Bureau of Reclamation
Appraisal Level Report
Engineering Assessment of the
AWSA Act Tier-2 Diversion Proposals &
Other Diversion and Storage Configurations

July 21, 2014

Phoenix Area Office
& Denver Technical Service Center
2004 AWSA Modified CAP Upper Gila Exchange Requirements

- NM to decide whether to construct a New Mexico Unit and notify the Secretary by December 31, 2014

- NM can exchange up to an annual average of 14,000 acre-feet/year from the Gila & San Francisco Rivers

- $66 million transferred to New Mexico to pay costs of the Unit \textit{or other water utilization alternatives} (payable over 10 years starting in 2012)

- Up to an additional $62 million is available IF NM chooses to build a Unit for the exchange
Reclamation’s Role in AWSA Implementation

• Provide oversight/support for the Secretary of Interior

• Manage the Lower Colorado River Basin Development Fund (LCRBDF)
  – Deposit LCRBD Funds into a New Mexico Unit Fund

• Assure Environmental Compliance of NM Unit
Reclamation Appraisal Level Report

Tasks

• MOU with ISC on May 7, 2013

• Appraisal level work
  • Engineering Assessment of the Three Tier 2 Diversion & Storage Proposals
  • Identification & Engineering Assessment of Other Diversion & Storage Options
  • Economic Analyses of Tier 2 Proposals & Other Diversion & Storage Options
  • Environmental Review for Potential Effects on Diversion and Storage Proposals
  • July 31, 2014 for Final Report to ISC
# AWSA Tier 2 Proposals

## Non-Diversion Proposals

<table>
<thead>
<tr>
<th>Proposal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grant Co. Water Commission Infrastructure &amp; Reuse</td>
</tr>
<tr>
<td>Grant County Recharge and Reservoir</td>
</tr>
<tr>
<td>City of Deming Wastewater Reuse</td>
</tr>
<tr>
<td>Municipal Conservation</td>
</tr>
<tr>
<td>Pleasanton Ditch Improvements</td>
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<tr>
<td>Luna Ditch Improvements</td>
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<tr>
<td>Sunset/New Mexico New Model Pipeline</td>
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<tr>
<td>San Francisco Watershed Restoration</td>
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<tr>
<td>New Mexico Forest Industry Association Watershed Restoration</td>
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<tr>
<td>New Mexico State University Watershed Restoration</td>
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<tr>
<td>Grant Soil &amp; Water Conservation District Forest Restoration</td>
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<tr>
<td>U.S. Forest Service Watershed Restoration</td>
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## Diversion Proposals

<table>
<thead>
<tr>
<th>Proposal</th>
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<tbody>
<tr>
<td>Southwest New Mexico Regional Water Supply</td>
</tr>
<tr>
<td>(Deming Surface Water Diversion)</td>
</tr>
<tr>
<td>Gila Basin Irrigation Commission Diversion and Storage</td>
</tr>
<tr>
<td>Hidalgo County Off-Stream</td>
</tr>
</tbody>
</table>
Other Diversion & Storage Options

**Single Canyon Storage Options**

<table>
<thead>
<tr>
<th>Canyon Name</th>
<th>Area (ac-ft)</th>
<th>Diversion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greenwood Canyon</td>
<td>26,000</td>
<td>1</td>
</tr>
<tr>
<td>Spar Canyon</td>
<td>3,100</td>
<td>4</td>
</tr>
<tr>
<td>Winn Canyon</td>
<td>2,750</td>
<td>1</td>
</tr>
<tr>
<td>Pope Canyon</td>
<td>7,900</td>
<td>1</td>
</tr>
<tr>
<td>Dam Canyon</td>
<td>4,400</td>
<td>1</td>
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</tbody>
</table>

**Multiple Canyon Storage Options**

<table>
<thead>
<tr>
<th>Canyon Name</th>
<th>Area (ac-ft)</th>
<th>Diversion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greenwood Canyon &amp; Sycamore Canyon</td>
<td>62,900</td>
<td>1</td>
</tr>
<tr>
<td>Mogollon Canyon &amp; Winn Canyon</td>
<td>14,250</td>
<td>4</td>
</tr>
<tr>
<td>Spar Canyon &amp; Garcia Canyon</td>
<td>10,600</td>
<td>4</td>
</tr>
</tbody>
</table>
Tier 2 Diversion Analyses

- Gila Basin Irrigation Commission (GBIC)
- Southwest New Mexico Regional Water Supply Project (City of Deming)
- Hidalgo County Off-Stream Project
GBIC

