

## CHAPTER 7

### Recommended Treatment Plant Plan



## Regional Optimization Master Plan Final Report

### Chapter 7 – Recommended Treatment Plan

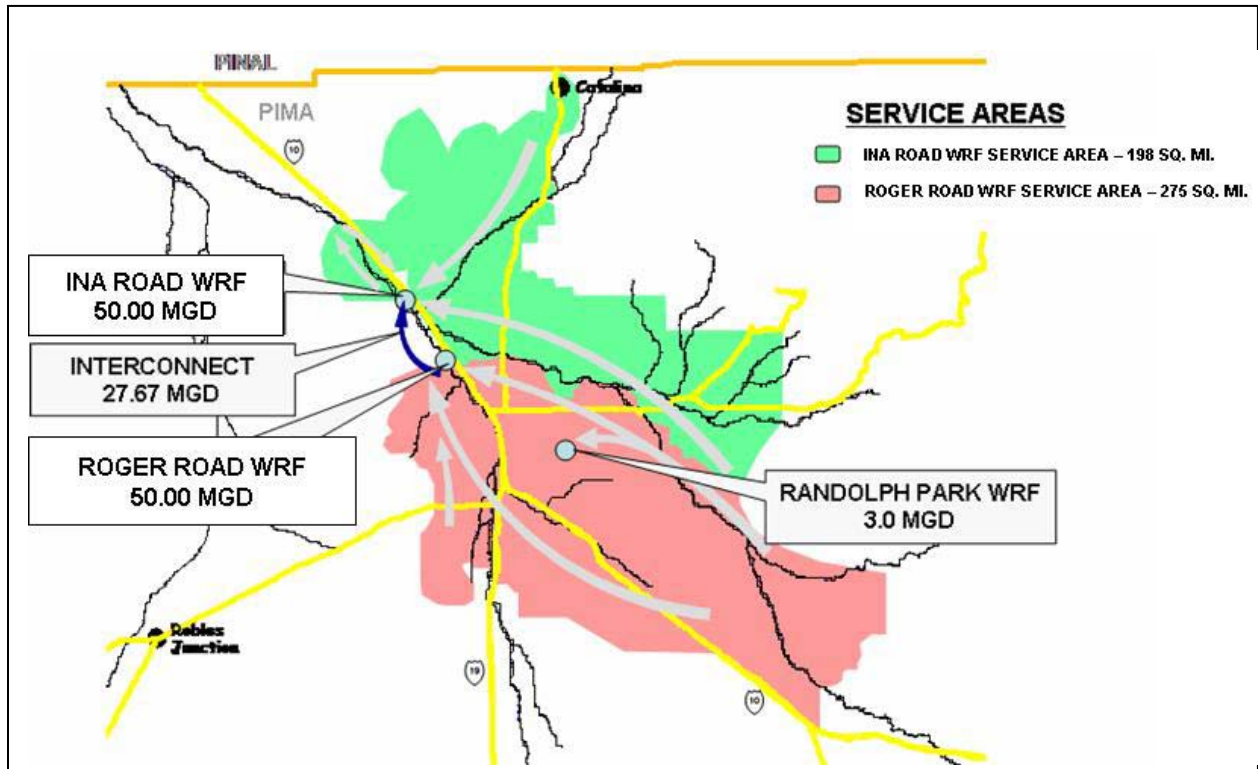
## Chapter 7 - Recommended Treatment Plan

### 7.1 Introduction

The two major wastewater treatment plants, Roger Road WRF and Ina Road WRF, service the metropolitan Tucson region and require new construction, reconstruction and expansion at the existing plant sites to meet near future regulations and population growth needs. The existing Roger Road WRF is located north and west of the City of Tucson center, and Ina Road WRF is located approximately 5 miles northwest of the Roger Road WRF site, both along the Santa Cruz River. Both plants are located east side of the Santa Cruz River and west side of I-10. **Figure 7-1** illustrates the location of the treatment plants relative to the Metropolitan Tucson service areas.

**Figure 7-1**

**Year 2030 Location of Major WRF s Relative to the Metropolitan Tucson Service Area**



A new wastewater treatment works without primary treatment is recommended for Roger Road WRF and the existing treatment facilities will be decommissioned and demolished once the new WRC is operational. It is recommended that the Ina Road WRF facilities be modified to accommodate the treatment of transferred wastewater and biosolids from the Roger Road WRF site.

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A new gravity interconnect pipeline will be constructed between the two plants to transport raw wastewater from the Roger Road WRF service area to Ina Road WRF to balance flows between the plants. The existing sludge force main between the plants will continue to serve the facilities. Also, a new pump station facility will be constructed by Tucson Water to convey reuse water through an existing water reuse service distribution system from Ina Road WRF to the existing storage reservoir and pumping station facility to meet some reuse water demand.

The metropolitan communities and residential areas are located within close proximity from both treatment plants and the population density is expected to increase in the surrounding area within the year 2030 planning horizon. A 350-foot buffer zone required by ADEQ currently exists at the Ina Road WRF and will be maintained throughout planned improvements and expansions. A 350-foot buffer zone required by ADEQ will be maintained between the new WRC and the property lines to serve as a buffer area. A comprehensive odor control system at the treatment facilities is recommended to assure that emissions are in compliance with Pima County DEQ Air Quality Permit requirements.

