GAM Task 10-025 Model Run Report

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Cynthia K. Ridgeway is the Manager of the Groundwater Availability Modeling Section and is responsible for oversight of work performed by employees under her direct supervision. The seal appearing on this document was authorized by Cynthia K. Ridgeway, P.G. 471 on June 10, 2010.

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EXECUTIVE SUMMARY:

The recently modified groundwater model for the Dockum Aquifer was used to evaluate the potential future conditions of the aquifer under a broad range of pumping scenarios between 2010 and 2060 for groundwater management areas 2, 3, and 7. A “base” pumping scenario was first developed and then systematically ramped up and down between zero and 1.9 times the level for the base scenario. In Groundwater Management Area 2, pumping for the base scenario is the same as the pumping for the last year of the historical-calibration period in the model (1997). In Groundwater Management Area 3, pumping in each county for the base scenario was set to levels recently recommended to the area by outside consultants. For Groundwater Management Area 7, pumping was determined iteratively to achieve 25 feet of drawdown in Midland and Nolan counties and 5 feet of drawdown in Mitchell County.

In Groundwater Management Area 2, the base pumping scenario containing 9,600 acre-feet of pumping resulted in 39 feet of drawdown between 2010 and 2060. Among the scenarios this ranges from 36 to 41 feet when applying pumping between zero and 18,000 acre-feet per year. In Groundwater Management Area 3, the base scenario containing 39,000 acre-feet of pumping per year resulted in 27 feet of drawdown. Among the scenarios this ranges from a water-level rise of 4 feet to a decline of 48 feet when applying pumping between zero and 77,000 acre-feet per year. In Groundwater Management Area 7, the base pumping scenario containing 35,000 acre-feet of pumping resulted in 8 feet of drawdown and ranges from a water-level rise of 5 feet to a decline of 24 feet when applying pumping between zero and 64,000 acre-feet per year.

PURPOSE OF MODEL RUNS

The model runs contained in this report were performed using the modified groundwater model for the Dockum Aquifer to evaluate the potential future conditions of the aquifer under a broad range of pumping scenarios.

DESCRIPTION OF MODEL RUNS:

The groundwater management areas in which the Dockum Aquifer is located are shown in Figure 1. Though the model was run for all areas shown in this figure, the results presented here focus on groundwater management areas 2, 3 and 7. For each of the management areas other than Groundwater Management Area 1, a “base” pumping scenario was set up and then ramped up and down for a total of nine model simulations. The range of pumping scenarios is expressed as a percent of the base scenario: zero percent, 20 percent, 40 percent, 60 percent, 80 percent, 130 percent, 160 percent, and 190 percent. Pumping was not adjusted among the scenarios in New Mexico or in Groundwater Management Area 1.

In Groundwater Management Area 1 pumping for the base scenario was set to achieve their adopted desired future condition of 30 feet of drawdown after 51 years. In Groundwater Management Area 3 the pumping in each county was set to levels recommended to the management area by contracted consultants. In Groundwater Management Area 7, pumping was adjusted in achieve 25 feet of drawdown in Midland and Nolan counties and 5 feet of drawdown in Mitchell County after 51 years. In all other areas the pumping for the base scenario is taken from the last year of the historical-calibration period of the model.

METHODS:

The recently modified groundwater model of the Dockum Aquifer (Oliver and Hutchison, 2010) was used in order to evaluate the potential future conditions of the aquifer for groundwater management areas 2, 3 and 7 under a broad range of pumping scenarios. This model is a modification of the groundwater availability model documented in Ewing and others (2008) and was completed in order to more effectively simulate future conditions.

A base scenario was established in which pumping for each of the groundwater management areas was set to either the level for the last year of the historical-calibration period, a specified amount of pumping requested by districts in the management area, or a pumping amount determined iteratively to achieve a specified potential desired future condition. The pumping in the base scenario was then systematically adjusted up and down to estimate drawdown changes under different pumping levels. More details on pumping in the model are given in the Pumping section below.

The historical-calibration period of the model ends in 1997 while the predictive simulation documented here begins in 2010. To determine the appropriate level of pumping between 1998 and 2009, the interim period leading up to the predictive simulation, a preliminary analysis of water levels in several selected wells in each groundwater management area was performed. As shown at the beginning of appendices A, B, and C for groundwater management areas 2, 3, and 7, respectively, these hydrographs do not indicate significant trends in water levels that indicate large changes in pumping during this time period. Based on this analysis, pumping levels and distribution for the last year of the historical-calibration portion of the model were assumed to be appropriate for the interim period. Pumping was, therefore, held constant at 1997 levels between 1998 and 2009.

PARAMETERS AND ASSUMPTIONS:

The parameters and assumptions for the model run using the modified groundwater model for the Dockum Aquifer are described below:

- The modified version the groundwater model for the Dockum Aquifer described in Oliver and Hutchison (2008) was used for this analysis. This model is an update to the previously developed groundwater availability model for the Dockum Aquifer described in Ewing and others (2008) completed in order to more effectively simulate future conditions. See Oliver and Hutchison (2010) and Ewing and others (2008) for assumptions and limitations of the model.

- The model includes two active layers which represent the upper and lower portions of the Dockum Aquifer. Layer 2 represents the upper portion of the Dockum Aquifer, the boundary of which is shown in Figure 1. Layer 3 represents the lower portion of the Dockum Aquifer. Layer 1, which is active in version 1.01 of the model documented in Ewing and others (2008), was inactivated in the modified model as described in Oliver and Hutchison (2010).

- The mean absolute error (a measure of the difference between simulated and measured water levels during model calibration) for the lower portion of the Dockum

Aquifer between 1980 and 1997 is 53 feet. This represents 2.5 percent of the hydraulic head drop across the model area.

- The MODFLOW General-Head Boundary package was used to simulate flow between the Dockum Aquifer and overlying aquifers. The water levels in the overlying aquifers were applied as described in Oliver and Hutchison (2010) using Groundwater Availability Model Run 09-001 (Smith, 2009) for the northern portion of the Ogallala Aquifer and Groundwater Availability Model Run 09-023 (Oliver, 2010b) for the southern portion of the Ogallala Aquifer.

- Cells were assigned to individual counties and groundwater conservation districts as shown in the September 14, 2009 version of the model grid file for the Dockum Aquifer. Because this model grid file predates development of the modified model, care was taken to ensure that only those fields in the model grid that were valid for the modified model were used for analysis of results.

- The recharge used for the model run represents average recharge as described in Ewing and others (2008).

- The results of the model simulations include portions of the Dockum Aquifer outside the official aquifer boundaries shown in TWDB (2007). These areas include groundwater with total dissolved solids concentrations that exceed 5,000 parts per million.

- All results presented in this report refer to the combined upper and lower portions of the Dockum Aquifer. Note, however, that pumping only occurs in the lower portion of the Dockum Aquifer in the groundwater availability model.

Pumping

For the base scenario, the pumping for each of the groundwater management areas was set to either the level for the last year of the historical-calibration period, a specified amount of pumping by the management area, or a pumping amount determined iteratively to achieve a specified desired future condition. For Groundwater Management Area 1, pumping was set to the level described in the Groundwater Availability Model Run 09-014 Addendum that achieves an average of 30 feet of drawdown between 2010 and 2060 (Oliver, 2010a). This was done because the members of Groundwater Management Area 1 recently adopted this as their desired future condition for the aquifer.

For Groundwater Management Area 3, the base pumping was adjusted to the levels recommended to the management area by two contracted consultants. The recommendation by Mr. Andy Donnelly of Daniel B. Stephens and Associates (on behalf of the Colorado River Municipal Water District) is shown in Table 1 and contains a pumping total for each county in the management area. In addition to this, Mr. Randy Williams of Bar-W Groundwater Exploration provided information that the Middle Pecos Groundwater Conservation District expects an additional 15,000 acre-feet of pumping from the Dockum Aquifer at a yet-to-be-determined location between the City of Imperial and the northernmost portion of Pecos County. This pumping was added to the recommendation by Mr. Donnelly for the base pumping scenario. The location of the additional 15,000 acre-feet of pumping, spread evenly among 23 model cells, is shown in Figure 2. This number of model cells was chosen for the additional well field in order to keep the maximum pumping rate in any of the cells no higher than the maximum pumping rate in any single cell in the model during the last year of the historical-calibration period.

For Groundwater Management Area 2, pumping was held constant at the level for the last year of the historical-calibration period. Groundwater Management Area 2 originally requested an average drawdown of 30 feet for the Dockum Aquifer. However, as shown in the Results section below, this drawdown could not be achieved even with zero pumping due to declining inflow from the overlying Ogallala Aquifer. The last year of the historical-calibration period was, therefore, chosen as an acceptable alternative for the base scenario.

After reviewing the previously completed Groundwater Availability Model Run 10-001 for the Dockum Aquifer (Oliver, 2010c), the members of Groundwater Management Area 7 expressed interest in a potential desired future condition of 25 feet of drawdown in Midland and Nolan counties and 5 feet of drawdown in Mitchell County. The pumping required to achieve these drawdowns was determined iteratively by increasing the pumping in each county, examining the results, and then repeating the process until the desired drawdowns were achieved. With the exception of Midland County, the amount of the increase in pumping over the level for the last year of the historical-calibration period was spread evenly among all model cells in the lower portion of the Dockum Aquifer in the county with existing pumping. Since no model cells contained existing pumping in Midland County, the pumping for the base scenario was applied evenly to all model cells in the county in the lower portion of the Dockum Aquifer. The pumping for the base scenario in the remaining areas, specifically the remaining counties in Groundwater Management Area 7, Groundwater Management Area 6 and New Mexico, was held constant at the level for the last year of the historical-calibration period.

The base pumping distribution described above was also adjusted up and down outside of Groundwater Management Area 1 and New Mexico in order to provide insight into the relationship between pumping and drawdown in the Dockum Aquifer. The pumping input to the model was multiplied by a factor to increase (factors of 1.3, 1.6, 1.9) or decrease (factors of 0.8, 0.6, 0.4, 0.2, and zero) the pumping in these areas. These factors were chosen in order to provide results from a broad range of pumping scenarios. The relationships generated are presented in the Results section below.

RESULTS:

Figure 1 below is a location map showing the Dockum Aquifer and those areas included in the groundwater availability model. Figure 1 also includes the locations of each groundwater management area and county in the model area.

Table 2 below shows a summary of the pumping and average drawdown for each groundwater management area in the model for each scenario. Notice that pumping is constant among the scenarios for Groundwater Management Area 1 and always results in 30 feet of drawdown between 2010 and 2060.

Groundwater Management Area 2, with the lowest pumping outside of the small portion of the aquifer located in Groundwater Management Area 6, contains the highest amount of drawdown for the base scenario. This drawdown ranges from 36 to 41 feet among the broad range of scenarios, indicating that the drawdown in likely due primarily to factors other than pumping in the Dockum Aquifer. Alternatively, drawdown in Groundwater Management Area 3 varies widely with the larger amount of pumping in the area from a water level increase of 4 feet in the zero pumping scenario to a decline of 48 feet in the 190 percent of base pumping scenario. This large change indicates that pumping in the Dockum Aquifer is the primary driving factor for determining drawdown in the area.

Though only a groundwater management area-wide summary of results is presented in Table 2, appendices to this report containing results for each groundwater management area have been included to provide more details on pumping and drawdown for each county and groundwater conservation district. Appendices A, B, and C contain detailed predictive model run results for groundwater management areas 2, 3, and 7, respectively.

To better illustrate how the model responds through time during the “Base” run, each appendix also contains figures of each of the major water budget terms between 1998 and 2060 for the groundwater management area. The components of the water budget are described below:

- Recharge— areally distributed recharge due to precipitation. Recharge is always shown as “Inflow” into the water budget. Recharge is modeled using the MODFLOW Recharge package.

- Pumping—water produced from wells in the aquifer. This component is always shown as “Outflow” from the water budget. Pumping is modeled using the MODFLOW Well package.

- Net change in storage—changes in the water stored in the aquifer. This component of the budget is often seen as water both going into and out of the aquifer because water levels may decline in some areas (water is being removed from storage) and rise in others (water is being added to storage). The “net” change in storage refers to the difference between the storage inflows and outflows.

- Net flow to or from overlying aquifers—this describes the amount of vertical flow entering or leaving the aquifer from or to overlying aquifers. This component is modeled using the MODFLOW General-Head Boundary package. Since flow can be either an inflow or an outflow, results are presented as “net” flows – the difference between inflows and outflows.

- Net interaction with Streams—describes the net interaction of the aquifer with streams. The interaction can be either an inflow (a losing stream) or an outflow (a gaining stream). Interaction with streams is modeled using the MODFLOW Stream package. The “net” interaction with streams refers to the difference between inflows and outflow from streams.

- Springs and Evapotranspiration—water that naturally discharges from the aquifer by direct evaporation, transpiration through plants, or from springs. This occurs in areas where the water level in the aquifer is near the land surface. Spring flow and evapotranspiration are always shown as "Outflows" from the water budget and are modeled using the MODFLOW Drain package.

- Net Lateral flow—describes net lateral flow within an aquifer between one area and an adjacent area (for example, lateral flow into and out of a groundwater management area). The "net" lateral flow refers to the difference between inflows and outflows.

It is important to note that sub-regional water budgets are not exact. This is due to the size of the model cells and the approach used to extract data from the model. To avoid double accounting, a model cell that straddles a political boundary (e.g. a county) is assigned to one side of the boundary based on the location of the centroid of the model cell. For example, if a cell contains two counties, the cell is assigned to the county where the centroid of the cell is located.

A more detailed discussion of the results shown in appendices A, B, and C for groundwater management areas 2, 3, and 7 is presented below.

Groundwater Management Area 2

Appendix A contains detailed results for the predictive model runs for Groundwater Management Area 2. As described in the Methods section, Figures A-1 through A-4 contain hydrographs for selected wells showing trends in water levels between 1980 and 2009. In general, as with the other groundwater management areas, the preliminary analysis of water levels during the interim period from 1998 to 2009 performed for this model run did not indicate any trends that would require a change in the pumping from the level for the last year of the historical-calibration period.

Figure A-5 depicts the drawdown between 2010 and 2060 versus the constantly applied pumping rate for each of the pumping scenarios. Drawdown is based on the water levels in the model for the end of 2009 and include both the upper and lower portions of the Dockum Aquifer. The average drawdown over Groundwater Management Area 2 is 39 feet for the base scenario with approximately 9,600 acre-feet of pumping per year. Among the scenarios, this ranges from 36 to 41 feet when applying pumping between zero and 18,000 acre-feet per year.

Figures A-6 through A-13 depict each of the water budget components described above for the Dockum Aquifer in Groundwater Management Area 2 for the base scenario. Figure A-6 shows that recharge remains constant through the predictive period at approximately 22,000 acre-feet per year. As shown in Figure A-7, pumping for the base scenario also remains constant at approximately 9,600 acre-feet per year.

Figure A-8 shows that the volume of water removed from storage in the Dockum Aquifer each year increases beginning in 2008. This corresponds to when Groundwater Availability Model Run 09-023 (Oliver, 2010b) was applied to the general-head boundary package in the model. This was used to simulate interaction with the overlying Ogallala Aquifer. The corresponding decline in inflow from the Ogallala Aquifer also begins in 2008 and is shown in Figure A-9.

Figures A-10 and A-11 depict interaction of the Dockum Aquifer with surficial processes such as streams, springs, and evapotranspiration. For each of these components, the amount of water discharging from the Dockum Aquifer declines through time as water levels decline.

Figure A-12 shows that, through the predictive period, there is a net outflow from Groundwater Management Area 2 to adjacent areas. The magnitude of this flow slowly declines with time as water levels decline, but it is also controlled by the changes in water levels in neighboring areas.

Tables A-1 through A-9 show the drawdown and pumping by decade for each county and groundwater conservation district in Groundwater Management Area 2 for the Dockum Aquifer. The results for each groundwater management area are also shown.

Groundwater Management Area 3

Appendix B contains detailed results for the predictive model runs for Groundwater Management Area 3. As described in the Methods section, the hydrographs shown in figures B-1 through B-4 do not indicate any trends in the water levels in the Dockum Aquifer that would require changing the pumping for the interim period from 1998 to 2009 from the level for the last year of the historical-calibration period.

Figure B-5 depicts the drawdown between 2010 and 2060 versus the constantly applied pumping rate for each of the pumping scenarios. Drawdown is based on the water levels in the model for the end of 2009. The average drawdown over Groundwater Management Area 3 is 27 feet for the base scenario with approximately 39,000 acre-feet of pumping per year. Among the scenarios, this ranges from a water level rise of 4 feet to a decline of 48 feet.

Figures B-6 through B-13 depict each of the water budget components described in the Results section above for the lower portion of the Dockum Aquifer in Groundwater Management Area 3 for the base scenario. Figure B-6 shows that no recharge from precipitation occurs to the Dockum Aquifer in Groundwater Management Area 3. This is because the portion of the Dockum Aquifer in the area is entirely subcrop, being overlain by other aquifers or units. Figure B-7 shows the pumping applied to the model each year between 1998 and 2060. At the beginning of the predictive period (2010), the pumping increases dramatically to meet the requests described in the Pumping section. This also includes a portion of the 15,000 acre-feet per year added in northern Pecos County (see Figure 2).

Figure B-8 shows that the volume of water removed from storage each year increases sharply during the first year of the predictive period before slowly declining. This increase is due to the much higher rate of pumping applied during the predictive model run as shown in Figure B-7 compared to the historical-calibration period.

Figure B-9 shows the net volume of flow to and from overlying aquifers in the Dockum Aquifer. Prior to 2010, a relatively small amount of water flowed upward from the Dockum Aquifer to the overlying aquifers (primarily the Pecos Valley Aquifer). Due to the increased pumping and subsequent decline in water levels, the direction of this flow is reversed beginning in 2010 with water flowing into the Dockum Aquifer from the overlying aquifers.

Figures B-10 and B-11 show that the model does not consider any interaction of the Dockum Aquifer with streams (Figure B-10) or discharge to springs or by evapotranspiration (Figure B-11). As with the recharge shown in Figure B-6, this is because the aquifer exists exclusively in subcrop in Groundwater Management Area 3.

Figure B-12 shows that, through the predictive period, there is a net inflow to Groundwater Management Area 3 from adjacent areas. At the beginning of the predictive period, the magnitude of flow decreases before slowly increasing. The initial decrease in the magnitude of inflow is counterintuitive with the increase in pumping in Groundwater Management Area 3. However, due to the increases in pumping in neighboring Groundwater Management Area 7, the net result is an initial decline in the lateral inflow before the gradual increase.

Tables B-1 through B-9 show the drawdown and pumping by decade for each county in Groundwater Management Area 3 for the Dockum Aquifer. The results for each groundwater management area is also shown. As shown in Table B-1, the pumping total for each county for the base scenario matches the requested pumping shown in Table 1. Note that the county and district results are not necessarily limited to Groundwater Management Area 3 (for example, Pecos County).

Groundwater Management Area 7

Appendix C contains detailed results for the predictive model runs for Groundwater Management Area 7. As described in the Methods section, the hydrographs shown in figures C-1 through C-4 do not indicate any trends in water levels in the Dockum Aquifer that would require changing the pumping for the interim period from 1998 to 2009 from the level for the last year of the historical-calibration period.

Figure C-5 depicts the average drawdown in the lower portion of the Dockum Aquifer between 2010 and 2060 versus the constantly applied rate of pumping for each of the pumping scenarios. The average drawdown over Groundwater Management Area 7 is 8 feet for the base scenario with approximately 35,000 acre-feet of pumping per year. Among the scenarios this ranges from a water-level increase of 5 feet to a decline of 24 feet when applying pumping between zero and 64,000 acre-feet per year.

Figures C-6 through C-13 depict each of the water budget components described in the Results section above for the Dockum Aquifer in Groundwater Management Area 7 for the base scenario. Figure C-6 shows that recharge remains constant through the predictive period at approximately 47,000 acre-feet per year. Figure C-7 shows the pumping applied to the model each year between 1998 and 2060. At the beginning of the predictive period the pumping increases dramatically to meet the requested drawdowns described in the pumping section for Midland, Mitchell, and Nolan counties.

Figure C-8 shows that the volume of water removed from storage each year increases sharply during the first year of the predictive period (2010), before slowly declining throughout the remainder of the period. This increase is due to the much higher rate of pumping applied during the predictive model run as shown in Figure C-7 compared to the historical-calibration period.

Figure C-9 shows the net volume of inflow from overlying aquifers to the Dockum Aquifer. At the beginning of the predictive period, the rate of inflow increases due to the increased pumping and subsequent decline in water levels.

Figures C-10 and C-11 depict interaction of the Dockum Aquifer with surficial processes such as streams, springs, and evapotranspiration. For each of these components, the amount of water discharging from the Dockum Aquifer decreases through time beginning in 2010 as water levels decline.

Figure C-12 shows that there is a net outflow through the predictive period from Groundwater Management Area 7 to adjacent areas. However, beginning in 2010, the magnitude of this outflow decreases significantly before leveling off.

Tables C-1 through C-9 show the drawdown and pumping by decade for each county and groundwater conservation district in Groundwater Management Area 7 and for each groundwater management area in the model for the Dockum Aquifer. Note that the county and district totals are not necessarily limited to Groundwater Management Area 7 (for example, Pecos County). As shown in Table C-1, the drawdown in the base scenario matches the request of 25 feet in Midland and Nolan counties and 5 feet in Mitchell County between 2010 and 2060.

REFERENCES AND ASSOCIATED MODEL RUNS:

Ewing, J.E., Jones, T.L., Yan, T., Vreugdenhil, A.M., Fryar, D.G., Pickens, J.F., Gordon, K., Nicot, J.P., Scanlon, B.R., Ashworth, J.B., Beach, J., 2008, Groundwater Availability Model for the Dockum Aquifer – Final Report: contract report to the Texas Water Development Board, 510 p.

Oliver, W., Hutchison, W.R., 2010, Modification and recalibration of the Groundwater Availability Model of the Dockum Aquifer: Texas Water Development Board, 114 p.

Oliver, W., 2010a, GAM Run 09-014 Addendum: Texas Water Development Board, GAM Run 09-014 Addendum Draft Report, 7 p.

Oliver, W., 2010b, GAM Run 09-023: Texas Water Development Board, GAM Run 09-023 Draft Report, 30 p.

Oliver, W., 2010c, GAM Run 10-001: Texas Water Development Board, GAM Run 10-001 Draft Report, 35 p.

Smith, R., 2009, GAM Run 09-001: Texas Water Development Board, GAM Run 09-001 Draft Report, 28 p.

Table 1. Recommended pumping from the Dockum Aquifer for the counties within Groundwater Management Area 3 in acre-feet per year.

County	Annual Pumping	Additional Well Field	Base Scenario Total
Crane	2,000		2,000
Loving	1,000		1,000
Pecos*	3,000	15,000	18,000
Reeves	5,000		5,000
Ward	7,000		7,000
Winkler	10,000		10,000

*Note that Pecos County pumping applies to the entire county, not just the portion within Groundwater Management Area 3.

Table 2. Pumping and drawdown for each scenario for each groundwater management area (GMA) in the model. Pumping is in acre-feet per year. Drawdown is in feet. Note that negative drawdown values indicate a water-level increase.

	2007 State Water Plan Availability for 2060*	Pumping by scenario								
		Zero	0.2	0.4	0.6	0.8	Base	1.3	1.6	1.9
GMA 1	173,200	21,226	21,226	21,226	21,226	21,226	21,226	21,226	21,226	21,226
GMA 2	16,398	0	1,921	3,843	5,764	7,685	9,607	12,488	15,370	18,252
GMA 3	17,558	0	7,706	15,412	23,124	30,825	38,961	51,564	64,167	76,770
GMA 6	200	0	14	28	42	56	70	91	112	133
GMA 7	41,365	0	7,115	14,230	22,041	28,459	35,144	44,772	54,401	64,030
		Average Drawdown								
GMA 1	-	30	30	30	30	30	30	30	30	30
GMA 2	-	36	37	37	38	39	39	40	40	41
GMA 3	-	-4	3	9	15	21	27	35	42	48
GMA 6	-	1	2	2	3	3	4	4	4	5
GMA 7	-	-5	-3	0	3	5	8	13	19	24

*Note that not all counties containing the Dockum Aquifer have specified availability in the 2007 State Water Plan. Also, since the Dockum Aquifer in Pecos County is located in both groundwater management areas 3 and 7, the state water plan availability (1,089 acre-feet per year) has been divided evenly between each area.

