

**FINAL PLAN**

# **CHAPTER 5: EVALUATION AND RECOMMENDATION OF WATER MANAGEMENT STRATEGIES**

Rio Grande Regional Water Plan

**B&V PROJECT NO. 411250**

**PREPARED FOR**

**Rio Grande Regional Water Planning Group**

**7 OCTOBER 2025**



# Table of Contents

<b>5.0</b>	<b>Evaluation and Recommendation of Water Management Strategies .....</b>	<b>5-1</b>
5.1	Potentially Feasible Water Management Strategies .....	5-1
5.1.1	Process to Identify Potentially Feasible WMSs .....	5-1
5.1.2	Description of Water Management Strategy Evaluation Process.....	5-3
5.1.3	Potential for ASR Projects to Meet Significant Identified Needs .....	5-8
5.1.4	Index of Entities with Links to Recommended and Alternative Water Management Strategies .....	5-8
5.2	Recommended Water Management Strategies .....	5-19
5.2.1	Water Conservation .....	5-20
5.2.2	Municipal Drought Management.....	5-60
5.2.3	Conversion of Water Right Classification .....	5-70
5.2.4	Biological Control of Arundo Donax.....	5-80
5.2.5	Reuse .....	5-84
5.2.6	New or Expanded Surface Water Treatment.....	5-110
5.2.7	New or Expanded Distribution and Transmission Facilities Resulting in Increased Supplies.....	5-116
5.2.8	Storage Reservoirs.....	5-125
5.2.9	New or Expanded Fresh Groundwater Supply .....	5-130
5.2.10	New or Expanded Brackish Groundwater Desalination .....	5-141
5.2.11	Seawater Desalination .....	5-172
5.2.12	Regional Water Supply Facilities .....	5-176
5.3	Alternative Water Management Strategies.....	5-183
5.3.1	Reuse (Alternative).....	5-184
5.3.2	New or Expanded Surface Water Treatment (Alternative).....	5-191
5.3.3	Storage Reservoirs (Alternative) .....	5-199
5.3.4	New or Expanded Fresh Groundwater Supply (Alternative).....	5-203
5.3.5	Seawater Desalination (Alternative) .....	5-208
5.3.6	Aquifer Storage and Recovery (Alternative) .....	5-212
5.4	Considered Water Management Strategies .....	5-216
5.5	Implementation of Certain Water Management Strategies.....	5-216

## LIST OF TABLES

Table 5-1	Qualified Reliability Evaluation Matrix* .....	5-7
Table 5-2	Index Summary of Each Entity’s Recommended and/or Alternative Water Management Strategies With Links.....	5-9
Table 5-3	Standards for Plumbing Fixtures.....	5-22
Table 5-4	Water Conservation Potentials of Low Flow Plumbing Fixtures.....	5-22
Table 5-5	2026 Region M Advanced Municipal Water Conservation Goals (GPCD) .....	5-24

Table 5-6	2026 Region M Projected Total Demand Reduction from Water Loss Mitigation (ac-ft/yr).....	5-25
Table 5-7	2026 Region M Projected Total Demand Reduction from Water Use Reduction (ac-ft/yr).....	5-27
Table 5-8	Estimated Costs for Water Loss Mitigation WMS.....	5-29
Table 5-9	Environmental Impacts for Recommended Advanced Municipal Water Conservation Strategies.....	5-32
Table 5-10	Irrigation District Conservation Water Savings (ac-ft/yr).....	5-35
Table 5-11	Estimated Cost per Acre-Foot of Water Conserved by Water Management Strategy.....	5-40
Table 5-12	Irrigation District Conservation WMS Costs.....	5-40
Table 5-13	Environmental Impacts of Recommended Irrigation District Water Conservation Strategies.....	5-45
Table 5-14	Decadal On-Farm Conservation Water Savings by County and River Basin for Irrigation.....	5-48
Table 5-15	On-Farm Irrigation WMS Costs.....	5-49
Table 5-16	Narrow Border Citrus Water Savings.....	5-49
Table 5-17	Environmental Impacts of Recommended On-Farm Irrigation Conservation Strategies.....	5-54
Table 5-18	2026 Region M Industrial Water Conservation Savings from Implementation of Industrial BMPs (ac-ft/yr).....	5-56
Table 5-19	2026 Total Annual Costs from Implementation of Best Management Practices.....	5-57
Table 5-20	Environmental Impacts for Recommended Industrial Conservation Strategies.....	5-59
Table 5-21	2026 Region M Drought Management 5 Percent Demand Reduction (ac-ft/yr).....	5-64
Table 5-22	2026 Region M Drought Management 5 Percent Demand Reduction Annual Lost Consumer Surplus (2023 dollars).....	5-65
Table 5-23	Environmental Impacts for Recommended Municipal Drought Management.....	5-69
Table 5-24	Urbanization Rates and Available Converted Water Rights Per County.....	5-71
Table 5-25	EXAMPLE - Cameron County Irrigation Districts Converted Water Rights Distribution (ac-ft/yr).....	5-73
Table 5-26	EXAMPLE - Hidalgo County Irrigation Districts Converted Water Rights Distribution (ac-ft/yr).....	5-75
Table 5-27	EXAMPLE - Maverick County Irrigation Districts Converted Water Rights Distribution (ac-ft/yr).....	5-77
Table 5-28	EXAMPLE - Willacy County Irrigation Districts Converted Water Rights Distribution (ac-ft/yr).....	5-77
Table 5-29	EXAMPLE - Unaffiliated Converted Water Rights Distribution (ac-ft/yr).....	5-78
Table 5-30	Firm Yield of Biological Control of <i>A. donax</i> , and Resulting Supplies (ac-ft/year).....	5-82
Table 5-31	Biological Control of <i>A. donax</i> Estimated Costs.....	5-82
Table 5-32	Environmental Impacts for Implementation of Biological Control of <i>A. donax</i> .....	5-84
Table 5-33	Quality Standards for Reclaimed Water on a 30-Day Average.....	5-86
Table 5-34	Edinburg – Non-Potable Reuse Project Costs.....	5-88

Table 5-35	Rio Hondo – Non-Potable Reuse Project Costs.....	5-89
Table 5-36	Elsa – Direct Reuse Water System Project Costs .....	5-90
Table 5-37	Agua SUD – West WWTP Indirect Potable Reuse Project Costs .....	5-94
Table 5-38	Brownsville – Southside WWTP Potable Reuse Phase I Project Costs .....	5-96
Table 5-39	Brownsville – Southside WWTP Potable Reuse Phase II Project Costs .....	5-96
Table 5-40	Brownsville – Indirect Potable Reuse Project Costs .....	5-98
Table 5-41	Laredo – South Laredo WWTP Potable Reuse Phase I Project Costs.....	5-100
Table 5-42	Laredo – South Laredo WWTP Potable Reuse Phase II Project Costs.....	5-100
Table 5-43	McAllen – Direct Potable Reuse Project Costs.....	5-102
Table 5-44	Mission – Potable Reuse Project Costs .....	5-103
Table 5-45	Pharr – Raw Water Augmentation Potable Reuse Project Costs.....	5-105
Table 5-46	San Juan – Direct Potable Reuse Project Costs.....	5-106
Table 5-47	Weslaco – North WWTP Potable Reuse Project Costs .....	5-107
Table 5-48	Environmental Impacts of Recommended Reuse Strategies.....	5-109
Table 5-49	Donna – WTP Expansion Project Costs .....	5-111
Table 5-50	East Rio Hondo WSC – North Harlingen Surface WTP Phase I Project Costs.....	5-112
Table 5-51	North Alamo WSC – Delta WTP Expansion Phase I Project Costs.....	5-113
Table 5-52	North Alamo WSC – Delta WTP Expansion Phase II Project Costs.....	5-113
Table 5-53	Olmito WSC – WTP Expansion Project Costs .....	5-114
Table 5-54	Environmental Impacts of Recommended New or Expanded Surface Water Treatment Strategies .....	5-116
Table 5-55	East Rio Hondo WSC – FM 2925 Transmission Line Project Costs.....	5-119
Table 5-56	El Jardin WSC – Distribution Pipeline Replacement Project Costs .....	5-119
Table 5-57	HCID No. 6 – Service Area Expansion Project Costs.....	5-120
Table 5-58	McAllen – Raw Waterline Project with HCID No. 1 Project Costs .....	5-122
Table 5-59	Rio Hondo – Emergency Interconnects Project Costs .....	5-122
Table 5-60	Environmental Impacts of Recommended Distribution and Transmission Strategies .....	5-124
Table 5-61	Details for Hydrologic Models Used for Evaluating Storage Reservoir Strategies.....	5-125
Table 5-62	Brownsville PUB – Banco Morales Reservoir Project Costs .....	5-128
Table 5-63	Environmental Impacts of Recommended Storage Reservoir Strategies.....	5-130
Table 5-64	Alamo – Fresh Groundwater Well Project Costs .....	5-132
Table 5-65	County-Other, Cameron – Expanded Fresh Groundwater Supply Project Costs.....	5-132
Table 5-66	County-Other, Starr – Additional Fresh Groundwater Wells Project Costs.....	5-133
Table 5-67	County-Other, Webb – Additional Fresh Groundwater Wells Project Costs.....	5-134
Table 5-68	Edcouch – New Fresh Groundwater Supply Project Costs .....	5-135
Table 5-69	Hidalgo – Expand Existing Fresh Groundwater Wells Project Costs.....	5-135
Table 5-70	Rio Hondo – Project Yield Available (ac-ft/yr) Under the MAG, by Decade .....	5-136
Table 5-71	Rio Hondo – New Fresh Groundwater Supply Project Costs .....	5-136

Table 5-72	Webb County Water Utility – Expanded Fresh Groundwater Supply Project Costs.....	5-137
Table 5-73	Weslaco – Groundwater Development and Blending Project Costs .....	5-138
Table 5-74	Elsa - Municipal Fresh Groundwater Well Project Costs .....	5-139
Table 5-75	Environmental Impacts of Recommended Fresh Groundwater Strategies.....	5-141
Table 5-77	Agua SUD – Brackish Groundwater Desalination Phase I Project Costs .....	5-144
Table 5-78	Agua SUD – Brackish Groundwater Desalination Phase II Project Costs .....	5-144
Table 5-79	Alamo – Brackish Groundwater Desalination Project Costs.....	5-144
Table 5-80	Eagle Pass Brackish Groundwater Desalination Project Yield Available (ac-ft/yr) Under the MAG, by Decade .....	5-145
Table 5-81	Eagle Pass – Brackish Groundwater Desalination Project Costs.....	5-146
Table 5-82	East Rio Hondo WSC North Cameron Regional WTP Wellfield Expansion Project Yield (ac-ft/yr), by Decade .....	5-146
Table 5-83	East Rio Hondo WSC – North Cameron Regional WTP Wellfield Expansion Project Costs .....	5-147
Table 5-84	East Rio Hondo WSC – Brackish Desalination Wellfield and RO at NRWTP and MASWTP Project Yield (ac-ft/yr), by Decade.....	5-148
Table 5-85	East Rio Hondo WSC – Brackish Desalination Wellfield and RO at NRWTP and MASWTP Project Costs .....	5-148
Table 5-86	East Rio Hondo WSC Expansion of MASWTP Project Yield (ac-ft/yr), by Decade .....	5-149
Table 5-87	East Rio Hondo WSC – Expansion of MASWTP Project Costs .....	5-149
Table 5-88	La Feria – Water Well with RO Unit Project Costs .....	5-150
Table 5-89	Lyford – Brackish Groundwater Desalination Project Costs .....	5-151
Table 5-90	McAllen – Brackish Groundwater Desalination Project Costs .....	5-152
Table 5-91	Mission – Brackish Groundwater Desalination Project Costs.....	5-152
Table 5-92	North Alamo WSC Delta Area Brackish Groundwater Desalination Project Yield (ac-ft/yr), by Decade .....	5-153
Table 5-93	North Alamo WSC – Delta Area Brackish Groundwater Desalination Project Costs.....	5-154
Table 5-94	Primera – RO WTP with Groundwater Well Project Costs .....	5-154
Table 5-95	San Benito – Brackish Groundwater Blending Project Costs .....	5-155
Table 5-96	San Juan – Brackish Groundwater Desalination Project Costs .....	5-156
Table 5-97	San Juan – WTP 1 Expansion with Brackish Groundwater Desalination Project Costs.....	5-157
Table 5-98	Sharyland WSC – Well and RO Unit at WTP 2 Project Costs.....	5-158
Table 5-99	Sharyland WSC – Well and RO Unit at WTP 3 Project Costs.....	5-159
Table 5-100	SRWA Brackish Well Field Expansion Yield (ac-ft/yr), by Decade .....	5-159
Table 5-101	Southmost RWA – Brackish Groundwater Desalination Wellfield Expansion Project Costs .....	5-160
Table 5-102	SRWA Phase 3 Brackish Well Field Optimization and Expansion Yield.....	5-160
Table 5-103	SRWA Phase 3 Brackish Well Field Expansion Project Yield (ac-ft/yr).....	5-161

Table 5-104	Southmost RWA – Phase 3 Brackish Well Field Expansion Project Costs.....	5-161
Table 5-105	SRWA Phase 4 Brackish Well Field and WTP Expansion Project Yield (ac-ft/yr) .....	5-162
Table 5-106	Southmost RWA – Phase 4 SRWA Wellfield and WTP Expansion Project Costs.....	5-163
Table 5-107	Donna – New Brackish Groundwater Desalination Project Costs .....	5-164
Table 5-108	Maverick County Brackish Groundwater Desalination Project Yield (ac-ft/yr), by Decade .....	5-165
Table 5-109	Maverick County – New Brackish Groundwater Desalination Project Costs.....	5-165
Table 5-110	Mercedes – New Brackish Groundwater Desalination Project Costs.....	5-166
Table 5-111	Pharr – New Brackish Groundwater Desalination Project Costs .....	5-167
Table 5-112	Environmental Impacts of Recommended Brackish Groundwater Desalination Strategies .....	5-170
Table 5-113	Laguna Madre Water District – Seawater Desalination Plant Project Costs .....	5-174
Table 5-114	Environmental Impacts of Recommended Seawater Desalination Strategies .....	5-176
Table 5-115	HCDD #1 – Delta Region Water Management Supply Delta “Panchita” Reservoir Project Costs .....	5-181
Table 5-116	HCDD #1 – Delta Region Water Management Supply Santa Cruz (Delta West) Reservoir Project Costs .....	5-181
Table 5-117	HCDD #1 – Delta Region Water Management Supply Engleman Reservoir Project Costs .....	5-181
Table 5-118	Environmental Impacts of Recommended Regional Water Supply Facilities Strategies .....	5-183
Table 5-119	Agua SUD – Non-Potable Reuse Project Costs (Alternative) .....	5-185
Table 5-120	La Feria – Non-Potable Reuse Project Costs (Alternative).....	5-186
Table 5-121	San Benito – Non-Potable Reuse Project Costs (Alternative).....	5-188
Table 5-122	San Benito – Direct Potable Reuse Project Costs (Alternative) .....	5-189
Table 5-123	Environmental Impacts of Alternative Reuse Strategies .....	5-191
Table 5-124	East Rio Hondo WSC – North Harlingen Surface WTP Phase II with IBT Project Costs (Alternative) .....	5-192
Table 5-125	Elsa – WTP Expansion and Interconnect to Engleman ID Project Costs (Alternative).....	5-193
Table 5-126	Laredo - El Pico Water Treatment Plant – Phase 1 Expansion Project Costs (Alternative).....	5-193
Table 5-127	Laredo - El Pico Water Treatment Plant – Phase 2 Expansion Project Costs (Alternative).....	5-194
Table 5-128	Laredo - El Pico Water Treatment Plant – Phase 3 Expansion Project Costs (Alternative).....	5-195
Table 5-129	Laredo - El Pico Water Treatment Plant – Phase 4 Expansion Project Costs (Alternative).....	5-196
Table 5-130	North Alamo WSC – WTP No. 5 Expansion Project Costs (Alternative).....	5-196
Table 5-131	Environmental Impacts of Alternative New or Expanded Surface Water Treatment Strategies .....	5-199

Table 5-132	Brownsville PUB – Brownsville/Matamoros Weir and Reservoir Project Costs (Alternative) .....	5-201
Table 5-133	Environmental Impacts of Alternative Storage Reservoir Strategies .....	5-203
Table 5-134	McAllen – Expand Fresh Groundwater Phase I Project Costs (Alternative) .....	5-204
Table 5-135	McAllen – Expand Fresh Groundwater Phase II Project Costs (Alternative) .....	5-204
Table 5-136	Mercedes – Expanded Existing Fresh Groundwater Supply Project Costs (Alternative) .....	5-205
Table 5-137	Military Highway WSC – Expand Fresh Groundwater Supply Project Costs (Alternative) .....	5-206
Table 5-138	Environmental Impacts of Alternative Fresh Groundwater Strategies .....	5-208
Table 5-139	Brownsville - Seawater Desalination Demonstration and Implementation WMS Supplies (ac-ft/yr), by Decade (Alternative) .....	5-209
Table 5-140	Brownsville – Seawater Desalination Demonstration Project Costs (Alternative) .....	5-209
Table 5-141	Brownsville – Seawater Desalination Implementation Project Costs (Alternative) .....	5-209
Table 5-142	Environmental Impacts of Alternative Seawater Desalination Strategies.....	5-211
Table 5-143	Eagle Pass – Aquifer Storage and Recovery Project Costs (Alternative).....	5-214
Table 5-144	Environmental Impacts of Alternative ASR Strategies.....	5-216

## LIST OF FIGURES

Figure 5-1	Example - Typical Water Supply Planning.....	5-61
Figure 5-2	Example - Drought Management Water Management Strategy Planning Application .....	5-61
Figure 5-3	Example - Annual Water Demand and Planned Water Supply.....	5-62
Figure 5-4	Costing Data and Output (TWDB, 2024) .....	5-63
Figure 5-5	Edinburg WWTP Non-Potable Reuse Project Location.....	5-88
Figure 5-6	Rio Hondo Non-Potable WWTP Effluent Reuse Project .....	5-89
Figure 5-7	Agua SUD West WWTP Indirect Potable Reuse Project Location.....	5-93
Figure 5-8	Brownsville Southside WWTP Potable Reuse Pipeline Location .....	5-95
Figure 5-9	Brownsville Indirect Potable Reuse Pipeline Location.....	5-97
Figure 5-10	South Laredo WWTP Potable Reuse Pipeline Project Location .....	5-99
Figure 5-11	McAllen Direct Potable Reuse Pipeline Project Location .....	5-101
Figure 5-12	Mission WWTP Potable Reuse Project Location.....	5-102
Figure 5-13	Pharr Raw Water Reservoir Augmentation Potable Reuse Project Location .....	5-104
Figure 5-14	Weslaco North WWTP Potable Reuse Pipeline Project Location .....	5-106
Figure 5-15	ERHWSC FM 2925 Transmission Line .....	5-118
Figure 5-16	McAllen HCID No. 1 Raw Water Pipeline Project Location.....	5-121
Figure 5-17	Brownsville PUB – Banco Morales Reservoir Project Location Map .....	5-127
Figure 5-18	Southmost RWA Phase 4 Wellfield and WTP Expansion Project Location Map.....	5-162
Figure 5-19	Laguna Madre Water District Seawater Desalination Project Location Map.....	5-173

Figure 5-20	HCDD #1 Delta “Panchita” Reservoir Project Location Map.....	5-177
Figure 5-21	HCDD #1 Santa Cruz (Delta West) Reservoir Project Location Map.....	5-178
Figure 5-22	HCDD #1 Engleman Reservoir Project Location Map .....	5-179
Figure 5-23	San Benito - Non-Potable Reuse Pipeline Location .....	5-187
Figure 5-24	Brownsville PUB – Brownsville/Matamoros Weir and Reservoir Project Location Map .....	5-200

**LIST OF APPENDICES**

Appendix 5A.	Potentially Feasible WMSs for WUGs with Needs
Appendix 5B.	Threatened and Endangered Species by County
Appendix 5C.	Water Supply Balances for WUGs and MWPs
Appendix 5D.	TWDB Uniform Costing Model Summary Reports
Appendix 5E.	Implementation Status of Certain WMSs

Final Draft

## List of Abbreviations

ac-ft	Acre-Feet
ac-ft/yr	Acre-Feet per Year
ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
ASR	Aquifer Storage and Recovery
BMP	Best Management Practice
BOD	Biochemical Oxygen Demand
CBOD	Carbonaceous Biochemical Oxygen Demand
CCID	Cameron County Irrigation District
CFU	Colony-Farming Unit
DFC	Desired Future Conditions
DMI	Domestic, Municipal, and Industrial
DOT	Department of Transportation
EAP	Emergency Action Plan
EMST	Ecological Mapping System of Texas
ERHWSC	East Rio Hondo Water Supply Corporation
GCD	Groundwater Conservation District
GIS	Geographic Information System
GMA	Groundwater Management Area
GPCD	Gallons per Capita per Day
HB	House Bill
HCID	Hidalgo County Irrigation District
IBWC	International Boundary and Water Commission
ID	Irrigation District
MAG	Modeled Available Groundwater
mg/L	Milligrams per Liter
mgd	Million Gallons per Day
MUD	Municipal Utility District
NAWSC	North Alamo Water Supply Corporation
NRG	Nueces-Rio Grande
NTU	Nephelometric Turbidity Units
NWI	National Wetlands Inventory
O&M	Operations and Maintenance
ppm	Parts per Million
psi	Pounds per Square Inch
PUB	Public Utilities Board
PVC	polyvinyl chloride

RGRWPG	Rio Grande Regional Water Planning Group
RO	Reverse Osmosis
ROW	Right-of-Way
RWP	Regional Water Plan
RWPA	Regional Water Planning Area
RWPG	Regional Water Planning Group
SB	Senate Bill
SCADA	Supervisory Control and Data Acquisition
SRWA	Southmost Regional Water Authority
SUD	Special Utility District
TAC	Texas Administrative Code
TCEQ	Texas Commission on Environmental Quality
TDS	Total Dissolved Solids
TML	Texas Municipal League
TPWD	Texas Parks and Wildlife Department
TSSWCB	Texas State Soil and Water Conservation Board
TWDB	Texas Water Development Board
UCM	Unified Cost Model
UF	Ultrafiltration
USACE	U.S. Army Corps of Engineers
USDA	United States Department of Agriculture
UTPA	University of Texas Pan America
WAM	Water Availability Model
WCAC	Water Conservation Advisory Council
WCID	Water Control and Improvement District
WMS	Water Management Strategy
WMSP	Water Management Strategy Project
WSC	Water Supply Corporation
WSOC	Water Supply Option Contracts
WTP	Water Treatment Plant
WUG	Water User Group
WWP	Wholesale Water Provider
WWTP	Wastewater Treatment Plant

## 5.0 Evaluation and Recommendation of Water Management Strategies

### 5.1 Potentially Feasible Water Management Strategies

Water management strategies (WMSs) were evaluated and updated in this Region M Regional Water Plan (RWP). The following chapter describes the process to identify potentially feasible WMSs, the evaluation of potentially feasible WMS, selection of recommended WMSs to meet future needs, and the implementation status of recommended WMSs that meet certain requirements.

Subsection 5.1.1 describes this process for identifying potentially feasible WMSs. Section 5.2 describes the evaluations for all recommended WMSs for each water user group (WUG) and irrigation district (ID), sorted by WMS category and WUG/ID. Section 5.3 describes alternative strategies and their evaluations, which are also considered potentially feasible and should be considered alternative recommendations, sorted by WMS category and WUG. Section 5.4 describes projects of interest that do not meet the Texas Water Development Board (TWDB) criteria to be a WMS but were considered by the Regional Water Planning Group (RWPG) during this planning process. These projects were submitted by sponsors with the potential to be part of suitable WMSs in the future. Section 5.5 discusses the implementation of several recommended WMSs that meet certain requirements.

#### 5.1.1 Process to Identify Potentially Feasible WMSs

An RWPG is tasked with evaluating all potentially feasible WMSs and recommending selected strategies to meet current and future needs in the region. Before a RWPG begins the process of identifying potentially feasible WMSs, RWPGs must document the process by which it will list all possible WMSs and identify the strategies that are potentially feasible for meeting a need in the region.

On November 1, 2023, the Rio Grande RWPG, after asking for public comments, considered and approved a documented process to identify potentially feasible WMSs for the 2026 Regional Water Planning Cycle. The approved process is as follows:

1. Current water planning information, including specific WMSs of interest, will be solicited from WUGs and Wholesale Water Providers (WWPs) in Fall 2023.
  - a. Solicitation of planning information will include the recommended WMSs in the 2021 Regional Water Plan.
  - b. WUGs/WWPs will be encouraged to classify each WMS on their 2021 Plan list as included or rejected for the 2026 Planning Cycle and provide comments, and also to list additional WMSs that will be new for the 2026 Planning Cycle.
2. A list of potential WMSs will be prepared based on an initial technical evaluation and needs analysis and the comments received, which will be available for consideration by the RWPG by early 2024.
3. Additional WMSs may be brought forth to the RWPG for consideration until May 2024.
4. The list of potential WMSs will be further considered to identify “potentially feasible” or “not potentially feasible” WMSs for WUGs and WWPs with identified water needs.

The request for WMS from stakeholders took place beginning in November of 2023, with follow-up taking place over the next 12 months. Municipal utilities and IDs submitted most of the new projects and strategies or requested to carry over projects and strategies from the 2021 Plan. The submitted

costs, projected yield, feasibility, and impacts were evaluated for accuracy, consistency, and compliance with TWDB rules and guidance where that information was available; where information was not available, assumptions were made and documented.

The WMS components that are included in this RWP are limited to projects that increase water supplies or reduce water losses. Infrastructure components associated with internal system improvements that do not make any additional water available to meet needs are not included in the RWP as WMSs.

Using the documented process identified above, the Rio Grande RWPG identified Potentially Feasible WMSs for the 2026 RWP. Appendix 5A provides a list of potentially feasible WMS for WUGs with needs. This list of potentially feasible strategies includes the following:

- Advanced Municipal Conservation
- Irrigation District Conservation
- Agricultural (On-Farm) Conservation
- Industrial Conservation
- Conversion of Water Right Classification
- New or Expanded Surface Water Treatment
- New or Expanded Distribution and Transmission Facilities Resulting in Increased Supplies
- Storage Reservoirs
- New or Expanded Fresh Groundwater Supply
- New or Expanded Brackish Groundwater Desalination
- Seawater Desalination
- Reuse
- Biological Control of Arundo Donax
- Drought Management
- Aquifer Storage and Recovery
- Regional Water Supply Facilities

The potentially feasible WMSs were evaluated using the Unified Cost Model (UCM), which was updated in April of 2024 and checked for accuracy, consistency, and compliance with source availability limitations. When specific project cost estimates were available, that was processed through the UCM and used to provide costs in September 2023 dollars.

ID Conservation, Advanced Municipal Conservation, and Municipal Drought Management were considered as potentially feasible WMSs for nearly any WUG with an identified need. These WMSs were subsequently recommended across the region on the basis of criteria described in those sections. The projected water saved through drought management, ID conservation improvements and Advanced Municipal Conservation was first subtracted from each WUG's need to obtain a revised need after conservation. If a need still existed, additional WMSs were considered for the WUG. In cases where two or more alternatives were available without significant negative impacts, an evaluation process was used to select the most appropriate WMS.

The WMS or portfolio of strategies, with sufficient yield to meet the needs after conservation and drought management, were recommended for each WUG and any additional viable WMS was listed as alternative recommended strategies. Only WMSs with insufficient information or major feasibility concerns were evaluated but not recommended.

In accordance with Chapter 31 of the Texas Administrative Code (TAC), Chapter 358.3 (19), the plan development was guided by the principal that designated water quality and related uses as shown in the state water quality management plan shall be improved or maintained. The state water quality management plan is developed and maintained by the Texas Commission on Environmental Quality (TCEQ) and can be found at the following weblink: <https://www.tceq.texas.gov/permitting/wqmp>.

### **5.1.2 Description of Water Management Strategy Evaluation Process**

Each potentially feasible WMS was evaluated on the basis of net quantity of water, reliability, financial costs, and environmental factors, which includes environmental and cultural considerations. Environmental considerations also include impacts to agricultural resources.

Subsections in Chapter 5.2 and 5.3 include detailed evaluations for each of the potentially feasible WMSs. Only projects that increase supplies to users can be included as potentially feasible WMSs.

#### **Net Quantity of Water**

Analyses of WMSs yields were performed under drought of record conditions. Firm yields were determined by considering Senate Bill 3 environmental flow standards adopted in 30 TAC §298 and other recommended WMSs to ensure that no WMSs relied on the same water availability volume or rendered multiple WMSs mutually exclusive.

#### **Impacts on Other Water Resources of the State**

The following provides a summary of impacts of each strategy category on other water resources of the state.

- Conservation: Water conservation strategies are expected to have no impacts on other water resources of the State.
- Drought Management: Drought management strategies are assumed to have no impacts on other water resources of the State.
- Conversion of Water Rights: Strategies involving conversions, transfers, or purchases of water rights are assumed to be using the same source of water and therefore do not impact other water resources of the State.
- New or Expanded Surface Water Treatment: Facilities expansion including new infrastructure such as pump stations and transmission pipelines do not impact other water resources of the State.
- New or Expanded Distribution and Transmission Facilities Resulting in Increased Supplies do not impact other water resources of the State.
- Direct Reuse: Direct reuse or recycled water strategies impact surface water sources by reducing the amount of effluent discharged to the surface water source.
- Indirect Reuse: Indirect reuse is assumed to eventually impact surface water sources by pulling out water that otherwise would have remained in the surface water source.

- **New or Expanded Fresh Groundwater:** Fresh groundwater strategies will only potentially impact surface water sources by increasing the amount of wastewater effluent discharged to streams.
- **New or Expanded Brackish Groundwater Desalination and Seawater Desalination:** Desalination strategies will potentially impact surface water sources by increasing the amount of wastewater effluent discharged to streams. In cases where the discharge stream from treatment is returned to surface water sources, those surface water sources may experience an increase in total dissolved solids. Discharges to groundwater using injection wells should be deep enough that there will be no impact to groundwater sources.
- **Aquifer Storage and Recovery (ASR):** For ASR strategies, a study is needed to determine any potential impacts to local groundwater. Treatment of water prior to injection should prevent water quality issues in other water resources of the State.
- **On/Off-channel Storage Reservoirs:** Surface water strategies that include new on/off-channel reservoirs impact the amount of water in the local stream or river by diverting and/or capturing it and not allowing it to flow downstream. No other impacts to other water resources of the State are anticipated.
- **Biological Control of *A. donax*:** Brush control water management strategies are intended to increase the amount of water that remains in the surface water source. No impacts to other water resources of the State are anticipated.

### Strategy Water Loss

Anticipated strategy water losses are taken into account and reported for each WMS type. For some WMSs, the percent water loss was calculated, and the information is included in each WMS evaluation. The following provides a summary of anticipated strategy water losses.

- **Conservation:** Water conservation strategies are assumed to have no associated water losses. In some instances, projects are intended to decrease the water loss for existing infrastructure.
- **Drought Management:** Drought management strategies are assumed to have no associated water losses.
- **Conversion of Water Rights:** Strategies involving conversions, transfers, or purchases of water rights are assumed to have no additional water losses associated with the use of existing infrastructure.
- **New or Expanded Surface Water Treatment:** Facilities expansion including new infrastructure such as pump stations and transmission pipelines are assumed to have no water losses.
- **New or Expanded Distribution and Transmission Facilities Resulting in Increased Supplies:** Infrastructure and distribution systems increase supplies through reducing water losses. This water management strategy is assumed to have no water losses.
- **Direct Reuse:** Direct reuse or recycled water strategies are assumed to have no water losses.
- **Indirect Reuse:** Indirect reuse is assumed to have no losses since the yield already incorporates any water lost due to transportation, evaporation, seepage, and channel or other associated carriage losses.
- **New or Expanded Fresh Groundwater:** Groundwater expansion strategies that assume additional yield from existing infrastructure have no additional water losses associated with them. Groundwater expansion, development, and importation strategies that require new infrastructure are assumed to have negligible water losses.

- **New or Expanded Brackish Groundwater Desalination and Seawater Desalination:** Desalination strategies include water loss associated with desalination treatment technologies and disposal of brine concentrate. Each desalination WMS has a calculated percent water loss indicated in the WMS evaluation.
- **Aquifer Storage and Recovery (ASR):** ASR strategies have losses due to recovery efficiency from the aquifer. Due to minimal specific studies completed at this point in Region M, this water management strategy is assumed to have no water losses. However, modeling and feasibility studies are recommended for entities interested in ASR.
- **On/Off-channel Storage Reservoirs:** Surface water strategies that include new on/off-channel reservoirs have water losses associated with evaporation. If water is transmitted via open channel canals, there are also water losses associated with evaporation. Water availability modeling used to determine firm yields of the reservoirs take evaporation into consideration.
- **Biological Control of *A. donax*:** Brush control water management strategies are intended to increase available surface and groundwater supplies through the selective control of brush species that are detrimental to water conservation, thus significantly reducing water losses.

### Financial Costs

Financial costs were evaluated using the UCM developed by the TWDB. Capital costs, debt service, annual operations and maintenance (O&M) costs, and unit costs of water are shown in the 2026 RWP in September 2023 dollars. Costs do not include distribution of water within a WUG after treatment.

Costs were evaluated using the UCM, and certain assumptions were made in each project unless specifically listed otherwise. The debt service is the application of capital budgeting to service the debt over the life of the loan. The loan period used for a reservoir was 40 years and the loan period for all other types of strategies was 20 years. An annual interest rate for project financing was assumed to be 3.5 percent in accordance with TWDB guidance.

For the Municipal Drought Management WMS (Refer to Section 5.2.2), the costs were evaluated using the TWDB Drought Management Tool, which estimates the economic costs of foregone water use.

## Environmental Impacts

Environmental impacts were evaluated for each potentially feasible WMS based on information provided by sponsors, available published information, maps and recent aerial photography, including available geographic information system (GIS) shapefiles. The project locations shown on maps in this chapter are conceptual in nature and are not meant to represent actual locations of facilities. Siting of facilities are subject to studies, designs, engineering, and/or contract negotiations to be determined by the project's sponsor later. Therefore, as projects enter the detailed design phases, it should be noted that potential environmental impacts identified in this analysis could be avoided or reduced through such approaches as facility layout or alignment adjustments, changes in construction methods, and construction timing. Environmental considerations assessed, where applicable, include:

- Acres impacted permanently;
- Construction impacted acreage;
- Inundation acreage;
- Agricultural resources impacted;
- Wetland impact;
- Habitat impacted acreage;
- Threatened and endangered species count (see Appendix 5B for a list of species by county);
- Cultural resources impact;
- Environmental water needs;
- Effect of upstream development on bays, estuaries, and arms of the Gulf of Mexico;
- Reduction in wastewater treatment plant (WWTP) effluent;
- Volume of brine;
- TDS of brine; and
- Reliability.

### Impacts to Agricultural Resources

Data was obtained from the Texas Parks and Wildlife Department (TPWD) Ecological Mapping System of Texas (EMST) and compiled with WMS projects into a GIS using ArcGIS software. Environmental datasets were overlaid on defined conceptual project boundaries or alignments for each WMS to determine potential project effects on vegetation and land use. For Region M, the vegetation and land use from the TPWD EMST was identified as: (1) row crops; (2) grass farms; and (3) orchards.

### Reliability

Reliability is an assessment of the availability of the specified water quantity to the user over time. Quantifiably, the water volumes presented in this plan for recommended strategies are firm supplies that are 100 percent reliable during Drought of Record conditions, per TWDB planning guidelines. Considering other factors that can affect long-term availability, such as potential future modeling or rule changes that are beyond the scope of this planning effort, the Rio Grande RWPG developed additional qualified reliability reporting in the form of a reliability evaluation matrix (Table 5-1) that was used in conjunction with other implementation considerations to also qualify the reliability of WMSs. Each WMS evaluation includes a qualified assessment of reliability.

**Table 5-1 Qualified Reliability Evaluation Matrix\***

Score	Reliability
1	Low
2	Low to Medium
3	Medium
4	Medium to High
5	High

\*Quantification of reliability is reported in the paragraph above this table and all water volumes presented in this plan are 100 percent reliable during Drought of Record conditions.

### **Environmental Water Needs**

The TCEQ has established environmental flow standards in 30 TAC §298 relating to the management of water resources in the state for the purpose of supporting a sound ecological environment in river basins and bay systems. The TCEQ has adopted environmental flow standards for the Rio Grande and its associated tributaries and bays to ensure environmental water needs are met. These adopted environmental flow standards are incorporated into the TCEQ’s full authorization water availability model (WAM), which also includes all water rights and permitted reservoir capacities. Potentially feasible WMSs in the 2026 RWP were evaluated to determine water availability(s) and WMS firm yield(s)/firm diversion(s) using an unmodified TCEQ WAM. This analysis reflects conditions under which an associated permit application would be evaluated by the TCEQ. As such, potentially feasible water management strategies included in this plan are assumed to have little to no effect (score of zero on a 0-5 scale) on environmental water needs, as they are already taken into consideration as part of the adopted environmental flow standards in the WAM analysis and will not compromise the environmental flow standards as established by 30 TAC §298.

### **Third-Party Social and Economic Impacts from Voluntary Redistribution of Water**

The 2026 RWP is based, in part, on voluntary transfer or redistribution of water resources to meet projected needs. Voluntary redistribution is the acquisition of water by willing buyers from willing sellers, subject to conditions of existing groundwater management plans and rules of applicable groundwater conservation districts (GCDs), in the case of groundwater supplies, and subject to existing surface water permits and water available from such permits. Refer to Chapters 3.1 and 3.2 for descriptions of methods used in determining quantities of groundwater and surface water available to meet projected water demands in the 2026 RWP.

Voluntary transfers of water include the underlying principles that (1) projected needs of a local area are met before consideration is given to movement of water from rural and agricultural areas to meet projected needs at more distant locations; (2) compensation will be made to water owners for water to meet projected needs of others; and (3) an evaluation is made of the social and economic impacts of voluntary transfers of water from rural and agricultural areas.

In the development of the 2026 RWP, the following principles have been followed: (1) water conservation has been the first WMS recommended to meet projected needs (shortages) of WUGs; and (2) all other recommended WMSs including movement of water from rural and agricultural areas must be based on the voluntary transfer concept and principles. The WMSs of the 2026 RWP were selected and sized in compliance with desired future conditions (DFCs) and modeled available groundwater

(MAG) requirements to limit impacts upon the supplies of water projected to be needed for use in rural and agricultural areas. In addition, the costing of each WMS includes estimated payments to landowners from which groundwater would be obtained and to holders of surface water rights to clearly reflect that implementation of these WMSs would include compensation of the owners of the water by those who would obtain and use the water (i.e., the willing seller-willing buyer condition underlying the voluntary transfer concept).

Counties may have projected needs for additional water supply (or have projected surpluses less than the volume associated with the recommended WMS); therefore, third-party economic impacts of redistribution may occur as future supply alternatives to local groundwater are developed. Implementation of the recommended WMSs could result in (1) drawdown of the water table, increasing local area pump lifts in the aquifer areas from which groundwater would be obtained; and would (2) provide payments to landowners for groundwater and to holders of surface water permits for use of surface water at rates negotiated between buyer and seller. Voluntary redistribution of water from rural and agricultural areas is likely to result in reduction of areas engaged in active crop production, and/or changes in crop species and productivity.

In addition, implementation of recommended WMSs can be expected to result in construction and associated expenditures in local areas where such projects are constructed, but neither the economic benefits of such expenditures, nor the subsequent economic development that might result from such expenditures, are estimated in this plan.

### **5.1.3 Potential for ASR Projects to Meet Significant Identified Needs**

In accordance with 31 TAC Section 357.34(h), if a Regional Water Planning Area (RWPA) has significant identified water needs, the RWPG shall provide a specific assessment of the potential for ASR projects to meet those needs. At the August 7, 2024, RWPG meeting, the Rio Grande RWPG defined the threshold of significant water needs to be a municipal WUG with an identified need of 10,000 acre-feet per year (ac-ft/yr) or greater. WUGs meeting this definition in the 2026 RWP by 2080 include McAllen and North Alamo Water Supply Corporation (WSC). At this point in time, the respective WUGs above and the Rio Grande RWPG have determined that ASR is an infeasible and cost-prohibitive strategy to increase water supplies in the region. During this planning cycle, only Eagle Pass requested to carry over an ASR Project from the 2021 Plan, and no new ASR projects were requested. Because Eagle Pass is currently looking at other options they consider more feasible, the Eagle Pass ASR Project is included in the 2026 RWP as an alternative WMS, which is further described in Section 5.3.6.

### **5.1.4 Index of Entities with Links to Recommended and Alternative Water Management Strategies**

The following table provides links to the various recommended and alternative water management strategies for each WUG and Irrigation District in Region M. Because the chapter is organized by WMS category, this table is provided to assist in identifying the strategies for a particular entity. The table is in alphabetical order, by entity.

**Table 5-2 Index Summary of Each Entity’s Recommended and/or Alternative Water Management Strategies With Links**

Entity	Strategy Name	Section
Agua SUD	Irrigation District Conservation	5.2.1.3
Agua SUD	Drought Management	5.2.2
Agua SUD	Conversion/Purchase of Surface Water Rights	5.2.3
Agua SUD	West WWTP Indirect Potable Reuse	5.2.5.2.1
Agua SUD	Brackish Groundwater Desalination	5.2.10.1
Alamo	Irrigation District Conservation	5.2.1.3
Alamo	Drought Management	5.2.2
Alamo	Conversion/Purchase of Surface Water Rights	5.2.3
Alamo	Fresh Groundwater Well	5.2.9.1
Alamo	Brackish Groundwater Desalination	5.2.10.2
Bayview Irrigation District	Irrigation District Conservation	5.2.1.3
Bayview Irrigation District	Conversion/Purchase of Surface Water Rights	5.2.3
Brownsville	Advanced Municipal Conservation	5.2.1.1
Brownsville	Irrigation District Conservation	5.2.1.3
Brownsville	Drought Management	5.2.2
Brownsville	Conversion/Purchase of Surface Water Rights	5.2.3
Brownsville	Southside WWTP Potable Reuse	5.2.5.2.2
Brownsville	Indirect Potable Reuse	5.2.5.2.3
Brownsville	Banco Morales Reservoir	5.2.8.1
Brownsville	Brownsville/Matamoros Weir and Reservoir (Alternative)	5.3.3.1
Brownsville	Seawater Desalination Demonstration and Implementation (Alternative)	5.3.5.1
Brownsville Irrigation District	Irrigation District Conservation	5.2.1.3
Brownsville Irrigation District	Conversion/Purchase of Surface Water Rights	5.2.3
Cameron County Irrigation District No. 2	Irrigation District Conservation	5.2.1.3
Cameron County Irrigation District No. 2	Conversion/Purchase of Surface Water Rights	5.2.3
Cameron County Irrigation District No. 6	Irrigation District Conservation	5.2.1.3
Cameron County Irrigation District No. 6	Conversion/Purchase of Surface Water Rights	5.2.3
Cameron County W.I.D No. 10	Irrigation District Conservation	5.2.1.3
Cameron County W.I.D No. 10	Conversion/Purchase of Surface Water Rights	5.2.3

Entity	Strategy Name	Section
Combes	Irrigation District Conservation	5.2.1.3
Combes	Conversion/Purchase of Surface Water Rights	5.2.3
County-Other, Cameron	Advanced Municipal Conservation	5.2.1.1
County-Other, Cameron	Irrigation District Conservation	5.2.1.3
County-Other, Cameron	Conversion/Purchase of Surface Water Rights	5.2.3
County-Other, Cameron	Expanded Fresh Groundwater Supply	5.2.9.2
County-Other, Hidalgo	Advanced Municipal Conservation	5.2.1.1
County-Other, Hidalgo	Irrigation District Conservation	5.2.1.3
County-Other, Hidalgo	Conversion/Purchase of Surface Water Rights	5.2.3
County-Other, Maverick	Irrigation District Conservation	5.2.1.3
County-Other, Maverick	Conversion/Purchase of Surface Water Rights	5.2.3
County-Other, Starr	Advanced Municipal Conservation	5.2.1.1
County-Other, Starr	Conversion/Purchase of Surface Water Rights	5.2.3
County-Other, Starr	Additional Fresh Groundwater Wells	5.2.9.3
County-Other, Webb	Advanced Municipal Conservation	5.2.1.1
County-Other, Webb	Conversion/Purchase of Surface Water Rights	5.2.3
County-Other, Webb	Additional Fresh Groundwater Wells	5.2.9.4
County-Other, Willacy	Irrigation District Conservation	5.2.1.3
County-Other, Willacy	Conversion/Purchase of Surface Water Rights	5.2.3
County-Other, Zapata	Advanced Municipal Conservation	5.2.1.1
County-Other, Zapata	Conversion/Purchase of Surface Water Rights	5.2.3
Delta Lake Irrigation District	Irrigation District Conservation	5.2.1.3
Delta Lake Irrigation District	Conversion/Purchase of Surface Water Rights	5.2.3
Donna	Irrigation District Conservation	5.2.1.3
Donna	Drought Management	5.2.2
Donna	Conversion/Purchase of Surface Water Rights	5.2.3
Donna	WTP Expansion	5.2.6.1
Donna	New Brackish Groundwater Desalination	5.2.10.21
Donna Irrigation District Hidalgo Co. No. 1	Irrigation District Conservation	5.2.1.3
Donna Irrigation District Hidalgo Co. No. 1	Conversion/Purchase of Surface Water Rights	5.2.3
Eagle Pass	Advanced Municipal Conservation	5.2.1.1
Eagle Pass	Drought Management	5.2.2
Eagle Pass	Conversion/Purchase of Surface Water Rights	5.2.3
Eagle Pass	Brackish Groundwater Desalination	5.2.10.3

Entity	Strategy Name	Section
Eagle Pass	Aquifer Storage and Recovery (Alternative)	5.3.6.1
East Rio Hondo WSC	Advanced Municipal Conservation	5.2.1.1
East Rio Hondo WSC	Irrigation District Conservation	5.2.1.3
East Rio Hondo WSC	Drought Management	5.2.2
East Rio Hondo WSC	Conversion/Purchase of Surface Water Rights	5.2.3
East Rio Hondo WSC	North Harlingen Surface WTP Phase I	5.2.6.2
East Rio Hondo WSC	FM 2925 Transmission Line	5.2.7.1
East Rio Hondo WSC	North Cameron Regional WTP Wellfield Expansion	5.2.10.4
East Rio Hondo WSC	Brackish Desalination Wellfield and RO at NRWTP and MASWTP	5.2.10.5
East Rio Hondo WSC	Expansion of MASWTP	5.2.10.6
East Rio Hondo WSC	North Harlingen Surface WTP Phase II with IBT (Alternative)	5.3.2.1
Edcouch	Irrigation District Conservation	5.2.1.3
Edcouch	New Fresh Groundwater Supply	5.2.9.5
Edcouch	Conversion/Purchase of Surface Water Rights	5.2.3
Edinburg	Advanced Municipal Conservation	5.2.1.1
Edinburg	Irrigation District Conservation	5.2.1.3
Edinburg	Drought Management	5.2.2
Edinburg	Conversion/Purchase of Surface Water Rights	5.2.3
Edinburg	Reuse Water for Cooling Tower and Landscaping Use	5.2.5.1.1
El Jardin WSC	Advanced Municipal Conservation	5.2.1.1
El Jardin WSC	Irrigation District Conservation	5.2.1.3
El Jardin WSC	Drought Management	5.2.2
El Jardin WSC	Conversion/Purchase of Surface Water Rights	5.2.3
El Jardin WSC	Distribution Pipeline Replacement	5.2.7.2
El Sauz WSC	Drought Management	5.2.2
El Sauz WSC	Advanced Municipal Conservation	5.2.1.1
El Sauz WSC	Conversion/Purchase of Surface Water Rights	5.2.3
El Tanque WSC	Advanced Municipal Conservation	5.2.1.1
El Tanque WSC	Drought Management	5.2.2
El Tanque WSC	Conversion/Purchase of Surface Water Rights	5.2.3
Elsa	Irrigation District Conservation	5.2.1.3
Elsa	Non-Potable Direct Reuse	5.2.5.1.3
Elsa	WTP Expansion and Interconnect to Engleman ID (Alternative)	5.3.2.2

Entity	Strategy Name	Section
Elsa	Conversion/Purchase of Surface Water Rights	5.2.3
Elsa	Municipal Fresh Groundwater Well	5.2.9.10
Engleman Irrigation District	Irrigation District Conservation	5.2.1.3
Engleman Irrigation District	Conversion/Purchase of Surface Water Rights	5.2.3
Falcon Rural WSC	Advanced Municipal Conservation	5.2.1.1
Falcon Rural WSC	Conversion/Purchase of Surface Water Rights	5.2.3
Harlingen	Advanced Municipal Conservation	5.2.1.1
Harlingen	Irrigation District Conservation	5.2.1.3
Harlingen	Drought Management	5.2.2
Harlingen	Conversion/Purchase of Surface Water Rights	5.2.3
Harlingen Irrigation District No. 1	Irrigation District Conservation	5.2.1.3
Harlingen Irrigation District No. 1	Conversion/Purchase of Surface Water Rights	5.2.3
Hidalgo	Drought Management	5.2.2
Hidalgo	Conversion/Purchase of Surface Water Rights	5.2.3
Hidalgo	Expand Existing Fresh Groundwater Wells	5.2.9.6
Hidalgo and Cameron Counties Irrigation District No. 9	Irrigation District Conservation	5.2.1.3
Hidalgo and Cameron Counties Irrigation District No. 9	Conversion/Purchase of Surface Water Rights	5.2.3
Hidalgo County Drainage District No. 1	Regional Water Supply Facilities	5.2.1.3
Hidalgo County Irrigation District No. 1	Irrigation District Conservation	5.2.1.3
Hidalgo County Irrigation District No. 1	Conversion/Purchase of Surface Water Rights	5.2.3
Hidalgo County Irrigation District No. 13	Irrigation District Conservation	5.2.1.3
Hidalgo County Irrigation District No. 13	Conversion/Purchase of Surface Water Rights	5.2.3
Hidalgo County Irrigation District No. 16	Irrigation District Conservation	5.2.1.3
Hidalgo County Irrigation District No. 16	Conversion/Purchase of Surface Water Rights	5.2.3
Hidalgo County Irrigation District No. 2	Irrigation District Conservation	5.2.1.3
Hidalgo County Irrigation District No. 2	Conversion/Purchase of Surface Water Rights	5.2.3
Hidalgo County Irrigation District No. 5	Irrigation District Conservation	5.2.1.3

Entity	Strategy Name	Section
Hidalgo County Irrigation District No. 5	Conversion/Purchase of Surface Water Rights	5.2.3
Hidalgo County Irrigation District No. 6	Irrigation District Conservation	5.2.1.3
Hidalgo County Irrigation District No. 6	Service Area Expansion	5.2.7.3
Hidalgo County Irrigation District No. 6	Conversion/Purchase of Surface Water Rights	5.2.3
Hidalgo County MUD 1	Irrigation District Conservation	5.2.1.3
Hidalgo County MUD 1	Drought Management	5.2.2
Hidalgo County MUD 1	Conversion/Purchase of Surface Water Rights	5.2.3
Hidalgo County Water Improvement District No. 18	Irrigation District Conservation	5.2.1.3
Hidalgo County Water Improvement District No. 18	Conversion/Purchase of Surface Water Rights	5.2.3
Hidalgo County Water Improvement District No. 19	Irrigation District Conservation	5.2.1.3
Hidalgo County Water Improvement District No. 19	Conversion/Purchase of Surface Water Rights	5.2.3
Hidalgo County Water Improvement District No. 3*	Irrigation District Conservation	5.2.1.3
Hidalgo County Water Improvement District No. 3*	Conversion/Purchase of Surface Water Rights	5.2.3
Irrigation, Cameron	Irrigation District Conservation	5.2.1.3
Irrigation, Cameron	On-Farm Irrigation Conservation	0
Irrigation, Cameron	Biological Control of Arundo Donax	5.2.4
Irrigation, Hidalgo	Irrigation District Conservation	5.2.1.3
Irrigation, Hidalgo	On-Farm Irrigation Conservation	0
Irrigation, Hidalgo	Biological Control of Arundo Donax	5.2.4
Irrigation, Jim Hogg	On-Farm Irrigation Conservation	0
Irrigation, Maverick	Irrigation District Conservation	5.2.1.3
Irrigation, Maverick	On-Farm Irrigation Conservation	0
Irrigation, Maverick	Biological Control of Arundo Donax	5.2.4
Irrigation, Starr	On-Farm Irrigation Conservation	0
Irrigation, Starr	Biological Control of Arundo Donax	5.2.4
Irrigation, Webb	On-Farm Irrigation Conservation	0
Irrigation, Webb	Biological Control of Arundo Donax	5.2.4
Irrigation, Willacy	Irrigation District Conservation	5.2.1.3

Entity	Strategy Name	Section
Irrigation, Willacy	On-Farm Irrigation Conservation	0
Irrigation, Willacy	Biological Control of Arundo Donax	5.2.4
Irrigation, Zapata	On-Farm Irrigation Conservation	0
Irrigation, Zapata	Biological Control of Arundo Donax	5.2.4
La Feria	Irrigation District Conservation	5.2.1.3
La Feria	Conversion/Purchase of Surface Water Rights	5.2.3
La Feria	Water Well with RO Unit	5.2.10.7
La Feria	Non-Potable Reuse (Alternative)	5.3.1.2
La Feria Irrigation District, Cameron County No. 3	Irrigation District Conservation	5.2.1.3
La Feria Irrigation District, Cameron County No. 3	Conversion/Purchase of Surface Water Rights	5.2.3
La Grulla	Advanced Municipal Conservation	5.2.1.1
La Grulla	Drought Management	5.2.2
La Grulla	Conversion/Purchase of Surface Water Rights	5.2.3
La Joya	Advanced Municipal Conservation	5.2.1.1
La Joya	Irrigation District Conservation	5.2.1.3
La Joya	Drought Management	5.2.2
La Joya	Conversion/Purchase of Surface Water Rights	5.2.3
La Villa	Advanced Municipal Conservation	5.2.1.1
La Villa	Irrigation District Conservation	5.2.1.3
La Villa	Drought Management	5.2.2
La Villa	Conversion/Purchase of Surface Water Rights	5.2.3
Laguna Madre Water District	Advanced Municipal Conservation	5.2.1.1
Laguna Madre Water District	Drought Management	5.2.2
Laguna Madre Water District	Conversion/Purchase of Surface Water Rights	5.2.3
Laguna Madre Water District	Seawater Desalination Plant	5.2.11.1
Laredo	Advanced Municipal Conservation	5.2.1.1
Laredo	Drought Management	5.2.2
Laredo	Conversion/Purchase of Surface Water Rights	5.2.3
Laredo	South Laredo WWTP Potable Reuse	5.2.5.2.4
Laredo	El Pico WTP Expansion Phases 1-4 (Alternative)	5.3.2.3
Los Fresnos	Irrigation District Conservation	5.2.1.3
Los Fresnos	Conversion/Purchase of Surface Water Rights	5.2.3
Lyford	Irrigation District Conservation	5.2.1.3
Lyford	Conversion/Purchase of Surface Water Rights	5.2.3

Entity	Strategy Name	Section
Lyford	Brackish Groundwater Desalination	5.2.10.8
Manufacturing, Cameron	Industrial Conservation	5.2.1.5
Manufacturing, Hidalgo	Industrial Conservation	5.2.1.5
Manufacturing, Maverick	Industrial Conservation	5.2.1.5
Manufacturing, Starr	Industrial Conservation	5.2.1.5
Manufacturing, Webb	Industrial Conservation	5.2.1.5
Maverick County	Conversion/Purchase of Surface Water Rights	5.2.3
Maverick County	New Brackish Groundwater Desalination	5.2.10.22
Maverick County Water Improvement District	Irrigation District Conservation	5.2.1.3
Maverick County Water Improvement District	Conversion/Purchase of Surface Water Rights	5.2.3
McAllen	Advanced Municipal Conservation	5.2.1.1
McAllen	Irrigation District Conservation	5.2.1.3
McAllen	Drought Management	5.2.2
McAllen	Conversion/Purchase of Surface Water Rights	5.2.3
McAllen	Direct Potable Reuse	5.2.5.2.5
McAllen	Raw Waterline Project with HCID No. 1	5.2.7.4
McAllen	Brackish Groundwater Desalination	5.2.10.9
McAllen	Expand Fresh Groundwater Phases I and II (Alternative)	5.3.4.1
Mercedes	Irrigation District Conservation	5.2.1.3
Mercedes	Drought Management	5.2.2
Mercedes	Conversion/Purchase of Surface Water Rights	5.2.3
Mercedes	New Brackish Groundwater Desalination	5.2.10.23
Mercedes	Expanded Existing Fresh Groundwater Supply (Alternative)	5.3.4.2
Military Highway WSC	Advanced Municipal Conservation	5.2.1.1
Military Highway WSC	Irrigation District Conservation	5.2.1.3
Military Highway WSC	Drought Management	5.2.2
Military Highway WSC	Conversion/Purchase of Surface Water Rights	5.2.3
Military Highway WSC	Expanded Fresh Groundwater Supply (Alternative)	5.3.4.3
Mining, Cameron	Irrigation District Conservation	5.2.1.3
Mining, Hidalgo	Industrial Conservation	5.2.1.5
Mining, Jim Hogg	Industrial Conservation	5.2.1.5
Mining, Maverick	Industrial Conservation	5.2.1.5
Mining, Starr	Industrial Conservation	5.2.1.5

Entity	Strategy Name	Section
Mining, Webb	Industrial Conservation	5.2.1.5
Mining, Zapata	Industrial Conservation	5.2.1.5
Mirando City WSC	Conversion/Purchase of Surface Water Rights	5.2.3
Mission	Advanced Municipal Conservation	5.2.1.1
Mission	Irrigation District Conservation	5.2.1.3
Mission	Drought Management	5.2.2
Mission	Conversion/Purchase of Surface Water Rights	5.2.3
Mission	Potable Reuse	5.2.5.2.6
Mission	Brackish Groundwater Desalination	5.2.10.10
North Alamo WSC	Advanced Municipal Conservation	5.2.1.1
North Alamo WSC	Irrigation District Conservation	5.2.1.3
North Alamo WSC	Drought Management	5.2.2
North Alamo WSC	Conversion/Purchase of Surface Water Rights	5.2.3
North Alamo WSC	Delta WTP Expansion	5.2.6.3
North Alamo WSC	Delta Area Brackish Groundwater Desalination	5.2.10.11
North Alamo WSC	WTP No. 5 Expansion (Alternative)	5.3.2.4
Olmito WSC	Advanced Municipal Conservation	5.2.1.1
Olmito WSC	Irrigation District Conservation	5.2.1.3
Olmito WSC	Conversion/Purchase of Surface Water Rights	5.2.3
Olmito WSC	WTP Expansion	5.2.6.4
Palm Valley	Advanced Municipal Conservation	5.2.1.1
Palm Valley	Irrigation District Conservation	5.2.1.3
Palm Valley	Conversion/Purchase of Surface Water Rights	5.2.3
Pharr	Advanced Municipal Conservation	5.2.1.1
Pharr	Irrigation District Conservation	5.2.1.3
Pharr	Drought Management	5.2.2
Pharr	Conversion/Purchase of Surface Water Rights	5.2.3
Pharr	Raw Water Augmentation Potable Reuse	5.2.5.2.7
Pharr	New Brackish Groundwater Desalination	5.2.10.24
Port Mansfield PUD	Advanced Municipal Conservation	5.2.1.1
Port Mansfield PUD	Irrigation District Conservation	5.2.1.3
Port Mansfield PUD	Drought Management	5.2.2
Port Mansfield PUD	Conversion/Purchase of Surface Water Rights	5.2.3
Primera	Irrigation District Conservation	5.2.1.3
Primera	Drought Management	5.2.2

Entity	Strategy Name	Section
Primera	Conversion/Purchase of Surface Water Rights	5.2.3
Primera	RO WTP with Groundwater Well	5.2.10.12
Raymondville	Irrigation District Conservation	5.2.1.3
Raymondville	Conversion/Purchase of Surface Water Rights	5.2.3
Rio Grande City	Advanced Municipal Conservation	5.2.1.1
Rio Grande City	Drought Management	5.2.2
Rio Grande City	Conversion/Purchase of Surface Water Rights	5.2.3
Rio Hondo	Irrigation District Conservation	5.2.1.3
Rio Hondo	Conversion/Purchase of Surface Water Rights	5.2.3
Rio Hondo	Non-Potable Wastewater Effluent Reuse	5.2.5.1.2
Rio Hondo	Emergency Interconnects	5.2.7.5
Rio Hondo	New Fresh Groundwater Supply	5.2.9.7
Rio WSC	Advanced Municipal Conservation	5.2.1.1
Rio WSC	Drought Management	5.2.2
Rio WSC	Conversion/Purchase of Surface Water Rights	5.2.3
Roma	Advanced Municipal Conservation	5.2.1.1
Roma	Drought Management	5.2.2
Roma	Conversion/Purchase of Surface Water Rights	5.2.3
San Benito	Irrigation District Conservation	5.2.1.3
San Benito	Drought Management	5.2.2
San Benito	Conversion/Purchase of Surface Water Rights	5.2.3
San Benito	Brackish Groundwater Blending	5.2.10.13
San Benito	Non-Potable Reuse (Alternative)	5.3.1.3
San Benito	Direct Potable Reuse (Alternative)	5.3.1.4
San Juan	Irrigation District Conservation	5.2.1.3
San Juan	Drought Management	5.2.2
San Juan	Conversion/Purchase of Surface Water Rights	5.2.3
San Juan	Direct Potable Reuse	5.2.5.2.8
San Juan	Brackish Groundwater Desalination	5.2.10.14
San Juan	WTP 1 Expansion with Brackish Groundwater Desalination	5.2.10.15
Santa Cruz Irrigation District No. 15*	Irrigation District Conservation	5.2.1.3
Santa Cruz Irrigation District No. 15*	Conversion/Purchase of Surface Water Rights	5.2.3
Santa Rosa	Irrigation District Conservation	5.2.1.3

Entity	Strategy Name	Section
Santa Rosa	Conversion/Purchase of Surface Water Rights	5.2.3
Sebastian MUD	Conversion/Purchase of Surface Water Rights	5.2.3
Sharyland WSC	Advanced Municipal Conservation	5.2.1.1
Sharyland WSC	Irrigation District Conservation	5.2.1.3
Sharyland WSC	Drought Management	5.2.2
Sharyland WSC	Conversion/Purchase of Surface Water Rights	5.2.3
Sharyland WSC	Well and RO Unit at WTP 2	5.2.10.16
Sharyland WSC	Well and RO Unit at WTP 3	5.2.10.17
Siesta Shores WCID	Irrigation District Conservation	5.2.1.3
Siesta Shores WCID	Conversion/Purchase of Surface Water Rights	5.2.3
Southmost Regional Water Authority	Brackish Groundwater Desalination Wellfield Expansion	5.2.10.18
Southmost Regional Water Authority	Phase 3 Wellfield Optimization and WTP Expansion	5.2.10.19
Southmost Regional Water Authority	Phase 4 SRWA Wellfield and WTP Expansion	5.2.10.20
Steam-Electric, Cameron	Irrigation District Conservation	5.2.1.3
Steam-Electric, Cameron	Industrial Conservation	5.2.1.5
Steam-Electric, Hidalgo	Industrial Conservation	5.2.1.5
Steam-Electric, Webb	Industrial Conservation	5.2.1.5
Union WSC	Advanced Municipal Conservation	5.2.1.1
Union WSC	Drought Management	5.2.2
Union WSC	Conversion/Purchase of Surface Water Rights	5.2.3
United Irrigation District	Irrigation District Conservation	5.2.1.3
United Irrigation District	Conversion/Purchase of Surface Water Rights	5.2.3
Valley Acres Irrigation District	Irrigation District Conservation	5.2.1.3
Valley Acres Irrigation District	Conversion/Purchase of Surface Water Rights	5.2.3
Valley MUD 2	Advanced Municipal Conservation	5.2.1.1
Valley MUD 2	Conversion/Purchase of Surface Water Rights	5.2.3
Webb County	Advanced Municipal Conservation	5.2.1.1
Webb County	Drought Management	5.2.2
Webb County	Expanded Fresh Groundwater Supply	5.2.9.8
Webb County	Conversion/Purchase of Surface Water Rights	5.2.3
Weslaco	Advanced Municipal Conservation	5.2.1.1
Weslaco	Irrigation District Conservation	5.2.1.3
Weslaco	Drought Management	5.2.2

Entity	Strategy Name	Section
Weslaco	Conversion/Purchase of Surface Water Rights	5.2.3
Weslaco	North WWTP Potable Reuse	5.2.5.2.9
Weslaco	Groundwater Development and Blending	5.2.9.9
Zapata County	Advanced Municipal Conservation	5.2.1.1
Zapata County	Drought Management	5.2.2
Zapata County	Conversion/Purchase of Surface Water Rights	5.2.3
Zapata County San Ygnacio and Ramireño	Advanced Municipal Conservation	5.2.1.1
Zapata County San Ygnacio and Ramireño	Conversion/Purchase of Surface Water Rights	5.2.3
Zapata County WCID-Hwy 16 East	Advanced Municipal Conservation	5.2.1.1
Zapata County WCID-Hwy 16 East	Conversion/Purchase of Surface Water Rights	5.2.3

\*In January 2025, Hidalgo County Water Improvement District No. 3 and Santa Cruz Water Control and Improvement District No. 15 consolidated into Hidalgo County Consolidated Water Control and Improvement District.

Water management strategies, projects, and management supply factor reports can all be found by linking to <https://www3.twdb.texas.gov/apps/SARA/reports/list> and entering '2026 Regional Water Plan' into the "Report Name" field to filter to all DB27 reports associated with the 2026 Regional Water Plans. Reports associated with this chapter include:

- Recommended WUG Water Management Strategies (WMS).
- Recommended Projects Associated with WMSs.
- Alternative WUG WMSs.
- Alternative Projects Associated with WMSs.
- WUG Management Supply Factor.

## 5.2 Recommended Water Management Strategies

The primary emphasis of the regional water planning effort is the development of regional water management strategies sufficient to meet the projected needs of WUGs throughout the state. Water needs are determined by comparing user group water demands to the water supplies available to that user group. The following sections present information concerning the identification, evaluation, and selection of specific water management strategies to meet specific projected water supply shortages for Region M. If a project sponsor wishes to be considered for certain types of State funding, the project that the funding is requested for must be included in the Regional and State Water Plan. It should be noted that local plans that are not inconsistent with the regional water supply plan are also eligible to apply for certain types of TWDB financial assistance to implement those local plans even though they have not been specifically recommended in this plan.

The identified water needs presented in Chapter 4 are based on MAG volumes and conservative surface water availability estimates, which assume only water available during a repeat of the worst Drought of Record (DOR), that all water rights are being fully and simultaneously utilized and exclude water available on an interruptible basis and water available as a result of municipal return flows. The water management strategies are intended to alleviate these projected water supply shortages (water needs). Appendix 5C provides a list of the recommended water management strategies by WUG and/or MWP and their resulting supply balance. Appendix 5D contains the TWDB Costing Tool Cost Summary for each applicable strategy. In accordance with 31 TAC §357.34(e)(3)(A), regional and state water plans are not to include the cost of distribution of water within a water user group service area.

### 5.2.1 Water Conservation

The 2026 Rio Grande Regional Water Plan is required to have a subsection of Chapter 5 that discusses all recommended conservation strategies. Conservation is recommended as a water management strategy for Irrigation, Manufacturing, Mining, and Steam-Electric WUGs, and for the majority of Irrigation Districts and municipal utilities in the region. The RWPG recognizes the need for financial assistance for implementing conservation requiring infrastructure improvements.

