

Groundwater Management in El Paso, Texas

by

William Ray Hutchison

ISBN: 1-58112-328-0

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ISBN: 1-58112-328-0

GROUNDWATER MANAGEMENT IN EL PASO, TEXAS

by

WILLIAM R. HUTCHISON, B.S., M.S.

DISSERTATION

Presented to the Faculty of the Graduate School

The University of Texas at El Paso

In Partial Fulfillment

of the Requirements

for the Degree of

DOCTOR OF PHILOSOPHY

Center for Environmental Resource Management

THE UNIVERSITY OF TEXAS AT EL PASO

May 2006

ABSTRACT

Groundwater represents an important supply source for municipal and irrigation uses in Far West Texas. The City of El Paso receives about 50 percent of its municipal water supply from surface water and 50 percent from local groundwater. Groundwater pumping in El Paso is from the Hueco Bolson and the Mesilla Bolson. Historic groundwater pumping in the Texas portion of the Mesilla Bolson has not resulted in significant changes in groundwater levels or groundwater quality in existing wells.

Historic pumping in the Hueco Bolson has resulted in lowered groundwater levels and brackish groundwater intrusion. The groundwater level declines have resulted in the intrusion of brackish groundwater into areas that historically pumped fresh groundwater. A 1979 assessment concluded that El Paso would deplete fresh groundwater in the Hueco Bolson by 2030 if groundwater pumping continued to increase. Partly as a result of the 1979 assessment, El Paso reduced its groundwater pumping from the Hueco Bolson by increasing surface water diversions from the Rio Grande, increasing conservation efforts, and increasing reclaimed water use. As a result, groundwater levels in many parts of the Hueco Bolson have stabilized.

Brackish groundwater intrusion remains an issue, and is being addressed with a brackish groundwater desalination plant, currently under construction. The new wells and existing wells that will supply this desalination plant will also assist in the management of brackish groundwater intrusion by intercepting the brackish groundwater before it can flow towards existing fresh groundwater wells.

The 2006 Far West Texas Regional Water Plan contemplates a groundwater transfer project to meet increasing demands in El Paso County beginning about 2030, mostly from the Dell City area in Hudspeth County, Texas. Groundwater management in the Dell City area is

governed by a groundwater conservation district that has established limits on groundwater pumping based on existing and historic uses. Groundwater pumping for irrigation began in the Dell City area in 1948, and groundwater levels have been essentially stable for since the 1980s. Future planning for a groundwater transfer project will require a detailed understanding of the hydrogeology of the groundwater in the Dell City area.

TABLE OF CONTENTS

ABSTRACT.....	iii
TABLE OF CONTENTS.....	v
LIST OF TABLES.....	viii
LIST OF FIGURES.....	ix
CHAPTER 1. INTRODUCTION.....	1
1.1 Past and Current EPWU Supplies.....	3
1.2 Current and Future El Paso County Supplies.....	9
CHAPTER 2. HYDROGEOLOGIC ELEMENTS OF GROUNDWATER MANAGEMENT .	16
2.1 Hydrogeologic Concepts.....	16
2.1.1 Inflow/Outflow Relationships.....	16
2.1.2 Groundwater Flow Models and Groundwater Budgets.....	22
2.2 Yield Concepts.....	25
2.3 Management Models.....	27
2.4 Discussion.....	28
CHAPTER 3. LEGAL AND INSTITUTIONAL ELEMENTS OF GROUNDWATER MANAGEMENT IN TEXAS.....	30
3.1 The Origin of the Rule of Capture.....	30
3.2 Legislative Action after the East Case.....	31
3.2.1 Groundwater Management Areas.....	32
3.2.2 Groundwater Conservation Districts.....	33
3.2.3 Regional Water Planning.....	36
3.3 Sipriano Case.....	38
3.4 Discussion.....	39
CHAPTER 4. OVERVIEW OF EL PASO AREA HYDROGEOLOGY.....	41
4.1 Geologic Setting and Geologic History.....	41
4.2 Groundwater Management Issues.....	52
4.2.1 Declining Groundwater Levels.....	52
4.2.2 Brackish Groundwater Intrusion.....	58
CHAPTER 5. GROUNDWATER CONDITIONS IN THE MESILLA BOLSON.....	62
5.1 Review of CH2M-Hill (2002) Groundwater Flow Model.....	64
5.2 Model Packages.....	69
5.2.1 Basic Package.....	70
5.2.2 Output Control Package.....	71
5.2.3 Block Centered Flow Package.....	71
5.2.4 Pre-Conditioned Conjugate Gradient Package.....	72

5.2.5	Well Package	72
5.2.6	Stream Routing Package	74
5.2.7	Evapotranspiration Package.....	75
5.2.8	Recharge Package	77
5.2.9	Time Variant Specified Head.....	78
5.3	Model Calibration	81
5.4	Groundwater Budget.....	83
5.4.1	Entire Model Domain	83
5.4.2	Texas Portion of the Mesilla Bolson.....	91
5.5	Future Groundwater Management.....	101
CHAPTER 6. GROUNDWATER CONDITIONS IN THE HUECO BOLSON		104
6.1	Past Views on Hueco Bolson Groundwater Conditions	107
6.1.1	Muller and Price (1979).....	109
6.1.2	Boyle Engineering (1991).....	117
6.1.3	Fahy and Sheng (2000).....	118
6.1.4	Discussion of Past Views.....	120
6.2	Groundwater Quality	120
6.3	Overview of Heywood and Yager (2003) Groundwater Flow Model.....	124
6.3.1	Model Packages	126
6.3.2	Model Calibration	137
6.3.3	Groundwater Flow Direction and Drawdown.....	142
6.4	Groundwater Budget of the Hueco Bolson.....	151
6.5	Groundwater Budget Analysis of the Interaction of Surface Water and Groundwater.....	158
6.6	Groundwater Budget of the El Paso Area.....	168
6.6.1	Inflow from New Mexico	169
6.6.2	Inflow from Area East of El Paso.....	170
6.6.3	Inflow from Surface Water System	170
6.6.4	Outflow to Juarez.....	172
6.6.5	Groundwater Storage Decline.....	173
6.7	Summary of Groundwater Budget Results	175
CHAPTER 7. FUTURE GROUNDWATER MANAGEMENT OF THE HUECO BOLSON		179
7.1	Base Case.....	179
7.2	No EPWU Pumping Scenario.....	188
7.3	JDF Scenario	200
7.4	JDF with Artificial Recharge.....	213
7.5	Summary of Results.....	226
7.5.1	Comparison of Groundwater Budgets	226
7.5.2	Analysis of Sustainability of Hueco Bolson Groundwater in the El Paso Area	228
CHAPTER 8. GROUNDWATER CONDITIONS AND MANAGEMENT IN THE DELL CITY, TEXAS AREA		231
8.1	Overview of Dell City/Diablo Plateau Study Area.....	234
8.1.1	Physiography.....	234

