Reclaimed Water Use Conceptual Master Plan for the City of Casa Grande and the Arizona Water Company Pinal Valley Planning Area

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Introduction

The City of Casa Grande updated its Wastewater Master Plan in 2006 (Carollo Engineers). The plan calls for expansion of the Kortsen Road Water Reclamation Plant to 12 million gallons per day (MGD) capacity by 2009 and upgrading the treatment level to A+ quality water suitable for open-access irrigation uses, and planning for water reclamation plant expansion at or near the existing plant site to accommodate the estimated buildout wastewater flows of 50 MGD. The plan also called for development of a plan to maximize use of available reclaimed water in the future.

This Reclaimed Water Use Conceptual Master Plan builds on the Carollo master plan. The project was a joint planning effort between the City of Casa Grande and Arizona Water Company (AWC). AWC provided in-kind services related to engineering analysis, mapping, and support services.

The objectives of this project are to:

- Provide a high level analysis of the reclaimed water use alternatives available for implementation within the planning area.
- Evaluate the potential costs, benefits, technical challenges, regulatory issues, and financing alternatives for effluent reuse options.
- Provide a recommended implementation action plan, including system funding alternatives
- Discuss and provide a potential framework for a Memorandum of Understanding between Casa Grande and Arizona Water Company designed to facilitate reclaimed water use within the service area.
- Identify additional engineering, hydrologic, and financial analyses required.

Chapter 1 – State Laws and Regulations Affecting the Use of Reclaimed Water

1.0 Overview of Regulations

The Arizona Department of Water Resources (ADWR) and the Arizona Department of Environmental Quality (ADEQ) administer multiple laws and regulations that control the discharge, management and use of reclaimed water within Arizona's Active Management Areas. This chapter summarizes the key regulations that must be complied with in order to effectively manage the City of Casa Grande's reclaimed water resources. Many of these laws and rules regulate the underground storage and recovery of effluent and the direct use of effluent for various uses. Some rules relate to restrictions on groundwater use in the Active Management Areas and are designed to encourage the reuse of effluent rather than continued discharge to stream channels. The A.R.S. statute number or ADWR or ADEQ Rule numbers are referenced below for selected topics.

1.1 Arizona Department of Water Resources – Statutes and Rules

1.1.1 Underground Storage Facility (USF) Permits (A.R.S. 45-801.01)

In order to accrue recharge storage credits, a recharge facility must be permitted as an Underground Storage Facility. There are two types of underground storage facility permits that may be obtained from ADWR. A "Constructed" USF permit allows for water to be stored in an aquifer using some type of constructed device, such as injection wells, percolation basins (spreading basins), or vadose zone wells. To be considered a constructed USF, a "body of water" must have been "designed, constructed, or altered so that water storage is a principal purpose of the body of water" (A.R.S. 45-815.01). A "Managed" USF permit allows for water to be discharged to a natural stream channel that allows water to percolate into the aquifer without the assistance of a constructed device.

With a Constructed USF permit, the permit holder can receive a storage credit for nearly all of the water discharged to the storage facility, minus evaporation and other losses and a "cut to the aquifer" of 5 percent. Generally evaporation and other losses such water uptake by plants and losses from water conveyance pipelines is less than 3 percent. Most of the approximately 60 permitted underground storage facilities in Arizona are constructed facilities. The 5 percent cut to aquifer is not deducted for effluent stored at a USF.

With a Managed USF, storage credits may be provided up to a maximum of 50 percent of the water discharged to the facility after evapotranspiration losses are deducted. For this reason, managed facilities are less common and only 6 such permits have been issued to date by ADWR.

To receive a permit, a USF permittee must demonstrate that:

- The project must be hydrologically feasible.
- The applicant must demonstrate financial and technical capability to carry out the project.
- The project will cause no unreasonable harm to land or other water users within the area of hydrologic impact of the project.
- The project must continue to be monitored to ensure water storage will not cause the migration of poor quality groundwater.

USF permits generally require the holder of the permit to, at a minimum, submit quarterly groundwater level and water quality sampling data and reports. Several monitor wells (minimum of 3) are normally required. Quarterly and annual reports are required to be filed with ADWR. USF permits list the specific water sources that are allowed to be stored at the facility. The permitting process through ADWR is relatively rigorous and is governed by A.R.S. 45-801.01 and R12-12-151. A hydrogeologic study is required to be submitted that calculates the "area of hydrologic impact" and demonstrates the facility will not cause unreasonable increasing harm to the land or other nearby well owners. The area of impact (AOI) is defined by a one-foot rise in the water table that is the result of the water recharge activity. There is a 295-day requirement for ADWR to complete a substantive review. However, in some cases, USF permits can require up to two years to obtain from the time the permit is first applied for, if questions arise regarding the technical aspects of the hydrologic modeling study.

Pilot Scale USF permits are available from ADWR for small projects in which less than 10,000 acre-feet of total aquifer storage will occur. These permits have an expedited review process and somewhat less detailed hydrologic study and monitoring requirements. Some holders of standard USF permits have begun by obtaining a pilot project permit and then converting to a standard permit after collecting more hydrologic data during operation of the storage facility.

1.1.2 Groundwater Savings Facility (GSF) Permits (A.R.S. 45-812.01)

A Groundwater Savings Facility Permit is obtained by an irrigation district. It allows the holder to utilize a renewable water supply (such as effluent or CAP water) to replace groundwater pumping thus creating groundwater savings. The renewable water source is referred to as "in-lieu" water. The operator of a GSF must agree to reduce its groundwater pumping on a gallon-for-gallon basis. The person delivering in-lieu water to a GSF is eligible to accrue long-term groundwater storage credits for later use. The Area of Impact for water stored using a Groundwater Savings Facility is considered to be the entire areal extent of the irrigation district boundaries. Approximately 20 Groundwater Savings Facilities have been permitted to date in Arizona. The following Pinal County irrigation districts have permitted GSFs and currently receive in-lieu Central Arizona Project water:

- San Carlos Irrigation and Drainage District (SCIDD)
- Maricopa Stanfield Irrigation and Drainage District (MSIDD)
- Central Arizona Irrigation and Drainage District (CAIDD)
- Hohokam Irrigation District
- Gila River Indian Irrigation and Drainage District

These facilities could potentially be used to store effluent underground and generate long-term storage credits if agreements could be established with the holder of the GSF permit. The GSF permits would likely need to be modified to include effluent as an eligible in-lieu water source.

1.1.3 Water Storage Permits (45-831.01)

A water storage permit allows the permit holder to store water at a permitted USF or GSF. In order to store water, the applicant must provide evidence of its legal right to the source water. The water storage permit creates a water storage account that is monitored and updated annually by ADWR. The holder of a USF permit must also obtain a water storage permit to store water. Annual water storage reports must be filed whether or not water was stored pursuant to the permit.

1.1.4 Long-term Storage Credits and Accounting

Operators of USFs and GSFs report to ADWR annually the amount of water stored for each storage permit holder. A long-term storage account is established by ADWR for each water storage permit holder. In order to accrue a long-term storage credit for water stored, it must be demonstrated that the water could not have been used directly, the water was not recovered in the year in which it was stored, and the water would not have been recharged naturally. Long-term storage credits may be gifted, sold, or leased to another entity by the holder of the credits. ADWR provides forms that must be filled out and submitted regarding transfers of credits to other entities.

Storage credits may be recovered using "recovery wells" from anywhere within the same AMA in which the water was stored, provided the use of the recovered water is "consistent with the AMA Management Plan." In general, this means the water is not being wasted by the user (i.e. the user is in compliance with ADWR management plan conservation requirements) and the use is generally a recognized beneficial use.

1.1.5 Recovery Well Permits and Storage Credit Recovery Issues

A recovery well permit allows the permit holder to recover long-term storage credits or to recover stored water annually. When recovered, stored water retains the legal character of the water that was originally stored (e.g. effluent remains effluent). The impact of recovering stored water must not damage other land and water users as noted in ADWR's well spacing and impact rules (R12-15-1301-1308). Existing wells operated as general service area wells by a water provider can also be permitted as recovery wells. However, there are some restrictions on the recovery of long-term storage credits using recovery wells that limit uses of the credits. These restrictions include:

- If a proposed recovery well is located within three miles of the service area of a municipal water provider (or water company certificated area), the owner/operator of the recovery well must have the consent of the potentially impacted provider.
- If recovered outside of the modeled "Area of Impact," the existing rate of groundwater level decline in the area must not exceed 4 feet per year.

When accounting for effluent storage credits recovered from within the hydrologic Area of Impact, the use of recovered water is not counted against a water provider's gallons per capita per day water conservation requirement established through the Active Management Area (AMA) management plans. Other incentives to encourage effluent reuse in the AMAs are discussed in section 2.5.

1.1.6 Other Management Plan and Statutory Incentives for Use of Reclaimed Water

The Lakes Rule (45-131 to 45-139)

The Lakes Rule was adopted in 1987 to stop the practice of constructing artificial lakes in the AMAs using groundwater or surface water. The lakes rule does allow these sources of water to be used in lakes within public parks and other facilities open to the public and golf course lakes. It also allows reclaimed water or poor quality groundwater to be used to fill decorative lakes. Interim use permits may be issued by ADWR for use of surface water or groundwater in non-public facility lakes for up to three years or until effluent is available to fill the lake. In 2007 ADWR issued a Substantive Policy Statement defining criteria that must be met to qualify as a public facility under the statute. These criteria have significantly tightened the definition and fewer facilities will likely qualify in the future. This policy statement could have the effect of increasing the demand for reclaimed water to fill new recreational and decorative lakes in developer-built parks and common areas within AMAs.

Other Effluent Use Incentives

When irrigating golf courses and other turf facilities over 10 acres in size (facilities subject to ADWR management plan turf water conservation allotments), 1 acre-foot of effluent use is counted as only 0.6 acre-foot of use toward the annual water use target. This provides a significant incentive for effluent use at turf facilities subject to conservation targets. Effluent stored underground and recovered from wells located within the hydrologic Area of Impact also qualify for this incentive. As mentioned earlier, effluent recharged and recovered from within the AOI is not subject to the 5 percent "cut to the aquifer" that surface water storage is subject to.

1.1.7 Water Exchanges – A Tool for Reclaimed Water Management

Water exchanges, regulated under A.R.S. 45-1001, provide a useful tool to help facilitate the beneficial use of reclaimed water. The purpose of water exchange is to match the water quality required by the user with available water supplies. For example, effluent from a municipal wastewater treatment plant could be exchanged with an agricultural irrigation district or individual farmer for surface water (e.g. Gila River water), CAP water, or groundwater rights. The water quality required by the agricultural user is met by municipal effluent delivered by the municipality. The higher quality surface water or groundwater can be delivered to the municipal provider or water company to access and deliver to its customers in a cost-effective manner. Exchanges can be an effective means of minimizing the costs of water conveyance to the point of use.

Water exchange contracts between entities must be enrolled with ADWR and an exchange permit is issued to both entities. Annual reports must be filed with ADWR by both entities involved in the exchange. The permit establishes the annual exchange water volume limits that each entity must adhere to. The water received in an exchange retains the legal character of the water given in an exchange. Numerous water exchanges have been permitted by ADWR to date and the permitting process is relatively straightforward. Exchanges can also involve more than two entities. Several examples of ongoing effluent for surface water exchanges include:

- The City of Phoenix-Salt River Project (SRP)-Roosevelt Irrigation District (RID) exchange. This is a three-way exchange whereby Phoenix provides reclaimed water to RID for irrigation use, RID provides groundwater to the SRP, and SRP provides surface water to Phoenix’s water treatment plant for potable use.
- The cities of Chandler and Mesa provide effluent to the Gila River Indian Community for agricultural use and the GRIC provide CAP water in exchange.

One potential disadvantage of exchanging effluent for another higher quality water source is that a discount of 10-20 percent may be requested by the entity providing the higher quality source, thereby lowering the volume of water available for use by the entity providing the lower quality source water. Both of the exchanges described above involve such a discount.

1.1.8 100-Year Assured Water Supply Rules – Value of Reclaimed Water and Underground Storage Credits

Arizona’s Assured Water Supply (AWS) Rules require that within the state’s Active Management Area (including the Pinal AMA), all subdivisions containing more than 6 lots must demonstrate a 100-year supply of water will be continuously available to the new homes. To demonstrate an AWS, the subdivision must be located within a water provider service area that has and maintains an “Assured Water Supply Designation” for the entire service area, or the developer must obtain an “Assured Water Supply

Certificate" for the subdivision. Most private water companies do not maintain AWS Designations but require each developer to apply for and obtain an AWS certificate from ADWR. This is the AWS model that Arizona Water Company operates under within the City of Casa Grande. With either method, it must be demonstrated that water that meets drinking water standards will be physically and legally available. The water provider must also demonstrate it has the financial capability to construct and maintain the water supply infrastructure required over the long-term. Developers may also be required to enroll the subdivision in the Central Arizona Groundwater Replenishment District (CAGRD) or pledge sufficient Irrigation Grandfathered Right extinguishment credits. The CAGRD is then responsible for replenishing the groundwater that is provided annually to each subdivision by the water provider. CAGRD accomplishes this by either:

- Purchasing existing underground storage credits stored within the same AMA as the groundwater use that is to be replenished.
- Purchasing effluent or surface water (CAP or other) and delivering it to a recharge facility located within the same AMA.

The CAGRD Plan of Operation (2006) identifies effluent as one of the primary new sources of water the CAGRD will pursue over the next five years. Projected CAGRD replenishment requirements within Pinal County and potential partnering opportunities with the City and AWC are discussed in Chapter 6.

One of the key issues for developers in obtaining an AWS certificate in the future in Casa Grande will be demonstrating physical availability of groundwater, since groundwater will continue to an important water source for Arizona Water Company (AWC). To meet this requirement, it must be shown that groundwater levels after 100 years will not exceed 1,100 feet below land surface. Recent groundwater modeling studies conducted by AWC indicate that maximum use of surface water (like use of AWC's Central Arizona Project allocation and future use of Gila River water) and maximum use of Casa Grande and Pinal AMA effluent will be important in ensuring that the physical availability requirement can be met as the City of Casa Grande and other areas develop.

In summary, direct and indirect use (recharge and recovery of storage credits) of Casa Grande's reclaimed water will continue to be of high value to: 1) developers within Casa Grande, 2) the Central Arizona Groundwater Replenishment District (CAGRD), and 3) Arizona Water Company and other private water companies.

1.2 Arizona Department of Environmental Quality (ADEQ) Reclaimed Water Permits

1.2.1 General Permit Requirements

A Reclaimed Water Individual Permit or Reclaimed Water General Permit issued by ADEQ applies to wastewater treatment facilities supplying reclaimed water and to the sites where the water is applied or used. A permit is required if you are:

- An owner or operator of a sewage treatment facility that generates reclaimed water for direct reuse.
- An owner or operator of a reclaimed water blending facility that mixes reclaimed water with other sources for distribution.
- A reclaimed water agent (an entity that receives water from a wastewater provider and distributes it to multiple end users).
- An end user of reclaimed water.
- A person who uses gray water.
- A person who directly reuses reclaimed water from a sewage treatment facility combined with industrial wastewater or combined with reclaimed water at an industrial wastewater treatment facility.
- A person who directly reuses reclaimed water from an industrial wastewater treatment facility in the production or processing of a crop or substance that may be used as human or animal food.

All wastewater treatment facilities providing reclaimed water for reuse must have an individual Aquifer Protection Permit (APP), or amend an existing APP to include certification for a particular Class of reclaimed water (A+, A, B+, B, or C). For the City of Casa Grande Phase 3 wastewater treatment plant expansion and modification to Class A+ water, the APP will be amended to Class A+ water. The new APP will require regular monitoring and reporting of reclaimed water quality to ensure that water quality limits for A+ water are met.

1.2.2 Classes of Reclaimed Water

Arizona's reclaimed water quality standards establish five classes of reclaimed water expressed as a combination of minimum treatment requirements (treatment processes) and a limited set of numeric water quality criteria. The City of Casa Grande has made the decision to make the necessary treatment process improvements during the upcoming Phase 3 plant expansion to produce A+ quality water. Class A+ water is water that has undergone secondary treatment, filtration, and disinfection. Class A reclaimed water is required for reuse applications where there is a relatively high risk of human exposure to potential pathogens in the reclaimed water (see Table 1.1 below, source A.A.C. 18-11-301). In order to produce Class A water, tertiary filtration and disinfection of wastewater is required. The + designation is given to effluent that meets a total nitrogen concentration of less than 10 mg/l. Denitrification of effluent to achieve the A+ rating will minimize regulatory concerns over nitrate contamination of groundwater where underground storage of effluent is desired. Thus the general permits for the direct reuse of Class A+ do not include additional nitrogen removal as a condition of reuse. Having A+ quality effluent will enable Casa Grande to maximize beneficial reuse opportunities for the water.

Table 1.1 - Minimum Reclaimed Water Quality Requirements for Direct Reuse

Type of Direct Reuse	Minimum Class of Reclaimed Water Required
Irrigation of food crops	A
Recreational impoundments	A
Residential landscape irrigation	A
Schoolground landscape irrigation	A
Open access landscape irrigation	A
Toilet and urinal flushing	A
Fire protection systems	A
Spray irrigation of an orchard or vineyard	A
Commercial closed loop air conditioning systems	A
Vehicle and equipment washing (does not include self-service vehicle washes)	A
Snowmaking	A
Surface irrigation of an orchard or vineyard	B
Golf course irrigation	B
Restricted access landscape irrigation	B
Landscape impoundment	B
Dust control	B
Soil compaction and similar construction activities	B
Pasture for milking animals	B
Livestock watering (dairy animals)	B
Concrete and cement mixing	B
Materials washing and sieving	B
Street cleaning	B
Pasture for non-dairy animals	C
Livestock watering (non-dairy animals)	C
Irrigation of sod farms	C
Irrigation of fiber, seed, forage, and similar crops	C
Silviculture	C

Note: Nothing in this Article prevents a wastewater treatment plant from using a higher quality reclaimed water for a type of direct reuse than the minimum class of reclaimed water listed in Table A. For example, a wastewater treatment plant may provide Class A reclaimed water for a type of direct reuse where Class B or Class C reclaimed water is acceptable.

1.2.3 Individual Reuse Permits

An individual permit is required for the reuse of industrial wastewater that contains a component of sewage or is used in processing any crop or substance that may be used as a human or animal food. An individual permit could be required if Casa Grande effluent was delivered to agricultural growers growing food crops. This requirement does not apply to industrial wastewater that is recycled or used in industrial processes.

1.2.4 General Permits

The City of Casa Grande will most likely need to obtain or amend its existing general reclaimed water permit to deliver water to new direct users. There are several types of general reclaimed water permits:

- Type 1 General Permit does not require notification and does not expire if the general permit conditions are continually met. These permits apply to home use of residential graywater.
- Type 2 General Permit requires a Notice of Intent (NOI) be filed with ADEQ and are valid for five years.
- Type 3 General Permit requires a Notice of Intent (NOI) be filed with ADEQ and are valid for five years. Type 3 General Permits are issued to reclaimed water blending facilities, reclaimed water agents, and users of gray water (not treated wastewater from a municipal water treatment plant). If the City sold water to an end user who then redistributed or sold water to other users as a delivery agent, a Type 3 permit would be required of the delivery agent.

Delivery of Class A+ effluent from the City's wastewater treatment plant to multiple direct users will require a Type 2 General Permit for Class A+ water. Each end user of the water has the responsibility of meeting all permit requirements such as signage and containment of the water on the site. The general requirements for this type of permit can be found in ADEQ rule R18-9-712. This rule states the following: Type 2 Reclaimed Water General Permit for Direct Reuse of Class A+ Reclaimed Water

- A Type 2 Reclaimed Water General Permit for Direct Reuse of Class A+ Reclaimed Water allows any direct reuse application of reclaimed water listed in 18 A.A.C. 11, Article 3, Appendix A, if the conditions in this Article are met.
- Record Maintenance. A permittee shall maintain records for five years that describe the direct reuse activities. The records shall be made available to the Department upon request.
- A permittee shall post signs as specified in R18-9-704(H).
- No lining is required for an impoundment storing Class A+ reclaimed water.

1.2.5 End User Signage Requirements for Reuse of Class A+ Water

Direct use of Class A+ water in some cases requires signage notifying the public that reclaimed water is in use on the site as follows:

- All hose bibs: signage required.
- With residential irrigation: Front yard, or all entrances to a subdivision if the signage is supplemented by written yearly notification to individual homeowners by the homeowner's association.
- School-ground irrigation: Signage on premises visible to staff and students.
- Other open access irrigation sites (e.g. public parks or open space): No signage required.
- Restricted Access Irrigation (e.g. golf courses, cemeteries): No signage required.
- Mobile Reclaimed Water Dispersal: Signage on back of truck or tank.