#### Recent and Recommended Water Conservation Legislation and Policies

Since the last “Water Conservation Advisory Council Report to the 88th Texas Legislature (2022),” the Texas State Legislature made a significant investment in water infrastructure through the passage of

Senate Bill (SB) 28 and Senate Joint Resolution (SJR) 75 providing for the creation of the Texas Water Fund. In addition, SB 30 authorized a one-time, \$1 billion supplemental appropriation of general revenue to the Texas Water Fund, contingent on enactment of SB 28 and approval of SJR 75 by voters. Proposition 6 (the proposition for SJR 75), creating the Texas Water Fund to assist in financing water projects in Texas, passed on November 7, 2023, with more than 77 percent in favor. The Texas Water Fund, managed by TWDB, prioritizes investment in water loss mitigation and other water strategies. The 88th Legislative Session also established the TexMesonet Hydrometeorology Network and created the TexMesonet Advisory Committee through House Bill (HB) 2759 to support a statewide evapotranspiration (ET) network.

The recent report, “Water Conservation Advisory Council Report to the 89th Texas Legislature (2024),” has recommended the following two additional legislations:

1. The Council recommends that the Texas Legislature replenish funding in the Agricultural Water Conservation Fund sufficient to support the TWDB’s grant and loan program for a total of \$15,000,000 for the next 10 years.
2. Increase appropriations by \$1,200,000 for the biennium to the TWDB to develop and support a statewide ET network within the TexMesonet. Funding will be used for:
  - Up to 2.5 new full-time equivalent staff positions;
  - Contracting a study on existing TexMesonet weather stations regarding siting requirements to calculate ET (study of fetch);
  - Resources to update existing sites to accommodate ET measurements; and
  - Grants and/or contracts with agencies to provide technical assistance.

### 5.2.1.1 Advanced Municipal Water Conservation

Water conservation is defined as methods and practices that reduce demand for water supply, increase the efficiency of supply, or use facilities so that available supply is conserved and made available for future use. All public water suppliers are required by the TAC Rule Section 288.2 to submit a Drought Contingency and Water Conservation Plan to the TCEQ for approval. These plans must include a utility profile including population and water use data (total gallons per capita per day (GPCD) and residential), 5-year and 10-year target-specific water savings goals, and conservation strategies to meet those goals. For the purposes of planning, municipal conservation is distinguished by two approaches: water loss mitigation and water use reduction. Water loss mitigation comprises the means to determine and control of real water loss through distribution system pipeline repair and replacement. Water use reduction includes but is not limited to: metering devices to measure and account for the amount of water diverted from the supply source; a program for universal metering of both customer and public uses of water; and programs for continuing public education.

In 2001, the Texas Legislature amended the Texas Water Code to require RWPGs to consider water conservation and drought management strategies for every entity with a projected water shortage (need). The Water Conservation Implementation Task Force was created by SB 1094 to identify water conservation best management practices (BMPs) and develop a BMP Guide for use by RWPGs and utilities.<sup>1</sup> In 2007, the task force was succeeded by the Water Conservation Advisory Council (WCAC) by the 80th Texas Legislature with the passage of SB 3 and HB 4. The primary roles of the WCAC include monitoring trends in water conservation implementation and technologies for potential inclusion as BMPs. Since its inception, the WCAC has continually worked with TWDB and TCEQ to update the “Best Management Practices Guide.” BMPs contained in the BMP Guide are voluntary efficiency measures that save a quantifiable amount of water, either directly or indirectly, and can be implemented within a specific time frame.<sup>2</sup>

The current TWDB municipal water demand projections account for expected water savings caused by the implementation of the 1991 State Water Efficient Plumbing Act, which established minimum standards for plumbing fixtures sold in Texas. The standards for new plumbing fixtures, as specified by the State Water Efficient Plumbing Act and updated by the TCEQ, are shown in Table 5-3. The TCEQ has established rules requiring the labeling of both plumbing fixtures and water-using appliances sold in Texas. The labels must specify the rates of flow for plumbing fixtures and lawn sprinklers, and the amounts of water used per cycle for clothes washers and dishwashers.

In 2009, the Texas Legislature enacted HB 2667, establishing new minimum standards for plumbing fixtures sold in Texas beginning in 2014. HB 2667 clarifies and sets out the national standards of the American Society of Mechanical Engineers (ASME) and American National Standards Institute (ANSI) by which plumbing fixtures will be produced and tested. This bill establishes a phase-in of high efficiency plumbing fixtures brought into Texas, which allowed manufacturers the time to change their production and retailers the opportunity to turn over their inventory. HB 2667 creates an exemption for those manufacturers that volunteer to register their products with the United States Environmental Protection Agency's WaterSense Program, which should result in additional water savings. This bill also repeals the

---

<sup>1</sup> Water Conservation Implementation Task Force. Report to the 79th Legislature, Texas Water Development Board, Special Report. Austin, Texas. November 2004.

<sup>2</sup> “Best Management Practices for Municipal Water Users.” Texas Water Development Board. Austin, Texas. May 2019.

TCEQ certification process for plumbing fixtures since the plumbing fixtures must meet national certification and testing procedures.

TCEQ has established rules to reflect this new change in law. The 2009 law required that by January 2014, all toilets use no more than 1.28 gallons per flush (20 percent savings from the 1991, 1.6 gallons per flush standard). Assuming an average frequency of per-person toilet use in households of 5.1 and a per-use savings of 0.32 gallons per use, the supplementary savings of adopting high-efficiency toilets is 1.63 GPCD. This change is also reflected in Table 5-3.

**Table 5-3 Standards for Plumbing Fixtures<sup>3</sup>**

Fixture	Standard
Toilets*	1.28 gallons per flush
Shower Heads	2.50 gpm at 80 psi
Urinals	0.50 gallons per flush
Faucet Aerators	2.20 gpm at 60 psi
Drinking Water Fountains	Self-closing valve
* Bill 2667 of the 81st Texas Legislature, 2009	

The TWDB has estimated that the effect of the new plumbing fixtures in dwellings, offices, and public places will be a reduction in per capita water use in comparison to what would have occurred with previous generations of plumbing fixtures shown in Table 5-4.

**Table 5-4 Water Conservation Potentials of Low Flow Plumbing Fixtures**

Plumbing Fixture	Water Savings (gpcd)		
	Pre-1995 Average Use to 1995 Standard	Pre-1995 Average Use to 2014 Standard	1995 Average Use to 2014 Standard
Showerheads*	13.0	NA	1.86
Toilets - residential	10.5	12.1	1.6
Toilets and urinals – commercial**	7.06	8.41	1.35
Showerheads*	13.0	NA	1.86
* Savings values shown assume 8 minutes per shower and 6.5 showers per person per week. ** Savings values shown assume state-level gender employee proportions and 6 days/week use for commercial toilet and urinal use.			

With respect to the RWP, any additional projected water savings from conservation programs must be listed as a separate WMS. The savings projected by the TWDB include complete replacement of existing plumbing fixtures to water-efficient fixtures by the year 2045. The projections also assume that all new construction includes water-efficient plumbing fixtures. It is important when including a retrofit program

<sup>3</sup> Title 30, Texas Administrative Code Section 290.252; 30 TAC, Chapter 290, Subchapter G; and Texas Health and Safety Code 372.

as a WMS to not double-count water savings, as savings caused by retrofits are already included in the base water demand projections.

Entities must submit a water conservation plan if the following occur:<sup>4</sup>

- The entity is a retail public water supplier with 3,300 or more connections;
- The entity is applying to the TWDB for financial assistance of more than \$500,000; or
- The entity has certain surface water rights through the TCEQ.

The Rio Grande RWPG has considered these water conservation plans from each WUG, as necessary, to inform conservation WMSs and other recommendations.

The link below contains model water conservation plans for the following types of water users:

- Municipal Water Use by Public Water Supplier
- Wholesale Public Water Suppliers
- Industrial Use
- Mining Use
- Agricultural Uses

[https://www.tceq.texas.gov/permitting/water\\_rights/wr\\_technical-resources/conserv.html#whattoinclude](https://www.tceq.texas.gov/permitting/water_rights/wr_technical-resources/conserv.html#whattoinclude)

### **Outdoor Water Use**

In 2018, the Texas Living Waters Project published the “Water Conservation by the Yard: A Statewide Analysis of Outdoor Water Savings Potential,” which detailed regional and statewide projected conservation savings based on effective outdoor watering education, technology, and restrictions. According to the Texas Living Waters Project, restricting outdoor water use to no more than twice per week can alone achieve much of the projected conservation savings in the 2017 State Water Plan efficiently utilizing the following limits:

- Number of days/week residents can water;
- Hours during which residents can irrigate; and
- Specific water delivering technologies.

The Texas Living Waters Project reported an estimated savings potential of twice per week outdoor watering restrictions ranges from 3.5 (low effort) to 8.5 (high effort) percent of total municipal demand. The Texas Living Waters Project research indicates that education and enforcement have a direct impact on the effectiveness of outdoor watering restrictions.

### **Municipal Water Conservations Goals**

Advanced Municipal Water Conservation is considered for every municipal WUG in Region M. For every municipal WUG with a projected need or a per capita water use rate greater than 140 GPCD, municipal conservation yield and costs were recommended. Regardless of need, conservation is not recommended for WUGs with a GPCD less than 80. Primera is the only WUG exhibiting needs with a Base GPCD less

---

<sup>4</sup> “Evaluation of Best Management Practices in Certain Water Conservation Plans,” Biennial Report to the Texas Legislature, 85th Legislative Session. Texas Water Development Board. 2017.

than 80 (79). While Primera exhibits a municipal need, their low GPCD does not suggest additional savings are achievable through conservation.

For entities that have projected needs, the usage reduction rate was based on the current GPCD. Entities with needs and a GPCD greater than 140 GPCD were assigned a 10 percent usage reduction per decade. After the 140 GPCD goal was achieved, or for entities with a need and a GPCD below 140, the decadal reduction was set to 5 percent. A minimum value of 80 GPCD was fixed. Once the minimum value was reached, entities were projected to stop reducing their GPCD. Table 5-5 shows the projected GPCD goals for recommended municipal WUGs.

It is encouraged that entities without needs that have a per capita water use rate under 140 GPCD implement advanced water conservation, but they were not recommended a specific advanced conservation WMS, as goals were not assigned to them, and no yield or costs were determined.

**Table 5-5 2026 Region M Advanced Municipal Water Conservation Goals (GPCD)**

WUG	County	Baseline (GPCD)	Projected GPCD Goals					
			2030	2040	2050	2060	2070	2080
Brownsville	Cameron	154	135	128	122	116	110	105
County-Other, Cameron	Cameron	147	128	121	115	109	104	99
County-Other, Hidalgo	Hidalgo	109	99	94	89	85	81	80
County-Other, Starr	Starr	115	104	99	94	90	85	81
County-Other, Webb	Webb	105	95	90	86	81	80	80
County-Other, Zapata	Zapata	127	115	109	103	98	93	89
Eagle Pass	Maverick	150	131	125	118	112	107	102
East Rio Hondo WSC	Cameron	125	115	109	104	98	93	89
Edinburg	Hidalgo	121	111	105	100	95	90	86
El Jardin WSC	Cameron	102	91	87	83	80	80	80
El Sauz WSC	Starr	91	83	80	80	80	80	80
El Tanque WSC	Starr	134	123	117	111	106	100	95
Falcon Rural WSC	Zapata	169	148	134	127	121	115	109
Harlingen	Cameron	159	139	132	126	119	113	108
Hidalgo County MUD 1	Hidalgo	92	83	80	80	80	80	80
La Grulla	Starr	161	141	127	121	115	109	104
La Joya	Hidalgo	116	106	101	96	91	87	82
La Villa	Hidalgo	100	91	87	82	80	80	80
Laguna Madre Water District	Cameron	378	336	302	272	245	220	198
Laredo	Webb	144	133	126	120	114	108	103

WUG	County	Baseline (GPCD)	Projected GPCD Goals					
			2030	2040	2050	2060	2070	2080
McAllen	Hidalgo	211	186	167	150	135	129	122
Military Highway WSC	Cameron	136	125	119	113	107	102	97
Mission	Hidalgo	187	164	148	133	126	120	114
North Alamo WSC	Cameron	146	128	121	115	110	104	99
Olmito WSC	Cameron	166	145	131	124	118	112	107
Palm Valley	Cameron	166	145	130	124	118	112	106
Pharr	Hidalgo	100	91	86	82	80	80	80
Port Mansfield PUD	Willacy	350	310	279	251	226	204	183
Rio Grande City	Starr	214	189	170	153	138	131	124
Rio WSC	Starr	93	85	81	80	80	80	80
Roma	Starr	108	99	94	89	85	80	80
Sharyland WSC	Hidalgo	160	140	126	120	114	108	103
Union WSC	Starr	157	138	131	124	118	112	106
Valley MUD 2	Cameron	286	253	228	205	185	166	150
Webb County	Webb	107	98	93	88	84	80	80
Weslaco	Hidalgo	156	136	130	123	117	111	106
Zapata County	Zapata	166	146	131	125	118	112	107
Zapata County San Ygnacio & Ramireño	Zapata	170	149	134	127	121	115	109
Zapata County WCID-Hwy 16 East	Zapata	266	237	213	192	173	155	140

The new GPCD for each decade was used along with the WUG population to determine the revised water demands for each decade. These values were subtracted from the original water demands to determine the amount of water conserved in each decade.

Two strategies – water loss mitigation and water use reduction – are recommended to reach the target GPCDs. The respective yields of total volume of water that could be conserved (demand reduction) are shown in Table 5-6 and Table 5-7.

**Table 5-6 2026 Region M Projected Total Demand Reduction from Water Loss Mitigation (ac-ft/yr)**

WUG	COUNTY	Water Loss Mitigation Demand Reduction (ac-ft/yr) <sup>1</sup>					
		2030	2040	2050	2060	2070	2080
Brownsville	Cameron	644	658	664	662	660	658
County-Other, Cameron	Cameron	42	34	24	17	11	7
County-Other, Hidalgo	Hidalgo	32	20	6	6	7	8
County-Other, Starr	Starr	5	5	6	6	7	7
County-Other, Webb	Webb	14	9	4	4	4	4
County-Other, Zapata	Zapata	2	2	2	2	2	2
Eagle Pass	Maverick	192	204	214	224	232	242
East Rio Hondo WSC	Cameron	72	86	100	110	116	122
Edinburg	Hidalgo	224	242	254	258	262	266
El Jardin WSC	Cameron	28	28	28	28	28	28
El Sauz WSC	Starr	4	4	4	4	4	4
El Tanque WSC	Starr	4	4	4	2	2	2
Falcon Rural WSC	Zapata	5	2	0	0	0	0
Harlingen	Cameron	296	302	306	304	304	304
Hidalgo County MUD 1	Hidalgo	10	10	10	12	12	12
La Grulla	Starr	117	32	32	34	34	36
La Joya	Hidalgo	12	12	14	14	14	14
La Villa	Hidalgo	4	6	6	6	6	6
Laguna Madre Water District	Cameron	371	379	383	382	381	379
Laredo	Webb	836	866	876	866	858	848
McAllen	Hidalgo	3,062	3,392	3,715	954	978	1,004
Military Highway WSC	Cameron	130	132	132	134	136	138
Mission	Hidalgo	1,445	1,523	394	404	414	424
North Alamo WSC	Cameron	706	776	822	830	838	846
Olmito WSC	Cameron	106	28	28	28	28	28
Palm Valley	Cameron	19	4	4	4	4	4
Pharr	Hidalgo	182	194	202	206	210	214
Port Mansfield PUD	Willacy	11	13	16	21	26	31
Rio Grande City	Starr	336	357	374	96	100	102
Rio WSC	Starr	16	20	20	20	20	20

WUG	COUNTY	Water Loss Mitigation Demand Reduction (ac-ft/yr) <sup>1</sup>					
		2030	2040	2050	2060	2070	2080
Roma	Starr	50	52	54	56	58	60
Sharyland WSC	Hidalgo	1,243	338	358	362	366	372
Union WSC	Starr	24	26	26	28	28	30
Valley MUD 2	Cameron	78	80	80	80	80	80
Webb County	Webb	30	42	52	52	52	50
Weslaco	Hidalgo	110	112	114	118	122	126
Zapata County	Zapata	146	38	38	36	36	36
Zapata County San Ygnacio & Ramireño	Zapata	5	2	0	0	0	0
Zapata County WCID-Hwy 16 East	Zapata	13	13	13	13	13	4

<sup>1</sup> Water Loss Mitigation is not recommended for County-Other WUGs.

**Table 5-7 2026 Region M Projected Total Demand Reduction from Water Use Reduction (ac-ft/yr)**

WUG	County	Water Use Reduction Demand Reduction (ac-ft/yr)					
		2030	2040	2050	2060	2070	2080
Brownsville	Cameron	2,581	3,992	5,450	6,785	8,046	9,232
County-Other, Cameron	Cameron	381	441	427	356	290	197
County-Other, Hidalgo	Hidalgo	128	158	71	109	153	176
County-Other, Starr	Starr	21	45	71	106	143	183
County-Other, Webb	Webb	56	71	53	72	78	78
County-Other, Zapata	Zapata	6	15	24	34	43	53
Eagle Pass	Maverick	768	1,246	1,768	2,299	2,845	3,399
East Rio Hondo WSC	Cameron	110	311	584	885	1,166	1,463
Edinburg	Hidalgo	340	880	1,506	2,086	2,649	3,206
El Jardin WSC	Cameron	39	99	163	199	199	198
El Sauz WSC	Starr	5	10	11	11	11	11
El Tanque WSC	Starr	6	12	17	23	25	27

WUG	County	Water Use Reduction Demand Reduction (ac-ft/yr)					
		2030	2040	2050	2060	2070	2080
Falcon Rural WSC	Zapata	2	8	10	10	10	9
Harlingen	Cameron	1,184	1,832	2,503	3,123	3,708	4,259
Hidalgo County MUD 1	Hidalgo	16	31	32	31	33	34
La Grulla	Starr	29	258	339	412	487	561
La Joya	Hidalgo	18	47	77	108	139	169
La Villa	Hidalgo	8	19	35	41	40	40
Laguna Madre Water District	Cameron	93	514	906	1,252	1,560	1,834
Laredo	Webb	1,252	3,160	5,182	7,001	8,686	10,243
McAllen	Hidalgo	770	4,566	8,770	15,339	17,359	19,371
Military Highway WSC	Cameron	194	479	778	1,080	1,375	1,664
Mission	Hidalgo	363	2,036	4,898	5,758	6,612	7,465
North Alamo WSC	Cameron	2,835	4,742	6,790	8,556	10,267	11,919
Olmito WSC	Cameron	26	225	284	341	396	449
Palm Valley	Cameron	5	41	51	60	69	77
Pharr	Hidalgo	276	689	1,175	1,427	1,456	1,486
Port Mansfield PUD	Willacy	3	18	38	66	103	151
Rio Grande City	Starr	85	483	886	1,553	1,760	1,970
Rio WSC	Starr	24	68	82	83	82	82
Roma	Starr	74	190	322	451	583	610
Sharyland WSC	Hidalgo	310	2,830	3,706	4,455	5,188	5,901
Union WSC	Starr	99	157	222	285	351	416
Valley MUD 2	Cameron	19	107	190	262	326	383
Webb County	Webb	45	151	309	417	510	506
Weslaco	Hidalgo	441	685	946	1,217	1,493	1,776
Zapata County	Zapata	37	308	383	452	512	569
Zapata County San Ygnacio & Ramireño	Zapata	2	8	10	10	11	11
Zapata County WCID-Hwy 16 East	Zapata	3	17	31	42	52	70

Costs were calculated to include a variety of conservation measures. The TWDB Cost Estimating Tool methodology was used to determine project costs, annual costs, and unit costs once the facility costs were developed.

As deteriorating infrastructure can have high rates of water loss, water loss mitigation is recommended through leak detection and repair, utility water audits and installation of advanced metering infrastructure. It is assumed that none of the distribution line replacements for this water conservation strategy are subject to adopted utility standard minimum size requirements that exceed two standard pipe diameters. Costs for leak detection and repair were estimated assuming 2 percent of the individual WUG’s pipeline is replaced each decade over the planning horizon. Implementing this conservation strategy would reduce approximately 1-3 percent of the WUG’s demand. Smart meters were assumed a cost of \$330 per home, with the assumption that 100 percent of homes would implement this strategy over the planning horizon. Implementing this conservation strategy would reduce approximately 1-5 percent of the demand. Water loss is discussed further in Chapter 1.

The following table provides the estimated costs for municipal conservation (water loss mitigation). The high unit cost reflects the cost of water main replacement.

**Table 5-8 Estimated Costs for Water Loss Mitigation WMS**

WUG	County	Water Loss Mitigation			
		Facility Cost (\$)	Project Cost (\$)	Annual Cost (\$)	Unit Cost (\$/AC-FT)
Brownsville	Cameron	\$41,453,000	\$56,070,000	\$4,023,333	\$6,059
County-Other, Cameron	Cameron	\$472,000	\$634,000	\$76,000	\$1,810
County-Other, Hidalgo	Hidalgo	\$770,000	\$1,034,000	\$124,000	\$3,875
County-Other, Starr	Starr	\$654,000	\$878,000	\$106,000	\$15,143
County-Other, Webb	Webb	\$433,000	\$581,000	\$70,000	\$5,000
County-Other, Zapata	Zapata	\$174,000	\$233,000	\$28,000	\$14,000
Eagle Pass	Maverick	\$21,502,000	\$29,148,000	\$1,680,000	\$6,942
East Rio Hondo WSC	Cameron	\$17,312,000	\$23,504,000	\$1,134,000	\$9,295
Edinburg	Hidalgo	\$24,308,000	\$32,910,000	\$2,170,667	\$8,160
El Jardin WSC	Cameron	\$4,481,000	\$6,080,000	\$313,000	\$11,179
El Sauz WSC	Starr	\$396,000	\$538,000	\$41,333	\$10,333
El Tanque WSC	Starr	\$246,000	\$336,000	\$17,333	\$4,333
Falcon Rural WSC	Zapata	\$98,000	\$135,000	\$5,167	\$1,033
Harlingen	Cameron	\$23,967,000	\$32,478,000	\$1,947,167	\$6,363
Hidalgo County MUD 1	Hidalgo	\$1,643,000	\$2,226,000	\$134,167	\$11,181
La Grulla	Starr	\$2,638,000	\$3,574,000	\$221,000	\$1,889

WUG	County	Water Loss Mitigation			
		Facility Cost (\$)	Project Cost (\$)	Annual Cost (\$)	Unit Cost (\$/AC-FT)
La Joya	Hidalgo	\$1,312,000	\$1,776,000	\$118,667	\$8,476
La Villa	Hidalgo	\$568,000	\$768,000	\$54,500	\$9,083
Laguna Madre Water District	Cameron	\$5,132,000	\$6,973,000	\$306,500	\$800
Laredo	Webb	\$62,286,000	\$84,303,000	\$5,708,000	\$6,516
McAllen	Hidalgo	\$44,622,000	\$60,341,000	\$4,422,667	\$1,190
Military Highway WSC	Cameron	\$8,759,000	\$11,834,000	\$929,000	\$6,732
Mission	Hidalgo	\$24,593,000	\$33,296,000	\$2,197,333	\$1,443
North Alamo WSC	Cameron	\$126,401,000	\$171,762,000	\$7,346,667	\$8,684
Olmito WSC	Cameron	\$1,974,000	\$2,675,000	\$169,833	\$1,602
Palm Valley	Cameron	\$229,000	\$310,000	\$26,167	\$1,377
Pharr	Hidalgo	\$22,184,000	\$30,017,000	\$2,088,333	\$9,759
Port Mansfield PUD	Willacy	\$932,000	\$1,281,000	\$40,000	\$1,290
Rio Grande City	Starr	\$4,750,000	\$6,427,000	\$449,333	\$1,201
Rio WSC	Starr	\$2,683,000	\$3,634,000	\$228,000	\$11,400
Roma	Starr	\$6,024,000	\$8,155,000	\$543,833	\$9,064
Sharyland WSC	Hidalgo	\$24,914,000	\$33,727,000	\$2,249,333	\$1,810
Union WSC	Starr	\$2,343,000	\$3,175,000	\$191,333	\$6,378
Valley MUD 2	Cameron	\$1,179,000	\$1,601,000	\$78,333	\$979
Webb County	Webb	\$3,260,000	\$4,394,000	\$414,333	\$7,968
Weslaco	Hidalgo	\$8,001,000	\$10,824,000	\$769,500	\$6,107
Zapata County	Zapata	\$3,865,000	\$5,248,000	\$250,667	\$1,717
Zapata County San Ygnacio & Ramireño	Zapata	\$182,000	\$250,000	\$7,333	\$1,467
Zapata County WCID-Hwy 16 East	Zapata	\$2,028,000	\$2,794,000	\$62,000	\$4,769

Water use reduction measures were assumed to be non-capital approaches, which could include both labor and materials associated with implementing standards, incentives, and outreach. Many of the non-capital cost measures include, but are not limited to, drought tolerant landscape, public education and outreach – including school programs, rebate and incentive programs – local ordinances that increase water efficiency by customers, support of legislation that increases water efficiency in plumbing products and appliances at both the State and Federal level, increased water efficiency in utility

operations, and conservation-oriented rate structures. Conservation measures for non-capital approaches were included in the annual costs at an average of \$305/ac-ft of water savings.

### **5.2.1.2 Environmental Impacts of Recommended Advanced Municipal Water Conservation Strategies**

Potential environment impacts for Advanced Municipal Water Conservation strategies have been identified and categorized as described below. The letters identifying each section correspond to the headings in Table 5-9.

#### **A. Acres Impacted Permanently**

Acres impacted permanently refers to the total amount of area that will be permanently impacted because of the implementation of a strategy. Water loss mitigation and water use reductions have no permanent impacts on acreage.

#### **B. Construction Impacted Acreage**

Temporary environmental impacts may be seen during construction activities, such as increased air and noise pollution, and land disturbance activities. However, these effects are typical of any construction project. Pipeline replacement under water loss mitigation assumes the acreage impacted is equivalent to the ROW easements required; it is assumed 50-feet for ROW.

#### **C. Agricultural Resources Impacted Acreage**

Agricultural resources impact acreage is a consolidation of vegetation and land use types specific to Region – row crops, grass farms, and orchards – identified in the TPWD EMST. This GIS mapping data was overlain WMS locations to estimate the agricultural impact acreage from the implementation of the associated strategy. As municipal water conservation strategies are applied to already developed acreage, there is no impact to agricultural resources.

#### **D. Wetland Impact**

The wetland impact refers to the probability that implementation of a WMS will affect a wetland. The location of wetlands in the Region was determined using the NWI located at <http://www.fws.gov/wetlands/Data/Mapper.html>.

A strategy received a "1" if all or part of the strategy is located in a wetland or if it is in close proximity to where construction activities are likely to impact the wetland. All other strategies received zeros. If the exact location of project is unknown it was given a zero because it was assumed that it would be located on a site that would not affect and wetland.

#### **E. Habitat Impacted Acreage**

Habitat impacted acreage refers to how the strategy will impact the habitat of the local area. The more area that is impacted because of the implementation of the strategy, the more the habitat of the area will be disrupted. Therefore, it was assumed that the permanent acreage impacted for a WMS is what would impact habitats.

#### **F. Cultural Resources Impact**

Cultural resources impact refers to how the strategy will impact cultural resources located within the area. Cultural resources are defined as the collective evidence of the past activities and

accomplishments of people, including locations; buildings; and features with scientific, cultural, or historic value. It is assumed that no WMSs negatively affect cultural resources. Mitigation costs are included for strategies that require infrastructure so it is assumed that none would be built in a location or way that disrupts culturally sensitive location.

**G. Reliability**

Reliability is an assessment of the availability of the specified water quantity to the user over time. If the quantity of water is available to the user all the time, then the strategy has a high reliability. If the quantity of water is contingent on other factors, reliability will be lower. Since these strategies are a demand reduction or supply efficiency increase, the reliability is high (reliability score = 5).

**H. Bays, Estuaries, and Arms of the Gulf of Mexico**

The environmental effects due to implementation of upstream WMS projects on bays, estuaries, and arms of the Gulf of Mexico are quantitatively assessed and reported. Water bodies designated as classified segments by the TCEQ that are within or downstream of Region M include the Brownsville Ship Channel, South Bay, Laguna Madre, and Gulf of Mexico. Effects to these water bodies were quantified by estimating whether the project is anticipated to decrease freshwater inflow in these classified water bodies.

A WMS project received a "1" if it is expected to decrease freshwater inflow into a classified water body. If a strategy were to increase freshwater inflow or otherwise have little to no impact on inflows, then the project would receive a zero.

A summary of the identified and quantified environmental impacts for recommended advanced municipal conservation strategies is presented in Table 5-9.

**Table 5-9 Environmental Impacts for Recommended Advanced Municipal Water Conservation Strategies**

Entity	WMS Name	Yield*	A	B	C	D	E	F	G	H
Brownsville	Advanced Municipal Water Conservation	3,225	0	520	0	0	0	0	5	1
County-Other, Cameron	Advanced Municipal Water Conservation	423	0	0	0	0	0	0	5	1
County-Other, Hidalgo	Advanced Municipal Water Conservation	160	0	0	0	0	0	0	5	1
County-Other, Starr	Advanced Municipal Water Conservation	26	0	0	0	0	0	0	5	1
County-Other, Webb	Advanced Municipal Water Conservation	70	0	0	0	0	0	0	5	1
County-Other, Zapata	Advanced Municipal Water Conservation	8	0	0	0	0	0	0	5	1
Eagle Pass	Advanced Municipal Water Conservation	960	0	349	0	0	0	0	5	1

Entity	WMS Name	Yield*	A	B	C	D	E	F	G	H
East Rio Hondo WSC	Advanced Municipal Water Conservation	182	0	324	0	0	0	0	5	1
Edinburg	Advanced Municipal Water Conservation	564	0	342	0	0	0	0	5	1
El Jardin WSC	Advanced Municipal Water Conservation	67	0	80	0	0	0	0	5	1
El Sauz WSC	Advanced Municipal Water Conservation	9	0	7	0	0	0	0	5	1
El Tanque WSC	Advanced Municipal Water Conservation	10	0	7	0	0	0	0	5	1
Falcon Rural WSC	Advanced Municipal Water Conservation	7	0	4	0	0	0	0	5	1
Harlingen	Advanced Municipal Water Conservation	1,480	0	375	0	0	0	0	5	1
Hidalgo County MUD 1	Advanced Municipal Water Conservation	26	0	25	0	0	0	0	5	1
La Grulla	Advanced Municipal Water Conservation	146	0	40	0	0	0	0	5	1
La Joya	Advanced Municipal Water Conservation	30	0	18	0	0	0	0	5	1
La Villa	Advanced Municipal Water Conservation	12	0	7	0	0	0	0	5	1
Laguna Madre Water District	Advanced Municipal Water Conservation	464	0	102	0	0	0	0	5	1
Laredo	Advanced Municipal Water Conservation	2,088	0	847	0	0	0	0	5	1
McAllen	Advanced Municipal Water Conservation	3,832	0	542	0	0	0	0	5	1
Military Highway WSC	Advanced Municipal Water Conservation	324	0	95	0	0	0	0	5	1
Mission	Advanced Municipal Water Conservation	1,808	0	345	0	0	0	0	5	1
North Alamo WSC	Advanced Municipal Water Conservation	3,541	0	2,545	0	0	0	0	5	1
Olmito WSC	Advanced Municipal Water Conservation	132	0	29	0	0	0	0	5	1
Palm Valley	Advanced Municipal Water Conservation	24	0	4	0	0	0	0	5	1

Entity	WMS Name	Yield*	A	B	C	D	E	F	G	H
Pharr	Advanced Municipal Water Conservation	458	0	291	0	0	0	0	5	1
Port Mansfield PUD	Advanced Municipal Water Conservation	14	0	36	0	0	0	0	5	1
Rio Grande City	Advanced Municipal Water Conservation	421	0	62	0	0	0	0	5	1
Rio WSC	Advanced Municipal Water Conservation	40	0	40	0	0	0	0	5	1
Roma	Advanced Municipal Water Conservation	124	0	84	0	0	0	0	5	1
Sharyland WSC	Advanced Municipal Water Conservation	1,553	0	345	0	0	0	0	5	1
Union WSC	Advanced Municipal Water Conservation	123	0	36	0	0	0	0	5	1
Valley MUD 2	Advanced Municipal Water Conservation	97	0	22	0	0	0	0	5	1
Webb County	Advanced Municipal Water Conservation	75	0	22	0	0	0	0	5	1
Weslaco	Advanced Municipal Water Conservation	551	0	102	0	0	0	0	5	1
Zapata County	Advanced Municipal Water Conservation	183	0	73	0	0	0	0	5	1
Zapata County San Ygnacio & Ramireño	Advanced Municipal Water Conservation	7	0	7	0	0	0	0	5	1
Zapata County WCID-Hwy 16 East	Advanced Municipal Water Conservation	16	0	87	0	0	0	0	5	1

\* Indicates first decade of implementation yield (ac-ft/yr).

**5.2.1.3 Irrigation District Water Conservation**

IDs carry over 85 percent of the water that is used from the Rio Grande system in Region M. These districts deliver water for all categories of water user. Most IDs have similar components: initial pump stations to divert water from the river, some storage in either off-channel reservoirs or in the main canals, and canal and/or pipeline networks that deliver water to farmland and municipal utilities for treatment and distribution. Most systems measure the water supplied to farmers using a flow rate estimate from delivery pipe rather than metering, which makes accurate volumetric pricing difficult.

Infrastructure and distribution systems increase supplies through reduction of losses and removing infrastructure bottlenecks that have limited the amount of water that can be supplies.

The ID systems require significant regular maintenance to mitigate losses and can benefit from more proactive improvements like gate and meter automation. Districts may experience losses in the range of 10 to 40 percent of the water that they divert. ID improvements include conservation measures, which directly reduce measurable losses, and operational improvements like automated gates and increased off-channel storage. Per TWDB rules, ID conservation yield is estimated for a drought year. ID improvements represent a group of low-cost WMS for Region M that decrease losses and improve service.

The ID conservation WMSs submitted via surveys over the past three planning cycles were used to form the basis of a general ID conservation WMS for all IDs. ID conservation strategies include the following:

- Canal lining (new linings and replacement of damaged linings);
- Installation or replacement of pipeline, including interconnects between IDs where IDs are capable of serving new WUG or measurable efficiency gains are achieved; and
- General repairs and improvements, including new metering and controls, which can include installation of automated system controls, meters and supervisory control and data acquisition (SCADA) systems where implementation leads to measurable efficiency gains.

All WMSs were assumed to apply to the first decade of planning, 2030, unless noted otherwise. The total annual estimated potential water savings in 2080 for all the WMSs submitted was 136,702 ac-ft. The amount of water that can be conserved per ID was calculated based on estimates of current conveyance efficiency and a maximum efficiency of 90 percent.<sup>5</sup> These savings are passed proportionally to ID customers; this allocation split is shown under each ID.

**Table 5-10 Irrigation District Conservation Water Savings (ac-ft/yr)**

Irrigation District	2030	2040	2050	2060	2070	2080
<b>Bayview Irrigation District</b>	<b>255</b>	<b>510</b>	<b>765</b>	<b>1,020</b>	<b>1,275</b>	<b>1,530</b>
County-Other, Cameron	7	13	20	27	34	40
Irrigation, Cameron	248	496	744	990	1,234	1,477
Unallocated	0	1	1	3	7	13
<b>Brownsville Irrigation District</b>	<b>608</b>	<b>1,216</b>	<b>1,823</b>	<b>2,431</b>	<b>3,039</b>	<b>3,647</b>
County-Other, Cameron	12	24	37	49	61	73
El Jardin	44	88	132	176	220	264
Irrigation, Cameron	467	934	1,399	1,863	2,322	2,779
Unallocated	85	170	255	343	436	531
<b>Cameron County Irrigation District No. 2, San Benito</b>	<b>1,248</b>	<b>2,497</b>	<b>3,745</b>	<b>4,994</b>	<b>6,242</b>	<b>7,491</b>
County-Other, Cameron	10	20	30	40	50	60
ERHWSC	92	184	276	369	460	553

<sup>5</sup> For comparison, the public water supply systems in Region M average approximately 73 percent efficiency, with about 27 percent losses caused by leaks and breakage in their systems.

Irrigation District	2030	2040	2050	2060	2070	2080
Irrigation, Cameron	1,012	2,023	3,032	4,036	5,032	6,022
Manufacturing, Cameron	3	6	10	13	16	19
Rio Hondo	13	26	39	51	64	77
San Benito	118	234	352	469	586	703
Unallocated	0	4	6	16	34	57
<b>Cameron County Irrigation District No. 6, Los Fresnos</b>	<b>272</b>	<b>543</b>	<b>815</b>	<b>1,086</b>	<b>1,358</b>	<b>1,629</b>
Brownsville	2	5	7	10	13	15
Manufacturing, Cameron	0	0	0	1	1	1
Irrigation, Cameron	161	321	482	641	800	957
Los Fresnos	9	18	26	35	44	53
Olmito	16	32	47	62	78	94
Unallocated	84	167	253	337	422	509
<b>Cameron County W.I.D No. 10, Rutherford Harding</b>	<b>372</b>	<b>632</b>	<b>748</b>	<b>864</b>	<b>978</b>	<b>1,092</b>
Irrigation, Cameron	116	232	348	464	578	692
Unallocated	256	400	400	400	400	400
<b>Delta Lake Irrigation District</b>	<b>4,222</b>	<b>8,444</b>	<b>12,666</b>	<b>16,888</b>	<b>21,110</b>	<b>25,331</b>
County-Other, Willacy	4	8	13	17	21	25
Irrigation, Hidalgo	1,652	3,302	4,949	6,588	8,214	9,829
Irrigation, Willacy	1,262	2,522	3,780	5,031	6,273	7,506
Lyford	40	82	122	164	204	246
Port Mansfield	6	13	19	25	31	38
Raymondville	240	480	720	960	1,200	1,440
Unallocated	1,018	2,037	3,063	4,103	5,167	6,247
<b>Donna Irrigation District Hidalgo Co. No. 1</b>	<b>1,412</b>	<b>2,824</b>	<b>4,235</b>	<b>5,647</b>	<b>7,059</b>	<b>8,471</b>
County-Other, Hidalgo	85	170	256	341	426	511
Donna	139	277	416	555	693	832
Irrigation, Hidalgo	1,188	2,374	3,558	4,736	5,905	7,067
Unallocated	0	3	5	15	35	61

Irrigation District	2030	2040	2050	2060	2070	2080
<b>Engleman Irrigation District</b>	<b>218</b>	<b>435</b>	<b>653</b>	<b>870</b>	<b>1,088</b>	<b>1,306</b>
Irrigation, Hidalgo	218	435	652	868	1,082	1,294
Unallocated	0	0	1	2	6	12
<b>Harlingen Irrigation District No. 1</b>	<b>600</b>	<b>1,200</b>	<b>1,800</b>	<b>2,400</b>	<b>3,000</b>	<b>3,600</b>
Combes	7	13	20	26	33	40
ERHWSC	4	8	12	12	14	17
Harlingen	199	400	599	801	1,000	1,199
Irrigation, Cameron	378	755	1,133	1,511	1,883	2,254
Military Highway	6	12	18	23	29	35
Palm Valley	3	5	8	10	13	16
Primera	3	7	10	13	17	20
Unallocated	0	0	0	4	11	19
<b>Hidalgo and Cameron Counties Irrigation District No. 9, Mercedes</b>	<b>2,915</b>	<b>5,830</b>	<b>8,745</b>	<b>11,661</b>	<b>14,576</b>	<b>17,491</b>
Edcouch	16	31	47	62	78	93
Elsa	36	73	109	145	181	217
Irrigation, Cameron	169	339	507	675	842	1,008
Irrigation, Hidalgo	2,120	4,236	6,349	8,451	10,537	12,609
La Villa	12	25	36	48	60	73
Mercedes	108	216	324	432	540	648
NAWSC	187	374	561	748	935	1,123
Weslaco	266	532	798	1,063	1,330	1,595
Unallocated	1	4	14	37	73	125
<b>Hidalgo County Irrigation District No. 1, Edinburg</b>	<b>1,789</b>	<b>3,576</b>	<b>5,221</b>	<b>6,075</b>	<b>6,928</b>	<b>7,780</b>
Edinburg	343	687	1,030	1,374	1,717	2,061
Hidalgo MUD	26	52	77	103	129	154
Irrigation, Hidalgo	936	1,870	2,662	2,662	2,662	2,662
McAllen	127	253	380	507	633	760
NAWSC	44	89	133	177	222	266
Sharyland	313	625	939	1,252	1,565	1,877
Unallocated	0	0	0	0	0	0

Irrigation District	2030	2040	2050	2060	2070	2080
<b>Hidalgo County Irrigation District No. 2, San Juan</b>	<b>2,588</b>	<b>5,176</b>	<b>7,763</b>	<b>10,351</b>	<b>12,939</b>	<b>15,527</b>
Alamo	104	209	313	418	522	626
Edinburg	100	201	300	400	501	601
Irrigation, Hidalgo	1,321	2,640	3,957	5,267	6,567	7,859
McAllen	561	1,123	1,684	2,245	2,806	3,368
NAWSC	86	175	261	349	435	523
Pharr	167	335	502	669	836	1,004
San Juan	63	127	190	253	317	380
Unallocated	186	366	556	750	955	1,166
<b>Hidalgo County Irrigation District No. 5, Progresso</b>	<b>183</b>	<b>366</b>	<b>549</b>	<b>732</b>	<b>915</b>	<b>1,098</b>
Irrigation, Hidalgo	183	366	548	730	910	1,089
Unallocated	0	0	1	2	5	9
<b>Hidalgo County Irrigation District No. 6, Mission 6</b>	<b>679</b>	<b>1,359</b>	<b>2,037</b>	<b>2,712</b>	<b>2,776</b>	<b>2,776</b>
Agua SUD	264	528	792	1,055	1,055	1,055
Irrigation, Hidalgo	415	831	1,245	1,657	1,721	1,721
Unallocated	0	0	0	0	0	0
<b>Hidalgo County Irrigation District No. 13</b>	<b>55</b>	<b>110</b>	<b>165</b>	<b>220</b>	<b>275</b>	<b>330</b>
Irrigation, Hidalgo	55	110	165	219	274	327
Unallocated	0	0	0	1	1	3
<b>Hidalgo County Irrigation District No. 16, Mission</b>	<b>543</b>	<b>1,087</b>	<b>1,630</b>	<b>2,174</b>	<b>2,717</b>	<b>3,260</b>
Agua SUD	118	234	352	470	586	704
Irrigation, Hidalgo	409	819	1,229	1,634	2,038	2,439
La Joya	16	33	49	65	81	97
Unallocated	0	1	0	5	12	20
<b>Hidalgo County Water Improvement District No. 3*</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>

<b>Irrigation District</b>	<b>2030</b>	<b>2040</b>	<b>2050</b>	<b>2060</b>	<b>2070</b>	<b>2080</b>
<b>Hidalgo County Water Improvement District No. 18</b>	<b>1</b>	<b>2</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
Irrigation, Hidalgo	1	2	2	3	4	5
Unallocated	0	0	0	0	0	0
<b>Hidalgo County Water Improvement District No. 19, Sharyland</b>	<b>101</b>	<b>202</b>	<b>304</b>	<b>405</b>	<b>506</b>	<b>607</b>
Irrigation, Hidalgo	101	202	303	404	503	602
Unallocated	0	0	1	1	3	5
<b>La Feria Irrigation District, Cameron County No. 3</b>	<b>1,455</b>	<b>2,911</b>	<b>4,366</b>	<b>5,822</b>	<b>7,277</b>	<b>8,733</b>
County-Other, Cameron	33	66	99	132	165	198
Irrigation, Hidalgo	1,255	2,508	3,759	5,003	6,238	7,464
La Feria	121	242	363	484	605	726
Santa Rosa	33	66	99	132	165	198
Siesta Shores	9	20	29	38	49	58
Unallocated	4	9	17	33	55	89
<b>Maverick County Water Improvement District</b>	<b>2,136</b>	<b>4,272</b>	<b>6,408</b>	<b>8,544</b>	<b>10,680</b>	<b>12,816</b>
County Other- Maverick	35	72	107	142	177	212
Irrigation, Maverick	2,062	4,121	6,177	8,222	10,252	12,268
Unallocated	39	79	124	180	251	336
<b>Santa Cruz Irrigation District No. 15*</b>	<b>1,781</b>	<b>3,562</b>	<b>5,343</b>	<b>7,124</b>	<b>8,905</b>	<b>9,255</b>
Irrigation, Hidalgo	1,493	2,984	4,472	5,952	7,422	8,430
NAWSC	37	75	112	150	187	225
Sharyland	100	200	300	400	500	600
Unallocated	151	303	459	622	796	0
<b>United Irrigation District</b>	<b>469</b>	<b>939</b>	<b>1,408</b>	<b>1,878</b>	<b>2,347</b>	<b>2,816</b>
Irrigation, Hidalgo	58	116	174	232	289	346
McAllen	94	187	281	375	469	563
Mission	181	361	541	722	902	1,083
Sharyland	87	173	261	347	434	521
Unallocated	49	102	151	202	253	303

Irrigation District	2030	2040	2050	2060	2070	2080
<b>Valley Acres Irrigation District</b>	<b>127</b>	<b>125</b>	<b>124</b>	<b>121</b>	<b>115</b>	<b>111</b>
Irrigation, Cameron	16	16	16	16	16	16
Irrigation, Hidalgo	111	109	108	105	99	95
Unallocated	0	0	0	0	0	0
<b>TOTAL</b>	<b>24,029</b>	<b>47,818</b>	<b>71,315</b>	<b>94,022</b>	<b>116,109</b>	<b>136,702</b>

\*In January 2025, Hidalgo County Water Improvement District No. 3 and Santa Cruz Water Control and Improvement District No. 15 consolidated into Hidalgo County Consolidated Water Control and Improvement District.

Table 5-11 shows the estimated cost per ac-ft of water conserved or stored by WMS Category. Because ID improvements decrease costs associated with O&M of facilities, O&M costs are shown as \$0. Table 5-12 estimates the cost of the strategy to the ID, assuming it takes the full planning horizon to realize the yields.

**Table 5-11 Estimated Cost per Acre-Foot of Water Conserved by Water Management Strategy**

	Canal Lining	Pipeline Installation	General Repairs and Improvements
O&M Cost per ac-ft	\$0	\$0	\$0
Capital Cost per ac-ft	\$8,258	\$5,220	\$9,140

**Table 5-12 Irrigation District Conservation WMS Costs**

No.	WUG	Total Cost of Facilities	Total Cost of Project	Annual Cost	Annual Cost of Water (\$ per ac-ft)
1	Bayview Irrigation District	\$10,676,000	\$14,881,000	\$597,000	\$390
2	Brownsville Irrigation District	\$25,449,000	\$35,473,000	\$1,422,000	\$390
3	Cameron County Irrigation District No. 2, San Benito	\$52,278,000	\$72,869,000	\$2,921,000	\$390
4	Cameron County Irrigation District No. 6, Los Fresnos	\$11,369,000	\$15,848,000	\$635,000	\$390
5	Cameron County W.I.D No. 10, Rutherford Harding	\$7,621,000	\$10,622,000	\$426,000	\$390
6	Delta Lake Irrigation District	\$176,782,000	\$246,411,000	\$9,878,000	\$390
7	Donna Irrigation District Hidalgo Co. No. 1	\$59,117,000	\$82,401,000	\$3,303,000	\$390
8	Engleman Irrigation District	\$9,112,000	\$12,701,000	\$509,000	\$390
9	Harlingen Irrigation District No. 1	\$25,124,000	\$35,019,000	\$1,404,000	\$390

No.	WUG	Total Cost of Facilities	Total Cost of Project	Annual Cost	Annual Cost of Water (\$ per ac-ft)
10	Hidalgo and Cameron Counties Irrigation District No. 9, Mercedes	\$122,065,000	\$170,143,000	\$6,821,000	\$390
11	Hidalgo County Irrigation District No. 1, Edinburg	\$54,295,000	\$75,680,000	\$3,034,000	\$390
12	Hidalgo County Irrigation District No. 2, San Juan	\$108,358,000	\$151,037,000	\$6,055,000	\$390
13	Hidalgo County Irrigation District No. 5, Progreso	\$7,666,000	\$10,685,000	\$428,000	\$390
14	Hidalgo County Irrigation District No. 6, Mission 6	\$19,373,000	\$27,004,000	\$1,083,000	\$390
15	Hidalgo County Irrigation District No. 13	\$2,304,000	\$3,211,000	\$129,000	\$391
16	Hidalgo County Irrigation District No. 16, Mission	\$22,754,000	\$31,716,000	\$1,271,000	\$390
17	Hidalgo County Water Improvement District No. 3*	\$-	\$-	\$-	\$-
18	Hidalgo County Water Improvement District No. 18	\$34,000	\$48,000	\$2,000	\$400
19	Hidalgo County Water Improvement District No. 19, Sharyland	\$4,239,000	\$5,908,000	\$237,000	\$390
20	La Feria Irrigation District, Cameron County No. 3	\$60,945,000	\$84,950,000	\$3,406,000	\$390
21	Maverick County Water Improvement District	\$89,439,000	\$124,666,000	\$4,998,000	\$390
22	Santa Cruz Irrigation District No. 15*	\$64,588,000	\$90,028,000	\$3,609,000	\$390
23	United Irrigation District	\$19,655,000	\$27,396,000	\$1,098,000	\$390
24	Valley Acres Irrigation District	\$886,000	\$1,236,000	\$50,000	\$390

\*In January 2025, Hidalgo County Water Improvement District No. 3 and Santa Cruz Water Control and Improvement District No. 15 consolidated into Hidalgo County Consolidated Water Control and Improvement District.

It is intended that these IDs should implement any water conservation strategies, including, but not limited to: metering; control automation; gates; canal lining; repair of canal lining; pipeline installation; district interconnects; or any other strategy that provides provide beneficial, measurable conservation improvements to the ID.

## **Canal Lining and Installation or Replacement of Pipeline**

Most district conveyance systems are predominantly earthen or lined canals, which can vary significantly in their efficiency depending on how well they are maintained and the type of soil or lining. Buried pipelines may also vary in efficiency depending on their condition. Many of the WMSs that were submitted cited studies by Dr. Guy Fipps and Dr. Rister at AgriLife, which attempted to measure seepage losses in a number of the IDs in the Lower Rio Grande Valley.

To determine a unit amount of water conserved per mile for canal lining and pipeline replacement strategies, results from seepage tests performed in the region were used. Seepage rates were obtained from TWRI Technical Reports that described seepage tests performed on canals for each of the IDs that submitted a canal lining or pipeline replacement strategy. Seepage results for both concrete-lined canals and earthen canals were averaged and used as the annual water conserved per mile for IDs that did not have any applicable seepage tests performed. It was assumed that the amount of water loss caused by evaporation is negligible; therefore, the same values for water conserved per mile were used for both canal lining and pipeline replacement strategies.

## **General Repairs and Improvements**

All repairs that result in increased supplies available to end users, reduced losses, and/or improved operations are recommended for all IDs.

## **Metering and Controls**

In accordance with TCEQ Watermaster rules, IDs in Region M meter water from the Rio Grande as it is pumped out of the river, but do not typically meter water provided to irrigators or for domestic water use for lawn watering and livestock. Canal riders, employees of the district, drive along the canals to verify that only users who requested water are withdrawing from the canals and estimate the amount of water delivered. In many cases the canal riders are also responsible for manually opening and closing headgates and turning pumps on and off.

In most districts, agricultural water deliveries are measured in "irrigations," which are considered to be between 4- to 8-inches of water over each irrigated acre, depending on the district, and are monitored by canal riders on the basis of the estimated flow rate and time that a headgate is open and/or measured water depths at some point in the field. There are significant losses associated with manual operations of district conveyance systems and the inaccuracies associated with visual observations of how much water is diverted. Additionally, metering could provide an incentive for (and data to support) conservation through charging a volumetric rate for water.

One analysis of water conservation implications of meters was conducted as part of the Rio Grande Initiative in cooperation with the Harlingen Irrigation District.<sup>6</sup> This project consisted of installing meters at farm irrigation delivery site locations serving 50 percent of the irrigated acreage in the district. The information generated by the meters provided flow data used for volumetric pricing and to improve the management of water delivery to end users. Installation and applications of meters at farm gate

---

<sup>6</sup> Texas Water Resources Institute Report TR-202. October 2002. *Efficient Irrigation for Water Conservation in the Rio Grande Basin*, (also known as the Rio Grande Basin Initiative, or RGBI). 2001. The initiative is administered through the US Department of Agriculture's National Institute of Food and Agriculture under Agreement No. 2010-34461-20677 and Agreement No. 2010-45049-20713, and the Texas Water Resources Institute, which is part of the Texas A&M AgriLife Extension Service, Texas A&M AgriLife Research, and the College of Agriculture and Life Sciences at Texas A&M University.

suggested annual water savings of 27 percent of the average annual water delivered to the affected area. Implementation of volumetric pricing enabled the district not only to manage the system and charge end users more accurately, but also to create an incentive for farmers to reduce their water use.

Another component of this analysis focused on the installation and use of meters and telemetry equipment in the district canals. The information generated by the meters and telemetry system provided flow data required to balance the distribution of water within the delivery canals. That is, information was generated regarding what areas were being irrigated and how much water was being supplied to each of these areas. The resulting improved management sought to minimize the over-delivery of water (i.e., waste), which has been estimated as high as 40 percent. Reducing the amount of water pumped also reduces the energy required and associated costs. This strategy was projected to save 3 percent of water diverted annually.

### **Education and Evaluation**

The process of evaluating existing infrastructure for efficiency is ongoing in the IDs. There is a need for more data and a more consistent approach to measuring system losses across districts for comparison purposes. There is a significant opportunity for increased education of the staff, management, and leadership of each district. A comprehensive review of existing policies, rules, funding mechanisms, and programs that can or do address IDs may be useful.

Although water savings as a result of education and evaluation programs have not been quantified, and are therefore not included as a recommended WMS, the RGRWPG recognizes the importance of education for all parties operating and depending on IDs, and continued efforts to evaluate the existing infrastructure.

#### **5.2.1.3.1 Environmental Impacts of Recommended Irrigation District Water Conservation Strategies**

Potential environment impacts for Irrigation District water conservation strategies have been identified and categorized as described below. The letters identifying each section correspond to the headings in Table 5-13.

##### **A. Acres Impacted Permanently**

Acres impacted permanently refers to the total amount of area that will be permanently impacted because of the implementation of a strategy. The following conservative assumptions were made (unless more detailed information for a specific was available):

- The acreage impacted for pipelines is equivalent to the right-of-way (ROW) easements required; it is assumed 50 feet for ROW unless otherwise known.
- It is assumed that canal lining, general improvements, and metering have no permanently impacted acreage.

##### **B. Construction Impacted Acreage**

Temporary environmental impacts may be seen during construction activities, such as increased air and noise pollution, and land disturbance activities. However, these effects are typical of any construction project. For ID conservation, impacted acreage was calculated with the following assumptions:

- The acreage impacted for pipelines and canal linings is equivalent to the ROW easements required; it is assumed 50-feet for ROW unless otherwise known.

- Unless otherwise known, the length of pipeline and canal lining projects is assumed using the calculated average value of 411 AF-conserved/mile of improvement.
- General improvements (canal gate replacements, SCADA, and other improvements) have an assumed 50-foot ROW and 50-foot project construction length.

### **C. Inundation Acreage**

The inundation acreage applies to reservoirs only and is equal to the amount of land that will be inundated by the construction of the reservoir.

### **D. Agricultural Resources Impacted Acreage**

Agricultural resources impact acreage is a consolidation of vegetation and land use types specific to Region – row crops, grass farms, and orchards - identified in the TPWD EMST. This GIS mapping data was overlain WMS locations to estimate the agricultural impact acreage from the implementation of the associated strategy.

### **E. Wetland Impact**

The wetland impact refers to the probability that implementation of a WMS will affect a wetland. The location of wetlands in the region was determined using the National Wetlands Inventory (NWI) located at <http://www.fws.gov/wetlands/Data/Mapper.html>.

A strategy received a "1" if all or part of the strategy is located in a wetland or if it is close enough to where construction activities are likely to impact the wetland. All other strategies received zeros. If the exact location of project is unknown, it was given a zero because it was assumed that it would be located on a site that would not affect any wetland.

### **F. Habitat Impacted Acreage**

Habitat impacted acreage refers to how the strategy will impact the habitat of the local area. The more area that is impacted because of the implementation of the strategy, the more the habitat of the area will be disrupted. Therefore, it was assumed that the permanent acreage impacted for a WMS is what would impact habitats.

### **G. Threatened and Endangered Species Count**

Threatened and endangered species count refers to how the strategy will impact those species in the area once implemented. This impact was quantified based on the number of federally-listed threatened and endangered species located within the county of the strategy. The number of threatened and endangered species came from the Texas Parks and Wildlife Department (TPWD) Rare, Threatened, and Endangered Species of Texas database (<http://tpwd.texas.gov/gis/rtest/>).

### **H. Cultural Resources Impact**

Cultural resources impact refers to how the strategy will impact cultural resources located within the area. Cultural resources are defined as the collective evidence of the past activities and accomplishments of people, including locations; buildings; and features with scientific, cultural, or historic value. It is assumed that no WMSs negatively affect cultural resources. Mitigation costs are included for strategies that require infrastructure, so it is assumed that none would be built in a location or way that disrupts culturally sensitive locations.

**I. Reliability**

Reliability is an assessment of the availability of the specified water quantity to the user over time. If the quantity of water is available to the user all the time, then the strategy has a high reliability. If the quantity of water is contingent on other factors, reliability will be lower. This strategy was developed in accordance with WAM and/or MAG values for the appropriate area. As such, WMSs associated with new/improved infrastructure or distribution system or facilities expansions are considered to be reliable supply (reliability score = 5) that will not compromise the DFCs as established by the MAG or the environmental flow standards as established by 30 TAC §298. The reliability of on/off-channel reservoirs is also projected to be high (reliability score = 5).

**J. Bays, Estuaries, and Arms of the Gulf of Mexico**

The environmental effects due to implementation of upstream WMS projects on bays, estuaries, and arms of the Gulf of Mexico are quantitatively assessed and reported. Water bodies designated as classified segments by the TCEQ that are within or downstream of Region M include the Brownsville Ship Channel, South Bay, Laguna Madre, and the Gulf of Mexico. Effects to these water bodies were quantified by estimating whether the project is anticipated to decrease freshwater inflow in these classified water bodies.

A WMS project received a "1" if it is expected to decrease freshwater inflow into a classified water body. If a strategy were to increase freshwater inflow or otherwise have little to no impact on inflows, then the project would receive a zero.

A summary of the identified and quantified environmental impacts for recommended Irrigation District water conservation strategies is presented in Table 5-13.

**Table 5-13 Environmental Impacts of Recommended Irrigation District Water Conservation Strategies**

Entity	Yield	A	B	C	D	E	F	G	H	I	J
Bayview ID	1,530	10	20	0	0	1	10	25	0	5	1
Brownsville ID	3,647	24	49	0	0	1	24	25	0	5	1
Cameron County ID No. 2, San Benito	7,491	50	101	0	0	1	50	25	0	5	1
Cameron County ID No. 6, Los Fresnos	1,629	11	22	0	0	1	11	25	0	5	1
Cameron County Water Improvement District No. 10, Rutherford Harding	2,231	15	30	0	0	1	15	25	0	5	1
Delta Lake ID	25,331	168	341	0	0	1	168	25	0	5	1
Donna ID Hidalgo Co. No. 1	8,471	56	114	0	0	1	56	8	0	5	1
Engelman ID	1,306	9	18	0	0	1	9	8	0	5	1
Harlingen ID No. 1	3,600	24	49	0	0	1	24	25	0	5	1
Hidalgo and Cameron Counties ID No. 9, Mercedes	7,491	116	235	0	0	1	116	28	0	5	1

Entity	Yield	A	B	C	D	E	F	G	H	I	J
Hidalgo County ID No. 1, Edinburg	17,315	115	233	0	0	1	115	8	0	5	1
Hidalgo County ID No. 2, San Juan	15,527	103	209	0	0	1	103	8	0	5	1
Hidalgo County ID No. 5, Progreso	1,098	7	14	0	0	1	7	8	0	5	1
Hidalgo County ID No. 6, Mission 6	4,076	27	55	0	0	1	27	8	0	5	1
Hidalgo County ID No. 13	330	2	4	0	0	1	2	8	0	5	1
Hidalgo County ID No. 16, Mission	3,260	22	45	0	0	1	22	8	0	5	1
Hidalgo County Water Improvement District No. 3*	0	0	0	0	0	1	0	8	0	5	1
Hidalgo County Water Improvement District No. 18	5	0	0	0	0	1	0	8	0	5	1
Hidalgo County Water Improvement District No. 19, Sharyland	607	4	8	0	0	1	4	8	0	5	1
La Feria ID, Cameron County No. 3	8,733	58	118	0	0	1	58	25	0	5	1
Maverick County Water Improvement District	12,816	85	172	0	0	1	85	3	0	5	1
Santa Cruz ID No. 15*	10,686	71	144	0	0	1	71	8	0	5	1
United ID	2,816	19	39	0	0	1	19	8	0	5	1
Valley Acres ID	1,237	8	16	0	0	1	8	28	0	5	1

\*In January 2025, Hidalgo County Water Improvement District No. 3 and Santa Cruz Water Control and Improvement District No. 15 consolidated into Hidalgo County Consolidated Water Control and Improvement District.

#### 5.2.1.4 On-Farm Irrigation Conservation

On-farm conservation measures can be grouped into the following categories: water use management practices, land management systems, on-farm water delivery systems, water district delivery systems, and tailwater recovery systems. Water district delivery system improvements, including conveyance infrastructure, metering, and telemetry, are discussed in detail in Section 5.2.1.3 and addressed as a separate WMS. However, for farmland in IDs, the operational effectiveness and efficiency of the IDs are necessary to reap the full benefits of on-farm measures. On-farm efficiency depends on timely delivery of water and adequate head to push water across a field. For these farmers, the incentive to conserve water is largely based on the ID, and their ability to volumetrically price water.

Water use management practices include scheduling irrigations and measuring water used or soil moisture, including on-farm audits. For irrigators relying on Rio Grande water, scheduling irrigations on

the basis of soil moisture metering is difficult because of the delay between when a farmer requests water and the time that it is actually available to use, which can be up to 5 to 7 days. However, metering of irrigation water, either short-term as a part of an on-farm water audit or long-term as a management strategy, is recommended where physically and economically feasible. Common practice currently is for districts to send an employee to monitor diversions, estimating the amount of water used based on how long a headgate is open or measuring water depth at certain locations. Where metering is implemented by the ID so that water can be volumetrically priced, farmers have an incentive for reducing their use of water and both the districts and the farmer can manage water more carefully.

Land management systems include laser leveling, brush control, conversion of irrigated farmland to dry-land farmland, and furrow dikes or narrow-border citrus, which is discussed in more detail below. Each of these strategies addresses how to manage farmland so that available water is used to maximum effect. Conversion of irrigated farmland to dry land farming generally equates to lower value and/or yield but can be a valuable tool if drought is anticipated and the water available to a farm is consolidated on a high-value crop. Crop selection based on market values, water demand, and acreage can be made so that farmers are best able to respond to drought.

On-farm water delivery system improvements limit losses in the conveyance of water to the crop and apply water precisely where it is needed for each type of plant. This includes surge valves, which can increase the uniformity of water application across a field, lining on-farm canals or use of poly-pipe, and drip or sprinkler systems. For irrigators using surface water in Region M, the lack of pressure head on irrigation water is a significant barrier to implementing many water delivery system improvements. Soil type can be a limitation for the use of surge valves, as well as limited pressure head or storage at or near the point of use. Research and demonstration projects on drip irrigation have shown significant increases in yield for some vegetables.

Tailwater recovery systems allow for excess water applied to farmland to be put to beneficial use. In place in much of the Lower Rio Grande Valley, tailwaters are collected in drainage canals, which discharge to the Arroyo Colorado, which may be utilized by other users downstream. Although this water tends to have high dissolved solids content, it is used for crops that can withstand high salinity and for other uses, including aquaculture. Treatment of tailwaters to potable standards is generally costly but may be appropriate where there are few alternatives.

These measures are considered on-farm conservation measures, but in most cases implementation of these measures in a drought year increases the potential yield of a crop per acre-foot of water but may not reduce irrigator's overall demand for water. When water is available in a drought year, farmers are likely to use it. Making better use of the water that is available is critical to helping farmers through drought, and the Region M Planning Group recommends continued research, education, demonstration, and large-scale implementation of these and any other irrigation conservation measures that farmers find to be appropriate.

A select subset of on-farm water conservation strategies, which were developed based on input from stakeholders and ID, are discussed in detail below. These are strategies that are of particular interest to the region, although the full range of BMP described in TWDB literature are recommended where

appropriate.<sup>7</sup> On-farm conservation is recommended for all irrigators in the planning area (Table 5-14). The On-Farm Irrigation Conservation WMS was developed based on the described categories.

- Water use management practices (e.g., scheduling, moisture metering, and on-farm audits) were assumed to be implemented across the region such that 25 percent of potential water savings have already been made. Five (5) percent efficiency gains were estimated for the remaining 75 percent over the planning horizon.
- Land management systems (e.g., laser leveling, narrow border citrus, and furrow dikes) were assumed to be 25 percent implemented, and the strategy estimates a 10 percent efficiency gain over the remaining 75 percent of irrigation water use over the planning horizon.
- On-farm water delivery systems (e.g., poly-pipe, surge valves, drip, sprinkler) were estimated to impart a 10 percent efficiency gain on 10 percent of irrigation water usage in 2030, for which that technology is appropriate and not already in place.

ID conveyance improvements were not included in the general on-farm conservation WMS but are addressed in Section 5.2.1.3.

**Table 5-14 Decadal On-Farm Conservation Water Savings by County and River Basin for Irrigation**

County	Basin	2030 Demand Projections (ac-ft/yr)	Management Practices (ac-ft/yr)	Land Management Systems (ac-ft/yr)	On-Farm Water Delivery Systems (ac-ft/yr)	Total Savings (ac-ft/yr)
Cameron	Nueces-Rio Grande	488,773	3,055	6,110	815	9,980
Cameron	Rio Grande	31,199	195	390	52	637
Hidalgo	Nueces-Rio Grande	640,071	4,000	8,001	1,067	13,068
Hidalgo	Rio Grande	26,489	166	331	44	541
Jim Hogg	Nueces-Rio Grande	282	2	3	1	6
Jim Hogg	Rio Grande	66	0	1	0	1
Maverick	Nueces	59,725	373	747	100	1,220
Starr	Rio Grande	23,109	144	289	39	472
Webb	Rio Grande	10,090	63	126	17	206
Willacy	Nueces-Rio Grande	96,412	603	1,205	161	1,969
Zapata	Rio Grande	4,936	31	62	8	101

<sup>7</sup> Texas Water Development Board. BMPs for Agricultural Water users. <http://www.twdb.texas.gov/conservation/BMPs/Ag/index.asp>. Accessed 2024.

It was assumed that it would take the duration of the planning horizon to realize the strategy yields. In September 2023 dollars, water use management practices were estimated to cost approximately \$610 per ac-ft/yr to implement, land management systems were estimated to cost approximately \$2,438 per ac-ft/yr to implement, and on-farm water delivery systems were estimated to cost approximately \$73 per ac-ft/yr to implement. Table 5-15 provides estimated costs.

