GROUNDWATER MANAGEMENT AREA NO. 1 P.O. Box 9257

Amarillo, TX 79105

JUL 30 2009

RECEIVED

Mr. J. Kevin Ward **Executive Administrator Texas Water Development Board** 1700 N. Congress Ave. Austin, TX 78701 (512) 463-7874

TWDB

Mr. Ward,

After reviewing the May 28, 2009 correspondence from you requesting additional information regarding the submission of the Desired Future Condition of the Ogallala Aquifer in the GMA#1 planning area, a key error was identified. Unfortunately, the Panhandle Groundwater Conservation District did not get the May 13, 2009 meeting where Resolution 2009-01 was adopted appropriately posted in accordance with Texas Water Code Section 36.108 (d-1) #2. Because of this, GMA#1 felt it necessary to hold a meeting on July 7, 2009 at 11:00 AM to ratify all actions taken at the May 13, 2009 meeting including the adoption of a Desired Future Condition for the Ogallala Aquifer in the GMA#1 planning area. Additionally, the GMA#1 addressed additional information requests including the submission of a "Descriptive Narrative" to be included in this letter.

On July 7, 2009, Groundwater Management Area #1 (GMA#1) formalized the adoption of Resolution 2009-01 that effectively established a Desired Future Condition for the Ogallala Aquifer in the GMA#1 area. The Desired Future Condition included in this resolution is as follows:

"The following Desired Future Conditions are hereby adopted for the Ogallala Aquifer within Groundwater Management Area 1 as described below:

- 40% volume in storage remaining in 50 years in the following:
- o North Plains GCD consisting of all or parts of the following counties Dallam, Hartley, Moore and Sherman; and
- o Parts of the following counties that are not in a Groundwater Conservation District will also fall under the 40/50 DFCs, those counties being Dallam, Hartley and Moore
- 50% volume in storage remaining in 50 years in the following:
 - o High Plains Underground Water Conservation District consisting of parts of the following counties: Armstrong, Potter and Randall;
 - o North Plains GCD consisting of all or parts of the following counties: Hansford, Hutchinson, Lipscomb and Ochiltree;
 - o Panhandle Groundwater Conservation District consisting of all or part of the following counties: Armstrong, Carson, Donley, Gray, Hutchinson, Potter, Roberts and Wheeler; and
 - o All or parts of the following counties that are not in a Groundwater Conservation District will also fall under the 50/50 DFCs, those counties being Hutchinson, Oldham and Randall

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• 80% volume in storage remaining in 50 years in Hemphill County; provided that, in the event it is legally determined that the roughly 390-acre tract of land located in southwest Hemphill County and described more particularly in Attachment A (the "390-acre tract") lies within the jurisdiction of the Panhandle Groundwater Conservation District and not within the jurisdiction of the Hemphill County Underground Water Conservation District, then the Desired Future Condition for the 390-acre tract shall be 50% volume in storage remaining in 50 years and the Desired Future Condition for the remainder of Hemphill County shall be 80% volume in storage remaining in 50 years."

Included in the attached packet is the meeting posting from each Groundwater Conservation District and the Administrative Agency for the July 7, 2009 meeting, the adopted minutes from the meeting, and an original signed resolution adopting the Desired Future Condition as required under the TWDB document, *How to Submit Desired Future Conditions to the Texas Water Development Board.*

In liew of the additional requests noted in the May 28, 2009 correspondence, TWDB GAM Run 2009-001 and TWDB GAM Run 2009-001 Supplement are attached. These documents constitute the scientific and modeling related perameters utilized by the GMA#1 in establishing the above referenced DFC.

The GMA#1 held a separate and appropriately posted meeting at 1:30 PM in order to consider the minutes from the 11:00 AM meeting where the Desired Future Condition for the Ogallala Aquifer in the GMA#1 Planning Area was adopted through resolution 2009-001.

GMA#1 has contracted with the Panhandle Regional Planning Commission to serve as the secretary in this process. As such, I will be readily available to discuss any questions, concerns, or suggestions that you may have. Thank you and the whole TWDB Staff for your assistance in this process.

Please see Attachment A to this letter for GMA#1's "Descriptive Narrative".

Thank you,

Kyle G. Ingham

Local Government Services Director

Panhandle Regional Planning Commission

P.O. Box 9257

Amarillo, TX 79105

kingham@theprpc.org

(806) 372-3381

ATTACHMENT A: Descriptive Narrative

Groundwater Management Area #1 DFC Submission - Ogallala Aquifer

Groundwater Management Area #1 (GMA#1)

Desired Future Condition of Ogallala Aquifer in GMA#1 Planning Area Adopted Through Resolution 2009-001

Descriptive Narrative:

Adopted Through: Groundwater Management Area #1 Resolution #2009-001

Adopted at: 11:00 AM meeting on July 7, 2009 at 415 W. 8th in Amarillo, TX

Adopted by: Unanimous vote of 4-0

Voted on by: <u>Chairman Danny Krienke – North Plains Groundwater Conservation District</u>

Mr. Jim Conkwright – High Plains Underground Water Conservation District
Mr. Jim Haley – Hemphill County Underground Water Conservation District
Mr. John R. Spearman – Panhandle Groundwater Conservation District

Modeling Utilized: Texas Water Development Board – Groundwater Availability Model #2009-001

<u>Texas Water Development Board – GAM #2009-001 – Supplement</u>

GMA#1 Meetings have been held on the following dates at the following locations:

DATE	TIME	LOCATION
12-Jan-06		White Deer, TX
24-Feb-06		Canadian, TX
2-May-06	12:01 PM	Dumas, TX
13-Nov-06	10:00 AM	PRPC Board Room
23-Jan-07	10:00 AM	PRPC Board Room
26-Mar-07	10:00 AM	PRPC Board Room
22-Aug-07	9:30 AM	PRPC Board Room
17-Oct-07	9:30 AM	PRPC Board Room
14-Nov-07	9:30 AM	ANB Plaza 2
21-Jan-08	9:30 AM	PRPC Board Room
6-May-08	10:00 AM	PRPC Board Room
18-Jun-08	1:30 PM	PRPC Board Room
6-Nov-08	2:00 PM	PRPC Board Room
15-Dec-08	2:00 PM	PRPC Board Room
2-Feb-09	1:30 PM	Chase Tower
13-Mar-09	1:30 PM	Chase Tower
13-May-09	1:30 PM	PRPC Board Room
7-Jul-09	11:00 AM	PRPC Board Room
7-Jul-09	1:30 PM	PRPC Board Room

Throughout the development of this DFC - GMA#1 has assessed the following GAM Runs:

Texas Water Development Board - Groundwater Availability Model 06-25
Texas Water Development Board - Groundwater Availability Model 07-01
Texas Water Development Board - Groundwater Availability Model 07-19
Texas Water Development Board - Groundwater Availability Model 07-31
Texas Water Development Board - Groundwater Availability Model 07-38
Texas Water Development Board - Groundwater Availability Model 08-16
Texas Water Development Board - Groundwater Availability Model 08-16 - Supplement
Texas Water Development Board - Groundwater Availability Model 09-001
Texas Water Development Board - Groundwater Availability Model 09-001 - Supplement

Minutes: Adopted minutes from the 7/7/09 AM GMA#1 Meeting attached as Attachment B

Adopted Minutes from previous meetings available upon request

Postings: Signed postings from each District and Administrative Agency attached as Attachment C
Previous meeting postings available upon request

Additional postings including newspaper and certified mail receipts available upon request

Resolution: Resolution 2009-001 is included as Attachment D

GMA#1 Expectation: TWDB will continue to utilize GAM Run 2009-001 and its Supplement in reference to this Desired Future Condition. These Runs are included as Attachment E

ATTACHMENT B: 7/7/09 AM GMA#1 Minutes

(Adopted)

Groundwater Management Area #1 DFC Submission - Ogallala Aquifer

Groundwater Management Area #1 Meeting

Minutes

July 7, 2009 – 11:00 AM

The Groundwater Management Area Number 1 (GMA #1) Joint Planning Committee (JPC) met on Tuesday, July 7, 2009 in the PRPC Board Room – 1st Floor of the Panhandle Regional Planning Commission, 415 W. Eight Ave., Amarillo, Texas with the following members in attendance:

Voting Members Present:

John R. Spearman, Panhandle Groundwater Conservation District; Daniel Krienke, North Plains Groundwater Conservation District; Jim Conkwright, High Plains Underground Water Conservation District; Jim Haley, Hemphill County Underground Water Conservation District.

Other Groundwater Management Area 1 Representatives Present:

C.E. Williams, Panhandle Groundwater Conservation District; Steve Walthour, North Plains Groundwater Conservation District; Janet Guthrie, Hemphill County Underground Water Conservation District; James Mitchell, High Plains Water District

Others present:

Others present.		
Jonathan Ellis	PRPC	
D. Scott Caldwell	PRPC	
Robert Bradley	TWDB	
Vanessa Guthrie	Canadian, TX	
Eric Lopez	PSC	
Steve Stevens	Mesa Water	***************************************
Gene Born	NPGCD	
Allen Feingold		
Scott Morris	COA	
Cindy Cockerham	Senator Seliger	
Saul Martinez	Senator Seliger	
Polo Oviedo		
Joyce Hinsley	LWV of Amarillo	
Mina Johnson	LWV	
Ben Weinheimer	TCFA	
F. Keith Good	North Plains GCD	
Alan Abraham	LWV	
Sarah Clifton	Senator Duncan	
Bill Mullican	HPWD/PGCD	
Jamie Allen	PRPC	
Kyle Ingham	PRPC	
Mary Alice Hughes	HCUWD	
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- 1. The meeting was called to order at 11:02 a.m. with Chairman Krienke presiding.
- 2. Roll Call and Introductions were made. Chairman Krienke welcomed everyone for coming and took roll call. All voting members were present.

3. Public Comment - Any citizens may address the GMA#1.

Allen Feingold addressed the Board, he stated that the GMA #1 needed to address water exportation issues, primarily regarding the Dallas/Fort Worth Metro-plex. Mr. Feingold made comment that such a strategy might be advantageous to the panhandle.

There being no other public comments, Chairman Krienke closed the public comment period.

4. Discuss and consider the minutes from May 13, 2009 GMA #1 Meeting.

Several corrections were proposed. Mr. Spearman made a motion to accept the minutes as corrected. Corrections include: p.1 – Charles Bower to Charles Bowers, Keith Bord to Keith Good, p.2 Bill Mulligan to Bill Mullican, George Harrington to George Arrington, p.4 intensive purposes to intents and purposes, p.5 produces to producers. Mr. Haley seconded the motion; the motion carried by unanimous vote.

5. Discussion - May 13, 2009 posting problem.

Mr. Ingham spoke to events of the May 13th GMA meeting; among them the adoption of the DFC. Mr. Ingham spoke to the receipt of a May 28, 2009 letter from the TWDB which requested three additional items for completion of the submission packet: the approved minutes from the meeting, a reference to the GAM Run utilized in the establishment of the DFC for the Ogallala Aquifer, and the meeting postings from three groundwater conservation districts. It was discovered that only three of the districts had posted the meeting notice, and though the Panhandle Groundwater Conservation District's posting was not directly requested it is a concern that the posting problem might invalidate actions taken at the May 13, 2009 meeting. Additionally Mr. Ingham spoke to the need of a "descriptive narrative" to be included in the submission of the DFC as identified in an attachment to the May 28, 2009 TWDB letter.

Mr. Ingham spoke additionally about where the need for the meeting to be posted at each district comes from. Specifically, Texas Water Code Section 36.108 requires all districts in whole or in part within the GMA planning area to post the meeting. TAC chapter 356-subchapter C-Rule 356.34 and the TWDB How to Submit Desired Future Conditions to the Texas Water Development Board do not address the posting in each District. Mr. Ingham noted that it may be advantageous to take a look at the actions taken at the previous meeting and ensure that they are addressed in a properly posted meeting.

Mr. Spearman asked Mr. Ingham if checks and balances were considered to help prevent a posting issue such as this in the future. Mr. Ingham and Mr. Williams responded in the affirmative.

6. Discussion: Actions taken by the GMA#1 at the May 13, 2009 meeting including action adopting the Desired Future Condition of the Ogallala Aquifer in the GMA#1 Planning Area.

Chairman Krienke stated that this item was to allow for any possible further discussion on the DFC. Mr. Ingham, for the benefit of the audience, read the section of the resolution which constituted the DFC to be adopted.

Members briefly discussed the relationship between the previously noted "descriptive narrative" and the previously adopted Resolution 2009-01. It was determined that a full discussion of the topic could be held under agenda item #9.

7. Action: Ratify all actions taken by GMA#1 at the May 13, 2009 meeting including action adopting the Desired Future Condition of the Ogallala Aquifer in the GMA#1 Planning Area.

Mr. Haley made a motion to adopt and ratify the decisions made at the May 13, 2009 meeting. Mr. Spearman seconded. Chairman Krienke asked for any further discussion, there being none he took a roll call vote. The results are as follows:

Mr. Conkwright (High Plains) - aye

Mr. Krienke (North Plains) - ave

Mr. Haley (Hemphill) - aye

Mr. Spearman (Panhandle) - aye

8. Discussion and Action: Identification of Groundwater Availability Model(s) utilized in development of GMA#1's Desired Future Condition for the Ogallala Aquifer.

Mr. Ingham said it might be advantageous for action be taken in order to directly reference in the descriptive narrative the GAM Run utilized in establishing the DFC for the Ogallala Aquifer adopted in Resolution 2009-01. Mr. Robert Bradley clarified that the correct numbering for the GAM Run used is 2009-001 and its supplement 2009-001 Supplement. Mr. Spearman made a motion to state that the GMA #1 was adopting its DFC off of TWDB GAM Run 2009-001 and the TWDB GAM Run 2009-001 Supplement. Mr. Conkwright seconded, motion passed unanimously.

9. Discussion and Action: Administrative completeness of Desired Future Condition submission to TWDB including additional items requested by TWDB such as a descriptive narrative identified in the TWDB's Submission Packet Checklist.

Chairman Krienke made comment that since two of the three items asked for in the administrative completeness document had already been discussed and addressed, he asked the members to discuss what else should be included in a descriptive narrative. Among the items to be included: the number of meetings had and where they were held; reference to the GAM Run utilized by the JPC as identified in the previous item, and all other GAM Runs referenced; reference to meeting minutes upon request;

reference to the resolution adopted, and expression of consensus that it adequately conveyed the will and reasoning of the board. Mr. Ingham stated that he would work up a draft and send it to the districts to review and approve before sending it to TWDB. Mr. Conkwright made a motion to direct Mr. Ingham to work with the district managers on this letter. Mr. Haley seconded, motion passed unanimously.

10. Public Comment – Any citizens may address the GMA #1. Please limit the comments to three minutes.

Chairman Krienke opened up the floor for public comment. There were none.

Chairman Krienke asked for a motion to adjourn. Mr. Haley made a motion to adjourn. Mr. Conkwright seconded. Chairman Krienke stated that the next meeting would be in order to discuss and consider the minutes from this meeting. Motion passed unanimously. The meeting adjourned at 11:37 a.m.