8.1.2	Climate.....	238
8.1.3	Geologic Setting.....	242
8.2	Previous Work.....	243
8.2.1	Scalapino (1950).....	243
8.2.2	Bjorklund (1957).....	244
8.2.3	Reed (1965, 1973, 1980).....	246
8.2.4	Parizek (1979).....	247
8.2.5	Gates and Others (1980).....	247
8.2.6	Kreitler and others (1990).....	248
8.2.7	Ashworth (1995).....	249
8.2.8	Mayer (1995).....	251
8.2.9	Hibbs and Others (1997).....	254
8.2.10	Brown and Caldwell (2001).....	255
8.2.11	Blair (2002a, 2002b).....	255
8.2.12	Groeneveld and Baugh (2002).....	256
8.2.13	George and Others (2005).....	258
8.3	Hydrogeologic Setting.....	260
8.3.1	Hydrostratigraphy.....	260
8.3.2	Structure.....	262
8.3.3	Water Levels and Regional Groundwater Flow.....	264
8.3.4	Recharge.....	268
8.3.5	Rivers, Streams, Springs, and Lakes.....	272
8.3.6	Hydraulic Properties.....	272
8.3.7	Playa Discharge.....	277
8.3.8	Groundwater Pumping.....	278
8.4	Conceptual Model of Groundwater Flow.....	287
8.4.1	Domain of the Flow System.....	287
8.4.2	Groundwater Occurrence.....	289
8.4.3	Groundwater Movement.....	291
8.4.5	Inflow Components.....	291
8.4.6	Outflow Components.....	293
8.5	Groundwater Regulation.....	294
8.5.1	Culberson County Groundwater Conservation District.....	294
8.5.2	Hudspeth County Underground Water Conservation District No. 1.....	296
8.5.3	Discussion of Rules of the Two Districts.....	300
8.6	Future Groundwater Management and Groundwater Importation.....	303
CHAPTER 9. DISCUSSION AND SUMMARY.....		310
9.1	Hueco Bolson.....	310
9.2	Future Groundwater Importation.....	315
REFERENCES.....		317
CURRICULUM VITAE.....		329

LIST OF TABLES

Table 1. Summary of EPWU Supply - 1967 to 2005	7
Table 2. El Paso County Demand Projections	13
Table 3. Summary of Future El Paso County Water Supplies – Alternative 6, Far West Texas Regional Water Plan	15
Table 4. Depths of Wells Shown in Figure 31	53
Table 5. Canutillo Area Model Input Files	70
Table 6. Canutillo Area Model Output Files	70
Table 7. Summary of Block Centered Flow Package Input Data	71
Table 8. Surface Water Features Simulated by Stream Routing Package	74
Table 9. Summary of Groundwater Budget for Entire Model Domain by Decade	84
Table 10. Summary of Groundwater Budget for Entire Model Domain by Decade	87
Table 11. Summary of Groundwater Budget for the Texas Portion of the Mesilla Bolson by Decade, Surface Water Recharge and Evapotranspiration Calculated Separately	93
Table 12. Summary of Groundwater Budget for the Texas Portion of the Mesilla Bolson by Decade, Net Discharge to Surface Water Calculated	96
Table 13. Summary of Muller and Price (1979) Supply and Demand Assumptions	110
Table 14. Summary of Groundwater Storage Estimates in El Paso and Juarez Areas Based on Chloride Concentrations	124
Table 15. Hueco Bolson Model Input Files	126
Table 16. Hueco Bolson Model Output Files	127
Table 17. Assumed Distribution of EPWU Pumping – JDF Scenario	202
Table 18. Assumed Distribution of EPWU Pumping – JDF with Artificial Recharge Scenario	214
Table 19. Summary of Groundwater Budget Terms from Simulations	227
Table 20. Storage Decline Analysis	228
Table 21. Summary of Precipitation Data	238
Table 22. Annual Precipitation Expressed as Percent of Average	241
Table 23. Estimates of Pumping and Irrigated Acreage in the Dell City Area	248
Table 24. Estimates of Irrigated Acreage and Pumping	249
Table 25. Summary of Mayer (1995) Simulations	253
Table 26. Simplified Stratigraphic Column – Dell City Area	260
Table 27. Summary of Recharge Estimates	269
Table 28. Summary of Specific Capacity Tests	274
Table 29. Estimates of Transmissivity Based on Specific Capacity Tests	275
Table 30. Groeneveld and Baugh (2002) Estimates of Playa Discharge	278
Table 31. Pre-2002 Estimates of Irrigated Acreage and Pumping	279
Table 32. Groeneveld and Baugh (2002) Estimates of Irrigated Acreage and Consumptive Pumping	281
Table 33. Comparison of Consumptive Pumping Estimates	284
Table 34. Comparison of Total Pumping Estimates	286
Table 35. Maxey-Eakin Recharge Factors and Alternate Range of Factors	292
Table 36. Water Allocation Limits	299

LIST OF FIGURES

Figure 1. Location of El Paso, Texas.....	2
Figure 2. Rio Grande and Elephant Butte Reservoir	3
Figure 3. Location of EPWU Water Rights Properties (Owned and Leased)	4
Figure 4. Location of Hueco Bolson, Mesilla Bolson and Los Muertos Bolson	5
Figure 5. Location of EPWU Wells and Surface Water Plants	6
Figure 6. History of EPWU Supplies from Groundwater (Hueco Bolson and Mesilla Bolson) and Surface Water (Rio Grande).....	6
Figure 7. EPWU Per Capita Demand	9
Figure 8. Current Conjunctive Use Supplies in El Paso County	10
Figure 9. Location of Far West Texas Region for Water Planning	12
Figure 10. Location of Properties in Hudspeth, Culberson, Jeff Davis, and Presidio Counties for Potential Future Groundwater Importation Projects	14
Figure 11. Groundwater System Prior to Development.....	17
Figure 12. Groundwater System after Initial Pumping.....	18
Figure 13. Groundwater System under Continued Pumping – New Equilibrium Condition	19
Figure 14. Groundwater System under Additional Increment of Increased Pumping.....	19
Figure 15. Gaining Stream Condition.....	20
Figure 16. Losing Stream Condition.....	21
Figure 17. Disconnected Stream Condition.....	22
Figure 18. Location of Groundwater Management Areas in Texas.....	33
Figure 19. Location of Groundwater Conservation Districts in Texas.....	34
Figure 20. Regional Water Planning Areas in Texas.....	37
Figure 21. Geographic Features of the El Paso Area.....	41
Figure 22. Horst and Graben Structure of Hueco and Mesilla Bolsons.....	42
Figure 23. Paleodrainages of Pliocene/Early Pleistocene (after Hawley, 1975)	44
Figure 24. Rio Grande Flow Through Fillmore Pass.....	45
Figure 25. Formation of Playa-Lake Complex in Present-Day Hueco Bolson.....	46
Figure 26. Rio Grande Flowing Through the Hueco Bolson.....	47
Figure 27. Rio Grande Flowing Towards Paso Del Norte.....	48
Figure 28. Formation of Fluvial-Deltaic System in Mesilla Bolson Terminating in Playa-Lake Complex.....	48
Figure 29. Rio Grande Flowing Through Paso Del Norte.....	49
Figure 30. Ancestral and Current Rio Grande and Current General Occurrence of Fresh and Brackish Groundwater	50
Figure 31. Location of Hydrograph Wells.....	53
Figure 32. Hydrograph of EPWU Well 25 (Hueco Bolson).....	54
Figure 33. Hydrograph of EPWU Well 37 (Hueco Bolson).....	55
Figure 34. Hydrograph of EPWU Well 413 (Hueco Bolson).....	55
Figure 35. Hydrograph of EPWU Well SP1 (Hueco Bolson)	56
Figure 36. Hydrograph of EPWU Well 109 (Mesilla Bolson)	56
Figure 37. Hydrograph of EPWU Well 206 (Mesilla Bolson)	57
Figure 38. Hydrograph of EPWU Well 304 (Mesilla Bolson)	57
Figure 39. Cross-Section of Fresh and Brackish Groundwater in the Hueco Bolson.....	58