**Table 5-15 On-Farm Irrigation WMS Costs**

WUG	Total Cost of Facilities	Total Cost of Project	Annual Cost	Annual Cost of Water (\$ per ac-ft)
Irrigation, Cameron	\$17,891,000	\$24,014,000	\$2,887,466	\$1,159
Irrigation, Hidalgo	\$22,933,000	\$30,782,000	\$3,701,275	\$1,159
Irrigation, Jim Hogg	\$11,000	\$14,000	\$1,726	\$863
Irrigation, Maverick	\$2,056,000	\$2,760,000	\$331,807	\$1,157
Irrigation, Starr	\$795,000	\$1,068,000	\$128,385	\$1,155
Irrigation, Webb	\$347,000	\$466,000	\$56,016	\$1,155
Irrigation, Willacy	\$3,317,000	\$4,452,000	\$535,324	\$1,158
Irrigation, Zapata	\$171,000	\$229,000	\$27,514	\$1,171

### Narrow-Border Citrus Irrigation

Narrow border flood irrigation, a subcomponent of land management systems, provides an alternative to the traditional pan flooding method of irrigation commonly used by citrus growers in the Lower Rio Grande Valley. This method is a cost-effective and easy to implement option that involves erecting narrow berms of soil between existing rows of citrus trees to direct and contain irrigation water directly in the root-zone of trees. This method can save about 35 percent of the water required for traditional flood irrigation. Currently, it is estimated that 10 percent of citrus growers in the Lower Rio Grande Valley have implemented the narrow border flood irrigation practice.

This practice has many benefits in addition to water and cost savings, including faster water channeling rates, higher water use efficiency in trees, reduced water in areas prone to weed growth, and fertilizer retention in the root-zone. The narrow border flood method can also be used in conjunction with other practices such as raised beds, denser plantings, and mesh groundcover that can enhance water use efficiency and water savings.

Based on TWDB irrigation water use records by crop between 2012 and 2021, the overall orchard acreage (assumed to be all citrus in Region M) increased by approximately 4,850 acres, and water use averaged 4.1 feet per acre. Assuming 10 percent increase in implementation per decade, the following on-farm conservation gains could be made in the counties where citrus is a prevalent crop. Because these gains are more easily quantifiable, they were used as a component in the estimates for the general on-farm WMS in Table 5-16.

**Table 5-16 Narrow Border Citrus Water Savings**

County	10-Year Average (ac)	10-Year Average (ac-ft/ac)	First Decade Implementation (ac)	Potential Water Conserved per decade (ac-ft)
Cameron	3,800	3.7	380	495
Hidalgo	6,700	4.5	670	1,065
Maverick	5,960	3.8	596	794
Webb	260	2.5	26	22
Willacy	500	3.4	50	59
<b>Total</b>	<b>17,220</b>	<b>4.1</b>	<b>1,722</b>	<b>2,443</b>

**Drip Irrigation**

Texas A&M AgriLife Research worked with producers and others to estimate the conservation and economic implications of drip irrigation for onions, cotton, sugarcane, and citrus. Based on farmer experience and surveys, drip irrigation is expected to reduce the water demand for certain crops, ranging from 2.5 acre-inches for cotton, 11 acre-inches for sugarcane, 17.8 acre-inches for onions, and up to 45 acre-inches for citrus. However, drip irrigation is expensive to install with very limited life resulting in the expected net returns to a farmer being negative for all except citrus. Additionally, the ID must maintain a fully charged canal for a longer period of time to supply a farmer for drip irrigation, which can cause additional losses in the overall system. The irrigation method used for comparison for this analysis was typical irrigation or gravity flow and flood. Drip irrigation is only an economically effective irrigation practice for citrus. Citrus conserved water and increased net revenue, as compared to flood-irrigated acres.<sup>8</sup> It was assumed that only water delivery improvements that were less expensive than the cost of water would be considered as composite costs in the general on-farm conservation WMS.

**Dry Year Option Contracts**

An approach to water marketing known as "dry year options" or "water supply option contracts" (WSOC) may reduce the impact on agricultural production while providing drought supplies for other uses. This concept involves temporary transfers of irrigation water to provide secure water supplies to non-agricultural users during droughts. This option would transfer water to other users when needed while preserving the water for agriculture during normal water supply situations. In Texas, WSOC is typically practiced in the Edwards Aquifer area to provide water for endangered species and San Antonio water users during drought. However, the implementation of this type of strategy would require significant changes to the current operating system of the Rio Grande, and the possibility of unintended consequences should be thoroughly evaluated before moving forward.

A WSOC as defined here is a formal contract or agreement between a farmer or a group of farmers and an urban water provider or authority to transfer water temporarily from agriculture to urban or another use, during occasional critical drought periods so that the purchaser secures a source of drought water supply. The farmer or ID does not relinquish ownership of the water right and retains access to the

<sup>8</sup> Wilbourn, Brant 1987- (2012). Economic Analysis of Alternative Irrigation Technologies: Texas Lower Rio Grande Valley. Master's thesis, Texas A&M University. Available electronically from <https://oaktrust.library.tamu.edu/handle/1969.1/148057>.

water supply during normal supply situations. In financial exchange market terminology, the holder of an option contract has the right to buy the commodity or stock (in this case, water) at a specified price, termed the striking or exercise price, from the seller of the option. The seller of the option is guaranteeing future delivery under specified conditions and price. In exchange for guaranteeing future delivery of the commodity at a set price, a further premium above the exercise price, called the option price, may be paid to the seller.<sup>9</sup> WSOC requirements are as follows:

The water supply must be reliable enough to provide sufficient water for the option use in drought years and plentiful enough in average years to supply the agricultural use.

Property rights must be definable and transferrable for market exchange. As with water right purchases, the amount of water transferred must be adjusted for conveyance and field losses to protect third parties (return flow water users).

Agricultural operations must be capable of being temporarily suspended or crop production under dryland conditions. This requirement limits option contracts primarily to annual crop operations and will exclude most livestock operations, perennial crops such as orchards, and contract crops such as sugar cane.

Both buyer and seller must have realistic knowledge of water use values and alternative water supply costs.

The probability and severity of drought (the expected frequency of exercising the option) must be able to be estimated within acceptable limits of risk for both parties.

Total option contract costs, including both transaction costs of negotiating and adjudicating the temporary transfer of water, and the costs of transporting the water to the point of intake of the purchaser, must be less than the costs of the next most costly water supply alternative of the purchaser.

---

<sup>9</sup> Contract Terms and Provisions: *Contract terms and provisions are important to identify and protect the rights of both parties. The exercise price is the cost each time (season/year) the option is exercised. This represents the payment to the farmer or the ID for the net value of foregone agricultural production or loss in district revenue. The present value cost of a water-option contract is the sum of the costs to exercise the option (take the water) multiplied by the expected number of times of option exercise plus any cost appreciation/depreciation of the value of the alternative source plus any payments to the seller to hold the option (option price), each discounted to present value.*

*Agricultural enterprise and water valuation models can be used to estimate foregone benefits to the farmer or ID. Actual exercise payments need to be negotiated based on both party's perceptions of transfer losses and benefits. Advance notification that the option is to be exercised should be given to the seller for planning purposes so that certain variable production costs can be avoided. Shorter advance notice raises seller costs with an associated higher level of reimbursement required. A flexible quantity provision may be required because of variations in drought water allocation, but the minimum acceptable delivery should be specified. Escalator clauses can be used to adjust contract prices protecting sellers from the effects of inflation.*

*Option exercise cost is the farmer's offering price for water delivery/foregoing delivery and would be site-specific, depending on the types of crops grown, quantity and cost of irrigation water, production costs, yields, and crop prices on the specific farms. The exercise cost also needs to be sufficient to cover any fixed production costs that might be incurred because the water supply was temporarily relinquished, and irrigated crop production ceased. These additional costs include the opportunity costs of family labor and management, taxes, depreciation on durable equipment, and cash overhead.*

The Lower Rio Grande Valley and Region M have some unique institutional, hydrologic, and economic conditions that would need to be addressed to provide seller and buyer incentives to enter into WSOC. Unlike many other areas of the Western United States, water rights are held by the IDs rather than farmers. Given this and the generally low price of agricultural water farmers have little incentive to conserve water (except in drought) and lack the ability to sell water conserved by more efficient irrigation methods or fallowing land such as for WSOC payments. While there is the potential for IDs to enter into a WSOC with another user, IDs would need to work with farmers and pass-through exercise payments to make WSOCs feasible from the point of view of the farmer. Also, with the generally low cost of ID water, the purchase of this water may be the lowest cost to urban providers and other users compared to alternative sources such as desalination or reuse.

Urban demand has the highest priority in drought conditions and therefore urban communities may feel little need to have WSOCs unless there is concern about the agricultural community and/or ID welfare.

The program involves a target time early enough that a farmer can make cropping decisions for the growing season and an option price is offered to secure that if needed water can be called. Then during the year, if the drought is sufficient that water is needed from the farmer, a preset price for delivery is paid and the farmer forgoes irrigation. In the event the water is not needed, it is available to the farmer. This suggests a cropping decision that can be irrigated but also can be produced dryland (rain-fed) in case the option is exercised.

### **Implementation Issues**

On the agricultural side, conservation savings would not result in a reduction of capital expenditures but a forced expenditure of funding to garner any savings. There is a finite upper limit to the amount of money that can be spent to conserve agricultural water and still be supported by agricultural income, as individual producers are responsible for implementation. The high cost of conservation and the lack of funds to pay for it make large-scale conservation projects unlikely.

As SWIFT funding is not eligible for individual producers, full implementation depends on funding from various grant and loan programs:

- TWDB's Agricultural Water Conservation Grants Program offers grants for projects that support agricultural irrigation conservation strategies in alignment with the state water plan and demonstrate agricultural water conservation best management practices, such as irrigation systems improvements, demonstrations and technology transfer, and equipment cost share grant programs. Applications must be submitted by a political subdivision such as GCDs or River Authorities. These entities can serve as sponsors or facilitators to pass funding through to local producers. More information can be found at <https://www.twdb.texas.gov/financial/programs/awcg/index.asp>.
- The Texas Department of Agriculture (TDA) hosts a series of grant, loan, and cost share assistance programs for agricultural producers which can be found at <https://texasagriculture.gov/Grants-Services/Grants-and-Services>.
- Through the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS), the Environmental Quality Incentive Program (EQIP) have made the costs of improvements more reasonable for farmers. More information can be found at <https://www.nrcs.usda.gov/programs-initiatives/eqip-environmental-quality-incentives>.

- Through partnerships for Climate-Smart Commodities, the USDA is providing technical and financial assistance to producers to implement climate-smart production practices on a voluntary basis on working lands. More information can be found at <https://www.usda.gov/climate-solutions/climate-smart-commodities>.
- The Water Quality Management Plan (WQMP) program, administered by the Texas State Soil and Water Conservation Board (TSSWCB), develops site-specific, voluntary plans specially crafted for agricultural or silvicultural lands approved by local Soil and Water Conservation Districts (SWCDs). TSSWCB offers financial assistance for implementation in the form of cost-share funding. To identify the appropriate TSSWCB Regional Office administering the WQMPs, visit [www.tsswcb.texas.gov/contact-us/regional-office-service-areas](http://www.tsswcb.texas.gov/contact-us/regional-office-service-areas).

Other programs, such as the Texas A&M AgriLife Extension Service’s FARM Assistance, offer additional, non-financial support for farmers. FARM Assistance provides individual producers with a statistically-based strategic financial analysis that is unique to the participant’s operation. The data garnered from these analyses provide Texas A&M AgriLife Extension Service with insight on the agricultural industry and enables research to help industry groups, policymakers, and individuals identify trends and gauge impacts at the industry-level.

#### **5.2.1.4.1 Environmental Impacts of Recommended On-Farm Irrigation Conservation Strategies**

Potential environment impacts for on-farm conservation have been identified and categorized as described below. The letters identifying each section correspond to the headings in Table 5-17.

##### **A. Acres Impacted**

Acres impacted permanently refers to the total amount of area that will be impacted because of the implementation of a strategy. It was assumed that the acreage impacted was equal to the number of acres irrigated in the most recent year of data, which would be 2021 for this planning cycle.

##### **B. Agricultural Resources Impacted Acreage**

Agricultural resources impact acreage is a consolidation of vegetation and land use types specific to Region – row crops, grass farms, and orchards – identified in the TPWD EMST. This GIS mapping data was overlain WMS locations to estimate the agricultural impact acreage from the implementation of the associated strategy.

##### **C. Wetland Impact**

The wetland impact refers to the probability that implementation of a WMS will affect a wetland. The location of wetlands in the region was determined using the NWI located at <http://www.fws.gov/wetlands/Data/Mapper.html>.

A strategy received a 1 if all or part of the strategy is located in a wetland or if it is in close proximity to where construction activities are likely to impact the wetland. All other strategies received zeros. If the exact location of project is unknown it was given a zero because it was assumed that it would be located on a site that would not affect and wetland. It is possible that excess runoff from irrigation could augment wetlands.

**D. Habitat Impacted Acreage**

Habitat impacted acreage refers to how the strategy will impact the habitat of the local area. It is assumed that no habitat will be affected by on-farm conservation because the land is already cultivated; therefore, there is no habitat to be affected.

**E. Threatened and Endangered Species Count**

Threatened and endangered species count refers to how the strategy will impact those species in the area once implemented. The species impact was quantified based on the number of federally-listed threatened and endangered species located within the county of the strategy. The number of threatened and endangered species came from the TPWD Rare, Threatened, and Endangered Species of Texas database (<http://tpwd.texas.gov/gis/rtest/>).

**F. Cultural Resources Impact**

Cultural resources impact refers to how the strategy will impact cultural resources located within the area. Cultural resources are defined as the collective evidence of the past activities and accomplishments of people, which also include locations; buildings; and features with scientific, cultural, or historic value. It is assumed that on-farm conservation does not negatively affect cultural resources because the land is already cultivated.

**G. Reliability**

Reliability is an assessment of the availability of the specified water quantity to the user over time. If the quantity of water is available to the user all the time, then the strategy has a high reliability. If the quantity of water is contingent on other factors, reliability will be lower. Since these strategies are a demand reduction or supply efficiency increase, the reliability is high (reliability score = 5).

**H. Bays, Estuaries, and Arms of the Gulf of Mexico**

The environmental effects due to implementation of upstream WMS projects on bays, estuaries, and arms of the Gulf of Mexico are quantitatively assessed and reported. Water bodies designated as classified segments by the TCEQ that are within or downstream of Region M include the Brownsville Ship Channel, South Bay, Laguna Madre, and Gulf of Mexico. Effects to these water bodies were quantified by estimating whether the project is anticipated to decrease freshwater inflow in these classified water bodies.

A WMS project received a "1" if it is expected to decrease freshwater inflow into a classified water body. If a strategy were to increase freshwater inflow or otherwise have little to no impact on inflows, then the project would receive a zero.

A summary of the identified and quantified environmental impacts for recommended on-farm irrigation conservation projects is presented in Table 5-17.

**Table 5-17 Environmental Impacts of Recommended On-Farm Irrigation Conservation Strategies**

Entity	Total Savings (ac-ft/yr)	A	B	C	D	E	F	G	H
Irrigation, Cameron	10,617	104,440	0	0	0	25	0	5	1

Entity	Total Savings (ac-ft/yr)	A	B	C	D	E	F	G	H
Irrigation, Hidalgo	13,609	177,750	0	0	0	8	0	5	1
Irrigation, Jim Hogg	7	140	0	0	0	3	0	5	1
Irrigation, Maverick	1,220	20,080	0	0	0	3	0	5	1
Irrigation, Starr	472	3,280	0	0	0	8	0	5	1
Irrigation, Webb	206	630	0	0	0	4	0	5	1
Irrigation, Willacy	1,969	21,290	0	0	0	22	0	5	1
Irrigation, Zapata	101	1,530	0	0	0	7	0	5	1

#### 5.2.1.5 Industrial Conservation

Implementation of BMPs for industrial users is recommended for every manufacturing, mining, and steam electric power user in Region M. The TWDB Water Conservation Implementation Task Force recommended strategies for industrial users to conserve water in the “Best Management Practices for Industrial Water Users” guidance.<sup>10</sup> The guide provides BMPs for specific industries, as well as general BMPs that are recommended for any type of industrial user. The BMPs provided include the following:

- Conservation Analysis and Planning
  - Cost Effectiveness Analysis.
  - Industrial Site-Specific Conservation.
  - Industrial Water Audit.
- Educational Practices
  - Management and Employee Programs.
- System Operations
  - Boiler and Steam Systems.
  - Industrial Alternative Sources and Reuse of Process Water.
  - Industrial Sub-metering.
  - Industrial Water Waste Reduction.

<sup>10</sup> Water Conservation Implementation Task Force, “Water Conservation Best Management Practices: Best Management Practices for Industrial Water Users,” February 2013.

- Refrigeration.
  - Rinsing/Cleaning.
  - Water Treatment.
- Cooling Systems Management
- Cooling Systems (Other than Cooling Towers).
  - Cooling Towers.
  - Once-Through Cooling.
- Landscaping
- Industrial Facility Landscaping.

The BMP guidance describes water audits as the initial way for industrial water users to increase water efficiency. It is assumed that all of the users for which this strategy is recommended will, at a minimum, perform a water audit. On average, the range of water savings from implementing water audits is between 10 to 35 percent. Therefore, 10 percent of the water demand of each manufacturing, mining, and steam electric power WUG is used to estimate the amount of water conserved per decade by implementing BMPs. Industrial water conservation values are summarized in Table 5-18.

**Table 5-18 2026 Region M Industrial Water Conservation Savings from Implementation of Industrial BMPs (ac-ft/yr)**

WUG	Industrial Water Conservation Savings (ac-ft/yr)					
	2030	2040	2050	2060	2070	2080
Cameron Manufacturing	46	48	50	51	53	55
Cameron Steam-Electric Power	17	17	17	17	17	17
Hidalgo Manufacturing	393	407	422	438	454	471
Hidalgo Mining	23	26	29	31	34	36
Hidalgo Steam-Electric Power	1,033	1,033	1,033	1,033	1,033	1,033
Jim Hogg Mining	1	1	1	1	1	1
Maverick Manufacturing	10	10	11	11	11	12
Maverick Mining	490	490	490	490	490	0
Starr Manufacturing	8	8	9	9	9	10
Starr Mining	19	20	21	21	22	22
Webb Manufacturing	8	8	8	9	9	9
Webb Mining	414	414	415	415	415	3
Webb Steam-Electric Power	13	13	13	13	13	13
Zapata Mining	1	1	1	1	1	1

Development of costs for industrial water conservation assume that only cost-positive measures will be implemented, or the costs to implement the best management practices are less than the cost of water saved. Costs also assume that an average water demand of 1,000 ac-ft/yr would equate to a \$10,000 water audit cost, with a minimum cost of \$2,000; that one audit will occur every five years, and implementation will occur by 2030. Estimated total annual costs are summarized in Table 5-19.

**Table 5-19 2026 Total Annual Costs from Implementation of Best Management Practices**

WUG	Total Annual Costs (\$/year)					
	2030	2040	2050	2060	2070	2080
Cameron Manufacturing	\$920	\$960	\$1,000	\$1,020	\$1,060	\$1,100
Cameron Steam-Electric Power	\$400	\$400	\$400	\$400	\$400	\$400
Hidalgo Manufacturing	\$7,860	\$8,140	\$8,440	\$8,760	\$9,080	\$9,420
Hidalgo Mining	\$460	\$520	\$580	\$620	\$680	\$720
Hidalgo Steam-Electric Power	\$20,660	\$20,660	\$20,660	\$20,660	\$20,660	\$20,660
Jim Hogg Mining	\$400	\$400	\$400	\$400	\$400	\$400
Maverick Manufacturing	\$400	\$400	\$400	\$400	\$400	\$400
Maverick Mining	\$9,800	\$9,800	\$9,800	\$9,800	\$9,800	\$0
Starr Manufacturing	\$400	\$400	\$400	\$400	\$400	\$400
Starr Mining	\$400	\$400	\$420	\$420	\$440	\$440
Webb Manufacturing	\$400	\$400	\$400	\$400	\$400	\$400
Webb Mining	\$8,280	\$8,280	\$8,300	\$8,300	\$8,300	\$0
Webb Steam-Electric Power	\$400	\$400	\$400	\$400	\$400	\$400
Zapata Mining	\$400	\$400	\$400	\$400	\$400	\$400

### 5.2.1.5.1 Environmental Impacts of Recommended Industrial Conservation Strategies

#### A. Acres Impacted Permanently

Acres impacted permanently refers to the total amount of area that will be permanently impacted because of the implementation of a strategy. The following conservative assumptions were made (unless more detailed information for a specific was available):

- No permanent acres are impacted for industrial conservation because the strategy will occur on land already used for industrial purposes.

#### B. Construction Impacted Acreage

Temporary environmental impacts may be seen during construction activities, such as increased air and noise pollution, and land disturbance activities. However, these effects are typical of any construction project. The construction impacted acreage was estimated as 1 acre.

### **C. Agricultural Resources Impacted Acreage**

Agricultural resources impact acreage is a consolidation of vegetation and land use types specific to Region – row crops, grass farms, and orchards - identified in the TPWD EMST. This GIS mapping data was overlain WMS locations to estimate the agricultural impact acreage from the implementation of the associated strategy.

### **D. Wetland Impact**

The wetland impact refers to the probability that implementation of a WMS will affect a wetland. The location of wetlands in the Region was determined using the NWI located at <http://www.fws.gov/wetlands/Data/Mapper.html>.

A strategy received a "1" if all or part of the strategy is located in a wetland or if it is close enough to where construction activities are likely to impact the wetland. All other strategies received zeros. If the exact location of project is unknown it was given a zero because it was assumed that it would be located on a site that would not affect and wetland.

### **E. Habitat Impacted Acreage**

Habitat impacted acreage refers to how the strategy will impact the habitat of the local area. The more area that is impacted because of the implementation of the strategy, the more the habitat of the area will be disrupted. Therefore, it was assumed that the permanent acreage impacted for a WMS is what would impact habitats.

### **F. Cultural Resources Impact**

Cultural resources impact refers to how the strategy will impact cultural resources located within the area. Cultural resources are defined as the collective evidence of the past activities and accomplishments of people, including locations; buildings; and features with scientific, cultural, or historic value. It is assumed that no WMSs negatively affect cultural resources. Mitigation costs are included for strategies that require infrastructure so it is assumed that none would be built in a location or way that disrupts culturally sensitive locations.

### **G. Reliability**

Reliability is an assessment of the availability of the specified water quantity to the user over time. If the quantity of water is available to the user all the time, then the strategy has a high reliability. If the quantity of water is contingent on other factors, reliability will be lower. Since these strategies are a demand reduction or supply efficiency increase, the reliability is high (reliability score = 5).

### **H. Bays, Estuaries, and Arms of the Gulf of Mexico**

The environmental effects due to implementation of upstream WMS projects on bays, estuaries, and arms of the Gulf of Mexico are quantitatively assessed and reported. Water bodies designated as classified segments by the TCEQ that are within or downstream of Region M include the Brownsville Ship Channel, South Bay, Laguna Madre, and Gulf of Mexico. Effects to these water bodies were quantified by estimating whether the project is anticipated to decrease freshwater inflow in these classified water bodies.

A WMS project received a "1" if it is expected to decrease freshwater inflow into a classified water body. If a strategy were to increase freshwater inflow or otherwise have little to no impact on inflows, then the project would receive a zero.

A summary of the identified and quantified environmental impacts for recommended industrial conservation strategies is presented in Table 5-20.

**Table 5-20 Environmental Impacts for Recommended Industrial Conservation Strategies**

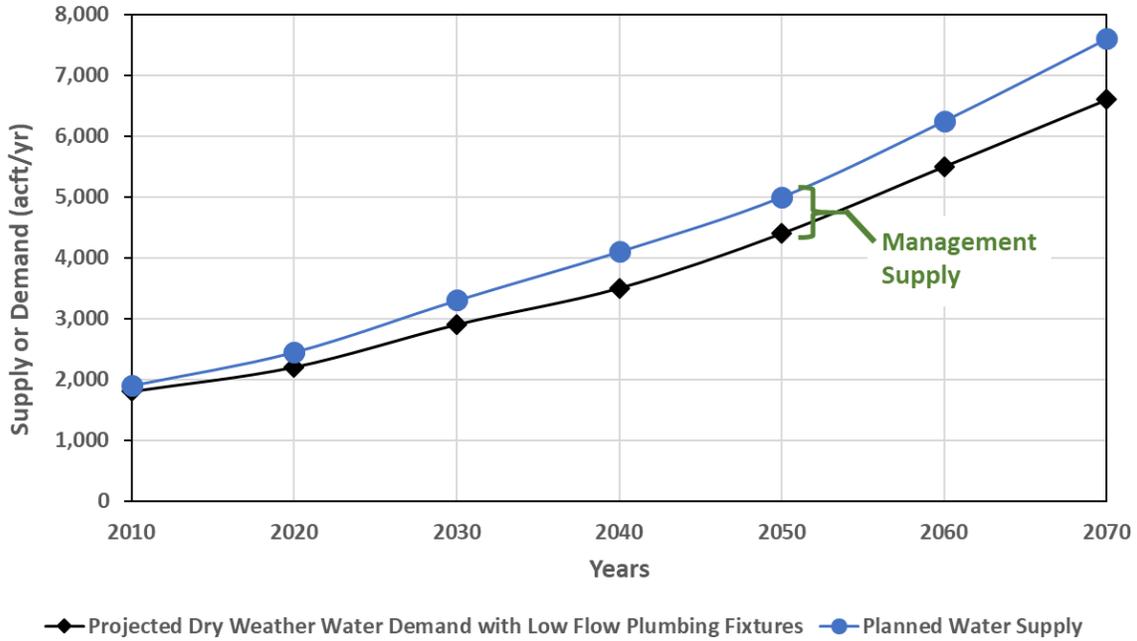
Entity	WMS Name	Yield*	A	B	C	D	E	F	G	H
Cameron Manufacturing	Industrial Conservation	46	0	1	0	0	0	0	5	1
Cameron Steam-Electric Power	Industrial Conservation	17	0	1	0	0	0	0	5	1
Hidalgo Manufacturing	Industrial Conservation	393	0	1	0	0	0	0	5	1
Hidalgo Mining	Industrial Conservation	23	0	1	0	0	0	0	5	1
Hidalgo Steam-Electric Power	Industrial Conservation	1,033	0	1	0	0	0	0	5	1
Jim Hogg Mining	Industrial Conservation	1	0	1	0	0	0	0	5	1
Maverick Manufacturing	Industrial Conservation	10	0	1	0	0	0	0	5	1
Maverick Mining	Industrial Conservation	490	0	1	0	0	0	0	5	1
Starr Manufacturing	Industrial Conservation	8	0	1	0	0	0	0	5	1
Starr Mining	Industrial Conservation	19	0	1	0	0	0	0	5	1
Webb Manufacturing	Industrial Conservation	8	0	1	0	0	0	0	5	1
Webb Mining	Industrial Conservation	414	0	1	0	0	0	0	5	1
Webb Steam-Electric Power	Industrial Conservation	13	0	1	0	0	0	0	5	1
Zapata Mining	Industrial Conservation	1	0	1	0	0	0	0	5	1
* Indicates first decade of implementation yield (ac-ft/yr)										

## 5.2.2 Municipal Drought Management

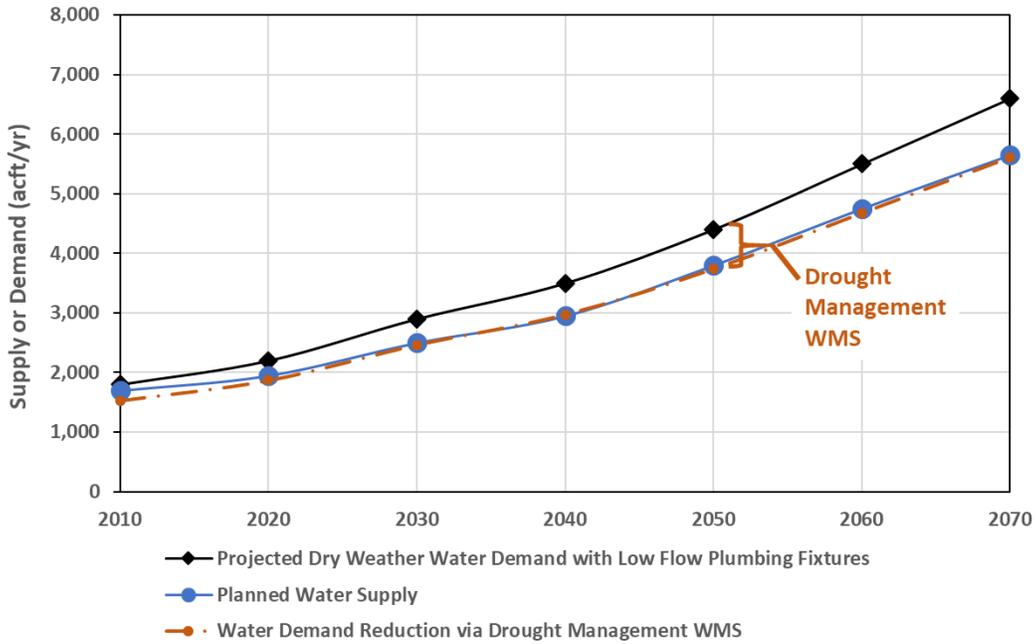
TAC, Chapter 357 Regional Water Planning Guidelines, states that “Regional water plan development shall include an evaluation of all WMSs the regional water planning group determines to be potentially feasible, including drought management measures including water demand management [357.7(a)(7)(B)].” Region M defines drought management as the periodic activation of approved drought contingency plans resulting in short-term demand reduction. An entity may make the conscious decision not to develop firm water supplies greater than or equal to projected water demands with the understanding that demands will have to be reduced or go unmet during times of drought. Using this rationale, an economic impact of not meeting projected water demands can be estimated and compared with the costs of other potentially feasible WMSs in terms of annual unit costs.

Figure 5-1 is a water supply planning example of the visual methodology completed in the 2017 State Water Plan. For each municipal WUG with an identified shortage or need during the planning period, a future water supply plan was developed consisting of one or more WMSs. In each case, the planned future water supply was greater than the projected dry weather demand to allow for drought more severe than the drought of record, uncertainty in water demand projections, and/or available supply from recommended WMSs. This difference between planned water supply and projected dry weather demand is called management supply in Region M.

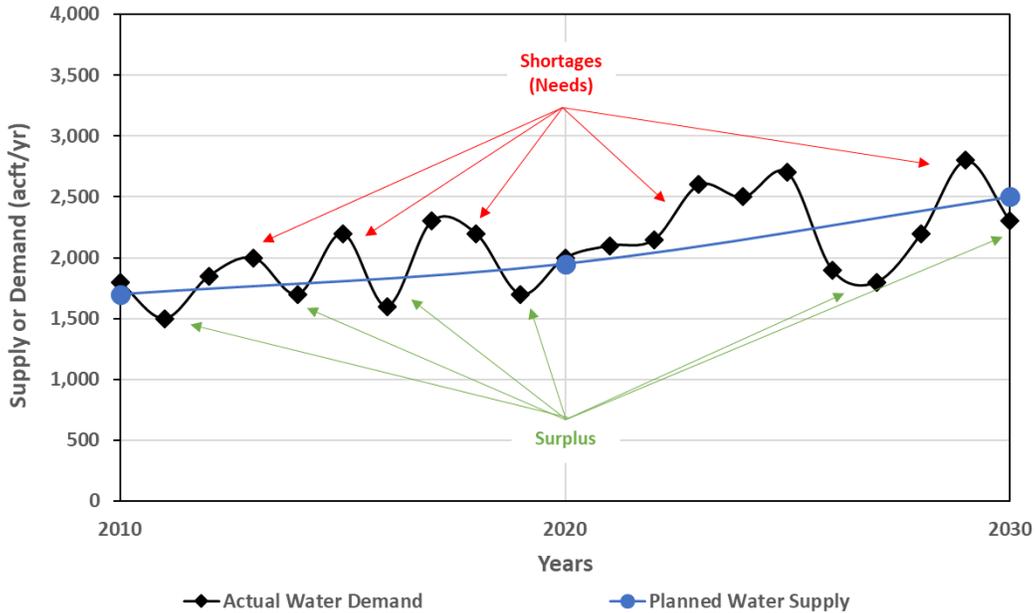
Figure 5-2 illustrates how a drought management WMS could alter the planning paradigm for WUGs with projected needs. Instead of identifying WMSs to meet the projected need, planned water supply remains below the projected dry weather water demand. The difference between these two lines represents the drought management WMS. Under this concept, the water demand of a WUG would be reduced by activating a drought contingency plan to reduce demands, resulting in unmet needs. This strategy of demand reduction could negate the need for WMSs to meet the full projected need of the WUG. Using this approach, the WUG is planning to manage water shortages through drought contingency plan activation if needed. This concept is more fully illustrated on Figure 5-3, which depicts that, in any given year, the actual demand may be above or below the planned supply. During times where the demand exceeds supply, the WUG would experience shortages and incur associated economic impacts.



**Figure 5-1 Example - Typical Water Supply Planning**



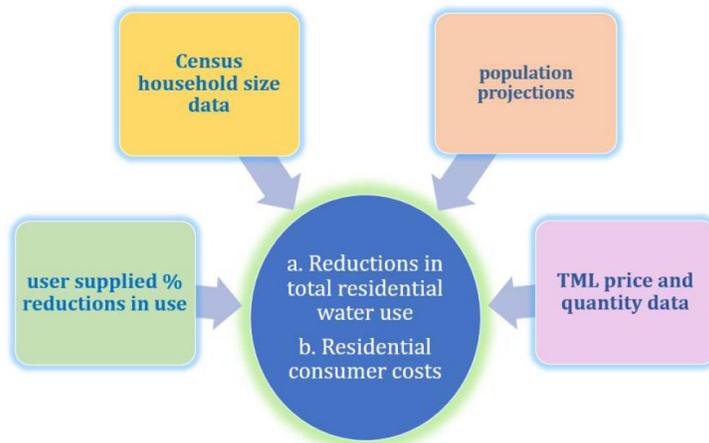
**Figure 5-2 Example - Drought Management Water Management Strategy Planning Application**



**Figure 5-3 Example - Annual Water Demand and Planned Water Supply**

### 5.2.2.1 Municipal Drought Management Strategy Methodology

On March 4, 2024, the TWDB released the Drought Management Costing Tool to estimate socioeconomic impacts and evaluate economic impact of the water volumes reduced by implementation of drought management strategies for the 2026 RWPs. As described in the TWDB provided Drought Management Costing Tool User Manual, “...the primary purpose of the tool is to provide WUG-level lost consumer surplus estimates and the expected household-level residential reductions in available water use associated with policy-imposed restrictions or reduction on residential outdoor water use.” The tool utilizes various inputs – *user supplied percentage reductions in use; census household size data; population projections; and Texas Municipal League (TML) price and quantity data* – to estimate reductions in water use and consumer costs (Figure 5-4). The following subsections summarize the components and features that comprise the drought management costing tool. More details can be found in the TWDB user manual.



## Figure 5-4 Costing Data and Output (TWDB, 2024)

### 5.2.2.2 Texas Municipal League Data

The TML generated water demand curves for WUGs from the 2023 annual cost and usage surveys. Parameters that were used included population, fees for 5,000 and 10,000 gallons of usages, and average monthly gallon usage for each household in the WUGs associated cities. This data was compiled to determine the expected price for the average monthly water use for the WUGs.

### 5.2.2.3 Analysis Assumptions

The following are the key assumptions in the development of the drought management costing tool (TWDB, 2024):

1. The relevant demand functions are only for residential outdoor water use. Historical studies have revealed that approximately 30 percent of residential use within the state is for outdoor water use. Therefore, this tool only allows potential reductions less than or equal to 30 percent of normal water use because of drought management strategies.
2. A representative value of -0.5 was assumed for the outdoor water demand.
3. Only residential water use reductions are examined. Available data did not support similar estimates for commercial water use.
4. County-Other WUGs are not included in this costing tool.
5. Year 2020 household size data (WUG-specific where possible) are employed to determine the number of households in each decade, based on the Board-adopted projected populations. These baseline household sizes are not assumed to adjust over time.
6. Baseline data from TML for average monthly prices and quantities (per household) from the years 2020-2023 was used in developing the demand functions for the various WUGs. Where possible, WUG-specific data were used. Proxy values based on planning region and three city size classifications were assigned to WUGs with no TML survey results.
7. Final lost consumer surplus estimates are expressed in year 2023 dollars to be consistent with the water management strategy costing requirements in the 2027 State Water Plan.

### 5.2.2.4 Use of the Costing Tool

The Microsoft Excel based tool is composed of the following three major components (tabs within the Excel workbook; TWDB, 2023):

1. **Data Entry:** User data entry form for decade-specific desired reductions in water use by region and WUG;
2. **Final Summary:** A summary of the key parameters and final cost (economic impact) and water savings estimates; and
3. **Population and Households:** Reference tab with background information on the number of households based on the 2020 census data and the Board-adopted 2030-2080 WUG and region level population projections.

For the intents and purposes of the Rio Grande RWPG and the Drought Management WMS, only total annual water reduction (ac-ft) and total annual cost (in 2023 dollars) data for the Region M WUGs were obtained from the drought management costing tool. Total annual water reduction by WUG is described

in Subsection 5.2.2.5 and detailed in Table 5-21. Total annual cost is described in Subsection 5.2.2.6 and detailed in Table 5-22.

### 5.2.2.5 Yield from Drought Management Strategy

TWDB defines *Total Annual Water Reduction* in the costing tool user manual as “... all household water use due to drought management plan implementation based on percentage of reduction,” which is estimated via the following:

$$\frac{\left[ \left( \frac{\text{population}}{\text{household size}} \right) * 12 * (\text{monthly reduction in gallons}) \right]}{325,851 \frac{\text{gal}}{\text{acft}}} \text{ [in acft].}$$

The Rio Grande RWPG selected 5 percent demand reduction for applicable WUGs beginning in 2030; water savings (demand reduction) are summarized in Table 5-21.

**Table 5-21 2026 Region M Drought Management 5 Percent Demand Reduction (ac-ft/yr)**

WUG	5% Demand Reduction (ac-ft/yr)					
	2030	2040	2050	2060	2070	2080
Agua SUD	209	224	234	239	243	248
Alamo	89	91	92	96	99	102
Brownsville	661	678	684	682	680	678
Donna	71	75	78	80	82	84
Eagle Pass	217	232	244	255	265	276
East Rio Hondo WSC	102	121	140	155	163	171
Edinburg	431	469	492	500	508	515
El Jardin WSC	127	131	132	131	131	131
El Sauz WSC	4	5	5	5	5	5
El Tanque WSC	4	4	3	3	3	2
Harlingen	346	355	358	357	356	355
Hidalgo	50	52	54	56	57	58
Hidalgo County MUD 1	22	23	23	24	25	25
La Grulla	61	65	68	70	72	74
La Joya	16	17	18	18	18	19
La Villa	17	20	22	22	21	21
Laguna Madre Water District	45	46	47	47	46	46
Laredo	1,264	1,315	1,330	1,316	1,303	1,289
McAllen	987	1,097	1,202	1,234	1,266	1,299

WUG	5% Demand Reduction (ac-ft/yr)					
	2030	2040	2050	2060	2070	2080
Mercedes	43	44	44	46	48	49
Military Highway WSC	150	152	152	155	157	159
Mission	610	645	668	684	700	717
North Alamo WSC	770	850	900	909	917	926
Pharr	398	425	443	452	461	471
Port Mansfield PUD	2	2	3	3	4	5
Primera	24	31	35	39	43	45
Rio Grande City	48	52	54	56	57	59
Rio WSC	28	34	37	37	37	37
Roma	59	62	65	67	69	71
San Benito	72	74	74	74	74	74
San Juan	88	90	92	95	98	102
Sharyland WSC	309	338	357	361	366	371
Union WSC	26	27	28	29	30	31
Webb County	38	54	68	67	66	66
Weslaco	101	104	106	110	113	117
Zapata County	38	39	39	38	38	38

**5.2.2.6 Drought Management Strategy Costs**

TWDB defines *Consumer Surplus* in the costing tool user manual as the difference between how much one is willing to pay and what they actually have to pay,” which is estimated via the following:

$$(average\ unit\ cost\ per\ acft) * (annual\ water\ reduction) [in\ 2023\ $].$$

Total annual cost can also be defined as the economic impact of not meeting projected water demands. The Rio Grande RWPG selected 5 percent demand reduction for applicable WUGs beginning in 2030; total annual costs are summarized in Table 5-22.

**Table 5-22 2026 Region M Drought Management 5 Percent Demand Reduction Annual Lost Consumer Surplus (2023 dollars)**

WUG	5% Demand Reduction Annual Lost Consumer Surplus (\$/year)					
	2030	2040	2050	2060	2070	2080
Agua SUD	\$25,809	\$27,702	\$28,924	\$29,479	\$30,039	\$30,604

WUG	5% Demand Reduction Annual Lost Consumer Surplus (\$/year)					
	2030	2040	2050	2060	2070	2080
Alamo	\$7,152	\$7,327	\$7,465	\$7,722	\$7,983	\$8,250
Brownsville	\$75,949	\$77,906	\$78,606	\$78,375	\$78,137	\$77,894
Donna	\$6,136	\$6,489	\$6,725	\$6,885	\$7,048	\$7,214
Eagle Pass	\$26,840	\$28,668	\$30,132	\$31,445	\$32,750	\$34,052
East Rio Hondo WSC	\$12,583	\$14,923	\$17,319	\$19,131	\$20,109	\$21,137
Edinburg	\$23,916	\$25,987	\$27,302	\$27,727	\$28,154	\$28,582
El Jardin WSC	\$15,728	\$16,134	\$16,280	\$16,234	\$16,189	\$16,140
El Sauz WSC	\$686	\$751	\$795	\$813	\$830	\$848
El Tanque WSC	\$655	\$571	\$499	\$444	\$395	\$352
Harlingen	\$19,769	\$20,280	\$20,466	\$20,412	\$20,358	\$20,303
Hidalgo	\$6,139	\$6,479	\$6,706	\$6,872	\$7,039	\$7,209
Hidalgo County MUD 1	\$2,701	\$2,800	\$2,873	\$2,960	\$3,048	\$3,139
La Grulla	\$5,411	\$5,782	\$6,056	\$6,232	\$6,410	\$6,590
La Joya	\$1,603	\$1,709	\$1,778	\$1,817	\$1,855	\$1,894
La Villa	\$629	\$749	\$821	\$813	\$805	\$796
Laguna Madre Water District	\$5,583	\$5,726	\$5,776	\$5,756	\$5,736	\$5,715
Laredo	\$69,495	\$72,254	\$73,091	\$72,349	\$71,598	\$70,838
McAllen	\$58,998	\$65,579	\$71,813	\$73,718	\$75,653	\$77,619
Mercedes	\$4,397	\$4,462	\$4,522	\$4,693	\$4,866	\$5,044
Military Highway WSC	\$18,578	\$18,753	\$18,822	\$19,103	\$19,391	\$19,686
Mission	\$32,443	\$34,297	\$35,533	\$36,388	\$37,255	\$38,134
North Alamo WSC	\$88,477	\$97,665	\$103,384	\$104,392	\$105,399	\$106,411
Pharr	\$31,998	\$34,202	\$35,637	\$36,371	\$37,112	\$37,862
Port Mansfield PUD	\$284	\$339	\$411	\$523	\$651	\$801
Primera	\$1,769	\$2,283	\$2,625	\$2,887	\$3,176	\$3,335
Rio Grande City	\$3,925	\$4,187	\$4,381	\$4,511	\$4,642	\$4,774
Rio WSC	\$3,507	\$4,154	\$4,572	\$4,571	\$4,565	\$4,555
Roma	\$5,768	\$6,096	\$6,348	\$6,555	\$6,764	\$6,977
San Benito	\$7,377	\$7,567	\$7,635	\$7,613	\$7,590	\$7,566
San Juan	\$10,889	\$11,152	\$11,362	\$11,753	\$12,152	\$12,559

WUG	5% Demand Reduction Annual Lost Consumer Surplus (\$/year)					
	2030	2040	2050	2060	2070	2080
Sharyland WSC	\$38,167	\$41,764	\$44,029	\$44,623	\$45,216	\$45,808
Union WSC	\$3,181	\$3,343	\$3,471	\$3,590	\$3,711	\$3,834
Webb County	\$4,729	\$6,627	\$8,375	\$8,291	\$8,206	\$8,120
Weslaco	\$10,506	\$10,786	\$11,003	\$11,373	\$11,750	\$12,135
Zapata County	\$4,724	\$4,794	\$4,795	\$4,746	\$4,696	\$4,643

**5.2.2.7 Environmental Impacts of Recommended Drought Management Strategies**

Potential environment impacts for municipal drought management have been identified and categorized as described below. The letters identifying each section correspond to the headings in Table 5-23. A 5 percent demand reduction was identified as a base drought management scenario for the applicable WUGs.

**A. Acres Impacted Permanently**

Acres impacted permanently refers to the total amount of area that will be permanently impacted because of the implementation of a strategy. There is no physical project associated with this WMS, and therefore no impacted acreage.

**B. Construction Impacted Acreage**

There is no anticipated construction associated with municipal drought management, and therefore no impacted acreage.

**C. Agricultural Resources Impacted Acreage**

Agricultural resources impact acreage is a consolidation of vegetation and land use types specific to Region – row crops, grass farms, and orchards - identified in the TPWD EMST. This GIS mapping data was overlain WMS locations to estimate the agricultural impact acreage from the implementation of the associated strategy.

**D. Wetland Impact**

The wetland impact refers to the probability that implementation of a WMS will affect a wetland. The location of wetlands in the Region was determined using the NWI located at <http://www.fws.gov/wetlands/Data/Mapper.html>.

This strategy would have no impact on wetlands.

**E. Habitat Impacted Acreage**

Habitat impacted acreage refers to how the strategy will impact the habitat of the local area. The more area that is impacted because of the implementation of the strategy, the more the habitat of the area will be disrupted. This strategy would have no impact on habitat.

#### **F. Cultural Resources Impact**

Cultural resources impact refers to how the strategy will impact cultural resources located within the area. Cultural resources are defined as the collective evidence of the past activities and accomplishments of people, including locations; buildings; and features with scientific, cultural, or historic value. This strategy would have no impact on cultural resources.

#### **G. Reliability**

Reliability is an assessment of the availability of the specified water quantity to the user over time. If the quantity of water is available to the user all the time, then the strategy has a high reliability. If the quantity of water is contingent on other factors, reliability will be lower. The reliability of these water management strategies is considered to be medium (reliability score = 3).

#### **H. Bays, Estuaries, and Arms of the Gulf of Mexico**

The environmental effects due to implementation of upstream WMS projects on bays, estuaries, and arms of the Gulf of Mexico are quantitatively assessed and reported. Water bodies designated as classified segments by the TCEQ that are within or downstream of Region M include the Brownsville Ship Channel, South Bay, Laguna Madre, and Gulf of Mexico. Effects to these water bodies were quantified by estimating whether the project is anticipated to decrease freshwater inflow in these classified water bodies.

A WMS project received a "1" if it is expected to decrease freshwater inflow into a classified water body. If a strategy were to increase freshwater inflow or otherwise have little to no impact on inflows, then the project would receive a zero.

A summary of the identified and quantified environmental impacts for municipal drought management is presented in Table 5-23. Additionally, it should be noted that because drought management reduces demand, this type of strategy decreases the amount of water that is discharged from a WWTP.

**Table 5-23 Environmental Impacts for Recommended Municipal Drought Management**

Entity	WMS Name	5% Demand Reduction*	A	B	C	D	E	F	G	H
Agua SUD	Drought Management	209	0	0	0	0	0	0	3	1
Alamo	Drought Management	89	0	0	0	0	0	0	3	1
Brownsville	Drought Management	661	0	0	0	0	0	0	3	1
Donna	Drought Management	71	0	0	0	0	0	0	3	1
Eagle Pass	Drought Management	217	0	0	0	0	0	0	3	1
ERHWSC	Drought Management	102	0	0	0	0	0	0	3	1
Edinburg	Drought Management	431	0	0	0	0	0	0	3	1
El Jardin WSC	Drought Management	127	0	0	0	0	0	0	3	1
El Sauz WSC	Drought Management	4	0	0	0	0	0	0	3	1
El Tanque WSC	Drought Management	4	0	0	0	0	0	0	3	1
Harlingen	Drought Management	346	0	0	0	0	0	0	3	1
Hidalgo	Drought Management	50	0	0	0	0	0	0	3	1
Hidalgo County MUD No. 1	Drought Management	22	0	0	0	0	0	0	3	1
La Grulla	Drought Management	61	0	0	0	0	0	0	3	1
La Joya	Drought Management	16	0	0	0	0	0	0	3	1
La Villa	Drought Management	17	0	0	0	0	0	0	3	1
Laguna Madre Water District	Drought Management	45	0	0	0	0	0	0	3	1
Laredo	Drought Management	1,264	0	0	0	0	0	0	3	1
McAllen	Drought Management	987	0	0	0	0	0	0	3	1
Mercedes	Drought Management	43	0	0	0	0	0	0	3	1
Military Highway WSC	Drought Management	150	0	0	0	0	0	0	3	1
Mission	Drought Management	610	0	0	0	0	0	0	3	1
NAWSC	Drought Management	770	0	0	0	0	0	0	3	1
Pharr	Drought Management	398	0	0	0	0	0	0	3	1
Port Mansfield PUD	Drought Management	2	0	0	0	0	0	0	3	1
Primera	Drought Management	24	0	0	0	0	0	0	3	1
Rio Grande City	Drought Management	48	0	0	0	0	0	0	3	1
Rio WSC	Drought Management	28	0	0	0	0	0	0	3	1

Entity	WMS Name	5% Demand Reduction*	A	B	C	D	E	F	G	H
Roma	Drought Management	59	0	0	0	0	0	0	3	1
San Benito	Drought Management	72	0	0	0	0	0	0	3	1
San Juan	Drought Management	88	0	0	0	0	0	0	3	1
Sharyland WSC	Drought Management	309	0	0	0	0	0	0	3	1
Union WSC	Drought Management	26	0	0	0	0	0	0	3	1
Webb County	Drought Management	38	0	0	0	0	0	0	3	1
Weslaco	Drought Management	101	0	0	0	0	0	0	3	1
Zapata County	Drought Management	38	0	0	0	0	0	0	3	1

\*Indicates demand reduced by 5 percent for 2030 (ac-ft/yr).

### 5.2.3 Conversion of Water Right Classification

Over the planning horizon it is expected that there will be increased urban and suburban development and increased pressure on the existing water supplies. Irrigation demands are expected to decrease as a result of these pressures and associated urbanization of land. In some cases, where water is owned by an individual farmer, there may be a point at which the conversion of irrigated farmland to dry-land farming will make economic sense based on the price of water. According to the TCEQ rules, if an irrigation water right is converted to a domestic, municipal, and industrial (DMI) water right, the maximum authorized diversion is reduced to 50 percent for Class A and 40 percent for Class B.

For the purpose of this plan, it was assumed that the historical rate of conversion of water rights from irrigation to municipal is indicative of the decrease in irrigation demand. The urbanization rate was calculated for each county based on the rate at which irrigation demand decreases per decade beginning with 2030 to 2040. The water rights made available via reduction of agricultural supplies – defined as exclusion – were assumed to be converted for DMI use.

Table 5-24 details the projected agricultural demands, the rate at which water rights are converted in each county, the reduction in irrigation supplies, and the reduction in irrigated acreage, assuming that each acre of land that is irrigated has an associated 2.5 ac-ft of water rights. Although there is measured historical urbanization for Jim Hogg County, these measurements were not considered statistically reliable based on the amount of total urbanization water rights.

**Table 5-24 Urbanization Rates and Available Converted Water Rights Per County**

	2030	2040	2050	2060	2070	2080
<b>Cameron County</b>						
Agricultural Demands	519,972	502,725	485,479	468,233	450,987	433,744
Exclusion Rate	3.43%	3.55%	3.68%	3.82%	3.98%	3.98%
Reduction in Agricultural Supplies (Cumulative)	6,843	13,680	20,511	27,331	34,132	40,645
Reduction in Irrigated Acreage (Cumulative)	6,948	13,896	20,844	27,792	34,738	41,409
<b>Hidalgo County</b>						
Agricultural Demands	666,560	644,451	622,343	600,236	578,127	556,024
Exclusion Rate	3.43%	3.55%	3.68%	3.82%	3.98%	3.98%
Reduction in Agricultural Supplies (Cumulative)	9,983	19,958	29,926	39,876	49,799	59,299
Reduction in Irrigated Acreage (Cumulative)	10,155	20,310	30,464	40,620	50,772	60,521
<b>Jim Hogg County</b>						
Agricultural Demands	348	337	325	314	302	290
Exclusion Rate	3.26%	3.69%	3.50%	3.97%	4.14%	4.14%
Reduction in Agricultural Supplies (Cumulative)	0	0	0	0	0	0
Reduction in Irrigated Acreage (Cumulative)	0	0	0	0	0	0
<b>Maverick County</b>						
Agricultural Demands	59,725	57,744	55,763	53,782	51,801	49,820
Exclusion Rate	3.43%	3.55%	3.68%	3.82%	3.98%	3.98%
Reduction in Agricultural Supplies (Cumulative)	1,945	3,889	5,832	7,771	9,705	11,557
Reduction in Irrigated Acreage (Cumulative)	1,981	3,961	5,942	7,922	9,903	11,804
<b>Starr County</b>						
Agricultural Demands	23,109	22,342	21,576	20,809	20,043	19,277
Exclusion Rate	3.43%	3.55%	3.69%	3.82%	3.97%	3.97%

	2030	2040	2050	2060	2070	2080
Reduction in Agricultural Supplies (Cumulative)	78	156	233	311	388	462
Reduction in Irrigated Acreage (Cumulative)	107	215	322	429	536	639
<b>Webb County</b>						
Agricultural Demands	10,090	9,756	9,421	9,086	8,752	8,417
Exclusion Rate	3.42%	3.56%	3.69%	3.82%	3.98%	3.98%
Reduction in Agricultural Supplies (Cumulative)	182	364	546	727	908	1,081
Reduction in Irrigated Acreage (Cumulative)	215	431	648	863	1,079	1,286
<b>Willacy County</b>						
Agricultural Demands	96,412	93,215	90,017	86,819	83,621	80,424
Exclusion Rate	3.43%	3.55%	3.68%	3.82%	3.98%	3.98%
Reduction in Agricultural Supplies (Cumulative)	2,410	4,819	7,226	9,629	12,025	14,319
Reduction in Irrigated Acreage (Cumulative)	2,424	4,848	7,273	9,697	12,121	14,448
<b>Zapata County</b>						
Agricultural Demands	4,936	4,773	4,609	4,445	4,281	4,117
Exclusion Rate	3.42%	3.56%	3.69%	3.83%	3.98%	3.98%
Reduction in Agricultural Supplies (Cumulative)	39	78	117	157	196	233
Reduction in Irrigated Acreage (Cumulative)	56	112	168	224	280	333
<b>Region M Total</b>						
Region M, Total Reduction in Agricultural Supplies (Cumulative)	21,480	42,944	64,391	85,801	107,152	127,596
Region M, Total Reduction in Irrigated Acreage (Cumulative)	21,886	43,773	65,660	87,547	109,429	130,442

For municipal WUGs with recommended strategies that required additional water rights to be feasible (such as expansion of a surface WTP) were allocated urbanized water rights to accompany those strategies. Additionally, the strategy for acquisition of water rights through urbanization was evaluated for all municipal WUGs either to meet any needs prior to 2080, or for inclusion to have consistency with the RWP in case an entity chooses to pursue conversion of surface water rights. In situations where a municipality is currently served by an ID that is expected to be urbanized, water rights from the specific ID were identified to be sold, if sufficient water rights were available.

A unit capital cost of approximately \$3,043/ac-ft has been estimated as the market value for this planning cycle. However, under Subchapter O of Chapter 49 Texas Water Code, a municipal supplier can buy water rights to the net irrigable acres in a subdivision at 68 percent of the market value. Therefore, if a strategy calls for a municipal water provider to purchase water rights from an ID that serves them, the urbanized land is within the jurisdiction of the provider, then this reduced rate could apply. Any costs associated with the delivery of water rates are assumed to be insignificant and are not included.

Each converted water right sold to an entity through a recommended WMS has been identified as either being sold through an ID from urbanized land within their service area or through converted water rights from land within a part of a county that is not served by an ID (unaffiliated). It should be noted that this one possible method for entities to receive urbanized water rights; however, there are multiple ways each user could purchase them. Table 5-25 through Table 5-29 present the potential distribution of converted water rights through the Conversion/Purchase of Surface Water Rights WMS for the purposes of the 2026 RWP. This table does not obligate any user to convert/purchase from another user.

**Table 5-25 EXAMPLE - Cameron County Irrigation Districts Converted Water Rights Distribution (ac-ft/yr)**

	Converted WR					
	2030	2040	2050	2060	2070	2080
<b>Bayview ID</b>						
DMI Supplies from Conversion	209	439	690	963	1,257	1,562
<b>Purchased DMI Supplies</b>						
North Alamo WSC	176	176	176	176	176	176
<b>Remaining Unassigned DMI Supplies</b>	<b>33</b>	<b>263</b>	<b>514</b>	<b>787</b>	<b>1,081</b>	<b>1,386</b>
<b>Brownsville ID</b>						
DMI Supplies from Conversion	393	826	1,299	1,812	2,365	2,939
<b>Purchased DMI Supplies</b>						
El Jardin WSC	0	50	50	50	50	50
<b>Remaining Unassigned DMI Supplies</b>	<b>393</b>	<b>776</b>	<b>1,249</b>	<b>1,762</b>	<b>2,315</b>	<b>2,889</b>
<b>Cameron County Irrigation District (CCID) No. 2</b>						
DMI Supplies from Conversion	2,123	4,332	6,629	9,011	11,480	13,943
<b>Purchased DMI Supplies</b>						
County-Other, Cameron	1,423	1,423	1,423	1,423	1,423	1,423
Rio Hondo	0	50	50	50	50	50
San Benito	0	50	50	50	50	50
Valley MUD 2	0	50	50	50	50	50

	Converted WR					
	2030	2040	2050	2060	2070	2080
<b>Remaining Unassigned DMI Supplies</b>	<b>700</b>	<b>2,759</b>	<b>5,056</b>	<b>7,438</b>	<b>9,907</b>	<b>12,370</b>
<b>CCID No. 6 (Los Fresnos)</b>						
DMI Supplies from Conversion	730	1,474	2,232	3,004	3,790	4,560
<b>Purchased DMI Supplies</b>						
Brownsville	0	50	50	50	50	50
Laguna Madre Water District	0	50	50	50	50	50
Laredo	0	50	50	50	50	50
Los Fresnos	0	50	50	50	50	50
North Alamo WSC	730	730	730	730	730	730
<b>Remaining Unassigned DMI Supplies</b>	<b>0</b>	<b>544</b>	<b>1,302</b>	<b>2,074</b>	<b>2,860</b>	<b>3,630</b>
<b>Harlingen ID</b>						
DMI Supplies from Conversion	1,745	3,524	5,336	7,183	9,062	10,904
<b>Purchased DMI Supplies</b>						
Combes	0	50	50	50	50	50
East Rio Hondo WSC	560	560	560	560	560	560
Harlingen	0	50	50	50	50	50
Military Highway WSC	0	50	50	50	50	50
North Alamo WSC	1,184	1,184	1,184	1,184	1,184	1,184
Palm Valley	0	50	50	50	50	50
Primera	1	154	260	340	428	477
<b>Remaining Unassigned DMI Supplies</b>	<b>0</b>	<b>1,426</b>	<b>3,132</b>	<b>4,899</b>	<b>6,690</b>	<b>8,483</b>
<b>La Feria ID (CCID No. 3)</b>						
DMI Supplies from Conversions	1,055	2,218	3,488	4,867	6,353	7,895
<b>Purchased DMI Supplies</b>						
La Feria	0	50	50	50	50	50
North Alamo WSC	1,000	1,000	1,000	1,000	1,000	1,000
Santa Rosa	0	50	50	50	50	50
Sebastian MUD	0	50	50	50	50	50
Siesta Shores WCID	0	50	50	50	50	50

	Converted WR					
	2030	2040	2050	2060	2070	2080
<b>Remaining Unassigned DMI Supplies</b>	<b>55</b>	<b>1,018</b>	<b>2,288</b>	<b>3,667</b>	<b>5,153</b>	<b>6,695</b>

**Table 5-26 EXAMPLE - Hidalgo County Irrigation Districts Converted Water Rights Distribution (ac-ft/yr)**

	Converted WR					
	2030	2040	2050	2060	2070	2080
<b>Donna ID / Hidalgo County Irrigation District (HCID) No. 1</b>						
DMI Supplies from Conversion	1,203	2,508	3,916	5,427	7,040	8,698
<b>Purchased DMI Supplies</b>						
Donna	950	2,240	2,240	2,240	2,240	2,240
<b>Remaining Unassigned DMI Supplies</b>	<b>253</b>	<b>268</b>	<b>1,676</b>	<b>3,187</b>	<b>4,800</b>	<b>6,458</b>
<b>HCID No. 9</b>						
DMI Supplies from Conversion	2,179	4,555	7,129	9,902	12,872	15,934
<b>Purchased DMI Supplies</b>						
County-Other, Hidalgo	306	306	306	306	306	306
Edcouch	0	50	50	50	50	50
El Sauz WSC	49	57	67	71	75	79
Elsa	0	50	50	50	50	50
La Villa	0	50	50	50	50	50
Mercedes	0	50	50	50	50	50
North Alamo WSC	1,814	2,064	3,745	3,746	3,747	3,748
Weslaco	0	50	50	50	50	50
<b>Remaining Unassigned DMI Supplies</b>	<b>10</b>	<b>1,878</b>	<b>2,761</b>	<b>5,529</b>	<b>8,494</b>	<b>11,551</b>
<b>HCID No. 1 (Edinburg)</b>						
DMI Supplies from Conversion	950	1,980	3,092	4,285	5,559	6,868
<b>Purchased DMI Supplies</b>						
Edinburg	0	50	50	50	50	50
El Tanque WSC	10	10	10	10	10	10
Hidalgo County MUD 1	0	50	50	50	50	50

	Converted WR					
	2030	2040	2050	2060	2070	2080
La Grulla	660	660	660	660	660	660
McAllen	0	50	50	50	50	50
Rio Grande City	243	243	243	243	243	243
Sharyland WSC	0	50	50	50	50	50
<b>Remaining Unassigned DMI Supplies</b>	<b>37</b>	<b>867</b>	<b>1,979</b>	<b>3,172</b>	<b>4,446</b>	<b>5,755</b>
<b>HCID No. 2 (San Juan)</b>						
DMI Supplies from Conversion	37	867	1,979	3,172	4,446	5,755
<b>Purchased DMI Supplies</b>						
Alamo	0	50	50	50	50	50
Pharr	947	947	947	947	947	947
San Juan	0	50	50	50	50	50
Union WSC	542	542	542	542	542	542
<b>Remaining Unassigned DMI Supplies</b>	<b>324</b>	<b>2,153</b>	<b>4,199</b>	<b>6,363</b>	<b>8,643</b>	<b>10,956</b>
<b>HCID No. 6 (Mission No. 6)</b>						
DMI Supplies from Conversion	419	873	1,363	1,889	2,451	3,028
<b>Purchased DMI Supplies</b>						
Agua SUD	0	870	869	868	867	866
<b>Remaining Unassigned DMI Supplies</b>	<b>419</b>	<b>3</b>	<b>494</b>	<b>1,021</b>	<b>1,584</b>	<b>2,162</b>
<b>HCID No. 16 (Mission No. 16)</b>						
DMI Supplies from Conversion	391	816	1,274	1,765	2,290	2,829
<b>Purchased DMI Supplies</b>						
La Joya	186	193	193	193	193	193
Rio WSC	125	215	294	294	294	294
<b>Remaining Unassigned DMI Supplies</b>	<b>80</b>	<b>408</b>	<b>787</b>	<b>1,278</b>	<b>1,803</b>	<b>2,342</b>
<b>HCWID No. 3 (McAllen No. 3)</b>						
DMI Supplies from Conversions	141	281	422	562	703	838
<b>Purchased DMI Supplies</b>						
Roma	0	50	50	50	50	50

	Converted WR					
	2030	2040	2050	2060	2070	2080
Zapata County	0	50	50	50	50	50
<b>Remaining Unassigned DMI Supplies</b>	<b>141</b>	<b>181</b>	<b>322</b>	<b>462</b>	<b>603</b>	<b>738</b>
<b>Santa Cruz ID No. 15</b>						
DMI Supplies from Conversion	835	1,798	2,890	4,110	5,458	6,889
<b>Purchased DMI Supplies</b>						
North Alamo WSC	835	835	835	835	835	835
<b>Remaining Unassigned DMI Supplies</b>	<b>0</b>	<b>1,798</b>	<b>2,890</b>	<b>4,110</b>	<b>5,458</b>	<b>6,889</b>
<b>United ID</b>						
DMI Supplies from Conversion	506	1,022	1,548	2,083	2,629	3,163
<b>Purchased DMI Supplies</b>						
Mission	0	50	50	50	50	50
North Alamo WSC	455	455	455	455	455	455
<b>Remaining Unassigned DMI Supplies</b>	<b>51</b>	<b>517</b>	<b>1,043</b>	<b>1,578</b>	<b>2,124</b>	<b>2,658</b>

**Table 5-27 EXAMPLE - Maverick County Irrigation Districts Converted Water Rights Distribution (ac-ft/yr)**

	Converted WR					
	2030	2040	2050	2060	2070	2080
<b>Maverick County ID</b>						
DMI Supplies from Conversion	1,664	3,508	5,532	7,736	10,121	12,601
<b>Purchased DMI Supplies</b>						
County-Other, Maverick	0	50	50	50	50	50
Eagle Pass	0	50	50	50	50	50
Maverick County	0	50	50	50	50	50
Olmito WSC	1,120	1,120	1,120	1,120	1,120	1,120
<b>Remaining Unassigned DMI Supplies</b>	<b>544</b>	<b>2,238</b>	<b>4,262</b>	<b>6,466</b>	<b>8,851</b>	<b>11,331</b>

**Table 5-28 EXAMPLE - Willacy County Irrigation Districts Converted Water Rights Distribution (ac-ft/yr)**

	Converted WR					
	2030	2040	2050	2060	2070	2080
<b>Delta Lake ID</b>						
DMI Supplies from Conversion	2,084	4,419	7,005	9,843	12,930	16,161
<b>Purchased DMI Supplies</b>						
County-Other, Willacy	0	50	50	50	50	50
Lyford	0	50	50	50	50	50
North Alamo WSC	0	4,230	4,229	4,228	4,227	4,226
Port Mansfield PUD	24	34	45	66	86	105
Raymondville	0	50	50	50	50	50
<b>Remaining Unassigned DMI Supplies</b>	<b>2,060</b>	<b>5</b>	<b>2,581</b>	<b>5,399</b>	<b>8,467</b>	<b>11,680</b>

**Table 5-29 EXAMPLE - Unaffiliated Converted Water Rights Distribution (ac-ft/yr)**

	Converted WR					
	2030	2040	2050	2060	2070	2080
<b>Cameron County (Unaffiliated)</b>						
DMI Supplies from Conversion	588	1,177	1,765	2,353	2,942	3,507
<b>Purchased DMI Supplies</b>						
County-Other, Cameron	588	588	588	588	588	588
<b>Remaining Unassigned DMI Supplies</b>	<b>0</b>	<b>589</b>	<b>1,177</b>	<b>1,765</b>	<b>2,354</b>	<b>2,919</b>
<b>Hidalgo County (Unaffiliated)</b>						
DMI Supplies from Conversion	499	998	1,497	1,996	2,495	2,974
<b>Purchased DMI Supplies</b>						
Agua SUD	0	250	251	252	253	254
County-Other, Hidalgo	499	499	499	499	499	499
Hidalgo	0	50	50	50	50	50
<b>Remaining Unassigned DMI Supplies</b>	<b>0</b>	<b>199</b>	<b>697</b>	<b>1,195</b>	<b>1,693</b>	<b>2,171</b>
<b>Webb County (Unaffiliated)</b>						
DMI Supplies from Conversion	1,661	1,761	1,859	1,956	2,050	2,058
<b>Purchased DMI Supplies</b>						

	Converted WR					
	2030	2040	2050	2060	2070	2080
County-Other, Starr	76	76	76	76	76	76
County-Other, Webb	697	697	697	697	697	697
Mirando City WSC	0	50	50	50	50	50
Webb County	0	50	50	50	50	50
Zapata County San Ygnacio & Ramireño	0	50	50	50	50	50
Zapata County WCID-Hwy 16 East	0	50	50	50	50	50
<b>Remaining Unassigned DMI Supplies</b>	<b>888</b>	<b>838</b>	<b>936</b>	<b>1,033</b>	<b>1,127</b>	<b>1,135</b>
<b>Starr County (Unaffiliated)</b>						
DMI Supplies from Conversion	113	226	339	452	565	674
<b>Purchased DMI Supplies</b>						
County-Other, Starr	113	113	113	113	113	113
<b>Remaining Unassigned DMI Supplies</b>	<b>0</b>	<b>113</b>	<b>226</b>	<b>339</b>	<b>452</b>	<b>561</b>
<b>Zapata County (Unaffiliated)</b>						
DMI Supplies from Conversion	58	116	174	232	290	346
<b>Purchased DMI Supplies</b>						
County-Other, Zapata	0	50	50	50	50	50
Falcon Rural WSC	0	50	50	50	50	50
<b>Remaining Unassigned DMI Supplies</b>	<b>58</b>	<b>16</b>	<b>74</b>	<b>132</b>	<b>190</b>	<b>246</b>

**5.2.3.1 Environmental Impacts of Recommended Conversion of Water Right Classification Strategies**

Potential environment impacts for Conversion/Purchase of Surface Water Rights WMSs have been identified below. The largest impact from urbanization of irrigation water rights is the land that is no longer irrigated. Table 5-24 quantifies the reduction of irrigated acreage per county. The reduction of irrigated acreage was estimated as the amount of urbanized water rights divided by 2.5, based on the standard authorization per acre. It was assumed that the permanent acreage impacted is the same as would impact habitats in the local area.