ATTACHMENT C: 7/7/09 AM GMA#1 Postings

Groundwater Management Area #1 DFC Submission - Ogallala Aquifer









GROUNDWATER MANAGEMENT AREA NO. 1

Notice of Meeting
11:00 AM
July 7, 2009

Panhandle Regional Planning Commission

1st Floor Board Room
415 W. 8th
Amarillo, Texas 79105

As required by Chapter 36.108(e) Texas Water Code, notice is hereby given by the Board of Directors of the North Plains Groundwater Conservation District, the High Plains Underground Water Conservation District, the Hemphill County Underground Water Conservation District and the Panhandle Groundwater Conservation District for the Districts' participation in a joint planning meeting, as required by Chapter 36.108. At the joint planning meeting, the presiding officer or the presiding officer's designee as required by Chapter 36.108(c), along with any number of members of the Board of Directors, will convene for the purpose of joint planning only and not to conduct any other District business. The joint planning meeting will be comprised of the Groundwater Conservation Districts (GCDs) located wholly or partially within Groundwater Management Area #1 (GMA #1) as delineated by the Texas Water Development Board. GCDs located in GMA #1 are as follows:

North Plains Groundwater Conservation District, High Plains Underground Water Conservation District No. 1, Hemphill County Underground Water Conservation District, and the Panhandle Groundwater Conservation District

At such time, any Board Members present and/or the designee of the respective District will discuss and may take any action on any items on this agenda (not necessarily in the pre-arranged order) it may determine would be appropriate for joint planning of GCDs in GMA #1.

AGENDA

- 1. Call to Order Welcome
- 2. Roll Call/Introductions
- 3. Public Comment Any citizens may address the GMA #1. Please limit the comments to three minutes.
- 4. Discussion and Action The Minutes from May 13, 2009 GMA #1 Meeting.
- 5. **Discussion:** May 13, 2009 posting problem

- 6. **Discussion:** Actions taken by the GMA#1 at the May 13, 2009 meeting including action adopting the Desired Future Condition of the Ogallala Aquifer in the GMA#1 Planning Area.
- 7. Action: Ratify all actions taken by GMA#1 at the May 13, 2009 meeting including action adopting the Desired Future Condition of the Ogallala Aquifer in the GMA#1 Planning Area.
- 8. **Discussion and Action:** Identification of Groundwater Availability Model(s) utilized in development of GMA#1's Desired Future Condition for the Ogallala Aquifer.
- Discussion and Action: Administrative completeness of Desired Future
 Condition submission to TWDB including additional items requested by TWDB
 such as a descriptive narrative identified in the TWDB's Submission Packet
 Checklist.
- 10. **Public Comment** Any citizens may address the GMA #1. Please limit the comments to three minutes.

11. Adjournment

I, the undersigned authority of the Panhandle Regional Planning Commission, do hereby certify that the above Notice of Meeting for Joint Planning for Groundwater Management Area #1 of the above named political subdivision is a true and correct copy of said Notice; and that a true and correct copy of said Notice was posted at a place convenient to the public at the office of said political subdivision listed above located at 415 W 8th Ave, Amarillo, and said Notice was posted on or before, July 1, 2009 at 5:00 pm and remained so posted continuously for at least 72 hours immediately preceding the start time of said meeting. A true and correct copy of said Notice was posted and has been filed with the following County Clerks, Armstrong, Carson, Dallam, Donley, Gray, Hansford, Hartley, Hemphill, Hutchinson, Lipscomb, Lubbock, Moore, Ochiltree, Oldham, Potter, Randall, Roberts, Sherman and Wheeler. A true and correct copy of said Notice has been posted on the bulletin board of each of the respective County Courthouses on or before, July 1, 2009, and said Notice will remain so posted for at least 72 hours immediately preceding the start time of said meeting.

Dated this the 1st day of July, 2009.

By:

Kyle Ingham, LGS Director

POSTED THIS THE 1st DAY OF July 2009 AT North Plains GCD

BY Kristen Alwan Signature

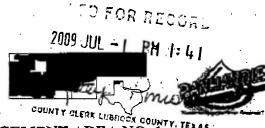
By Control Printed Name

Signature

Panhandle Regional Planning Commission







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- 6. Discussion: Actions taken by the GMA#1 at the May 13, 2009 meeting including action adopting the Desired Future Condition of the Ogallala Aquifer in the GMA#1 Planning Area.
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sefore, July 1, 2009, and said Notice will rema start time of said meeting	un so postea jor at teast /2 hours immediately preceau
Dated this the 1 st day of July, 2009.	
	Panhandle Regional Planning Commission By:
	Kyle Ingham, LGS Director
POSTED THIS THE 1st DAY OF M	July , 2009 AT Lubbock, Texas
BY Jim Conkwright Printed Name	Signature Signature









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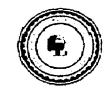
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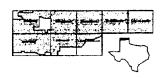
Dated this the 1st day of July, 2009.

	Ку	le Ingham, LGS D	irector	
POSTED THIS THE LOT DAY OF DAY OF Printed Name				White Deer Texas

Panhandle Regional Planning Commission









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11. Adjournment

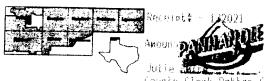
I, the undersigned authority of the Panhandle Regional Planning Commission, do hereby certify that the above Notice of Meeting for Joint Planning for Groundwater Management Area #1 of the above named political subdivision is a true and correct copy of said Notice; and that a true and correct copy of said Notice was posted at a place convenient to the public at the office of said political subdivision listed above located at 415 W 8th Ave, Amarillo, and said Notice was posted on or before, July 1, 2009 at 5:00 pm and remained so posted continuously for at least 72 hours immediately preceding the start time of said meeting. A true and correct copy of said Notice was posted and has been filed with the following County Clerks, Armstrong, Carson, Dallam, Donley, Gray, Hansford, Hartley, Hemphill, Hutchinson, Lipscomb, Lubbock, Moore, Ochiltree, Oldham, Potter, Randall, Roberts, Sherman and Wheeler. A true and correct copy of said Notice has been posted on the bulletin board of each of the respective County Courthouses on or before, July 1, 2009, and said Notice will remain so posted for at least 72 hours immediately preceding the start time of said meeting.

Dated this the 1st day of July, 2009.
Panhandle Regional Planning Commission By: Kyle Ingham, LGS Director
POSTED THIS THE 30 DAY OF The 2009 AT 1 STRICT MALE STORY STATE ST
Printed Name Signature

3.00







GROUNDWATER MANAGEMENT AREA NO.

Notice of Meeting
11:00 AM
July 7, 2009

Panhandle Regional Planning Commission

1st Floor Board Room
415 W. 8th
Amarillo, Texas 79105

As required by Chapter 36.108(e) Texas Water Code, notice is hereby given by the Board of Directors of the North Plains Groundwater Conservation District, the High Plains Underground Water Conservation District, the Hemphill County Underground Water Conservation District and the Panhandle Groundwater Conservation District for the Districts' participation in a joint planning meeting, as required by Chapter 36.108. At the joint planning meeting, the presiding officer or the presiding officer's designee as required by Chapter 36.108(c), along with any number of members of the Board of Directors, will convene for the purpose of joint planning only and not to conduct any other District business. The joint planning meeting will be comprised of the Groundwater Conservation Districts (GCDs) located wholly or partially within Groundwater Management Area #1 (GMA #1) as delineated by the Texas Water Development Board. GCDs located in GMA #1 are as follows:

North Plains Groundwater Conservation District, High Plains Underground Water Conservation District No. 1, Hemphill County Underground Water Conservation District, and the Panhandle Groundwater Conservation District

At such time, any Board Members present and/or the designee of the respective District will discuss and may take any action on any items on this agenda (not necessarily in the pre-arranged order) it may determine would be appropriate for joint planning of GCDs in GMA #1.

AGENDA

- 1. Call to Order Welcome
- 2. Roll Call/Introductions
- 3. Public Comment Any citizens may address the GMA #1. Please limit the comments to three minutes.
- 4. Discussion and Action The Minutes from May 13, 2009 GMA #1 Meeting.
- 5. Discussion: May 13, 2009 posting problem

- 6. **Discussion:** Actions taken by the GMA#1 at the May 13, 2009 meeting including action adopting the Desired Future Condition of the Ogallala Aquifer in the GMA#1 Planning Area.
- 7. Action: Ratify all actions taken by GMA#1 at the May 13, 2009 meeting including action adopting the Desired Future Condition of the Ogallala Aquifer in the GMA#1 Planning Area.
- 8. Discussion and Action: Identification of Groundwater Availability Model(s) utilized in development of GMA#1's Desired Future Condition for the Ogallala Aquifer.
- 9. Discussion and Action: Administrative completeness of Desired Future Condition submission to TWDB including additional items requested by TWDB such as a descriptive narrative identified in the TWDB's Submission Packet Checklist.
- 10. **Public Comment** Any citizens may address the GMA #1. Please limit the comments to three minutes.

11. Adjournment

I, the undersigned authority of the Panhandle Regional Planning Commission, do hereby certify that the above Notice of Meeting for Joint Planning for Groundwater Management Area #1 of the above named political subdivision is a true and correct copy of said Notice; and that a true and correct copy of said Notice was posted at a place convenient to the public at the office of said political subdivision listed above located at 415 W 8th Ave, Amarillo, and said Notice was posted on or before, July 1, 2009 at 5:00 pm and remained so posted continuously for at least 72 hours immediately preceding the start time of said meeting. A true and correct copy of said Notice was posted and has been filed with the following County Clerks.

Armstrong, Carson, Dallam, Donley, Gray, Hansford, Hartley, Hemphill, Hutchinson, Lipscomb, Lubbock, Moore, Ochiltree, Oldham, Potter, Randall, Roberts, Sherman and Wheeler. A true and correct copy of said Notice has been posted on the bulletin board of each of the respective County Courthouses on or before, July 1, 2009, and said Notice will remain so posted for at least 72 hours immediately preceding the start time of said meeting.	
Dated this the 1 st day of July, 2009.	
Panhandle Regional Planning Commission By: Kyle Ingham, LGS Director	
POSTED THIS THE Day DAY OF Month, 2009 AT SHE Location	
BY Printed Name Signature	

ATTACHMENT D: Resolution 2009-01 (Signed)

Groundwater Management Area #1 DFC Submission - Ogallala Aquifer

RESOLUTION NO. 2009-01

OF THE GROUNDWATER MANAGEMENT AREA 1 JOINT PLANNING COMMITTEE ADOPTING DESIRED FUTURE CONDITIONS FOR THE OGALLALA AND RITA BLANCA AQUIFERS

WHEREAS, Groundwater Management Area 1 ("GMA-1") is comprised of eighteen counties in the northern section of the Texas Panhandle and encompasses four groundwater conservation districts – the Hemphill County Underground Water Conservation District ("Hemphill District"), portions of the High Plains Underground Water Conservation District ("High Plains District"), the North Plains Groundwater Conservation District ("North Plains District"), and the Panhandle Groundwater Conservation District ("Panhandle District");

WHEREAS, the Ogallala Aquifer and the Rita Blanca Aquifer are referenced as one layer in the Northern Ogallala GAM, any references to the "Ogallala Aquifer" in this document shall also include and apply to any groundwater in the Rita Blanca Aquifer in those portions of GMA 1;

WHEREAS, GMA-1 unanimously supports the following goals, ideals and standards for GMA-1. The GMA-1 member Districts have worked to learn the rules and goals of each individual district, along with the history of how each District has arrived at their different management philosophies. The members of GMA-1 agree and support the Desired Future Conditions ("DFCs") as set out below. These conditions are viewed only as starting points for GMA-1 to go forth for the next five years as charged. The members of GMA-1 agree that constant monitoring from each District is necessary to measure the depths and scope of the Ogallala Aquifer and the Rita Blanca Aquifer, where it exists, and to manage these groundwater resources to achieve these DFCs;

WHEREAS, pursuant to Texas Water Code Ann. § 36.108, the presiding officer, or his designee, from each of the four Districts in GMA-1 are obligated to engage in ongoing joint planning to, among other things, establish the DFCs of the aquifers within GMA-1;

WHEREAS, such joint planning has been undertaken, and is ongoing, by the four presiding officers or designees of the Districts, and this body has come to be known as the-GMA-1 Joint Planning Committee (JPC);

WHEREAS, the JPC in GMA-1 has met as required by Section 36.108 of the Texas Water Code for joint planning not only to set the initial DFCs, but also to move towards improved conservation of the Ogallala Aquifer within its boundaries;

WHEREAS, the Ogallala Aquifer consists of substantially different characteristics and conditions across its boundaries and pursuant to Texas Water Code Ann. § 36.108, when considering the adoption of DFCs, the JPC is obligated to and has considered the "uses or conditions of an aquifer within the GMA that differ substantially from one area to another" and may adopt different DFCs for different areas overlying an aquifer;

WHEREAS, the JPC also believes the DFCs to be generally consistent with the 2006 Panhandle Regional Water Plan and the 2007 State Water Plan;

WHEREAS, the DFCs adopted by the JPC on this date are subject to revision in the future;

WHEREAS, the JPC desires to honor the mandates of Chapter 36 of the Texas Water Code, including private property rights, and desires to treat everyone in a reasonable manner given the extreme diversity through the area;

WHEREAS, the JPC desires to inform the citizens of the Texas Panhandle about the Ogallala Aquifer, the diversity of the aquifer and its uses and conditions, and the challenges of groundwater management with minimal impact to the local economy;

WHEREAS, the JPC has worked closely with the Texas Water Development Board, their hydrologists and other qualified professionals to base the adopted Desired Future Conditions on the best available science;

WHEREAS, the JPC is striving towards the intent of the joint planning process and is fully committed to continuing this important process and achieving the ultimate goal to conserve and preserve the aquifer;

NOW, THEREFORE, BE IT RESOLVED BY THE JOINT PLANNING COMMITTEE OF GROUNDWATER MANAGEMENT AREA 1 THAT:

- 1. All the preceding statements formed the basis for the decision by the Groundwater Management Area 1 Joint Planning Committee to adopt on this date, the DFCs set forth herein:
- 2. The following Desired Future Conditions are hereby adopted for the Ogallala Aquifer within Groundwater Management Area 1 as described below:
 - 40% volume in storage remaining in 50 years in the following:
 - North Plains GCD consisting of all or parts of the following counties Dallam, Hartley, Moore and Sherman; and
 - Parts of the following counties that are not in a Groundwater Conservation District will also fall under the 40/50 DFCs, those counties being Dallam, Hartley and Moore
- 50% volume in storage remaining in 50 years in the following:
 - High Plains Underground Water Conservation District consisting of parts of the following counties: Armstrong, Potter and Randall;
 - North Plains GCD consisting of all or parts of the following counties: Hansford, Hutchinson, Lipscomb and Ochiltree;
 - Panhandle Groundwater Conservation District consisting of all or part of the following counties: Armstrong, Carson, Donley, Gray, Hutchinson, Potter, Roberts and Wheeler; and

- All or parts of the following counties that are not in a Groundwater Conservation District will also fall under the 50/50 DFCs, those counties being Hutchinson, Oldham and Randall
- 80% volume in storage remaining in 50 years in Hemphill County; provided that, in the event it is legally determined that the roughly 390-acre tract of land located in southwest Hemphill County and described more particularly in Attachment A (the "390-acre tract") lies within the jurisdiction of the Panhandle Groundwater Conservation District and not within the jurisdiction of the Hemphill County Underground Water Conservation District, then the Desired Future Condition for the 390-acre tract shall be 50% volume in storage remaining in 50 years and the Desired Future Condition for the remainder of Hemphill County shall be 80% volume in storage remaining in 50 years.

The JPC recognizes that each District's boundaries may change due to the consolidation or annexation of land in GMA 1 that is either in or out of a district, therefore, the consolidated or annexed land will follow the rules, regulations, and Desired Future Conditions of the receiving District. The members of the JPC for GMA 1 **unanimously** agree that these are the goals for the DFCs in GMA -1 for the next five years.

- 3. These DFCs shall become effective on the date indicated below and shall remain in effect for five years, unless modified or repealed sooner by the JPC in accordance with applicable law.
- 4. The members of the Groundwater Management Area 1 Joint Planning Committee agree to continue to work in good faith on joint planning efforts in a manner consistent with applicable law.
- 5. All Districts in Groundwater Management Area 1 are unified in fulfilling the charge, set forth in Section 36.0015, Texas Water Code, to "provide for the conservation, preservation, protection, recharging, and prevention of waste of groundwater, and of groundwater reservoirs or their subdivisions, and to control subsidence caused by withdrawal of water from those groundwater reservoirs or their subdivisions, consistent with the objectives of Section 59, Article XVI, Texas Constitution, groundwater conservation districts may be created as provided by this chapter. Groundwater conservation districts created as provided by this chapter are the state's preferred method of groundwater management through rules developed, adopted, and promulgated by a district in accordance with the provisions of this chapter."