Figure 40. Operation Status of EPWU Wells, 1997-2002	59
Figure 41. Historical Trend of Chloride Concentrations in Ft Bliss Well FB16	60
Figure 42. Historical Trend of Chloride Concentrations in EPWU Well 80	60
Figure 43. Groundwater Pumping Estimates from 1915 to 1995	62
Figure 44. Location of EPWU Wells in the Canutillo Area	63
Figure 45. Pumping from EPWU Wells in the Canutillo Area (1967 to 2005).....	63
Figure 46. Groundwater Flow Model Domain of CH2M-Hill (2002).....	67
Figure 47. Hydrostratigraphy of the Mesilla Bolson	68
Figure 48. Conceptual Model of Groundwater Flow in the Area	69
Figure 49. Specified Flux Inflows (Well Package).....	72
Figure 50. Specified Flux Outflows (Well Package).....	73
Figure 51. Surface Water Features (Rio Grande, Canals and Drains) as Simulated with the STR Package	75
Figure 52. Shallow Groundwater Evapotranspiration Area.....	76
Figure 53. Evapotranspiration Rate	76
Figure 54. Positive “Net Irrigation Flux” Estimates	77
Figure 55. Negative “Net Irrigation Flux” Estimates	78
Figure 56. Layer 1 CHD Boundaries	79
Figure 57. Layer 2 CHD Boundaries	79
Figure 58. Layer 3 CHD Boundaries	80
Figure 59. Layer 4 CHD Boundaries	80
Figure 60. Total Pumping vs. Boundary Inflow - Entire Model Domain.....	89
Figure 61. Total Pumping vs. Boundary Outflow - Entire Model Domain	89
Figure 62. Total Pumping vs. Net Groundwater Discharge to the Surface Water System - Entire Model Domain	90
Figure 63. Total Pumping vs. Groundwater Storage Change - Entire Model Domain.....	91
Figure 64. Location of Texas Portion of the Mesilla Bolson for Purposes of Subregional Groundwater Budget Development	92
Figure 65. Groundwater Storage Change in the Texas Portion of the Mesilla Bolson.....	98
Figure 66. Total Pumping vs. Groundwater Storage Change in the Texas Portion of the Mesilla Bolson	99
Figure 67. Total Pumping vs. Net Inflow from New Mexico in the Texas Portion of the Mesilla Bolson	100
Figure 68. Total Pumping vs. Net Discharge to the Surface Water System in the Texas Portion of the Mesilla Bolson.....	100
Figure 69. Historic Pumping in the Hueco Bolson	104
Figure 70. Location of EPWU Hueco Bolson Wells	105
Figure 71. Pumping from EPWU Wells in the Hueco Bolson (1967 to 2005).....	105
Figure 72. Total Demand Comparison.....	111
Figure 73. Municipal Surface Water Diversion Comparison	111
Figure 74. Municipal Groundwater Pumping Comparison.....	112
Figure 75. Comparison of “Natural” Recharge Estimates	114
Figure 76. Comparison of “Induced” Recharge Estimates	115
Figure 77. Comparison of Groundwater Storage Decline Estimates.....	115
Figure 78. Chloride Concentration at Elevation 3,558 ft MSL.....	122

Figure 79. Chloride Concentration at Elevation 3,361 ft MSL.....	122
Figure 80. Chloride Concentration at Elevation 3,164 ft MSL.....	123
Figure 81. Chloride Concentration at Elevation 2,967 ft MSL.....	123
Figure 82. Domain of Hueco Bolson Groundwater Model.....	125
Figure 83. North-South Cross Section of Hueco Bolson Model Layering (Column 49)	128
Figure 84. East-West Cross Section of Hueco Bolson Model Layering (Row 50)	129
Figure 85. East West Cross Section of Hueco Bolson Model Layering (Row 115).....	129
Figure 86. Location of Horizontal Flow Barrier (HFB) Boundaries	130
Figure 87. Location of Drain Boundaries	131
Figure 88. Evapotranspiration Areas in Hueco Bolson Model After 1925.....	133
Figure 89. Mountain Front Recharge and Areas with Recharge from Irrigation.....	134
Figure 90. Recharge Scaling Factor.....	135
Figure 91. Location of Stream Package Boundaries.....	136
Figure 92. Hueco Bolson Model Calibration – EPWU Wells	138
Figure 93. Hueco Bolson Model Calibration – JMAS Wells	138
Figure 94. EPWU Well 421 Hydrograph.....	139
Figure 95. EPWU Well 505 Hydrograph.....	140
Figure 96. EPWU Well 48 Hydrograph.....	140
Figure 97. EPWU Well 28 Hydrograph.....	141
Figure 98. Location of Hydrograph Wells.....	141
Figure 99. Pre-Development Groundwater Flow Direction	142
Figure 100. Groundwater Flow Direction in 2002.....	143
Figure 101. Hueco Bolson Drawdown in 1962	144
Figure 102. Hueco Bolson Drawdown in 1972	144
Figure 103. Hueco Bolson Drawdown in 1982	145
Figure 104. Hueco Bolson Drawdown in 1992	145
Figure 105. Hueco Bolson Drawdown in 2002	146
Figure 106. Location of Cross-Sections.....	147
Figure 107. Cross Section A-A’ (North-South).....	148
Figure 108. Cross Section B-B’ (East-West).....	149
Figure 109. Cross Section C-C’ (Along Rio Grande, Northwest-Southeast)	150
Figure 110. Hueco Bolson Inflow by Decade.....	152
Figure 111. Pumping vs. Inflow	153
Figure 112. Hueco Bolson Outflow by Decade.....	154
Figure 113. Pumping vs. Other Components of Outflow	155
Figure 114. Hueco Bolson Storage Change by Decade.....	156
Figure 115. Pumping vs. Groundwater Storage Change.....	156
Figure 116. Summary of Storage Decline and Capture in the Hueco Bolson by Decade	157
Figure 117. Location of Rio Grande Alluvium.....	159
Figure 118. Isotopic Signatures of Hueco Bolson Groundwater in Texas and Chihuahua and Rio Grande Alluvium Groundwater	160
Figure 119. Location of Wells Used in the Analysis Shown in Figure 118	160
Figure 120. Predevelopment Groundwater Flow Patterns.....	161
Figure 121. Location of Nested Well Described by Hibbs and others (2003).....	162
Figure 122. Groundwater Level and Tritium Data from Nested Well.....	163