1.3 Water Quality Impacts on Long-term Use of Reclaimed Water

1.3.1 Effluent Total Dissolved Solids Content

Arizona's reclaimed water use standards are among the most stringent of any state. Therefore, standards are not anticipated to become more stringent in the foreseeable future. However, the higher salinity level of reclaimed water versus fresh water is an issue that must be managed in relation to long-term use of reclaimed water for irrigation and industrial uses. In general, municipal wastewater is 200 mg/l to 300 mg/l higher in total dissolved solids (TDS) content than the potable source water. Salt buildup in the soil must be managed properly by periodically applying excess irrigation water to flush the salts through the root zone of the grass in order to maintain healthy turf. Some turf grasses are more salt tolerant than others, with Bermuda grass being among the more salt tolerant species. The total dissolved solids content of quarterly effluent samples from the Casa Grande Water Reclamation Plant from 2005 through 2007 is shown in Table 1.2.

The data indicates that Casa Grande effluent averages approximately 1000 to 1100 mg/l TDS. This level of salt content is acceptable for most irrigation uses, including irrigation of Bermuda grasses. However, the data indicates there may be an increasing trend in salt levels over the three-year period. If salt content continues to increase, some potential uses for reclaimed water could be negatively impacted at some point in the future. The increasing trend (if the trend bears out) could be due to variations in levels of TDS in the potable source water or additional salt loads being discharged to the wastewater stream. Additional salt loading could be due to factors such as: 1) increasing use of water softeners, 2) increasing industrial salt loads, or 3) lower levels of residential or commercial interior water use due to water conservation efforts, particularly in new homes meeting the existing low-flow plumbing codes. Other central Arizona communities have experienced increasing TDS levels in wastewater over the last decade (e.g. the City of Phoenix). It is recommended that the City of Casa Grande continue to monitor quarterly or monthly TDS levels and trends.

Table 1.2
Casa Grande Effluent Total Dissolved Solids Concentrations

	1Q 2005	2Q 2005	3Q 2005	4Q 2005	Avg.
TDS mg/L	1100	1000	1000	1000	1025
	1Q 2006	**2Q 2006**	**3Q 2006**	**4Q 2006**	**Avg.**
TDS mg/L	970	960	990	1000	980
	1Q 2007	**2Q 2007**	**3Q 2007**	**4Q 2007**	**Avg.**
TDS mg/L	1100	1100	1100	730	1008

1.3.2 Emerging Contaminants

There are several potential emerging contaminant issues that could impact future Aquifer Protection Permit water quality standards and the ability (and cost) to recharge reclaimed water in the future. The current water quality parameters and constituents of concern include:

- Endocrine disruptors/pharmaceuticals and personal care products. Ultra-Violet (UV) or Ozone treatment may be required in the future to reduce the occurrence of these chemicals in effluent.
- NDMA – California currently has an action level of 20 ng/l. UV oxidation can reduce NDMA levels in effluent.
- Perchlorate
- Total Organic Carbon – This is a potential issue for recharge, particularly recharge using injection or vadose zone wells. Other states currently have more stringent standards than Arizona (e.g. California). Advanced treatment with Granular Activated Carbon and or enhanced coagulation may be considered in the future.
- Arsenic – the standard of 10 ug/l must be met.
- Salinity issues could become a consideration in the future.
- The Phase 3 Plant Expansion will use Chlorine as the primary disinfection agent. Therefore, the formation of disinfection byproducts (Trihalomethanes) is a concern related to meeting APP permit water quality requirements when considering direct injection as a recharge method. If direct injection is the chosen method of recharge, advanced oxidation processes using a UV-peroxide system will likely be needed to remove TTHMs to below drinking water standards.

It is possible that as more data becomes available on the occurrence of these and other constituents in wastewater effluent and the health effects of low concentrations of the chemicals, EPA may implement standards for some constituents that will require advanced treatment systems to be installed by wastewater providers.

1.4 Central Arizona Association of Governments (CAAG) Resolution No. 2007-9

In November of 2007, CAAG adopted Resolution No. 2007-9 regarding new policies on wastewater management planning within Pinal and Gila Counties. In this resolution, the agency adopted the following standards that will impact future effluent management decisions by the City of Casa Grande:

- Cooperation with local jurisdictions to foster and create Regional solutions to water quality issues.
- The creation of Regional wastewater treatment facilities, rather than numerous smaller facilities or large on-site collection systems, where feasible.
- The elimination of package plants where feasible.
- The reclamation of effluent for reuse or recharge, rather than discharge.
- In the event of necessary or unavoidable discharge, treating effluent to A or A+ quality standards.
- The reduction of discharge points, and ensuring discharges are beneficial, or at a minimum, not destructive or harmful to adjacent areas.
- The avocation of all municipalities providing sewer service to become Designated Management Agencies.

This policy statement indicates the preference of Pinal County and CAAG for maximizing the reuse of reclaimed water as opposed to continued discharges to stream courses. However, this policy does not minimize the importance of having viable discharge options and permits for use during periods when adequate reuse alternatives are not available, during periods of wet weather, or during distribution system emergencies when deliveries to reuse customers is not possible.

Chapter 2 – Reclaimed Water Use in Selected Arizona Cities

2.0 Overview

Arizona is one of the leaders among states in water reuse. This chapter provides a summary of how selected Arizona communities and water providers are using or are planning to use reclaimed water. This information is provided as background information useful in shaping future reclaimed water use decisions by the City of Casa Grande.

2.1 Town of Gilbert

Since 1986 the Town of Gilbert has used 100 percent of its reclaimed water, operating an extensive water reclamation system that delivers water to over 26 direct users, including golf courses, parks, schools, HOA common areas, decorative lakes, wildlife habitat areas, and industrial facilities. Gilbert also operates several spreading basin recharge facilities (18 ponds), including the 110-acre Riparian Preserve, a multi-use recharge and wildlife preserve which opened in 1999. Recharge basins comprise 70-acres of the Preserve. The facility also provides amenities such as trails for hiking, bicycling, and equestrian uses; campsites and picnic ramadas; wetland areas that create wildlife habitat and viewing opportunities; a 5-acre urban fishing lake filled with recovered reclaimed water; an environmental education center (planned); and a police substation. Water storage credits recovered using recovery wells in the shallow aquifer are also used to provide water to several water ski lakes.

In 2004, Gilbert delivered 6,983 acre-feet of effluent to direct users, and recharged 5,229 acre-feet of effluent. The total reuse amount equaled 30 percent of Gilbert's 2004 potable water deliveries. The water reclamation facility (WRF), with a capacity of 11 million gallons per day (MGD), treats water to Class A+ standards. A second WRF has been constructed in partnership with the City of Mesa and the Town of Queen Creek that will treat 16 MGD in its initial phase, with Gilbert's capacity being 7 MGD.

Developers of new communities and businesses are financially responsible for building the infrastructure needed to connect to Gilbert's backbone reclaimed water distribution system. There are no plans to require individual homeowners to use reclaimed water. The Town's water conservation ordinance, adopted in 2000, is designed to encourage reclaimed water use in new developments several key features of this ordinance are:

- Landscaping in common areas of new single family and multifamily developments shall be limited to 10 percent of the turfed area, unless irrigated with reclaimed water. If irrigated with reclaimed water, 50 percent turf is allowed.
- For commercial developments, water-intensive landscaped area is limited to 10,000 square feet plus 20 percent of the landscaped area, unless reclaimed water is used at the site. If irrigated with reclaimed water, up to 50 percent of the landscaped area may be water-intensive landscaping.

2.2 City of Flagstaff

Reclaimed water is produced by both of Flagstaff's WRPs. Treated effluent from the Wildcat Hill Plant provides Class B effluent to golf courses and recreational areas on the east side of town. Effluent from the Rio de Flag WRP supplies Class A+ water to schools and parks, a golf course, cemeteries, and public landscapes, and several residences. Over 1.4 MGD of effluent (AAD) is supplied each year for irrigation. The City maintains over 5 miles of distribution mains.

Flagstaff also provides effluent at four water hauling stations for use in vehicle washing, street and sidewalk cleaning, dust control, livestock watering and other uses. The guidelines for water hauling include adequate signage on water trucks. Billing is done on the honor system, with customers agreeing to log and pay for each load.

2.3 City of Mesa

The City of Mesa produces over 40,000 acre-feet per year of reclaimed water from 3 water reclamation plants. Most of the effluent Mesa produces is used for groundwater recharge and for agricultural irrigation. To date, Mesa has accrued over 70,000 AF of long-term storage credits. Effluent from the Northwest WRP (capacity 18 MGD) is discharged to two recharge sites and the Salt River. Effluent from this plant is also used to irrigate a nearby golf course and for landscape irrigation along the 202 Freeway. The Southeast Water Reclamation Plant (8 MGD capacity) produces Class A+ water for golf course irrigation, pond replenishment, and agricultural irrigation.

The City of Mesa jointly owns the new Greenfield Road WRP (16 MGD capacity) with the Towns of Gilbert and Queen Creek. Mesa's portion of the effluent from this plant will be delivered to the Gila River Indian Community (GRIC) for agricultural irrigation as part of water exchange. Mesa's contract allows up to 29,400 AF/YR of effluent to be delivered to the GRIC in exchange for 23,530 AF/YR of CAP water. The ultimate capacity of this plant is slated to be 52 MGD, with Mesa owning 24 MGD of the total. (Reference: City of Mesa Website).

2.4 City of Tucson

The City of Tucson, one of the leaders in water reuse in Arizona, began operating its water reclamation system in 1984. Today, Tucson provides over 12,000 acre-feet/year of reclaimed water for direct use to over 900 customers, including: 14 golf courses, 35 parks, and 47 schools (the University of Arizona and Pima Community College included). Tucson maintains approximately 100 miles of reclaimed water Distribution mains. Tucson's reclaimed water plant at Roger Road near I-10 has been producing Class A effluent for 23 years. Reclaimed water makes up about 8 percent of the water delivered to customers each year.

The remainder of the water produced at its reclamation plant or obtained from the Pima County WWTP (about 6,000 acre-feet/year) is recharged and stored seasonally at its Sweetwater groundwater recharge facility (a multi-use wetlands-spreading basin facility) and recovered through recovery wells for delivery to reclaimed water customers during the high-demand summer period.

Tucson provides effluent for residential use to only two subdivisions. However, in calendar year 2003, only 1.6 percent of the total reclaimed water delivered to direct use customers went to single family residences. Tucson does not actively seek out additional subdivisions for residential use because of difficulties experienced in the past with: 1) maintenance of reclaimed water notification signs and 2) performance of periodic cross connection tests has been difficult in one of the subdivisions because residents have been uncooperative. Therefore, in many cases the backflow inspector must visit sites several times to complete the inspection. Because of the relatively small lot sizes, placement of the required backflow device and reclaimed water warning sign has been problematic. Tucson will make reclaimed water available to subdivisions that request the service on a case-by-case basis if the homeowners pay all costs of installation of facilities and ongoing maintenance costs.

Tucson water charges $2.13/1000 gallons for reclaimed water service. Tucson and Pima County have ordinances that require new golf courses to irrigate with reclaimed water. Tucson requires all new turf facilities 10 acres and larger to be served with reclaimed water. The Tucson water resources plan calls for full use of available effluent resources in the future. (References: City of Tucson Website; Reclaimed Water – Is it for Everyone? Tom Clark, and Karen Dotson, Tucson Water; Sweetwater Recharge Facilities: Serving Tucson for 20 Years, John P. Kmiec, Tim M Thomure, Tucson Water).

2.5 City of Peoria

The City of Peoria developed a water reuse master plan in 2005. This plan calls for development of an extensive water reclamation system broken up into 3 distinct planning areas of the City, each served by its own water reclamation facility. Currently, Peoria delivers effluent from its Jomax Road WRP (0.75 MGD capacity) to direct users for turf and landscape irrigation of golf courses, parks, and schools within the Vistancia development. This facility will be expanded to 9 MGD and will continue to supply new turf users. Construction of a groundwater recharge facility to recharge excess effluent is also planned.

The central area of Peoria is served by the 4 MGD capacity Beardsley Road WRP and related aquifer recharge facilities. This facility is planned for ultimate expansion to 8 MGD by 2025. The southern portion of Peoria is served by the new Butler Drive WRP (10 MGD). Peoria plans to recharge effluent from this plant in the Salt River Project's "NAUSP" spreading basin recharge facility located about 2 miles south of the WRP. In addition, Peoria plans to connect direct users (turf facilities and industrial users) located in close proximity to the effluent transmission main. In the near-term (through 2010), the plan calls for Peoria to: 1) expand its recharge facilities at the Beardsley Road WRP, 2) expand direct use deliveries to large turf users from the Jomax Road WRP to new developing subdivisions, 3) initiate a public involvement process regarding direct use of effluent from the City's other WRPs, and 4) finalize reuse policies, ordinances, and standard customer agreements. Peoria's plan calls for connecting additional direct use customers in all planning areas after 2011. The total projected demand for direct use by 2025 is 12.2 MGD, or approximately 60 percent of total projected effluent available by that date. (Reference: City of Peoria Water Reuse Master Plan Executive Summary – June, 2005).

2.6 City of Phoenix

The City of Phoenix reuses its effluent in several ways, including:

- Delivery to the Roosevelt Irrigation District (RID) or agricultural irrigation. This is accomplished in a three-way water exchange that includes the Salt River Project (discussed further below).
- Sale to the Palo Verde Nuclear Generating station for cooling water.
- Direct delivery to large turf users for irrigation needs.
- Habitat restoration and habitat enhancement in the Tres Rios Wetlands facility.

RID-SRP-Phoenix Effluent Exchange – RID Groundwater Savings Facility

In this exchange, Phoenix provides RID with up to 30,000 AF/YR of effluent from the 23rd Avenue WRP. In exchange, RID pumps up to 20,000 AF/YR of groundwater into SRP's canal system for use in meeting irrigation demands. SRP then provides Phoenix with up to 20,000 AF/YR of Salt River surface water supplies for treatment at Phoenix's potable water treatment plants. Additional effluent (up to 30,000 AF additional), can be provided to the RID for indirect groundwater recharge in its Groundwater Savings Facility (GSF).

Palo Verde Nuclear Power Plant (PVNPP) Deliveries

Effluent deliveries from the regional 91st Avenue waste water treatment plant (WWTP) to the PVNPP began in the 1970s. Annual deliveries average approximately 75,000 AF/YR.

Tres Rios Constructed Wetlands Project

Historically, effluent from the 91st Avenue WWTP that could not be used directly by PVNPP was discharged to the Salt River under a NPDES permit. Increasing costs of compliance with more stringent water quality standards for discharge led Phoenix and the other Valley cities that own the plant to look for alternative uses for effluent. The remote location of the plant in relation to existing potential direct users of effluent makes direct use for irrigation very costly.

As a result, the Tres Rios constructed wetlands was built in the late 1990's to test the feasibility of a large scale flood control, habitat restoration, and wastewater treatment plan downstream of the 91st Avenue WWTP. After a successful test of the pilot scale treatment, the full scale Tres Rios project is now under construction. This project will improve and enhance a 7-mile long, 1500-acre section of the Salt and Gila Rivers in southwestern Phoenix. The project consists of a flood protection levee, effluent pump station, emergent wetlands, and riparian corridors and open water marsh areas to replace existing non-native salt cedar in the river. The Tres Rios Full Scale Project is being 65% funded by the U.S. Army Corps of Engineers. The primary goals of the project are flood protection for the local residents and habitat restoration for the native animals. (Reference: City of Phoenix Website).

Agua Fria Linear Recharge Project

Phoenix is in the feasibility study phase regarding a groundwater replenishment project called the Agua Fria Linear Recharge Project. Incidental opportunities for providing passive recreation and/or enhancing native habitat along the Agua Fria River are also being investigated. Most of the reclaimed water from the 91st Avenue WWTP is currently reused for ecosystem habitat restoration, agricultural irrigation and industrial purposes. However, an estimated 13 to 20 billion gallons of this water currently is not used for these purposes and is discharged annually to the Salt River. The current Agua Fria Linear Recharge Project conceptual plan is based on in-stream recharge. This type of recharge project usually involves discharging water into a dry riverbed or wash and allowing the water to seep into the bed of the river. This conceptual plan uses the in-stream recharge method with an option of discharging water into the Agua Fria channel at several locations. This multiple discharge is called linear recharge. The proposed study area for linear recharge extends from Indian School Road to Bell Road along the Agua Fria River. (Reference: City of Phoenix Website).

Cave Creek WRP Direct Uses and Recharge

The Cave Creek WRP is located in developing northeast Phoenix, north of the CAP canal (capacity 8 MGD). This plant produces Class A+ effluent for delivery to large turf users and for groundwater recharge. Recharge is accomplished through a Managed USF facility in Cave Creek and through on-site vadose zone wells. Phoenix City Code requires all new turf facilities large than five acres to be irrigated with reclaimed water and developers must provide reclaimed water infrastructure to supply effluent. Developers must construct effluent distribution lines to connect to the City's backbone system. If it is not cost-effective to provide reclaimed water due to the distance from the City's reclaimed water system, the facilities must be built to facilitate future conversion to reclaimed water (e.g. purple pipe is installed initially). Another water reclamation plant is planned in the future to serve northwest Phoenix that will also provide water for direct use and groundwater recharge.

2.7 City of Scottsdale

The City of Scottsdale is a golf course mecca. Scottsdale provides Class A+ effluent for irrigation uses at approximately 22 golf courses through the City's Reclaimed Water Delivery System (RWDS). Golf courses pay all the costs to receive reclaimed water for irrigation through the RWDS. The RWDS is the largest reclaimed water system in the Valley, with a peak delivery capacity of 20 MGD. The system delivers effluent and some untreated CAP water during peak demand months to all golf courses along Pima Road north of the Loop 101. City policy requires that any future golf courses must provide their own renewable surface water supply in order to locate in Scottsdale.

The Scottsdale Water Campus, a state-of-the-art facility that treats wastewater to irrigation standards, went into service in 1999. In winter, when golf course irrigation needs are low, the effluent is further purified to drinking water standards using reverse osmosis technology, and recharged using a system of approximately 28 vadose zone wells having an average capacity of 500 gallons per minute (gpm). In recent years, Scottsdale recharged about 6,000 acre-feet (1,955,106 gals) of reclaimed water and CAP water at the Water Campus. Stored water credits are recovered through the City's existing potable well system. Approximately half of the reclaimed water produced at the plant (Plans call for the Water Campus and its recharge capacity to be expanded to meet growth needs). At buildout capacity, the plant will have the capacity to meet all existing golf course peak-day demands. Scottsdale requires all new golf courses, landscaping, and park turf areas to be irrigated with non-potable water to the greatest extent possible. (References: City of Scottsdale Website, Scottsdale Integrated Water Resources Master Plan, 2005, Malcolm Pirnie)

2.8 Arizona American Water (AAW)

AAW is the largest private water company in Arizona and one of the few private water providers that provides wastewater treatment and water reuse facilities. AAW is the service provider for the Sun Cities area and the Anthem development north of Phoenix. AAW operates the Northwest Valley WRP (5 MGD capacity) located in Sun City West. The Class A+ effluent produced at this facility is used entirely for groundwater recharge. The recharge is accomplished using a series of approximately 12 spreading basins located on land adjacent to the plant. In the future, plans call for some of the reclaimed water to be delivered to a local golf course for direct use.

At the Anthem development, a relatively new master planned community of approximately 8,500 homes and businesses, AAW operates a microfiltration water reclamation plant. Anthem was planned for total reuse of all wastewater. Class A+ effluent blended with untreated CAP water is delivered for turf irrigation at golf courses, parks, and schools, and roadway medians. In the winter months, excess effluent is recharged using a trench-type recharge facility and long-term storage credits are recovered through potable system wells.

2.9 Summary – Common Themes in Effluent Utilization

Most cities in Arizona's Active Management Areas and across the state have taken decisive steps to maximize the beneficial use of effluent. This summary of reclaimed water use among communities shows differences in approach from city to city. However, several common themes and strategies can be identified that relate to common circumstances and situations facing the providers. These common elements include:

- Several cities have constructed extensive distribution systems to deliver water to direct turf users and utilize the majority of reclaimed for turf irrigation (Note Flagstaff, Tucson, Scottsdale, Gilbert). However, to make this type of reuse cost-effective, most communities either implemented the programs early during the development of the city so reclaimed water mains could be constructed when developments were being built, or other reuse opportunities (i.e. groundwater recharge) were limited (e.g. Flagstaff due to geology of the region).
- Even in communities where direct uses predominate, groundwater recharge plays a key role in maximizing effluent reuse potential. In most cases, long-term storage credits are recovered using potable water wells, but in one case, recovered water was delivered to turf facilities through the reclaimed water distribution system (Tucson).
- The predominant recharge method is use of spreading basins where the local geology permits. Where not feasible, injection wells and vadose zone wells are used. Two providers (Phoenix and Peoria) have used stream channel recharge to accomplish recharge.
- In relatively built-out cities where constructing an effluent distribution system through developed areas would be expensive and disruptive to the community (e.g. Mesa, Phoenix, Sun Cities), groundwater recharge or providing effluent in water exchanges in return for another water source is the predominant approach. This is also the preferred approach in situations where the water reclamation plant is located remote from potential users.
- In new developing areas of the community, most cities require new golf courses and large turf facilities (larger than either 5 acres or 10 acres) to be irrigated with effluent. An effort is made to maximize cost-effective direct uses and recharge is used as a supplemental reuse strategy.