• Principle Components:
  – Diversion
  – Open Channel Conveyance
  – Underground Storage
GBIC

• 2 Diversion Structures
  – Confluence of Mogollon Creek and Gila River
  – Existing Gila Farms diversion location
GBIC Conveyance

[Map of Mogollon Creek showing GBIC Conveyance, including Diversion Structure, New Canals, Existing Canals, and Spar Canyon.]
GBIC Lower Diversion

- 5,000 ft. Structural length
- 4,400 ft. Compacted embankment with 2.5 ft. x 10 ft. slurry wall
- Cost: $10,900,000
GBIC Storage

- Infiltration Gallery
  - Recharge System
  - Collection System

- On Farm Storage

- Injection/Pumping Wells
GBIC Recharge System
GBIC Collection System
GBIC On Farm Storage

TYPICAL CONCEPTUAL STORAGE POND SCHEMATIC
GBIC PROPOSAL

PROFILE NOT TO SCALE
GBIC Cost

• The total project cost is estimated at $41,800,000

  – Upper diversion structure $9,300,000
  – Gila Farms diversion structure $10,800,000
  – Connection ditches (2 @ 350 cfs) $4,860,000
  – Upsize existing ditches $1,000,000
  – Storage ponds (10) $3,800,000
  – Pipeline recharge system $10,900,000
  – Infiltration Gallery $1,100,000

  $41,800,000

• OM&R @1.4% of total project cost is $585,000/yr
City of Deming

• Principle Components:
  – Diversion
  – Storage Reservoirs
  – Closed Conduit (Pipeline) Conveyance
City of Deming

- 2 Diversion Components
  - Captured Flows
  - Subsurface Diversions
Mangas Creek
Pipeline to Deming
City of Deming Cost

- The total project cost is estimated at $503,100,000
  - Mogollon dam $158,000,000
  - Infiltration Gallery and Pumping Plant $34,100,000
  - Mangas dam $155,000,000
  - Pipeline to Deming $156,000,000

OM&R is estimated to cost $8,850,000/yr
Hidalgo County Off-Stream Project

• Principle Components:
  – Diversion
  – Open Channel Conveyance
  – Storage Reservoirs
Hidalgo Diversion

- 950 ft. Structural length
- 350 ft. Sheet pilings driven 25 ft. into compacted embankment
- Cost: $9,300,000
Hidalgo Conveyance
Virden Storage Facility
Hidalgo County Cost

• The total project cost is estimated at $235,000,000
  - Diversion Dam and Canal $115,000,000
  - Schoolhouse Dam $105,000,000
  - Virden Dam $14,700,000
    $234,700,000

OM&R is estimated to cost $1,530,000/yr
Other Diversion and Storage Options

- 4 Diversion Locations
- 24 Storage Locations
  - 7 Locations Selected for Further Analyses
  - 3 Storage Configurations Presented
Conveyance Routes

Diversion 1

Diversion 2

Diversion 3

Diversion 4
Diversion 1

- 4 Storage Sites
  - Winn Canyon
  - Pope Canyon
  - Sycamore Canyon
  - Greenwood Canyon
Winn Canyon

- Storage capacity- 2,750 ac-ft
- Reservoir area- 109 acres
- Dam structural height- 81 ft
- Embankment dam crest length- 1500 ft
- Dam crest elevation- 4670 ft
- Embankment dam volume- 829,000 yd$^3$
- Canal conveyance length from Diversion 1 to reservoir of 42,230 ft
Pope Canyon

- Storage capacity - 7,900 ac-ft
- Reservoir area - 219 acres
- Dam structural height - 126 ft
- Embankment dam crest length - 1500 ft
- Dam crest elevation - 4633 ft
- Embankment dam volume - 2,440,000 yd$^3$
- Canal conveyance length from Diversion 1 to reservoir of 113,750 ft
Sycamore Canyon

- Storage capacity: 36,900 ac-ft
- Reservoir area: 583 acres
- Dam structural height: 186 ft
- Embankment dam crest length: 4400 ft
- Dam crest elevation: 4623 ft
- Embankment dam volume: 6,800,000 yd³
- Canal conveyance length from Diversion 1 to reservoir: 118,950 ft
Greenwood Canyon