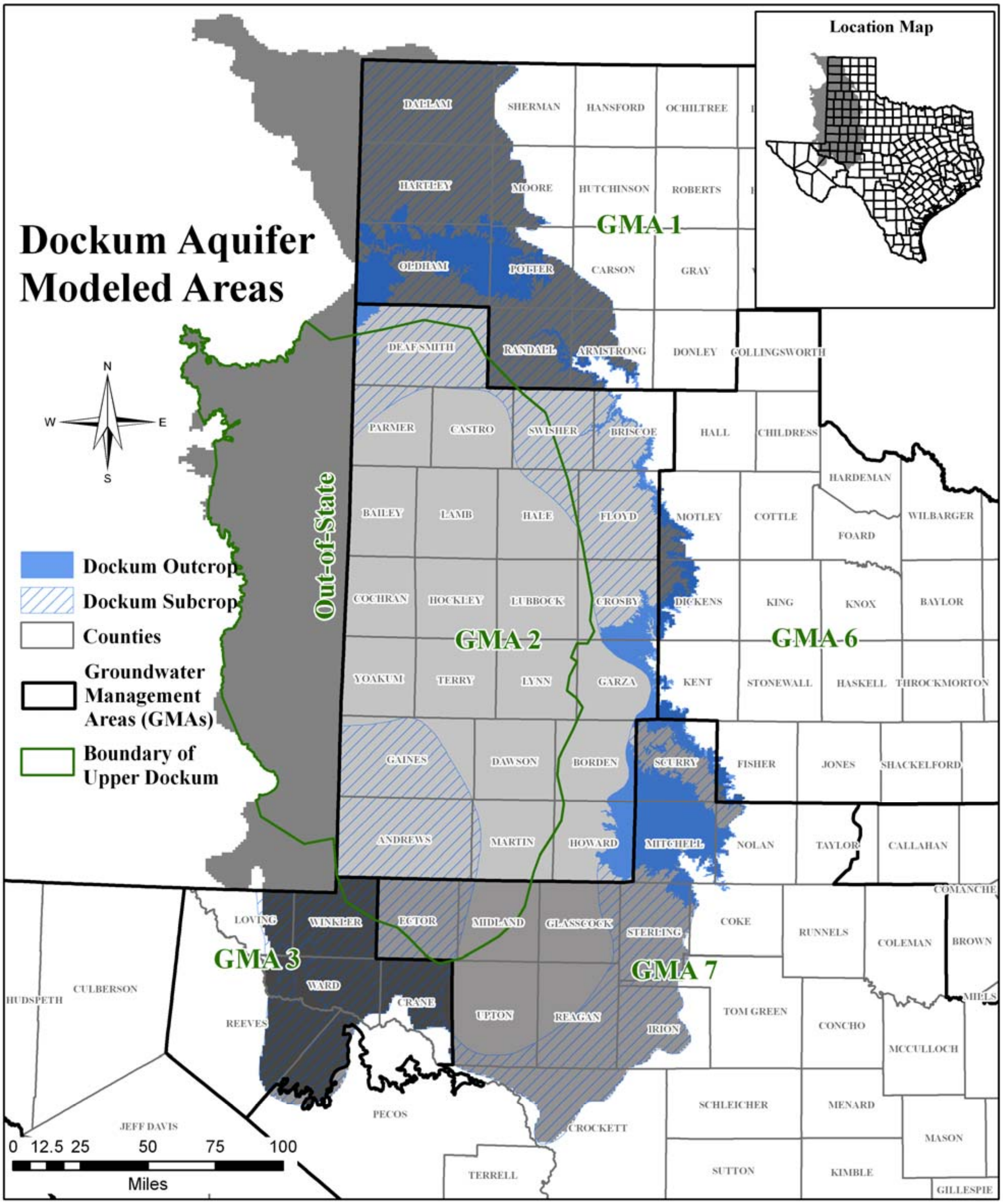

Figure 1. Location map showing model grid cells representing the Dockum Aquifer, groundwater management areas, and the Dockum Aquifer boundary.

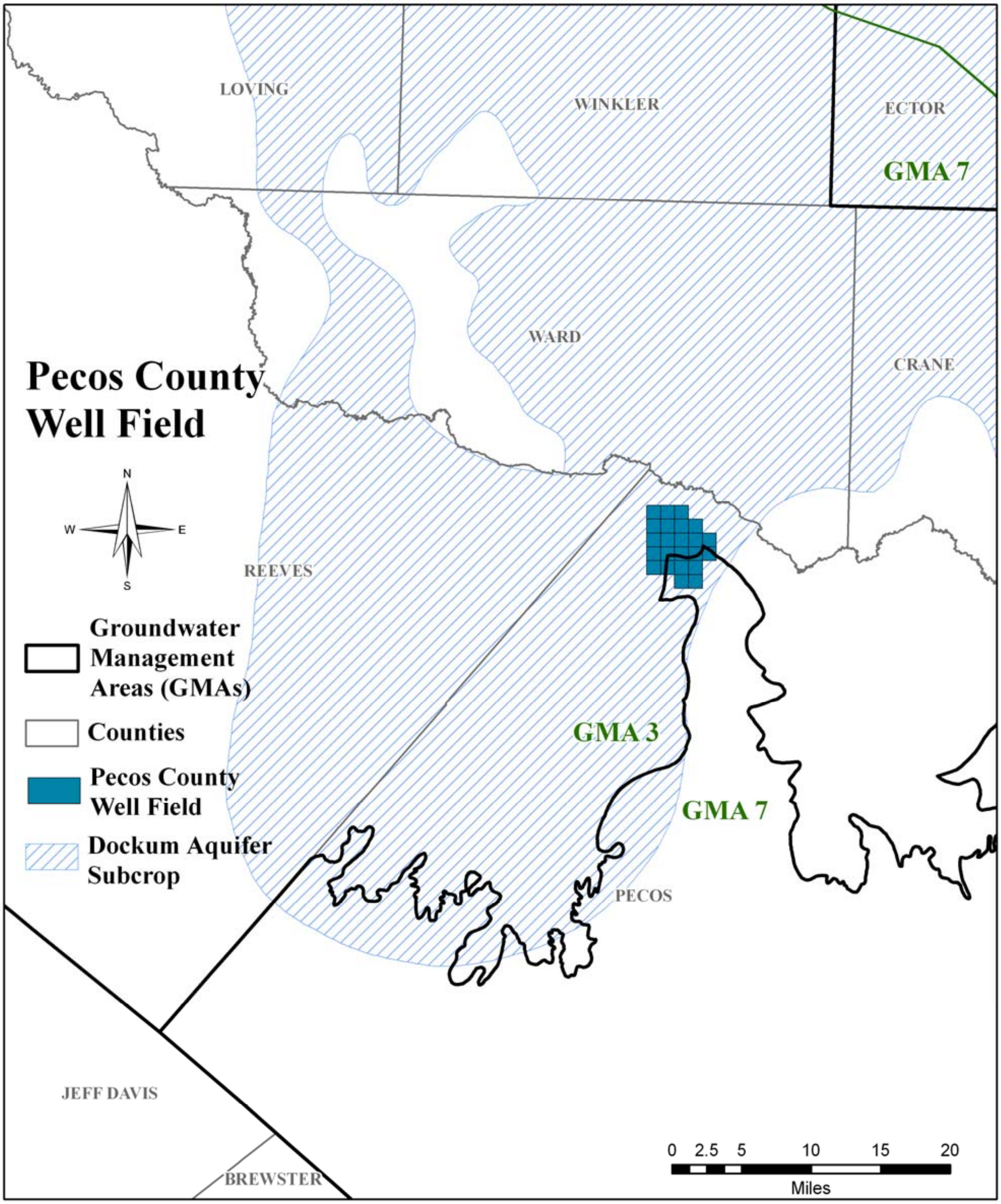

Figure 2. Location of the 23 cells chosen for the well field containing 15,000 acre-feet of pumping per year in Pecos County. See the Pumping section above for more details.

Appendix A

Spread Analysis Results for Groundwater Management Area 2

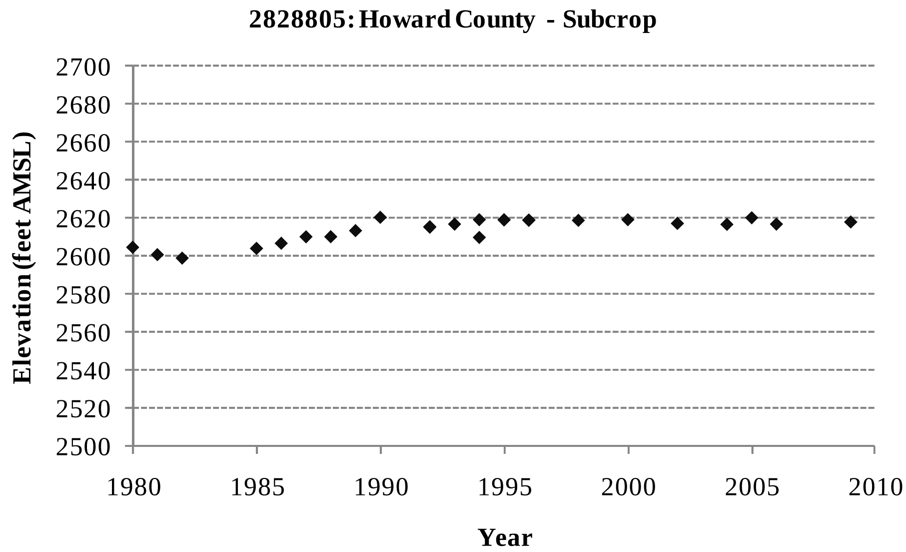

Figure A-1. Hydrograph of state well 2828805 located in the subcrop portion of the Dockum Aquifer in Howard County.

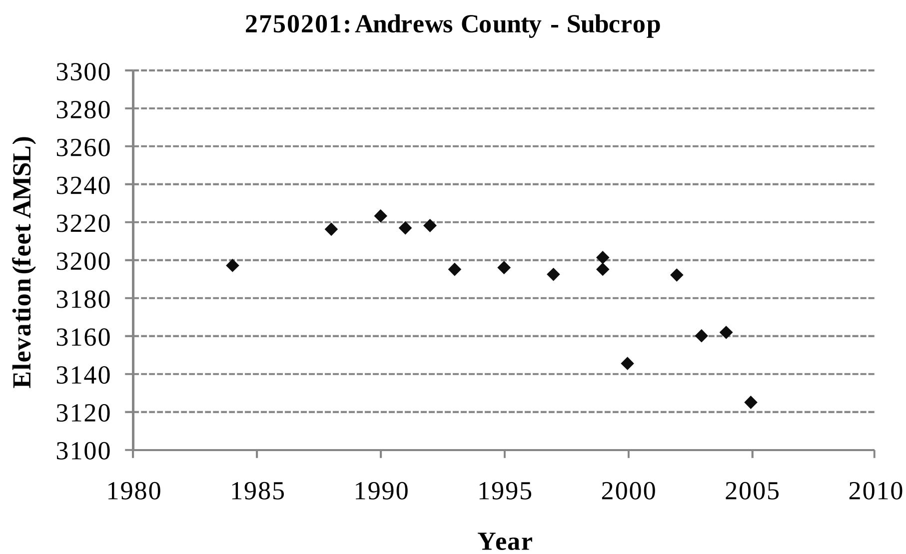

Figure A-2. Hydrograph of state well 2750201 located in the subcrop portion of the Dockum Aquifer in Andrews County.

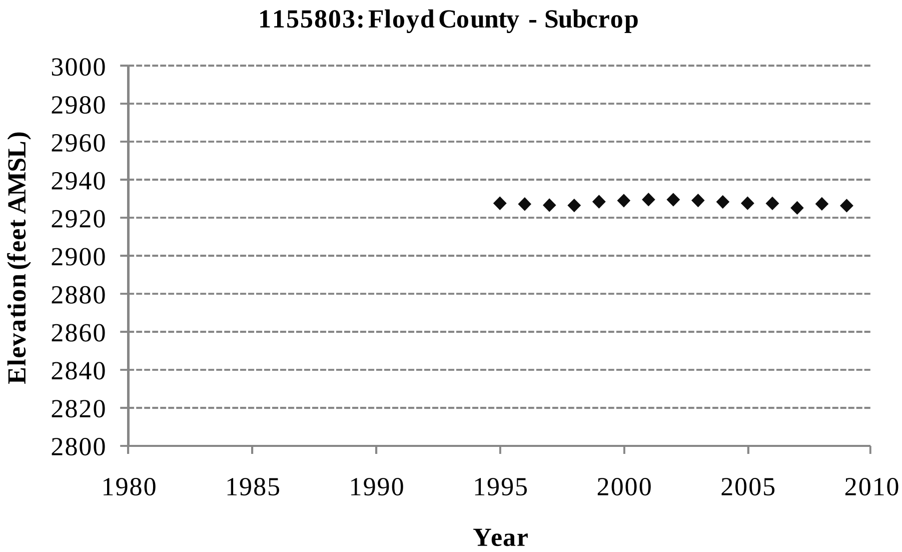

Figure A-3. Hydrograph of state well 1155803 located in the subcrop portion of the Dockum Aquifer in Floyd County.

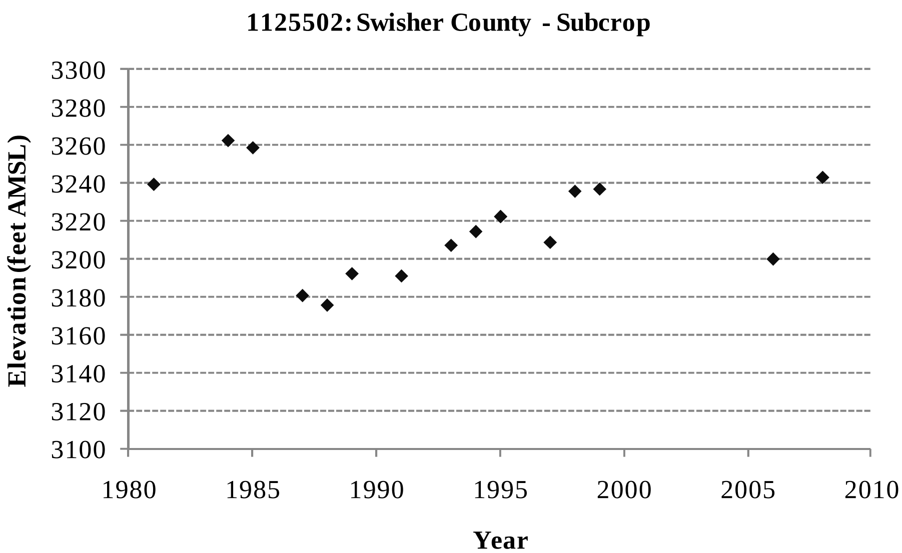

Figure A-4. Hydrograph of state well 1125502 located in the subcrop portion of the Dockum Aquifer in Swisher County.

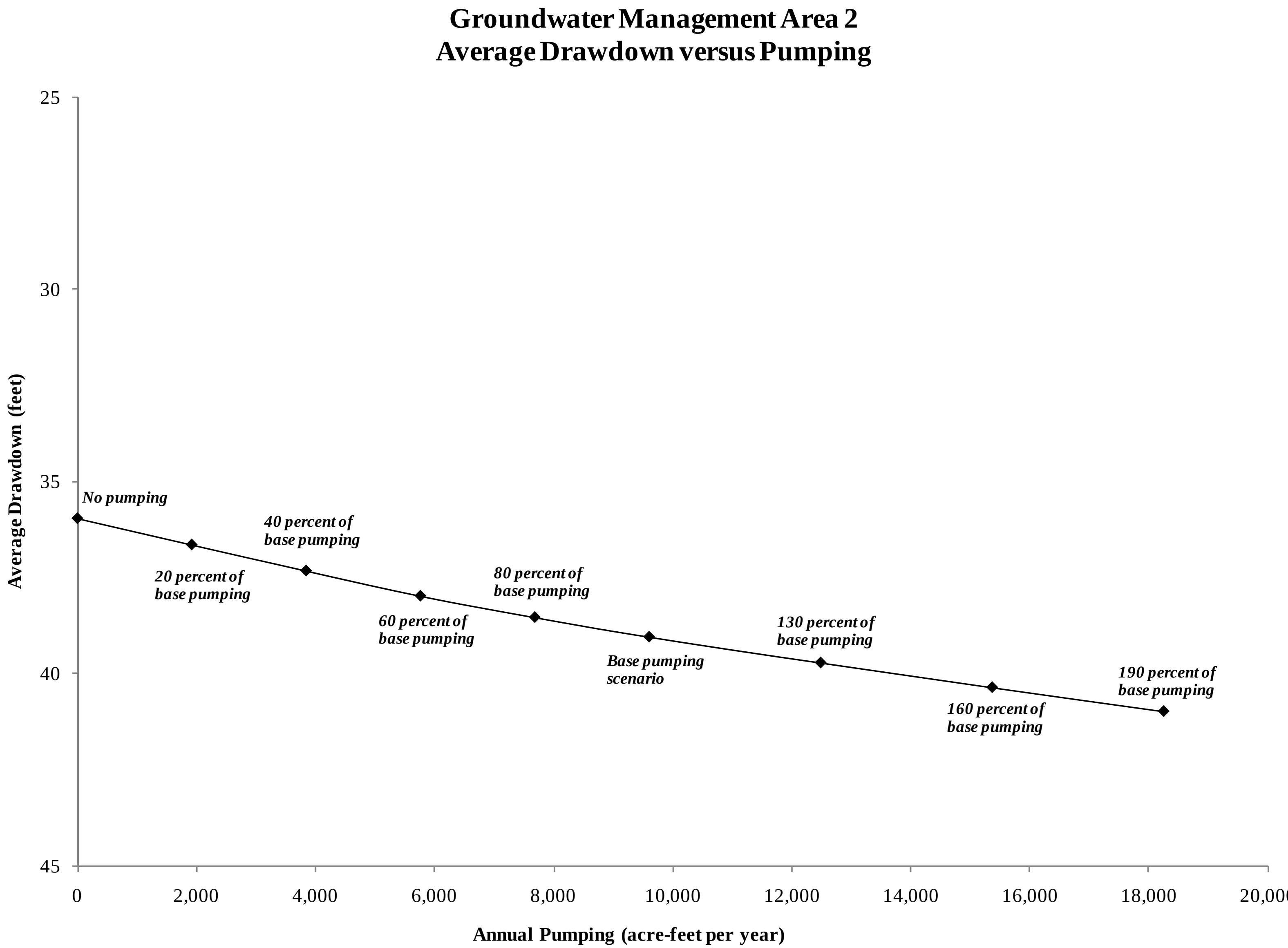

Figure A-5. Average drawdown between 2010 and 2060 versus pumping for each of the pumping scenarios for Groundwater Management Area 2.

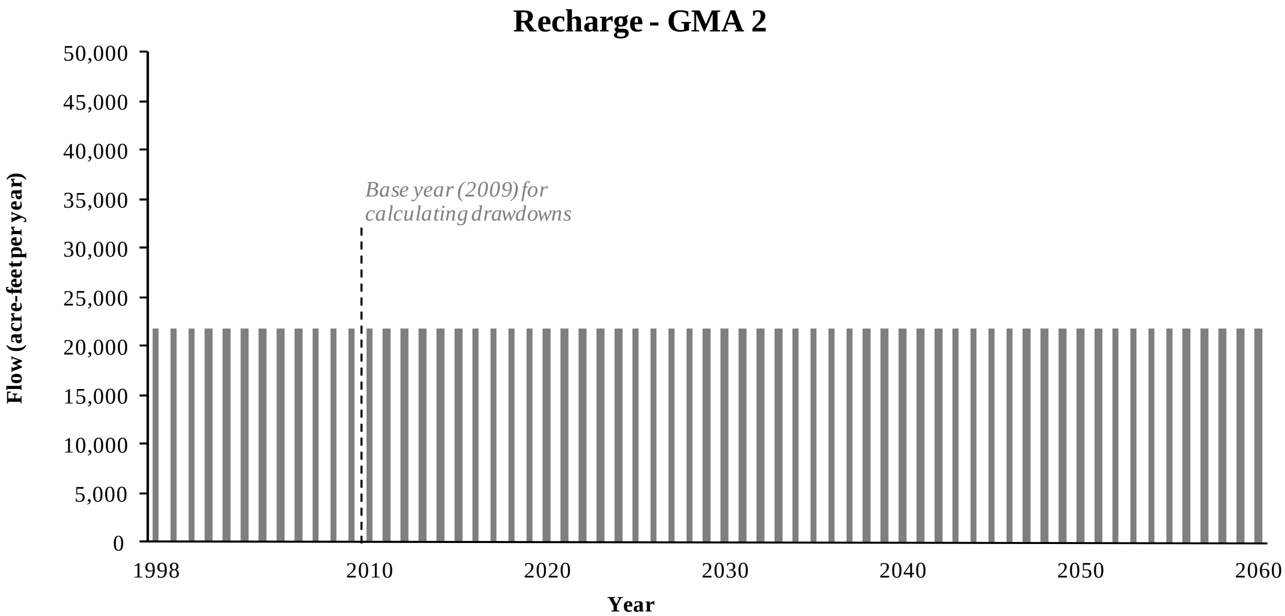

Figure A-6. Recharge to the Dockum Aquifer by year in the groundwater availability model for Groundwater Management Area 2.

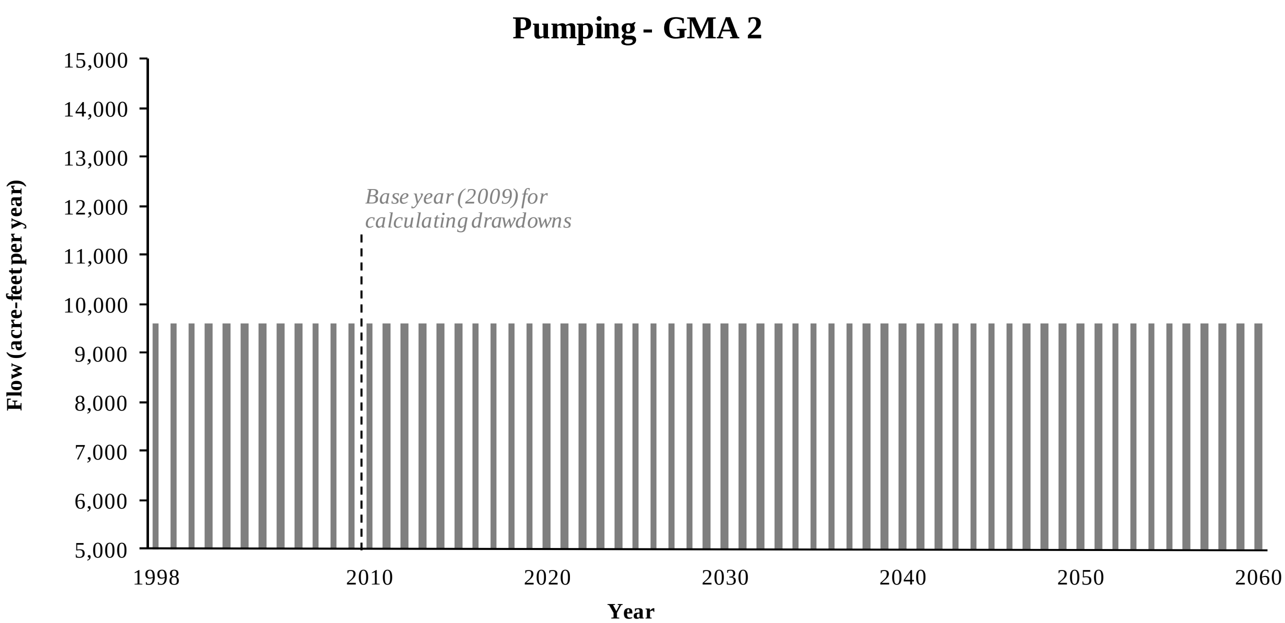

Figure A-7. Pumping output from the groundwater availability model in the Dockum Aquifer by year for Groundwater Management Area 2.