Chapter 3 – Projected Effluent Available for Use by Casa Grande and Within the Pinal AMA

3.0 Chapter Overview

This chapter presents wastewater flow projections and the projected quantities of effluent that may be available for reuse from the City of Casa Grande Kortsen Road Water Reclamation Plant (WRP) and from other Pinal AMA wastewater treatment plant locations. Projections are provided for the following primary wastewater providers in the AMA: City of Casa Grande, City of Eloy, City of Coolidge, and Arizona Sanitary District. The current uses of reclaimed water and the future reuse plans of the non-Casa Grande entities are briefly discussed. The locations of the existing WRPs of these entities are shown in Figure 3.1. Information for the non-City of Casa Grande entities was derived from the wastewater master plans, 208 Amendment Applications of the entities, or personal communications with staff.

Currently, the relatively large distances between the WRPs in the Pinal AMA make partnering on joint recharge projects unlikely in the near-term. Future partnering between entities related to effluent recharge activities may be more feasible in the future as reclaimed water distribution networks are built enabling effluent to be conveyed in the direction of neighboring WRPs.

3.1 City of Eloy

The City of Eloy completed a master plan update in 2007 and made application to CAAG for a 208 Water Quality Management Plan Amendment and Designated Management Agency (DMA) Area Amendment (Carollo Engineers, 2007). Eloy currently operates an existing WWTP with a peak flow capacity of 2.0 MGD and an annual average daily flow (AADF) capacity of 0.74 MGD. The plant currently produces class B effluent which is recharged in basins located on the WWTP site. The Master Plan calls for the existing Eloy WWTP to be expanded to a capacity of 10.5 MGD in 3 expansion phases. The Phase 1 expansion to 4 MGD AADF is scheduled for construction in 2008. The Phase 2 expansion to 7 MGD is projected to be on-line by 2010. With this expansion, the plant tertiary treatment (filtration) will be added to produce Class A+ water.

3.1.1 Eloy DMA Future Regional Wastewater Treatment and Reuse Strategy

The proposed Eloy DMA area encompasses 158 square miles and is shown on Figure 3.1. The total buildout population of the DMA is 628,484 with a buildout wastewater flow of 65.3 MGD. Eloy's Master Plan calls for developers to construct small first phases (less than 2 MGD) of 8 separate regional water reclamation plants (WRPs) serving a defined sub-area of the DMA. These facilities are projected to be brought on-line between 2010 and 2015, after which they will be turned over to Eloy for operation and maintenance. The construction schedule of the plants will depend on the development schedule of the lead developer constructing the plants. The regional facilities will then be expanded by the City as population in the collection areas grow. The projected buildout capacity of these regional facilities ranges from 3.2 MGD to 9.3 MGD. All regional plants will be constructed to produce class A+ water to enable open access irrigation uses.

3.1.2 Eloy Regional Effluent Projections

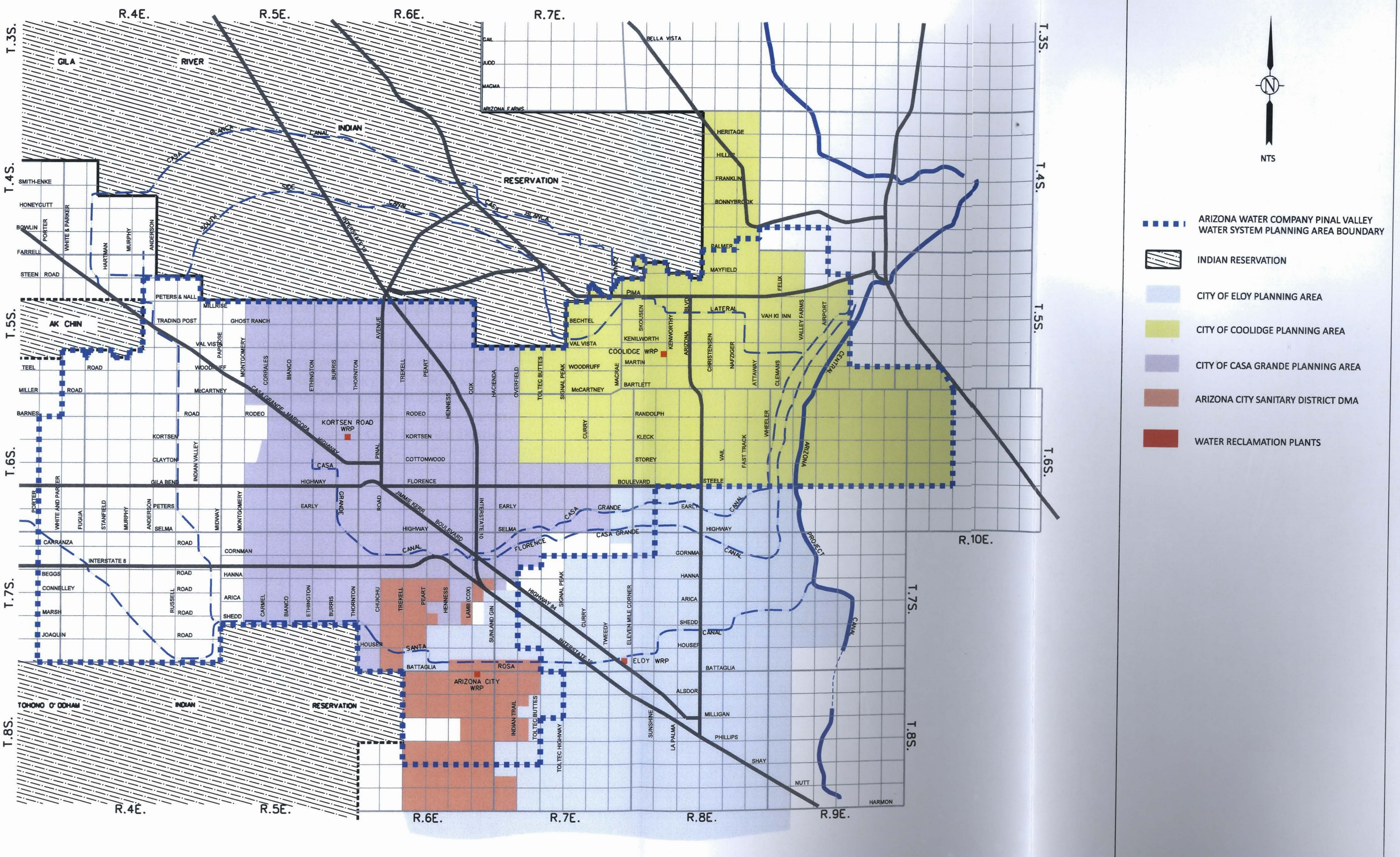
The effluent from each of Eloy's planned WRPs will be used for irrigation of large turf areas, community lakes and groundwater recharge. The WRPs will be located close to water reuse opportunities to facilitate reuse. Projected wastewater flows and effluent availability are shown in Table 3.1. The buildout flow of 65.3 MGD exceeds the buildout flow projected for the City of Casa Grande Planning area. (Reference: City of Eloy CAAG 20 Water Quality Management Plan Amendment and Designated Management Agency (DMA) Area Amendment; Carollo Engineers, 2007)

Table 3.1
City of Eloy Wastewater Flow and Effluent Projections
(MGD)

Year	2010	2020	2030	Buildout
Existing Plant	4.0	7.0	10.4	10.4
Sub-Areas Composite	0	14.0	42.4	54.9
Total	4.0	21.0	52.8	65.3

3.2 City of Coolidge

The City of Coolidge operates a lagoon type wastewater treatment plant located about 2 miles west of the downtown area. The plant produces Class C effluent that is delivered to farms south of the plant for agricultural irrigation of City-owned and privately owned land. The plant was expanded in 2007 from 1.35 MGD capacity to 2.0 MGD. Currently, the plant treats approximately 750,000 gal/day of flow on an average annual basis. It is estimated that it will be 4-5 years before another plant expansion in needed. In 2005, CAAG approved Coolidge's 208 Water Quality Plan Amendment application to expand the plant to 12 MGD and convert the plant to a mechanical plant. No schedule has been developed for this plant expansion due to the recent slowdown in housing construction in the Coolidge area. (References: Coolidge website and personal communication, Bob Flatley, City Manager).



Pinal Valley Water Reclamation Facilities and Planning Area

Figure 3.1

3.3 Arizona City Sanitary District

The Arizona City Sanitary District operates a wastewater treatment plant that currently produces Class B effluent. The existing rated capacity of the plant is 1.5 MGD. Average annual daily (AAD) flow in 2007 was 0.85 MGD. Projections indicated that by 2014, the AAD flow at the plant will be 1.2 MGD. Currently, the effluent is delivered at no cost to the Arizona City Golf Course (Avg. annual delivery of 350,000 gal./day), with the remainder delivered to a nearby farmer and discharged to a wash via an AZPDES permit.

Arizona City is in the process of permitting a spreading basin recharge facility located on 7 acres of District-owned land located about ½ mile northwest of the plant adjacent to the agricultural land that now receives effluent. The facility has been permitted through ADWR as an Underground Storage Facility (USF) with a permitted capacity for Phase 1 of the project of 250,000 gal./day. The facility consists of 3, 1-acre recharge basins. It is estimated the 7-acre site could ultimately support the recharge of 1.5 to 2.0 MGD.

The DMA of the District was updated in 2005 to include approximately 42 square miles. The District plans to complete an update of its master plan within the next two years. The District's current plan is to expand the existing plant capacity to 3.3 MGD as growth in the area dictates. Another "satellite" plant is planned to be located southwest of the current plant to serve several proposed new developments in the area. A plant location has not yet been selected (Reference: Personal Communication, Gary Boileau, District Plant Superintendent).

3.4 City of Casa Grande

3.4.1 Wastewater Master Plan Update and Plant Expansion Plans

In 2006, the City of Casa Grande contracted with Carollo Engineers to complete a Conceptual Wastewater Master Plan and Wastewater Feasibility Study. The wastewater flow projections done for the City's existing wastewater plant in the Carollo plans are used as the basis of the effluent projections presented in this Reclaimed Water Use Conceptual Master Plan. It should be noted that the Carollo projections in near-term (next 5 years) may be somewhat aggressive in light of the slowdown in housing construction that has occurred in 2007 and is continuing in 2008. Thus the near-term effluent flow projections in this plan should also be considered on the high side and may not occur until 2 or 3 years further out than shown in this plan.

The Carollo plans evaluated four different alternatives for expansion of the City's wastewater treatment plant capacity beyond the current 12 MGD Phase III expansion at the existing Kortsen Road plant. These alternatives included building one or more new regional treatment plants in the eastern and western parts of the planning area and expanding the treatment capacity at or near the current plant site on Kortsen Road. The selected alternative (Alternative 4), calls for the area west of Montgomery Road to be served by Global Water. Wastewater from the remainder of the service area beyond the 12 MGD capacity of the Phase III plant expansion will be collected and treated at a new regional WRF plant to be constructed at or near the existing plant. This approach will promote centralized wastewater treatment and use of reclaimed water. Constructing the regional plant at or near the existing site will likely require modifying the treatment train from the existing extended aeration and aerobic digestion process trains to either a conventional secondary clarification and filtration train or membrane bioreactors.

In this plan it is assumed that all reclaimed water will be produced at the current plant location for distribution to water users. The design of the Phase III Plant expansion is 95 percent complete. This expansion, scheduled to be in service by late 2009, will bring the plant capacity to 12 MGD and increase the level of treatment to A+ quality water. (Reference: City of Casa Grande Wastewater Feasibility Study – Summary Report; Carollo Engineers, Sept. 2006)

3.4.2 Current Casa Grande Effluent Uses and Contracts

Currently, the City of Casa Grande provides effluent to two major users of effluent: the municipal golf course and the Reliant Energy Desert Basin Power Plant. A third customer, Frito-Lay Inc., is expected to begin using water in the summer of 2008.

3.4.2.1 SRP - Reliant Energy Desert Basin, LLC Effluent Sales Agreement and Current Use and Operation of Effluent Delivery Facilities

This agreement, executed in 2001, covers the terms and conditions of effluent sales by the City to the SRP power plant located on Burris Road approximately ½ mile from the

Kortsen Road Plant. The effluent delivery facilities consist of a pump station located on west end of the WRP's effluent storage pond. The station has two 2,250 gpm pumps. A 20" HDP pipe delivers water from the pump station to the Reliant Energy Plant where the water is mixed with CAP water deliveries. The annual percentage mix of CAP water and effluent is currently about 60/40. The effluent pump station is automatically controlled by float level controllers in the storage pond located at the Reliant Plant. As the plant needs more cooling water, the pumps start.

The daily use of effluent by the plant in 2007 varied from 0 MGD to 1.8 MGD with wide day-to-day variances possible depending on SRP power generation needs (based on 2007 daily water use data). SRP recently purchased additional land adjacent to the existing power plant for possible construction of additional power generation facilities. There are no immediate plans for power plant expansion, but it is likely this site will be expanded within 5-15 years as Pinal County power needs increase. Therefore, there is a high likelihood of increasing long-term demand for additional cooling water demand at the Reliant plant. (Personal Communication: Shawn Grant, Senior Engineer, SRP Desert Basin Generating Station).

The key provisions of the agreement are as follows:

- Term of Contract – 40 years with SRP able to execute up to 4, 5-year extensions upon written notice to the City.
- The maximum daily amount of effluent that may be delivered is 3.2 MGD.
- The initial "Average Daily Amount" of delivery set in the contract was 1.4 MGD. This was to be the basis of take-or-pay billing provisions of the contract.
- The initial price of the water was $0.50/1000 gallons. This price may be adjusted annually by the City based on the Consumer Price Index (CPI) for the preceding year.
- The City may reopen the negotiation of the price of the effluent to "market rates" if the City has received a bona fide offer from a third party for the purchase of effluent at a price in excess of the effluent payment. If a renegotiated price cannot be agreed to, the City may terminate the agreement with ten years notice to SRP.
- The City may give written notice to SRP that the Annual Average Daily Amount will increase first to 2.1 MGD, then to 2.8 MGD. Within two weeks of receiving written notice, SRP shall order the equipment needed to enable it to take the additional water. (The existing pump station and 20" effluent pipeline already have the capacity to take these potential amounts).
- SRP has the right to reduce the Annual Average Daily Amount (AADA) if its use of water is less than 85 percent of the then current AADA. Six months after such notice, the AADA shall be reduced to equal the actual SRP plant use. The plant has been using only about 0.6 MGD since 2005, therefore the AADA in effect has been reduced.
- The delivery point is the SRP Plant.
- The City owns the pump station and the 20" HDP pipeline. SRP is responsible for operation and maintenance of the pump station and pipeline.

- Daily variances in effluent deliveries from the AADA may not exceed 100 percent of the AADA (but may not exceed the Maximum daily amount of 3.2 MGD).

3.4.2.2 Summary of Frito-Lay Effluent Sales Agreement

This agreement, executed May 17, 2005, covers the terms and conditions of the City's sale of effluent for agricultural irrigation uses to Frito-Lay. The water will be used during the summer months as supplemental irrigation of alfalfa on a parcel of land adjacent to the treatment plant. The Frito-Lay pump station and pipeline are currently under construction and are scheduled to be in-service by April, 2008 for the start of the irrigation season. The pump station will have two variable speed drive pumps capable of a maximum output of 1,800 gpm (2.6 MGD). The station will be capable of remote operation from the Frito-Lay plant. The effluent will be used as a supplemental source in addition to Frito-Lay plant process reject water and SCIDD water. Effluent use will peak in June and July as irrigation needs peak. The company has no plans to deed the pump station and pipeline to the City within the foreseeable future. Within the next 2-3 years, Frito-Lay plans to increase its ability to recycle plant water by adding additional water treatment facilities at the plant. When this project is complete, the plant will reduce the acreage of alfalfa irrigated for the purpose of water disposal. When this happens, it is likely that Frito-Lay's demand for effluent will decrease to less than the 500 acre-feet per year now anticipated. (Reference: Personal communication, Tyler Mummert, Frito-Lay). The key provisions of the agreement are as follows:

- The term of the agreement is 10-years, with automatic renewal for 3 consecutive option terms of 10-years, unless either party notifies the other that it does not wish to renew the agreement or the parties are unable to agree on a renegotiated effluent unit price. (Total possible term – 40 years).
- The base price of effluent shall remain $0.40/1000 gallons for the initial 10-year term (beginning in 2005 with execution of the agreement).
- The effluent unit price may be opened and renegotiated by the City upon providing notice to Frito-Lay at least 18-months prior to the end of the initial contract period.
- Frito-Lay is responsible for construction of the pump station (located on City property) and pipeline needed to deliver effluent from the delivery point to its property. Frito-Lay will operate and maintain the facilities. They have the option of deeding the facilities to the City, subject to acceptance by the City.
- Frito-Lay may take water and the City is obligated to provide effluent only during the summer months, defined as April 15th through October 15 of each calendar year.
- Frito-Lay must submit a Purchase Notice to the City for the "receiving period" (not more than 12-months duration) 30 days prior to the start of the first receiving period. After the first period, Purchase Notices must be submitted to the City at least 6 months prior to the commencement of the receiving period.

- The City will make available up to 500 acre-feet per of effluent through the year 2015. After that, 600 acre-feet per year must be made available if Frito-Lay requests the water.
- Once the Purchase Notice is given, Frito-Lay must pay for the effluent whether it uses it or not (take-or-pay). Charges for effluent ordered but not taken are due at the end of the receiving period.
- Frito-Lay may submit requests for additional request for more effluent for the receiving period, but the City is not obligated to provide the increased amount, but may provided it if available.
- The contract does not discuss monthly, or daily delivery limits.

3.4.3 Projected Casa Grande Effluent Production

The projected average annual daily flows generated by Carollo Engineers served as the starting point for projecting the amount of reclaimed water that would be available from the Kortsen Road WRF in the future. The Carollo AAD flows shown in Table 3.2 were used to project average annual and monthly average daily wastewater flows and effluent available for existing and new uses for each projection year. The monthly effluent budgets are based on monthly peaking factors derived from the 2005-2007 reclaimed water deliveries to existing uses shown in Table 3.3. The projected monthly average daily flows for each year were used to create monthly budgets for use in determining the amount of effluent projected to be available in the future to existing users and that which could be made available to new direct uses and to groundwater recharge facilities under different scenarios. Existing uses include deliveries to the Casa Grande Municipal Golf Course for irrigation, the Salt River Project's Desert Basin Power Plant for cooling water, and discharges to the North Branch of the Santa Cruz Wash.

Frito-Lay's anticipated use was projected based on discussions with Frito-Lay staff. In 2001, Casa Grande signed a contract with Frito-Lay, Inc. to sell effluent for agricultural irrigation. These deliveries are expected to begin in the spring of 2008 and are considered part of current effluent commitments in the effluent budgets. Also included as a current use are in-plant uses and evaporation losses from the three effluent storage basins totaling 120-acres.

Table 3.2
Projected Average Annual Daily Wastewater Flows
(MGD)

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2020	Buildout
Projected Annual AAD	4.3	4.9	5.5	6.2	7.0	8.1	9.6	11.0	12.6	19.6	50.0

Source: City of Casa Grande Wastewater Feasibility Study – Summary Report; Carollo Engineers, Sept. 2006

Table 3.3
Historical Reclaimed Water Deliveries by Month
(MG)

	Jan-05	Feb-05	Mar-05	Apr-05	May-05	Jun-05	Jul-05	Aug-05	Sep-05	Oct-05	Nov-05	Dec-05	Total Mg
Wash	77.5	56	52.7	60	37.5	15	6	38.75	6.5	6.82	60	85.25	**502.02**
Golf	1.89	0	10.32	20.7	19.86	25.64	39.46	22.94	26.47	24.64	18.15	6.49	**216.56**
SRP	40.25	40.4	38.72	1.9	31.43	26.44	23.31	28.41	9.37	25.46	20.74	12.16	**298.59**
Total	119.64	96.4	101.74	82.6	88.79	67.08	68.77	90.1	42.34	56.92	98.89	103.9	1017.17
%	0.118	0.095	0.100	0.081	0.087	0.066	0.068	0.089	0.042	0.056	0.097	0.102	1.000

	Jan-06	Feb-06	Mar-06	Apr-06	May-06	Jun-06	Jul-06	Aug-06	Sep-06	Oct-06	Nov-06	Dec-06	Total Mg
Wash	83.7	77	108	62.5	62	51	55.2	62	90	93	97.5	108.5	**950.4**
Golf	9	11.04	9.07	21.63	26.38	32.59	29.24	21.15	10.66	24.35	15.65	9.62	**220.38**
SRP	17.6	12.44	0.61	4.15	8.39	16.98	21.36	19.63	15.14	4.15	9.45	12.09	**141.99**
Total	110.3	100.48	117.68	88.28	96.77	100.57	105.8	102.78	115.8	121.5	122.6	130.21	1312.77
%	0.084	0.077	0.090	0.067	0.074	0.077	0.081	0.078	0.088	0.093	0.093	0.099	1.000

	Jan-07	Feb-07	Mar-07	Apr-07	May-07	Jun-07	Jul-07	Aug-07	Sep-07	Oct-07	Nov-07	Dec-07	Total Mg
Wash	124	105	124	105	62	45	77.5	77.5	75	62	105	113.78	**1075.78**
Golf	5.93	5.96	15.94	16.01	32.8	33.57	29.47	21.93	22.8	25.22	15.38	10.09	**235.10**
SRP	8.14	9.37	4.9	6.23	22.15	22.18	20.39	27.01	29.29	34.03	5.98	12.68	**202.35**

3.4.4 Conclusions - Future Effluent Availability for Current and New Uses

Annual and monthly effluent budgets were produced for the following projections years: 2008 to 2015, 2020, and buildout of the service area. Effluent budgets for average annual day (AAD), and budgets for January average day and June average day of each projection year are shown in Tables 3.4, 3.5, and 3.6. Projected effluent available for new uses in years 2008, 2010, 2015, and 2020 is also shown graphically in Figures 3.2, 3.3, 3.4, and 3.5. The following conclusions can be drawn from the data regarding the availability of effluent for new uses after existing contract obligations and losses are met:

1. During the peak summer demand period in 2008, there is currently little or no effluent available for new uses or recharge. By 2010, there is projected to be 1.03 MGD available in June, growing to over 6 MGD by and by 2015.

