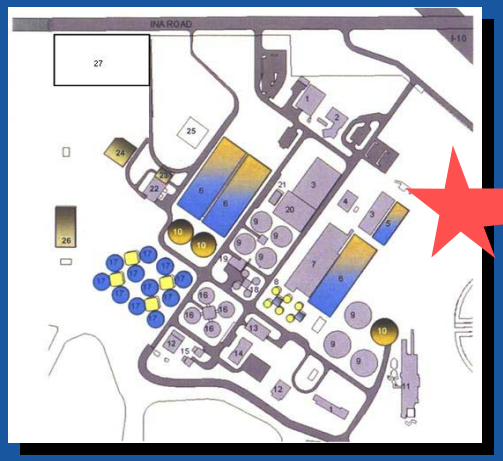
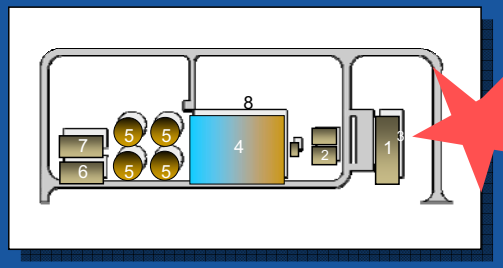
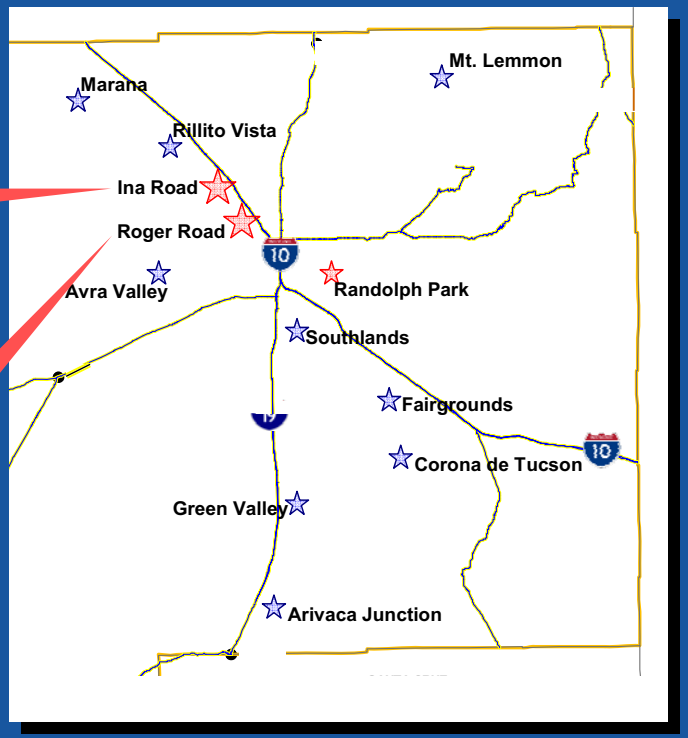
Pima County Regional Wastewater
Reclamation Department

Pima County Wastewater
Management Department

Regional Optimization Master Plan
Final Report







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November 2007

Pima County
Regional Optimization Master Plan

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Final Report

Executive Summary

Pima County Regional Wastewater Reclamation Department

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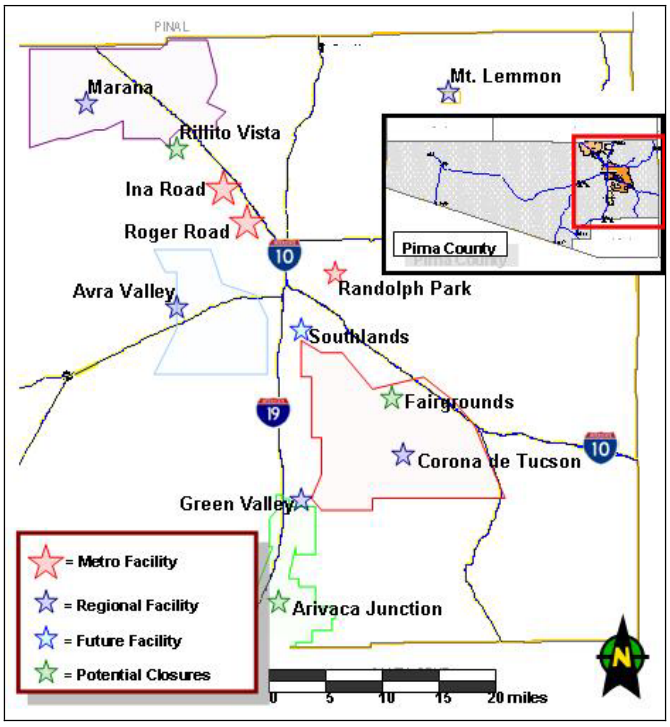
Executive Summary

Pima County Regional Wastewater Reclamation Department (PCRWRD) owns and operates regional wastewater conveyance and treatment systems serving Eastern Pima County. The regional systems consists of over 3,300 miles of sewer lines (of which 230 miles are major trunk lines or interceptors), 34 conveyance system lift stations, two major treatment facilities and one wastewater reclamation facility in the metropolitan (metro) area, and eight smaller wastewater reclamation facilities in the non-metro area. The mission of PCRWRD is to protect public health, safety and the environment by providing quality service and sound environmental stewardship of renewable resources.

