El Paso Desalination Plant

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August 9, 2007
Current El Paso Water Supply

- Hueco Bolson Groundwater
- Mesilla Bolson Groundwater
- Rio Grande Diversion
Surface Water Plants
Hueco Wells
Mesilla Wells
Hueco Bolson
~ 1.6 million acres
~ 2,500 sq. mi.
Brackish Groundwater Intrusion
Groundwater Management Issues

- Declining groundwater levels
- Brackish water intrusion
Kay Bailey Hutchison
Desalination Plant

- EPWU and Ft Bliss
- Desalination Plant and some wells located on Ft Bliss
- Concentrate disposal by injection well
18.5 mgd from Hueco Bolson enters the RO Plant, producing 27.5 mgd output. The concentrate from the RO Plant is 3 mgd, which is directed to the Injection Reservoir. The remaining 3 mgd is directed to the Tank.
Hueco Bolson → 12 mgd → RO Plant
18.5 mgd → RO Plant
27.5 mgd

3 mgd of Concentrate → Tank

3 mgd

Injection Reservoir
Major Components

- Production Wells and Collector Lines
- Plant and Near-Plant Piping
- Concentrate Disposal Wells and Pipelines
Existing EPWU Wells
Rehabilitated Wells (3)
Connected to Collector Line (4)
New Wells on Loop 375 (16)
Production Wells and Collectors

- 3 Well Drilling Contracts
- 3 Pump Furnish-and-Install Contracts
- 4 Well Equipping Contracts
- 2 Pipeline Contracts

Period of Work: March 2005 to June 2007
Plant and Near-Plant Pipes

• Reverse Osmosis Plant
• “4-Pipe” Project (41,800 ft)
  – Airport Well Collector (Final)
  – Loop 375 Collector (Final)
  – Concentrate Pipeline (Initial)
  – Finished Water Pipeline
pressure

semipermeable membrane

salt water

fresh water
ESPA-1 Membranes

Diagram showing a rolled membrane with labeled parts:
- Concentrate
- Product
- Feed
- Feed Spacer
- Permeate Carrier
- Membrane
- Glue
Plant Overview

- 5 Skids
- Flow Rate: 1.70 to 3.64 mgd per skid
- Expected Recovery: 70% to 82.5%
- Expected Salt Rejection: up to 93%
Pretreatment

- Antiscalant
- Acid
  - pH adjustment to 7.4
Finished Water Treatment

- pH Adjustment to 7.5
  - Caustic Soda
- Corrosion Inhibitor
  - ~ 2 ppm
- Disinfection
  - Sodium Hypochlorite
  - 1 ppm Cl residual
Concentrate Treatment

- Ability to add acid as needed
Plant and Near-Plant Pipelines

• 2 Contracts
  – Plant
  – 4-pipe project

Period of Work: July 2005 to June 2007
Concentrate Disposal

- 3 Injection Wells
- Surface Injection Facilities
- Concentrate Pipeline (97,800 ft)
## Cost Comparison (2002)

<table>
<thead>
<tr>
<th>Disposal Method</th>
<th>Capital (million)</th>
<th>Annual O&amp;M (million)</th>
<th>Present Value (million)</th>
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</thead>
<tbody>
<tr>
<td>Passive Evaporation</td>
<td>$41</td>
<td>$1.0</td>
<td>$71</td>
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<tr>
<td>Enhanced Evaporation</td>
<td>$23</td>
<td>$2.9</td>
<td>$88</td>
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<tr>
<td>Deep Well Injection</td>
<td>$7</td>
<td>$0.8</td>
<td>$25</td>
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Injection Wells
Injection Well Construction

- Class I Standards
- Open Hole Injection Zone
- Well 3 (2006) – 4,030 ft deep
- Well 2 (2007) – 3,720 ft deep
Injection Well Summary

- Depth to Water (Static) ~ 500 ft
- Injection Capacity 1,400 to 2,000 gpm
- Depth to Water (Injection) > 350 ft
- Formation Water TDS ~ 8,800 mg/l
- Bottom Hole Temperature ~ 160°F
Surface Injection Facilities

- Yard Piping
- Storage Tanks (~300,000 gal each site)
- Electrical System (solar w/ backup)
- Communications and Controls
Injection Well Issues

• Reservoir capacity
  – Ongoing evaluation during initial operation of wells

• Potential for mineral precipitation
  – Concentrate is supersaturated with respect to:
    • Calcite
    • Barite
    • Silica
Concentrate Disposal

- Test Hole Drilling Contract (USACE)
- 3 Injection Well Construction Contracts
- Surface Injection Facility Contract
- Downhole Equipping Contract
- Concentrate Pipeline Contract

Period of Work: April 2003 to June 2007
30-Day Commissioning Test

- Originally Scheduled for May and June 2007
- Scenarios:
  1. One Skid (low flow)
  2. Two Skids (low flow)
  3. Three Skids (low flow)
  4. Four Skids (low flow)
  5. Five Skids (low flow)
  6. Five Skids (max flow)
  7. Two Skids (high flow)
Start-up Issues

- Programming of Control System
- Communications with Wells
- Plant Equipment
Start-up Summary

- Began July 19, 2007
- Currently running Scenario 6
Capital Costs

- Production Wells and Collectors: $30 Million
- Plant and Near-Plant Pipes: $40 Million
- Concentrate Disposal: $17 Million

Total Cost: $87 Million
(21 Contracts)
Sources of Funding

- Congressional Appropriations $26.0 Million
- TWDB Interest Free Loan $1.0 Million
- EPWU Bonds and Cash $56.7 Million
- Army Contribution $3.3 Million
- Total $87.0 Million
Annual Operating Costs
Assumes $0.07/kwh and 80% Operation

- Wells, Collectors $700,000
- Ft Bliss (water and land) $1,300,000
- Desalination Plant $2,600,000
- Disposal $200,000
- Finished Water Pipeline $26,000

- Total $4,826,000
Amortized Capital and O&M ($/AF)
Assumes 5% Discount Rate

- Wells, Collectors $189
- Ft Bliss (water and land) $42
- Desalination Plant $232
- Disposal $49
- Finished Water Pipeline $22

- Total $534
Questions?