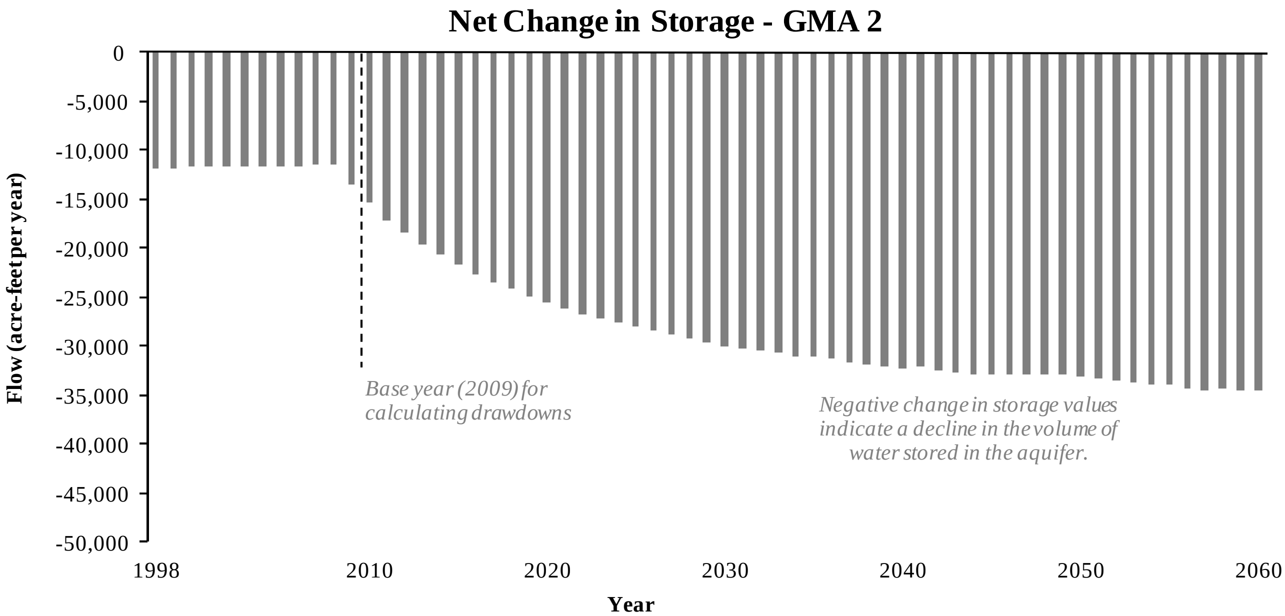

Figure A-8. Net change in storage (the volume of water stored in the aquifer) by year in the Dockum Aquifer for Groundwater Management Area 2.

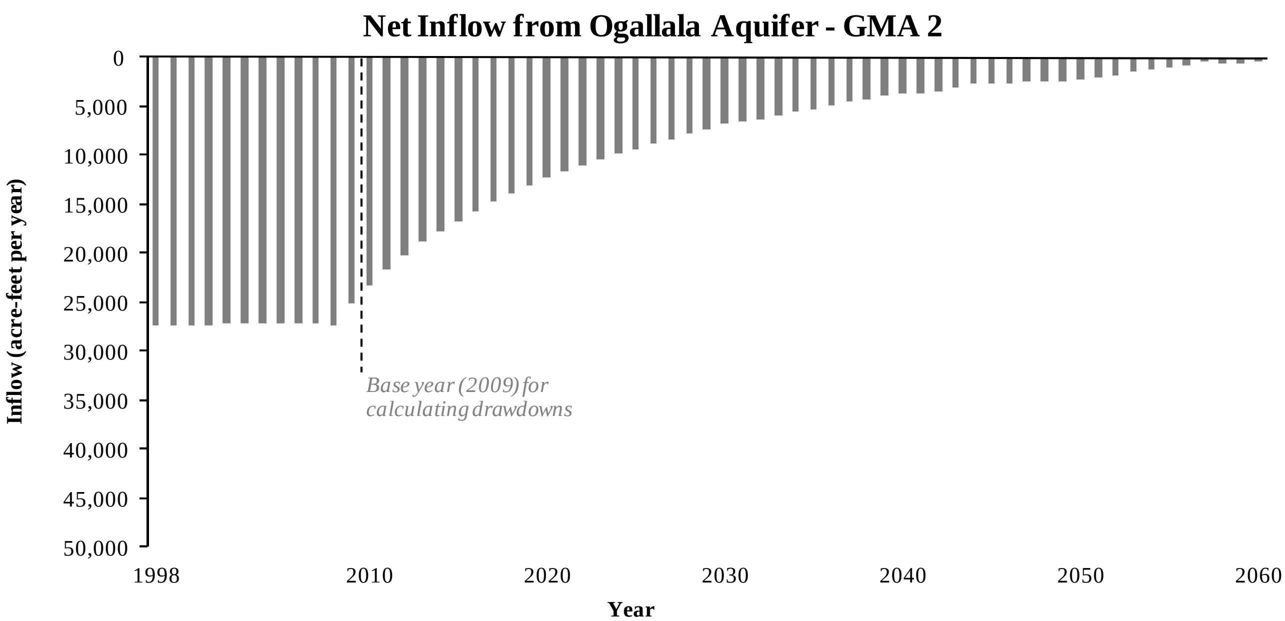

Figure A-9. Net inflow from overlying aquifers (primarily the Ogallala Aquifer) into the Dockum Aquifer by year for Groundwater Management Area 2.

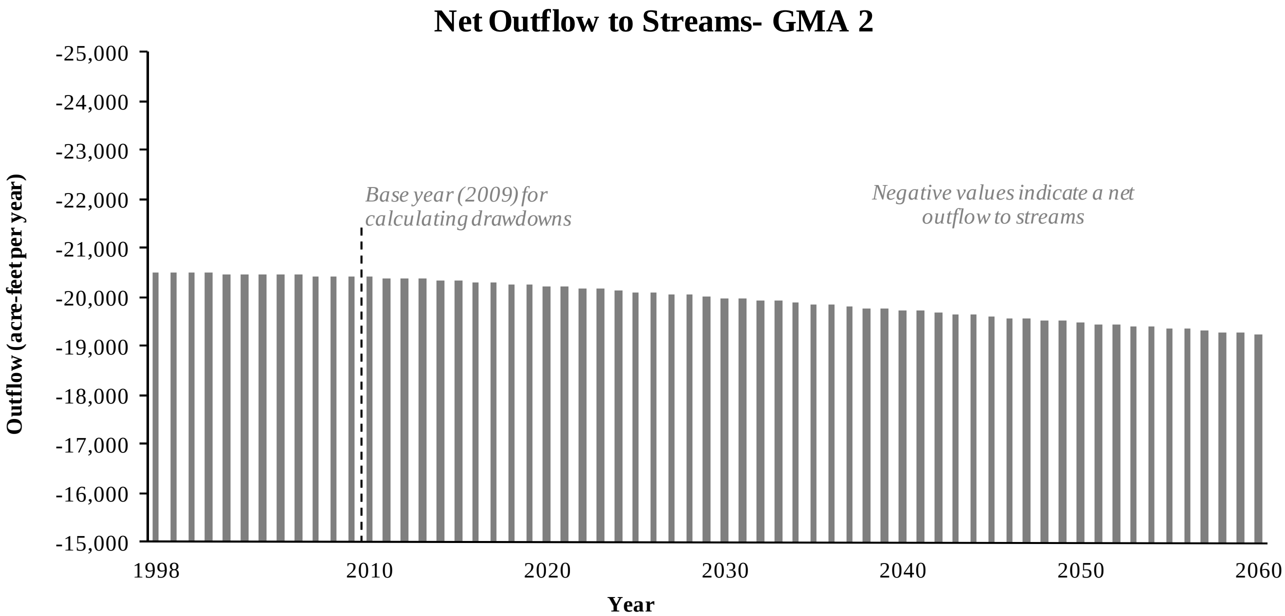

Figure A-10. Net outflow to streams from the Dockum Aquifer by year for Groundwater Management Area 2.

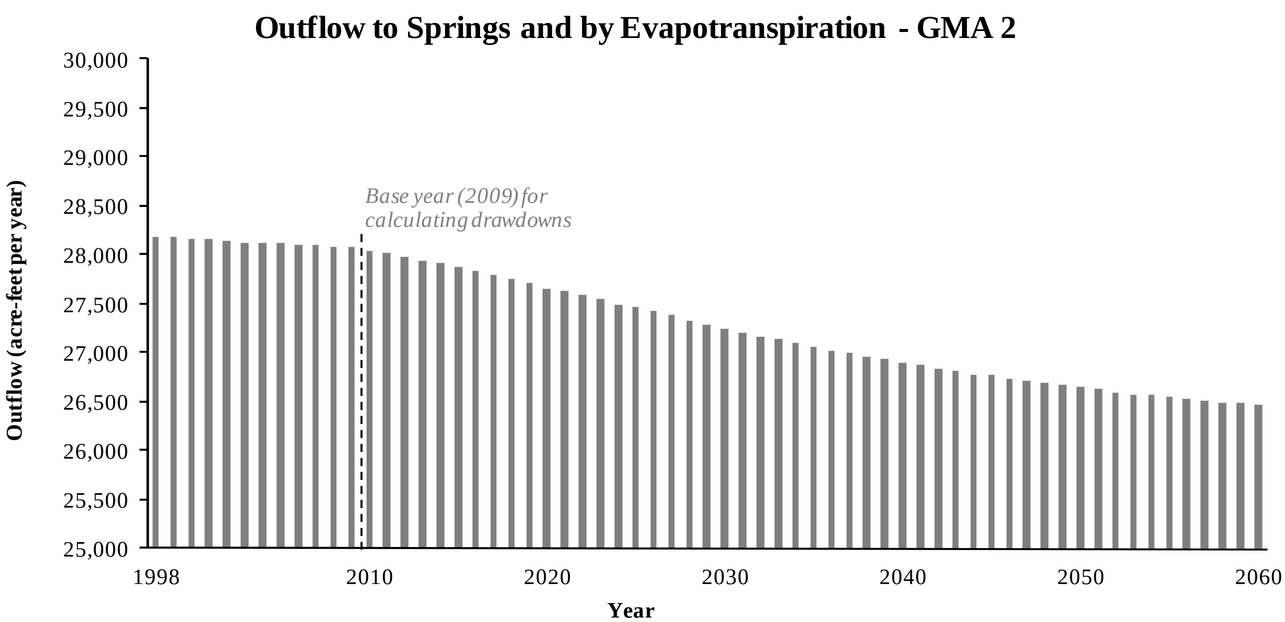

Figure A-11. Outflow from the Dockum Aquifer in Groundwater Management Area 2 to springs and by evapotranspiration.

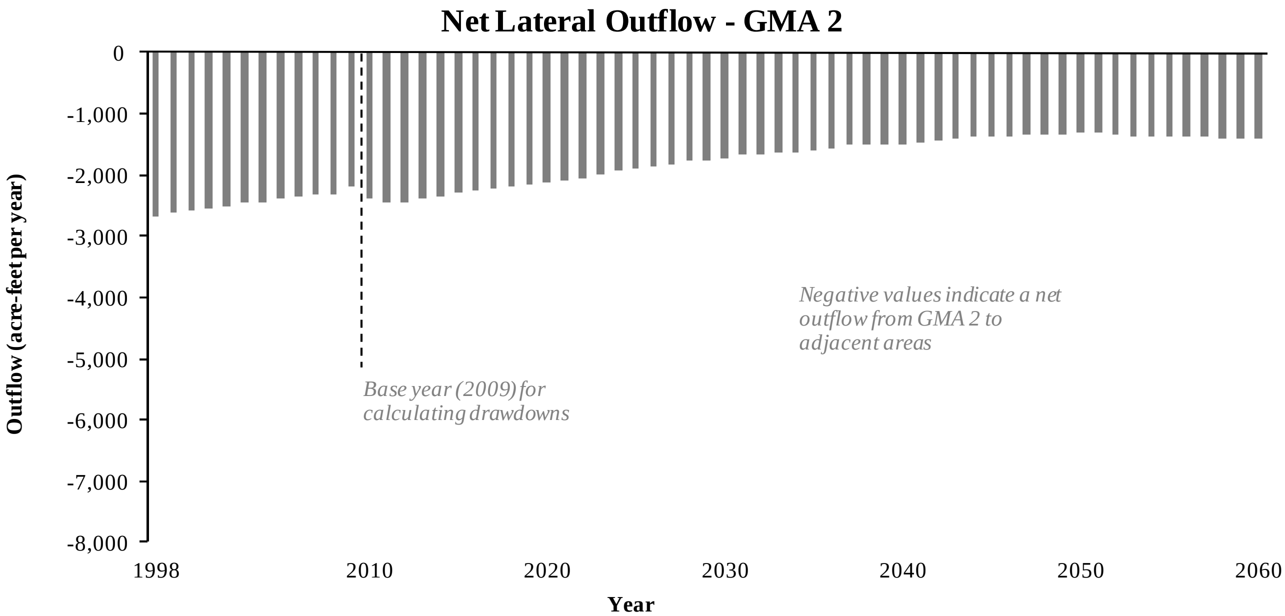

Figure A-12. Net lateral outflow from the Dockum Aquifer in Groundwater Management Area 2 to adjacent areas.

Table A-1. Pumping (in acre-feet per year) and average drawdown (in feet) in the Dockum Aquifer between 2010 and 2060 for each county, underground water conservation district (UWCD), and groundwater management area (GMA) in Groundwater Management Area 2 for the base scenario.

Base Scenario	Pumping						Average drawdown					
	2010	2020	2030	2040	2050	2060	2010	2020	2030	2040	2050	2060
County												
Andrews	10	10	10	10	10	10	0	5	9	14	17	19
Bailey	0	0	0	0	0	0	1	12	20	22	24	24
Borden	56	56	56	56	56	56	0	1	2	3	6	8
Briscoe	6	6	6	6	6	6	0	1	3	4	5	6
Castro	0	0	0	0	0	0	2	22	41	54	58	58
Cochran	0	0	0	0	0	0	0	10	22	27	24	13
Crosby	3,548	3,548	3,548	3,548	3,548	3,548	1	18	38	58	74	79
Dawson	2	2	2	2	2	2	1	16	33	48	57	61
Deaf Smith	3,868	3,868	3,868	3,868	3,868	3,868	1	10	17	21	25	29
Floyd	1,091	1,091	1,091	1,091	1,091	1,091	1	16	34	51	65	74
Gaines	0	0	0	0	0	0	1	13	23	32	39	43
Garza	96	96	96	96	96	96	0	0	0	0	0	1
Hale	130	130	130	130	130	130	2	22	39	49	53	55
Hockley	571	571	571	571	571	571	1	15	30	41	50	54
Howard	61	61	61	61	61	61	0	0	1	1	2	3
Lamb	0	0	0	0	0	0	2	17	30	39	42	44
Lubbock	3	3	3	3	3	3	1	18	34	47	51	51
Lynn	0	0	0	0	0	0	1	15	31	46	61	73
Martin	0	0	0	0	0	0	1	9	19	28	34	40
Parmer	1	1	1	1	1	1	1	5	9	10	10	9
Swisher	162	162	162	162	162	162	1	17	29	38	42	42
Terry	0	0	0	0	0	0	1	17	28	35	43	50
Yoakum	0	0	0	0	0	0	1	10	18	26	30	29
District												
Garza County UWCD	96	96	96	96	96	96	0	0	0	0	0	1
High Plains UWCD No. 1	8,613	8,613	8,613	8,613	8,613	8,613	1	16	29	39	44	46
Llano Estacado UWCD	0	0	0	0	0	0	1	13	23	32	39	43
Mesa UWCD	2	2	2	2	2	2	1	16	33	48	57	61
Permian Basin UWCD	60	60	60	60	60	60	0	6	13	19	23	27
Sandy Land UWCD	0	0	0	0	0	0	1	10	18	26	30	29
South Plains UWCD	0	0	0	0	0	0	1	17	28	35	43	50
Management Area												
Out-of-State	7,793	7,793	7,793	7,793	7,793	7,793	0	1	1	1	2	2
GMA 1	21,226	21,226	21,226	21,226	21,226	21,226	4	13	19	23	27	30
GMA 2	9,607	9,607	9,607	9,607	9,607	9,607	1	12	23	31	37	39
GMA 3	38,961	38,961	38,961	38,961	38,961	38,961	17	24	25	26	27	27
GMA 6	70	70	70	70	70	70	0	1	1	2	3	4
GMA 7	35,144	35,144	35,144	35,144	35,144	35,144	1	3	5	6	7	8

Table A-2. Pumping (in acre-feet per year) and average drawdown (in feet) in the Dockum Aquifer between 2010 and 2060 for each county, underground water conservation district (UWCD), and groundwater management area (GMA) in Groundwater Management Area 2 for the zero pumping scenario.

Zero Pumping Scenario	Pumping						Average drawdown					
	2010	2020	2030	2040	2050	2060	2010	2020	2030	2040	2050	2060
County												
Andrews	0	0	0	0	0	0	0	5	9	13	16	19
Bailey	0	0	0	0	0	0	1	12	20	22	24	24
Borden	0	0	0	0	0	0	0	1	2	3	6	8
Briscoe	0	0	0	0	0	0	0	1	2	3	4	5
Castro	0	0	0	0	0	0	2	22	40	54	57	56
Cochran	0	0	0	0	0	0	0	10	21	26	23	12
Crosby	0	0	0	0	0	0	-2	3	20	40	53	55
Dawson	0	0	0	0	0	0	1	16	33	48	57	61
Deaf Smith	0	0	0	0	0	0	-1	3	7	10	13	16
Floyd	0	0	0	0	0	0	-1	7	23	39	52	61
Gaines	0	0	0	0	0	0	1	13	23	32	39	43
Garza	0	0	0	0	0	0	0	0	0	0	0	1
Hale	0	0	0	0	0	0	2	22	38	48	52	53
Hockley	0	0	0	0	0	0	0	10	24	34	41	42
Howard	0	0	0	0	0	0	0	0	1	1	2	2
Lamb	0	0	0	0	0	0	2	17	30	38	42	44
Lubbock	0	0	0	0	0	0	1	17	34	46	50	49
Lynn	0	0	0	0	0	0	1	15	31	46	61	73
Martin	0	0	0	0	0	0	1	9	19	27	34	39
Parmer	0	0	0	0	0	0	1	5	8	9	9	8
Swisher	0	0	0	0	0	0	1	16	28	36	39	39
Terry	0	0	0	0	0	0	1	17	28	35	42	50
Yoakum	0	0	0	0	0	0	1	10	18	26	30	29
District												
Garza County UWCD	0	0	0	0	0	0	0	0	0	0	0	1
High Plains UWCD No. 1	1,297	1,297	1,297	1,297	1,297	1,297	1	13	26	35	40	41
Llano Estacado UWCD	0	0	0	0	0	0	1	13	23	32	39	43
Mesa UWCD	0	0	0	0	0	0	1	16	33	48	57	61
Permian Basin UWCD	0	0	0	0	0	0	0	6	13	18	23	27
Sandy Land UWCD	0	0	0	0	0	0	1	10	18	26	30	29
South Plains UWCD	0	0	0	0	0	0	1	17	28	35	43	50
Management Area												
Out-of-State	7,793	7,793	7,793	7,793	7,793	7,793	0	1	1	1	1	2
GMA 1	21,226	21,226	21,226	21,226	21,226	21,226	4	13	18	23	27	30
GMA 2	0	0	0	0	0	0	1	11	21	29	34	36
GMA 3	0	0	0	0	0	0	-1	-3	-4	-4	-4	-4
GMA 6	0	0	0	0	0	0	-1	-1	0	0	1	1
GMA 7	0	0	0	0	0	0	-1	-5	-6	-6	-5	-5

Table A-3. Pumping (in acre-feet per year) and average drawdown (in feet) in the Dockum Aquifer between 2010 and 2060 for each county, underground water conservation district (UWCD), and groundwater management area (GMA) in Groundwater Management Area 2 for the 20 percent of base pumping scenario.

20 Percent of Base	Pumping						Average drawdown					
	2010	2020	2030	2040	2050	2060	2010	2020	2030	2040	2050	2060
County												
Andrews	2	2	2	2	2	2	0	5	9	13	16	19
Bailey	0	0	0	0	0	0	1	12	20	22	24	24
Borden	11	11	11	11	11	11	0	1	2	3	6	8
Briscoe	1	1	1	1	1	1	0	1	2	3	5	6
Castro	0	0	0	0	0	0	2	22	40	54	57	57
Cochran	0	0	0	0	0	0	0	10	21	27	24	12
Crosby	710	710	710	710	710	710	-2	6	24	44	57	62
Dawson	0	0	0	0	0	0	1	16	33	48	57	61
Deaf Smith	774	774	774	774	774	774	-1	4	9	13	16	19
Floyd	218	218	218	218	218	218	0	9	25	41	55	63
Gaines	0	0	0	0	0	0	1	13	23	32	39	43
Garza	19	19	19	19	19	19	0	0	0	0	0	1
Hale	26	26	26	26	26	26	2	22	38	48	52	53
Hockley	114	114	114	114	114	114	1	11	25	36	43	44
Howard	12	12	12	12	12	12	0	0	1	1	2	2
Lamb	0	0	0	0	0	0	2	17	30	39	42	44
Lubbock	1	1	1	1	1	1	1	17	34	46	51	50
Lynn	0	0	0	0	0	0	1	15	31	46	61	73
Martin	0	0	0	0	0	0	1	9	19	27	34	39
Parmer	0	0	0	0	0	0	1	5	9	9	9	8
Swisher	32	32	32	32	32	32	1	16	28	37	40	40
Terry	0	0	0	0	0	0	1	17	28	35	43	50
Yoakum	0	0	0	0	0	0	1	10	18	26	30	29
District												
Garza County UWCD	19	19	19	19	19	19	0	0	0	0	0	1
High Plains UWCD No. 1	2,760	2,760	2,760	2,760	2,760	2,760	1	14	27	36	41	42
Llano Estacado UWCD	0	0	0	0	0	0	1	13	23	32	39	43
Mesa UWCD	0	0	0	0	0	0	1	16	33	48	57	61
Permian Basin UWCD	12	12	12	12	12	12	0	6	13	19	23	27
Sandy Land UWCD	0	0	0	0	0	0	1	10	18	26	30	29
South Plains UWCD	0	0	0	0	0	0	1	17	28	35	43	50
Management Area												
Out-of-State	7,793	7,793	7,793	7,793	7,793	7,793	0	1	1	1	2	2
GMA 1	21,226	21,226	21,226	21,226	21,226	21,226	4	13	18	23	27	30
GMA 2	1,921	1,921	1,921	1,921	1,921	1,921	1	11	22	30	35	37
GMA 3	7,706	7,706	7,706	7,706	7,706	7,706	2	3	3	3	3	3
GMA 6	14	14	14	14	14	14	0	0	0	1	1	2
GMA 7	7,115	7,115	7,115	7,115	7,115	7,115	-1	-3	-4	-3	-3	-3

Table A-4. Pumping (in acre-feet per year) and average drawdown (in feet) in the Dockum Aquifer between 2010 and 2060 for each county, underground water conservation district (UWCD), and groundwater management area (GMA) in Groundwater Management Area 2 for the 40 percent of base pumping scenario.

