Pima County Receives A+ for ROMP Upgrades
2015 Arizona WateReuse Symposium

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Pima County, Arizona

• Regional Water Reclamation Department
  – Serves Nearly 1,000,000 Customers
  – 700 Square Mile Service Area
  – 7 Water Reclamation Facilities
    • Two major facilities (Tres Rios WRF & Agua Nueva WRF)
    • 5 Sub-Regional WRFs
  – Treats 55 to 60 mgd of Wastewater
  – Discharges To:
    • Percolation Basins
    • Reclaimed Water Distribution System (Tucson Water)
    • Lower Santa Cruz River
Regional Optimization Master Plan

- County-wide Looked at Wastewater Infrastructure Needs
- Addressed Current / Future Regulatory Requirements
- Examined Current / Future Water Reuse Needs
- Defined a Program to Achieve Objectives / Goals
ROMP Objectives

• Upgrade/Rehabilitate Aging Treatment Works Infrastructure
• Expand Facilities to Meet Future Population Flows
• Utilize Modern Treatment Technologies
• Meet Effluent Nitrogen Limits
  – TKN Less than 8 mg/L
  – Ammonia less than 1.75 mg/L
  – Meet Class A+ Discharge
• Keep Water in Pima County
Bardenpho (Agua Nueva WRF & Tres Rios WRF)

PROCESS SCHEMATIC

INFLUENT FLOW

PRIMARY CLARIFIER

BARDENPHO BIOREACTOR SYSTEM

SECONDARY CLARIFIER

CHLORINE CONTACT BASIN

SANTA CRUZ RIVER

RECLAIMED WATER (TUCSON WATER SYSTEM)

PROCESS FLOW ABBREVIATIONS
Ana = Anaerobic
Anx = Anoxic
Aer = Aeration
Tres Rios WRF

Pre-ROMP

Post-ROMP

ROMP Additions
Agua Nueva WRF

Pre-ROMP

Post-ROMP

ROMP Additions
## Effluent Discharge Quality

<table>
<thead>
<tr>
<th>Constituent</th>
<th>Influent Characteristics</th>
<th>Pre-ROMP Upgrades (Before 2013)</th>
<th>Post-Construction (After 2014)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BOD5, mg/L</td>
<td>230</td>
<td>10</td>
<td>&lt;3</td>
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<tr>
<td>TSS, mg/L</td>
<td>280</td>
<td>13</td>
<td>&lt;1</td>
</tr>
<tr>
<td>TKN, mg/L</td>
<td>45</td>
<td>24</td>
<td>6</td>
</tr>
<tr>
<td>Ammonia, mg/L</td>
<td>33</td>
<td>19</td>
<td>1.75</td>
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<tr>
<td>Phosphorus, mg/L</td>
<td>7</td>
<td>4</td>
<td>&lt;2</td>
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</tbody>
</table>
Reclaimed Water

FLOW (MGD) vs TIME (Months)

- RECLAIMED WATER
- AGUA NUEVA WRF FLOW
Santa Cruz River

- 184 miles Long
- Attracted People 12,000 Years Ago
- Source of Irrigation Water for Native Tribes
- River Water Course
  - Originates – Southeast Arizona High Grasslands
  - Runs South to Mexico
  - Turns North Through Tucson
  - Northwest to Gila River
  - West to Colorado River
  - South to Gulf of California
- Once a Perennial Stream
  - Dried up From Ground Water Pumping
Santa Cruz River System

Map showing the Santa Cruz River System with key cities and geographical features.
Lower Santa Cruz River  (Pima County)

Three Rivers
Cortaro Narrows
Marana Flats
Ancient Irrigation Ditches

Irrigation System (1,200 B.C.)
Lower Santa Cruz Flow Extent

- **Flow Extent = Visible Flow**
- **Effluent Dependency**
  - River Flow: 
    - 2013
    - 2014

- Annual Rainfall: 6.6 inches, 9.7 inches

![Diagram showing flow extent and effluent dependency for 2013 and 2014.]
Flow Stretch is Shorter

- Flow extend decreased from 2013 to 2014.
- 2% to 3% evaporation / plant uptake
- 2013 -- No dry days at end of reach
- 2014 -- 94 dry days at end of reach
  - More flow diverted (223 AF/month)
    - Reclaimed Water
    - Irrigation
- 2013 -- 33% as recharge
- 2014 -- 45% as recharge
Water Clarity

• 2013 Generally Cloudy (NTU = 46)
• 2014 Marked Decline in Turbidity (NTU=15)
  – Less Fines in Water Column
  – Less Solids to Seal River Bottom
### Nutrient Pollution

<table>
<thead>
<tr>
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<th>2013</th>
<th>2014</th>
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<tbody>
<tr>
<td>TDS</td>
<td>684</td>
<td>652</td>
</tr>
<tr>
<td>NH₄, mg/L</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>DO, mg/L</td>
<td>5.7</td>
<td>8.2</td>
</tr>
<tr>
<td>BOD₅, mg/L</td>
<td>18</td>
<td>3</td>
</tr>
<tr>
<td>Metals</td>
<td>*</td>
<td>*</td>
</tr>
</tbody>
</table>

* Ar, Cd, Cr, Co, Pb, Hg, Se, Zn: below levels to protect aquatic wildlife
Wildlife Along Lower Santa Cruz River

- Habitat Created Along 23 Mile Reach of Lower Santa Cruz River
- Birds - 215 Species Observed
Aquatic Wildlife

- Fish - Western Mosquito Fish / Catfish
- Invertebrates – Midges / Mayflies
Aquatic Wildlife (Cont’d.)

- Aquatic Wildlife (2014) – Some Improvement
  - Amphibians / Reptiles: Leopard Frogs, Sonora Mud Turtle, Mexican Gartersnake, Couch’s Spade Foot Toad, American Bullfrog, …
Riparian Vegetation

- 2014 Wetland Plants Increased
- Still Abundance of High-Nitrogen Tolerant Plants
- Community Planting of Thousands of Mesquites and Palo Verde Trees, and Shrubs Along Lower Santa Cruz River
Social Impacts / River Benefits

- Seven Parks Associated or Adjacent River
  - Loop Recreational Path Along the River
- Odor from Wastewater Treatment Facilities Are Gone or Barely Noticeable
- Youth Program – Introduces Importance of Water in Community
- Ramp-up of Appreciation for a Vital Resource
Youth Painting & Poetry Program
Community Awareness
Notable Findings

- Water Clarity Improvement
- Water Quality Improvement
- Nutrient Pollution Decline
- Flow Extent Decline (*more recharge / reuse*)
- Aquatic Wildlife Observed Signs of Improvement
- **Pima County Scores A+**