The recommended treatment plant plan for the year 2030 facilities plan includes the following topics:

- Transportation corridors and other area infrastructure
- Land use and area development
- Special projects
- Location of future treatment expansions
- Expansion of treatment infrastructure
- Expansion of treatment utilities and utility corridors
- Architecture and landscape
- Support facilities
- Plant storm water plan
- Year 2030 master plan layout for selected alternative
- Summary

## 7.2 Transportation Corridors and Other Area Infrastructure

### 7.2.1 Transportation Corridors

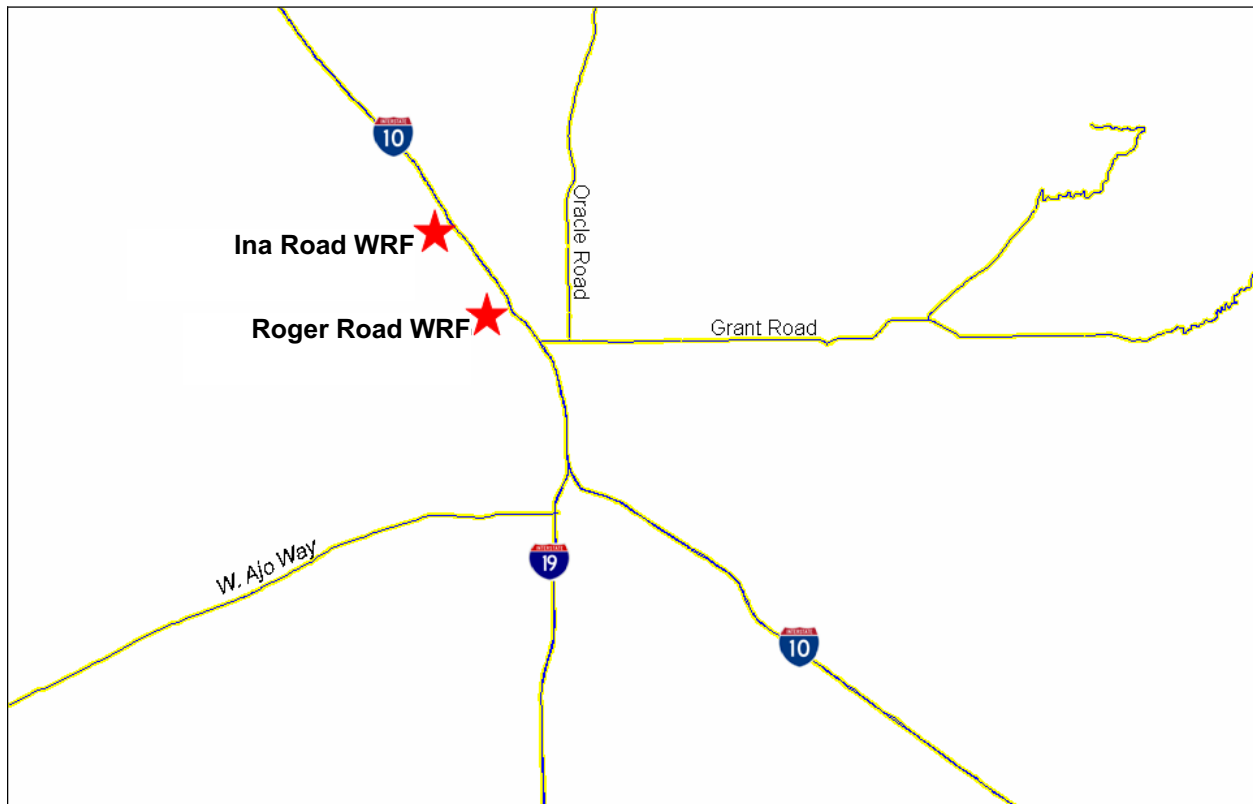
Major road access to both wastewater treatment facilities is from I-10. Access to the existing and new WRC is from the frontage road along I-10 onto Sweetwater Drive, which is near the major intersection of I-10 and Prince Road.

Road access to the Ina Road WRF is off of Ina Road, west of the interchange of I-10 and Ina Road. Future access to Ina Road is planned to be moved onto the I-10 frontage road to the south of the intersection of Ina Road with the interstate highway. **Figure 7-2** illustrates the major transportation corridors near the treatment plants.

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**Figure 7-2**  
**Major Transportation Corridors near Reclamation Plants**



### 7.2.2 Stormwater/Flood Control Planning

Storm water plans will be developed for the new WRC and modified for the Ina Road WRF to meet the Pima County Flood Control District design requirements for onsite detention systems and upholds PCRWRD's philosophy of no off-site discharges of storm water. The storm water plans will be developed in conjunction with detailed designs for each facility and will address storm water issues both during construction and post construction. Each storm water detention system will be designed to hold a 100-year, two-hour rainfall event on site.

### 7.3 Land Use and Area Development

#### 7.3.1 Current Land Use

Current land use is limited to the existing treatment facilities at both treatment plant locations, except the existing sports complex with baseball diamond at the southeast side of the Ina Road WRF facilities.

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#### 7.3.2 Future Area Development

Extraordinary multi-faceted recreational and ecological facilities for use by the region are being studied within the corridor from the areas of the new WRC north towards the Ina Road WRF. The study anticipates that the future facilities will be located on the land owned by the City of Tucson, Pima County and the State of Arizona. **Figure 7-3** illustrates a possible site plan of the new park development. Before the plan can be finalized the needs of PCRWRD and Tucson Water will need to be incorporated.