40 Percent of Base	Pumping						Average drawdown					
	2010	2020	2030	2040	2050	2060	2010	2020	2030	2040	2050	2060
County												
Andrews	4	4	4	4	4	4	0	5	9	13	17	19
Bailey	0	0	0	0	0	0	1	12	20	22	24	24
Borden	22	22	22	22	22	22	0	1	2	3	6	8
Briscoe	2	2	2	2	2	2	0	1	2	4	5	6
Castro	0	0	0	0	0	0	2	22	40	54	57	57
Cochran	0	0	0	0	0	0	0	10	21	27	24	12
Crosby	1,419	1,419	1,419	1,419	1,419	1,419	-1	9	27	47	62	68
Dawson	1	1	1	1	1	1	1	16	33	48	57	61
Deaf Smith	1,547	1,547	1,547	1,547	1,547	1,547	0	6	11	15	18	21
Floyd	436	436	436	436	436	436	0	11	27	43	57	66
Gaines	0	0	0	0	0	0	1	13	23	32	39	43
Garza	38	38	38	38	38	38	0	0	0	0	0	1
Hale	52	52	52	52	52	52	2	22	38	48	52	53
Hockley	228	228	228	228	228	228	1	12	26	37	45	47
Howard	24	24	24	24	24	24	0	0	1	1	2	2
Lamb	0	0	0	0	0	0	2	17	30	39	42	44
Lubbock	1	1	1	1	1	1	1	18	34	47	51	50
Lynn	0	0	0	0	0	0	1	15	31	46	61	73
Martin	0	0	0	0	0	0	1	9	19	27	34	39
Parmer	0	0	0	0	0	0	1	5	9	10	9	8
Swisher	65	65	65	65	65	65	1	16	29	37	40	40
Terry	0	0	0	0	0	0	1	17	28	35	43	50
Yoakum	0	0	0	0	0	0	1	10	18	26	30	29
District												
Garza County UWCD	38	38	38	38	38	38	0	0	0	0	0	1
High Plains UWCD No. 1	4,223	4,223	4,223	4,223	4,223	4,223	1	14	27	37	42	43
Llano Estacado UWCD	0	0	0	0	0	0	1	13	23	32	39	43
Mesa UWCD	1	1	1	1	1	1	1	16	33	48	57	61
Permian Basin UWCD	24	24	24	24	24	24	0	6	13	19	23	27
Sandy Land UWCD	0	0	0	0	0	0	1	10	18	26	30	29
South Plains UWCD	0	0	0	0	0	0	1	17	28	35	43	50
Management Area												
Out-of-State	7,793	7,793	7,793	7,793	7,793	7,793	0	1	1	1	2	2
GMA 1	21,226	21,226	21,226	21,226	21,226	21,226	4	13	19	23	27	30
GMA 2	3,843	3,843	3,843	3,843	3,843	3,843	1	12	22	30	35	37
GMA 3	15,412	15,412	15,412	15,412	15,412	15,412	6	8	9	9	9	9
GMA 6	28	28	28	28	28	28	0	0	0	1	2	2
GMA 7	14,230	14,230	14,230	14,230	14,230	14,230	0	-2	-1	-1	0	0

Table A-5. Pumping (in acre-feet per year) and average drawdown (in feet) in the Dockum Aquifer between 2010 and 2060 for each county, underground water conservation district (UWCD), and groundwater management area (GMA) in Groundwater Management Area 2 for the 60 percent of base pumping scenario.

60 Percent of Base	Pumping						Average drawdown					
	2010	**2020**	**2030**	**2040**	**2050**	**2060**	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
County												
Andrews	6	6	6	6	6	6	0	5	9	13	17	19
Bailey	0	0	0	0	0	0	1	12	20	22	24	24
Borden	33	33	33	33	33	33	0	1	2	3	6	8
Briscoe	4	4	4	4	4	4	0	1	2	4	5	6
Castro	0	0	0	0	0	0	2	22	40	54	58	57
Cochran	0	0	0	0	0	0	0	10	21	27	24	12
Crosby	2,128	2,128	2,128	2,128	2,128	2,128	0	12	31	51	66	74
Dawson	1	1	1	1	1	1	1	16	33	48	57	61
Deaf Smith	2,321	2,321	2,321	2,321	2,321	2,321	0	7	13	17	21	24
Floyd	655	655	655	655	655	655	0	12	29	46	60	69
Gaines	0	0	0	0	0	0	1	13	23	32	39	43
Garza	57	57	57	57	57	57	0	0	0	0	0	1
Hale	78	78	78	78	78	78	2	22	38	48	53	54
Hockley	342	342	342	342	342	342	1	13	28	38	46	49
Howard	36	36	36	36	36	36	0	0	1	1	2	3
Lamb	0	0	0	0	0	0	2	17	30	39	42	44
Lubbock	2	2	2	2	2	2	1	18	34	47	51	50
Lynn	0	0	0	0	0	0	1	15	31	46	61	73
Martin	0	0	0	0	0	0	1	9	19	28	34	40
Parmer	1	1	1	1	1	1	1	5	9	10	10	9
Swisher	97	97	97	97	97	97	1	16	29	37	41	41
Terry	0	0	0	0	0	0	1	17	28	35	43	50
Yoakum	0	0	0	0	0	0	1	10	18	26	30	29
District												
Garza County UWCD	57	57	57	57	57	57	0	0	0	0	0	1
High Plains UWCD No. 1	5,687	5,687	5,687	5,687	5,687	5,687	1	15	28	37	43	44
Llano Estacado UWCD	0	0	0	0	0	0	1	13	23	32	39	43
Mesa UWCD	1	1	1	1	1	1	1	16	33	48	57	61
Permian Basin UWCD	36	36	36	36	36	36	0	6	13	19	23	27
Sandy Land UWCD	0	0	0	0	0	0	1	10	18	26	30	29
South Plains UWCD	0	0	0	0	0	0	1	17	28	35	43	50
Management Area												
Out-of-State	7,793	7,793	7,793	7,793	7,793	7,793	0	1	1	1	2	2
GMA 1	21,226	21,226	21,226	21,226	21,226	21,226	4	13	19	23	27	30
GMA 2	5,764	5,764	5,764	5,764	5,764	5,764	1	12	22	31	36	38
GMA 3	23,124	23,124	23,124	23,124	23,124	23,124	10	14	15	15	15	15
GMA 6	42	42	42	42	42	42	0	0	1	1	2	3
GMA 7	22,041	22,041	22,041	22,041	22,041	22,041	0	0	1	2	3	3

Table A-6. Pumping (in acre-feet per year) and average drawdown (in feet) in the Dockum Aquifer between 2010 and 2060 for each county, underground water conservation district (UWCD), and groundwater management area (GMA) in Groundwater Management Area 2 for the 80 percent of base pumping scenario.

80 Percent of Base	Pumping						Average drawdown					
	2010	2020	2030	2040	2050	2060	2010	2020	2030	2040	2050	2060
County												
Andrews	8	8	8	8	8	8	0	5	9	13	17	19
Bailey	0	0	0	0	0	0	1	12	20	22	24	24
Borden	44	44	44	44	44	44	0	1	2	3	6	8
Briscoe	5	5	5	5	5	5	0	1	3	4	5	6
Castro	0	0	0	0	0	0	2	22	40	54	58	58
Cochran	0	0	0	0	0	0	0	10	21	27	24	12
Crosby	2,838	2,838	2,838	2,838	2,838	2,838	1	15	34	54	70	77
Dawson	1	1	1	1	1	1	1	16	33	48	57	61
Deaf Smith	3,095	3,095	3,095	3,095	3,095	3,095	0	8	15	19	23	27
Floyd	873	873	873	873	873	873	1	14	31	48	62	71
Gaines	0	0	0	0	0	0	1	13	23	32	39	43
Garza	77	77	77	77	77	77	0	0	0	0	0	1
Hale	104	104	104	104	104	104	2	22	38	49	53	54
Hockley	457	457	457	457	457	457	1	14	29	40	48	51
Howard	49	49	49	49	49	49	0	0	1	1	2	3
Lamb	0	0	0	0	0	0	2	17	30	39	42	44
Lubbock	3	3	3	3	3	3	1	18	34	47	51	51
Lynn	0	0	0	0	0	0	1	15	31	46	61	73
Martin	0	0	0	0	0	0	1	9	19	27	34	40
Parmer	1	1	1	1	1	1	1	5	9	10	10	9
Swisher	130	130	130	130	130	130	1	16	29	38	41	41
Terry	0	0	0	0	0	0	1	17	28	35	43	50
Yoakum	0	0	0	0	0	0	1	10	18	26	30	29
District												
Garza County UWCD	77	77	77	77	77	77	0	0	0	0	0	1
High Plains UWCD No. 1	7,150	7,150	7,150	7,150	7,150	7,150	1	15	29	38	44	45
Llano Estacado UWCD	0	0	0	0	0	0	1	13	23	32	39	43
Mesa UWCD	1	1	1	1	1	1	1	16	33	48	57	61
Permian Basin UWCD	48	48	48	48	48	48	0	6	13	19	23	27
Sandy Land UWCD	0	0	0	0	0	0	1	10	18	26	30	29
South Plains UWCD	0	0	0	0	0	0	1	17	28	35	43	50
Management Area												
Out-of-State	7,793	7,793	7,793	7,793	7,793	7,793	0	1	1	1	2	2
GMA 1	21,226	21,226	21,226	21,226	21,226	21,226	4	13	19	23	27	30
GMA 2	7,685	7,685	7,685	7,685	7,685	7,685	1	12	23	31	36	39
GMA 3	30,825	30,825	30,825	30,825	30,825	30,825	13	19	20	21	21	21
GMA 6	56	56	56	56	56	56	0	0	1	2	3	3
GMA 7	28,459	28,459	28,459	28,459	28,459	28,459	1	2	3	4	5	5

Table A-7. Pumping (in acre-feet per year) and average drawdown (in feet) in the Dockum Aquifer between 2010 and 2060 for each county, underground water conservation district (UWCD), and groundwater management area (GMA) in Groundwater Management Area 2 for the 130 percent of base pumping scenario.

130 Percent of Base	Pumping						Average drawdown					
	2010	**2020**	**2030**	**2040**	**2050**	**2060**	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
County												
Andrews	430	430	430	430	430	430	0	5	10	15	18	21
Bailey	1	1	1	1	1	1	1	12	20	22	24	24
Borden	286	286	286	286	286	286	0	1	2	3	6	8
Briscoe	119	119	119	119	119	119	0	2	3	5	6	7
Castro	0	0	0	0	0	0	2	22	41	55	58	58
Cochran	0	0	0	0	0	0	0	10	22	27	24	13
Crosby	3,828	3,828	3,828	3,828	3,828	3,828	1	19	39	59	75	80
Dawson	16	16	16	16	16	16	1	16	33	48	57	61
Deaf Smith	4,290	4,290	4,290	4,290	4,290	4,290	1	11	18	22	27	31
Floyd	1,387	1,387	1,387	1,387	1,387	1,387	1	18	36	54	67	77
Gaines	0	0	0	0	0	0	1	13	23	32	39	43
Garza	354	354	354	354	354	354	0	0	0	0	1	1
Hale	434	434	434	434	434	434	2	23	40	50	55	57
Hockley	571	571	571	571	571	571	1	15	30	41	50	54
Howard	327	327	327	327	327	327	0	0	1	2	2	3
Lamb	0	0	0	0	0	0	2	17	30	39	42	45
Lubbock	9	9	9	9	9	9	2	18	35	47	52	51
Lynn	3	3	3	3	3	3	1	15	31	46	61	73
Martin	0	0	0	0	0	0	1	9	19	28	35	40
Parmer	1	1	1	1	1	1	1	5	10	11	10	10
Swisher	430	430	430	430	430	430	2	18	31	40	44	45
Terry	0	0	0	0	0	0	1	17	28	35	43	50
Yoakum	0	0	0	0	0	0	1	10	18	26	30	29
District												
Garza County UWCD	354	354	354	354	354	354	0	0	0	0	1	1
High Plains UWCD No. 1	9,652	9,652	9,652	9,652	9,652	9,652	1	16	30	40	45	47
Llano Estacado UWCD	0	0	0	0	0	0	1	13	23	32	39	43
Mesa UWCD	16	16	16	16	16	16	1	16	33	48	57	61
Permian Basin UWCD	315	315	315	315	315	315	0	6	13	19	24	27
Sandy Land UWCD	0	0	0	0	0	0	1	10	18	26	30	29
South Plains UWCD	0	0	0	0	0	0	1	17	28	35	43	50
Management Area												
Out-of-State	7,793	7,793	7,793	7,793	7,793	7,793	0	1	1	2	2	2
GMA 1	21,226	21,226	21,226	21,226	21,226	21,226	4	13	19	23	27	30
GMA 2	12,488	12,488	12,488	12,488	12,488	12,488	1	13	24	32	37	40
GMA 3	51,564	51,564	51,564	51,564	51,564	51,564	22	31	33	33	34	35
GMA 6	91	91	91	91	91	91	0	1	2	3	3	4
GMA 7	44,772	44,772	44,772	44,772	44,772	44,772	1	7	9	11	12	13

Table A-8. Pumping (in acre-feet per year) and average drawdown (in feet) in the Dockum Aquifer between 2010 and 2060 for each county, underground water conservation district (UWCD), and groundwater management area (GMA) in Groundwater Management Area 2 for the 160 percent of base pumping scenario.

160 Percent of Base	Pumping						Average drawdown					
	2010	2020	2030	2040	2050	2060	2010	2020	2030	2040	2050	2060
County												
Andrews	850	850	850	850	850	850	1	6	11	16	20	23
Bailey	1	1	1	1	1	1	1	12	20	22	24	24
Borden	516	516	516	516	516	516	0	1	2	3	6	8
Briscoe	231	231	231	231	231	231	0	2	4	5	6	7
Castro	1	1	1	1	1	1	2	23	41	55	59	59
Cochran	0	0	0	0	0	0	0	10	22	27	24	13
Crosby	4,109	4,109	4,109	4,109	4,109	4,109	2	20	40	60	75	80
Dawson	31	31	31	31	31	31	1	16	33	48	58	61
Deaf Smith	4,712	4,712	4,712	4,712	4,712	4,712	1	12	19	24	28	32
Floyd	1,684	1,684	1,684	1,684	1,684	1,684	2	20	39	56	70	79
Gaines	0	0	0	0	0	0	1	13	23	32	39	43
Garza	613	613	613	613	613	613	0	0	0	0	1	1
Hale	738	738	738	738	738	738	3	24	41	52	57	60
Hockley	571	571	571	571	571	571	1	15	30	41	50	54
Howard	593	593	593	593	593	593	0	0	1	2	2	3
Lamb	0	0	0	0	0	0	2	17	30	39	42	45
Lubbock	15	15	15	15	15	15	2	18	35	47	52	52
Lynn	5	5	5	5	5	5	1	15	31	46	61	74
Martin	0	0	0	0	0	0	1	9	19	28	35	40
Parmer	2	2	2	2	2	2	1	6	10	11	11	10
Swisher	697	697	697	697	697	697	2	19	33	42	46	47
Terry	0	0	0	0	0	0	1	17	28	35	43	50
Yoakum	0	0	0	0	0	0	1	10	18	26	30	29
District												
Garza County UWCD	613	613	613	613	613	613	0	0	0	0	1	1
High Plains UWCD No. 1	10,691	10,691	10,691	10,691	10,691	10,691	1	16	30	40	46	48
Llano Estacado UWCD	0	0	0	0	0	0	1	13	23	32	39	43
Mesa UWCD	31	31	31	31	31	31	1	16	33	48	58	61
Permian Basin UWCD	569	569	569	569	569	569	0	6	13	19	24	28
Sandy Land UWCD	0	0	0	0	0	0	1	10	18	26	30	29
South Plains UWCD	0	0	0	0	0	0	1	17	28	35	43	50
Management Area												
Out-of-State	7,793	7,793	7,793	7,793	7,793	7,793	0	1	1	2	2	2
GMA 1	21,226	21,226	21,226	21,226	21,226	21,226	4	13	19	23	27	30
GMA 2	15,370	15,370	15,370	15,370	15,370	15,370	1	13	24	32	38	40
GMA 3	64,167	64,167	64,167	64,167	64,167	64,167	27	38	39	40	41	42
GMA 6	112	112	112	112	112	112	0	1	2	3	4	4
GMA 7	54,401	54,401	54,401	54,401	54,401	54,401	2	10	14	16	18	19

Table A-9. Pumping (in acre-feet per year) and average drawdown (in feet) in the Dockum Aquifer between 2010 and 2060 for each county, underground water conservation district (UWCD), and groundwater management area (GMA) in Groundwater Management Area 2 for the 160 percent of base pumping scenario.

190 Percent of Base	Pumping						Average drawdown					
	2010	2020	2030	2040	2050	2060	2010	2020	2030	2040	2050	2060
County												
Andrews	1,270	1,270	1,270	1,270	1,270	1,270	1	7	12	17	21	24
Bailey	1	1	1	1	1	1	1	12	20	22	24	24
Borden	746	746	746	746	746	746	0	1	2	3	6	8
Briscoe	344	344	344	344	344	344	0	2	4	6	7	8
Castro	1	1	1	1	1	1	2	23	41	55	59	59
Cochran	0	0	0	0	0	0	0	10	22	27	24	13
Crosby	4,389	4,389	4,389	4,389	4,389	4,389	2	21	41	61	76	81
Dawson	45	45	45	45	45	45	1	16	33	48	58	61
Deaf Smith	5,134	5,134	5,134	5,134	5,134	5,134	2	13	20	25	30	34
Floyd	1,980	1,980	1,980	1,980	1,980	1,980	2	22	42	59	72	82
Gaines	0	0	0	0	0	0	1	13	23	32	39	43
Garza	871	871	871	871	871	871	0	0	0	1	1	1
Hale	1,042	1,042	1,042	1,042	1,042	1,042	3	25	42	54	59	63
Hockley	572	572	572	572	572	572	1	15	30	41	50	54
Howard	858	858	858	858	858	858	0	1	1	2	3	3
Lamb	0	0	0	0	0	0	2	18	30	39	43	45
Lubbock	20	20	20	20	20	20	2	18	35	48	52	52
Lynn	7	7	7	7	7	7	1	15	31	46	61	74
Martin	0	0	0	0	0	0	1	10	19	28	35	41
Parmer	2	2	2	2	2	2	1	6	10	11	11	10
Swisher	965	965	965	965	965	965	2	20	34	44	48	50
Terry	0	0	0	0	0	0	1	17	28	35	43	50
Yoakum	0	0	0	0	0	0	1	10	18	26	30	29
District												
Garza County UWCD	871	871	871	871	871	871	0	0	0	1	1	1
High Plains UWCD No. 1	11,730	11,730	11,730	11,730	11,730	11,730	2	17	31	41	46	48
Llano Estacado UWCD	0	0	0	0	0	0	1	13	23	32	39	43
Mesa UWCD	45	45	45	45	45	45	1	16	33	48	58	61
Permian Basin UWCD	824	824	824	824	824	824	0	6	13	19	24	28
Sandy Land UWCD	0	0	0	0	0	0	1	10	18	26	30	29
South Plains UWCD	0	0	0	0	0	0	1	17	28	35	43	50
Management Area												
Out-of-State	7,793	7,793	7,793	7,793	7,793	7,793	0	1	1	2	2	2
GMA 1	21,226	21,226	21,226	21,226	21,226	21,226	4	13	19	23	27	30
GMA 2	18,252	18,252	18,252	18,252	18,252	18,252	1	13	24	33	38	41
GMA 3	76,770	76,770	76,770	76,770	76,770	76,770	32	43	45	46	47	48
GMA 6	133	133	133	133	133	133	0	1	2	3	4	5
GMA 7	64,030	64,030	64,030	64,030	64,030	64,030	3	13	18	21	23	24

Appendix B

Spread Analysis Results for Groundwater Management Area 3

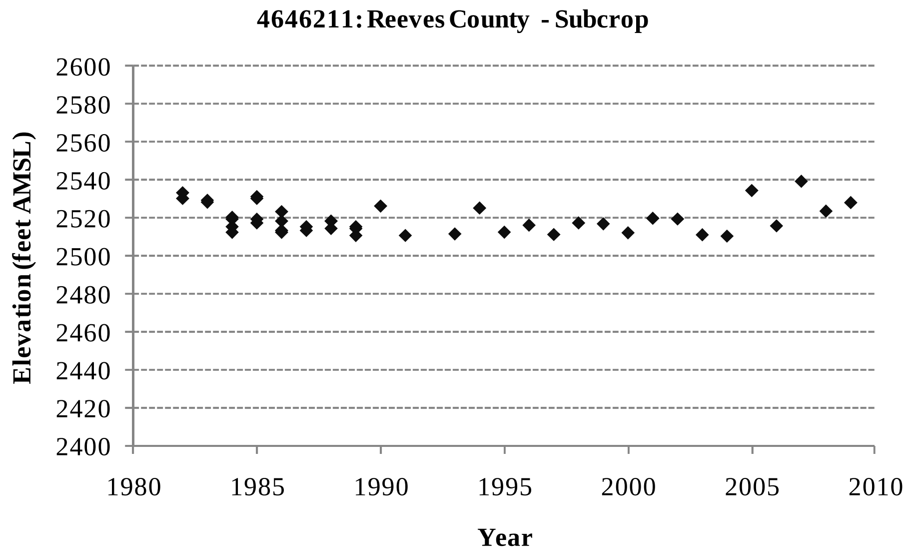

Figure B-1. Hydrograph of state well 4646211 located in the subcrop portion of the Dockum Aquifer in Reeves County.

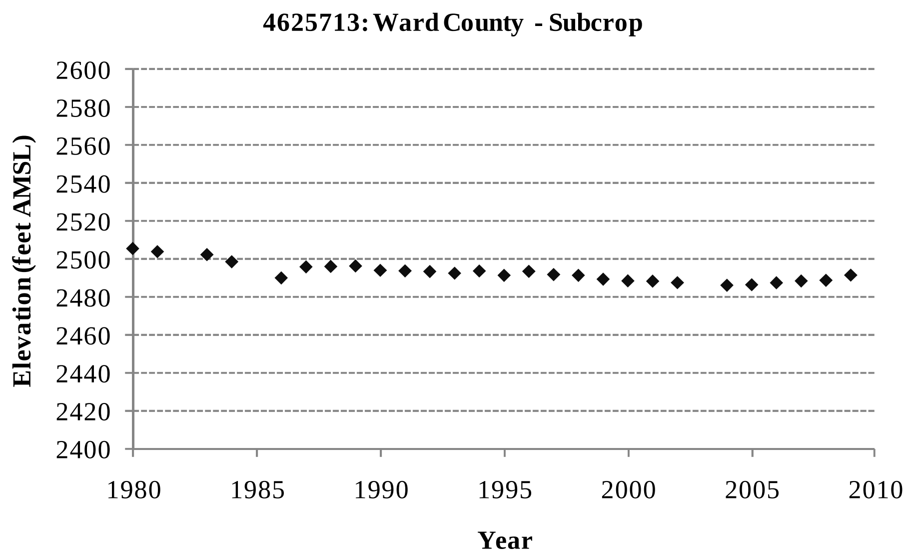

Figure B-2. Hydrograph of state well 4625713 located in the subcrop portion of the Dockum Aquifer in Ward County.

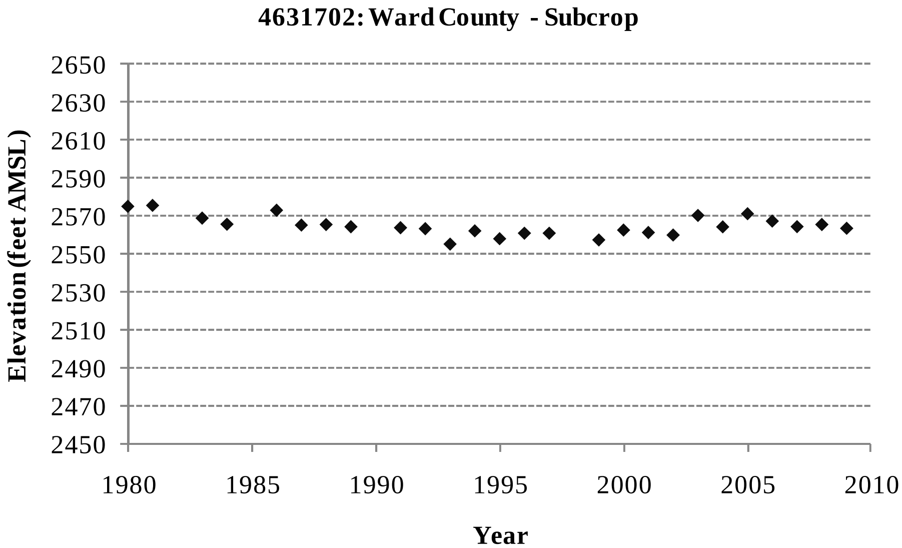

Figure B-3. Hydrograph of state well 4631702 located in the subcrop portion of the Dockum Aquifer in Ward County.

