## *4.5 Llano Estacado Regional Water Plan*

In Section 1, the Llano Estacado Region is described. In Section 2 projections of population and water demand are presented. In Section 3, existing water supplies are tabulated. In Section 4, the projected water demands of Section 2 are compared with the existing water supplies of Section 3 and needs (shortages) for additional supplies are calculated. In Section 4.4, water management strategies are identified, described, and evaluated. The information from Sections 1, 2, 3, and 4 is used in the development of the following water plan for the region.

For purposes of developing the 2011 Llano Estacado Regional Water Plan, the LERWPG adopted a municipal water conservation goal of reducing per capita water use by 1 percent per year for those WUGs that have projected needs (shortages) and that had per capita water use in year 2000 that was greater than the Llano Estacado Region average per capita water use in 2000 of 172 gallons per person per day (gpcd). The goal is to continue the municipal water conservation water management strategy of reducing per capita water use by 1 percent per year until per capita water use is reduced to the year 2000 Region average municipal water use of 172 gpcd.

Water management strategies included in the plan to meet the needs of specific water user groups include municipal water conservation and local groundwater development for municipalities, and irrigation BMPs and an irrigation water conservation water management strategy for irrigators, while strategies that are not specific to a particular water user group, but instead are region-wide strategies include weather modification and brush management. The plan does not propose any changes to existing water contracts or option agreements. Further, the plan was created in close cooperation with each wholesale water provider in the region, and no strategy contained in the plan would adversely affect any existing water contracts, option agreements, or special water resources.

For each city with a projected need and a per capita water use of 172 gpcd or greater, municipal water conservation is included as a water management strategy until the goal of 172 gpcd is reached. Municipal water conservation beyond that which is estimated to be accomplished through low flow plumbing fixtures and the municipal water conservation strategy is not included, since municipal water conservation is estimated to cost more than the next available source of water; e.g. in the range of $627 per acft to $689 per acft compared to costs of local groundwater in the range of approximately $49 per acft to approximately $283 per acft.

Additional water supply to meet needs above those that can potentially be met through municipal water conservation is the expansion or replacement of existing wells or well fields with new wells. If the new wells or well fields are located on private property, the city will need to purchase that property or purchase water rights.

The proposed plan encourages the continued and expanded use of irrigation BMPs and an irrigation water conservation strategy to meet as much as possible of the projected irrigation needs of the region. Individual irrigators who have not already adopted irrigation BMPs and installed available efficient irrigation application equipment, such as Low Energy Precision Application (LEPA), Low Pressure Sprinkler Systems (LESA), and subsurface or drip irrigation will need to do so as soon as possible to conserve their current water supplies.

Non-specific strategies would contribute to increasing the region's water supplies on a widespread scale for all water user groups, as opposed to being specifically applicable to an individual user group. These include weather modification and brush control. Both weather modification and brush control have been and should continue to be carried out by underground water conservation districts, soil and water conservation districts, and private groups, as desired and supported by the citizens of local areas affected. The local choice is particularly appropriate for precipitation enhancement and brush control strategies.

The water management strategies are intended to assist in meeting the water needs of the region during all types of weather, but are especially directed at meeting needs during drought. In addition, these strategies were selected to contribute to sustainability of present supplies of groundwater. The detailed plans for each of the 21 counties of the Llano Estacado Planning Region are presented in alphabetic order below. In each county plan, each water user group of the county is listed, and if the user group has a projected need (shortage) during the planning horizon, a water management strategy to meet the need is included, except in the case of irrigated agriculture, for which it has been determined that it is not economically feasible to meet all of the projected needs at this time. The strategies selected are those that are estimated to be the lowest cost by virtue of the fact that they are the strategies located nearest to the location of need.

Drought Management is not a recommended water management strategy to meet projected water needs in Region O, in part because it cannot be demonstrated to be an economically feasible strategy. The TWDB socioeconomic impact analysis of unmet water needs in Region O shows income losses due to unmet irrigation, confined animal feeding,

business, and commercial water needs (shortages) of approximately $282 per acft/yr in 2010 increasing to approximately $457 per acft/yr in 2030, and to approximately $615 per acft/yr in 2060 (calculated from data in Table 4-24). The Water Conservation water management strategies recommended in the 2011 Regional Water Plan, together with the other water management strategies appear to the LERWPG to be superior to the use of Drought Management strategies that are costly to the economy and the people of the region, and unpredictable as to time of occurrence and duration. The uncertainty and the cost associated therewith is not acceptable to the LERWPG, thus Drought Management is not included as a recommended water management strategy. **However, the LERWPG recognizes the individual cities "Demand Management and Drought Contingency Plans" that are on file with the TCEQ. The surface water supplies of this plan are included only at the firm yield quantities and the groundwater supplies are included at the quantities estimated to be available through existing facilities and aquifer capabilities. Therefore, the LERWPG depends upon water users to follow their respective drought management plans and to implement any additional water conservation needed during droughts that may affect existing and planned water management strategies.**

(This page intentionally left blank.)

### *4.5.1 Bailey County Water Supply Plan*

Table 4.5-1 lists each water user group in Bailey County and its corresponding surplus or shortage in years 2030 and 2060. For each water user group with a projected shortage, a water supply plan has been developed and is presented in the following subsections.

***Table 4.5-1.***
***Bailey County Surplus/Shortage****

| *Water User Group* | *Surplus/Shortage*[1] | | *Comment* |
|---|---|---|---|
| | *2030 (acft/yr)* | *2060 (acft/yr)* | |
| City of Muleshoe | 0 | 0 | No projected surplus/shortage |
| County Other | 0 | 0 | No projected surplus/shortage |
| Industrial | 0 | 0 | No projected surplus/shortage |
| Steam Electric | 0 | 0 | No projected demand |
| Mining | 0 | 0 | No projected surplus/shortage |
| Irrigation | -84,647 | -83,220 | Projected shortage – see plan below |
| Beef Feedlot Livestock | 0 | 0 | No projected surplus/shortage |
| Range & All Other Livestock | 0 | 0 | No projected surplus/shortage |

[1] From Table 4-1, Section 4.1 – Water Needs Projections by Water User Group.

* Computations are at the county level of detail, and although the county data show a surplus or shortage, there no doubt are individual water users of each county who have a shortage when the county shows an overall surplus; e.g., the projected surplus water is not located such that those who have shortages can obtain it.

#### *4.5.1.1 The City of Muleshoe*

##### *4.5.1.1.1 Description of Supply*

- **Source:** Ogallala Aquifer
- **Current Supply:** Adequate to meet demands through 2060.

##### *4.5.1.1.2 Water Supply Plan*

Working within the planning criteria established by the LERWPG and TWDB, the following water supply plan is recommended for the City of Muleshoe.

- Municipal water conservation.

#### *4.5.1.1.3 Costs*

Costs of the recommended plan for the City of Muleshoe are:

a. Municipal water conservation:
   - Cost Source: Section 4.4.1, Table 4.4-8
   - Date to be Implemented: Prior to 2010
   - Annual Cost: See Table 4.5-2 for a cost summary of this option.

***Table 4.5-2.***
***Recommended Plan Costs by Decade for the City of Muleshoe***

| *Plan Element* | *2010* | *2020* | *2030* | *2040* | *2050* | *2060* |
|---|---|---|---|---|---|---|
| Projected Shortage (acft/yr) | 0 | 0 | 0 | 0 | 0 | 0 |
| **Municipal Water Conservation** | | | | | | |
| Quantity Available (acft/yr) | 79 | 81 | 67 | 51 | 44 | 44 |
| Annual Cost ($/yr) | $57,930 | $56,372 | $45,327 | $33,260 | $28,708 | $28,180 |
| Unit Cost ($/acft) | $733 | $696 | $676 | $652 | $652 | $640 |

### *4.5.1.2 Irrigation*

#### *4.5.1.2.1 Description of Supply*

- **Source:** Ogallala Aquifer and Reclaimed Water
- **Current Supply:** 96,917 acft/yr in 2010 declining to 74,851 acft/yr in 2060.

#### *4.5.1.2.2 Water Supply Plan*

The use of irrigation BMPs in the past in Bailey County has increased water use efficiency and thereby contributed to maintaining levels of irrigation production in the region. The Irrigation Water Conservation Water Management Strategy is recommended for Bailey County irrigation farmers (Section 4.4.1.2). However, it is not economically feasible to meet all of the irrigation needs (shortages) at this time.

#### *4.5.1.2.3 Costs*

a. Irrigation water conservation:
   - Cost Source: Section 4.4.1.2, Table 4.4-13A
   - Date to be Implemented: Prior to 2012
   - Total Cost: $13,440,000

- Annual Cost: $1,040,000; including debt service at 20 yrs useful life of systems (Table 4.5-3).

***Table 4.5-3.***
***Recommended Plan Costs by Decade for Irrigation – Bailey County***

| Plan Element | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|
| Projected Irrigation Need (Shortage) (acft/yr) | 81,561 | 85,721 | 84,647 | 84,229 | 83,647 | 83,220 |
| Irrigation Conservation Quantity (acft/yr) | 18,636 | 16,772 | 15,095 | 13,585 | 12,227 | 11,004 |
| Annual Cost (million dollars/ year)(Table 4.4-13A) | $1.17 | $1.17 | $1.17 | $1.17 | $1.17 | $1.17 |
| Unit Cost ($/acft) (Table 4.4-13B) | $63 | $70 | $78 | $86 | $96 | $106 |

(This page intentionally left blank.)

### *4.5.2 Briscoe County Water Supply Plan*

Table 4.5-4 lists each water user group in Briscoe County and their corresponding surplus or shortage in years 2030 and 2060. For each water user group with a projected shortage, a water supply plan has been developed and is presented in the following subsections.

***Table 4.5-4.***
***Briscoe County Surplus/Shortage****

| *Water User Group* | *Surplus/Shortage*[1] | | *Comment* |
|---|---|---|---|
| | *2030 (acft/yr)* | *2060 (acft/yr)* | |
| City of Silverton | -123 | -108 | To replace quantity from Lake Mackenzie |
| County Other (Quitague) | 0 | 0 | No projected surplus/shortage |
| Industrial | 0 | 0 | No projected demand |
| Steam Electric | 0 | 0 | No projected demand |
| Mining | 0 | 0 | No projected demand |
| Irrigation | -12,029 | -14,523 | Projected shortage – see plan below |
| Beef Feedlot Livestock | 0 | 0 | No projected demand |
| Range & All Other Livestock | 0 | 0 | No projected surplus/shortage |

[1] From Table 4-2, Section 4.1 – Water Needs Projections by Water User Group.

* Computations are at the county level of detail, and although the county data show a surplus or shortage, there no doubt are individual water users of each county who have a shortage when the county shows an overall surplus; e.g., the projected surplus water is not located such that those who have shortages can obtain it.

#### *4.5.2.1 The City of Silverton*

##### 4.5.2.1.1 Description of Supply

- **Source:** Ogallala Aquifer
- **Current Supply:** Additional supplies needed due to lack of dependability of quantities from Lake Mackenzie and poor water quality of existing wells.

##### 4.5.2.1.2 Water Supply Plan

Working within the planning criteria established by the LERWPG and TWDB, the following water supply plan is recommended to meet the projected shortages of the City of Silverton through 2060.

- Local groundwater development beginning in 2012 needed to supply 126 acft/yr in 2020, and 108 acfr/yr in 2060. There appears to be adequate saturated thickness of the Ogallala Aquifer approximately 12 miles from the City of Silverton into which new water supply wells can be located.

#### 4.5.2.1.3 Costs

Costs of the recommended plan for the City of Silverton to meet projected needs shortages are:

a. Local groundwater development (See Section 4.4.2 for scheduling and a cost summary of this option):
   - Cost Source: Section 4.4.2, Table 4.4-31
   - Date to be Implemented: 2012
   - Total Project Cost: $6,171,850
   - Annual Cost: See Table 4.5-5A for a cost summary of this option.

**Table 4.5-5A.**
Recommended Plan Costs by Decade for the City of Silverton

| *Plan Element* | *2010* | *2020* | *2030* | *2040* | *2050* | *2060* |
|---|---|---|---|---|---|---|
| Projected Shortage (acft/yr) | 128 | 126 | 123 | 115 | 111 | 108 |
| **Local Groundwater Development** | | | | | | |
| Quantity Available (acft/yr) | — | 126 | 123 | 115 | 111 | 108 |
| Annual Cost ($/yr) | — | $594,580 | $594,580 | $594,580 | $56,518 | $56,518 |
| Unit Cost ($/acft) | — | $1,399 | $1,399 | $1,399 | $509 | $523 |

### *4.5.2.2 Irrigation*

#### *4.5.2.2.1 Description of Supply*

- **Source:** Ogallala, Dockum, and Seymour Aquifers
- **Current Supply:** 26,635 acft/yr in 2010 declining to 6,481 acft/yr in 2060.

#### *4.5.2.2.2 Water Supply Plan*

The use of irrigation BMPs in the past in Briscoe County have increased water use efficiency and thereby contributed to maintaining levels of irrigation production in the region. The Irrigation Water Conservation Water Management Strategy is recommended for Briscoe

County irrigation farmers (Section 4.4.1.2). However, it is not economically feasible to meet all of the irrigation needs (shortages) at this time.

#### *4.5.2.2.3 Costs*

a. Irrigation water conservation:

- Cost Source: Section 4.4.1.2, Table 4.4-13A
- Date to be Implemented: Prior to 2010
- Total Cost: $4,730,000
- Annual Cost: $410,000; including debt service at 20 yrs useful life of systems (Table 4.5-5).

***Table 4.5-5.***
***Recommended Plan Costs by Decade for Irrigation – Briscoe County***

| Plan Element | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|
| Projected Irrigation Need (Shortage) (acft/yr) | 0 | 4,684 | 12,029 | 13,577 | 14,821 | 14,523 |
| Irrigation Conservation Quantity (acft/yr) | 6,555 | 5,900 | 5,310 | 4,779 | 4,301 | 3,871 |
| Annual Cost (million dollars/yr) (Table 4.4-13A) | $0.41 | $0.41 | $0.41 | $0.41 | $0.41 | $0.41 |
| Unit Cost ($/acft) (Table 4.4-13B) | $63 | $70 | $78 | $86 | $96 | $106 |

(This page intentionally left blank.)

### *4.5.3 Castro County Water Supply Plan*

Table 4.5-6 lists each water user group in Castro County and their corresponding surplus or shortage in years 2030 and 2060. For each water user group with a projected shortage, a water supply plan has been developed and is presented in the following subsections.

***Table 4.5-6.***
***Castro County Surplus/Shortage****

| *Water User Group* | *Surplus/Shortage*[1] | | *Comment* |
|---|---|---|---|
| | *2030 (acft/yr)* | *2060 (acft/yr)* | |
| City of Dimmitt | -744 | -844 | Projected shortage – see plan below |
| City of Hart | 0 | -82 | Projected shortage – see plan below |
| County Other | 0 | 0 | No projected surplus/shortage |
| Industrial | 0 | 0 | No projected surplus/shortage |
| Steam Electric | 0 | 0 | No projected demand |
| Mining | 0 | 0 | No projected demand |
| Irrigation | -263,849 | -346,166 | Projected shortage – see plan below |
| Beef Feedlot Livestock | -1,612 | -5,144 | Projected shortage – see plan below |
| Dairies | -450 | -1,228 | Projected shortage – see plan below |
| Range & All Other Livestock | 0 | 0 | No projected surplus/shortage |

[1] From Table 4-3, Section 4.1 – Water Needs Projections by Water User Group.

* Computations are at the county level of detail, and although the county data show a surplus or shortage, there no doubt are individual water users of each county who have a shortage when the county shows an overall surplus; e.g., the projected surplus water is not located such that those who have shortages can obtain it.

#### *4.5.3.1 The City of Dimmitt*

##### *4.5.3.1.1 Description of Supply*

- **Source:** Ogallala Aquifer
- **Current Supply:** Adequate to meet demands until approximately 2024, at which time additional supplies will be needed

##### *4.5.3.1.2 Water Supply Plan*

Working within the planning criteria established by the LERWPG and TWDB, the following water supply plan is recommended to meet the projected shortages of the City of Dimmitt through 2060.

- Municipal water conservation, and
- Local groundwater development beginning in 2019 needed to supply an additional 844 acft/yr in 2060. There appears to be adequate saturated thickness of the Ogallala Aquifer approximately 11 miles from the City of Dimmitt into which the city could locate new municipal water supply wells.

#### *4.5.3.1.3 Costs*

Costs of the recommended plan for the City of Dimmitt to meet 2060 shortages are:

a. Municipal water conservation:
   - Cost Source: Section 4.4.1, Table 4.4-8
   - Date to be Implemented: Prior to 2010
   - Annual Cost: See Table 4.5-7 for a cost summary of this option.

b. Local groundwater development (See Section 4.4.2 for scheduling and a cost summary of this option):
   - Cost Source: Section 4.4.2, Table 4.4-19
   - Date to be Implemented: 2019
   - Total Project Cost: $786,894
   - Annual Cost: See Table 4.5-7 for a cost summary of this option.

***Table 4.5-7.***
***Recommended Plan Costs by Decade for the City of Dimmitt***

| *Plan Element* | *2010* | *2020* | *2030* | *2040* | *2050* | *2060* |
|---|---|---|---|---|---|---|
| Projected Shortage (acft/yr) | 0 | 0 | 744 | 805 | 832 | 844 |
| **Municipal Water Conservation** | | | | | | |
| Quantity Available (acft/yr) | 75 | 110 | 97 | 81 | 75 | 74 |
| Annual Cost ($/yr) | $54,358 | $69,934 | $59,860 | $48,128 | $43,422 | $42,660 |
| Unit Cost ($/acft) | $725 | $636 | $617 | $594 | $579 | $576 |
| **Local Groundwater Development** | | | | | | |
| Quantity Available (acft/yr) | — | 446 | 810 | 729 | 1,070 | 963 |
| Annual Cost ($/yr) | — | $47,624 | $95,248 | $95,248 | $142,872 | $142,872 |
| Unit Cost ($/acft) | — | $107 | $118 | $131 | $134 | $148 |

### *4.5.3.2 The City of Hart*

#### *4.5.3.2.1 Description of Supply*

- **Source:** Ogallala Aquifer
- **Current Supply:** Adequate to meet demands until approximately 2045, at which time additional supplies will be needed

#### *4.5.3.2.2 Water Supply Plan*

Working within the planning criteria established by the LERWPG and TWDB, the following water supply plan is recommended to meet the projected shortages of the City of Hart through 2060.

- Local groundwater development beginning in 2045 needed to supply an additional 82 acft/yr in 2060. There appears to be adequate saturated thickness of the Ogallala Aquifer approximately two miles from the City of Hart into which the city could locate new municipal water supply wells.

#### *4.5.3.2.3 Costs*

Costs of the recommended plan for the City of Hart to meet 2060 shortages are:

a. Local groundwater development (See Section 4.4.2 for scheduling and a cost summary of this option):
   - Cost Source: Section 4.4.2, Table 4.4-23
   - Date to be Implemented: 2045
   - Total Project Cost: $509,256
   - Annual Cost: See Table 4.5-8 for a cost summary of this option.

***Table 4.5-8.***
***Recommended Plan Costs by Decade for the City of Hart***

| *Plan Element* | *2010* | *2020* | *2030* | *2040* | *2050* | *2060* |
|---|---|---|---|---|---|---|
| Projected Shortage (acft/yr) | 0 | 0 | 0 | 0 | 67 | 82 |
| **Local Groundwater Development** | | | | | | |
| Quantity Available (acft/yr) | — | — | — | — | 198 | 178 |
| Annual Cost ($/yr) | — | — | — | — | $63,446 | $63,446 |
| Unit Cost ($/acft) | — | — | — | — | $320 | $356 |

#### *4.5.3.3 Irrigation*

##### *4.5.3.3.1 Description of Supply*

- **Source:** Ogallala Aquifer and Reclaimed Water
- **Current Supply:** 337,973 acft/yr in 2010 declining to 47,060 acft/yr in 2060.

##### *4.5.3.3.2 Water Supply Plan*

The use of irrigation BMPs in the past in Castro County have increased water use efficiency and thereby contributed to maintaining levels of irrigation production in the region. The Irrigation Water Conservation Water Management Strategy is recommended for Castro County irrigation farmers (Section 4.4.1.2). However, it is not economically feasible to meet all of the irrigation needs (shortages) at this time.

##### *4.5.3.3.3 Costs*

a. Irrigation water conservation:
   - Cost Source: Section 4.4.1.2, Table 4.4-13A
   - Date to be Implemented: Prior to 2010
   - Total Cost: $30,490,000
   - Annual Cost: $2,660,000; including debt service at 20 yrs useful life of systems (Table 4.5-9).

#### *4.5.3.4 Confined Animal Feeding Operations (CAFOs) Beef Feedyards and Dairies*

##### *4.5.3.4.1 Description of Supply*

- **Source:** Ogallala Aquifer
- **Current Supply:** 8,022 acft/yr in 2010 declining to 5,808 acft/yr in 2060.

- Working within the planning criteria established by the LERWPG and TWDB, it is not feasible to meet the CAFO (Beef Feedyards and Dairies) needs (shortages) at this time, for the following reasons: (1) the CAFOs are owned by private individuals and are located several miles apart, (2) needs (shortages) of individual CAFOs are projected to develop at different times during the planning period, such that demands for quantities of water from water management strategies (WMSs) will not arise such that the WMSs can be successfully implemented from the financial standpoints, and (3) cost estimates of water management strategies evaluated appear to be in excess of affordability for CAFOs (Section 4.4.3.9). In addition, at the present time, it does not appear that there are organizations available to the CAFOs that have authority to implement water management strategies to deliver the needed water.