**Figure 7-3**  
**Future Area Development Site Plan**



The plan includes the construction of tournament grade facilities for amateur soccer, softball and baseball along I-10 at the site of the Roger Road WRF and the restoration of riparian habitat along the Santa Cruz

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River. Walking and biking trails, picnicking areas and other features would connect Columbus Park to the new recreational areas and the surrounding communities. In addition, the plan offers the potential for a connection to the Silver Bell golf course to make one large public space for community use. The Transportation Department has plans to improve the intersection of Camino del Cerro and I-10 which would greatly improve access to the park site.

The new recreational facilities would have the capacity to attract out-of-region events that in turn would support economic development to the area, including hotel, shopping and restaurant facilities. The recreational facilities would include baseball fields, soccer fields and softball fields.

#### 7.4 Special Projects

The Tres Rios Del Norte Project Ecosystem Restoration Feasibility study is being conducted by the Corps of Engineers with support by Pima County Regional Flood Control District (PCRFC), City of Tucson and City of Marana. The study covers 18 miles of the Santa Cruz River from Prince Road to North Sanders Road and encompasses 19,800 acres. Objectives of the study are:

- Ecosystem restoration
- Flood damage control
- Ground water recharge
- Recreation
- Cultural resource preservation

The restoration area is divided into three reaches:

- Price Road north to Ina Road (Reach 1)
- Ina Road north to Avra Valley Road
- Avra Valley Road north to North Sanders Road

Out of the three reaches, Reach 1 directly involves the effluent discharge from the two major WRFs. Reach 1 covers the Santa Cruz River from the Roger Road WRF discharge to the Ina Road WRF discharge. The recommended plan for Reach 1 is to develop cottonwood and willow tree habitat, mesquite bosque habitat along with other native plant and shrub species at the edges and to create wetland areas in the river bottom. Wetland areas will have water depths of 6 inches to 9 feet. The recommended plan requires approximately 2 to 7 mgd of effluent water including consumptive and evaporative losses, direct precipitation, constructed ground water recharge and channel losses.

#### 7.5 Location of Future Treatment Expansions

At the existing Roger Road WRF there is a “green space” on the south side of the existing plant that is available to site a new facility to treat 32 mgd of wastewater as well as north of the existing Roger Road WRF. The site south of the existing treatment works would be the new water reclamation facility campus (WRC) along Sweetwater Drive on the south side of the existing treatment facilities and west of the existing Tucson water reclaimed water filtration plant, reservoir and pumping station operations. The location along Sweetwater Drive meets the regulatory requirements for 350-foot setbacks using City of

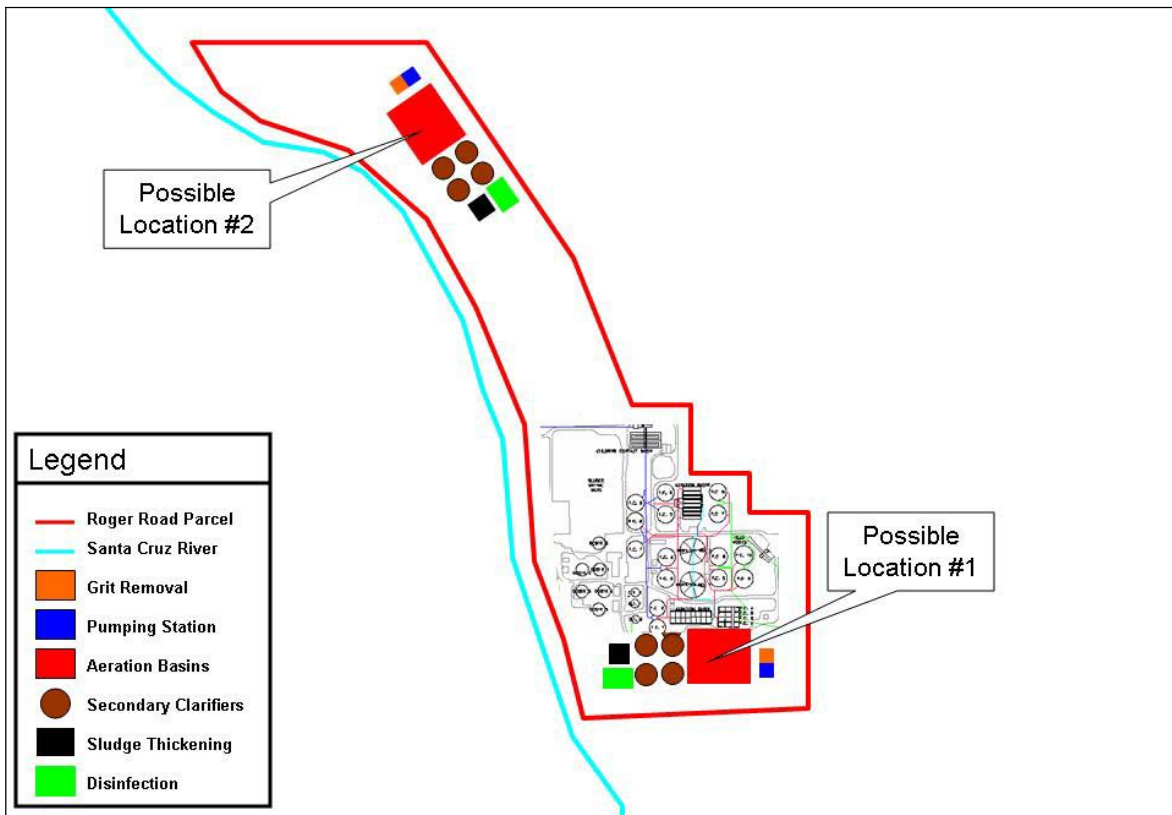
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Tucson owned land. The plan maximizes the availability of public land for alternative uses such as new sports complex, enables upstream discharge to the Santa Cruz River to sustain riparian habitat and locates operations adjacent to the existing and future reclaimed water operation. The site to the north of the existing treatment works would be located adjacent to the Santa Cruz River and removed from existing operations. Further, the site to the north can expand on the environmental theme for future park consideration. Because of the constrictions issues and integration with the future park theme the north site is recommended. The costs to construct at the either the north site or south site are considered similar. The recommended plan at Roger Road WRF is for a new WRC without primary sedimentation tanks. The existing facilities will continue operations until the new facilities are commissioned and then the existing facilities will be demolished.

