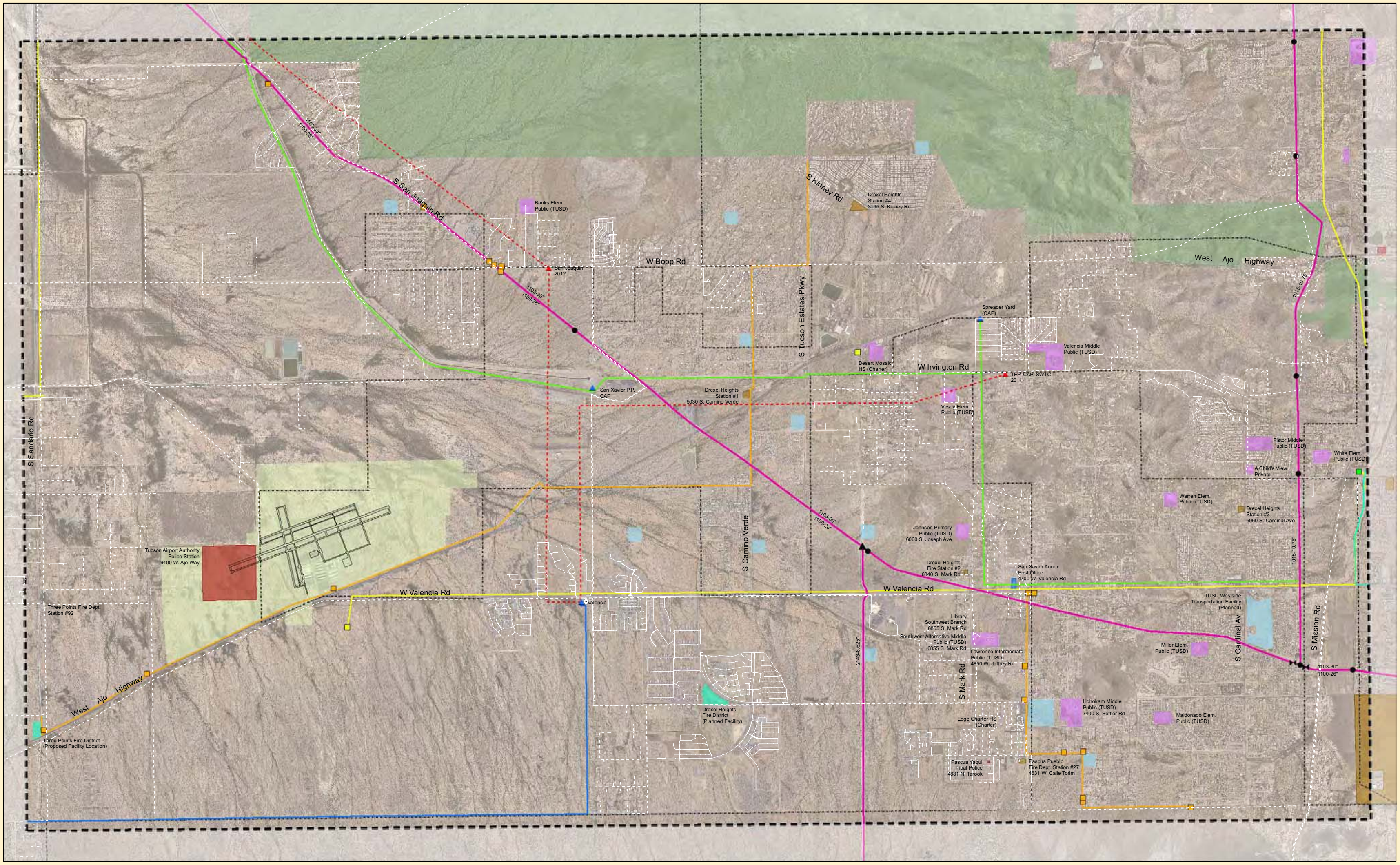

Map O-1
Other Public Services and Facilities

- Existing Substation
- Proposed New Substation
- Regulator Station (SWG)
- Existing CAP 115 Kv Transmission Line
- Existing SWTC 115Kv
- Proposed New SWTC 115 Kv Transmission Line (2012)
- SWG Existing High Pressure Feeder (>60 ps.i.)
- Ryan Airfield Ultimate Property
- Southwest Infrastructure Plan Boundary
- Existing TEP Substation
- Proposed TEP Substation
- Existing TEP Line
- Proposed TEP Line
- School
- Post Office
- Police Station
- Fire Station
- Proposed Fire Station
- EPNG Meter
- EPNG Station
- EPNG Valve
- El Paso Natural Gas Pipeline
- TRICO Electric Station
- TRICO Primary Overhead
- TRICO Primary Underground
- TRICO ServiceTerritory
- TUSD Property

Southwest Infrastructure Plan

Pima County Index Map

Index Map Scale 1:2,250,000

0 0.5 1 2 Miles

Stantec Consulting, Inc
201 North Bonita Avenue Suite 101
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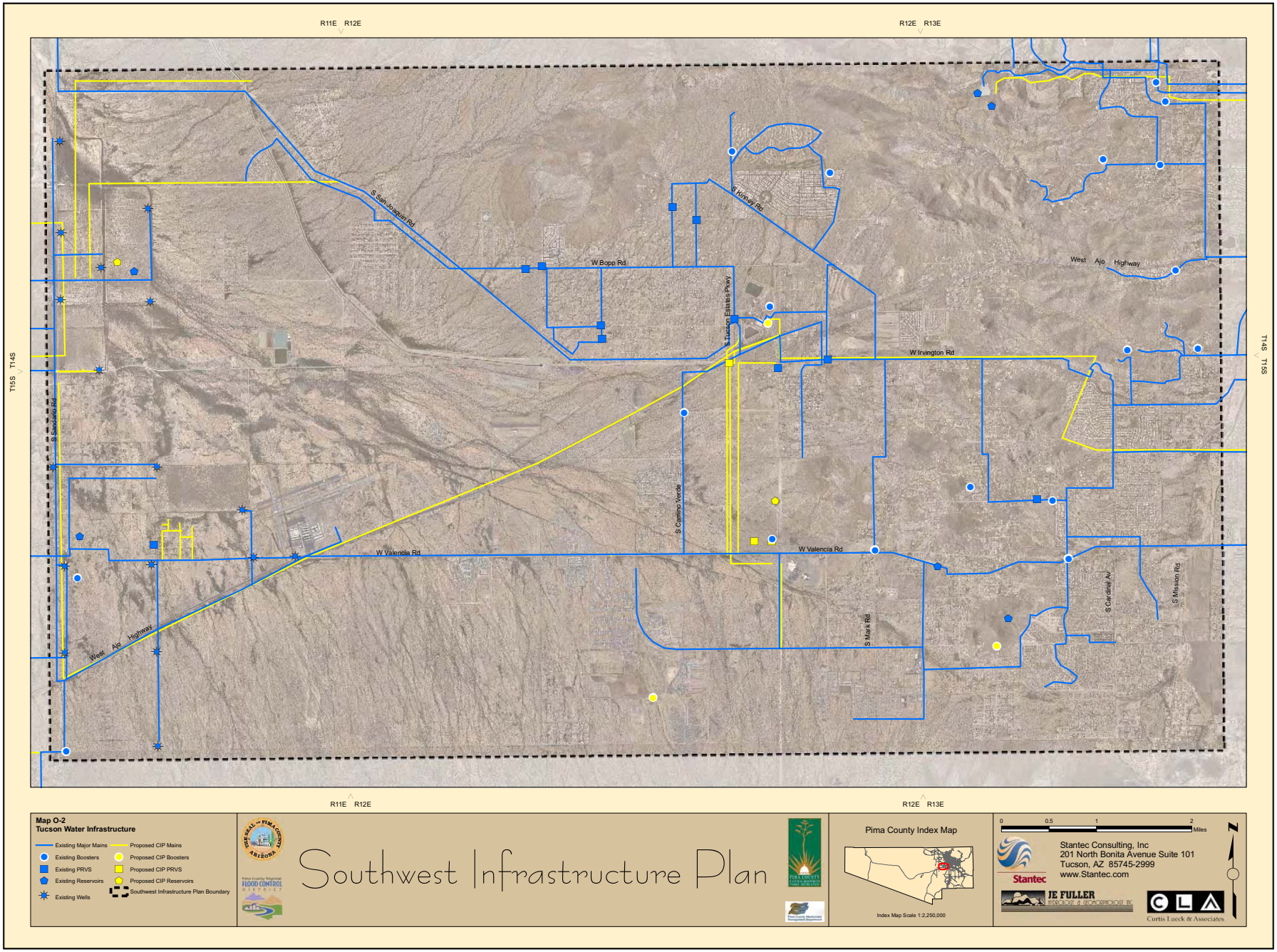
www.Stantec.com

JE FULLER HYDROLOGY & GEOMORPHOLOGY, INC

Curtis Lueck & Associates



Map O-2
Tucson Water Infrastructure

- Existing Major Mains
- Existing Boosters
- Existing PRVS
- Existing Reservoirs
- Existing Wells
- Proposed CIP Mains
- Proposed CIP Boosters
- Proposed CIP PRVS
- Proposed CIP Reservoirs
- Southwest Infrastructure Plan Boundary

Southwest Infrastructure Plan

Pima County Index Map

Index Map Scale 1:2,250,000

0 0.5 1 2 Miles

N

Stantec Consulting, Inc
201 North Bonita Avenue Suite 101
Tucson, AZ 85745-2999
www.Stantec.com

Stantec
JE FULLER
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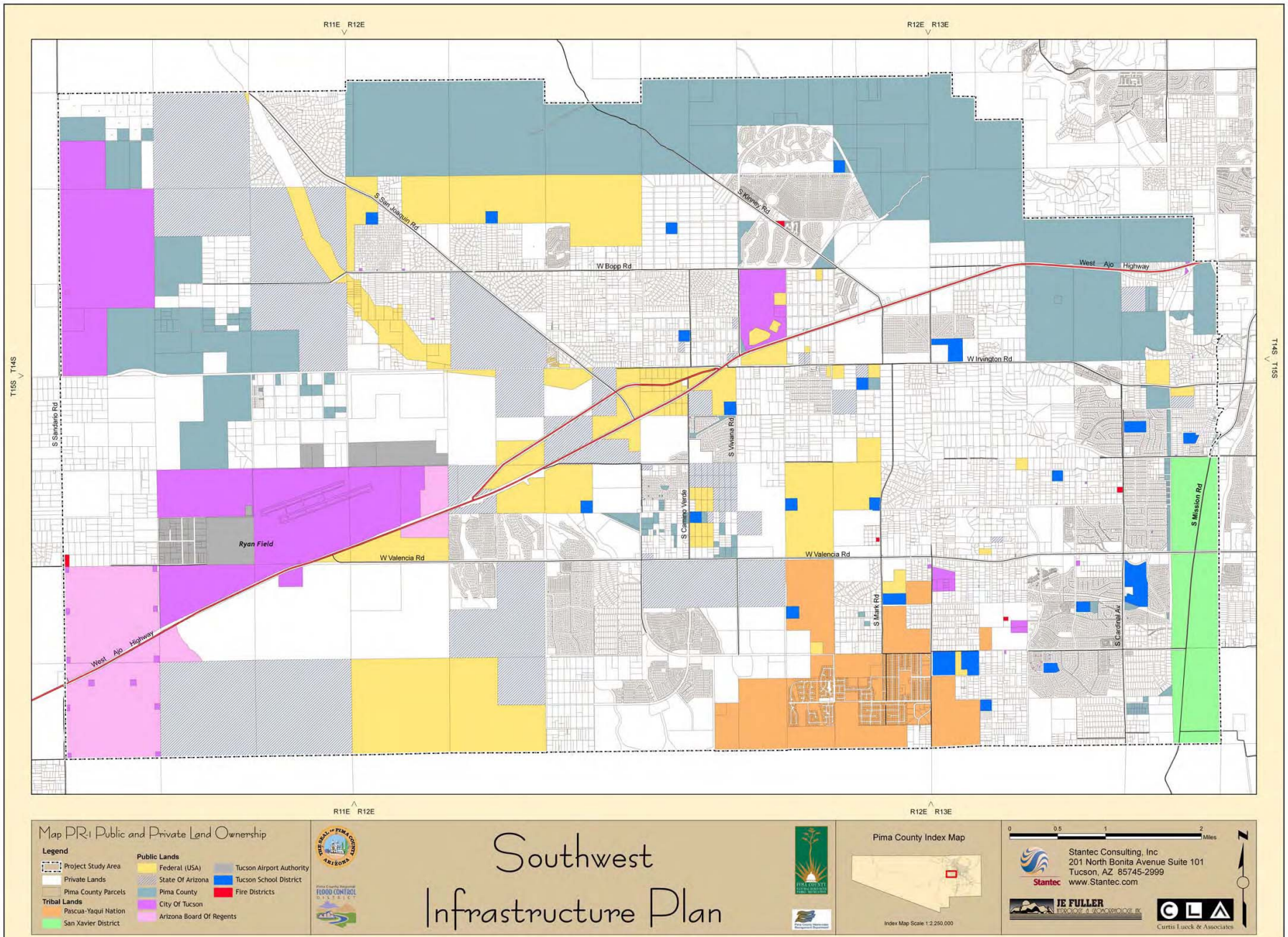

Map PR-1 Public and Private Land Ownership

Legend

- Project Study Area
- Private Lands
- Pima County Parcels

Tribal Lands

- Pascua-Yaqui Nation
- San Xavier District

Public Lands

- Federal (USA)
- State Of Arizona
- Pima County
- City Of Tucson
- Arizona Board Of Regents
- Tucson Airport Authority
- Tucson School District
- Fire Districts

Southwest Infrastructure Plan

Pima County Index Map

Index Map Scale 1:2,250,000

0 0.5 1 2 Miles

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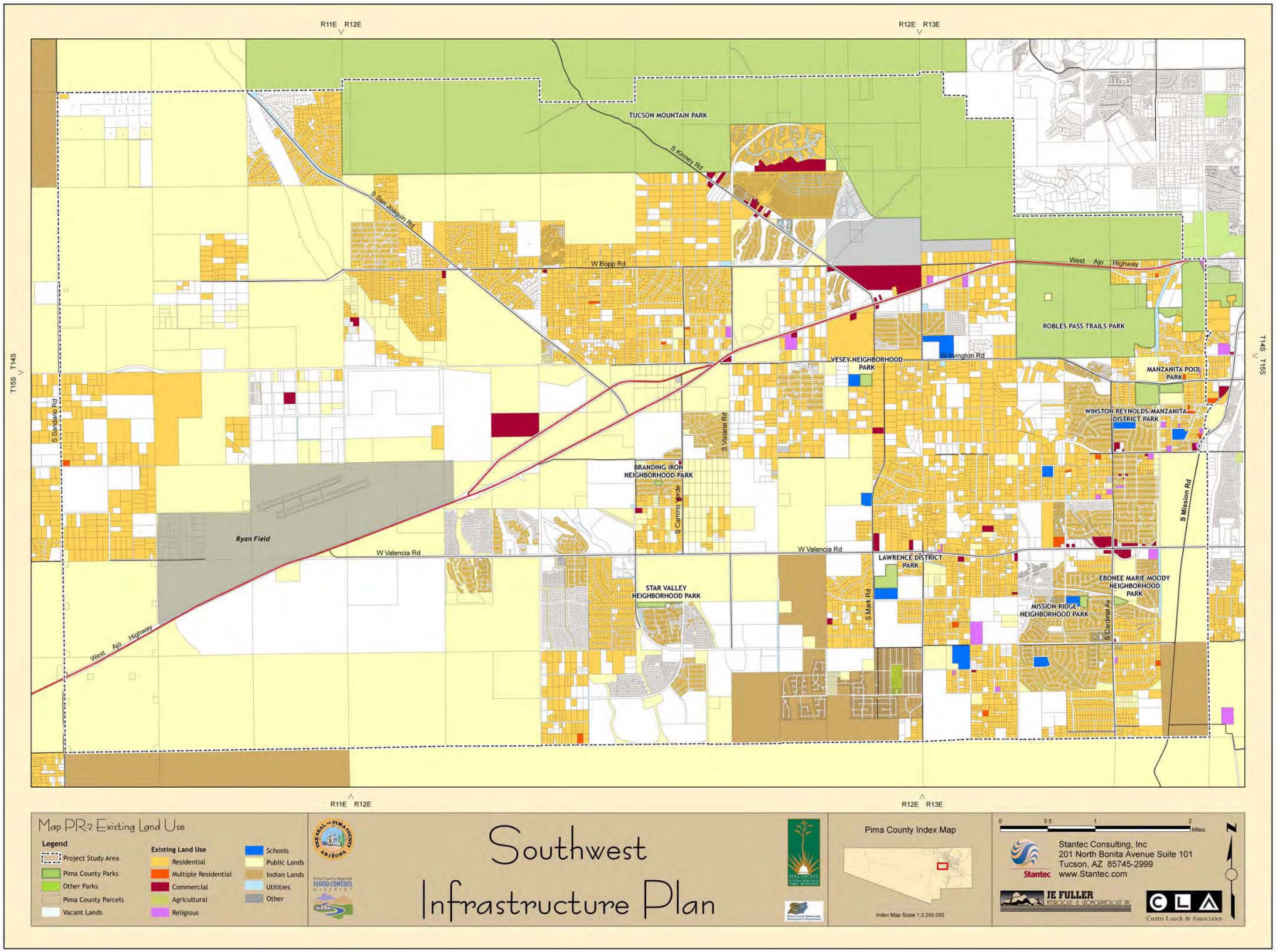