***Table 4.5-9.***
***Recommended Plan Costs by Decade for Irrigation and CAFOs – Castro County***

| Plan Element | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|
| Projected Irrigation Need (Shortage) (acft/yr) | 146,695 | 191,770 | 263,849 | 351,293 | 352,004 | 346,166 |
| Irrigation Conservation Quantity (acft/yr) | 42,268 | 38,041 | 34,237 | 30,813 | 27,732 | 24,959 |
| Annual Cost (million dollars/yr) (Table 4.4-13A) | $2.66 | $2.66 | $2.66 | $2.66 | $2.66 | $2.66 |
| Unit Cost ($/acft) (Table 4.4-13B) | $63 | $70 | $78 | $86 | $96 | $106 |
| | | | | | | |
| Projected CAFO Need (Shortage) (acft/yr) | --- | 759 | 2,062 | 5,028 | 5,953 | 6,372 |

(This page intentionally left blank.)

### *4.5.4 Cochran County Water Supply Plan*

Table 4.5-10 lists each water user group in Cochran County and its corresponding surplus or shortage in years 2030 and 2060. For each water user group with a projected shortage, a water supply plan has been developed and is presented in the following subsections.

***Table 4.5-10.***
***Cochran County Surplus/Shortage****

| *Water User Group* | *Surplus/Shortage*[1] | | *Comment* |
|---|---|---|---|
| | *2030 (acft/yr)* | *2060 (acft/yr)* | |
| City of Morton | -565 | -496 | Projected shortage – see plan below |
| County Other | 0 | 0 | No projected surplus/shortage |
| Industrial | 0 | 0 | No projected demand |
| Steam Electric | 0 | 0 | No projected demand |
| Mining | 0 | 0 | No projected surplus/shortage |
| Irrigation | -37,006 | -72,644 | Projected shortage – see plan below |
| Beef Feedlot Livestock | 0 | 0 | No projected surplus/shortage |
| Range & All Other Livestock | 0 | 0 | No projected surplus/shortage |

[1] From Table 4-4, Section 4.1 – Water Needs Projections by Water User Group.

* Computations are at the county level of detail, and although the county data show a surplus or shortage, there no doubt are individual water users of each county who have a shortage when the county shows an overall surplus; e.g., the projected surplus water is not located such that those who have shortages can obtain it.

#### *4.5.4.1 City of Morton*

##### *4.5.4.1.1 Description of Supply*

- **Source:** Ogallala Aquifer
- **Current Supply:** Adequate to meet demands until approximately 2015, at which time additional supplies will be needed

##### *4.5.4.1.2 Water Supply Plan*

Working within the planning criteria established by the LERWPG and TWDB, the following water supply plan is recommended to meet the projected shortages of the City of Morton through 2060.

- Municipal water conservation, and

- Local groundwater development beginning in 2015 needed to supply an additional 496 acft/yr in 2060. There appears to be adequate saturated thickness of the Ogallala Aquifer approximately three miles from the City of Morton into which the city could locate new municipal water supply wells.

#### *4.5.4.1.3 Costs*

Costs of the recommended plan for the City of Morton to meet 2060 shortages are:

a. Municipal water conservation:
   - Cost Source: Section 4.4.1, Table 4.4-8
   - Date to be Implemented: Prior to 2010
   - Annual Cost: See Table 4.5-11 for a cost summary of this option.

b. Local groundwater development (See Section 4.4.2 for scheduling and a cost summary of this option):
   - Cost Source: Section 4.4.2, Table 4.4-31
   - Date to be Implemented: 2015
   - Total Project Cost: $1,185,162
   - Annual Cost: See Table 4.5-13 for a cost summary of this option.

***Table 4.5-11.***
***Recommended Plan Costs by Decade for the City of Morton***

| *Plan Element* | *2010* | *2020* | *2030* | *2040* | *2050* | *2060* |
|---|---|---|---|---|---|---|
| Projected Shortage (acft/yr) | 0 | 560 | 565 | 547 | 521 | 496 |
| **Municipal Water Conservation** | | | | | | |
| Quantity Available (acft/yr) | 41 | 56 | 48 | 38 | 34 | 32 |
| Annual Cost ($/yr) | $29,859 | $36,110 | $30,383 | $23,334 | $20,272 | $19,286 |
| Unit Cost ($/acft) | $728 | $645 | $633 | $614 | $596 | $603 |
| **Local Groundwater Development** | | | | | | |
| Quantity Available (acft/yr) | — | 855 | 770 | 693 | 623 | 561 |
| Annual Cost ($/yr) | — | $158,842 | $158,842 | $158,842 | $55,519 | $55,519 |
| Unit Cost ($/acft) | — | $186 | $206 | $292 | $89 | $99 |

### *4.5.4.2 Irrigation*

#### *4.5.4.2.1 Description of Supply*

- **Source:** Ogallala Aquifer and Reclaimed Water

- **Current Supply:** 75,443 acft/yr in 2010 declining to 22,661 acft/yr in 2060.

#### *4.5.4.2.2 Water Supply Plan*

The use of irrigation BMPs in the past in Cochran County have increased water use efficiency and thereby contributed to maintaining levels of irrigation production in the region. The Irrigation Water Conservation Water Management Strategy is recommended for Cochran County irrigation farmers (Section 4.4.1.2). However, it is not economically feasible to meet all of the irrigation needs (shortages) at this time.

#### *4.5.4.3.3 Costs*

a. Irrigation water conservation:
   - Cost Source: Section 4.4.1.2, Table 4.4-13A
   - Date to be Implemented: Prior to 2010
   - Total Cost: $14,580,000
   - Annual Cost: $1,270,000; including debt service at 20 yrs useful life of systems (Table 4.5-12).

***Table 4.5-12.***
***Recommended Plan Costs by Decade for Irrigation – Cochran County***

| Plan Element | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|
| Projected Irrigation Need (Shortage) (acft/yr) | 39,909 | 38,596 | 37,006 | 35,505 | 76,645 | 72,644 |
| Irrigation Conservation Quantity (acft/yr) | 20,215 | 18,193 | 16,374 | 14,737 | 13,263 | 11,937 |
| Annual Cost (million dollars/yr) (Table 4.4-13A) | $1.27 | $1.27 | $1.27 | $1.27 | $1.27 | $1.27 |
| Unit Cost ($/acft) (Table 4.4-13B) | $63 | $70 | $78 | $86 | $96 | $106 |

(This page intentionally left blank.)

### *4.5.5 Crosby County Water Supply Plan*

Table 4.5-13 lists each water user group in Crosby County and its corresponding surplus or shortage in years 2030 and 2060. For each water user group with a projected shortage, a water supply plan has been developed and is presented in the following subsections.

***Table 4.5-13.***
***Crosby County Surplus/Shortage****

| *Water User Group* | *Surplus/Shortage*[1] | | *Comment* |
|---|---|---|---|
| | *2030 (acft/yr)* | *2060 (acft/yr)* | |
| City of Crosbyton | 0 | -336 | Projected shortage – see plan below |
| City of Lorenzo | -37 | -108 | Projected shortage – see plan below |
| City of Ralls | -4 | -318 | Projected shortage – see plan below |
| County Other | 100 | 100 | Projected surplus |
| Industrial | 0 | 0 | No projected surplus/shortage |
| Steam Electric | 0 | 0 | No projected demand |
| Mining | 0 | 0 | No projected surplus/shortage |
| Irrigation | -16,327 | -14,102 | Projected shortage – see plan below |
| Beef Feedlot Livestock | 0 | 0 | No projected surplus/shortage |
| Range & All Other Livestock | 0 | 0 | No projected surplus/shortage |

[1] From Table 4-5, Section 4.1 – Water Needs Projections by Water User Group.

* Computations are at the county level of detail, and although the county data show a surplus or shortage, there no doubt are individual water users of each county who have a shortage when the county shows an overall surplus; e.g., the projected surplus water is not located such that those who have shortages can obtain it.

#### *4.5.5.1 The City of Crosbyton*

##### *4.5.5.1.1 Description of Supply*

- **Source:** Ogallala Aquifer and White River Reservoir
- **Current Supply:** Adequate to meet demands until approximately 2005, at which time additional supplies will be needed

##### *4.5.5.1.2 Water Supply Plan*

Working within the planning criteria established by the LERWPG and TWDB, the following water supply plan is recommended to meet the projected shortages of the City of Crosbyton through 2060.

- Local groundwater development in partnership with the White River MWD needed to supply an additional 336 acft/yr in 2060.

#### *4.5.5.1.3 Costs*

Costs of the recommended plan for the City of Crosbyton to meet 2060 shortages are:

a. Local groundwater development in partnership with the White River MWD:
   - Cost Source: Section 4.4.3.8, Table 4.4-59
   - Date to be Implemented: 2015
   - Annual Cost: See Table 4.5-14 for a cost summary of this option.

***Table 4.5-14.***
***Recommended Plan Costs by Decade for the City of Crosbyton***

| *Plan Element* | *2010* | *2020* | *2030* | *2040* | *2050* | *2060* |
|---|---|---|---|---|---|---|
| Projected Shortage (acft/yr) | 0 | 0 | 0 | 0 | 0 | 336 |
| **Local Groundwater Development (with the White River MWD)** | | | | | | |
| Quantity Available (acft/yr) | 0 | 400 | 400 | 400 | 400 | 400 |
| Annual Cost ($/yr) | 0 | $18,200 | $18,200 | $18,200 | $18,200 | $18,200 |
| Unit Cost ($/acft) | -- | $45 | $45 | $45 | $45 | $45 |

### *4.5.5.2 The City of Lorenzo*

#### *4.5.5.2.1 Description of Supply*

- **Source:** Ogallala Aquifer
- **Current Supply:** Adequate to meet demands until approximately 2025, at which time additional supplies will be needed

#### *4.5.5.2.2 Water Supply Plan*

Working within the planning criteria established by the LERWPG and TWDB, the following water supply plan is recommended to meet the projected shortages of the City of Lorenzo through 2060.

- Local groundwater development beginning in 2021 needed to supply an additional 108 acft/yr in 2060. There appears to be adequate saturated thickness of the Ogallala Aquifer approximately two miles from the City of Lorenzo into which the city could locate new municipal water supply wells.

#### *4.5.5.2.3 Costs*

Costs of the recommended plan for the City of Lorenzo to meet 2060 shortages are:

a. Local groundwater development (See Section 4.4.2 for scheduling and a cost summary of this option):
   - Cost Source: Section 4.4.2, Table 4.4-26
   - Date to be Implemented: 2021
   - Total Project Cost: $349,250
   - Annual Cost: See Table 4.5-15 for a cost summary of this option.

***Table 4.5-15.***
***Recommended Plan Costs by Decade for the City of Lorenzo***

| *Plan Element* | *2010* | *2020* | *2030* | *2040* | *2050* | *2060* |
|---|---|---|---|---|---|---|
| Projected Shortage (acft/yr) | 0 | 0 | 37 | 69 | 92 | 108 |
| **Local Groundwater Development** | | | | | | |
| Quantity Available (acft/yr) | — | — | 206 | 185 | 167 | 150 |
| Annual Cost ($/yr) | — | — | $44,171 | $44,171 | $13,723 | $13,723 |
| Unit Cost ($/acft) | — | — | $214 | $239 | $82 | $91 |

### *4.5.5.3 The City of Ralls*

#### *4.5.5.3.1 Description of Supply*

- **Source:** White River Reservoir
- **Current Supply:** Adequate to meet demands until approximately 2005, at which time additional supplies will be needed.

#### *4.5.5.3.2 Water Supply Plan*

Working within the planning criteria established by the LERWPG and TWDB, the following water supply plan is recommended to meet the projected shortages of the City of Ralls through 2060.

- Local groundwater development in partnership with the White River MWD needed to supply an additional 318 acft/yr in 2060.

#### *4.5.5.3.3 Costs*

Costs of the recommended plan for the City of Ralls to meet 2060 shortages are:

a. Local groundwater development in partnership with the White River MWD:
   - Cost Source: Section 4.4.3.8, Table 4.4-59
   - Date to be Implemented: 2015
   - Annual Cost: See Table 4.5-16 for a cost summary of this option.

***Table 4.5-16.***
***Recommended Plan Costs by Decade for the City of Ralls***

| *Plan Element* | *2010* | *2020* | *2030* | *2040* | *2050* | *2060* |
|---|---|---|---|---|---|---|
| Projected Shortage (acft/yr) | 0 | 0 | 4 | 7 | 323 | 318 |
| **Local Groundwater Development (with the White River MWD)** | | | | | | |
| Quantity Available (acft/yr) | 0 | 400 | 400 | 400 | 400 | 400 |
| Annual Cost ($/yr) | -- | $18,200 | $18,200 | $18,200 | $18,200 | $18,200 |
| Unit Cost ($/acft) | -- | $45 | $45 | $45 | $45 | $45 |

### *4.5.5.4 Irrigation*

#### *4.5.5.4.1 Description of Supply*

- **Source:** Ogallala and Seymour Aquifers, and Reclaimed Water
- **Current Supply:** 98,329 acft/yr in 2010 declining to 81,408 acft/yr in 2060.

#### *4.5.5.4.2 Water Supply Plan*

The use of irrigation BMPs in the past in Crosby County have increased water use efficiency and thereby contributed to maintaining levels of irrigation production in the region. The Irrigation Water Conservation Water Management Strategy is recommended for Crosby County irrigation farmers (Section 4.4.1.2).

#### *4.5.5.3.3 Costs*

a. Irrigation water conservation:
   - Cost Source: Section 4.4.1.2, Table 4.4-13A
   - Date to be Implemented: Prior to 2012
   - Total Cost: $19,030,000

- Annual Cost: $1,660,000; including debt service at 20 yrs useful life of systems (Table 4.5-17).

***Table 4.5-17.***
***Recommended Plan Costs by Decade for Irrigation – Crosby County***

| Plan Element | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|
| Projected Irrigation Need (Shortage) (acft/yr) | 17,030 | 16,573 | 16,327 | 15,870 | 14,494 | 14,102 |
| Irrigation Conservation Quantity (acft/yr) | 26,380 | 23,742 | 21,368 | 19,231 | 17,308 | 15,577 |
| Annual Cost (million dollars/yr) (Table 4.4-13A) | $1.66 | $1.66 | $1.66 | $1.66 | $1.66 | $1.66 |
| Unit Cost ($/acft) (Table 4.4-13B) | $63 | $70 | $78 | $86 | $96 | $106 |

(This page intentionally left blank.)

### *4.5.6 Dawson County Water Supply Plan*

Table 4.5-18 lists each water user group in Dawson County and its corresponding surplus or shortage in years 2030 and 2060. For each water user group with a projected shortage, a water supply plan has been developed and is presented in the following subsections.

***Table 4.5-18.***
***Dawson County Surplus/Shortage****

| *Water User Group* | *Surplus/Shortage*[1] | | *Comment* |
|---|---|---|---|
| | *2030 (acft/yr)* | *2060 (acft/yr)* | |
| City of Lamesa | 383 | 228 | Projected surplus |
| City of O'Donnell (part) | 41 | 42 | Projected surplus |
| County Other | 0 | 0 | No projected surplus/shortage |
| Industrial | 0 | 0 | No projected surplus/shortage |
| Steam Electric | 0 | 0 | No projected demand |
| Mining | 0 | 0 | No projected surplus/shortage |
| Irrigation | -89,824 | -73,068 | Projected shortage – see plan below |
| Beef Feedlot Livestock | 0 | 0 | No projected demand |
| Range & All Other Livestock | 0 | 0 | No projected surplus/shortage |

[1] From Table 4-6, Section 4.1 – Water Needs Projections by Water User Group.

* Computations are at the county level of detail, and although the county data show a surplus or shortage, there no doubt are individual water users of each county who have a shortage when the county shows an overall surplus; e.g., the projected surplus water is not located such that those who have shortages can obtain it.

#### *4.5.6.1 The City of Lamesa*

##### *4.5.6.1.1 Description of Supply*

- **Source:** Ogallala Aquifer and Lake Meredith
- **Current Supply:** Adequate to meet demands through 2060.

##### *4.5.6.1.2 Water Supply Plan*

Working within the planning criteria established by the LERWPG and TWDB, the following water supply plan is recommended for the City of Lamesa.

- Municipal water conservation.

#### *4.5.6.1.3 Costs*

Costs of the recommended plan for the City of Lamesa are:

a. Municipal water conservation:
   - Cost Source: Section 4.4.1, Table 4.4-8
   - Date to be Implemented: Prior to 2012
   - Annual Cost: See Table 4.5-19 for a cost summary of this option.

***Table 4.5-19.***
***Recommended Plan Costs by Decade for the City of Lamesa***

| *Plan Element* | *2010* | *2020* | *2030* | *2040* | *2050* | *2060* |
|---|---|---|---|---|---|---|
| Projected Shortage (acft/yr) | 0 | 0 | 0 | 0 | 0 | 0 |
| **Municipal Water Conservation** | | | | | | |
| Quantity Available (acft/yr) | 212 | 400 | 501 | 471 | 448 | 431 |
| Annual Cost ($/yr) | $147,965 | $238,281 | $284,147 | $260,930 | $245,779 | $236,474 |
| Unit Cost ($/acft) | $698 | $596 | $567 | $554 | $549 | $549 |

### *4.5.6.2 Irrigation*

#### *4.5.6.2.1 Description of Supply*

- **Source:** Ogallala Aquifer
- **Current Supply:** 42,277 acft/yr in 2010 declining to 30,135 acft/yr in 2060.

#### *4.5.6.2.2 Water Supply Plan*

The use of irrigation BMPs in the past in Dawson County have increased water use efficiency and thereby contributed to maintaining levels of irrigation production in the region. The Irrigation Water Conservation Water Management Strategy is recommended for Dawson County irrigation farmers (Section 4.4.1.2). However, it is not economically feasible to meet all of the irrigation needs (shortages) at this time.

#### *4.5.6.3.3 Costs*

a. Irrigation water conservation:
   - Cost Source: Section 4.4.1.2, Table 4.4-13A
   - Date to be Implemented: Prior to 2012
   - Total Cost: $4,380,000

- Annual Cost: $380,000; including debt service at 20 yrs useful life of systems (Table 4.5-20).

***Table 4.5-20.***
***Recommended Plan Costs by Decade for Irrigation – Dawson County***

| Plan Element | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|
| Projected Irrigation Need (Shortage) (acft/yr) | 95,628 | 94,657 | 89,924 | 85,978 | 79,229 | 73,068 |
| Irrigation Conservation Quantity (acft/yr) | 6,080 | 5,472 | 4,925 | 4,432 | 3,989 | 3,590 |
| Annual Cost (million dollars/yr) (Table 4.4-13A) | $0.38 | $0.38 | $0.38 | $0.38 | $0.38 | $0.38 |
| Unit Cost ($/acft) (Table 4.4-13B) | $36 | $70 | $78 | $86 | $96 | $106 |

(This page intentionally left blank.)

### *4.5.7 Deaf Smith County Water Supply Plan*

Table 4.5-21 lists each water user group in Deaf Smith County and their corresponding surplus or shortage in years 2030 and 2060. For each water user group with a projected shortage, a water supply plan has been developed and is presented in the following subsections.

***Table 4.5-21.***
***Deaf Smith County Surplus/Shortage****

| *Water User Group* | *Surplus/Shortage*[1] | | *Comment* |
|---|---|---|---|
| | *2030 (acft/yr)* | *2060 (acft/yr)* | |
| City of Hereford | 3,751 | 3,789 | Projected surplus |
| County Other | 0 | 0 | No projected surplus/shortage |
| Industrial | 0 | 0 | No projected surplus/shortage |
| Steam Electric | 0 | 0 | No projected demand |
| Mining | 0 | 0 | No projected demand |
| Irrigation | -225,001 | -242,805 | Projected shortage – see plan below |
| Beef Feedlot Livestock | 0 | -582 | Projected shortage |
| Dairies | 0 | 0 | No projected surplus/shortage |
| Range & All Other Livestock | 0 | 0 | No projected surplus/shortage |

[1] From Table 4-7, Section 4.1 – Water Needs Projections by Water User Group.

* Computations are at the county level of detail, and although the county data show a surplus or shortage, there no doubt are individual water users of each county who have a shortage when the county shows an overall surplus; e.g., the projected surplus water is not located such that those who have shortages can obtain it.

#### *4.5.7.1 The City of Hereford*

##### *4.5.7.1.1 Description of Supply*

- **Source:** Ogallala Aquifer and Dockum Aquifer
- **Current Supply:** Adequate to meet demands through 2060.

##### *4.5.7.1.2 Water Supply Plan*

Working within the planning criteria established by the LERWPG and TWDB, the following water supply plan is recommended for the City of Hereford.

- Municipal water conservation.

#### *4.5.7.1.3 Costs*

Costs of the recommended plan for the City of Hereford are:

a. Municipal water conservation:
   - Cost Source: Section 4.4.1, Table 4.4-7
   - Date to be Implemented: Prior to 2012
   - Annual Cost: See Table 4.5-22 for a cost summary of this option.

***Table 4.5-22.***
***Recommended Plan Costs by Decade for the City of Hereford***

| *Plan Element* | *2010* | *2020* | *2030* | *2040* | *2050* | *2060* |
|---|---|---|---|---|---|---|
| Projected Shortage (acft/yr) | 0 | 0 | 0 | 0 | 0 | 0 |
| **Municipal Water Conservation** | | | | | | |
| Quantity Available (acft/yr) | 302 | 572 | 649 | 610 | 596 | 598 |
| Annual Cost ($/yr) | $212,336 | $341,834 | $372,020 | $340,279 | $329,440 | $330,411 |
| Unit Cost ($/acft) | $703 | $598 | $573 | $558 | $553 | $553 |

### *4.5.7.2 Irrigation*

#### *4.5.7.2.1 Description of Supply*

- **Source:** Ogallala Aquifer and Reclaimed Water
- **Current Supply:** 189,659 acft/yr in 2010 declining to 63,968 acft/yr in 2060.