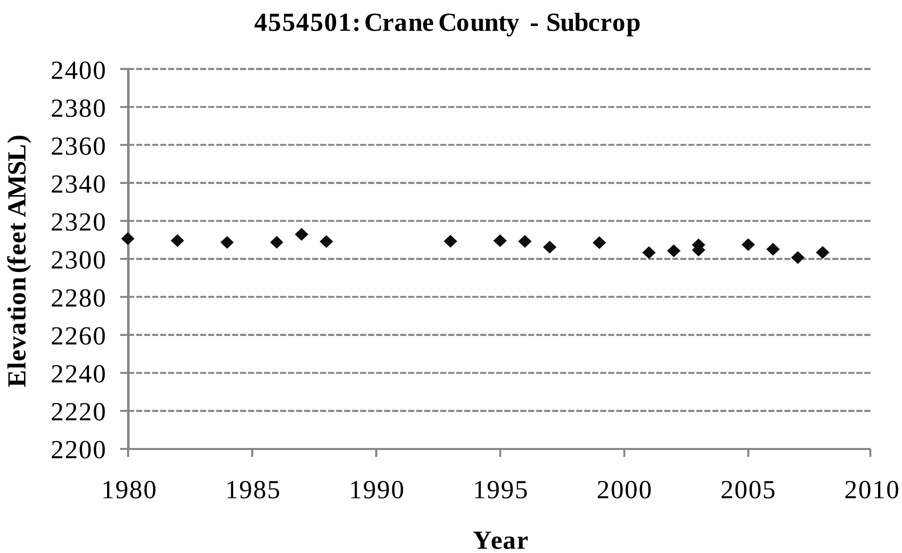

Figure B-4. Hydrograph of state well 4554501 located in the subcrop portion of the Dockum Aquifer in Crane County.

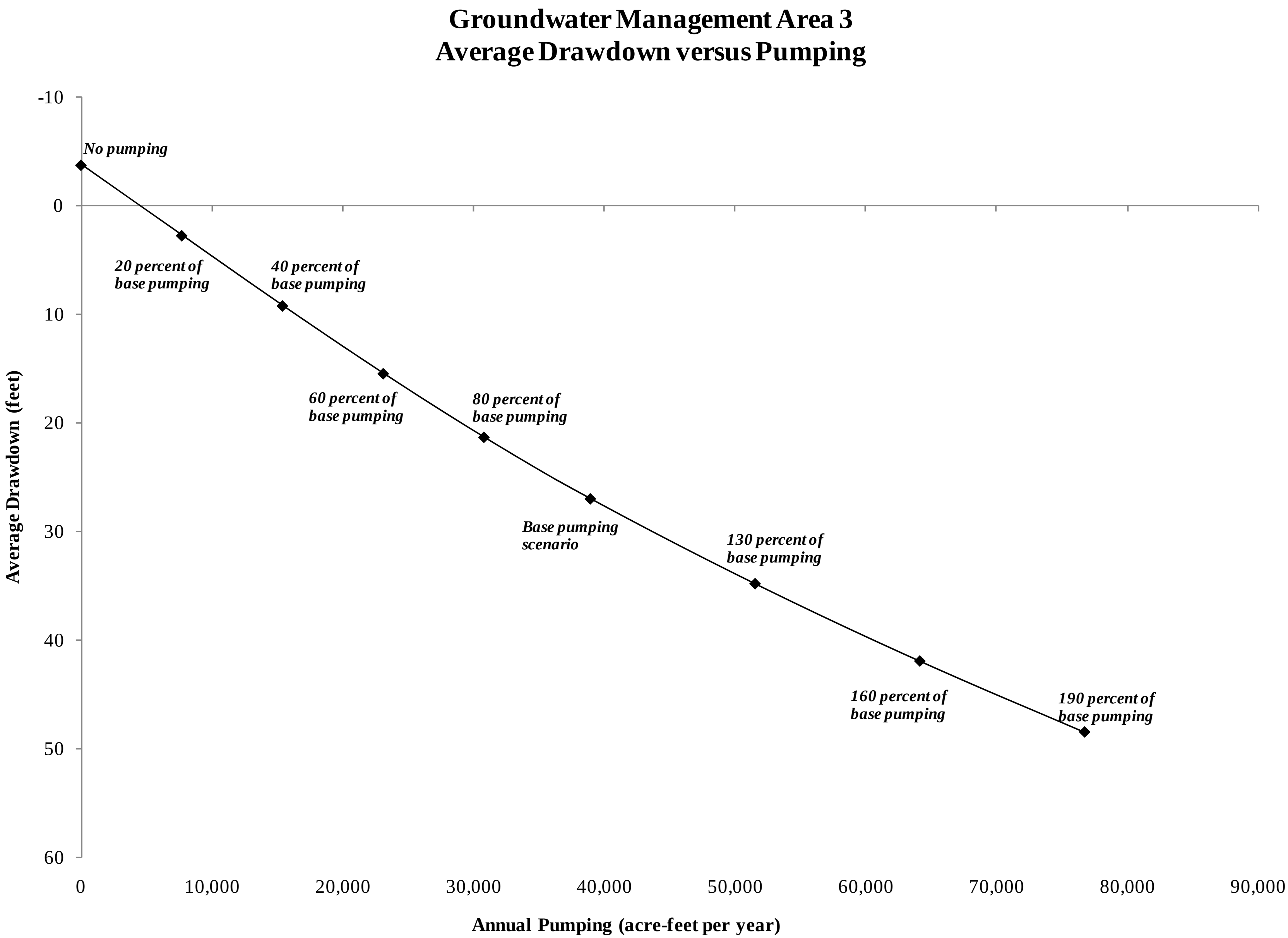

Figure B-5. Average drawdown through time for each of the pumping scenarios for Groundwater Management Area 3.

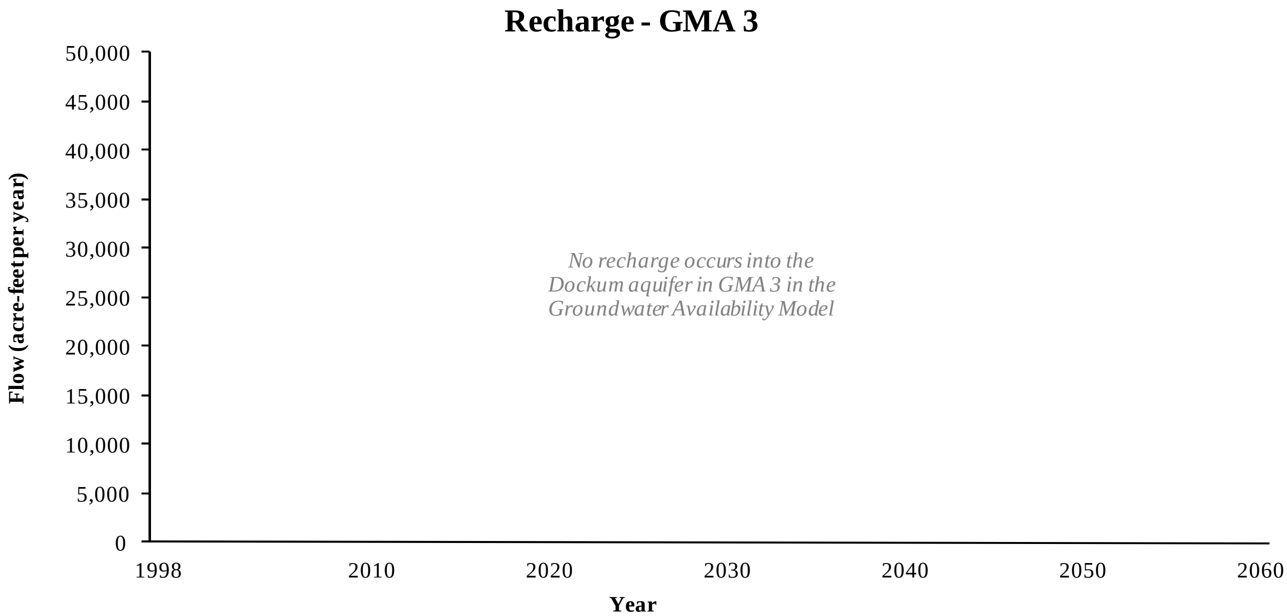

Figure B-6. Recharge to the Dockum Aquifer by year in the groundwater availability model for Groundwater Management Area 3. Note that no recharge from precipitation occurs to the Dockum Aquifer in the model because the aquifer is in subcrop in the management area.

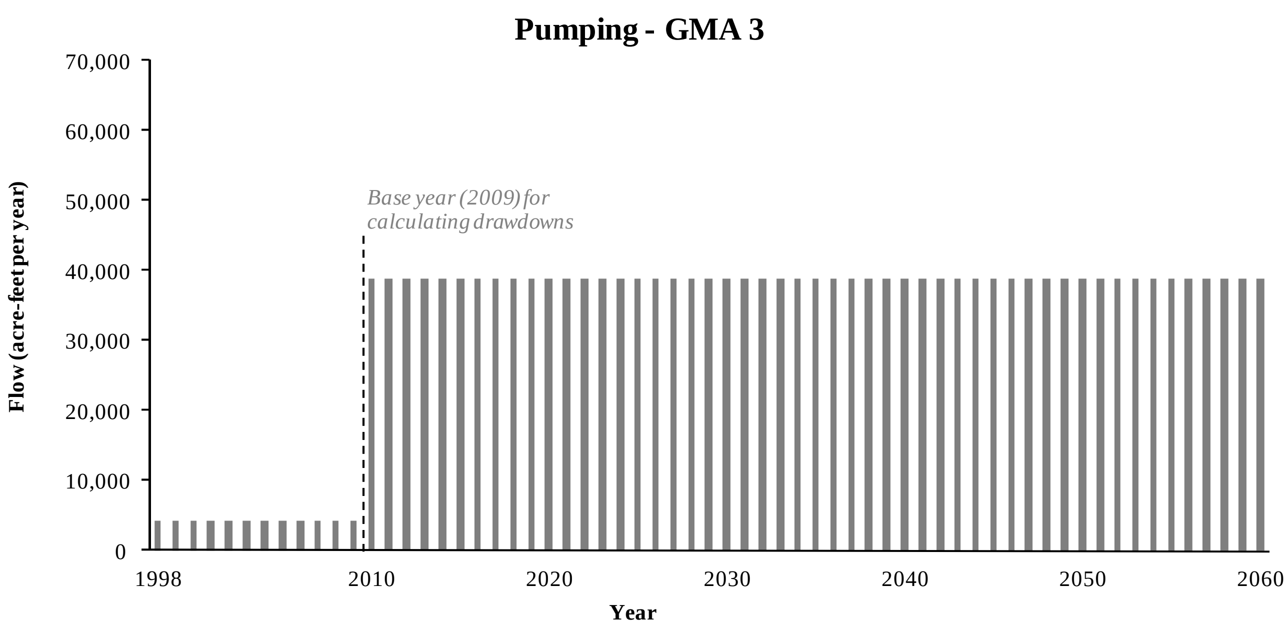

Figure B-7. Pumping output from the groundwater availability model in the Dockum Aquifer by year for Groundwater Management Area 3.

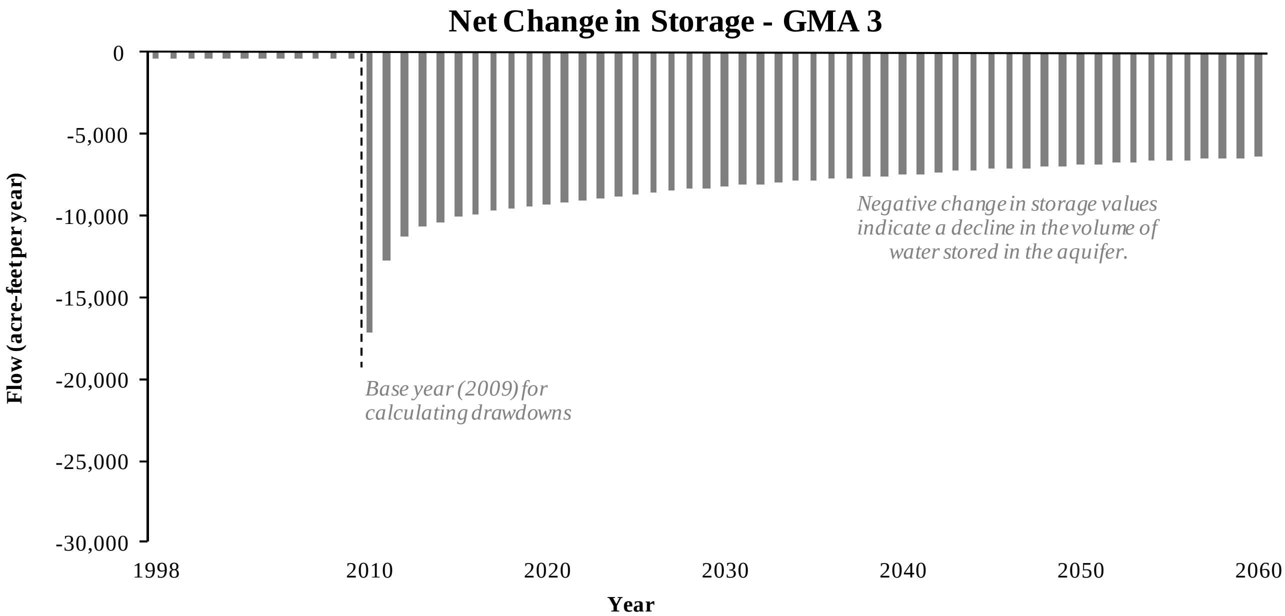

Figure B-8. Net change in storage (the volume of water stored in the aquifer) by year in the Dockum Aquifer for Groundwater Management Area 3.

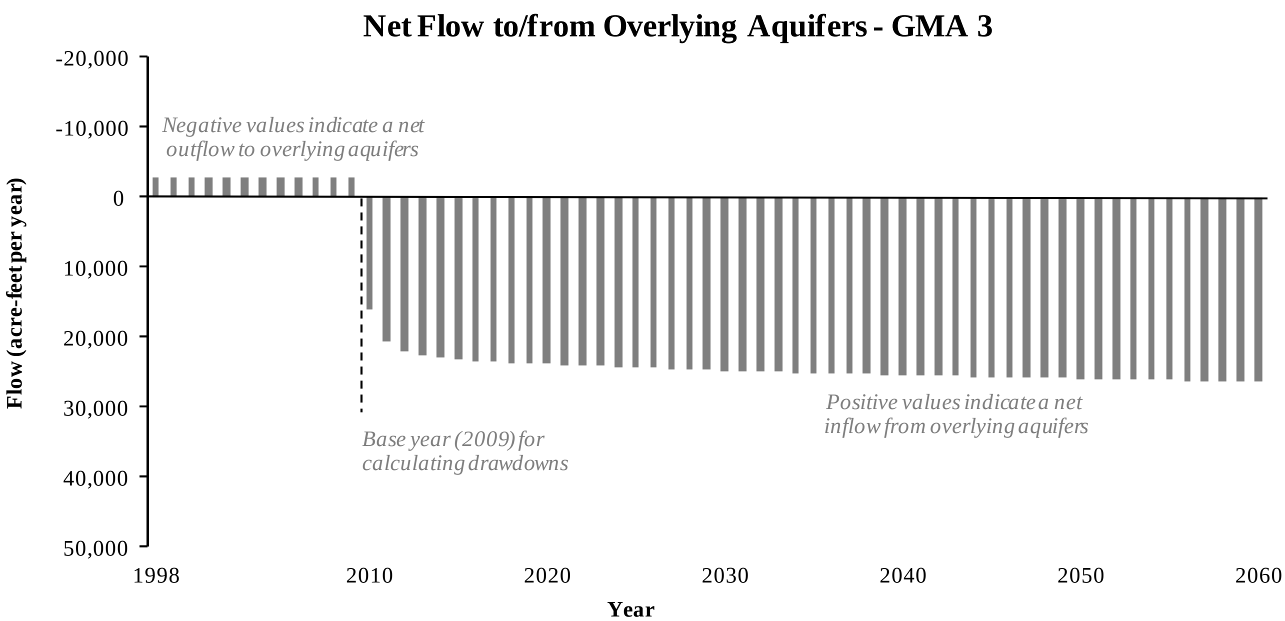

Figure B-9. Net flow between overlying aquifers and the Dockum Aquifer by year for Groundwater Management Area 3.

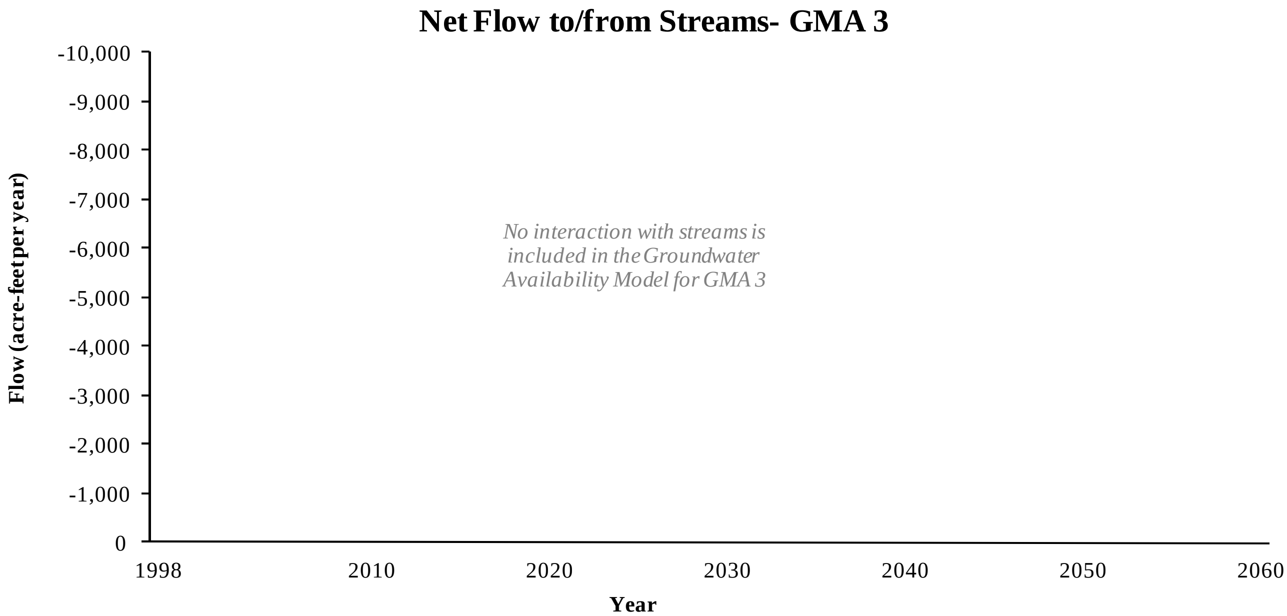

Figure B-10. Net flow to/from streams in the Dockum Aquifer by year for Groundwater Management Area 3. Note that no interaction with streams occurs to the Dockum Aquifer in the model because the aquifer is in subcrop in the management area.

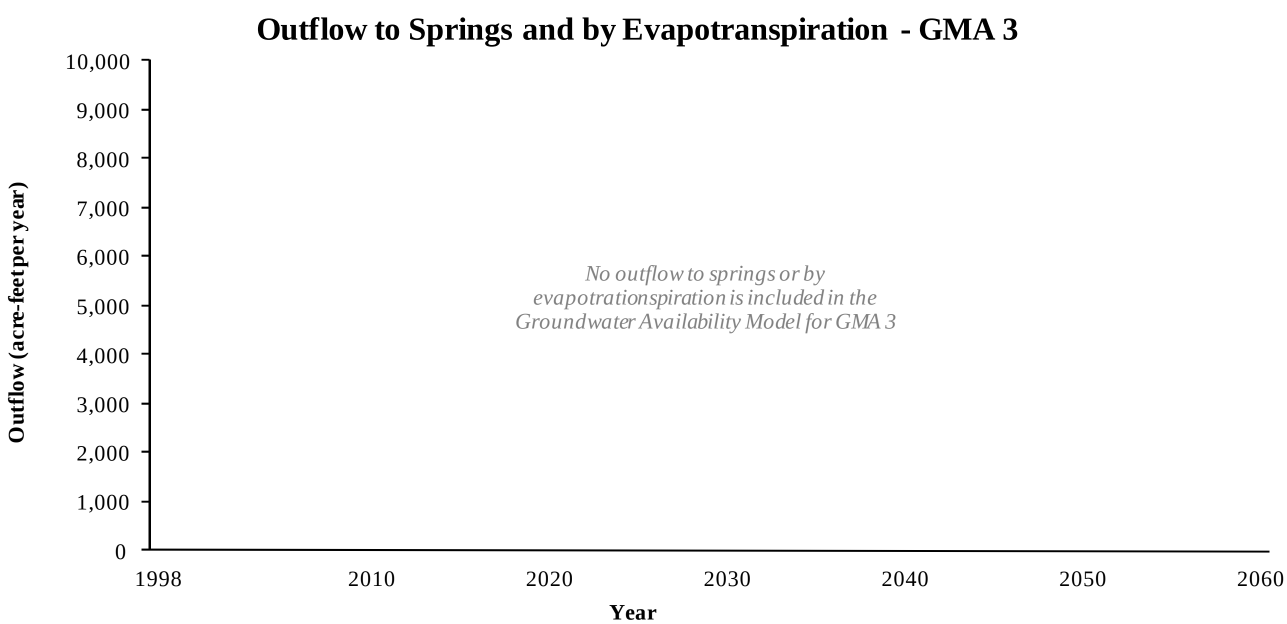

Figure B-11. Outflow from the Dockum Aquifer in Groundwater Management Area 3 to springs and by evapotranspiration. Note that no outflow to springs or by evaporation occurs to the Dockum Aquifer in the model because the aquifer is in subcrop in the management area.

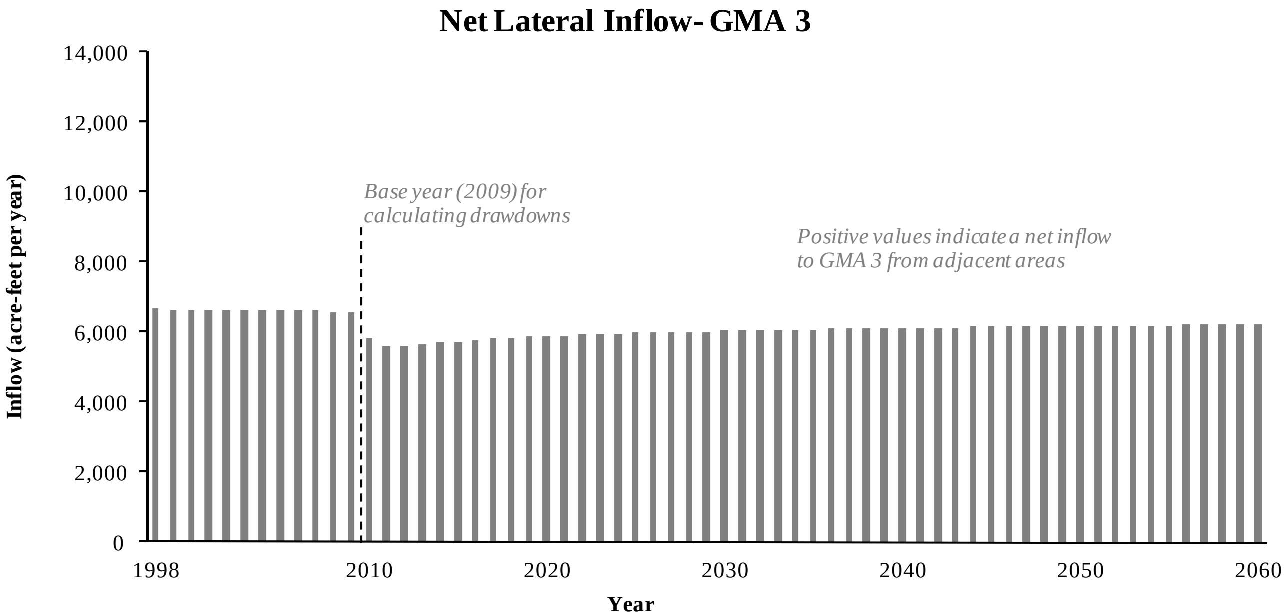

Figure B-12. Net lateral inflow to the Dockum Aquifer in Groundwater Management Area 3 from adjacent areas.