PASSED AND APPROVED BY A VOTE OF 4 TO 0 OF THE VOTING MEMBERS OF THE GROUNDWATER MANAGEMENT AREA 1 JOINT PLANNING COMMITTEE THIS 13th DAY OF MAX, 2009.

Daniel Krienke, Chairman JPC
President, Board of Directors

North Plains Groundwater Conservation District

Date

Jim Conbusight Jim Conkwright, Vice Chairman JPC

General Manager

High Plains Underground Water Conservation District

John R. Spearman, Secretary JPC President, Board of Directors

Panhandle Groundwater Conservation District

Jim Haley, Member JPC

President, Board of Directors

Hemphill County Underground Water Conservation District

ATTACHMENT A (Description of the "390-acre tract")

The North 300 acres of the East One-Half (E/2) of Section 13, Block A-2, H&GN RR Survey in Hemphill County, Texas, and 90 acres of said Section 13 described as follows:

BEGINNING at a point on the West line of said Survey, 1247 varas South of Northwest corner of said Survey No. 13, and Southwest corner of tract of land heretofore conveyed by N.W. McCuistion to T.D. McCuistion;

THENCE East parallel with the North line of said Survey No. 13, a distance of 950 varas to a stake for a corner;

THENCE West along the North line of 40 acre tract known as the W.M. Cotton tract off same survey, and running West parallel with the North line of this survey, a distance of 950 varas to a stake in the West line of said survey;

THENCE North with the West line of said Survey No. 13, a distance of 534-3/8 varas to PLACE OF BEGINNING.

ATTACHMENT E: TWDB GAM RUN 2009-001

Plus (Supplement)
Groundwater Management Area #1
DFC Submission - Ogallala Aquifer

GAM run 09-001

by Richard Smith, P.G.

Texas Water Development Board Groundwater Availability Modeling Section (512) 936-0877 February 17, 2009

EXECUTIVE SUMMARY:

Groundwater Management Area 1 requested a groundwater availability model run to determine if retaining three different volumes of groundwater after 50 fifty years of pumping in the Ogallala Aquifer in three predetermined geographical subdivisions in Groundwater Management Area 1 (Figure 1) was feasible. They requested 40 percent retention of the starting point volume after fifty years in subdivision 1, 80 percent retention in subdivision 2, and 50 percent retention in subdivision 3. We ran the northern segment of the Ogallala Aquifer groundwater availability model in order to evaluate the three different proposed desired future conditions for the Ogallala Aquifer within Groundwater Management Area 1. The southern segment of the Ogallala Aquifer was run for Potter, Randall, and Armstrong counties and reported in the supplement to GAM run 08-16 (Smith, 2008b). These numbers have not changed. We applied annual pumping based on individual cell volumes for each grid cell. After calculating the total volume in each grid cell and adding the recharge, we calculated the pumping rate for each cell that would result in the retention of the desired percent of the volume at the end of fifty years as specified in the request. The results were used to generate a new well file for the model of the northern portion of the Ogallala Aquifer in Groundwater Management Area 1. Pumping rates varied according to aquifer thickness. By 2060, large parts of Dallam, Hartley, and Moore counties and smaller part Sherman County become "dry". Carson, Gray, and Hutchinson counties also include dry cells by this time. However, the model simulation did achieve the desired future conditions as described in the request.

REQUESTOR:

Mr. Steve Walthour with the North Plains Groundwater Conservation District on behalf of Groundwater Management Area 1.

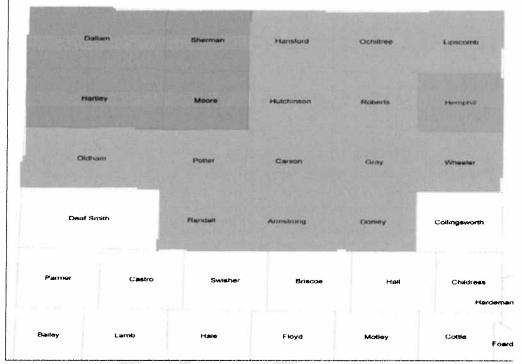


Figure 1. Subdivisions requested by the groundwater conservation districts in Groundwater Management Area 1. Pink counties are Subdivision 1, the blue county is Subdivision 2 and green counties are Subdivision 3

DESCRIPTION OF REQUEST:

The groundwater conservation districts in Groundwater Management Area 1 requested a groundwater availability model run to determine if retaining different volumes of groundwater after fifty years of pumping in the Ogallala Aquifer in three subdivisions of the groundwater management area (Figure 1) was feasible. The three subdivisions are as follows:

- Subdivision 1 is comprised of Dallam, Hartley, Moore, and Sherman counties;
- Subdivision 2 is comprised of Hemphill County; and
- Subdivision 3 is comprised of Hutchinson, Hansford, Lipscomb, Ochiltree, Armstrong, Carson, Donley, Gray, Oldham, Potter, Randall, Roberts, and Wheeler counties.

The districts requested that the Texas Water Development Board (TWDB) provide the draft managed available groundwater estimates in the management area based upon the draft desired future condition of the Ogallala Aquifer for each subdivision as follows:

- Subdivision 1 is to achieve at least 40 percent of the 2006 total aquifer storage remaining in 2060. The TWDB shall calculate the amount of managed available groundwater for the 50 year period with an initial amount of available groundwater set at 1,331,500 acre-feet for the first year. This starting point will decrease at a fixed percent throughout the 50 years to achieve the desired future condition of the Ogallala Aquifer goal for the subdivision.
- Subdivision 2 is to have at least 80 percent of the total aquifer storage remaining in 2060. The annual pumping volume will be 55,000 acre-feet without change through the fifty year simulation period.
- Subdivision 3 is to have at least 50 percent of the baseline total aquifer storage remaining in 2060. TWDB shall estimate the managed available groundwater volume by reducing the total aquifer storage by no more than 1.25 percent annually.

Based on the pumping rates established in GAM Run 07-31 (Smith, 2007) the districts requested that the area-wide pumping rates be applied to the northern and southern segments of the Ogallala Aquifer groundwater availability models for a fifty year period with 2006 as the baseline year.

METHODS:

1

To address the request, we did the following steps:

- We selected a stress period in the northern portion of the Ogallala Aquifer groundwater availability model which best approximated water-level information and volume information supplied by the North Plains Groundwater Conservation District. The District's 2006 information corresponds to stress period 55 in the model which became the base year.
- Initial pumping rates were calculated on a cell-by-cell basis, based on either the volume or maximum percent declines described in the request above plus the average recharge. We then annually decreased pumping by a set percent rate to achieve the desired final volumes of water as described in the request above.
- The pumping rates per grid cell were used to create a new well file which was then used as input to the model.
- The model was run to simulate projections for fifty years.
- Water levels for the base year and final year of the simulation, as well as the base
 of the aquifer and hydraulic properties, were exported from the model to ArcGIS®
 to compare and analyze the volume remaining in the aquifer.
- Saturated thickness maps were constructed on a decadal basis starting with 2010 and extending to 2060.

The model was then zoned by county. Pumpage was extracted from the model to develop a table of the managed available groundwater for each county.

PARAMETERS AND ASSUMPTIONS:

- We used version 2.01 of the groundwater availability model for the northern part of the Ogallala Aquifer (Dutton, 2004) and version 1.01 of the groundwater availability model for the southern part of the Ogallala Aquifer (Blandford and others, 2003),
- See Dutton and others (2001) and Dutton (2004) for assumptions and limitations of the model for the northern part of the Ogallala Aquifer. Root mean squared error for this model is 53 feet. This error has more of an effect on model results where the aquifer is thin.
- See Blandford and others (2003) for assumptions and limitations of the model for the southern part of the Ogallala Aquifer. Root mean squared error for this model is 47 feet. This error will have more of an effect on model results where the aquifer is thin.
- Recharge was reappraised in the updated model of the northern part of the Ogallala Aquifer (Dutton, 2004).
- Average recharge used in both of the models was based on a percentage of
 precipitation for the 1950 through 1990 period of record. Since this includes the
 1950s drought of record, the average recharge used for this analysis is considered
 a conservative estimate.
- For Oldham, Randall, Potter, and Armstrong counties, which are partially included in both the northern and southern parts of the Ogallala Aquifer groundwater availability models, we will combine the results of the volume calculation from each model to get full county totals. At this time this report only includes the results from the groundwater availability model for the northern portion of the Ogallala Aquifer. It should be noted that we will use the volume calculated from each model for that segment of the county covered as the starting point for the annual pumping rate calculation which would result in a fifty percent decline over a fifty year period.
- It should be noted that The Rita Blanca Aquifer is part of the layer representing the Ogallala Aquifer in western Dallam and Hartley counties.

RESULTS:

Table 1 gives the starting and the final volumes for each of the three subdivisions calculated from the model at the end of the 50 year simulation. The rates of water-level decline, and the percentage decrease in pumping compared with the previous stress period, were adjusted to achieve the desired future condition of the Ogallala Aquifer requested for each subdivision. The starting pumpage was 1.98 percent of the initial volume in Subdivision 1, 55,000 acre-feet per year in Subdivision 2, and 1.25 percent in Subdivision 3. It should be noted that recharge was added back into the initial value which accounts for a larger initial available groundwater value than a simple 1.98 percent or 1.25 percent of the starting volume.

Figures 2 to 19 show the saturated thickness of the northern portion of the Ogallala Aquifer by decade from 2010 through 2060. Large swaths of the western counties (Dallam, Hartley, Moore and Sherman), go dry by 2060 while the eastern and south central counties maintain large areas of saturated thickness at that time.

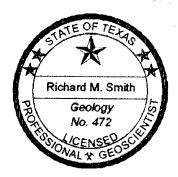
REFERENCES:

Dutton, A., 2004, Adjustments of parameters to improve the calibration of the Og-N model of the Ogallala aquifer, Panhandle Water Planning Area: Bureau of Economic Geology, The University of Texas at Austin, 9 p

Blandford, T.N., Blazer, D.J., Calhoun, K.C., Dutton, A.R., Naing, T., Reedy, R.C., and Scanlon, B.R., 2003, Groundwater availability of the southern Ogallala aquifer in Texas and New Mexico—Numerical Simulations Through 2050: Final Report prepared for the Texas Water Development Board by Daniel B. Stephens & Associates, Inc., 158 p.

Dutton, A., Reedy, R., and Mace, R., 2001, Saturated thickness of the Ogallala aquifer in the Panhandle Water Planning Area—Simulation of 2000 through 2050 Withdrawal Projections: prepared for the Panhandle Water Planning Group by the Bureau of Economic Geology, The University of Texas at Austin, 54 p.

Smith, R, 2007, GAM Run 07-31, Texas Water Development Board, 23 p. Smith, R, 2008a, GAM Run 08-16, Texas Water Development Board, 30 p. Smith, R, 2008b, Supplement to GAM Run 08-16, Texas Water Development Board, 7 p.



The seal appearing on this document was authorized by Richard M. Smith, P.G., on February 17, 2009.

Table 1: Volumes within each Subdivision with decline rates and final percentages.

Subdivision	Initial volumes in acre-feet	Final volumes in acre-feet	Decline rate	Final percentage remaining				
1	68,426,375	27,349,643	0.059	39.97 %				
2	15,492,740	12,349,626	0.00	79.71 %				
3	145,937,684	73,025,835	0.0075	50.04 %				

Table 2: Zo	ones within the model	* Š.
Zone	County	GCD
2	Dallam	North Plains coverage
3	Dallam	No North Plains - non district areas
4	Sherman	North Plains coverage
5	Lipscomb	North Plains coverage
6	Ochiltree	North Plains coverage
7	Hansford	North Plains coverage
8	Roberts	Pan Handle coverage
10	Hartley	North Plains coverage
11	Hartley	No North Plains - non district areas
12	Moore	North Plains coverage
13	Moore	No North Plains - non district areas
14	Hutchinson*	North Plains coverage
15	Hutchinson	No North Plains - non district areas
16	Hutchinson	Panhandle coverage
17	Hemphill	Hemphill
19	Carson	Panhandle coverage
20	Carson	Panhandle coverage
	Gray	Panhandle coverage
23	Potter	Panhandle coverage
25	Wheeler	Panhandle coverage
26	Oldham	No coverage
27	Potter	Panhandle coverage
29	Randall	High Plains coverage
30	Donley	Panhandle coverage
31	Armstrong	Panhandle coverage
33	Randall	No Coverage

Table 3: Managed available groundwater for Subdivision 1 and 2. All numbers are in acre-feet. NPGCD = North Plains Groundwater Conservation District. UWCD = Underground Water Conservation District.

	Hemphill County UWCD	54,998	54,998	54,998	54,998	54,998	54,998	54,998	54,998	54,998	54,998	54.998	54,998	54,998	54,998	54,998	54,998	54,998	54,998	54,998	54,998	54,998	54,998	54,998	54,998	54,998
	Moore	245,736	236,346	227,759	219,923	211,725	204,736	197,377	190,821	183,604	178,016	172,489	167,254	161,928	156,958	151,214	147,140	142,848	137,943	132,895	128,836	125,173	122,050	118,768	115,000	112,540
Suppressore and	Moore No district	38,012	36,439	34,648	32,933	31,846	30,808	29,814	27,790	25,558	24,970	23,891	23,360	22,846	22,357	21,145	20,203	19,534	18,157	16,322	15,233	14,634	13,816	13,255	11,776	11,248
	Moore	207,724	199,907	193,111	186,990	179,879	173,928	167,563	163,031	158,046	153,046	148,598	143,894	139,082	134,601	130,069	126,937	123,314	119,786	116,573	113,603	110,539	108,234	105,513	103,224	101,292
	Hartley Total	419,881	410,762	402,441	394,845	387,670	380,090	373,437	367,195	361,790	356,208	349,698	344,237	338,760	333,994	329,544	325,073	321,733	317,563	312,596	309,345	304,934	301,916	298,912	295,894	292,944
	Hartley No district	56,230	54,302	52,764	51,590	50,485	48,380	47,162	45,754	44,667	43,393	41,207	39,828	37,803	36,312	34,885	33,036	32,613	31,547	29,199	28,215	26,389	26,121	25,021	23,749	22,502
	Hardey	363,651	356,460	349,677	343,255	337,185	331,710	326,275	321,441	317,123	312,815	308,491	304,409	300,957	297,682	294,659	292,037	289,120	286,016	283,397	281,130	278,545	275,795	273,891	272,145	270,442
	Hansford	270,396	268,381	266,382	264,397	262,428	260,472	258,532	256,606	254,694	252,797	250,913	249,044	247,189	245,347	243,519	241,705	239,904	238,117	236,343	234,582	232,835	231,100	229,378	227,670	225,973
	Ochiltree	256,701	254,789	252,891	251,006	249,136	247,281	245,438	243,610	241,795	239,993	238,206	236,431	234,670	232,921	231,186	229,464	227,754	226,057	224,373	222,702	221,042	219,396	217,761	216,139	214,529
THE OWNER WHEN PARTY AND ADDRESS.	Lipscomb	246,011	244,179	242,359	240,554	238,762	236,983	235,217	233,465	231,726	229,999	228,286	226,585	224,897	223,222	221,559	219,908	218,270	216,644	215,030	213,428	211,838	210,259	208,693	207,138	205,595
	Sherman	270,088	261,845	254,087	246,787	239,921	233,456	227,375	221,654	216,265	211,201	206,430	201,943	197,722	193,748	189,777	186,264	182,956	179,621	176,696	173,727	171,137	168,700	166,408	164,250	162,221
	Dallam	440,852	433,910	425,579	418,791	413,086	404,838	398,700	391,293	382,873	373,766	365,596	356,936	349,188	342,007	334,562	327,713	321,506	313,061	307,855	302,212	296,030	289,020	281,312	276,861	268,290
•	Dallam No district	100,090	98,388	96,502	94,723	93,317	91,194	89,703	88,039	86,208	84,716	83,296	82,187	81,139	79,910	78,969	78,077	77,452	76,644	76,094	75,144	74,234	73,055	72,331	71,424	70,032
	Dallam	340,762	335,522	329,077	324,068	319,769	313,644	308,997	303,254	296,665	289,050	282,300	274,749	268,049	262,097	255,593	249,636	244,054	236,417	231,761	227,068	221,796	215,965	208,981	205,437	198,258
THE PERSON NAMED IN	Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034

Table 3 cont: Managed available groundwater for Subdivision 1 and 2. All numbers are in acre-feet. NPGCD = North Plains Groundwater Conservation District and UWCD = Underground Water Conservation District.