#### *4.5.7.2.2 Water Supply Plan*

The use of irrigation BMPs in the past in Deaf Smith County have increased water use efficiency and thereby contributed to maintaining levels of irrigation production in the region. The Irrigation Water Conservation Water Management Strategy is recommended for Deaf Smith County irrigation farmers (Section 4.4.1.2). However, it is not economically feasible to meet all of the irrigation needs (shortages) at this time.

#### *4.5.7.3.3 Costs*

a. Irrigation water conservation:
   - Cost Source: Section 4.4.1.2, Table 4.4-13A
   - Date to be Implemented: Prior to 2012
   - Total Cost: $30,470,000

- Annual Cost: $2,660,000; including debt service at 20 yrs useful life of systems (Table 4.5-23).

***Table 4.5-23.***
***Recommended Plan Costs by Decade for Irrigation and CAFOs – Deaf Smith County***

| Plan Element | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|
| Projected Irrigation Need (Shortage) (acft/yr) | 171,481 | 195,821 | 225,001 | 254,754 | 247,310 | 242,805 |
| Irrigation Conservation Quantity (acft/yr) | 42,246 | 38,022 | 34,219 | 30,797 | 27,718 | 24,946 |
| Annual Cost (million dollars/yr) (Table 4.4-13A) | $2.66 | $2.66 | $2.66 | $2.66 | $2.66 | $2.66 |
| Unit Cost ($/acft) (Table 4.4-13B) | $63 | $70 | $78 | $86 | $96 | $106 |
| | | | | | | |
| Projected CAFO Need (Shortage) (acft/yr) | --- | --- | --- | 517 | 548 | 582 |

### *4.5.7.3 Confined Animal Feeding Operations (CAFOs) Beef Feedyards and Dairies*

#### *4.5.7.3.1 Description of Supply*

- **Source:** Ogallala Aquifer
- **Current Supply:** 10,142 acft/yr in 2010, increasing to 14,364 acft/yr in 2060, with demand increasing by a greater quantity of 582 acft/yr in 2060.

- Working within the planning criteria established by the LERWPG and TWDB, is not feasible to meet the CAFO (Beef Feedyards and Dairies) needs (shortages) at this time, for the following reasons: (1) the CAFOs are owned by private individuals and are located several miles apart, (2) needs (shortages) of individual CAFOs are projected to develop at different times during the planning period, such that demands for quantities of water from water management strategies (WMSs) will not arise such that the WMSs can be successfully implemented from the financial standpoints, and (3) cost estimates of water management strategies evaluated appear to be in excess of affordability for CAFOs (Section 4.4.3.9). In addition, at the present time, it does not appear that there are organizations available to the CAFOs that have authority to implement water management strategies to deliver the needed water.

(This page intentionally left blank.)

### *4.5.8 Dickens County Water Supply Plan*

Table 4.5-24 lists each water user group in Dickens County and its corresponding surplus or shortage in years 2030 and 2060. For each water user group with a projected shortage, a water supply plan has been developed and is presented in the following subsections.

***Table 4.5-24.***
***Dickens County Surplus/Shortage****

| *Water User Group* | *Surplus/Shortage*[1] | | *Comment* |
|---|---|---|---|
| | *2030 (acft/yr)* | *2060 (acft/yr)* | |
| City of Spur | 0 | -257 | Projected shortage – see plan below |
| County Other | 80 | 74 | Projected surplus |
| Industrial | 0 | 0 | No projected demand |
| Steam Electric | 0 | 0 | No projected demand |
| Mining | 0 | 0 | No projected surplus/shortage |
| Irrigation | -3,053 | -2,663 | Projected shortage – see plan below |
| Beef Feedlot Livestock | 0 | 0 | No projected demand |
| Range & All Other Livestock | 0 | 0 | No projected surplus/shortage |

1 From Table 4-8, Section 4.1 – Water Needs Projections by Water User Group.

* Computations are at the county level of detail, and although the county data show a surplus or shortage, there no doubt are individual water users of each county who have a shortage when the county shows an overall surplus; e.g., the projected surplus water is not located such that those who have shortages can obtain it.

#### *4.5.8.1 The City of Spur*

##### *4.5.8.1.1 Description of Supply*

- **Source:** White River Reservoir
- **Current Supply:** Adequate to meet demands until approximately 2005, at which time additional supplies will be needed.

##### *4.5.8.1.2 Water Supply Plan*

Working within the planning criteria established by the LERWPG and TWDB, the following water supply plan is recommended for the City of Spur.

- Municipal water conservation; and
- Local groundwater development in partnership with the White River MWD needed to supply an additional 257 acft/yr in 2060.

#### *4.5.8.1.3 Costs*

Costs of the recommended plan for the City of Spur are:

a. Municipal water conservation:
   - Cost Source: Section 4.4.1, Table 4.4-8
   - Date to be Implemented: Prior to 2012
   - Annual Cost: See Table 4.5-25 for a cost summary of this option.

b. Local groundwater development in partnership with the White River MWD:
   - Cost Source: Section 4.4.3.8, Table 4.4-59
   - Date to be Implemented: 2015
   - Annual Cost: See Table 4.5-25 for a cost summary of this option.

***Table 4.5-25.***
***Recommended Plan Costs by Decade for the City of Spur***

| *Plan Element* | *2010* | *2020* | *2030* | *2040* | *2050* | *2060* |
|---|---|---|---|---|---|---|
| Projected Shortage (acft/yr) | 0 | 0 | 0 | 0 | 151 | 257 |
| **Municipal Water Conservation** | | | | | | |
| Quantity Available (acft/yr) | 21 | 42 | 54 | 50 | 48 | 48 |
| Annual Cost ($/yr) | $14,901 | $24,732 | $30,270 | $27,573 | $25,775 | $25,775 |
| Unit Cost ($/acft) | $710 | $589 | $561 | $551 | $537 | $537 |
| **Local Groundwater Development (with the White River MWD)** | | | | | | |
| Quantity Available (acft/yr) | 400 | 400 | 400 | 400 | 400 | 400 |
| Annual Cost ($/yr) | $18,200 | $18,200 | $18,200 | $18,200 | $18,200 | $18,200 |
| Unit Cost ($/acft) | $45 | $45 | $45 | $45 | $45 | $45 |

### *4.5.8.2 Irrigation*

#### *4.5.8.2.1 Description of Supply*

- **Source:** Ogallala Aquifer
- **Current Supply:** 5,796 acft/yr in 2010 declining to 5,171 acft/yr in 2060.

#### *4.5.8.2.2 Water Supply Plan*

The use of irrigation BMPs in the past in Dickens County have increased water use efficiency and thereby contributed to maintaining levels of irrigation production in the region.

The Irrigation Water Conservation Water Management Strategy is recommended for Dickens County irrigation farmers (Section 4.4.1.2). However, it is not economically feasible to meet all of the irrigation needs (shortages) at this time.

#### *4.5.8.3.3 Costs*

a. Irrigation water conservation:

- Cost Source: Section 4.4.1.2, Table 4.4-13A
- Date to be Implemented: Prior to 2012
- Total Cost: $1,300,000
- Annual Cost: $110,000; including debt service at 20 yrs useful life of systems (Table 4.5-26).

***Table 4.5-26.***
***Recommended Plan Costs by Decade for Irrigation – Dickens County***

| Plan Element | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|
| Projected Irrigation Need (Shortage) (acft/yr) | 3,321 | 3,185 | 3,053 | 2,921 | 2,792 | 2,663 |
| Irrigation Conservation Quantity (acft/yr) | 1,803 | 1,622 | 1,460 | 1,314 | 1,183 | 1,064 |
| Annual Cost (million dollars/yr) (Table 4.4-13A) | $0.11 | $0.11 | $0.11 | $0.11 | $0.11 | $0.11 |
| Unit Cost ($/acft) (Table 4.4-13B) | $63 | $70 | $78 | $86 | $96 | $106 |

(This page intentionally left blank.)

### *4.5.9 Floyd County Water Supply Plan*

Table 4.5-27 lists each water user group in Floyd County and its corresponding surplus or shortage in years 2030 and 2060. For each water user group with a projected shortage, a water supply plan has been developed and is presented in the following subsections.

***Table 4.5-27.***
***Floyd County Surplus/Shortage****

| *Water User Group* | *Surplus/Shortage*[1] | | *Comment* |
|---|---|---|---|
| | *2030 (acft/yr)* | *2060 (acft/yr)* | |
| City of Floydada | 0 | 0 | No projected surplus/shortage |
| City of Lockney | -240 | -212 | Projected shortage – see plan below |
| County Other | 0 | 0 | No projected surplus/shortage |
| Industrial | 0 | 0 | No projected demand |
| Steam Electric | 0 | 0 | No projected demand |
| Mining | 0 | 0 | No projected demand |
| Irrigation | -108,967 | -100,073 | Projected shortage – see plan below |
| Beef Feedlot Livestock | 0 | 0 | No projected surplus/shortage |
| Range & All Other Livestock | 0 | 0 | No projected surplus/shortage |

[1] From Table 4-9, Section 4.1 – Water Needs Projections by Water User Group.

* Computations are at the county level of detail, and although the county data show a surplus or shortage, there no doubt are individual water users of each county who have a shortage when the county shows an overall surplus; e.g., the projected surplus water is not located such that those who have shortages can obtain it.

#### *4.5.9.1 The City of Lockney*

##### *4.5.9.1.1 Description of Supply*

- **Source:** Ogallala Aquifer and Lake Mackenzie
- **Current Supply:** Adequate to meet demands until approximately 2025, at which time additional supplies will be needed

##### *4.5.9.1.2 Water Supply Plan*

Working within the planning criteria established by the LERWPG and TWDB, the following water supply plan is recommended to meet the projected shortages of the City of Lockney through 2060.

- Local groundwater development beginning in 2021 needed to supply an additional 212 acft/yr in 2060. There appears to be adequate saturated thickness of the Ogallala Aquifer approximately two miles from the City of Lockney into which the city could locate new municipal water supply wells.

#### *4.5.9.1.3 Costs*

Costs of the recommended plan for the City of Lockney to meet 2030 shortages are:

a. Local groundwater development (See Section 4.4.2 for scheduling and a cost summary of this option):
   - Cost Source: Section 4.4.2, Table 4.4-25
   - Date to be Implemented: 2021
   - Total Project Cost: $388,302
   - Annual Cost: See Table 4.5-28 for a cost summary of this option.

***Table 4.5-28.***
***Recommended Plan Costs by Decade for the City of Lockney***

| *Plan Element* | *2010* | *2020* | *2030* | *2040* | *2050* | *2060* |
|---|---|---|---|---|---|---|
| Projected Shortage (acft/yr) | 0 | 0 | 240 | 234 | 224 | 212 |
| **Local Groundwater Development** | | | | | | |
| Quantity Available (acft/yr) | — | — | 410 | 369 | 332 | 299 |
| Annual Cost ($/yr) | — | — | $59,755 | $59,755 | $59,755 | $25,903 |
| Unit Cost ($/acft) | — | — | $146 | $162 | $180 | $87 |

### *4.5.9.2 Irrigation*

#### *4.5.9.2.1 Description of Supply*

- **Source:** Ogallala Aquifer and Reclaimed Water
- **Current Supply:** 136,848 acft/yr in 2010 declining to 85,954 acft/yr in 2060.

#### *4.5.9.2.2 Water Supply Plan*

The use of irrigation BMPs in the past in Floyd County have increased water use efficiency and thereby contributed to maintaining levels of irrigation production in the region. The Irrigation Water Conservation Water Management Strategy is recommended for Floyd County irrigation farmers (Section 4.4.1.2). However, it is not economically feasible to meet all of the irrigation needs (shortages) at this time.

#### *4.5.9.3.3 Costs*

a. Irrigation water conservation:

- Cost Source: Section 4.4.1.2, Table 4.4-13A
- Date to be Implemented: Prior to 2012
- Total Cost: $32,220,000
- Annual Cost: $2,810,000; including debt service at 20 yrs useful life of systems (Table 4.5-29).

***Table 4.5-29.***
***Recommended Plan Costs by Decade for Irrigation – Floyd County***

| Plan Element | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|
| Projected Irrigation Need (Shortage) (acft/yr) | 90,731 | 106,391 | 108,967 | 108,966 | 105,148 | 100,073 |
| Irrigation Conservation Quantity (acft/yr) | 44,665 | 40,198 | 36,178 | 32,561 | 29,305 | 26,374 |
| Annual Cost (million dollars/yr) (Table 4.4-13A) | $2.81 | $2.81 | $2.81 | $2.81 | $2.81 | $2.81 |
| Unit Cost ($/acft) (Table 4.4-13B) | $63 | $70 | $78 | $86 | $96 | $106 |

(This page intentionally left blank.)

### *4.5.10 Gaines County Water Supply Plan*

Table 4.5-30 lists each water user group in Gaines County and its corresponding surplus or shortage in years 2030 and 2060. For each water user group with a projected shortage, a water supply plan has been developed and is presented in the following subsections.

***Table 4.5-30.***
***Gaines County Surplus/Shortage****

| *Water User Group* | *Surplus/Shortage*[1] | | *Comment* |
|---|---|---|---|
| | *2030 (acft/yr)* | *2060 (acft/yr)* | |
| City of Seagraves | 0 | 0 | No projected surplus/shortage |
| City of Seminole | 0 | 0 | No projected surplus/shortage |
| County Other | 0 | 0 | No projected surplus/shortage |
| Industrial | 0 | 0 | No projected demand |
| Steam Electric | 0 | 0 | No projected demand |
| Mining | 0 | 0 | No projected surplus/shortage |
| Irrigation | -119,451 | -139,981 | Projected shortage – see plan below |
| Beef Feedlot Livestock | 0 | 0 | No projected surplus/shortage |
| Range & All Other Livestock | 0 | 0 | No projected surplus/shortage |

[1] From Table 4-10, Section 4.1 – Water Needs Projections by Water User Group.

* Computations are at the county level of detail, and although the county data show a surplus or shortage, there no doubt are individual water users of each county who have a shortage when the county shows an overall surplus; e.g., the projected surplus water is not located such that those who have shortages can obtain it.

#### *4.5.10.1 Irrigation*

##### *4.5.10.1.1 Description of Supply*

- **Source:** Ogallala Aquifer
- **Current Supply:** 325,949 acft/yr in 2010 declining to 160,991 acft/yr in 2060.

##### *4.5.10.1.2 Water Supply Plan*

The use of irrigation BMPs in the past in Gaines County have increased water use efficiency and thereby contributed to maintaining levels of irrigation production in the region. The Irrigation Water Conservation Water Management Strategy is recommended for Gaines

County irrigation farmers (Section 4.4.1.2). However, it is not economically feasible to meet all of the irrigation needs (shortages) at this time.

#### *4.5.10.1.3 Costs*

a. Irrigation water conservation:

- Cost Source: Section 4.4.1.2, Table 4.4-13A
- Date to be Implemented: Prior to 2012
- Total Cost: $ 7,580,000
- Annual Cost: $ 660,000; including debt service at 20 yrs useful life of systems (Table 4.5-31).

***Table 4.5-31.***
***Recommended Plan Costs by Decade for Irrigation – Gaines County***

| Plan Element | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|
| Projected Irrigation Need (Shortage) (acft/yr) | 67,285 | 105,447 | 119,451 | 127,613 | 134,285 | 139,981 |
| Irrigation Conservation Quantity (acft/yr) | 10,515 | 9,463 | 8,517 | 7,665 | 6,898 | 6,209 |
| Annual Cost (million dollars/yr) (Table 4.4-13A) | $0.66 | $0.66 | $0.66 | $0.66 | $0.66 | $0.66 |
| Unit Cost ($/acft) (Table 4.4-13B) | $63 | $70 | $78 | $86 | $96 | $106 |

### *4.5.11 Garza County Water Supply Plan*

Table 4.5-32 lists each water user group in Garza County and its corresponding surplus or shortage in years 2030 and 2060. For each water user group with a projected shortage, a water supply plan has been developed and is presented in the following subsections.

***Table 4.5-32.***
***Garza County Surplus/Shortage****

| *Water User Group* | *Surplus/Shortage*[1] | | *Comment* |
|---|---|---|---|
| | *2030 (acft/yr)* | *2060 (acft/yr)* | |
| City of Post | 183 | -206 | Projected shortage – see plan below |
| Lake Alan Henry WSD | -270 | -270 | New service area – see plan below |
| County Other | 14 | 14 | Projected surplus |
| Industrial | 0 | 0 | No projected surplus/shortage |
| Steam Electric | 0 | 0 | No projected demand |
| Mining | 0 | 0 | No projected surplus/shortage |
| Irrigation | -3,995 | -3,212 | Projected shortage – see plan below |
| Beef Feedlot Livestock | 0 | 0 | No projected demand |
| Range & All Other Livestock | 0 | 0 | No projected surplus/shortage |

[1] From Table 4-11, Section 4.1 – Water Needs Projections by Water User Group.

* Computations are at the county level of detail, and although the county data show a surplus or shortage, there no doubt are individual water users of each county who have a shortage when the county shows an overall surplus; e.g., the projected surplus water is not located such that those who have shortages can obtain it.

#### *4.5.11.1 The City of Post*

##### *4.5.11.1.1 Description of Supply*

- **Source:** Lake Meredith (CRMWA via Slaton) and White River Reservoir
- **Current Supply:** Adequate to meet demands until approximately 2035, at which time additional supplies will be needed

##### *4.5.11.1.2 Water Supply Plan*

Working within the planning criteria established by the LERWPG and TWDB, the following water supply plan is recommended to meet the projected shortages of the City of Post through 2060.

- Local groundwater development in partnership with the White River MWD needed to supply an additional 206 acft/yr in 2060.

#### *4.5.11.1.3 Costs*

Costs of the recommended plan for the City of Post to meet 2060 shortages are:

a. Local groundwater development in partnership with the White River MWD:
   - Cost Source: Section 4.4.3.10, Table 4.4-59
   - Date to be Implemented: 2012
   - Annual Cost: See Table 4.5-33 for a cost summary of this option.

***Table 4.5-33.***
***Recommended Plan Costs by Decade for the City of Post***

| *Plan Element* | *2010* | *2020* | *2030* | *2040* | *2050* | *2060* |
|---|---|---|---|---|---|---|
| Projected Shortage (acft/yr) | 0 | 0 | 0 | 261 | 243 | 206 |
| **Local Groundwater Development (with the White River MWD)** | | | | | | |
| Quantity Available (acft/yr) | 0 | 400 | 400 | 400 | 400 | 400 |
| Annual Cost ($/yr) | -- | $18,200 | $18,200 | $18,200 | $18,200 | $18,200 |
| Unit Cost ($/acft) | -- | $45 | $45 | $45 | $45 | $45 |

### *4.5.11.2 Lake Alan Henry WSD*

#### *4.5.11.2.1 Description of Supply*

- **Source:** Lake Alan Henry via contract with Lubbock.
- **Current Supply:** The new Lake Alan Henry Water Supply District is projected to need supplies prior to 2012.

#### *4.5.11.2.2 Water Supply Plan*

Working within the planning criteria established by the LERWPG and TWDB, the following water supply plan is recommended to meet the projected shortages of the Lake Alan Henry WSD through 2060.

- Supply from Lake Alan Henry beginning prior to 2012.

#### *4.5.11.2.3 Costs*

Costs of the recommended plan for the Lake Alan Henry Water Supply District to meet 2060 shortages are:

a. Supply from Lake Alan Henry (See Section 4.4.3.1):
   - Cost Source: Section 4.4.3.1, Table 4.4-40
   - Date to be Implemented: 2012
   - Total Project Cost: $7,334,502
   - Annual Cost: See Table 4.5-34 for a cost summary of this option.

***Table 4.5-34.***
***Recommended Plan Costs by Decade for the Lake Alan Henry WSD***

| *Plan Element* | *2010* | *2020* | *2030* | *2040* | *2050* | *2060* |
|---|---|---|---|---|---|---|
| Projected Shortage (acft/yr) | 270 | 270 | 270 | 270 | 270 | 270 |
| **Supply from Lake Alan Henry** | | | | | | |
| Quantity Available (acft/yr) | 0 | 270 | 270 | 270 | 270 | 270 |
| Annual Cost ($/yr) | -- | $904,135 | $904,135 | $904,135 | $904,135 | $904,135 |
| Unit Cost ($/acft) | -- | $3,349 | $3,349 | $3,349 | $3,349 | $3,349 |

### *4.5.11.3 Irrigation*

#### *4.5.11.3.1 Description of Supply*

- **Source:** Ogallala and Dockum Aquifers
- **Current Supply:** 6,739 acft/yr in 2010 declining to 5,259 acft/yr in 2060.

#### *4.5.11.3.2 Water Supply Plan*

The use of irrigation BMPs in the past in Garza County have increased water use efficiency and thereby contributed to maintaining levels of irrigation production in the region. The Irrigation Water Conservation Water Management Strategy is recommended for Garza County irrigation farmers (Section 4.4.1.2). The strategy is projected to meet the irrigation water needs of Garza County.