2. During the winter low-demand period (January), there is currently over 3 MGD of effluent available for recharge or new direct uses. By 2010, there is projected to be over 5 MGD available.

3. On an annual basis, if all effluent projected to be available could be used directly or recharged, the following amounts of additional water resources could be generated for the planning area: 2008 – 2,600 AF; 2010 – 4,100 AF; 2015 AF – 11,300 AF; 2020 – 19,100 AF; Buildout – 53,100 AF.

4. Wastewater flows and effluent production is lowest in the summer months when irrigation and power plant demands are the highest. During the winter months, effluent production peaks when irrigation water needs are lowest. This pattern emphasizes the need to have groundwater recharge facilities in place to beneficially use effluent produced in the winter months. It is not viable to create enough turf facility irrigation demand to use all effluent available during the winter without creating extremely high summer irrigation demands that cannot be met with effluent and must be heavily supplemented with potable water.

5. A groundwater recharge facility having 10 MGD capacity could be fully utilized during the winter months by 2015.

6. At buildout, the average annual daily amount of effluent available for direct use or recharge is projected to be 47.46 MGD. During January, approximately 53 MGD is projected to be available. In June at buildout, approximately 36 MGD is projected to be available.

Chapter 4 discusses and evaluates various alternatives that could be implemented to utilize the effluent projected to be available.

Table 3.4

Projected Annual Average Daily Effluent Water Balance and Availability for Reuse (MGD)											
Year	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2020**	**Buildout**
Projected AAD Flow	4.3	4.9	5.5	6.2	7.0	8.1	9.6	11.0	12.6	19.6	50.0
Existing User/Contracts											
In-Plant Uses/Loss	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63
SRP Power Plant	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Frito Lay	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45
Municipal Golf Course	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64
Remaining for New Uses	1.76	2.36	2.96	3.66	4.46	5.56	7.06	8.46	10.06	17.06	47.46
Acre-feet Available	1,969	2,644	3,316	4,100	4,996	6,228	7,908	9,476	11,269	19,110	53,162

Table 3.5

Projected Effluent Water Balance and Availability for Reuse – January Avg. Day (MGD)											
Year	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2020**	**Buildout**
Projected Annual AAD	4.3	4.9	5.5	6.2	7.0	8.1	9.6	11.0	12.6	19.6	50.0
Projected Jan. AD Flow	4.7	5.3	6.0	6.8	7.6	8.8	10.5	12.0	13.7	21.4	54.5
Existing User/Contracts											
In-Plant Uses/Loss	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
SRP Power Plant	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01
Frito Lay	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Municipal Golf Course	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19
Remaining for New Uses	3.38	4.03	4.69	5.45	6.32	7.52	9.15	10.68	12.42	20.05	53.19

Table 3.6

Projected Effluent Water Balance and Availability for Reuse – June Avg. Day (MGD)											
Year	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2020**	**Buildout**
Projected Annual AAD	4.3	4.9	5.5	6.2	7.0	8.1	9.6	11.0	12.6	19.6	50.0
Projected June AD Flow	3.46	3.94	4.42	4.98	5.63	6.51	7.72	8.84	10.13	15.76	40.20
Existing User/Contracts											
In-Plant Uses/Loss	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
SRP Power Plant	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frito Lay	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Municipal Golf Course	1.06	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05
Remaining for New Uses	0.50	0.01	0.47	1.03	1.67	2.56	3.77	4.89	6.18	11.81	36.25

Figure 3.2

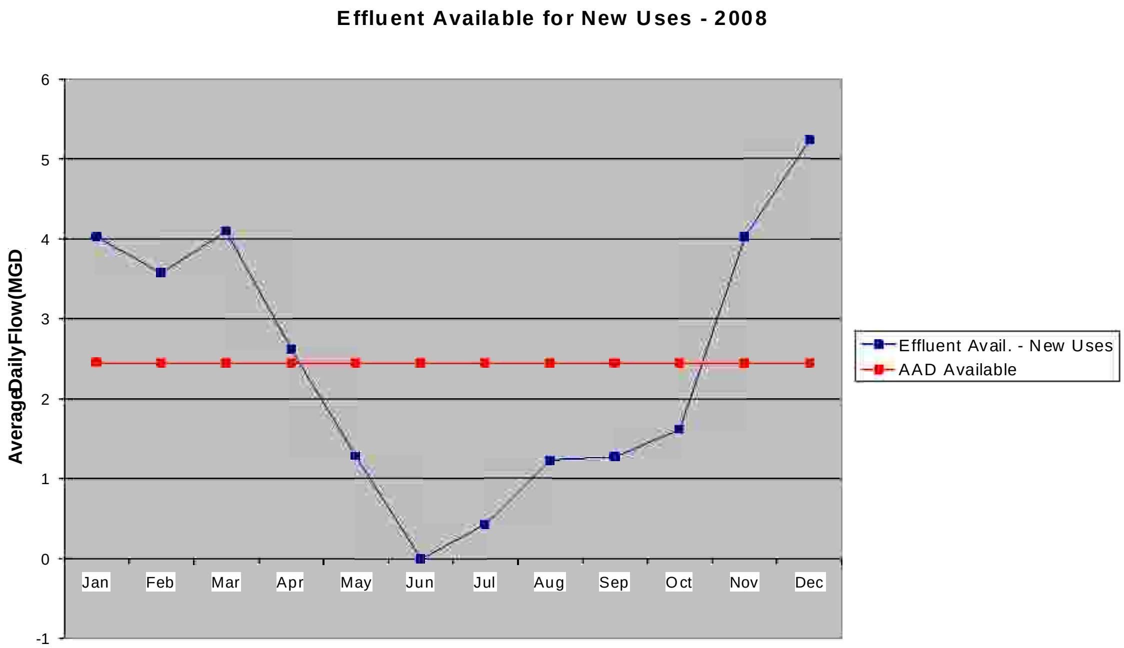


Figure 3.3

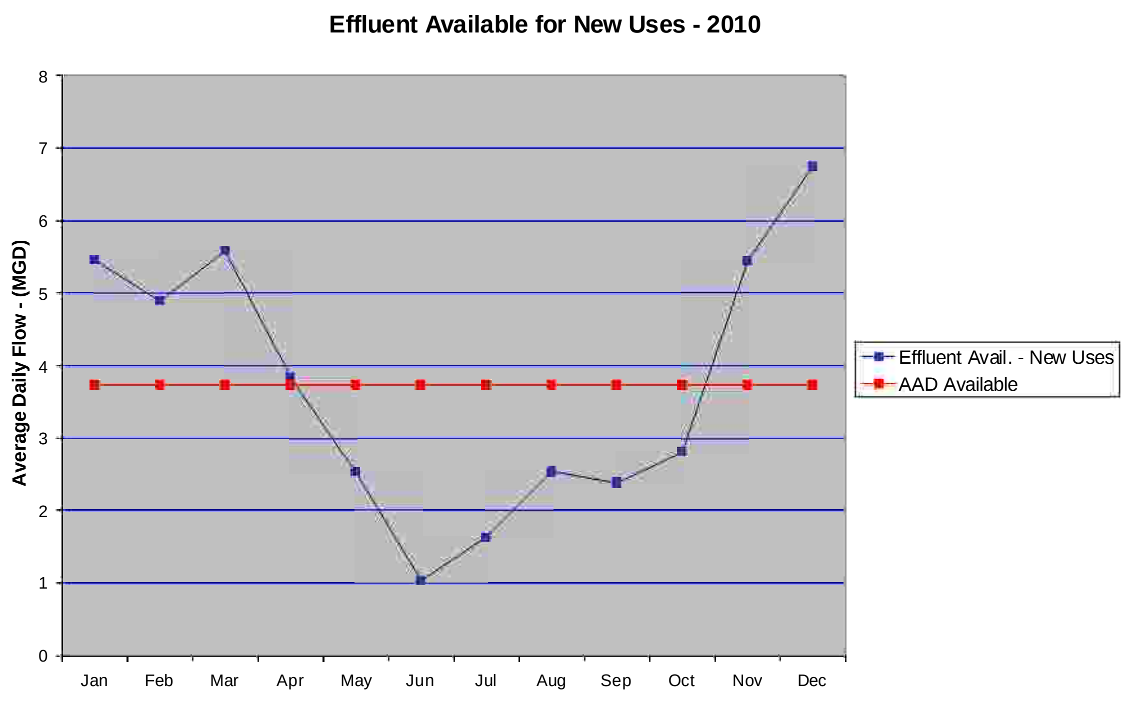


Figure 3.4

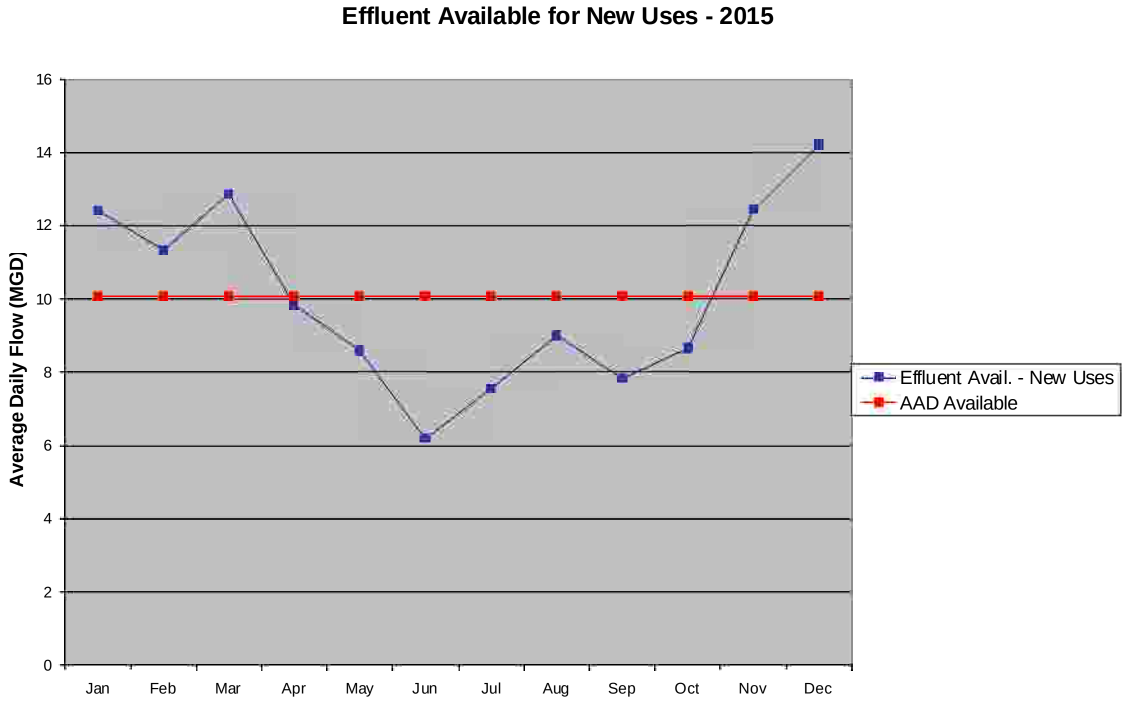
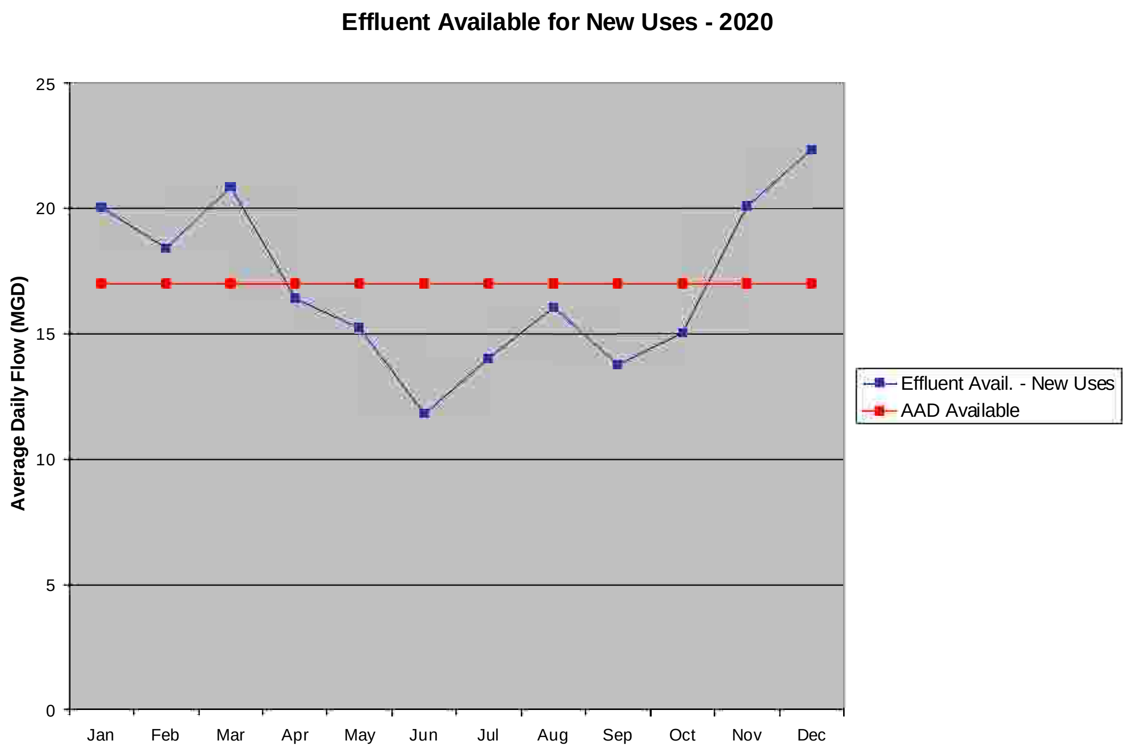


Figure 3.5



Chapter 4 – Analysis of Casa Grande Effluent Use Alternatives

4.0 Chapter Overview

The effluent budgets presented in Chapter 3 indicate that a significant volume of effluent will be available at the Kortsen Road WRP for beneficial uses as the City grows. The overall water reclamation program objective is to maximize beneficial use of effluent and minimize future effluent discharges to the North Branch of the Santa Cruz Wash. Chapter 4 summarizes conceptual level analyses of the advantages and disadvantages, costs, potential benefits, and institutional and regulatory constraints associated with various effluent use alternatives. Conceptual level project cost estimates are based on the facility and unit costs provided in Appendix 1. Any projects considered further for implementation will require more detailed planning and engineering studies to assess project feasibility and cost.

To place recharge projects and water exchange projects on an equal footing for cost comparisons, cost estimates for all alternatives except where noted, are based on constructing pump stations, pipelines, and recharge facilities of 10 MGD capacity. The 10 MGD capacity was selected because it would enable reuse of the projected average annual day flow available for reuse in 2015 and nearly all winter time flows available for reuse in 2015. However, any of the projects could be implemented at either larger or smaller capacities or facilities could be phased to reduce up-front capital costs. Aquifer testing, modeling, permitting and agreement negotiation costs are not included in the analysis but would apply to all alternatives. A summary of the comparison of the alternatives is shown in table 4.4.

The water reuse alternatives listed below were selected for analysis based on existing contractual agreements, the results of the Clear Creek Inc. recharge study (summarized in this chapter), and discussions with Casa Grande staff. Projects 1-5 are groundwater recharge projects and projects 6-12 are projects involving water deliveries for direct irrigation uses or exchanges for surface water supplies. Projects are not listed in order of preference.

1) Pipeline to Santa Rosa Canal for delivery to Maricopa Stanfield Irrigation and Drainage District Groundwater Savings Facility (GSF).

1b) 16-inch pipeline to Casa Grande Canal for delivery to SCIDD Groundwater Savings Facility.

2) Pipeline to Casa Grande Airport and construct Vadose Zone wells.

3) Pipeline to Casa Grande Airport and construct injection or aquifer storage and recovery wells.

4) Pipeline west from WRP to Montgomery Road and construct spreading basin recharge facility.

5) A "Managed" underground storage recharge facility in the North Branch of the Santa Cruz Wash downstream of Kortsen Road WRP.

6) New reclaimed water distribution system for direct use at existing park, schools in central Casa Grande (11 users).

6b) New reclaimed water distribution system for direct use at existing park, schools, and golf course in central Casa Grande (12 users).

7) Developer-constructed direct delivery to system to large turf facilities in new developments (e.g. Desert Color)

8) Construct pipeline north to Gila River Indian Community (GRIC) Southside Canal for agricultural uses and exchange with GRIC for CAP water.

9) A dual distribution system (purple pipe system) in new developments for outdoor irrigation uses at individual residences and large turf facilities.

10) Interim Direct Delivery of Effluent to Individual Farms (no costs developed).

11) Provide Effluent to Contractors for Use as Construction Water and for Dust Control (no costs developed).

12) Provide Effluent for Irrigation Needs of Planned Linear Parks and Trail Corridors (no costs developed).

Direct potable reuse of effluent was not evaluated as part of this report. While the water treatment technology exists to treat wastewater to potable standards, state regulations currently prohibit direct potable reuse. In addition, public acceptance of direct potable reuse is currently lacking. However, it is generally recognized that at some point in the future, direct potable reuse may become a viable alternative for use of Casa Grande's reclaimed water supplies.

4.0.1 Clear Creek Associates Recharge Siting and Prioritization Study - Summary

The locations of the recharge project alternatives presented for analysis here are based on the recommendations of the 2007 study by Clear Creek Associates. This reconnaissance level study of the Casa Grande planning area prioritized the most favorable areas for future groundwater recharge activities. The study area encompassed 368 square miles. A matrix approach was used based on the evaluation of seven criteria influencing recharge potential. These criteria were:

- Proximity to mines and environmentally sensitive areas
- Well impacts (proximity to existing wells)
- Thickness of the Lower Conglomerate Unit
- Distance from the WRP
- Depth to top of the Lower Unit
- Mapped extent of the perched aquifer
- Aquifer hydraulic conductivity.

The study determined that siting of a recharge facility at or in close proximity to the WRP is not practical due to poor surface percolation rates, an extensive subsurface clay unit that creates a perched aquifer in the area, and relatively shallow bedrock (less than 1000 feet below land surface) below the perched aquifer. These factors result in a high probability of future water mounding problems associated with recharge activities. The study report included a map illustrating the most favorable locations for recharge within the planning area (see Appendix 2). The most favorable areas for recharge closest to the WRP include:

- Most locations west of Montgomery Road
- Most locations northwest of the WRP, including the Airport property
- Some locations east of I-10, between Rodeo Road and Peters Road

The study recommended that the City identify specific parcels of land within these areas for performing site specific investigations to further determine suitability for recharge facility construction. These investigations would include surface percolation tests to determine suitability for surface spreading facilities, and borings to 200 to 300 feet to determine groundwater depth and aquifer geologic characteristics. If necessary, the analysis should include deep borings to characterize the deeper geologic units. Well injection and recovery tests may also be required to determine the feasibility of recharge and recovery using injections wells or aquifer storage and recovery wells (ASR well).

This study provides the city with a good tool with which to prioritize areas for more detailed hydrogeologic study. It should be noted that areas that are rated somewhat lower than "most favorable" may also be suitable for recharge. It is recommended that consideration of an area for further site specific analysis and potential recharge operations should not be ruled out if other attributes of the area are favorable, for example, along the corridor of an existing or planned reclaimed water distribution line.

4.1 Alternative 1: Pipeline to Santa Rosa Canal for Delivery to Maricopa Stanfield Irrigation and Drainage District (MSIDD) Groundwater Savings Facility

This alternative involves delivery of effluent to the Santa Rosa Canal, operated by the Central Arizona Irrigation and Drainage District (CAIDD) and the MSIDD. Effluent would be delivered as "in-lieu" water to the Groundwater Savings Facilities (GSFs) operated by either of the districts. Long-term storage credits would be generated through these deliveries and credits could be sold to: 1) water providers for use in maintaining Assured Water Supply Designations, 2) developers for use in obtaining Assured Water Supply Certificates, or 3) the Central Arizona Groundwater Replenishment District (CAGRD) for meeting its groundwater replenishment obligations.