Table B-1. Pumping (in acre-feet per year) and average drawdown (in feet) in the Dockum Aquifer between 2010 and 2060 for each county, groundwater conservation district (GCD), and groundwater management area (GMA) for Groundwater Management Area 3 for the base scenario.

Base Scenario	Pumping						Average drawdown					
	2010	**2020**	**2030**	**2040**	**2050**	**2060**	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
County												
Crane	2,000	2,000	2,000	2,000	2,000	2,000	4	6	6	7	7	8
Loving	1,000	1,000	1,000	1,000	1,000	1,000	18	21	22	23	23	24
Pecos	18,000	18,000	18,000	18,000	18,000	18,000	33	46	46	46	47	47
Reeves	5,000	5,000	5,000	5,000	5,000	5,000	12	15	15	16	16	17
Ward	7,000	7,000	7,000	7,000	7,000	7,000	20	28	29	30	30	31
Winkler	10,000	10,000	10,000	10,000	10,000	10,000	17	28	29	30	31	32
District												
Middle Pecos GCD	18,000	18,000	18,000	18,000	18,000	18,000	33	46	46	46	47	47
Management Area												
Out-of-State	7,793	7,793	7,793	7,793	7,793	7,793	0	1	1	1	2	2
GMA 1	21,226	21,226	21,226	21,226	21,226	21,226	4	13	19	23	27	30
GMA 2	9,607	9,607	9,607	9,607	9,607	9,607	1	12	23	31	37	39
GMA 3	38,961	38,961	38,961	38,961	38,961	38,961	17	24	25	26	27	27
GMA 6	70	70	70	70	70	70	0	1	1	2	3	4
GMA 7	35,144	35,144	35,144	35,144	35,144	35,144	1	3	5	6	7	8

Table B-2. Pumping (in acre-feet per year) and average drawdown (in feet) in the Dockum Aquifer between 2010 and 2060 for each county, groundwater conservation district (GCD), and groundwater management area (GMA) for Groundwater Management Area 3 for the zero pumping scenario.

Zero Pumping Scenario	Pumping						Average drawdown					
	2010	**2020**	**2030**	**2040**	**2050**	**2060**	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
County												
Crane	0	0	0	0	0	0	0	0	0	0	0	0
Loving	0	0	0	0	0	0	0	-1	-1	-1	-1	-1
Pecos	0	0	0	0	0	0	-2	-3	-3	-3	-3	-3
Reeves	0	0	0	0	0	0	-1	-3	-4	-4	-4	-4
Ward	0	0	0	0	0	0	0	-1	-1	-1	-1	-1
Winkler	0	0	0	0	0	0	-1	-8	-9	-9	-9	-9
District												
Middle Pecos GCD	0	0	0	0	0	0	-2	-3	-3	-3	-3	-3
Management Area												
Out-of-State	7,793	7,793	7,793	7,793	7,793	7,793	0	1	1	1	1	2
GMA 1	21,226	21,226	21,226	21,226	21,226	21,226	4	13	18	23	27	30
GMA 2	0	0	0	0	0	0	1	11	21	29	34	36
GMA 3	0	0	0	0	0	0	-1	-3	-4	-4	-4	-4
GMA 6	0	0	0	0	0	0	-1	-1	0	0	1	1
GMA 7	0	0	0	0	0	0	-1	-5	-6	-6	-5	-5

Table B-3. Pumping (in acre-feet per year) and average drawdown (in feet) in the Dockum Aquifer between 2010 and 2060 for each county, groundwater conservation district (GCD), and groundwater management area (GMA) for Groundwater Management Area 3 for the 20 percent of base pumping scenario.

20 Percent of Base	Pumping						Average drawdown					
	2010	2020	2030	2040	2050	2060	2010	2020	2030	2040	2050	2060
County												
Crane	400	400	400	400	400	400	1	1	1	1	1	1
Loving	200	200	200	200	200	200	3	3	4	4	4	4
Pecos	3,600	3,600	3,600	3,600	3,600	3,600	5	7	7	7	7	7
Reeves	1,000	1,000	1,000	1,000	1,000	1,000	0	1	1	1	1	1
Ward	1,400	1,400	1,400	1,400	1,400	1,400	4	6	6	6	6	6
Winkler	2,000	2,000	2,000	2,000	2,000	2,000	0	0	0	0	0	0
District												
Middle Pecos GCD	3,600	3,600	3,600	3,600	3,600	3,600	5	7	7	7	7	7
Management Area												
Out-of-State	7,793	7,793	7,793	7,793	7,793	7,793	0	1	1	1	2	2
GMA 1	21,226	21,226	21,226	21,226	21,226	21,226	4	13	18	23	27	30
GMA 2	1,921	1,921	1,921	1,921	1,921	1,921	1	11	22	30	35	37
GMA 3	7,706	7,706	7,706	7,706	7,706	7,706	2	3	3	3	3	3
GMA 6	14	14	14	14	14	14	0	0	0	1	1	2
GMA 7	7,115	7,115	7,115	7,115	7,115	7,115	-1	-3	-4	-3	-3	-3

Table B-4. Pumping (in acre-feet per year) and average drawdown (in feet) in the Dockum Aquifer between 2010 and 2060 for each county, groundwater conservation district (GCD), and groundwater management area (GMA) for Groundwater Management Area 3 for the 40 percent of base pumping scenario.

40 Percent of Base	Pumping						Average drawdown					
	2010	2020	2030	2040	2050	2060	2010	2020	2030	2040	2050	2060
County												
Crane	800	800	800	800	800	800	2	2	2	3	3	3
Loving	400	400	400	400	400	400	7	8	9	9	9	10
Pecos	7,200	7,200	7,200	7,200	7,200	7,200	12	17	17	17	17	17
Reeves	2,000	2,000	2,000	2,000	2,000	2,000	3	4	4	5	5	5
Ward	2,800	2,800	2,800	2,800	2,800	2,800	9	12	13	13	13	13
Winkler	4,000	4,000	4,000	4,000	4,000	4,000	4	8	8	8	9	9
District												
Middle Pecos GCD	7,200	7,200	7,200	7,200	7,200	7,200	12	17	17	17	17	17
Management Area												
Out-of-State	7,793	7,793	7,793	7,793	7,793	7,793	0	1	1	1	2	2
GMA 1	21,226	21,226	21,226	21,226	21,226	21,226	4	13	19	23	27	30
GMA 2	3,843	3,843	3,843	3,843	3,843	3,843	1	12	22	30	35	37
GMA 3	15,412	15,412	15,412	15,412	15,412	15,412	6	8	9	9	9	9
GMA 6	28	28	28	28	28	28	0	0	0	1	2	2
GMA 7	14,230	14,230	14,230	14,230	14,230	14,230	0	-2	-1	-1	0	0

Table B-5. Pumping (in acre-feet per year) and average drawdown (in feet) in the Dockum Aquifer between 2010 and 2060 for each county, groundwater conservation district (GCD), and groundwater management area (GMA) for Groundwater Management Area 3 for the 60 percent of base pumping scenario.

60 Percent of Base	Pumping						Average drawdown					
	2010	2020	2030	2040	2050	2060	2010	2020	2030	2040	2050	2060
County												
Crane	1,200	1,200	1,200	1,200	1,200	1,200	2	3	4	4	4	5
Loving	600	600	600	600	600	600	11	13	14	14	14	15
Pecos	10,800	10,800	10,800	10,800	10,800	10,800	19	26	26	26	26	26
Reeves	3,000	3,000	3,000	3,000	3,000	3,000	6	8	8	8	9	9
Ward	4,200	4,200	4,200	4,200	4,200	4,200	13	18	19	19	19	20
Winkler	6,005	6,005	6,005	6,005	6,005	6,005	9	15	16	16	17	17
District												
Middle Pecos GCD	10,800	10,800	10,800	10,800	10,800	10,800	19	26	26	26	26	26
Management Area												
Out-of-State	7,793	7,793	7,793	7,793	7,793	7,793	0	1	1	1	2	2
GMA 1	21,226	21,226	21,226	21,226	21,226	21,226	4	13	19	23	27	30
GMA 2	5,764	5,764	5,764	5,764	5,764	5,764	1	12	22	31	36	38
GMA 3	23,124	23,124	23,124	23,124	23,124	23,124	10	14	15	15	15	15
GMA 6	42	42	42	42	42	42	0	0	1	1	2	3
GMA 7	22,041	22,041	22,041	22,041	22,041	22,041	0	0	1	2	3	3

Table B-6. Pumping (in acre-feet per year) and average drawdown (in feet) in the Dockum Aquifer between 2010 and 2060 for each county, groundwater conservation district (GCD), and groundwater management area (GMA) for Groundwater Management Area 3 for the 80 percent of base pumping scenario.

80 Percent of Base	Pumping						Average drawdown					
	2010	2020	2030	2040	2050	2060	2010	2020	2030	2040	2050	2060
County												
Crane	1,600	1,600	1,600	1,600	1,600	1,600	3	5	5	5	6	6
Loving	800	800	800	800	800	800	14	17	18	19	19	19
Pecos	14,400	14,400	14,400	14,400	14,400	14,400	26	35	36	36	36	36
Reeves	4,000	4,000	4,000	4,000	4,000	4,000	9	11	12	12	12	13
Ward	5,600	5,600	5,600	5,600	5,600	5,600	17	24	24	25	26	26
Winkler	8,000	8,000	8,000	8,000	8,000	8,000	13	22	23	24	24	25
District												
Middle Pecos GCD	14,400	14,400	14,400	14,400	14,400	14,400	26	35	36	36	36	36
Management Area												
Out-of-State	7,793	7,793	7,793	7,793	7,793	7,793	0	1	1	1	2	2
GMA 1	21,226	21,226	21,226	21,226	21,226	21,226	4	13	19	23	27	30
GMA 2	7,685	7,685	7,685	7,685	7,685	7,685	1	12	23	31	36	39
GMA 3	30,825	30,825	30,825	30,825	30,825	30,825	13	19	20	21	21	21
GMA 6	56	56	56	56	56	56	0	0	1	2	3	3
GMA 7	28,459	28,459	28,459	28,459	28,459	28,459	1	2	3	4	5	5

Table B-7. Pumping (in acre-feet per year) and average drawdown (in feet) in the Dockum Aquifer between 2010 and 2060 for each county, groundwater conservation district (GCD), and groundwater management area (GMA) for Groundwater Management Area 3 for the 130 percent of base pumping scenario.

130 Percent of Base	Pumping						Average drawdown					
	2010	**2020**	**2030**	**2040**	**2050**	**2060**	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
County												
Crane	2,600	2,600	2,600	2,600	2,600	2,600	5	8	8	9	10	10
Loving	1,300	1,300	1,300	1,300	1,300	1,300	22	27	27	28	29	30
Pecos	23,399	23,399	23,399	23,399	23,399	23,399	45	61	62	63	63	63
Reeves	6,500	6,500	6,500	6,500	6,500	6,500	16	20	21	22	22	23
Ward	9,100	9,100	9,100	9,100	9,100	9,100	24	33	34	35	36	37
Winkler	13,000	13,000	13,000	13,000	13,000	13,000	23	36	38	39	40	41
District												
Middle Pecos GCD	23,399	23,399	23,399	23,399	23,399	23,399	45	61	62	63	63	63
Management Area												
Out-of-State	7,793	7,793	7,793	7,793	7,793	7,793	0	1	1	2	2	2
GMA 1	21,226	21,226	21,226	21,226	21,226	21,226	4	13	19	23	27	30
GMA 2	12,488	12,488	12,488	12,488	12,488	12,488	1	13	24	32	37	40
GMA 3	51,564	51,564	51,564	51,564	51,564	51,564	22	31	33	33	34	35
GMA 6	91	91	91	91	91	91	0	1	2	3	3	4
GMA 7	44,772	44,772	44,772	44,772	44,772	44,772	1	7	9	11	12	13

Table B-8. Pumping (in acre-feet per year) and average drawdown (in feet) in the Dockum Aquifer between 2010 and 2060 for each county, groundwater conservation district (GCD), and groundwater management area (GMA) for Groundwater Management Area 3 for the 160 percent of base pumping scenario.

160 Percent of Base	Pumping						Average drawdown					
	2010	**2020**	**2030**	**2040**	**2050**	**2060**	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
County												
Crane	3,200	3,200	3,200	3,200	3,200	3,200	6	9	10	11	12	12
Loving	1,600	1,600	1,600	1,600	1,600	1,600	26	31	32	33	33	34
Pecos	28,799	28,799	28,799	28,799	28,799	28,799	57	76	77	78	79	79
Reeves	8,000	8,000	8,000	8,000	8,000	8,000	20	25	26	27	28	28
Ward	11,200	11,200	11,200	11,200	11,200	11,200	28	38	39	40	41	42
Winkler	16,000	16,000	16,000	16,000	16,000	16,000	28	43	45	46	47	48
District												
Middle Pecos GCD	28,799	28,799	28,799	28,799	28,799	28,799	57	76	77	78	79	79
Management Area												
Out-of-State	7,793	7,793	7,793	7,793	7,793	7,793	0	1	1	2	2	2
GMA 1	21,226	21,226	21,226	21,226	21,226	21,226	4	13	19	23	27	30
GMA 2	15,370	15,370	15,370	15,370	15,370	15,370	1	13	24	32	38	40
GMA 3	64,167	64,167	64,167	64,167	64,167	64,167	27	38	39	40	41	42
GMA 6	112	112	112	112	112	112	0	1	2	3	4	4
GMA 7	54,401	54,401	54,401	54,401	54,401	54,401	2	10	14	16	18	19

Table B-9. Pumping (in acre-feet per year) and average drawdown (in feet) in the Dockum Aquifer between 2010 and 2060 for each county, groundwater conservation district (GCD), and groundwater management area (GMA) for Groundwater Management Area 3 for the 190 percent of base pumping scenario.

190 Percent of Base	Pumping						Average drawdown					
	2010	**2020**	**2030**	**2040**	**2050**	**2060**	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
County												
Crane	3,800	3,800	3,800	3,800	3,800	3,800	8	11	12	13	14	14
Loving	1,900	1,900	1,900	1,900	1,900	1,900	30	34	35	36	37	38
Pecos	34,199	34,199	34,199	34,199	34,199	34,199	67	90	91	92	93	94
Reeves	9,500	9,500	9,500	9,500	9,500	9,500	24	29	31	32	33	34
Ward	13,300	13,300	13,300	13,300	13,300	13,300	31	42	44	45	46	47
Winkler	18,999	18,999	18,999	18,999	18,999	18,999	32	48	51	52	53	55
District												
Middle Pecos GCD	34,199	34,199	34,199	34,199	34,199	34,199	67	90	91	92	93	94
Management Area												
Out-of-State	7,793	7,793	7,793	7,793	7,793	7,793	0	1	1	2	2	2
GMA 1	21,226	21,226	21,226	21,226	21,226	21,226	4	13	19	23	27	30
GMA 2	18,252	18,252	18,252	18,252	18,252	18,252	1	13	24	33	38	41
GMA 3	76,770	76,770	76,770	76,770	76,770	76,770	32	43	45	46	47	48
GMA 6	133	133	133	133	133	133	0	1	2	3	4	5
GMA 7	64,030	64,030	64,030	64,030	64,030	64,030	3	13	18	21	23	24

Appendix C

Spread Analysis Results for Groundwater Management Area 7

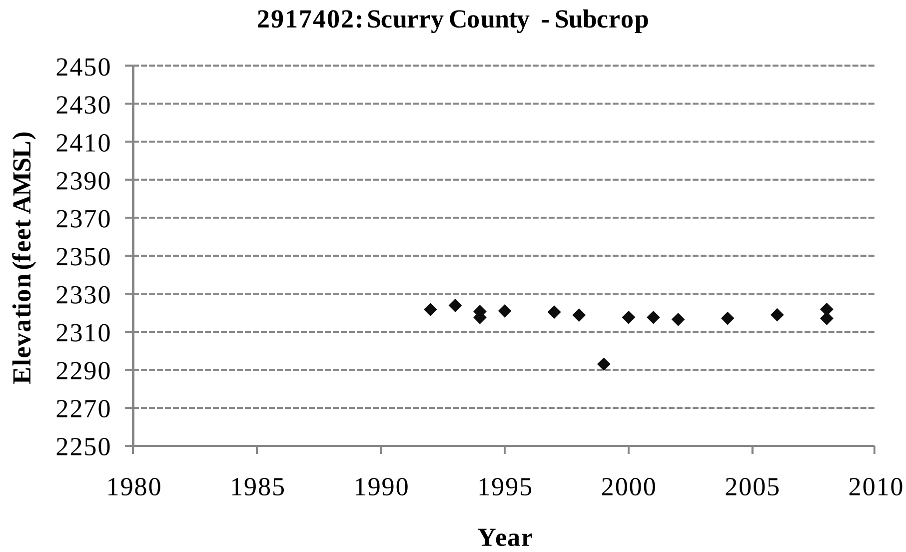

Figure C-2. Hydrograph of state well 2917402 located in the subcrop portion of the Dockum Aquifer in Scurry County.

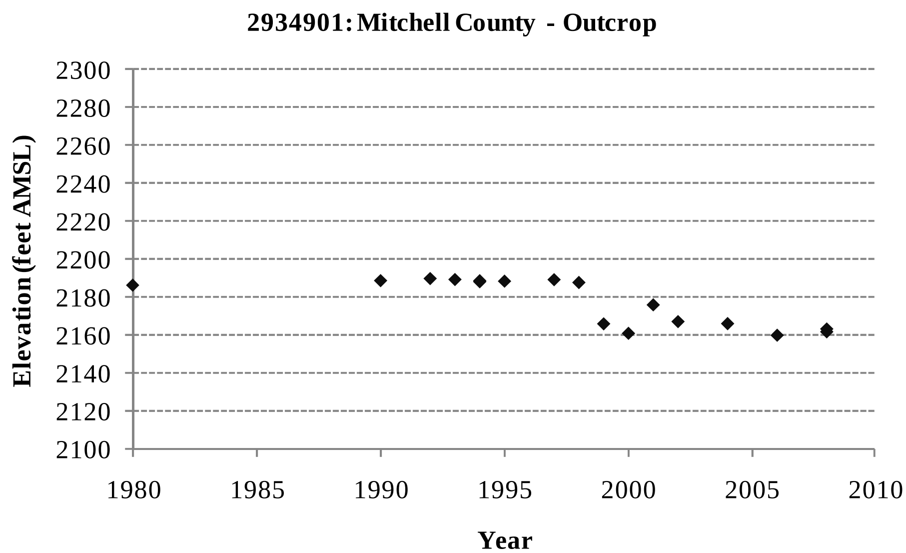

Figure C-3. Hydrograph of state well 2934901 located in the outcrop portion of the Dockum Aquifer in Mitchell County.

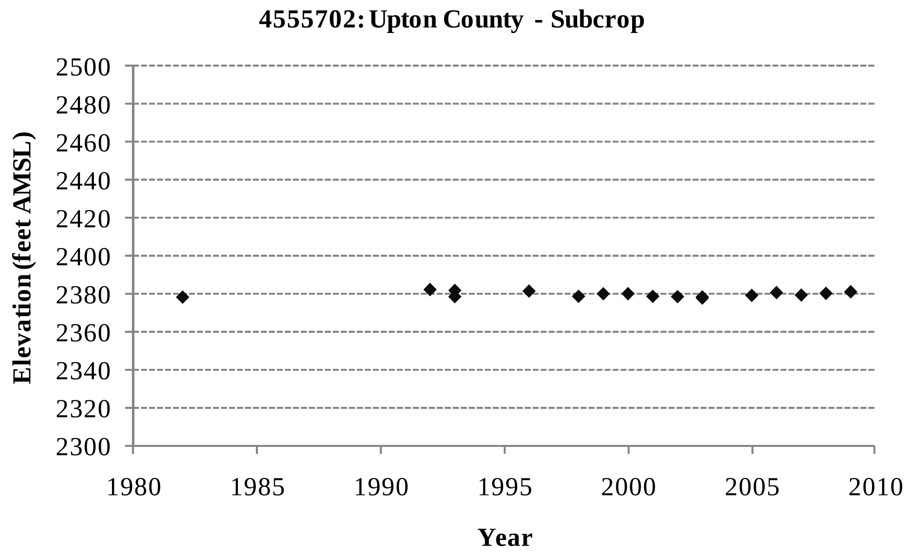

Figure C-4. Hydrograph of state well 4555702 located in the subcrop portion of the Dockum Aquifer in Upton County.

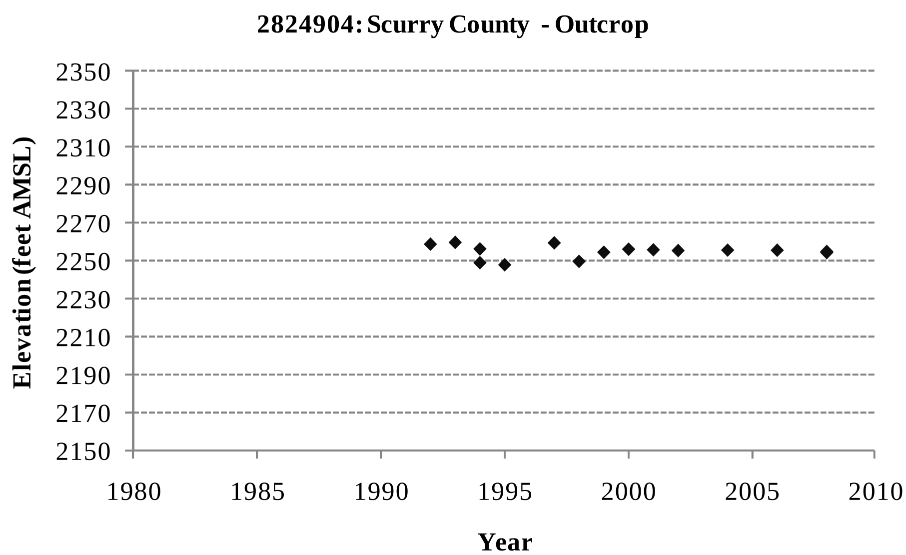

Figure C-5. Hydrograph of state well 2824904 located in the outcrop portion of the Dockum Aquifer in Scurry County.