**Agricultural Resources Impacted Acreage**

Agricultural resources impact acreage is a consolidation of vegetation and land use types specific to Region – row crops, grass farms, and orchards - identified in the TPWD EMST. This GIS mapping data was overlain WMS locations to estimate the agricultural impact acreage from the implementation of the

associated strategy. Given that the Conversion/Purchase of Surface Water Rights WMS is an acquisition of water rights with no infrastructure, this WMS as a whole has zero acres agricultural resources impacted.

## Reliability

Reliability is an assessment of the availability of the specified water quantity to the user over time. If the quantity of water is available to the user all the time, then the strategy has a high reliability. If the quantity of water is contingent on other factors, reliability will be lower. The reliability of conversion and purchase of surface water rights strategies is expected to be medium (reliability score = 3) because of uncertainty involved in purchasing existing permits and changing the type of use to municipal use. There could be competing development that may impact the reliability of securing sufficient permits from willing sellers.

## Bays, Estuaries, and Arms of the Gulf of Mexico

The environmental effects due to implementation of conversion/purchase of surface water rights on bays, estuaries, and arms of the Gulf of Mexico are quantitatively not expected to directly impact inflows into a classified water body. Therefore, these WMS projects are assumed to have a score of zero.

### 5.2.4 Biological Control of *Arundo Donax*

Brush control is the process of removing non-native brush from the banks along rivers and streams and upland areas to reduce water consumption by vegetation and increase stream flows and groundwater availability. In 2017, the Texas State Soil and Water Conservation Board (TSSWCB) published the Water Supply Enhancement Program Annual Report, which detailed the efforts and execution of the TSSWCB projects throughout Texas. The report includes: the revised State Water Supply Enhancement Plan; feasibility studies; project allocations and request for proposals; conservation planning and program outreach; and assessment of Regional Water Planning Groups and the State Water Plan. Following initial successful brush control treatments, the TSSWCB found through 12 status reviews that the various target species did not grow above the 5 percent canopy requirement and thus did not warrant further treatment. These reviews were conducted 3 years after initial treatment. The second set of reviews will be conducted 8 to 9 years after the initial treatment. According to the annual report, implementation of the Water Supply Enhancement Program for Texas projects that removal of approximately 30,200 acres of non-native brush will enhance water yield by 9,364 ac-ft/yr.<sup>11</sup> For Region M, brush control is recommended generally, but the removal of *Arundo donax* (*A. donax*; Carrizo cane/giant reed) has been the focus in saving water and increasing supply to waterways in the Rio Grande.

*A. donax* is an invasive water-using weed that infests the riparian areas of the Lower Rio Grande Basin. It grows up to 30 feet tall (typically 18 to 24 feet) and at a rate of up to 4 inches per day. This invasive weed is native to Mediterranean Europe, where various insect species naturally control the reed's growth. *A. donax* is a heavy water user, with estimates of up to 5.0 ac-ft of water per acre per year.

Most control measures, including fire and mechanical, accelerated the spread of the plant. Chemicals can be temporarily effective but are very costly (\$5,000 per acre) and may impact water quality for both U.S. and Mexican supplies. *A. donax* specific insects have been imported by USDA, evaluated, permitted and released in the United States and Mexico for biological control: *Tetramesa romana* (gall wasp); *Rhizaspidiotus donacis* (scale); and *Lasioptera donacis* (leafminer). Research studies conducted by USDA

---

<sup>11</sup> Texas State Soil and Water Conservation Board. "Water Supply Enhancement Program – 2017 Annual Report." TSSWCB. <https://www.tsswcb.texas.gov/programs/water-supply-enhancement-program>. 2018.

and Texas A&M University showed that moderate levels of attack by the biocontrol agents should reduce water use of *A. donax*.

Research conducted in 2009 by Emily Seawright (Texas A&M, Dept of Ag. Economics) was based on a 50-year program of biological releases of insects targeting *A. donax* and thus reducing the water consumption of the plant. The analysis was based on increasing levels of biological control agents over time reaching an equilibrium much as exists in Spain today. The agents were expected to achieve 67 percent control of size and acreage of *Arundo* over the 50-year period. The reduction in water consumption by *A. donax* was offset somewhat by water use of emerging native riparian vegetation, and the additional water would be shared equally between the United States and Mexico. For cost analysis, it was assumed that the saved water would be used for irrigation purposes based on the Rio Grande Watermaster rules.

Five (5) years post release of the *A. donax* gall wasp, *Tetramesa romana*, into the riparian habitats of the lower Rio Grande River, changes in the health of *A. donax* were documented. These changes in plant attributes were fairly consistent along the study area of 558 river miles between Del Rio and Brownsville, Texas, and support the hypothesis that the *A. donax* wasp has had a significant impact as a biological control agent. Plant attributes were measured prior to release in 10 quadrats at each of 10 field sites in 2007, and measured again at the same undisturbed sites, 5 years after the release of *T. romana*, in 2014. Aboveground biomass of *A. donax* decreased on average by 22 percent across the 10 sites. This decline in biomass was negatively correlated to increased total numbers of *T. romana* exit holes in main and lateral shoots per site in 2014 compared to 2007. Changes in biomass, live shoot density and shoot lengths (especially the positive effect of galling on main and lateral shoot mortality), appear to be leading to a consistent decline of *A. donax*. Economically, this reduction in *A. donax* biomass is estimated to be saving \$4.4 million per year in agricultural water. Measurements in 2015, 2017, and 2019 showed additional reduction in biomass up to 44 percent, especially between Laredo and Brownsville where annual temperatures are high.<sup>12</sup> A conservative 32 percent reduction in biomass has been estimated for Region M as a whole. Additional impacts are expected as populations of the wasp increase and as other biological control agents such as the *A. donax* scale, *Rhizaspidiotus donacis*, become more widespread.<sup>13</sup>

The establishment of *A. donax* wasp in the lower Rio Grande River is producing multiple environmental, political, and water conservation benefits. The wasp has also been established in Mexico, including the tributary rivers in Mexico.<sup>14</sup> The reduction in *A. donax* biomass will likely allow native flora and fauna to return, which has many multi-trophic benefits environmentally.<sup>15</sup> Reduction in biomass increases within stand visibility, which allows for safer and more effective law enforcement activities along the international border.<sup>16</sup>

Potential water conservation benefits were estimated at the start of the program by Seawright et al. (2009). A current estimate was calculated using the Seawright model for water conservation and value attributable to the 22 percent reduction in biomass. This suggests a water savings of 6,593 ac-ft because of reduced consumptive use by *A. donax*, accounting for water used by regrowth of native riparian plants. Since the United States receives about 2/9 of this water, availability to the United States would

---

<sup>12</sup> Goolsby et al. 2015, Moran et al. 2017, Marshall et al. 2018.

<sup>13</sup> Goolsby et al. 2019.

<sup>14</sup> Martinez Jimenez et al. 2017.

<sup>15</sup> Racelis 2012a.

<sup>16</sup> Goolsby et al. 2017.

be 2,183 ac-ft. This water, available annually, will increase over time, as will the effectiveness and expansion of the biological control agents. It is assumed that 80 percent of the total water saved through biological control will be above the Amistad or Falcon Reservoirs in the Rio Grande Watershed, thus making that water available as a supply for irrigators; estimated for drought of record conditions (Table 5-30).

**Table 5-30 Firm Yield of Biological Control of *A. donax*, and Resulting Supplies (ac-ft/year)**

Firm Yield	2030	2040	2050	2060	2070	2080
Total Region M Savings	3,175	3,175	3,175	3,175	3,175	3,175
Savings Upstream of Reservoirs	2,539	2,539	2,539	2,539	2,539	2,539
<b>Irrigation Supply Distribution</b>						
Irrigation, Cameron	955	955	955	955	955	955
Irrigation, Hidalgo	1,226	1,226	1,226	1,226	1,226	1,226
Irrigation, Maverick	110	110	110	110	110	110
Irrigation, Starr	43	43	43	43	43	43
Irrigation, Webb	19	19	19	19	19	19
Irrigation, Willacy	178	178	178	178	178	178
Irrigation, Zapata	9	9	9	9	9	9

The annual value of the water in agriculture for the Bi-National Rio Grande Valley is an estimated \$917,808, where the US portion is \$303,848 and 1 ac-ft is valued at \$139. Given increasing water issues in the region, and an estimated current market price of \$3,043/ac-ft, the value of the water savings for the United States would be approximately \$4.4 million per year. Impacts from the *A. donax* wasp and other biological control agents are expected to increase the environmental, political, and economic benefits realized by the biological control program. The costs for operating and monitoring the biological controls program are estimated in Table 5-31.

**Table 5-31 Biological Control of *A. donax* Estimated Costs**

	2030	2040	2050	2060	2070	2080
Water Saved (ac-ft/yr)	2,539	2,539	2,539	2,539	2,539	2,539
Cost per acre-foot (\$)	\$14	\$14	\$14	\$14	\$14	\$14
Total Cost (2023)	\$35,568	\$35,568	\$35,568	\$35,568	\$35,568	\$35,568

#### 5.2.4.1 Environmental Impacts of Recommended Biological Control of *A. donax* Strategies

##### A. Acres Impacted Permanently

Acres impacted permanently refers to the total amount of area that will be permanently impacted because of the implementation of a strategy. For Brush Control/Bio-Control of *A. donax*, the acres impacted are the acres removed of the invasive species.

## **B. Construction Impacted Acreage**

Temporary environmental impacts may be seen during construction activities, such as increased air and noise pollution, and land disturbance activities. However, these effects are typical of any construction project. Based on the release of the bio-control agents and minimal capacity to measure and monitor the brush control process, the construction impacted acreage was estimated to be 10 percent of the acres impacted permanently.

## **C. Agricultural Resources Impacted Acreage**

Agricultural resources impact acreage is a consolidation of vegetation and land use types specific to Region – row crops, grass farms, and orchards - identified in the TPWD EMST. This GIS mapping data was overlain WMS locations to estimate the agricultural impact acreage from the implementation of the associated strategy.

## **D. Wetland Impact**

The wetland impact refers to the probability that implementation of a WMS will affect a wetland. The location of wetlands in the Region was determined using the NWI located at <http://www.fws.gov/wetlands/Data/Mapper.html>.

A strategy received a "1" if all or part of the strategy is located in a wetland or if it is close enough to where construction activities are likely to impact the wetland. All other strategies received zeros. If the exact location of project is unknown it was given a zero because it was assumed that it would be located on a site that would not affect and wetland.

## **E. Habitat Impacted Acreage**

Habitat impacted acreage refers to how the strategy will impact the habitat of the local area. The more area that is impacted because of the implementation of the strategy, the more the habitat of the area will be disrupted. Therefore, it was assumed that the permanent acreage impacted for a WMS is what would impact habitats.

## **F. Cultural Resources Impact**

Cultural resources impact refers to how the strategy will impact cultural resources located within the area. Cultural resources are defined as the collective evidence of the past activities and accomplishments of people, including locations; buildings; and features with scientific, cultural, or historic value. It is assumed that no WMSs negatively affect cultural resources. Mitigation costs are included for strategies that require infrastructure so it is assumed that none would be built in a location or way that disrupts culturally sensitive locations.

## **G. Reliability**

Reliability is an assessment of the availability of the specified water quantity to the user over time. If the quantity of water is available to the user all the time, then the strategy has a high reliability. If the quantity of water is contingent on other factors, reliability will be lower. The supplies from these strategies are considered to be of low reliability since the brush must be continually treated to continue to provide additional supplies.

## H. Bays, Estuaries, and Arms of the Gulf of Mexico

The environmental effects due to implementation of upstream WMS projects on bays, estuaries, and arms of the Gulf of Mexico are quantitatively assessed and reported. Water bodies designated as classified segments by the TCEQ that are within or downstream of Region M include the Brownsville Ship Channel, South Bay, Laguna Madre, and Gulf of Mexico. Effects to these water bodies were quantified by estimating whether the project is anticipated to decrease freshwater inflow in these classified water bodies.

A WMS project received a "1" if it is expected to decrease freshwater inflow into a classified water body. If a strategy were to increase freshwater inflow or otherwise have little to no impact on inflows, then the project would receive a zero.

A summary of the identified and quantified environmental impacts for recommended Biological Control of *A. donax* is presented in Table 5-32.

**Table 5-32 Environmental Impacts for Implementation of Biological Control of *A. donax***

Entity	Yield*	A	B	C	D	E	F	G	H
Irrigation, Cameron	955	191	19	0	1	191	0	1	0
Irrigation, Hidalgo	1,226	245	25	0	1	245	0	1	0
Irrigation, Jim Hogg	1	0	0	0	1	0	0	1	0
Irrigation, Maverick	110	22	2	0	1	22	0	1	0
Irrigation, Starr	43	9	1	0	1	9	0	1	0
Irrigation, Webb	19	4	0	0	1	4	0	1	0
Irrigation, Willacy	178	35	4	0	1	35	0	1	0
Irrigation, Zapata	9	2	0	0	1	2	0	1	0

\* Indicates first decade of implementation yield (ac-ft/yr).

### 5.2.5 Reuse

Wastewater reuse is defined as the types of projects that utilize treated wastewater effluent as a replacement for water supply, reducing the overall demand for fresh water supply. Wastewater reuse can be classified into two major types, defined by how the reuse water is handled. Direct reuse involves introducing treated wastewater directly from a wastewater plant to the place of use. For example, piping treated wastewater from a wastewater treatment plant (WWTP) to a golf course. Indirect reuse involves discharging treated wastewater to an environmental buffer like a river, aquifer, or lake for subsequent use. Virtually any water supply entity with a WWTP could pursue a reuse alternative, provided that downstream water rights do not have a claim for the entire return flow. Both direct and indirect wastewater reuse can be applied to potable and non-potable uses.

#### 5.2.5.1 Non-Potable Reuse

Wastewater reuse is most commonly used for non-potable (not for drinking) purposes, such as agriculture, landscape, public parks, and golf course irrigation. Other non-potable applications include cooling water for power plants and oil refineries, industrial process water, toilet flushing, dust control, construction activities, concrete mixing, and artificial lakes. For the purposes of this plan, non-potable

supplies are limited to meeting 25 percent of municipal need but can be sold to non-municipal WUGs to meet up to 100 percent of their demands.

The wastewater reuse WMS is feasible if several factors are taken into consideration: (1) the location of wastewater treatment facilities relative to the location of potential users of reclaimed water; (2) the level of treatment and quality of the reclaimed water; (3) the water quality requirements for particular use; and (4) the public acceptance of reuse.

State regulatory requirements for non-potable reuse of reclaimed water place constraints on both the types of uses considered acceptable and the manner in which reclaimed water is managed and used. Wastewater reuse quality and system design requirements are regulated by TCEQ by 30 TAC Section 210. TCEQ allows the following two types of non-potable reuse as defined by the use of the water and the required water quality:

- Type I – Use of reclaimed water where contact between humans or food crops and the reclaimed water is likely; and
- Type II – Use of reclaimed water where contact between humans or food crops and the reclaimed water is unlikely.

Current TCEQ criteria for non-potable reuse water are shown in Table 5-33.

**Table 5-33 Quality Standards for Reclaimed Water on a 30-Day Average**

Parameter	Allowable Level
<b>Type I Reuse</b>	
BOD5 or CBOD5	5 mg/L
Turbidity	3 NTU
Fecal Coliform	20 CFU/100 mL* 75 CFU/100 mL**
Enterococci	4 CFU/100 mL* 9 CFU/100 mL**
<b>Type II Reuse – For a system other than a pond</b>	
BOD5	20 mg/L
Or CBOD5	15 mg/L
Fecal Coliform	200 CFU/100 mL* 800 CFU/100 mL**
Enterococci	35 CFU/100 mL* 89 CFU/100 mL**
<b>Type II Reuse – For a pond</b>	
BOD5	30 mg/L
Fecal Coliform	200 CFU/100 mL* 800 CFU/100 mL**
Enterococci	35 CFU/100 mL* 89 CFU/100 mL**
BOD - biochemical oxygen demand CBOD - carbonaceous biochemical oxygen demand CFU - colony-forming unit mg/L - milligrams per liter mL - milliliter NTU - nephelometric turbidity units * 30-day geometric mean ** Maximum single grab sample	

Non-potable reuse was evaluated for those entities that identified it as a desired WMS, and for some WUGs where no other water supplies were available to meet needs. In each case, the demands of the end user were evaluated to verify that the supply was only considered where a demand would have otherwise been filled by municipal water, either raw or treated. The yield was limited to meet no more than 25 percent of the WUG’s demand in any decade. There were five non-potable reuse projects evaluated for the 2026 planning cycle. Two are included as recommended water management

strategies, and the other three are included as alternative strategies in Section 5.3.1. The following are the recommended strategies:

- Edinburg – Non-Potable Reuse.
- Rio Hondo – Non-Potable Reuse.
- Elsa – Non-Potable Reuse.

Environmental impacts are described in Section 5.2.5.3.

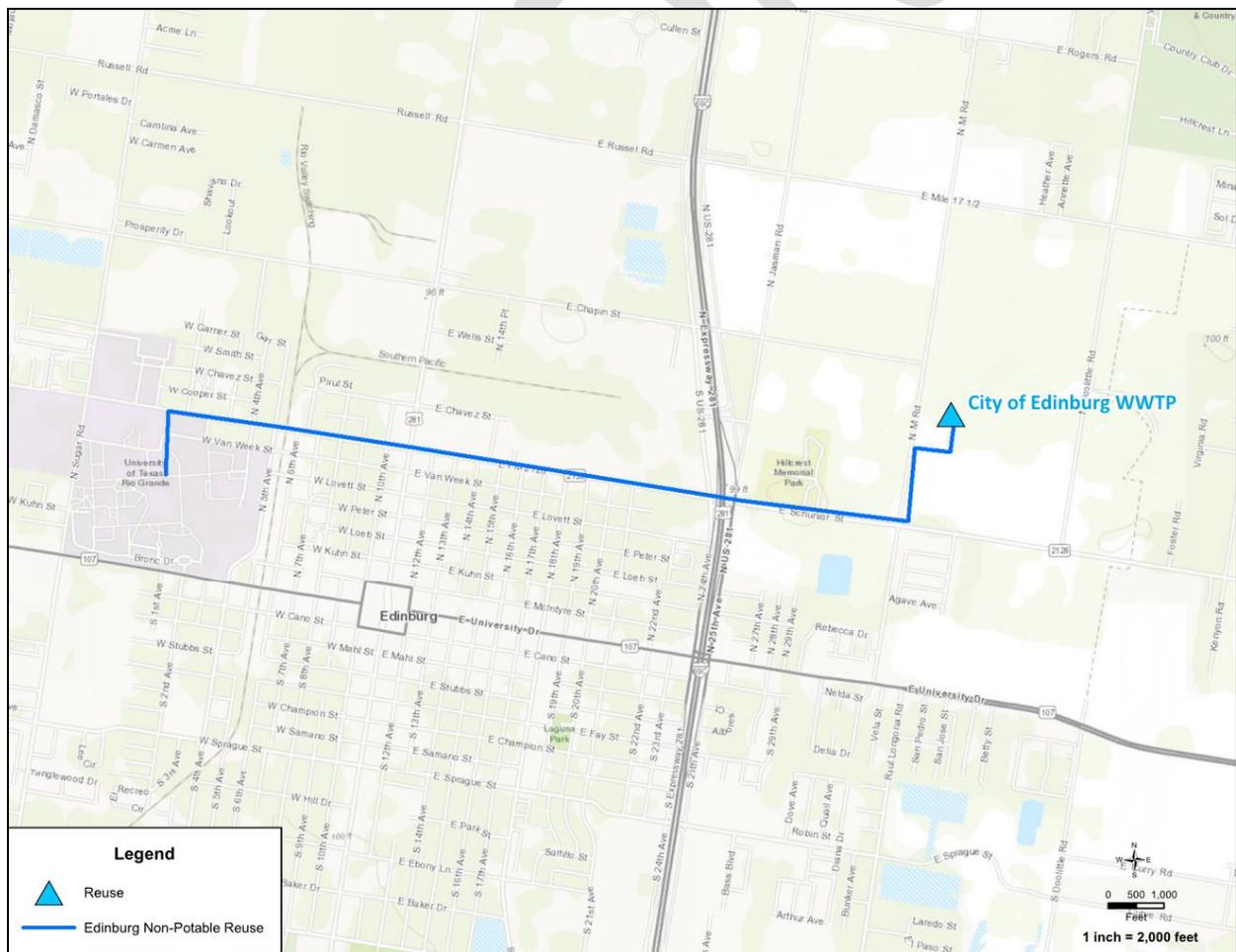
### 5.2.5.1.1 Edinburg – Reuse Water for Cooling Tower and Landscaping Usage

#### Project Source

This strategy was submitted by the Edinburg to the RWPG.

#### Description

For this direct non-potable reuse strategy, Edinburg would provide the University of Texas Pan America (UTPA) with reuse water from their WWTP. UTPA would use the reclaimed water for non-potable needs such as cooling water makeup and landscape irrigation. A map of the approximate alignment for the Edinburg WWTP non-potable reuse line is shown on Figure 5-5.



**Figure 5-5 Edinburg WWTP Non-Potable Reuse Project Location**

**Available Supply**

The Edinburg WWTP currently supplies approximately 3.5 million gallons per day (mgd) of reuse water. It has the capacity to provide an additional 3.5 mgd, or 3,920 ac-ft/yr, of reclaimed water to be used by UTPA. It is likely that additional reuse water would be available in future years; however, that is outside of the scope of this specific strategy. Population and demand projections show increase over time, so this amount of water should continue to be available. Non-potable water in this RWP is accounted for as addressing a maximum of 25 percent of the city’s demands, and the remainder is sold to manufacturing. Because this project recently has been put on hold, the online date has been moved to 2040.

**Engineering and Costing**

This strategy involves construction of a pump station and pipeline to convey the reclaimed water from the WWTP to the UTPA campus. It was assumed that some additional tertiary treatment at the plant would also be installed. It is assumed that the construction period would be 1 year.

Table 5-34 outlines the project costs developed in the UCM. Treatment Level 1 was used in the UCM to provide a cost estimate for the small amount of additional treatment that may be required. The full UCM project cost estimate summary is provided in Appendix 5D.

**Implementation Issues**

Approval for a reclaimed water system is needed from TCEQ. Construction of the new pipeline may also include any of the following permits: USACE Section 404 permit; TPWD sand, shell, gravel, and marl permit; TPDES Storm Water Pollution Prevention Plan; Texas DOT ROW permit.

**Table 5-34 Edinburg – Non-Potable Reuse Project Costs**

Facilities Cost	Total Project Cost	Annual Cost	Annual Cost of Water (\$ per ac-ft)	Annual Cost of Water After Debt Service (\$ per ac-ft)
\$14,770,000	\$20,488,000	\$2,526,000	\$644	\$278

**5.2.5.1.2 Rio Hondo – Non-Potable Wastewater Effluent Reuse**

**Project Source**

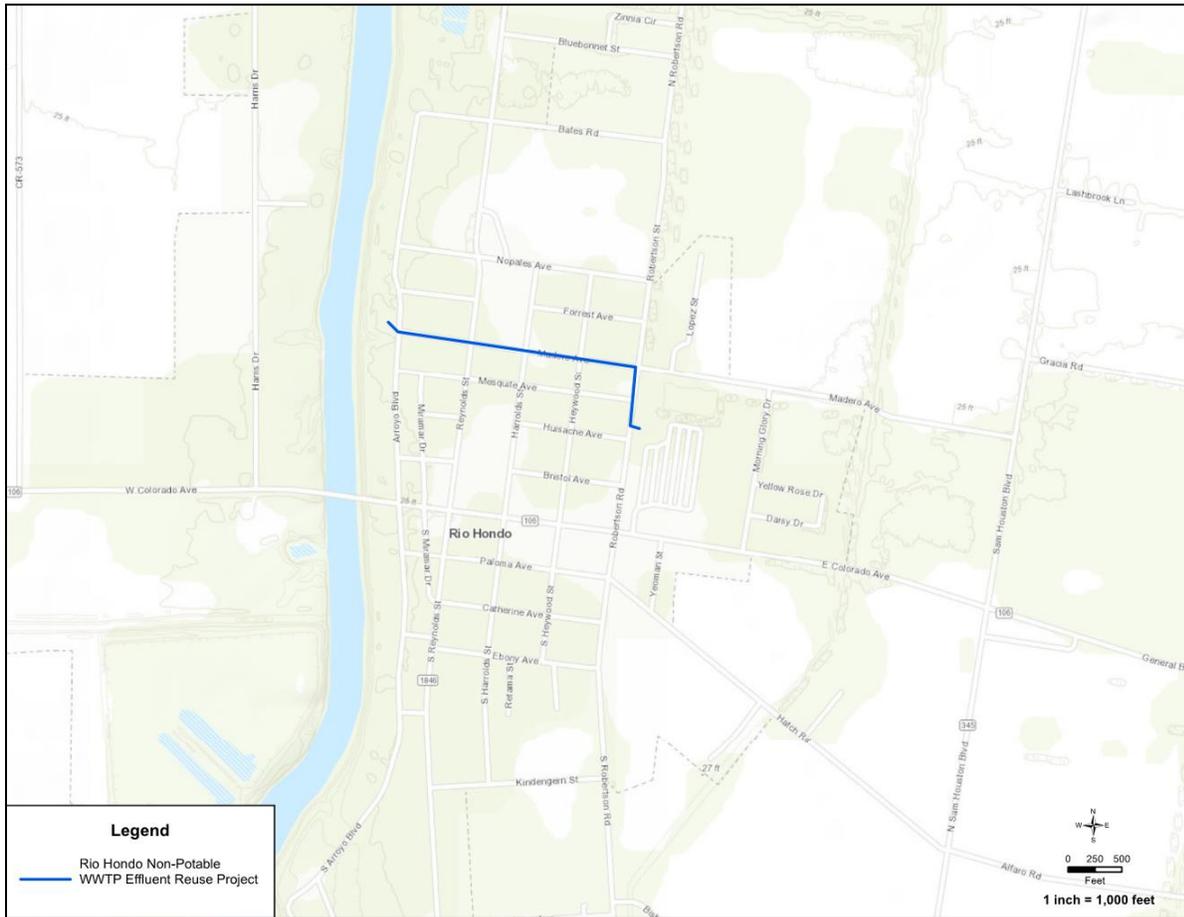
This strategy was submitted by Rio Hondo to the RWPG.

**Description**

Rio Hondo proposes a non-potable reuse project to utilize effluent from its WWTP. The proposed pipeline alignment is shown on Figure 5-6.

**Available Supply**

The WWTP is expected to have a capacity of 450 ac-ft/yr; however, the non-potable supply expected to meet Rio Hondo’s needs is limited to 25 percent of demands. Therefore, the supply expected to come online by 2040 is 30 ac-ft/yr and stay constant through 2080. Population and demand projections show no decrease over time, so this amount of water should continue to be available.



**Figure 5-6 Rio Hondo Non-Potable WWTP Effluent Reuse Project**

**Engineering and Costing**

Additional treatment for the WWTP effluent would include treatment to Type 2 standards. The concentrate waste would be disposed with the remainder of the effluent that is discharged from the plant. A new pump station at the WWTP site, 6” transmission pipeline, and 30,000-gallon ground storage tank would be constructed. It is assumed that the construction period would be 2 years. Table 5-35 outlines the project costs developed in the UCM. The full UCM project cost estimate summary is provided in Appendix 5D.

**Implementation Issues**

Implementation of a non-potable reuse project would require approval by TCEQ. Construction of the new pipeline may also include any of the following permits: USACE Section 404 permit; TPWD sand, shell, gravel, and marl permit; TPDES Storm Water Pollution Prevention Plan; Texas DOT ROW permit.

**Table 5-35 Rio Hondo – Non-Potable Reuse Project Costs**

Facilities Cost	Total Project Cost	Annual Cost	Annual Cost of Water (\$ per ac-ft)	Annual Cost of Water After Debt Service (\$ per ac-ft)
-----------------	--------------------	-------------	-------------------------------------	--

\$2,563,000	\$3,861,000	\$333,000	\$11,100	\$2,033
-------------	-------------	-----------	----------	---------

### 5.2.5.1.3 Elsa – Non-Potable Direct Reuse Water System

#### Project Source

This strategy was submitted by Elsa to the RWPG for the 2026 RWP.

#### Description

This strategy is to construct a direct reuse water system to utilize treated effluent from Elsa’s WWTP for non-potable irrigation of parks and fields and future commercial demands. The strategy includes storage, transmission, and additional treatment. Additional treatment of the secondary effluent includes optional UV or filtration enhancement at the WWTP (level 1 advanced treatment was assumed for costing purposes).

#### Available Supply

The source of supply for this direct reuse water system is secondary effluent from Elsa’s WWTP. It is anticipated that the non-potable reuse system could supply 168 ac-ft/yr by 2040, with the potential to supply up to 336 ac-ft/yr. For the purposes of the 2026 RWP, non-potable supplies are limited to meeting 25 percent of municipal demand but can be sold to non-municipal WUGs to meet up to 100 percent of their demands. Since the users for this supply are currently municipal irrigation or commercial uses, supply will be limited to 25% of Elsa’s demand. Therefore, the yield is assumed to be 108 ac-ft/yr and this number is what the unit cost is based on.

#### Engineering and Costing

Costs for this strategy from the UCM include water treatment (level 1 advanced treatment), 150,000-gallon storage tank, 10-inch 1-mile transmission pipeline, pump station with flow regulation and SCADA-compatible monitoring, and land acquisition. It is assumed that the construction period for this strategy is 1 year. Table 5-36 outlines the costs developed in the UCM. The full UCM project cost estimate summary is provided in Appendix 5D.

#### Implementation Issues

Approval for a direct reuse non-potable water system is needed from TCEQ. Construction of the new pipeline may also include any of the following permits: USACE Section 404 permit; TPWD sand, shell, gravel, and marl permit; TPDES Storm Water Pollution Prevention Plan; Texas DOT ROW permit.

**Table 5-36 Elsa – Direct Reuse Water System Project Costs**

Facilities Cost	Total Project Cost	Annual Cost	Annual Cost of Water (\$ per ac-ft)	Annual Cost of Water After Debt Service (\$ per ac-ft)
\$4,481,000	\$6,303,000	\$689,000	\$6,380	\$2,278

### 5.2.5.2 Potable Reuse

Potable reuse of reclaimed water refers to the intentional reuse of highly treated wastewater effluent as a supplemental source of water supply for potable use. Indirect potable reuse is practiced in Texas

where surface water supplies are deliberately augmented with wastewater effluent. The general steps in indirect potable reuse are as follows:

1. Wastewater is treated at a conventional WWTP.
2. The water is again treated through microfiltration, ultrafiltration, and/or reverse osmosis (RO).
3. The treated water is returned to the natural environment and mixes with other waters for an extended period of time.
4. The blended water is sent to a WTP for conventional water treatment.
5. The water is stored and pumped to distribution.

The TCEQ is currently in the process of establishing the requirements for both indirect and direct potable reuse. In 2012, TWDB funded a study to assess the potential for direct potable reuse in Texas and develop a resource document that provides scientific and technical information for the implementation of direct potable reuse.<sup>17</sup> The final version of the report was released in April 2015. There are three direct potable reuse projects to date in Texas. The City of Wichita Falls, the City of Big Spring, and El Paso Water Utilities<sup>18</sup> have all implemented direct potable reuse projects. Each of the three cities were issued permits from the TCEQ following extensive testing of the drinking water.

All of the potable reuse strategies recommended in this RWP are considered direct reuse because none of the strategies have sufficient evidence that the reuse water would be retained in a natural environmental buffer for what would be considered an extended amount of time. By TWDB definition, indirect reuse refers to water that is returned to a natural water body such that an additional permit is required to access that water after buffering.

The wastewater reuse WMS is feasible if several factors are taken into consideration: (1) the location of wastewater treatment facilities relative to the location of potential surface waters and water treatment facilities; (2) the level of treatment and quality of the reclaimed water; and (3) public acceptance of reuse. There were thirteen potable reuse projects evaluated for the 2026 planning cycle. Twelve were carried over from the 2021 planning cycle and one is new. Twelve are included as recommended water management strategies, and the other one is included as an alternative strategy in Section 5.3.1. The following are the recommended strategies:

- Agua SUD – West WWTP Indirect Potable Reuse.
- Brownsville Public Utilities Board – Indirect Potable Reuse
- Brownsville Public Utilities Board – Southside WWTP Phase I and Phase II.
- Laredo – South Laredo Creek WWTP Phase I and Phase II.
- McAllen – Direct Potable Reuse.
- Mission – Potable Reuse.
- Pharr – Indirect Potable Reuse
- San Juan – Potable Reuse.
- Weslaco - Weslaco North WWTP Potable Reuse.

---

<sup>17</sup> <http://www.twdb.texas.gov/innovativewater/reuse/projects/directpotable/index.asp>.

<sup>18</sup> <http://www.twdb.texas.gov/publications/shells/WaterReuse.pdf>.

Environmental impacts are described in Section 5.2.5.3.

#### **5.2.5.2.1 Agua SUD – West WWTP Indirect Potable Reuse**

##### **Project Source**

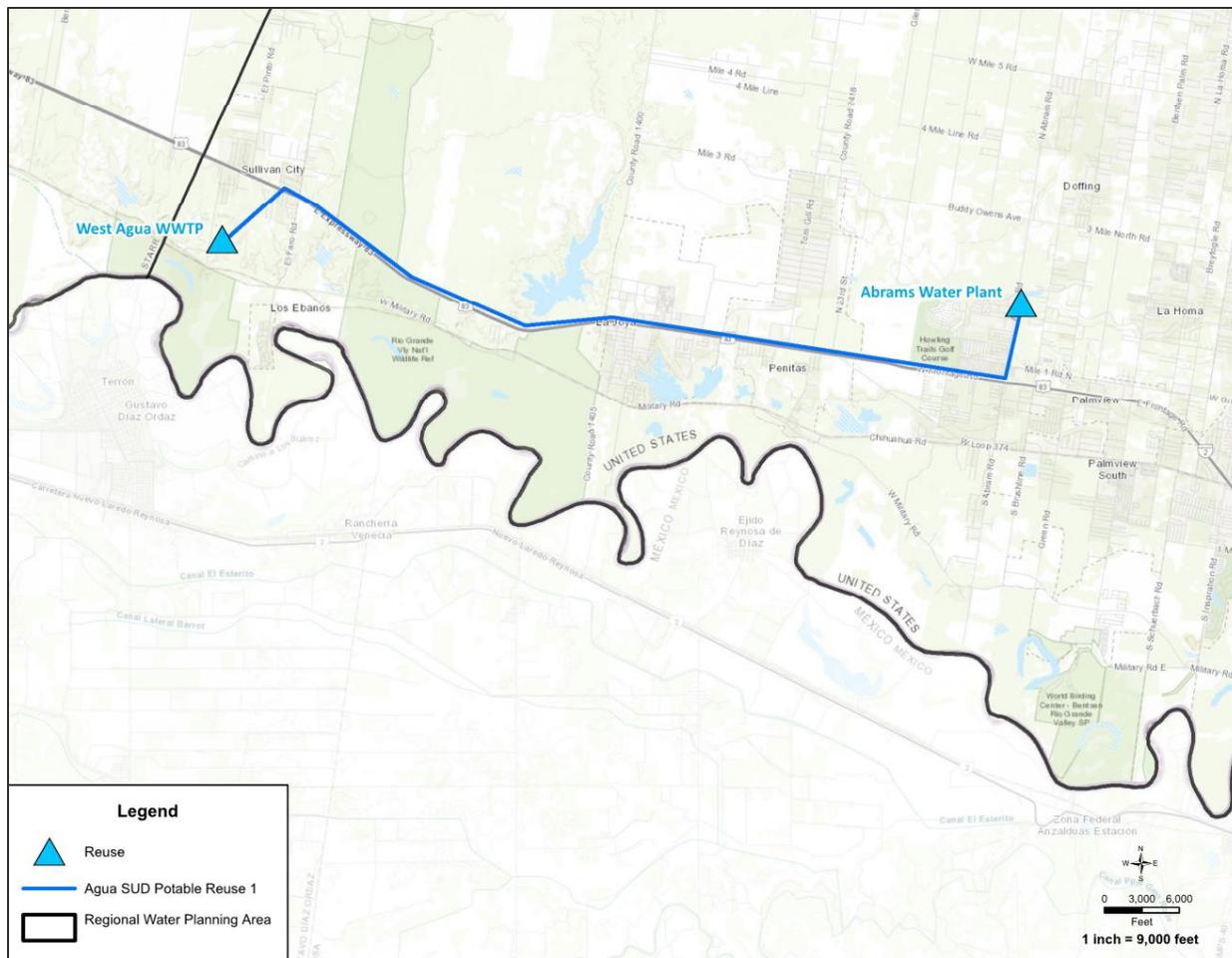
This strategy was submitted by Agua SUD to the RWPG.

##### **Description**

The Agua SUD owns the West Agua WWTP, located in Sullivan City, Texas. Currently there is no reuse water supplied from the existing WWTP. This indirect potable reuse strategy involves reuse water being pumped from the WWTP to the raw water supply reservoir located at Agua SUD's Abram's WTP to supplement raw water from the Rio Grande. Tertiary treatment would be required at the WWTP prior to pumping the treated effluent to the raw water supply reservoir. A map of the approximate locations of the Agua SUD reuse line is shown on Figure 5-7.

##### **Available Supply**

The West Agua WWTP produces 1.4 mgd of reclaimed water. Based on population and demand projections for Agua SUD, it is anticipated that the effluent flow will increase to 2 mgd by 2040. Project calculations assume 60 percent of the effluent stream will be treated and that the maximum produced water volume is 50 percent of the effluent stream, considering membrane recovery rates. The resulting supply for the project was determined to be 1,120 ac-ft/yr by 2040. Population and demand projections show increase over time, so this amount of water should continue to be available.



**Figure 5-7** Agua SUD West WWTP Indirect Potable Reuse Project Location

### Engineering and Costing

The Agua SUD potable reuse option would include one new pump stations and a 10” pipeline to transfer the treated effluent from the WWTP to the raw water supply reservoir. Additional tertiary treatment would be needed at the WWTP. It is assumed that the construction period would be 2 years.

Table 5-37 outlines the project costs developed in the UCM. It was assumed that filtration at the WWTP will be needed in addition to membrane treatment; therefore, Treatment Level 2, Simple Filtration, was used in the UCM. The existing plant footprints were assumed to have adequate space for the additional treatment and pump stations, so land acquisition is not required at the WWTP. An 11-mile pipeline and pump station to transfer the treated effluent to the raw water supply reservoir was included. In addition, a 1 MG ground storage tank with a roof was included. The full UCM project cost estimate summary is provided in Appendix 5D.

## Implementation Issues

Implementation of a potable reuse project would require approval by TCEQ. Any requirements developed by TCEQ for potable reuse by the time this project is constructed would need to be met. Construction of the new pipelines may also include any of the following permits: U.S. Army Corps of Engineers (USACE) Section 404 permit; TPWD sand, shell, gravel, and marl permit; TPDES Storm Water Pollution Prevention Plan; Texas DOT ROW permit. Additionally, local public opinion of potable reuse would have to be considered, and a public relations campaign may be required.

**Table 5-37 Agua SUD – West WWTP Indirect Potable Reuse Project Costs**

Facilities Cost	Total Project Cost	Annual Cost	Annual Cost of Water (\$ per ac-ft)	Annual Cost of Water After Debt Service (\$ per ac-ft)
\$26,990,000	\$38,987,000	\$3,570,000	\$3,188	\$740

### 5.2.5.2.2 Brownsville – Southside WWTP Potable Reuse

#### Project Source

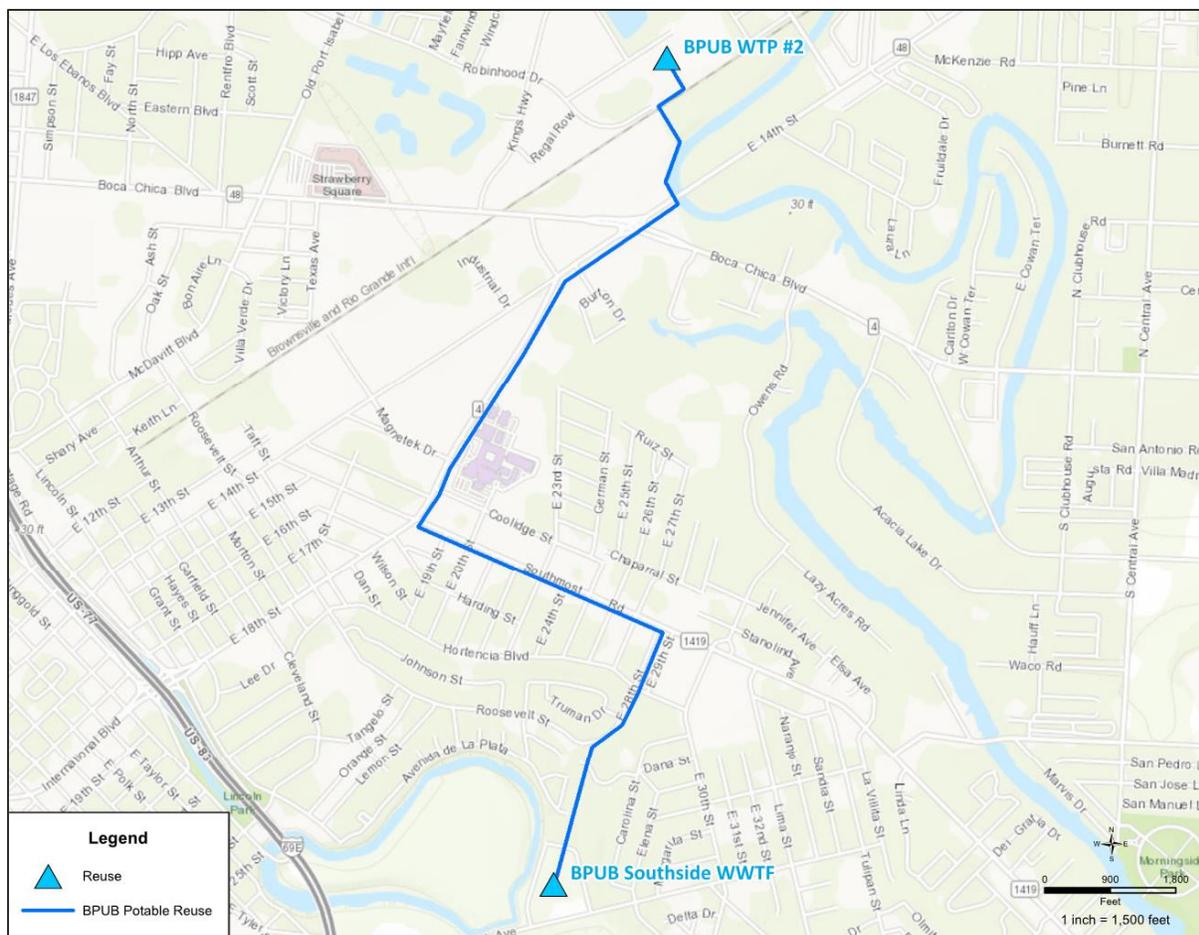
This strategy was originally identified by the RWPG, but Brownsville has requested to keep it in the plan this cycle.

#### Description

This direct potable reuse strategy is to pump treated effluent from the Brownsville Southside WWTP to the Brownsville WTP No. 2. A map of the recommended potable reuse strategy is shown on Figure 5-8.

#### Available Supply

Based on recorded WWTP flows, the annual average flow for Brownsville Southside WWTP is 12.8 mgd. Approximately half of that flow is assumed to be available on a consistent basis; therefore, 6.4 mgd, or 7,168 ac-ft/yr, would be the maximum volume to be produced for potable reuse in 2030. For this two phased WMS, Brownsville’s Southside WWTP will produce 3,360 ac-ft/yr of potable water in 2050 and expand to produce a total of 5,040 ac-ft/yr in 2070. Population and demand projections show no decrease over time, so this amount of water should continue to be available.



**Figure 5-8 Brownsville Southside WWTP Potable Reuse Pipeline Location**

### Engineering and Costing

Additional treatment for the WWTP effluent would include microfiltration, RO, and advanced oxidation. The concentrate waste would be disposed with the remainder of the effluent that is discharged from the plant. A new pump station at the WWTP site and a pipeline to convey the reuse water to Brownsville WTP No. 2 would be constructed. The 18", 3-mile pipeline and pump station would be built to handle the full build out flow during the first phase, but the treatment facilities would be expanded during Phase II construction. Only WWTP infrastructure and costs associated with the expansion of the treatment capacity that will increase supplies beyond those existing and that do not replace portions of existing supply have been included in this plan. It is assumed that the construction period would be 1 year for each phase. Table 5-38 and Table 5-39 outline the project costs developed in the UCM. The full UCM project cost estimate summary is provided in Appendix 5D.

### Implementation Issues

Implementation of a direct potable reuse project would require approval by TCEQ. Any requirements developed by TCEQ for potable reuse by the time this project is constructed would need to be met. Additionally, local public opinion of potable reuse would have to be considered, and a public relations campaign may be required.

**Table 5-38      Brownsville – Southside WWTP Potable Reuse Phase I Project Costs**

Facilities Cost	Total Project Cost	Annual Cost	Annual Cost of Water (\$ per ac-ft)	Annual Cost of Water After Debt Service (\$ per ac-ft)
\$37,770,000	\$52,618,000	\$7,408,000	\$2,205	\$1,104

**Table 5-39      Brownsville – Southside WWTP Potable Reuse Phase II Project Costs**

Facilities Cost	Total Project Cost	Annual Cost	Annual Cost of Water (\$ per ac-ft)	Annual Cost of Water After Debt Service (\$ per ac-ft)
\$15,819,000	\$22,050,000	\$3,502,000	\$2,085	\$1,161

**5.2.5.2.3 Brownsville – Indirect Potable Reuse****Project Source**

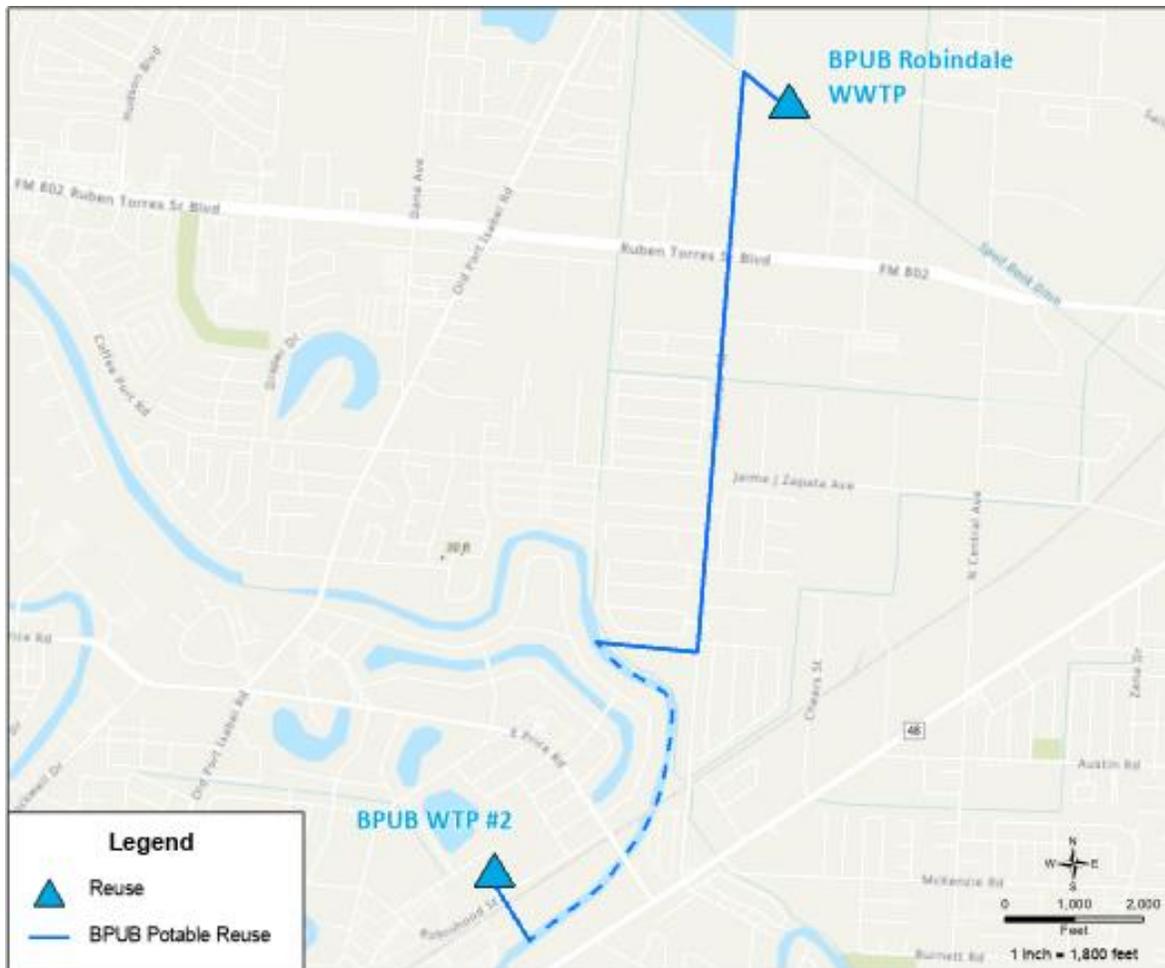
This strategy was requested by Brownsville during the 2026 planning cycle.

**Description**

This indirect potable reuse strategy is to pipe treated effluent from the Brownsville Robindale WWTP and outfall in the Resaca De La Guerra, and then be pulled out for treatment at the Brownsville WTP No. 2. A map of the recommended indirect potable reuse strategy is shown on Figure 5-9.

**Available Supply**

The Robindale WWTP has average effluent flows of 8 mgd. Approximately half of that flow is assumed to be available for reuse; therefore, 4 mgd, or 4,480 ac-ft/yr, would be the maximum volume to be produced for potable reuse in 2030, and that volume would be carried through 2080. Population and demand projections show no decrease over time, so this amount of water should continue to be available.



**Figure 5-9 Brownsville Indirect Potable Reuse Pipeline Location**

### Engineering and Costing

Advanced treatment for the WWTP effluent before leaving the WWTP site would likely be needed, but Brownsville is currently exploring what type would work best. The concentrate waste would be disposed with the remainder of the effluent that is discharged from the plant. A new pump station at the WWTP site and a 16", 8,500-foot-long pipeline would be constructed to convey the reuse water to an outfall in the Resaca De La Guerra, although there is currently an existing pipeline owned by Brownsville Irrigation District (ID) that is in proximity to the conveyance pathway and Brownsville Public Utilities Board (PUB) has contacted the ID about potentially using that pipeline instead. The effluent will travel approximately 6,000 feet down the Resaca where it will be pulled out through an existing intake to Brownsville WTP No. 2. Once at Brownsville WTP No. 2, some additional brackish desalination treatment may be needed. This additional treatment is included as part of the costs. Because both the WWTP and the WTP have space available for additional treatment and pumping, no land acquisition costs are assumed for those components. It is assumed that the construction period would be 2 years. Table 5-40 outlines the project costs developed in the UCM. The full UCM project cost estimate summary is provided in Appendix 5D.

## Implementation Issues

Implementation of an indirect potable reuse project would require approval by TCEQ. Any requirements developed by TCEQ for potable reuse by the time this project is constructed would need to be met. Construction of the new pipeline may also include any of the following permits: USACE Section 404 permit; TPWD sand, shell, gravel, and marl permit; TPDES Storm Water Pollution Prevention Plan; Texas DOT ROW permit. Additionally, local public opinion of indirect potable reuse would have to be considered, and a public relations campaign may be required.

**Table 5-40      Brownsville – Indirect Potable Reuse Project Costs**

Facilities Cost	Total Project Cost	Annual Cost	Annual Cost of Water (\$ per ac-ft)	Annual Cost of Water After Debt Service (\$ per ac-ft)
\$74,693,000	\$107,403,000	\$17,849,000	\$3,984	\$2,298

### 5.2.5.2.4 Laredo – South Laredo WWTP Potable Reuse

#### Project Source

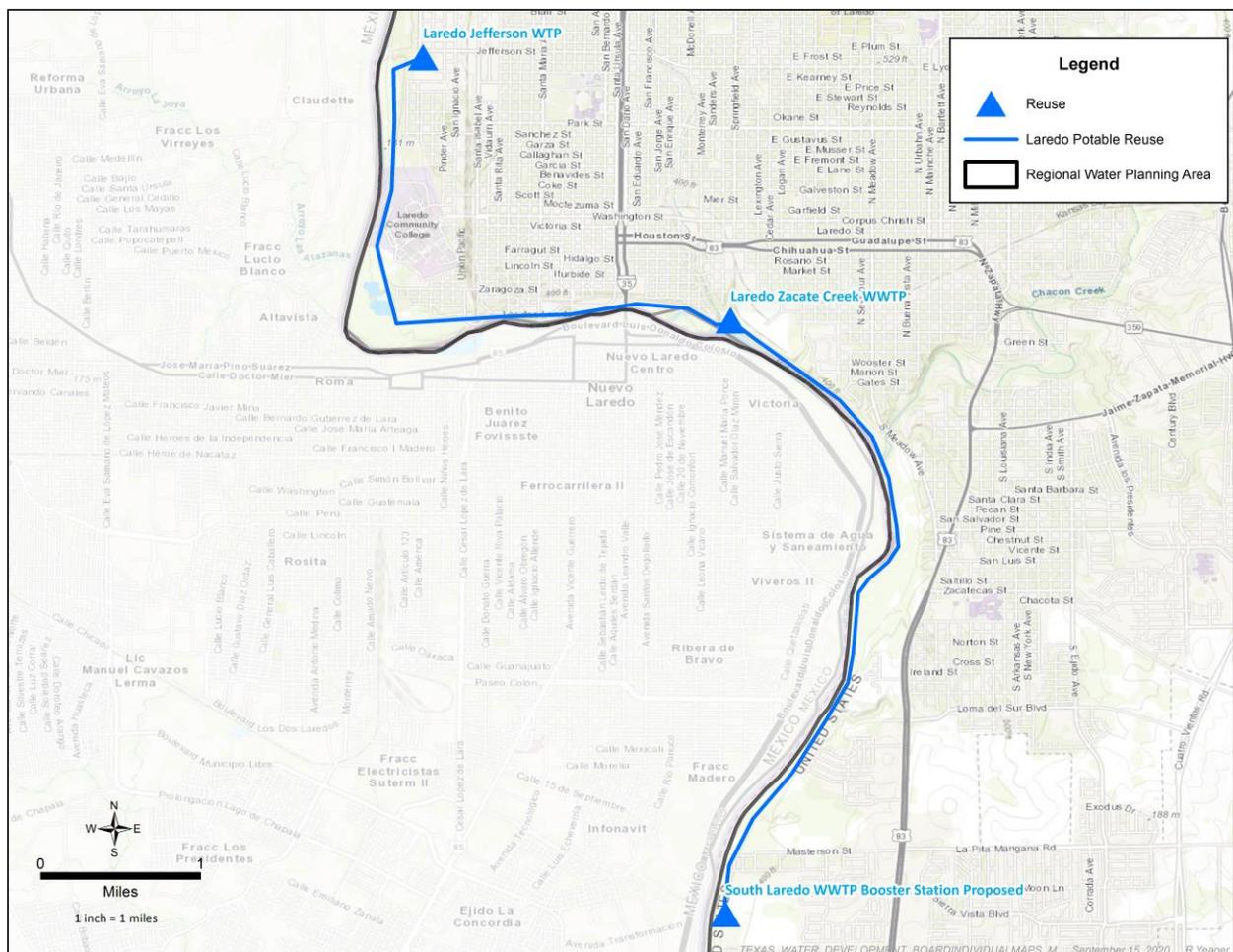
This strategy was submitted by Laredo to the RWPG during the 2021 regional water planning process and has been updated for the 2026 planning cycle.

#### Description

This direct potable reuse strategy is to pump treated effluent from the South Laredo WWTP to the Laredo Jefferson WTP. The approximate alignment of the South Laredo WWTP potable reuse pipeline is shown on Figure 5-10.

#### Available Supply

After the completion of WWTP expansion, the annual average flow for the South Laredo Creek WWTP will be an estimated 18 mgd. Approximately half of the flow is assumed to be available on a consistent basis. The WWTP currently provides 0.1 mgd of non-potable reuse; therefore, 6.9 mgd or 7,728 ac-ft/yr, is available for indirect potable reuse. Phase 1 of this strategy will produce 3,360 ac-ft/yr in 2040. Phase II of this strategy will produce a total of 4,480 ac-ft/yr of reuse water in 2060 to meet Laredo's future needs. Population and demand projections show no decrease below 2030 projections (41, 831 ac-ft/yr), so this amount of water should continue to be available.



**Figure 5-10 South Laredo WWTP Potable Reuse Pipeline Project Location**

### Engineering and Costing

Additional treatment for the WWTP effluent would include microfiltration, RO, and advanced oxidation. The concentrate waste would be disposed with the remainder of the effluent that is discharged from the plant. A new pump station and 1 MGD ground storage tank at the South Laredo WWTP site and a 16” pipeline, which is sized sufficiently for both phases, to convey the reuse water to Jefferson WTP, would be constructed. During Phase II construction, the pump station and treatment would be expanded to ultimate build out capacity. Only WWTP infrastructure and costs associated with the expansion of the treatment capacity that will increase supplies beyond those existing and that do not replace portions of existing supply have been included in this plan. It is assumed the construction period for each phase would be 2 years. Phase I would begin providing supply in the 2040 decade, and Phase II in the 2060 decade. Table 5-41 through Table 5-42 outline the project costs developed in the UCM. The full UCM project cost estimate summary is provided in Appendix 5D.

### Implementation Issues

Implementation of a direct potable reuse project would require approval by TCEQ. Any requirements developed by TCEQ for potable reuse by the time this project is constructed would need to be met. Additionally, local public opinion of potable reuse would have to be taken into account and a public relations campaign may be required.

**Table 5-41 Laredo – South Laredo WWTP Potable Reuse Phase I Project Costs**

Facilities Cost	Total Project Cost	Annual Cost	Annual Cost of Water (\$ per ac-ft)	Annual Cost of Water After Debt Service (\$ per ac-ft)
\$49,578,000	\$71,438,000	\$8,961,000	\$2,667	\$1,174

**Table 5-42 Laredo – South Laredo WWTP Potable Reuse Phase II Project Costs**

Facilities Cost	Total Project Cost	Annual Cost	Annual Cost of Water (\$ per ac-ft)	Annual Cost of Water After Debt Service (\$ per ac-ft)
\$12,850,000	\$18,473,000	\$2,769,000	\$2,472	\$1,313

### 5.2.5.2.5 McAllen – Direct Potable Reuse

#### Project Source

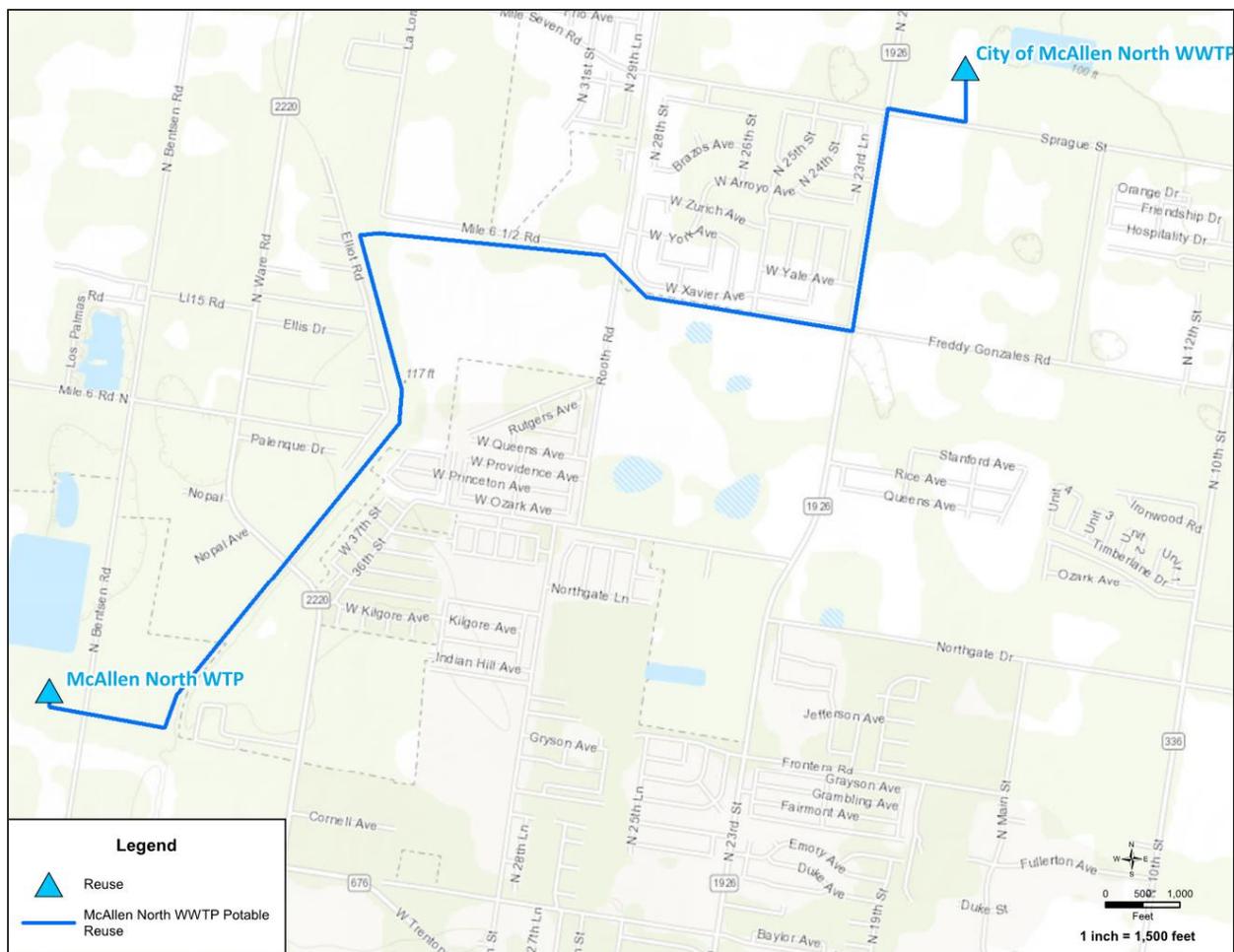
This strategy was originally identified by the RWPG, but McAllen requested to keep it as a recommended strategy for the 2026 planning cycle.

#### Description

This direct potable reuse strategy is to pump treated effluent from the McAllen WWTP to the McAllen WTP. The estimate route for the North WWTP potable reuse pipeline is shown on Figure 5-11. Because the North WWTP already provides non-potable reuse, depending on the amount of reuse available, the treated effluent may end up coming from the South WWTP. For costing purposes, the North WWTP was assumed.

#### Available Supply

Based on recorded WWTP flows, the current annual average flow for McAllen North WWTP is 11.25 mgd. It is assumed that up to half of the effluent flow will be available for potable reuse. This project assumes that approximately 3,880 ac-ft/yr of potable reuse will be produced by 2040. Population and demand projections continue to increase over time, so this amount of water should continue to be available.



**Figure 5-11 McAllen Direct Potable Reuse Pipeline Project Location**

### Engineering and Costing

Additional treatment for the WWTP effluent would include microfiltration, RO, and advanced oxidation. The concentrate waste would be disposed with the remainder of the effluent that is discharged from the plant. Along with the treatment, a new pump station and 3 mgd ground storage tank at the WWTP site and an 18" pipeline to convey the reuse water to McAllen WTP would be constructed. It is assumed that the construction period would be 2 years.

Table 5-43 outlines the project costs developed in the UCM. The full UCM project cost estimate summary is provided in Appendix 5D.

### Implementation Issues

Implementation of a direct potable reuse project would require approval by TCEQ. Any requirements developed by TCEQ for potable reuse by the time this project is constructed would need to be met. Additionally, local public opinion of potable reuse would have to be taken into account and a public relations campaign may be required.