Figure 123. Simulated and Actual Groundwater Elevation at EPWU Well 83 (Adjacent to USGS Nested Well Site)	164
Figure 124. “Urban” and “Rural” Alluvium	165
Figure 125. Flow between Alluvium and Hueco Bolson (Texas and Chihuahua)	166
Figure 126. El Paso Area for Subregional Groundwater Budget Analysis.....	168
Figure 127. El Paso Area Inflow from New Mexico	169
Figure 128. El Paso Area Inflow from the East.....	170
Figure 129. El Paso Area Inflow from Surface Water.....	171
Figure 130. El Paso Area Outflow to Juarez.....	173
Figure 131. Groundwater Storage Changes in the El Paso Area	174
Figure 132. Cross-Section A-A’ – Base Case (North-South).....	181
Figure 133. Cross Section B-B’ – Base Case (North-South).....	182
Figure 134. Cross Section C-C’ – Base Case (Along Rio Grande, Northwest-Southeast).....	183
Figure 135. Groundwater Flow Direction at Year 50 and Current Groundwater Quality – Base Case.....	184
Figure 136. El Paso Area Inflow from New Mexico – Base Case	185
Figure 137. El Paso Area Inflow from East – Base Case	185
Figure 138. El Paso Area Inflow from Surface Water System – Base Case	186
Figure 139. El Paso Area Outflow to Juarez – Base Case.....	187
Figure 140. El Paso Area Storage Decline – Base Case	187
Figure 141. Cross Section A-A’ – No EPWU Pumping Scenario (North-South).....	189
Figure 142. Cross-Section B-B’ – No EPWU Pumping Scenario (East-West).....	190
Figure 143. Cross-Section C-C’ – No EPWU Pumping Scenario (Along Rio Grande, Northwest-Southeast).....	191
Figure 144. Groundwater Flow Direction at Year 20 – No EPWU Pumping Scenario	192
Figure 145. Groundwater Flow Direction at Year 30 – No EPWU Pumping Scenario	193
Figure 146. Groundwater Flow Direction at Year 50 – No EPWU Pumping Scenario	193
Figure 147. Groundwater Flow Direction at Year 50 and Current Groundwater Quality – No EPWU Pumping Scenario.....	194
Figure 148. El Paso Area Inflow from New Mexico – No EPWU Pumping Scenario	195
Figure 149. El Paso Area Inflow from the East – No EPWU Pumping Scenario	196
Figure 150. El Paso Area Inflow from Surface Water System – No EPWU Pumping Scenario	197
Figure 151. El Paso Area Outflow to Juarez – No EPWU Pumping Scenario.....	198
Figure 152. El Paso Area Storage Decline – No EPWU Pumping Scenario.....	199
Figure 153. Location of Source Wells, Blend Wells, and Desalination Plant.....	201
Figure 154. Cross-Section A-A’ – JDF Scenario (North-South).....	203
Figure 155. Cross-Section B-B’ – JDF Scenario (East-West).....	204
Figure 156. Cross-Section C-C’ – JDF Scenario (Along Rio Grande, Northwest-Southeast) ...	205
Figure 157. Groundwater Flow Direction at Year 50 – JDF Scenario	206
Figure 158. Groundwater Flow Direction at Year 50 and Current Groundwater Quality – JDF Scenario.....	207
Figure 159. El Paso Area Inflow from New Mexico – JDF Scenario	208
Figure 160. El Paso Area Inflow from the East – JDF Scenario	209
Figure 161. El Paso Area Inflow from the Surface Water System – JDF Scenario	210

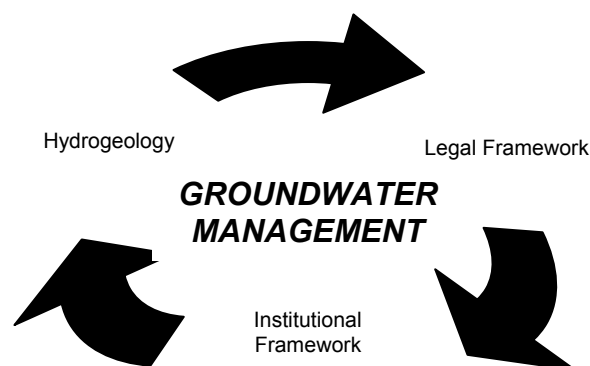
Figure 162. El Paso Area Outflow to Juarez – JDF Scenario.....	211
Figure 163. El Paso Area Storage Decline – JDF Scenario.....	212
Figure 164. Location of Spreading Basins and JDF Wells.....	214
Figure 165. Cross-Section A-A’ – JDF with Artificial Recharge Scenario (North-South).....	216
Figure 166. Cross-Section B-B’– JDF with Artificial Recharge Scenario (West-East).....	217
Figure 167. Cross-Section C-C’ – JDF with Artificial Recharge Scenario (Along Rio Grande, Northwest-Southeast).....	218
Figure 168. Groundwater Flow Direction at Year 50 in Layer 2 – JDF with Artificial Recharge Scenario.....	219
Figure 169. Groundwater Flow Direction at Year 50 in Layer 5 – JDF with Artificial Recharge Scenario.....	220
Figure 170. El Paso Area Inflow from New Mexico – JDF with Artificial Recharge Scenario	221
Figure 171. El Paso Area Inflow from the East – JDF with Artificial Recharge Scenario	222
Figure 172. El Paso Area Inflow from the Surface Water System – JDF with Artificial Recharge Scenario.....	223
Figure 173. El Paso Area Outflow to Juarez – JDF with Artificial Recharge Scenario	224
Figure 174. El Paso Area Groundwater Storage Decline – JDF with Artificial Recharge Scenario	225
Figure 175. Location of Dell City, Texas	231
Figure 176. Location of Bone Spring-Victorio Peak Aquifer and Capitan Reef Aquifer as Currently Designated by the Texas Water Development Board.....	232
Figure 177. Location of Properties in the Dell City Area and Capitan Reef Properties for Potential Future EPWU Groundwater Importation Projects.....	233
Figure 178. Location of Groundwater Conservation Districts in the Dell City Area.....	234
Figure 179. Watershed Divides and Southern Groundwater Divide	235
Figure 180. Physiographic Units.....	236
Figure 181. Location of Precipitation Stations	239
Figure 182. Elevation vs. Average Annual Precipitation	240
Figure 183. Generalized Cross-Section of Dell City Area	243
Figure 184. Groundwater Elevation Contours in the Dell City Area	255
Figure 185. Estimated Irrigated Area in 1975	257
Figure 186. Estimated Area of Playa Discharge in 1988.....	258
Figure 187. Proposed New Boundary for the Bone Spring-Victorio Peak Aquifer	259
Figure 188. Fence Diagram of Cornudas Mountain Area.....	261
Figure 189. Generalized Location of Faults and Flexures.....	263
Figure 190. Well Locations in the Dell City Area.....	264
Figure 191. Location of Selected Wells.....	265
Figure 192. Hydrograph of Well 25S 18E 21 233.....	266
Figure 193. Hydrograph of Well 26S 18E 30 321	266
Figure 194. Hydrograph of Well 48-17-202.....	267
Figure 195. Hydrograph of Well 48-07-502.....	267
Figure 196. Hydrograph of Well 48-07-904.....	268
Figure 197. Comparison of Irrigated Acreage Estimates.....	282
Figure 198. Domain of Groundwater Flow System.....	288