**Figure 7-4** illustrates the recommended new facilities without primary treatment at Roger Road WRF. **Figure 7-5** illustrates the extent of demolition of the existing Roger Road WRF facilities after new treatment plant is operational. **Figure 7-6** illustrates the site plan for future expansion of facilities capacity by 50 percent beyond the year 2030.

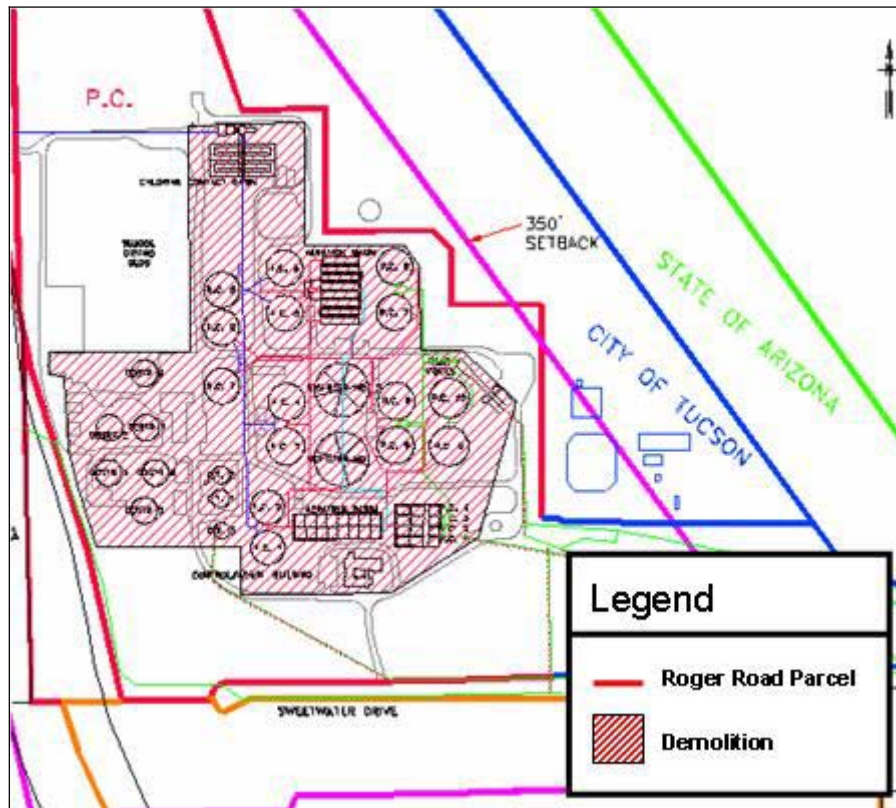
**Figure 7-4**  
**New WRC – 32-mgd Facility**