**Table 5-43 McAllen – Direct Potable Reuse Project Costs**

Facilities Cost	Total Project Cost	Annual Cost	Annual Cost of Water (\$ per ac-ft)	Annual Cost of Water After Debt Service (\$ per ac-ft)
\$43,387,000	\$62,443,000	\$8,611,000	\$2,219	\$1,088

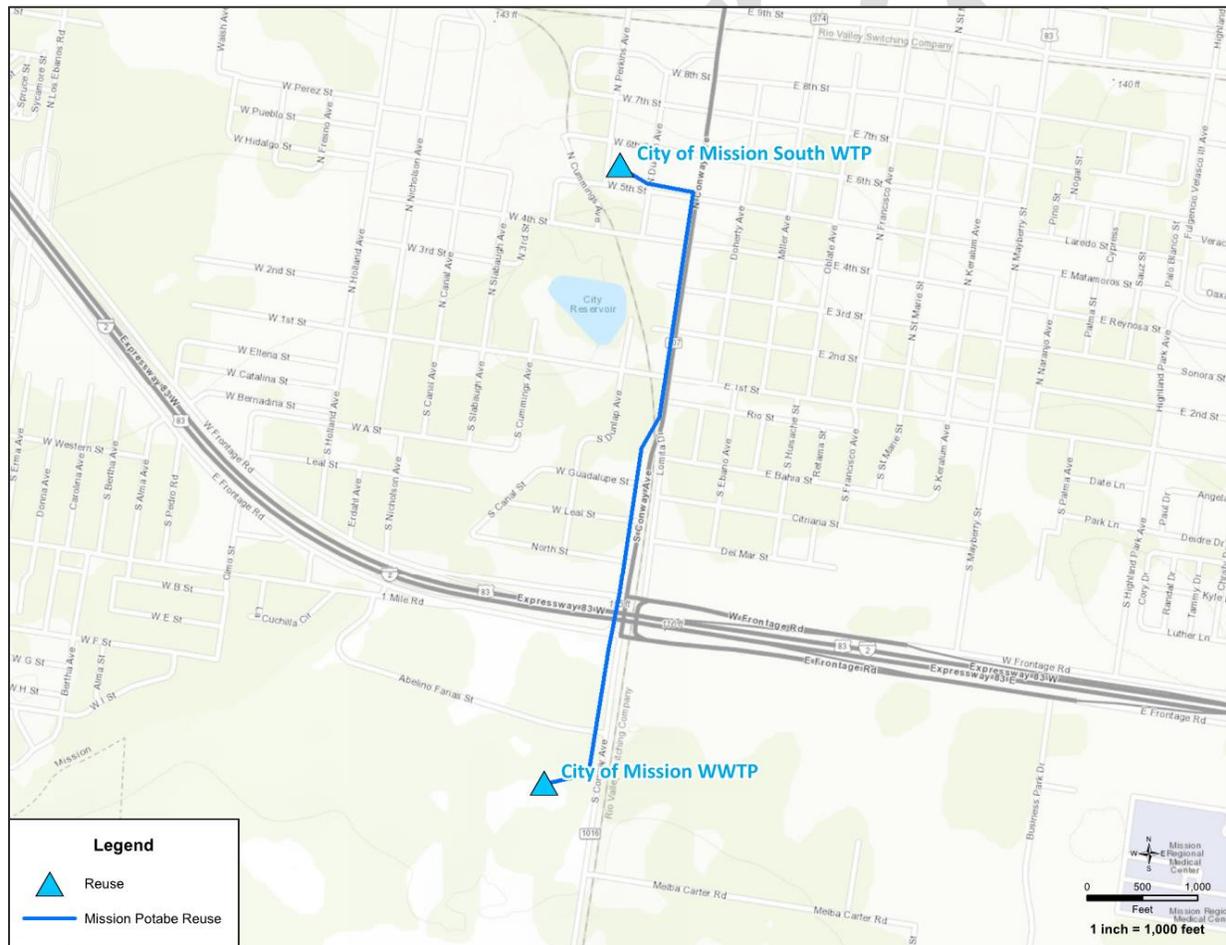
**5.2.5.2.6 Mission – Potable Reuse**

**Project Source**

This strategy was identified by the RWPG.

**Description**

This strategy is for the City of Mission to use wastewater effluent for direct potable reuse. Effluent from the Mission WWTP will be pumped to the South WTP for conventional treatment after it has gone through advanced treatment. The estimate route of the Mission WWTP Potable Reuse Pipeline is shown on Figure 5-12.



**Figure 5-12 Mission WWTP Potable Reuse Project Location**

### Available Supply

The Mission WWTP currently treats 13.5 mgd on average. It is assumed approximately half of the effluent flow can be produced for potable reuse. Mission could utilize the available effluent to supply an additional 3.5 mgd, or 3,920 ac-ft/yr, of water starting in 2040. It is assumed that 20 percent of the influent water would be lost through the treatment process; therefore, 4,700 ac-ft/yr of wastewater effluent would be used. Population and demand projections continue to increase over time, so this amount of water should continue to be available.

### Engineering and Costing

Additional treatment for the WWTP effluent would include microfiltration, RO, and advanced oxidation. The concentrate waste would be disposed with the remainder of the effluent that is discharged from the plant. Along with the treatment, a new pump station and 2 MG ground storage tank at the WWTP site and a 16" pipeline to convey the reuse water to the WTP would be constructed. It is assumed that the construction period would be 2 years. Table 5-44 outlines the project costs developed in the UCM. The full UCM project cost estimate summary is provided in Appendix 5D.

### Implementation Issues

Implementation of a direct potable reuse project would require approval by TCEQ. Any requirements developed by TCEQ for potable reuse by the time this project is constructed would need to be met. Additionally, local public opinion of potable reuse would have to be taken into account and a public relations campaign may be required.

**Table 5-44 Mission – Potable Reuse Project Costs**

Facilities Cost	Total Project Cost	Annual Cost	Annual Cost of Water (\$ per ac-ft)	Annual Cost of Water After Debt Service (\$ per ac-ft)
\$38,520,000	\$55,415,000	\$8,053,000	\$2,054	\$1,060

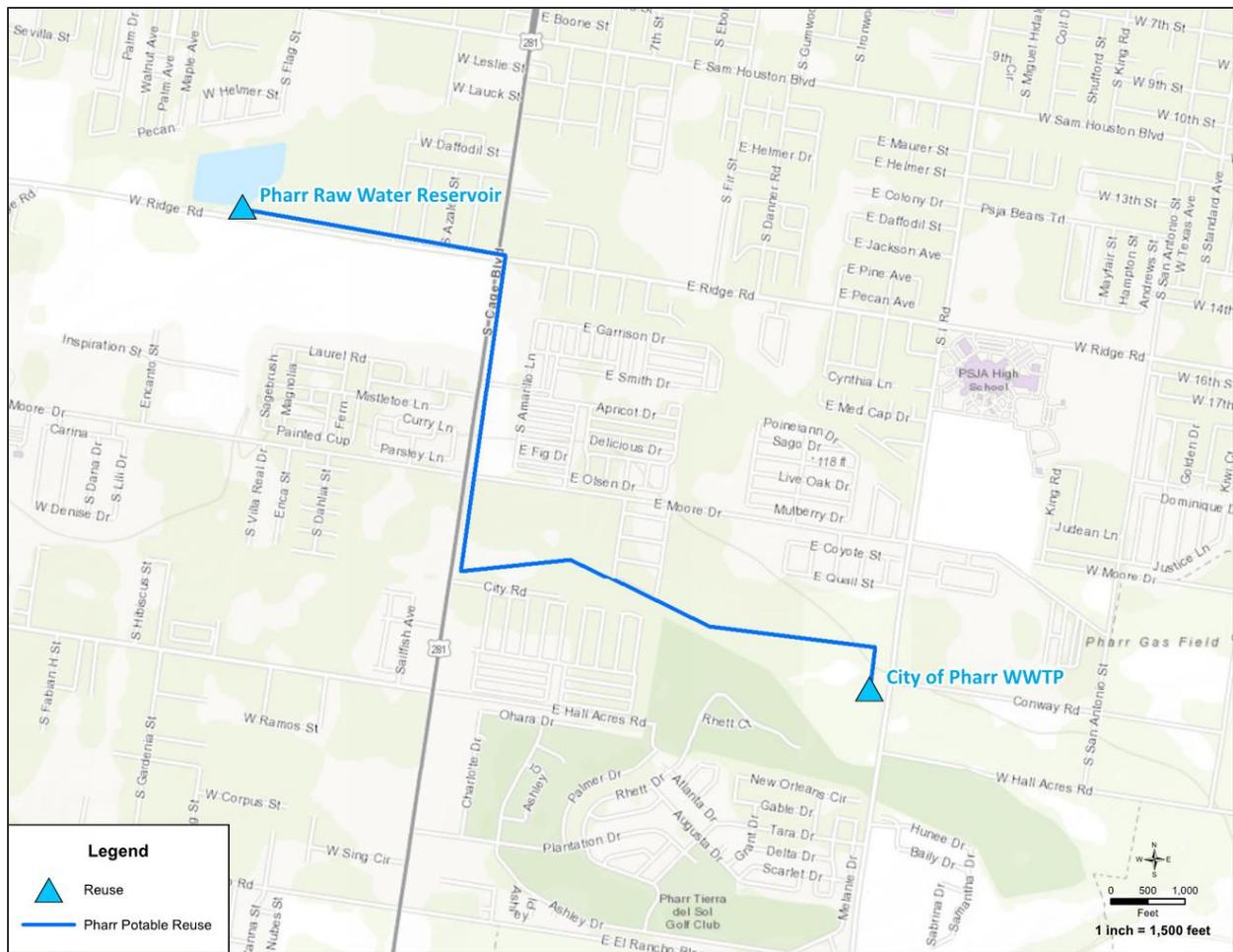
#### 5.2.5.2.7 Pharr – Raw Water Augmentation Potable Reuse

##### Project Source

This strategy was submitted by the Pharr to the RWPG.

##### Description

This direct potable reuse strategy is to augment the Pharr's raw water supply with reuse water. A portion of the WWTP effluent would be treated to near drinking water standards, stored in a buffering pond, and then pumped to a raw water storage pond where it would mix with raw Rio Grande water supplied by Hidalgo County ID No. 2. This strategy was presented to and approved by TWDB in a Water Reuse Priority and Implementation Plan Report, prepared in September 2011. The approximate alignment of the Pharr WWTP potable reuse pipeline for the Raw Water Reservoir Augmentation WMS is shown on Figure 5-13.



**Figure 5-13 Pharr Raw Water Reservoir Augmentation Potable Reuse Project Location**

### Available Supply

The current plant flow of the Pharr WWTP is 6 mgd. This project would produce 3 mgd of that flow, based on planning assumptions that no more than fifty percent of wastewater effluent will be supplied by reuse. The total available supply for this strategy is 3 mgd, or 3,360 ac-ft/yr, and is assumed to come online by 2040. It is assumed that 20 percent of the influent water would be lost through the treatment process; therefore, 4,030 ac-ft/yr of wastewater effluent would be used. Population and demand projections continue to increase over time, so this amount of water should continue to be available.

### Engineering and Costing

The components of this project include a WWTP equalization basin, pipeline and pump station to convey water from the WWTP to the new advanced reclaimed WTP, storage pond, and pump station to be constructed next to the existing WWTP on City owned land. A 16" pipeline is also required to convey the reclaimed water to the raw water storage pond near the WTP. The advanced treatment plant will consist of membrane filtration, RO, and ultraviolet disinfection (Advanced Treatment Level 1). Concentrate disposal from the treatment processes would be discharged to the Arroyo Colorado with the traditional WWTP discharge. It is assumed that the construction period would be 1.5 years.

Land acquisition costs are limited to the pipeline route since the other infrastructure components will be built on City-owned land. Table 5-45 outlines the project costs developed in the UCM. The full UCM project cost estimate summary is provided in Appendix 5D.

### Implementation Issues

Final design of the indirect potable reuse project would require approval by TCEQ. Any requirements developed by TCEQ for potable reuse by the time this project is constructed would need to be met. Construction of the new pipeline may also include any of the following permits: USACE Section 404 permit; TPWD sand, shell, gravel, and marl permit; TPDES Storm Water Pollution Prevention Plan; Texas DOT ROW permit. Additionally, local public opinion of potable reuse would have to be taken into account and a public relations campaign may be required.

**Table 5-45 Pharr – Raw Water Augmentation Potable Reuse Project Costs**

Facilities Cost	Total Project Cost	Annual Cost	Annual Cost of Water (\$ per ac-ft)	Annual Cost of Water After Debt Service (\$ per ac-ft)
\$40,387,000	\$57,373,000	\$7,666,000	\$2,282	\$1,117

### 5.2.5.2.8 San Juan – Direct Potable Reuse

#### Project Source

This strategy was submitted by San Juan to the RWPG during the 2021 regional water planning process.

#### Description

This strategy is for the City of San Juan to use wastewater effluent for direct potable reuse. It is assumed effluent from the San Juan WWTP would be pumped to the city’s WTP for conventional treatment after it has gone through advanced treatment.

#### Available Supply

Based on the revised water demand projections for the 2026 cycle, the San Juan WWTP effluent is assumed to produce approximately 1,120 ac-ft/yr for potable reuse, which is approximately 30 percent of the total water demand. Based on an assessment of the City of San Juan’s demands and needs, this strategy is anticipated to be implemented in the 2050 decade. Population and demand projections continue to increase over time, so this amount of water should continue to be available.

#### Engineering and Costing

Additional treatment for the WWTP effluent would include microfiltration, RO, and advanced oxidation. The concentrate waste would be disposed with the remainder of the effluent that is discharged from the plant. A new pump station and 0.5 MG ground storage tank at the WWTP site and an 8”, 1-mile pipeline to convey the reuse water to the WTP would be constructed. It is assumed that the construction period would be 2 years. Table 5-46 outlines the project costs developed in the UCM. The full UCM project cost estimate summary is provided in Appendix 5D.

### Implementation Issues

Implementation of a direct potable reuse project would require approval by TCEQ. Any requirements developed by TCEQ for potable reuse by the time this project is constructed would need to be met.

Additionally, local public opinion of potable reuse would have to be taken into account and a public relations campaign may be required.

**Table 5-46 San Juan – Direct Potable Reuse Project Costs**

Facilities Cost	Total Project Cost	Annual Cost	Annual Cost of Water (\$ per ac-ft)	Annual Cost of Water After Debt Service (\$ per ac-ft)
\$16,115,000	\$23,305,000	\$3,173,000	\$2,833	\$1,371

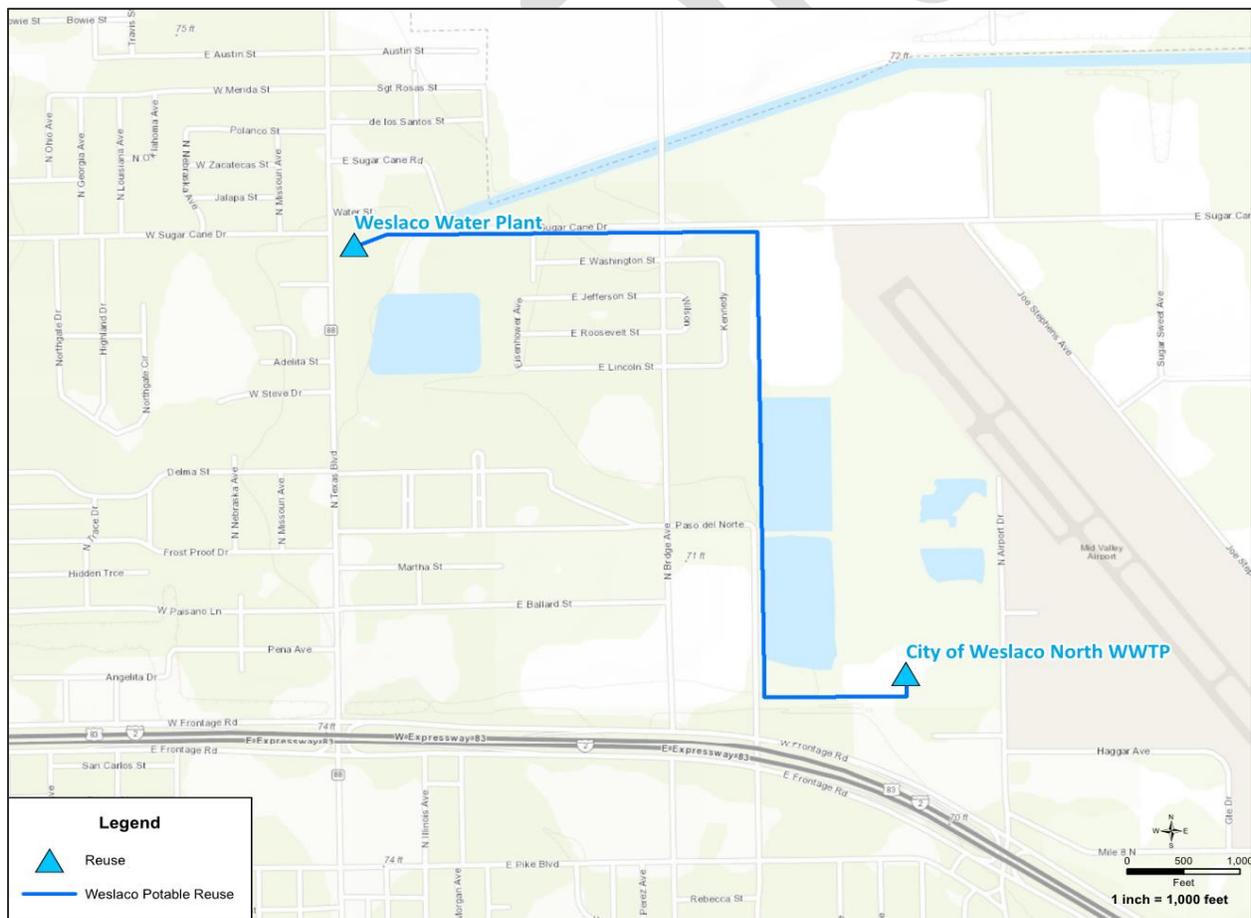
### 5.2.5.2.9 Weslaco– North WWTP Potable Reuse

#### Project Source

This strategy was identified by the RWPG.

#### Description

This direct potable reuse strategy is to pump treated effluent from the Weslaco North WWTP to the Weslaco WTP. The approximate alignment of the North WWTP potable reuse pipeline is shown on Figure 5-14.



**Figure 5-14 Weslaco North WWTP Potable Reuse Pipeline Project Location**

## Available Supply

Based on the projected water demands for Weslaco for the 2026 planning cycle, it is anticipated that up to 1,120 ac-ft/yr of potable reuse could be supplied beginning in 2050, which is approximately 20 percent of the demand in that decade. Population and demand projections continue to increase over time, so this amount of water should continue to be available.

## Engineering and Costing

Additional treatment for the WWTP effluent would include microfiltration, RO, and advanced oxidation. The concentrate waste would be disposed with the remainder of the effluent that is discharged from the plant. A new pump station and 0.5 MG ground storage tank at the WWTP site and an 8", 1-mile pipeline to convey the reuse water to the Weslaco WTP would be constructed. It is assumed that the construction period would be 2 years. Table 5-47 outlines the project costs developed in the UCM. The full UCM project cost estimate summary is provided in Appendix 5D.

## Implementation Issues

Implementation of a potable reuse project would require approval by TCEQ. Any requirements developed by TCEQ for potable reuse by the time this project is constructed would need to be met. Additionally, local public opinion of potable reuse would have to be taken into account and a public relations campaign may be required.

**Table 5-47 Weslaco – North WWTP Potable Reuse Project Costs**

Facilities Cost	Total Project Cost	Annual Cost	Annual Cost of Water (\$ per ac-ft)	Annual Cost of Water After Debt Service (\$ per ac-ft)
\$15,706,000	\$22,720,000	\$3,101,000	\$2,769	\$1,342

### 5.2.5.3 Environmental Impacts of Recommended Reuse Strategies

Potential environment impacts for recommended reuse strategies have been identified and categorized as described below. The letters identifying each section correspond to the headings in Table 5-48.

#### A. Acres Impacted Permanently

Acres impacted permanently refers to the total amount of area that will be permanently impacted because of the implementation of a strategy. The following conservative assumptions were made (unless more detailed information for a specific facility was available):

- The acres impacted for pipelines is equivalent to the ROW easements required; it is assumed 100-feet for ROW unless otherwise known; and
- WTP impacts are estimated using UCM, which is based on the plant capacity.

#### B. Construction Impacted Acreage

Temporary environmental impacts may be seen during construction activities, such as increased air and noise pollution, and land disturbance activities. However, these effects are typical of any construction project. The construction impacted acreage was estimated as 110 percent (rounded up to a whole number) of the permanently impacted acreage.

### **C. Agricultural Resources Impacted Acreage**

Agricultural resources impact acreage is a consolidation of vegetation and land use types specific to Region – row crops, grass farms, and orchards – identified in the TPWD EMST. This GIS mapping data was overlain WMS locations to estimate the agricultural impact acreage from the implementation of the associated strategy.

### **D. Wetland Impact**

The wetland impact refers to the probability that implementation of a WMS will affect a wetland. The location of wetlands in the region was determined using the NWI located at <http://www.fws.gov/wetlands/Data/Mapper.html>.

A strategy received a “1” if all or part of the strategy is located in a wetland or if it is in close proximity to where construction activities are likely to impact the wetland. All other strategies received zeros. If the exact location of project is unknown it was given a zero because it was assumed that it would be located on a site that would not affect and wetland.

### **E. Habitat Impacted Acreage**

Habitat impacted acreage refers to how the strategy will impact the habitat of the local area. The more area that is impacted because of the implementation of the strategy, the more the habitat of the area will be disrupted. Therefore, it was assumed that the permanent acreage impacted for a WMS is what would impact habitats.

### **F. Threatened and Endangered Species Count**

Threatened and endangered species count refers to how the strategy will impact those species in the area once implemented. The species impact was quantified based on the number of federally-listed threatened and endangered species located within the county of the strategy. The number of threatened and endangered species came from the TPWD Rare, Threatened, and Endangered Species of Texas database (<http://tpwd.texas.gov/gis/rtest/>).

### **G. Cultural Resources Impact**

Cultural resources impact refers to how the strategy will impact cultural resources located within the area. Cultural resources are defined as the collective evidence of the past activities and accomplishments of people, which also include locations; buildings; and features with scientific, cultural, or historic value. It is assumed that no WMSs negatively affect cultural resources. Mitigation costs are included for strategies that require infrastructure so it is assumed that none would be built in a location or way that disrupts culturally sensitive locations.

### **H. Reduction in WWTP Effluent (ac-ft/yr)**

Environmental impacts may be seen because of lower WWTP effluent flows to the discharge streams for wastewater effluent reuse strategies. These impacts could include the following:

- Decreases to the stream flow/level.
- Change in the water quality by reducing the organic levels.
- Effects to fish and wildlife that inhabit the streams.

**I. Reliability**

Reliability is an assessment of the availability of the specified water quantity to the user over time. If the quantity of water is available to the user all the time, then the strategy has a high reliability. If the quantity of water is contingent on other factors, reliability will be lower. Supply amounts for this strategy were developed based on estimates of water use and related return flows to specific wastewater treatment plants. Where applicable, consideration was given for specific minimum by-pass flow requirements where required by water rights. This strategy is considered highly reliable (reliability score = 5). There is potential for the reuse supplies to develop at a faster or slower rate, depending on the volume of return flows.

**J. Bays, Estuaries, and Arms of the Gulf of Mexico**

The environmental effects due to implementation of upstream WMS projects on bays, estuaries, and arms of the Gulf of Mexico are quantitatively assessed and reported. Water bodies designated as classified segments by the TCEQ that are within or downstream of Region M include the Brownsville Ship Channel, South Bay, Laguna Madre, and Gulf of Mexico. Effects to these water bodies were quantified by estimating whether the project is anticipated to decrease freshwater inflow in these classified water bodies.

A WMS project received a “1” if it is expected to decrease freshwater inflow into a classified water body. If a strategy were to increase freshwater inflow or otherwise have little to no impact on inflows, then the project would receive a zero.

A summary of the identified and quantified environmental impacts for the recommended reuse projects is presented in Table 5-48.

**Table 5-48 Environmental Impacts of Recommended Reuse Strategies**

Entity	WMS Name	Yield*	A	B	C	D	E	F	G	H	I	J
<b>Non-Potable</b>												
Edinburg	Reuse Water for Cooling Tower and Landscaping Usage	3,920	43	47	1	0	43	8	0	3,920	5	1
Elsa	Non-Potable Direct Reuse Water System	108	11	12	0	0	11	8	0	108	5	1
Rio Hondo	Non-Potable Wastewater Effluent Reuse	30	25	28	0	0	25	25	0	30	5	1
<b>Potable</b>												
Agua SUD	West WWTP Indirect Potable Reuse	1,120	140	154	19	0	140	8	0	1,120	5	1
Brownsville	Indirect Potable Reuse	4,480	16	17	0	1	16	25	0	4,480	5	1
Brownsville	Southside WWTP Potable Wastewater Effluent Reuse (Phase 1)	3,360	43	47	0	0	43	25	0	3,360	5	1

Entity	WMS Name	Yield*	A	B	C	D	E	F	G	H	I	J
Brownsville	Southside WWTP Potable Wastewater Effluent Reuse (Phase 2)	5,040	43	47	0	0	43	25	0	5,040	5	1
Laredo	South Laredo WWTP Potable Wastewater Effluent Reuse (Phase 1)	3,360	43	47	0	0	43	4	0	3,360	5	1
Laredo	South Laredo WWTP Potable Wastewater Effluent Reuse (Phase 2)	6,720	43	47	0	0	43	4	0	6,720	5	1
McAllen	Direct Potable Reuse	3,880	45	50	3	0	45	8	0	3,880	5	1
Mission	Potable Reuse	3,920	19	21	0	0	19	8	0	3,920	5	1
Pharr	Raw Water Augmentation Potable Reuse	3,360	38	42	1	0	38	8	0	3,360	5	1
San Juan	Potable Reuse	1,120	42	47	0	0	42	8	0	1,120	5	1
Weslaco	North WWTP Potable Wastewater Effluent Reuse	1,120	15	17	0	0	15	8	0	1,120	5	1

\* First decade of implementation yield (ac-ft/yr).

## 5.2.6 New or Expanded Surface Water Treatment

New or expanded surface water treatment strategies refers to developing additional surface water treatment infrastructure (treatment plants) to remove bottlenecks that have limited the amount of water that can be supplied.

For the 2026 planning cycle, projects from the previous cycle were carried forward and modified as needed. Four of the strategies are recommended and four are alternative strategies discussed in Subsection 5.3.2. The recommended strategies include:

- Donna – WTP Expansion.
- East Rio Hondo WSC – North Harlingen Surface WTP Phase I.
- North Alamo WSC – Delta WTP Expansion Phase I and II.
- Olmito WSC – WTP Expansion.

Environmental impacts are described in Section 5.2.6.5.

### 5.2.6.1 Donna – WTP Expansion

#### Project Source

This strategy was submitted by Donna to the RWPG.

## Description

This strategy is for the expansion of the WTP of Donna. The treatment plant is currently under violation for capacity with TCEQ and needs to be expanded. The WMS includes increased WTP capacity, acquisition of water rights, new storage reservoir (approximately 260 ac-ft), and new raw water pump station (i.e., new raw water reservoir and raw water pump station storage improvements).

The existing WTP currently relies on an existing irrigation canal for raw water, but the canal is unreliable, and the plant has seen recent raw water shortages. Constructing a raw water reservoir, primarily for storage, at the plant and a raw water pump station for conveyance to the proposed reservoir will supply the utility with a reliable raw water source.

## Available Supply

This strategy would expand the WTP from 4 mgd to 6 mgd, supplying an additional 2,240 ac-ft/yr of drinking water. Based on projected demands, the WTP would initially supply 950 ac-ft/yr by 2030 and increase to full capacity from 2040 onward.

## Engineering and Costing

Costs for this strategy from the UCM include WTP expansion, storage reservoir, intake from the reservoir, pipeline to and from the reservoir, and a pump station. Only WTP infrastructure and costs associated with the expansion of the WTP that will increase supplies beyond those existing and that do not replace portions of existing supply have been included in this plan. The plant has enough land area for expansion, so land acquisition for the WTP was not included in the costing model. It is assumed that the construction period for this strategy is 2 years.

Costs for this project do not include the purchase of water rights available through voluntary conversion of irrigation rights. Those costs are included for Donna under the Conversion of Surface Water Rights water management strategy.

Table 5-49 outlines the project costs developed in the UCM. The full UCM project cost estimate summary is provided in Appendix 5D.

## Implementation Issues

No major implementation issues are expected for this strategy. As with any project, necessary state and federal permits must be obtained before construction can begin.

**Table 5-49 Donna – WTP Expansion Project Costs**

Facilities Cost	Total Project Cost	Annual Cost	Annual Cost of Water (\$ per ac-ft)	Annual Cost of Water After Debt Service (\$ per ac-ft)
\$30,023,000	\$43,167,000	\$3,818,000	\$1,704	\$571

### 5.2.6.2 East Rio Hondo WSC – North Harlingen Surface WTP Phase I

#### Project Source

This strategy was submitted by East Rio Hondo WSC (ERHWSC) to the RWPG during the 2016 Regional Water Planning process.

#### Description

This strategy is to construct a new surface WTP just west of Rio Hondo and pipeline so that raw water would be pumped from Harlingen ID. The pipeline would reduce losses currently experienced in conveyance to treatment, and treatment capacity will be sufficient to handle current and future surface water rights.

#### Available Supply

The pump station and treatment plant would be designed for 3.5 mgd capacity. The plant will treat approximately 3,200 ac-ft/yr of water rights currently owned by ERHWSC, and an estimated 560 ac-ft/yr of additional water rights available through conversion of irrigation water rights. For the intents and purposes of the plan, based on information provided by ERHWSC for the 2026 planning cycle, 560 ac-ft/yr is accounted for in the supply balance, based on assumed loss reduction. This strategy is assumed to be online by 2030.

#### Engineering and Costing

Costs for this strategy from the UCM include a new water treatment plant, an intake from the irrigation canal, a pump station and 5-mile pipeline (sized for potential full buildout), land acquisition, and pipeline ROW for Phase I of the strategy. Costs associated with the purchase of surface water rights is included separately under the Conversion of Surface Water Rights water management strategy. It is assumed that the construction period for this strategy is 1 year for Phase I. Table 5-50 outlines the project costs developed in the UCM. The full UCM project cost estimate summary is provided in Appendix 5D.

#### Implementation Issues

The availability of surface water rights required to supply the treatment plant is a potential implementation issue.

**Table 5-50 East Rio Hondo WSC – North Harlingen Surface WTP Phase I Project Costs**

Facilities Cost	Total Project Cost	Annual Cost	Annual Cost of Water (\$ per ac-ft)	Annual Cost of Water After Debt Service (\$ per ac-ft)
\$54,205,000	\$75,778,000	\$8,738,000	\$15,604	\$6,093

### 5.2.6.3 North Alamo WSC – Delta WTP Expansion

#### Project Source

This strategy was submitted by North Alamo WSC (NAWSC) to the RWPG during the 2016 Regional Water Planning Process.

## Description

This strategy is for the expansion of Delta WTP. The expansion would serve residents within the Edcouch, Elsa, La Villa, Monte Alto, and surrounding areas. It would also provide the NAWSC the ability to utilize other water districts as a source of push water for delivery of water in times of drought.

## Available Supply

The expansion of Delta WTP would provide NAWSC with the ability to treat an additional 4,480 ac-ft/yr of drinking water in Phase I, and 6,160 ac-ft/yr (increase of 1,680 ac-ft/yr) in Phase II. Phase I would be constructed in 2040 and Phase II would occur in 2050. Conversion of Water Rights is required for this supply.

## Engineering and Costing

Costs for this strategy from the UCM include the WTP expansion only. Only WTP infrastructure and costs associated with the expansion of the WTP that will increase supplies beyond those existing and that do not replace portions of existing supply have been included in this plan. It is assumed that the WTP expansion can occur on existing owned land and no land acquisition is needed. It is assumed that the construction period for each phase is one year. Costs associated with purchasing water rights are included separately under the Conversion of Surface Water Rights water management strategy. Table 5-51 outlines the project costs developed in the UCM. for Phase I, and Phase II is presented in Table 5-52. The full UCM project cost estimate summaries are provided in Appendix 5D.

## Implementation Issues

As with any project, necessary state and federal permits must be obtained before construction can begin.

**Table 5-51 North Alamo WSC – Delta WTP Expansion Phase I Project Costs**

Facilities Cost	Total Project Cost	Annual Cost	Annual Cost of Water (\$ per ac-ft)	Annual Cost of Water After Debt Service (\$ per ac-ft)
\$14,620,000	\$20,379,000	\$2,608,000	\$582	\$262

**Table 5-52 North Alamo WSC – Delta WTP Expansion Phase II Project Costs**

Facilities Cost	Total Project Cost	Annual Cost	Annual Cost of Water (\$ per ac-ft)	Annual Cost of Water After Debt Service (\$ per ac-ft)
\$8,706,000	\$12,135,000	\$1,677,000	\$998	\$490

### 5.2.6.4 Olmito WSC – WTP Expansion

#### Project Source

This strategy was submitted by Olmito WSC to the RWPG during the 2021 regional water planning process and they confirmed they are still requesting to include it for the 2026 planning cycle.

## Description

This strategy is for the expansion of Olmito WSC's WTP from 2 mgd to 3 mgd. The WTP is currently at an estimated 82% capacity with 2,830 connections. Before Olmito WSC reaches a TCEQ violation of 85% capacity (2,951 connections), Olmito WSC plans to expand their WTP.

## Available Supply

The expansion of the WTP would provide Olmito WSC with an additional 1,120 ac-ft/yr, which would require Conversion of Water Rights for this supply. Olmito WSC is currently in the planning phase of this project and so this strategy has an implementation decade of 2030.

## Engineering and Costing

Costs for this strategy from the UCM include the WTP expansion. Only WTP infrastructure and costs associated with the expansion of the WTP that will increase supplies beyond those existing and that do not replace portions of existing supply have been included in this plan. It is assumed that the expansion can fit on land currently owned by Olmito WSC, so no land acquisition costs are included. Costs for purchasing water rights is included separately under the Conversion of Surface Water Rights water management strategy. It is assumed that the construction period is one year. Table 5-53 outlines the project costs developed in the UCM. The full UCM project cost estimate summary is provided in Appendix 5D.

## Implementation Issues

As with any project, necessary state and federal permits must be obtained before construction can begin.

**Table 5-53 Olmito WSC – WTP Expansion Project Costs**

Facilities Cost	Total Project Cost	Annual Cost	Annual Cost of Water (\$ per ac-ft)	Annual Cost of Water After Debt Service (\$ per ac-ft)
\$7,523,000	\$10,490,000	\$1,490,000	\$1,330	\$671

### 5.2.6.5 Environmental Impacts of Recommended New or Expanded Surface Water Treatment Strategies

Potential environment impacts for water infrastructure systems strategies have been identified and categorized as described below. The letters identifying each section correspond to the headings in Table 5-54.

#### A. Acres Impacted Permanently

Acres impacted permanently refers to the total amount of area that will be permanently impacted because of the implementation of a strategy. The following conservative assumptions were made (unless more detailed information for a specific was available):

- The acreage impacted for pipelines is equivalent to the right-of-way (ROW) easements required; it is assumed 50 feet for ROW unless otherwise known.
- WTP impacts are estimated using UCM, which is based on the plant type and capacity.

## **B. Construction Impacted Acreage**

Temporary environmental impacts may be seen during construction activities, such as increased air and noise pollution, and land disturbance activities. However, these effects are typical of any construction project. The construction impacted acreage was estimated as 110 percent (rounded up to a whole number) of the permanently impacted acreage.

## **C. Inundation Acreage**

The inundation acreage applies to reservoirs only and is equal to the amount of land that will be inundated by the construction of the reservoir.

## **D. Agricultural Resources Impacted Acreage**

Agricultural resources impact acreage is a consolidation of vegetation and land use types specific to Region – row crops, grass farms, and orchards - identified in the TPWD EMST. This GIS mapping data was overlain WMS locations to estimate the agricultural impact acreage from the implementation of the associated strategy.

## **E. Wetland Impact**

The wetland impact refers to the probability that implementation of a WMS will affect a wetland. The location of wetlands in the region was determined using the National Wetlands Inventory (NWI) located at <http://www.fws.gov/wetlands/Data/Mapper.html>.

A strategy received a "1" if all or part of the strategy is located in a wetland or if it is close enough to where construction activities are likely to impact the wetland. All other strategies received zeros. If the exact location of project is unknown, it was given a zero because it was assumed that it would be located on a site that would not affect any wetland.

## **F. Habitat Impacted Acreage**

Habitat impacted acreage refers to how the strategy will impact the habitat of the local area. The more area that is impacted because of the implementation of the strategy, the more the habitat of the area will be disrupted. Therefore, it was assumed that the permanent acreage impacted for a WMS is what would impact habitats.

## **G. Threatened and Endangered Species Count**

Threatened and endangered species count refers to how the strategy will impact those species in the area once implemented. This impact was quantified based on the number of federally-listed threatened and endangered species located within the county of the strategy. The number of threatened and endangered species came from the Texas Parks and Wildlife Department (TPWD) Rare, Threatened, and Endangered Species of Texas database (<http://tpwd.texas.gov/gis/rtest/>).

## **H. Cultural Resources Impact**

Cultural resources impact refers to how the strategy will impact cultural resources located within the area. Cultural resources are defined as the collective evidence of the past activities and accomplishments of people, including locations; buildings; and features with scientific, cultural, or historic value. It is assumed that no WMSs negatively affect cultural resources. Mitigation costs are included for strategies that require infrastructure, so it is assumed that none would be built in a location or way that disrupts culturally sensitive locations.

## I. Reliability

Reliability is an assessment of the availability of the specified water quantity to the user over time. If the quantity of water is available to the user all the time, then the strategy has a high reliability. If the quantity of water is contingent on other factors, reliability will be lower. This strategy was developed in accordance with WAM and/or MAG values for the appropriate area. As such, WMSs associated with new/improved infrastructure or distribution system or facilities expansions are considered to be reliable supply (reliability score = 5) that will not compromise the DFCs as established by the MAG or the environmental flow standards as established by 30 TAC §298.

## J. Bays, Estuaries, and Arms of the Gulf of Mexico

The environmental effects due to implementation of upstream WMS projects on bays, estuaries, and arms of the Gulf of Mexico are quantitatively assessed and reported. Water bodies designated as classified segments by the TCEQ that are within or downstream of Region M include the Brownsville Ship Channel, South Bay, Laguna Madre, and the Gulf of Mexico. Effects to these water bodies were quantified by estimating whether the project is anticipated to decrease freshwater inflow in these classified water bodies.

A WMS project received a "1" if it is expected to decrease freshwater inflow into a classified water body. If a strategy were to increase freshwater inflow or otherwise have little to no impact on inflows, then the project would receive a zero.

A summary of the identified and quantified environmental impacts for recommended new or expanded surface water treatment is presented in Table 5-54.

**Table 5-54 Environmental Impacts of Recommended New or Expanded Surface Water Treatment Strategies**

Entity	WMS Name	Yield*	A	B	C	D	E	F	G	H	I	J
Donna	WTP Expansion**	950	31	34	0	1	0	31	8	0	5	1
ERHWSC	Surface WTP Phase I	800	68	75	0	4	0	68	25	0	5	1
NAWSC	Delta WTP Expansion	4,480	2	3	0	0	0	2	8	0	5	1
Olmito WSC	WTP Expansion	1,120	1	2	0	0	0	1	25	0	5	1
*First decade of implementation yield (ac-ft/yr).												
** Donna – WTP Expansion includes New Raw Water Reservoir and Raw Water Pump Station												

### 5.2.7 New or Expanded Distribution and Transmission Facilities Resulting in Increased Supplies

New or expanded distribution and transmission facilities increase supplies through reduction of losses and movement of water to areas of growth where it previously wasn't provided. Because these projects are particular to the municipal utility systems, these projects were evaluated individually on the basis of available information. Five recommended strategies were carried forward from the 2021 Plan and updated to reflect current conditions. The five recommended strategies include:

- East Rio Hondo WSC – FM 2925 Transmission Line.

- El Jardin WSC – Distribution Pipeline Replacement
- HCID No. 6 – Service Area Expansion
- McAllen – Raw Waterline Project with HCID No. 1.
- Rio Hondo – Emergency Interconnects.

Environmental impacts are described in Section 5.2.7.6.

### **5.2.7.1 East Rio Hondo WSC – FM 2925 Transmission Line**

#### **Project Source**

This strategy was submitted by ERHWSC to the RWPG during the 2016 Regional Water Planning Process.

#### **Description**

This strategy is for the installation of a potable water transmission line from the ERHWSC system to Arroyo City system (AC). Currently, the AC system receives water from a transmission line which results in water flowing through the system from east to west. The majority of the population is located on the east side of the system, while the west end of AC system has few connections, resulting in significant water being lost due to constantly having to flush the west end of the system in order to maintain a compliant chloramine residual. The FM2925 Transmission Line will allow water to flow through the AC system from west to east, which is central to improve efficiency and enhance conservation by eliminating water losses due to the need for constant flushing. The approximate location of the FM 2925 Transmission Line is shown on Figure 5-15.



**Figure 5-15 ERHWSO FM 2925 Transmission Line**

### Available Supply

This strategy will increase system efficiency and conserve water by eliminating the losses associated with the current conveyance of supplies to Arroyo City. The drought year water savings is estimated at 30 ac-ft/yr, with the project planned to be online by 2040.

### Engineering and Costing

Costs for this strategy from the UCM include a pump station, pipeline, and land acquisition for pipeline ROW. It is assumed that the construction period for this strategy is one year. Table 5-55 the project costs developed in the UCM. The full UCM project cost estimate summary is provided in Appendix 5D.

### Implementation Issues

No major implementation issues are anticipated for this strategy. Utility crossing permits and easements would be required for several entities including Texas Department of Transportation (DOT), Cameron County, Cameron County Drainage District, and Cameron County ID.

**Table 5-55 East Rio Hondo WSC – FM 2925 Transmission Line Project Costs**

Facilities Cost	Total Project Cost	Annual Cost	Annual Cost of Water (\$ per ac-ft)	Annual Cost of Water After Debt Service (\$ per ac-ft)
\$14,023,000	\$20,283,000	\$1,589,000	\$52,967	\$5,400

**5.2.7.2 El Jardin WSC – Distribution Pipeline Replacement**

**Project Source**

This strategy was submitted by El Jardin WSC to the RWPG.

**Description**

This strategy is to replace approximately 235,535 linear feet of substandard water mains within the existing distribution system. The WSC’s distribution system was constructed in the mid-1960s and many of the original pipes are still being used today. This strategy would replace the 4 and 6-inch pipes that are leaking and possibly broken with 8-inch polyvinyl chloride (PVC) pipe. Leak detection and repair measures are included under Advanced Municipal Conservation, Section 5.2.1.1, but because this includes an increase in pipe size, rather than just replacing the same size pipe, it is being included as a separate project.

**Available Supply**

El Jardin WSC estimates that at least 3.6 million gallons of treated water (11 ac-ft/yr) could be saved each year with this strategy. It is assumed this strategy will be online by 2040.

**Engineering and Costing**

Costs for this strategy from the UCM only include the cost of pipeline. No land acquisition was assumed, but surveying and environmental studies for the pipeline routes were. Additionally, no O&M for the pipelines are assumed because there would not be additional costs beyond what there are now, with possibly less O&M required. It is assumed that the construction period for this strategy is 2 years. Table 5-56 outlines the project costs developed in the UCM. The full UCM project cost estimate summary is provided in Appendix 5D.

**Implementation Issues**

No significant implementation issues are associated with this strategy. Permits would be required by Cameron County and TX DOT.

**Table 5-56 El Jardin WSC – Distribution Pipeline Replacement Project Costs**

Facilities Cost	Total Project Cost	Annual Cost	Annual Cost of Water (\$ per ac-ft)	Annual Cost of Water After Debt Service (\$ per ac-ft)
\$38,840,000	\$55,738,000	\$3,922,000	\$356,555	\$9

**5.2.7.3 HCID No. 6 – Transmission Line**

**Project Source**

This strategy was submitted by HCID NO. 6 to the RWPG.

### Description

In addition to general ID improvements, HCID No. 6 has plans to construct a transmission line in order to deliver additional supplies to Agua SUD’s customers.

### Available Supply

New supplies that will be delivered via this WMS Project are included in the Conversion of Water Rights WMS for Agua SUD (refer to Section 5.2.3). It is assumed that infrastructure along with the surface water rights purchase will be online by 2040 and can provide a minimum of 1,120 ac-ft/yr to Agua SUD.

### Engineering and Costing

Infrastructure included in the transmission line project are a 400 ac-ft reservoir for storage, a raw water pump station, and transmission pipeline. Costs associated with this WMS Project were calculated by increasing costs provided by the ID to September 2023 \$ and are summarized in Table 5-57. The full UCM project cost estimate summary is provided in Appendix 5D.

### Implementation Issues

No major implementation issues are anticipated for this strategy. Utility crossing permits and easements would be required for several entities.

**Table 5-57 HCID No. 6 – Service Area Expansion Project Costs**

Facilities Cost	Total Project Cost	Annual Cost	Annual Cost of Water (\$ per ac-ft)	Annual Cost of Water After Debt Service (\$ per ac-ft)
\$17,572,000	\$24,007,000	\$1,725,000	\$1,540	\$211

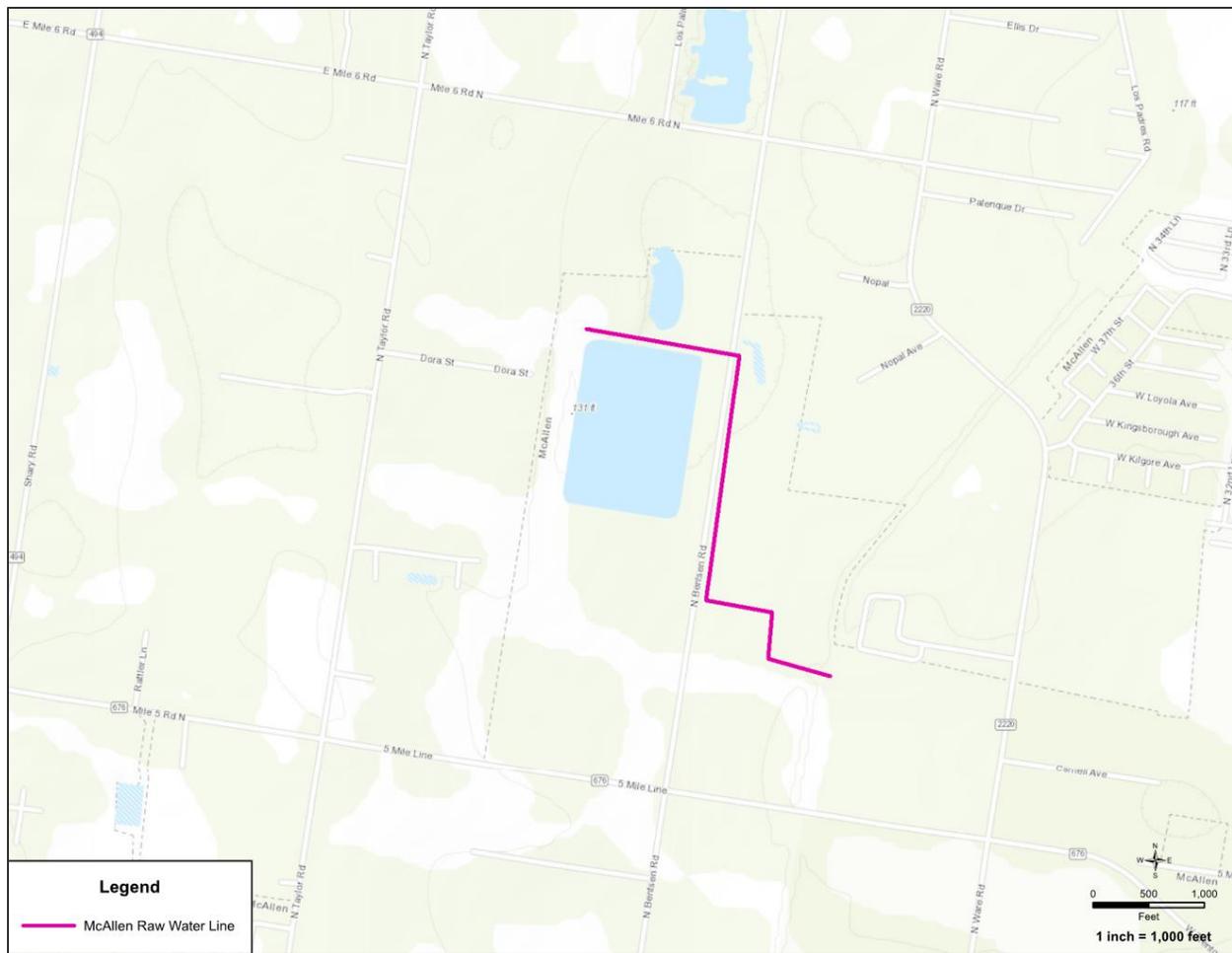
### 5.2.7.4 McAllen – Raw Waterline Project with HCID No. 1

#### Project Source

This strategy was submitted by the McAllen to the RWPG.

#### Description

This strategy is for the construction of a raw water transmission line from HCID No. 1 to McAllen’s North WTP. The raw water transmission line would provide the WTP with a second source of raw water from the irrigation canal, an important redundancy that does not currently exist. A map of the proposed pipeline alignment is shown on Figure 5-16.



**Figure 5-16 McAllen HCID No. 1 Raw Water Pipeline Project Location**

### Available Supply

Executed water rights and the raw water transmission line will provide McAllen with 800 ac-ft/yr beginning in the 2030 decade.

### Engineering and Costing

Costs for this strategy from the UCM include a pump station, pipeline, and land acquisition for pipeline ROW. Table 5-58 outlines the project costs developed in the UCM. The full UCM project cost estimate summary is provided in Appendix 5D.

### Implementation Issues

The project is completely within the service area limits of McAllen and no major issues are known at this time. Construction of the new pipeline may include any of the following permits: USACE Section 404 permit; TPWD sand, shell, gravel, and marl permit; TPDES Storm Water Pollution Prevention Plan; Texas DOT ROW permit. Additionally, easement acquisition may be required for the pipeline route.

**Table 5-58 McAllen – Raw Waterline Project with HCID No. 1 Project Costs**

Facilities Cost	Total Project Cost	Annual Cost	Annual Cost of Water (\$ per ac-ft)	Annual Cost of Water After Debt Service (\$ per ac-ft)
\$1,554,000	\$2,258,000	\$198,000	\$248	\$50

**5.2.7.5 Rio Hondo – Emergency Interconnects**

**Project Source**

This strategy was submitted by Rio Hondo to the RWPG during the 2016 Regional Water Planning process.

**Description**

This strategy is to construct a treated water delivery source from ERHWSC and a raw water pipeline from Harlingen ID to alleviate shortages in dry months caused by push water issues. During drought, when agricultural water is cut off, Irrigation District canals that move water from the Rio Grande to agricultural and municipal users have less water in them, because the agricultural water is not in the canal to “push” the municipal water to its recipients, reducing the volume of municipal supplies that reaches Rio Hondo. This emergency interconnect strategy provides a new increased supply of firm water above existing supply under drought of record conditions that Rio Hondo can rely on.

**Available Supply**

The emergency interconnect would have the capacity to provide 1 mgd (1,120 ac-ft/yr) of treated water from ERHWSC, and 1 mgd (1,120 ac-ft/yr) of raw water from Harlingen ID by 2030. However, Rio Hondo is only expected to use the emergency interconnect for a portion of each drought year and so supplies are based on 30 days of raw water and 30 days of treated water per year, or 20 ac-ft/yr, per the demand projections for this planning cycle.

**Engineering and Costing**

Costs for this strategy from the UCM include a pump station, pipeline, land acquisition, and pipeline ROW for each emergency connect. It is assumed that the construction period for this strategy is 1 year. Table 5-59 outlines the project costs developed in the UCM. The full UCM project cost estimate summary is provided in Appendix 5D.

**Implementation Issues**

No major implementation issues are anticipated for this strategy.

**Table 5-59 Rio Hondo – Emergency Interconnects Project Costs**

Facilities Cost	Total Project Cost	Annual Cost	Annual Cost of Water (\$ per ac-ft)	Annual Cost of Water After Debt Service (\$ per ac-ft)
\$5,231,000	\$7,551,000	\$635,600	\$31,780	\$5,280

### 5.2.7.6 Environmental Impacts of Recommended Distribution and Transmission Facilities Strategies

Potential environment impacts for water distribution systems strategies have been identified and categorized as described below. The letters identifying each section correspond to the headings in Table 5-60.

#### A. Acres Impacted Permanently

Acres impacted permanently refers to the total amount of area that will be permanently impacted because of the implementation of a strategy. The following conservative assumptions were made (unless more detailed information for a specific was available):

- The acreage impacted for pipelines is equivalent to the right-of-way (ROW) easements required; it is assumed 50 feet for ROW unless otherwise known.

#### B. Construction Impacted Acreage

Temporary environmental impacts may be seen during construction activities, such as increased air and noise pollution, and land disturbance activities. However, these effects are typical of any construction project. The construction impacted acreage was estimated as 110 percent (rounded up to a whole number) of the permanently impacted acreage.

#### C. Inundation Acreage

The inundation acreage applies to reservoirs only and is equal to the amount of land that will be inundated by the construction of the reservoir.

#### D. Agricultural Resources Impacted Acreage

Agricultural resources impact acreage is a consolidation of vegetation and land use types specific to Region – row crops, grass farms, and orchards - identified in the TPWD EMST. This GIS mapping data was overlain WMS locations to estimate the agricultural impact acreage from the implementation of the associated strategy.

#### E. Wetland Impact

The wetland impact refers to the probability that implementation of a WMS will affect a wetland. The location of wetlands in the region was determined using the National Wetlands Inventory (NWI) located at <http://www.fws.gov/wetlands/Data/Mapper.html>.

A strategy received a "1" if all or part of the strategy is located in a wetland or if it is close enough to where construction activities are likely to impact the wetland. All other strategies received zeros. If the exact location of project is unknown, it was given a zero because it was assumed that it would be located on a site that would not affect any wetland.

#### F. Habitat Impacted Acreage

Habitat impacted acreage refers to how the strategy will impact the habitat of the local area. The more area that is impacted because of the implementation of the strategy, the more the habitat of the area will be disrupted. Therefore, it was assumed that the permanent acreage impacted for a WMS is what would impact habitats.

## G. Threatened and Endangered Species Count

Threatened and endangered species count refers to how the strategy will impact those species in the area once implemented. This impact was quantified based on the number of federally-listed threatened and endangered species located within the county of the strategy. The number of threatened and endangered species came from the Texas Parks and Wildlife Department (TPWD) Rare, Threatened, and Endangered Species of Texas database (<http://tpwd.texas.gov/gis/rtest/>).

## H. Cultural Resources Impact

Cultural resources impact refers to how the strategy will impact cultural resources located within the area. Cultural resources are defined as the collective evidence of the past activities and accomplishments of people, including locations; buildings; and features with scientific, cultural, or historic value. It is assumed that no WMSs negatively affect cultural resources. Mitigation costs are included for strategies that require infrastructure, so it is assumed that none would be built in a location or way that disrupts culturally sensitive locations.

## I. Reliability

Reliability is an assessment of the availability of the specified water quantity to the user over time. If the quantity of water is available to the user all the time, then the strategy has a high reliability. If the quantity of water is contingent on other factors, reliability will be lower. This strategy was developed in accordance with WAM and/or MAG values for the appropriate area. As such, WMSs associated with new/improved infrastructure or distribution system or facilities expansions are considered to be reliable supply (reliability score = 5) that will not compromise the DFCs as established by the MAG or the environmental flow standards as established by 30 TAC §298.

## J. Bays, Estuaries, and Arms of the Gulf of Mexico

The environmental effects due to implementation of upstream WMS projects on bays, estuaries, and arms of the Gulf of Mexico are quantitatively assessed and reported. Water bodies designated as classified segments by the TCEQ that are within or downstream of Region M include the Brownsville Ship Channel, South Bay, Laguna Madre, and the Gulf of Mexico. Effects to these water bodies were quantified by estimating whether the project is anticipated to decrease freshwater inflow in these classified water bodies.

A WMS project received a "1" if it is expected to decrease freshwater inflow into a classified water body. If a strategy were to increase freshwater inflow or otherwise have little to no impact on inflows, then the project would receive a zero.

A summary of the identified and quantified environmental impacts for recommended distribution and transmission projects is presented in Table 5-60.

**Table 5-60 Environmental Impacts of Recommended Distribution and Transmission Strategies**

Entity	WMS Name	Yield*	A	B	C	D	E	F	G	H	I	J
ERHWSC	FM 2925 Water Transmission Line	30	142	156	0	32	0	142	25	0	5	0
El Jardin WSC	Distribution Pipeline Replacement	11	790	869	0	0	0	790	25	0	5	0

Entity	WMS Name	Yield*	A	B	C	D	E	F	G	H	I	J
HCID No. 6	Service Area Expansion	1,120	Unk**	Unk**	Unk**	Unk**	0	Unk**	8	0	5	0
McAllen	Raw Water Line Project	800	15	17	0	2	0	15	8	0	5	0
Rio Hondo	Emergency Interconnects	70	40	44	0	0	0	40	25	0	5	0
*First decade of implementation yield (ac-ft/yr).												
**These impacts are unknown due to the fact that costs were provided without infrastructure lengths or footprints provided.												

### 5.2.8 Storage Reservoirs

Storage reservoirs include both on-channel and off-channel new storage in the region. In some cases, other strategy categories contain projects that also include small storage ponds/reservoirs that are included within the larger project. They are not included in this section.

There are four off-channel reservoirs that are included as recommended strategies in the 2026 Plan. One of them, the Banco Morales Reservoir, is included in this section.

The other three (Delta “Panchita” Reservoir, Santa Cruz Reservoir, and Engleman Reservoir) are included with water treatment plants and fall under a regional type of strategy called the Delta Region Water Management Supply. The description for those three are in Section 5.2.12 Regional Water Supply Facilities.

There is also one alternative storage reservoir strategy that is described in Section 5.3.3.

Details for the hydrologic models used for evaluating storage reservoir water management strategies are listed in Table 5-61

**Table 5-61 Details for Hydrologic Models Used for Evaluating Storage Reservoir Strategies**

Model Name	Version Date	Input/Output Files Used	Date Model Used	Comments
TCEQ Rio Grande Run 3	10/1/2023	RG3.dat, RG3.dis, RG3.flo, RG3.his, RG3.fad, RG3.eva	Late 2024	Brownsville Weir set to Firm Yield (all other at authorized demand) and Banco Morales OCR Added as Described in Strategy Description
		RG3.out then numerous Tables *.tou		
		July 2022 version of the SIM and TABLES executables.		
		1-RG3-BMFY-2030 2-RG3-BMFY-2040 3-RG3-BMFY-2050 4-RG3-BMFY-2060 5-RG3-BMFY-2070 6-RG3-BMFY-2080		

Model Name	Version Date	Input/Output Files Used	Date Model Used	Comments
TCEQ Nueces-Rio Grande Coastal WAM Run 3	10/1/2023	NRG3.dat, NRG3.dis, NRG3.flo, NRG3.his, NRG3.fad, NRG3.eva	Late 2024	Delta Reservoir Project set to Yield with all associated Delta Reservoir water right authorizations operated with relative priority Upstream to Downstream. All other at authorized demand.
		NRG3.out then numerous Tables *.tou		
		July 2022 version of the SIM and TABLES executables.		
		7-NRG3-DL-UD		
TCEQ Nueces-Rio Grande Coastal WAM Run 3	10/1/2023	NRG3.dat, NRG3.dis, NRG3.flo, NRG3.his, NRG3.fad, NRG3.eva	Late 2024	Delta Reservoir Project set to Yield with all associated Delta Reservoir water right authorizations operated with relative priority Downstream to Upstream. All other at authorized demand.
		NRG3.out then numerous Tables *.tou		
		July 2022 version of the SIM and TABLES executables.		
		8-NRG3-DL-DU		

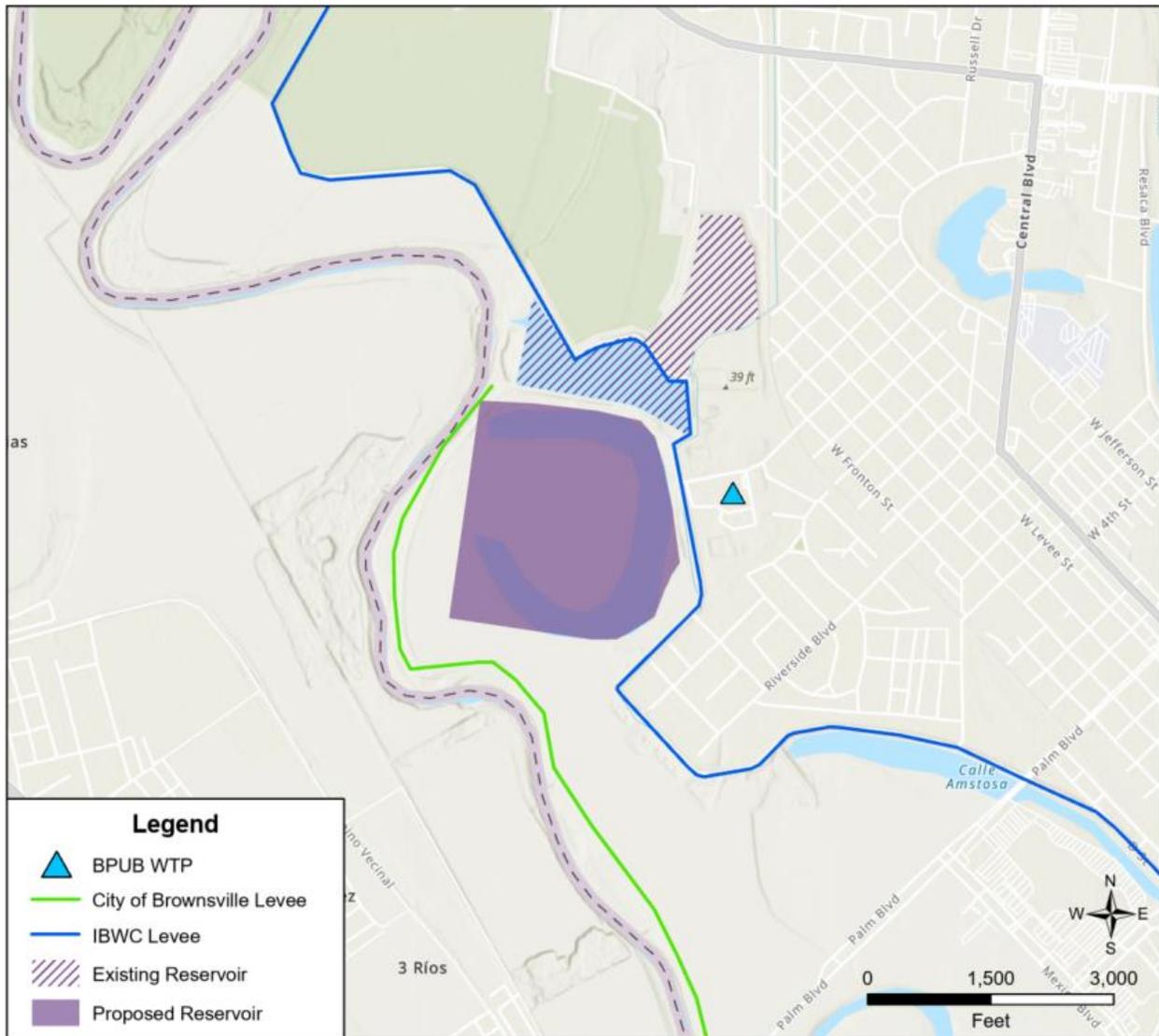
### 5.2.8.1 Brownsville PUB – Banco Morales Reservoir

#### Project Source

This strategy was submitted by Brownsville to the RWPG during the 2016 Regional Water Planning process and has been updated in each planning cycle since.

#### Description

This strategy is for the construction of an off-channel raw water reservoir to capture excess water from the lower Rio Grande that currently flows into the Gulf of Mexico. Water is currently released from the Falcon Dam with no opportunity to capture water at a downstream location in the event of rain or changed conditions. The reservoir would be located between the existing International Boundary and Water Commission (IBWC) levee system and the City of Brownsville’s levee along the Rio Grande, adjacent to BPUB’s WTP No. 1. Figure 5-17 shows the location of the reservoir project.



**Figure 5-17 Brownsville PUB – Banco Morales Reservoir Project Location Map**

### Available Supply

In addition to other water rights, BPUB currently has authorization to divert up to 40,000 ac-ft/yr of excess flows from the Rio Grande under TCEQ Permit No. 1838. Excess flows are defined as all U.S. waters passing the Brownsville stream flow gauging station above a base flow rate of 25 cfs. This proposed strategy would add an additional 400 million gallons (1,227 ac-ft) of storage capacity for the excess flows, resulting in a total storage capacity of 616 million gallons. The Rio Grande Water Availability Model (WAM) includes an evaluation of the drought year reliability for the Permit No. 1838. For the 2026 planning cycle, the Rio Grande WAM has been updated with naturalized flows through 2018 and a new drought-of-record period, as well as the correction of an error related to Permit No. 1838 that was in previous versions of the WAM. As a result, the estimated firm yield of 140 ac-ft/yr is much lower than in previous plans, although more water would be available in non-drought years. Planned implementation is before 2040.

## Engineering and Costing

The UCM was used to determine estimate costs for construction and maintenance of the reservoir. It is assumed that the construction period for this strategy is 1 year. The proposed site of the Banco Morales Reservoir is adjacent to the two existing reservoirs and the existing river pump station; therefore, piping system can be used to fill the new reservoir. The Banco will require pumping facilities to pump out of the reservoir and a transmission line to the Water Plant 1 intake and reservoir pump station intake. Both intakes are adjacent to the existing reservoir. This cost estimate is representative of 60 acres for the Reservoir foot-print and conservation pool at a land acquisition cost of \$365,000 and a mitigation cost for the same acreage of \$365,000, as well as a pump station and transmission line requiring land acquisition of 8 acres at a cost of \$51,000 and a mitigation cost for the same acreage of \$38,000. Table 5-62 outlines the project costs developed in the UCM. The full UCM project cost estimate summary is provided in Appendix 5D.

## Implementation Issues

BPUB will need complete the environmental compliance requirements and obtain a federal 404 permit authorization. BPUB would operate this project in conjunction with their existing flows diversion Permit No. 1838, which authorizes diversions of excess flows from the Rio Grande of 40,000 ac-ft/yr.

Banco Morales Reservoir has several environmental issues that have been raised as concerns. Most notable include impacts on water quality (i.e., increased salinity) within the reservoir caused by evaporative losses, increased risk of flooding, and potential impacts to habitat from reservoir construction and inundation. However, many of the environmental issues that have been raised regarding the Banco Morales Reservoir may be addressed through the Section 404/10 Federal permitting process and preparation of an Emergency Action Plan (EAP) through the TCEQ.

**Table 5-62      Brownsville PUB – Banco Morales Reservoir Project Costs**

Facilities Cost	Total Project Cost	Annual Cost	Annual Cost of Water (\$ per ac-ft)	Annual Cost of Water After Debt Service (\$ per ac-ft)
\$9,906,000	\$14,638,000	\$899,000	\$6,421	\$1,200

### 5.2.8.2 Environmental Impacts of Recommended Storage Reservoir Strategies

Potential environment impacts for reservoir storage systems strategies have been identified and categorized as described below. The letters identifying each section correspond to the headings in Table 5-63.

#### A.      Acres Impacted Permanently

Acres impacted permanently refers to the total amount of area that will be permanently impacted because of the implementation of a strategy. The following conservative assumptions were made (unless more detailed information for a specific was available):

- The acreage impacted for pipelines is equivalent to the right-of-way (ROW) easements required; it is assumed 50 feet for ROW unless otherwise known.
- WTP impacts are estimated using UCM, which is based on the plant type and capacity.

## **B. Construction Impacted Acreage**

Temporary environmental impacts may be seen during construction activities, such as increased air and noise pollution, and land disturbance activities. However, these effects are typical of any construction project. The construction impacted acreage was estimated as 110 percent (rounded up to a whole number) of the permanently impacted acreage.

## **C. Inundation Acreage**

The inundation acreage applies to reservoirs only and is equal to the amount of land that will be inundated by the construction of the reservoir.