Figure 199. Hydrographs of Paired Wells: Shallow Well (48-07-505) and Deep Well (48-07-501)	289
Figure 200. Conceptual Groundwater System with Flow Field	307
Figure 201. Location of Wells Adjacent to the Playa.....	307
Figure 202. Groundwater Flow under Pumping Conditions, Wells Adjacent to Playa.....	308
Figure 203. Location of Wells Away from Playa.....	308
Figure 204. Groundwater Flow under Pumping Conditions, Wells Away from Playa.....	309

CHAPTER 1. INTRODUCTION

Desert landscapes and mountains characterize far west Texas. Surface water is generally scarce, except for the Rio Grande. Consequently, groundwater represents an important supply source for municipal, irrigation, manufacturing, mining and domestic uses. Managing groundwater resources is important to the present and future of the communities in the area.

Groundwater management combines elements of the hydrogeology of an area, and the legal and institutional framework of the state and region. This dissertation represents a study of the current state of groundwater management in El Paso, Texas,



the largest city in west Texas along the border between Texas and Chihuahua (Figure 1). El Paso Water Utilities is the largest provider of water and wastewater services in El Paso County, and provides services within the City of El Paso and several unincorporated areas of El Paso County.

El Paso groundwater management is unique for a two major reasons. First, although the climate in the region is arid (annual rainfall averages 8 inches), water is supplied from both surface water from the Rio Grande and groundwater. Second, it is a city that is located in a state with a unique approach to groundwater regulation, and is within a binational (United States of America and Mexico) and tri-state (Texas, New Mexico and Chihuahua) region. The metropolitan area of El Paso, Texas and Ciudad Juarez, Chihuahua represents the largest international border community in the world.

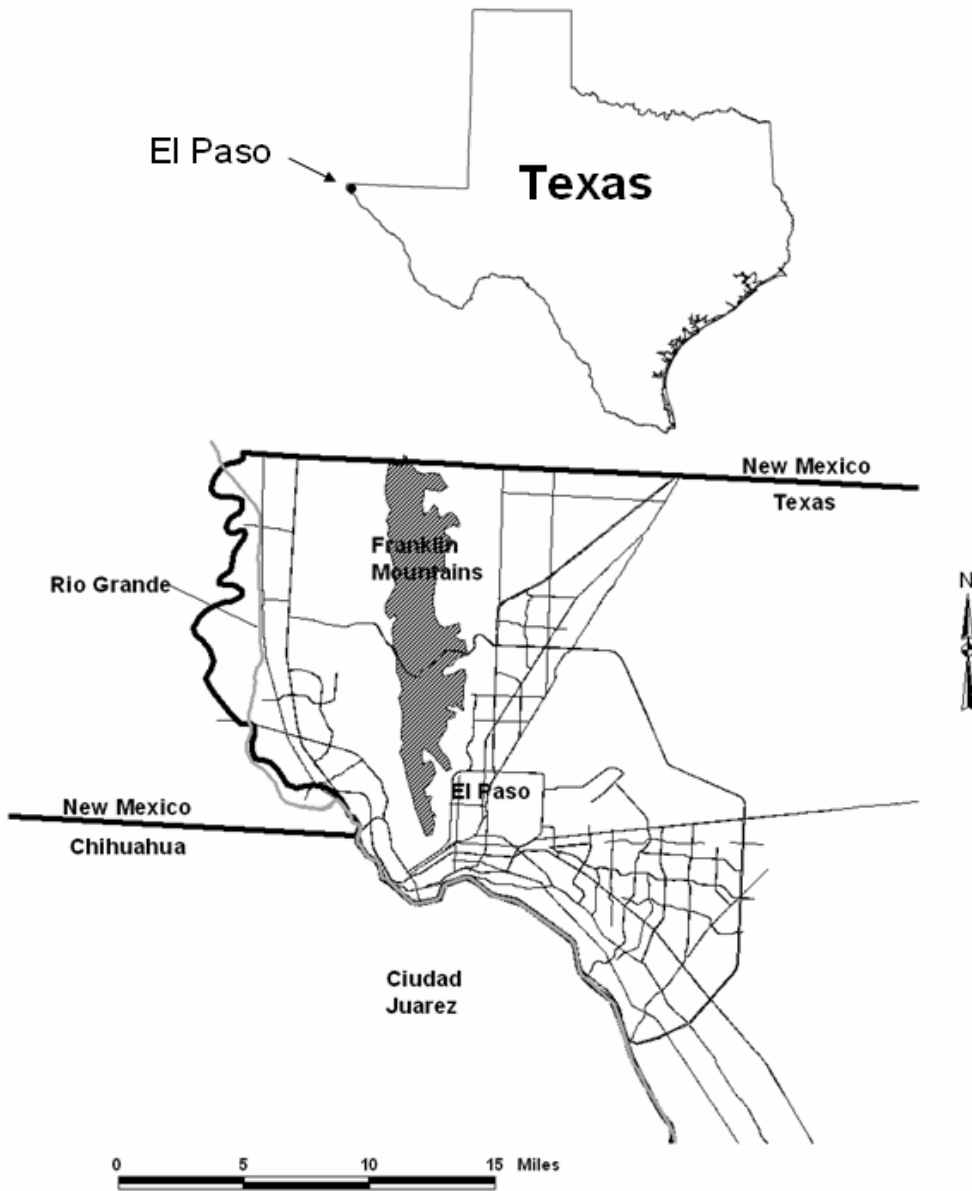


Figure 1. Location of El Paso, Texas

The hydrogeology of the area is influenced by the presence of the Rio Grande and the arid climate. The institutional and legal framework aspects are influenced by the unique groundwater regulation approach in Texas coupled with the binational and tri-state location of El Paso.

1.1 Past and Current EPWU Supplies

Since the beginning of the 20th century, El Paso Water Utilities (EPWU) has relied on both surface water and groundwater for municipal water supply. Surface water is supplied from the Rio Grande (Figure 2).