Map PR-2 Existing Land Use

Legend

- Project Study Area
- Pima County Parks
- Other Parks
- Pima County Parcels
- Vacant Lands

Existing Land Use

- Residential
- Multiple Residential
- Commercial
- Agricultural
- Religious
- Schools
- Public Lands
- Indian Lands
- Utilities
- Other

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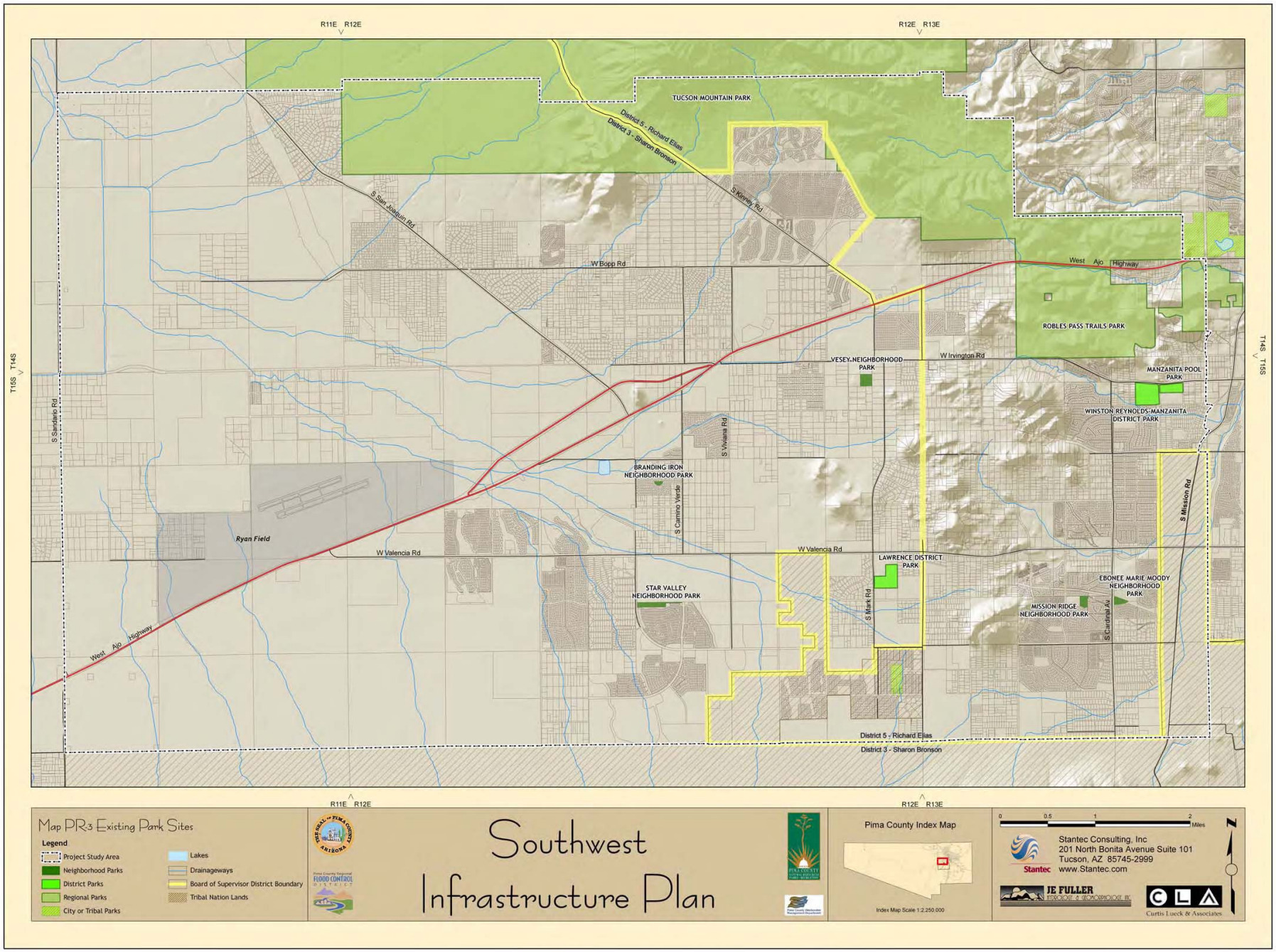

Map PR-3 Existing Park Sites

Legend

- Project Study Area
- Neighborhood Parks
- District Parks
- Regional Parks
- City or Tribal Parks
- Lakes
- Drainageways
- Board of Supervisor District Boundary
- Tribal Nation Lands

Southwest Infrastructure Plan

Pima County Index Map

Index Map Scale 1:2,250,000

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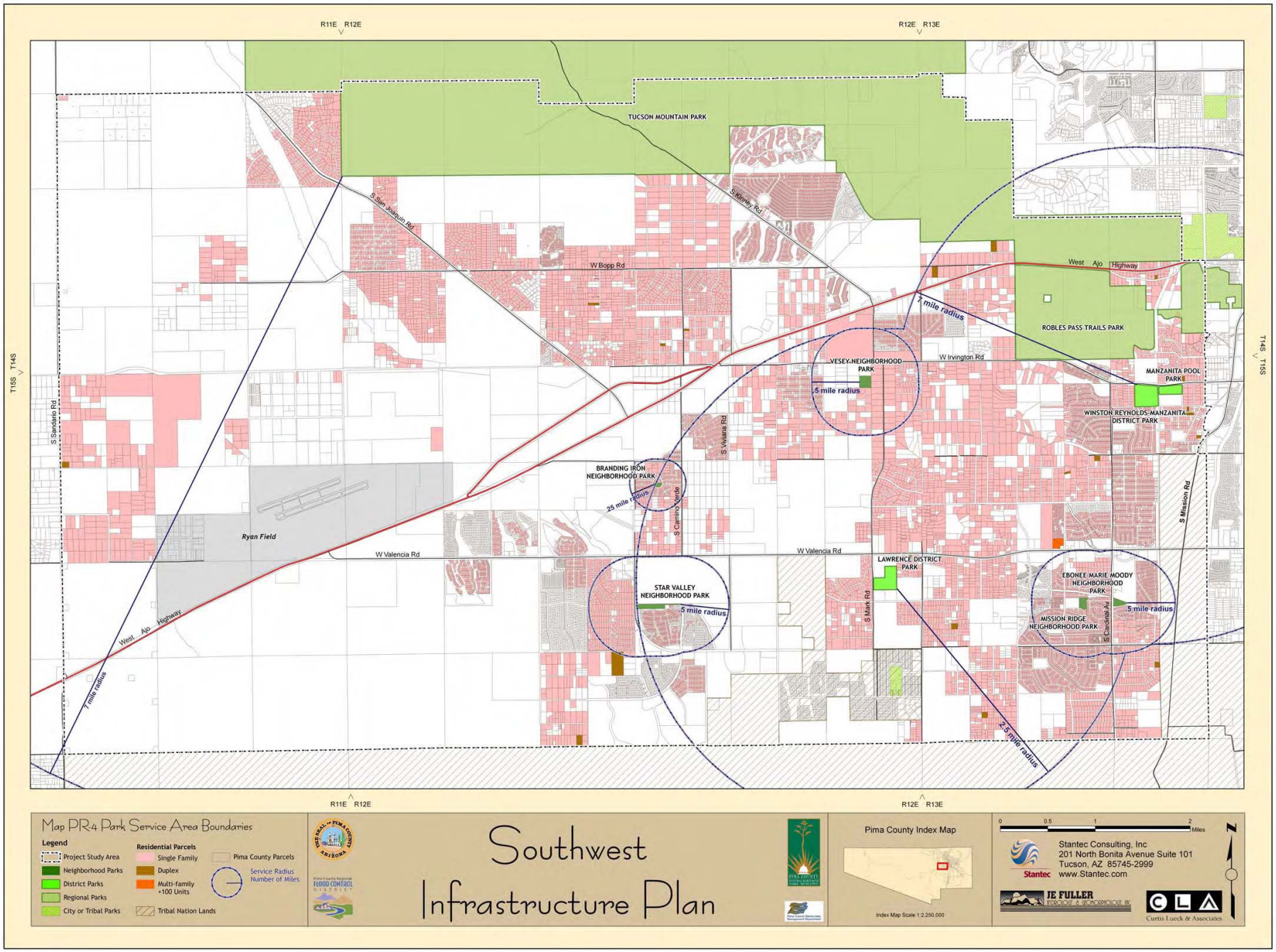

Map PR-4 Park Service Area Boundaries

Legend

- Project Study Area
- Neighborhood Parks
- District Parks
- Regional Parks
- City or Tribal Parks

Residential Parcels

- Single Family
- Duplex
- Multi-family +100 Units
- Pima County Parcels
- Service Radius Number of Miles
- Tribal Nation Lands

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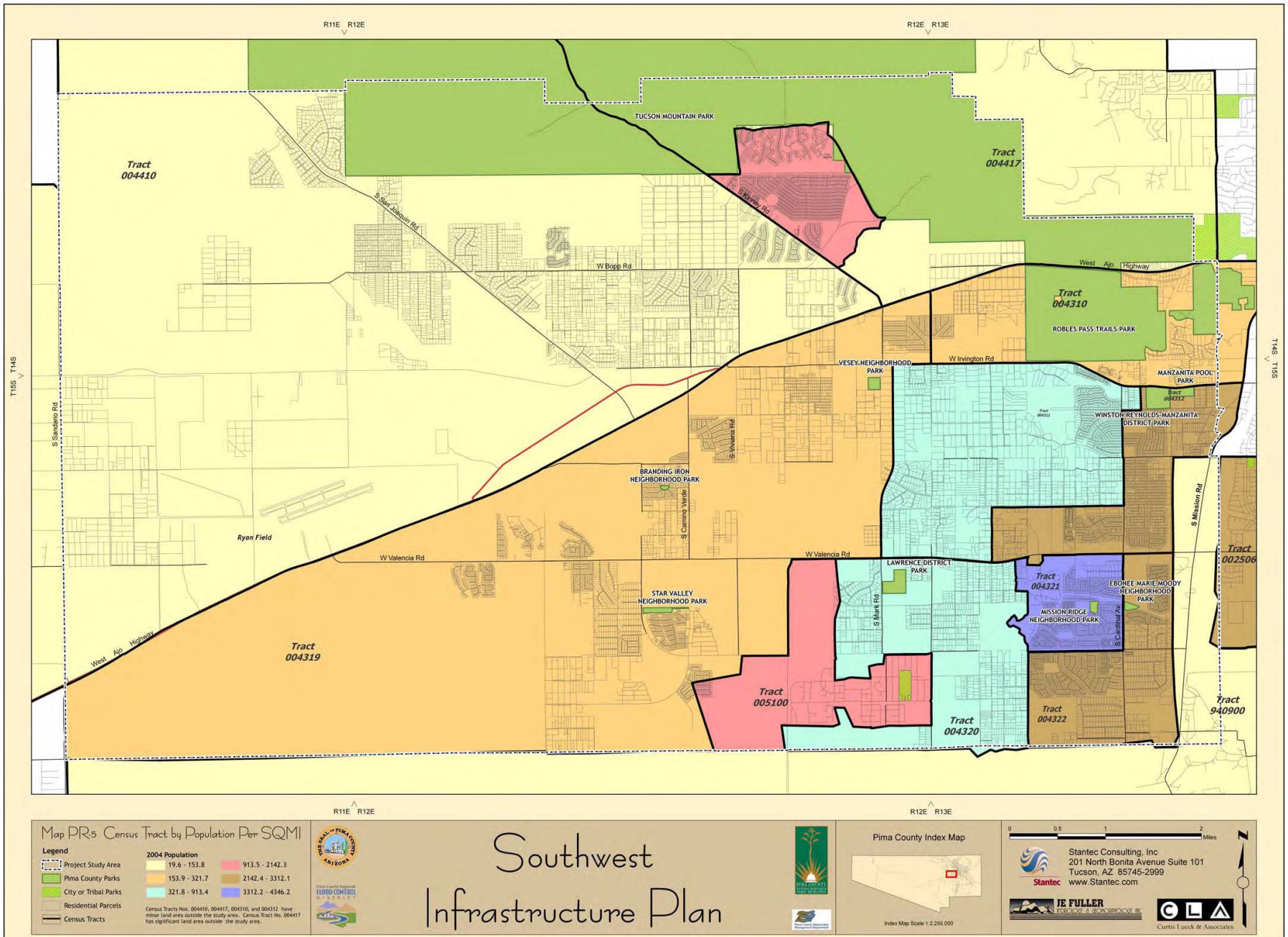

Map PR-5 Census Tract by Population Per SQMI

Legend

- Project Study Area
- Pima County Parks
- City or Tribal Parks
- Residential Parcels
- Census Tracts

2004 Population

19.6 - 153.8	913.5 - 2142.3
153.9 - 321.7	2142.4 - 3312.1
321.8 - 913.4	3312.2 - 4346.2

Census Tracts Nos. 004410, 004417, 004310, and 004312 have minor land area outside the study area. Census Tract No. 004417 has significant land area outside the study area.