## **D. Agricultural Resources Impacted Acreage**

Agricultural resources impact acreage is a consolidation of vegetation and land use types specific to Region – row crops, grass farms, and orchards - identified in the TPWD EMST. This GIS mapping data was overlain WMS locations to estimate the agricultural impact acreage from the implementation of the associated strategy.

## **E. Wetland Impact**

The wetland impact refers to the probability that implementation of a WMS will affect a wetland. The location of wetlands in the region was determined using the National Wetlands Inventory (NWI) located at <http://www.fws.gov/wetlands/Data/Mapper.html>.

A strategy received a "1" if all or part of the strategy is located in a wetland or if it is close enough to where construction activities are likely to impact the wetland. All other strategies received zeros. If the exact location of project is unknown, it was given a zero because it was assumed that it would be located on a site that would not affect any wetland.

## **F. Habitat Impacted Acreage**

Habitat impacted acreage refers to how the strategy will impact the habitat of the local area. The more area that is impacted because of the implementation of the strategy, the more the habitat of the area will be disrupted. Therefore, it was assumed that the permanent acreage impacted for a WMS is what would impact habitats.

## **G. Threatened and Endangered Species Count**

Threatened and endangered species count refers to how the strategy will impact those species in the area once implemented. This impact was quantified based on the number of federally-listed threatened and endangered species located within the county of the strategy. The number of threatened and endangered species came from the Texas Parks and Wildlife Department (TPWD) Rare, Threatened, and Endangered Species of Texas database (<http://tpwd.texas.gov/gis/rtest/>).

## **H. Cultural Resources Impact**

Cultural resources impact refers to how the strategy will impact cultural resources located within the area. Cultural resources are defined as the collective evidence of the past activities and accomplishments of people, including locations; buildings; and features with scientific, cultural, or historic value. It is assumed that no WMSs negatively affect cultural resources. Mitigation costs are included for strategies that require infrastructure, so it is assumed that none would be built in a location or way that disrupts culturally sensitive locations.

**I. Reliability**

Reliability is an assessment of the availability of the specified water quantity to the user over time. If the quantity of water is available to the user all the time, then the strategy has a high reliability. If the quantity of water is contingent on other factors, reliability will be lower. This strategy was developed in accordance with WAM and/or MAG values for the appropriate area. As such, WMSs associated with new/improved infrastructure or distribution system or facilities expansions are considered to be reliable supply (reliability score = 5) that will not compromise the DFCs as established by the MAG or the environmental flow standards as established by 30 TAC §298. The reliability of on/off-channel reservoirs is also projected to be high (reliability score = 5).

**J. Bays, Estuaries, and Arms of the Gulf of Mexico**

The environmental effects due to implementation of upstream WMS projects on bays, estuaries, and arms of the Gulf of Mexico are quantitatively assessed and reported. Water bodies designated as classified segments by the TCEQ that are within or downstream of Region M include the Brownsville Ship Channel, South Bay, Laguna Madre, and the Gulf of Mexico. Effects to these water bodies were quantified by estimating whether the project is anticipated to decrease freshwater inflow in these classified water bodies.

A WMS project received a "1" if it is expected to decrease freshwater inflow into a classified water body. If a strategy were to increase freshwater inflow or otherwise have little to no impact on inflows, then the project would receive a zero.

A summary of the identified and quantified environmental impacts for recommended and alternative municipal infrastructure is presented in Table 5-63.

**Table 5-63 Environmental Impacts of Recommended Storage Reservoir Strategies**

Entity	WMS Name	Yield*	A	B	C	D	E	F	G	H	I	J
<b>Storage</b>												
<b>Recommended</b>												
Brownsville PUB	Banco Morales Reservoir	140	60	66	60	0	0	60	25	0	5	1
*First decade of implementation yield (ac-ft/yr).												

**5.2.9 New or Expanded Fresh Groundwater Supply**

While there is not abundant fresh groundwater available in Region M, there are numerous entities and individuals that rely on minimally treated groundwater to meet their needs. For example, this includes cities that are farther from the Rio Grande and with surface water distribution networks that have few alternative sources and have identified portions of the aquifer(s) that produce acceptable water for municipal use without advanced treatment technology.

In some cases, where there appears to be additional available fresh groundwater, further development of that source is recommended, within the MAG values for the applicable aquifer. In many instances this is the recommendation for County-Other entities, where domestic wells are distributed over a large area

and pump small amounts for a single household, although there are planned communities within Webb County that will fall under County-Other as well.

For the 2026 planning cycle, nine recommended fresh groundwater strategies were carried over from the 2021 cycle, with updates made as needed. Three others were carried over as alternative strategies and are described in Section 5.3.4. The recommended fresh groundwater strategies include:

- Alamo – Fresh Groundwater Well.
- County-Other, Cameron – Expanded Fresh Groundwater Supply.
- County-Other, Starr – Additional Fresh Groundwater Wells.
- County-Other, Webb – Additional Fresh Groundwater Wells.
- Edcouch – New Fresh Groundwater Supply
- Hidalgo – Expand Existing Fresh Groundwater Wells
- Rio Hondo – New Fresh Groundwater Supply
- Webb County Water Utility – Expanded Fresh Groundwater Supply
- Weslaco – Groundwater Development and Blending
- Elsa – Municipal Fresh Groundwater Well

Environmental impacts are described in Section 5.2.9.11.

### **5.2.9.1 Alamo – Fresh Groundwater Well**

#### **Project Source**

This strategy was submitted by Alamo to the RWPG.

#### **Description**

This strategy is to provide additional groundwater to Alamo with the installation of a groundwater well. The city operates a 5 mgd conventional WTP supplied by an existing well. The new well will be located approximately 1,000 feet from the existing well. It is assumed that the salinity of the new well will be similar to the existing well, so desalination treatment will not be needed.

#### **Available Supply**

It is estimated that the new groundwater well could provide an additional 1 mgd (1,120 ac-ft/yr) to the WTP of the city. This supply would come from the Gulf Coast Aquifer System in Hidalgo County. There is sufficient supply within the MAG to support this project.

#### **Engineering and Costing**

Costs for this strategy from the UCM include groundwater well pumping, well field piping, land acquisition, and operations and maintenance. It is assumed that the construction period for this strategy is 1 year. Table 5-64 outlines the project costs developed in the UCM. The full UCM project cost estimate summary is provided in Appendix 5D.

### Implementation Issues

No implementation issues have been identified. There is no Groundwater Conservation District within the Alamo water service area.

**Table 5-64 Alamo – Fresh Groundwater Well Project Costs**

Facilities Cost	Total Project Cost	Annual Cost	Annual Cost of Water (\$ per ac-ft)	Annual Cost of Water After Debt Service (\$ per ac-ft)
\$1,714,000	\$2,411,000	\$210,000	\$188	\$36

### 5.2.9.2 County-Other, Cameron – Expanded Fresh Groundwater Supply

#### Project Source

This strategy was recommended in the 2016 RWP and has been updated by the RWPG.

#### Description

This strategy is to provide additional supply to County-Other, Cameron with the installation of fresh groundwater wells.

#### Available Yield

This strategy allows for the development of 2,500 ac-ft/yr of groundwater from the Gulf Coast Aquifer System in Cameron County, beginning in 2030. This supply is within the stated groundwater availability for Cameron County.

#### Engineering and Costing

The UCM was utilized to develop estimated costs for this strategy in September 2023 dollars based on assumptions about the individual wells. The wells were costed with a capacity of 350 gpm. Well piping and land acquisition were also included in the cost estimate, although in some cases those may not be needed if the well is for a private homeowner. Disinfection treatment was also included. Table 5-65 outlines the project costs developed in the UCM. The full UCM project cost estimate summary is provided in Appendix 5D.

### Implementation Issues

No major implementation issues are expected for this strategy. Construction of the new groundwater wells and piping may also include a TCEQ well drilling permit, purchase of land, and a TXDOT right-of-way permit. There is no Groundwater Conservation District in Cameron County.

**Table 5-65 County-Other, Cameron – Expanded Fresh Groundwater Supply Project Costs**

Facilities Cost	Total Project Cost	Annual Cost	Annual Cost of Water (\$ per ac-ft)	Annual Cost of Water After Debt Service (\$ per ac-ft)
\$7,918,000	\$11,549,000	\$1,080,000	\$432	\$107

### 5.2.9.3 County-Other, Starr – Additional Fresh Groundwater Wells

#### Project Source

This strategy was identified by the RWPG and continues to be included for the 2026 Plan.

#### Description

This strategy is to provide additional supply to County-Other, Starr with fresh groundwater wells.

#### Available Yield

The available supply is 400 ac-ft/yr beginning in 2030. This supply is available from the Gulf Coast Aquifer System in Starr County.

#### Engineering and Costing

The UCM was utilized to develop estimated costs for this strategy based on assumptions about the individual wells. Five wells were costed with a capacity of 50 gpm, including well construction, studies, land acquisition, and O&M, assuming limited well field piping. Disinfection treatment cost was included. Table 5-66 outlines the project costs developed in the UCM. The full UCM project cost estimate summary is provided in Appendix 5D.

#### Implementation Issues

No major implementation issues are expected for this strategy. Construction of the new groundwater wells and piping may require a TCEQ well drilling permit, as well as coordination with and approval from the Starr Groundwater Conservation District.

**Table 5-66 County-Other, Starr – Additional Fresh Groundwater Wells Project Costs**

Facilities Cost	Total Project Cost	Annual Cost	Annual Cost of Water (\$ per ac-ft)	Annual Cost of Water After Debt Service (\$ per ac-ft)
\$1,216,000	\$1,718,000	\$182,000	\$455	\$153

### 5.2.9.4 County-Other, Webb – Additional Fresh Groundwater Wells

#### Project Source

This strategy was identified by the RWPG and updated to incorporate new developments for the 2026 Plan.

#### Description

This strategy is to provide additional supply to County-Other, Webb with the installation of fresh groundwater wells.

#### Available Yield

Based on preliminary needs estimates for County-Other, Webb, and information about two new development projects north of Laredo, a total of 1,120 ac-ft/yr has been identified for supply beginning in 2030. It is assumed that 560 ac-ft/yr will come from the Carrizo-Wilcox Aquifer in Webb County and the other 560 ac-ft/yr will come from the Yegua-Jackson Aquifer in Webb County.

## Engineering and Costing

UCM was used to estimate costs on the basis of the project requirements shown below. Eight wells were costed with a capacity of 200 gpm, including well construction, field piping, disinfection treatment, a ground storage tank, studies, land acquisition, and O&M. Table 5-67 outlines the project costs developed in the UCM. The full UCM project cost estimate summary is provided in Appendix 5D.

## Implementation Issues

No major implementation issues are expected for this strategy. Construction of new groundwater wells may also include a TCEQ well drilling permit, and wells for domestic use are encouraged to perform water quality testing. There is no groundwater conservation district in Webb County.

**Table 5-67 County-Other, Webb – Additional Fresh Groundwater Wells Project Costs**

Facilities Cost	Total Project Cost	Annual Cost	Annual Cost of Water (\$ per ac-ft)	Annual Cost of Water After Debt Service (\$ per ac-ft)
\$12,617,000	\$18,353,000	\$1,504,000	\$1,343	\$190

### 5.2.9.5 Edcouch – New Fresh Groundwater Supply

#### Project Source

This strategy was submitted by Edcouch to the RWPG in the 2016 planning cycle.

#### Description

This strategy is for the construction of a groundwater well and raw water transmission line to deliver water to the existing 1.5 mgd WTP. Edcouch currently receives raw water from the Rio Grande through the canal system operated by HCID No. 9. This strategy would ensure a reliable secondary source of raw water for Edcouch in case of limited supplies through the ID.

Edcouch anticipates drilling a pilot well and conducting a water quality study to ensure that the present water treatment processes at the existing WTP can treat the new water supply. After testing, Edcouch will identify if additional treatment would be needed at the WTP.

#### Available Supply

The project includes two 350 gpm wells, which are assumed to operate approximately 50 percent of the time. The wells would be located in the Gulf Coast Aquifer System in Hidalgo County. These wells would supply 500 ac-ft of groundwater per year to supplement the existing raw surface water supply beginning in 2030.

## Engineering and Costing

Costs for this strategy from the UCM include a well pump, well field piping, a 4-mile transmission line, disinfection treatment, and land acquisition. It is assumed that the construction period for this strategy is 2 years. Table 5-68 outlines the project costs developed in the UCM. The full UCM project cost estimate summary is provided in Appendix 5D.

### Implementation Issues

No major implementation issues are associated with this strategy. Edcouch would need to receive permits from the TCEQ. The Edcouch service area is not within a groundwater conservation district.

**Table 5-68 Edcouch – New Fresh Groundwater Supply Project Costs**

Facilities Cost	Total Project Cost	Annual Cost	Annual Cost of Water (\$ per ac-ft)	Annual Cost of Water After Debt Service (\$ per ac-ft)
\$6,395,000	\$9,529,000	\$801,000	\$1,602	\$262

### 5.2.9.6 Hidalgo – Expand Existing Fresh Groundwater Wells

#### Project Source

This strategy was recommended in the 2016 RWP and updated by the RWPG.

#### Description

This strategy is to provide additional supply to Hidalgo with the installation of additional fresh groundwater wells.

#### Available Supply

The proposed groundwater wells would provide 300 ac-ft/yr in 2040 from the Gulf Coast Aquifer System in Hidalgo County.

#### Engineering and Costing

Costs for this strategy from the UCM include groundwater well pumping, well field piping, land acquisition, and water disinfection. It is assumed that the construction period for this strategy is 1 year. Table 5-69 outlines the project costs developed in the UCM. The full UCM project cost estimate summary is provided in Appendix 5D.

### Implementation Issues

No major implementation issues are expected for this strategy. Varying groundwater quality in the Gulf Coast Aquifer is a concern, but freshwater wells are productive in the area near Hidalgo. All recommended groundwater pumping is guided by the MAG values. Construction of the new groundwater well and piping may also include a TCEQ well drilling permit, purchase of land, and a Texas DOT ROW permit. There is no groundwater conservation district within the Hidalgo service area.

**Table 5-69 Hidalgo – Expand Existing Fresh Groundwater Wells Project Costs**

Facilities Cost	Total Project Cost	Annual Cost	Annual Cost of Water (\$ per ac-ft)	Annual Cost of Water After Debt Service (\$ per ac-ft)
\$2,612,000	\$3,811,000	\$325,000	\$1,083	\$190

### 5.2.9.7 Rio Hondo – New Fresh Groundwater Supply

#### Project Source

This strategy was submitted by Rio Hondo to the RWPG.

#### Description

This strategy is for the construction of two 750 gpm wells. The well siting will be on Rio Hondo-owned property based on the area hydrogeology, acquisition feasibility, construction feasibility, regulatory compliance, hydraulic considerations, environmental factors, and cost. A water transmission line will be routed from the new wells to the existing raw water reservoirs.

#### Available Supply

This project was sized to access 1 mgd (1,120 ac-ft/yr) of fresh groundwater from the Gulf Coast Aquifer System in Cameron County. The Gulf Coast Aquifer in Cameron County is showing some MAG-limited issues this planning cycle, due to high demand for new groundwater projects resulting from surface water availability issues. As a result, while the project is expected to come online by 2030, the full yield will not be available until 2060. Table 5-70 outlines the available project yield for each decade.

**Table 5-70 Rio Hondo – Project Yield Available (ac-ft/yr) Under the MAG, by Decade**

2030	2040	2050	2060	2070	2080
1,040	988	1,106	1,120	1,120	1,120

#### Engineering and Costing

Costs for this strategy from the UCM include two groundwater wells, well field piping, a 1-mile transmission line and pump station, and land acquisition (for the transmission line only). It is assumed that the construction period for this strategy is 1 year. Table 5-71 outlines the project costs developed in the UCM. The last column in the table shows the annual unit cost of the water, based on the MAG-limited available yield for 2030. The full UCM project cost estimate summary is provided in Appendix 5D.

#### Implementation Issues

The yield of the project will need to stay within the MAG, particularly during the first few decades of implementation. There is no GCD within the service area of Rio Hondo.

**Table 5-71 Rio Hondo – New Fresh Groundwater Supply Project Costs**

Facilities Cost	Total Project Cost	Annual Cost	Annual Cost of Water – Ultimate (\$ per ac-ft)	Annual Cost of Water After Debt Service (\$ per ac-ft)	Annual Cost of Water – First Decade Online (\$ per ac-ft)
\$6,177,000	\$8,738,000	\$729,000	\$651	\$103	\$701

### 5.2.9.8 Webb County Water Utility – Expanded Fresh Groundwater Supply

#### Project Source

This strategy was submitted by Webb County Water Utility during the 2021 regional water planning process.

## Description

This strategy is to provide additional supply to Webb County Water Utility, as a part of the improvements to the utility’s WTP and groundwater system. The strategy shown here reflects only the additional new groundwater supply components that provide an increase to their existing supplies.

## Available Yield

Due to MAG limitations, this strategy would provide up to 180 ac-ft/yr from the Carrizo-Wilcox Aquifer in Webb County starting in the 2030 decade.

## Engineering and Costing

Costs for this strategy from the UCM include groundwater well pumping, well field piping, land acquisition, and water disinfection. It is assumed the construction / rehabilitation period for this strategy is one year.

UCM was used to estimate costs on the basis of the project requirements shown below. Two wells were costed with a capacity of 200 gpm, including well construction, well field piping, disinfection treatment, studies, land acquisition, and O&M. Table 5-72 outlines the project costs developed in the UCM. The full UCM project cost estimate summary is provided in Appendix 5D.

## Implementation Issues

No major implementation issues are expected for this strategy. Construction of new groundwater wells may also include a TCEQ well drilling permit, and wells for domestic use are encouraged to perform water quality testing. There is no groundwater conservation district in Webb County.

**Table 5-72 Webb County Water Utility – Expanded Fresh Groundwater Supply Project Costs**

Facilities Cost	Total Project Cost	Annual Cost	Annual Cost of Water (\$ per ac-ft)	Annual Cost of Water After Debt Service (\$ per ac-ft)
\$2,467,000	\$3,549,000	\$299,000	\$1,661	\$272

## 5.2.9.9 Weslaco – Groundwater Development and Blending

### Project Source

This strategy was submitted by Weslaco to the RWPG.

### Description

This strategy is for the construction of a groundwater well to supplement the drinking water supply of Weslaco. They plan to blend the groundwater with treated drinking water. Weslaco is currently supplied with raw water from Hidalgo and Cameron Counties ID No. 9. This strategy would provide them with an alternate source of water, especially during times of drought. Possible well site locations still need to be evaluated and it is anticipated that a pilot well and water quality study will be required.

### Available Supply

It is anticipated that 0.5 mgd (560 ac-ft/yr) would be produced from the well in the Gulf Coast Aquifer System in Hidalgo County, beginning in 2030.

## Engineering and Costing

Costs for this strategy from the UCM include a 400 gpm well and pump, well field piping, and land acquisition. It is assumed that the construction period for this strategy is 1 year. Table 5-73 outlines the project costs developed in the UCM. The full UCM project cost estimate summary is provided in Appendix 5D.

## Implementation Issues

As with any project, necessary state and federal permits must be obtained before construction can begin. There is no groundwater conservation district within the Weslaco service area.

**Table 5-73 Weslaco – Groundwater Development and Blending Project Costs**

Facilities Cost	Total Project Cost	Annual Cost	Annual Cost of Water (\$ per ac-ft)	Annual Cost of Water After Debt Service (\$ per ac-ft)
\$1,343,000	\$1,943,000	\$157,000	\$280	\$36

### 5.2.9.10 Elsa – Municipal Fresh Groundwater Well

#### Project Source

This strategy was submitted by Elsa to the RWPG for the 2026 RWP.

#### Description

This strategy is to provide new additional supply to Elsa with the installation of a high-capacity fresh groundwater well in the Evangeline portion of the Gulf Coast Aquifer System to supplement and blend with the existing surface supply, enhancing system resilience and long-term sustainability.

Using a blending ratio of 40-60% groundwater to 40-60% surface water, groundwater supply from the new well would be treated with chlorine disinfection and blended before entering the distribution system. Telemetry and VFD controls will be implemented for automated operation and monitoring.

#### Available Supply

The proposed groundwater wells would provide 2,464 ac-ft/yr (2.2 MGD) beginning by 2040 from the Evangeline portion of the Gulf Coast Aquifer System in Hidalgo County. There is sufficient supply within the MAG to support this project.

## Engineering and Costing

Costs for this strategy from the UCM include groundwater well pumping, well field piping, land acquisition, water disinfection, and a 2-mile transmission pipeline and pump station to connect the wellfield to the existing surface water plant. It is assumed that the construction period for this strategy is 1 year. Table 5-74 outlines the project costs developed in the UCM. The full UCM project cost estimate summary is provided in Appendix 5D.

## Implementation Issues

No major implementation issues are expected for this strategy. Varying groundwater quality in the Gulf Coast Aquifer is a concern, but freshwater wells are productive in the area. All recommended groundwater pumping is guided by the MAG values. Construction of the new groundwater well and

pipng may also include a TCEQ well drilling permit, purchase of land, and a Texas DOT ROW permit. There is no groundwater conservation district within the Elsa service area.

**Table 5-74 Elsa - Municipal Fresh Groundwater Well Project Costs**

Facilities Cost	Total Project Cost	Annual Cost	Annual Cost of Water (\$ per ac-ft)	Annual Cost of Water After Debt Service (\$ per ac-ft)
\$7,996,000	\$11,143,000	\$1,048,000	\$425	\$108

### 5.2.9.11 Environmental Impacts of Recommended Fresh Groundwater Strategies

Potential environment impacts for fresh groundwater strategies have been identified and categorized as described below. The letters identifying each section correspond to the headings in Table 5-75

#### Environmental Impacts of Recommended Fresh Groundwater Strategies

#### A. Acres Impacted Permanently

Acres impacted permanently refer to the total amount of area that will be permanently impacted because of the implementation of a strategy. The following conservative assumptions were made (unless more detailed information for a specific was available):

- The acres impacted for pipelines is equivalent to the ROW easements required; it is assumed 100-feet for ROW unless otherwise known.
- WTP impacts are estimated using UCM, which is based on the plant capacity.
- The impact of wells and wellfields are given by the UCM, which includes 0.5 acre per well.

#### B. Construction Impacted Acreage

Temporary environmental impacts may be seen during construction activities, such as increased air and noise pollution, and land disturbance activities. However, these effects are typical of any construction project. The construction impacted acreage was estimated as 110 percent (rounded up to a whole number) of the permanently impacted acreage.

#### C. Agricultural Resources Impacted Acreage

Agricultural resources impact acreage is a consolidation of vegetation and land use types specific to Region – row crops, grass farms, and orchards - identified in the TPWD EMST. This GIS mapping data was overlain WMS locations to estimate the agricultural impact acreage from the implementation of the associated strategy.

#### D. Wetland Impact

The wetland impact refers to the probability that implementation of a WMS will affect a wetland. The location of wetlands in the Region was determined using the NWI located at <http://www.fws.gov/wetlands/Data/Mapper.html>.

A strategy received a "1" if all or part of the strategy is located in a wetland or if it is close enough to where construction activities are likely to impact the wetland. All other strategies received zeros. If the

exact location of project is unknown it was given a zero because it was assumed that it would be located on a site that would not affect and wetland.

#### **E. Habitat Impacted Acreage**

Habitat impacted acreage refers to how the strategy will impact the habitat of the local area. The more area that is impacted because of the implementation of the strategy, the more the habitat of the area will be disrupted. Therefore, it was assumed that the permanent acreage impacted for a WMS is what would impact habitats.

#### **F. Threatened and Endangered Species Count**

Threatened and endangered species count refers to how the strategy will impact those species in the area once implemented. This impact was quantified based on the number of federally-listed threatened and endangered species located within the county of the strategy. The number of threatened and endangered species came from the TPWD Rare, Threatened, and Endangered Species of Texas database (<http://tpwd.texas.gov/gis/rtest/>).

#### **G. Cultural Resources Impact**

Cultural resources impact refers to how the strategy will impact cultural resources located within the area. Cultural resources are defined as the collective evidence of the past activities and accomplishments of people, including locations, buildings, and features with scientific, cultural, or historic value. It is assumed that no WMSs negatively affect cultural resources. Mitigation costs are included for strategies that require infrastructure so it is assumed that none would be built in a location or way that disrupts culturally sensitive locations.

#### **H. Reliability**

Reliability is an assessment of the availability of the specified water quantity to the user over time. If the quantity of water is available to the user all the time, then the strategy has a high reliability. If the quantity of water is contingent on other factors, reliability will be lower. These strategies were developed in accordance with MAG values for the appropriate aquifer and county. As such, most are considered to be reliable supply (reliability score = 5) that will not compromise the DFCs as established by the relevant GCD (where applicable) and groundwater management area (GMA). Some of the strategies may score slightly lower in reliability due to availability of hydrogeologic information from existing nearby wells, potential of differing well productivity and water quality, potential impacts to natural resources and aquifer competition or restrictions.

#### **I. Bays, Estuaries, and Arms of the Gulf of Mexico**

The environmental effects due to implementation of upstream WMS projects on bays, estuaries, and arms of the Gulf of Mexico are quantitatively assessed and reported. Water bodies designated as classified segments by the TCEQ that are within or downstream of Region M include the Brownsville Ship Channel, South Bay, Laguna Madre, and Gulf of Mexico. Effects to these water bodies were quantified by estimating whether the project is anticipated to decrease freshwater inflow in these classified water bodies.

A WMS project received a "1" if it is expected to decrease freshwater inflow into a classified water body. If a strategy were to increase freshwater inflow or otherwise have little to no impact on inflows, then the project would receive a zero.

A summary of the identified and quantified environmental impacts for recommended and alternative fresh groundwater projects is presented in Table 5-75 Environmental Impacts of Recommended Fresh Groundwater Strategies

**Table 5-75 Environmental Impacts of Recommended Fresh Groundwater Strategies**

Entity	WMS Name	Yield*	A	B	C	D	E	F	G	H	I
Alamo	Groundwater Well	1,120	5	6	0	0	5	8	0	5	0
County-Other, Cameron	Expand Groundwater Supply	2,500	32	35	0	0	32	25	0	5	0
County-Other, Starr	Additional Groundwater Wells	400	8	9	0	0	8	8	0	5	0
County-Other, Webb	Additional Groundwater Wells	1,120	75	82	0	0	75	4	0	5	0
Elsa	Municipal Fresh Groundwater Well	2,464	13	15	0	0	13	8	0	5	0
Edcouch	New Groundwater Supply	500	61	67	0	0	61	8	0	4	0
Hidalgo	Expand Existing Groundwater Wells	300	5	6	1	0	5	8	0	4	0
Rio Hondo	New Groundwater Supply	1,120	1	1	0	0	1	25	0	3	0
Webb County Water Utility	Expanded Groundwater Supply	180	10	11	0	0	10	4	0	4	0
Weslaco	Groundwater Blending	560	5	6	0	0	5	8	0	4	0
*First decade of implementation yield (ac-ft/yr)											

### 5.2.10 New or Expanded Brackish Groundwater Desalination

Desalination is the process of removing dissolved solids and other minerals from brackish and saline groundwater, and seawater. TWDB classifies brackish groundwater as groundwater with a total dissolved solids (TDS) content between 1,000 and 10,000 parts per million (ppm), while saline groundwater exceeds 10,000 ppm of TDS (TWDB, 2019). The most common method of treatment is membrane technology, but there are other technologies, including thermal processes such as multistage flash distillation, multiple-effect distillation, and vapor compression. Thermal processes are energy intense and are more common in the Middle East where fuels are more abundant.

The prevalent membrane technology is RO, which forces saline water through semi-permeable membranes to separate into fresh water and highly concentrated briny byproduct. For high TDS, RO is more energy intensive and has a lower yield of permeate, or fresh water. A typical pressure for seawater with 35,000 mg/L could be in excess of 1,000 pounds per square inch (psi). This is in contrast to less than 200 psi for 3,000 mg/L TDS groundwater. The higher TDS treatment plants yield less than 50 percent of the water supplied. The remaining 50 percent is highly saline residual, which generally requires disposal and can add significant costs to a project. Conversely, lower salinity brackish water facilities are able to produce an 80 percent to 20 percent, fresh water to residual concentrate. Surface water intakes will

require additional pretreatment of suspended solids prior to the RO treatment. The TWDB recommends the following for all desalination projects:

- Feasibility studies;
- Consideration of regional-scale projects;
- Assessment of combined uses of seawater and brackish groundwater sources as a means of enhancing the cost-competitiveness of a desalination project;
- Identification and assessment of regional partnerships, including local entities experienced in desalination research;
- Identification and assessment of water transfers resulting from net new water created by a desalination project that could enhance the benefits of the project to other large water users/municipalities;
- Consider approaches to structuring such transfers and draft agreements that would be required to secure their implementation;
- Identification and assessment of likely power sources and potential for co-located facility; and
- Assessment of project funding and development alternatives.

For the 2026 planning cycle, thirteen recommended brackish groundwater desalination strategies were carried over from the 2021 cycle, with updates made as needed, and eleven new strategies were evaluated. All twenty-four strategies are identified as recommended for this planning cycle, although some have MAG-limited yields in earlier decades. The recommended brackish groundwater desalination strategies include:

- Agua SUD – Brackish Groundwater Desalination Phase I and II.
- Alamo – Brackish Groundwater Desalination.
- Eagle Pass – Brackish Groundwater Desalination.
- East Rio Hondo WSC – North Cameron Regional WTP Wellfield Expansion.
- East Rio Hondo WSC – Brackish Desalination Wellfield and RO at NRWTP and MASWTP.
- East Rio Hondo WSC – Expansion of MASWTP.
- La Feria – Water Well with RO Unit.
- Lyford – Brackish Groundwater Desalination.
- McAllen – Brackish Groundwater Desalination.
- Mission – Brackish Groundwater Desalination.
- North Alamo WSC – Delta Area Brackish Groundwater Desalination.
- Primera – RO WTP with Groundwater Well.
- San Benito – Brackish Groundwater Blending.
- San Juan – Brackish Groundwater Desalination.
- San Juan – WTP 1 Expansion with Brackish Groundwater Desalination.
- Sharyland WSC – Well and RO Unit at WTP 2.

- Sharyland WSC – Well and RO Unit at WTP 3.
- Southmost RWA – Brackish Groundwater Desalination Wellfield Expansion.
- Southmost RWA – Phase 3 SRWA Wellfield Optimization and WTP Expansion.
- Southmost RWA – Phase 4 SRWA Wellfield and WTP Expansion.
- Donna – New Brackish Groundwater Desalination.
- Maverick County – New Brackish Groundwater Desalination.
- Mercedes – New Brackish Groundwater Desalination.
- Pharr – New Brackish Groundwater Desalination.

Environmental impacts are described in Section 5.2.10.25

### 5.2.10.1 Agua SUD – Brackish Groundwater Desalination

#### Project Source

This strategy was submitted by Agua Special Utility District (Agua SUD) to the RWPG for the 2026 RWP.

#### Description

Agua SUD primarily relies on surface water sources to meet its drinking water needs. To diversify the district’s water portfolio, Agua SUD plans to conduct a feasibility study aimed at establishing groundwater as an alternative source via the Gulf Coast Aquifer System in Hidalgo County. This strategy is to drill a new brackish groundwater well field and constructing a new RO WTP to treat the brackish water to potable drinking water standards. An injection well is included for disposal of brine concentrate.

#### Available Supply

The first phase of the new brackish groundwater project is sized to pump 3,500 ac-ft/yr and supply 2,800 ac-ft/yr starting in the 2030 decade. The second phase of the project is sized to pump an additional 3,500 ac-ft/yr starting in the 2050 decade. Assuming a RO efficiency of 80%, this strategy would require pumping 7,000 ac-ft/yr of raw water, resulting in the 5,600 ac-ft/yr total yield for both phases (20% water loss).

#### Engineering and Costing

Costs for this strategy from the UCM include groundwater well pumping, well field piping, land acquisition, and water treatment. It is assumed that the construction period for this strategy is 1.5 years. Table 5-76 and Table 5-77 outline the project costs developed in the UCM for Phase I and Phase II, respectively. The full UCM project cost estimate summary is provided in Appendix 5D.

#### Implementation Issues

No major implementation issues are expected for this strategy. Approval for additional concentrate disposal will be needed from TCEQ. Construction of the new groundwater well and piping may also include purchase of land and a Texas DOT ROW permit. There is no groundwater conservation district within the Agua SUD service area.

**Table 5-76 Agua SUD – Brackish Groundwater Desalination Phase I Project Costs**

Facilities Cost	Total Project Cost	Annual Cost	Annual Cost of Water (\$ per ac-ft)	Annual Cost of Water After Debt Service (\$ per ac-ft)
\$46,518,000	\$66,173,000	\$11,405,000	\$4,073	\$2,411

**Table 5-77 Agua SUD – Brackish Groundwater Desalination Phase II Project Costs**

Facilities Cost	Total Project Cost	Annual Cost	Annual Cost of Water (\$ per ac-ft)	Annual Cost of Water After Debt Service (\$ per ac-ft)
\$46,518,000	\$66,173,000	\$11,405,000	\$4,073	\$2,411

### 5.2.10.2 Alamo – Brackish Groundwater Desalination

#### Project Source

This strategy was recommended in the 2011 RWP and updated by the RWPG.

#### Description

This strategy is to drill a new brackish groundwater well from the Gulf Coast Aquifer System in Hidalgo County and construct a new RO WTP to treat the brackish water to potable drinking water standards. An injection well is included for disposal of brine concentrate.

#### Available Supply

This strategy would provide an additional 0.8 mgd of drinking water supply to Alamo by 2030. Assuming a RO efficiency of 80%, this strategy would require pumping 1,120 ac-ft/yr of raw water, resulting in the 896 ac-ft/yr yield (20% water loss).

#### Engineering and Costing

Costs for this strategy from the UCM include groundwater well pumping, well field piping, land acquisition, and brackish desalination water treatment with a concentrate injection well. It is assumed that the construction period for this strategy is 1.5 years. Table 5-78 outlines the project costs developed in the UCM. The full UCM project cost estimate summary is provided in Appendix 5D.

#### Implementation Issues

No major implementation issues are expected for this strategy. Approval for additional concentrate disposal will be needed from TCEQ. Construction of the new groundwater well and piping may also include purchase of land and a Texas DOT ROW permit. There is no groundwater conservation district within the Alamo service area.

**Table 5-78 Alamo – Brackish Groundwater Desalination Project Costs**

Facilities Cost	Total Project Cost	Annual Cost	Annual Cost of Water (\$ per ac-ft)	Annual Cost of Water After Debt Service (\$ per ac-ft)

\$26,468,000	\$37,573,000	\$7,380,000	\$8,237	\$5,286
--------------	--------------	-------------	---------	---------

### 5.2.10.3 Eagle Pass – Brackish Groundwater Desalination

#### Project Source

This strategy was submitted by Eagle Pass to the RWPG.

#### Description

Eagle Pass is currently exploring options for developing groundwater as a water source and is looking at potential wellfield sites in multiple counties. This strategy is for the construction of nine 750 gpm production wells and four 300 gpm injection wells for brine disposal, a 30-mile transmission pipeline, and a 4.7 mgd brackish desalination WTP. This project is planned to include 2 wellfields; the first in Maverick County with two production wells, WTP, and four injection wells, and the second approximately 30 miles away in Kinney County (Region J). The planned 30-mile transmission pipeline will deliver water produced from the Kinney County wellfield to the WTP on site in Maverick County. Considerations based on the area hydrogeology, acquisition feasibility, construction feasibility, regulatory compliance, hydraulic considerations, environmental factors, and cost. The project is expected to come online by 2030.

#### Available Supply

This project is designed to provide a total of 4.65 mgd (5,210 ac-ft/yr) of treated water from the Carrizo-Wilcox Aquifer in Maverick and the Edwards-Trinity-Plateau, Pecos Valley, and Trinity Aquifers in the Rio Grande Basin in Kinney County (Region J). Eagle Pass is also looking at a potential source for this strategy in Maverick County known as the Maverick Basin, but there is currently not enough information known about this particular source to determine a firm yield, so this strategy uses the Carrizo-Wilcox Aquifer instead.

For the Maverick County wellfield, assuming an RO efficiency of 80%, this strategy would require pumping 263 ac-ft/yr of raw water, resulting in the 210 ac-ft/yr yield (20% water loss). Similarly, for the Kinney County wellfield, assuming an RO efficiency of 80%, this strategy would require pumping 6,250 ac-ft/yr of raw water, resulting in the 5,000 ac-ft/yr yield (20% water loss). Table 5-79 outlines the project supply yield for each decade.

**Table 5-79 Eagle Pass Brackish Groundwater Desalination Project Yield Available (ac-ft/yr) Under the MAG, by Decade**

	2030	2040	2050	2060	2070	2080
Maverick County Supply Yield	210	210	210	210	210	210
Kinney County Supply Yield	5,000	5,000	5,000	5,000	5,000	5,000
Total Supply	5,210	5,210	5,210	5,210	5,210	5,210

#### Engineering and Costing

Costs from the UCM for this strategy include production and injection wells, groundwater well pumping, well field piping, transmission line, water treatment plant, land acquisition, and permitting. O&M costs were estimated for the well and operating the desalination facility at capacity. It is assumed that the

construction period would be no longer than 1 year. Table 5-80 outlines the project cost developed in the UCM.

### Implementation Issues

This project develops a wellfield outside of Region M. Coordination with Region J and the Groundwater Conservation District in Kinney County will be needed. The yield of the project will need to stay within the MAG. Approval for additional concentrate disposal will be needed from TCEQ. Construction of the new groundwater well and piping may also include purchase of land and a TXDOT right-of-way permit.

**Table 5-80 Eagle Pass – Brackish Groundwater Desalination Project Costs**

Facilities Cost	Total Project Cost	Annual Cost	Annual Cost of Water (\$ per ac-ft)	Annual Cost of Water After Debt Service (\$ per ac-ft)
\$130,647,000	\$181,710,000	\$23,367,000	\$4,485	\$2,034

### 5.2.10.4 East Rio Hondo WSC – North Cameron Regional WTP Wellfield Expansion

#### Project Source

This strategy was submitted by ERHWSC to the RWPG on behalf of ERHWSC.

#### Description

This strategy is for the addition of two 2,300 gpm groundwater wells and a 20-inch, 10.5-mile transmission line to increase the brackish water supply to the existing North Cameron Regional RO WTP. The WTP is located between the cities of Santa Rosa and Combes, increasing supplies to the ERHWSC systems. ERHWSC’s supply would be delivered by the completed Bean Road Transmission Line.

#### Available Supply

The North Cameron Regional desalination plant currently treats 1.15 mgd of brackish water supplied by one groundwater well. The WTP has the capacity to treat 2.70 mgd raw water, and this strategy would supply the additional 1.55 mgd of brackish water from the Gulf Coast Aquifer in Cameron County needed to bring the plant to full capacity. No additional treatment is necessary. Assuming an RO efficiency of 80%, this strategy would require pumping 1,736 ac-ft/yr of raw water, resulting in the 1,389 ac-ft/yr yield (20% water loss). This strategy is expected to be online by 2030. The Gulf Coast Aquifer in Cameron County is showing some MAG-limited issues this planning cycle, due to high demand for new groundwater projects resulting from surface water availability issues. Table 5-81 outlines the project yield for each decade. The available yield varies depending on MAG. The table shows both the requested yield for the project, as well as the available yield that accounts for these MAG limitations.

**Table 5-81 East Rio Hondo WSC North Cameron Regional WTP Wellfield Expansion Project Yield (ac-ft/yr), by Decade**

	2030	2040	2050	2060	2070	2080
Requested Yield	1,389	1,389	1,389	1,389	1,389	1,389
Available Yield under MAG	1,290	1,225	1,371	1,389	1,389	1,389

## Engineering and Costing

Capital costs from the UCM for this strategy include groundwater well pumping, well field piping, transmission line, ground storage tank, land acquisition, and permitting. O&M costs were estimated for the well and operating the desalination facility at capacity. It is assumed that the construction period would be no longer than 1 year. Table 5-82 outlines the project cost developed in the UCM.

Infrastructure was sized to deliver the sponsor requested yield, but because the project is MAG limited the annual unit cost was calculated using the available yield in the first decade of implementation. The last column in the table shows the annual unit cost of the water, based on the MAG-limited available yield for 2030. The full UCM project cost estimate summary is provided in Appendix 5D.

## Implementation Issues

No major implementation issues are expected for this strategy. Approval for additional concentrate disposal will be needed from TCEQ. Construction of the new groundwater well and piping may also include purchase of land and a TXDOT right-of-way permit.

**Table 5-82 East Rio Hondo WSC – North Cameron Regional WTP Wellfield Expansion Project Costs**

Facilities Cost	Total Project Cost	Annual Cost	Annual Cost of Water – Ultimate (\$ per ac-ft)	Annual Cost of Water After Debt Service (\$ per ac-ft)	Annual Cost of Water – First Decade Online (\$ per ac-ft)
\$25,848,000	\$35,856,000	\$2,804,000	\$2,019	\$202	\$2,174

### 5.2.10.5 East Rio Hondo WSC – Brackish Desalination Wellfield and RO at NRWTP and MASWTP

#### Project Source

This strategy was submitted by East Rio Hondo WSC (ERHWSC) to the RWPG.

#### Description

This strategy is for the construction of six 1,000 gpm production wells and three 300 gpm injection wells for brine disposal a 4 mgd expansion to the Martha Ann Simpson WTP (MASWTP) and a 1.6 mgd expansion to the Nelson Road WTP (NRWTP). The well siting will be near NRWTP and MASWTP based on the area hydrogeology, acquisition feasibility, construction feasibility, regulatory compliance, hydraulic considerations, environmental factors, and cost. The project is expected to come online by 2040.

#### Available Supply

This project was sized with a peaking factor of 2 to provide 2.8 mgd (3,136 ac-ft/yr) on average and have peak production of 5.6 mgd (6,272 ac-ft/yr) of brackish groundwater from the Gulf Coast Aquifer System in Cameron County. Assuming an RO efficiency of 80%, this strategy would require pumping 3,920 ac-ft/yr of raw water on average, resulting in the 3,136 ac-ft/yr yield (20% water loss). The Gulf Coast Aquifer in Cameron County is showing some MAG-limited issues this planning cycle, due to high demand for new groundwater projects resulting from surface water availability issues. Table 5-83 outlines the project yield for each decade. The available yield varies depending on MAG. The table shows both the requested yield for the project, as well as the available yield that accounts for these MAG limitations.

**Table 5-83 East Rio Hondo WSC – Brackish Desalination Wellfield and RO at NRWTP and MASWTP Project Yield (ac-ft/yr), by Decade**

	2030	2040	2050	2060	2070	2080
Requested Yield	-	3,136	3,136	3,136	3,136	3,136
Available Yield under MAG	-	2,766	3,096	3,136	3,136	3,136

### Engineering and Costing

Costs from the UCM for this strategy include production and injection wells, groundwater well pumping, well field piping, two water treatment plant expansions, land acquisition, and permitting. O&M costs were estimated for the well and operating the desalination facility at capacity. It is assumed that the construction period would be no longer than 1 year. Infrastructure was sized to deliver the sponsor requested yield, but because the project is MAG limited the annual unit cost was calculated using the available yield in the first decade of implementation. Table 5-84 outlines the project costs developed in the UCM. The last column in the table shows the annual unit cost of the water, based on the MAG-limited available yield for 2040. The full UCM project cost estimate summary is provided in Appendix 5D.

### Implementation Issues

The yield of the project will need to stay within the MAG, particularly during the first few decades of implementation. There is no GCD within the service area of East Rio Hondo WSC. Approval for additional concentrate disposal will be needed from TCEQ. Construction of the new groundwater well and piping may also include purchase of land and a TXDOT right-of-way permit.

**Table 5-84 East Rio Hondo WSC – Brackish Desalination Wellfield and RO at NRWTP and MASWTP Project Costs**

Facilities Cost	Total Project Cost	Annual Cost	Annual Cost of Water – Ultimate (\$ per ac-ft)	Annual Cost of Water After Debt Service (\$ per ac-ft)	Annual Cost of Water – First Decade Online (\$ per ac-ft)
\$79,212,000	\$110,697,000	\$21,747,000	\$6,935	\$4,451	\$7,862

## 5.2.10.6 East Rio Hondo WSC – Expansion of MASWTP

### Project Source

This strategy was submitted by East Rio Hondo WSC (ERHWSC) to the RWPG.

### Description

This strategy is for the construction of two 2,000 gpm wells, one 300 gpm injection well for concentrate disposal, and a 1 mgd expansion to the Martha Ann Simpson WTP (MASWTP). The well siting will be near the MASWTP property based on the area hydrogeology, acquisition feasibility, construction feasibility, regulatory compliance, hydraulic considerations, environmental factors, and cost. The project is expected to come online in the 2040 decade.

### Available Supply

This project was sized to produce 1 mgd (1,120 ac-ft/yr) of brackish groundwater from the Gulf Coast Aquifer System in Cameron County. Assuming an RO efficiency of 80%, this strategy would require pumping 1,400 ac-ft/yr of raw water, resulting in the 1,120 ac-ft/yr yield (20% water loss). The Gulf Coast Aquifer in Cameron County is showing some MAG-limited issues this planning cycle, due to high demand for new groundwater projects resulting from surface water availability issues. Table 5-85 outlines the project yield for each decade. The available yield varies depending on MAG. The table shows both the requested yield for the project, as well as the available yield that accounts for these MAG limitations.

**Table 5-85 East Rio Hondo WSC Expansion of MASWTP Project Yield (ac-ft/yr), by Decade**

	2030	2040	2050	2060	2070	2080
Requested Yield	-	1,120	1,120	1,120	1,120	1,120
Available Yield under MAG	-	988	1,106	1,120	1,120	1,120

### Engineering and Costing

Costs from the UCM for this strategy include production wells and injection wells, groundwater well pumping, well field piping, WTP expansion, land acquisition, and permitting. Only WTP infrastructure and costs associated with the expansion of the WTP that will increase supplies beyond those existing and that do not replace portions of existing supply have been included in this plan. O&M costs were estimated for the well and operating the desalination facility at capacity. It is assumed that the construction period would be no longer than 1 year. Infrastructure was sized to deliver the sponsor requested yield, but because the project is MAG limited the annual unit cost was calculated using the available yield in the first decade of implementation. Table 5-86 outlines the project costs developed in the UCM. The last column in the table shows the annual unit cost of the water, based on the MAG-limited available yield for 2040. The full UCM project cost estimate summary is provided in Appendix 5D.

### Implementation Issues

The yield of the project will need to stay within the MAG, particularly during the first few decades of implementation. There is no GCD within the service area of East Rio Hondo WSC. Approval for additional concentrate disposal will be needed from TCEQ. Construction of the new groundwater well and piping may also include purchase of land and a TXDOT right-of-way permit.

**Table 5-86 East Rio Hondo WSC – Expansion of MASWTP Project Costs**

Facilities Cost	Total Project Cost	Annual Cost	Annual Cost of Water – Ultimate (\$ per ac-ft)	Annual Cost of Water After Debt Service (\$ per ac-ft)	Annual Cost of Water – First Decade Online (\$ per ac-ft)
\$11,169,000	\$15,652,000	\$1,913,000	\$1,708	\$725	\$1,936

### 5.2.10.7 La Feria – Water Well with RO Unit

#### Project Source

This strategy was submitted by La Feria to the RWPG in 2021 and updated by the RWPG.

## Description

This strategy is to provide additional drinking water supply from the Gulf Coast Aquifer System in Cameron County to the La Feria with the installation of a groundwater well, high-pressure RO system, and an injection well for disposal of brine concentrate. Water produced from the RO system will then go to the utility’s WTP for conventional treatment. A location adjacent to the WTP is proposed for the well to limit the well field piping that is needed. La Feria has already drilled a pilot well and confirmed that water supply is available at approximately 500 feet below ground surface. This strategy is anticipated for the 2030 decade.

## Available Supply

On the basis of the pilot well information, the city believes the groundwater well can pump 1.25 mgd to produce 1.0 mgd of water from the RO unit. Based on the approval of the non-MAG portion of Cameron County, La Feria would be able to access 1,120 ac-ft/yr. Assuming an RO efficiency of 80%, this strategy would require pumping 1,400 ac-ft/yr of raw water, resulting in the 1,120 ac-ft/yr yield (20% water loss).

## Engineering and Costing

Costs for this strategy from the UCM include groundwater well pumping, well field piping, land acquisition, and water treatment. It is assumed that the construction period for this strategy is one year. Table 5-87 outlines the project costs developed in the UCM. The full UCM project cost estimate summary is provided in Appendix 5D.

## Implementation Issues

No major implementation issues are expected for this strategy. Approval for additional concentrate disposal will be needed from TCEQ. Construction of the new groundwater well and piping may also include purchase of land and a TXDOT right-of-way permit. There is no groundwater conservation district within the La Feria service area.

**Table 5-87 La Feria – Water Well with RO Unit Project Costs**

Facilities Cost	Total Project Cost	Annual Cost	Annual Cost of Water (\$ per ac-ft)	Annual Cost of Water After Debt Service (\$ per ac-ft)
\$28,386,000	\$39,709,000	\$7,565,000	\$6,754	\$4,260

## 5.2.10.8 Lyford – Brackish Groundwater Desalination

### Project Source

This strategy was submitted by Lyford in the 2021 Plan and updated by the RWPG.

### Description

This strategy is to install a groundwater well and RO membrane water treatment facility to provide an alternate source of water for Lyford. The proposed location would be adjacent to the city’s WTP where the water would receive conventional treatment after the RO process.

### Available Supply

This strategy would provide an additional 0.5 mgd of drinking water supply to the city in 2040. Assuming a RO efficiency of 80%, this strategy would require pumping 700 ac-ft/yr of raw water, resulting in the 560 ac-ft/yr yield (20% water loss).

### Engineering and Costing

Costs for this strategy from the UCM include groundwater well pumping, well field piping, land acquisition, water treatment, and an injection well for disposal of brine concentrate. Based on the BRACS study, well depth is estimated at 1,000 feet below ground surface. The well is sized to pump 125 percent of the produced water supply to account for treatment efficiency. It is assumed that the construction period for this strategy is 1 year. Table 5-88 outlines the project costs developed in the UCM. The full UCM project cost estimate summary is provided in Appendix 5D.

### Implementation Issues

No major implementation issues are expected for this strategy. Approval for concentrate disposal will be needed from TCEQ. Construction of the new groundwater well and piping may also include purchase of land if there is not adequate room at the WTP site. There is no groundwater conservation district within the Lyford service area.

**Table 5-88 Lyford – Brackish Groundwater Desalination Project Costs**

Facilities Cost	Total Project Cost	Annual Cost	Annual Cost of Water (\$ per ac-ft)	Annual Cost of Water After Debt Service (\$ per ac-ft)
\$15,464,000	\$21,611,000	\$3,913,000	\$6,988	\$4,271

### 5.2.10.9 McAllen – Brackish Groundwater Desalination

#### Project Source

This strategy was recommended in the 2011 RWP and updated by the RWPG.

#### Description

This strategy is for drilling four new groundwater wells from the Gulf Coast Aquifer System in Hidalgo County and constructing a new RO WTP to treat the brackish water to potable drinking water standards. An injection well is included for disposal of brine concentrate.

### Available Supply

Based on preliminary needs estimates for McAllen, the new brackish groundwater plant is sized for 6 mgd of treatment, which will yield 6,720 ac-ft/yr beginning in the 2030 decade. Assuming a RO efficiency of 80%, this strategy would require pumping 8,400 ac-ft/yr of raw water, resulting in the 6,720 ac-ft/yr yield (20% water loss).

### Engineering and Costing

Costs for this strategy from the UCM include groundwater well pumping, well field piping, land acquisition, and water treatment. It is assumed that the construction period for this strategy is 1.5 years. Table 5-89 outlines the project costs developed in the UCM. The full UCM project cost estimate summary is provided in Appendix 5D.

### Implementation Issues

No major implementation issues are expected for this strategy. Approval for additional concentrate disposal will be needed from TCEQ. Construction of the new groundwater well and piping may also include purchase of land and a Texas DOT ROW permit. There is no groundwater conservation district within the McAllen service area.

**Table 5-89 McAllen – Brackish Groundwater Desalination Project Costs**

Facilities Cost	Total Project Cost	Annual Cost	Annual Cost of Water (\$ per ac-ft)	Annual Cost of Water After Debt Service (\$ per ac-ft)
\$67,303,000	\$95,598,000	\$17,809,000	\$2,650	\$1,649

### 5.2.10.10 Mission – Brackish Groundwater Desalination

#### Project Source

This strategy was recommended in the 2016 RWP and updated by the RWPG.

#### Description

This strategy is for drilling three new brackish groundwater wells in the Gulf Coast Aquifer System in Hidalgo County and constructing a new RO WTP to treat the brackish water to potable drinking water standards. An injection well is included for disposal of brine concentrate.

#### Available Supply

Based on preliminary needs estimates for Mission, the new brackish groundwater plant would treat 3 mgd (3,360 ac-ft/yr) and produce 2,688 ac-ft/yr. Assuming an RO efficiency of 80%, this strategy would require pumping 3,360 ac-ft/yr of raw water, resulting in the 2,688 ac-ft/yr yield (20% water loss). This project is anticipated to be online by 2030.

#### Engineering and Costing

Costs for this strategy from the UCM include groundwater well pumping, well field piping, land acquisition, and water treatment. It is assumed that the construction period for this strategy is 1.5 years. Table 5-90 outlines the project costs developed in the UCM. The full UCM project cost estimate summary is provided in Appendix 5D.

### Implementation Issues

No major implementation issues are expected for this strategy. Approval for additional concentrate disposal will be needed from TCEQ. Construction of the new groundwater well and piping may also include purchase of land and a Texas DOT ROW permit. There is no groundwater conservation district within the Mission service area.

**Table 5-90 Mission – Brackish Groundwater Desalination Project Costs**

Facilities Cost	Total Project Cost	Annual Cost	Annual Cost of Water (\$ per ac-ft)	Annual Cost of Water After Debt Service (\$ per ac-ft)
\$45,681,000	\$63,913,000	\$11,794,000	\$4,388	\$2,715

### 5.2.10.11 North Alamo WSC – Delta Area Brackish Groundwater Desalination

#### Project Source

This strategy was originally recommended during the 2016 regional water planning process, which initially had an implementation decade of 2060. NAWSC submitted this strategy for recommendation during the 2021 planning cycle.

#### Description

As provided by NAWSC, the Delta Area Brackish Groundwater Desalination Plant will pump 2,800 ac-ft/yr from the Gulf Coast Aquifer in Cameron County. This strategy will serve the residents of Hargill, Monte Alto, La Sara, and surrounding areas in NAWSC’s service area.

#### Available Supply

Assuming an 80% membrane recovery rate – pumping 2,800 ac-ft/yr of raw water, the Delta Area Brackish Groundwater Desalination Plant would produce 2,240 ac-ft/yr beginning in the 2030 decade. The Gulf Coast Aquifer in Cameron County is showing some MAG-limited issues this planning cycle, due to high demand for new groundwater projects resulting from surface water availability issues. Table 5-91 outlines the project yield for each decade. The available yield varies depending on MAG. The table shows both the requested yield for the project, as well as the available yield that accounts for these MAG limitations.

**Table 5-91 North Alamo WSC Delta Area Brackish Groundwater Desalination Project Yield (ac-ft/yr), by Decade**

	2030	2040	2050	2060	2070	2080
Requested Yield	2,240	2,240	2,240	2,240	2,240	2,240
Available Yield under MAG	2,080	1,976	2,211	2,240	2,240	2,240

#### Engineering and Costing

Costs for this strategy from the UCM include the desalination plant, well field, and injection well for disposal of brine concentrate. It is assumed that the construction period for each phase is two years. Table 5-92 outlines the project costs developed in the UCM. The last column in the table shows the annual unit cost of the water, based on the MAG-limited available yield for 2030. The full UCM project cost estimate summary is provided in Appendix 5D.

#### Implementation Issues

No major implementation issues are expected for this strategy. Approval for concentrate disposal will be needed from TCEQ. Construction of groundwater well(s) and piping may also include purchase of land and a TXDOT right-of-way permit. There is no groundwater conservation district within the North Alamo WSC service area.

**Table 5-92 North Alamo WSC – Delta Area Brackish Groundwater Desalination Project Costs**

Facilities Cost	Total Project Cost	Annual Cost	Annual Cost of Water – Ultimate (\$ per ac-ft)	Annual Cost of Water After Debt Service (\$ per ac-ft)	Annual Cost of Water – First Decade Online (\$ per ac-ft)
\$36,130,000	\$50,511,000	\$9,585,000	\$4,279	\$2,692	\$4,851

**5.2.10.12 Primera – RO WTP with Groundwater Well****Project Source**

This strategy was submitted by Primera in the 2021 Plan and updated by the RWPG.

**Description**

This strategy is for the construction of a new RO WTP with ground storage and a groundwater well in the Gulf Coast Aquifer System in Cameron County. Primera is currently supplied with drinking water from the North Cameron Regional Water Project WTP and Harlingen. This strategy would allow Primera to have its own drinking water source by 2030.

**Available Supply**

Due to the approval and increased availability of the non-MAG portion in Cameron County, Primera is able to access up to 1,120 ac-ft/yr through this strategy. Assuming a RO efficiency of 80%, this strategy would require pumping 1,400 ac-ft/yr of raw water, resulting in the 1,120 ac-ft/yr yield (20% water loss).

**Engineering and Costing**

Costs for this strategy from the UCM include well field pumping, well field piping, water treatment, land acquisition, and an injection well for disposal of brine concentrate. More information on the proposed location of the plant and existing distribution system is needed to include costs for pipelines. Membrane treatment efficiency is assumed to be 80 percent, so the wells and well field piping are designed for 1,400 ac-ft/yr. It is assumed that the construction period would be 1.5 years. Table 5-93 outlines the project costs developed in the UCM. The full UCM project cost estimate summary is provided in Appendix 5D.

**Implementation Issues**

A pilot well and water quality study will be needed. There is no groundwater conservation district within the Primera service area.

**Table 5-93 Primera – RO WTP with Groundwater Well Project Costs**

Facilities Cost	Total Project Cost	Annual Cost	Annual Cost of Water (\$ per ac-ft)	Annual Cost of Water After Debt Service (\$ per ac-ft)
\$32,317,000	\$45,926,000	\$8,041,000	\$7,179	\$4,295

### 5.2.10.13 San Benito – Brackish Groundwater Blending

#### Project Source

This strategy was submitted by San Benito in the 2021 Plan and updated by the RWPG.

#### Description

This strategy is for the construction of one groundwater well from the Gulf Coast Aquifer System and raw water collection lines to supplement San Benito’s water supply. The brackish groundwater will be mixed with the current surface water source at 10 percent to 15 percent the average daily demand. The city plans to construct the well at the WTP No. 2 site.

#### Available Supply

Based on the availability of the non-MAG portion of the Gulf Coast Aquifer System in Cameron County, San Benito is able to access a total of 0.5 mgd for a well operating at 500 gpm. The project yields 560 ac-ft/yr starting in the 2030 decade.

#### Engineering and Costing

Costs for this strategy from the UCM include groundwater wells, well field piping, and pipeline right-of-way. It is assumed that the construction period for this strategy is 1 year. Table 5-94 outlines the project costs developed in the UCM. The full UCM project cost estimate summary is provided in Appendix 5D.

#### Implementation Issues

Construction of the new groundwater wells and piping may also include purchase of land and a Texas DOT ROW permit. It is anticipated that a pilot well and water quality study will be needed to implement this strategy. There is no groundwater conservation district within the San Benito service area.

**Table 5-94 San Benito – Brackish Groundwater Blending Project Costs**

Facilities Cost	Total Project Cost	Annual Cost	Annual Cost of Water (\$ per ac-ft)	Annual Cost of Water After Debt Service (\$ per ac-ft)
\$971,000	\$1,399,000	\$120,000	\$214	\$39

### 5.2.10.14 San Juan – Brackish Groundwater Desalination

#### Project Source

This strategy was submitted by San Juan in the 2021 Plan and updated by the RWPG.

#### Description

This strategy is to install a groundwater well and RO membrane water treatment facility to provide an alternate source of water for San Juan.

#### Available Supply

This strategy would provide an additional 1.0 mgd (1,120 ac-ft/yr) of drinking water supply to San Juan by the 2030 decade. Assuming a RO efficiency of 80%, this strategy would require pumping 1,400 ac-ft/yr of raw water from the Gulf Coast Aquifer System in Hidalgo County, resulting in the 1,120 ac-ft/yr yield (20% water loss).

#### Engineering and Costing

Costs for this strategy from the UCM include groundwater well pumping, well field piping, land acquisition, water treatment, and a concentrate injection well. Based on the BRACS study, well depth is estimated at 1,000 feet below ground surface. The well is sized to pump 125 percent of the produced water supply to account for treatment efficiency. It is assumed that the construction period for this strategy is 1 year. Table 5-95 outlines the project costs developed in the UCM. The full UCM project cost estimate summary is provided in Appendix 5D.

#### Implementation Issues

No major implementation issues are expected for this strategy. Approval for concentrate disposal will be needed from TCEQ. Construction of the new groundwater well and piping may also include purchase of land if there is not adequate room at the WTP site. There is no groundwater conservation district within the service area of San Juan.

**Table 5-95 San Juan – Brackish Groundwater Desalination Project Costs**

Facilities Cost	Total Project Cost	Annual Cost	Annual Cost of Water (\$ per ac-ft)	Annual Cost of Water After Debt Service (\$ per ac-ft)
\$28,746,000	\$40,253,000	\$7,626,000	\$6,809	\$4,280

### 5.2.10.15 San Juan – WTP 1 Expansion with Brackish Groundwater Desalination

#### Project Source

This strategy was submitted by San Juan in the 2021 Plan and updated by the RWPG.

#### Description

This strategy consists of expanding and upgrading WTP No. 1 and installing groundwater wells with membrane treatment.

### Available Supply

The project as submitted included 3 mgd (3,360 ac-ft/yr) of brackish groundwater treatment capacity from the Gulf Coast Aquifer System in Hidalgo County. Assuming an RO efficiency of 80%, this strategy would require pumping 4,200 ac-ft/yr of raw water, resulting in the 3,360 ac-ft/yr yield (20% water loss).

### Engineering and Costing

The components of this project include four new groundwater wells, well field piping, and membrane filters. The brackish desalination treatment plant will consist of membrane filtration. It is assumed that concentrate disposal from the treatment processes would be discharged to surface water; it is assumed that the construction period would be 1.5 years. Treatment Level 4 was used on the UCM spreadsheet to estimate the costs for addition of the new membrane filters. Table 5-96 outlines the project costs developed in the UCM. The full UCM project cost estimate summary is provided in Appendix 5D.

### Implementation Issues

Approval for concentrate disposal will be needed from TCEQ. Construction of the groundwater well may also include purchase of land and a Texas DOT ROW permit. As with any project, necessary state and federal permits must be obtained before construction can begin. There is no groundwater conservation district within the service area of San Juan.

**Table 5-96 San Juan – WTP 1 Expansion with Brackish Groundwater Desalination Project Costs**

Facilities Cost	Total Project Cost	Annual Cost	Annual Cost of Water (\$ per ac-ft)	Annual Cost of Water After Debt Service (\$ per ac-ft)
\$45,870,000	\$65,264,000	\$11,966,000	\$3,561	\$2,195

### 5.2.10.16 Sharyland WSC – Well and RO Unit at WTP 2

#### Project Source

This strategy was submitted by Sharyland WSC in the 2021 Plan and updated by the RWPG.

#### Description

This strategy is to provide additional supply to Sharyland WSC WTP No. 2 with the installation of a groundwater well and high-pressure RO system. An injection well is included for disposal of brine concentrate.

#### Available Supply

The proposed groundwater well is sized to pump 1,125 ac-ft/yr from the Gulf Coast Aquifer System in Hidalgo County and the RO system would provide the WTP No. 2 with 900 ac-ft/yr of supply. This assumes an 80 percent membrane recovery rate. Assuming a RO efficiency of 80%, this strategy would require pumping 1,125 ac-ft/yr of raw water, resulting in the 900 ac-ft/yr yield (20% water loss). The project is anticipated to be online by 2040.

#### Engineering and Costing

Costs for this strategy from the UCM include groundwater well pumping, well field piping, water treatment, and land acquisition. It is assumed that the construction period would be 1 year. Table 5-97

outlines the project costs developed in the UCM. The full UCM project cost estimate summary is provided in Appendix 5D.

### Implementation Issues

No major implementation issues are expected for this strategy. Approval for concentrate disposal will be needed from TCEQ. Construction of a groundwater well and piping may also include purchase of land and a Texas DOT ROW permit. There is no groundwater conservation district within the Sharyland WSC service area.

**Table 5-97 Sharyland WSC – Well and RO Unit at WTP 2 Project Costs**

Facilities Cost	Total Project Cost	Annual Cost	Annual Cost of Water (\$ per ac-ft)	Annual Cost of Water After Debt Service (\$ per ac-ft)
\$27,423,000	\$38,480,000	\$6,567,000	\$7,297	\$4,289

### 5.2.10.17 Sharyland WSC – Well and RO Unit at WTP 3

#### Project Source

This strategy was submitted by Sharyland WSC in the 2021 Plan and updated by the RWPG.

#### Description

This strategy is to provide additional supply to Sharyland WSC WTP No. 3 with the installation of a groundwater well and high-pressure RO system. An injection well is included for disposal of brine concentrate. WTP No. 3 has been recently completed.

#### Available Supply

The proposed groundwater well is sized to pump 1,125 ac-ft/yr from the Gulf Coast Aquifer System in Hidalgo County and the system would provide the WTP No. 3 with 900 ac-ft/yr of supply. This assumes an 80% membrane recovery rate (20% water loss). The project is anticipated to be online by 2040.

#### Engineering and Costing

Costs for this strategy from the UCM include well field pumping, well field piping, water treatment, and land acquisition. Slightly to moderately saline groundwater was assumed to be available at approximately 800 feet below ground surface for cost estimation purposes. It is assumed that the construction period would be 1 year. Table 5-98 outlines the project costs developed in the UCM. The full UCM project cost estimate summary is provided in Appendix 5D.

### Implementation Issues

No major implementation issues are expected for this strategy. Approval for concentrate disposal will be needed from TCEQ. Construction of a groundwater well and piping may also include purchase of land and a Texas DOT ROW permit. There is no groundwater conservation district within the Sharyland WSC service area.

**Table 5-98 Sharyland WSC – Well and RO Unit at WTP 3 Project Costs**

Facilities Cost	Total Project Cost	Annual Cost	Annual Cost of Water (\$ per ac-ft)	Annual Cost of Water After Debt Service (\$ per ac-ft)
\$27,423,000	\$38,480,000	\$6,567,000	\$7,297	\$4,289

**5.2.10.18 Southmost RWA – Brackish Groundwater Desalination Wellfield Expansion**

**Project Source**

This strategy was submitted by Southmost Regional Water Authority (SRWA) to the RWPG.

**Description**

This strategy is for the expansion of the SRWA brackish groundwater wells. No additional treatment is required for this expansion. The expansion consists of 2 new wells and a 24-inch transmission line to connect new wellfield to existing wellfield pump station. SRWA already own the property on which the new wellfield is planned to be located. This WMS is planned for the 2030 decade.

**Available Supply**

Depending on groundwater availability in the Gulf Coast Aquifer in Cameron County and given the current WTP RO efficiency of 75%, the two new wells included in this strategy would require pumping 1,294 ac-ft/yr of raw water, resulting in the 980 ac-ft/yr (0.87 MGD) yield (25% water loss). However, due to high demand for new groundwater projects resulting from surface water availability issues, production from the new wells included in this strategy will be limited by the MAG in the earlier decades, therefore the available yield varies depending on the MAG. Table 5-99 shows both the requested yield for the project, as well as the available yield that accounts for these MAG limitations.