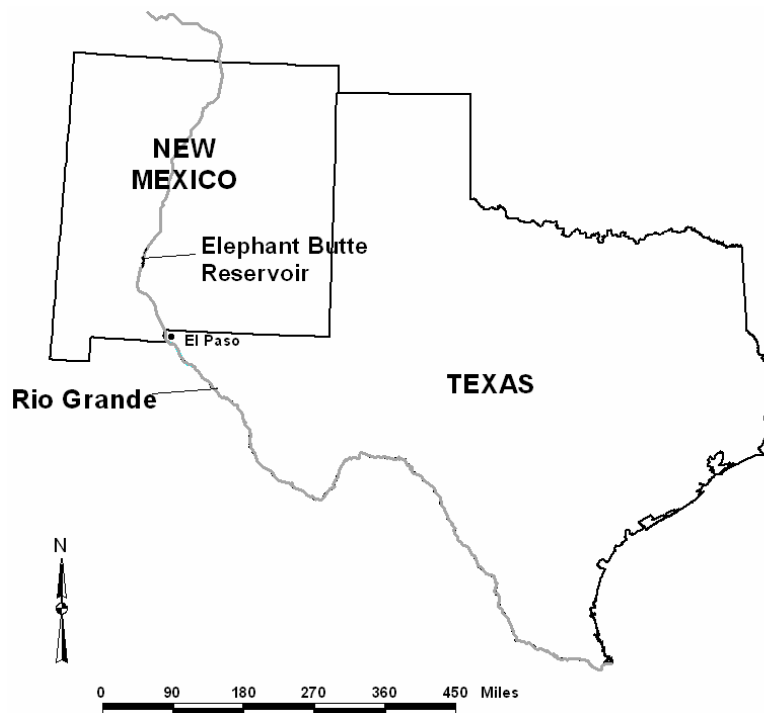


Figure 2. Rio Grande and Elephant Butte Reservoir

The Rio Grande flows that are diverted in the El Paso area are primarily derived from snowmelt runoff in southern Colorado and northern New Mexico. Historically, there are also occasional flood surges associated with storm systems in the summer monsoon season. Spring runoff is stored in Elephant Butte Reservoir in southern New Mexico before releases are made for irrigation and municipal use in southern New Mexico and the El Paso area. EPWU is a customer of the local irrigation district (El Paso County Water Improvement District No.1), and obtains water through ownership of water rights land, or leasing of water rights from agricultural water rights holders (Figure 3).

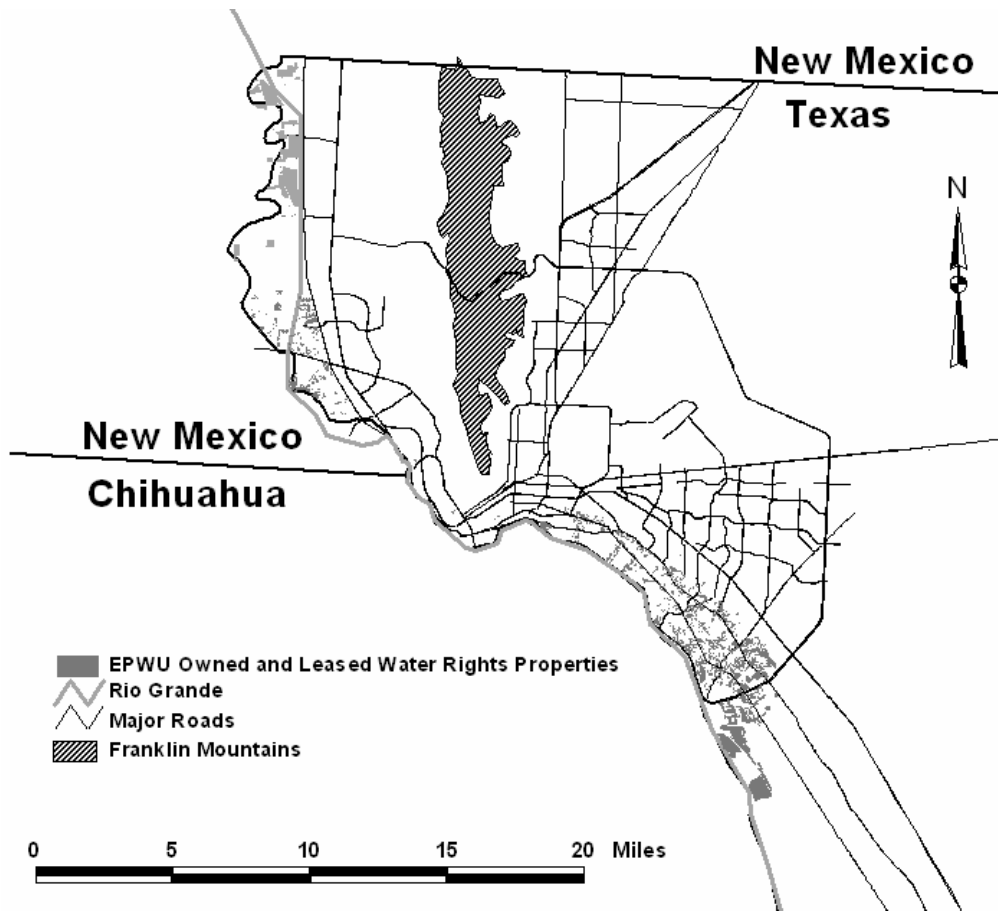


Figure 3. Location of EPWU Water Rights Properties (Owned and Leased)

Groundwater supplies are pumped from the Mesilla Bolson and the Hueco Bolson (Figure 4). The Los Muertos Bolson, adjacent to the Mesilla Bolson is also shown in Figure 4. These groundwater basins underlie portions of New Mexico, Texas and Chihuahua (Creel and others, 2006). Groundwater occurs in unconsolidated fluvial, alluvial, and lacustrine sediments. The Rio Grande plays an important role in the recharge and discharge of both groundwater basins.