- Storage capacity: 26,000 ac-ft
- Reservoir area: 481 acres
- Dam structural height: 176 ft
- Embankment dam crest length: 1412 ft
- Dam crest elevation: 4632 ft
- Embankment dam volume: 3,035,000 yd$^3$
- Canal conveyance length from Diversion 1 to reservoir of 136,600 ft
Diversion 2

• 1 Storage Site
  – Dam Canyon
Dam Canyon

- Storage capacity- 9,400 ac-ft
- Reservoir area- 135 acres
- Dam structural height- 247 ft
- Embankment dam crest length- 1715 ft
- Dam crest elevation- 4685 ft
- Embankment dam volume- 4,290,000 yd$^3$
- Canal conveyance length from Diversion 2 to reservoir of 172,900 ft
Diversion 3

- 1 Storage Site
  - Garcia Canyon
Garcia Canyon

- Storage capacity - 7,500 ac-ft
- Reservoir area - 203 acres
- Dam structural height - 115 ft
- Embankment dam crest length - 2650 ft
- Dam crest elevation - 4762 ft
- Embankment dam volume - 2,120,000 yd$^3$
- Canal conveyance length from Diversion 3 to reservoir of 87,800 ft
Diversion 4

- 1 Storage Site
  - Spar Canyon
Spar Canyon

- Storage capacity- 9,400 ac-ft
- Reservoir area- 135 acres
- Dam structural height- 247 ft
- Embankment dam crest length- 1715 ft
- Dam crest elevation- 4685 ft
- Embankment dam volume- 4,290,000 yd$^3$
- Canal conveyance length from Diversion 2 to reservoir of 172,900 ft
<table>
<thead>
<tr>
<th>Storage site</th>
<th>Construction Cost ($)</th>
<th>Storage Volume (AF)</th>
<th>Cost per AF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spar</td>
<td>161,583,000</td>
<td>3,100</td>
<td>52,100</td>
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<tr>
<td>Winn</td>
<td>83,291,200</td>
<td>2,750</td>
<td>30,300</td>
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<tr>
<td>Garcia</td>
<td>207,933,000</td>
<td>7,500</td>
<td>27,700</td>
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<tr>
<td>Pope</td>
<td>234,011,200</td>
<td>7,900</td>
<td>29,600</td>
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<tr>
<td>Greenwood</td>
<td>280,511,200</td>
<td>26,000</td>
<td>10,800</td>
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<tr>
<td>Sycamore</td>
<td>363,601,200</td>
<td>36,900</td>
<td>9,900</td>
</tr>
<tr>
<td>Dam</td>
<td>307,223,000</td>
<td>9,400</td>
<td>32,700</td>
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</tbody>
</table>
Storage Options

• Storage Configurations:
  – Alternative 1:     64,000 AF
  – Alternative 2:     10,000 AF
  – Alternative 3:     14,000 AF
Alternative 1

- Cost: $598,450,000
  - Sycamore  36,900 AF
  - Greenwood 26,000 AF
  62,900 AF
- OM&R: $4,470,000/yr
Alternative 2

- Cost: $294,373,000
  - Spar 3,100 AF
  - Garcia 7,500 AF
  - 10,600 AF
- OM&R: 2,525,000/yr
Alternative 3

- Cost: $307,303,000
  - Mogollon 11,500 AF
  - Winn 2,750 AF 14,250 AF
- OM&R: 2,684,000/yr
## Other Diversion and Storage Options Cost

<table>
<thead>
<tr>
<th>Storage Sites</th>
<th>Storage Volume (AF)</th>
<th>Construction Cost ($)</th>
<th>Cost per AF</th>
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</thead>
<tbody>
<tr>
<td>Sycamore &amp; Greenwood</td>
<td>62,900</td>
<td>$598,450,000</td>
<td>$9,514.31</td>
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<tr>
<td>Mogollon &amp; Winn</td>
<td>14,250</td>
<td>$307,303,000</td>
<td>$21,565.10</td>
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<tr>
<td>Spar &amp; Garcia</td>
<td>10,600</td>
<td>$294,373,000</td>
<td>$27,771.00</td>
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</tbody>
</table>
Miscellaneous Considerations

• Replace diversion structures with infiltration gallery
  – Diversion structure $9 Million vs $16.2 Million for Infiltration gallery

• Cost of water treatment at the Deming pipeline termination
  – $21.1 Million for Deming’s municipal use of 3,900 acre-ft per year

• Tunnel versus open channel water conveyance

• Lining reservoirs
  – At $1.74 / sq. ft, $163,000 for 2 acre pond, $9.1 Million for Winn Canyon
Questions?

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