	Hemphill County UWCD	54.998	54 998	54.998	54 998	54.998	54 998	54,998	54,998	54,998	54,998	54,998	54,998	54,998	54,938	54.938	54.938	54.938	54 938	54 938	54.938	54.938	54,938	54,938	54.938	54,938	54.938
	Moore Total	110,231	108 035	105.490	103.516	101,907	899 668	97,830	96,315	94,113	92,149	91,281	90,185	88,727	86,552	85,444	82.879	81.672	80.282	79 211	78.098	77.502	76.505	75,331	74.250	73,451	72,600
	Moore No district	10,720	10.283	9.327	8.818	8,323	7.459	6,768	6,392	6,140	5.435	5,417	5,401	4,947	4,711	4.699	3,823	3,593			3.131	3,125	2,771	2,767	2,763	2,540	2,406
	Moore	99,511	97.752	96,163	94,698	93,584	92.109	91,062	89,923	87,973	86,714	85,864	84,784	83,780	81,841	80,745	79,056	78,079	77,138	76.074	74,967	74,377	73,734	72,564	71,487	70,911	70,194
	Hartley Total	290,020	286.884	284,784	282.311	280,692	278.427	276,569	275,229	273,694	271,288	268,955	267,408	264,874	263,024	261,691	260,164	258,758	257,465	256.038	254,526	252,254	251,293	249,423	247,123	245,450	243,139
	Hartley No district	21,497	19,893	19,334	18,368	17,845	16,915	16,221	15,927	15,449	14,970	13,888	13,631	12,583	12,152	11,726	11,487	11,259	10,645	10,239	10,022	9,250	8,669	8,356	7,967	7,950	
	Hartley	268,523	266,991	265,450	263,943	262,847	261,512	260,348	259,302	258,245	256,318	255,067	253,777	252,291	250,872	249,965	248,677	247,499	246,820	245,799	244,504	243,004	242,624	241,067	239,156	237,500	235,389
	Hansford	224,290	222,619	220,930	219,284	217,651	216,029	214,420	212,822	211,237	209,663	208,101	206,551	205,012	203,485	201,969	200,464	198,813	197,332	195,789	194,264	192,682	191,177	189,376	187,893	186,493	184,990
	Ochiltree	212,930	211,344	209,770	208,207	206,656	205,116	203,588	202,071	200,566	199,071	197,589	196,116	194,655	193,205	191,766	190,337	188,871	187,428	186,032	184,646	183,270	181,840	180,485	179,141	177,806	176,481
n District.	Lipscomb	204,063	202,543	201,034	199,537	198,050	196,574	195,110	193,656	192,214	190,782	189,360	187,949	186,549	185,160	183,780	182,411	181,052	179,703	178,364	177,036	175,717	174,408	173,108	171,819	170,474	169,204
and UWCD = Underground Water Conservation District	Sherman	160,309	158,511	156,822	155,228	153,728	152,122	150,797	149,551	148,183	147,080	146,041	145,063	144,144	143,281	142,346	141,468	140,559	139,885	138,948	138,164	137,493	136,964	136,468	135,448	135,009	134,488
und Water	Dallam	263,300	258,278	246,928	241,786	235,830	227,783	220,887	214,438	206,778	200,172	192,802	187,313	181,592	174,820	169,572	162,123	156,679	152,613	148,560	145,105	140,177	134,602	131,009	127,971	123,426	119,982
- Undergro	Dallam No district	69,382	950'69	67,330	67,043	65,965	64,905	63,252	62,116	61,714	61,214	59,761	59,091	58,242	57,292	22,665	54,547	53,133	51,917	50,521	48,709	48,313	47,124	45,942	45,070	43,651	42,422
nd UWCD =	Dallam	193,918	189,222	179,598	174,743	169,865	162,878	157,635	152,322	145,064	138,958	133,041	128,222	123,350	117,528	113,907	107,576	103,546	100,696	98,039	96,396	91,864	87,478	85,067	82,901	79,775	77,560
ar	Year	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060

Table 4: Managed available groundwater for Subdivision 3. All numbers are in acre-feet. NPGCD = North Plains Groundwater Conservation District, UWCD = Underground Water Conservation District, PGCD= Panhandle Groundwater Conservation District, and HPUWCD = High Plains Underground Water Conservation District. Note: this table only represents the portion of the Ogallala Aquifer located in the northern segment of the Ogallala Aquifer groundwater availability model for Oldham, Randall, Potter, and Armstrong counties.

Randall No district	12.171	12,080	11,990	11,901	11,812	11,724	11,637	11,550	11,464	11,379	11,294	11,210	11,126	11,043	10,961	10,879	10,798	10,718	10,638	10,559	10,480	10,402	10,325	10,248	10,171
Randall	6,830	6,779	6.728	6,678	6,629	6,579	6,530	6,481	6,433	6,385	6,338	6,291	6,244	6,197	6,151	6,105	090'9	6,014	5,970	5,925	5,881	5,837	5,794	5,751	5,708
Armstrong	47,395	47,041	46,691	46,343	45,998	45,655	45,315	44,977	44,642	44,310	43,980	43,652	43,327	43,004	42,684	42,366	42,050	41,737	41,426	41,117	40,811	40,507	40,205	39,906	39,608
Donley	88 024	87,369	86,718	86,072	85,430	84,794	84,162	83,535	82,913	82,295	81,682	81,074	80,470	79,870	79,275	78,685	78,098	77,516	76,939	76,366	75,797	75,232	74,672	74,115	73,563
Oldham No district	5,289	5,250	5,211	5,172	5,133	5,095	5,057	5,019	4,982	4,945	4,908	4,871	4,835	4,799	4,763	4,728	4,693	4,658	4,623	4,589	4,554	4,520	4,487	4,453	4,420
Wheeler	10,04	109,222	108,408	107,600	106,799	106,003	105,213	104,429	103,651	102,879	102,113	101,352	100,597	99,848	99,104	98,365	97,633	96,905	96,183	95,467	94,755	94,049	93,349	92,653	91,963
Potter PGCD	35,950	35,683	35,417	35,153	34,891	34,631	34,373	34,117	33,863	33,611	33 360	33,112	32,865	32,620	32,377	32,136	31,896	31,659	31,423	31,189	30,957	30,726	30,497	30,270	30,044
Gray	180,604	179,259	177,923	176,598	175,282	173,976	172,680	171,394	170,117	168,849	167,591	166,343	165,104	163,874	162,653	161,441	160,238	159,044	157,860	156,684	155,516	154,358	153,208	152,066	150,933
Carson	190,230	188,813	187,407	186,010	184,625	183,249	181,884	180,529	179,184	177,849	176,524	175,209	173,904	172,608	171,322	170,046	168,779	167,522	166,274	165,035	163,805	162,585	161,374	160,171	158,978
Roberts	367,090	364,355	361,641	358,946	356,272	353,618	350,984	348,369	345,773	343,197	340,64	338,103	335,584	333,084	330,602	328,139	325,695	323,268	320,860	318,470	316,097	313,742	311,405	309,085	306,782
Hutchinson Total	150,398	149,278	148,166	147,062	145,967	144,879	143,799	142,728	141,665	140,610	139,562	138,522	137,490	136,467	135,449	134,440	133,439	132,445	131,458	130,479	129,507	128,541	127,584	126,634	125,690
Hutchinson	13,715	13,613	13,512	13,411	13,311	13,212	13,113	13,016	12,919	12,823	12,727	12,632	12,538	12,445	12,352	12,260	12,169	12,078	11,988	11,899	11,810	11,722	11,635	11,548	11,462
Hutchinson No district	82,509	81,895	81,284	80,679	80,078	79,481	78,889	78,301	77,718	77,139	76,564	75,994	75,428	74,866	74,308	73,754	73,205	72,660	72,118	71,581	71,048	70,518	69,993	69,472	68,954
Hutchinson	54,174	53,770	53,370	52,972	52,578	52,186	51,797	51,411	51,028	50,648	50,271	49,896	49,524	49,156	48,789	48,426	48,065	47,707	47,352	46,999	46,649	46,301	45,956	45,614	45,274
Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034

Table 4 cont: Managed available groundwater for Subdivision 3. All numbers are in acre-feet. NPGCD = North Plains Groundwater Conservation District, UWCD = Underground Water Conservation District, PGCD= Panhandle Groundwater Conservation District. Note: this table only represents the portion of the Ogallala Aquifer located in the northern segment of the Ogallala Aquifer groundwater availability model for Oldham, Randall, Potter, and Armstrong counties.