PCRWRD recognizes the value of long-range planning in making timely, cost effective decisions; and the need for an effective treatment strategy for current and projected future wastewater flows to its facilities. A significant element in affecting the strategy is the need for a reduction in ammonia and nitrogen concentrations discharged into the Santa Cruz River to comply with current and future environmental regulatory requirements set forth by the Arizona Department of Environmental Quality (ADEQ). In addition, the County seeks to optimize biosolids treatment, reuse and disposal. To that end, PCRWRD commissioned the development of a master plan for future wastewater conveyance and treatment in the PCRWRD service area. **Figure ES-1** shows the current and future PCRWRD operated wastewater treatment facilities.

Figure ES - 1
Current and Future County Treatment Facilities



The purpose of the master plan is twofold. First is to determine an optimal strategy for regulatory compliance which includes: long-term flow and capacity management, treatment of future wastewater increases from the Pima County wastewater service basins, rehabilitation of existing facilities, optimization of solids handling, reuse and disposal, complete utilization of biogas, and optimal methods to provide reclaimed water. The second purpose is to develop a coordinated Capital Improvement Program (CIP) including cost estimates, schedules and a recommended project delivery and funding strategy for implementation of resulting projects and integration with the total PCRWRD CIP.

The master plan serves as a broad road map for future activities. It identifies potential pathways, as well as obstacles to the implementation of the master plan CIP. Through the appropriate level of evaluation, the best option is identified and selected for implementation, without precluding changes in direction that may be prompted by future needs. The Pima County Regional Optimization Master Plan forecasts needs for wastewater treatment capacity throughout the PCRWRD service area and the facilities required to meet those needs through the year 2030. The master plan builds upon the 2006 Metro Area Facility Plan Update in addition to several planning and engineering efforts previously performed for, or by the PCRWRD. The plan is based on current and potential future regulatory and PCRWRD customer requirements, and identifies how and when wastewater treatment facilities will be upgraded and expanded, as well as how existing facilities will be integrated into future expansions or de-commissioned through the year 2030. The plan recommends a comprehensive CIP with treatment components and systems, phasing schedules and cost apportionments for future implementation of PCRWRD wastewater infrastructure needs in accordance with individual ADEQ facility requirements. As the master plan was developed, two concurrent efforts were implemented focusing on Strategic Development and CIP Development. This executive summary presents the major findings, conclusions, and recommendations of the Regional Optimization Master Plan.

Regulatory Requirements

Regulatory requirements were examined as they pertain to the collection, conveyance, and wastewater treatment systems. Reviews of current regulatory requirements regarding wastewater treatment facility design and level of treatment were completed. Capacity and systems condition assessments for Roger Road Wastewater Reclamation Facility (WRF), Ina Road WRF, and their respective conveyance systems were undertaken to determine compliance with regulatory requirements and to draw conclusions regarding the suitability of the facilities to stay in service at existing, greater, or reduced capacity in the current treatment mode and in a converted nutrient removal mode.

To meet the future permit requirements, process modifications and changes are required to lower ammonia and total nitrogen discharge levels. Other relevant and pertinent issues include addressing odor control, safety and upgrades of the existing facilities to be compliant with environmental, regulatory and building code requirements.

Treatment Plant Evaluation

Roger Road WRF is the older of the two major wastewater treatment plants and symptoms of aging are apparent. From an operational and maintenance point of view, there are several drawbacks with the facility's current treatment unit operations, including the primary and final clarifiers. By modern

wastewater treatment practice, the clarifiers are too shallow to be effective in advanced wastewater treatment and the feed and withdraw systems are inadequate. Moreover, continued use of the system at Roger Road WRF would require a significant investment in rehabilitation. From detailed surveys significant rehabilitation is required for some process units to remain in long term service, and equipment and structures replacement is needed for some elements that are reaching the end of their useful service life.

The biological nutrient removal activated sludge (BNRAS) portion of the Ina Road WRF is new (operations started up in the 2006) and is in excellent physical and operating condition. However, the high-purity oxygen (HPO) system which is an older part of the plant has signs of aging in the structures and equipment, particularly the HPO Reactors. In addition, the high purity oxygen system is not compatible with modern, efficient multi-staged nutrient removal systems. Furthermore, the HPO reactor configuration and size is unsuitable for retrofitting to ammonia and nitrogen removal service. Moreover, save the HPO Reactors, the facilities at Ina Road are readily adaptable with some modifications and upgrades to the process needs of the future.

Overall Treatment Strategy

The overall treatment strategy for the Pima County Regional Optimization Master Plan addresses two primary issues, process selection and wastewater management. To address the first issue, the best process to meet current regulatory requirements as well as probable future regulatory requirements was selected. To address the second issue, a wastewater management configuration was selected to determine how much flow will be treated at Roger Road WRF and how much flow will be treated at Ina Road WRF.

Due to expected stringent effluent requirements and effluent reuse requirements, a high degree of treatment is required. To meet the effluent goals, a combination of biological nitrogen removal processes and, if required by future ADEQ regulations, biological phosphorus (Bio-P) removal was found to be the most cost effective. A review of biological nutrient removal (BNR) processes for nitrogen and phosphorus removal included in-depth considerations and evaluations of four processes: Bardenpho, Modified Ludzack-Ettinger (MLE), Integrated Fixed-Film Activated Sludge (IFAS), and Bio-Towers/Nitrifying Activated Sludge (BT/NAS). After consideration of a wide range of issues and combinations, the Bardenpho process was determined as the most reliable and cost effective process for both treatment plants.