#### *4.5.11.3.3 Costs*

a. Irrigation water conservation:
   - Cost Source: Section 4.4.1.2, Table 4.4-13A

- Date to be Implemented: Prior to 2012
- Total Cost: $3,190,000
- Annual Cost: $280,000; including debt service at 20 yrs useful life of systems (Table 4.5-35).

***Table 4.5-35.***
***Recommended Plan Costs by Decade for Irrigation – Garza County***

| Plan Element | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|
| Projected Irrigation Need (Shortage) (acft/yr) | 4,712 | 4,301 | 3,995 | 3,721 | 3,455 | 3,212 |
| Irrigation Conservation Quantity (acft/yr) | 4,428 | 3,985 | 3,587 | 3,228 | 2,905 | 2,615 |
| Annual Cost (million dollars/yr) (Table 4.4-13A) | $0.28 | $0.28 | $0.28 | $0.28 | $0.28 | $0.28 |
| Unit Cost ($/acft) (Table 4.4-13B) | $63 | $70 | $78 | $86 | $96 | $106 |

### *4.5.12 Hale County Water Supply Plan*

Table 4.5-36 lists each water user group in Hale County and its corresponding surplus or shortage in years 2030 and 2060. For each water user group with a projected shortage, a water supply plan has been developed and is presented in the following subsections.

***Table 4.5-36.***
***Hale County Surplus/Shortage****

| *Water User Group* | *Surplus/Shortage*[1] | | *Comment* |
|---|---|---|---|
| | *2030 (acft/yr)* | *2060 (acft/yr)* | |
| City of Abernathy[2] | -366 | -446 | Projected shortage – see plan below |
| City of Hale Center | 0 | 0 | No Projected surplus/shortage |
| City of Petersburg | 0 | -306 | Projected shortage – see plan below |
| City of Plainview | 9,255 | 6,469 | Projected surplus – see plan below |
| County Other | 0 | 0 | No projected surplus/shortage |
| Industrial | 0 | 0 | No projected surplus/shortage |
| Steam Electric | 0 | 0 | No projected demand |
| Mining | 0 | 0 | No projected surplus/shortage |
| Irrigation | -138,629 | -221,050 | Projected shortage – see plan below |
| Beef Feedlot Livestock | -573 | -2,058 | Projected shortage |
| Dairies | 0 | -460 | Projected shortage |
| Range & All Other Livestock | 0 | 0 | No projected surplus/shortage |

[1] From Table 4-12, Section 4.1 – Water Needs Projections by Water User Group.

[2] A portion of the City of Abernathy is located in Lubbock County. However, the city's total projected shortage is shown here.

* Computations are at the county level of detail, and although the county data show a surplus or shortage, there no doubt are individual water users of each county who have a shortage when the county shows an overall surplus; e.g., the projected surplus water is not located such that those who have shortages can obtain it.

#### *4.5.12.1 The City of Abernathy*

##### *4.5.12.1.1 Description of Supply*

- **Source:** Ogallala Aquifer
- **Current Supply:** Adequate to meet demands until approximately 2015, at which time additional supplies will be needed

#### *4.5.12.1.2 Water Supply Plan*

Working within the planning criteria established by the LERWPG and TWDB, the following water supply plan is recommended to meet the projected shortages of the City of Abernathy through 2060.

- Municipal water conservation, and
- Local groundwater development beginning in 2015 needed to supply an additional 446 acft/yr in 2060. There appears to be adequate saturated thickness of the Ogallala Aquifer approximately 10 miles from the City of Abernathy into which the city could locate new municipal water supply wells.

#### *4.5.12.1.3 Costs*

Costs of the recommended plan for the City of Abernathy to meet 2060 shortages are:

a. Municipal water conservation:
   - Cost Source: Section 4.4.1, Table 4.4-8
   - Date to be Implemented: Prior to 2012
   - Annual Cost: See Table 4.5-37 for a cost summary of this option.

***Table 4.5-37.***
***Recommended Plan Costs by Decade for the City of Abernathy***

| *Plan Element* | *2010* | *2020* | *2030* | *2040* | *2050* | *2060* |
|---|---|---|---|---|---|---|
| Projected Shortage (acft/yr) | 0 | 304 | 366 | 403 | 433 | 446 |
| **Municipal Water Conservation** | | | | | | |
| Quantity Available (acft/yr) | 50 | 48 | 43 | 32 | 28 | 27 |
| Annual Cost ($/yr) | $35,831 | $32,462 | $28,378 | $20,469 | $17,686 | $17,334 |
| Unit Cost ($/acft) | $717 | $676 | $660 | $640 | $632 | $642 |
| **Local Groundwater Development** | | | | | | |
| Quantity Available (acft/yr) | — | 428 | 385 | 510 | 459 | 439 |
| Annual Cost ($/yr) | — | $47,624 | $47,624 | $77,459 | $77,459 | $77,459 |
| Unit Cost ($/acft) | — | $111 | $124 | $152 | $169 | $176 |

Local groundwater development (See Section 4.4.2 for scheduling and a cost summary of this option):
   - Cost Source: Section 4.4.2, Table 4.4-15
   - Date to be Implemented: 2011
   - Total Project Cost: $699,732

- Annual Cost: See Table 4.5-37 for a cost summary of this option.

### *4.5.12.2 The City of Petersburg*

#### *4.5.12.2.1 Description of Supply*

- **Source:** Ogallala Aquifer
- **Current Supply:** Adequate to meet demands until approximately 2045, at which time additional supplies will be needed.

#### *4.5.12.2.2 Water Supply Plan*

Working within the planning criteria established by the LERWPG and TWDB, the following water supply plan is recommended to meet the projected shortages of the City of Petersburg through 2060.

- Municipal water conservation, and
- Local groundwater development beginning in 2041 needed to supply an additional 306 acft/yr in 2060. There appears to be adequate saturated thickness of the Ogallala Aquifer approximately one mile from the City of Petersburg into which the city could locate new municipal water supply wells.

#### *4.5.12.2.3 Costs*

Costs of the recommended plan for the City of Petersburg to meet 2060 shortages are:

a. Municipal water conservation:
   - Cost Source: Section 4.4.1, Table 4.4-7
   - Date to be Implemented: Prior to 2012
   - Annual Cost: See Table 4.5-38 for a cost summary of this option.

b. Local groundwater development (See Section 4.4.2 for scheduling and a cost summary of this option):
   - Cost Source: Section 4.4.2, Table 4.4-29
   - Date to be Implemented: 2041
   - Total Project Cost: $334,846
   - Annual Cost: See Table 4.5-38 for a cost summary of this option.

***Table 4.5-38.***
***Recommended Plan Costs by Decade for the City of Petersburg***

| *Plan Element* | *2010* | *2020* | *2030* | *2040* | *2050* | *2060* |
|---|---|---|---|---|---|---|
| Projected Shortage (acft/yr) | 0 | 0 | 0 | 0 | 312 | 306 |
| **Municipal Water Conservation** | | | | | | |
| Quantity Available (acft/yr) | 21 | 24 | 20 | 16 | 14 | 14 |
| Annual Cost ($/yr) | $15,127 | $16,276 | $13,253 | $9,746 | $8,403 | $8,241 |
| Unit Cost ($/acft) | $720 | $678 | $663 | $609 | $600 | $589 |
| **Local Groundwater Development** | | | | | | |
| Quantity Available (acft/yr) | — | — | — | — | 410 | 369 |
| Annual Cost ($/yr) | — | — | — | — | $54,608 | $54,608 |
| Unit Cost ($/acft) | — | — | — | — | $133 | $148 |

### *4.5.12.3 Irrigation*

#### *4.5.12.3.1 Description of Supply*

- **Source:** Ogallala Aquifer and Reclaimed Water
- **Current Supply:** 335,702 acft/yr in 2010 declining to 78,926 acft/yr in 2060.

#### *4.5.12.3.2 Water Supply Plan*

The use of irrigation BMPs in the past in Hale County have increased water use efficiency and thereby contributed to maintaining levels of irrigation production in the region. The Irrigation Water Conservation Water Management Strategy is recommended for Hale County irrigation farmers (Section 4.4.1.2). However, it is not economically feasible to meet all of the irrigation needs (shortages) at this time.

#### *4.5.12.3.3 Costs*

a. Irrigation water conservation:
   - Cost Source: Section 4.4.1.2, Table 4.4-13A
   - Date to be Implemented: Prior to 2010
   - Total Cost: $30,570,000
   - Annual Cost: $2,670,000; including debt service at 20 yrs useful life of systems (Table 4.5-39).

***Table 4.5-39.***
***Recommended Plan Costs by Decade for Irrigation and CAFOs– Hale County***

| Plan Element | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|
| Projected Irrigation Need (Shortage) (acft/yr) | 22,217 | 55,312 | 138,629 | 206,294 | 222,871 | 221,050 |
| Irrigation Conservation Quantity (acft/yr) | 42,381 | 38,143 | 34,329 | 30,896 | 27,806 | 25,026 |
| Annual Cost (million dollars/yr) (Table 4.4-13A) | $2.67 | $2.67 | $2.67 | $2.67 | $2.67 | $2.67 |
| Unit Cost ($/acft) (Table 4.4-13B) | $63 | $70 | $78 | $86 | $96 | $106 |
| | | | | | | |
| Projected CAFO Need (Shortage) (acft/yr) | --- | --- | 573 | 796 | 2,147 | 2,518 |

### *4.5.12.4 Confined Animal Feeding Operations (CAFOs) Beef Feedyards and Dairies*

#### *4.5.7.4.1 Description of Supply*

- **Source:** Ogallala Aquifer
- **Current Supply:** 2,300 acft/yr in 2010, decreasing 969 to acft/yr in 2060.
- Working within the planning criteria established by the LERWPG and TWDB, is not feasible to meet the CAFO (Beef Feedyards and Dairies) needs (shortages) at this time, for the following reasons: (1) the CAFOs are owned by private individuals and are located several miles apart, (2) needs (shortages) of individual CAFOs are projected to develop at different times during the planning period, such that demands for quantities of water from water management strategies (WMSs) will not arise such that the WMSs can be successfully implemented from the financial standpoints, and (3) cost estimates of water management strategies evaluated appear to be in excess of affordability for CAFOs (Section 4.4.3.9). In addition, at the present time, it does not appear that there are organizations available to the CAFOs that have authority to implement water management strategies to deliver the needed water.

(This page intentionally left blank.)

### *4.5.13 Hockley County Water Supply Plan*

Table 4.5-40 lists each water user group in Hockley County and its corresponding surplus or shortage in years 2030 and 2060. For each water user group with a projected shortage, a water supply plan has been developed and is presented in the following subsections.

***Table 4.5-40.***
***Hockley County Surplus/Shortage****

| *Water User Group* | *Surplus/Shortage*[1] | | *Comment* |
|---|---|---|---|
| | *2030 (acft/yr)* | *2060 (acft/yr)* | |
| City of Anton | -272 | -243 | Projected shortage – see plan below |
| City of Levelland | 867 | 701 | Projected surplus |
| City of Ropesville | -91 | -81 | Projected shortage – see plan below |
| City of Smyer | 0 | -62 | Projected shortage – see plan below |
| City of Sundown | -353 | -316 | Projected shortage – see plan below |
| County Other | 0 | 0 | No projected surplus/shortage |
| Industrial | 0 | 0 | No projected surplus/shortage |
| Steam Electric | 0 | 0 | No projected demand |
| Mining | 0 | 0 | No projected surplus/shortage |
| Irrigation | -82,859 | -81,644 | Projected shortage – see plan below |
| Beef Feedlot Livestock | 0 | 0 | No projected surplus/shortage |
| Range & All Other Livestock | 0 | 0 | No projected surplus/shortage |

[1] From Table 4-13, Section 4.1 – Water Needs Projections by Water User Group.

* Computations are at the county level of detail, and although the county data show a surplus or shortage, there no doubt are individual water users of each county who have a shortage when the county shows an overall surplus; e.g., the projected surplus water is not located such that those who have shortages can obtain it.

#### *4.5.13.1 The City of Anton*

##### *4.5.13.1.1 Description of Supply*

- **Source:** Ogallala Aquifer
- **Current Supply:** Adequate to meet demands until approximately 2010, at which time additional supplies will be needed

#### *4.5.13.1.2 Water Supply Plan*

Working within the planning criteria established by the LERWPG and TWDB, the following water supply plan is recommended to meet the projected shortages of the City of Anton through 2060.

- Municipal water conservation, and
- Local groundwater development beginning in 2010 needed to supply an additional 243 acft/yr in 2060. There appears to be adequate saturated thickness of the Ogallala Aquifer approximately four miles from the City of Anton into which the city could locate new municipal water supply wells.

#### *4.5.13.1.3 Costs*

Costs of the recommended plan for the City of Anton to meet 2060 shortages are:

a. Municipal water conservation:
   - Cost Source: Section 4.4.1, Table 4.4-8
   - Date to be Implemented: Prior to 2012
   - Annual Cost: See Table 4.5-41 for a cost summary of this option.

***Table 4.5-41.***
***Recommended Plan Costs by Decade for the City of Anton***

| *Plan Element* | *2010* | *2020* | *2030* | *2040* | *2050* | *2060* |
|---|---|---|---|---|---|---|
| Projected Shortage (acft/yr) | 263 | 270 | 272 | 268 | 256 | 243 |
| **Municipal Water Conservation** | | | | | | |
| Quantity Available (acft/yr) | 14 | 11 | 6 | 2 | 0 | 0 |
| Annual Cost ($/yr) | $10,668 | $7,792 | $4,561 | $1,141 | 0 | 0 |
| Unit Cost ($/acft) | $762 | $708 | $760 | $571 | — | — |
| **Local Groundwater Development** | | | | | | |
| Quantity Available (acft/yr) | 408 | 367 | 330 | 297 | 268 | 243 |
| Annual Cost ($/yr) | $131,350 | $131,350 | $131,350 | $131,350 | $31,507 | $31,507 |
| Unit Cost ($/acft) | $322 | $358 | $398 | $442 | $76 | $84 |

b. Local groundwater development (See Section 4.4.2 for scheduling and a cost summary of this option):
   - Cost Source: Section 4.4.2, Table 4.4-16
   - Date to be Implemented: 2011
   - Total Project Cost: $1,145,246

- Annual Cost: See Table 4.5-41 for a cost summary of this option.

### *4.5.13.2 The City of Ropesville*

#### *4.5.13.2.1 Description of Supply*

- **Source:** Ogallala Aquifer
- **Current Supply:** Adequate to meet demands until approximately 2025, at which time additional supplies will be needed.

#### *4.5.13.2.2 Water Supply Plan*

Working within the planning criteria established by the LERWPG and TWDB, the following water supply plan is recommended to meet the projected shortages of the City of Ropesville through 2060.

- Local groundwater development beginning in 2021 needed to supply an additional 81 acft/yr in 2060. There appears to be adequate saturated thickness of the Ogallala Aquifer approximately two miles from the City of Ropesville into which the city could locate new municipal water supply wells.

#### *4.5.13.2.3 Costs*

Costs of the recommended plan for the City of Ropesville to meet 2060 shortages are:

a. Local groundwater development (See Section 4.4.2 for scheduling and a cost summary of this option):
   - Cost Source: Section 4.4.2, Table 4.4-32
   - Date to be Implemented: 2021
   - Total Project Cost: $349,252
   - Annual Cost: See Table 4.5-42 for a cost summary of this option.

***Table 4.5-42.***
***Recommended Plan Costs by Decade for the City of Ropesville***

| *Plan Element* | *2010* | *2020* | *2030* | *2040* | *2050* | *2060* |
|---|---|---|---|---|---|---|
| Projected Shortage (acft/yr) | 0 | 0 | 91 | 89 | 85 | 81 |
| **Local Groundwater Development** | | | | | | |
| Quantity Available (acft/yr) | — | — | 193 | 174 | 157 | 141 |
| Annual Cost ($/yr) | — | — | $44,171 | $44,171 | $44,171 | $13,723 |
| Unit Cost ($/acft) | — | — | $229 | $254 | $281 | $97 |

### *4.5.13.3 The City of Smyer*

#### *4.5.13.3.1 Description of Supply*

- **Source:** Ogallala Aquifer
- **Current Supply:** Adequate to meet demands until approximately 2055, at which time additional supplies will be needed

#### *4.5.13.3.2 Water Supply Plan*

Working within the planning criteria established by the LERWPG and TWDB, the following water supply plan is recommended to meet the projected shortages of the City of Smyer through 2060.

- Local groundwater development beginning in 2051 needed to supply an additional 62 acft/yr in 2060. There appears to be adequate saturated thickness of the Ogallala Aquifer approximately one mile from the City of Smyer into which the city could locate new municipal water supply wells.

#### *4.5.13.3.3. Costs*

Costs of the recommended plan for the City of Smyer to meet 2060 shortages are:

a. Local groundwater development (See Section 4.4.2 for scheduling and a cost summary of this option):
   - Cost Source: Section 4.4.2, Table 4.4-42
   - Date to be Implemented: 2051
   - Total Project Cost: $249,976
   - Annual Cost: See Table 4.5-43 for a cost summary of this option.

***Table 4.5-43.***
***Recommended Plan Costs by Decade for the City of Smyer***

| *Plan Element* | *2010* | *2020* | *2030* | *2040* | *2050* | *2060* |
|---|---|---|---|---|---|---|
| Projected Shortage (acft/yr) | 0 | 0 | 0 | 0 | 0 | 62 |
| **Local Groundwater Development** | | | | | | |
| Quantity Available (acft/yr) | — | — | — | — | — | 193 |
| Annual Cost ($/yr) | — | — | — | — | — | $34,613 |
| Unit Cost ($/acft) | — | — | — | — | — | $179 |

#### *4.5.13.4 The City of Sundown*

##### *4.5.13.4.1 Description of Supply*

- **Source:** Ogallala Aquifer
- **Current Supply:** Adequate to meet demands until approximately 2015, at which time additional supplies will be needed

##### *4.5.13.4.2 Water Supply Plan*

Working within the planning criteria established by the LERWPG and TWDB, the following water supply plan is recommended to meet the projected shortages of the City of Sundown through 2060.

- Municipal water conservation, and
- Local groundwater development beginning in 2016 needed to supply an additional 316 acft/yr in 2060. There appears to be adequate saturated thickness of the Ogallala Aquifer approximately two miles from the City of Sundown into which the city could locate new municipal water supply wells.

##### *4.5.13.4.3 Costs*

Costs of the recommended plan for the City of Sundown to meet 2060 shortages are:

a. Municipal water conservation:
   - Cost Source: Section 4.4.1, Table 4.4-8
   - Date to be Implemented: Prior to 2012
   - Annual Cost: See Table 4.5-44 for a cost summary of this option.

b. Local groundwater development (See Section 4.4.2 for scheduling and a cost summary of this option):
   - Cost Source: Section 4.4.2, Table 4.4-35
   - Date to be Implemented: 2016
   - Total Project Cost: $948,479
   - Annual Cost: See Table 4.5-44 for a cost summary of this option.

***Table 4.5-44.***
***Recommended Plan Costs by Decade for the City of Sundown***

| *Plan Element* | *2010* | *2020* | *2030* | *2040* | *2050* | *2060* |
|---|---|---|---|---|---|---|
| Projected Shortage (acft/yr) | 0 | 350 | 353 | 347 | 332 | 316 |
| **Municipal Water Conservation** | | | | | | |
| Quantity Available (acft/yr) | 24 | 25 | 19 | 14 | 11 | 11 |
| Annual Cost ($/yr) | $18,000 | $16,942 | $13,065 | $8,786 | $7,071 | $6,722 |
| Unit Cost ($/acft) | $750 | $678 | $688 | $628 | $643 | $611 |
| **Local Groundwater Development** | | | | | | |
| Quantity Available (acft/yr) | — | 412 | 569 | 512 | 461 | 415 |
| Annual Cost ($/yr) | — | $93,120 | $122,955 | $122,955 | $40,267 | $40,267 |
| Unit Cost ($/acft) | — | $226 | $216 | $240 | $87 | $97 |

### *4.5.13.5 Irrigation*

#### *4.5.13.5.1 Description of Supply*

- **Source:** Ogallala Aquifer and Reclaimed Water
- **Current Supply:** 105,038 acft/yr in 2010 declining to 57,167 acft/yr in 2060.

#### *4.5.13.5.2 Water Supply Plan*

The use of irrigation BMPs in the past in Hockley County have increased water use efficiency and thereby contributed to maintaining levels of irrigation production in the region. The Irrigation Water Conservation Water Management Strategy is recommended for Hockley County irrigation farmers (Section 4.4.1.2). However, it is not economically feasible to meet all of the irrigation needs (shortages) at this time.

#### *4.5.13.3.3 Costs*

a. Irrigation water conservation:
   - Cost Source: Section 4.4.1.2, Table 4.4-13A
   - Date to be Implemented: Prior to 2012
   - Total Cost: $20,230,000
   - Annual Cost: $1,760,000; including debt service at 20 yrs useful life of systems (Table 4.5-45).

***Table 4.5-45.***
***Recommended Plan Costs by Decade for Irrigation – Hockley County***

| Plan Element | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|
| Projected Irrigation Need (Shortage) (acft/yr) | 63,682 | 75,675 | 82,859 | 87,831 | 83,837 | 81,644 |
| Irrigation Conservation Quantity (acft/yr) | 28,053 | 25,247 | 22,723 | 20,450 | 18,405 | 16,565 |
| Annual Cost (million dollars/yr) (Table 4.4-13A) | $1.76 | $1.76 | $1.76 | $1.76 | $1.76 | $1.76 |
| Unit Cost ($/acft) (Table 4.4-13B) | $63 | $70 | $78 | $86 | $96 | $106 |

(This page intentionally left blank.)