The Santa Rosa Canal is now used to deliver a combination of CAP water and groundwater for agricultural uses in the district. Currently, no potable water treatment plants receive water from the canal. However, there may be interest in the future by Arizona Water Company or other water providers in constructing water treatment plants on or near the canal. Future potable water plant deliveries using the canal are a potential constraint on deliveries of effluent to these districts due to regulatory and public perception concerns.

4.1.1 Cost Estimate

This project would involve constructing a 10 MGD capacity pump station and 8.5 miles of 24-inch pipeline south from the WRP to the Santa Rosa Canal. Estimated capital and operation and maintenance costs are as follows:

Pipeline	$11.1 million
Pump Station	2.2
Total Capital Cost	$13.3 million

Operation and Maintenance Cost - $40/AF
Revenue from sale of in-lieu water - $20/AF

4.1.2 Advantages (Pros) and Disadvantages (Cons) of Alternative

Pros

- GSF facility is already permitted
- No technical uncertainties with ability to recharge water, minimal permitting costs
- Market exists for sale of storage credits

Cons

- Curtailed groundwater pumping is not in close proximity to the central Casa Grande planning area and AWC well fields.
- Winter demand for agricultural water may be low when available effluent is at a peak.
- GSF capacity to accept effluent will be reduced in the future as lands are urbanized.
- A long-term contract with the District may not be possible due to potential for potable water treatment plant.

4.1.3 Alternative 1b: Construct a 16-inch Pipeline to Casa Grande Canal for delivery to San Carlos Irrigation and Drainage District Groundwater Savings Facility (GSF) or for Exchange of Gila River Water

This alternative involves construction of a 16-inch effluent main in the Burris Road alignment to deliver water to the Casa Grande canal at Peters Road. Other delivery points on the SCIDD canal and lateral system and direct deliveries to individual farms are also possible along this route. A 5 MGD capacity 16-inch main is evaluated here because the capacity of the SCIDD system at the tail end of delivery system to use the full 10 MGD capacity is unknown. A pipeline in the Thornton Road alignment could also be used to accomplish this connection.

Delivery of effluent to SCIDD could be done as in-lieu water deliveries to the GSF or as part of an exchange for Gila River Water for sale and delivery to Arizona Water Company's planned Pinal Valley surface water treatment plant. However, the first phase of AWC's plant is being designed to treat CAP water and will have limited ability to treat a blend of Gila River water (poorer quality water) and CAP water. Any delivery of water to SCIDD would likely provide only a short-term effluent reuse option (10-20 years) because there are only approximately 6-8 sections of SCIDD agricultural lands downstream of the delivery point. Much of this land is likely to urbanize in the next 20 years.

At this conceptual level of analysis, the Burris Road alignment is likely the preferred alignment over the Thornton Road alignment for a pipeline to the south. The Burris Road alignment would place the pipeline closer to the Francisco Grande resort and closer to the most favorable recharge areas west of Montgomery Road. Additional study of potential pipeline alignments is needed to determine the best alignment if these reuse options are to be considered further.

4.1.4 Cost Estimate – SCIDD GSF Delivery

This project would involve constructing a 5 MGD capacity pump station and 3.5 miles of 16-inch pipeline south from the WRP in the Burris Road alignment to the Casa Grande canal at Peters Road. Estimated capital and operation and maintenance costs are as follows:

Pipeline	$3.20 million
Pump Station	1.75
Total Capital Cost	$4.95 million

Operation and Maintenance Cost - $40/AF
Revenue from sale of in-lieu water - $20/AF

4.1.5 Advantages (Pros) and Disadvantages (Cons) of Alternative

Pros

- GSF facility is already permitted
- No technical uncertainties with ability to recharge water, minimal permitting costs
- Market exists for sale of storage credits

Cons

- Winter demand for effluent may be low when available effluent is at a peak.
- Limited GSF capacity at end of SCIDD system to accept effluent will be reduced further over next 10-15 years as lands are urbanized.
- Ability of SCIDD to accept water at end of system must be evaluated further to determine viability of this alternative.

4.2 Alternative 2: Pipeline to Casa Grande Airport and Construct Vadose Zone Wells

This alternative involves constructing a pump station and 3.8 miles of 24-inch pipeline from the SRP to the airport in the Thornton road alignment (including 0.5 miles within the airport property), and constructing 23 vadose zone recharge wells. This alternative would require additional hydrogeologic study of the airport area to determine aquifer characteristics and suitability for recharge at this location. Vadose zone wells are typically 48-inch diameter wells to a maximum depth of 180 feet. Depth is limited by the augur technology used to drill the large diameter wells. The advantages of vadose zone wells are that if fine materials that would impede percolation rates of spreading basin recharge facilities are present, they can be avoided. Underground Storage Facilities using vadose zone wells are easier to permit than injection or ASR wells and should not require advanced treatment to remove organics. Of the 38 constructed Underground Storage Facilities in the Phoenix Active Management Area, 15 of the facilities utilize vadose zone wells.

4.2.1 Cost Estimate

Vadose zone wells in central Arizona typically are able to recharge from 250 to 350 gpm. It is assumed for this analysis that the average recharge capacity for each well is 300 gpm. The cost of each well, including engineering and administration, is assumed to be $230,000 per well. Well spacing is assumed to be a minimum of 100 feet. Vadose zone wells are subject to clogging and reduced capacity over time. For the purpose of this analysis, the average life expected for each well is assumed to be 10 years, though some reduction in well capacity can be seen much sooner. Therefore, it is assumed that wells will need to be replaced once during the 20-year capital cost amortization period.

Implementing this project would involve the following estimated capital and O&M costs:

Pipeline	$ 5.0 million
Pump Station	2.2
Vadose Zone Wells	10.6
Total Capital Cost	$17.8 million

Pumping Operation and Maintenance Cost	$40/AF
Vadose Zone Well Maintenance Cost	$9/AF

4.2.2 Advantages (Pros) and Disadvantages (Cons) of Alternative

Pros

- Initially, lowest capital and O&M cost of constructed recharge alternatives.
- Small land requirements, City already owns land.
- Simple technology, easier permitting than injection wells.
- Does not require advanced treatment of effluent to remove organic contaminants.
- Low community impact compared to spreading basins.
- Pipeline could be extended north to deliver water to GRIC exchange.
- Desert Color effluent pipeline could be oversized by the City to accommodate deliveries to recharge facilities, thereby reducing costs.

Cons

- Limited life of wells due to clogging will likely require replacement after 7-10 years.
- Clay lenses below 180 feet could limit use of vadose zone wells.

4.3 Alternative 3: Pipeline to Airport – Construct Injection or Aquifer Storage and Recovery (ASR) Recharge Wells

This alternative is similar to Alternative 4.2 except that injection wells or ASR wells would be constructed. Injection wells are constructed similar to a high capacity water production well drilled to a similar depth (usually greater than 1000 feet). Water is introduced into the well under pressure and the water is "injected" directly into the water table within the aquifer. This method of recharge is generally used where subsurface geology will not allow the use of surface spreading basins or vadose zone wells due to the occurrence of impermeable strata in the subsurface that impede the flow of water downward resulting in water mounding problems that limit recharge capacity. ASR wells have the added capability of being operated in injection mode or as a production well to recover the injected water on either a seasonal basis or during drought years. ASR wells could be operated conjunctively with a reclaimed water distribution system delivering water to direct irrigation customers. Water could be stored underground during the winter months when irrigation demands are low and recovered and delivered to irrigation customers during the peak summer demand period.

One disadvantage of using direct injection wells or ASR wells is that the A+ effluent produced at the Kortsen Road WRP will likely require the addition of advanced treatment facilities to reduce the concentrations of organic compounds such as Total Organic Carbon (TOC) and Trihalomethanes (TTHMs) created as disinfection by-products during the wastewater treatment process. One commonly used method of treatment to break down these compounds is the use of an Ultra-Violet-Peroxide system. Planning level costs for UV-Peroxide treatment of $500,000 per MGD of capacity are therefore included in the cost estimate provided for this alternative. Due to the high cost of additional treatment, this alternative may be better suited to future implementation in the event that aquifer water quality standards become more stringent and advanced treatment of effluent is also required for surface spreading and vadose zone wells.

4.3.1 Cost Estimate

Estimated capital and operation and maintenance costs for this alternative are as follows:

Pipeline	$5.0 million
Pump Station	2.2
UV- Peroxide System	5.0
Injection Wells	9.1
Total Capital Cost	$21.3 million

UV Peroxide O&M Cost -	$200,000/Yr/MGD of capacity, $182/AF
Pumping O&M Cost	$40/AF

4.3.2 Advantages (Pros) and Disadvantages (Cons) of Alternative

Pros

- Small land requirements, City already owns land.
- Low community impact compared to spreading basins.
- Pipeline could be extended north to deliver water to GRIC exchange.
- Wells not subject to clogging like vadose zone wells.

Cons

- Requires expensive advanced treatment to remove organics.
- More difficult permitting process than other recharge alternatives.
- High initial cost.

4.4 Alternative 4: Pipeline West to Montgomery Road – Construct Spreading Basin Recharge Facility

This alternative would involve constructing 5.0 miles of 24-inch pipeline west from the WRP in the Kortsen Road alignment to at least Montgomery Road. Several areas west of Montgomery Road were rated as "most favorable" for recharge in the Clear Creek study. These areas are also located far enough from the Casa Grande Municipal Airport that potential constraints related to Federal Aviation Administration bird strike regulations should not be a factor. Thus a spreading basin recharge facility may be feasible in this area, pending detailed hydrogeologic testing. Land would need to be acquired for construction of a spreading basin facility and is included in the cost estimates below.

A variation on this alternative is to locate a spreading basin facility (or vadose zone well complex) west of the Francisco Grande Resort in conjunction with building a pipeline to deliver water for irrigation of the Francisco Grande golf course and park.

4.4.1 Cost Estimates

The cost assumptions used in this analysis for spreading basins are based on the actual costs of four recharge facilities constructed by the Central Arizona Project from 2001 through 2006. Costs were inflated to 2008 dollars and expressed on the basis of a cost of $171,500 per acre of recharge basin. In sizing the facility for 10 MGD capacity it was assumed that the average infiltration rate is 1.2 ft/day. Also, it was assumed that only half of the basins would be wetted at any one time and that 1.5 times the basin acreage needed would be acquired to accommodate berms, roads, and buffers for the facility. Based on these assumptions, a total of 76.8 acres is assumed to be required for the construction of 51.2 acres of spreading basins. Land cost was assumed to be $75,000 per acre.

The estimated costs for this project are as follows:

Pipeline	$6.6 million
Pump station	2.2
Land	8.8
Spreading Basin Facilities	5.8
Total Capital Cost	$23.4 million

4.4.2 Advantages (Pros) and Disadvantages (Cons) of Alternative

Pros

- Recharge basins are based on simple technology if geology is suitable.
- Does not require advanced treatment of A+ effluent to gain APP approval.
- Maximum additional treatment in soil profile thus easiest to permit from an Aquifer Protection Permit perspective.
- Pipeline in Kortsen Road, if extended 2 miles to the south, could be used to deliver water to Francisco Grande golf course and park.
- Alternative project location west of Francisco Grande could be combined with pipeline in Burris Road that delivers effluent to SCIDD and/or MSIDD GSF.

Cons

- Most difficult type of recharge project to locate to avoid surface clay layers that impede water flow.
- Difficult to site near airports due to FAA bird strike concerns.
- Large land requirements and associated costs.
- Potential vector control issues require careful water management and may be a concern to nearby residents.

4.5 Alternative 5: Managed Underground Storage Facility in North Branch of Santa Cruz Wash Downstream of WRP

Managed underground storage facilities permitted by the Arizona Department of Water Resources do not utilize constructed recharge basins or wells. In managed facilities, recharge is carried out by discharging water to a natural waterway. Of the approximately 55 permitted USFs in central Arizona, only 5 are Managed USFs involving effluent (City of El Mirage, City of Tucson (2 facilities), City of Phoenix - Cave Creek, and Prescott Valley). A Managed USF can also be used to convey water to the location of a constructed USF facility, thus combining the two concepts. For example, a Managed USF in the Santa Cruz Wash could be used to convey water downstream to a facility west of Montgomery Road.

By statute, Managed USFs may generate a maximum long-term storage credit volume of 50 percent of the water calculated as reaching the aquifer, after evaporation, transpiration losses from riparian vegetation, and any downstream diversions are subtracted. In addition, during periods when rainfall events cause significant natural stream discharges to the managed USF stream reach, ADWR does not allow credits to be generated. Permits include requirements for monitoring these types of flows and reporting the data in required quarterly and annual reports. Permits also include groundwater level alert levels that trigger a condition where no storage credits will be generated. For example, the City of El Mirage USF permit states that when groundwater levels rise to 30 feet below land surface or less, the USF permit is in "Prohibition Status" and no recharge credits shall accrue until water levels subside to below the limit.

In the case of the Santa Cruz wash, natural flows are relatively infrequent, generally less than 20 days per year. When all water loss factors are considered, the amount of storage credits that are likely to be generated can be considerably less than 50 percent of the flow discharged to the stream. For the purposes of this cost analysis, it is assumed that 35 percent of the effluent discharged to the stream channel would generate long-term storage credits (based on 50 percent eligibility for 70 percent of the total effluent discharged).

Managed USF facility permits often require one or more monitoring wells to record groundwater level changes at intervals along the stretch of stream channel over which the water infiltrates. Production wells in the area may also be used if the entity has regular access to the well. Currently, Casa Grande discharges to the wash flow approximately 7 miles downstream (2 miles past Montgomery Road) before fully infiltrating. Another unknown that could affect the ADWR permitting of a managed USF is the presence of the perched aquifer conditions at the WRP plant site and downstream for approximately 4-5 miles along the Santa Cruz wash channel. The presence of a high water table in the area could preclude the permitting of a managed USF.

4.5.1 Cost Estimates

For the purposes of this analysis it is assumed that a maximum of 7 monitor wells would be required to be constructed along the 7-mile course of the stream channel at a cost of $20,000 per well. This cost could be reduced if existing production wells can be used as monitor points. Other improvements that may be required include lining the discharge channel to the outfall at the wash and construction of a new outfall and flow measurement station at an estimated cost of $150,000.

The estimated costs of this project are as follows:

Monitor Wells	$140,000
Channel lining	75,000
Outfall facility	75,000
Total Capital Cost	$290,000

Monitoring and Reporting Operation and Maintenance Cost $100,000/yr

4.5.2 Advantages (Pros) and Disadvantages (Cons) of Alternative

Pros

- Minimal capital cost.
- Would maintain existing riparian habitat.
- Ease and quickness of permitting unless high water table present.
- Good short-term inexpensive way to get started on recharge.

Cons

- May not meet CAAG policy goal of no discharge for future discharges resulting from population growth.
- Maximum of 50 percent long-term storage credits allowed after evapo-transpiration losses.

4.6 Alternative 6: Direct Delivery to Existing Parks, Schools in Central Casa Grande for Turf Irrigation

There are a number of existing parks and schools in central Casa Grande having significant turf irrigation demands. These facilities could potentially be served with reclaimed water instead of potable water now provided by Arizona Water Company or private wells. To determine the feasibility of constructing a distribution system to deliver effluent from the Kortsen Road WRP to these facilities, a conceptual level analysis was conducted. This analysis identified potential users, the approximate number of acres of turf irrigated, and estimated annual and peak-daily turf water demand at each facility. Two cost estimates were developed for two different distribution system configurations to deliver effluent to the facilities. The parks and schools identified and approximate annual and peak daily water demands of each facility are shown in Table 4.1. Table 4.1 also includes the existing private golf courses of Francisco Grande (and related park), and the Palm Creek Golf/RV Resort. The locations of the potential users and effluent distribution system are shown on Figure 4.1. Approximately 2,481 acre-feet per year of potable water could be conserved if effluent could be delivered to all of these facilities. It should be noted the level of accuracy of these conceptual level demand calculations is plus or minus 25 percent.

4.6.1 Cost Estimates

Conceptual level capital and operation and maintenance cost estimates were developed for two alternative distribution systems to deliver effluent to central Casa Grande facilities. In Alternative 6, eleven (11) of the parks, schools and private facilities shown in Table 4.2, located within approximately 1300 feet of the proposed alignment of the effluent distribution main described below were identified, and the water demands totaled. The total peak-day and annual water demand for these facilities is 1.22 MGD and 528 AF/YR respectively. These facilities could be served by a 12” main constructed from the WRP along Kortsen Road to Pinal Avenue, an 8” main in Kortsen Road from Pinal Avenue to Casa Grande Road, then continuing south to Florence Boulevard.

The conceptual level capital cost estimate for this system, including turf facility on-site metering and connection costs is $3.2 million, with annual operation and maintenance costs of approximately $50,000. The 20-year annualized capital and operation and maintenance costs for such a system would be approximately $371,000 per year. This cost represents the amount of revenue each year the sales of reclaimed water would need to collect annually to pay off the cost of the system in 20 years (assumes the system capital cost is financed over 20 years at approximately 6 percent). To collect this much revenue annually, assuming 528 AF/YR of water sold, the effluent would need to be priced at $2.16/1000 gallons ($702/AF). This cost is almost 1.5 times higher than the 2007 Arizona Water Company potable water rate of $1.49/1000 gallons.

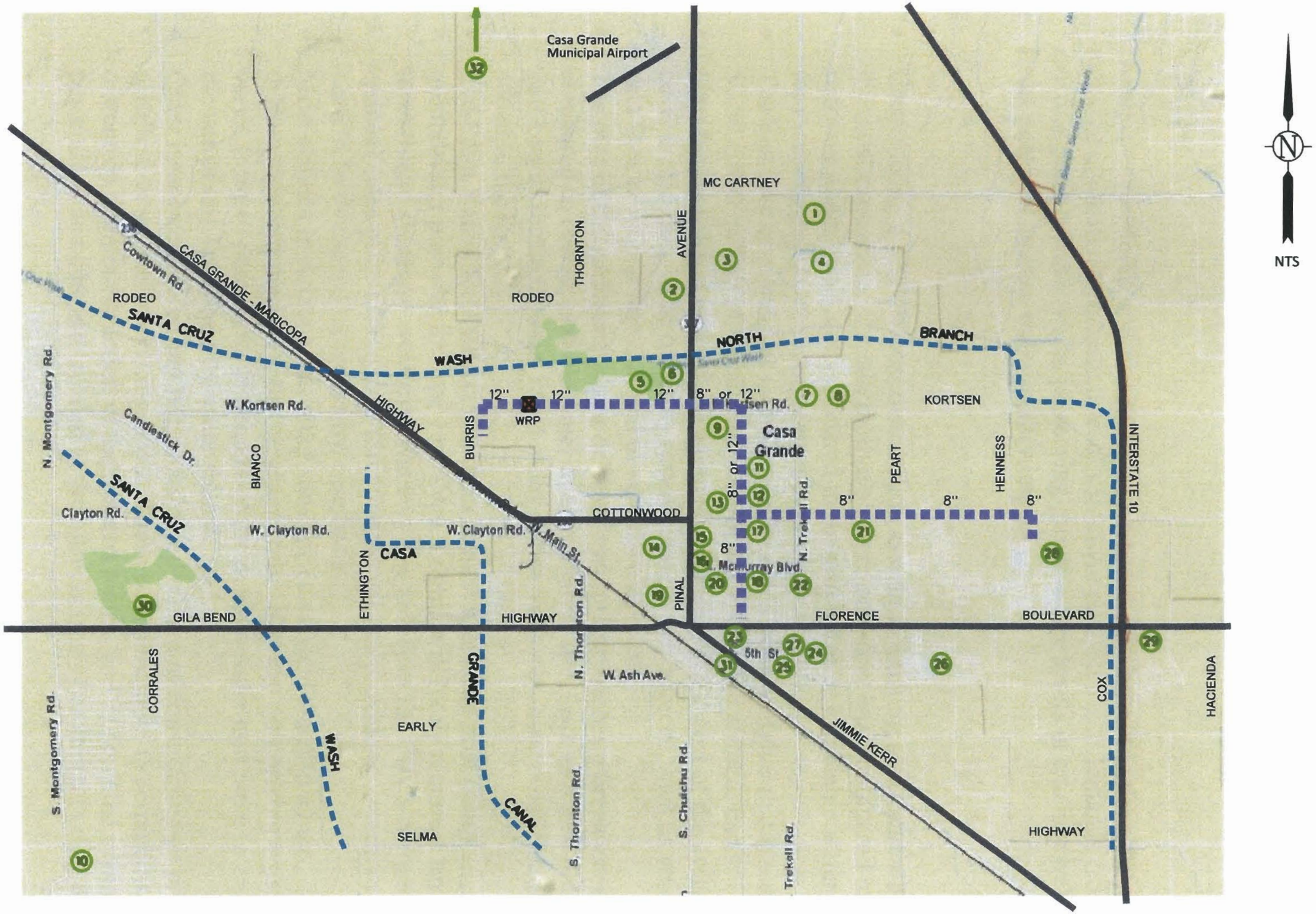
In Alternative 6b, the Palm Creek Resort golf course demand was added to the Alternative 6 system in an effort to increase annual effluent sales and revenue, and make the system more cost-effective. An 8” main would be extended 2.5 miles in Cottonwood Avenue from Casa Grande Avenue to the Palm Creek Resort.