Three options for dividing the projected year 2030 flow of 82 mgd between the treatment plants were selected for analysis including: 32 mgd to Roger Road WRF and 50 mgd to Ina Road WRF, 20 mgd to Roger Road WRF and 62 mgd to Ina Road WRF, and all 82 mgd to Ina Road WRF. Wastewater characteristics were determined based on the information contained in the 2004 – 2005 GPS-X modeling and a special testing program. Future loadings were predicated on water conservation and included consideration of the loadings from recycle flows from expected future biosolids operations.

Using the Bardenpho process, flow split options were compared using technical and economic criteria. The flow-split option of 32 mgd to Roger Road WRF and 50 mgd to Ina Road WRF was determined as the most cost effective option. Rehabilitating and modifying the aging Roger Road WRF involves cost uncertainties. In addition there are risks in operating the plant in compliance with regulatory permit

requirements while adhering to the regulated implementation schedule to convert the process. Thus, constructing a new Water Reclamation Campus (WRC) was determined to be the most favorable option for the Roger Road facility.

Biosolids

Current biosolids processing practices and future alternatives for complying with federal biosolids regulations were evaluated and recommendations for PCRWRD's future biosolids processing and disposal methods are provided. The overall goal of these evaluations is to provide a road map for biosolids processing and handling that will allow the County to continue with cost effective biosolids disposal and reuse options through the 25-year planning period.

The future biosolids management plan needs to be flexible and adaptable to changes in the reuse or disposal markets. Federal regulations define two levels of biosolids which are produced by various processing methods: Class B (the current level produced by PCRWRD) biosolids can be applied to agricultural lands and to other restricted uses, and Class A biosolids, which requires more extensive processing, can be beneficially reused with few restrictions.

The County is currently utilizing land application through a local contractor to reuse biosolids. This option appears to be viable through the planning period. However, there is concern that most of the agricultural lands for biosolids application in close proximity of the plants are controlled by a single contractor, and therefore controls the market and price of biosolids disposal; or that the agricultural land is disappearing because of population growth in the County.

A market that shows promise is a dry Class A biosolids product for mine reclamation. A current University of Arizona project utilizing Green Valley WRF biosolids for reclamation at the Asarco Mission Mine has been successful. This market should be investigated further as there are a number of mines located in Arizona, many in the southern region of Pima County. This disposal option may be most applicable to the non-metro regional facilities.

Although the current biosolids disposal strategy is cost effective, it is one dimensional. An extensive market study is required to provide PCRWRD with a flexible, multi-dimensional long-term disposal or reuse strategy. The market assessment needs to address long-term biosolids management, most notably to determine the demand for a Class A, or Class B product or both; identify multiple biosolids disposal options and outlets; and determine if processing on a sub-regional scale, as well as regional scale is viable.