### *4.5.14 Lamb County Water Supply Plan*

Table 4.5-46 lists each water user group in Lamb County and its corresponding surplus or shortage in years 2030 and 2060. For each water user group with a projected shortage, a water supply plan has been developed and is presented in the following subsections.

***Table 4.5-46.***
***Lamb County Surplus/Shortage****

| *Water User Group* | *Surplus/(Shortage)*[1] | | *Comment* |
|---|---|---|---|
| | *2030 (acft/yr)* | *2060 (acft/yr)* | |
| City of Amherst | 0 | 0 | No projected surplus/shortage |
| City of Earth | 0 | -276 | Projected shortage – see plan below |
| City of Littlefield | 0 | 0 | No projected surplus/shortage |
| City of Olton | 0 | 0 | No projected surplus/shortage |
| City of Sudan | 0 | 0 | No projected surplus/shortage |
| County Other | 0 | 0 | No projected surplus/shortage |
| Industrial | 0 | 0 | No projected surplus/shortage |
| Steam Electric | 0 | 0 | No projected surplus/shortage |
| Mining | 0 | 0 | No projected surplus/shortage |
| Irrigation | -201,653 | -250,645 | Projected shortage – see plan below |
| Beef Feedlot Livestock | -241 | -1,730 | Projected shortage |
| Dairies | -134 | -1,280 | Projected shortage |
| Range & All Other Livestock | 0 | 0 | No projected surplus/shortage |

[1] From Table 4-14, Section 4.1 – Water Needs Projections by Water User Group.

* Computations are at the county level of detail, and although the county data show a surplus or shortage, there no doubt are individual water users of each county who have a shortage when the county shows an overall surplus; e.g., the projected surplus water is not located such that those who have shortages can obtain it.

#### *4.5.14.1 The City of Earth*

##### *4.5.14.1.1 Description of Supply*

- **Source:** Ogallala Aquifer
- **Current Supply:** Adequate to meet demands until approximately 2035, at which time additional supplies will be needed

#### *4.5.14.1.2 Water Supply Plan*

Working within the planning criteria established by the LERWPG and TWDB, the following water supply plan is recommended to meet the projected shortages of the City of Earth through 2060.

- Municipal water conservation, and
- Local groundwater development beginning in 2031 needed to supply an additional 276 acft/yr in 2060. There appears to be adequate saturated thickness of the Ogallala Aquifer approximately three miles from the City of Earth into which the city could locate new municipal water supply wells.

#### *4.5.14.1.3. Costs*

Costs of the recommended plan for the City of Earth to meet 2060 shortages are:

a. Municipal water conservation:
   - Cost Source: Section 4.4.1, Table 4.4-8
   - Date to be Implemented: Prior to 2012
   - Annual Cost: See Table 4.5-47 for a cost summary of this option.

***Table 4.5-47.***
***Recommended Plan Costs by Decade for the City of Earth***

| *Plan Element* | *2010* | *2020* | *2030* | *2040* | *2050* | *2060* |
|---|---|---|---|---|---|---|
| Projected Shortage (acft/yr) | 0 | 0 | 0 | 283 | 280 | 276 |
| **Municipal Water Conservation** | | | | | | |
| Quantity Available (acft/yr) | 20 | 28 | 25 | 21 | 20 | 17 |
| Annual Cost ($/yr) | $14,310 | $17,609 | $15,273 | $12,481 | $11,301 | $11,150 |
| Unit Cost ($/acft) | $716 | $629 | $611 | $594 | $565 | $656 |
| **Local Groundwater Development** | | | | | | |
| Quantity Available (acft/yr) | — | — | — | 393 | 354 | 318 |
| Annual Cost ($/yr) | — | — | — | $96,796 | $96,796 | $96,796 |
| Unit Cost ($/acft) | — | — | — | $246 | $273 | $304 |

b. Local groundwater development (See Section 4.4.2 for scheduling and a cost summary of this option):
   - Cost Source: Section 4.4.2, Table 4.4-20
   - Date to be Implemented: 2031
   - Total Project Cost: $786,325

- Annual Cost: See Table 4.5-47 for a cost summary of this option.

### *4.5.14.2 Irrigation*

#### *4.5.14.2.1 Description of Supply*

- **Source:** Ogallala Aquifer and Reclaimed Water
- **Current Supply:** 248,481 acft/yr in 2010 declining to 45,217 acft/yr in 2060.

#### *4.5.14.2.2 Water Supply Plan*

The use of irrigation BMPs in the past in Lamb County have increased water use efficiency and thereby contributed to maintaining levels of irrigation production in the region. The Irrigation Water Conservation Water Management Strategy is recommended for Lamb County irrigation farmers (Section 4.4.1.2). However, it is not economically feasible to meet all of the irrigation needs (shortages) at this time.

#### *4.5.14.2.3 Costs*

a. Irrigation water conservation:
   - Cost Source: Section 4.4.1.2, Table 4.4-13A
   - Date to be Implemented: Prior to 2012
   - Total Cost: $20,520,000
   - Annual Cost: $1,790,000; including debt service at 20 yrs useful life of systems (Table 4.5-48).

**Table 4.5-48.**
**Recommended Plan Costs by Decade for Irrigation and CAFOs – Lamb County**

| Plan Element | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|
| Projected Irrigation Need (Shortage) (acft/yr) | 114,832 | 158,445 | 201,653 | 238,554 | 248,375 | 250,645 |
| Irrigation Conservation Quantity (acft/yr) | 28,457 | 25,611 | 23,050 | 20,745 | 18,670 | 16,803 |
| Annual Cost (million dollars/yr) (Table 4.4-13A) | $1.79 | $1.79 | $1.79 | $1.79 | $1.79 | $1.79 |
| Unit Cost ($/acft) (Table 4.4-13B) | $63 | $70 | $78 | $86 | $96 | $106 |
| | | | | | | |
| Projected CAFO Need (Shortage) (acft/yr) | --- | --- | 375 | 1,618 | 2,347 | 3,009 |

### *4.5.14.3 Confined Animal Feeding Operations (CAFOs) Beef Feedyards and Dairies*

#### *4.5.14.3.1 Description of Supply*

- **Source:** Ogallala Aquifer
- **Current Supply:** 2,909 acft/yr in 2010, decreasing1,377 acft/yr in 2060.

- Working within the planning criteria established by the LERWPG and TWDB, is not feasible to meet the CAFO (Beef Feedyards and Dairies) needs (shortages) at this time, for the following reasons: (1) the CAFOs are owned by private individuals and are located several miles apart, (2) needs (shortages) of individual CAFOs are projected to develop at different times during the planning period, such that demands for quantities of water from water management strategies (WMSs) will not arise such that the WMSs can be successfully implemented from the financial standpoints, and (3) cost estimates of water management strategies evaluated appear to be in excess of affordability for CAFOs (Section 4.4.3.9). In addition, at the present time, it does not appear that there are organizations available to the CAFOs that have authority to implement water management strategies to deliver the needed water.

### *4.5.15 Lubbock County Water Supply Plan*

Table 4.5-49 lists each water user group in Lubbock County and its corresponding surplus or shortage in years 2030 and 2060. For each water user group with a projected shortage, a water supply plan has been developed and is presented in the following subsections.

***Table 4.5-49.***
***Lubbock County Surplus/Shortage***

| *Water User Group* | *Surplus/Shortage*[1] | | *Comment* |
|---|---|---|---|
| | *2030 (acft/yr)* | *2060 (acft/yr)* | |
| City of Abernathy | -- | -- | See Hale County (Included in Hale County) |
| City of Idalou | 0 | -272 | Projected shortage – see plan below |
| City of Lubbock | -13,454 | -20,649 | Projected shortage – see plan below |
| City of New Deal | -20 | -20 | Projected shortage – see plan below |
| City of Ransom Canyon | 0 | 0 | Projected surplus |
| City of Shallowater | -190 | -184 | Projected shortage – see plan below |
| City of Slaton | 193 | 227 | Projected surplus |
| City of Wolfforth | 397 | -388 | Projected shortage – see plan below |
| County Other | 0 | 0 | No projected surplus/shortage |
| Industrial | 0 | 0 | No projected surplus/shortage |
| Steam Electric | 0 | 0 | No projected surplus/shortage |
| Mining | 0 | 0 | No projected surplus/shortage |
| Irrigation | -99,575 | -96,846 | Projected shortage –see plan below |
| Beef Feedlot Livestock | 0 | 0 | No projected surplus/shortage |
| Range & All Other Livestock | 0 | 0 | No projected surplus/shortage |

[1] From Table 4-15, Section 4.1 – Water Needs Projections by Water User Group.

* Computations are at the county level of detail, and although the county data show a surplus or shortage, there no doubt are individual water users of each county who have a shortage when the county shows an overall surplus; e.g., the projected surplus water is not located such that those who have shortages can obtain it.

#### *4.5.15.1 The City of Abernathy (See Hale County)*

#### *4.5.15.2 The City of Idalou*

##### *4.5.15.2.1 Description of Supply*

- **Source:** Ogallala Aquifer

- **Current Supply:** Adequate to meet demands until approximately 2035, at which time additional supplies will be needed

#### *4.5.15.2.2 Water Supply Plan*

Working within the planning criteria established by the LERWPG and TWDB, the following water supply plan is recommended to meet the projected shortages of the City of Idalou through 2060.

- Local groundwater development beginning in 2031 needed to supply an additional 272 acft/yr in 2060. There appears to be adequate saturated thickness of the Ogallala Aquifer approximately four miles from the City of Idalou into which the city could locate new municipal water supply wells.

#### *4.5.15.2.3 Costs*

Costs of the recommended plan for the City of Idalou to meet 2060 shortages are:

a. Local groundwater development (See Section 4.4.2 for scheduling and a cost summary of this option):
   - Cost Source: Section 4.4.2, Table 4.4-24
   - Date to be Implemented: 2031
   - Total Project Cost: $770,132
   - Annual Cost: See Table 4.5-50 for a cost summary of this option.

***Table 4.5-50.***
***Recommended Plan Costs by Decade for the City of Idalou***

| *Plan Element* | *2010* | *2020* | *2030* | *2040* | *2050* | *2060* |
|---|---|---|---|---|---|---|
| Projected Shortage (acft/yr) | 0 | 0 | 0 | 274 | 273 | 272 |
| **Local Groundwater Development** | | | | | | |
| Quantity Available (acft/yr) | — | — | — | 410 | 369 | 332 |
| Annual Cost ($/yr) | — | — | — | $96,514 | $96,514 | $96,514 |
| Unit Cost ($/acft) | — | — | — | $235 | $261 | $291 |

### *4.5.15.3 The City of Lubbock*

#### *4.5.15.3.1 Description of Supply*

- **Source:** Ogallala Aquifer and Lake Meredith
- **Current Supply:** Adequate to meet demands through 2015.

#### *4.5.15.3.2 Water Supply Plan*

Working within the planning criteria established by the LERWPG and TWDB, the following water supply plan is recommended for the City of Lubbock.

- Municipal water conservation,
- Lake Alan Henry Supply to Lubbock,
- Jim Bertram Lake System Expansion - Lake 7,
- Post Reservoir,
- Lubbock North Fork Diversion Operation, and
- Lubbock Brackish Groundwater Desalination.

#### *4.5.15.3.3 Costs*

Costs of the recommended plan for the City of Lubbock are:

a. Municipal water conservation:
   - Cost Source: Section 4.4.1, Table 4.4-8
   - Date to be Implemented: Prior to 2010
   - Annual Cost: See Table 4.5-51 for a cost summary of this option.

b. Lake Alan Henry Supply to Lubbock:
   - Cost Source: Section 4.4.3.2, Table 4.4-41
   - Date to be Implemented: Prior to 2020
   - Total Project Cost: $294,329,000
   - Annual Cost: See Table 4.5-41 for a cost summary of this option.

c. Lubbock Jim Bertram Lake System Expansion – Lake 7
   - Cost Source: Section 4.4.3.3. Table 4.4-46
   - Date to be Implemented: 2020
   - Total Project Cost: $68,288,000
   - Annual Cost: See Table 4.5-51 for a cost summary of this option.

d. Post Reservoir
   - Cost Source: Section 4.4.3.5
   - Date to be Implemented: 2030
   - Total Project Cost: $110,307,000
   - Annual Cost: See Table 4.4-55 for a cost summary of this option.

e. Lubbock North Fork Diversion Operation
   - Cost Source: Section 4.4.3.4. Table 4.4-51
   - Date to be Implemented: 2045
   - Total Project Cost: $153,040,000
   - Annual Cost: See Table 4.5-51 for a cost summary of this option.

***Table 4.5-51.***
***Estimated Plan Costs by Decade for the City of Lubbock***

| *Plan Element* | *2010* | *2020* | *2030* | *2040* | *2050* | *2060* |
|---|---|---|---|---|---|---|
| Projected Shortage (acft/yr) | 8,602 | 10,496 | 13,454 | 15,765 | 19,333 | 20,649 |
| **Municipal Water Conservation (Strategy is included until the regional goal of 172 gpcd is reached)** | | | | | | |
| Quantity Available (acft/yr) | 4,132 | 7,662 | 7,112 | 6,441 | 6,256 | 6,405 |
| Annual Cost ($/yr) (millions) | $2.710 | $4.473 | $4.073 | $3.599 | $3.462 | $3.545 |
| Unit Cost ($/acft) | $656 | $583 | $572 | $559 | $553 | $554 |
| **Lake Alan Henry Supply to Lubbock** | | | | | | |
| Quantity Available (acft/yr) | 0 | 21,880 | 21,880 | 21,880 | 21,880 | 21,880 |
| Annual Cost ($/yr) (millions) | — | $28.655 | $28.655 | $28.655 | $28.655 | $28.655 |
| Unit Cost ($/acft) | — | $1,310 | $1,310 | $1,310 | $1,310 | $1,310 |
| **Lubbock Jim Bertram Lake System Expansion - Lake 7** | | | | | | |
| Quantity Available (acft/yr) | 0 | 17,650 | 17,650 | 17,650 | 17,650 | 17,650 |
| Annual Cost ($/yr) (millions) | — | $7.956 | $7.956 | $7.956 | $7.956 | $7.956 |
| Unit Cost ($/acft) | — | $451 | $451 | $451 | $451 | $451 |
| **Post Reservoir** | | | | | | |
| Quantity Available (acft/yr) | 0 | 0 | 22,270 | 22,270 | 22,270 | 22,270 |
| Annual Cost ($/yr) (millions) | — | — | $15,786 | $15,786 | $15,786 | $15,786 |
| Unit Cost ($/acft) | — | — | $695 | $695 | $695 | $695 |
| **Lubbock North Fork Diversion Operation** | | | | | | |
| Quantity Available (acft/yr) | 0 | 0 | 0 | 0 | 3,675 | 3,675 |
| Annual Cost ($/yr) (millions) | — | — | — | — | $23.298 | $23.298 |
| Unit Cost ($/acft) | — | — | — | — | $6,340 | $6,340 |
| **Lubbock Brackish Groundwater Desalination** | | | | | | |
| Quantity Available (acft/yr) | 0 | 3,360 | 3,360 | 3,360 | 3,360 | 3,360 |
| Annual Cost ($/yr) (millions) | — | $2.418 | $2.418 | $2.418 | $2.418 | $2.418 |
| Unit Cost ($/acft) | — | $720 | $720 | $720 | $720 | $720 |

c. Lubbock Brackish Groundwater Desalination
   d. Cost Source: Section 4.4.3.6, Table 4.4-57
   e. Date to be Implemented: 2020
   f. Total Project Cost: $13,167,230
   g. Annual Cost: See Table 4.4-57 for a cost summary of this option.

### *4.5.15.4 The City of New Deal*

#### *4.5.15.4.1 Description of Supply*

- **Source:** City of Slaton (CRMWA)
- **Current Supply:** Adequate to meet demands until approximately 2015, at which time additional supplies will be needed

#### *4.5.15.4.2 Water Supply Plan*

Working within the planning criteria established by the LERWPG and TWDB, the following water supply plan is recommended to meet the projected shortages of the City of New Deal through 2060.

- Local groundwater development beginning in 2011 needed to supply an additional 12 acft/yr in 2020, increasing to 20 acft/yr from 2030 to 2060. There appears to be adequate saturated thickness of the Ogallala Aquifer approximately four miles from the City of New Deal into which the city could locate new municipal water supply wells.

#### *4.5.15.4.3 Costs*

Costs of the recommended plan for the City of New Deal to meet 2060 shortages are:

a. Local groundwater development (See Section 4.4.2 for scheduling and a cost summary of this option):
   - Cost Source: Section 4.4.2, Table 4.4-28
   - Date to be Implemented: 2012
   - Total Project Cost: $547,803
   - Annual Cost: See Table 4.5-52 for a cost summary of this option.

***Table 4.5-52.***
***Recommended Plan Costs by Decade for the City of New Deal***

| *Plan Element* | *2010* | *2020* | *2030* | *2040* | *2050* | *2060* |
|---|---|---|---|---|---|---|
| Projected Shortage (acft/yr) | 0 | 12 | 20 | 20 | 20 | 20 |
| **Local Groundwater Development** | | | | | | |
| Quantity Available (acft/yr) | — | 193 | 174 | 157 | 141 | 127 |
| Annual Cost ($/yr) | — | $63,286 | $63,286 | $63,286 | $15,528 | $15,528 |
| Unit Cost ($/acft) | — | $328 | $363 | $403 | $110 | $122 |

### *4.5.15.5 The City of Ransom Canyon*

#### *4.5.15.5.1 Description of Supply*

- **Source:** Ogallala Aquifer
- **Current Supply:** Adequate to meet demands through 2060.

#### *4.5.15.5.2 Water Supply Plan*

Working within the planning criteria established by the LERWPG and TWDB, the following water supply plan is recommended for the City of Ransom Canyon.

- Municipal water conservation.

#### *4.5.15.5.3 Costs*

Costs of the recommended plan for the City of Ransom Canyon are:

a. Municipal water conservation:
   - Cost Source: Section 4.4.1, Table 4.4-8
   - Date to be Implemented: Prior to 2012
   - Annual Cost: See Table 4.5-53 for a cost summary of this option.

***Table 4.5-53.***
***Recommended Plan Costs by Decade for the City of Ransom Canyon***

| *Plan Element* | *2010* | *2020* | *2030* | *2040* | *2050* | *2060* |
|---|---|---|---|---|---|---|
| Projected Shortage (acft/yr) | 0 | 0 | 0 | 0 | 0 | 0 |
| **Municipal Water Conservation** | | | | | | |
| Quantity Available (acft/yr) | 35 | 90 | 162 | 248 | 325 | 342 |
| Annual Cost ($/yr) | $22,221 | $51,167 | $89,255 | $133,876 | $174,412 | $183,611 |
| Unit Cost ($/acft) | $635 | $569 | $551 | $540 | $537 | $537 |

### *4.5.15.6 The City of Shallowater*

#### *4.5.15.6.1 Description of Supply*

- **Source:** Ogallala Aquifer and City of Lubbock (CRMWA)
- **Current Supply:** Adequate to meet demands until approximately 2010, at which time additional supplies will be needed

#### *4.5.15.6.2 Water Supply Plan*

Working within the planning criteria established by the LERWPG and TWDB, the following water supply plan is recommended to meet the projected shortages of the City of Shallowater through 2060.

- Local groundwater development beginning in 2010 needed to supply an additional 184 acft/yr in 2060. There appears to be adequate saturated thickness of the Ogallala Aquifer approximately two miles from the City of Shallowater into which the city could locate new municipal water supply wells.

#### *4.5.15.6.3 Costs*

Costs of the recommended plan for the City of Shallowater to meet 2060 shortages are:

a. Local groundwater development (See Section 4.4.2 for scheduling and a cost summary of this option):
   - Cost Source: Section 4.4.2, Table 4.4-33
   - Date to be Implemented: 2012
   - Total Project Cost: $479,941
   - Annual Cost: See Table 4.5-54 for a cost summary of this option.

***Table 4.5-54.***
***Recommended Plan Costs by Decade for the City of Shallowater***

| *Plan Element* | *2010* | *2020* | *2030* | *2040* | *2050* | *2060* |
|---|---|---|---|---|---|---|
| Projected Shortage (acft/yr) | 157 | 180 | 190 | 184 | 192 | 184 |
| **Local Groundwater Development** | | | | | | |
| Quantity Available (acft/yr) | 432 | 389 | 350 | 315 | 283 | 255 |
| Annual Cost ($/yr) | $68,577 | $68,577 | $68,577 | $26,736 | $26,736 | $26,736 |
| Unit Cost ($/acft) | $159 | $176 | $196 | $85 | $94 | $105 |

### *4.5.15.7 The City of Wolfforth*

#### *4.5.15.7.1 Description of Supply*

- **Source:** Ogallala Aquifer
- **Current Supply:** Adequate to meet demands until approximately 2045, at which time additional supplies will be needed

#### *4.5.15.7.2 Water Supply Plan*

Working within the planning criteria established by the LERWPG and TWDB, the following water supply plan is recommended to meet the projected shortages of the City of Wolfforth through 2060.

- Local groundwater development beginning in 2045 needed to supply an additional 388 acft/yr in 2060. There appears to be adequate saturated thickness of the Ogallala Aquifer approximately two miles from the City of Wolfforth into which the city could locate new municipal water supply wells.

#### *4.5.15.7.3 Costs*

Costs of the recommended plan for the City of Wolfforth to meet 2060 shortages are:

a. Local groundwater development (See Section 4.4.2 for scheduling and a cost summary of this option):
   - Cost Source: Section 4.4.2, Table 4.4-38
   - Date to be Implemented: 2045
   - Total Project Cost: $255,698
   - Annual Cost: See Table 4.5-55 for a cost summary of this option.