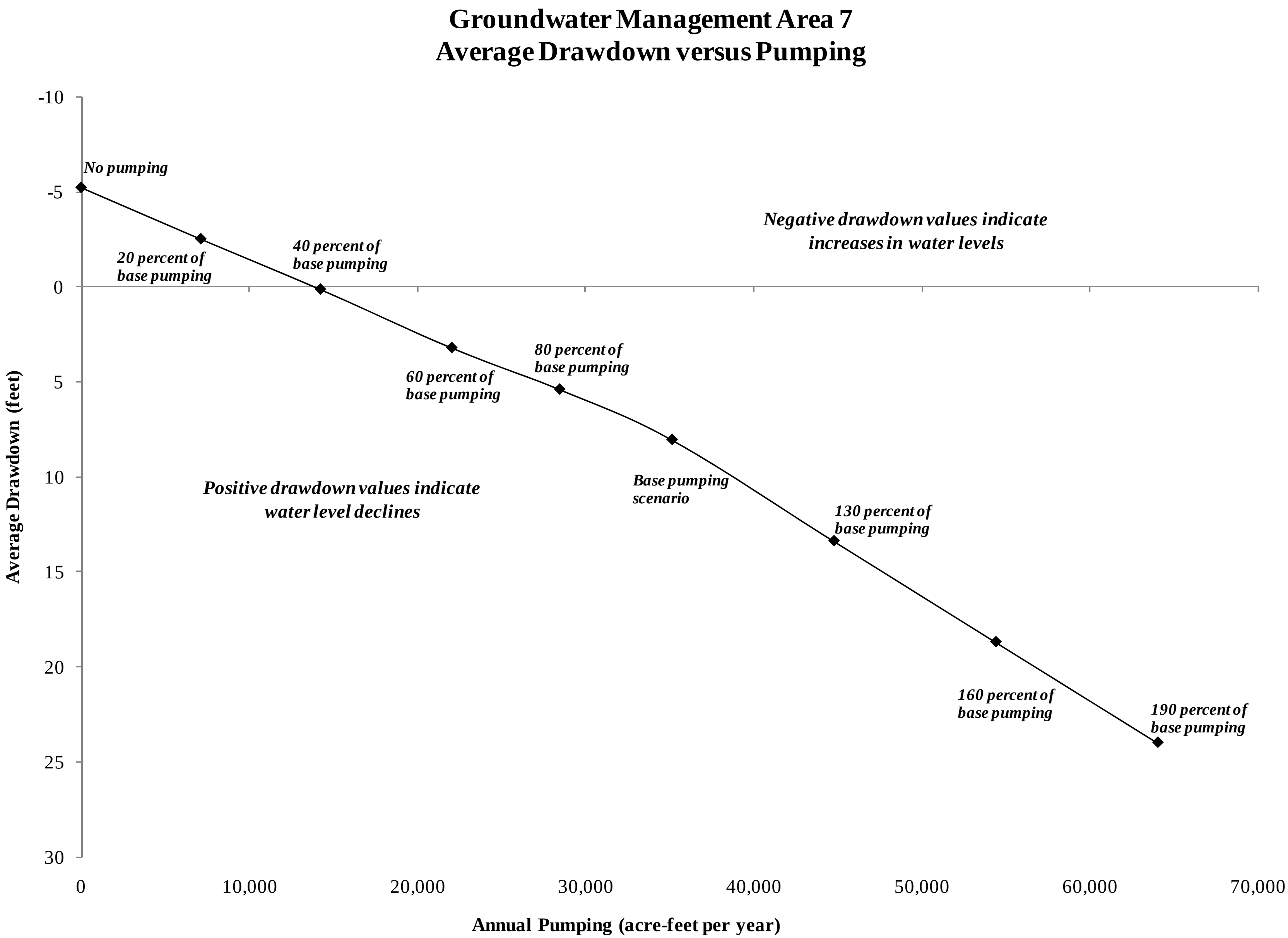

Figure C-1. Average drawdown through time for each of the pumping scenarios for Groundwater Management Area 7.

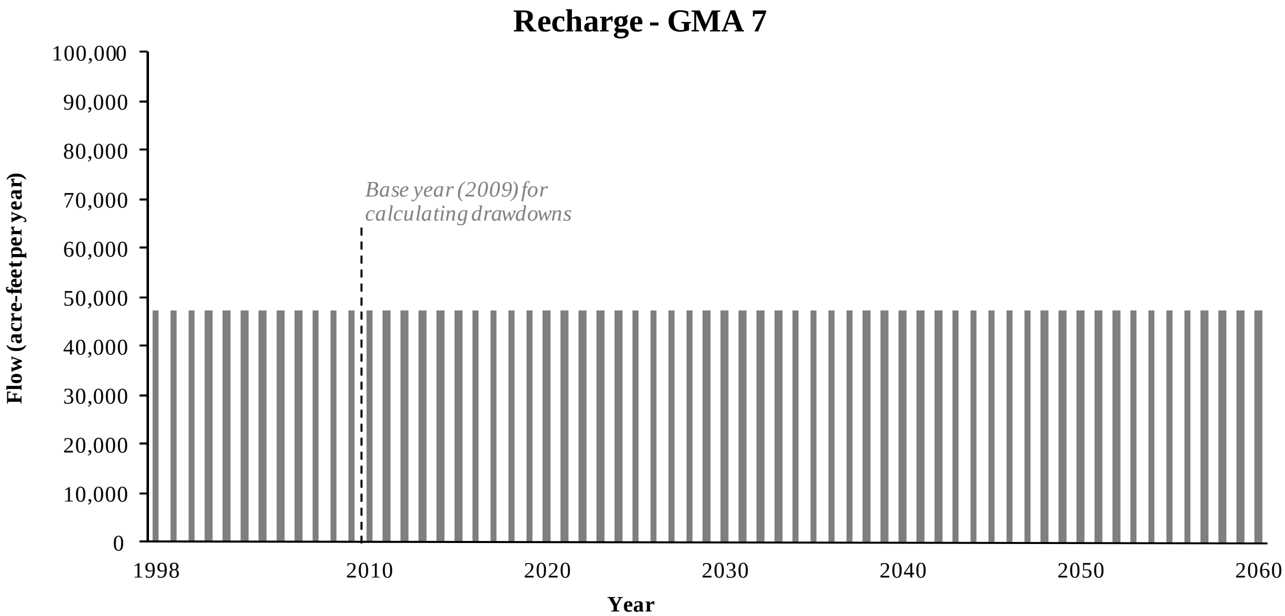

Figure C-6. Recharge to the Dockum Aquifer by year in the groundwater availability model for Groundwater Management Area 7.

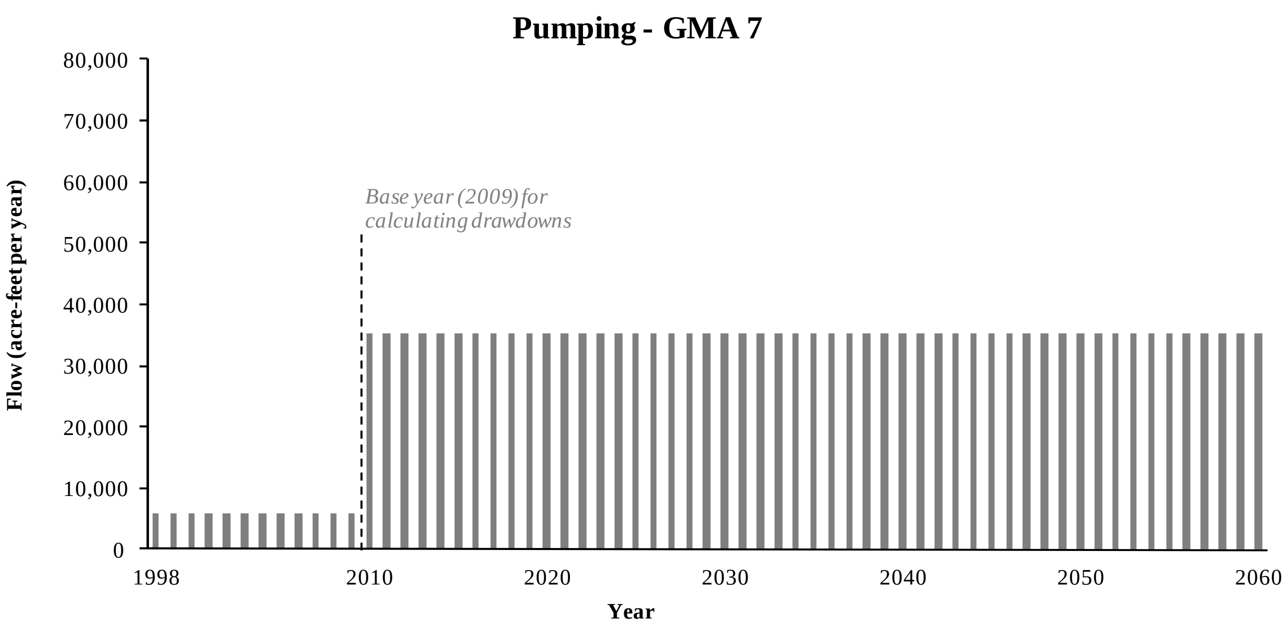

Figure C-7. Pumping output from the groundwater availability model in the Dockum Aquifer by year for Groundwater Management Area 7.

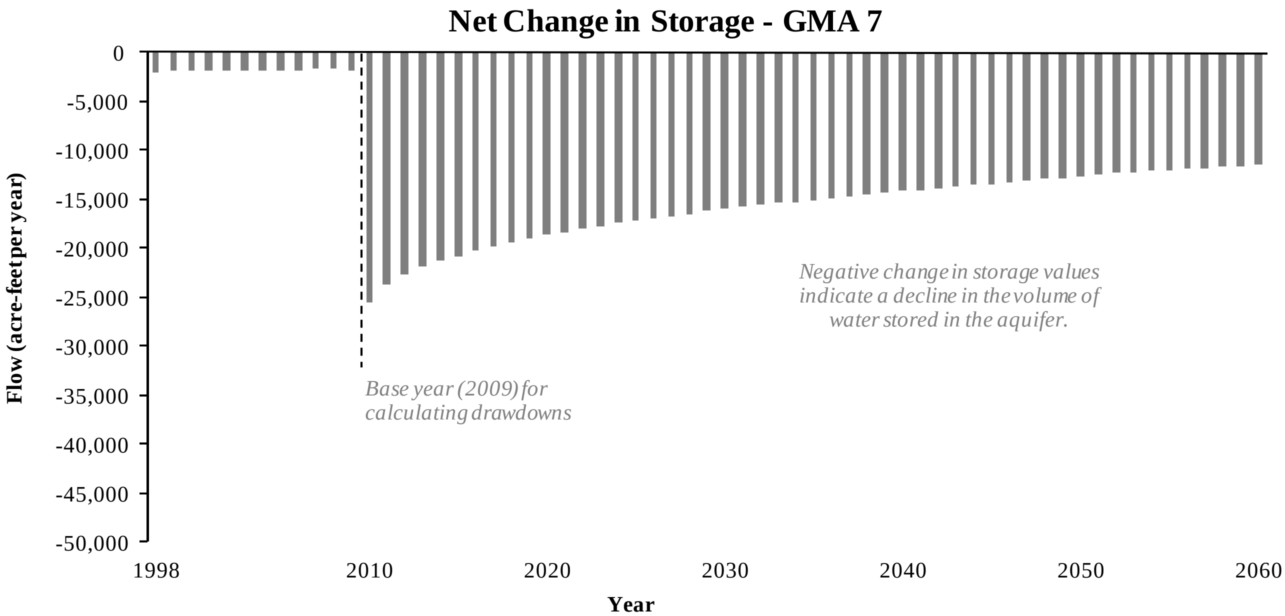

Figure C-8. Net change in storage (the volume of water stored in the aquifer) by year in the Dockum Aquifer for Groundwater Management Area 7.

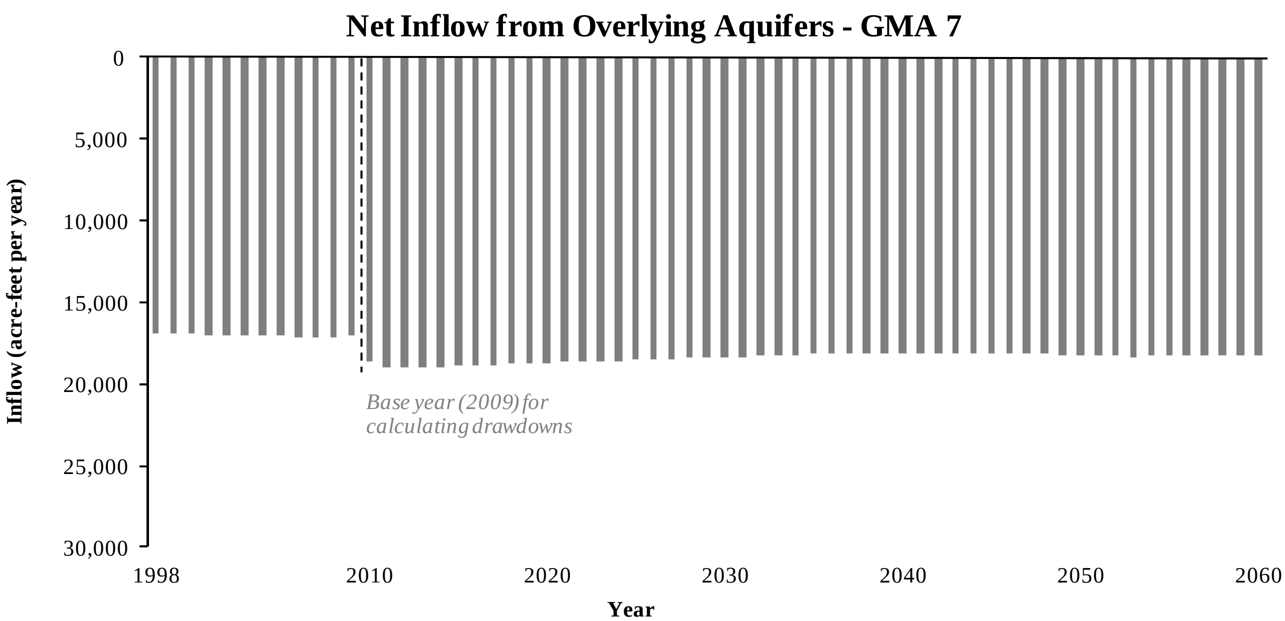

Figure C-9. Net inflow from overlying aquifers into the Dockum Aquifer by year for Groundwater Management Area 7.

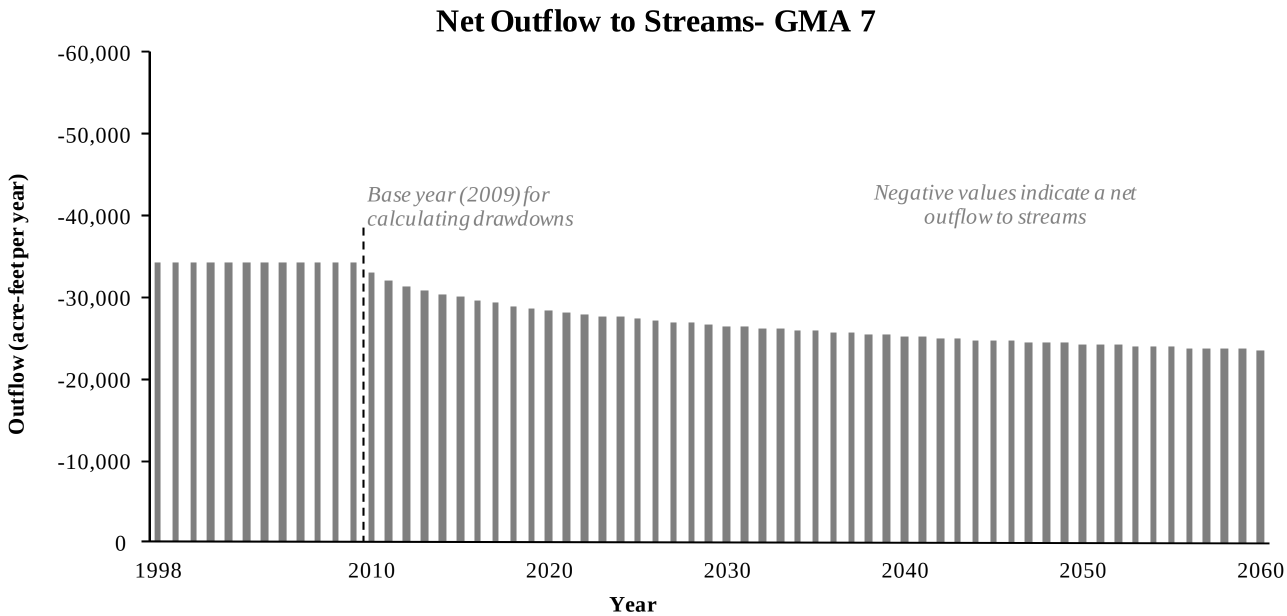

Figure C-10. Net flow outflow to streams from the Dockum Aquifer by year for Groundwater Management Area 7.

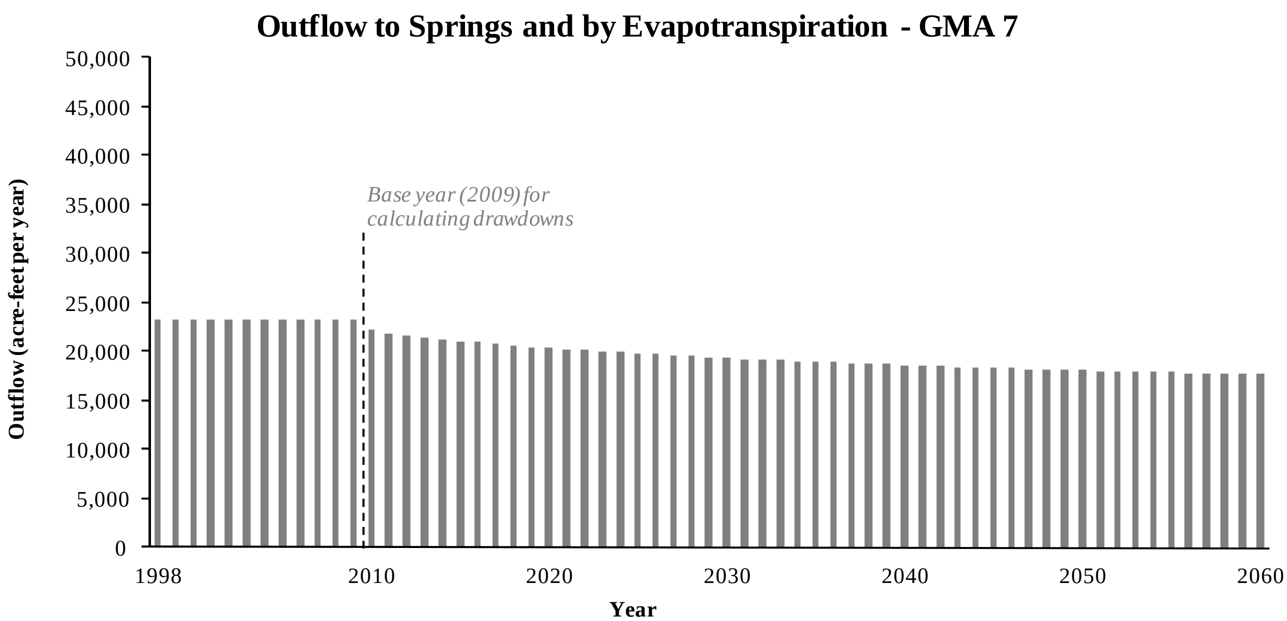

Figure C-11. Outflow from the Dockum Aquifer in Groundwater Management Area 3 to springs and by evapotranspiration.

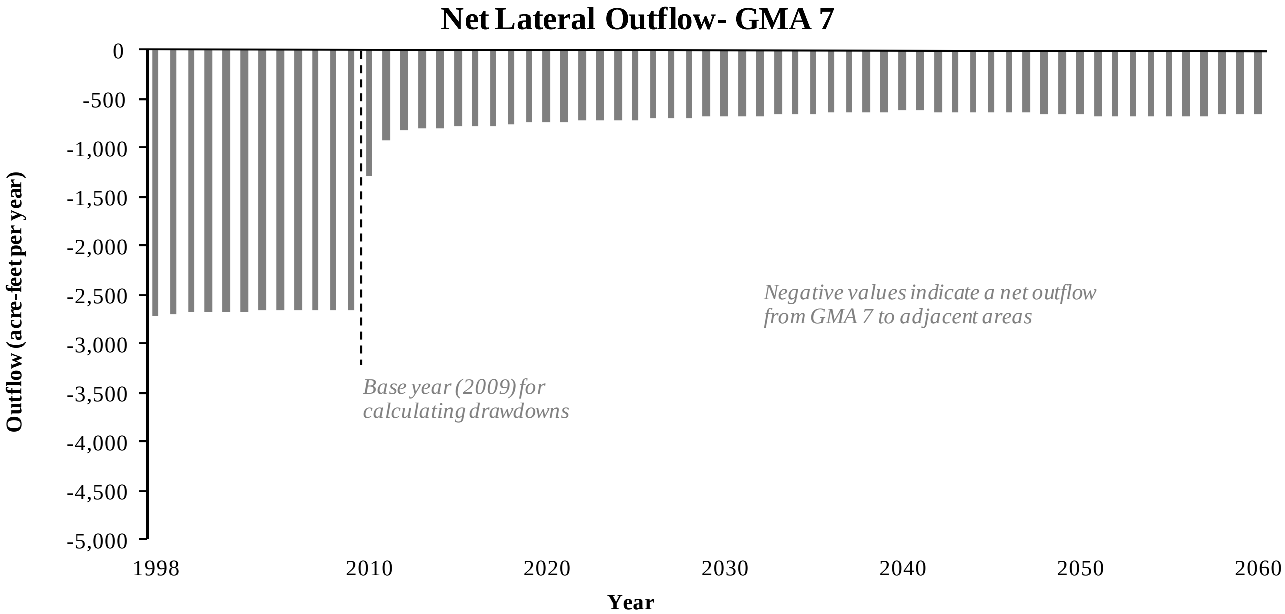

Figure C-12. Net lateral outflow from the Dockum Aquifer in Groundwater Management Area 3 to adjacent areas.

Table C-1. Pumping (in acre-feet per year) and average drawdown (in feet) in the Dockum Aquifer between 2010 and 2060 for each county, groundwater conservation district (GCD), and groundwater management area (GMA) for Groundwater Management Area 7 for the base scenario. UWCD is Underground Water Conservation District.

Base Scenario	Pumping						Average drawdown					
	2010	**2020**	**2030**	**2040**	**2050**	**2060**	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
County												
Coke	0	0	0	0	0	0	0	0	0	0	0	1
Crockett	2	2	2	2	2	2	0	2	3	4	4	4
Ector	528	528	528	528	528	528	0	2	4	6	7	7
Glasscock	0	0	0	0	0	0	0	1	1	2	2	3
Irion	0	0	0	0	0	0	0	1	2	2	2	2
Midland	1,400	1,400	1,400	1,400	1,400	1,400	1	7	13	18	22	25
Mitchell	21,875	21,875	21,875	21,875	21,875	21,875	0	2	3	4	4	5
Nolan	3,800	3,800	3,800	3,800	3,800	3,800	14	18	21	22	24	25
Pecos	18,000	18,000	18,000	18,000	18,000	18,000	33	46	46	46	47	47
Reagan	2,064	2,064	2,064	2,064	2,064	2,064	1	4	6	7	7	7
Scurry	1,208	1,208	1,208	1,208	1,208	1,208	0	0	0	0	0	0
Sterling	10	10	10	10	10	10	0	0	0	1	1	1
Tom Green	0	0	0	0	0	0	0	2	2	3	3	3
Upton	219	219	219	219	219	219	1	3	4	5	6	6
District												
Coke County UWCD	0	0	0	0	0	0	0	0	0	0	0	1
Crockett County GCD	2	2	2	2	2	2	0	2	3	4	4	4
Glasscock GCD	1,027	1,027	1,027	1,027	1,027	1,027	0	1	2	2	3	3
Irion County WCD	0	0	0	0	0	0	0	1	2	2	2	2
Lone Wolf GCD	21,875	21,875	21,875	21,875	21,875	21,875	0	2	3	4	4	5
Middle Pecos GCD	18,000	18,000	18,000	18,000	18,000	18,000	33	46	46	46	47	47
Santa Rita UWCD	1,037	1,037	1,037	1,037	1,037	1,037	1	4	6	6	7	7
Sterling County UWCD	10	10	10	10	10	10	0	0	0	1	1	1
Wes-Tex GCD	3,800	3,800	3,800	3,800	3,800	3,800	14	18	21	22	24	25
Management Area												
Out-of-State	7,793	7,793	7,793	7,793	7,793	7,793	0	1	1	1	2	2
GMA 1	21,226	21,226	21,226	21,226	21,226	21,226	4	13	19	23	27	30
GMA 2	9,607	9,607	9,607	9,607	9,607	9,607	1	12	23	31	37	39
GMA 3	38,961	38,961	38,961	38,961	38,961	38,961	17	24	25	26	27	27
GMA 6	70	70	70	70	70	70	0	1	1	2	3	4
GMA 7	35,144	35,144	35,144	35,144	35,144	35,144	1	3	5	6	7	8

Table C-2. Pumping (in acre-feet per year) and average drawdown (in feet) in the Dockum Aquifer between 2010 and 2060 for each county, groundwater conservation district (GCD), and groundwater management area (GMA) for Groundwater Management Area 7 for the zero pumping scenario. UWCD is Underground Water Conservation District.