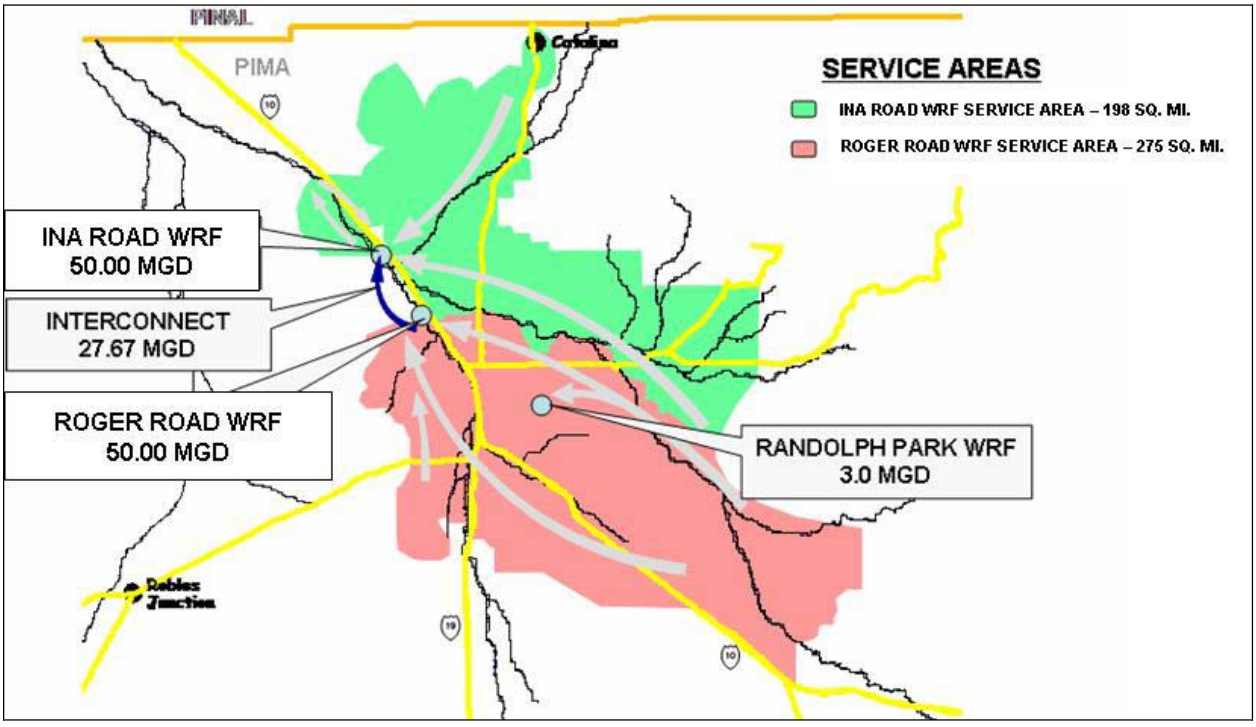
Conveyance System Evaluation

In 2003 PCRWRD commissioned a conveyance system condition assessment. This was part of PCRWRD's on-going asset management program to evaluate about 230 miles of trunk and interceptor sewers. Results of the assessment discovered sewer segments in need of rehabilitation/replacement in the Aviation Corridor, Canada del Oro, Old Nogales Highway, Pantano, Santa Cruz, South Rillito, Southwest and Tanque Verde Interceptors; as well as over 3,000 manholes, several siphon boxes and many of the lift

station wet-wells, which exhibited hydrogen sulfide corrosion. PCRWRD has an active program to address these issues.

In the very near future the Roger Road WRF will have insufficient capacity to accommodate additional flows generated by population growth in its service area. Therefore a major element of the conveyance evaluation was a detailed analysis of transferring flows from the Roger Road WRF to the Ina Road WRF. Three routing alternatives were considered. In the recommended least cost option, the plant interconnect pipeline parallels the existing sludge force main route from the Roger Road WRF to the Ina Road WRF. The major wastewater treatment facilities' locations, the metropolitan Tucson service basin areas, and the projected future treatment and conveyance system capacities are shown on **Figure ES-2**.

Figure ES - 2
Year 2030 Location of Major WRFs Relative to the Metropolitan Tucson Service Area



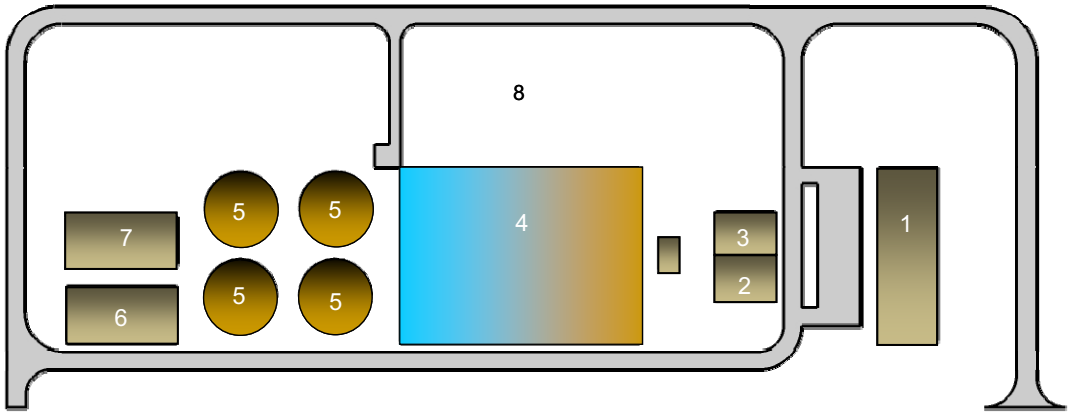
To evaluate the current and future conveyance system capacities, a hydraulic model was developed for routing existing and proposed future flows through the Pima County conveyance systems. While the Pima County conveyance system experiences an increase in flow in response to wet weather events, it has adequate excess capacity to convey both the normal wastewater flows and the additional stormwater induced flows in accordance with the Arizona Department of Environmental Quality's Capacity, Management, Operation, and Maintenance criteria. However, as the service area populations grow, excess system capacity currently available for wet weather flow will be reduced and the ability for the system to reliably convey peak wet weather flows will subsequently be reduced. Because of this capacity

reduction, some portions of the system will need to be augmented in the future to maintain adequate capacity for wet weather flows. These areas of future need are identified in the details of the master plan.