Southwest Infrastructure Plan

Pima County Index Map

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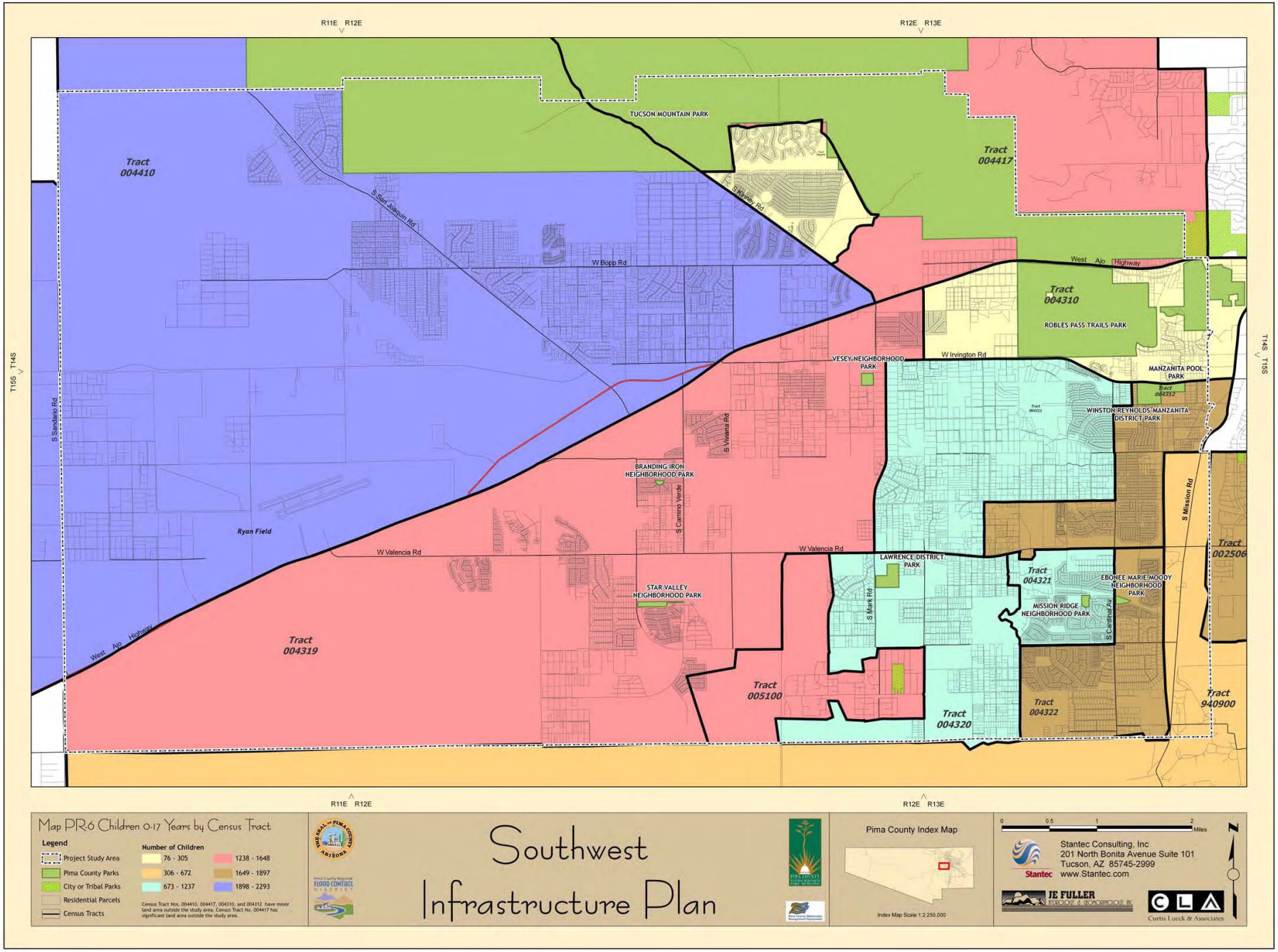

Map PR-6 Children 0-17 Years by Census Tract

Legend

- Project Study Area
- Pima County Parks
- City or Tribal Parks
- Residential Parcels
- Census Tracts

Number of Children

76 - 305	1238 - 1648
306 - 672	1649 - 1897
673 - 1237	1898 - 2293

Census Tract Nos. 004410, 004417, 004310, and 004312 have minor land area outside the study area. Census Tract No. 004417 has significant land area outside the study area.

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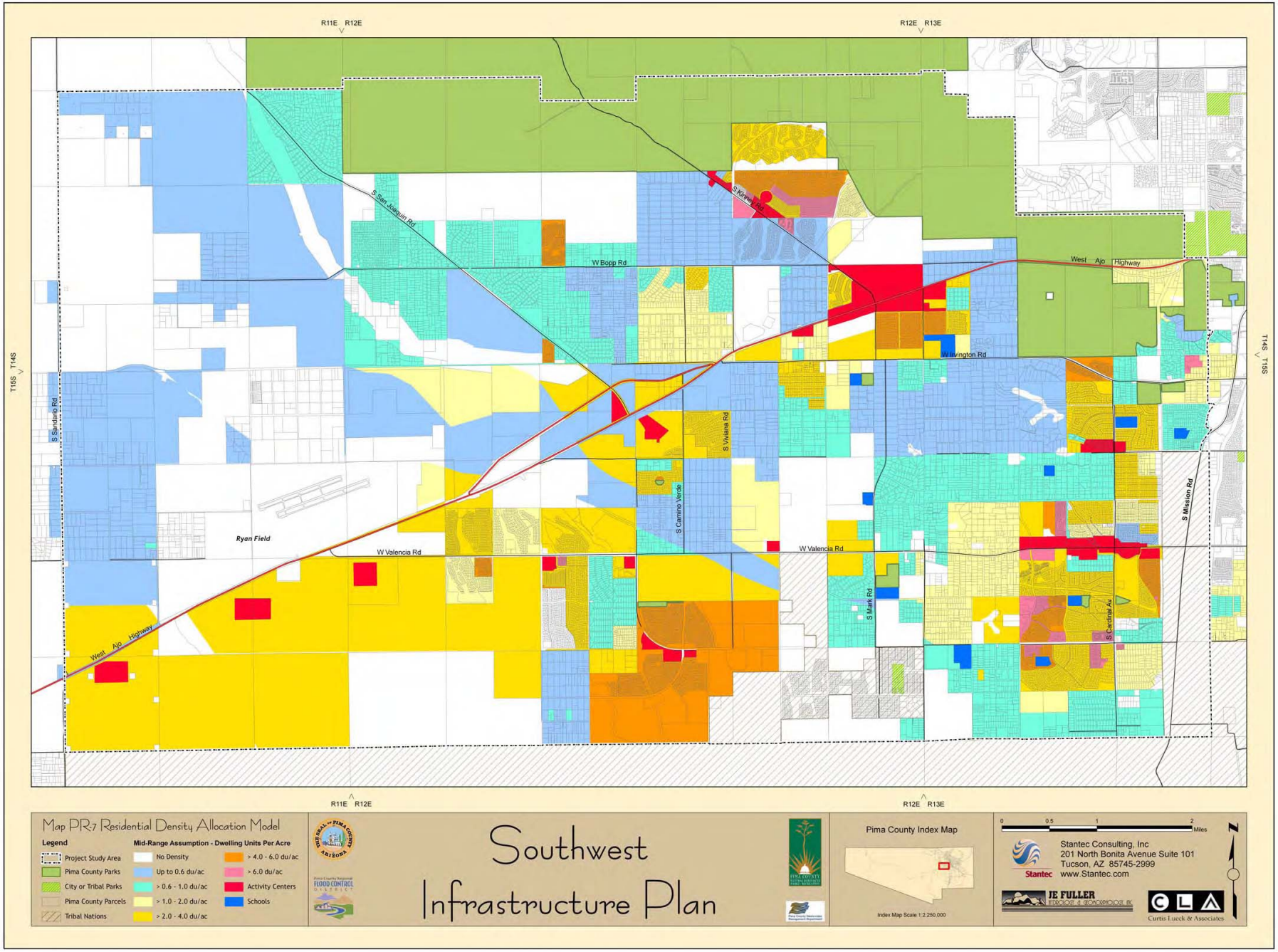

Map PR-7 Residential Density Allocation Model

Legend

- Project Study Area
- Pima County Parks
- City or Tribal Parks
- Pima County Parcels
- Tribal Nations

Mid-Range Assumption - Dwelling Units Per Acre

- No Density
- Up to 0.6 du/ac
- > 0.6 - 1.0 du/ac
- > 1.0 - 2.0 du/ac
- > 2.0 - 4.0 du/ac
- > 4.0 - 6.0 du/ac
- > 6.0 du/ac
- Activity Centers
- Schools

Southwest Infrastructure Plan

Pima County Index Map

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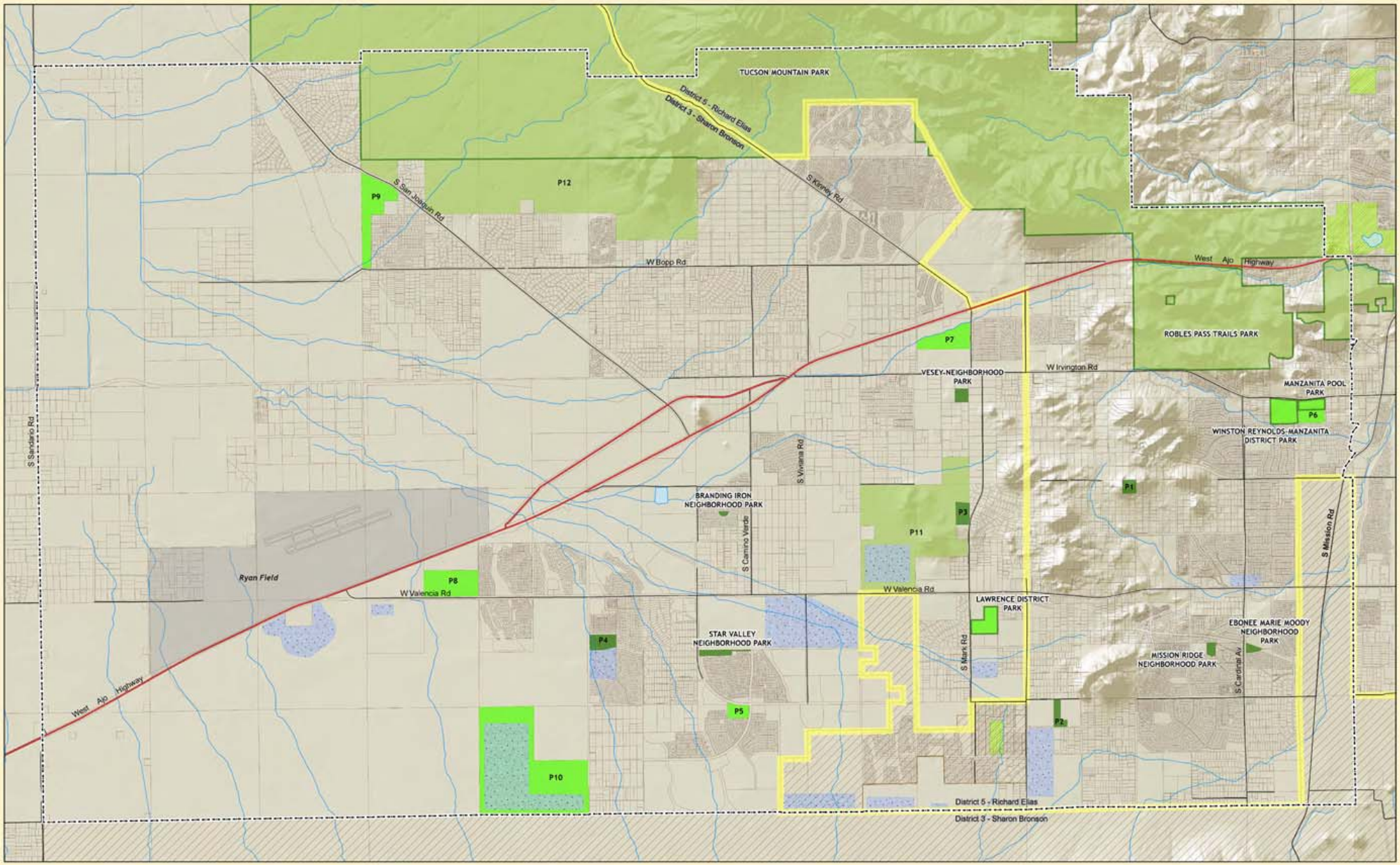

Map PR-8 Existing and Proposed Park Sites

Legend

- Project Study Area
- Neighborhood Parks
- District Parks
- Regional Parks
- City or Tribal Parks
- Proposed Flood Control Facilities
- Lakes
- Drainageways
- Board of Supervisor District Boundary
- Tribal Nation Lands

Southwest Infrastructure Plan

Pima County Index Map

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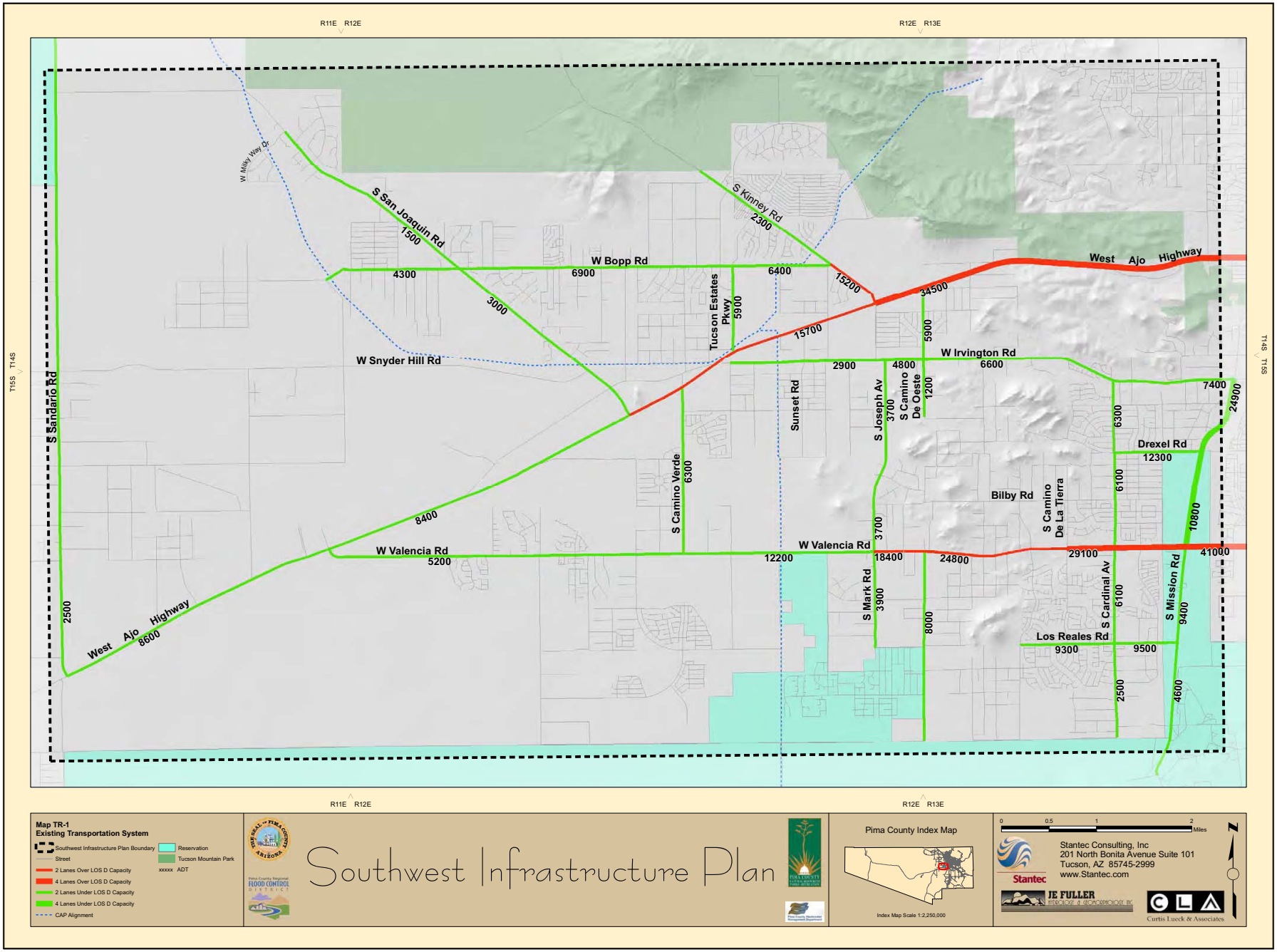