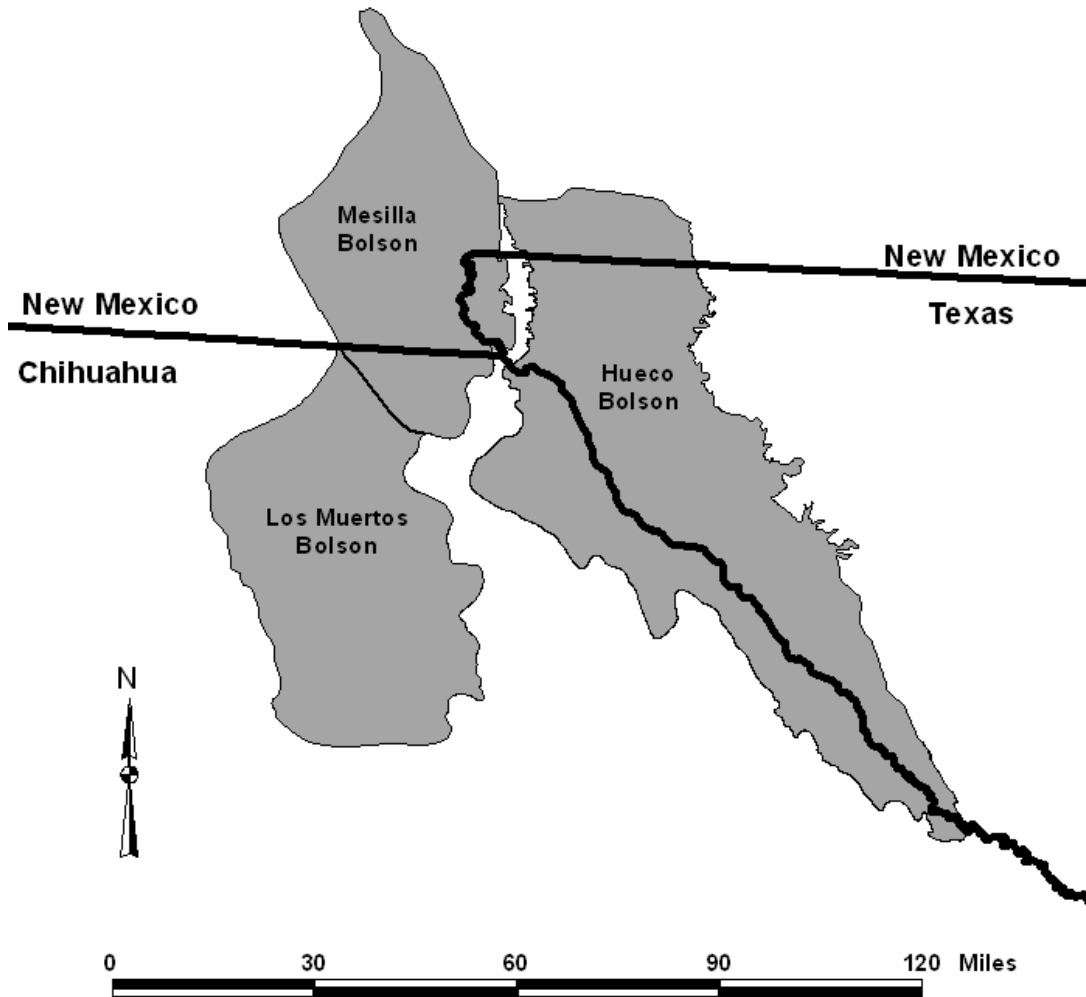


Figure 4. Location of Hueco Bolson, Mesilla Bolson and Los Muertos Bolson

The location of EPWU wells in the Hueco Bolson and Mesilla Bolson and the location of the two EPWU surface water treatment plants are shown on Figure 5. Annual production from each of these sources is summarized in Figure 6, and the data are summarized in Table 1.

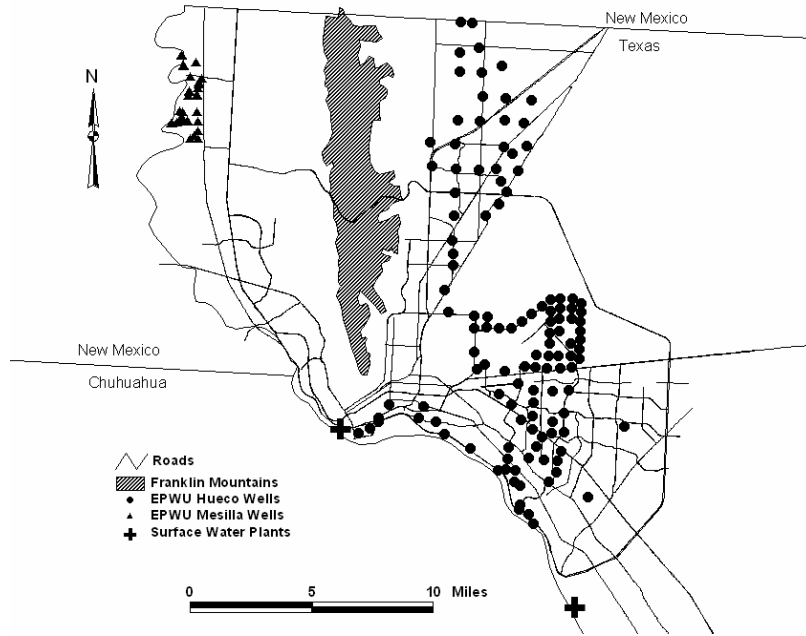


Figure 5. Location of EPWU Wells and Surface Water Plants

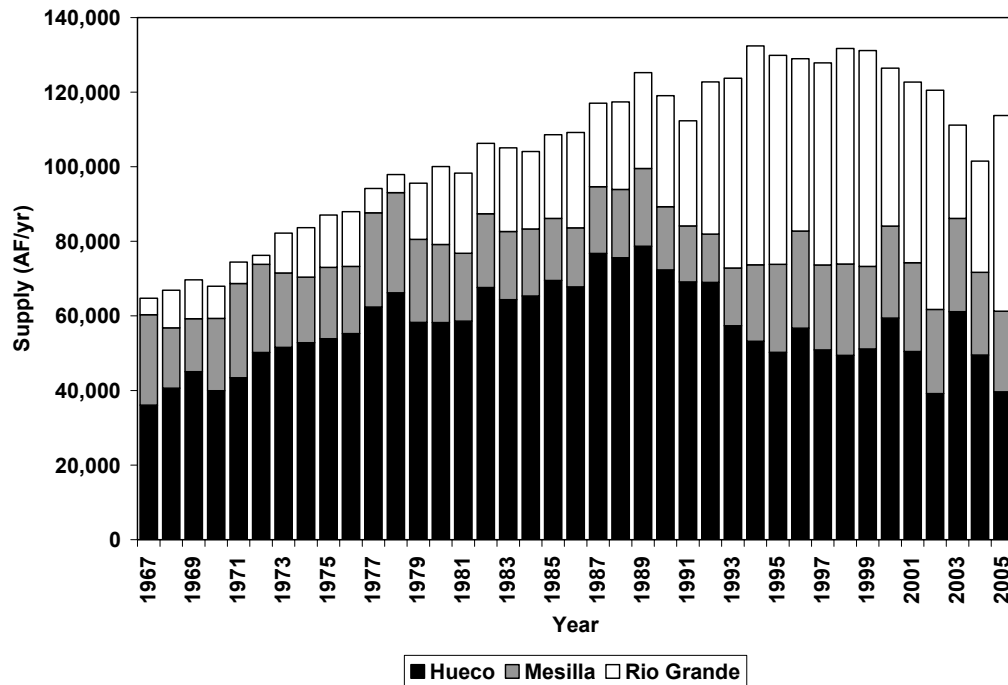


Figure 6. History of EPWU Supplies from Groundwater (Hueco Bolson and Mesilla Bolson) and Surface Water (Rio Grande)