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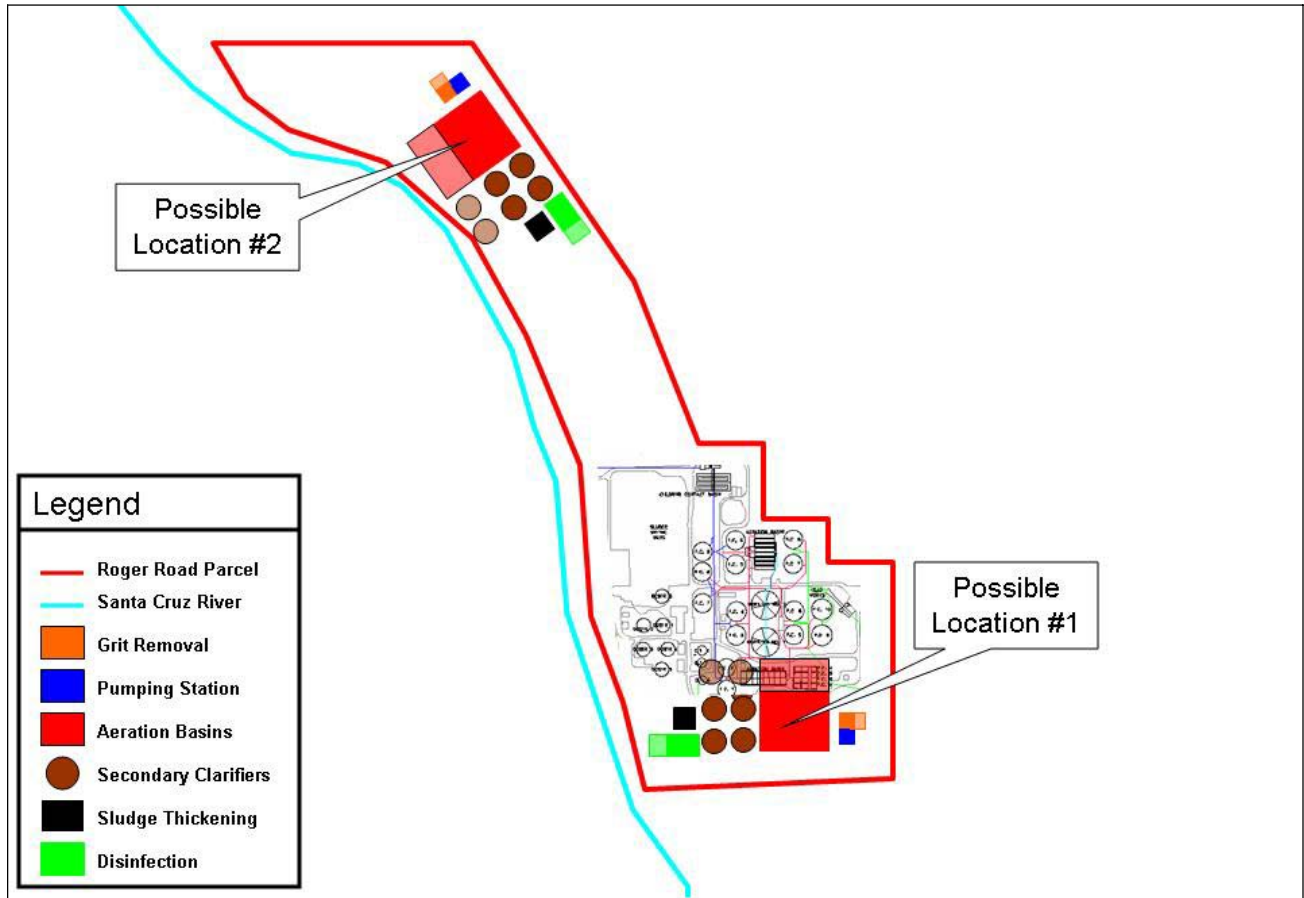
**Figure 7-5**  
**Demolition After New WRC Construction**



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**Figure 7-6**  
**Roger Road WRF Future Expansion Beyond Year 2030**



At Ina Road WRF the future facilities will treat 50 mgd of wastewater and will become the centralized location for handling and treatment of biosolids. The recommended plan includes addition of new facilities and rehabilitation of the existing facilities while maintaining the existing 350-foot setback and includes space for the addition of biosolids processing facilities for future production of Class A biosolids.

**Figure 7-7** illustrates the recommended the year 2030 facility at Ina Road WRF. **Figure 7-8** illustrates site plan with the space required beyond the year 2030 for expansion of both the wastewater and biosolids treatment capacity by 50 percent. This plan would utilize some of the County-owned property at the sports park south of the existing plant.





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## 7.7 Expansion of Treatment Utilities and Utility Corridors

### 7.7.1 Power Supply

**Roger Road WRF:** The plant is presently served by a 2400 volt, 3-phase, 3-wire delta ungrounded electrical service from Tucson Electric Power Company. The utility service drop consists of 3-500kVA transformers feeding a Main Switchgear that is configured in a hot sequence arrangement with six fusible contactors. 2400 volt power is distributed to Power Centers and transformers throughout the site. The Power Centers and transformers step the voltage down to 480 volts, 3-phase on the secondary to feed Motor Control Centers. The majority of the secondaries are connected delta ungrounded. Motor control centers are configured in a Main-Tie-Main circuit breaker arrangement with one main served from the utility source and the other from the plant generators. The MCCs provide power to the plants process equipment loads and supporting systems.

The plant generators consist of 3-400kW, 480 volts, 3-phase, 3-wire delta ungrounded natural/methane duel fuel engine driven generators. The generators may be operated in parallel or totally isolated from each other. Generator power is distributed via three switchboards with feeder breakers serving individual motor control centers.

The existing power distribution system will remain to serve the existing plant with minor alterations made to provide power to interim and temporary plant improvements.

**New Water Reclamation Campus:** The new WRC will be served with a new power distribution system. The new system will have redundant power sources. This may consist of one utility source and on site power generation for backup. The primary distribution system will consists of 13.8kV Switchgear configured in a Main-Tie-Main circuit breaker arrangement. Redundant 13.8kV, 3-phase power feeders will be distributed throughout the site. Pad mount transformers will be provided with 480 volt, 3-phase, 4-wire wye connected secondaries to serve Switchgear and Motor Control Centers. Other secondary voltages may be provided as required to serve large motor loads (Pumps, Blowers, etc.). Switchgear and Motor Control Centers will be configured in a Main-Tie-Main circuit breaker arrangement. The overall system will be designed with the flexibility to serve loads at startup and possible future expansions.