Map TR-1
Existing Transportation System

- Southwest Infrastructure Plan Boundary
- Street
- 2 Lanes Over LOS D Capacity
- 4 Lanes Over LOS D Capacity
- 2 Lanes Under LOS D Capacity
- 4 Lanes Under LOS D Capacity
- CAP Alignment
- Reservation
- Tucson Mountain Park
- xxxxx ADT

Southwest Infrastructure Plan

Pima County Index Map

Index Map Scale 1:2,250,000

0 0.5 1 2 Miles

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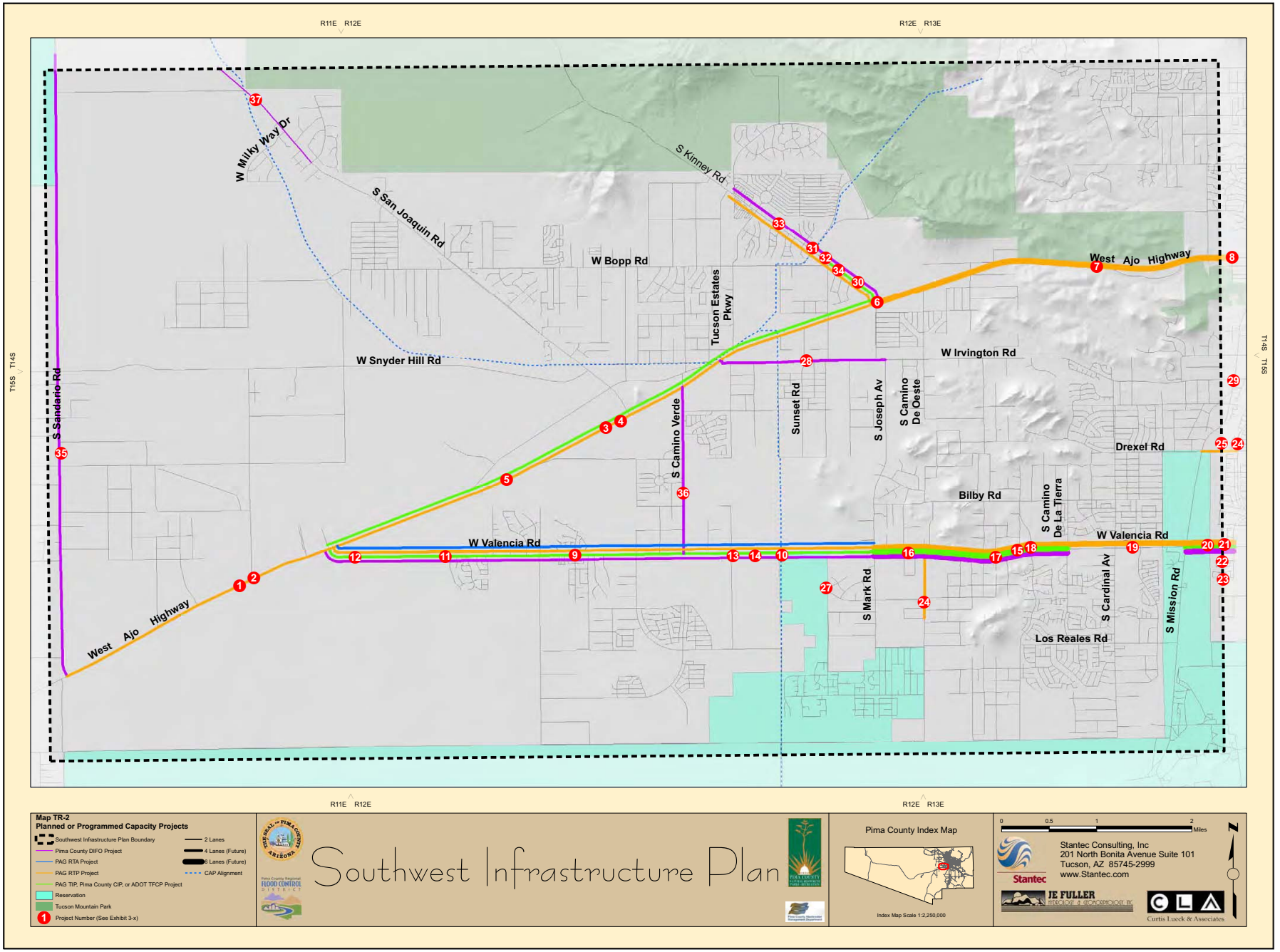
R11E R12E
R12E R13E
T15S T14S
T14S T15S
W Milky Way Dr
S San Joaquin Rd
S Kinney Rd
W Bopp Rd
Tucson Estates Pkwy
West Ajo Highway
W Snyder Hill Rd
W Irvington Rd
S Sandario Rd
S Camino Verde
Sunset Rd
S Joseph Av
S Camino De Oeste
Drexel Rd
Bilby Rd
S Camino De La Tierra
W Valencia Rd
S Mark Rd
S Cardinal Av
S Mission Rd
Los Reales Rd
Map TR-2
Planned or Programmed Capacity Projects
Southwest Infrastructure Plan Boundary
Pima County DIFO Project
PAG RTA Project
PAG RTP Project
PAG TIP, Pima County CIP, or ADOT TFCP Project
Reservation
Tucson Mountain Park
Project Number (See Exhibit 3-x)
2 Lanes
4 Lanes (Future)
6 Lanes (Future)
CAP Alignment
Southwest Infrastructure Plan
Pima County Index Map
Index Map Scale 1:2,250,000
0 0.5 1 2 Miles
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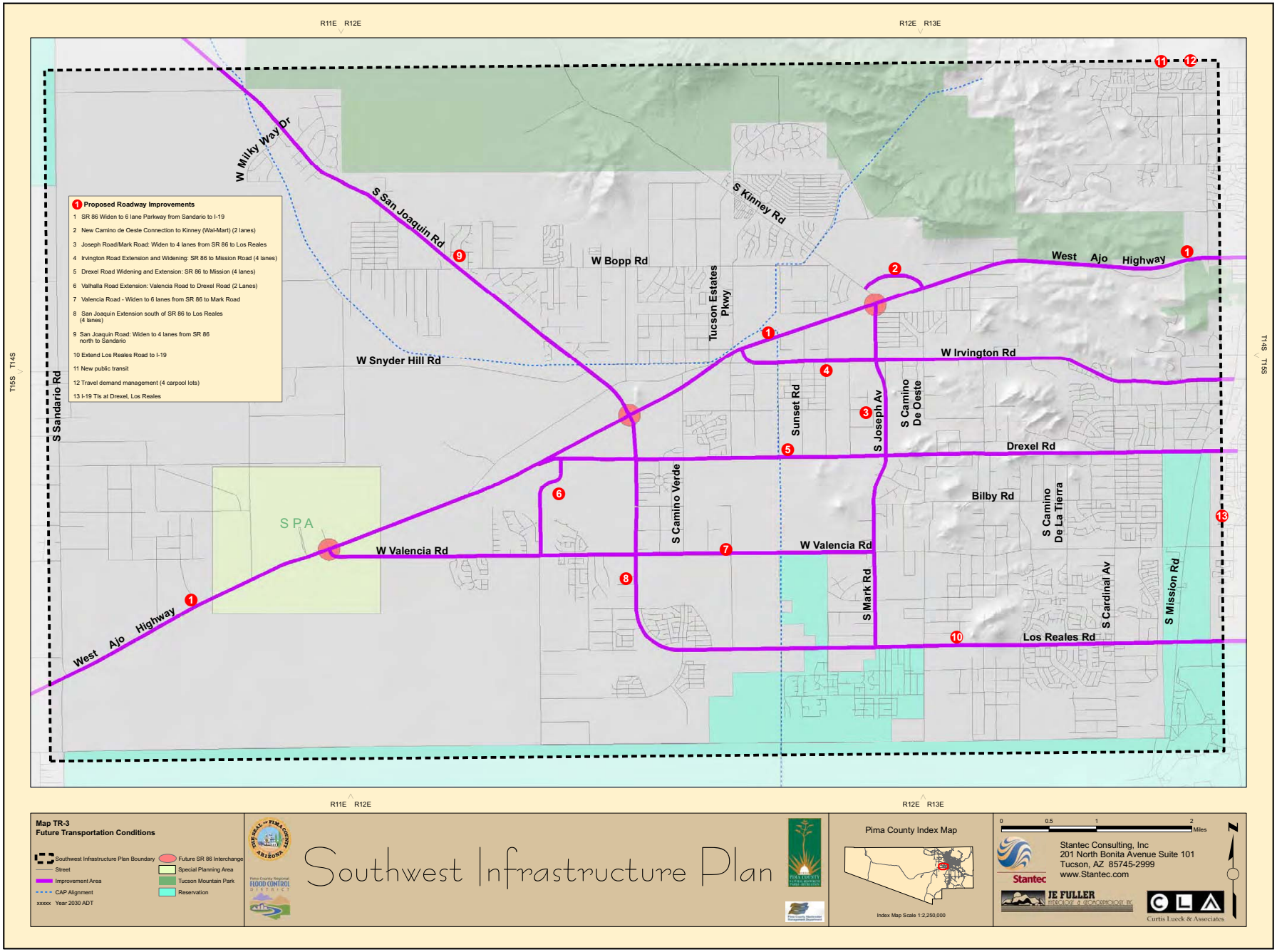

Map TR-3
Future Transportation Conditions

- Southwest Infrastructure Plan Boundary
- Street
- Improvement Area
- CAP Alignment
- xxxxx Year 2030 ADT
- Future SR 86 Interchange
- Special Planning Area
- Tucson Mountain Park
- Reservation

Southwest Infrastructure Plan

Pima County Index Map

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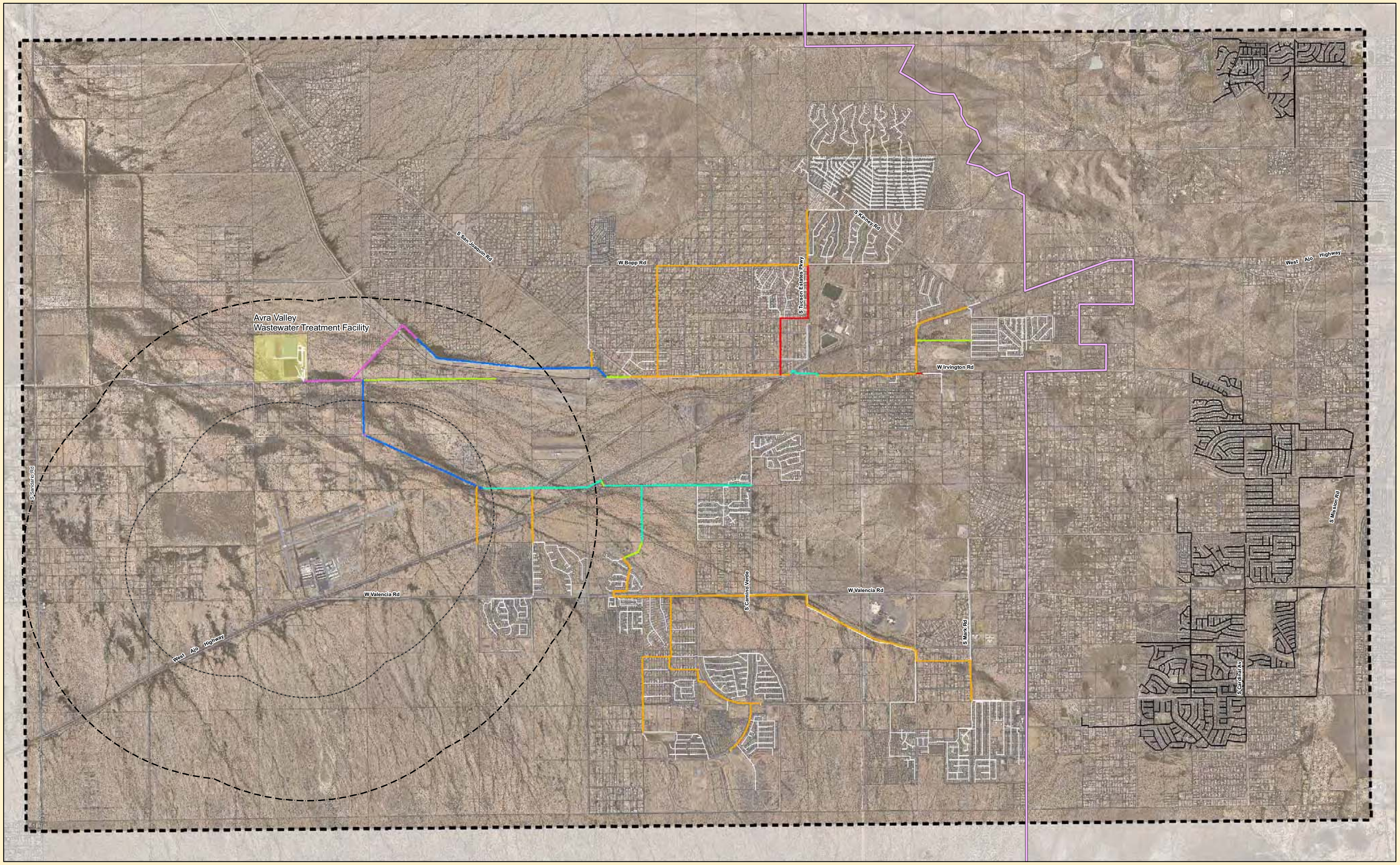
R11E R12E

R12E R13E

T15S T14S

T14S T15S



Map W-1
Existing Wastewater Collection System

R11E R12E

R12E R13E

Modeled Backbone Network

- 8"
- 12"
- 15"
- 18"
- 21"
- 24"
- Pipes <12"
- Pipes draining to Roger Road Wastewater Treatment Plant
- Avra Valley Sub-basin Boundary
- Land Parcel
- Southwest Infrastructure Plan Boundary
- Hazardous Wildlife Attractants Seperation Distance - 10,000' (Jet Aircraft)
- Hazardous Wildlife Attractants Seperation Distance - 5,000' (Piston Aircraft)