Table 1. Summary of EPWU Supply - 1967 to 2005
All Values in AF/yr

Year	Hueco Pumping	Mesilla Pumping	Surface Water	Total Supply
1967	36,050	24,276	4,426	64,752
1968	40,649	16,147	10,111	66,907
1969	45,055	14,197	10,415	69,668
1970	39,951	19,370	8,631	67,951
1971	43,390	25,291	5,722	74,403
1972	50,190	23,626	2,426	76,243
1973	51,569	19,940	10,674	82,183
1974	52,798	17,596	13,281	83,675
1975	53,865	19,132	14,041	87,039
1976	55,236	18,011	14,680	87,927
1977	62,398	25,258	6,496	94,151
1978	66,212	26,821	4,840	97,873
1979	58,278	22,276	15,038	95,592
1980	58,213	20,917	20,929	100,059
1981	58,587	18,221	21,481	98,289
1982	67,612	19,743	18,922	106,277
1983	64,328	18,298	22,419	105,045
1984	65,309	17,979	20,769	104,058
1985	69,482	16,660	22,423	108,565
1986	67,776	15,822	25,588	109,186
1987	76,741	17,894	22,378	117,014
1988	75,572	18,338	23,448	117,359
1989	78,699	20,841	25,674	125,215
1990	72,332	16,920	29,812	119,064
1991	69,117	15,024	28,153	112,294
1992	68,965	12,956	40,810	122,731
1993	57,363	15,477	50,868	123,709
1994	53,187	20,526	58,667	132,380
1995	50,220	23,605	56,060	129,885
1996	56,711	26,019	46,219	128,948
1997	50,870	22,772	54,194	127,837
1998	49,398	24,509	57,794	131,700
1999	51,127	22,136	57,879	131,142
2000	59,410	24,682	42,329	126,421
2001	50,438	23,823	48,428	122,689
2002	39,151	22,591	58,743	120,485
2003	61,103	25,063	24,992	111,158
2004	49,480	22,221	29,794	101,495
2005	39,630	21,635	52,546	113,721

EPWU pumping in the Hueco Bolson peaked at about 80,000 acre-feet per year (AF/yr) in 1989. As a result of concerns regarding the long-term ability to continue this level of pumping (e.g. Muller and Price, 1979 and Boyle Engineering, 1991), EPWU implemented the following water management strategies: 1) adopted a rate structure that increases the cost of water for high use, 2) promoted water conservation through various incentive programs, 3) increased the use of Rio Grande Water, and 4) expanded the reuse of reclaimed water.

EPWU pumping in the Hueco Bolson in 2002 was below 40,000 AF/yr for the first time since 1967. Hueco pumping increased in 2003 and 2004 due to a drought and the associated reduction in surface water diversions. Pumping again dropped below 40,000 AF/yr in 2005 as a result of a return of nearly full river allocation conditions. The conjunctive use of surface water and groundwater (increasing groundwater pumping in times of surface water shortages) to meet overall demands is part of EPWU's overall water supply strategy.

The surface water plants have a combined capacity of 100 mgd. Under normal river flow conditions, the plants operate seven months during the year (i.e. during the irrigation season). EPWU is a customer of El Paso County Water Improvement District No.1, and receives water from the Rio Grande Project via its ownership of lands within the project area or through leases from water rights holders. Currently, El Paso has water rights of about 65,000 AF/yr from the Rio Grande Project (Far West Texas Regional Planning Group, hereinafter FWTRPG, 2006).

Despite population increases, total demand has been declining since the late 1990s due to conservation and pricing strategies. Current total demand is about 110,000 AF/yr. Per capita demand has been reduced from about 225 gallons per person per day in the 1970s to about 137 gallons per person per day in 2005 (Figure 7).

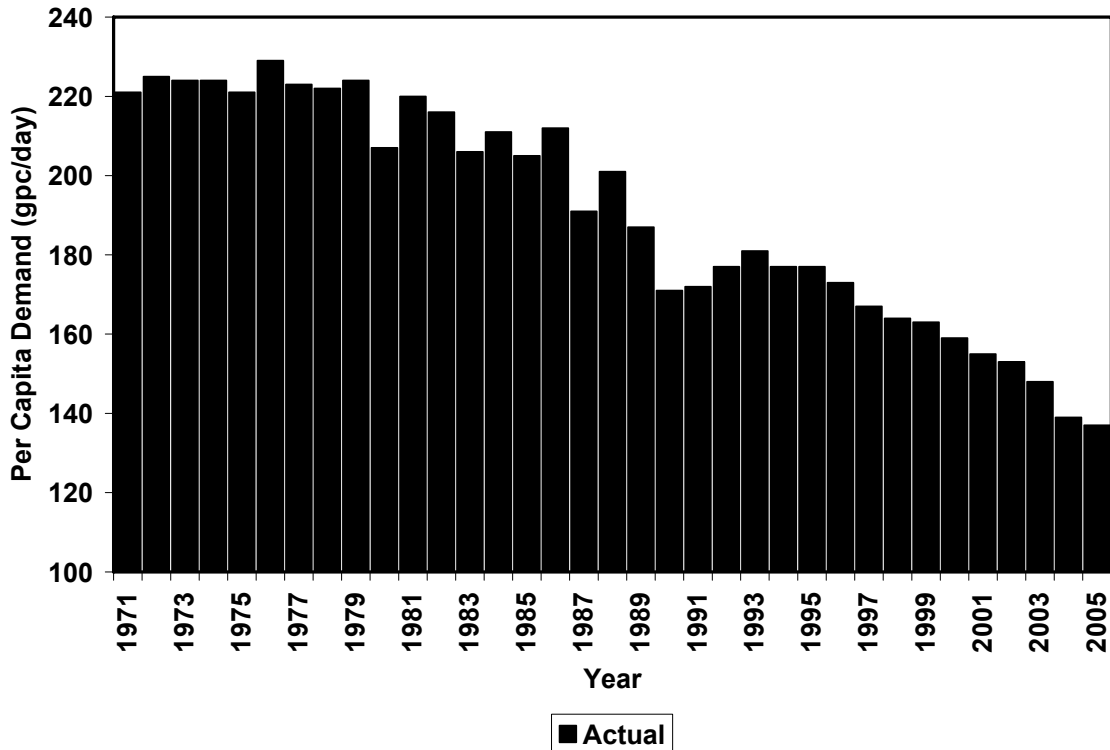


Figure 7. EPWU Per Capita Demand

1.2 Current and Future El Paso County Supplies

Currently, EPWU supplies about 90% of all municipal water in El Paso County (FWTRPG, 2006). The recently completed Regional Water Plan included a study of alternative means of supplying nonagricultural water to El Paso County through the year 2060 (FWTRPG, 2006 and Gooch and others, 2006).

Based on current capacities of wells and surface water plants, and the limitation that surface water is only available during the irrigation season, total available municipal supply in El Paso County is about 150,000 AF/yr (FWTRPG, 2006). This total includes about 5,000 AF/yr of reclaimed water supply that is available independent of drought conditions. Under full surface water allocation conditions, municipal surface water supply is about 60,000 AF/yr. Under these