***Table 4.5-55.***
***Recommended Plan Costs by Decade for the City of Wolfforth***

| *Plan Element* | *2010* | *2020* | *2030* | *2040* | *2050* | *2060* |
|---|---|---|---|---|---|---|
| Projected Shortage (acft/yr) | 0 | 0 | 0 | 0 | 165 | 388 |
| **Local Groundwater Development** | | | | | | |
| Quantity Available (acft/yr) | 0 | 0 | 0 | 0 | 437 | 393 |
| Annual Cost ($/yr) | 0 | 0 | 0 | 0 | $47,049 | $47,049 |
| Unit Cost ($/acft) | 0 | 0 | 0 | 0 | $108 | $120 |

### *4.5.15.8 Irrigation*

#### *4.5.15 8.1 Description of Supply*

- **Source:** Ogallala Aquifer and Reclaimed Water
- **Current Supply:** 168,610 acft/yr in 2010 declining to 76,161 acft/yr in 2060.

#### *4.5.15 8.2 Water Supply Plan*

The use of irrigation BMPs in the past in Lubbock County have increased water use efficiency and thereby contributed to maintaining levels of irrigation production in the region. The Irrigation Water Conservation Water Management Strategy is recommended for Lubbock County irrigation farmers (Section 4.4.1.2). However, it is not economically feasible to meet all of the irrigation needs (shortages) at this time.

#### *4.5.15.3.3 Costs*

a. Irrigation water conservation:

- Cost Source: Section 4.4.1.2, Table 4.4-13A
- Date to be Implemented: Prior to 2012
- Total Cost: $35,280,000
- Annual Cost: $3,080,000; including debt service at 20 yrs useful life of systems (Table 4.5-56).

***Table 4.5-56.***
***Recommended Plan Costs by Decade for Irrigation – Lubbock County***

| Plan Element | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|
| Projected Irrigation Need (Shortage) (acft/yr) | 61,046 | 90,653 | 99,575 | 109,703 | 102,293 | 96,846 |
| Irrigation Conservation Quantity (acft/yr) | 48,909 | 44,018 | 39,616 | 35,655 | 32,089 | 28,880 |
| Annual Cost (million dollars/yr) (Table 4.4-13A) | $3.08 | $3.08 | $3.08 | $3.08 | $3.08 | $3.08 |
| Unit Cost ($/acft) (Table 4.4-13B) | $63 | $70 | $78 | $86 | $96 | $106 |

(This page intentionally left blank)

### *4.5.16 Lynn County Water Supply Plan*

Table 4.5-57 lists each water user group in Lynn County and its corresponding surplus or shortage in years 2030 and 2060. For each water user group with a projected shortage, a water supply plan has been developed and is presented in the following subsections.

***Table 4.5-57.***
***Lynn County Surplus/Shortage***

| *Water User Group* | *Surplus/Shortage*[1] | | *Comment* |
|---|---|---|---|
| | *2030 (acft/yr)* | *2060 (acft/yr)* | |
| City of O'Donnell (part) | 122 | 113 | Projected surplus |
| City of Tahoka | 44 | 39 | Projected surplus |
| City of Wilson | -65 | -55 | Projected shortage – see plan below |
| County Other | 100 | 100 | Projected surplus |
| Industrial | 0 | 0 | No projected demand |
| Steam Electric | 0 | 0 | No projected demand |
| Mining | 0 | 0 | No projected surplus/shortage |
| Irrigation | 21,651 | 36,474 | Projected surplus – see plan below |
| Beef Feedlot Livestock | 0 | 0 | No projected demand |
| Range & All Other Livestock | 0 | 0 | No projected surplus/shortage |

[1] From Table 4-16, Section 4.1 – Water Needs Projections by Water User Group.

* Computations are at the county level of detail, and although the county data show a surplus or shortage, there no doubt are individual water users of each county who have a shortage when the county shows an overall surplus; e.g., the projected surplus water is not located such that those who have shortages can obtain it.

### *4.5.16.1 The City of Wilson*

#### *4.5.16.1.1 Description of Supply*

- **Source:** Ogallala Aquifer
- **Current Supply:** Adequate to meet demands until approximately 2015, at which time additional supplies will be needed

#### *4.5.16.1.2 Water Supply Plan*

Working within the planning criteria established by the LERWPG and TWDB, the following water supply plan is recommended to meet the projected shortages of the City of Wilson through 2060.

- Local groundwater development beginning in 2011 needed to supply an additional 55 acft/yr in 2060. There appears to be adequate saturated thickness of the Ogallala Aquifer approximately two miles from the City of Wilson into which the city could locate new municipal water supply wells, and
- Purchase water from the City of Lubbock.

#### *4.5.16.1.3 Costs*

Costs of the recommended plan for the City of Wilson to meet 2060 shortages are:

a. Local groundwater development (See Section 4.4.2 for scheduling and a cost summary of this option):
   - Cost Source: Section 4.4.2, Table 4.4-37
   - Date to be Implemented: 2012
   - Total Project Cost: $349,252
   - Annual Cost: See Table 4.5-58 for a cost summary of this option.

***Table 4.5-58.***
***Recommended Plan Costs by Decade for the City of Wilson***

| *Plan Element* | *2010* | *2020* | *2030* | *2040* | *2050* | *2060* |
|---|---|---|---|---|---|---|
| Projected Shortage (acft/yr) | 0 | 68 | 65 | 63 | 60 | 55 |
| **Local Groundwater Development** | | | | | | |
| Quantity Available (acft/yr) | — | 193 | 174 | 157 | 141 | 127 |
| Annual Cost ($/yr) | — | $44,171 | $44,171 | $44,171 | $13,723 | $13,723 |
| Unit Cost ($/acft) | — | $229 | $254 | $281 | $97 | $108 |

### *4.5.16.2 Irrigation*

#### *4.5.16.2.1 Description of Supply*

- **Source:** Ogallala and Edwards-Trinity Aquifers, and Reclaimed Water
- **Current Supply:** 131,397 acft/yr in 2010 declining to 122,861 acft/yr in 2060.

#### *4.5.16.2.2 Water Supply Plan*

The use of irrigation BMPs in the past in Lynn County have increased water use efficiency and thereby contributed to maintaining levels of irrigation production in the region. The Irrigation Water Conservation Water Management Strategy is recommended for Lynn

County irrigation farmers (Section 4.4.1.2) even though there is no projected need (shortage) during the planning period. Irrigation water conservation will contribute to extending the future life of the aquifer in the county.

#### *4.5.16.3.3 Costs*

a. Irrigation water conservation:

- Cost Source: Section 4.4.1.2, Table 4.4-13A
- Date to be Implemented: Prior to 2010
- Total Cost: $8,410,000
- Annual Cost: $730,000; including debt service at 20 yrs useful life of systems (Table 4.5-59).

***Table 4.5-59.***
***Recommended Plan Costs by Decade for Irrigation – Lynn County***

| Plan Element | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|
| Projected Irrigation Need (Shortage) (acft/yr) | 550 | 508 | 464 | 408 | 406 | 402 |
| Irrigation Conservation Quantity (acft/yr) | 11,660 | 10,494 | 9,445 | 8,500 | 7,650 | 6,885 |
| Annual Cost (million dollars/yr) (Table 4.4-13A) | $0.73 | $0.73 | $0.73 | $0.73 | $0.73 | $0.73 |
| Unit Cost ($/acft) (Table 4.4-13B) | $63 | $70 | $78 | $86 | $96 | $106 |

(This page intentionally left blank.)

### *4.5.17 Motley County Water Supply Plan*

Table 4.5-60 lists each water user group in Motley County and their corresponding surplus or shortage in years 2030 and 2060. For each water user group with a projected shortage, a water supply plan has been developed and is presented in the following subsections.

***Table 4.5-60.***
***Motley County Surplus/Shortage***

| *Water User Group* | *Surplus/Shortage*[1] | | *Comment* |
|---|---|---|---|
| | *2030 (acft/yr)* | *2060 (acft/yr)* | |
| City of Matador | 0 | 0 | No projected surplus/shortage |
| County Other | 0 | 0 | No projected surplus/shortage |
| Industrial | 0 | 0 | No projected surplus/shortage |
| Steam Electric | 0 | 0 | No projected demand |
| Mining | 0 | 0 | No projected surplus/shortage |
| Irrigation | -1,266 | -1,025 | Projected shortage – see plan below |
| Beef Feedlot Livestock | 0 | 0 | No projected demand |
| Range & All Other Livestock | 0 | 0 | No projected surplus/shortage |

[1] From Table 4-17, Section 4.1 – Water Needs Projections by Water User Group.

* Computations are at the county level of detail, and although the county data show a surplus or shortage, there no doubt are individual water users of each county who have a shortage when the county shows an overall surplus; e.g., the projected surplus water is not located such that those who have shortages can obtain it.

#### *4.5.17.1 The City of Matador*

##### *4.5.17.1.1 Description of Supply*

- **Source:** Ogallala Aquifer
- **Current Supply:** Adequate to meet demands through 2060.

##### *4.5.17.1.2 Water Supply Plan*

Working within the planning criteria established by the LERWPG and TWDB, the following water supply plan is recommended for the City of Matador.

- Municipal water conservation.

#### *4.5.17.1.3 Costs*

Costs of the recommended plan for the City of Matador are:

a. Municipal water conservation:
   - Cost Source: Section 4.4.1, Table 4.4-8
   - Date to be Implemented: Prior to 2010
   - Annual Cost: See Table 4.5-61 for a cost summary of this option.

***Table 4.5-61.***
***Recommended Plan Costs by Decade for the City of Matador***

| *Plan Element* | *2010* | *2020* | *2030* | *2040* | *2050* | *2060* |
|---|---|---|---|---|---|---|
| Projected Shortage (acft/yr) | 0 | 0 | 0 | 0 | 0 | 0 |
| **Municipal Water Conservation** | | | | | | |
| Quantity Available (acft/yr) | 20 | 37 | 49 | 57 | 63 | 62 |
| Annual Cost ($/yr) | $13,187 | $21,388 | $27,143 | $30,618 | $33,864 | $33,087 |
| Unit Cost ($/acft) | $659 | $578 | $554 | $537 | $538 | $534 |

### *4.5.17.2 Irrigation*

#### *4.5.17.2.1 Description of Supply*

- **Source:** Ogallala and Seymour Aquifers
- **Current Supply:** 7,562 acft/yr in 2010 declining to 6,616 acft/yr in 2060.

#### *4.5.17.2.2 Water Supply Plan*

The use of irrigation BMPs in the past in Motley County have increased water use efficiency and thereby contributed to maintaining levels of irrigation production in the region. The Irrigation Water Conservation Water Management Strategy is recommended for Motley County irrigation farmers (Section 4.4.1.2). however, information available indicates that practically all of the presently irrigated acreages are equipped with efficient application systems. Irrigation water conservation will contribute to extending the future life of the aquifer in the county.

#### *4.5.17.3.3 Costs*

a. Irrigation water conservation:

- Cost Source: Section 4.4.1.2, Table 4.4-13A
- Date to be Implemented: Prior to 2010
- Total Cost: $640,000
- Annual Cost: $60,000; including debt service at 20 yrs useful life of systems (Table 4.5-62).

***Table 4.5-62.***
***Recommended Plan Costs by Decade for Irrigation – Motley County***

| Plan Element | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|
| Projected Irrigation Need (Shortage) (acft/yr) | 1,332 | 1,266 | 1,208 | 1,154 | 1,092 | 1,025 |
| Irrigation Conservation Quantity (acft/yr) | 886 | 798 | 718 | 646 | 582 | 523 |
| Annual Cost (million dollars/yr) (Table 4.4-13A) | $0.06 | $0.06 | $0.06 | $0.06 | $0.06 | $0.06 |
| Unit Cost ($/acft) (Table 4.4-13B) | $63 | $70 | $78 | $86 | $96 | $106 |

(This page intentionally left blank.)

### *4.5.18 Parmer County Water Supply Plan*

Table 4.5-63 lists each water user group in Parmer County and its corresponding surplus or shortage in years 2030 and 2060. For each water user group with a projected shortage, a water supply plan has been developed and is presented in the following subsections.

***Table 4.5-63.***
***Parmer County Surplus/Shortage***

| *Water User Group* | *Surplus/Shortage*[1] | | *Comment* |
|---|---|---|---|
| | *2030 (acft/yr)* | *2060 (acft/yr)* | |
| City of Bovina | 0 | 0 | No projected surplus/shortage |
| City of Farwell | -46 | -106 | Projected shortage – see plan below |
| City of Friona | -384 | -431 | Projected shortage – see plan below |
| County Other | 0 | 0 | No projected surplus/shortage |
| Industrial | 0 | 0 | No projected surplus/shortage |
| Steam Electric | 0 | 0 | No projected demand |
| Mining | 0 | 0 | No projected demand |
| Irrigation | -361,623 | -346,700 | Projected shortage – see plan below |
| Beef Feedlot Livestock | 0 | -3,377 | Projected shortage |
| Dairies | -180 | -1,715 | Projected shortage |
| Range & All Other Livestock | 0 | 0 | No projected surplus/shortage |

[1] From Table 4-18, Section 4.1 – Water Needs Projections by Water User Group.

* Computations are at the county level of detail, and although the county data show a surplus or shortage, there no doubt are individual water users of each county who have a shortage when the county shows an overall surplus; e.g., the projected surplus water is not located such that those who have shortages can obtain it.

#### *4.5.18.1 The City of Farwell*

##### *4.5.18.1.1 Description of Supply*

- **Source:** Ogallala Aquifer
- **Current Supply:** Adequate to meet demands until approximately 2045, at which time additional supplies will be needed

#### *4.5.18.1.2 Water Supply Plan*

Working within the planning criteria established by the LERWPG and TWDB, the following water supply plan is recommended to meet the projected shortages of the City of Farwell through 2060.

- Municipal water conservation, and
- Local groundwater development beginning in 2045 needed to supply an additional 106 acft/yr in 2060. There appears to be adequate saturated thickness of the Ogallala Aquifer approximately three miles from the City of Farwell into which the city could locate new municipal water supply wells.

#### *4.5.18.1.3 Costs*

Costs of the recommended plan for the City of Farwell to meet 2060 shortages are:

a. Municipal water conservation:
   - Cost Source: Section 4.4.1, Table 4.4-7
   - Date to be Implemented: Prior to 2012
   - Annual Cost: See Table 4.5-64 for a cost summary of this option.

***Table 4.5-64.***
***Recommended Plan Costs by Decade for the City of Farwell***

| *Plan Element* | *2010* | *2020* | *2030* | *2040* | *2050* | *2060* |
|---|---|---|---|---|---|---|
| Projected Shortage (acft/yr) | 0 | 1 | 46 | 80 | 99 | 106 |
| **Municipal Water Conservation** | | | | | | |
| Quantity Available (acft/yr) | 33 | 64 | 94 | 101 | 97 | 91 |
| Annual Cost ($/yr) | $22,349 | $37,626 | $52,264 | $55,249 | $52,239 | $49,354 |
| Unit Cost ($/acft) | $677 | $588 | $556 | $547 | $539 | $542 |
| **Local Groundwater Development** | | | | | | |
| Quantity Available (acft/yr) | — | 147 | 132 | 119 | 107 | 107 |
| Annual Cost ($/yr) | — | $29,835 | $29,835 | $12,369 | $12,369 | $12,369 |
| Unit Cost ($/acft) | — | $203 | $226 | $104 | $115 | $115 |

b. Local groundwater development (See Section 4.4.2 for scheduling and a cost summary of this option):
   - Cost Source: Section 4.4.2, Table 4.4-21
   - Date to be Implemented: 2020

- Total Project Cost: $163,152
- Annual Cost: See Table 4.5-64 for a cost summary of this option.

### *4.5.18.2 The City of Friona*

#### *4.5.18.2.1 Description of Supply*

- **Source:** Ogallala Aquifer
- **Current Supply:** Adequate to meet demands until approximately 2025, at which time additional supplies will be needed

#### *4.5.18.2.2 Water Supply Plan*

Working within the planning criteria established by the LERWPG and TWDB, the following water supply plan is recommended to meet the projected shortages of the City of Friona through 2060.

- Municipal water conservation, and
- Local groundwater development beginning in 2010 needed to supply an additional 431 acft/yr in 2060. There appears to be adequate saturated thickness of the Ogallala Aquifer approximately 4 miles from the City of Friona into which the city could locate new municipal water supply wells.

#### *4.5.18.2.3 Costs*

Costs of the recommended plan for the City of Friona to meet 2060 shortages are:

a. Municipal water conservation:
   - Cost Source: Section 4.4.1, Table 4.4-8
   - Date to be Implemented: Prior to 2012
   - Annual Cost: See Table 4.5-65 for a cost summary of this option.

b. Local groundwater development (See Section 4.4.2 for scheduling and a cost summary of this option):
   - Cost Source: Section 4.4.2, Table 4.4-22
   - Date to be Implemented: 2012
   - Total Project Cost: $524,596
   - Annual Cost: See Table 4.5-65 for a cost summary of this option.

***Table 4.5-65.***
***Recommended Plan Costs by Decade for the City of Friona***

| *Plan Element* | *2010* | *2020* | *2030* | *2040* | *2050* | *2060* |
|---|---|---|---|---|---|---|
| Projected Shortage (acft/yr) | 0 | 0 | 384 | 425 | 437 | 431 |
| **Municipal Water Conservation** | | | | | | |
| Quantity Available (acft/yr) | 46 | 34 | 20 | 5 | 0 | 0 |
| Annual Cost ($/yr) | $33,831 | $25,156 | $14,735 | $3,709 | - | - |
| Unit Cost ($/acft) | $735 | $740 | $737 | $742 | - | - |
| **Local Groundwater Development** | | | | | | |
| Quantity Available (acft/yr) | -- | -- | 419 | 753 | 678 | 610 |
| Annual Cost ($/yr) | -- | -- | $47,624 | $95,248 | $95,248 | $49,514 |
| Unit Cost ($/acft) | -- | -- | $114 | $126 | $140 | $81 |

### *4.5.18.3 Irrigation*

#### *4.5.18.4.1 Description of Supply*

- **Source:** Ogallala Aquifer and Reclaimed Water
- **Current Supply:** 249,653 acft/yr in 2010 declining to 38,624 acft/yr in 2060.

#### *4.5.18.4.2 Water Supply Plan*

The use of irrigation BMPs in the past in Parmer County have increased water use efficiency and thereby contributed to maintaining levels of irrigation production in the region. The Irrigation Water Conservation Water Management Strategy is recommended for Parmer County irrigation farmers (Section 4.4.1.2). However, it is not economically feasible to meet all of the irrigation needs (shortages) at this time.

#### *4.5.18.3.3 Costs*

a. Irrigation water conservation:
   - Cost Source: Section 4.4.1.2, Table 4.4-13A
   - Date to be Implemented: Prior to 2010
   - Total Cost: $13,790,000
   - Annual Cost: $1,200,000; including debt service at 20 yrs useful life of systems (Table 4.5-66).

***Table 4.5-66.***
***Recommended Plan Costs by Decade for Irrigation and CAFOs– Parmer County***

| Plan Element | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|
| Projected Irrigation Need (Shortage) (acft/yr) | 161,382 | 331,230 | 361,623 | 357,040 | 351,465 | 346,700 |
| Irrigation Conservation Quantity (acft/yr) | 19,120 | 17,208 | 15,487 | 13,938 | 12,545 | 11,290 |
| Annual Cost (million dollars/yr) (Table 4.4-13A) | $1.20 | $1.20 | $1.20 | $1.20 | $1.20 | $1.20 |
| Unit Cost ($/acft) (Table 4.4-13B) | $63 | $70 | $78 | $86 | $96 | $106 |
| | | | | | | |
| Projected CAFO Need (Shortage) (acft/yr) | --- | --- | 180 | 1,546 | 3,712 | 5,092 |

### *4.5.18.4 Confined Animal Feeding Operations (CAFOs) Beef Feedyards and Dairies*

#### *4.5.18.4.1 Description of Supply*

- **Source:** Ogallala Aquifer
- **Current Supply:** 7,595 acft/yr in 2010, increasing to 8,107 acft/yr in 2060, but with demand increasing to 5,092 more than supply available in 2060.

- Working within the planning criteria established by the LERWPG and TWDB, is not feasible to meet the CAFO (Beef Feedyards and Dairies) needs (shortages) at this time, for the following reasons: (1) the CAFOs are owned by private individuals and are located several miles apart, (2) needs (shortages) of individual CAFOs are projected to develop at different times during the planning period, such that demands for quantities of water from water management strategies (WMSs) will not arise such that the WMSs can be successfully implemented from the financial standpoints, and (3) cost estimates of water management strategies evaluated appear to be in excess of affordability for CAFOs (Section 4.4.3.9). In addition, at the present time, it does not appear that there are organizations available to the CAFOs that have authority to implement water management strategies to deliver the needed water.

*(This page intentionally left blank.)*

### *4.5.19 Swisher County Water Supply Plan*

Table 4.5-67 lists each water user group in Swisher County and its corresponding surplus or shortage in years 2030 and 2060. For each water user group with a projected shortage, a water supply plan has been developed and is presented in the following subsections.