Southwest Infrastructure Plan

Pima County Index Map

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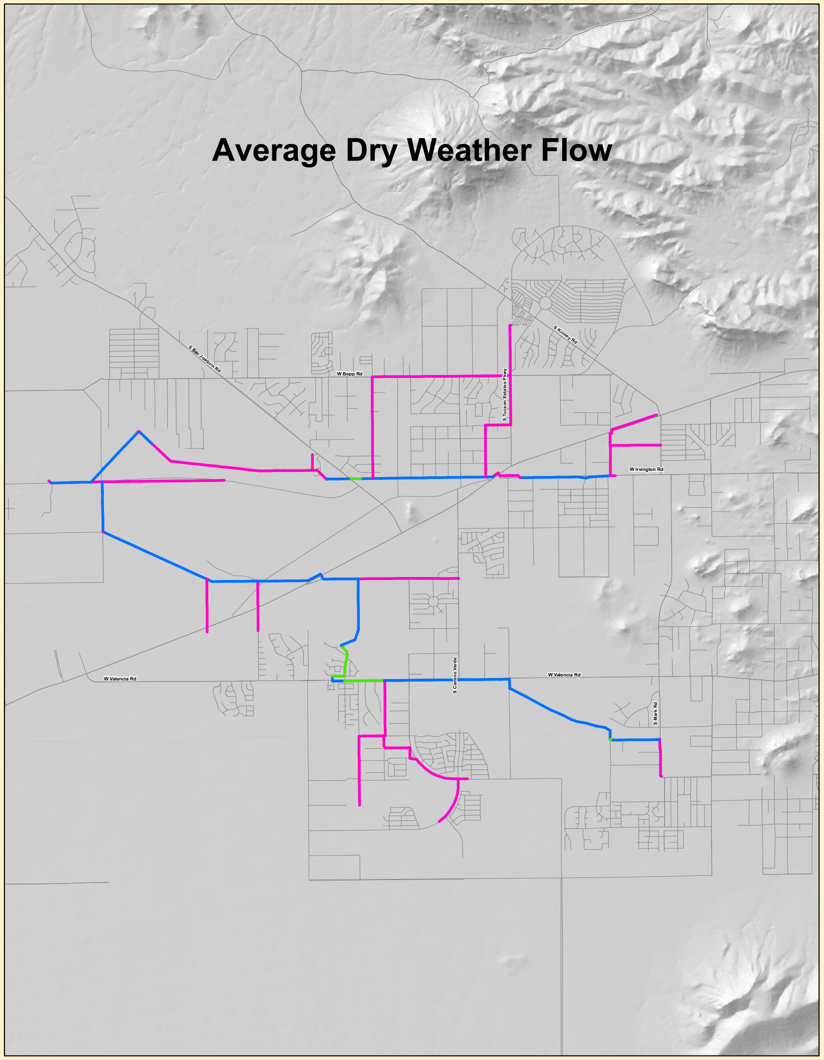
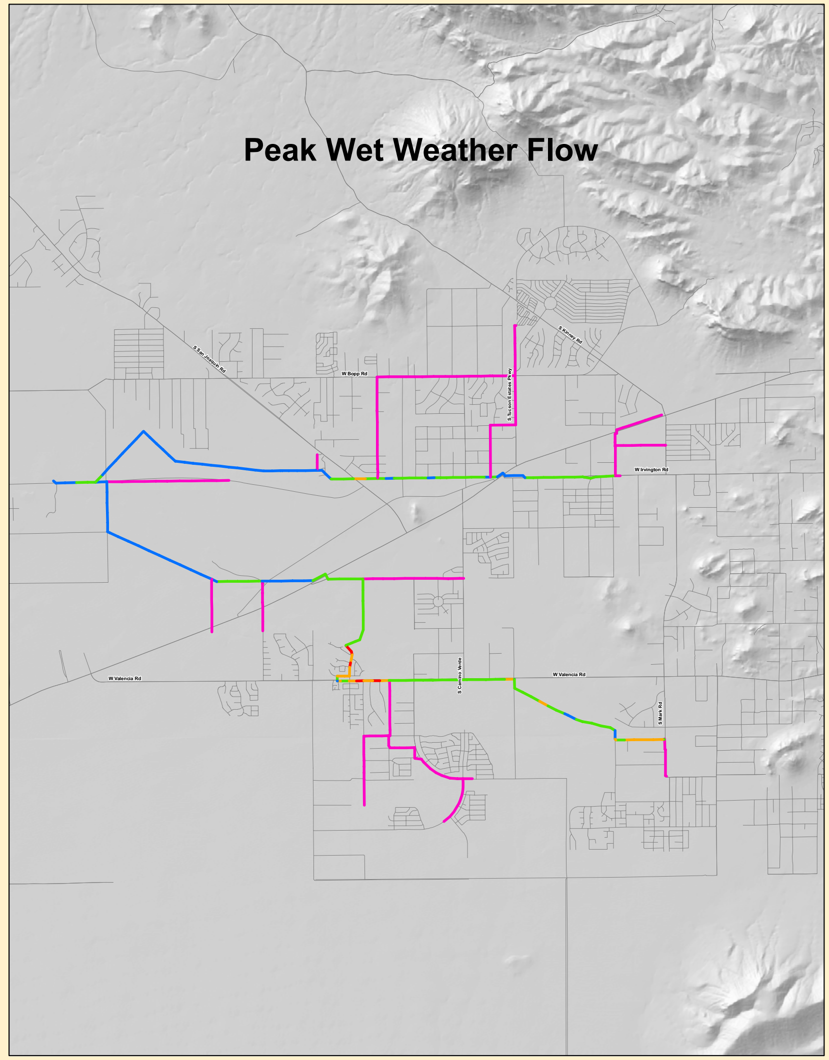




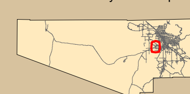
Map W-2
Existing System Residential Capacity Analysis Results

Simulated Depth Over Diameter (d/D) Ratio:

- Less Than 0.200
- 0.200 to 0.399
- 0.400 to 0.599
- 0.600 to 0.799
- 0.800 to 1.000

Southwest Infrastructure Plan

Pima County Index Map



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0 2,000 4,000 8,000
1" = 2000'

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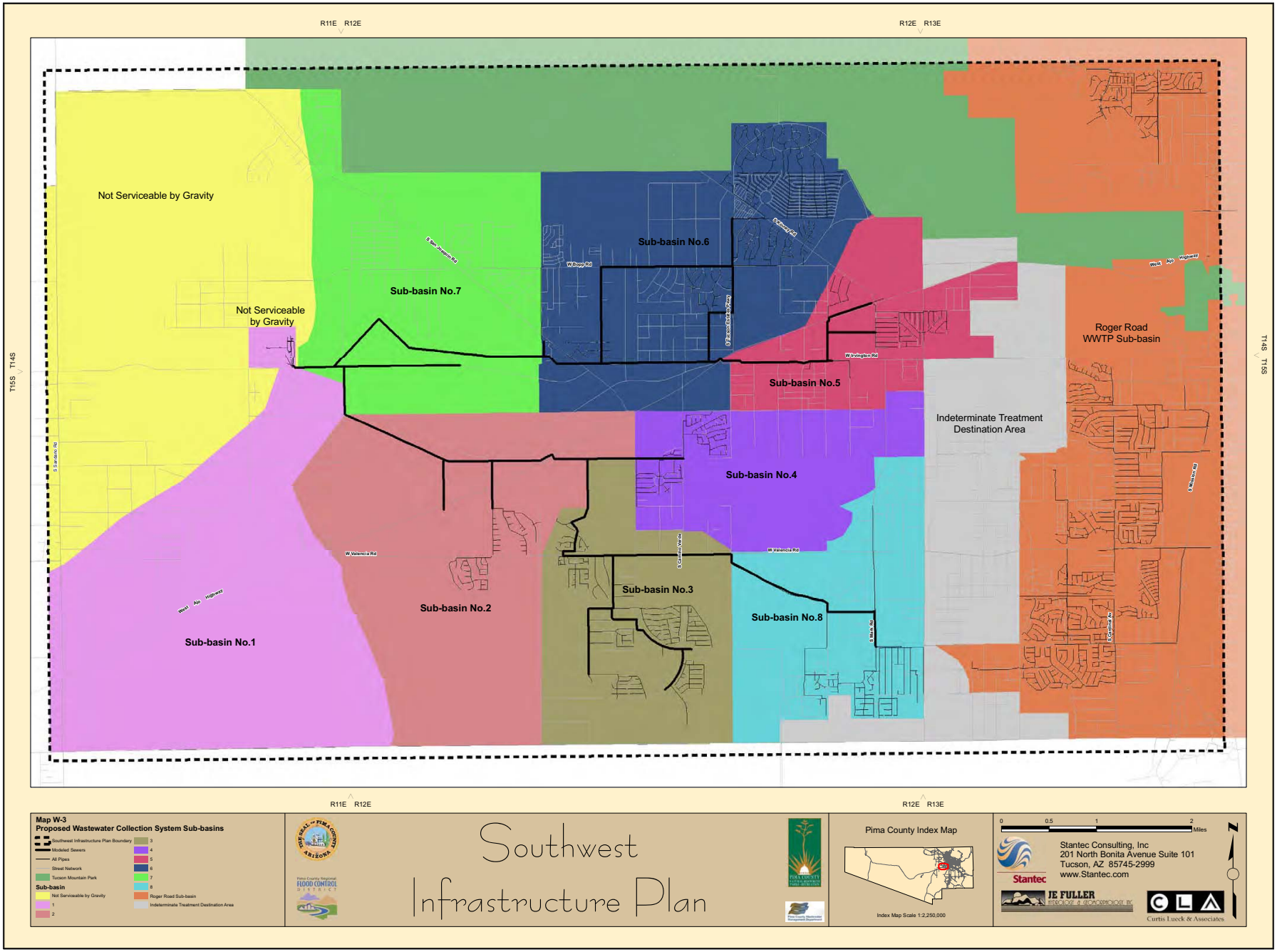

Map W-3
Proposed Wastewater Collection System Sub-basins

- Southwest Infrastructure Plan Boundary
- Modeled Sewers
- All Pipes
- Street Network
- Tucson Mountain Park

Sub-basin

- Not Serviceable by Gravity
- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- Roger Road Sub-basin
- Indeterminate Treatment Destination Area

Southwest Infrastructure Plan

Pima County Index Map

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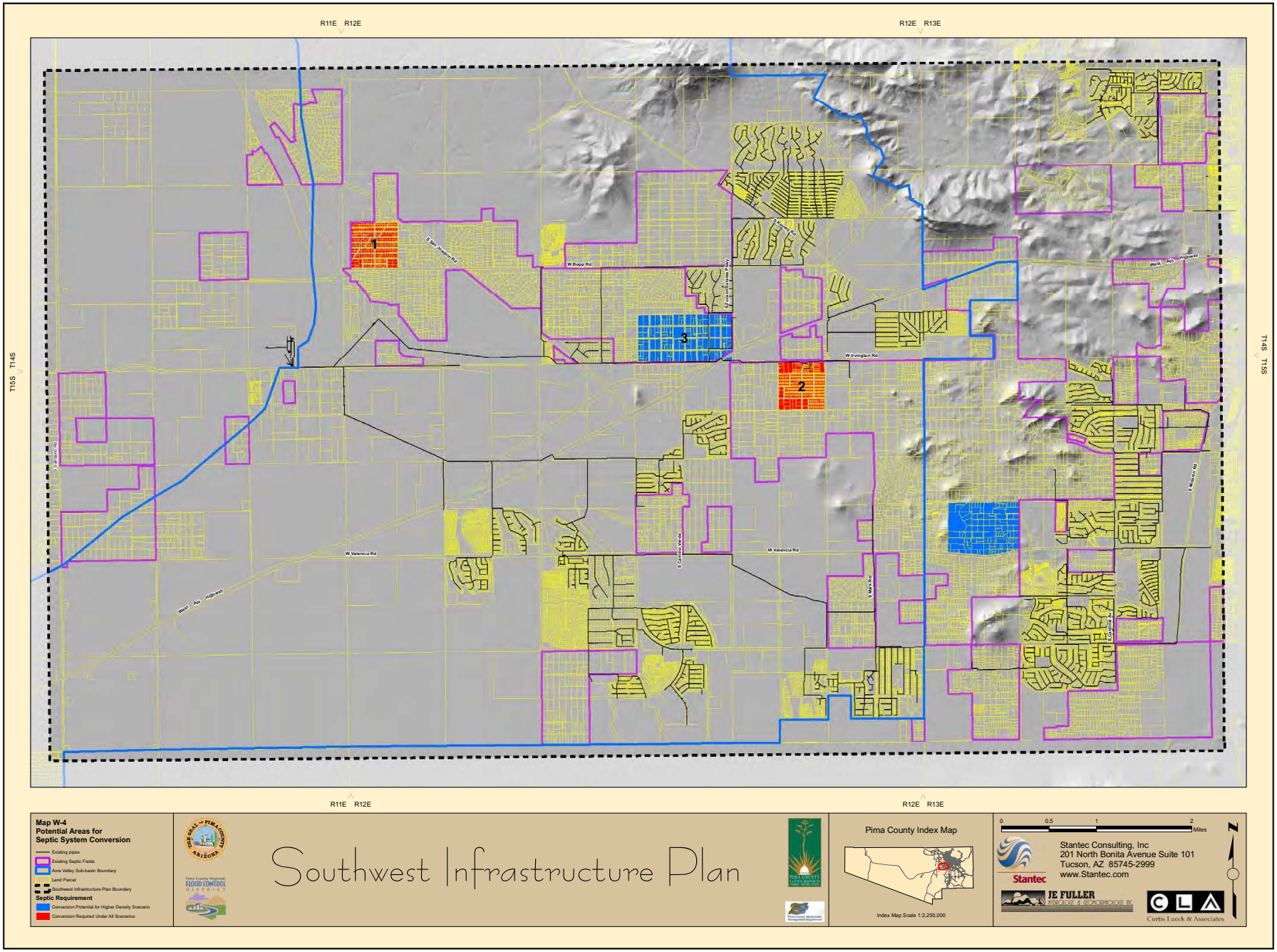

Map W-4
Potential Areas for
Septic System Conversion

- Existing pipes
- Existing Septic Fields
- Avra Valley Sub-basin Boundary
- Land Parcel
- Southwest Infrastructure Plan Boundary

Septic Requirement

- Conversion Potential for Higher Density Scenario
- Conversion Required Under All Scenarios

Southwest Infrastructure Plan

Pima County Index Map

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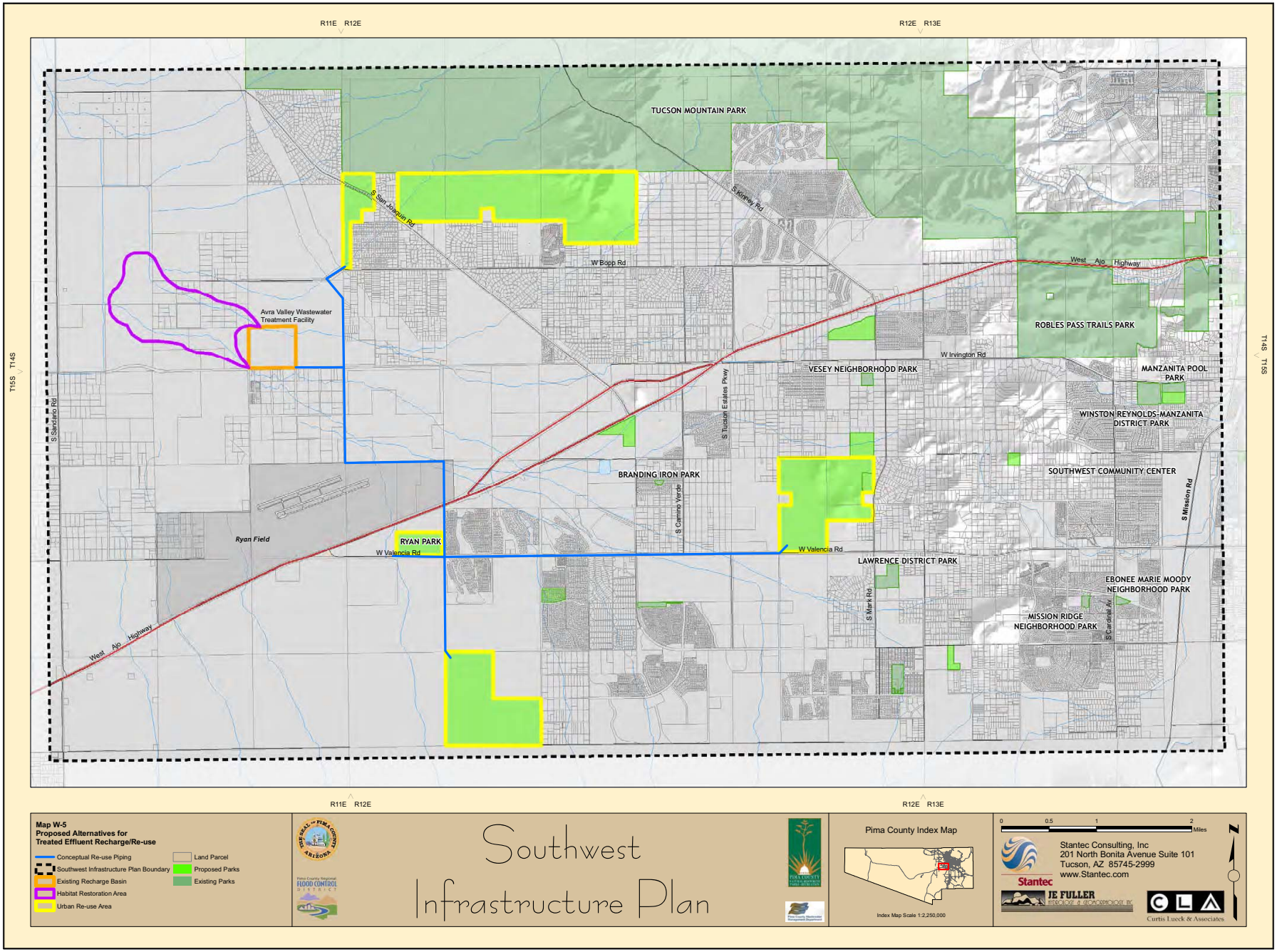