**Ina Road WRF:** The plant is served from two utility sources with multiple service drops and on site generators. The original treatment plant constructed during the 1970's and the Centrifuge Building added in the 1980's is powered by the generators at the plant power generation facility. The plant expansion is powered from three separate TEP incoming utility electric services.

The plant power generation system consists of seven 650kW, 4160 volts, 3-phase generators connected in parallel to 4.16kV Switchgear "A/B". The existing plant power generation system utilizes sludge gas and purchased natural gas as a fuel source (see Chapter 5 for discussions and recommendations regarding the future use of sludge gas). Switchgear feeder breakers distribute power to six outdoor unit substations and three 400 horsepower Oxygen Compressors. The unit substations are connected delta-wye with their secondaries rated 480-volts, 3-phase. The secondary of each unit substation serves a close coupled walk-

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in aisle 480-volt switchboard with the exception of the two at the Centrifuge Building. The Centrifuge Building unit substations serves a motor control center directly from the secondaries of the substation transformers. Those configured with secondary switchboards distribute power to motor control centers and other utilization equipment.

The three TEP incoming utility electric services are located at the Headworks, New RAS/WAS Pump Station and the Blower Building. TEP provides incoming power at 13.8kV, 3-phase that is stepped down at each location to the required utilization voltages using Plant owned transformers and unit substations.

A unified power distribution system will be implemented as the plant is expanded. The unified system will feature redundant power sources. This will consist of dual utility sources, on site generators or combinations of both. The three existing utility services will ultimately be decommissioned and the equipment combined into the new distribution system. The new distribution system will be similar to that described for the new WRC. The exception being the implementation of 4160V distribution equipment for utilizing the existing on site generators if reused in the future plant expansions.

#### 7.7.2 Potable Water Supply

Potable water is supplied to the treatment plants by the City of Tucson. A new potable water supply network will be provided for the new WRC and the existing potable water system will be decommissioned upon startup of the new facilities.

#### 7.7.3 Reuse Water Supply

The new WRC will be located north of the existing facilities, which will be demolished. A new reuse water supply system with new pump station will be constructed by Tucson Water to provide reuse water from the new effluent disinfection facilities to their operation.

At the Ina Road WRF a reuse water system will be constructed to supply reuse water to the water distribution network. If Class A+ reuse water is produced at the Ina Road WRF, then a new supply, reservoir system, disinfection system and distribution piping will be constructed by Tucson Water on a parcel of land provided by Pima County. If Class B+ reuse water is produced then Tucson Water would have to add filtration to its operation at the site. Pima County has not committed to the actual location of the property to be provided to Tucson Water. Source of the reuse water will be disinfected plant effluent.

#### 7.7.4 Plant Air Supply

A new plant air supply system will be provided for the new WRC facilities. The existing plant air supply system at the Ina Road WRF will be upgraded to facilitate the needs for the expanded future facilities.

### 7.8 Architecture and Landscape

Existing facilities consist of a wide variety of architectural styles and landscape types, reflecting independent decisions made at each plant expansion. Through the year 2030 planning horizon,

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architectural and landscaping design will be guided by a single architectural and landscape theme to harmonize the existing and new facilities consistent with the new land use plan.

Objectives of the architectural and landscape plan are to conceal process and mechanical components, to control off-site view-sheds, and to unify architecture and landscaping throughout the WRFs. Most of the treatment components are basins, and their walls extend only a few feet above grade. Several associated buildings house treatment systems, equipment and personnel. The architectural and landscape plan integrates these elements in a style that reinforces the public friendly concept and the important role of the wastewater treatment in environmental protection and water reclamation.

Roger Road WRF will be a new facility constructed adjacent to a public space open for recreation and community sports activities. Architectural features and desert landscape developments provide a public friendly image and reflect a water campus concept. Use of indigenous materials and energy conserving building systems will be integrated into the design of the facilities.

#### 7.8.1 Personnel Facilities

The Personnel facilities will include the required quantities of offices, conference rooms, miscellaneous storage and lunchrooms. Toilet and locker rooms will be designed for future staff level requirements. The Personnel facilities for the new WRC will be new facilities, planned to incorporate Plant Laboratory functions as well. The existing Ina Road WRF will be assessed and rehabilitated or expanded.

#### 7.8.2 Maintenance Facilities

Maintenance facilities for the Roger Road WRF will be new facilities, designed in conjunction with the new WRC and tailored to meet the identified needs. The existing Ina Road WRF will be assessed and revised as needed to accommodate planned plant expansion requirements.

#### 7.8.3 Laboratory Facilities

A new central laboratory will house appropriate laboratory area functions for regulatory compliance analysis to be performed. The central laboratory function will be combined with personnel functions in a new facility to be located at or near the new WRC.

There is also a need for plant laboratory space for routine, unit process monitoring of operations. Such plant lab spaces will be incorporated into structures adjacent to and serving the various unit processes at the new WRC. Existing plant lab spaces at the Ina Road WRF has been assessed in the past with the County deciding to build a new central laboratory. Additional plant laboratory spaces will be provided in structures adjacent to and serving the various unit processes associated with expansion facilities.

#### 7.8.4 Parking

Adequate parking space will be allocated at each plant for employees, visitors and plant vehicles. Covered parking is required for employees and visitors vehicles at both Ina Road WRF and Roger Road

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WRF. Maintenance vehicle parking space adjacent to process facilities and other plant buildings does not necessarily need to be covered.