Veg Hubblinon Hubb				CONTRACT PROPERTY			, 1 vanidan,	Craimin, Ivandan, 1 Otte1, and Annistrong countries	anguiro n	anig contine	'n				
44,937 68,440 11,377 124,754 304,497 157,794 149,806 29,820 91,778 4,384 56,668 43,847 56,673 11,222 12,232 14,341 12,322 12,232 14,342 12,322 12,232 14,342 14,342 12,232 14,342 14,443 14,443 14,443 14,342 14,343 14,343 14,343 14,344 14,144 14,344 14,144 14,344 14,144 14,444 14,444 14,444 14,444 14,444 14,444 14,4	ear	Hutchinson	Hutchinson No district	Hutchinson	Hutchinson Total	Roberts	Carson	Gray	Potter PGCD	Wheeler	Oldham No district	Donley	Armstrong	Randall	Randall No district
44 570 67 330 11 292 12 3824 30 2228 15 67 14 14 68 3 14 10 3 14 10 3 14 10 3 14 10 3 14 10 3 14 10 3 14 10 4 12 10 4 270 1 12 20 1 12 20 2 29 37 6 1 14 58 2 9 32 4 28 17 2 13 36 3 14 20 3 14 30	035	44,937	68,440	11,377	124,754	304.497	157 794	149 809	29.820	04 270	1.00.4	70 04			
44,270 67,424 11,224 12,024 20,6168 14,324 90,598 4,324 7,2471 30,000 5,623 4,3940 66,622 11,124 12,1966 297,742 14,568 29,734 4,288 29,734 4,288 29,734 4,288 1,394 66,922 11,124 121,966 297,742 14,589 29,892 4,288 4,288 1,394 28,828 4,288 1,394 1,394 28,828 4,288 1,394 38,434 5,490 5,496 4,2,866 65,437 10,496 120,176 290,322 155,034 14,288 28,978 4,288 4,288 7,193 38,415 5,497 4,2,666 65,437 10,496 110,766 110,766 110,760 140,425 18,898 18,717 28,898 18,717 41,170 28,998 18,717 41,110 28,098 18,717 41,110 28,098 18,717 41,110 28,098 18,717 41,110 28,098 18,717 41,1	336	44,602	67.930	11 292	123 827	302 220	400,000	140,000	020,020	91,410	186,4	73,015	39,313	5,665	10,096
4.3.940 66.922 11,720 12,230.2 299,742 14,588 29,378 4,326 29,588 38,933 4,326 5,841 3,8730 5,881 4.3.940 66.922 11,124 11,136 297,742 15,293 16,486 29,588 28,978 18,588 28,588 38,588 38,588 38,780 5,841 5,840 43,946 66,923 11,024 12,076 295,522 15,044 13,988 38,789 28,788 31,878 5,447 42,965 66,486 10,716 117,488 288,986 144,177 28,888 144,177 28,898 144,187 4,195 69,877 37,898 5,417 41,971 63,986 10,636 116,539 288,988 144,157 28,188 147,174 147,524 148,888 147,524 148,888 27,288 147,767 48,778 47,175 47,174 47,174 47,174 47,174 47,174 47,174 47,174 47,174 47,174 47,174	337	44,270	67 424	11 200	120,024	302,200	130,001	146,093	29,598	90,598	4,354	72,471	39,020	5,623	10,020
43.612 66.423 1.71.986 28.97.42 1.85.293 145.428 14.86.86 89.85.35 4.298 7.1.386 38.441 5.40 43.618 66.623 11.044 11.21.706 26.95.23 153.144 145.394 28.156 87.288 7.086 38.155 5.498 4.3.618 65.437 10.877 119.279 291.136 150.104 145.394 28.808 4.288 7.288 7.086 38.155 5.498 4.2.666 65.437 10.877 118.350 288.968 149.747 142.169 28.300 86.623 4.185 6.988 7.778 4.197 5.417 4.2.866 65.437 11.046 21.858 2.891 2.890 2.875 4.197 37.308 5.376 5.376 5.376 5.376 5.417 5.417 5.417 5.417 5.417 5.417 5.417 5.417 5.417 4.107 6.929 5.217 4.117 6.828 7.117 5.418 6.829 7.108	38	43 940	66,022	11,200	206,221	299,976	155,451	147,585	29,378	89,923	4,322	71,931	38,730	5,581	9,946
4.2.965 65.329 152,144 145,394 28,922 85,886 4,256 70,864 38,155 5,496 4.2.965 65,329 10,304 12,1076 299,322 155,144 145,394 28,686 4,256 70,864 38,155 5,496 4.2.966 65,437 10,877 119,279 291,136 150,870 143,236 28,512 4,195 68,523 4,165 69,291 37,730 5,477 4.2.966 65,436 10,796 116,393 284,678 143,247 142,199 88,533 4,163 69,291 37,836 5,477 4.1,971 63,086 10,796 116,393 284,678 143,246 28,936 143,747 142,199 88,337 4,102 88,783 5,417 4.1,301 63,086 10,400 115,272 280,467 147,24 180,400 17,443 180,427 143,744 4,011 66,291 37,336 5,297 4.0,366 62,100 10,323 114,251		43,040	00,322	11,124	121,986	297,742	154,293	146,486	29,159	89,253	4,290	71,395	38,441	5,540	9.872
4.266 65,829 10,959 120,176 293,32 15,008 14,311 28,728 4,226 66,812 37,878 64,67 4.2966 65,437 10,877 119,279 211,38 16,877 14,278 24,196 69,812 37,878 54,17 42,266 65,436 10,796 118,350 289,968 149,747 142,189 28,300 69,291 37,308 5,376 42,286 65,496 10,716 117,468 286,815 144,110 28,089 69,291 37,308 5,376 41,507 63,986 10,716 117,468 286,815 144,110 28,089 27,672 89,378 4,102 69,291 37,308 5,376 41,507 63,986 10,716 115,725 282,557 146,425 13,889 27,672 89,474 4,011 67,749 35,395 5,179 5,179 40,565 62,506 10,478 114,251 136,819 27,261 89,444 4,011 66,749 </td <td>600</td> <td>43,612</td> <td>66,423</td> <td>11,041</td> <td>121,076</td> <td>295,523</td> <td>153,144</td> <td>145,394</td> <td>28,942</td> <td>88,588</td> <td>4,258</td> <td>70,864</td> <td>38.155</td> <td>5 498</td> <td>9 798</td>	600	43,612	66,423	11,041	121,076	295,523	153,144	145,394	28,942	88,588	4,258	70,864	38.155	5 498	9 798
42,966 65,437 10,877 119,279 291,136 150,870 143,236 28,512 87,273 4,195 69,812 37,308 5,376 42,604 64,966 10,766 118,360 288,968 149,747 142,169 28,330 4,163 69,291 37,308 5,376 42,266 64,466 10,776 117,68 148,374 142,169 28,337 4,163 69,291 37,308 5,376 41,971 63,966 10,776 117,4815 286,815 144,110 28,098 85,337 4,162 68,753 36,754 5,297 41,301 63,096 10,476 114,416 280,482 14,176 4,172 68,775 37,030 5,376 40,956 62,566 10,400 113,921 276,28 14,771 14,141 28,337 4,142 66,749 35,399 5,176 40,056 62,100 10,323 113,327 276,289 14,171 67,68 82,827 3,981 66,78 <td>040</td> <td>43,288</td> <td>62,929</td> <td>10,959</td> <td>120,176</td> <td>293,322</td> <td>152,003</td> <td>144,311</td> <td>28,726</td> <td>87,928</td> <td>4.226</td> <td>70.336</td> <td>37.870</td> <td>5,467</td> <td>967.0</td>	040	43,288	62,929	10,959	120,176	293,322	152,003	144,311	28,726	87,928	4.226	70.336	37.870	5,467	967.0
42,2604 64,950 10,796 118,350 288,968 149,747 142,169 28,300 86,623 4,163 69,291 37,030 5,376 42,286 64,466 10,716 117,468 288,968 144,111 28,089 85,978 4,132 68,775 37,030 5,376 4,1971 63,986 10,576 116,633 284,678 147,524 139,923 27,880 85,378 4,102 68,263 36,754 5,297 4,1971 63,036 10,655 114,815 280,455 144,525 138,899 27,468 84,707 4,071 67,754 36,481 5,287 40,955 62,566 10,400 113,927 144,551 135,899 27,681 84,707 4,041 67,754 36,481 5,218 40,056 62,100 10,323 113,073 278,289 143,776 136,891 27,618 84,707 4,041 67,754 36,919 5,176 40,012 61,178 11,2231 1	141	42,965	65,437	10,877	119,279	291,136	150,870	143,236	28,512	87,273	4.195	69.812	37 588	5.417	0.653
42,286 64,466 10,716 117,468 286,815 148,631 141,110 28,089 85,978 4,132 68,775 37,030 5,386 41,971 63,386 10,658 116,593 284,678 147,524 139,923 27,880 85,337 4,102 68,263 36,764 5,297 41,659 63,508 10,657 115,725 282,557 146,426 138,880 27,672 84,701 67,754 36,481 5,257 40,955 62,566 10,400 113,921 27,828 144,251 136,819 27,612 84,701 67,749 36,299 5,179 40,955 62,566 10,400 113,921 276,289 144,176 17,849 27,461 87,444 4,011 67,749 36,399 5,179 40,012 61,176 10,188 144,271 136,819 27,261 82,444 4,011 67,769 36,399 5,179 40,012 61,178 110,284 142,110 134,788	342	42,604	64,950	10,796	118,350	288,968	149,747	142,169	28,300	86,623	4,163	69,291	37,308	5.376	9.581
41,971 63,966 10,636 116,593 284,678 147,524 139,923 27,880 85,337 4,102 68,263 36,754 5,297 41,659 63,509 10,557 115,725 282,557 146,425 138,880 27,672 84,701 4,071 67,754 36,784 5,287 40,656 63,609 10,478 114,815 280,452 146,826 84,070 4,041 67,754 36,481 5,287 40,955 62,606 10,400 113,927 276,289 143,176 136,819 27,261 84,070 4,041 67,754 36,784 5,179 40,955 62,100 10,323 113,073 276,289 143,176 136,89 27,261 84,401 4,011 67,754 36,289 5,179 40,347 61,638 10,246 112,231 274,231 142,110 137,782 26,86 82,205 3,981 65,758 36,744 4,011 67,754 36,99 56,768 36,764	543	42,286	64,466	10,716	117,468	286,815	148,631	141,110	28,089	82,978	4,132	68,775	37,030	5,336	9,509
41,559 63,509 10,557 115,725 282,557 146,425 138,880 27,672 84,701 4,071 67,754 36,481 5,257 41,301 63,369 10,557 115,725 282,557 146,425 138,880 27,662 84,070 4,041 67,250 36,481 5,257 40,955 62,566 10,400 113,921 278,383 144,251 136,819 27,261 84,070 4,041 67,250 36,289 5,179 40,955 62,566 10,400 113,921 276,289 143,176 135,799 27,058 82,225 3,981 66,251 35,401 5,179 40,012 61,03 10,246 112,231 274,231 142,110 134,788 26,866 82,265 3,951 65,758 35,401 5,102 39,635 60,723 10,094 110,452 270,160 140,000 132,787 26,458 80,337 3,863 64,299 34,620 36,148 3,661 80,789 <	ŧ ;	41,971	63,986	10,636	116,593	284,678	147,524	139,923	27,880	85,337	4,102	68,263	36.754	5 297	9,238
41,301 63,036 10,478 114,815 280,452 145,334 137,846 27,466 84,070 4,041 67,250 36,209 5,218 40,955 62,566 10,400 113,921 278,363 144,251 136,819 27,261 83,444 4,011 66,749 35,939 5,179 40,650 62,100 10,323 113,073 276,289 143,176 135,799 27,056 82,282 3,981 66,749 35,939 5,179 40,042 61,638 10,246 112,231 274,231 142,140 134,788 26,866 82,205 3,961 65,768 35,406 5,105 39,635 60,727 10,094 110,452 27,1160 140,000 132,787 26,458 80,337 36,478 36,878 5,162 36,178 36,478 36,899 5,179 36,178 36,899 5,179 5,178 36,896 82,289 5,179 5,178 36,896 82,178 36,996 5,179 5,178 <td< td=""><td>0 t</td><td>41,659</td><td>63,509</td><td>10,557</td><td>115,725</td><td>282,557</td><td>146,425</td><td>138,880</td><td>27,672</td><td>84,701</td><td>4,071</td><td>67.754</td><td>36.481</td><td>5.257</td><td>0368</td></td<>	0 t	41,659	63,509	10,557	115,725	282,557	146,425	138,880	27,672	84,701	4,071	67.754	36.481	5.257	0368
40,955 62,566 10,400 113,921 278,363 144,251 136,819 27,261 83,444 4,011 66,749 35,939 5,179 40,650 62,100 10,323 113,073 276,289 143,176 135,799 27,058 82,822 3,981 66,251 35,671 5,140 40,050 62,100 10,246 112,231 274,231 142,110 134,788 26,856 82,205 3,981 66,251 35,406 5,102 39,635 60,723 10,094 110,452 270,160 140,000 132,787 26,458 80,337 3,892 64,782 35,406 5,102 39,430 60,727 10,094 110,452 270,160 140,000 132,787 26,458 80,373 3,892 64,782 35,406 5,102 39,430 60,727 10,018 109,628 266,149 137,922 130,816 26,261 80,278 3,892 64,782 3,893 66,278 3,893 64,782 <	946	41,301	63,036	10,478	114,815	280,452	145,334	137,846	27,466	84,070	4.041	67.250	36.209	5.21g	000,0
40,650 62,100 10,323 113,073 276,289 143,176 135,799 27,058 82,822 3,981 66,251 35,671 5,140 40,347 61,638 10,246 112,231 274,231 142,110 134,788 26,856 82,205 3,981 66,758 35,406 5,102 40,012 61,178 10,094 110,452 27,187 140,010 137,787 26,458 80,337 3,892 64,782 34,406 5,102 39,430 60,270 10,018 109,628 26,149 137,922 26,458 80,337 3,893 64,782 34,880 5,026 38,340 60,270 10,018 109,628 26,149 137,922 26,458 26,665 13,893 64,289 34,820 5,026 38,340 60,270 10,018 109,628 26,149 137,922 130,816 26,665 13,883 64,289 34,620 4,986 38,365 58,933 9,796 107,094 26,14	747	40,955	62,566	10,400	113,921	278,363	144,251	136,819	27,261	83,444	4,011	66.749	35 939	5,179	0,2,0
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40012 61178 10.169 111.359 272.187 14.065 81.533 65.56 81.533 65.750 93.400 5.102 39.635 60.723 10.094 110.452 270.160 140.000 132.787 26.458 80.937 3.892 64.782 34.880 5.026 39.340 60.270 10.018 10.9628 268.147 138.957 131.798 26.261 80.278 3.863 64.299 34.620 4.989 38,991 59,872 10.018 109.628 266.149 137.922 130.816 26.261 80.278 3.863 64.299 34.620 4.989 38,700 59,375 9,870 107.945 266.146 136.894 129.841 25,618 3.835 63.820 34.362 4.969 38,700 59,375 9,796 107.094 262.198 135,874 128,820 25,618 77,912 37.78 62.873 4,878 37,626 58,494 9,723 106,174 260.245	946	40,347	61,638	10,246	112,231	274,231	142,110	134.788	26 856	82 205	2 051	&E 7E0	20,07	, i	9,100
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39,340 60,270 10,018 109,628 268,147 138,957 131,798 26,261 80,278 3,892 64,782 34,880 5,026 38,991 59,821 9,944 108,756 266,149 137,922 130,816 26,065 79,680 3,835 63,820 34,620 4,989 38,700 59,375 9,870 107,945 264,166 136,894 129,841 25,845 79,086 3,835 63,820 34,362 4,985 38,700 59,375 9,870 107,945 264,166 136,894 129,841 25,845 79,086 3,835 63,820 4,915 4,915 37,957 58,934 9,723 106,174 260,245 134,862 127,860 25,428 77,912 3,756 62,404 33,506 4,842 37,674 58,058 9,651 106,174 260,245 134,862 127,980 25,238 77,332 3,722 61,939 33,257 4,806 37,289 57,626<	151	39,635	60.723	10 094	110 452	270 460	440.000	133,783	000'07	01,093	3,922	65,268	35,142	5,064	9,024
38,991 59,821 9,944 108,756 266,149 138,957 131,98 26,261 80,278 3,863 64,299 34,620 4,989 38,700 59,875 9,870 107,945 266,146 137,922 130,816 26,065 79,680 3,835 63,820 34,620 4,989 38,700 59,375 9,870 107,945 264,166 136,894 129,841 25,845 79,086 63,344 34,057 4,915 37,957 58,494 9,723 106,174 260,245 134,862 127,860 25,428 77,912 3,756 62,404 33,506 4,842 37,674 58,058 9,651 106,174 260,245 134,862 127,860 25,428 77,332 3,726 61,939 33,257 4,806 37,289 57,626 9,651 106,383 258,306 132,860 125,922 25,032 76,755 3,694 61,478 33,009 4,770 37,011 57,196 9,508 </td <td>52</td> <td>39,340</td> <td>60,270</td> <td>10.018</td> <td>100,629</td> <td>000,100</td> <td>140,000</td> <td>132,787</td> <td>26,458</td> <td>80,937</td> <td>3,892</td> <td>64,782</td> <td>34,880</td> <td>5,026</td> <td>8,957</td>	52	39,340	60,270	10.018	100,629	000,100	140,000	132,787	26,458	80,937	3,892	64,782	34,880	5,026	8,957
38,700 59,375 9,870 107,945 26,115 136,841 25,845 79,086 3,835 63,820 34,362 4,952 38,365 58,933 9,796 107,094 264,166 136,894 129,841 25,845 79,086 3,836 63,344 34,057 4,915 37,957 58,994 9,723 106,174 260,245 13,862 127,860 25,428 77,912 3,750 62,873 33,758 4,878 37,674 58,058 9,651 106,174 260,245 13,862 127,860 25,2428 77,912 3,750 61,939 33,257 4,806 37,289 57,626 9,579 104,494 256,382 132,860 125,962 25,032 76,755 3,694 61,478 33,009 4,770 37,011 57,196 9,508 103,715 254,472 131,870 125,024 24,845 76,184 3,666 61,020 32,763 4,735 36,704 9,578 103,715 <td>53</td> <td>38,991</td> <td>59,821</td> <td>9.944</td> <td>108,026</td> <td>266 140</td> <td>138,957</td> <td>131,798</td> <td>26,261</td> <td>80,278</td> <td>3,863</td> <td>64,299</td> <td>34,620</td> <td>4,989</td> <td>8,890</td>	53	38,991	59,821	9.944	108,026	266 140	138,957	131,798	26,261	80,278	3,863	64,299	34,620	4,989	8,890
38,365 58,933 9,796 107,094 262,198 135,874 128,820 25,618 78,497 3,778 62,873 33,758 4,915 37,957 58,934 9,723 106,174 260,245 134,862 127,860 25,428 77,912 3,756 62,404 33,506 4,842 37,674 58,058 9,651 106,174 260,245 13,867 126,908 25,238 77,332 3,722 61,939 33,257 4,806 37,289 57,626 9,579 104,494 256,382 132,860 125,962 25,032 76,755 3,694 61,478 33,009 4,770 37,011 57,196 9,578 103,475 254,472 131,870 125,024 24,845 76,184 3,666 61,020 32,763 4,735 36,736 56,770 9,437 102,942 255,576 130,888 124,092 24,666 75,616 36,586 61,020 32,519 4,899	25	38,700	59,375	9.870	107 945	264 166	126,101	130,010	20,02	79,680	3,835	63,820	34,362	4,952	8,824
37,957 58,494 9,723 106,174 262,198 135,874 128,820 25,618 78,497 3,778 62,873 33,758 4,878 37,957 58,494 9,723 106,174 260,245 134,862 127,860 25,428 77,912 3,750 62,404 33,506 4,842 37,674 58,058 9,651 106,383 258,306 133,857 126,908 25,238 77,332 3,722 61,939 33,257 4,806 37,289 57,626 9,579 104,494 256,382 132,860 125,962 25,032 76,755 3,694 61,478 33,009 4,770 37,011 57,196 9,508 103,715 254,472 131,870 125,024 24,845 76,184 3,666 61,020 32,763 4,735 36,735 56,770 9,437 102,942 255,576 130,888 124,092 24,660 75,616 3,639 61,020 32,519 4,899	55	38.365	58 033	0.206	101,040	204,100	130,034	129,841	25,845	980'6/	3,806	63,344	34,057	4,915	8,758
37,674 58,058 9,651 105,383 258,306 133,857 126,908 25,238 77,332 3,726 62,404 33,506 4,842 4,842 37,674 58,058 9,651 105,383 258,386 133,857 126,908 25,238 77,332 3,722 61,939 33,257 4,806 37,289 57,626 9,579 104,494 256,382 132,860 125,962 25,032 76,755 3,694 61,478 33,009 4,770 37,011 57,196 9,508 103,715 254,472 131,870 125,024 24,845 76,184 3,666 61,020 32,763 4,735 36,770 9,437 102,942 252,576 130,888 124,092 24,660 75,616 3,639 60,565 32,519 4,699	5.6	37 957	50,000	9,796	107,094	262,198	135,874	128,820	25,618	78,497	3,778	62,873	33,758	4,878	8,693
37,289 57,626 9,579 104,494 256,382 132,860 125,962 25,032 76,755 3,694 61,478 33,009 4,770 37,011 57,196 9,508 103,715 254,472 131,870 125,024 24,845 76,184 3,666 61,020 32,763 4,735 36,770 9,437 102,942 255,576 130,888 124,092 24,660 75,616 3,639 60,565 32,519 4,699	3 1	106,10	50,494	9,723	106,174	260,245	134,862	127,860	25,428	77,912	3,750	62,404	33,506	4.842	8 628
37,289 57,626 9,579 104,494 256,382 132,860 125,962 25,032 76,755 3,694 61,478 33,009 4,770 37,011 57,196 9,508 103,715 254,472 131,870 125,024 24,845 76,184 3,666 61,020 32,763 4,735 36,735 56,770 9,437 102,942 252,576 130,888 124,092 24,660 75,616 3,639 60,565 32,519 4,699	5 E	57,074	58,058	9,651	105,383	258,306	133,857	126,908	25,238	77,332	3,722	61,939	33.257	4 806	8 564
36,735 56,770 9,437 102,942 252,576 130,888 124,092 24,660 75,616 3,639 60,665 32,519 4,699	n c	37,289	57,626	9,579	104,494	256,382	132,860	125,962	25,032	76,755	3,694	61.478	33.009	4 770	200,00
36,735 56,770 9,437 102,942 252,576 130,888 124,092 24,660 75,616 3,639 60,565 32,519 4,699	n 6	37,011	57,196	9,508	103,715	254,472	131,870	125,024	24,845	76,184	3,666	61,020	32,763	4 735	8.437
	00	36,735	56,770	9,437	102,942	252,576	130,888	124,092	24,660	75,616	3,639	60,565	32.519	4.699	8 374

