SUMMARY

I. Background

The Lower Rio Grande Basin Study (Basin Study) proposal was selected for fiscal year 2011 funding in July 2011. The Bureau of Reclamation (Reclamation) and the Rio Grande Regional Water Authority (RGRWA) with its 53 member entities, in collaboration with other Texas water and environmental agencies, and the International Boundary and Water Commission (IBWC) conducted the cost-shared Basin Study to evaluate the impacts of climate variability and change on water supply imbalances within an eight-county region (State of Texas water planning Region M) along the U.S./Mexico border in south Texas. The study was conducted under the authority of Public Law (P.L.) 111-11, Subtitle F.

Water supplies in the area are primarily from the Rio Grande, with much of the drainage located in Mexico and regulated by releases from Falcon and Amistad Reservoirs (figure S-1), which are managed by the IBWC, in compliance with the Treaty of 1944 Utilization of Waters of the Colorado and Tijuana Rivers and of the Rio Grande (Treaty). Much of the water deliveries in the study area are made through a network of canals that are managed by 27 different irrigation districts. The supply issues facing the Lower Rio Grande Basin in both the United States and Mexico are extremely complex, ranging from a multinational to local scale.

Figure S-1: Project study area.
Under the authority of the SECURE Water Act (Public Law [P.L.] 111-11), the U.S. Department of the Interior (Interior) established WaterSMART (Sustain and Manage America’s Resources for Tomorrow) in February 2010 to facilitate the work of Interior’s bureaus in pursuing a sustainable water supply for the Nation. The program focuses on improving water conservation and sustainability and helping water resource managers make sound decisions about water use. It identifies strategies to ensure that this and future generations will have sufficient supplies of clean water for drinking, economic activities, recreation, and ecosystem health. The program also identifies adaptive measures to address climate change and its impact on future water demands. The four required elements of a Basin Study are:

1. Projections of water supply and demand within the basin, including an assessment of risks to the water supply relating to climate change as defined in section 9503(b)(2) of the SECURE Water Act.

   The study finds that climate change is likely to result in increased temperatures, decreased precipitation, and increased evapotranspiration in the study area (chapter 2).

2. Analysis of how existing water and power infrastructure and operations will perform in the face of changing water realities, such as population increases and climate change, as well as other impacts identified within section 9503(b)(3) of the SECURE Water Act as appropriate.

   The study finds that in addition to the 592,084 acre-feet per year (ac-ft/yr) of supply shortfall (demand minus supply) predicted by the existing regional planning process by 2060, an additional 86,438 ac-ft/yr will be needed due to climate change. This will greatly reduce the reliability of deliveries to all users dependent on deliveries of Rio Grande water via irrigation systems (chapter 2).

3. Development of appropriate adaptation and mitigation strategies to meet future water demands.

   The study developed a planning objective that would reduce dependency on the Rio Grande in the part of the study area most susceptible to water supply imbalances and would meet the additional shortfall projected (chapter 3).

4. A tradeoff analysis of the strategies identified and findings and recommendations as appropriate. This includes an analysis of all proposed alternatives in terms of their relative cost, environmental impact, risk (probability of not accomplishing the desired/expected outcome), stakeholder response, or other attributes common to the alternatives.
Summary

The study examined the existing water management strategies proposed by the regional planning process against the planning objective and selected four for further study (seawater desalination, brackish groundwater desalination [BGD], reuse, and fresh groundwater development) while emphasizing the continuing need for conservation and the need for a portfolio approach to include all approved elements of the regional planning process (chapter 3). The four strategies are examined further in chapter 4. Brackish groundwater desalination was recommended as being most suitable for preliminary engineering and affordability analysis. This strategy was further developed to recommend three generalized locations for future desalination plants, which were then analyzed using the Texas Water Development Board’s (TWDB) Unified Costing Model (chapter 5), and an affordability analysis was conducted (chapter 6).

The study cost $412,798 (52 percent (%) RGWRA; 48% Federal cost share) and was completed in 24 months.