Table 4.1
Existing Parks and Schools in Central Casa Grande

	Type (Turf/Ind)	Acres of Turf	Peak Use MGD	Annual Use (AF)	Map Ref. #
Potential Users					
-					
Casa Grande Union H.S.	T	14	0.16	67.2	1
Coyote Ranch Park	T	5	0.06	24	3
Rancho Grande Park	T	3	0.03	14.4	4
Paul Mason Sports Complex	T	14	0.16	67.2	2
Francisco Grande Golf Course	T	120	1.33	576	30
Francisco Grande Park	T	20	0.22	96	30
Casa Grande Lakes Dev.	T	30	0.33	144	6
College Park	T	10	0.11	48	9
O'Neil Park	T	10	0.11	48	13
Burrus Park	T	5	0.06	24	11
Carr McNatt Park	T	25	0.28	120	18
Ward Park	T	2	0.02	9.6	20
West Park	T	3	0.03	14.4	19
Cruz Park	T	5	0.06	24	14
Frank Gilbert Park	T	5	0.06	24	22
Pearl Park	T	8	0.09	38.4	23
Eastland Park	T	3	0.03	14.4	27
Mosely Park	T	8	0.09	38.4	24
Palm Creek Golf/RV Resort	T	90	1.00	432	28
Mission Royal Golf Club	T	90	1.00	432	29
Ironwood Elementary School	T	4	0.04	19.2	21
Cactus Wind/Casa Verde H.S.	T	5	0.06	24	17
Cactus Middle School	T	7	0.08	33.6	8
Cholla Elementary School	T	4	0.04	19.2	7
Mesquite Elementary School	T	4	0.04	19.2	26
Palo Verde Elementary School	T	4	0.04	19.2	25
Cottonwood Elementary School	T	4	0.04	19.2	12
Casa Grande Middle School	T	7	0.08	33.6	16
St. Anthony School	T	4	0.04	19.2	31
Saguaro Elementary School	T	4	0.04	19.2	15
Total Potential Use		517.00	5.74	2481.60	

Table 4.2
Turf Facilities within 1300 feet of Potential Effluent Distribution System

	Type (Turf/Ind)	Acres of Turf	Peak MGD	Annual Use (AF)	Map Ref. #
Turf Facilities Within 1300' of Mainline					
Casa Grande Lakes Dev.	T	30	0.33	144	6
College Park	T	10	0.11	48	9
O'Neil Park	T	10	0.11	48	13
Burrus Park	T	5	0.06	24	11
Carr McNatt Park	T	25	0.28	120	18
Cottonwood Elementary School	T	4	0.04	19.2	12
Pearl Park	T	8	0.09	38.4	23
Ward Park	T	2	0.02	9.6	20
Saguaro Elementary School	T	4	0.04	19.2	15
Cactus Wind/Casa Verde H.S.	T	5	0.06	24	17
Casa Grande Middle School	T	7	0.08	33.6	16
Total Potential Use			1.22	528.00	



POTENTIAL RECLAIMED WATER USER LIST

Map No.

1. Casa Grande Union H.S.
2. Paul Mason Sports Complex
3. Coyote Ranch Park
4. Rancho Grande Park
5. Dave White Golf / Park
6. Casa Grande Lakes Development
7. Cholla Elementary
8. Cactus Middle School
9. College Park
10. Casa Grande Golf & RV Resort
11. Burrus Park
12. Cottonwood Elementary
13. O'Neil Park
14. Cruz Park
15. Saguaro Elementary
16. Casa Grande Middle School
17. Cactus Wind - Casa Verde H.S.
18. Carr McNatt Park
19. West Park
20. Ward Park
21. Ironwood Elementary
22. Frank Gilbert Park
23. Pearl Park
24. Mosely Park
25. Palo Verde Elementary
26. Mesquite Elementary
27. Eastland Park
28. Palm Creek Golf/ RV Park
29. Mission Royale Golf Club
30. Francisco Grande Golf / Park
31. St. Anthony School
32. Desert Color

MAP LEGEND

Potential User - Turf or Industrial Facility

City of Casa Grande Water Reclamation Plant

Potential Reclaimed Water Distribution Main

Potential Reclaimed Water Users and Distribution System

Figure 4.1

The results of this addition is that the estimated system capital cost increases to $4.8 million and the 20-years annual capital and O&M cost increases to $476,000. However, the total annual effluent sales would increase to just over 1000 AF/YR, reducing the price of the effluent to $1.60 per/1000 gallons ($522/AF). This price is just slightly higher than the current potable rate of $1.49/1000 gallons.

4.6.2 Advantages (Pros) and Disadvantages (Cons) of Alternative

Conclusions and recommendations arising from the results of this conceptual level cost analysis are:

Pros

- Direct use of effluent provides the greatest hydrologic benefit to the aquifer than recharge alternatives because it results in lower potable water demands from existing potable water wells, preserving groundwater levels in existing well fields.
- Least potential aquifer water quality impact.

Cons

- Constructing a new effluent distribution system to existing parks and schools is the most expensive reuse alternative on a per acre-foot basis compared to recharge alternatives, and compared to the current price of potable water if user fees were to pay for the cost of the system.
- The unit cost of reclaimed water would be considerably higher that the current $0.50 /1000 gallons charged by Casa Grande to existing effluent users.
- User fees could not support the annual capital and O&M cost of the system and costs would have to be offset by revenue from other sources, such as wastewater user fees or impact fees charged to new development.
- The cost of the reclaimed water delivery system approaches a break-even cost compared to current potable water rates if a large user, such as a new or existing golf course located within 1 to 2 miles (Palm Valley in this example) can be added to the system.
- The Palm Valley Golf Resort and other similar users that now pump groundwater pursuant to Type 1 or Type 2 rights will likely require a financial incentive to switch to reclaimed water. The ability of the City's current effluent sales price of $163/AF ($0.50/1000 gal.) to provide an incentive would need to be evaluated on a case-by-case basis.
- Most utilities in Arizona and other states price effluent water at a rate discounted from the local potable water costs. Effluent unit pricing typically varies from 40 percent to 80 percent of the potable water unit price to encourage the use of this lower quality water source.
- Other issues need to be carefully considered related to constructing an effluent distribution system to existing users. These issues include: 1) community disruption from construction of distribution mains, and 2) potential community perceptions and concerns related to the introduction of reclaimed water on

public parks and school grounds, 3) financial issues related to Arizona Water Company's lost revenue associated with decreased water sales when facilities convert to reclaimed water supplied by Casa Grande.

4.7 Alternative 7: Direct Delivery to Large Turf Facilities in New Developments

4.7.1 Desert Color Development Agreement and Future Effluent Use

The Desert Color conceptual master plan includes numerous turf facilities, including golf courses, regional parks, and numerous small neighborhood parks that could be irrigated with effluent. The total potential effluent water demand and the timing of the demand by development phase is not known by the developer at this time. The City of Casa Grande has executed a development agreement with the 8,000+ acre master planned community of Desert Color. This agreement includes provisions regarding the future provision by the City of effluent for turf irrigation at parks, common areas and schools, construction uses, lakes, and monument features. Specifically, the agreement includes the following provisions:

- The development is entitled to effluent in the amount of its wastewater flow contribution to the City's WRP, less "normal amounts of processing loss."
- The developer is responsible for constructing an effluent distribution system to convey the effluent from the WRP to the development and to users. The design of the facilities must be approved by the City.
- The facilities shall be eligible for public improvements of the Community Facilities District (CFD).

4.7.2 Potential for Effluent Use on New Large Turf Facilities in Casa Grande

Irrigation of large turf facilities (golf courses, parks, schools, decorative lakes) is a widely practiced and accepted form of effluent reuse in Arizona and other states. As discussed in Chapter 2, many cities in Arizona require large turf facilities in new developments to be irrigated with reclaimed water. Requirements vary, but generally developers are required to install all on-site and offsite reclaimed water delivery system infrastructure, connect to mainlines that have already been installed by the city, or provide on-site reclaimed water piping for later connection to the reuse system when the city constructs mains into the area.

To examine the feasibility of requiring new large turf facilities within Casa Grande to be irrigated with effluent, a projection of potential turf facility irrigation demand in new developments was developed for the Casa Grande planning area. This projection was then compared to the projected availability of effluent for new uses presented in the effluent budgets presented in Chapter 3. The assumptions used to develop the turf demand projection are based on the following Casa Grande Planning Department requirements and discussions with Casa Grande staff:

- The average open space area of new planned developments is 18% (minimum requirement is 15%).
- Though not a requirement, assume 25 % of the open space will be landscaped in turf for recreational uses (includes regional and neighborhood parks, and retention areas).
- Though not a requirement, assume each 640 acres of development will contain one school site that has an average of 7 acres of turf.
- Turf facility demand is 4.8 AF/AC/YR based on ADWR turf allotments.

Based on these assumptions, for every 640 acres of land developed, it is projected that 36 acres of turf will be developed that results in an annual water demand of 172.8 AF/YR (based on 4.8 AF/AC). This equals an AAD demand of 0.15 MGD and a June AAD demand of 0.25 MGD. Using a 10 percent annual residential growth rate, the projected number of new homes constructed annually is approximately 2,500 per year. Assuming an overall density of 2.8 homes/acre based on the Casa Grande General Plan, the number of new acres developed annually would be 893 acres. Using 893 acres of new development annually and the above assumptions, the projected annual demand increase for reclaimed water is 0.21 MGD (AAD) and a peak June day water demand increase of 0.35 MGD.

New development turf water demand projections were then compared to the projected availability of effluent derived from the water budgets. These comparisons are shown in Table 4.3 beginning in 2010 because it is assumed that it will take a minimum of two years for new developments (including Desert Color) to fully develop new turf uses on reclaimed water. The comparisons indicate sufficient effluent should be available on an average annual basis and a peak-day basis to supply large turf areas in new developments, should Casa Grande elect to implement such a requirement. However, there is very little surplus effluent projected during the summer high demand period until about 2015. Until that time, peak summer demands may need to be supplemented with potable water or other sources. The large difference between the AAD demand and peak-day demand emphasizes the importance of having recharge facilities in place to utilize effluent during the winter months when turf irrigation needs are low. The availability of effluent to meet new large turf demand also assumes that SRP does not expand its power plant and require additional effluent, and that no new private or municipal golf courses are irrigated with effluent over the next 5-7 years. If either of those new water demands develop there would likely be a shortage of available effluent during the summer months until after 2015.

Over the long-term through buildout of the service area, development of 2,500 additional homes per year is projected to produce 0.49 MGD of wastewater flow annually (2.8 persons per dwelling unit x 70 gal. per person). When associated commercial and industrial wastewater flows are added, there will be sufficient effluent generated through buildout to provide for peak summer demands in common areas, schools, and parks, with a significant surplus available for other direct uses, including golf course irrigation, industrial uses and groundwater recharge.

Table 4.3
Potential Large Turf Water Demand in New Developments versus Reclaimed Water Available after Current Uses (MGD)

Year	2010	2011	2012	2013	2014	2015	2020	Buildout
Effluent Available June	1.03	1.67	2.56	3.77	4.89	6.18	11.81	36.25
June AAD Turf Demand	0.34	0.69	1.03	1.36	1.72	2.04	3.74	12.3
Surplus/Def.	0.69	0.98	1.53	2.41	3.17	4.14	8.07	23.95
Effluent Available (AAD)	3.66	4.46	5.56	7.06	8.46	10.06	17.06	47.46
AAD Turf Demand	0.21	0.42	0.63	0.84	1.05	1.26	2.31	7.5
Surplus/(Def.)	3.45	4.04	4.93	6.22	7.41	8.8	14.75	39.96

4.7.3 Advantages (Pros) and Disadvantages (Cons) of Alternative

Pros

- Developers can be required to fund a substantial portion of the construction of the mainline and on-site water distribution system.
- Fewer community and public perception issues than requiring direct use at facilities now irrigated with potable water.
- Widely accepted practice, few regulatory issues and constraints with Class A+ water
- Greatest hydrologic benefit – use replaces potable groundwater use.
- Least impact to groundwater quality compared to recharge alternatives.
- Distribution system could also be used to deliver water to recharge facility west of Montgomery Road.

Cons

- Potentially high initial cost to City of building large diameter pipelines in advance of development unless facility construction is phased.

4.8 Alternative 8: Delivery to the Gila River Indian Community (GRIC) in Exchange for CAP Water

This alternative involves constructing a pump station and pipeline approximately 9.25 miles north from the WRP in the Burris Road alignment to deliver water to the Southside Canal, located on the GRIC reservation approximately. The GRIC would use the water for agricultural irrigation and in return, provide CAP water to the City by executing a water exchange contract and enrolling the exchange with the Arizona Department of Water Resources. The City would then sell the water to Arizona Water Company for treatment at AWC's planned Pinal Valley Water Treatment Plant or direct delivery of untreated CAP to industrial or irrigation users within Casa Grande. The GRIC currently has two such effluent CAP water exchanges in place. The City of Mesa contract allows Mesa to deliver a maximum of 29,400 AF/YR of effluent in exchange for 23,520 AF/YR of CAP water. The City of Chandler also exchanges effluent with the GRIC. In these exchanges, the cities receive 4 acre-feet of CAP water for every 5 acre-feet of effluent provided to GRIC.

4.8.1 Cost Estimates

The estimated cost of the facilities required to implement the exchange include:

Pipeline	$12.2 million
Pump Station	2.2
Total Capital Cost	$14.4 million

Pumping Operation and Maintenance Cost $40/AF

CAP water for the purposes of this analysis is valued in terms of the estimated cost to acquire main-stem Colorado River water rights at $2,000 per AF, plus the cost to wheel the water through the CAP system (CAP capital charges, OM&R, and pumping costs).

In addition, the annualized capital and O&M cost of treating the CAP exchange water at an expansion of AWC's planned Pinal Valley WTP must be included in the analysis, even though it is not a direct cost to the City. This cost is estimated at approximately $500/AF ($100 per AF operation and maintenance costs; and $400/AF annualized capital cost based on 50 percent of the per AF capital cost of Phase I of the Pinal Valley WTP of $75 million for 10 MGD capacity plant).

4.8.2 Advantages (Pros) and Disadvantages (Cons) of Alternative

Pros

- Providing additional surface water source to the service area will directly offset future groundwater pumping and results in greatest hydrologic benefit.
- No permitting issues/uncertainties associated with recharge alternatives.
- As the cost of Colorado River supplies increases, cost per acre-foot for this alternative becomes more competitive with other alternatives.

Cons

- Dependent on successful completion of surface water treatment plant to implement.
- May require lengthy negotiations to execute exchange and water sale to AWC.
- High per acre-foot cost when cost of potable water treatment considered.

4.9 Alternative 9: Dual Distribution System (Purple Pipe System) to Deliver Effluent to Individual Residences for Outdoor Irrigation Use

Effluent delivery to individual residences for outdoor irrigation uses is not a common practice in Arizona or other western states. Deliveries to large turf irrigation customers and groundwater recharge are generally the most cost-effective water reuse strategies. However, the costs and benefits of providing reclaimed water to all customers in new subdivisions was evaluated and presented here for comparison to other alternatives.

Post Ranch, a 640-acre development located at east of Overfield Road and south of Florence Boulevard, was selected as a fairly typical new subdivision for which to evaluate this alternative. Post Ranch was not selected because of its geographical location. Location of a subdivision had no bearing on this analysis because only the costs of reclaimed water mains within the development were included. Capital and annual operation and maintenance costs were developed for a complete dual distribution system designed to deliver effluent to large turf users, common area landscaping tracks and each of 1,655 individual residences within the development. It is estimated that a dual distribution system for the development would enable direct use of a maximum of approximately 420 acre-feet of effluent annually if all homeowners used effluent exclusively for outdoor irrigation uses. This figure is based on ADWR Third Management Plan outdoor residential use target of 131 gallons per housing unit per day for new development and 4.8 AF/AC for common area landscaping and parks and schools. The annual projected effluent demands break out as follows:

Park	30 AF
School	30 AF
Open Space	122 AF
Residences	238 AF
Total	420 AF

This level of use is considered optimistic, as some homeowners can be expected to prefer using potable water due to its higher quality and due to perception issues related to reclaimed water. Maps showing the potential reclaimed water system for Post Ranch are found in Appendix 3.

4.9.1 Cost Estimates

The costs for a complete dual reclaimed water distribution system for the Post Ranch development would require the following estimated capital expenditures, in addition to the costs of the potable water system for the development.

Reclaimed Water Mains (93,000 ft of 8,6,and 4-inch)	$4.8 million
Reclaimed Water Pump Station	1.5
Reclaimed Water Services and backflow preventers	1.8
Total Estimated Capital Cost	$8.1 million

In addition to relatively high capital costs for only 420 AF/YR of effluent use, significant annual operation and maintenance costs for the effluent distribution system within the development must also be considered. These cost estimates include:

Annual RP Backflow test ($50 per test)	$ 83,000
Service replacements (12 @ $2,500)	270,000
Valve maintenance	154,000
Meter reading (monthly)	23,000
Blue Stake	12,000
Meter Change outs	5,000
Annual pumping cost/pump maintenance	50,000
Total Estimated Annual O&M Cost	$597,000

Note: (Cost estimates provided by Arizona Water Company)

4.9.2 Advantages (Pros) and Disadvantages (Cons) of Alternative

<u>Pros</u>

- Maximizes direct use of effluent

<u>Cons</u>

- Very high capital and annual operation and maintenance cost per AF compared to other alternatives
- Potential health concerns with unregulated misuse of reclaimed water at individual residences.
- Difficulties in enforcing backflow prevention practices at residences and potential for cross-connection and contamination of potable water system.
- Availability of effluent throughout development at a lower unit cost than potable water could promote the establishment of high landscape water demands.
- Potable water unit rates for consumers may increase significantly because annual potable water sales would decrease significantly but overall cost to potable system capital and maintenance costs would not decrease significantly.

4.10 <u>Alternative 10</u>: Interim Direct Delivery of Effluent to Individual Farms

Effluent could be delivered to individual farms located along pipelines that would be constructed to deliver water to either constructed recharge facilities, groundwater savings facilities, or to supply other direct users. This alternative is considered to be an incidental interim use because the farms located closest to the Kortsen Road WRP will likely be urbanized within the next 10-15 years. No cost estimate is provided for this alternative due to the individual nature of each agricultural grower's situation. However, costs should be minimal when the farmland is located adjacent or near planned effluent pipelines. The additional infrastructure needs would consist of installing valve and metering stations, and a pressure reduction valve to enable discharge to the farm's irrigation ditch network. It is recommended that the potential for agricultural deliveries of this type be evaluated during detailed project engineering for selected reuse project alternatives.

4.11 <u>Alternative 11</u>: Provide Effluent to Contractors for Use as Construction Water and for Dust Control

Class A+ effluent is suitable for use in construction for ground settling, dust control and other activities. The City could construct stations for filling of water trucks. The City of Flagstaff currently maintains four such water stations. Stations could be established at the WRP plant site and at strategic locations along the alignment of any effluent distribution system constructed to deliver water to either recharge facilities or to supply direct irrigation users. One potential constraint for general contractors using reclaimed water for dust control is that water trucks may not be used for potable water use unless disinfected using approved methods. While construction water and dust control water use are not a large use currently (approximately 50 AF/YR), dust control issues in Pinal County are increasing, and water for dust control is likely to be a growing need. One additional benefit of providing effluent for dust control is encouraging community attitudes regarding the importance of water conservation.

4.12 Alternative 12: Provide Effluent for Irrigation of Planned Linear Parks and Trail Corridors

The City's Trail System Master Plan was reviewed and evaluated for opportunities for reclaimed water use. The plan calls for the construction of a system of regional multi-use trails that will have landscape elements requiring irrigation water for desert-type trees and shrubs and perhaps turf.

"Linear Parks" are defined as 100' wide open-space corridors that include paved pathways, trails, native and constructed landscapes, rest areas, and other amenities. In some areas the parks may be as wide as ¼ mile. The Casa Grande Linear Park will run along the North Branch of the Santa Cruz Wash north of the Kortsen Road WRP, then south along Burris Road for several miles. This park could be served by potential effluent distribution mains along Burris Road or Thornton Road that deliver effluent to a future recharge facility at the Municipal Airport, and/or the main that delivers water to the turf users within the Desert Color development. In addition, a "Resource and Trail Park" that may have significant irrigation demands is planned along Burris Road at Camino Grande Road north of the WRP. There is also a major "Community Trail" corridor planned for almost the entire length of the Montgomery Road alignment within the municipal planning area. This trail could be provided effluent from mains constructed west to a future recharge facility and/or to deliver effluent to the Francisco Grande Resort.

It is recommended that the City's Planning and Parks and Recreation Departments be consulted during future reclaimed water main planning activities to determine the timing of construction of trails and near-term and longer-term opportunities for reclaimed water use at these facilities.