Recommended Treatment Plan

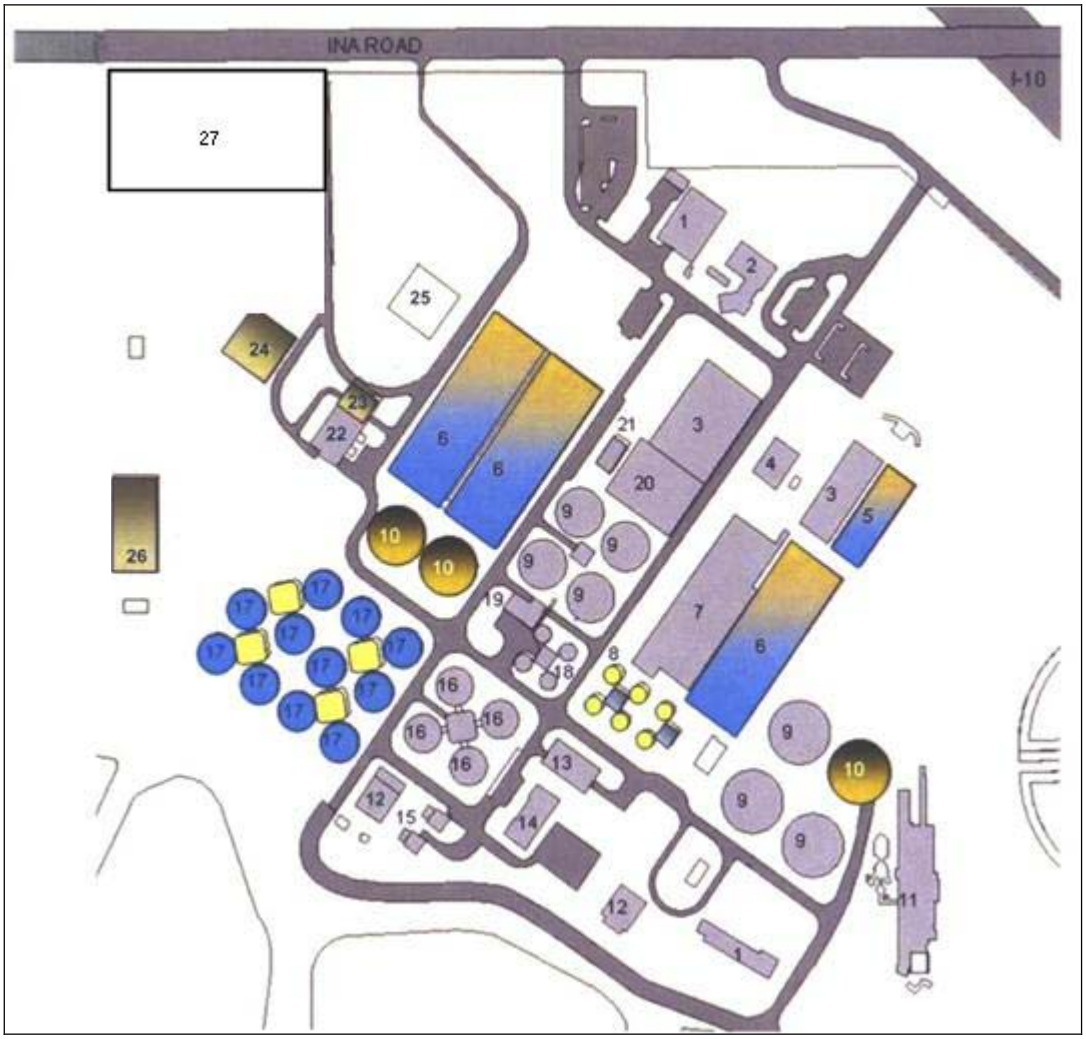
Recommendations for specific modifications, upgrades and replacements at the Roger Road WRF and the Ina Road WRF were developed to enable the wastewater treatment facilities to serve Pima County through the year 2030. The recommendations include upgrading the Ina Road WRF facilities with the Bardenpho technology and expanding capacity from 37.5 mgd to 50 mgd to treat additional flow created from regional population growth. In addition, a new 32 mgd wastewater reclamation plant, utilizing Bardenpho technology in the vicinity of the Roger Road WRF is recommended. Afterwards the existing treatment facilities at Roger Road will be decommissioned and demolished after the new plant is placed into service. The location of the new Water Reclamation Campus will be either north or south of the existing Roger Road WRF and County owned land. **Figure ES-3** and **Figure ES-4** show the Roger Road WRF and Ina Road WRF master plan layouts for the year 2030, respectively.

Figure ES - 3
New WRC – 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

Figure ES - 4
Ina Road WRF – Year 2030 Master Plan Layout



Legend:

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

A new gravity plant interconnect pipeline (Santa Cruz Interceptor Phase IV) will be constructed between the two plants to transport raw wastewater from the Roger Road WRF service area to the Ina Road WRF. The existing sludge force main between the plants will continue to serve the facilities. A new effluent force main and pump station facility will be constructed by Tucson Water to transport treated effluent from the Roger Road facilities to existing water reclamation facilities to meet the City of Tucson's reuse water demand. At Ina Road WRF, Tucson Water will construct a new effluent pump station, force main and other facilities to provide additional treatment prior to distribution of reclaimed water to their existing reclaimed water service distribution system.

Population densities in the metropolitan areas located within close proximity to both treatment plants are expected to increase by the year 2030. A 350-foot buffer zone, required by ADEQ, for odor and noise control will be maintained between the treatment facilities and the property lines.

Non-Metro Treatment Overview and Strategic Management Plan

Non-metro wastewater reclamation facilities serve the wastewater treatment needs outside the metropolitan Tucson region. The non-metro service areas are experiencing rapid population growth. This growth is forecast to continue, thereby increasing flow into PCRWRD's non-metro conveyance and treatment systems. Therefore a strategy to treat current and projected future wastewater flows at the non-metro wastewater reclamation facilities was developed.

Existing non-metro wastewater treatment works were constructed to meet wastewater treatment demands of small housing and community developments. At the time of their construction, forwarding flow for treatment at the Roger Road WRF or Ina Road WRF was not an optimal solution because it would have required long stretches of conveyance structures transporting relatively low flows to serve a few customers. Also, as constructed the treatment technologies differ from facility to facility, but were usually relatively simple wastewater treatment systems permitted by ADEQ. As populations in the non-metro areas grow and wastewater flow increases, PCRWRD is required by ADEQ to reduce nutrient concentrations in the plant effluent. Thus, the wastewater treatment technologies at the non-metro facilities will need to be expanded or upgraded or both with a significant amount of capital investment.