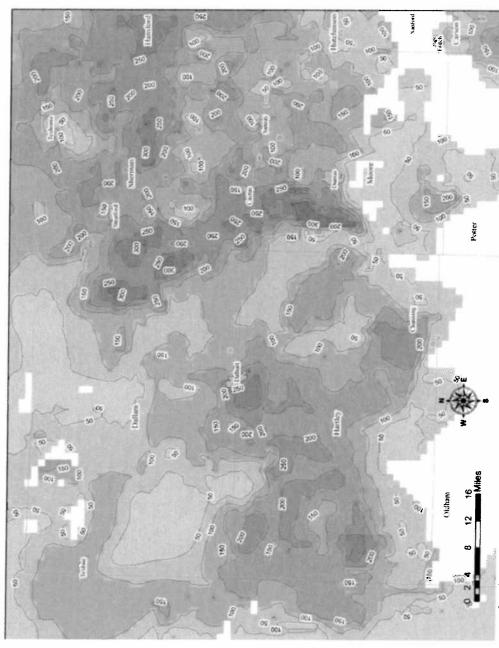


Figure 2: Baseline year showing saturated thickness on the western side of the northern portion of the Ogallala Aquifer. White cells are inactive and/or outside the boundary of the model.

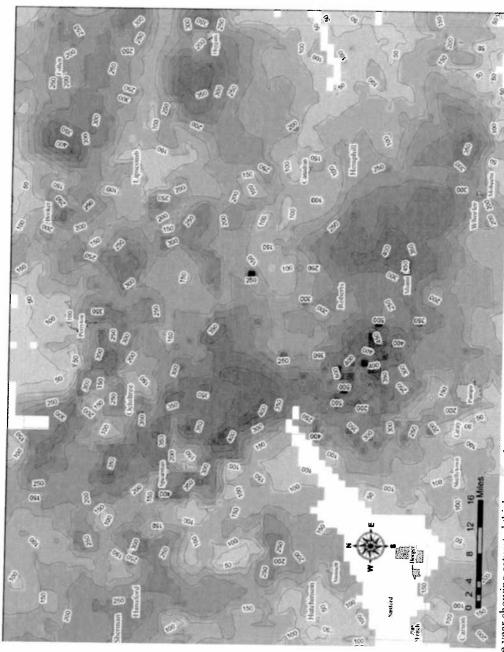


Figure 3: Baseline year showing saturated thickness on the eastern side of the northern portion of the Ogallala Aquifer. White cells are inactive and/or outside the boundary of the model.

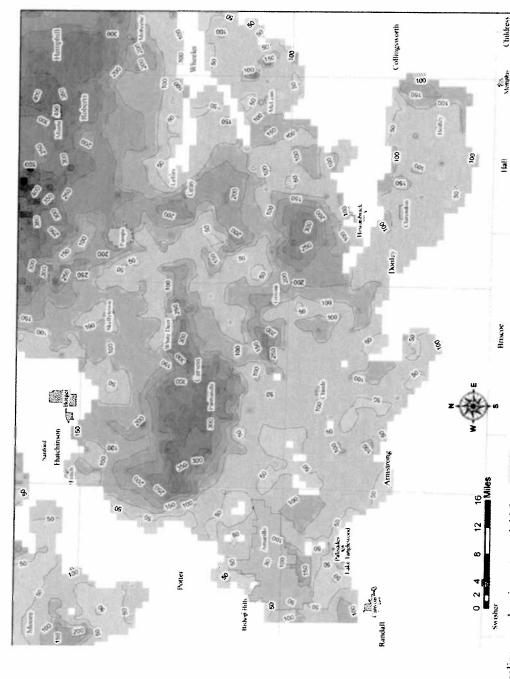


Figure 4: Baseline year showing saturated thickness on the south central side of the northern portion of the Ogallala Aquifer. White cells are inactive and/or outside the boundary of the model.

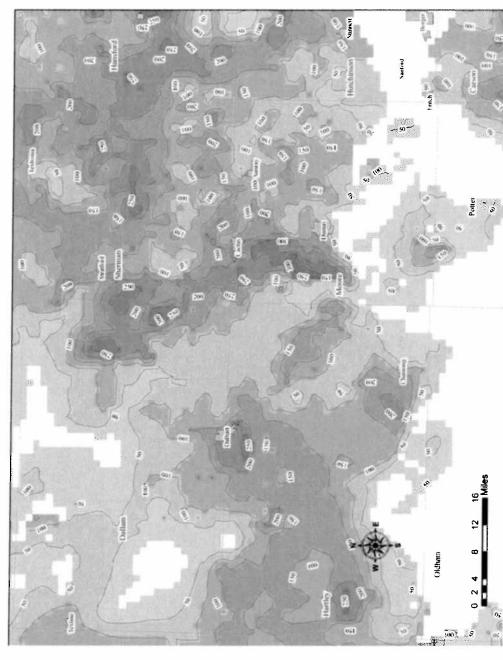


Figure 5: 2020 saturated thickness on the western side of the northern portion of the Ogallala Aquifer. White cells are inactive and/or outside the boundary of the model.

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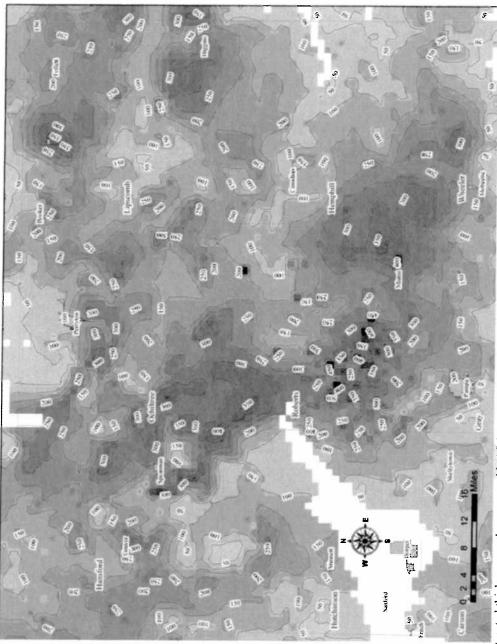


Figure 6: 2020 saturated thickness on the eastern side of the northern portion of the Ogallala Aquifer. White cells are inactive and/or outside the boundary of the model.

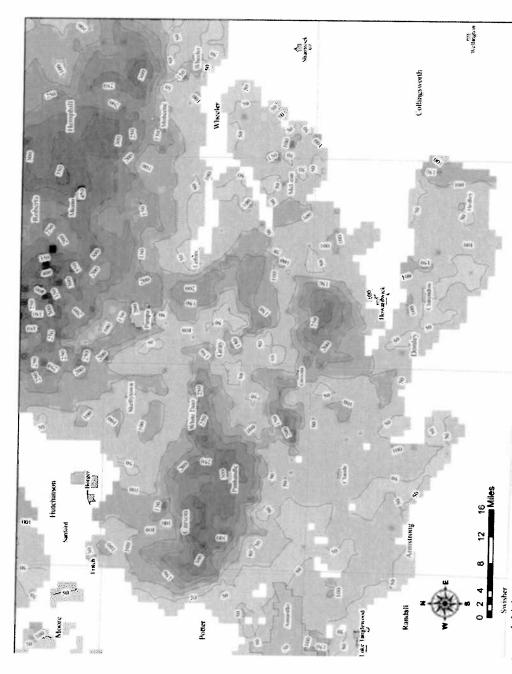


Figure 7: 2020 saturated thickness on the south central side of the northern portion of the Ogallala Aquifer. White cells are inactive and/or outside the boundary of the model.

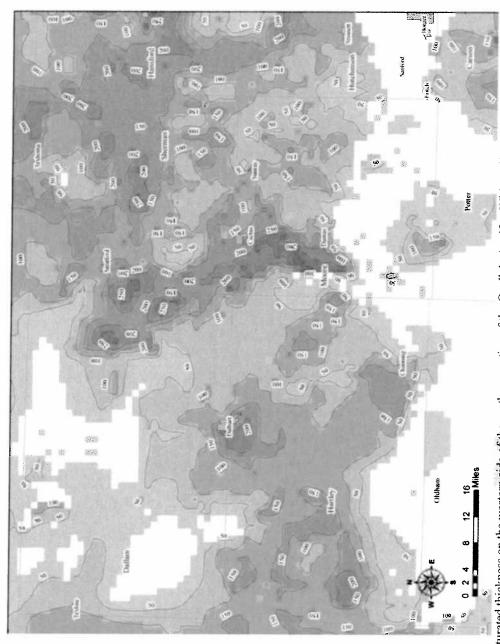


Figure 8: 2030 saturated thickness on the western side of the northern portion of the Ogallala Aquifer. White cells are inactive and/or outside the boundary of the model.

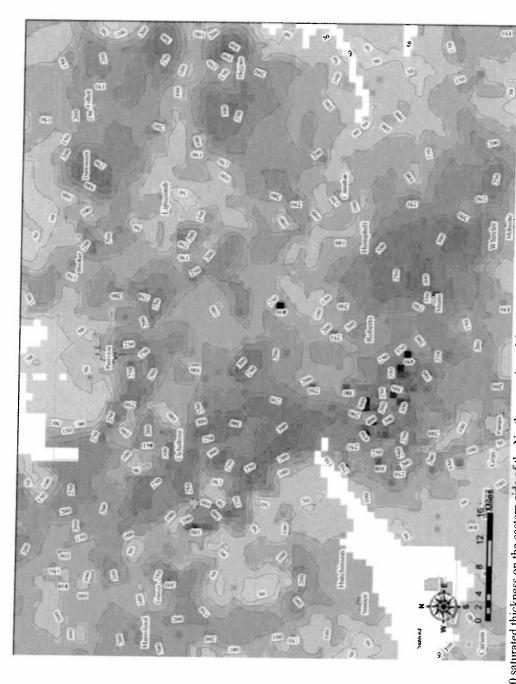


Figure 9: 2030 saturated thickness on the eastern side of the Northern portion of the Ogallala Aquifer. White cells are inactive and/or outside the boundary of the model.

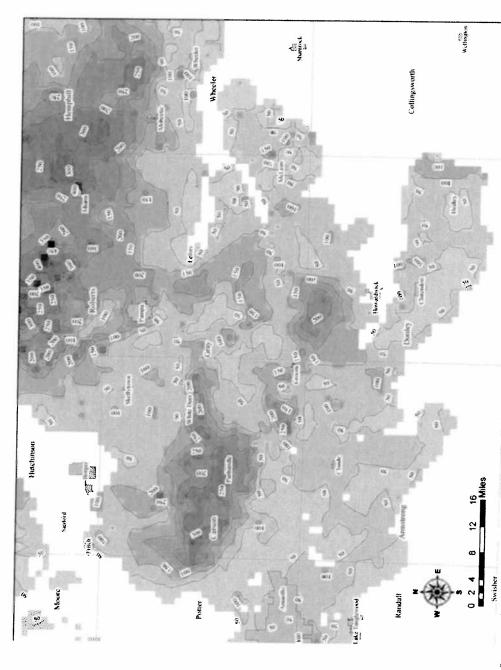


Figure 10: 2030 saturated thickness on the south central side of the northern portion of the Ogallala Aquifer. White cells are inactive and/or outside the boundary of the model.

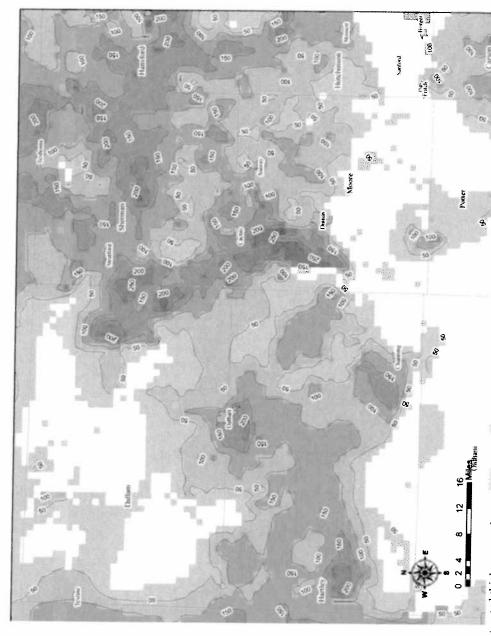


Figure 11: 2040 saturated thickness on the western side of the northern portion of the Ogallala Aquifer. White cells are inactive and/or outside the boundary of the model.

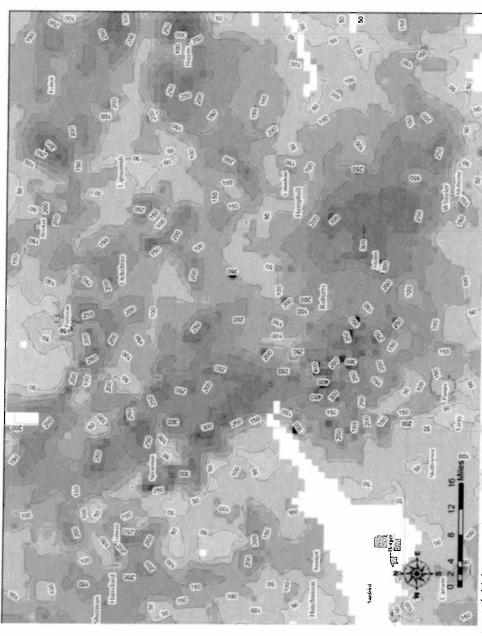


Figure 12: 2040 saturated thickness on the eastern side of the northern portion of the Ogallala Aquifer. White cells are inactive and/or outside the boundary of the model.

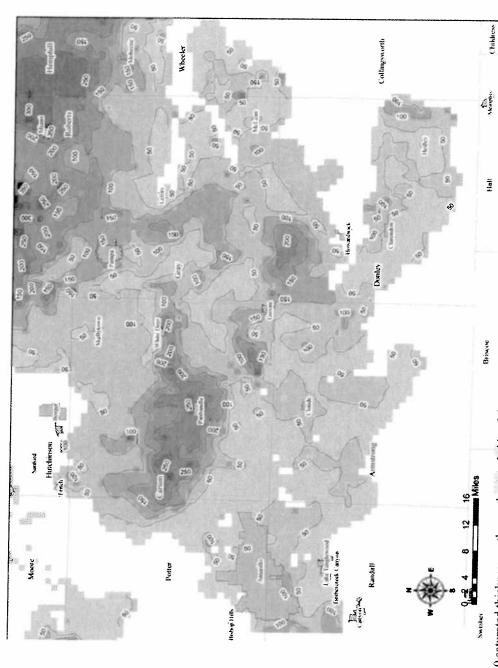


Figure 13: 2040 saturated thickness on the south central side of the northern portion of the Ogallala Aquifer. White cells are inactive and/or outside the boundary of the model.