Map W-5
Proposed Alternatives for Treated Effluent Recharge/Re-use

- Conceptual Re-use Piping
- Southwest Infrastructure Plan Boundary
- Existing Recharge Basin
- Habitat Restoration Area
- Urban Re-use Area
- Land Parcel
- Proposed Parks
- Existing Parks

Southwest Infrastructure Plan

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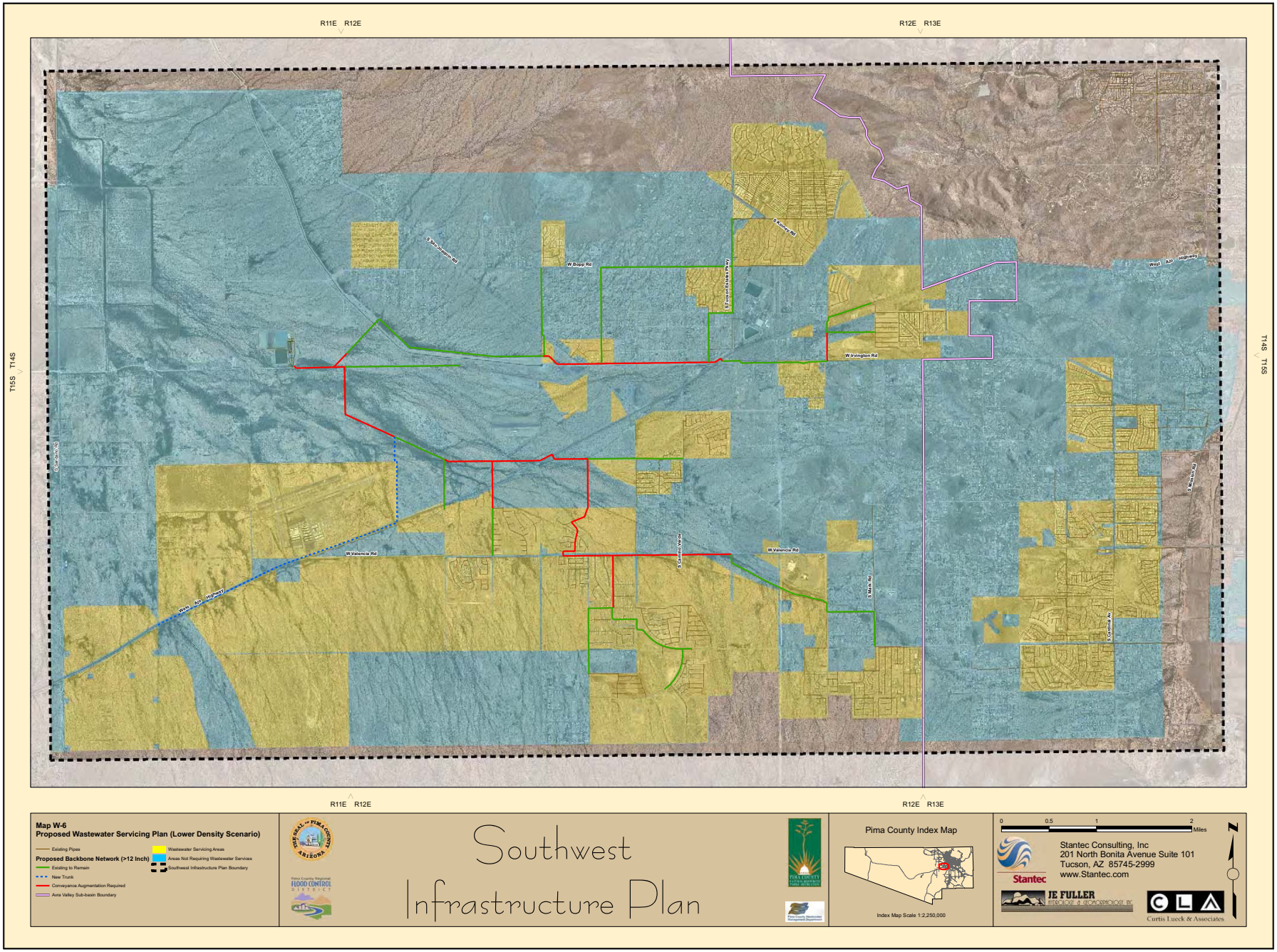

Map W-6
Proposed Wastewater Servicing Plan (Lower Density Scenario)

- Existing Pipes
- **Proposed Backbone Network (>12 Inch)**
  - Existing to Remain
  - New Trunk
  - Conveyance Augmentation Required
- Avra Valley Sub-basin Boundary
- Wastewater Servicing Areas
- Areas Not Requiring Wastewater Services
- Southwest Infrastructure Plan Boundary

Southwest Infrastructure Plan

Pima County Index Map

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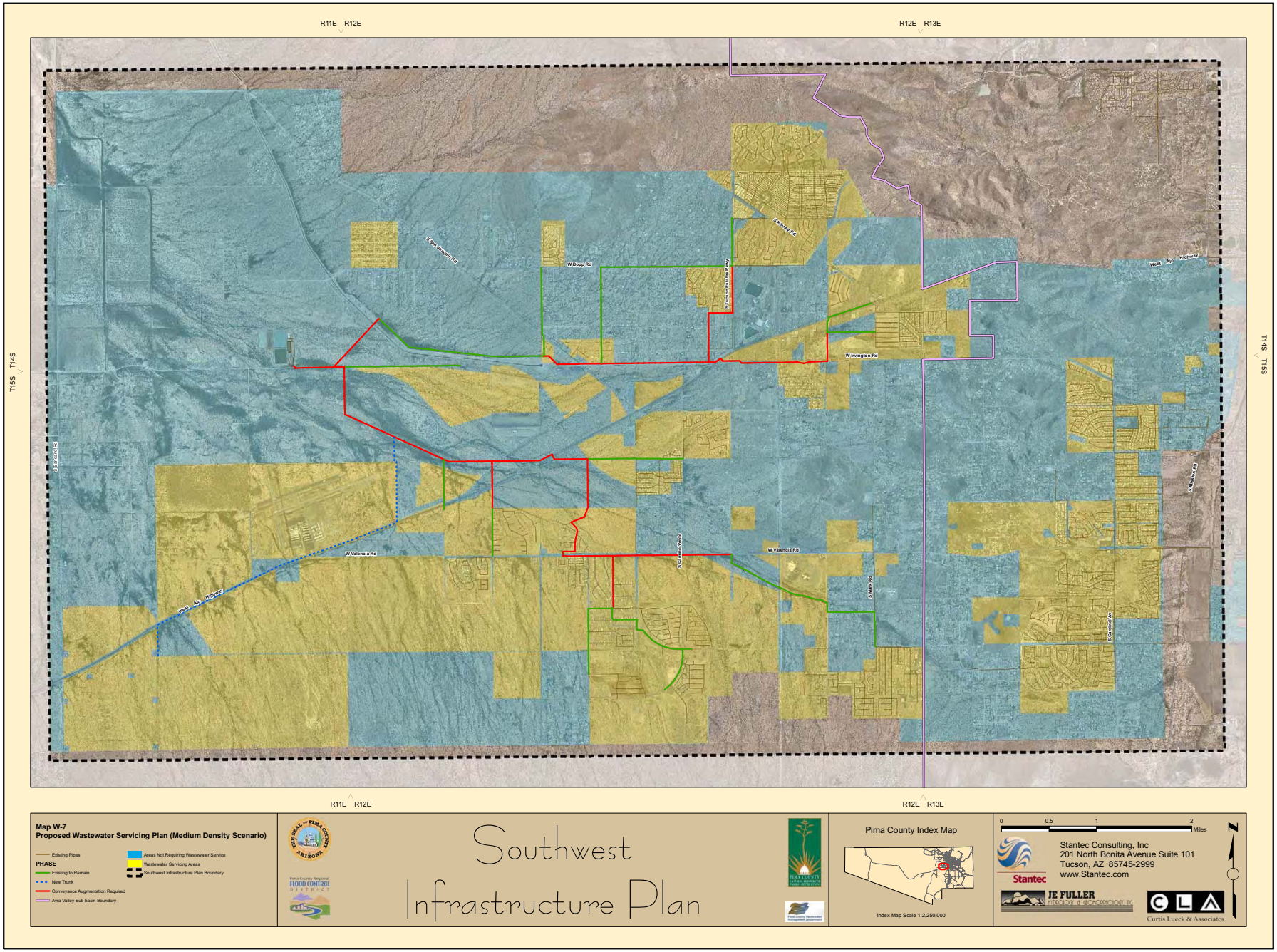

Map W-7
Proposed Wastewater Servicing Plan (Medium Density Scenario)

- Existing Pipes
- PHASE
  - Existing to Remain
  - New Trunk
  - Conveyance Augmentation Required
- Avra Valley Sub-basin Boundary
- Areas Not Requiring Wastewater Service
- Wastewater Servicing Areas
- Southwest Infrastructure Plan Boundary

Southwest Infrastructure Plan

Pima County Index Map

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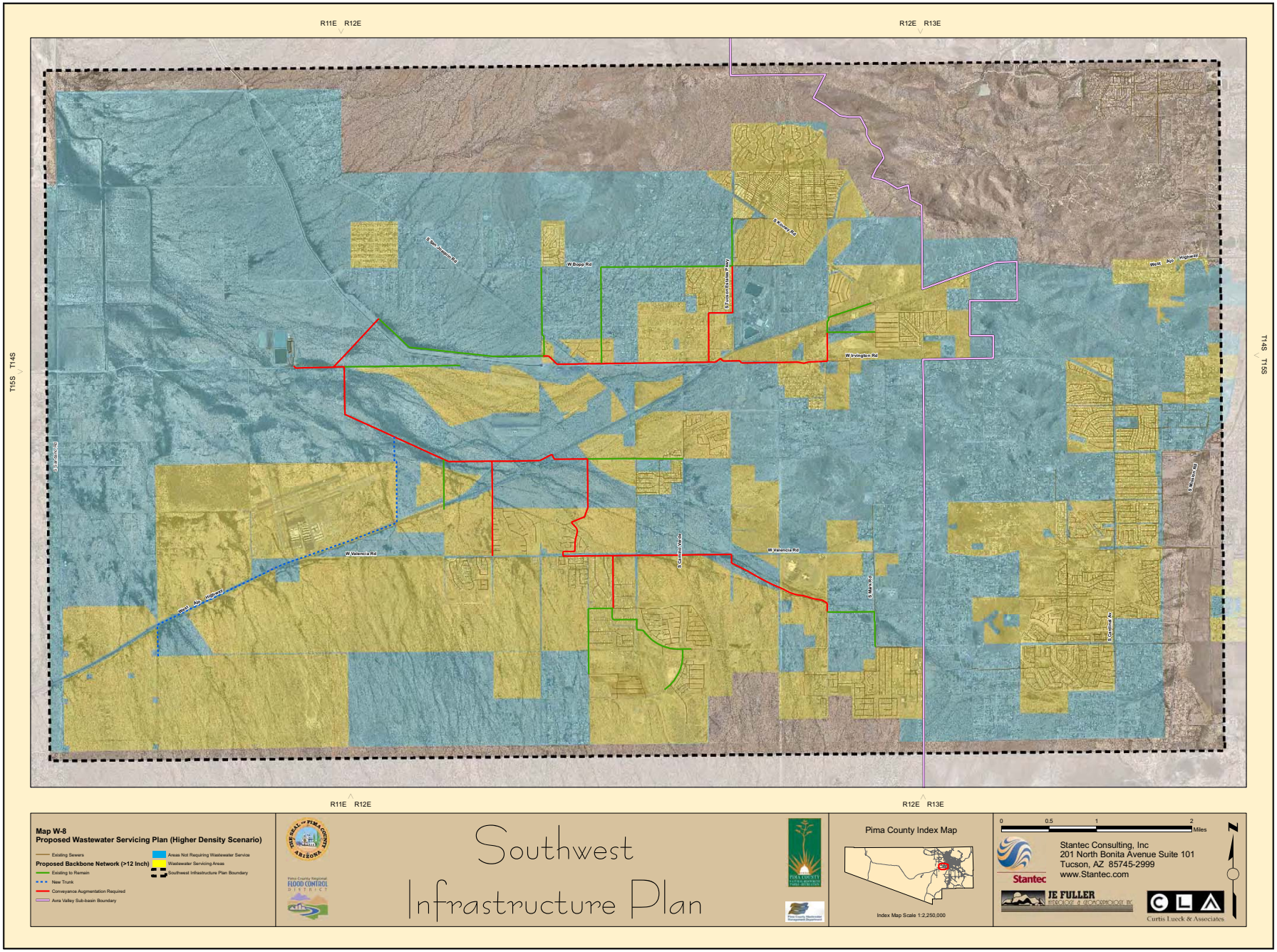

Map W-8
Proposed Wastewater Servicing Plan (Higher Density Scenario)

- Existing Sewers
- Proposed Backbone Network (>12 Inch)
  - Existing to Remain
  - New Trunk
  - Conveyance Augmentation Required
- Avra Valley Sub-basin Boundary
- Areas Not Requiring Wastewater Service
- Wastewater Servicing Areas
- Southwest Infrastructure Plan Boundary

Southwest Infrastructure Plan

Pima County Index Map

Index Map Scale 1:2,250,000

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Appendix F

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Total Cumulative Capital Spending for Pima County

Totals Asset Categories	Pre-2005	2006	2007	2008	2009	2010	2011	2012	2013
SWIP Capital Needed	-	-	-	7,575,767	16,151,533	39,609,317	59,328,083	93,921,200	124,741,282
SWIP GOB	-	-	-	-	-	-	-	-	-
SWIP Impact Fees	-	-	-	7,575,767	16,151,533	39,609,317	59,328,083	91,347,700	110,891,600
SWIP Agency Funding	-	-	-	-	-	-	-	-	-
SWIP Private	-	-	-	-	-	-	-	-	-
SWIP Special Function Bonds	-	-	-	-	-	-	-	2,573,500	13,849,682
Bonds- Completed	173,241,826	396,497,734	376,672,848	357,839,205	339,947,245	322,949,883	306,802,389	291,462,269	276,889,156
Bonds- Current	-	-	86,317,335	213,112,097	352,608,279	436,542,949	439,308,719	424,107,669	407,802,286
Candidate Projects for Bonding	-	-	-	-	-	-	-	-	3,497,633,042
Total Capital Required	173,241,826	-	-	7,575,767	16,151,533	39,609,317	59,328,083	93,921,200	124,741,282
Total Bond Funding Required	173,241,826	396,497,734	462,990,183	570,951,303	692,555,524	759,492,831	746,111,108	715,569,938	4,182,324,484
Funding Ceiling (Bond limits)	1,001,815,128	1,007,144,399	1,030,493,319	1,074,639,791	1,119,855,047	1,166,158,483	1,213,569,728	1,262,108,645	1,311,795,331
Funding Margin/(Gap)	828,573,302	$610,646,665	567,503,136	$503,688,488	$427,299,524	$406,665,652	$467,458,620	$546,538,707	($2,870,529,153)