The current and planned activities for each of PCRWRD's non-metro WRFs were evaluated. Five of the non-metro areas were identified to have significant growth. Projected future flows at each of these facilities are as shown in **Table ES-1**. The capacity of the existing facilities will be expanded to meet the projected increases in flows. A new Southland WRF will be required to meet the wastewater treatment requirements of that non-metro area.

Table ES - 1
2030 Non-metro Facility Projected Flow

Facility Location	Projected 2030 Flow (mgd)
Avra Valley WRF	3.0
Corona de Tucson WRF	2.1
Green Valley WRF	4.4
Marana WRF	4.4
Southlands WRF	10.5

CIP Elements

The recommended wastewater conveyance and treatment facilities outlined for the next 15 years in Pima County under the Regional Optimization Master Plan have capital costs estimated at $536 million in 2006 labor and construction dollars. Most of these facilities must be constructed over the next ten years to comply with a regulatory imposed compliance schedule. Project elements are broadly categorized under plant interconnect, new WRC, expansion and upgrade of Ina Road WRF, and support facilities.

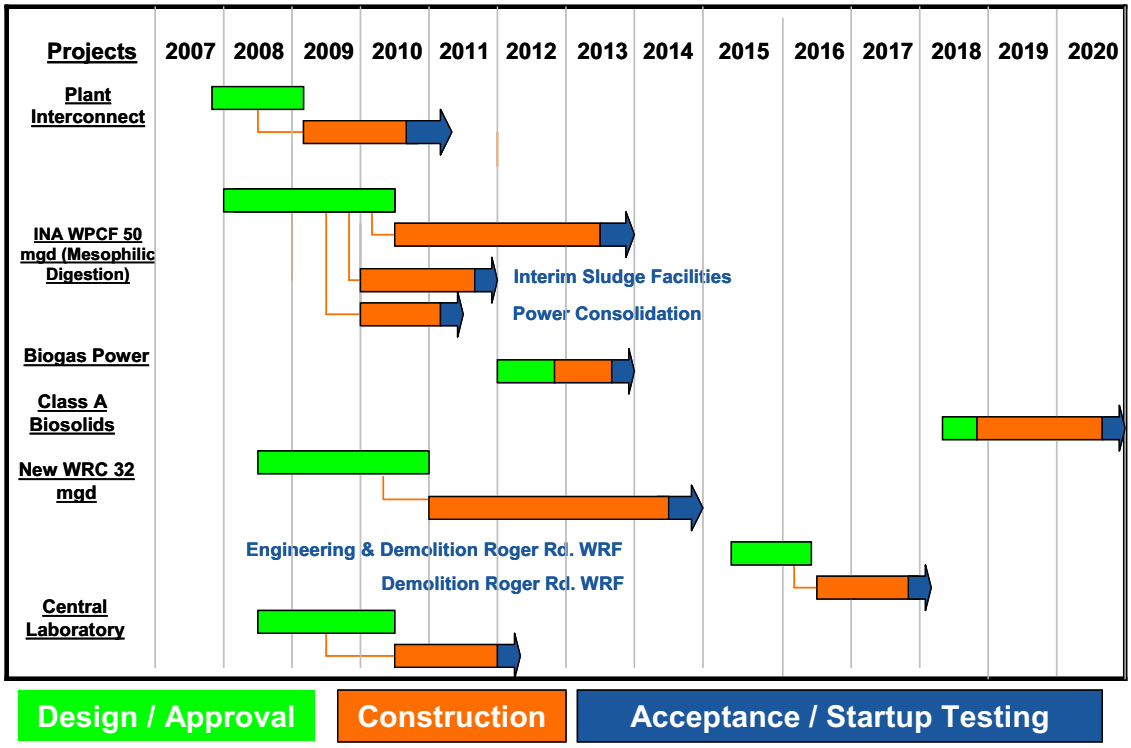
CIP Phasing and Cost Schedule

Master planning for the next 25 years has identified the need for PCRWRD to expand its wastewater treatment plant capacity and implement environmental controls to comply with more stringent requirements for effluent discharges into the Santa Cruz River or reclaimed water use. Detailed analysis and recommendations are provided for the optimal financial plan strategy to procure facilities to meet projected future wastewater flows delivered to the Roger Road WRF and the Ina Road WRF, and the ADEQ regulatory requirements. The financial plan includes specific costs and anticipated project phasing, which will be integrated ultimately into PCRWRD's comprehensive overall CIP. In addition, the strategic financial plan discusses alternative capital funding options and recommends of the most appropriate funding strategy that will meet PCRWRD's financial objectives.

Implementation Plan

Specific costs for required wastewater facilities and systems, and project phasing are integrated into PCRWRD's overall CIP to form the critical elements of the implementation plan. Phasing of the projects to meet the regulatory and growth needs of the community is required across the 25-year planning horizon. Some projects are immediate, such as the plant interconnect pipeline. Other projects will be delayed, such as the demolition of the existing Roger Road facilities, which cannot occur until the new Roger Road WRC is constructed and in service. The project timeline for completion of the new WRC and expansion and upgrades at Ina Road WRF to meet the ADEQ mandated reduction of ammonia toxicity requirements, as written in the ADEQ issued operating permits of the plants, are January 2015 and January 2014, respectively is shown in **Figure ES-5**