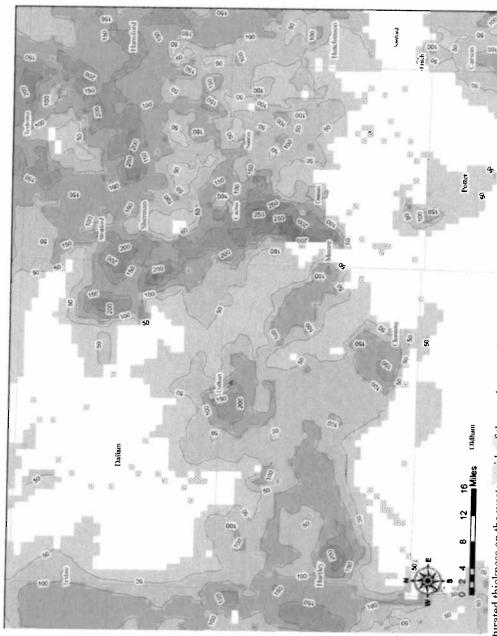


Figure 14: 2050 saturated thickness on the western side of the northern portion of the Ogallala Aquifer. White cells are inactive and/or outside the boundary of the model.

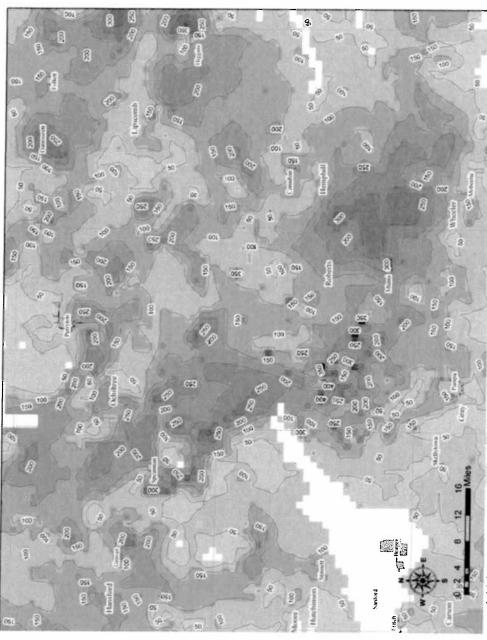


Figure 15: 2050 saturated thickness on the eastern side of the northern portion of the Ogallala Aquifer. White cells are inactive and/or outside the boundary of the model.

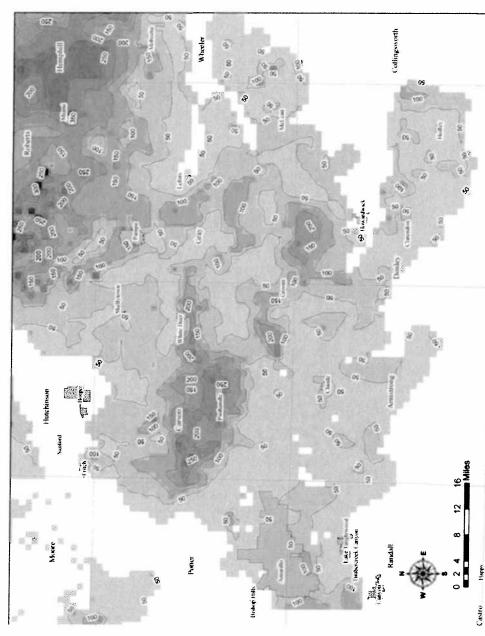


Figure 16: 2050 saturated thickness on the south central side of the northern portion of the Ogallala Aquifer. White cells are inactive and/or outside the boundary of the model.

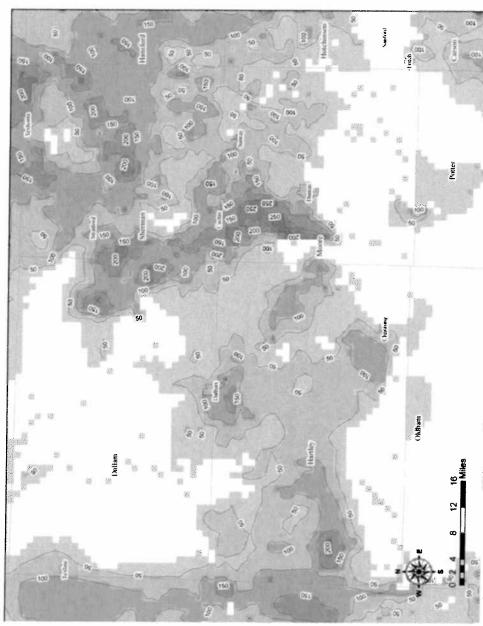


Figure 17: 2060 saturated thickness on the westem side of the northern portion of the Ogallala Aquifer. White cells are inactive and/or outside the boundary of the model.

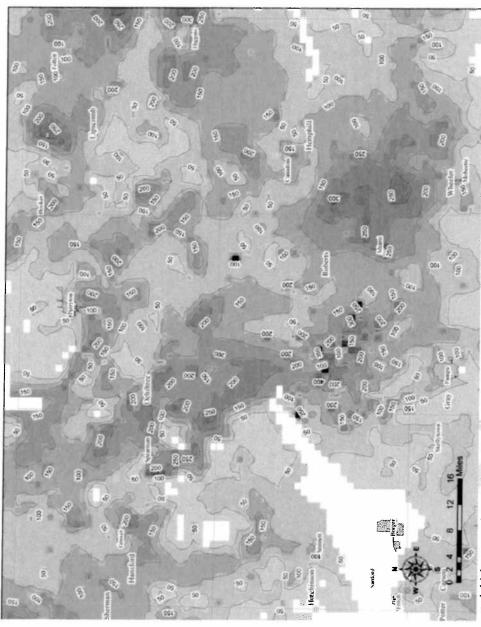


Figure 18: 2060 saturated thickness on the eastern side of the northern portion of the Ogallala Aquifer. White cells are inactive and/or outside the boundary of the model.

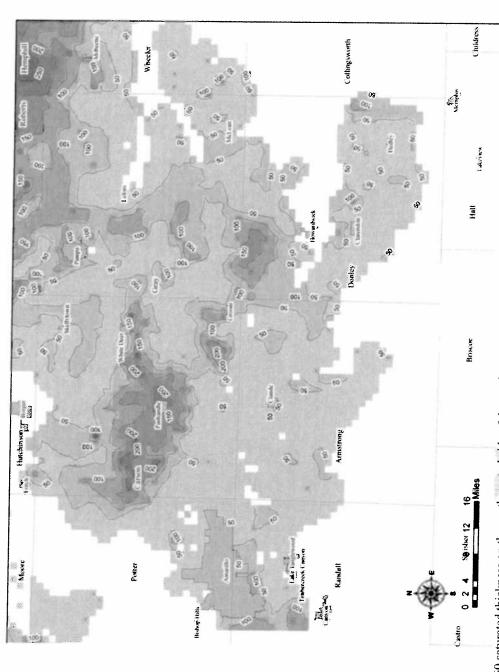


Figure 19: 2060 saturated thickness on the south central side of the northern portion of the Ogallala Aquifer. White cells are inactive and/or outside the boundary of the model.

GAM run 09-001(Supplement)

by Richard Smith, P.G.

Texas Water Development Board Groundwater Availability Modeling Section (512) 936-0877 February 26, 2009

EXECUTIVE SUMMARY:

Initially Groundwater Management Area 1 requested a groundwater availability model run to determine if retaining three different volumes of groundwater after 50 fifty years of pumping in the Ogallala Aquifer in three predetermined geographical divisions in Groundwater Management Area 1 (Figure 1) was feasible. They requested 40 percent retention of the starting point volume after fifty years in division 1, 90 percent retention in division 2, and 50 percent retention in division 3. We ran the northern segment of the Ogallala Aquifer groundwater availability model in order to evaluate the three different proposed desired future conditions for the Ogallala Aquifer within Groundwater Management Area 1. The southern segment of the Ogallala Aquifer was run for Potter, Randall, and Armstrong counties and reported in the supplement to GAM run 08-16 (Smith, 2008b). These numbers have not changed. We applied annual pumping based on individual cell volumes for each grid cell. After calculating the total volume in each grid cell and adding the recharge, we calculated the pumping rate for each cell that would result in the retention of the desired percent of the volume at the end of fifty years as specified in the request. The results were used to generate a new well file for the model of the northern portion of the Ogallala Aquifer in Groundwater Management Area 1. We determined that a 50 percent retention in the counties surrounding division 2 (Hemphill County) would result in a 90 percent retention in the county with no pumping. After discussions with Ms. Janet Gutherie with the Hemphill County Groundwater Conservation District on behalf of Groundwater Management Area 1, it was determined that the initial request would be adjusted to reflect 80 percent retention in subdivision 2 instead of 90 percent. This report summarizes our initial analysis when we applied zero pumpage in Hemphill County and observed 89.71 percent remaining after fifty years.

REQUESTOR:

Ms. Janet Guthrie with the Hemphill County Groundwater Conservation District on behalf of Groundwater Management Area 1.

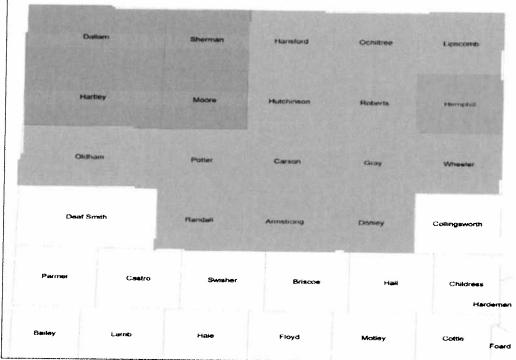


Figure 1. Divisions requested by the groundwater conservation districts in Groundwater Management Area 1. Pink counties are Division 1, the blue county is Division 2 and green counties are Division 3.

DESCRIPTION OF REQUEST:

The groundwater conservation districts in Groundwater Management Area 1 requested a groundwater availability model run to determine if retaining different volumes of groundwater after fifty years of pumping in the Ogallala Aquifer in three divisions of the groundwater management area (Figure 1) was feasible. The three divisions are as follows:

- Division 1 is comprised of Dallam, Hartley, Moore, and Sherman counties;
- Division 2 is comprised of Hemphill County; and
- Division 3 is comprised of Hutchinson, Hansford, Lipscomb, Ochiltree, Armstrong, Carson, Donley, Gray, Oldham, Potter, Randall, Roberts, and Wheeler counties.

The districts requested that the Texas Water Development Board (TWDB) provide the draft managed available groundwater estimates in the management area based upon the draft desired future condition of the Ogallala Aquifer for each division as follows:

- Division 1 is to achieve at least 40 percent of the 2006 total aquifer storage remaining in 2060. The TWDB shall calculate the amount of managed available groundwater for the 50 year period with an initial amount of available groundwater set at 1,331,500 acre-feet for the first year. This starting point will decrease at a fixed percent throughout the 50 years to achieve the desired future condition of the Ogallala Aquifer goal for the division.
- Division 2 is to have at least 80 percent (revised from 90 percent) of the total aquifer storage remaining in 2060. The annual pumping volume will be 55,000 acre-feet without change through the fifty year simulation period.
- Division 3 is to have at least 50 percent of the baseline total aquifer storage remaining in 2060. TWDB shall estimate the managed available groundwater volume by reducing the total aquifer storage by no more than 1.25 percent annually.

Based on the pumping rates established in GAM Run 07-31 (Smith, 2007) the districts requested that the area-wide pumping rates be applied to the northern and southern segments of the Ogallala Aquifer groundwater availability models for a fifty year period with 2006 as the baseline year.

METHODS:

To address the request, we did the following steps:

- we selected a stress period in the northern portion of the Ogallala Aquifer groundwater availability model which best approximated water-level information and volume information supplied by the North Plains Groundwater Conservation District. The District's 2006 information corresponds to stress period 55 in the model which became the base year;
- initial pumping rates were calculated on a cell-by-cell basis, based on either the volume or maximum percent declines described in the request above plus the average recharge. We then annually decreased pumping by a set percent rate to achieve the desired final volumes of water as described in the request above;
- the pumping rates per grid cell were used to create a new well file which was then used as input to the model;
- the model was run to simulate projections for fifty years;
- water levels for the base year and final year of the simulation, as well as the base
 of the aquifer and hydraulic properties, were exported from the model to ArcGIS®
 to compare and analyze the volume remaining in the aquifer; and
- saturated thickness maps were constructed on a decadal basis starting with 2010 and extending to 2060.

The model was then zoned by county. Pumpage was extracted from the model to develop a table of the managed available groundwater for each county.

PARAMETERS AND ASSUMPTIONS:

- We used version 2.01 of the groundwater availability model for the northern part of the Ogallala Aquifer (Dutton, 2004) and version 1.01 of the groundwater availability model for the southern part of the Ogallala Aquifer (Blandford and others, 2003),
- See Dutton and others (2001) and Dutton (2004) for assumptions and limitations of the model for the northern part of the Ogallala Aquifer. Root mean squared error for this model is 53 feet. This error has more of an effect on model results where the aquifer is thin.
- See Blandford and others (2003) for assumptions and limitations of the model for the southern part of the Ogallala Aquifer. Root mean squared error for this model is 47 feet. This error will have more of an effect on model results where the aquifer is thin.
- Recharge was reappraised in the updated model of the northern part of the Ogallala Aquifer (Dutton, 2004).
- Average recharge used in both of the models was based on a percentage of precipitation for the 1950 through 1990 period of record. Since this includes the 1950s drought of record, the average recharge used for this analysis is considered a conservative estimate.
- For Oldham, Randall, Potter, and Armstrong counties, which are partially included in both the northern and southern parts of the Ogallala Aquifer groundwater availability models, we will combine the results of the volume calculation from each model to get full county totals. At this time this report only includes the results from the groundwater availability model for the northern portion of the Ogallala Aquifer. It should be noted that we will use the volume calculated from each model for that segment of the county covered as the starting point for the annual pumping rate calculation which would result in a fifty percent decline over a fifty year period.
- It should be noted that the Rita Blanca Aquifer is part of the layer representing the Ogallala Aquifer in western Dallam and Hartley counties.
- For this simulation we did not include any pumpage for Hemphill County.

RESULTS:

Table 1 gives the starting and the final volumes for each of the three divisions calculated from the model at the end of the 50 year simulation. The rates of water-level decline, and the percentage decrease in pumping compared with the previous stress period, were adjusted to achieve the desired future condition of the Ogallala Aquifer requested for each division. The starting pumpage was 1.98 percent of the initial volume in Division 1, zero acre-feet per year in Division 2, and 1.25 percent in Division 3. It should be noted that recharge was added back into the initial value which accounts for a larger initial available groundwater value than a simple 1.98 percent or 1.25 percent of the starting volume.

All numbers are expressed in acre-feet per year. Tables 2 and 3 show the tabulated results for Divisions 1, 2, and 3. Recharge was added back into each pumping value for each stress period in Divisions 1 and 3. The zero acre-feet of pumpage per year in Division 2 was maintained throughout the 50-year simulation. The declines are different since the starting volumes and the final requested volumes are different for each division.

Figures 2 to 9 show the saturated thickness of the northern portion of the Ogallala Aquifer by decade from 2010 through 2060 with Figures 5 through 9 centered on Hemphill County. Large areas of dry cells in Lipscomb, Roberts and Wheeler counties serve as drains on Hemphill County.