4.13 Alternative 13: Multi-Use Groundwater Recharge Facility

Several cities in central Arizona have constructed multi-use groundwater recharge facilities that include spreading basin recharge facilities combined with features such as constructed wildlife habitat and recreational amenities like hiking trails, wildlife viewing platforms, picnic areas, fishing lakes, and educational kiosks and centers. The Town of Gilbert's Riparian Reserve is a prime example of a popular facility that is visited and enjoyed by tens of thousands of people each year. However, a spreading basin recharge facility that provides other benefits to the community in association with effluent recharge can go a long way to facilitate acceptance by the local community. No cost/benefit analysis is provided for this type of facility because projects of this nature can include any combination of facilities and resulting costs. However, multi-use projects are typically very expensive. As an example, the total construction budget for the City of Chandler – Chandler Heights Recharge Project on 103 acres, exceeds $22 million (Source: City of Chandler Utilities Department). However, other City Departments are contributing a significant amount of capital funding toward the project.

4.14 Comparison of Effluent Use Alternatives

There are numerous effluent use alternatives available to the City of Casa Grande, each with different estimated costs, benefits, water resources and hydrologic benefits, and potential regulatory and institutional constraints. Table 4.4 summarizes these factors for each alternative. The estimated capital costs, O&M costs, potential revenues from the sale of effluent or long-term storage credits, and the annual net cost per acre-foot of water sold or recharged are provided. The hydrologic benefits to the local aquifer from which Arizona Water Company provides water to the City of Casa Grande are rated for each alternative on a scale of 1 to 3 (1 being greatest benefit). Finally, the potential institutional and regulatory constraints to implementation are rated from 1 to 3 (1 being the fewest constraints). Figure 4.2 shows the location of the various effluent use projects and pipeline alternatives.

Recharge/Water Exchange Alternatives

Cost/Benefit: The estimated capital costs of recharge alternatives vary widely, from $23.4 million for a spreading basin facility located west of Montgomery Road (Alt. 4) to only $0.4 million for a managed recharge facility in the Santa Cruz Wash (Alt. 5). After accounting for potential revenue for sale of long-term storage credits at $200/AF, the annualized cost per acre-foot of water recharged varies from $418 per acre-foot for injection wells located at the airport (Alt. 3) to a negative $171 per acre-foot (net benefit) for a managed recharge facility in the Santa Cruz Wash (Alt. 5).

Providing effluent to the GRIC in exchange for CAP water is the most expensive of the recharge/exchange alternatives due to the added cost of treating the CAP water for potable use.

Hydrologic Benefit: Providing effluent to the GRIC in exchange for and direct use of CAP water by Arizona Water Company would provide the greatest hydrologic benefit of any alternative because it would directly offset groundwater pumping by AWC. From the perspective of hydrologic benefit to the aquifer, recharge at the airport should provide the greatest immediate benefit of the recharge alternatives because water would be recharged in an area closest to existing and planned potable water production well fields of Arizona Water Company and in an area where the perched aquifer conditions do not exist. Recharge carried out in facilities constructed west of Montgomery Road or in-lieu recharge done in the MSIDD or SCIDD GSF facilities would benefit the aquifer serving Casa Grande in a more indirect and long-term manner.

RECLAIMED WATER USE ALTERNATIVES

1. Pipeline to Santa Rosa Canal for Delivery to MSIDD GSF

1b. 16" Pipeline to Casa Grande Canal for Delivery to SCIDD GSF

2. Pipeline to Airport - Construct Vadose Zone Wells

3. Pipeline to Airport - Construct Injection Wells

4. Pipeline West to Montgomery Road - Construct Spreading Basins

5. Managed Recharge Facility in Santa Cruz Wash

6. Direct Delivery to Existing Parks and Schools (11 Users)

6b. Direct Delivery to Existing Parks, Schools, and Golf Courses (12 Users)

7. Direct Delivery to new Users (I.E. Desert Color)

8. Delivery to Gila River Indian Community in Exchange for CAP Water

MAP LEGEND

Reclaimed Water Use Alternatives

City of Casa Grande Water Reclamation Plant

Potential Reclaimed Water Distribution Main

Reclaimed Water Use Alternatives

Figure 4.2

Institutional/Regulatory Issues: Alternative 2 - vadose zone wells located at the airport, has the fewest regulatory (permitting) and institutional constraints and uncertainties of the recharge alternatives. All other recharge or water exchange alternatives have more significant permitting, community issues, or institutional uncertainty associated with the projects.

Direct Use Alternatives

Cost/Benefits: Of the direct use alternatives studied, Alternative 9 – Dual Distribution System (Purple Pipe System) to deliver effluent to individual residences for outdoor irrigation use is by far the least favorable from a cost/benefit perspective. This alternative, with a net cost $3,068/AF, is approximately five to ten times more expensive than other direct use alternatives. Alternative 6 – Construction by the City of a distribution system to deliver effluent to 11 existing parks and schools, is the next least favorable from a cost/benefit perspective (net cost $538/AF). When a major golf course user is added to the system (Alternative 6b) the economics become more favorable, but the net cost is still $323/AF. Alternative 7 – Delivery to new users through a system constructed largely by developers and operated by the City would have a lower cost-benefit than Alternative 6b if a substantial part of the effluent delivery system is constructed by developers at their cost.

Institutional/Regulatory Issues:

Irrigation of large turf facilities using effluent is a common practice in Arizona and other states. However, constructing an effluent distribution system to existing parks and schools in central Casa Grande was rated as having the greatest potential for institutional constraints to implementation. These issues include: traffic disruption during construction, water pricing challenges to implementation, and relations issues in switching to reclaimed water. These issues are significantly less in relation to reclaimed water use on large turf facilities in new developments (golf courses, parks, and schools) at the inception of the development and should not deter implementation of direct use for large turf facility irrigation in new developments. Constructing a dual distribution system to deliver effluent to all homeowners was also rated a having the greatest potential for regulatory issues related to potential misuse of water by homeowners and cross-connection potential with the potable system.

Table 4.4
Comparison of Effluent Use Alternatives

Effluent Use Strategy	Total Capital Cost ($mil)	Pipe Cost ($mil)	Pump Station Cost ($mil)	Other Cost ($mil)	Rech. Facil. Cost ($mil)	Annual O&M Cost	GSF Water Sale Revenue	Total Annual Cost per AF (1)	Cost/AF after Sale or Exchange (4)	Hydro. Benefit (2)	Instit. Regul. Issues (3)
(1) Pipeline to Santa Rosa Canal for Delivery to MSIDD GSF	**$13.3**	$11.1	$2.2	$0.0	$0.0	$440,000	$220,000	$141	**-$59**	3	3
(1b) 16" Pipeline to Casa Grande Canal for Delivery to SCIDD GSF	**$5.0**	$3.2	$1.8	$0.0	$0.0	$220,000	$110,000	$110	**-$90**	3	3
(2) Pipeline to Airport - Construct Vadose Zone Wells	**$17.8**	$5.0	$2.2	$0.0	$10.6	$540,000	$0	$211	**$11**	1	1
(3) Pipeline to Airport - Construct Injection Wells	**$21.3**	$5.0	$2.2	$5.0	$9.1	$2,465,000	$0	$418	**$218**	1	2
(4) Pipeline West to Montgomery Rd. - Construct Spreading Basins	**$23.4**	$6.6	$2.2	$5.8	$8.8	$540,000	$0	$262	**$62**	2	1
(5) Managed Recharge Facility in Santa Cruz Wash	**$0.3**	$0.0	$0.0	$0.3	$0.0	$100,000	$0	$29	**-$171**	2	2
(6) Direct Delivery to Existing Parks, Schools (11 users)	**$3.2**	$1.7	$1.0	$0.5	$0.0	$50,000	$0	$701	**$538**	1	3
(6b) Direct Delivery to Existing Parks , Schools, Golf C.(12 User)	**$4.8**	$2.6	$1.5	$0.7	$0.0	$60,000	$0	$486	**$323**	1	3
(7) Direct Delivery to New Users (e.g. Desert Color) (8)	**NA**	NA	NA	NA	$0.0	$60,000	$0	$486	**$323**	1	1
(8) Delivery to GRIC in Exchange for CAP Water (6)	**$16.6**	$14.4	$2.2	$0.0	$0.0	$440,000	$0	$191	**$266**	1	3
(9) Dual Distribution System for use at Individual Residences (7)	**$8.1**	$4.9	$1.5	$1.8	$0.0	$597,000	$0	$3,350	**$3,187**	1	3

Notes

(1) Cost less revenue derived from delivery to facility
(2) Hydrologic benefits based on location of recharge in relation to current and projected areas of groundwater declines - 1 = greatest benefit
(3) Institutional and regulatory constraints - 1 = fewest potential constraints to implementation
(4) Assumptions: Long-term Storage Credit value$200/AF, direct delivery price $0.50/1000 gal ($163/AF), CAP exchange water value $425/AF based on $2,000/AF cost to purchase Colorado R. rights and additional cost to wheel through CAP system
(5) Capital costs assumed amortized over 20 years at 6% interest.
(6) Includes annualized capital and O&M cost of water treatment plant expansion
(7) For delivery of 420 AF/YR effluent to 1624 homes and large turf areas in Post Ranch Development
(8) General capital costs based on those developed for alternative 6b

Chapter 5 – Recommended Reclaimed Water Use Action Plan

5.0 Overall Recommendations

As described in Chapter 2, most municipalities and many private wastewater providers in Arizona use a combination of direct and indirect effluent use strategies to achieve full or near-full beneficial reuse of effluent. Based on the analysis of alternatives for the City of Casa Grande presented in Chapter 4, several viable effluent use alternatives exist that, if implemented, could achieve full use of projected effluent volumes while providing long-term water management benefits to the area and financial benefits to the City.

This chapter provides recommendations regarding the alternatives that appear the most favorable for further evaluation, including a recommended action plan for implementation of selected alternatives. A combination of direct effluent use alternatives and recharge project implementation is recommended. Recommendations are divided into Near-term (2008-2010) and Long-term (2011-2015).

5.1 Near-Term Action Plan (2008-2010)

The following are actions recommended in the 2008-2010 period:

1) Pursue permitting in 2008-09 of a managed underground storage facility (USF) in the North Branch Santa Cruz Wash as an interim, low-cost recharge solution.

2) Begin discussion as soon as possible with the Central Arizona Groundwater Replenishment District (CAGRD) leading to a Memorandum of Understanding regarding a long-term agreement for sale of long-term storage credits to CAGRD.

3) Implement a policy/ordinance requiring new golf courses and large turf facilities in new developments (where cost-effective) to be irrigated with reclaimed water. Require developers to construct the necessary reclaimed water infrastructure, for ownership and operation by the City. As part of this policy, develop a standard effluent pricing structure for all future customers.

4) Consider contributing capital toward over-sizing of effluent transmission mains and pump stations constructed by developers. Over-sizing would facilitate development of a back-bone system capable of delivering effluent to new developments located north, west, and south of the Kortsen Road WRP.

5) Evaluate the Burris Road alignment south and Highway 84 west for sizing and construction of a back-bone effluent transmission main to deliver effluent potentially to: Francisco Grande Resort, a constructed recharge facility west of the resort, in-lieu water to SCIDD and MSIDD canals, and deliveries to other large turf users in new developments (e.g. the Legends golf course).

6) Pursue studies leading to the implementation of a 10 MGD capacity constructed underground storage facility located at either the Airport (using vadose zone wells) or west of Montgomery Road (either spreading basins or vadose zone wells). As a first step, conduct detailed hydrogeologic studies, to include conducting ring infiltrometer tests, and drilling shallow and deep test holes at the Airport and at selected areas west of Montgomery Road (west of Francisco Grande Resort) to evaluate recharge potential at selected locations.

7) Meet with representatives of the Maricopa Stanfield Irrigation District (MSIDD), the Central Arizona Irrigation and Drainage District (CAIDD), and the San Carlos Irrigation and Drainage District (SCIDD) to evaluate the potential quantity of effluent that could be delivered as in-lieu water to the Groundwater Savings Facilities operated by those entities.

8) Consider contributing capital to over-size the Burris Road effluent main to be constructed by the Desert Color development to enable effluent deliveries to a future airport recharge facility, other direct users, or to a potential effluent/CAP water exchange with the GRIC.

9) Initiate discussions with the Central Arizona Groundwater Replenishment District (CAGRD) leading to an agreement in 2008 involving effluent sales to CAGRD and some form of CAGRD financial, technical or operations involvement in a Managed and/or Constructed Underground Storage Facility.

10) Based on the results of the hydrogeologic studies and effluent pipeline studies, develop a 6-year water reclamation capital improvement program budget for the 2010-2015 period.

11) Based on the CIP budget, implement a Water Reclamation Development Impact Fee to new development to be used in funding the capital needs of the projects selected for implementation.

12) Negotiate a Memorandum of Understanding with Arizona Water Company (AWC) regarding: 1) AWC's future operation and maintenance of City-owned reclaimed water distribution and recharge facilities, and 2) Cooperation regarding future planning activities designed to maximize the beneficial use of reclaimed water.

13) Evaluate the potential to use El Paso Natural Gas Company's abandoned 12" steel gas pipeline in the Burris Road alignment as an interim conveyance method for effluent. This pipeline extends both north and south from Kortsen Road for several miles.

5.1.1 Studies Needed to Facilitate Implementation of 2008-2010 Action Plan Recommendations

1) Hydrogeologic modeling study and permitting assistance to implement a managed underground storage facility in the North Branch of the Santa Cruz Wash (Estimated Budget: $20,000 to $30,000).

2) Hydrogeologic testing program (including test drilling) to evaluate the viability of two recharge facility locations: the Municipal Airport and an area west of the Francisco Grande Resort (Estimated Budget: $175,000 to $200,000).

3) Reclaimed water distribution system planning study to develop a back-bone distribution system plan to serve turf facilities in new developments, planned linear parks and trail corridors, and deliver water to planned recharge facilities and selected irrigation and industrial users (Estimated Cost: $50,000 to $75,000).

4) Conduct a consultant or in-house study to develop a water reclamation impact fee component as part of the sewer develop impact fee (Estimated cost: $30,000 to $50,000).

5.2 Long-term Action Plan (2011-2015)

The following are actions recommended in the 2011-2020 period:

1) By 2014, construct a 10 MGD capacity recharge facility at either the Airport location or a location west of Montgomery Road. Depending on the growth rate of effluent production over the 2008-2014 period and the growth of direct use customers, construction of the recharge facility capacity could be phased.

2) Construct the first phase of a back-bone reclaimed water transmission system to deliver water to new large turf users, linear parks, industrial users, and recharge facilities.

3) Evaluate the feasibility, costs, and benefits of reducing the size of the existing 120-acre effluent holding pond to reduce evaporation losses and increase the availability of effluent for direct deliveries and underground storage. For example, downsizing the ponds to 20 acres would reduce annual evaporation losses by approximately 500 AF/YR. If sold at $200/AF, this would generate an additional $100,000 per year in revenue. Downsizing the ponds could also free up land for the construction of future treatment plant expansions beyond the Phase III expansion capacity of 12 MGD.

4) Develop additional direct and indirect reclaimed water use plans to enable beneficial use of all additional effluent flows projected through buildout.

Plans should be based on the assumption that additional discharges to the Santa Cruz Wash beyond current AZPDES permit limitations of 6 MGD may not be possible in the future, except under emergency conditions.

Chapter 6 – Water Reclamation System Funding Alternatives

6.0 Overview

Construction of a major reclaimed water distribution system and groundwater recharge facilities to achieve full use of available effluent will require significant capital resources over the next 5-6 years. The cost estimates for the reuse alternatives studied indicate potential costs in the range of $20 million to $30 million over the next 6 years. This Chapter summarizes alternative mechanisms for funding the planning, design, and construction of reclaimed water distribution facilities. The alternatives discussed here include:

- Development Impact Fees
- Wastewater Rate Increases
- Developer-Construction of Facilities
- Developer Contributions toward the City-constructed Facilities
- Central Arizona Groundwater Replenishment District (CAGRD) contributions to funding facilities in association with an effluent purchase contract

6.1 Development Impact Fees

The City currently collects a sewer development impact fee of $4,116 per unit for a ¾" water meter and $6,914 for a 1" water meter. The sewer fee levels were increased in September, 2007, primarily in the Collection category. Proportionally higher fees are charged for multi-family and commercial developments purchasing larger meter sizes. The total fee is partitioned into the following categories comprising the indicated percentage of the total fee: Treatment (37.2%), Collection (59.96 %), Equipment (2.7%), and Studies (0.04%). In calendar year 2007, approximately $3.85 million in sewer impact fees were collected. Of that total, $2.4 million (62.3%) was related to single family residential permits and $1.45 million (37.7%) was related to commercial impact fees. These totals reflect the lower sewer impact fees that were in effect for most of 2007 and are based on 1005 single family permits issued in 2007. Approximately 71 commercial permits and 1 public building permit were issued.

A potential means of funding the study, design, and construction of reclaimed water facilities would be to implement a "Water Reclamation" category to the existing sewer development fee. This section presents a high-level analysis to evaluate how much the sewer impact fee would potentially need to be increased to fund some of the alternative projects identified in this plan. The following assumptions provide the basis of the "what-if" analysis:

- Potential capital needs of $30 million over the 2010 to 2015 period. This figure might potentially include the cost of some or all of the following facilities: 1) one major 10 MGD recharge facility, 2) a managed recharge facility in the Santa Cruz Wash, 3) a 10 MGD reclaimed water pumping station and transmission main, and 4) some participation in over-sizing of reclaimed water mains constructed by developers.

- A return to an average new single family home construction rate of 2,000 units per year that contribute impact fees.
- Additional commercial impact fees revenues at recent historical percentages of residential impact fees.

Based on the above distribution of single family unit versus commercial unit sewer impact fees collected in 2007, implementing a water reclamation impact fee at various levels would result in the estimated annual revenues shown in the Table 6.1 below.

Table 6.1
Potential Annual Water Reclamation Impact Fee Revenues

Potential SF Unit Recl. Fee	Potential Revenue SF Units	Potential Revenue Com. Units	Total Potential Revenue
$250	$500,000	$302,000	$802,000
$500	$1,000,000	$604,000	$1,604,000
$750	$1,500,000	$906,000	$2,406,000
$1,000	$2,000,000	$1,208,000	$3,208,000
$1,500	$3,000,000	$1,812,000	$4,812,000

For example, annual fee revenues of $2.4 million could, in theory, pay for the annual debt service on approximately $24 million in capital improvements related to a new water reclamation program, if projects are financed over 20 years at approximately a 6 percent interest rate.

6.2 Central Arizona Groundwater Replenishment District (CAGRD) Funding

The Central Arizona Groundwater Replenishment District (CAGRD) has expressed a desire to purchase effluent from the City and other operators of wastewater treatment plants to meet its Plan of Operation targets for acquiring long-term water supplies. The Plan of Operation currently identifies replenishment obligations of approximately 11,000 AF/YR by the year 2020 in the Pinal AMA. However, with recent changes to the state's Pinal AMA Assured Water Supply Rules, it is anticipated that more developments within the AMA will need to enroll in the CAGRD, thereby increasing the long-term replenishment obligations well beyond 11,000 AF/YR.

A meeting was held with Mr. Cliff Neal and Mr. Tom Harbour of the CAGRD on January 23, 2008 to discuss the CAGRD's interest in pursuing an agreement with the City of Casa Grande regarding purchase of effluent or purchase of long-term storage credits. Several topics and alternatives for cooperation between the City and CAGRD were discussed, including:

- CAGRD's long-term water needs in Casa Grande and Pinal County

- Projected effluent available for recharge from Korsten Road WRP (and current uses).
- Potential for CAGRD to provide up-front funding for design and construction of reclaimed water conveyance distribution and recharge facilities in return for a 100-year commitment by the City to provide a specific volume of credits annually.
- Interest and ability for CAGRD to provide staff expertise related to design and construction of facilities.
- Potential ownership and operation of recharge facilities by CAGRD.
- Potential joint ownership of recharge facilities.

6.2.1 Meeting Outcomes and Conclusions Regarding Most Feasible CAGRD-City of Casa Grande Partnering Opportunities

Based on the discussion at the meeting, the following are recommendations regarding the most feasible framework for an agreement with CAGRD.

- The CAGRD need for long-term water supplies exceeds the amount of effluent projected to be available for recharge through the year 2015. CAGRD would be interested in purchasing as much storage credit as could be produced at a 10 MGD Casa Grande recharge facility.
- CAGRD would prefer to enter into a long-term contract with the City for purchase of storage credits generated at City-owned and operated facilities. For meeting ADWR assured water supply criteria, CAGRD would prefer a contractual commitment of 100-years.
- In return for a long-term commitment, CAGRD is prepared to discuss providing a significant up-front capacity payment for each acre-foot of effluent storage credit provided. In addition, an annual charge for each acre-foot of water recharged would be paid by CAGRD to the City (i.e. an operation and maintenance charge).
- If an agreement can be reached, CAGRD may be willing to provide technical assistance to the City in the pre-design study, design and permitting phases of bringing a recharge facility on-line.
- It will take 4-5 years to design and construct a constructed recharge facility, when all pre-design studies, land acquisition, design, permitting, and construction are considered. It was discussed that a first step to take to begin recharging effluent as soon as possible (within the next 18 months) would be to implement a Managed facility in the North Branch of the Santa Cruz Wash. This could enable CAGRD to begin purchasing storage credits and make an initial capital contribution toward implementing the Managed facility and potentially toward the planned constructed recharge facility.
- Though not discussed with CAGRD at the meeting, it is recommended the City require that any storage credits sold be reserved by CAGRD to meet groundwater replenishment obligations of developments within the City of Casa Grande.