II. Findings

A. Water Supplies and Demands

The magnitude and frequency of water supply shortages within the study area are severe, even before projecting the effects of climate change. Based on an analysis of the currently adapted Region M Plan, which is incorporated in the State Water Plan, the population in the eight-county region is expected to grow from 1.7 million in 2010 to 4.0 million in 2060, resulting in the need for an additional 592,000 ac-ft/yr, or about 35%, of the total water demand. The State Water Plan identified strategies to meet those needs. This study determined that climate change may likely increase the shortage by an additional 86,438 ac-ft/yr, and this was the focus of this Basin Study.

B. Planning Objective

The study’s planning objective was developed to address the 86,438 ac-ft/yr shortfall in consideration of the following requirements and constraints:

- Reduce dependency on the Rio Grande
- Preserve existing water rights

• Preserve downstream flows for irrigation/push water and environmental needs

• Contain actions that are within the reasonable control of study sponsors

• Concentrate on Cameron, Willacy, and Hidalgo County needs

Alleviate projected water supply imbalances in the study area by developing one or more alternatives in Cameron, Willacy, and Hidalgo Counties that will (1) provide a minimum of 86,438 acre-feet of water year round by 2060; (2) protect existing water rights; (3) be compatible with regulations, policies, and environmental law; and (4) be implementable within the reasonable control of study sponsors.

C. Alternatives/Adaptive Strategies

An appraisal-level plan formulation and evaluation process was conducted that divided the study area into four major groups based on proximity and existing interconnecting pipelines and transfer agreements. Each group was evaluated based on vulnerability to drought (towns that have been in danger of losing access to water within 6 months according to the Texas Commission on Environmental Quality’s 180-day drought watch list)\(^2\) and projected average annual shortages as shown in the 2012 State Water Plan. The distribution of demands among the groups was used to distribute proposed supplies.

The analyses showed that an alternative comprised of three distinct regional BGD systems would best meet the planning objective.

• The Group 1 system, shown on figure S-2, would serve 10 communities by constructing two BGD facilities at 31.4 million gallons per day (MGD) each and associated transmission pipelines and pumps. The 70,400 ac-ft/yr project is estimated to cost $308,046,000 (2012).

• The Group 2 system is shown on figure S-3 and would serve 10 communities. It would include one BGD facility at 9.2 MGD and associated transmission pipelines and pumps. The cost is estimated at $86,477,000 (2012) and would provide 10,300 ac-ft/yr.

• The Group 3 system is shown on figure S-4 and would serve eight communities. It would provide 12,300 ac-ft/yr and include an 11.8-MGD BGD facility and associated transmission pipelines and pumps. The cost is estimated at $99,551,000 (2012).

\(^2\) http://www.tceq.texas.gov/drinkingwater/trot/droughtw.html
Figure S-2: Group 1 facilities.
Figure S-3: Group 2 facilities.
Figure S-4: Group 3 facilities.
* Group 4 includes Brownsville and shows the greatest projected shortage in 2060. However, since the Southmost Regional Water Authority (SRWA) Desalination Plant is operating at full capacity and currently undergoing expansion, the communities that are served by this facility (and therefore the group) are not included in this BGD alternative. It is recommended that an expansion of the SRWA facilities be considered as a component in any regional water supply plan.

A summary of the BGD alternative based on the P&Gs\(^3\) of effectiveness, acceptability, completeness, and efficiency is as follows:

<table>
<thead>
<tr>
<th>EFFECTIVENESS</th>
<th>Effectiveness is the extent an alternative plan alleviates the problems. Distributed brackish desalination systems could feasibly provide the target production volume to municipal groups.</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACCEPTABILITY</td>
<td>Acceptability is the workability and viability of the alternative with respect to acceptance by State/local/public entities and compatibility with laws and regulations. Brine disposal may be challenging depending on the particular location, but regional precedent is set for surface water discharge.</td>
</tr>
<tr>
<td>COMPLETENESS</td>
<td>Completeness is the extent an alternative provides and accounts for all necessary investments or other actions.</td>
</tr>
<tr>
<td>EFFICIENCY</td>
<td>Efficiency is the extent to which an alternative is the most cost-effective solution. The distributed facilities appear to be most efficient in operational costs.</td>
</tr>
</tbody>
</table>