***Table 4.5-67.***
***Swisher County Surplus/Shortage***

| *Water User Group* | *Surplus/Shortage*[1] | | *Comment* |
|---|---|---|---|
| | *2030 (acft/yr)* | *2060 (acft/yr)* | |
| City of Happy | 0 | 0 | No projected surplus/shortage |
| City of Kress | 60 | 24 | No projected shortage |
| City of Tulia | -417 | -417 | Projected shortage – see plan below |
| County Other | 0 | 0 | No projected surplus/shortage |
| Industrial | 0 | 0 | No projected demand |
| Steam Electric | 0 | 0 | No projected demand |
| Mining | 0 | 0 | No projected demand |
| Irrigation | -95,875 | -107,533 | Projected shortage – see plan below |
| Beef Feedlot Livestock | 0 | 0 | No projected surplus/shortage |
| Range & All Other Livestock | 0 | 0 | No projected surplus/shortage |

[1] From Table 4-19, Section 4.1 – Water Needs Projections by Water User Group.

* Computations are at the county level of detail, and although the county data show a surplus or shortage, there no doubt are individual water users of each county who have a shortage when the county shows an overall surplus; e.g., the projected surplus water is not located such that those who have shortages can obtain it.

#### *4.5.19.1 The City of Tulia*

##### *4.5.19.1.1 Description of Supply*

- **Source:** Ogallala Aquifer
- **Current Supply:** Adequate to meet demands until approximately 2005, at which time additional supplies will be needed.

##### *4.5.19.1.2 Water Supply Plan*

Working within the planning criteria established by the LERWPG and TWDB, the following water supply plan is recommended to meet the projected shortages of the City of Tulia through 2060.

- Municipal water conservation; and
- Local groundwater development beginning in 2011 needed to supply an additional 417 acft/yr in 2060. There appears to be adequate saturated thickness of the Ogallala Aquifer approximately four miles from the City of Tulia into which the city could locate new municipal water supply wells.

#### *4.5.19.1.3 Costs*

Costs of the recommended plan for the City of Tulia are:

a. Municipal water conservation:
   - Cost Source: Section 4.4.1, Table 4.4-8
   - Date to be Implemented: Prior to 2012
   - Annual Cost: See Table 4.5-68 for a cost summary of this option.

***Table 4.5-68.***
***Recommended Plan Costs by Decade for the City of Tulia***

| *Plan Element* | *2010* | *2020* | *2030* | *2040* | *2050* | *2060* |
|---|---|---|---|---|---|---|
| Projected Shortage (acft/yr) | 417 | 417 | 417 | 417 | 417 | 417 |
| **Municipal Water Conservation** | | | | | | |
| Quantity Available (acft/yr) | 18 | 0 | 0 | 0 | 0 | 0 |
| Annual Cost ($/yr) | $13,283 | — | — | — | — | — |
| Unit Cost ($/acft) | $738 | — | — | — | — | — |
| **Local Groundwater Development** | | | | | | |
| Quantity Available (acft/yr) | 432 | 778 | 700 | 630 | 567 | 510 |
| Annual Cost ($/yr) | $134,743 | $180,162 | $180,162 | $57,533 | $57,533 | $57,533 |
| Unit Cost ($/acft) | $312 | $232 | $257 | $91 | $101 | $113 |

Local groundwater development (See Section 4.4.2 for scheduling and a cost summary of this option):
   - Cost Source: Section 4.4.2, Table 4.4-36
   - Date to be Implemented: 2012
   - Total Project Cost: $1,406,624
   - Annual Cost: See Table 4.5-68 for a cost summary of this option.

### *4.5.19.2 Irrigation*

#### *4.5.19.2.1 Description of Supply*

- **Source:** Ogallala Aquifer
- **Current Supply:** 148,846 acft/yr in 2010 declining to 58,842 acft/yr in 2060.

#### *4.5.19.2.2 Water Supply Plan*

The use of irrigation BMPs in the past in Swisher County have increased water use efficiency and thereby contributed to maintaining levels of irrigation production in the region. The Irrigation Water Conservation Water Management Strategy is recommended for Swisher County irrigation farmers (Section 4.4.1.2), which is projected to meet the irrigation needs through 2020. However, it is not economically feasible to meet all of the irrigation needs (shortages) beyond 2020, at this time.

#### *4.5.19.2.3 Costs*

a. Irrigation water conservation:
   - Cost Source: Section 4.4.1.2, Table 4.4-13A
   - Date to be Implemented: Prior to 2012
   - Total Cost: $37,880,000
   - Annual Cost: $3,300,000; including debt service at 20 yrs useful life of systems (Table 4.5-69).

***Table 4.5-69.***
***Recommended Plan Costs by Decade for Irrigation – Swisher County***

| Plan Element | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|
| Projected Irrigation Need (Shortage) (acft/yr) | 22,646 | 60,423 | 95,875 | 105,385 | 107,602 | 107,533 |
| Irrigation Conservation Quantity (acft/yr) | 52,517 | 47,266 | 42,539 | 38,285 | 34,457 | 31,011 |
| Annual Cost (million dollars/yr) (Table 4.4-13A) | $3.30 | $3.30 | $3.30 | $3.30 | $3.30 | $3.30 |
| Unit Cost ($/acft) (Table 4.4-13B) | $63 | $70 | $78 | $86 | $96 | $106 |

*(This page intentionally left blank.)*

### *4.5.20 Terry County Water Supply Plan*

Table 4.5-70 lists each water user group in Terry County and its corresponding surplus or shortage in years 2030 and 2060. For each water user group with a projected shortage, a water supply plan has been developed and is presented in the following subsections.

***Table 4.5-70.***
***Terry County Surplus/Shortage***

| *Water User Group* | *Surplus/Shortage*[1] | | *Comment* |
|---|---|---|---|
| | *2030 (acft/yr)* | *2060 (acft/yr)* | |
| City of Brownfield | -280 | -457 | Projected shortage – see plan below |
| City of Meadow | 0 | 0 | No projected surplus/shortage |
| County Other | 0 | 0 | No projected surplus/shortage |
| Industrial | 0 | 0 | No projected surplus/shortage |
| Steam Electric | 0 | 0 | No projected demand |
| Mining | 0 | 0 | No projected surplus/shortage |
| Irrigation | -101,067 | -89,755 | Projected shortage – see plan below |
| Beef Feedlot Livestock | 0 | 0 | No projected demand |
| Range & All Other Livestock | 0 | 0 | No projected surplus/shortage |

[1] From Table 4-20, Section 4.1 – Water Needs Projections by Water User Group.

* Computations are at the county level of detail, and although the county data show a surplus or shortage, there no doubt are individual water users of each county who have a shortage when the county shows an overall surplus; e.g., the projected surplus water is not located such that those who have shortages can obtain it.

#### *4.5.20.1 The City of Brownfield*

##### *4.5.20.1.1 Description of Supply*

- **Source:** Ogallala Aquifer and Canadian River Municipal Water Authority
- **Current Supply:** Adequate to meet demands until approximately 2015, at which time additional supplies will be needed

##### *4.5.20.1.2 Water Supply Plan*

Working within the planning criteria established by the LERWPG and TWDB, the following water supply plan is recommended to meet the projected shortages of the City of Brownfield through 2060.

- Municipal water conservation,
- Expand supplies from CRMWA.

#### *4.5.20.1.3 Costs*

Costs of the recommended plan for the City of Brownfield to meet 2060 shortages are:

a. Municipal water conservation:
   - Cost Source: Section 4.4.1, Table 4.4-8
   - Date to be Implemented: Prior to 2012
   - Annual Cost: See Table 4.5-71 for a cost summary of this option.

b. Expand Supplies from CRMWA:
   - Cost Source: Section 4.4.3.5, Table 4.4-53.
   - Date to be Implemented: Prior to 2012
   - Total Project Cost: Purchase at per acre-foot cost from CRMWA (Based on calculation of Brownfield share of CRMWA supply at 1.56 percent, or 494 acft/yr)
   - Annual Cost: See Table 4.5-71 for a cost summary of this option.

***Table 4.5-71.***
***Recommended Plan Costs by Decade for the City of Brownfield***

| *Plan Element* | *2010* | *2020* | *2030* | *2040* | *2050* | *2060* |
|---|---|---|---|---|---|---|
| Projected Shortage (acft/yr) | 0 | 115 | 280 | 435 | 458 | 457 |
| **Municipal Water Conservation** | | | | | | |
| Quantity Available (acft/yr) | 211 | 448 | 687 | 802 | 793 | 788 |
| Annual Cost ($/yr) | $142,485 | $261,914 | $380,644 | $433,686 | $425,849 | $423,482 |
| Unit Cost ($/acft) | $675 | $585 | $554 | $541 | $537 | $537 |
| **Expand Supplies from CRMWA *** | | | | | | |
| Quantity Available (acft/yr)* | 494 | 494 | 494 | 494 | 494 | 494 |
| Annual Cost ($/yr)* | % of total | % | % | % | % | % of total |
| Unit Cost ($/acft)* | $282 | $282 | $282 | $282 | $282 | $282 |
| * See 4.5.20.1.3 c, above. Adjusted to September 2008 prices is $282 per acft. | | | | | | |

### *4.5.20.2 Irrigation*

#### *4.5.20.2.1 Description of Supply*

- **Source:** Ogallala Aquifer

- **Current Supply:** 117,837 acft/yr in 2010 declining to 58,377 acft/yr in 2060.

#### *4.5.20.2.2 Water Supply Plan*

The use of irrigation BMPs in the past in Terry County have increased water use efficiency and thereby contributed to maintaining levels of irrigation production in the region. The Irrigation Water Conservation Water Management Strategy is recommended for Terry County irrigation farmers (Section 4.4.1.2), however, information available indicates that nearly all of presently irrigated acres are equipped with efficient application systems, thus, there is very little potential for additional irrigation conservation through use of this water management strategy. As is the case elsewhere in Region O, it is not economically feasible to meet all of the irrigation needs (shortages) at this time.

#### *4.5.20.3.3 Costs*

a. Irrigation water conservation:
   - Cost Source: Section 4.4.1.2, Table 4.4-13A
   - Date to be Implemented: Prior to 2012
   - Total Cost: $9,580,000
   - Annual Cost: $840,000; including debt service at 20 yrs useful life of systems (Table 4.5-72).

***Table 4.5-72.***
***Recommended Plan Costs by Decade for Irrigation – Terry County***

| Plan Element | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|
| Projected Irrigation Need (Shortage) (acft/yr) | 74,888 | 91,977 | 101,067 | 106,240 | 97,749 | 89,755 |
| Irrigation Conservation Quantity (acft/yr) | 13,285 | 11,956 | 10,760 | 9,684 | 8,716 | 7,844 |
| Annual Cost (million dollars/yr) (Table 4.4-13A) | $0.84 | $0.84 | $0.84 | $0.84 | $0.84 | $0.84 |
| Unit Cost ($/acft) (Table 4.4-13B) | $63 | $70 | $78 | $86 | $96 | $106 |

(This page intentionally left blank.)

### *4.5.21 Yoakum County Water Supply Plan*

Table 4.5-73 lists each water user group in Yoakum County and its corresponding surplus or shortage in years 2030 and 2060. For each water user group with a projected shortage, a water supply plan has been developed and is presented in the following subsections.

***Table 4.5-73.***
***Yoakum County Surplus/Shortage***

| *Water User Group* | *Surplus/Shortage*[1] | | *Comment* |
|---|---|---|---|
| | *2030 (acft/yr)* | *2060 (acft/yr)* | |
| City of Denver City | -979 | -1,000 | Projected shortage – see plan below |
| City of Plains | -468 | -457 | Projected shortage – see plan below |
| County Other | 0 | 0 | No projected surplus/shortage |
| Industrial | 0 | 0 | No projected demand |
| Steam Electric | 0 | 0 | No projected surplus/shortage |
| Mining | 0 | 0 | No projected surplus/shortage |
| Irrigation | -21,868 | -18,502 | Projected shortage – see plan below |
| Beef Feedlot Livestock | 0 | 0 | No projected demand |
| Range & All Other Livestock | 0 | 0 | No projected surplus/shortage |

[1] From Table 4-21, Section 4.1 – Water Needs Projections by Water User Group.

* Computations are at the county level of detail, and although the county data show a surplus or shortage, there no doubt are individual water users of each county who have a shortage when the county shows an overall surplus; e.g., the projected surplus water is not located such that those who have shortages can obtain it.

#### *4.5.21.1 The City of Denver City*

##### *4.5.21.1.1 Description of Supply*

- **Source:** Ogallala Aquifer
- **Current Supply:** Adequate to meet demands until approximately 2025, at which time additional supplies will be needed

##### *4.5.21.1.2 Water Supply Plan*

Working within the planning criteria established by the LERWPG and TWDB, the following water supply plan is recommended to meet the projected shortages of the City of Denver City through 2060.

- Municipal water conservation, and
- Local groundwater development beginning in 2021 needed to supply an additional 1,000 acft/yr in 2060. There appears to be adequate saturated thickness of the Ogallala Aquifer approximately 14 miles from the City of Denver City into which the city could locate new municipal water supply wells.

#### *4.5.21.1.3 Costs*

Costs of the recommended plan for the City of Denver City to meet 2060 shortages are:

a. Municipal water conservation:
   - Cost Source: Section 4.4.1, Table 4.4-8
   - Date to be Implemented: Prior to 2012
   - Annual Cost: See Table 4.5-74 for a cost summary of this option.

b. Local groundwater development (See Section 4.4.2 for scheduling and a cost summary of this option):
   - Cost Source: Section 4.4.2, Table 4.4-18
   - Date to be Implemented: 2021
   - Total Project Cost: $786,894
   - Annual Cost: See Table 4.5-74 for a cost summary of this option.

***Table 4.5-74.***
***Recommended Plan Costs by Decade for the City of Denver City***

| *Plan Element* | *2010* | *2020* | *2030* | *2040* | *2050* | *2060* |
|---|---|---|---|---|---|---|
| Projected Shortage (acft/yr) | 0 | 0 | 979 | 1,046 | 1,024 | 1,000 |
| **Municipal Water Conservation** | | | | | | |
| Quantity Available (acft/yr) | 77 | 169 | 179 | 171 | 160 | 155 |
| Annual Cost ($/yr) | $54,309 | $100,614 | $102,694 | $95,011 | $88,085 | $85,093 |
| Unit Cost ($/acft) | $705 | $595 | $574 | $556 | $551 | $549 |
| **Local Groundwater Development** | | | | | | |
| Quantity Available (acft/yr) | — | — | 1,283 | 1,154 | 1,039 | 935 |
| Annual Cost ($/yr) | — | — | $142,872 | $142,872 | $142,872 | $74,271 |
| Unit Cost ($/acft) | — | — | $111 | $124 | $138 | $79 |

#### *4.5.21.2 The City of Plains*

##### *4.5.21.2.1 Description of Supply*

- **Source:** Ogallala Aquifer
- **Current Supply:** Adequate to meet demands until approximately 2015, at which time additional supplies will be needed

##### *4.5.21.2.2 Water Supply Plan*

Working within the planning criteria established by the LERWPG and TWDB, the following water supply plan is recommended to meet the projected shortages of the City of Plains through 2060.

- Municipal water conservation, and
- Local groundwater development beginning in 2012 needed to supply an additional 457 acft/yr in 2060. There appears to be adequate saturated thickness of the Ogallala Aquifer approximately three miles from the City of Plains into which the city could locate new municipal water supply wells.

##### *4.5.21.2.3 Costs*

Costs of the recommended plan for the City of Plains to meet 2060 shortages are:

a. Municipal water conservation:
   - Cost Source: Section 4.4.1, Table 4.4-8
   - Date to be Implemented: Prior to 2012
   - Annual Cost: See Table 4.5-75 for a cost summary of this option.

b. Local groundwater development (See Section 4.4.2 for scheduling and a cost summary of this option):
   - Cost Source: Section 4.4.2, Table 4.4-30
   - Date to be Implemented: 2012
   - Total Project Cost: $1,186,082
   - Annual Cost: See Table 4.5-75 for a cost summary of this option.

***Table 4.5-75.***
***Recommended Plan Costs by Decade for the City of Plains***

| *Plan Element* | *2010* | *2020* | *2030* | *2040* | *2050* | *2060* |
|---|---|---|---|---|---|---|
| Projected Shortage (acft/yr) | 0 | 448 | 468 | 488 | 473 | 457 |
| **Municipal Water Conservation** | | | | | | |
| Quantity Available (acft/yr) | 33 | 68 | 106 | 107 | 102 | 98 |
| Annual Cost ($/yr) | $22,840 | $40,237 | $59,512 | $58,404 | $55,219 | $53,358 |
| Unit Cost ($/acft) | $692 | $592 | $561 | $546 | $541 | $544 |
| **Local Groundwater Development** | | | | | | |
| Quantity Available (acft/yr) | — | 618 | 556 | 501 | 600 | 539 |
| Annual Cost ($/yr) | — | $127,819 | $127,819 | $127,819 | $71,716 | $71,716 |
| Unit Cost ($/acft) | — | $207 | $230 | $255 | $120 | $133 |

### *4.5.21.3 Irrigation*

#### *4.5.21.3.1 Description of Supply*

- **Source:** Ogallala Aquifer
- **Current Supply:** 97,200 acft/yr in 2010 declining to 76,640 acft/yr in 2060.

#### *4.5.21.3.2 Water Supply Plan*

The use of irrigation BMPs in the past in Yoakum County have increased water use efficiency and thereby contributed to maintaining levels of irrigation production in the region. The Irrigation Water Conservation Water Management Strategy is recommended for Yoakum County irrigation farmers (Section 4.4.1.2), however, information available indicates that nearly all of presently irrigated acres are equipped with efficient application systems, thus, there is very little potential for additional irrigation conservation through use of this water management strategy. As is the case elsewhere in Region O, it is not economically feasible to meet all of the irrigation needs (shortages) at this time.

#### *4.5.21.3.3 Costs*

a. Irrigation water conservation:
   - Cost Source: Section 4.4.1.2, Table 4.4-13A
   - Date to be Implemented: Prior to 2012
   - Total Cost: $7,510,000

- Annual Cost: $65,000; including debt service at 20 yrs useful life of systems (Table 4.5-76).

***Table 4.5-76.***
***Recommended Plan Costs by Decade for Irrigation – Yoakum County***

| Plan Element | 2010 | 2020 | 2030 | 2040 | 2050 | 2060 |
|---|---|---|---|---|---|---|
| Projected Irrigation Need (Shortage) (acft/yr) | 23,779 | 22,744 | 21,868 | 20,553 | 19,576 | 18,502 |
| Irrigation Conservation Quantity (acft/yr) | 10,407 | 9,366 | 8,429 | 7,587 | 6,828 | 6,145 |
| Annual Cost (million dollars/yr) (Table 4.4-13A) | $0.65 | $0.65 | $0.65 | $0.65 | $0.65 | $0.65 |
| Unit Cost ($/acft) (Table 4.4-13B) | $63 | $70 | $78 | $86 | $96 | $106 |

### *4.5.22 Water Supply Plans for Wholesale Water Providers*

Table 4.5-77 lists each Wholesale Water Provider identified by the LERWPG and their corresponding surplus or shortage in years 2030 and 2060. Water supply plans that have been developed for CRMWA, City of Lubbock, and WRMWD are described below. Mackenzie Municipal Water Authority is also projected to have a shortage during the planning period; however no plan has been developed for this entity. Instead, a plan to develop locally available groundwater has been developed for each of the MMWA customers with a projected need.

***Table 4.5-77.***
***Wholesale Water Provider Surplus/Shortage***

| *Water User Group* | *Surplus/Shortage[1]* | | *Comment* |
|---|---|---|---|
| | *2030 (acft/yr)* | *2060 (acft/yr)* | |
| Canadian River Municipal Water Authority (CRMWA) | | | Projected shortage of main pipeline capacity at southern customer locations |
| City of Lubbock | 13,454 | 20,649 | Projected shortage – see plan below. |
| Mackenzie Municipal Water Authority (MMWA) | -2,128 | -1,936 | Projected shortage – see comment above. |
| White River Municipal Water District (WRMWD) | -686 | -1,489 | Projected shortage – see plan below. |

[1] From Table 4-23, Section 4.2 – Water Needs Projections by Major Water Provider.

### *4.5.22.1 Canadian River Municipal Water Authority (CRMWA)(See Section 4.4.3.10)*

#### *4.5.22.1.1 Description of Supply*

- **Source:** Ogallala Aquifer and Lake Meredith.
- **Current Supply:** Adequate to meet demands, but subject to pipeline capacity limitations in southernmost reaches of delivery system.

#### *4.5.22.1.2 Water Supply Plan*

Working within the planning criteria established by the LERWPG and TWDB, the following water supply plan is recommended for the CRMWA System.

- Add Capacity of Groundwater Supply to meet needs of 7 southernmost located CRMWA customers in Region O.

#### *4.5.22.1.3 Costs*

Costs of the recommended plan for CRMWA are:

- Cost Source: Section 4.4.3.10 Table 4.4-69 and Table 4.4-70.
- Date to be Implemented: Prior to 2030.
- Total Project Cost: $56,574,000. (Well Fields 2 and 2A)
- Annual Cost: See Table 4.5-78 for a cost summary of this option.

***Table 4.5-78.***
***Recommended Plan Costs by Decade for the Canadian River Municipal Water Authority***

| *Plan Element* | *2010* | *2020* | *2030* | *2040* | *2050* | *2060* |
|---|---|---|---|---|---|---|
| Projected Shortage (acft/yr) | -- | -- | -- | -- | -- | -- |
| **CRMWA Expand Groundwater Supply** | | | | | | |
| Quantity Available (acft/yr) | -- | -- | 15,700 | 14,130 | 12,717 | 11,445 |
| Annual Cost ($/yr) (millions) | -- | -- | $5.8 | $5.8 | $5.8 | $5.8 |
| Unit Cost ($/acft) | -- | -- | $370 | $412 | $456 | $507 |

### *4.5.22.2 The City of Lubbock (See Sections 4.4.3 and 4.5.15.3)*

#### *4.5.22.2.1 Description of Supply*

- **Source:** Ogallala Aquifer and Lake Meredith
- **Current Supply:** Adequate to meet demands through 2015.