**Table 5-99 SRWA Brackish Well Field Expansion Yield (ac-ft/yr), by Decade**

	2030	2040	2050	2060	2070	2080
Requested Yield	980	980	980	980	980	980
Available Yield under MAG	901	856	958	980	980	980

**Engineering and Costing**

Capital costs from the UCM for this strategy include wellfield, groundwater well pumping, well field piping, transmission line, and permitting. O&M costs were estimated for the well and operating the desalination facility at capacity. It is assumed that the construction period would be no longer than 1 year. Infrastructure was sized to deliver the sponsor requested yield, but because the project is MAG limited the annual unit cost was calculated using the available yield in the first decade of implementation. Table 5-100 outlines the project costs developed in the UCM. The last column in the table shows the annual unit cost of the water, based on the MAG-limited available yield for 2030. The full UCM project cost estimate summary is provided in Appendix 5D.

**Implementation Issues**

No major implementation issues are expected for this strategy. The yield of the project will need to stay within the MAG, particularly during the first few decades of implementation. Approval for additional

concentrate disposal will be needed from TCEQ. Construction of the new groundwater well and piping may also include purchase of land and a TXDOT right-of-way permit. There is no groundwater conservation district within the SRWA service area.

**Table 5-100 Southmost RWA – Brackish Groundwater Desalination Wellfield Expansion Project Costs**

Facilities Cost	Total Project Cost	Annual Cost	Annual Cost of Water – Ultimate (\$ per ac-ft)	Annual Cost of Water After Debt Service (\$ per ac-ft)	Annual Cost of Water – First Decade Online (\$ per ac-ft)
\$3,292,000	\$4,605,000	\$395,000	\$403	\$73	\$483

### 5.2.10.19 Southmost RWA – Phase 3 SRWA Wellfield Optimization and WTP Expansion

#### Project Source

This strategy was submitted by Southmost Regional Water Authority (SRWA) to the RWPG.

#### Description

This strategy is for Phase 3 Brackish Well Field Optimization and Expansion of the SRWA brackish groundwater wells and water treatment plant. The project includes optimization of 20 wells, the addition of 2 new wells, and an expansion to the WTP. The optimization of 20 wells will include deepening the wells, increasing the casing diameter from 6-inches to 10-inches, and increasing the screened area. The total project is anticipated to produce an additional 2.2MGD of treated water. Phase 3 is planned to be online by the 2030 decade.

#### Available Supply

The wellfield optimization, expanded wellfield, and WTP expansion could produce an additional 2.2 MGD (2,464 ac-ft/yr) of treated water. Optimization to increase efficiency of 20 wells and the WTP is anticipated to improve water production and supply approximately 1.33 MGD (1,484 ac-ft/yr); whereas the wellfield expansion was designed to supply an additional 0.87 MGD (980 ac-ft/yr).

**Table 5-101 SRWA Phase 3 Brackish Well Field Optimization and Expansion Yield**

Component	Supply
Infrastructure Optimization	1,484 ac-ft/yr
Wellfield Expansion	980 ac-ft/yr
Total Supply	2,464 ac-ft/yr

Depending on groundwater availability in the Gulf Coast Aquifer in Cameron County, the two new wells are designed to produce 980 ac-ft/yr yield. However, production from the new wells included in this strategy will be limited by the MAG in the earlier decades, therefore the available yield varies depending on MAG. Table 5-102 shows both the requested yield for the expanded wellfield, as well as the available yield that accounts for these MAG limitations. Expanded wellfield infrastructure was designed using the current WTP RO efficiency of 75%.

**Table 5-102 SRWA Phase 3 Brackish Well Field Expansion Project Yield (ac-ft/yr)**

	2030	2040	2050	2060	2070	2080
Requested Yield	980	980	980	980	980	980
Available Yield	888	828	963	980	980	980

**Engineering and Costing**

Capital costs from the UCM for this strategy include well optimization, new groundwater production wells, groundwater well pumping, well field piping, WTP expansion, and permitting. Only WTP infrastructure and costs associated with the expansion of the WTP that will increase supplies beyond those existing and that do not replace portions of existing supply have been included in this plan. O&M costs were estimated for the well and operating the desalination facility at capacity. It is assumed that the construction period would be no longer than 1 year. Table 5-103 outlines the project costs developed in the UCM. The last column in the table shows the annual unit cost of the water, based on the MAG-limited available yield for 2030. The full UCM project cost estimate summary is provided in Appendix 5D.

**Implementation Issues**

No major implementation issues are expected for this strategy. Approval for additional concentrate disposal will be needed from TCEQ. Construction of the new groundwater well and piping may also include purchase of land and a TXDOT right-of-way permit. There is no groundwater conservation district within the SRWA service area.

**Table 5-103 Southmost RWA – Phase 3 Brackish Well Field Expansion Project Costs**

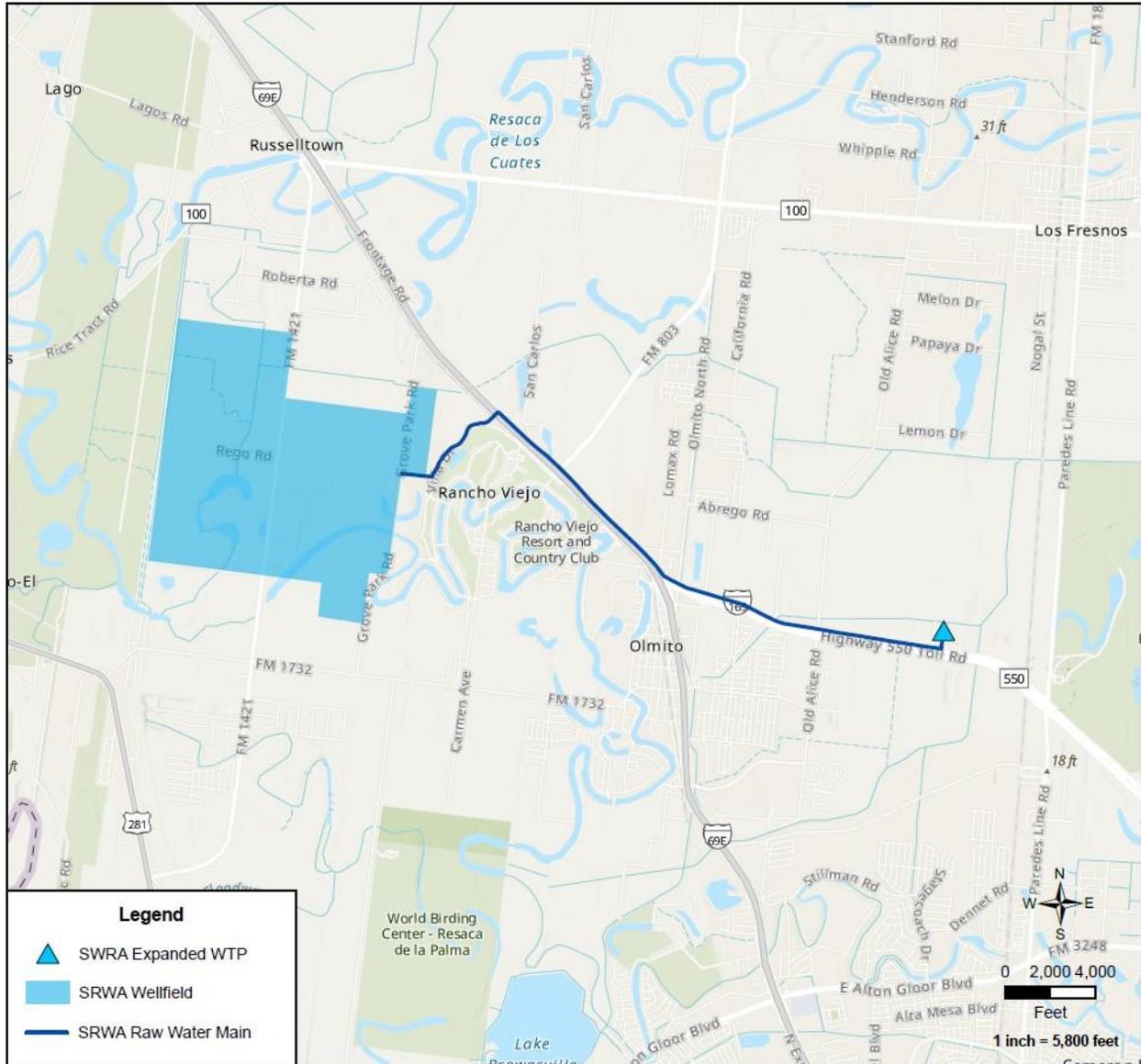
Facilities Cost	Total Project Cost	Annual Cost	Annual Cost of Water – Ultimate (\$ per ac-ft)	Annual Cost of Water After Debt Service (\$ per ac-ft)	Annual Cost of Water – First Decade Online (\$ per ac-ft)
\$45,258,000	\$63,112,000	\$10,769,000	\$4,371	\$2,568	\$4,540

**5.2.10.20 Southmost RWA – Phase 4 SRWA Wellfield and WTP Expansion****Project Source**

This strategy was submitted by Southmost Regional Water Authority (SRWA) to the RWPG.

**Description**

This strategy is for Phase 4 Expansion of the SRWA brackish groundwater wells and water treatment plant. Phase 4 is planned to be online by the 2030 decade. Figure 5-18 shows the location of the project.



**Figure 5-18 Southmost RWA Phase 4 Wellfield and WTP Expansion Project Location Map**

**Available Supply**

Depending on groundwater availability in the Gulf Coast Aquifer in Cameron County, the wellfield and WTP expansion could be between 12.5 to 20 MGD. For the 2026 RWP, the project is requesting a yield of 12.5 MGD. Given the current WTP RO efficiency of 75%, this strategy would require pumping 18,480 ac-ft/yr of raw water, resulting in the 14,000 ac-ft/yr yield (25% water loss). However, this strategy is limited by the MAG, therefore the available yield varies depending on MAG. The table below shows both the requested yield for the project, as well as the available yield that accounts for these MAG limitations.

**Table 5-104 SRWA Phase 4 Brackish Well Field and WTP Expansion Project Yield (ac-ft/yr)**

	2030	2040	2050	2060	2070	2080
--	------	------	------	------	------	------

Requested Yield	14,000	14,000	14,000	14,000	14,000	14,000
Available Yield	12,840	12,177	13,678	13,860	13,860	13,860

### Engineering and Costing

Capital costs from the UCM for this strategy include groundwater production well, pumping, well field piping, transmission line and pump station, water treatment plant expansion, land acquisition, and permitting. Only WTP infrastructure and costs associated with the expansion of the WTP that will increase supplies beyond those existing and that do not replace portions of existing supply have been included in this plan. O&M costs were estimated for the well and operating the desalination facility at capacity. It is assumed that the construction period would be no longer than 1 year. Table 5-105

Southmost RWA – Phase 4 SRWA Wellfield and WTP Expansion Project Costs outlines the project costs developed in the UCM. The last column in the table shows the annual unit cost of the water, based on the MAG-limited available yield for 2030. The full UCM project cost estimate summary is provided in Appendix 5D.

### Implementation Issues

No major implementation issues are expected for this strategy. Approval for additional concentrate disposal will be needed from TCEQ. Construction of the new groundwater well and piping may also include purchase of land and a TXDOT right-of-way permit. There is no groundwater conservation district within the SRWA service area.

**Table 5-105 Southmost RWA – Phase 4 SRWA Wellfield and WTP Expansion Project Costs**

Facilities Cost	Total Project Cost	Annual Cost	Annual Cost of Water – Ultimate (\$ per ac-ft)	Annual Cost of Water After Debt Service (\$ per ac-ft)	Annual Cost of Water – First Decade Online (\$ per ac-ft)
\$3,792,000	\$197,098,000	\$32,698,000	\$2,336	\$1,467	\$2,547

### 5.2.10.21 Donna – New Brackish Groundwater Desalination

#### Project Source

This strategy was submitted by Donna to the RWPG for the 2026 RWP during the public comment period.

#### Description

This strategy is to construct a new brackish groundwater wellfield, treatment plant, and transmission pipeline to address long-term reliability and regulatory compliance. This project will add a new source of reliable water supply.

#### Available Supply

Aquifer testing indicates each new well can yield 0.72–1.0 MGD from the Gulf Coast Aquifer in Hidalgo County. With an assumed 80 percent RO recovery, an initial set of 7-9 wells (≈6.25 MGD of raw water, or 7,000 ac-ft/yr) will provide 5 MGD (5,600 ac-ft/yr) of finished supply by 2040.

## Engineering and Costing

The components of this project include the construction of a new brackish groundwater treatment facility, a well field, a 7-mile transmission pipeline and pump station, and land acquisition. Costing assumes 9 new groundwater wells to support the facility. A 7-mile, 24-inch pipeline is required to deliver treated water to a future connection point. The advanced treatment system includes RO membrane technology (New Water Treatment Plant Level 4). Concentrate from the RO process will be discharged into a local stream and injection wells are not included in the costing. Table 5-106 outlines the project costs developed in the UCM. The full UCM project cost estimate summary is provided in Appendix 5D.

## Implementation Issues

The final design of Donna’s groundwater supply augmentation project requires approval from the Texas Commission on Environmental Quality (TCEQ), with compliance to regulations for treated water quality and concentrate discharge. Additional permitting may involve multiple agencies such as the U.S. Army Corps of Engineers (USACE), International Boundary and Water Commission (IBWC), U.S. Customs and Border Protection (USCBP), and the Hidalgo County Regional Mobility Authority (HCRMA). There is no groundwater conservation district within the Donna service area.

**Table 5-106 Donna – New Brackish Groundwater Desalination Project Costs**

Facilities Cost	Total Project Cost	Annual Cost	Annual Cost of Water (\$ per ac-ft)	Annual Cost of Water After Debt Service (\$ per ac-ft)
\$82,930,000	\$118,371,000	\$18,480,000	\$3,300	\$1,814

## 5.2.10.22 Maverick County – New Brackish Groundwater Desalination

### Project Source

This strategy was submitted by Maverick County to the RWPG for the 2026 RWP during the public comment period.

### Description

This strategy is to construct a new brackish groundwater wellfield, treatment plant, and transmission pipeline to address long-term reliability and regulatory compliance. This project will provide a new source of reliable water supply.

### Available Supply

Maverick County is planning on a 1.5 MGD (1,680 ac-ft/yr) treatment facility. The Carrizo-Wilcox Aquifer availability in Maverick County remaining under the MAG (after existing supplies and other water management strategies) is currently showing a maximum of approximately 170 ac-ft/yr in the 2030-2060 decades, with less water available in the 2070-2080 decades. With the assumption of an 80% membrane recovery rate, pumping 170 ac-ft/yr would provide a firm, finished yield of 136 ac-ft/yr. It is assumed this project would be online by 2040.

Table 5-107 outlines the project yield for each decade, showing both the requested yield for the project, as well as the available yield that accounts for the MAG limitations.

**Table 5-107 Maverick County Brackish Groundwater Desalination Project Yield (ac-ft/yr), by Decade**

	2030	2040	2050	2060	2070	2080
Requested Yield	0	1,680	1,680	1,680	1,680	1,680
Available Yield under MAG	0	136	136	136	4	4

### Engineering and Costing

The components of this project include the construction of a new brackish groundwater treatment facility (1.5 MGD), a well field, a 3.5-mile transmission pipeline and pump station, a 0.5 MG ground storage tank, and land acquisition. Costing assumes 3 new groundwater wells to support the facility. A 3.5-mile, 14-inch transmission pipeline is required to deliver treated water to a future connection point. The advanced treatment system includes RO membrane technology (New Water Treatment Plant Level 4). Concentrate from the RO process will be discharged into a local stream and injection wells are not included in the costing. Table 5-108 outlines the project costs developed in the UCM. Within the table, the annual unit cost of water should the full project volume be available (1,680 ac-ft/yr) is shown. The last column in the table shows the annual unit cost of the water based on the MAG-limited available yield for 2030 (136 ac-ft/yr). The full UCM project cost estimate summary is provided in Appendix 5D.

### Implementation Issues

No major implementation issues are expected for this strategy. Approval for concentrate discharge will be needed from TCEQ. Construction of groundwater well(s) and piping may also include purchase of land and a TXDOT right-of-way permit. There is no groundwater conservation district within the Maverick County service area. Concerns were expressed by Wintergarden GCD during the public comment period of the planning cycle that the size of this project is not in line with the amount of groundwater available, and that the project should be sized more appropriately.

**Table 5-108 Maverick County – New Brackish Groundwater Desalination Project Costs**

Facilities Cost	Total Project Cost	Annual Cost	Annual Cost of Water – Requested (\$ per ac-ft)	Annual Cost of Water After Debt Service (\$ per ac-ft)	Annual Cost of Water –MAG-Limited (\$ per ac-ft)
\$40,118,000	\$57,218,000	\$9,532,000	\$5,674	\$3,278	\$70,088

### 5.2.10.23 Mercedes – New Brackish Groundwater Desalination

#### Project Source

This strategy was submitted by Mercedes to the RWPG for the 2026 RWP during the public comment period.

## Description

This strategy is to construct a new brackish groundwater wellfield, treatment plant, and transmission pipeline to address long-term reliability and regulatory compliance. This project will add a new source of reliable water supply.

## Available Supply

Aquifer testing indicates each new well can yield 0.72–1.0 MGD from the Gulf Coast Aquifer in Hidalgo County. With an assumed 80 percent RO recovery, an initial set of 7-9 wells (≈6.25 MGD of raw water, or 7,000 ac-ft/yr) will provide 5 MGD (5,600 ac-ft/yr) of finished supply by 2040.

## Engineering and Costing

The components of this project include the construction of a new brackish groundwater treatment facility, a well field, a 7-mile transmission pipeline and pump station, and land acquisition. Costing assumes 9 new groundwater wells to support the facility. A 7-mile, 24-inch pipeline is required to deliver treated water to a future connection point. The advanced treatment system includes RO membrane technology (New Water Treatment Plant Level 4). Concentrate from the RO process will be discharged into a local stream and injection wells are not included in the costing. Table 5-109 outlines the project costs developed in the UCM. The full UCM project cost estimate summary is provided in Appendix 5D.

## Implementation Issues

The final design of Mercedes' groundwater supply augmentation project requires approval from the Texas Commission on Environmental Quality (TCEQ), with compliance to regulations for treated water quality and concentrate discharge. Additional permitting may involve multiple agencies such as the U.S. Army Corps of Engineers (USACE), International Boundary and Water Commission (IBWC), U.S. Customs and Border Protection (USCBP), and the Hidalgo County Regional Mobility Authority (HCRMA). There is no groundwater conservation district within the Mercedes service area.

**Table 5-109 Mercedes – New Brackish Groundwater Desalination Project Costs**

Facilities Cost	Total Project Cost	Annual Cost	Annual Cost of Water (\$ per ac-ft)	Annual Cost of Water After Debt Service (\$ per ac-ft)
\$82,930,000	\$118,371,000	\$18,480,000	\$3,300	\$1,814

## 5.2.10.24 Pharr – New Brackish Groundwater Desalination

### Project Source

This strategy was submitted by Pharr to the RWPG for the 2026 RWP during the public comment period.

## Description

This direct groundwater supply strategy is intended to supplement Pharr’s raw water system with brackish groundwater from newly developed wells. This water would be conveyed to a proposed treatment facility on the City-owned Chowdary Tract. The raw water would be treated using a reverse osmosis (RO) membrane system to meet primary drinking water standards, followed by post-treatment for corrosion control and disinfection. Treated water would then be pumped through a 2.4-mile 24-inch pipeline to integrate with the City’s existing 24” transmission main.

## Available Supply

Aquifer testing indicates each new well can yield 0.72–1.0 MGD from the Gulf Coast Aquifer in Hidalgo County. With an assumed 75 percent RO recovery, an initial set of 7–10 wells (≈6.7 MGD of raw water) will provide 5 MGD (5,600 ac-ft/yr) of finished supply by 2030, sufficient to meet average-day deficits through 2060 and potentially expandable to 10 MGD or more as demand grows in the future. Only the first phase of 5,600 ac-ft/yr is assumed for this planning cycle. Additional phases may be considered in future planning cycles.

## Engineering and Costing

The components of this project include the construction of a new brackish groundwater treatment facility, a well field, and a transmission pipeline and pump station at the City-owned Chowdary Tract. Costing assumes 9 new groundwater wells to support the facility. A 2.4-mile, 24-inch PVC pipeline is required to deliver treated water to Pharr’s existing 24-inch transmission main. Land acquisition is only assumed for transmission line right-of-way, but surveying and environmental costs are assumed for the entire project area. The advanced treatment system includes RO membrane technology (New Water Treatment Plant Level 4). Concentrate from the RO process will be discharged into the Arroyo Colorado. Table 5-110 outlines the project costs developed in the UCM. The full UCM project cost estimate summary is provided in Appendix 5D.

## Implementation Issues

The final design of Pharr’s groundwater supply augmentation project requires approval from the Texas Commission on Environmental Quality (TCEQ), with compliance to regulations for treated water quality and concentrate discharge. Additional permitting may involve multiple agencies such as the U.S. Army Corps of Engineers (USACE), International Boundary and Water Commission (IBWC), U.S. Customs and Border Protection (USCBP), and the Hidalgo County Regional Mobility Authority (HCRMA). There is no groundwater conservation district within the Pharr service area.

**Table 5-110 Pharr – New Brackish Groundwater Desalination Project Costs**

Facilities Cost	Total Project Cost	Annual Cost	Annual Cost of Water (\$ per ac-ft)	Annual Cost of Water After Debt Service (\$ per ac-ft)
\$73,743,000	\$105,288,000	\$17,437,000	\$3,114	\$1,791

### 5.2.10.25 Environmental Impacts of Recommended Brackish Groundwater Strategies

Potential environment impacts for recommended brackish groundwater desalination strategies have been identified and categorized as described below. The letters identifying each section correspond to the headings in Table 5-111.

#### A. Acres Impacted Permanently

Acres impacted permanently refer to the total amount of area that will be permanently impacted because of the implementation of a strategy. The following conservative assumptions were made (unless more detailed information for a specific was available):

- The acres impacted for pipelines is equivalent to the ROW easements required; it is assumed 100-feet for ROW unless otherwise known.
- WTP impacts are estimated using UCM, which is based on the plant capacity.
- The impact of wells and wellfields are given by the UCM, which includes 0.5 acre per well.

#### B. Construction Impacted Acreage

Temporary environmental impacts may be seen during construction activities, such as increased air and noise pollution, and land disturbance activities. However, these effects are typical of any construction project. The construction impacted acreage was estimated as 110 percent (rounded up to a whole number) of the permanently impacted acreage.

#### C. Agricultural Resources Impacted Acreage

Agricultural resources impact acreage is a consolidation of vegetation and land use types specific to Region – row crops, grass farms, and orchards - identified in the TPWD EMST. This GIS mapping data was overlain WMS locations to estimate the agricultural impact acreage from the implementation of the associated strategy.

#### D. Wetland Impact

The wetland impact refers to the probability that implementation of a WMS will affect a wetland. The location of wetlands in the region was determined using the NWI located at <http://www.fws.gov/wetlands/Data/Mapper.html>.

A strategy received a "1" if all or part of the strategy is located in a wetland or if it is close enough to where construction activities are likely to impact the wetland. All other strategies received zeros. If the exact location of project is unknown it was given a zero because it was assumed that it would be located on a site that would not affect and wetland.

#### E. Habitat Impacted Acreage

Habitat impacted acreage refers to how the strategy will impact the habitat of the local area. The more area that is impacted because of the implementation of the strategy, the more the habitat of the area will be disrupted. Therefore, it was assumed that the permanent acreage impacted for a WMS is what would impact habitats.

#### F. Threatened and Endangered Species Count

Threatened and endangered species count refers to how the strategy will impact those species in the area once implemented. This impact was quantified based on the number of federally-listed threatened

and endangered species located within the county of the strategy. The number of threatened and endangered species came from the TPWD Rare, Threatened, and Endangered Species of Texas database (<http://tpwd.texas.gov/gis/rtest/>).

#### **G. Cultural Resources Impact**

Cultural resources impact refers to how the strategy will impact cultural resources located within the area. Cultural resources are defined as the collective evidence of the past activities and accomplishments of people, including locations; buildings; and features with scientific, cultural, or historic value. It is assumed that no WMSs negatively affect cultural resources. Mitigation costs are included for strategies that require infrastructure so it is assumed that none would be built in a location or way that disrupts culturally sensitive locations.

#### **H. Volume of Brine (ac-ft)**

The volume of brine quantifies the amount of brine concentrate from the desalination process that is released as surface water discharge. It is assumed that brackish groundwater desalination plants are 80 percent efficient, unless otherwise stated, so 20 percent of the amount of water pumped from the aquifer is discharged as brine concentrate.

#### **I. TDS of Brine (mg/L)**

The TDS of brine provides the concentrate of the brine discharge. This number was calculated by assuming that the raw brackish groundwater has a TDS of 3,500 mg/L. A TDS of 0 mg/L was used for the finished water.

#### **J. Reliability**

Reliability is an assessment of the availability of the specified water quantity to the user over time. If the quantity of water is available to the user all the time, then the strategy has a high reliability. If the quantity of water is contingent on other factors, reliability will be lower. Each desalination water management strategy was assessed on their reliability, varying between medium to high, contingent on factors such as the ability to desalinate and dispose reject water or availability of hydrogeologic studies in the area to determine suitability of formations for new wells.

#### **K. Bays, Estuaries, and Arms of the Gulf of Mexico**

The environmental effects due to implementation of upstream WMS projects on bays, estuaries, and arms of the Gulf of Mexico are quantitatively assessed and reported. Water bodies designated as classified segments by the TCEQ that are within or downstream of Region M include the Brownsville Ship Channel, South Bay, Laguna Madre, and Gulf of Mexico. Effects to these water bodies were quantified by estimating whether the project is anticipated to decrease freshwater inflow in these classified water bodies.

A WMS project received a "1" if it is expected to decrease freshwater inflow into a classified water body. If a strategy were to increase freshwater inflow or otherwise have little to no impact on inflows, then the project would receive a zero.

A summary of the identified and quantified environmental impacts for recommended brackish groundwater desalination projects is presented in Table 5-111.

**Table 5-111 Environmental Impacts of Recommended Brackish Groundwater Desalination Strategies**

Entity	WMS Name	Yield*	A	B	C	D	E	F	G	H	I	J	K
Agua SUD	Brackish Groundwater Desalination (Phase 1)	2,800	21	23	0	0	21	8	0	700	17,500	5	0
Agua SUD	Brackish Groundwater Desalination (Phase 2)	2,800	21	23	0	0	21	8	0	700	17,500	5	0
Alamo	Brackish Groundwater Desalination	896	6	7	0	0	6	8	0	224	17,500	5	0
Donna	New Brackish Groundwater Desalination	5,600	123	135	48	0	123	8	0	1,400	17,500	5	0
Eagle Pass	Brackish Groundwater Desalination	5,210	145	160	24	0	145	3	0	1,303	17,500	5	0
ERHWSC	North Cameron Regional WTP Wellfield Expansion	1,290	49	54	4	0	49	25	0	322	17,500	3	0
ERHWSC	Brackish Desal Wellfield and RO at NRWTP and MASWTP	2,766	16	18	16	0	16	25	0	784	17,500	3	0
ERHWSC	Expansion of MASWTP	988	4	5	0	0	4	25	0	280	17,500	3	0
La Feria	Water Well with RO Unit	1,120	1	2	0	0	1	25	0	280	17,500	3	0
Lyford	Brackish Groundwater Well and Desalination	560	5	6	0	0	5	22	0	140	17,500	5	0
Maverick County	New Brackish Groundwater Desalination	136	59	65	0	0	59	3	0	34	17,500	3	0
McAllen	Brackish Groundwater Desalination Treatment	6,720	19	21	0	0	19	8	0	1,680	17,500	5	0

Entity	WMS Name	Yield*	A	B	C	D	E	F	G	H	I	J	K
Mercedes	New Brackish Groundwater Desalination	5,600	123	135	48	0	123	8	0	1,400	17,500	5	0
Mission	Brackish Groundwater Desalination Plant	2,688	18	20	0	0	18	8	0	672	17,500	5	0
NAWSC	Delta Area Brackish Groundwater Desalination Plant	2,080	9	10	1	0	9	25	0	560	17,500	3	0
Pharr	New Brackish Groundwater Desalination	5,600	79	87	0	0	79	8	0	1,900	14,000	5	0
Primera	RO WTP with Groundwater Well	1,120	1	1	0	0	1	8	0	280	17,500	5	0
San Benito	Brackish Groundwater Blending	560	3	4	3	0	3	25	0	0	0	3	0
San Juan	Brackish Groundwater Desalination	1,120	1	2	0	0	7	8	0	280	17,500	5	0
San Juan	WTP 1 Expansion with Brackish Groundwater Desalination	3,360	19	21	2	0	19	8	0	840	17,500	3	0
Sharyland WSC	Well and RO Unit at WTP 2	900	7	8	0	0	7	8	0	225	17,500	5	0
Sharyland WSC	Well and RO Unit at WTP 3	900	7	8	1	0	7	8	0	225	17,500	5	0
Southmost RWA	Brackish Groundwater Desalination Wellfield Expansion	901	0	0	0	0	0	25	0	314	14,000	3	0
Southmost RWA	Phase 3 SRWA Wellfield and WTP Expansion	2,372	0	0	0	0	0	25	0	821	14,000	3	0

Entity	WMS Name	Yield*	A	B	C	D	E	F	G	H	I	J	K
Southmost RWA	Phase 4 SRWA Wellfield and WTP Expansion	12,840	7	8	0	0	7	25	0	4,480	14,000	3	0

\*First decade of implementation yield (ac-ft/yr).

**5.2.11 Seawater Desalination**

Seawater desalination still remains one of the more expensive WMSs, but costs have declined over the years as technology has advanced. In addition, as population and water demand grow, there continue to be limits to available resources inland, while seawater has a seemingly vast supply. Texas does not yet have a seawater desalination plant for municipal purposes, but there are multiple currently in the works along the Texas coast.

For the 2026 planning cycle, one recommended seawater desalination strategy was carried over from the 2021 cycle, with updates made. There are also two alternative strategies that were carried over from the 2021 Plan which are included in the alternative strategy Section 5.3.5. Additionally, a third seawater desalination strategy was considered by the Rio Grande RWPG this cycle but was ultimately not included as recommended or alternative. That strategy is mentioned in Section 5.4.

The recommended seawater desalination strategy included for the 2026 planning cycle is:

- Laguna Madre Water District – Seawater Desalination Plant.

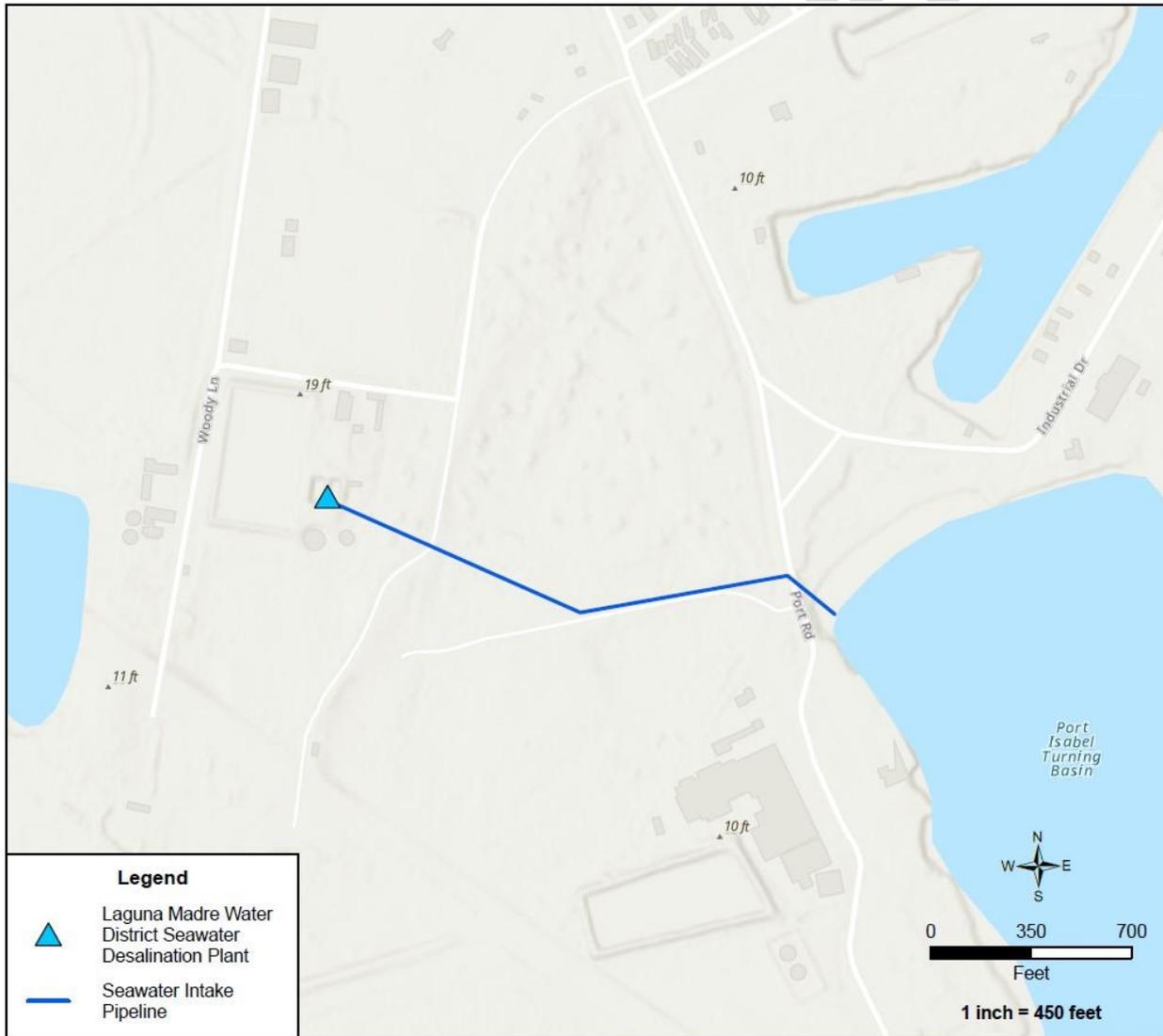
### 5.2.11.1 Laguna Madre Water District – Seawater Desalination Plant

#### Project Source

This strategy was submitted by Laguna Madre Water District during the 2021 regional water planning process and updated for this planning cycle using Laguna Madre’s 2024 Feasibility Study.

#### Description

This strategy is for the full implementation of the 1.0 mgd seawater desalination pilot study conducted and completed in August 2010. This strategy includes full-scale components for the 5 mgd project like the intake system, concentrate disposal system, and land acquisition. This project is anticipated to be online by the 2030 decade. Figure 5-19 shows the location of the project.



**Figure 5-19** Laguna Madre Water District Seawater Desalination Project Location Map

### Available Supply

This strategy would improve the seawater desalination pilot study facility to provide a supply of approximately 5.0 mgd of drinking water (5,600 ac-ft/yr) by 2030.

### Engineering and Costing

This strategy includes an intake structure, piping, land acquisition, and treatment. The infrastructure was sized based on an RO efficiency of 50 percent. Table 5-112 outlines the project costs developed in the UCM. The full UCM project cost estimate summary is provided in Appendix 5D.

### Implementation Issues

Financing a full-scale seawater desalination facility is a major implementation issue. A 12-month, 1 mgd pilot plant study was completed in December 2009 with a final report published in August 2010 by NRS Engineering Water Solutions (TWDB, 2019). A feasibility study for the 5 mgd Port Isabel Seawater Desalination Treatment Facility was submitted to the U.S. Bureau of Reclamation in 2024 in support of the Title XVI Program for federal grant consideration.

**Table 5-112 Laguna Madre Water District – Seawater Desalination Plant Project Costs**

Facilities Cost	Total Project Cost	Annual Cost	Annual Cost of Water (\$ per ac-ft)	Annual Cost of Water After Debt Service (\$ per ac-ft)
\$91,039,000	\$127,001,000	\$21,396,000	\$3,821	\$2,226

### 5.2.11.2 Environmental Impacts of Recommended Seawater Desalination Strategies

Potential environment impacts for recommended seawater desalination strategies have been identified and categorized as described below. The letters identifying each section correspond to the headings in Table 5-113.

#### A. Acres Impacted Permanently

Acres impacted permanently refer to the total amount of area that will be permanently impacted because of the implementation of a strategy. The following conservative assumptions were made (unless more detailed information for a specific was available):

- The acres impacted for pipelines is equivalent to the ROW easements required; it is assumed 100-feet for ROW unless otherwise known.
- WTP impacts are estimated using UCM, which is based on the plant capacity.

#### B. Construction Impacted Acreage

Temporary environmental impacts may be seen during construction activities, such as increased air and noise pollution, and land disturbance activities. However, these effects are typical of any construction project. The construction impacted acreage was estimated as 110 percent (rounded up to a whole number) of the permanently impacted acreage.

#### C. Agricultural Resources Impacted Acreage

Agricultural resources impact acreage is a consolidation of vegetation and land use types specific to Region – row crops, grass farms, and orchards - identified in the TPWD EMST. This GIS mapping data was

overlay WMS locations to estimate the agricultural impact acreage from the implementation of the associated strategy.

#### **D. Wetland Impact**

The wetland impact refers to the probability that implementation of a WMS will affect a wetland. The location of wetlands in the region was determined using the NWI located at <http://www.fws.gov/wetlands/Data/Mapper.html>.

A strategy received a "1" if all or part of the strategy is located in a wetland or if it is close enough to where construction activities are likely to impact the wetland. All other strategies received zeros. If the exact location of project is unknown it was given a zero because it was assumed that it would be located on a site that would not affect and wetland.

#### **E. Habitat Impacted Acreage**

Habitat impacted acreage refers to how the strategy will impact the habitat of the local area. The more area that is impacted because of the implementation of the strategy, the more the habitat of the area will be disrupted. Therefore, it was assumed that the permanent acreage impacted for a WMS is what would impact habitats.

#### **F. Threatened and Endangered Species Count**

Threatened and endangered species count refers to how the strategy will impact those species in the area once implemented. This impact was quantified based on the number of federally-listed threatened and endangered species located within the county of the strategy. The number of threatened and endangered species came from the TPWD Rare, Threatened, and Endangered Species of Texas database (<http://tpwd.texas.gov/gis/rtest/>).

#### **G. Cultural Resources Impact**

Cultural resources impact refers to how the strategy will impact cultural resources located within the area. Cultural resources are defined as the collective evidence of the past activities and accomplishments of people, including locations; buildings; and features with scientific, cultural, or historic value. It is assumed that no WMSs negatively affect cultural resources. Mitigation costs are included for strategies that require infrastructure so it is assumed that none would be built in a location or way that disrupts culturally sensitive locations.

#### **H. Volume of Brine (ac-ft)**

The volume of brine quantifies the amount of brine concentrate from the desalination process that is released as surface water discharge. An efficiency of 50 percent was assumed for seawater desalination.

#### **I. TDS of Brine (mg/L)**

The TDS of brine provides the concentrate of the brine discharge. This number was calculated by assuming that the TDS of the seawater is 35,000 mg/L. A TDS of 0 mg/L was used for the finished water.

#### **J. Reliability**

Reliability is an assessment of the availability of the specified water quantity to the user over time. If the quantity of water is available to the user all the time, then the strategy has a high reliability. If the quantity of water is contingent on other factors, reliability will be lower. Each desalination water

management strategy was assessed on their reliability, varying between medium to high, contingent on factors such as the ability to desalinate and dispose reject water.

**K. Bays, Estuaries, and Arms of the Gulf of Mexico**

The environmental effects due to implementation of upstream WMS projects on bays, estuaries, and arms of the Gulf of Mexico are quantitatively assessed and reported. Water bodies designated as classified segments by the TCEQ that are within or downstream of Region M include the Brownsville Ship Channel, South Bay, Laguna Madre, and Gulf of Mexico. Effects to these water bodies were quantified by estimating whether the project is anticipated to decrease freshwater inflow in these classified water bodies.

A WMS project received a "1" if it is expected to decrease freshwater inflow into a classified water body. If a strategy were to increase freshwater inflow or otherwise have little to no impact on inflows, then the project would receive a zero.

A summary of the identified and quantified environmental impacts for recommended seawater desalination projects is presented in Table 5-113.

**Table 5-113 Environmental Impacts of Recommended Seawater Desalination Strategies**

Entity	WMS Name	Yield*	A	B	C	D	E	F	G	H	I	J	K
Laguna Madre Water District	Seawater Desalination Plant	5,600	12	13	0	1	12	25	0	5,600	70,000	5	0
*First decade of implementation yield (ac-ft/yr).													

**5.2.12 Regional Water Supply Facilities**

The TWDB encourages the consideration and development of water management strategies that can meet needs on a regional level. The Rio Grande RWPG has recommended one water management strategy for the 2026 planning cycle that includes a system of off-channel reservoirs, water treatment plants, and transmission lines that could provide water supplies to entities within and outside of Hidalgo County. This project is the Delta Region Water Management Supply strategy, sponsored by Hidalgo County Drainage District #1 (HCDD #1).

**5.2.12.1 HCDD#1 – Delta Region Water Management Supply**

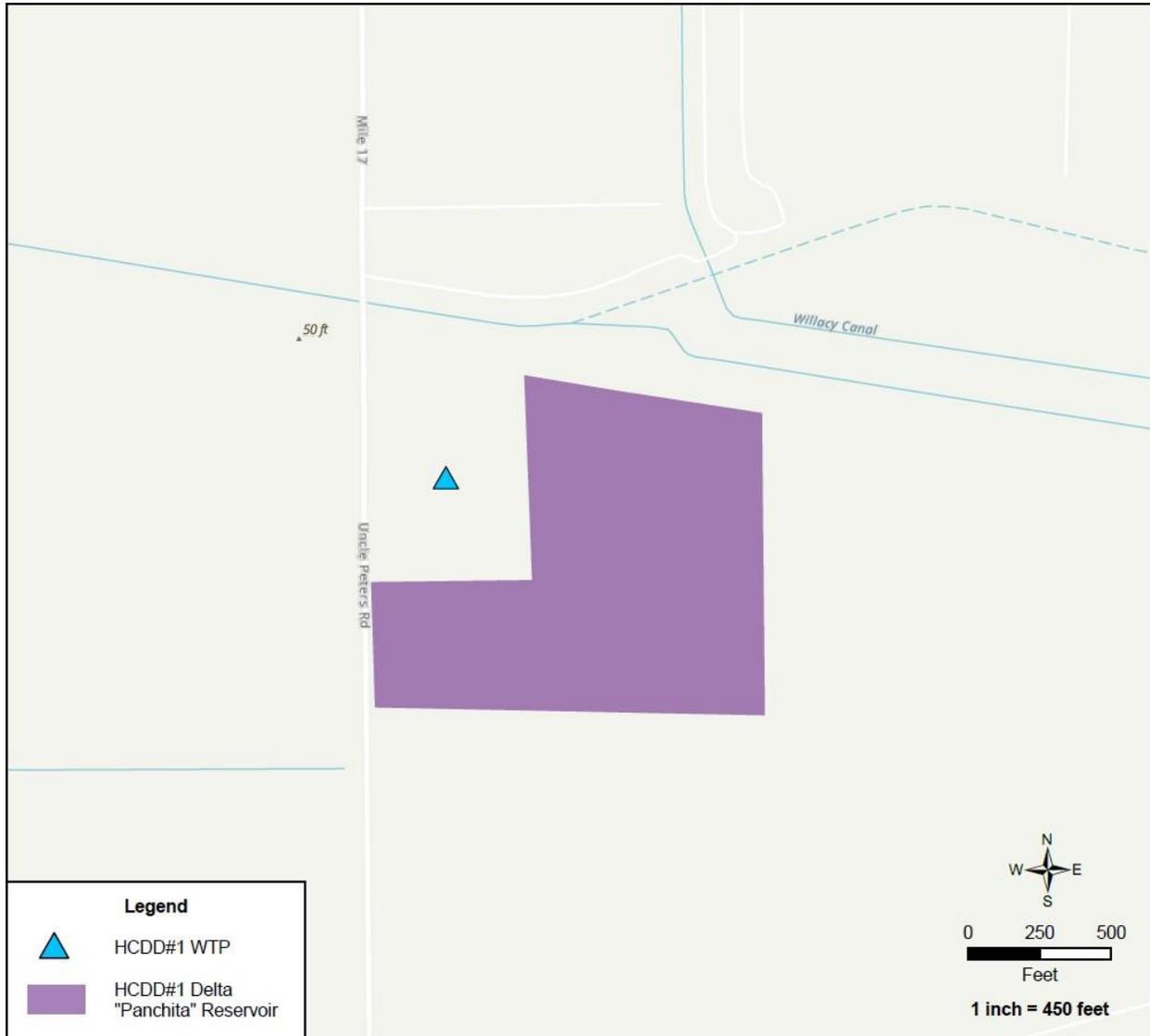
**Project Source**

A version of this strategy had been included in the 2016 RGRWP as a recommended strategy but was not included in the 2021 RGRWP until it was requested to be added as an amendment to the 2021 RGRWP. It was requested by HCDD #1 to be included for the 2026 planning cycle.

**Description**

This strategy is to construct three reservoirs in northeastern Hidalgo County to capture tailwaters and precipitation runoff for beneficial use. Each proposed reservoir in this strategy is separated into a different Water Management Strategy Project (WMSP): the Delta “Panchita” Reservoir (235 ac-ft capacity, online 2040), the Santa Cruz (Delta West) Reservoir (4,621 ac-ft capacity, online 2030), and the

Engleman Reservoir (280 ac-ft capacity, online 2050). These reservoirs will allow for better control and management of flows in the drainage network and will allow for the drainage district to treat and distribute a portion of the flows for sale to potential customers Figure 5-20 through Figure 5-22 show the project location maps for the three reservoirs.



**Figure 5-20 HCDD #1 Delta "Panchita" Reservoir Project Location Map**



**Figure 5-21 HCDD #1 Santa Cruz (Delta West) Reservoir Project Location Map**



**Figure 5-22 HCDD #1 Engleman Reservoir Project Location Map**

### Available Supply

The reservoirs are all in the Delta Watershed, which is distinct from other portions of the Nueces-Rio Grande Basin and will not impact downstream water rights. Recently established environmental flow requirements for the Nueces-Rio Grande Basin do not place any limitations on the drainageways that will be impacted by this strategy.

Kennedy Resource Company performed the Water Availability Modeling (WAM) analysis to determine the firm yield of each reservoir. The current version of the TCEQ Nueces-Rio Grande (NRG) Full Authorization WAM, dated October 23, 2023, was used to determine the firm yield. To assess the reservoirs' firm yields using the most updated version of the TCEQ NRG Full Authorization WAM, edits were required to include project off-channel reservoirs and return flows available for diversion by HCDD #1 permit 13195.

Because the reservoirs will be operated as a single system, operating procedures can impact the firm yields for each reservoir. For purposes of inclusion in the 2026 Regional Water Plan, an operating

scenario entitled, “Fully Utilized Panchita Reservoir” (with return flows) was utilized to determine firm yields. The Fully Utilized Panchita Reservoir operating procedure assumes the Panchita Reservoir has senior priority, diverting up to its full permitted amount. Any remaining water not diverted, or not reserved for use at Panchita Reservoir, could be diverted by the Santa Cruz (Delta West) and Engleman Reservoirs, which have junior priority. While the water use permit used for this strategy only has one priority date, the NRG Full Authorization WAM was modified by changing each reservoir’s priority date (by one day) and revising the order of the proposed reservoir diversions. Changes to the priority dates in the WAM were done to simulate either a junior or senior date when compared to the other project reservoirs. Changes to the permit priority dates will not impact priority order with any other water permits in the project watershed. The TWDB acknowledges these operational changes do not impact other water rights in the basin. Further, the TWDB approved this approach to modify priority dates as part of the hydrologic variance process for the 2026 planning cycle.

The firm yields were analyzed without return flows included. Without return flows, the individual reservoir firm yield is 9,200 ac-ft/yr for the Delta “Panchita” Reservoir, 7,800 ac-ft/yr for the Santa Cruz (Delta West) Reservoir, and 900 ac-ft/yr for the Engleman Reservoir. However, project yield is limited by water treatment plant capacity for two of the three reservoirs. The Santa Cruz (Delta West) Reservoir will provide 5,600 ac-ft/yr when it comes online in 2030. The Delta “Panchita” Reservoir will provide an additional 5,600 ac-ft/yr when it comes online in 2040. The Engleman Reservoir will further provide an additional 900 ac-ft/yr when it comes online in 2050.

### **Engineering and Costing**

Costs for each project within this strategy were developed using the TWDB Uniform Costing Model (UCM) and include land acquisition, the reservoir, an intake and pump station, transmission pipeline (distance estimated for costing purposes as an end user has not been identified at this time), and advanced water treatment facility with micro-filtration and reverse osmosis. It is assumed that the construction period for this strategy is 2 years for each reservoir. The reservoir footprint for the Delta “Panchita” Reservoir is 25 acres, with a land acquisition cost of \$161,000 and a mitigation cost of \$161,000 for the same acreage, while the intake, pump station, transmission pipeline, and treatment facility require 54 acres of land acquisition at a cost of \$328,000 and a mitigation cost of \$146,000 for the same acreage. The reservoir footprint for the Santa Cruz (Delta West) Reservoir is 418 acres, with a land acquisition cost of \$2,693,000 and a mitigation cost of \$2,693,000 for the same acreage, while the intake, pump station, transmission pipeline, and treatment facility require 81 acres of land acquisition at a cost of \$501,000 and a mitigation cost of \$213,000 for the same acreage. The reservoir footprint for the Engleman Reservoir is 25 acres, with a land acquisition cost of \$161,000 and a mitigation cost of \$161,000 for the same acreage, while the intake, pump station, transmission pipeline, and treatment facility require 54 acres of land acquisition at a cost of \$342,000 and a mitigation cost of \$151,000 for the same acreage. Table 5-114 outlines the project costs developed in the UCM for the Delta “Panchita” Reservoir, Table 5-115 outlines the project costs developed in the UCM for the Santa Cruz (Delta West) Reservoir, and Table 5-116 outlines the project costs developed in the UCM for the Engleman Reservoir. The costs shown are in September 2023 dollars. The full UCM project cost estimate summaries are provided in Appendix 5D.

### **Implementation Issues**

The main implementation issue for the three reservoirs and future water treatment plants would be funding for the projects. State and federal permits must be obtained before construction can begin, potentially including a Section 404, Clean Water Act Permit. Additionally, the project may need to comply with the National Environmental Policy Act if federal funding is involved and with the

Endangered Species Act if any threatened and endangered species are impacted. However, the project has received a non-jurisdictional determination from the U.S. Army Corps of Engineers.

The project would divert and use water from drainageways, channels, and canals within the Delta Watershed. This project captures and beneficially uses tailwaters and precipitation runoff, which would otherwise discharge into the Laguna Madre. Diversion of water for this project is unlikely to cause significant, detrimental impacts to key parameters of water quality for the drainageways and downstream water bodies to the Laguna Madre. In fact, the "Environmental Flows Recommendations Report", prepared by Rio Grande, Rio Grande Estuary, and Lower Laguna Madre Basin and Bay Expert Science Team, indicates that a reduction in freshwater entering the Laguna Madre would benefit the natural aquatic plant life by maintaining the salinity. The project will use advanced water treatment, including micro-filtration and reverse osmosis. If disposed in the drainage canals, the brine concentrate could increase levels of total dissolved solids in the receiving stream.

The Delta Region Water Management Supply Strategy currently has Memoranda of Understanding with two Irrigation Districts, Engleman and Delta Lake. The largest potential impact on cultural resources associated with this strategy comes from pipeline construction and operation. Therefore, pipelines should follow existing and shared rights-of-way whenever possible to minimize the area of disturbance.

**Table 5-114 HCDD #1 – Delta Region Water Management Supply Delta “Panchita” Reservoir Project Costs**

Facilities Cost	Total Project Cost	Annual Cost	Annual Cost of Water (\$ per ac-ft)	Annual Cost of Water After Debt Service (\$ per ac-ft)
\$61,580,000	\$89,113,000	\$12,110,000	\$2,163	\$1,072

**Table 5-115 HCDD #1 – Delta Region Water Management Supply Santa Cruz (Delta West) Reservoir Project Costs**

Facilities Cost	Total Project Cost	Annual Cost	Annual Cost of Water (\$ per ac-ft)	Annual Cost of Water After Debt Service (\$ per ac-ft)
\$79,234,000	\$120,121,000	\$14,051,000	\$2,509	\$1,126

**Table 5-116 HCDD #1 – Delta Region Water Management Supply Engleman Reservoir Project Costs**

Facilities Cost	Total Project Cost	Annual Cost	Annual Cost of Water (\$ per ac-ft)	Annual Cost of Water After Debt Service (\$ per ac-ft)
\$22,934,000	\$33,665,000	\$3,644,000	\$4,049	\$1,601

### 5.2.12.2 Environmental Impacts of Recommended Regional Water Supply Facilities Strategies

Potential environment impacts for regional water supply facilities strategies have been identified and categorized as described below. The letters identifying each section correspond to the headings in Table 5-117.

#### **A. Acres Impacted Permanently**

Acres impacted permanently refers to the total amount of area that will be permanently impacted because of the implementation of a strategy. The following conservative assumptions were made (unless more detailed information for a specific was available):

- The acreage impacted for pipelines is equivalent to the right-of-way (ROW) easements required; it is assumed 50 feet for ROW unless otherwise known.
- WTP impacts are estimated using UCM, which is based on the plant type and capacity.

#### **B. Construction Impacted Acreage**

Temporary environmental impacts may be seen during construction activities, such as increased air and noise pollution, and land disturbance activities. However, these effects are typical of any construction project. The construction impacted acreage was estimated as 110 percent (rounded up to a whole number) of the permanently impacted acreage.

#### **C. Inundation Acreage**

The inundation acreage applies to reservoirs only and is equal to the amount of land that will be inundated by the construction of the reservoir.

#### **D. Agricultural Resources Impacted Acreage**

Agricultural resources impact acreage is a consolidation of vegetation and land use types specific to Region – row crops, grass farms, and orchards - identified in the TPWD EMST. This GIS mapping data was overlain WMS locations to estimate the agricultural impact acreage from the implementation of the associated strategy.

#### **E. Wetland Impact**

The wetland impact refers to the probability that implementation of a WMS will affect a wetland. The location of wetlands in the region was determined using the National Wetlands Inventory (NWI) located at <http://www.fws.gov/wetlands/Data/Mapper.html>.

A strategy received a "1" if all or part of the strategy is located in a wetland or if it is close enough to where construction activities are likely to impact the wetland. All other strategies received zeros. If the exact location of project is unknown, it was given a zero because it was assumed that it would be located on a site that would not affect any wetland.

#### **F. Habitat Impacted Acreage**

Habitat impacted acreage refers to how the strategy will impact the habitat of the local area. The more area that is impacted because of the implementation of the strategy, the more the habitat of the area will be disrupted. Therefore, it was assumed that the permanent acreage impacted for a WMS is what would impact habitats.

#### **G. Threatened and Endangered Species Count**

Threatened and endangered species count refers to how the strategy will impact those species in the area once implemented. This impact was quantified based on the number of federally-listed threatened and endangered species located within the county of the strategy. The number of threatened and

endangered species came from the Texas Parks and Wildlife Department (TPWD) Rare, Threatened, and Endangered Species of Texas database (<http://tpwd.texas.gov/gis/rtest/>).

**H. Cultural Resources Impact**

Cultural resources impact refers to how the strategy will impact cultural resources located within the area. Cultural resources are defined as the collective evidence of the past activities and accomplishments of people, including locations; buildings; and features with scientific, cultural, or historic value. It is assumed that no WMSs negatively affect cultural resources. Mitigation costs are included for strategies that require infrastructure, so it is assumed that none would be built in a location or way that disrupts culturally sensitive locations.

**I. Reliability**

Reliability is an assessment of the availability of the specified water quantity to the user over time. If the quantity of water is available to the user all the time, then the strategy has a high reliability. If the quantity of water is contingent on other factors, reliability will be lower. This strategy was developed in accordance with WAM and/or MAG values for the appropriate area. As such, WMSs associated with new/improved infrastructure or distribution system or facilities expansions are considered to be reliable supply (reliability score = 5) that will not compromise the DFCs as established by the MAG or the environmental flow standards as established by 30 TAC §298. The reliability of on/off-channel reservoirs is also projected to be high (reliability score = 5).

**J. Bays, Estuaries, and Arms of the Gulf of Mexico**

The environmental effects due to implementation of upstream WMS projects on bays, estuaries, and arms of the Gulf of Mexico are quantitatively assessed and reported. Water bodies designated as classified segments by the TCEQ that are within or downstream of Region M include the Brownsville Ship Channel, South Bay, Laguna Madre, and the Gulf of Mexico. Effects to these water bodies were quantified by estimating whether the project is anticipated to decrease freshwater inflow in these classified water bodies.

A WMS project received a "1" if it is expected to decrease freshwater inflow into a classified water body. If a strategy were to increase freshwater inflow or otherwise have little to no impact on inflows, then the project would receive a zero.

A summary of the identified and quantified environmental impacts for recommended and alternative municipal infrastructure is presented in Table 5-117.

**Table 5-117 Environmental Impacts of Recommended Regional Water Supply Facilities Strategies**

Entity	WMS Name	Yield*	A	B	C	D	E	F	G	H	I	J
HCDD #1	Delta Region Water Management Supply	5,600	557	613	468	0	1	557	8	0	5	1
*First decade of implementation yield (ac-ft/yr).												

**5.3 Alternative Water Management Strategies**

This section of Chapter 5 presents the evaluation of alternative water management strategies (WMS). Alternative WMSs are defined as a fully evaluated WMS that may be substituted into a Regional Water

Plan if a recommended WMS is no longer recommended. In some cases, alternative strategies are included as alternative because they are identified as a “Plan B” for a project sponsor. In other cases, it is because the yield volumes are larger than what can be justified under existing water availability or the RWPG feels it does not meet their criteria for a recommended WMS, such as due to high cost or significant environmental impacts.

### **5.3.1 Reuse (Alternative)**

Wastewater reuse is defined as the types of projects that utilize treated wastewater effluent as a replacement for water supply, reducing the overall demand for fresh water supply. Wastewater reuse can be classified into two major types, defined by how the reuse water is handled. Direct reuse involves introducing treated wastewater directly from a wastewater plant to the place of use. For example, piping treated wastewater from a wastewater treatment plant (WWTP) to a golf course. Indirect reuse involves discharging treated wastewater to an environmental buffer like a river, aquifer, or lake for subsequent use. Virtually any water supply entity with a WWTP could pursue a reuse alternative, provided that downstream water rights do not have a claim for the entire return flow. Both direct and indirect wastewater reuse can be applied to potable and non-potable uses. See Subsections 5.2.5.1 and 5.2.5.2 for additional details on non-potable and potable reuse.

Four water management strategies have been included as alternative strategies in the 2026 Plan. Three are non-potable and one is potable. They are included as follows:

- Agua SUD – Non-Potable Reuse.
- La Feria – Non-Potable Reuse.
- San Benito – Non-Potable Reuse.
- San Benito – Direct Potable Reuse.

Environmental impacts are described in Section 5.3.1.5.

#### **5.3.1.1 Agua SUD – Non-Potable Reuse (Alternative)**

##### **Project Source**

This strategy was submitted by the Agua SUD to the RWPG.

##### **Description**

The Agua SUD owns one WWTP (West Agua WWTP) which is located in Sullivan City, Texas. This direct non-potable reuse strategy is to provide Type II reclaimed water currently produced at the West Agua WWTP to individual customers with a need for reuse water.

##### **Available Supply**

Because there were no specific customers or uses identified for the non-potable reuse, it was assumed that only 5 percent of Agua SUD’s 2030 WUG demand could be met by non-potable reuse. Therefore, this strategy was sized to produce 350 ac-ft/yr, beginning in 2030.

##### **Engineering and Costing**

Costs for this strategy from the UCM include tertiary treatment at the WWTP and storage. The submitted strategy discussed having customers receive the reclaimed water at the WWTP; therefore, no pumping or piping costs were included. It is assumed the storage will fit on the existing property, so no

land acquisition costs were included. Table 5-118 outlines the project costs developed in the UCM. The full UCM project cost estimate summary is provided in Appendix 5D.

### Implementation Issues

Approval for a reclaimed water system is needed from TCEQ.

**Table 5-118 Agua SUD – Non-Potable Reuse Project Costs (Alternative)**

Facilities Cost	Total Project Cost	Annual Cost	Annual Cost of Water (\$ per ac-ft)	Annual Cost of Water After Debt Service (\$ per ac-ft)
\$4,566,000	\$6,366,000	\$901,000	\$2,574	\$1,294

### 5.3.1.2 La Feria – Non-Potable Reuse (Alternative)

#### Project Source

This strategy was submitted by La Feria to the RWPG and has been adapted from the 2016 RWP.

#### Description

La Feria currently uses wastewater effluent to fill three small lakes in the city’s Nature Park. This direct non-potable reuse strategy involves adding tertiary treatment to the WWTP and using additional effluent to irrigate the native vegetation at the park.

#### Available Supply

The WWTP has a rated capacity of 1.25 mgd and a 2013 daily average of 0.38 mgd. A portion of the WWTP effluent is already conveyed to Nature Park, so according to current flows, an additional 0.155 mgd could be available. Because demand projections for La Feria are fairly flat this planning cycle, the projected limitation of reuse water available is the additional 0.155 mgd, or 170 ac-ft/yr. This WMS could enable a supply volume of 50 ac-ft/yr in 2030, increasing to a full supply of 170 ac-ft/yr in 2040.

Although a certain amount of water is available to use for irrigation; because the plants at Nature Park are native vegetation, no additional irrigation should be required for them. Therefore, this management strategy is not recommended and is listed as an alternative because it does not necessarily displace any the demand shown for La Feria.

#### Engineering and Costing

To establish this management strategy, tertiary treatment would be added to the WWTP, and additional pumping and piping would be needed to convey the reclaimed water to the park. Stainless steel disk, cloth media filters would be installed to further treat the wastewater effluent. A ground storage tank would also be included to provide one day’s worth of storage. It is assumed that the construction period would be 1 year.

Table 5-119 outlines the project costs developed in the UCM. Treatment Level 2 was used on the UCM spreadsheet to estimate the costs for addition of the cloth media filters. The full UCM project cost estimate summary is provided in Appendix 5D.

## Implementation Issues

TCEQ approval for a reclaimed water system is needed. Construction of the new pipeline may also include any of the following permits: USACE Section 404 permit; TPWD sand, shell, gravel, and marl permit; TPDES Storm Water Pollution Prevention Plan; and TXDOT right-of-way permit.

**Table 5-119 La Feria – Non-Potable Reuse Project Costs (Alternative)**

Facilities Cost	Total Project Cost	Annual Cost	Annual Cost of Water (\$ per ac-ft)	Annual Cost of Water After Debt Service (\$ per ac-ft)
\$3,938,000	\$5,620,000	\$627,000	\$3,688	\$3,938,000

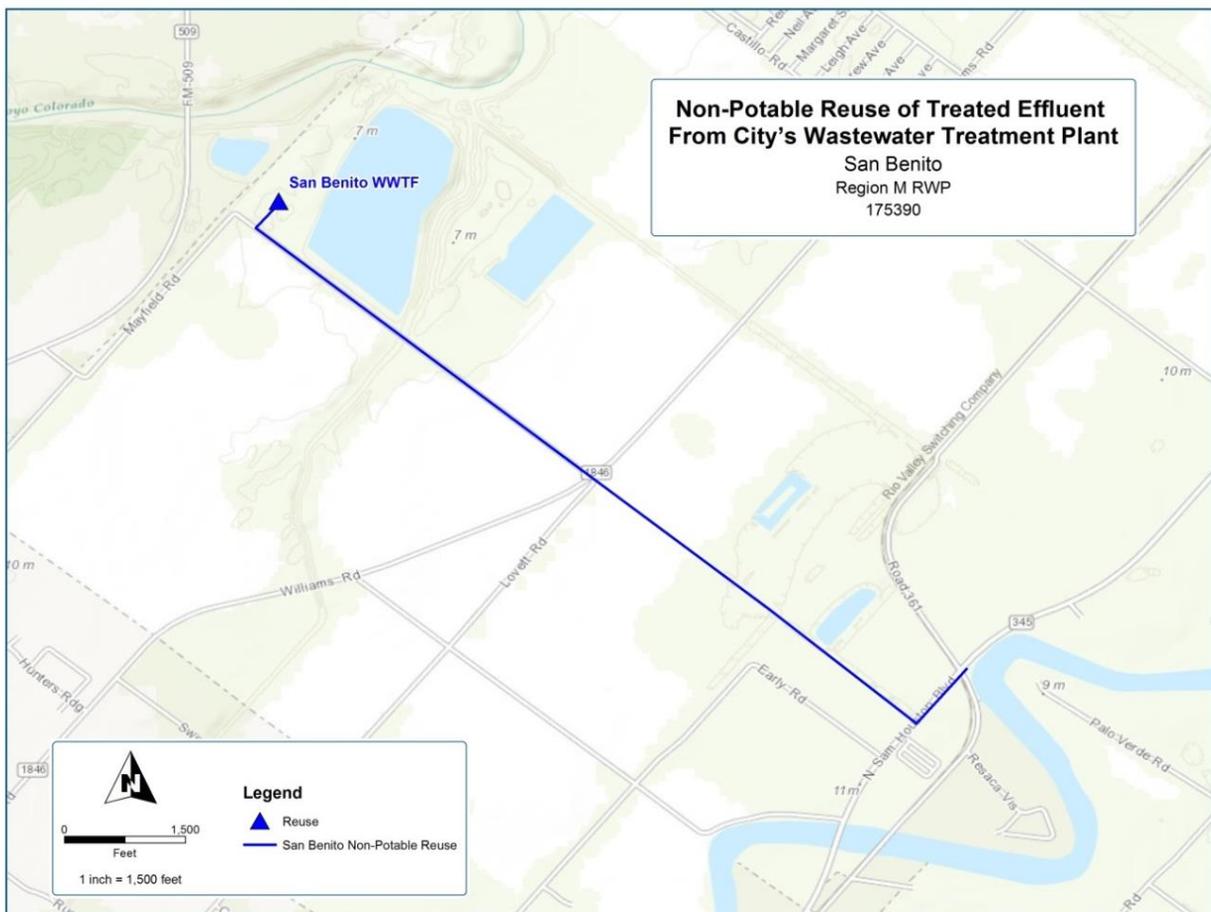
### 5.3.1.3 San Benito– Non-Potable Reuse (Alternative)

#### Project Source

This strategy was submitted by the San Benito to the RWPG.

#### Description

This indirect non-potable reuse strategy involves diverting a portion of WWTP effluent to a canal for irrigation use. A map depicting the approximate alignment of the reuse pipeline is shown on Figure 5-23.



**Figure 5-23 San Benito - Non-Potable Reuse Pipeline Location**

**Available Supply**

The San Benito WWTP currently discharges 2.3 mgd of effluent into a minor stream that feeds the Arroyo Colorado. Of this, 1,120 ac-ft/yr would be diverted and used to supplement the flows in the irrigation canal for Cameron County Irrigation use. It is assumed this strategy would be implemented beginning in 2030 and carried through to 2080.

Final Draft

## Engineering and Costing

This project would require modifications to the WWTP’s effluent pump station and a new pipeline. It is assumed that the construction period would be 1 year. No additional treatment is assumed. Table 5-120 outlines the project costs developed in the UCM. The full UCM project cost estimate summary is provided in Appendix 5D.