Bond Retirement Rate	5%	annually
	95%	Retirement rate

Minimum Margin (2005-2012)	406,665,652

Date: 5/16/2007 10:31 AM

Stantec

Total Cumulative Capital Spending for Pima County

Totals Asset Categories	2014	2015	2016	2017	2018	2019	2020	2021	2022
SWIP Capital Needed	167,869,814	206,140,745	234,685,477	273,724,259	293,503,559	376,844,237	461,174,832	555,225,228	654,746,590
SWIP GOB	805,940	1,571,583	1,493,004	10,293,754	23,673,506	36,384,271	39,584,097	39,855,342	45,583,992
SWIP Impact Fees	141,938,010	168,126,820	187,968,870	209,429,570	215,314,430	284,760,668	353,629,005	434,985,733	516,342,460
SWIP Agency Funding	-	-	-	-	-	-	-	-	-
SWIP Private	-	-	-	-	-	-	-	-	-
SWIP Special Function Bonds	25,125,864	36,402,045	45,104,727	53,807,409	53,807,409	53,807,409	64,250,627	74,693,845	85,137,064
Bonds- Completed	263,044,698	249,892,463	237,397,840	225,527,948	214,251,551	203,538,973	193,362,024	183,693,923	174,509,227
Bonds- Current	388,683,164	369,514,124	442,829,056	430,809,603	409,269,123	388,805,667	369,365,384	350,897,114	333,352,259
Candidate Projects for Bonding	3,322,751,390	3,156,613,820	2,998,783,129	2,848,843,973	2,706,401,774	2,571,081,686	2,442,527,601	2,320,401,221	2,204,381,160
Total Capital Required	167,869,814	206,140,745	234,685,477	273,724,259	293,503,559	376,844,237	461,174,832	555,225,228	654,746,590
Total Bond Funding Required	3,975,285,192	3,777,591,991	3,680,503,029	3,515,475,278	3,353,595,954	3,199,810,596	3,044,839,106	2,894,847,601	2,757,826,638
Funding Ceiling (Bond limits)	1,362,650,113	1,414,693,549	1,467,946,429	1,522,429,766	1,578,164,804	1,635,173,008	1,693,476,065	1,753,095,881	1,814,054,580
Funding Margin/(Gap)	($2,612,635,080)	($2,362,898,442)	($2,212,556,601)	($1,993,045,511)	($1,775,431,149)	($1,564,637,588)	($1,351,363,042)	($1,141,751,720)	($943,772,058)

Bond Retirement Rate	5%	annually
	95%	Retirement rate

Minimum Margin (2005-2012)	406,665,652

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Total Cumulative Capital Spending for Pima County

Totals Asset Categories	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
SWIP Capital Needed	674,662,825	738,512,060	787,773,360	837,034,660	886,954,460	892,941,260	897,747,560	898,551,810	899,175,560	899,799,310
SWIP GOB	48,775,759	53,961,188	54,742,628	55,484,997	56,848,747	55,991,060	53,995,757	52,100,219	50,118,958	48,236,760
SWIP Impact Fees	520,344,510	566,126,310	611,908,110	657,689,910	703,471,710	707,473,760	711,475,810	711,475,810	711,475,810	711,475,810
SWIP Agency Funding	-	-	-	-	-	-	-	-	-	-
SWIP Private	-	-	-	-	-	-	-	-	-	-
SWIP Special Function Bonds	95,580,282	106,023,500	106,023,500	106,023,500	106,023,500	106,023,500	106,023,500	106,023,500	106,023,500	106,023,500
Bonds- Completed	165,783,766	157,494,577	149,619,849	142,138,856	135,031,913	128,280,318	121,866,302	115,772,987	109,984,337	104,485,120
Bonds- Current	316,684,646	300,850,413	285,807,893	271,517,498	257,941,623	245,044,542	232,792,315	221,152,699	210,095,064	199,590,311
Candidate Projects for Bonding	2,094,162,102	1,989,453,997	1,889,981,297	1,795,482,232	1,705,708,121	1,620,422,715	1,539,401,579	1,462,431,500	1,389,309,925	1,319,844,429
Total Capital Required	674,662,825	738,512,060	787,773,360	837,034,660	886,954,460	892,941,260	897,747,560	898,551,810	899,175,560	899,799,310
Total Bond Funding Required	2,625,406,272	2,501,760,175	2,380,151,667	2,264,623,583	2,155,530,404	2,049,738,634	1,948,055,952	1,851,457,405	1,759,508,284	1,672,156,620
Funding Ceiling (Bond limits)	1,876,374,499	1,940,078,185	2,005,188,394	2,071,728,082	2,139,720,407	2,209,188,722	2,280,156,568	2,352,647,674	2,426,685,946	2,502,295,467
Funding Margin/(Gap)	($749,031,774)	($561,681,990)	($374,963,273)	($192,895,501)	($15,809,997)	$159,450,088	$332,100,616	$501,190,269	$667,177,662	$830,138,847

Bond Retirement Rate	5%	annually
	95%	Retirement rate

Minimum Margin (2005-2012)	406,665,652

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Total Cumulative Capital Spending for Pima County

Totals Asset Categories	2033	2034	2035	2036	2037	2038	2039	2040	2041
SWIP Capital Needed	899,799,310	899,799,310	899,799,310	899,799,310	899,799,310	899,799,310	899,799,310	899,799,310	899,799,310
SWIP GOB	45,824,922	43,533,676	41,356,992	39,289,142	37,324,685	35,458,451	33,685,529	32,001,252	30,401,190
SWIP Impact Fees	711,475,810	711,475,810	711,475,810	711,475,810	711,475,810	711,475,810	711,475,810	711,475,810	711,475,810
SWIP Agency Funding	-	-	-	-	-	-	-	-	-
SWIP Private	-	-	-	-	-	-	-	-	-
SWIP Special Function Bonds	106,023,500	106,023,500	106,023,500	106,023,500	106,023,500	106,023,500	106,023,500	106,023,500	106,023,500
Bonds- Completed	99,260,864	94,297,821	89,582,930	85,103,784	80,848,594	76,806,165	72,965,856	69,317,564	65,851,685
Bonds- Current	189,610,795	180,130,256	171,123,743	162,567,556	154,439,178	146,717,219	139,381,358	132,412,290	125,791,676
Candidate Projects for Bonding	1,253,852,207	1,191,159,597	1,131,601,617	1,075,021,536	1,021,270,459	970,206,936	921,696,590	875,611,760	831,831,172
Total Capital Required	899,799,310	899,799,310	899,799,310	899,799,310	899,799,310	899,799,310	899,799,310	899,799,310	899,799,310
Total Bond Funding Required	1,588,548,789	1,509,121,350	1,433,665,282	1,361,982,018	1,293,882,917	1,229,188,771	1,167,729,333	1,109,342,866	1,053,875,723
Funding Ceiling (Bond limits)	2,579,500,488	2,658,325,419	2,738,794,828	2,820,933,430	2,904,766,080	2,990,317,764	3,077,613,594	3,166,678,793	3,257,538,691
Funding Margin/(Gap)	$990,951,698	$1,149,204,069	$1,305,129,546	$1,458,951,412	$1,610,883,163	$1,761,128,993	$1,909,884,261	$2,057,335,926	$2,203,662,968

Bond Retirement Rate	5%	annually
	95%	Retirement rate

Minimum Margin (2005-2012)	406,665,652

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Total Cumulative Capital Spending for Pima County

Totals Asset Categories	2042	2043	2044	2045	2046	2047	2048	2049	2050
SWIP Capital Needed	899,799,310	899,799,310	899,799,310	899,799,310	899,799,310	899,799,310	899,799,310	899,799,310	899,799,310
SWIP GOB	28,881,130	27,437,074	26,065,220	24,761,959	23,523,861	22,347,668	21,230,284	20,168,770	19,160,332
SWIP Impact Fees	711,475,810	711,475,810	711,475,810	711,475,810	711,475,810	711,475,810	711,475,810	711,475,810	711,475,810
SWIP Agency Funding	-	-	-	-	-	-	-	-	-
SWIP Private	-	-	-	-	-	-	-	-	-
SWIP Special Function Bonds	106,023,500	106,023,500	106,023,500	106,023,500	106,023,500	106,023,500	106,023,500	106,023,500	106,023,500
Bonds- Completed	62,559,101	59,431,146	56,459,589	53,636,609	50,954,779	48,407,040	45,986,688	43,687,354	41,502,986
Bonds- Current	119,502,092	113,526,987	107,850,638	102,458,106	97,335,201	92,468,441	87,845,019	83,452,768	79,280,129
Candidate Projects for Bonding	790,239,614	750,727,633	713,191,251	677,531,689	643,655,104	611,472,349	580,898,732	551,853,795	524,261,105
Total Capital Required	899,799,310	899,799,310	899,799,310	899,799,310	899,799,310	899,799,310	899,799,310	899,799,310	899,799,310
Total Bond Funding Required	1,001,181,937	951,122,840	903,566,698	858,388,363	815,468,945	774,695,498	735,960,723	699,162,687	664,204,552
Funding Ceiling (Bond limits)	3,350,218,714	3,444,744,369	3,541,141,240	3,639,434,971	3,739,651,254	3,841,815,819	3,945,954,419	4,052,092,817	4,160,256,768
Funding Margin/(Gap)	$2,349,036,777	$2,493,621,529	$2,637,574,543	$2,781,046,608	$2,924,182,309	$3,067,120,321	$3,209,993,697	$3,352,930,130	$3,496,052,215

Bond Retirement Rate	5%	annually
	95%	Retirement rate

Minimum Margin (2005-2012)	406,665,652

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Total Cumulative Capital Spending for Pima County

Totals Asset Categories	2051	2052	2053	2054	2055	2056	2057
SWIP Capital Needed	899,799,310	899,799,310	899,799,310	899,799,310	899,799,310	899,799,310	899,799,310
SWIP GOB	18,202,315	17,292,199	16,427,589	15,606,210	14,825,899	14,084,604	13,380,374
SWIP Impact Fees	711,475,810	711,475,810	711,475,810	711,475,810	711,475,810	711,475,810	711,475,810
SWIP Agency Funding	-	-	-	-	-	-	-
SWIP Private	-	-	-	-	-	-	-
SWIP Special Function Bonds	106,023,500	106,023,500	106,023,500	106,023,500	106,023,500	106,023,500	106,023,500
Bonds- Completed	39,427,837	37,456,445	35,583,623	33,804,441	32,114,219	30,508,508	28,983,083
Bonds- Current	75,316,123	71,550,317	67,972,801	64,574,161	61,345,453	58,278,180	55,364,271
Candidate Projects for Bonding	498,048,050	473,145,647	449,488,365	427,013,947	405,663,250	385,380,087	366,111,083
Total Capital Required	899,799,310	899,799,310	899,799,310	899,799,310	899,799,310	899,799,310	899,799,310
Total Bond Funding Required	630,994,325	599,444,608	569,472,378	540,998,759	513,948,821	488,251,380	463,838,811
Funding Ceiling (Bond limits)	4,270,472,006	4,382,764,230	4,497,159,081	4,613,682,132	4,732,358,861	4,853,214,640	4,976,274,708
Funding Margin/(Gap)	$3,639,477,681	$3,783,319,621	$3,927,686,703	$4,072,683,372	$4,218,410,040	$4,364,963,259	$4,512,435,897

Bond Retirement Rate	5%	annually
	95%	Retirement rate

Minimum Margin (2005-2012)	406,665,652

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SWIP Capital Spending

Data Cells

Category	Asset Description	Location	Capital Cost	Plan Start Year	Construction Years	Priority	Maximum Delay	Lastest Year Start	Actual Start Year	End Year	GOB	Impact Fee	Agency Funding	Private	Special Purpose Bond
Facilities	Government Service Center	TBD	$ 19,000,000	2010	3	A	0	2010	2010	2012	0%	100%			
Facilities	Sample 3			2009	4	c	0	2012	2012	2015	100%				
Facilities	Sample 3			2009	4	c	0	2017	2017	2020	100%				
Facilities	Sample 3			2009	4	c	0	2022	2022	2025	100%				
Facilities	Sample 3			2009	4	c	10	2037	2027	2030	100%				

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SWIP Capital Spending

Data Cells

Category	Asset Description	Location	Capital Cost	Plan Start Year	Construction Years	Priority	Maximum Delay	Lastest Year Start	Actual Start Year	End Year	GOB	Impact Fee	Agency Funding	Private	Special Purpose Bond
Transportation	Ajo Highway - Widen two additional lanes1		$ 57,420,000	2024	4	a	0	2024	2024	2027	15%	85%	0%		0%
Transportation	Ajo Highway - Three grade separations at locations to be determined		$ 60,000,000	2024	4	a	0	2024	2024	2027		100%	0%		0%
Transportation	Camino de Oeste - New 2-lane connection to Kinney Road (Wal-Mart)		$ 7,920,000	2012	4	a	0	2012	2012	2015		100%	0%		0%
Transportation	Joseph Road/Mark Road - wWiden to 4-lanes from Ajo Highway to Los Reales		$ 29,304,000	2014	4	a	0	2014	2014	2017		100%	0%		0%
Transportation	Irvington Road - Extension and widening; Ajo Highway to Mission Road (4 lanes)	dot-49	$ 40,000,000	2019	4	a	0	2019	2019	2022		100%	0%		0%
Transportation	Drexel Road - Extension and widening; Ajo Highway to Mission Road (4 lanes)	dot-49	$ 60,000,000	2019	4	a	0	2019	2019	2022		100%	0%		0%
Transportation	Valhalla Road - Extension from Valencia Road to Drexel Road (2 lanes)		$ 3,960,000	2014	4	a	0	2014	2014	2017		100%	0%		0%
Transportation	Valencia Road - Widen to 6 lanes from Ajo Highway to Mark Road2	rta21	$ 45,540,000	2019	4	a	0	2019	2019	2022		100%	0%		0%
Transportation	San Joaquin Road - Extension south of Ajo Highway to Los Reales (4 lanes)		$ 30,096,000	2014	4	a	0	2014	2014	2017		100%	0%		0%
Transportation	San Joaquin Road - Widen to 4-lanes from Ajo Highway north to Sandario		$ 57,816,000	2019	4	a	0	2019	2019	2022		100%	0%		0%
Transportation	Los Reales - Construct 4-lane arterial from San Joaquin to I-19		$ 48,312,000	2024	4	a	0	2024	2024	2027		100%	0%		0%
Transportation	Public Transit Service - Capital Costs		$ 19,062,510	2019	4	a	0	2019	2019	2022		100%	0%		0%
Transportation	Travel Demand Management Program - 4 carpool lots at locations to be determined		$ 5,200,000	2019	4	a	0	2019	2019	2022		100%	0%		0%
Transportation	Interchange I-19 at Drexel3		$ 10,000,000	2019	4	a	0	2019	2019	2022		100%	0%		0%
Transportation	Interchange I-19 at Los Reales3		$ 10,000,000	2024	4	a	0	2024	2024	2027		100%	0%		0%
Transportation	Interchange Auxiliary Lanes/ Capacity		$ 20,790,000	2019	4	a	0	2019	2019	2022		100%	0%		0%
Transportation	Existing Related Planned Projects carry over		$ 80,041,000	2010	20	a	0	2010	2010	2029		100%	0%		0%