## 7.9 Support Facilities

Support facilities will each be designed with massing, shape and materials to harmonize with the other structures at each location, as well as with the predominant textures, colors and forms of the surrounding landscape.

### 7.9.1 SCADA System

The County has decided to have a central SCAD Control Center for their entire wastewater system. Actual location has not yet been determined by the County. The general instrumentation and process control concept at Roger Road WRF and Ina Road WRF is to provide three levels of control.

- Field or local control at the equipment or field device
- Process control for all equipment and devices located within specific process areas
- System or central control through a distributed control system

At the field or local level a control panel will be provided to control or monitor each piece of equipment or field device. Control at this level will be used for equipment or system interface, equipment maintenance and for intermittent process operations.

At the process level a control panel will provide process control and monitoring capabilities for a specific process area or system. Process control may control several pieces of equipment that are interrelated for that process area or operating unit. The process panel may be located in a central area of a specific process or system area. The process panel will provide equipment status, alarms, control devise and process measurements.

Central control will be through a distributed control system. The control system will have established hierarchy to place control priorities for limiting equipment control to one location at a time and incorporating the highest priority at the equipment location and the lowest priority through the distributed control system.

The systems at Ina Road WRF will be expanded to operate under the above operational control concept. The new WRC will be provided with a fully integrated and functional instrumentation and control system.

Electrical power usage will be monitored in different areas of plants. A comprehensive equipment tagging for equipment, valves, field devices and signals will be established and coordinated with the instrumentation and control system.

The Central SCADA Control Center will also monitor all the security elements to be incorporated with the new or expanded facilities.

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#### 7.9.2 Odor Control

The odor sources in the wastewater works may be broadly divided into two categories, wastewater collection system and wastewater treatment plant. Main odor sources from the collection system are manholes, drop structures, siphons, pump station wet wells and discharges from the wastewater transport pipelines. Major odor sources from the treatment plant include headworks, screen and grit facilities, pump station wet wells, splitter boxes, primary clarifiers, aeration tanks and sludge treatment and handling facilities.

The year 2030 plan will provide a long-term solution for potential odors from both collection system and wastewater treatment plants. The odor control measures will include:

- Minimize odor potential in the collection system with pH adjustment, oxygen addition, chemical addition, etc.
- Cover the openings and channels in the treatment processes properly
- Collect and treat the odorous air
- Disperse the treated air into the atmosphere in the way to minimize the odor impact to the surrounding communities

#### 7.9.3 Chemical Handling

Chemical handling includes storage, preparation, metering and delivering chemicals used in the wastewater treatment processes. Chemicals for laboratory functions are not included in this chapter. Chemical addition is a critical part of certain processes, while it enhances others. Areas where chemicals are introduced into the wastewater treatment systems and processes are:

- *Wastewater Treatment:* Sodium hypochlorite is added into the return activated sludge system or surfaced sprayed on the aeration basins to control nuisance microorganisms, such as Nocardia.
- *Effluent Disinfection:* Currently, sodium hypochlorite is added to the plant effluent for disinfection. Sodium bisulfite is added at the end of the contact basins to de-chlorinate any residual chlorine in the plant effluent prior to its release to the receiving stream. The future effluent disinfection technology for the plants may change and alter the chemicals applied.
- *Sludge Thickening:* Polymer is added to the sludge as a coagulant to optimize performance of the thickening process.
- *Sludge Dewatering:* Polymer is added to the digested sludge as a coagulant to optimize the performance of the dewatering centrifuges.
- *Odor Control:* Currently, sodium hydroxide and sodium hypochlorite and granular activated carbon are used for odor control at various locations around the wastewater treatment sites. Future odor control systems may employ scrubber technologies that use these chemicals. The System Wide Odor Control Plan provides odor control system recommendations.

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For purposes of handling, delivery and storage chemical systems will need to be centralized to the extent practicable at each of the plant sites. Chemicals will be stored in appropriate containers with secondary containment where appropriate and necessary.

#### 7.9.4 Security

Onsite security system will include perimeter fencing, controlled plant access and egress, internal access controls and management of personnel onsite, including staff, vendors and visitors. Electronic surveillance will be employed to monitor critical areas of the facilities via SCADA. The security plan will include emergency response plans for man-made threats and natural disasters.

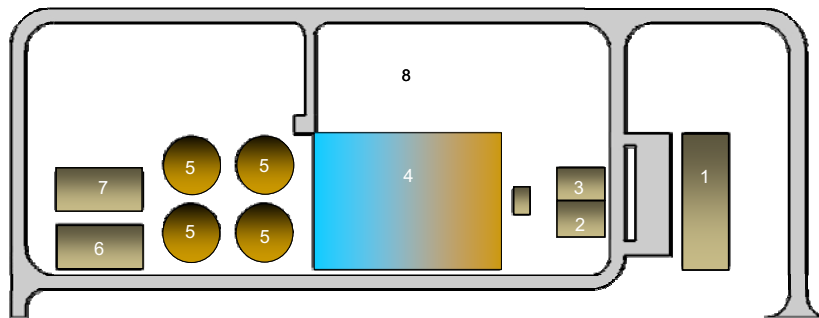
#### 7.10 Plant Stormwater Plan

Stormwater detention systems for the facilities at Roger Road WRF and Ina Road WRF are required by Pima County Regional Flood Control District and must be maintained. The storm water plan must meet the Pima County Regional Flood Control District design requirements for onsite detention systems and upholds the philosophy of off-site discharges. The storm water detention system will be designed to hold a 100-year, two-hour rainfall event on site.