Zero Pumping Scenario	Pumping						Average drawdown					
	2010	2020	2030	2040	2050	2060	2010	2020	2030	2040	2050	2060
County												
Coke	0	0	0	0	0	0	0	0	0	0	0	0
Crockett	0	0	0	0	0	0	-1	-9	-13	-15	-15	-16
Ector	0	0	0	0	0	0	0	1	3	4	5	5
Glasscock	0	0	0	0	0	0	-1	-5	-5	-5	-5	-5
Irion	0	0	0	0	0	0	0	-1	-3	-4	-4	-5
Midland	0	0	0	0	0	0	0	4	9	14	17	20
Mitchell	0	0	0	0	0	0	0	0	0	0	0	0
Nolan	0	0	0	0	0	0	-8	-8	-9	-9	-9	-10
Pecos	0	0	0	0	0	0	-2	-3	-3	-3	-3	-3
Reagan	0	0	0	0	0	0	-6	-33	-42	-45	-46	-47
Scurry	0	0	0	0	0	0	0	0	-1	-1	-1	-1
Sterling	0	0	0	0	0	0	0	-1	-2	-2	-2	-2
Tom Green	0	0	0	0	0	0	0	-3	-6	-8	-9	-9
Upton	0	0	0	0	0	0	-1	-6	-8	-10	-10	-11
District												
Coke County UWCD	0	0	0	0	0	0	0	0	0	0	0	0
Crockett County GCD	0	0	0	0	0	0	-1	-9	-13	-15	-15	-16
Glasscock GCD	0	0	0	0	0	0	-3	-12	-14	-14	-14	-14
Irion County WCD	0	0	0	0	0	0	0	-1	-3	-4	-5	-5
Lone Wolf GCD	0	0	0	0	0	0	0	0	0	0	0	0
Middle Pecos GCD	0	0	0	0	0	0	-2	-3	-3	-3	-3	-3
Santa Rita UWCD	0	0	0	0	0	0	-4	-28	-37	-40	-42	-42
Sterling County UWCD	0	0	0	0	0	0	0	-1	-2	-2	-2	-2
Wes-Tex GCD	0	0	0	0	0	0	-8	-8	-9	-9	-9	-10
Management Area												
Out-of-State	7,793	7,793	7,793	7,793	7,793	7,793	0	1	1	1	1	2
GMA 1	21,226	21,226	21,226	21,226	21,226	21,226	4	13	18	23	27	30
GMA 2	0	0	0	0	0	0	1	11	21	29	34	36
GMA 3	0	0	0	0	0	0	-1	-3	-4	-4	-4	-4
GMA 6	0	0	0	0	0	0	-1	-1	0	0	1	1
GMA 7	0	0	0	0	0	0	-1	-5	-6	-6	-5	-5

Table C-3. Pumping (in acre-feet per year) and average drawdown (in feet) in the Dockum Aquifer between 2010 and 2060 for each county, groundwater conservation district (GCD), and groundwater management area (GMA) for Groundwater Management Area 7 for the 20 percent of base pumping scenario. UWCD is Underground Water Conservation District.

20 Percent of Base	Pumping						Average drawdown					
	2010	2020	2030	2040	2050	2060	2010	2020	2030	2040	2050	2060
County												
Coke	0	0	0	0	0	0	0	0	0	0	0	0
Crockett	0	0	0	0	0	0	0	-7	-10	-11	-12	-12
Ector	106	106	106	106	106	106	0	1	3	4	5	5
Glasscock	0	0	0	0	0	0	-1	-4	-4	-4	-3	-3
Irion	0	0	0	0	0	0	0	-1	-2	-3	-3	-3
Midland	280	280	280	280	280	280	0	5	10	15	18	21
Mitchell	4,375	4,375	4,375	4,375	4,375	4,375	0	0	0	1	1	1
Nolan	760	760	760	760	760	760	0	0	1	1	1	1
Pecos	3,600	3,600	3,600	3,600	3,600	3,600	5	7	7	7	7	7
Reagan	413	413	413	413	413	413	-4	-25	-32	-35	-36	-36
Scurry	242	242	242	242	242	242	0	0	0	0	-1	-1
Sterling	2	2	2	2	2	2	0	-1	-1	-1	-1	-1
Tom Green	0	0	0	0	0	0	0	-2	-5	-6	-6	-6
Upton	44	44	44	44	44	44	0	-4	-6	-7	-7	-7
District												
Coke County UWCD	0	0	0	0	0	0	0	0	0	0	0	0
Crockett County GCD	0	0	0	0	0	0	0	-7	-10	-11	-12	-12
Glasscock GCD	205	205	205	205	205	205	-2	-10	-11	-11	-11	-10
Irion County WCD	0	0	0	0	0	0	0	-1	-2	-3	-3	-4
Lone Wolf GCD	4,375	4,375	4,375	4,375	4,375	4,375	0	0	0	1	1	1
Middle Pecos GCD	3,600	3,600	3,600	3,600	3,600	3,600	5	7	7	7	7	7
Santa Rita UWCD	207	207	207	207	207	207	-3	-22	-28	-31	-32	-32
Sterling County UWCD	2	2	2	2	2	2	0	-1	-1	-1	-1	-1
Wes-Tex GCD	760	760	760	760	760	760	0	0	1	1	1	1
Management Area												
Out-of-State	7,793	7,793	7,793	7,793	7,793	7,793	0	1	1	1	2	2
GMA 1	21,226	21,226	21,226	21,226	21,226	21,226	4	13	18	23	27	30
GMA 2	1,921	1,921	1,921	1,921	1,921	1,921	1	11	22	30	35	37
GMA 3	7,706	7,706	7,706	7,706	7,706	7,706	2	3	3	3	3	3
GMA 6	14	14	14	14	14	14	0	0	0	1	1	2
GMA 7	7,115	7,115	7,115	7,115	7,115	7,115	-1	-3	-4	-3	-3	-3

Table C-4. Pumping (in acre-feet per year) and average drawdown (in feet) in the Dockum Aquifer between 2010 and 2060 for each county, groundwater conservation district (GCD), and groundwater management area (GMA) for Groundwater Management Area 7 for the 40 percent of base pumping scenario. UWCD is Underground Water Conservation District.

40 Percent of Base	Pumping						Average drawdown					
	2010	2020	2030	2040	2050	2060	2010	2020	2030	2040	2050	2060
County												
Coke	0	0	0	0	0	0	0	0	0	0	0	0
Crockett	1	1	1	1	1	1	0	-5	-7	-8	-8	-8
Ector	211	211	211	211	211	211	0	1	3	5	6	6
Glasscock	0	0	0	0	0	0	-1	-3	-3	-2	-2	-2
Irion	0	0	0	0	0	0	0	0	-1	-2	-2	-2
Midland	560	560	560	560	560	560	0	6	11	16	19	22
Mitchell	8,750	8,750	8,750	8,750	8,750	8,750	0	1	1	1	2	2
Nolan	1,520	1,520	1,520	1,520	1,520	1,520	4	5	6	6	7	7
Pecos	7,200	7,200	7,200	7,200	7,200	7,200	12	17	17	17	17	17
Reagan	826	826	826	826	826	826	-3	-18	-23	-24	-25	-25
Scurry	483	483	483	483	483	483	0	0	0	0	0	0
Sterling	4	4	4	4	4	4	0	0	-1	-1	-1	-1
Tom Green	0	0	0	0	0	0	0	-1	-3	-4	-4	-4
Upton	88	88	88	88	88	88	0	-2	-3	-4	-4	-4
District												
Coke County UWCD	0	0	0	0	0	0	0	0	0	0	0	0
Crockett County GCD	1	1	1	1	1	1	0	-5	-7	-8	-8	-8
Glasscock GCD	411	411	411	411	411	411	-2	-7	-8	-8	-7	-7
Irion County WCD	0	0	0	0	0	0	0	0	-1	-2	-2	-2
Lone Wolf GCD	8,750	8,750	8,750	8,750	8,750	8,750	0	1	1	1	2	2
Middle Pecos GCD	7,200	7,200	7,200	7,200	7,200	7,200	12	17	17	17	17	17
Santa Rita UWCD	415	415	415	415	415	415	-2	-15	-20	-22	-22	-22
Sterling County UWCD	4	4	4	4	4	4	0	0	-1	-1	-1	-1
Wes-Tex GCD	1,520	1,520	1,520	1,520	1,520	1,520	4	5	6	6	7	7
Management Area												
Out-of-State	7,793	7,793	7,793	7,793	7,793	7,793	0	1	1	1	2	2
GMA 1	21,226	21,226	21,226	21,226	21,226	21,226	4	13	19	23	27	30
GMA 2	3,843	3,843	3,843	3,843	3,843	3,843	1	12	22	30	35	37
GMA 3	15,412	15,412	15,412	15,412	15,412	15,412	6	8	9	9	9	9
GMA 6	28	28	28	28	28	28	0	0	0	1	2	2
GMA 7	14,230	14,230	14,230	14,230	14,230	14,230	0	-2	-1	-1	0	0

Table C-5. Pumping (in acre-feet per year) and average drawdown (in feet) in the Dockum Aquifer between 2010 and 2060 for each county, groundwater conservation district (GCD), and groundwater management area (GMA) for Groundwater Management Area 7 for the 60 percent of base pumping scenario. UWCD is Underground Water Conservation District.

60 Percent of Base	Pumping						Average drawdown					
	2010	2020	2030	2040	2050	2060	2010	2020	2030	2040	2050	2060
County												
Coke	0	0	0	0	0	0	0	0	0	0	0	0
Crockett	1	1	1	1	1	1	0	-3	-4	-4	-4	-4
Ector	317	317	317	317	317	317	0	2	4	5	6	6
Glasscock	0	0	0	0	0	0	0	-1	-1	-1	0	0
Irion	0	0	0	0	0	0	0	0	0	0	-1	-1
Midland	1,537	1,537	1,537	1,537	1,537	1,537	1	7	13	18	22	25
Mitchell	13,126	13,126	13,126	13,126	13,126	13,126	0	1	2	2	3	3
Nolan	2,280	2,280	2,280	2,280	2,280	2,280	7	9	11	12	12	13
Pecos	10,800	10,800	10,800	10,800	10,800	10,800	19	26	26	26	26	26
Reagan	1,238	1,238	1,238	1,238	1,238	1,238	-2	-11	-13	-14	-14	-14
Scurry	725	725	725	725	725	725	0	0	0	0	0	0
Sterling	6	6	6	6	6	6	0	0	0	0	0	0
Tom Green	0	0	0	0	0	0	0	0	-1	-2	-2	-2
Upton	131	131	131	131	131	131	0	0	-1	-1	0	0
District												
Coke County UWCD	0	0	0	0	0	0	0	0	0	0	0	0
Crockett County GCD	1	1	1	1	1	1	0	-3	-4	-4	-4	-4
Glasscock GCD	616	616	616	616	616	616	-1	-4	-4	-4	-4	-3
Irion County WCD	0	0	0	0	0	0	0	0	0	-1	-1	-1
Lone Wolf GCD	13,126	13,126	13,126	13,126	13,126	13,126	0	1	2	2	3	3
Middle Pecos GCD	10,800	10,800	10,800	10,800	10,800	10,800	19	26	26	26	26	26
Santa Rita UWCD	622	622	622	622	622	622	-1	-9	-11	-12	-12	-12
Sterling County UWCD	6	6	6	6	6	6	0	0	0	0	0	0
Wes-Tex GCD	2,280	2,280	2,280	2,280	2,280	2,280	7	9	11	12	12	13
Management Area												
Out-of-State	7,793	7,793	7,793	7,793	7,793	7,793	0	1	1	1	2	2
GMA 1	21,226	21,226	21,226	21,226	21,226	21,226	4	13	19	23	27	30
GMA 2	5,764	5,764	5,764	5,764	5,764	5,764	1	12	22	31	36	38
GMA 3	23,124	23,124	23,124	23,124	23,124	23,124	10	14	15	15	15	15
GMA 6	42	42	42	42	42	42	0	0	1	1	2	3
GMA 7	22,041	22,041	22,041	22,041	22,041	22,041	0	0	1	2	3	3

Table C-6. Pumping (in acre-feet per year) and average drawdown (in feet) in the Dockum Aquifer between 2010 and 2060 for each county, groundwater conservation district (GCD), and groundwater management area (GMA) for Groundwater Management Area 7 for the 80 percent of base pumping scenario. UWCD is Underground Water Conservation District.

80 Percent of Base	Pumping						Average drawdown					
	2010	2020	2030	2040	2050	2060	2010	2020	2030	2040	2050	2060
County												
Coke	0	0	0	0	0	0	0	0	0	0	0	0
Crockett	2	2	2	2	2	2	0	0	0	0	0	0
Ector	422	422	422	422	422	422	0	2	4	5	6	7
Glasscock	0	0	0	0	0	0	0	0	0	0	1	1
Irion	0	0	0	0	0	0	0	1	1	1	1	1
Midland	1,120	1,120	1,120	1,120	1,120	1,120	1	7	12	17	21	24
Mitchell	17,500	17,500	17,500	17,500	17,500	17,500	0	1	2	3	3	4
Nolan	3,040	3,040	3,040	3,040	3,040	3,040	11	14	16	17	18	19
Pecos	14,400	14,400	14,400	14,400	14,400	14,400	26	35	36	36	36	36
Reagan	1,651	1,651	1,651	1,651	1,651	1,651	-1	-3	-4	-4	-4	-4
Scurry	967	967	967	967	967	967	0	0	0	0	0	0
Sterling	8	8	8	8	8	8	0	0	0	0	0	0
Tom Green	0	0	0	0	0	0	0	1	1	0	0	0
Upton	175	175	175	175	175	175	0	1	1	2	2	3
District												
Coke County UWCD	0	0	0	0	0	0	0	0	0	0	0	0
Crockett County GCD	2	2	2	2	2	2	0	0	0	0	0	0
Glasscock GCD	822	822	822	822	822	822	0	-2	-1	-1	-1	0
Irion County WCD	0	0	0	0	0	0	0	1	1	1	1	1
Lone Wolf GCD	17,500	17,500	17,500	17,500	17,500	17,500	0	1	2	3	3	4
Middle Pecos GCD	14,400	14,400	14,400	14,400	14,400	14,400	26	35	36	36	36	36
Santa Rita UWCD	830	830	830	830	830	830	0	-2	-3	-3	-3	-3
Sterling County UWCD	8	8	8	8	8	8	0	0	0	0	0	0
Wes-Tex GCD	3,040	3,040	3,040	3,040	3,040	3,040	11	14	16	17	18	19
Management Area												
Out-of-State	7,793	7,793	7,793	7,793	7,793	7,793	0	1	1	1	2	2
GMA 1	21,226	21,226	21,226	21,226	21,226	21,226	4	13	19	23	27	30
GMA 2	7,685	7,685	7,685	7,685	7,685	7,685	1	12	23	31	36	39
GMA 3	30,825	30,825	30,825	30,825	30,825	30,825	13	19	20	21	21	21
GMA 6	56	56	56	56	56	56	0	0	1	2	3	3
GMA 7	28,459	28,459	28,459	28,459	28,459	28,459	1	2	3	4	5	5

Table C-7. Pumping (in acre-feet per year) and average drawdown (in feet) in the Dockum Aquifer between 2010 and 2060 for each county, groundwater conservation district (GCD), and groundwater management area (GMA) for Groundwater Management Area 7 for the 130 percent of base pumping scenario. UWCD is Underground Water Conservation District.

130 Percent of Base	Pumping						Average drawdown					
	2010	2020	2030	2040	2050	2060	2010	2020	2030	2040	2050	2060
County												
Coke	0	0	0	0	0	0	0	0	0	0	1	1
Crockett	3	3	3	3	3	3	1	8	11	13	13	14
Ector	686	686	686	686	686	686	0	3	5	7	8	8
Glasscock	0	0	0	0	0	0	0	2	2	3	4	4
Irion	0	0	0	0	0	0	0	5	7	8	9	9
Midland	1,820	1,820	1,820	1,820	1,820	1,820	1	8	14	20	24	27
Mitchell	28,438	28,438	28,438	28,438	28,438	28,438	0	2	4	5	6	7
Nolan	4,940	4,940	4,940	4,940	4,940	4,940	19	25	28	31	33	34
Pecos	23,399	23,399	23,399	23,399	23,399	23,399	45	61	62	63	63	63
Reagan	2,683	2,683	2,683	2,683	2,683	2,683	3	20	26	29	30	31
Scurry	1,571	1,571	1,571	1,571	1,571	1,571	0	0	0	1	1	1
Sterling	13	13	13	13	13	13	0	1	1	1	2	2
Tom Green	0	0	0	0	0	0	0	4	7	8	8	8
Upton	285	285	285	285	285	285	1	5	8	10	11	12
District												
Coke County UWCD	0	0	0	0	0	0	0	0	0	0	1	1
Crockett County GCD	3	3	3	3	3	3	1	8	11	13	13	14
Glasscock GCD	1,145	1,145	1,145	1,145	1,145	1,145	1	4	5	6	6	7
Irion County WCD	0	0	0	0	0	0	0	5	7	8	9	9
Lone Wolf GCD	28,438	28,438	28,438	28,438	28,438	28,438	0	2	4	5	6	7
Middle Pecos GCD	23,399	23,399	23,399	23,399	23,399	23,399	45	61	62	63	63	63
Santa Rita UWCD	1,539	1,539	1,539	1,539	1,539	1,539	3	20	26	29	30	31
Sterling County UWCD	13	13	13	13	13	13	0	1	1	1	2	2
Wes-Tex GCD	4,940	4,940	4,940	4,940	4,940	4,940	19	25	28	31	33	34
Management Area												
Out-of-State	7,793	7,793	7,793	7,793	7,793	7,793	0	1	1	2	2	2
GMA 1	21,226	21,226	21,226	21,226	21,226	21,226	4	13	19	23	27	30
GMA 2	12,488	12,488	12,488	12,488	12,488	12,488	1	13	24	32	37	40
GMA 3	51,564	51,564	51,564	51,564	51,564	51,564	22	31	33	33	34	35
GMA 6	91	91	91	91	91	91	0	1	2	3	3	4
GMA 7	44,772	44,772	44,772	44,772	44,772	44,772	1	7	9	11	12	13

Table C-8. Pumping (in acre-feet per year) and average drawdown (in feet) in the Dockum Aquifer between 2010 and 2060 for each county, groundwater conservation district (GCD), and groundwater management area (GMA) for Groundwater Management Area 7 for the 160 percent of base pumping scenario. UWCD is Underground Water Conservation District.

160 Percent of Base	Pumping						Average drawdown					
	2010	**2020**	**2030**	**2040**	**2050**	**2060**	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
County												
Coke	0	0	0	0	0	0	0	0	0	1	1	1
Crockett	3	3	3	3	3	3	1	13	19	22	23	24
Ector	845	845	845	845	845	845	0	3	5	7	8	9
Glasscock	0	0	0	0	0	0	1	3	4	4	5	5
Irion	0	0	0	0	0	0	1	9	13	15	15	16
Midland	2,240	2,240	2,240	2,240	2,240	2,240	1	9	15	21	25	29
Mitchell	35,001	35,001	35,001	35,001	35,001	35,001	1	3	5	6	7	8
Nolan	6,080	6,080	6,080	6,080	6,080	6,080	24	31	36	39	42	44
Pecos	28,799	28,799	28,799	28,799	28,799	28,799	57	76	77	78	79	79
Reagan	3,302	3,302	3,302	3,302	3,302	3,302	6	36	47	51	53	54
Scurry	1,934	1,934	1,934	1,934	1,934	1,934	0	0	1	1	1	1
Sterling	16	16	16	16	16	16	0	1	2	2	3	3
Tom Green	0	0	0	0	0	0	1	7	11	13	13	14
Upton	350	350	350	350	350	350	1	8	12	15	16	18
District												
Coke County UWCD	0	0	0	0	0	0	0	0	0	1	1	1
Crockett County GCD	3	3	3	3	3	3	1	13	19	22	23	24
Glasscock GCD	1,262	1,262	1,262	1,262	1,262	1,262	1	6	8	9	10	10
Irion County WCD	0	0	0	0	0	0	1	9	13	15	16	16
Lone Wolf GCD	35,001	35,001	35,001	35,001	35,001	35,001	1	3	5	6	7	8
Middle Pecos GCD	28,799	28,799	28,799	28,799	28,799	28,799	57	76	77	78	79	79
Santa Rita UWCD	2,040	2,040	2,040	2,040	2,040	2,040	6	36	47	51	53	54
Sterling County UWCD	16	16	16	16	16	16	0	1	2	2	3	3
Wes-Tex GCD	6,080	6,080	6,080	6,080	6,080	6,080	24	31	36	39	42	44
Management Area												
Out-of-State	7,793	7,793	7,793	7,793	7,793	7,793	0	1	1	2	2	2
GMA 1	21,226	21,226	21,226	21,226	21,226	21,226	4	13	19	23	27	30
GMA 2	15,370	15,370	15,370	15,370	15,370	15,370	1	13	24	32	38	40
GMA 3	64,167	64,167	64,167	64,167	64,167	64,167	27	38	39	40	41	42
GMA 6	112	112	112	112	112	112	0	1	2	3	4	4
GMA 7	54,401	54,401	54,401	54,401	54,401	54,401	2	10	14	16	18	19

Table C-9. Pumping (in acre-feet per year) and average drawdown (in feet) in the Dockum Aquifer between 2010 and 2060 for each county, groundwater conservation district (GCD), and groundwater management area (GMA) for Groundwater Management Area 7 for the 190 percent of base pumping scenario. UWCD is Underground Water Conservation District.

190 Percent of Base	Pumping						Average drawdown					
	2010	2020	2030	2040	2050	2060	2010	2020	2030	2040	2050	2060
County												
Coke	0	0	0	0	0	0	0	0	0	1	1	1
Crockett	4	4	4	4	4	4	2	19	27	31	33	34
Ector	1,003	1,003	1,003	1,003	1,003	1,003	0	3	6	8	9	10
Glasscock	0	0	0	0	0	0	1	4	5	6	6	7
Irion	0	0	0	0	0	0	1	12	18	21	22	22
Midland	2,660	2,660	2,660	2,660	2,660	2,660	1	10	16	22	27	30
Mitchell	41,563	41,563	41,563	41,563	41,563	41,563	1	4	6	8	9	10
Nolan	7,220	7,220	7,220	7,220	7,220	7,220	30	38	44	48	52	55
Pecos	34,199	34,199	34,199	34,199	34,199	34,199	67	90	91	92	93	94
Reagan	3,921	3,921	3,921	3,921	3,921	3,921	9	53	67	73	76	78
Scurry	2,297	2,297	2,297	2,297	2,297	2,297	0	1	1	1	1	1
Sterling	19	19	19	19	19	19	0	2	3	3	3	4
Tom Green	0	0	0	0	0	0	1	10	15	18	19	19
Upton	416	416	416	416	416	416	2	10	16	20	22	23
District												
Coke County UWCD	0	0	0	0	0	0	0	0	0	1	1	1
Crockett County GCD	4	4	4	4	4	4	2	19	27	31	33	34
Glasscock GCD	1,379	1,379	1,379	1,379	1,379	1,379	2	9	11	12	13	14
Irion County WCD	0	0	0	0	0	0	1	13	19	21	22	23
Lone Wolf GCD	41,563	41,563	41,563	41,563	41,563	41,563	1	4	6	8	9	10
Middle Pecos GCD	34,199	34,199	34,199	34,199	34,199	34,199	67	90	91	92	93	94
Santa Rita UWCD	2,542	2,542	2,542	2,542	2,542	2,542	9	52	67	73	76	78
Sterling County UWCD	19	19	19	19	19	19	0	2	3	3	3	4
Wes-Tex GCD	7,220	7,220	7,220	7,220	7,220	7,220	30	38	44	48	52	55
Management Area												
Out-of-State	7,793	7,793	7,793	7,793	7,793	7,793	0	1	1	2	2	2
GMA 1	21,226	21,226	21,226	21,226	21,226	21,226	4	13	19	23	27	30
GMA 2	18,252	18,252	18,252	18,252	18,252	18,252	1	13	24	33	38	41
GMA 3	76,770	76,770	76,770	76,770	76,770	76,770	32	43	45	46	47	48
GMA 6	133	133	133	133	133	133	0	1	2	3	4	5
GMA 7	64,030	64,030	64,030	64,030	64,030	64,030	3	13	18	21	23	24