Figure ES - 5
Project Compliance Timeline



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ABBREVIATIONS / ACRONYMS

Abbreviations / Acronyms

Abbreviation / Acronym	Meaning
°C	Degrees Celsius
µg/L	Micrograms per Liter
2006 Facility Plan	Pima County Wastewater Management Department's 2006 Metropolitan Facility Plan Update
A&We	Aquatic and Wildlife Ephemeral
AAC	Arizona Administrative Code
ACC	Arizona Corporation Commission
ACSC	Aviation Corridor to Santa Cruz Interceptor
ADEQ	Arizona Department of Environmental Quality
ADWF	Average Dry Weather Flows
ADWR	Arizona Department of Water Resources
AF	Acre Feet
Ag	Silver
AL	Alert Level
APP	Aquifer Protection Permit
AQL	Acceptable Quality Level
AS/NTF	Activated Sludge/Nitrifying Trickling Filter
ASDM	Arizona Sonora Desert Museum
AT	Aeration Tank
AWQS	Aquifer Water Quality Standards
AZPDES	Arizona Pollution Discharge Elimination System
BACT	Best Available Control Technology
BADCT	Best Available Demonstrated Control Technology
BAF	Biological Aerated Filters
BAN	Bond Anticipation Note
BFP	Belt Filter Press
Bid-build	Design-Bid-Build
Bio-P	Biological Phosphorus
BNR	Biological Nutrient Removal
BNRAS	Biological Nutrient Removal Activated Sludge
BNROD	Biological Nutrient Removal Oxidation Ditch

Abbreviation / Acronym	Meaning
BOD	Biochemical Oxygen Demand
BOD_5	5-day Biochemical Oxygen Demand
BOO	Build/Own/Operate
BOOL	Build/Own/Operate/Lease
BOOT	Build/Own/Operate/Transfer
BT/NAS	Biotowers/Nitrifying Activated Sludge
CAB	Capital Appreciation Bond
CAP	Central Arizona Project
CASS	Central Arizona Salinity Study
CCTV	Closed Circuit Television
CDO	Canada Del Oro
CDU	Chemical Dosing Unit
CEP	Conservation Effluent Pool
cf	Cubic Feet
CFR	Code of Federal Register
cfs	Cubic Feet per Second
CFU	Colony Forming Units
Chem-P	Chemical Phosphorus
CHP	Combined Heat & Power
CIP	Capital Improvement Program
Cl_2	Chlorine
CMAR	Construction-Manager-At-Risk
CMOM	Capacity, Management, Operation and Maintenance
CO	Carbon Monoxide
COD	Chemical Oxygen Demand
COP	Certificates of Participation
CRRPS	Continental Ranch Regional Pump Station
CrVI	Chromium – Valence 6
CRWWPS	Continental Ranch Wastewater Pumping Station
CTP	Central Treatment Plant
Cu	Copper
CW	Campbell Wash
d/D	Depth to Diameter Ratio
DAF	Dissolved Air Flotation

Abbreviation / Acronym	Meaning
D/B	Design/Build
D-B-B	Design-Bid-Build
D/B/O	Design/Build/Operate
DEM	Digital Elevation Map
DEQ	Department of Environmental Quality
DHI	Danish Hydraulic Institute
DI	Deionized
DO	Dissolved Oxygen
DPF	Daily Peak Flow
DUPF	Diurnal Peaking Factor
DWP	Dewatering Pump
E. coli	Escherichia coli
e.g.	Exempli Gratia
EMS	Environmental Management System
ENR	Engineering News Record
EPA	Environmental Protection Agency
EQ	Equalization
etc.	Et Cetera
FASL	Feet Above Sea Level
FEP	Facultative/Evaporation Pond
fps	Feet per Second
GAN	Grant Anticipation Note
GBT	Gravity Belt Thickener
GDC	Generator Distribution Center
GIS	Geographic Information System
GMP	Guaranteed Maximum Price
gpcd	Gallons per Capita per Day
gpd	Gallons per Day
GT	Gravity Thickener
GV	Green Valley
H_2S	Hydrogen Sulfide
HAA	Haloacetic Acid
HAMP	Houghton Area Master Plan
HAP	Hazardous (halogenated) Air Pollution

Abbreviation / Acronym	Meaning
HCU	Heating and Cooling Use
HDPE	High-Density Polyethylene
HEX	Heat Exhaust
hp	Horsepower
HPF	Hourly Peak Flow
HPO	High Purity Oxygen
hr	Hour(s)
HRT	Hydraulic Retention Time
HVAC	Heating, Ventilation, Air Conditioning
Hw	Hot Water
Hwy	Highway
I&C	Instrumentation and Control
i.e.	Id Est
I/I	Infiltration/Inflow
I/O	Input/Output
I-10	Interstate 10
IC	Internal Combustion
IFAS	Integrated Fixed Film Activated Sludge
IGA	Intergovernmental Agreement
in	Inch(es)
IOU	Investor-Owned Water Utilities
IR	Ina Road
IRS	Internal Revenue Service
IT	Information Technology
kV	Kilovolt
kVA	Kilo-Volt Ampere
kW	Kilowatt
kWh	Kilowatthour
lbs	Pound
LOX	Liquid Oxygen
LSCRMRP	Lower Santa Cruz River Managed
MACT	Maximum Achievable Control Technology
MBBR	Moving Bed Bioreactor
MBH	1,000 BTUs/hour