#### 7.11 Year 2030 Master Plan Layout for Selected Alternative

Figure 7-9 and Figure 7-10 illustrate the year 2030 master plan layout for the facilities at Roger Road WRF and Ina Road WRF, respectively.

**Figure 7-9**  
**Roger Road WRF – Year 2030 Master Plan Layout**



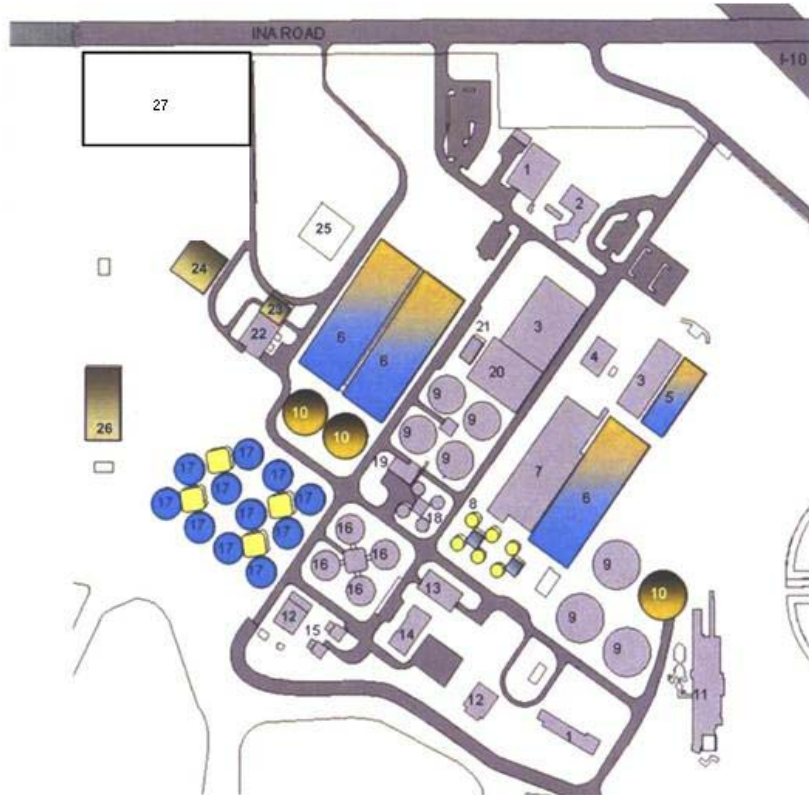
**Legend:**

1. Administration Facility
2. Headworks (Influent PS, Screens)
3. Grit Removal Facility
4. Bardenpho Aeration Tanks
5. Final Clarifiers
6. Disinfection Facilities
7. Sludge Thickening/Transfer Facility
8. Area for Future Expansion

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**Figure 7-10  
Ina Road WRF – Year 2030 Master Plan Layout**



**Legend:**

- |                                       |   |
|---------------------------------------|---|
| 1. Existing Warehouse                 | 15. Existing Chlorination Buildings     |
| 2. Existing Administration Building   | 16. Existing Digesters                  |
| 3. Existing Primary Clarifiers        | 17. New Digesters                       |
| 4. Existing Blower Building           | 18. Existing Sludge Thickeners          |
| 5. New Primary Clarifiers             | 19. Existing Vacuum Filtration Building |
| 6. New Aeration Tanks                 | 20. Existing Activated Sludge Reactor   |
| 7. Existing Aeration Tanks            | 21. Existing Oxygen Production          |
| 8. New Sludge Thickeners              | 22. Existing Centrifuge Building        |
| 9. Existing Secondary Clarifiers      | 23. Extension to Centrifuge Building    |
| 10. New Secondary Clarifier           | 24. New GBT Thickening Building         |
| 11. Existing Headworks                | 25. Existing Sludge Storage Basin       |
| 12. Existing Chlorine Contact Basin   | 26. New Disinfection Facilities         |
| 13. Existing Energy Recovery Building | 27. Pima County Industrial Waste        |
| 14. Existing Training Center          | 28. Tucson Water Facilities (not shown) |

**7.12 Conceptual Basis of Design**

A conceptual Basis of Design was prepared for the expansion upgrade of Ina Road WRC and the new WRC. The report is included in **Appendix I**

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#### 7.13 Summary

The recommended treatment plant plan for the year 2030 provides a Water Reclamation Campus adjacent to the existing Roger Road site and, upgrades and expansion of the existing plant at Ina Road. This will affect many aspects of the existing treatment facility features as summarized below.

- New infrastructure to be constructed and existing infrastructure to be expanded or upgraded
- Expansion of infrastructure to accommodate increased flows to be handled at both plant locations
- Provision for new and/or expansion of utilities including power, potable water and plant air supply.
- Provision for new and/or expansion of water reuse facilities by Tucson Water
- Reshaped transport corridors, and storm water and flood control measures
- New multi-faceted recreational, commercial and ecological development in the vicinity of the existing Roger Road WRF.
- Ecosystem restoration and creation of riparian habitat in the Santa Cruz River
- Provision for future expansion beyond the year 2030 at both treatment facilities
- Architecture and landscape amenable to public friendly image