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SWIP Capital Spending

Data Cells

Category	Asset Description	Location	Capital Cost	Plan Start Year	Construction Years	Priority	Maximum Delay	Lastest Year Start	Actual Start Year	End Year	GOB	Impact Fee	Agency Funding	Private	Special Purpose Bond
Flood Control	Ajo Highway	Ajo Highway - Sandario Road to Intersta	$ 16,412,900	2022	3	a	0	2022	2022	2024	100%	0%			
Flood Control	Valencia Road	Valencia Road - Ajo Highway to Mark R	$ 16,517,900	2017	3	a	0	2017	2017	2019	100%	0%			
Flood Control	San Joaquin Road	San Joaquin Road - Ajo Highway north	$ 8,163,900	2017	3	a	0	2017	2017	2019	100%	0%			
Flood Control	South Camino Verde	South Camino Verde - Ajo Highway sou	$ 3,916,900	2010	3	a	0	2010	2010	2012	0%	100%			
Flood Control	Valhalla Road	Valhalla Road - Valencia Road to Drexe	$ 7,145,000	2012	3	a	0	2012	2012	2014	0%	100%			
Flood Control	San Joaquin Road	San Joaquin Road - Ajo Highway south	$ 7,427,800	2012	3	a	0	2012	2012	2014	0%	100%			
Flood Control	Pasqua Yaqui Stormwater Improvements	Basin No. 1 (Pascua Yaqui Tribe) and F	$ 7,661,300	2008	3	A	0	2008	2008	2010	0%	100%			
Flood Control	Black Wash Detention Basin	Basin No. 2 (south of Valencia, east of (	$ 15,066,000	2008	3	A	0	2008	2008	2010	0%	100%			
Flood Control	Pascua Yaqui Basins	Basin Nos. 3,4,5 (adjacent to Hermans	$ 8,059,400	2014	2	a	0	2014	2014	2015	20%	80%			
Flood Control	Detention basins and collector/conveyor cha	Basin Nos. 6,7 (Channel sections 1 & 2	$ 15,849,600	2018	3	a	0	2018	2018	2020	95%	5%			
Flood Control	Drexel Road	Drexel Road - Ajo Highway to Mission R	$ 1,733,700	2017	3	a	0	2017	2017	2019	0%	100%			
Flood Control	Irvington Road	Irvington Road and Calle Don Miguel	$ 1,944,400	2017	3	c	10	2027	2017	2019	100%	0%			

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SWIP Capital Spending

Data Cells

Category	Asset Description	Location	Capital Cost	Plan Start Year	Construction Years	Priority	Maximum Delay	Lastest Year Start	Actual Start Year	End Year	GOB	Impact Fee	Agency Funding	Private	Special Purpose Bond
Waste Water	Avra Valley WWTF 4.0 MGD Oxidation Ditch Expansion		$ -	2006	3	A	0	2006	2006	2008	0%	0%			100%
Waste Water	Replace the existing 2.2 MGD treatment train (temporary facility) with a new 2.5 M		$ -	2019	4	A	0	2019	2019	2022	0%	0%			100%
Waste Water	Replace the existing 2.2 MGD facility with a new 5.5 MGD facility.		$ -	2014	4	A	0	2014	2014	2017	0%	0%			100%
Waste Water	Add 2.5 MGD to the 4.0 MGD facility		$ 39,500,000	2013	5	A	0	2013	2013	2017	0%	0%			100%
Waste Water	Add 3.0 MGD to the 6.5 MGD facility		$ 47,400,000	2020	5	A	0	2020	2020	2024	0%	0%			100%
Waste Water	Replace the existing 2.2 MGD facility with a new 8.0 MGD facility.		$ -	2011	4	A	0	2011	2011	2014	0%	0%			100%
Waste Water	Add 2.5 MGD to the 4.0 MGD facility		$ -	2011	4	A	0	2011	2011	2014	0%	0%			100%
Waste Water	Add 3.0 MGD to the 6.5 MGD facility		$ -	2017	4	A	0	2017	2017	2020	0%	0%			100%
Waste Water	Add 2.5 MGD to the 9.5 MGD facility		$ -	2035	4	A	0	2035	2035	2038	0%	0%			100%
Waste Water	Recharge/re-use treated effluent to support Lower Density Scenario		$ -	2019	4	A	0	2019	2019	2022	0%	0%			100%
Waste Water	Recharge/re-use treated effluent to support Medium Density Scenario		$ -	2014	4	A	0	2014	2014	2017	0%	0%			100%
Waste Water	Add 2.5 MGD to the 4.0 MGD facility		$ 4,013,409	2013	5	A	0	2013	2013	2017	0%	0%			100%
Waste Water	Add 3.0 MGD to the 6.5 MGD facility		$ 4,816,091	2020	5	A	0	2020	2020	2024	0%	0%			100%
Waste Water	Recharge/re-use treated effluent to support Higher Density Scenario		$ -	2017	4	A	0	2017	2017	2020	0%	0%			100%
Waste Water	Add 2.5 MGD to the 4.0 MGD facility		$ -	2011	4	A	0	2011	2011	2014	0%	0%			100%
Waste Water	Add 3.0 MGD to the 6.5 MGD facility		$ -	2017	4	A	0	2017	2017	2020	0%	0%			100%
Waste Water	Add 2.5 MGD to the 9.5 MGD facility		$ -	2035	4	A	0	2035	2035	2038	0%	0%			100%
Waste Water	Septic Conversion	Section 2, T15S, R12E	$ 4,347,000	2012	4	C	10	2022	2012	2015	0%	0%			100%
Waste Water	Septic Conversion	Section 30, T14S, R12E	$ 5,947,000	2012	4	C	10	2022	2012	2015	0%	0%			100%
Waste Water	Septic Conversion	Section 34, T14S, R12E	$ -	2012	4	C	10	2022	2012	2015	0%	0%			100%

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SWIP Capital Spending

Data Cells

Category	Asset Description	Location	Capital Cost	Plan Start Year	Construction Years	Priority	Maximum Delay	Lastest Year Start	Actual Start Year	End Year	GOB	Impact Fee	Agency Funding	Private	Special Purpose Bond
Parks & Rec	To Be Determined	P1	$ 1,247,500	2031	2	A	0	2031	2031	2032	100%	0%			
Parks & Rec	To Be Determined	P2	$ 1,608,500	2029	2	A	0	2029	2029	2030	100%	0%			
Parks & Rec	Portion of BLM Parcel	P3	$ 2,081,500	2017	2	A	0	2017	2017	2018		100%			
Parks & Rec	Portion of Planned Detention Area	P4	$ 2,652,500	2025	2	A	0	2025	2025	2026	100%	0%			
Parks & Rec	Star Valley Phase 2	P5	$ 2,000,000	2009	2	A	0	2009	2009	2010		100%			
Parks & Rec	Manzanita Park	P6	$ 2,286,000	2014	2	A	0	2014	2014	2015		100%			
Parks & Rec	To Be Determined	P7	$ 6,482,000	2010	2	A	0	2010	2010	2011		100%			
Parks & Rec	Ryan Park	P8	$ 9,673,500	2011	2	A	0	2011	2011	2012		100%			
Parks & Rec	Tucson Mountain Park	P9	$ 10,328,500	2012	2	A	0	2012	2012	2013		100%			
Parks & Rec	To Be Determined	P10	$ 30,006,000	2021	2	A	0	2021	2021	2022	15%	85%			
Parks & Rec	Saginaw Hill*	P11	$ 3,969,500	2027	2	A	0	2027	2027	2028	100%	0%			
Parks & Rec	Tucson Mountain Park Expansion*	P12	$ 7,080,000	2012	2	A	0	2012	2012	2013		100%			

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Total Cumulative Capital Spending for SWIP Area

Totals Asset Categories	Pre-2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
SWIP Capital Needed	-	-	-	7,575,767	16,151,533	39,609,317	59,328,083	93,921,200	124,741,282	167,869,814	206,140,745	234,685,477
SWIP GOB	-	-	-	-	-	-	-	-	-	805,940	1,571,583	1,493,004
SWIP Impact Fees	-	-	-	7,575,767	16,151,533	39,609,317	59,328,083	91,347,700	110,891,600	141,938,010	168,126,820	187,968,870
SWIP Agency Funding	-	-	-	-	-	-	-	-	-	-	-	-
SWIP Private	-	-	-	-	-	-	-	-	-	-	-	-
SWIP Special Purpose Bonds	-	-	-	-	-	-	-	2,573,500	13,849,682	25,125,864	36,402,045	45,104,727
Total Capital Required	-	-	-	7,575,767	16,151,533	39,609,317	59,328,083	93,921,200	124,741,282	167,869,814	206,140,745	234,685,477
Total Bond Funding Required	-	-	-	-	-	-	-	-	-	805,940	1,571,583	1,493,004
Funding Ceiling (Bond limits)				-	2,505,388	5,010,776	8,483,521	11,956,266	15,429,011	18,901,756	22,374,501	25,847,246
Funding Margin/(Gap)				$0	$2,505,388	$5,010,776	$8,483,521	$11,956,266	$15,429,011	$18,095,816	$20,802,918	$24,354,243

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Total Cumulative Capital Spending for SWIP Area

Totals Asset Categories	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
SWIP Capital Needed	273,724,259	293,503,559	376,844,237	461,174,832	555,225,228	654,746,590	674,662,825	738,512,060	787,773,360	837,034,660	886,954,460
SWIP GOB	10,293,754	23,673,506	36,384,271	39,584,097	39,855,342	45,583,992	48,775,759	53,961,188	54,742,628	55,484,997	56,848,747
SWIP Impact Fees	209,429,570	215,314,430	284,760,668	353,629,005	434,985,733	516,342,460	520,344,510	566,126,310	611,908,110	657,689,910	703,471,710
SWIP Agency Funding	-	-	-	-	-	-	-	-	-	-	-
SWIP Private	-	-	-	-	-	-	-	-	-	-	-
SWIP Special Purpose Bonds	53,807,409	53,807,409	53,807,409	64,250,627	74,693,845	85,137,064	95,580,282	106,023,500	106,023,500	106,023,500	106,023,500
Total Capital Required	273,724,259	293,503,559	376,844,237	461,174,832	555,225,228	654,746,590	674,662,825	738,512,060	787,773,360	837,034,660	886,954,460
Total Bond Funding Required	10,293,754	23,673,506	36,384,271	39,584,097	39,855,342	45,583,992	48,775,759	53,961,188	54,742,628	55,484,997	56,848,747
Funding Ceiling (Bond limits)	29,319,992	32,792,737	36,265,482	39,738,227	43,210,972	46,683,717	50,156,462	53,629,208	56,152,294	58,675,381	61,198,467
Funding Margin/(Gap)	$19,026,238	$9,119,231	($118,789)	$154,130	$3,355,630	$1,099,725	$1,380,704	($331,980)	$1,409,666	$3,190,384	$4,349,720

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Total Cumulative Capital Spending for SWIP Area

Totals Asset Categories	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
SWIP Capital Needed	892,941,260	897,747,560	898,551,810	899,175,560	899,799,310	899,799,310	899,799,310	899,799,310	899,799,310	899,799,310	899,799,310
SWIP GOB	55,991,060	53,995,757	52,100,219	50,118,958	48,236,760	45,824,922	43,533,676	41,356,992	39,289,142	37,324,685	35,458,451
SWIP Impact Fees	707,473,760	711,475,810	711,475,810	711,475,810	711,475,810	711,475,810	711,475,810	711,475,810	711,475,810	711,475,810	711,475,810
SWIP Agency Funding	-	-	-	-	-	-	-	-	-	-	-
SWIP Private	-	-	-	-	-	-	-	-	-	-	-
SWIP Special Purpose Bonds	106,023,500	106,023,500	106,023,500	106,023,500	106,023,500	106,023,500	106,023,500	106,023,500	106,023,500	106,023,500	106,023,500
Total Capital Required	892,941,260	897,747,560	898,551,810	899,175,560	899,799,310	899,799,310	899,799,310	899,799,310	899,799,310	899,799,310	899,799,310
Total Bond Funding Required	55,991,060	53,995,757	52,100,219	50,118,958	48,236,760	45,824,922	43,533,676	41,356,992	39,289,142	37,324,685	35,458,451
Funding Ceiling (Bond limits)	63,721,554	66,244,640	68,767,727	71,290,813	72,199,057	73,107,300	74,015,543	74,923,786	75,832,030	76,740,273	77,648,516
Funding Margin/(Gap)	$7,730,494	$12,248,884	$16,667,508	$21,171,855	$23,962,297	$27,282,378	$30,481,867	$33,566,794	$36,542,887	$39,415,588	$42,190,065

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Total Cumulative Capital Spending for SWIP Area

Totals Asset Categories	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049
SWIP Capital Needed	899,799,310	899,799,310	899,799,310	899,799,310	899,799,310	899,799,310	899,799,310	899,799,310	899,799,310	899,799,310	899,799,310
SWIP GOB	33,685,529	32,001,252	30,401,190	28,881,130	27,437,074	26,065,220	24,761,959	23,523,861	22,347,668	21,230,284	20,168,770
SWIP Impact Fees	711,475,810	711,475,810	711,475,810	711,475,810	711,475,810	711,475,810	711,475,810	711,475,810	711,475,810	711,475,810	711,475,810
SWIP Agency Funding	-	-	-	-	-	-	-	-	-	-	-
SWIP Private	-	-	-	-	-	-	-	-	-	-	-
SWIP Special Purpose Bonds	106,023,500	106,023,500	106,023,500	106,023,500	106,023,500	106,023,500	106,023,500	106,023,500	106,023,500	106,023,500	106,023,500
Total Capital Required	899,799,310	899,799,310	899,799,310	899,799,310	899,799,310	899,799,310	899,799,310	899,799,310	899,799,310	899,799,310	899,799,310
Total Bond Funding Required	33,685,529	32,001,252	30,401,190	28,881,130	27,437,074	26,065,220	24,761,959	23,523,861	22,347,668	21,230,284	20,168,770
Funding Ceiling (Bond limits)	78,556,759	78,556,759	78,556,759	78,556,759	78,556,759	78,556,759	78,556,759	78,556,759	78,556,759	78,556,759	78,556,759
Funding Margin/(Gap)	$44,871,231	$46,555,507	$48,155,570	$49,675,629	$51,119,686	$52,491,540	$53,794,801	$55,032,899	$56,209,092	$57,326,475	$58,387,989

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Total Cumulative Capital Spending for SWIP Area

Totals Asset Categories	2050	2051	2052	2053	2054	2055	2056	2057
SWIP Capital Needed	899,799,310	899,799,310	899,799,310	899,799,310	899,799,310	899,799,310	899,799,310	899,799,310
SWIP GOB	19,160,332	18,202,315	17,292,199	16,427,589	15,606,210	14,825,899	14,084,604	13,380,374
SWIP Impact Fees	711,475,810	711,475,810	711,475,810	711,475,810	711,475,810	711,475,810	711,475,810	711,475,810
SWIP Agency Funding	-	-	-	-	-	-	-	-
SWIP Private	-	-	-	-	-	-	-	-
SWIP Special Purpose Bonds	106,023,500	106,023,500	106,023,500	106,023,500	106,023,500	106,023,500	106,023,500	106,023,500
Total Capital Required	899,799,310	899,799,310	899,799,310	899,799,310	899,799,310	899,799,310	899,799,310	899,799,310
Total Bond Funding Required	19,160,332	18,202,315	17,292,199	16,427,589	15,606,210	14,825,899	14,084,604	13,380,374
Funding Ceiling (Bond limits)	78,556,759	78,556,759	78,556,759	78,556,759	78,556,759	78,556,759	78,556,759	78,556,759
Funding Margin/(Gap)	$59,396,428	$60,354,444	$61,264,560	$62,129,170	$62,950,549	$63,730,860	$64,472,155	$65,176,385