<u>Potential Revenue Generation</u>

If a contract for 1,000 acre-feet/year of effluent storage credits were made to the CAGRD at a cost of $2,000 per acre-foot, this would generate $2 million in up-front funding to the City for design, permitting and construction of groundwater recharge facilities. This value was selected for this example because it approximates the current value per acre-foot of the 100-year CAP water leases secured by cities from the Gila River Indian Community (GRIC) as part of the GRIC Water Rights Settlement in 2006. Table 3.4 indicates that in 2008, approximately 2,644 AF of effluent will be available to deliver to an underground storage facility on an average annual basis. If this volume of effluent was delivered to a "Managed" USF in Santa Cruz Wash, approximately 925 AF of long-term effluent storage credits could be generated if 35 percent of the water discharged to the wash were counted as credits by ADWR.

In addition to paying a capital charge, CAGRD would pay an annual operation and maintenance fee for each acre-foot of water that generated a storage credit. This fee would be based on the annual cost to operate and maintain the effluent distribution system from the plant to the recharge site, plus the cost to operate and maintain the recharge facility (including permit maintenance, testing and regulatory reporting).

6.3 Wastewater Rate Increases

The potential impact on wastewater rates (or user fees) of funding the capital and operation and maintenance costs of an effluent distribution system and recharge facility was investigated. The following data for 2007 was used in this analysis, provided by the City of Casa Grande Finance Department:

- Total residential sewer connections – 12,209
- Total commercial sewer connections – 616
- Average residential monthly sewer bill - $11.68, which generates approximately $1.71 million per year in revenue.
- Assume annual inflation adjustment increases in sewer rates pay for other Departmental capital costs and operation cost increases.
- Assume average commercial sewer connection pays $50/month in user fees and generates $0.37 million per year in revenue.
- Total revenue collected in 2007 approximately $2.08 million

<u>Conclusions</u>

In order to potentially fund a $30 million water reclamation capital program ($3.0 million in potential debt service) solely with increases in user fees would require approximately a 150 percent increase in sewer fees. It is therefore doubtful that sewer rate increases are a feasible alternative to generate anywhere near the full capital revenue needs of the projects discussed in this plan. However, rate increases in the range of 10 to 15 percent could generate additional revenues in the range of $200,000 to $300,000 to pay for annual operation and maintenance costs of new reclaimed water distribution and recharge facilities. In addition, the annual sale of long-term storage credits to the CAGRD, developers, or water providers should generate enough revenue to cover operation and maintenance costs and could be priced to generate a net positive cash flow for the City.

Sale of effluent for direct irrigation uses to large turf areas could also generate significant additional annual revenues for the City. For example, at the current price of $163/AF charged to the SRP's Desert Basin power plant, sale of each additional 1,000 AF/YR of effluent would generate $163,000 per year and pay for a significant portion of the projected annual O&M cost of a reclaimed water distribution system. It may be possible in the future to increase the rate charged for direct sale of effluent. While each city's situation is unique, several cities in central Arizona currently sell effluent at rates that are significantly higher than $163/AF, some as high as $500/AF to $600/AF.

6.4 Developer-Constructed Facilities and Developer Contributions to City Constructed Effluent Transmission Facilities

6.4.1 Developer-Constructed Facilities

Several cities having extensive effluent distribution networks require new developments containing golf courses, parks, schools, or common areas exceeding a certain acreage of turf to install the effluent distribution mains to the turf areas at the developer's cost (usually 12" and smaller mains) from the city's backbone effluent distribution system. This policy allows the reclaimed mains to be installed at the time the development installs streets, potable water, and sewer mains and avoids later disruptions. The city's capital improvement program is then responsible for paying only for the pumping, storage, and larger transmission mains.

Some developers of large master planned communities having extensive reclaimed water demands may wish to develop in advance of the City of Casa Grande's CIP program schedule for constructing large effluent transmission mains into the area. In such a case, the City may wish to contribute funding through a development agreement toward the developer's construction of the main to "over-size" the pipe above the developer's needs to provide for planned future regional needs. This can be a cost-effective way of building a system over time. Another variation of this approach is to have the developer pay up-front for the full cost of the larger pipe and receive payback through credits on the water reclamation impact fee (assuming there is a fee in place).

6.4.2 Developer Contributions Toward City-Constructed Facilities

This approach has been used in Scottsdale, where 22 golf courses receiving effluent from the city's system were required to contribute an up-front proportional share of the capital cost of the system (per MGD of delivery capacity). In addition, developers were required to build their own connecting main. This approach is well-suited where a few large users are the primary customers of the system.

6.5 Funding Options – Conclusions and Recommendations

There are several feasible alternatives available to the City of Casa Grande to fund the construction and operation of new reclaimed water use projects. Use of a combination of the approaches discussed in this chapter is recommended. It is recommended that the City consider implementing some combination of the following funding approaches:

- After developing a 6-year water reclamation capital improvement program budget, implement a water reclamation impact fee component to the existing sewer impact fee to fund reclamation program capital needs.
- Enter into discussions with the Central Arizona Groundwater Replenishment District toward a Memorandum of Understanding involving an up-front capital contribution from CAGRD in return for a long-term commitment for sale of long-term storage credits.
- Consider future sewer rate increases to pay for annual water reclamation operation and maintenance costs that cannot be covered by annual revenues from sale of effluent and long-term storage credits to users.
- Consider increasing the rates charged for direct effluent sales in the future, within the constraints of current contracts.
- In the future, when the City's backbone effluent transmission system has been planned, implement an ordinance requiring developers of large turf facilities to construct and dedicate smaller diameter mains to connect to the City' system.
- Consider City financial participation in developer-constructed pipelines.

Chapter 7 - Framework for City of Casa Grande-Arizona Water Company Memorandum of Understanding (MOU)

7.1 Overview

The City of Casa Grande (the "City") currently does not operate pressurized water delivery systems within the City. That responsibility has been carried out for many years by Arizona Water Company ("AWC"). In addition to operating its Casa Grande water system, AWC operates the Coolidge, Arizona City, Apache Junction, Superior, Oracle, San Manuel, Stanfield and Tierra Grande water systems in Pinal County, as well as other systems in 7 other counties in Arizona. Both entities recognize the importance of maximizing the beneficial use of effluent as a component of meeting projected long-term water resources needs within the Pinal Active Management Area. Toward that goal, the City staff and AWC have agreed to explore feasible alternatives for a formal Memorandum of Understanding with the overall objective of maximizing the cost-effective, beneficial use of effluent produced at the Kortsen Road WRP. This chapter describes several alternatives regarding how the entities might work together to share responsibilities and create synergies that serve to promote cost-effective effluent use opportunities. Discussion is provided regarding a potential framework for the MOU that would lay out the responsibilities of the two entities with respect to:

- Planning of reclaimed water use facilities
- Design and permitting of facilities
- Construction Management
- Operation and maintenance of facilities
- System funding and ownership
- Effluent pricing strategies
- Establishing service to new effluent customers

7.2 Planning Activities for Reclaimed Water Use Programs

Both entities have a vested interest in developing programs and policies that maximize effluent use within the City of Casa Grande and the Pinal AMA. AWC recently conducted a water resources planning study for its Pinal Valley water service areas that identifies that even with total reuse of available effluent, additional renewable water resources will need to be secured to meet the build-out water needs of the area. This study underscores the importance of achieving full use of effluent. AWC's involvement in reclaimed water management planning is important to ensure that effluent groundwater recharge and recovery activities are carried out in locations that do the most to maintain water levels within the well fields from which AWC pumps groundwater to serve Casa Grande. In addition, recharge should be carried out in locations that do not negatively impact the water quality of AWC's groundwater wells.

For these reasons, it is appropriate that the MOU include a commitment from both entities for staff participation and cooperation in future reclaimed water use planning studies conducted by either entity.

7.3 Design and Permitting of Facilities

Cooperation by both entities in the design and permitting of reclaimed water distribution and recharge facilities is advantageous for the following reasons:

- Should AWC be the entity that operates and maintains facilities (discussed in section 7.5), effluent pumping stations and transmission facilities are designed in a manner consistent with AWC's current water distribution facilities. AWC participation in the design process will help ensure facilities can be operated and maintained without significant additional training of staff.
- Health regulations require that reclaimed water mains maintain a minimum of 6 feet of separation from potable water mains. AWC involvement in project design and construction management will ensure this is carried out.
- AWC has an Engineering Department experienced in the design and design review process for pump stations and pressurized water transmission systems.
- AWC is experienced in filing annual water use reports with the Arizona Department of Water Resources (ADWR). It therefore would be advantageous for AWC to be responsible for filing quarterly and annual ADWR reports on future recharge facilities, especially if AWC operates and maintains the facility.
- If AWC operates and maintains recharge facilities, AWC involvement in design of the facilities is appropriate to ensure seamless operations.

Therefore, the MOU could include requirements and commitments that the City and Arizona Water Company cooperate on reclaimed water facility design and permitting. A project design review committee could be established consisting of engineering staff of both entities. Both entities would commit to devote adequate staff to the design and permitting process.

7.4 Construction Management of Facilities

As in the case of engineering design and permitting, cooperation by both entities in construction management will be advantageous in constructing facilities capable of being operated and maintained in the most cost-effective way possible. For example, construction management of reclaimed water main projects bid by the City could be managed by Arizona Water Company under a contract with the City. Projects could also be jointly managed by the City and AWC. For major pipeline, pump stations, or recharge facilities, a third party construction management firm could be contracted with by either the City or AWC. Since each project is likely to have different construction management needs, it is recommended the MOU discuss several possible approaches and provide flexibility to respond to varying project needs.

7.5 Operation and Maintenance of Facilities – Meter Reading and Customer Billing

The City does not currently have staff experienced with the operation and maintenance of pressurized water delivery systems. If the City was to operate and maintain new reclaimed water delivery and recharge facilities, it would be necessary for the City to hire a significant number of additional staff. In contrast, AWC currently has a staff in excess of 75 employees serving the operations, maintenance, and meter reading needs of its Casa Grande, Coolidge, Arizona City, Stanfield and Tierra Grande system alone. In addition, staff in the AWC Corporate Office in Phoenix carries out regulatory reporting (ADEQ, ADWR, and Arizona Corporation Commission) and billing activities. AWC staff is therefore well-positioned to provide for the cost-effective operation, maintenance, permit compliance, and billing needs of a future reclaimed water system serving the City of Casa Grande. AWC staff is experienced in the day-to-day activities required to operate and maintain a pressurized water system, including:

- Pump repair and maintenance
- Electrical and SCADA system maintenance
- Water line and service leak repair
- Water line valve exercise, repair, and maintenance
- Service and meter installation
- Backflow device maintenance and annual testing
- Meter reading
- Customer billing
- Regulatory reporting

AWC's long-term experience and significant local staffing capability to carry out these functions should enable AWC to provide cost-effective operation and maintenance of future reclaimed water systems serving the City. It is therefore recommended that the MOU explore as one option, a contractual framework under which AWC would provide a full range of services to operate and maintain future reclaimed water systems and provide effluent service to customers. Under this framework, the City would maintain ownership of the effluent, reclaimed water system and effluent storage credits. Under this contractual framework, AWC would bill effluent customers under rates established to encourage and promote effluent use, and accomplish the City's and AWC's goals of maximizing the cost-effective, beneficial use of effluent produced at the Kortsen Road WRP. Another option to be considered, of course, is for the City to design, own, operate and maintain all effluent facilities and provide effluent service to customers. As indicated earlier in this section, however, the City would need to hire a significant number of additional staff under this option. Under either option, however, the City could be able to apply the benefits of effluent storage credits to those customers to which long-term storage credits are sold (e.g. the CAGRD).

7.6 Reclaimed Water System Ownership

An important question to be addressed in the MOU is ownership of reclaimed water infrastructure and how the construction of the infrastructure is funded. Ownership and funding sources are interrelated issues. Three options for ownership of planned reclaimed water distribution and recharge facilities are: 1) Ownership, operation and maintenance of all reclaimed water and recharge facilities by AWC and sale of effluent to AWC by the City at the plant for delivery and sale to AWC's customers, 2) Ownership, operation and maintenance of all reclaimed water and recharge facilities by the City with the City selling effluent to its customers; and 3) Ownership of all reclaimed water and recharge facilities by the City, with operation and maintenance of the reclaimed water and recharge facilities by AWC with effluent sales by AWC to its customers. Each option has advantages and disadvantages, and present separate issues that impact the feasibility of implementing each such option. It is recommended that the City and AWC meet and confer to establish the appropriate option to pursue.

Considerations that impact the feasibility of the three alternatives include:

1) Under existing zoning authority, the City has the ability to pass ordinances requiring reclaimed water use on large turf facilities in new developments. AWC could not independently require such reclaimed water use by its customers and would need to seek approval from the Arizona Corporation Commission for the appropriate effluent tariffs, including rate tariffs.

2) The City currently charges a significant sewer development impact fee to pay for new facilities construction. It is a logical extension to increase this fee to pay for water reclamation facilities construction because beneficial reuse of effluent will provide additional water resources for new development within the City.

3) The City currently has contracts with two major effluent users (SRP and Frito-Lay) and must meet those contractual obligations. Keeping ownership of the system would allow the City to plan for and secure the funding necessary regarding deliveries to new users and recharge facilities.

4) Ownership of the system by AWC would require AWC to obtain approval from the ACC of tariffs for reclaimed water user rates and connection fees to pay for the capital costs of the system. This option may increase the cost of effluent service, and discourage its use.

5) Reclaimed water rates must be priced below potable water rates in order to encourage or promote the use of reclaimed water. It is critical, therefore, that the primary source of funding will need to be developer contributions either in the form of: 1) impact or connection fees for all new homes, or 2) large financial contributions from developments containing large turf facilities such as golf courses, parks, schools, and common areas that are reclaimed water customers.

7.7 Potential Framework for a Memorandum of Understanding

The discussion of issues in this chapter provides a potential framework to begin discussion between the City of Casa Grande and Arizona Water Company regarding the negotiation of a Memorandum of Understanding that would include but not be limited to consideration and resolution of the following items:

1) Ownership of and capital funding of future reclaimed water delivery and recharge facilities.

2) Water reclamation facility operation and maintenance permit maintenance, meter reading and billing responsibilities.

3) Establishment of the sources of capital funding for system construction, including consideration of: a) Casa Grande impact fees, b) developer contributions to either Casa Grande or AWC, or c) Arizona Water Company connection fees per a new tariff approved by the ACC.

4) Establishment of appropriate reclaimed water rates and rates for sales of effluent storage credits.

5) A potential commitment from both entities for staff participation in future reclaimed water use planning studies conducted by either entity.

6) Potential cooperation and joint participation regarding reclaimed water facility design and permitting. It is recommended that a project design review committee be established consisting of engineering staff of both entities. Both entities would commit to devote adequate staff to the design and permitting process.

7) Potential Arizona Water Company involvement in construction management activities.

Appendices

Appendix 1 – Conceptual Level Facility Unit Cost Assumptions

Pipelines ($/ft) DIP

8”	$60
12”	$90
16”	$175
24”	$250

Pump Stations

1.5 MGD to 2.0 MGD	$1,500,000
4.0 MGD	$1,750,000
8.0 MGD	$2,000,000
12.0 MGD	$2,200,000

Recharge Facility Costs

Spreading Basin Facility

Land - @ $75,000 per acre
Design/Construction Cost per basin acre - $171,500/acre
(Based on actual cost of 4 CAP facilities inflated to 2008 $, Tonapah, Hieroglyphics Mtn., Agua Fria, Lower Santa Cruz)

Assume 1.2 ft/day percolation rate (conservative), assume half of basins out of service for drying, assume 1.5 basin area = total land need (accounts for buffers, access roads, berms)

Recharge Wells

Vadose Zone Wells (48” diameter, PVC casing and screen) – Assume 250-350 gpm capacity per well, assume maximum depth of 180 ft. Assume life of 7 years due to clogging. Note: Scottsdale wells still operational after 14 years (RO water). Minimum spacing recommended is 100 ft. between wells. (Source; Personal communication, Sheila Ehlers, HydroSystems, Inc.)

Estimated Costs

Well Construction cost	$125,000
Above ground, Electrical/SCADA	75,000
Engineering/Project Management	30,000
Total	$230,000

<u>Retrofit of existing production wells for injection use</u>	$500,000
<u>New injection/ASR well</u>	$1,300,000

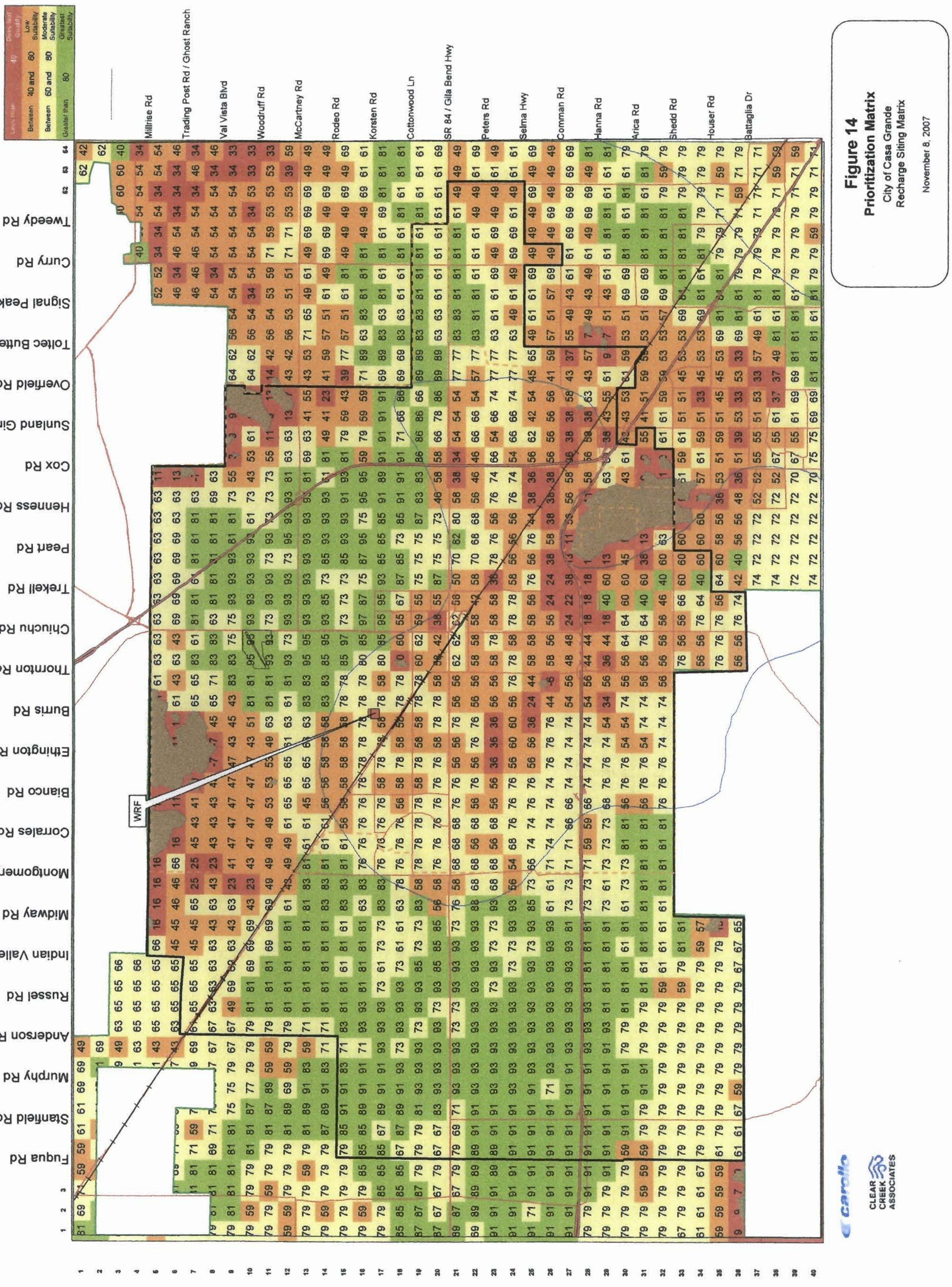
Assume 1000 gpm/well

Well sites – 0.25 acres @ $75,000/acre

Test Borings

200’ to 300’ using hollow-stemmed auger	$5,000 per boring
Deeper borings to 1000’ using mud rotary drill rig	$50,000 per boring

Appendix 2
Map of Recharge Areas Prioritized



EFFLUENT PIPE TO EVERY HOME

16,743 LF of 8" C-900 PVC Main

26,004 LF of 6" C-900 PVC Main

50,000 LF of 4" C-900 PVC Main

Appendix 3
Map of Dual Distribution System
Post Ranch Development

Effluent Pipe to Every Home