#### *4.5.22.2.2 Water Supply Plan*

Working within the planning criteria established by the LERWPG and TWDB, the following water supply plan is recommended for the City of Lubbock.

- Municipal water conservation,
- Lake Alan Henry Supply to Lubbock,
- Jim Bertram Lake System Expansion - Lake 7,
- Lubbock North Fork Diversion Operation,
- Post Reservoir, and
- Lubbock Brackish Groundwater Desalination.

#### *4.5.22.2.3 Costs*

Costs of the recommended plan for the City of Lubbock are:

a. Municipal water conservation:

- Cost Source: Section 4.4.1, Table 4.4-8
- Date to be Implemented: Prior to 2010
- Annual Cost: See Table 4.5-51 for a cost summary of this option.

b. Lake Alan Henry Supply to Lubbock:
   - Cost Source: Section 4.4.3.2, Table 4.4-41.
   - Date to be Implemented: Prior to 2020.
   - Total Project Cost: $294,329,000.
   - Annual Cost: See Table 4.5-41 for a cost summary of this option.

c. Lubbock Jim Bertram Lake System Expansion – Lake 7
   - Cost Source: Section 4.4.3.3. Table 4.4-46
   - Date to be Implemented: 2020.
   - Total Project Cost: $68,288,000
   - Annual Cost: See Table 4.5-79 for a cost summary of this option.

d. Post Reservoir
   - Cost Source: Section 4.4.3.5
   - Date to be Implemented: 2030
   - Total Project Cost: $110,307,000
   - Annual Cost: See Table 4.5-79 for a cost summary of this option.

e. Lubbock North Fork Diversion Operation
   - Cost Source: Section 4.4.3.4. Table 4.4-51
   - Date to be Implemented: 2045
   - Total Project Cost: $153,040,000
   - Annual Cost: See Table 4.5-79 for a cost summary of this option.

f. Lubbock Brackish Groundwater Desalination
   - Cost Source: Section 4.4.3.6, Table 4.4-57
   - Date to be Implemented: 2020
   - Total Project Cost: $13,167,230
   - Annual Cost: See Table 4.5-79 for a cost summary of this option.

***Table 4.5-79.***
***Estimated Plan Costs by Decade for the City of Lubbock***

| *Plan Element* | *2010* | *2020* | *2030* | *2040* | *2050* | *2060* |
|---|---|---|---|---|---|---|
| Projected Shortage (acft/yr) | 8,602 | 10,496 | 13,454 | 15,765 | 19,333 | 20,649 |
| **Municipal Water Conservation (Strategy is included until the regional goal of 172 gpcd is reached)** | | | | | | |
| Quantity Available (acft/yr) | 4,132 | 7,662 | 7,112 | 6,441 | 6,256 | 6,405 |
| Annual Cost ($/yr) (millions) | $2.710 | $4.473 | $4.073 | $3.599 | $3.462 | $3.545 |
| Unit Cost ($/acft) | $656 | $583 | $572 | $559 | $553 | $554 |
| **Lake Alan Henry Supply to Lubbock** | | | | | | |
| Quantity Available (acft/yr) | 0 | 21,880 | 21,880 | 21,880 | 21,880 | 21,880 |
| Annual Cost ($/yr) (millions) | — | $28.655 | $28.655 | $28.655 | $28.655 | $28.655 |
| Unit Cost ($/acft) | — | $1,310 | $1,310 | $1,310 | $1,310 | $1,310 |
| **Lubbock Jim Bertram Lake System Expansion - Lake 7** | | | | | | |
| Quantity Available (acft/yr) | 0 | 17,650 | 17,650 | 17,650 | 17,650 | 17,650 |
| Annual Cost ($/yr) (millions) | — | $7.956 | $7.956 | $7.956 | $7.956 | $7.956 |
| Unit Cost ($/acft) | __ | $451 | $451 | $451 | $451 | $451 |
| **Post Reservoir** | | | | | | |
| Quantity Available (acft/yr) | 0 | 0 | 22,270 | 22,270 | 22,270 | 22,270 |
| Annual Cost ($/yr) (millions) | — | — | $15,786 | $15,786 | $15,786 | $15,786 |
| Unit Cost ($/acft) | __ | __ | $695 | $695 | $695 | $695 |
| **Lubbock North Fork Diversion Operation** | | | | | | |
| Quantity Available (acft/yr) | 0 | 0 | 0 | 0 | 3,675 | 3,675 |
| Annual Cost ($/yr) (millions) | — | — | — | — | $23.298 | $23.298 |
| Unit Cost ($/acft) | __ | __ | __ | __ | $6,340 | $6,340 |
| **Lubbock Brackish Groundwater Desalination** | | | | | | |
| Quantity Available (acft/yr) | 0 | 3,360 | 3,360 | 3,360 | 3,360 | 3,360 |
| Annual Cost ($/yr) (millions) | — | $2.418 | $2.418 | $2.418 | $2.418 | $2.418 |
| Unit Cost ($/acft) | — | $720 | $720 | $720 | $720 | $720 |

### *4.5.22.3 White River Municipal Water District (See Section 4.4.3.7)*

#### *4.5.22.3.1 Description of Supply*

- **Source:** White River Lake
- **Current Supply:** Adequate to meet demands through 2010.

#### *4.5.22.3.2 Water Supply Plan*

Working within the planning criteria established by the LERWPG and TWDB, the following water supply plan is recommended for the White River Municipal Water District.

- Municipal water conservation, and
- Reclaimed Water, and
- Local groundwater development by 2012 on land owned by the District in Crosby County.

#### *4.5.22.3.3 Costs*

Costs of the recommended plan for the White River Municipal Water District are:

a. Reclaimed Water:

- Cost Source: Section 4.4.3.7, table 4.4-58
- Date to be Implemented: Prior to 2020
- Total Project Cost: $38,089,684
- Annual Cost: See Table 4.5-80 for a cost summary of this option.

b. Local groundwater development (see Section 4.4.3.8 for a cost summary of this option).

- Cost Source: Section 4.4.3.8, Table 4.4-59
- Date to be Implemented: 2012
- Total Project Cost: $1,063,625
- Annual Cost: See Table 4.5-80 for a cost summary of this option.

***Table 4.5-80.***
***Recommended Plan Costs by Decade for the White River Municipal Water District****

| *Plan Element* | *2010* | *2020* | *2030* | *2040* | *2050* | *2060* |
|---|---|---|---|---|---|---|
| Projected Shortage (acft/yr) | 0 | 0 | 0 | 0 | 0 | 0 |
| **Municipal Water Conservation (By Member Cities)** | | | | | | |
| Quantity Available (acft/yr) | 21 | 42 | 54 | 50 | 48 | 48 |
| Annual Cost ($/yr) | $14,847 | $24,654 | $30,132 | $27,450 | $25,680 | $25,680 |
| Unit Cost ($/acft) | $707 | $587 | $558 | $549 | $535 | $535 |
| **Reclaimed Water*** | | | | | | |
| Quantity Available (acft/yr) | — | 2,240 | 2,240 | 2,240 | 2,240 | 2,240 |
| Annual Cost ($/yr) (millions) | — | $3.567 | $3.567 | $3.567 | $3.567 | $3.567 |
| Unit Cost ($/acft) | — | $1,593 | $1,593 | $1,593 | $1,593 | $1,593 |
| **Local Groundwater Development** | | | | | | |
| Quantity Available (acft/yr) | — | 7,742 | 7,742 | 7,742 | 7,742 | 7,742 |
| Annual Cost ($/yr) | — | $345,308 | $345,308 | $345,308 | $345,308 | $345,308 |
| Unit Cost ($/acft) | — | $45 | $45 | $45 | $45 | $45 |

* This water management strategy augments the quantity of water that can be obtained from White River Lake for diversion to the District's existing water treatment plant located at the lake. The purpose of the WMS is to maintain the District's capability to supply water to its member cities.

### *4.5.23 Region-Wide Water Management Strategies Included in the Llano Estacado Water Plan*

#### *4.5.23.1 Precipitation Enhancement (See Section 4.4.4.1 for a description of this option)*

Weather modification is included in the Llano Estacado Regional Water Plan. Weather modification, or precipitation enhancement, has the potential to increase the quantity of water that would be available to all water user groups in the Llano Estacado Region, as well as reduce pumpage requirements from the Ogallala Aquifer. Several cloud seeding operations are being carried out in Texas, including the Southern Ogallala Rainfall Enhancement (SOAR) program, which includes 2.3 million acres in Gaines, Terry, and Yoakum Counties at an annual cost of $109,200, or 4.7 cents per acre per year.

Although available data and cloud seeding experience are not adequate to give reliable estimates of long-term increases in precipitation, the present information indicates that precipitation can be increased by cloud seeding. For the 3,593 square mile (2,300,000-acre)

SOAR area, an increase in precipitation of one and one-half inches would result in an increase of about 287,500 acft of water per year to the land surface. At a cost of 4.7 cents per acre, the cost per acft of water is $0.38.

Additional precipitation during the growing season, which is the period during which present cloud seeding projects are operated, would directly and immediately benefit dryland and irrigated agriculture. Crop and grazing yields will be increased, irrigation water pumped from the Ogallala Aquifer can be reduced, and lawn irrigation can be reduced. The latter effect will contribute to meeting projected municipal water needs by reducing the quantities used per year from present supplies. Additionally, increased runoff could increase the water supply in public water supply reservoirs. An increase of water supply in playa lakes would increase natural recharge and provide water for wildlife.

#### *4.5.23.2 Brush Control (See Section 4.4.4.2 for a description of this option)*

Brush control is included in the Llano Estacado Regional Water Plan. Brush control could increase water supply in the Llano Estacado Region by increasing the runoff into lakes and reservoirs. The areas of the region where significant concentrations of brush occur are in the east "caprock counties" and in the western counties. In addition, there are approximately one million acres in the U.S. Department of Agriculture's (USDA) Conservation Reserve Program (CRP) located within the region. As the current contracts with USDA expire on these CRP areas and as the USDA programs change, some of the land may be returned to cultivated row crops; however, some of the land is expected to remain in grass. If these grassland acres are not managed to prevent brush infestation, these areas could become brush covered and thereby further contribute to the brush problem of the region.

Of the 21 counties in the region, 13 counties meet the condition of having 50,000 or more acres of mesquite and shinnery oak combined. The counties located in the southwest corner of the region and along the caprock have the highest acreages of mesquite and shinnery oak and would primarily be the locations where brush control can be applied to increase water supplies. As has been demonstrated in Crosby County on the White River Reservoir watershed, brush control can contribute to increased inflows to a reservoir. The existing Alan Henry Reservoir and the proposed Post Reservoir are located in Garza County, which has over 185,000 acres of

mesquite and shinnery oak. Brush control projects on the watersheds of these two reservoirs could result in increased firm yields and thereby contribute to the region's water supply.

The capital outlay to implement brush control upon 50 percent of the mesquite and shinnery oak infested acres in counties having more than 50,000 acres of these two species of brush is estimated at $53.33 million, with an annual cost of $3.53 million (see Section 4.4.4.2 for a discussion of costing assumptions and procedures). For example, if brush control were to be implemented on the Alan Henry Reservoir contributing watershed, the annual cost would be approximately $425,324. If the yield of the reservoir were increased by 10 percent, or 2,250 acft/yr, the cost per acft of raw water yield at the reservoir would be $189, or $0.57 per thousand gallons. The owners of the Alan Henry Reservoir and the proposed Post Reservoir should cooperate with the landowners of the watersheds and the Texas State Soil and Water Conservation Board to implement brush control on these watersheds.

#### *4.5.23.3 Desalt Brackish Groundwater (See Section 4.4.4.3 for a description of this option)*

Desalting brackish groundwater is included in the Llano Estacado Regional Water Plan. The potential source of water for this option is the Santa Rosa Aquifer of the Dockum Formation, which underlies the entire area of the Llano Estacado Water Planning Region. Data currently available indicate that the quality of water in the Santa Rosa in the majority of the planning region is unsuitable for most uses without treatment, including most municipal and irrigation uses. Cost estimates are presented for two levels of feedwater salinity—3,000 mg/L and 5,000 mg/L, and three water treatment plant sizes—0.2 MGD, 1.0 MGD, and 3.0 MGD, and include costs of obtaining untreated (raw) brackish groundwater for the desalination plants, and costs of concentrate disposal. The cost per acft for a 0.2 MGD plant to desalt 3,000 mg/L water is estimated at $1,047 per acft, or $3.21 per 1,000 gallons (Table 4.4-81), with total cost including raw water desalination, and concentrate disposal of $2,412 per acft, or $7.40 per 1,000 gallons (Table 4.4-81). The cost for a 0.2 MGD plant to desalt 5,000 mg/L water is estimated at $1,232 per acft, or $3.78 per 1,000 gallons (Table 4.4-82), with a total cost of water, including raw water, desalination, and concentrate disposal of $2,597 per acft, or $7.97 per 1,000 gallons (Table 4.4-82).

At larger sized water treatment plants, the costs are lower. For a 1.0 MGD plant the cost to desalt 3,000 mg/L water is estimated at $630 per acft, or $1.93 per 1,000 gallons; the cost to

desalt 5,000 mg/L water is estimated at $714 per acft, or $2.19 per 1,000 gallons (Tables 4.4-81 and 4.4-82, respectively). A 3.0 MGD size plant is estimated to have a desalt cost of $473 per acft, or $1.45 per 1,000 gallons for water with 3,000 mg/L of salts, and for water with 5,000 mg/L of salts, the cost is $546 per acft, or $1.68 per 1,000 gallons (Tables 4.4-81 and 4.4-82, respectively).

Total cost of desalted water, including raw water, desalination, and concentrate disposal for a 1.0 MGD size facility to desalt 3,000 mg/L water is $1,825 per acft ($5.60 per 1,000 gallons), and to desalt 5,000 mg/L water is $1,909 per acft ($5.86 per 1,000 gallons) Tables 4.4-81 and 4.4-82, respectively). Total cost of desalted water, including raw water, desalination, and concentrate disposal for a 3.0 MGD size facility to desalt 3,000 mg/L water is $1,601 per acft ($3.85 per 1,000 gallons), and to desalt 5,000 mg/L water is $1,618 per acft ($4.96 per 1,000 gallons) (Tables 4.4-81 and 4.4-82, respectively).

#### *4.5.23.4 Research and Development of Drought Tolerant Crops and New Technology (See Section 4.4.4.5 for a description of this option)*

Research and development of drought tolerant crops, new technology, and demonstration initiatives to expedite transfer of available technology to are included in the Llano Estacado Regional Water Plan. In addition, the Llano Estacado Regional Water Planning Group recommends that funding be continued at adequate levels to accomplish these objectives.

#### *4.5.23.5 Reuse of Municipal Effluent (See Section 4.4.4.6 for a description of this option)*

Of the total quantities of water used for municipal purposes, approximately 45 percent to 65 percent is returned to the respective municipal wastewater treatment plants for treatment and disposal. In the Llano Estacado Water Planning Region a large percentage of this treated effluent or reclaimed water is used for irrigation of open spaces, golf courses, and neighboring farmland. The quantity is between 45 percent and 65 percent of the quantity of municipal use and could be a significant source of water in the future for a number of uses, including perhaps municipal use, if treatment levels can be increased to the extent that the use of such water does not pose a health risk. The Llano Estacado Regional Water Planning Group recommends that funding be made available to universities, water districts, and the cities to further study the quantity of water available from this option and to study treatment technologies to make this option feasible for a larger number of uses.

#### *4.5.23.6 Stormwater Capture and Use (See Section 4.4.4.7 for a description of this option)*

In some cities of the Llano Estacado Water Planning Region, disposal of stormwater has become a serious problem. Lubbock is one of the cities having this problem. Therefore, in this water-short region, it has become desirable to evaluate the possibility to capture, treat, as appropriate and needed, and use this water as a source of supply for non-potable, as well as potable uses. The Llano Estacado Regional Water Planning Group recommends that funding be made available to the cities and water districts to further study the quantity of water available from this option and to study ways to successfully integrate flood protection, storage, and treatment, as needed, of this stormwater for useful purposes.

#### *4.5.23.7 Agricultural Water Conservation Practices on Farms (See Section 4.4.1.2 for a description of this option)*

Agricultural water conservation practices on farms are included in the Llano Estacado Regional Water Plan in order to sustain the present water supplies, enhance agricultural profitability, and enhance playa basins for wildlife habitat and aquifer recharge. In the Llano Estacado Region, both irrigation and non-irrigated, or dryland farming is projected. For the most part, the irrigated acreages are those acres lying above saturated sections of the Ogallala Formation that have sufficient quantities of water to justify drilling, equipping, and pumping irrigation wells. Such wells supply water that is used to supplement precipitation for crop production.

Irrigated and dryland farming attempt to maximize the efficiency of use of irrigation water and precipitation in the area. This is done through the use of Low Energy Precision Application (LEPA) and Low Elevation Sprinkler (LESA) irrigation systems, furrow diking, plant residue management, bench leveling, and terracing.

### *4.5.24 Public Education*

Underground water conservation districts, cities, universities, the Texas Agricultural Extension Service and other water agencies will continue existing education and information dissemination programs. In addition, Llano Estacado Region water suppliers and agencies will build a strong cooperative relationship with formal and informal educators including the region's Educational Service Centers and Independent School Districts.

(This page intentionally left blank.)

### *4.5.25 Drought and Drought Response*

Water supplies are included in Section 3 of the Llano Estacado Regional Water Plan as firm yields during drought of record for surface water sources, and dependable supplies during drought of record for groundwater sources, i.e., drought of record conditions underlie the calculations of water supply available from each source, included in Section 3 for each water user group. Therefore, each source of supply is for drought conditions. In addition, in accordance with requirements of SB 1, TCEQ has required retail water suppliers to prepare drought contingency plans. However, Texas Water Code Section 16.053(e)(3)(A) and 31 TAC 357.5(e)(7) require that for each source of water supply in the regional water planning area designated in accordance with 31 TAC 357.7(a)(1), the regional water plan shall identify: (A) factors specific to each source of water supply to be considered in determining whether to initiate a drought response, and (B) actions to be taken as part of the response.

Given that the major source of water for all uses in the Llano Estacado Region is the Ogallala Aquifer, with surface water from the Canadian River Municipal Water Authority, White River Municipal Water District, and Mackenzie Municipal Water Authority, for some municipal and industrial uses, the effects of drought are through increased demands upon the water supply facilities to provide larger quantities of water from each water supply source. For example, in the region, demands increase during droughts, placing ever-greater demands upon wells, pumps, motors, storage facilities, and the aquifer and surface water reservoirs. Therefore, the primary factor specific to each water supply is atmosphere conditions affecting precipitation, evaporation, and evapotranspiration. Thus, when atmospheric conditions result in: (1) reduced precipitation and (2) increased evaporation and evapotranspiration, the Llano Estacado Regional Water Plan recommendation is that drought response be initiated as described below.

Drought Trigger Conditions will be based on local atmospheric conditions using the currently available potential evaporation-transpiration (PET) stations. For the purposes of this planning cycle, it is recommended that local precipitation be factored into the consideration of implementing a drought trigger. Recommended drought triggers are presented as follows.

#### *4.5.25.1 Drought Triggers*

**Alert Stage of Drought**: Precipitation at less than 50 percent of the 30-year average for the month and 55 percent of the 30-year average of the preceding twelve months.

**Warning Stage of Drought**: Precipitation at less than 25 percent of the 30 year average for the month and 45 percent of the 30 year average of the preceding twelve months.

The Llano Estacado Water Planning Area will be divided into geographical areas based on location of existing PET stations for drought trigger and response purposes. The current locations of a PET stations within Region O are Dimmitt, Earth, Farwell, Halfway, Lamesa, Lubbock, and Seminole.

The drought trigger and response zones in the Llano Estacado Water Planning Area are shown in Table 4.5-81.

***Table 4.5-81.***
***Drought Trigger and Response Zones***
***in the Llano Estacado Water Planning Area***

| *PET Stations* | *Counties* |
|---|---|
| Dimmitt | Castro, Deaf Smith, and Swisher |
| Earth | Cochran and Lamb |
| Farwell | Bailey and Parmer |
| Halfway | Briscoe, Floyd, Hale, and Motley |
| Lamesa | Dawson, Garza, and Lynn |
| Lubbock | Crosby, Dickens, Hockley, and Lubbock |
| Seminole | Gaines, Terry, and Yoakum |

### *4.5.25.2 Drought Response*

As the LERWPG is a planning body only, with no implementation authority, it is emphasized that these drought triggers and responses are recommendations only. Since local public water suppliers and water districts are all required to have adopted a Drought Contingency Plan that contains drought responses unique to each specific entity, these entities are the only ones who have the authority to manage their particular water supply or area of authority. Therefore, the LERWPG recommends that these entities carry out their respective plans based upon the triggers listed above.

For example:

1. When the Alert Stage Drought Conditions have been triggered as described above, the (RELEVANT BODY, COMMITTEE, ETC.) will notify all affected entities in the

relevant geographical area. Those entities exercise their authority to implement their own Drought Contingency Plans, as they deem necessary.

2. When the Warning Stage Drought Conditions have been triggered as described above, the (RELEVANT BODY, COMMITTEE, ETC.) will notify all affected entities in the relevant geographical area. These entities exercise their authority to implement their own Drought Contingency Plans, as they deem necessary.

(This page intentionally left blank.)