## Implementation Issues

TCEQ approval for a reclaimed water system is needed. Construction of the new pipeline may also include any of the following permits: USACE Section 404 permit; TPWD sand, shell, gravel, and marl permit; TPDES Storm Water Pollution Prevention Plan; and TXDOT right-of-way permit.

Use of any ID canals to convey recycled water (specifically Cameron County ID No. 2 listed here), would require a permit from the ID.

**Table 5-120 San Benito – Non-Potable Reuse Project Costs (Alternative)**

Facilities Cost	Total Project Cost	Annual Cost	Annual Cost of Water (\$ per ac-ft)	Annual Cost of Water After Debt Service (\$ per ac-ft)
\$2,967,000	\$4,233,000	\$370,000	\$330	\$66

### 5.3.1.4 San Benito – Direct Potable Reuse (Alternative)

#### Project Source

This strategy was submitted by the San Benito to the RWPG.

#### Description

A modular WTP would be built to provide additional treatment for the treated wastewater effluent to bring it to potable water standards. The direct potable reuse water would then serve potable water needs for the north portion of San Benito.

#### Available Supply

The San Benito WWTP currently discharges 2.3 mgd of effluent into a minor stream. Due to the projected slow growth in demand this planning cycle, it is assumed that 1 mgd, or 1,120 ac-ft/yr, would be produced from the modular treatment plant by 2040 and kept constant throughout the planning cycle.

## Engineering and Costing

This project consists of a new modular advanced WTP, pump station, 3-mile, 8” transmission pipeline, and storage tank to bring the reuse water into the utility’s distribution system. It is assumed that the construction period would be 2 years. Table 5-121 outlines the project costs developed in the UCM. The full UCM project cost estimate summary is provided in Appendix 5D.

## Implementation Issues

TCEQ approval for a reclaimed water system is needed. Construction of the new pipelines may also include any of the following permits: USACE Section 404 permit; TPWD sand, shell, gravel, and marl permit; TPDES Storm Water Pollution Prevention Plan; and TXDOT right-of-way permit. Additionally,

local public opinion of potable reuse would have to be taken into account and a public relations campaign may be required.

**Table 5-121 San Benito – Direct Potable Reuse Project Costs (Alternative)**

Facilities Cost	Total Project Cost	Annual Cost	Annual Cost of Water (\$ per ac-ft)	Annual Cost of Water After Debt Service (\$ per ac-ft)
\$19,410,000	\$28,025,000	\$3,533,000	\$3,154	\$1,396

### 5.3.1.5 Environmental Impacts of Alternative Reuse Strategies

Potential environment impacts for alternative reuse strategies have been identified and categorized as described below. The letters identifying each section correspond to the headings in Table 5-122.

#### A. Acres Impacted Permanently

Acres impacted permanently refers to the total amount of area that will be permanently impacted because of the implementation of a strategy. The following conservative assumptions were made (unless more detailed information for a specific facility was available):

- The acres impacted for pipelines is equivalent to the ROW easements required; it is assumed 100-feet for ROW unless otherwise known; and
- WTP impacts are estimated using UCM, which is based on the plant capacity.

#### B. Construction Impacted Acreage

Temporary environmental impacts may be seen during construction activities, such as increased air and noise pollution, and land disturbance activities. However, these effects are typical of any construction project. The construction impacted acreage was estimated as 110 percent (rounded up to a whole number) of the permanently impacted acreage.

#### C. Agricultural Resources Impacted Acreage

Agricultural resources impact acreage is a consolidation of vegetation and land use types specific to Region – row crops, grass farms, and orchards - identified in the TPWD EMST. This GIS mapping data was overlain WMS locations to estimate the agricultural impact acreage from the implementation of the associated strategy.

#### D. Wetland Impact

The wetland impact refers to the probability that implementation of a WMS will affect a wetland. The location of wetlands in the region was determined using the NWI located at <http://www.fws.gov/wetlands/Data/Mapper.html>.

A strategy received a "1" if all or part of the strategy is located in a wetland or if it is in close proximity to where construction activities are likely to impact the wetland. All other strategies received zeros. If the exact location of project is unknown it was given a zero because it was assumed that it would be located on a site that would not affect and wetland.

#### **E. Habitat Impacted Acreage**

Habitat impacted acreage refers to how the strategy will impact the habitat of the local area. The more area that is impacted because of the implementation of the strategy, the more the habitat of the area will be disrupted. Therefore, it was assumed that the permanent acreage impacted for a WMS is what would impact habitats.

#### **F. Threatened and Endangered Species Count**

Threatened and endangered species count refers to how the strategy will impact those species in the area once implemented. The species impact was quantified based on the number of federally-listed threatened and endangered species located within the county of the strategy. The number of threatened and endangered species came from the TPWD Rare, Threatened, and Endangered Species of Texas database (<http://tpwd.texas.gov/gis/rtest/>).

#### **G. Cultural Resources Impact**

Cultural resources impact refers to how the strategy will impact cultural resources located within the area. Cultural resources are defined as the collective evidence of the past activities and accomplishments of people, which also include locations; buildings; and features with scientific, cultural, or historic value. It is assumed that no WMSs negatively affect cultural resources. Mitigation costs are included for strategies that require infrastructure so it is assumed that none would be built in a location or way that disrupts culturally sensitive locations.

#### **H. Reduction in WWTP Effluent (ac-ft/yr)**

Environmental impacts may be seen because of lower WWTP effluent flows to the discharge streams for wastewater effluent reuse strategies. These impacts could include the following:

- Decreases to the stream flow/level.
- Change in the water quality by reducing the organic levels.
- Effects to fish and wildlife that inhabit the streams.

#### **I. Reliability**

Reliability is an assessment of the availability of the specified water quantity to the user over time. If the quantity of water is available to the user all the time, then the strategy has a high reliability. If the quantity of water is contingent on other factors, reliability will be lower. Supply amounts for this strategy were developed based on estimates of water use and related return flows to specific wastewater treatment plants. Where applicable, consideration was given for specific minimum by-pass flow requirements where required by water rights. This strategy is considered highly reliable (reliability score = 5). There is potential for the reuse supplies to develop at a faster or slower rate, depending on the volume of return flows.

#### **J. Bays, Estuaries, and Arms of the Gulf of Mexico**

The environmental effects due to implementation of upstream WMS projects on bays, estuaries, and arms of the Gulf of Mexico are quantitatively assessed and reported. Water bodies designated as classified segments by the TCEQ that are within or downstream of Region M include the Brownsville Ship Channel, South Bay, Laguna Madre, and Gulf of Mexico. Effects to these water bodies were quantified by estimating whether the project is anticipated to decrease freshwater inflow in these classified water bodies.

A WMS project received a "1" if it is expected to decrease freshwater inflow into a classified water body. If a strategy were to increase freshwater inflow or otherwise have little to no impact on inflows, then the project would receive a zero.

A summary of the identified and quantified environmental impacts for alternative reuse projects is presented in Table 5-122.

**Table 5-122 Environmental Impacts of Alternative Reuse Strategies**

Entity	WMS Name	Yield*	A	B	C	D	E	F	G	H	I	J
Agua SUD	Non-Potable Wastewater Effluent Reuse**	350	140	154	0	0	140	8	0	350	5	1
La Feria	Non-Potable Wastewater Effluent Reuse**	50	13	15	0	0	13	25	0	170	5	1
San Benito	Non-Potable Wastewater Effluent Reuse**	1,120	32	35	0	0	32	25	0	1,120	5	1
San Benito	Potable Wastewater Effluent Reuse**	1,120	44	48	0	0	44	25	0	1,120	5	1

\* First decade of implementation yield (ac-ft/yr).

### 5.3.2 New or Expanded Surface Water Treatment (Alternative)

New or expanded surface water treatment strategies refers to developing additional surface water treatment infrastructure (treatment plants) to remove bottlenecks that have limited the amount of water that can be supplied.

For the 2026 planning cycle, projects from the previous cycle were carried forward and modified as needed. The four alternative strategies include:

- East Rio Hondo WSC – North Harlingen Surface WTP Phase II with IBT.
- Elsa – WTP Expansion and Interconnect to Engleman ID
- Laredo – El Pico WTP Expansion Phases 1-4
- North Alamo WSC – WTP No. 5 Expansion

Environmental impacts are described in Section 5.3.2.5.

#### 5.3.2.1 East Rio Hondo WSC – North Harlingen Surface WTP Phase II with IBT (Alternative)

##### Project Source

This strategy was submitted by ERHWSC to the RWPG concurrently with the recommended Phase I portion of the project during the 2016 regional water planning process.

##### Description

Phase II includes a WTP expansion, with inter-basin transfer of surface water with a proposed implementation decade of 2050.

### Available Supply

The treatment plant expansions would be designed for an additional 2.3 mgd capacity. Through Phase II, the surface WTP would treat approximately 3,760 ac-ft/yr from the Phase I portion and an additional 2,500 ac-ft/yr, that requires up to 2,500 ac-ft of converted irrigation water rights.

### Engineering and Costing

As detailed above, costs for this strategy from the UCM include expanding the WTP, with inter-basin transfer of surface water. Only WTP infrastructure and costs associated with the expansion of the WTP that will increase supplies beyond those existing and that do not replace portions of existing supply have been included in this plan. The pipeline and pump station were assumed to be built full-size during Phase I, so no additional costs are included for those items. Costs associated with the purchase of surface water rights is included under the Conversion of Surface Water Rights water management strategy. No additional land acquisition is assumed for this phase. It is assumed that the construction period for this strategy is 1 year. Because of the needs of ERHWSC, only Phase I is recommended, and Phase II has remained an alternative this planning cycle. Table 5-123 outlines the project costs developed in the UCM. The full UCM project cost estimate summary is provided in Appendix 5D.

### Implementation Issues

The availability of surface water rights required to supply the treatment plant expansion is a potential implementation issue.

**Table 5-123 East Rio Hondo WSC – North Harlingen Surface WTP Phase II with IBT Project Costs (Alternative)**

Facilities Cost	Total Project Cost	Annual Cost	Annual Cost of Water (\$ per ac-ft)	Annual Cost of Water After Debt Service (\$ per ac-ft)
\$10,599,000	\$14,775,000	\$1,975,000	\$790	\$374

### 5.3.2.2 Elsa – WTP Expansion and Interconnect to Engleman ID (Alternative)

#### Project Source

This strategy was submitted by Elsa to the RWPG during the 2016 regional water planning process.

#### Description

This strategy is for an interconnect between Elsa and Engleman ID. Hidalgo County ID No. 9 is currently the sole source for Elsa raw water. This strategy would provide Elsa with a reliable second source of raw water in case of drought or when a supply is down for an extended period of time for system repairs. It also includes an expansion of Elsa's WTP.

### Available Supply

Based on updated demand projections for the 2026 planning cycle, this strategy would expand Elsa's WTP by 1 mgd (1,120 ac-ft/yr) by the 2030 decade.

### Engineering and Costing

Costs for this strategy from the UCM include a 1 mgd WTP expansion, a 10", 2.4-mile pipeline, and pipeline right-of-way. Only WTP infrastructure and costs associated with the expansion of the WTP that

will increase supplies beyond those existing and that do not replace portions of existing supply have been included in this plan. It is assumed that the construction period for this strategy is 1 year. Table 5-124 outlines the project costs developed in the UCM. The full UCM project cost estimate summary is provided in Appendix 5D.

### Implementation Issues

No implementation issues have been identified at this time.

**Table 5-124 Elsa – WTP Expansion and Interconnect to Engleman ID Project Costs (Alternative)**

Facilities Cost	Total Project Cost	Annual Cost	Annual Cost of Water (\$ per ac-ft)	Annual Cost of Water After Debt Service (\$ per ac-ft)
\$10,089,000	\$14,207,000	\$1,795,000	\$1,603	\$711

### 5.3.2.3 Laredo – El Pico WTP Expansion Phases 1-4 (Alternative)

#### 5.3.2.3.1 Laredo - El Pico Water Treatment Plant – Phase 1 Expansion

##### Project Source

This strategy was submitted by Laredo to the RWPG during the 2016 regional water planning process.

##### Description

This strategy is for the expansion of the El Pico WTP from 20 mgd to 45 mgd. This expansion would occur by 2030.

##### Available Supply

Expanding the plant would supply an additional 25 mgd (28,000 ac-ft/yr) of drinking water.

##### Engineering and Costing

Costs for this strategy from the UCM include only water treatment expansion and land acquisition. Only WTP infrastructure and costs associated with the expansion of the WTP that will increase supplies beyond those existing and that do not replace portions of existing supply have been included in this plan. It is assumed that the construction period for this strategy is 1.5 years. Table 5-125 outlines the project costs developed in the UCM. The full UCM project cost estimate summary is provided in Appendix 5D.

### Implementation Issues

Necessary state and federal permits must be obtained before construction can begin. Additionally, an available surface water supply would need to be assured for the capacity of this expansion. Laredo’s existing supplies should be able to supply the needed water for this expansion.

**Table 5-125 Laredo - El Pico Water Treatment Plant – Phase 1 Expansion Project Costs (Alternative)**

Facilities Cost	Total Project Cost	Annual Cost	Annual Cost of Water (\$ per ac-ft)	Annual Cost of Water After Debt Service (\$ per ac-ft)
\$57,022,000	\$80,900,000	\$9,684,000	\$346	\$143

### 5.3.2.3.2 Laredo - El Pico Water Treatment Plant – Phase 2 Expansion

#### Project Source

This strategy was submitted by Laredo to the RWPG during the 2016 regional water planning process.

#### Description

This strategy is to expand the El Pico WTP from 45 mgd to 70 mgd. This expansion would occur by 2040.

#### Available Supply

Expanding the plant would supply an additional 25 mgd (28,000 ac-ft/yr) of drinking water.

#### Engineering and Costing

Costs for this strategy from the UCM include only water treatment expansion and land acquisition. Only WTP infrastructure and costs associated with the expansion of the WTP that will increase supplies beyond those existing and that do not replace portions of existing supply have been included in this plan. It is assumed that the construction period for this strategy is 1.5 years. Table 5-126 outlines the project costs developed in the UCM. The full UCM project cost estimate summary is provided in Appendix 5D.

#### Implementation Issues

As with any project, necessary state and federal permits must be obtained before construction can begin. Additionally, an available surface water supply would need to be assured for the capacity of this expansion. Existing supplies plus the purchase of available surface water rights should meet the supply needed.

**Table 5-126 Laredo - El Pico Water Treatment Plant – Phase 2 Expansion Project Costs (Alternative)**

Facilities Cost	Total Project Cost	Annual Cost	Annual Cost of Water (\$ per ac-ft)	Annual Cost of Water After Debt Service (\$ per ac-ft)
\$57,022,000	\$80,900,000	\$9,684,000	\$346	\$143

### 5.3.2.3.3 Laredo - El Pico Water Treatment Plant – Phase 3 Expansion

#### Project Source

This strategy was submitted by Laredo to the RWPG during the 2016 regional water planning process.

#### Description

This strategy is to expand the El Pico WTP from 70 mgd to 100 mgd. This expansion would occur by 2060.

#### Available Supply

Expanding the plant would supply an additional 30 mgd (33,600 ac-ft/yr) of drinking water.

### Engineering and Costing

Costs for this strategy from the UCM include only water treatment expansion and land acquisition, assuming 1.5 years for construction. Only WTP infrastructure and costs associated with the expansion of the WTP that will increase supplies beyond those existing and that do not replace portions of existing supply have been included in this plan. Table 5-127 outlines the project costs developed in the UCM. The full UCM project cost estimate summary is provided in Appendix 5D.

### Implementation Issues

As with any project, necessary state and federal permits must be obtained before construction can begin. Additionally, an available surface water supply would need to be assured for the capacity of this expansion. There should be available surface water rights for purchase in the 2060 decade that would meet the supply needs.

**Table 5-127 Laredo - El Pico Water Treatment Plant – Phase 3 Expansion Project Costs (Alternative)**

Facilities Cost	Total Project Cost	Annual Cost	Annual Cost of Water (\$ per ac-ft)	Annual Cost of Water After Debt Service (\$ per ac-ft)
\$66,425,000	\$94,247,000	\$11,281,000	\$336	\$138

### 5.3.2.3.4 Laredo - El Pico Water Treatment Plant – Phase 4 Expansion

#### Project Source

This strategy was submitted by Laredo to the RWPG during the 2016 regional water planning process.

#### Description

This strategy is to expand the El Pico WTP from 100 mgd to 130 mgd by 2080.

#### Available Supply

Expanding the plant would supply an additional 30 mgd (33,600 ac-ft/yr) of drinking water.

### Engineering and Costing

Costs for this strategy from the UCM include only water treatment expansion and land acquisition, and 1.5 years assumed for construction. Only WTP infrastructure and costs associated with the expansion of the WTP that will increase supplies beyond those existing and that do not replace portions of existing supply have been included in this plan. Table 5-128 details the project costs developed in the UCM. The full UCM project cost estimate summary is provided in Appendix 5D.

### Implementation Issues

As with any project, necessary state and federal permits must be obtained before construction can begin. Additionally, an available surface water supply would need to be assured for the capacity of this expansion. By 2080, there should be available surface water rights for purchase that can supply this project.

**Table 5-128 Laredo - El Pico Water Treatment Plant – Phase 4 Expansion Project Costs (Alternative)**

Facilities Cost	Total Project Cost	Annual Cost	Annual Cost of Water (\$ per ac-ft)	Annual Cost of Water After Debt Service (\$ per ac-ft)
\$66,425,000	\$94,247,000	\$11,281,000	\$336	\$138

**5.3.2.4 North Alamo WSC – WTP No. 5 Expansion (Alternative)**

**Project Source**

This strategy was originally submitted by NAWSC to the RWPG during the 2016 regional water planning process.

**Description**

This strategy is for the expansion of WTP No. 5 and a 16-inch waterline. The expansion would serve residents within the Weslaco, Donna, Alamo, and surrounding areas. This strategy would also hydraulically interconnect the NAWSC distribution system, allowing for utilization of other water districts in time of drought for push water. It would also provide the NAWSC the ability to utilize other water districts as a source of push water for delivery of water in times of drought. Acquisition of surface water rights through urbanization is required for this strategy.

**Available Supply**

The expansion of WTP No. 5 would provide NAWSC with capacity to treat an additional 4 mgd of drinking water. In 2030, it is assumed the water rights are available for the plant to supply the additional treatment capacity of 4,480 ac-ft/yr. However, because of supplies from other sources and strategies, this strategy is now an alternative for this planning cycle.

**Engineering and Costing**

Costs for this strategy from the UCM include a 4 mgd WTP expansion, a pump station, and a 16", 4.2-mile pipeline. Only WTP infrastructure and costs associated with the expansion of the WTP that will increase supplies beyond those existing and that do not replace portions of existing supply have been included in this plan. Costs associated with the purchase of water rights is included separately under the Conversion of Surface Water Rights water management strategy. Land acquisition costs are only assumed for pipeline right-of-way. It is assumed that the construction period for this strategy is 1 year. Table 5-129 outlines the project costs developed in the UCM. The full UCM project cost estimate summary is provided in Appendix 5D.

**Implementation Issues**

The project would be constructed within existing easements and rights-of-way; however, as with any project, necessary state and federal permits must be obtained before construction can begin.

**Table 5-129 North Alamo WSC – WTP No. 5 Expansion Project Costs (Alternative)**

Facilities Cost	Total Project Cost	Annual Cost	Annual Cost of Water (\$ per ac-ft)	Annual Cost of Water After Debt Service (\$ per ac-ft)
\$23,422,000	\$32,799,000	\$3,704,000	\$827	\$313

### 5.3.2.5 Environmental Impacts of Alternative New or Expanded Surface Water Treatment Strategies

Potential environment impacts for alternative water infrastructure systems strategies have been identified and categorized as described below. The letters identifying each section correspond to the headings in Table 5-130.

#### A. Acres Impacted Permanently

Acres impacted permanently refers to the total amount of area that will be permanently impacted because of the implementation of a strategy. The following conservative assumptions were made (unless more detailed information for a specific was available):

- The acreage impacted for pipelines is equivalent to the right-of-way (ROW) easements required; it is assumed 50 feet for ROW unless otherwise known.
- WTP impacts are estimated using UCM, which is based on the plant type and capacity.

#### B. Construction Impacted Acreage

Temporary environmental impacts may be seen during construction activities, such as increased air and noise pollution, and land disturbance activities. However, these effects are typical of any construction project. The construction impacted acreage was estimated as 110 percent (rounded up to a whole number) of the permanently impacted acreage.

#### C. Inundation Acreage

The inundation acreage applies to reservoirs only and is equal to the amount of land that will be inundated by the construction of the reservoir.

#### D. Agricultural Resources Impacted Acreage

Agricultural resources impact acreage is a consolidation of vegetation and land use types specific to Region – row crops, grass farms, and orchards - identified in the TPWD EMST. This GIS mapping data was overlain WMS locations to estimate the agricultural impact acreage from the implementation of the associated strategy.

#### E. Wetland Impact

The wetland impact refers to the probability that implementation of a WMS will affect a wetland. The location of wetlands in the region was determined using the National Wetlands Inventory (NWI) located at <http://www.fws.gov/wetlands/Data/Mapper.html>.

A strategy received a "1" if all or part of the strategy is located in a wetland or if it is close enough to where construction activities are likely to impact the wetland. All other strategies received zeros. If the exact location of project is unknown, it was given a zero because it was assumed that it would be located on a site that would not affect any wetland.

#### F. Habitat Impacted Acreage

Habitat impacted acreage refers to how the strategy will impact the habitat of the local area. The more area that is impacted because of the implementation of the strategy, the more the habitat of the area will be disrupted. Therefore, it was assumed that the permanent acreage impacted for a WMS is what would impact habitats.

## **G. Threatened and Endangered Species Count**

Threatened and endangered species count refers to how the strategy will impact those species in the area once implemented. This impact was quantified based on the number of federally-listed threatened and endangered species located within the county of the strategy. The number of threatened and endangered species came from the Texas Parks and Wildlife Department (TPWD) Rare, Threatened, and Endangered Species of Texas database (<http://tpwd.texas.gov/gis/rtest/>).

## **H. Cultural Resources Impact**

Cultural resources impact refers to how the strategy will impact cultural resources located within the area. Cultural resources are defined as the collective evidence of the past activities and accomplishments of people, including locations; buildings; and features with scientific, cultural, or historic value. It is assumed that no WMSs negatively affect cultural resources. Mitigation costs are included for strategies that require infrastructure, so it is assumed that none would be built in a location or way that disrupts culturally sensitive locations.

## **I. Reliability**

Reliability is an assessment of the availability of the specified water quantity to the user over time. If the quantity of water is available to the user all the time, then the strategy has a high reliability. If the quantity of water is contingent on other factors, reliability will be lower. This strategy was developed in accordance with WAM and/or MAG values for the appropriate area. As such, WMSs associated with new/improved infrastructure or distribution system or facilities expansions are considered to be reliable supply (reliability score = 5) that will not compromise the DFCs as established by the MAG or the environmental flow standards as established by 30 TAC §298.

## **J. Bays, Estuaries, and Arms of the Gulf of Mexico**

The environmental effects due to implementation of upstream WMS projects on bays, estuaries, and arms of the Gulf of Mexico are quantitatively assessed and reported. Water bodies designated as classified segments by the TCEQ that are within or downstream of Region M include the Brownsville Ship Channel, South Bay, Laguna Madre, and the Gulf of Mexico. Effects to these water bodies were quantified by estimating whether the project is anticipated to decrease freshwater inflow in these classified water bodies.

A WMS project received a "1" if it is expected to decrease freshwater inflow into a classified water body. If a strategy were to increase freshwater inflow or otherwise have little to no impact on inflows, then the project would receive a zero.

A summary of the identified and quantified environmental impacts for alternative new or expanded surface water treatment infrastructure is presented in Table 5-130.

**Table 5-130 Environmental Impacts of Alternative New or Expanded Surface Water Treatment Strategies**

Entity	WMS Name	Yield*	A	B	C	D	E	F	G	H	I	J
ERHWSC	Surface WTP Phase II with Inter-Basin Transfer of Surface Water	2,500	2	3	0	0	0	1	25	0	5	1
Elsa	WTP Expansion and Interconnect to Engleman ID	1,120	1	2	0	0	0	1	8	0	5	1
Laredo	El Pico WTP Expansion (Phase 1-4)	28,000	13	14	0	0	0	13	4	0	5	1
NAWSC	Expansion of WTP No. 5	4,480	2	3	0	0	0	2	8	0	5	1
*First decade of implementation yield (ac-ft/yr).												

### 5.3.3 Storage Reservoirs (Alternative)

Storage reservoirs include both on-channel and off-channel new storage in the region. In some cases, other strategy categories contain projects that also include small storage ponds/reservoirs that are included within the larger project. They are not included in this section.

There is one alternative storage reservoir strategy included for the 2026 planning cycle, which is the Brownsville/Matamoros Weir and Reservoir.

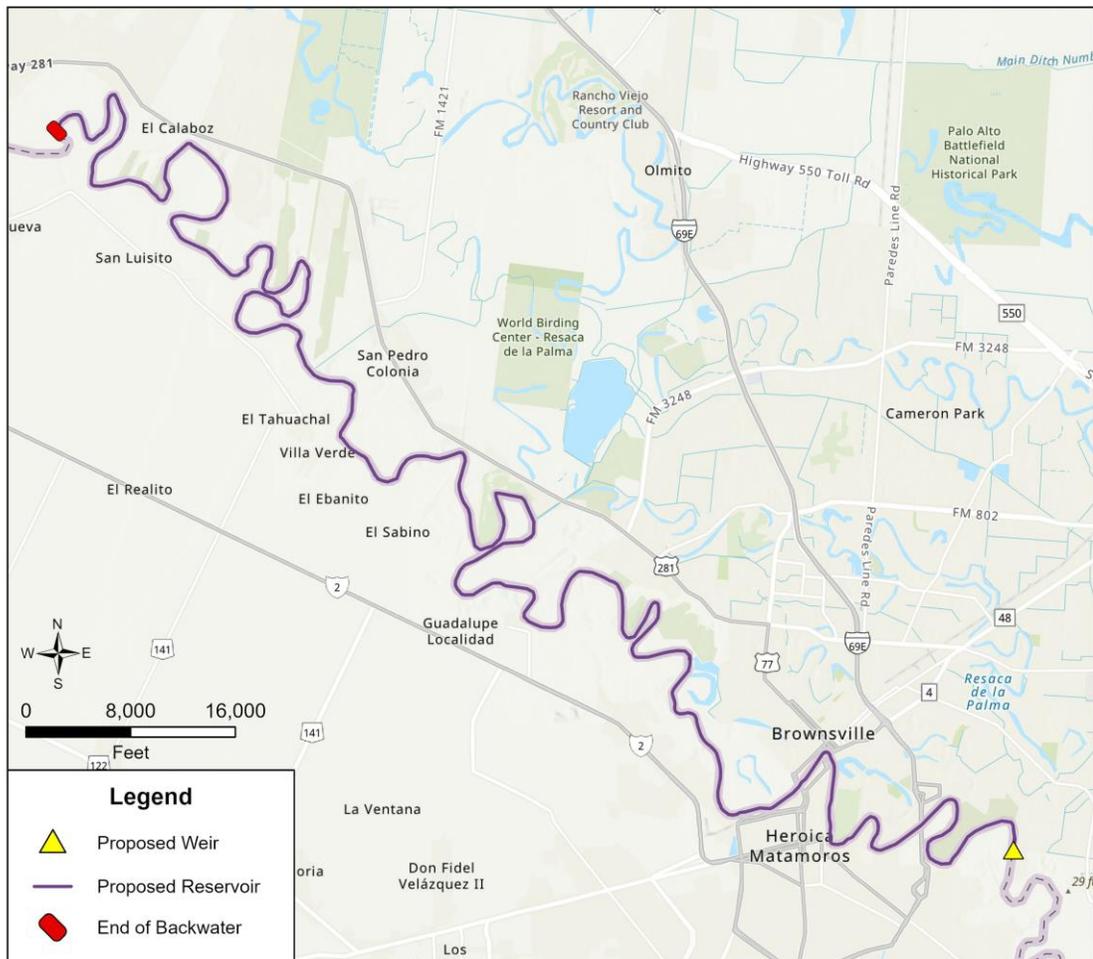
#### 5.3.3.1 Brownsville PUB – Brownsville/Matamoros Weir and Reservoir (Alternative)

##### Project Source

This strategy was submitted by Brownsville to the RWPG during the 2016 regional water planning process.

##### Description

This strategy is for the construction of a weir and on-channel reservoir to capture and store excess river flow for an additional water supply in the lower Rio Grande Valley. The weir and reservoir would be located about four miles southeast of Brownsville. This project is on hold pending approval from Mexico. Figure 5-24 shows the location of the weir and reservoir project.



**Figure 5-24 Brownsville PUB – Brownsville/Matamoros Weir and Reservoir Project Location Map**

### Available Supply

BPUB currently has authorization to divert up to 40,000 ac-ft/yr of “excess flows” from the Rio Grande under TCEQ Permit No. 1838. Excess flows are defined as all US waters passing the Brownsville gauging station above 25 cfs. Excess US river flows will be impounded in the Brownsville Reservoir under BPUB’s TCEQ water rights Permit No. 5259. For the 2026 planning cycle, the Rio Grande WAM has been updated with naturalized flows through 2018 and a new drought-of-record period, as well as the correction of an error related to Permit No. 1838 that was in previous versions of the WAM. As a result, the estimated firm yield of 2,035 ac-ft/yr is much lower than in previous plans. Planned implementation is before 2040.

### Engineering and Costing

Costs for this strategy from the UCM include an on-channel reservoir (using a weir) and land acquisition. It is assumed that the construction period for this strategy is one year. This cost estimate is representative of 300 acres for the Reservoir footprint and conservation pool, at a land acquisition cost of \$1,823,000 and a mitigation cost of \$1,823,000 for the same acreage. There are no other land acquisition or mitigation acreages or costs associated with this project. Table 5-131 outlines the project costs developed in the UCM. The full UCM project cost estimate summary is provided in Appendix 5D.

## Implementation Issues

Environmental issues include impacts on water quality (i.e., increased salinity) within and downstream of the reservoir, impacts to aquatic and riparian habitat as a result of changes in downstream flow and salinity patterns, potential impacts to habitat from reservoir construction and inundation, potential adverse impacts to the Audubon Society’s Sabal Palm Sanctuary, and increased risk of flooding. The project sponsors have indicated their intent to operate the proposed project to mitigate these concerns; resource advocates remain concerned about these issues.

TCEQ issued a water right permit for the Brownsville Weir and Reservoir Project in 2000. This permit authorizes the construction of the Brownsville Weir on the Rio Grande and impoundment of 6,000 ac-ft of Rio Grande water in the Brownsville Reservoir. Special conditions included in this permit require the BPUB to (1) pass a minimum flow of 25 cfs when water is being impounded, (2) pass sufficient water through the reservoir to satisfy demands of downstream water rights holders as directed by the Rio Grande Watermaster, (3) monitor salinity in the Rio Grande downstream of the weir near the riverine/estuarine interface (23.6 river miles upstream from the mouth of the river) and only impound water in the reservoir when the measured salinity is less than an established low salinity condition, and (4) consult with the TCEQ, TPWD, USFWS, and other appropriate agencies to develop and implement an acceptable mitigation plan for the overall Brownsville Weir and Reservoir Project.

The mitigation plan for the project will be developed and finalized through the Section 404/10 process under the authority of the Galveston District of the Corps of Engineers. Environmental issues that have been raised must be satisfactorily addressed through the Section 404/10 federal permitting process and through the IBWC project approval process in order for the project to be authorized. The IBWC will be the lead agency for all discussions and dealings with Mexico that depend on the Section 404/10 permit.

**Table 5-131 Brownsville PUB – Brownsville/Matamoros Weir and Reservoir Project Costs (Alternative)**

Facilities Cost	Total Project Cost	Annual Cost	Annual Cost of Water (\$ per ac-ft)	Annual Cost of Water After Debt Service (\$ per ac-ft)
\$9,173,000	\$16,569,000	\$914,000	\$449	\$68

### 5.3.3.2 Environmental Impacts of Alternative Storage Reservoir Strategies

Potential environment impacts for storage reservoir strategies have been identified and categorized as described below. The letters identifying each section correspond to the headings in Table 5-132.

#### A. Acres Impacted Permanently

Acres impacted permanently refers to the total amount of area that will be permanently impacted because of the implementation of a strategy. The following conservative assumptions were made (unless more detailed information for a specific was available):

- The acreage impacted for pipelines is equivalent to the right-of-way (ROW) easements required; it is assumed 50 feet for ROW unless otherwise known.
- WTP impacts are estimated using UCM, which is based on the plant type and capacity.

## **B. Construction Impacted Acreage**

Temporary environmental impacts may be seen during construction activities, such as increased air and noise pollution, and land disturbance activities. However, these effects are typical of any construction project. The construction impacted acreage was estimated as 110 percent (rounded up to a whole number) of the permanently impacted acreage.

## **C. Inundation Acreage**

The inundation acreage applies to reservoirs only and is equal to the amount of land that will be inundated by the construction of the reservoir.

## **D. Agricultural Resources Impacted Acreage**

Agricultural resources impact acreage is a consolidation of vegetation and land use types specific to Region – row crops, grass farms, and orchards - identified in the TPWD EMST. This GIS mapping data was overlain WMS locations to estimate the agricultural impact acreage from the implementation of the associated strategy.

## **E. Wetland Impact**

The wetland impact refers to the probability that implementation of a WMS will affect a wetland. The location of wetlands in the region was determined using the National Wetlands Inventory (NWI) located at <http://www.fws.gov/wetlands/Data/Mapper.html>.

A strategy received a "1" if all or part of the strategy is located in a wetland or if it is close enough to where construction activities are likely to impact the wetland. All other strategies received zeros. If the exact location of project is unknown, it was given a zero because it was assumed that it would be located on a site that would not affect any wetland.

## **F. Habitat Impacted Acreage**

Habitat impacted acreage refers to how the strategy will impact the habitat of the local area. The more area that is impacted because of the implementation of the strategy, the more the habitat of the area will be disrupted. Therefore, it was assumed that the permanent acreage impacted for a WMS is what would impact habitats.

## **G. Threatened and Endangered Species Count**

Threatened and endangered species count refers to how the strategy will impact those species in the area once implemented. This impact was quantified based on the number of federally-listed threatened and endangered species located within the county of the strategy. The number of threatened and endangered species came from the Texas Parks and Wildlife Department (TPWD) Rare, Threatened, and Endangered Species of Texas database (<http://tpwd.texas.gov/gis/rtest/>).

## **H. Cultural Resources Impact**

Cultural resources impact refers to how the strategy will impact cultural resources located within the area. Cultural resources are defined as the collective evidence of the past activities and accomplishments of people, including locations; buildings; and features with scientific, cultural, or historic value. It is assumed that no WMSs negatively affect cultural resources. Mitigation costs are included for strategies that require infrastructure, so it is assumed that none would be built in a location or way that disrupts culturally sensitive locations.

**I. Reliability**

Reliability is an assessment of the availability of the specified water quantity to the user over time. If the quantity of water is available to the user all the time, then the strategy has a high reliability. If the quantity of water is contingent on other factors, reliability will be lower. This strategy was developed in accordance with WAM and/or MAG values for the appropriate area. As such, WMSs associated with new/improved infrastructure or distribution system or facilities expansions are considered to be reliable supply (reliability score = 5) that will not compromise the DFCs as established by the MAG or the environmental flow standards as established by 30 TAC §298. The reliability of on/off-channel reservoirs is also projected to be high (reliability score = 5).

**J. Bays, Estuaries, and Arms of the Gulf of Mexico**

The environmental effects due to implementation of upstream WMS projects on bays, estuaries, and arms of the Gulf of Mexico are quantitatively assessed and reported. Water bodies designated as classified segments by the TCEQ that are within or downstream of Region M include the Brownsville Ship Channel, South Bay, Laguna Madre, and the Gulf of Mexico. Effects to these water bodies were quantified by estimating whether the project is anticipated to decrease freshwater inflow in these classified water bodies.

A WMS project received a "1" if it is expected to decrease freshwater inflow into a classified water body. If a strategy were to increase freshwater inflow or otherwise have little to no impact on inflows, then the project would receive a zero.

A summary of the identified and quantified environmental impacts for alternative storage reservoirs is presented in Table 5-132.

**Table 5-132 Environmental Impacts of Alternative Storage Reservoir Strategies**

Entity	WMS Name	Yield*	A	B	C	D	E	F	G	H	I	J
Brownsville PUB	Brownsville/Matamoros Weir and Reservoir	19,176	300	330	300	0	0	300	25	0	5	1
*First decade of implementation yield (ac-ft/yr).												

**5.3.4 New or Expanded Fresh Groundwater Supply (Alternative)**

While there is not abundant fresh groundwater available in Region M, there are numerous entities and individuals that rely on minimally treated groundwater to meet their needs. For example, this includes cities that are farther from the Rio Grande and with surface water distribution networks that have few alternative sources and have identified portions of the aquifer(s) that produce acceptable water for municipal use without advanced treatment technology.

For the 2026 planning cycle, three alternative fresh groundwater strategies were carried over from the 2021 cycle, with updates made as needed. The alternative fresh groundwater strategies include:

- McAllen – Expand Fresh Groundwater Phases I and II.
- Mercedes – Expanded Existing Fresh Groundwater Supply.
- Military Highway WSC – Expand Fresh Groundwater.

Environmental impacts are described in Section 5.3.4.4.

### 5.3.4.1 McAllen – Expand Fresh Groundwater Phases I and II (Alternative)

#### Project Source

This strategy was recommended in the 2016 RWP and has been updated by the RWPG.

#### Description

This strategy is to provide additional supply to McAllen with the installation of additional fresh groundwater wells.

#### Available Supply

The proposed groundwater wells would provide 500 ac-ft/yr from the Gulf Coast Aquifer System in Hidalgo County in Phase I, beginning in 2030, and a total of 1,500 ac-ft/yr once Phase II is implemented by 2060.

#### Engineering and Costing

This project includes costing for wellfields, including pumps and piping, and disinfection treatment. It is assumed that the construction period for this strategy is 1 years for each phase. Table 5-133 and Table 5-134 outline the project costs developed in the UCM for Phase I and Phase II, respectively. The full UCM project cost estimate summaries are provided in Appendix 5D.

#### Implementation Issues

No major implementation issues are expected for this strategy. Construction of the new groundwater well and piping may also include a TCEQ well drilling permit, purchase of land, and a TXDOT right-of-way permit. There is no groundwater conservation district within the McAllen service area.

**Table 5-133 McAllen – Expand Fresh Groundwater Phase I Project Costs (Alternative)**

Facilities Cost	Total Project Cost	Annual Cost	Annual Cost of Water (\$ per ac-ft)	Annual Cost of Water After Debt Service (\$ per ac-ft)
\$1,309,000	\$1,874,000	\$190,000	\$380	\$116

**Table 5-134 McAllen – Expand Fresh Groundwater Phase II Project Costs (Alternative)**

Facilities Cost	Total Project Cost	Annual Cost	Annual Cost of Water (\$ per ac-ft)	Annual Cost of Water After Debt Service (\$ per ac-ft)
\$2,663,000	\$3,808,000	\$367,000	\$367	\$99

### 5.3.4.2 Mercedes – Expanded Existing Fresh Groundwater Supply (Alternative)

#### Project Source

This strategy was recommended in the 2016 RWP and has been updated by the RWPG.

#### Description

This strategy is to provide additional supply to Mercedes with an additional groundwater well.

### Available Supply

The proposed groundwater well would provide 560 ac-ft/yr from the Gulf Coast Aquifer System in Hidalgo County, beginning in 2030.

### Engineering and Costing

This project includes costing for wellfields, including pumps and piping, and disinfection treatment. Costs for this strategy from the UCM assumed that the construction period is 1 year. Table 5-135 outlines the project costs developed in the UCM. The full UCM project cost estimate summaries are provided in Appendix 5D.

### Implementation Issues

No major implementation issues are expected for this strategy. Construction of the new groundwater well and piping may also include a TCEQ well drilling permit, purchase of land, and a TXDOT right-of-way permit. There is no groundwater conservation district within the Mercedes service area.

**Table 5-135 Mercedes – Expanded Existing Fresh Groundwater Supply Project Costs (Alternative)**

Facilities Cost	Total Project Cost	Annual Cost	Annual Cost of Water (\$ per ac-ft)	Annual Cost of Water After Debt Service (\$ per ac-ft)
\$1,358,000	\$1,944,000	\$197,000	\$352	\$107

### 5.3.4.3 Military Highway WSC – Expand Fresh Groundwater Supply

#### Project Source

This strategy was recommended in the 2016 RWP and has been updated by the RWPG.

#### Description

This strategy is to provide additional supply to Military Highway WSC in Hidalgo County with the installation of additional fresh groundwater wells.

#### Available Supply

The proposed groundwater wells would provide 560 ac-ft/yr in 2030 from the Gulf Coast Aquifer System in Hidalgo County.

#### Engineering and Costing

Costs for this strategy from the UCM include a 350 gpm well with pump, well field piping, land acquisition, and water disinfection. It is assumed that the construction period for this strategy is 1 year per phase. Table 5-136 outlines the project costs developed in the UCM. The full UCM project cost estimate summaries are provided in Appendix 5D.

#### Implementation Issues

No major implementation issues are expected for this strategy. Construction of the new groundwater well and piping may also include a TCEQ well drilling permit, purchase of land, and a TXDOT right-of-way permit. There is no groundwater conservation district within the Military Highway WSC service area.

**Table 5-136 Military Highway WSC – Expand Fresh Groundwater Supply Project Costs (Alternative)**

Facilities Cost	Total Project Cost	Annual Cost	Annual Cost of Water (\$ per ac-ft)	Annual Cost of Water After Debt Service (\$ per ac-ft)
\$1,358,000	\$1,944,000	\$197,000	\$352	\$107

#### 5.3.4.4 Environmental Impacts of Alternative Fresh Groundwater Strategies

Potential environment impacts for alternative fresh groundwater strategies have been identified and categorized as described below. The letters identifying each section correspond to the headings in Table 5-137.

##### A. Acres Impacted Permanently

Acres impacted permanently refer to the total amount of area that will be permanently impacted because of the implementation of a strategy. The following conservative assumptions were made (unless more detailed information for a specific was available):

- The acres impacted for pipelines is equivalent to the ROW easements required; it is assumed 100-feet for ROW unless otherwise known.
- WTP impacts are estimated using UCM, which is based on the plant capacity.
- The impact of wells and wellfields are given by the UCM, which includes 0.5 acre per well.

##### B. Construction Impacted Acreage

Temporary environmental impacts may be seen during construction activities, such as increased air and noise pollution, and land disturbance activities. However, these effects are typical of any construction project. The construction impacted acreage was estimated as 110 percent (rounded up to a whole number) of the permanently impacted acreage.

##### C. Agricultural Resources Impacted Acreage

Agricultural resources impact acreage is a consolidation of vegetation and land use types specific to Region – row crops, grass farms, and orchards - identified in the TPWD EMST. This GIS mapping data was overlain WMS locations to estimate the agricultural impact acreage from the implementation of the associated strategy.

##### D. Wetland Impact

The wetland impact refers to the probability that implementation of a WMS will affect a wetland. The location of wetlands in the Region was determined using the NWI located at <http://www.fws.gov/wetlands/Data/Mapper.html>.

A strategy received a "1" if all or part of the strategy is located in a wetland or if it is close enough to where construction activities are likely to impact the wetland. All other strategies received zeros. If the exact location of project is unknown it was given a zero because it was assumed that it would be located on a site that would not affect and wetland.

#### **E. Habitat Impacted Acreage**

Habitat impacted acreage refers to how the strategy will impact the habitat of the local area. The more area that is impacted because of the implementation of the strategy, the more the habitat of the area will be disrupted. Therefore, it was assumed that the permanent acreage impacted for a WMS is what would impact habitats.

#### **F. Threatened and Endangered Species Count**

Threatened and endangered species count refers to how the strategy will impact those species in the area once implemented. This impact was quantified based on the number of federally-listed threatened and endangered species located within the county of the strategy. The number of threatened and endangered species came from the TPWD Rare, Threatened, and Endangered Species of Texas database (<http://tpwd.texas.gov/gis/rtest/>).

#### **G. Cultural Resources Impact**

Cultural resources impact refers to how the strategy will impact cultural resources located within the area. Cultural resources are defined as the collective evidence of the past activities and accomplishments of people, including locations, buildings, and features with scientific, cultural, or historic value. It is assumed that no WMSs negatively affect cultural resources. Mitigation costs are included for strategies that require infrastructure so it is assumed that none would be built in a location or way that disrupts culturally sensitive locations.

#### **H. Reliability**

Reliability is an assessment of the availability of the specified water quantity to the user over time. If the quantity of water is available to the user all the time, then the strategy has a high reliability. If the quantity of water is contingent on other factors, reliability will be lower. These strategies were developed in accordance with MAG values for the appropriate aquifer and county. As such, most are considered to be reliable supply (reliability score = 5) that will not compromise the DFCs as established by the relevant GCD (where applicable) and GMA. Some of the strategies may score slightly lower in reliability due to availability of hydrogeologic information from existing nearby wells, potential of differing well productivity and water quality, potential impacts to natural resources and aquifer competition or restrictions.

#### **I. Bays, Estuaries, and Arms of the Gulf of Mexico**

The environmental effects due to implementation of upstream WMS projects on bays, estuaries, and arms of the Gulf of Mexico are quantitatively assessed and reported. Water bodies designated as classified segments by the TCEQ that are within or downstream of Region M include the Brownsville Ship Channel, South Bay, Laguna Madre, and Gulf of Mexico. Effects to these water bodies were quantified by estimating whether the project is anticipated to decrease freshwater inflow in these classified water bodies.

A WMS project received a "1" if it is expected to decrease freshwater inflow into a classified water body. If a strategy were to increase freshwater inflow or otherwise have little to no impact on inflows, then the project would receive a zero.

A summary of the identified and quantified environmental impacts for recommended and alternative fresh groundwater projects is presented in Table 5-137.

**Table 5-137 Environmental Impacts of Alternative Fresh Groundwater Strategies**

Entity	WMS Name	Yield*	A	B	C	D	E	F	G	H	I
McAllen	Expand Existing Groundwater Supply (Phase I-II)	500	9	10	0	0	9	8	0	5	0
Mercedes	Expand Existing Groundwater Supply	560	3	3	0	0	3	8	0	5	0
Military Highway WSC	Expand Existing Groundwater Wells (Hidalgo County)	560	3	3	0	0	3	8	0	5	0

\*First decade of implementation yield (ac-ft/yr)

### 5.3.5 Seawater Desalination (Alternative)

Seawater desalination still remains one of the more expensive WMSs, but costs have declined over the years as technology has advanced. In addition, as population and water demand grow, there continue to be limits to available resources inland, while seawater has a seemingly vast supply. Texas does not yet have a seawater desalination plant for municipal purposes, but there are multiple currently in the works along the Texas coast.

For the 2026 planning cycle, two alternative seawater desalination strategy were carried over from the 2021 cycle, with updates made.

The alternative seawater desalination strategies included for the 2026 planning cycle are:

- Brownsville PUB – Seawater Desalination Demonstration.
- Brownsville PUB – Seawater Desalination Implementation.

These two strategies are combined together below, but have separate project costs. Environmental impacts are described in Section 5.3.5.2.

#### 5.3.5.1 Brownsville PUB – Seawater Desalination Demonstration and Implementation (Alternative)

##### Project Source

This strategy was submitted by the City of Brownsville to the RWPG during the 2016 regional water planning process.

##### Description

This strategy is for the construction of a 2.5 mgd seawater desalination facility on the south shore of the Brownsville Ship Channel. In anticipation of a future expansion to a 25 mgd facility, this strategy includes some full-scale components like the intake system, concentrate disposal system, and land acquisition.

##### Available Supply

This strategy would start with a desalination demonstration in 2030, supplying 2.5 mgd (2,800 ac-ft/yr) of drinking water. It is assumed that the full-scale, 25 mgd (28,000 ac-ft/yr) desalination facility will be

constructed by 2060 when Brownsville’s drinking water demand exceeds its current water treatment capacity. A breakdown of the supplies is summarized in Table 5-138.

**Table 5-138 Brownsville - Seawater Desalination Demonstration and Implementation WMS Supplies (ac-ft/yr), by Decade (Alternative)**

Brownsville	2030	2040	2050	2060	2070	2080
Brownsville	2,603	2,603	2,603	26,022	26,022	26,022
El Jardin WSC	108	108	108	1,081	1,081	1,081
Manufacturing, Cameron	56	56	56	565	565	565
Steam-Electric Power, Cameron	33	33	33	332	332	332
<b>Total WMS Supply</b>	<b>2,800</b>	<b>2,800</b>	<b>2,800</b>	<b>28,000</b>	<b>28,000</b>	<b>28,000</b>

### Engineering and Costing

This strategy includes two separate costs. One cost is for the initial 2.5 mgd demonstration, including an intake structure, piping, land acquisition, and treatment. The second cost includes the facility expansion to 25 mgd, including expanded intake structure and pipeline. Only WTP infrastructure and costs associated with the expansion of the WTP that will increase supplies beyond those existing and that do not replace portions of existing supply have been included in this plan. Infrastructure was sized assuming a treatment efficiency of 50 percent.

This strategy proposes construction and implementation of alternative energy generation facilities, including wind generation and landfill gas reclamation. These options could not be incorporated into the UCM and are not included in the costs presented. Table 5-139 and Table 5-140 outline the project costs developed in the UCM. The full UCM project cost estimate summaries are provided in Appendix 5D.

### Implementation Issues

Financing a full-scale seawater desalination facility is a major implementation issue. The BPUB is researching potential federal, state, and local funding sources to help finance this strategy.

**Table 5-139 Brownsville – Seawater Desalination Demonstration Project Costs (Alternative)**

Facilities Cost	Total Project Cost	Annual Cost	Annual Cost of Water (\$ per ac-ft)	Annual Cost of Water After Debt Service (\$ per ac-ft)
\$51,060,000	\$71,260,000	\$11,914,000	\$4,255	\$2,465

**Table 5-140 Brownsville – Seawater Desalination Implementation Project Costs (Alternative)**

Facilities Cost	Total Project Cost	Annual Cost	Annual Cost of Water (\$ per ac-ft)	Annual Cost of Water After Debt Service (\$ per ac-ft)
\$318,823,000	\$444,378,000	\$75,464,000	\$2,995	\$1,755

### 5.3.5.2 Environmental Impacts of Alternative Seawater Desalination Strategies

Potential environment impacts for alternative seawater desalination strategies have been identified and categorized as described below. The letters identifying each section correspond to the headings in Table 5-141.

#### A. Acres Impacted Permanently

Acres impacted permanently refer to the total amount of area that will be permanently impacted because of the implementation of a strategy. The following conservative assumptions were made (unless more detailed information for a specific was available):

- The acres impacted for pipelines is equivalent to the ROW easements required; it is assumed 100-feet for ROW unless otherwise known.
- WTP impacts are estimated using UCM, which is based on the plant capacity.

#### B. Construction Impacted Acreage

Temporary environmental impacts may be seen during construction activities, such as increased air and noise pollution, and land disturbance activities. However, these effects are typical of any construction project. The construction impacted acreage was estimated as 110 percent (rounded up to a whole number) of the permanently impacted acreage.

#### C. Agricultural Resources Impacted Acreage

Agricultural resources impact acreage is a consolidation of vegetation and land use types specific to Region – row crops, grass farms, and orchards - identified in the TPWD EMST. This GIS mapping data was overlain WMS locations to estimate the agricultural impact acreage from the implementation of the associated strategy.

#### D. Wetland Impact

The wetland impact refers to the probability that implementation of a WMS will affect a wetland. The location of wetlands in the region was determined using the NWI located at <http://www.fws.gov/wetlands/Data/Mapper.html>.

A strategy received a "1" if all or part of the strategy is located in a wetland or if it is close enough to where construction activities are likely to impact the wetland. All other strategies received zeros. If the exact location of project is unknown it was given a zero because it was assumed that it would be located on a site that would not affect and wetland.

#### E. Habitat Impacted Acreage

Habitat impacted acreage refers to how the strategy will impact the habitat of the local area. The more area that is impacted because of the implementation of the strategy, the more the habitat of the area will be disrupted. Therefore, it was assumed that the permanent acreage impacted for a WMS is what would impact habitats.

#### F. Threatened and Endangered Species Count

Threatened and endangered species count refers to how the strategy will impact those species in the area once implemented. This impact was quantified based on the number of federally-listed threatened and endangered species located within the county of the strategy. The number of threatened and

endangered species came from the TPWD Rare, Threatened, and Endangered Species of Texas database (<http://tpwd.texas.gov/gis/rtest/>).

#### **G. Cultural Resources Impact**

Cultural resources impact refers to how the strategy will impact cultural resources located within the area. Cultural resources are defined as the collective evidence of the past activities and accomplishments of people, including locations; buildings; and features with scientific, cultural, or historic value. It is assumed that no WMSs negatively affect cultural resources. Mitigation costs are included for strategies that require infrastructure so it is assumed that none would be built in a location or way that disrupts culturally sensitive locations.

#### **H. Volume of Brine (ac-ft)**

The volume of brine quantifies the amount of brine concentrate from the desalination process that is released as surface water discharge. An efficiency of 50 percent was assumed for seawater desalination.

#### **I. TDS of Brine (mg/L)**

The TDS of brine provides the concentrate of the brine discharge. This number was calculated by assuming that the TDS of the seawater is 35,000 mg/L. A TDS of 0 mg/L was used for the finished water for both types of desalination.

#### **J. Reliability**

Reliability is an assessment of the availability of the specified water quantity to the user over time. If the quantity of water is available to the user all the time, then the strategy has a high reliability. If the quantity of water is contingent on other factors, reliability will be lower. Each desalination water management strategy was assessed on their reliability, varying between medium to high, contingent on factors such as the ability to desalinate and dispose reject water.

#### **K. Bays, Estuaries, and Arms of the Gulf of Mexico**

The environmental effects due to implementation of upstream WMS projects on bays, estuaries, and arms of the Gulf of Mexico are quantitatively assessed and reported. Water bodies designated as classified segments by the TCEQ that are within or downstream of Region M include the Brownsville Ship Channel, South Bay, Laguna Madre, and Gulf of Mexico. Effects to these water bodies were quantified by estimating whether the project is anticipated to decrease freshwater inflow in these classified water bodies.

A WMS project received a "1" if it is expected to decrease freshwater inflow into a classified water body. If a strategy were to increase freshwater inflow or otherwise have little to no impact on inflows, then the project would receive a zero.

A summary of the identified and quantified environmental impacts for alternative seawater desalination projects is presented in Table 5-141.

#### **Table 5-141 Environmental Impacts of Alternative Seawater Desalination Strategies**

Entity	WMS Name	Yield*	A	B	C	D	E	F	G	H	I	J	K
Brownsville	Seawater Desalination Demonstration	2,800	7	8	0	1	7	25	0	2,800	70,000	4	0
Brownsville	Seawater Desalination Implementation	28,000	17	19	0	1	17	25	0	28,000	70,000	5	0

\*First decade of implementation yield (ac-ft/yr).

### 5.3.6 Aquifer Storage and Recovery (Alternative)

ASR can be an effective way to assist a water user in management of its water resources and to access a reliable water supply during times of drought. The concept is a water storage system located in an underground aquifer. Water can be pumped into the aquifer when there is excess available and recovered through the same wellfield when it is needed. ASR has benefits over surface water storage because there are no evaporative losses, it does not lose storage capacity because of sedimentation, it requires a smaller footprint, and environmental issues associated with land inundation are minimized. The TAC requires water to meet primary drinking water standards prior to injection and continue to meet the standards while in storage. Therefore, in many circumstances, the water can be pumped straight to the distribution system to meet peak demands and cost savings can be realized by sizing other water facilities to meet average demands.

In 2019, the 86th Texas Legislature passed HB 721, which directs the TWDB to conduct a statewide survey of various aquifers to identify suitability for ASR projects. Additionally, the 86th Texas Legislature passed HB 720, which allows unappropriated water, including storm water and floodwater, to be appropriated for aquifer and ASR projects.<sup>19</sup> ASR is growing to be popular across the state of Texas.

Determination of the specific ASR location is important because an aquifer with suitable storage conditions must be identified and permitted. Geologic assessments must be performed for the proposed wellfield site to determine its suitability. Also, it is preferable to locate the ASR near the water source and/or distribution system to minimize conveyance costs.

Only one ASR project was carried over from the 2021 regional water planning process: Eagle Pass ASR Project. However, due to costs and minimal studies near Eagle Pass, this project remains an alternative WMS. No new ASR projects were submitted for the 2026 planning cycle.

Although there are no specific ASR strategies recommended in the 2026 Regional Water Plan, the Rio Grande RWPG does recommend that municipalities consider ASR in the future. Studies on groundwater in Region M, including the Brackish Water in the Gulf Coast Aquifer; Lower Rio Grande Valley, Texas (BRACS) report, should be used to determine the feasibility of ASR for entities that are considering the strategy.<sup>20</sup> The BRACS study contains preliminary evaluations of hydraulic characteristics of the Gulf Coast Aquifer at certain locations in the Lower Rio Grande Valley. the TWDB has funded preliminary ASR

<sup>19</sup> Texas Water Development Board. "Aquifer Storage and Recovery." <http://www.twdb.texas.gov/innovativewater/asr/index.asp>. 2019.

<sup>20</sup> John E. Meyer, P.G., Andrea Croskrey, Matthew R. Wise, P.G., Sanjeev Kalaswad, Ph.D., P.G. "Brackish Water in the Gulf Coast Aquifer; Lower Rio Grande Valley, Texas." Texas Water Development Board. 2013.

feasibility studies for the Brownsville PUB (1997) and the City of Laredo (1999)<sup>21</sup> and Eagle Pass has indicated their interest in a study. Although the studies indicated that ASR is feasible and recommended further investigation, the municipalities chose not to continue evaluation of the technology. The Rio Grande RWPG encourages Brownsville and Laredo to continue to assess ASR and other municipalities to consider the strategy.

### **5.3.6.1 Eagle Pass – Aquifer Storage and Recovery (Alternative)**

#### **Project Source**

This strategy was submitted by Eagle Pass to the RWPG.

#### **Description**

This strategy is for using ASR for Eagle Pass.

#### **Available Supply**

The supply for this WMS will come from Eagle Pass's current supplies, although in the future additional water management strategies may need to be implemented to provide additional supply. When the entity has a surplus of water supplies, the excess water will be injected into the aquifer for storage, assumed to be the Carrizo-Wilcox Aquifer. When Eagle Pass is experiencing water shortage or drought conditions, water can be recovered from the aquifer and delivered throughout its system. For the purposes of this plan, it is assumed the ASR project will have a capacity of 3,360 ac-ft/yr that would be available by 2040. The strategy water loss of ASR water is assumed to be zero for the purpose of this WMS modeling, but further study is recommended.

#### **Engineering and Costing**

Costs for this strategy from the UCM include a new WTP, land acquisition, and a new well field with dual purpose well pumps for both injecting surplus water and recovering the stored water, and well field piping. It is assumed that the construction period for this strategy is 1.5 years. Table 5-142 outlines the project costs developed in the UCM. The full UCM project cost estimate summaries are provided in Appendix 5D.

#### **Implementation Issues**

Additional studies will need to be conducted for the feasibility of the project. Appropriate TCEQ permitting is required. Construction of the new groundwater well and piping may also include purchase of land and a TXDOT right-of-way permit.

---

<sup>21</sup> Matthew Webb. "Aquifer Storage and Recovery in Texas: 2015." TWDB Technical Note 15-04. 2015.

**Table 5-142 Eagle Pass – Aquifer Storage and Recovery Project Costs (Alternative)**

Facilities Cost	Total Project Cost	Annual Cost	Annual Cost of Water (\$ per ac-ft)	Annual Cost of Water After Debt Service (\$ per ac-ft)
\$56,922,000	\$81,870,000	\$8,812,000	\$2,623	\$908

### 5.3.6.2 Environmental Impacts of Alternative ASR Strategies

The environmental impacts for the alternative Eagle ASR project are discussed below.

#### A. Acres Impacted Permanently

Acres impacted permanently refers to the total amount of area that will be permanently impacted because of the implementation of a strategy. The following conservative assumptions were made (unless more detailed information for a specific facility was available):

- The acres impacted for pipelines is equivalent to the ROW easements required; it is assumed 100-feet for ROW unless otherwise known;
- WTP impacts are estimated using UCM, which is based on the plant capacity; and
- Wellfield impacts are estimated using the UCM, which is based on the proposed wellfield.

#### B. Construction Impacted Acreage

Temporary environmental impacts may be seen during construction activities, such as increased air and noise pollution, and land disturbance activities. However, these effects are typical of any construction project. The construction impacted acreage was estimated as 110 percent (rounded up to a whole number) of the permanently impacted acreage.

#### C. Agricultural Resources Impacted Acreage

Agricultural resources impact acreage is a consolidation of vegetation and land use types specific to Region – row crops, grass farms, and orchards – identified in the TPWD EMST. This GIS mapping data was overlain WMS locations to estimate the agricultural impact acreage from the implementation of the associated strategy.

#### D. Wetland Impact

The wetland impact refers to the probability that implementation of a WMS will affect a wetland. The location of wetlands in the region was determined using the NWI located at <http://www.fws.gov/wetlands/Data/Mapper.html>.

A strategy received a “1” if all or part of the strategy is located in a wetland or if it is in close proximity to where construction activities are likely to impact the wetland. All other strategies received zeros. If the exact location of project is unknown it was given a zero because it was assumed that it would be located on a site that would not affect and wetland.

#### E. Habitat Impacted Acreage

Habitat impacted acreage refers to how the strategy will impact the habitat of the local area. The more area that is impacted because of the implementation of the strategy, the more the habitat of the area

will be disrupted. Therefore, it was assumed that the permanent acreage impacted for a WMS is what would impact habitats.

#### **F. Threatened and Endangered Species Count**

Threatened and endangered species count refers to how the strategy will impact those species in the area once implemented. The species impact was quantified based on the number of federally-listed threatened and endangered species located within the county of the strategy. The number of threatened and endangered species came from the TPWD Rare, Threatened, and Endangered Species of Texas database (<http://tpwd.texas.gov/gis/rtest/>).

#### **G. Cultural Resources Impact**

Cultural resources impact refers to how the strategy will impact cultural resources located within the area. Cultural resources are defined as the collective evidence of the past activities and accomplishments of people, which also include locations; buildings; and features with scientific, cultural, or historic value. It is assumed that no WMSs negatively affect cultural resources. Mitigation costs are included for strategies that require infrastructure so it is assumed that none would be built in a location or way that disrupts culturally sensitive locations.

#### **H. Reliability**

Reliability is an assessment of the availability of the specified water quantity to the user over time. If the quantity of water is available to the user all the time, then the strategy has a high reliability. If the quantity of water is contingent on other factors, reliability will be lower. Successful ASR development is highly reliable (reliability score = 5). It is normally possible to achieve 90-95% recovery efficiency. Challenges to reliability include natural groundwater flow away from the ASR site and the associated drift of the storage bubble, thus reducing available supplies. Flat hydraulic gradients are not typical in Texas, especially in shallow aquifers. This migration of stored water is an important consideration in determining the reliability and viability of an ASR project. Also, since withdrawal of groundwater is a property right, competition with other nearby users could reduce the reliability of this water. One way to address the issue of other competing wells is to own the property rights over the storage bubble but that will drive up the strategy costs. If the water is recharged and recovered over a relatively short period (e.g., one year), the likelihood of reduced reliability is low. However, short-term ASR operations are highly dependent on the local aquifer hydrogeological features and that may impact reliability as well.

#### **I. Bays, Estuaries, and Arms of the Gulf of Mexico**

The environmental effects due to implementation of upstream WMS projects on bays, estuaries, and arms of the Gulf of Mexico are quantitatively assessed and reported. Water bodies designated as classified segments by the TCEQ that are within or downstream of Region M include the Brownsville Ship Channel, South Bay, Laguna Madre, and Gulf of Mexico. Effects to these water bodies were quantified by estimating whether the project is anticipated to decrease freshwater inflow in these classified water bodies.

A WMS project received a "1" if it is expected to decrease freshwater inflow into a classified water body. If a strategy were to increase freshwater inflow or otherwise have little to no impact on inflows, then the project would receive a zero.

A summary of the identified and quantified environmental impacts for alternative ASR strategies is presented in Table 5-143.

**Table 5-143 Environmental Impacts of Alternative ASR Strategies**

Entity	WMS Name	Yield*	A	B	C	D	E	F	G	H	I
Eagle Pass	Eagle Pass ASR Project	3,360	2	3	0	0	2	3	0	5	0
*First decade of implementation yield (ac-ft/yr).											

## 5.4 Considered Water Management Strategies

The TWDB rules require the RWPG to evaluate all potentially feasible water management strategies to meet the Region’s identified demand deficits. Feasibility is based on evaluation criteria established by the TWDB and the RWPG including project cost, unit cost, yield, reliability, environmental impact, local preference, and institutional constraints. In some cases, water management strategies were identified or requested and evaluated, but after initial evaluation, were determined by the RWPG or in some cases the potential project sponsor to not be suitable for consideration at this time or the project sponsor decided to no longer include them.

In addition, there were a few water management strategies that were requested by project sponsors as public comments on the Initially Prepared Plan where there was not sufficient time nor budget to evaluate them to the extent that would meet TWDB requirements. These projects are also listed below.

Considered, but not recommended or alternative, strategies include:

- Seawater Desalination project submitted by South Texas Water Private Utilities, LLC.
- Off-Channel Reservoir project submitted by Donna
- Off-Channel Reservoir project submitted by Mercedes
- Off-Channel Reservoir project submitted by Rio Hondo

## 5.5 Implementation of Certain Water Management Strategies

This subsection is a new requirement for inclusion in the 2026 Regional Water Plans. The purpose of this new subsection is to document the implementation status of certain WMSs that are recommended in the plan to demonstrate the feasibility of each recommended strategy to be fully implemented by the online decade documented in the Regional Water Plan.

The implementation status must be documented for the following types of recommended WMSs with any online planning decade:

- All reservoir strategies (including major and minor reservoirs);
- All seawater desalination strategies;
- Direct potable reuse strategies that provide greater than 5,000 acre-feet per year (AFY) of supply;
- Brackish groundwater strategies that provide greater than 10,000 AFY of supply;

- Aquifer storage and recovery strategies that provide greater than 10,000 AFY;
- All water transfers from out of state; and
- Any other innovative technology projects the RWPG considers appropriate.

The status includes key milestones achieved, such as when a WMS sponsor took an affirmative vote or other action to make expenditures necessary to apply for permits and/or perform planning, design, or construction. A table is included in Appendix 5E, which documents these key milestones. The appendix also includes graphics that display the full planning horizon (from 2020 to 2080) and separate graphical timelines for each project that includes major anticipated, future implementation milestones. The projects that meet the above requirements include:

- Brownsville – Southside WWTP Potable Reuse
- Brownsville – Banco Morales Reservoir
- Southmost RWA - Southmost RWA Phase 4 SRWA Wellfield and WTP Expansion
- HCDD#1 – Delta “Panchita” Reservoir
- HCDD#1 – Santa Cruz (Delta West) Reservoir
- HCDD#1 – Engleman Reservoir
- Laguna Madre Water District – Seawater Desalination Plant

**Appendix 5A. Potentially Feasible WMSs for WUGs with Needs**

Final Draft

## Appendix 5B. Threatened and Endangered Species by County

Final Draft

**Appendix 5C. Water Supply Balances for WUGs and MWPs**

Final Draft

**Appendix 5D. TWDB Uniform Costing Model Summary Reports**

Final Draft

**Appendix 5E. Implementation Status of Certain WMSs**

Final Draft