D. Next Steps and Future Considerations

Brackish groundwater desalination facilities have been identified at an appraisal level of detail to meet the planning objective. There may be opportunities for Reclamation to assist the local entities with additional analyses through cost-shared WaterSMART Title XVI feasibility studies (P.L. 102-575) or SECURE feasibility studies (P.L. 111-11).

Non-Federal funding may be available through the following programs administered by the TWDB (described more fully in chapter 6):

- Drinking Water State Revolving Fund
- Rural Water Assistance Fund
- State Participation Program
- Water Infrastructure Fund

Economically Distressed Areas Program
Regional Water Supply and Wastewater Facilities Planning Program

E. Consequences of Taking No Action

The impacts of not addressing the staggering water supply and demand imbalances, both current and future, in the Lower Rio Grande River Basin are severe. The study area is home to 27 irrigation districts and a multimillion dollar crop and citrus industry that drives both the local and national economy. The annual value of crops and citrus grown in the study area is estimated at $50 million and $200 million, respectively. Texas is the third largest citrus producer and fourth largest sugarcane producer in the United States, most of which is grown in the study area. Other prominent crops include cotton, sorghum, and corn. Irrigation water rights in the study area are junior to municipal and industrial rights (M&I), and as such are subject to proration during supply shortages, which can have devastating impacts on agricultural uses and the local economy when shortages occur. For instance, the 2009 drought resulted in interrupted water diversions for some irrigation districts with junior water rights, which resulted in a 49% loss of acreage and $19 million in losses for farmers in parts of the study area.4

Droughts can result in potential curtailments to M&I users as well. As a result of severe drought conditions since 2011, several irrigation districts in the region announced this spring (2013) that agricultural deliveries were being curtailed, which also subsequently affected municipal supplies that depend on agricultural conveyance systems for water deliveries. Climate change will likely exacerbate this competition by making less water available for agricultural uses, thereby placing even more pressure on proposed reallocations from agricultural to M&I uses.

According to the Region M Plan, when agricultural shortages occur, costs to the local economy have been estimated to be about $135 million and a loss of 4,130 jobs annually. These adverse economic impacts would have environmental justice implications as well. The study area contains a disproportionate number of persons living below the poverty level when compared to the rest of Texas (35.7 versus 15.4%). In addition, the median household income in the area is $23,489, well below the State average of $39,927.

The consequences of water supply imbalances extend well beyond adverse impacts on the economy of the region. Imbalances are and will continue to have adverse impacts on the sensitive ecological communities that depend on the Rio Grande River and associated riparian habitat. The Lower Rio Grande Valley

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National Wildlife Refuge and Wildlife Corridor, administered by the U.S. Fish and Wildlife Service and Texas Parks and Wildlife, respectively, cover 91,000 acres in the region, with plans to expand to 132,000 acres. The study area is located within a major confluence of two flyways for migratory birds and waterfowl and is home to the World Birding Center, which is a top worldwide destination for birdwatching. Furthermore, 69 rare, threatened, or endangered species are supported by these protected areas. All of these sensitive resources will be subject to increased stressors in the future as water supplies become more constrained by increased demand and climate change.

Solutions to the expected shortages in the study area must include the continued development of the range of strategies recommended by Region M and adapted by the State Water Plan, many of which would increase the efficiency of the use of Rio Grande supplies when implemented by the water user groups and government entities at all levels. Figure S-5 depicts the relative portions of future water strategies contained in the current Region M Plan for meeting all but 86,438 ac-ft/yr identified in this study.

Figure S-5: Relative portions of future water supply strategies from the 2010 Region M Plan.