Abbreviation / Acronym	Meaning
MBR	Membrane Bioreactor
MCC	Motor Control Center
MCRT	Mean Cell Retention Time
MG	Million Gallons
mg/L	Milligrams per Liter
mgd	Million Gallons per Day
MH	Manhole
mL	Milliliter
MLE	Modified Ludzack-Ettinger
MLSS	Mixed Liquor Suspended Solids
MPC	Municipal Property Corporation
MPF	Monthly Peak Flow
MPN	Most Probable Number
NASSCO	National Association of Sewer Service Companies
ND	Non Detect
NdeN	Nitrification-Denitrification
NDMA	N-nitrosodiumdimethylamine
NEMA	National Electrical Manufacturer's Association
ng/L	Nano-Grams per Liter
NH_4-N	Ammonium as Nitrogen
Nitrate-N	Nitrate as Nitrogen
NO_3	Nitrate
NOI	Notice of Intent
NO_X	Nitrogen Oxide
NPDES	National Pollutant Discharge Elimination System
NRI	North Rillito Interceptor
NRI	North Rillito Interceptor
NTU	Nephelometric Turbidity Unit
NWO	Northwest Outfall
O&M	Operations and Maintenance
ORP	Oxidation Reduction Potential
PAB	private Activity Bonds
PAG	Pima Association of Governments
Pb	Lead

Abbreviation / Acronym	Meaning
PBC	Partial Body Contact
PCB	Polychlorinated Biphenyls
PCRFCD	Pima County Regional Flood Control District
PCWMD	Pima County Wastewater Management Department
PE	Population Equivalent
PF	Peaking Factor
PF_{DW}	Dry Weather Peaking Factor
PFRP	Process to Further Reduce Pathogens
PF_{WW}	Wet Weather Peaking Factor
pH	Measure of Acidity and Alkalinity
PLC	Programmable Logic Controller
PM10	Particulate Matter less than Nanometers
POC	Point of Compliance
PONT	Pontatoc Wash
Ppb	Parts per Billion
ppbv	Parts per Billion by Volume
ppm	Parts per Million
PQL	Practical Quantitation Level
PSA	Pressure Swing Absorption
psig	Pounds per Square Inch
PSP	Primary Sludge Pump
PSRP	Process to Significantly Reduce Pathogens
PTI	Pantano Interceptor
PW	Present Worth
$Q_{50\%}$	Median Peak Daily Flow
QA/QC	Quality Assurance and Quality Control
Q_{ADF}	Average Daily Dry Weather Flow
R.O.W.	Right of Way
RAN	Revenue Anticipation Notes
RAS	Return Activated Sludge
REC	Recognized Environmental Condition
RFEI	Request for Expression of Interest
ROMP	Regional Optimization Master Plan
rpm	Revolutions per Minute

Abbreviation / Acronym	Meaning
RR	Roger Road
RTU	Remote Terminal Unit
SAR	Specific Absorption Rate
SAT	Soil Aquifer Treatment
SAWRSA	Southern Arizona Water Rights Settlement Act
$sBOD_5$	Soluble 5-day Biochemical Oxygen Demand
SCADA	Supervisor Control and Data Acquisition
SCC	Santa Cruz Central Interceptor
SCE	Santa Cruz-East Interceptor
scfm	Standard Cubic Feet per Minute
SCI	Santa Cruz Interceptor
SDCP	Sonoran Desert Conservation Plan
SEI	Southeast Interceptor
sf	Square Feet
SO_X	Sulfur Oxides
SRC	South Rillito Interceptor-Central
SRF	State Revolving Loan Fund
SRI	South Rillito Interceptor
SROG	Subregional Operating Group
SRT	Sludge Retention Time
SRWC	South Rillito Interceptor-West, Central Line
SRWN	South Rillito Interceptor-West, North Line
SRWS	South Rillito Interceptor-West, South Line
SSO	Sanitary Sewer Overflow
SWI	Southwest Interceptor
SWIP	Southwest Infrastructure Plan
TAN	Tax Anticipation Notes
TAZ	Traffic Analysis Zone
TCLP	Toxicity Characteristics Leachate Procedure
TDS	Total Dissolved Solids
TEP	Tucson Electric Power
THM	Trihalomethane
TKN	Total Kjeldahl Nitrogen
TN	Total Nitrogen

Abbreviation / Acronym	Meaning
TOC	Total Organic Carbon
TP	Total Phosphorus
TPAD	Temperature Phased Anaerobic Digestion
tpd	Tons per Day
TPU	Third Party Use
TRAN	Tax and Revenue Anticipation Note
TSS	Total Suspended Solids
TUCDIV	Tucson Boulevard Diversion
TVSS	Transient Voltage Surge Suppression
UCMR	Unregulated Contaminant Monitoring Rule
USEPA	United States Environmental Protection Agency
USFS	United States Forest Service
UV	Ultraviolet
V	Volt
VA	Vulnerability Assessment
VFD	Variable Frequency Drive
VOC	Volatile Organic Carbon
VRDO	Variable Tax-Exempt Debt
VSS	Volatile Suspended Solids
WAS	Waste Activated Sludge
WERF	Water Environment Research Foundation
WET	Whole Effluent Toxicity
WF	Weighting Factor
WIFA	Water Infrastructure Finance Authority
WPCF	Water Pollution Control Facility
WRC	Reclamation Campus
WRF	Water Reclamation Facility
WWTF	Wastewater Treatment Facility
WWTP	Wastewater Treatment Plant