REFERENCES:

Dutton, A., 2004, Adjustments of parameters to improve the calibration of the Og-N model of the Ogallala aquifer, Panhandle Water Planning Area: Bureau of Economic Geology, The University of Texas at Austin, 9 p

Blandford, T.N., Blazer, D.J., Calhoun, K.C., Dutton, A.R., Naing, T., Reedy, R.C., and Scanlon, B.R., 2003, Groundwater availability of the southern Ogallala aquifer in Texas and New Mexico—Numerical Simulations Through 2050: Final Report prepared for the Texas Water Development Board by Daniel B. Stephens & Associates, Inc., 158 p.

Dutton, A., Reedy, R., and Mace, R., 2001, Saturated thickness of the Ogallala aquifer in the Panhandle Water Planning Area—Simulation of 2000 through 2050 Withdrawal Projections: prepared for the Panhandle Water Planning Group by the Bureau of Economic Geology, The University of Texas at Austin, 54 p.

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The seal appearing on this document was authorized by Richard M. Smith, P.G., on February 17, 2009.

Table 1: Volumes within each Division with decline rates and final percentages.

Division	Initial volumes in acre-feet	Final volumes in acre-feet	Decline rate	Final percentage remaining
1	68,426,375	27,349,643	0.059	39.97 %
2	15,492,740	13,899,256	0.00	89.71 %
3	145,937,684	73,507,835	0.0775	50.4 %

Table 2: Managed available groundwater for Division 1 and 2. All numbers are in acre-feet. NPGCD = North Plains Groundwater Conservation District. UWCD = Underground Water Conservation District.

	Hemphill County UWCD		0	0		> <	>	o (5	0	0	0	0	0		0	0	0	0	0	0	0	· c	> 0	D	0	0	0	0	0
	Moore		245,736	236,346	227 759	210.023	244 775	027,112	204,736	197,377	190,821	183,604	178,016	172 480	172,463	107,754	161,928	156,958	151,214	147,140	142,848	137.943	132 895	420 026	120,030	125,173	122,050	118,768	115,000	112,540
	Moore No district		38,012	36,439	34.648	32 033	31 846	010,040	30,000	29,814	27,790	25,558	24,970	23 891	096.66	73,300	22,846	22,357	21,145	20,203	19,534	18,157	16 322	15 233	5,50	14,634	13,816	13,255	11,776	11,248
	Moore		207,724	199,907	193,111	186 990	179.879	172,070	07,07	595,701	163,031	158,046	153,046	148.598	112 804	143,034	790,851	134,601	130,069	126,937	123,314	119,786	116,573	113 603	440 500	110,539	108,234	105,513	103,224	101,292
	Hartley Total		419,881	410,762	402,441	394.845	387 670	380,090	270,000	10,407	367,195	361,790	356,208	349,698	344 237	320 760	000,000	333,994	329,544	325,073	321,733	317,563	312,596	309.345	304 034	304,934	301,916	298,912	295,894	292,944
	Hartley No district		26,230	54,302	52,764	51,590	50.485	48.380	47.162	77,102	45,754	44,667	43,393	41,207	39 828	37 803	000,00	30,312	34,885	33,036	32,613	31,547	29,199	28.215	28 380	20,000	721,02	25,021	23,749	22,502
	Hartley	200 000	169,595	356,460	349,677	343,255	337,185	331,710	326 975	204 444	1441	317,123	312,815	308,491	304.409	300 957	202,000	700'167	294,659	292,037	289,120	286,016	283,397	281,130	278 545	מער זער	267,677	273,891	272,145	270,442
	Hansford	270 306	210,390	268,381	266,382	264,397	262,428	260,472	258 532	256,002	200,000	724,694	252,797	250,913	249,044	247 189	245 347	140,042	243,519	241,705	239,904	238,117	236,343	234,582	232 835	224 400	231,100	229,378	227,670	225,973
	Ochiltree	258 704	101,002	254,789	252,891	251,006	249,136	247,281	245,438	243.610	210,017	241,/35	239,993	238,206	236,431	234.670	232 921	204,021	231,180	229,464	227,754	226,057	224,373	222,702	221.042	210 30E	060,613	217,761	216,139	214,529
	Lipscomb	246 011	110,012	244,179	242,359	240,554	238,762	236,983	235,217	233 465	234 726	231,120	229,999	228,286	226,585	224,897	223 222	324 550	666,122	208,812	218,270	216,644	215,030	213,428	211,838	210 259	000,000	208,693	207,138	205,595
	Sherman	270.088	20000	261,845	254,087	246,787	239,921	233,456	227,375	221.654	216.265	210,200	102,112	206,430	201,943	197,722	193.748	189 777	100,111	100,204	906,201	1/9,621	176,696	173,727	171,137	168 700	188 400	104,000	067,401	162,221
	Dallam	440,852	422.040	433,910	425,579	418,791	413,086	404,838	398,700	391,293	382,873	372 766	3/3/100	365,596	356,936	349,188	342,007	334 562	307,743	204 506	347.664	100,010	307,855	302,212	296,030	289,020	281 312	210,102	100,072	700,290
HERE STREET, S	Dallam No district	100,090	00 300	90,00	206,08	94,723	93,317	91,194	89,703	88,039	86.208	84 716	2 1,1	63,296	82,187	81,139	79,910	78.969	78.077	77.452	20 E, 1 1	10,044	/6,094	75,144	74,234	73,055	72 331	74 424	7. C.S.O.O.Y	70,032
	Dallam	340,762	335 522	220,000	329,017	324,068	319,769	313,644	308,997	303,254	296,665	289.050	200 200	202,300	274,749	268,049	262,097	255,593	249 636	244 054	236.417	224.11	10/,162	227,068	221,796	215,965	208,981	205.437	198.258	20,700
	Year	2010	2011	2017	2012	2013	2014	2015	2016	2017	2018	2019	0000	2020	2021	2022	2023	2024	2025	2026	2027	2028	2020	6707	2030	2031	2032	2033	2034	- } !

Table 2 cont: Managed available groundwater for Division 1 and 2. All numbers are in acre-feet. NPGCD = North Plains Groundwater Conservation District and UWCD = Underground Water Conservation District.

121116	Hemphill County UWCD	,	Э (0	0	0	0	0	0	0	0	, ,	> <	> <	> 0	> 6	5	0	0	0	0	0	0	0	, ,	› c	> <	o c	0
	Moore	740	110,231	108,035	105,490	103,516	101,907	895'66	97,830	96,315	94,113	92 149	91.281	90 185	00,100	00,121	700,00	85,444	82,879	81,672	80,282	79,211	78,098	77,502	76 505	75 331	74.250	73.451	72,600
	Moore No district	40 700	10,720	10,283	9,32/	8,818	8,323	7,459	6,768	6,392	6,140	5.435	5 4 1 7	5,117	7,07	1,6,4	11/,4	4,699	3,823	3,593	3,144	3,137	3,131	3,125	2.771	2.767	2.763	2.540	2,406
	Moore	00 544	110,66	201,18	90,103	94,698	93,584	92,109	91,062	89,923	87,973	86.714	85.864	84 784	83.780	81841	2, 6	60,745	79,056	78,079	77,138	76,074	74,967	74,377	73.734	72.564	71 487	70,911	70,194
	Hartley Total	20,020	20,020	707 707	40 / hoz	282,311	760,007	278,427	276,569	275,229	273,694	271,288	268,955	267.408	264 874	263.024	764 604	160,102	260,164	258,758	257,465	256,038	254,526	252,254	251,293	249,423	247.123	245,450	243,139
	Hartley No district	21 497	10,101	10,000	‡ 00° 0° 0° 0° 0° 0° 0° 0° 0° 0° 0° 0° 0°	18,358	240,1-	CLE,OL	16,221	15,927	15,449	14,970	13,888	13,631	12.583	12,152	11 726	11,120	11,48/	11,259	10,645	10,239	10,022	9,250	8,669	8,356	7,967	7,950	7,750
	Hartley	268 523	266 991	265.450	262,042	262,943	204 540	710'107	260,348	259,302	258,245	256,318	255,067	253,777	252,291	250,872	249 965	240,000	710,017	247,499	246,820	245,799	244,504	243,004	242,624	241,067	239,156	237,500	235,389
	Hansford	224.290	222.619	220 930	210.284	217,651	216.020	670,012	214,420	212,822	211,237	209,663	208,101	206,551	205,012	203,485	201 969	200 ABA	400,404	196,013	197,332	195,789	194,264	192,682	191,177	189,376	187,893	186,493	184,990
	Ochiltree	212,930	211,344	209.770	208 207	206,556	205 118	202 200	203,588	202,071	200,566	199,071	197,589	196,116	194,655	193,205	191,766	190 337	100,001	100,011	074,101	186,032	184,646	183,270	181,840	180,485	179,141	177,806	176,481
on District.	Lipscomb	204,063	202,543	201.034	199 537	198,050	196 574	106 110	193,110	193,656	192,214	190,782	189,360	187,949	186,549	185,160	183,780	182 411	181 052	170 703	170,000	173,364	177,036	1/5,717	174,408	173,108	171,819	170,474	169,204
and UWCD = Underground Water Conservation District.	Sherman	160,309	158,511	156,822	155.228	153,728	152.122	150 797	130,737	149,551	148,183	147,080	146,041	145,063	144,144	143,281	142,346	141.468	140 559	139 RRF	139,000	130,940	136, 164	137,493	136,964	136,468	135,448	135,009	134,488
ound Water	Dallam	263,300	258,278	246,928	241,786	235,830	227,783	220 887	244 420	214,438	206,778	200,172	192,802	187,313	181,592	174,820	169,572	162,123	156.679	152,613	148 560						127,971		119,982
= Undergr	Dallam No district	69,382	950'69	67,330	67,043	65,965	64,905	63.252	62 11E	04,110	01,/14	61,214	59,761	59,091	58,242	57,292	55,665	54,547	53,133	51,917	50 521	48 709	20,101	10,010	47,124	45,942	45,070	43,651	42,422
	Dallam	193,918	189,222	179,598	174,743	169,865	162,878	157,635	152 322	145.054	143,004	138,958	133,041	128,222	123,350	117,528	113,907	107,576	103,546	100,696	98.039	36,396	01,000	01,004	87,478	/90,08	82,901	79,775	094'//
es .	Year	2035	2036	2037	2038	2039	2040	2041	2042	2043	C+07	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2030	/507	2028	2029	7000

Table 3: Managed available groundwater for Division 3. All numbers are in acre-feet. NPGCD = North Plains Groundwater Conservation District, UWCD = Underground Water Conservation District, PGCD= Panhandle Groundwater Conservation District, and HPUWCD = High Plains Underground Water Conservation District. Note: this table only represents the portion of the Ogallala Aquifer located in the northern segment of the Ogallala Aquifer groundwater availability model for Oldham, Randall, Potter, and Armstrong counties.

	Randall No district		12,171	12,080	11,990	11 901	1,00	44 704	11,124	11,63/	11,550	11,464	11,3/9	11,294	11.210	11 126	1,150	5,045	10,961	10,879	10,798	10,718	10,638	10,559	10 480	10.402	40 to 04	10,525	10,248	
	Randall		6,830	6,779	6,728	6.678	6,679	6.570	0,0	0,030	0,481	0,433	0,385	6,338	6.291	6 244	0,£17	5 6	6,151	6,105	090'9	6,014	5,970	5,925	5.881	5 837	707	40.70	5,708	
	Armstrong		47,395	47,041	46,691	46.343	45 998	45,655	45.000	43,313	118,44	44,042	010,44	43,980	43,652	43,327	43.004	10,00	42,084	42,366	42,050	41,/3/	41,426	41,117	40,811	40 507	40.205	30,006	39,608	
	Donley	00 00	68,024	87,369	86,718	86.072	85.430	84 794	84.162	03,102	00,000	02,313 82,20E	067,20	81,682	81,074	80,470	79.870	70.07	017,61	78,685	77,540	010,77	666'0/	998'92	75,797	75.232	74 672	74 115	73,563	
	Oldham No district	2000	607'0	5,250	5,211	5,172	5,133	5.095	5.057	5,000	4 080	4,502	0,5	4,908	4,871	4,835	4.799	4 763	7, 100	4,728	4,093	4,000	4,023	4,589	4,554	4,520	4.487	4 453	4,420	
	Wheeler	110.041	140'011	109,222	108,408	107,600	106,799	106,003	105 213	104 429	103.651	102,821	400 440	102,113	101,352	100,597	99.848	99 104	100,00	90,303	97,033	06,303	60.00	95,467	94,755	94,049	93.349	92,653	91,963	
	Potter PGCD	35 950	000'00	35,683	35,417	35,153	34,891	34,631	34.373	34 117	33.863	33.611	000 00	23,360	33,112	32,865	32,620	32.377	32 136	34 806	31,650	31.403	044,10	31,189	30,957	30,726	30,497	30.270	30,044	
	Gray PGCD	180 604	470 000	807'6/	177,923	176,598	175,282	173,976	172,680	171.394	170,117	168.849	187 504	180'701	166,343	165,104	163,874	162.653	161 441	160.238	159 044	157.860	00,00	156,684	155,516	154,358	153,208	152,066	150,933	
	Carson	190.230	100 040	510,001	187,407	186,010	184,625	183,249	181,884	180,529	179,184	177,849	17E 59A	110,024	175,209	173,904	172,608	171,322	170.046	168 779	167.522	166.274	165,005	02,030	163,805	162,585	161,374	160,171	158,978	
	Roberts	367.090	36.4 35E	000,100	301,641	358,946	356,272	353,618	350,984	348,369	345,773	343,197	340 641	The fate	338,103	335,584	333,084	330,602	328 139	325.695	323.268	320,860	318 470	010,410	316,097	313,742	311,405	309,085	306,782	
Statistical library	Hutchinson Total	150,398	149 278	149,400	140,100	147,062	145,967	144,879	143,799	142,728	141,665	140,610	139.562	200 mon	138,522	137,490	136,467	135,449	134,440	133,439	132,445	131,458	130.479	614,001	129,507	128,541	127,584	126,634	125,690	
	Hutchinson PGCD	13,715	13 613	12 510	210,01	13,411	13,311	13,212	13,113	13,016	12,919	12,823	12.727	40.000	12,632	12,538	12,445	12,352	12,260	12,169	12,078	11,988	11 899	44 040	019,11	11,722	11,635	11,548	11,462	
	Hutchinson No district	82,509	81,895	81 284	02,10	80,679	80,078	79,481	78,889	78,301	77,718	77,139	76,564	75 004	77,400	75,428	74,866	74,308	73,754	73,205	72,660	72,118	71.581	71 049	1,040	70,518	69,993	69,472	68,954	
	Hutchinson	54,174	53,770	53.370	570(23	278,20	52,578	52,186	51,797	51,411	51,028	50,648	50,271	49 896	19,030	49,524	49,156	48,789	48,426	48,065	47,707	47,352	46,999	46 649	Sto, ot	46,301	45,956	45,614	45,274	
	Year	2010	2011	2012	2013	5013	2014	2015	2016	2017	2018	2019	2020	2021	2022	7707	2023	2024	2025	2026	2027	2028	2029	2030	2024	1502	2032	2033	2034	

Table 3 cont: Managed available groundwater for Division 3. All numbers are in acre-feet. NPGCD = North Plains Groundwater Conservation District, UWCD = Underground Water Conservation District, PGCD= Panhandle Groundwater Conservation District, and HPUWCD = High Plains Underground Water Conservation District. Note: this table only represents the portion of the Ogallala Aquifer located in the northern segment of the Ogallala Aquifer groundwater availability model for Oldham, Randall, Potter, and Armstrong counties.

	Randall No district	10 096	10,020	9.946	9.872	862 6	9.725	9.653	9,581	605'6	9,438	9.368	9 298	9 2 2 9	9.160	260.6	9.024	8.957	8,890	8.824	8.758	8 693	8,628	8.564	8,500	8,437	8,374
	Randall	5 665	5,623	5.581	5.540	5.498	5.457	5,417	5,376	5,336	5,297	5.257	5.218	5.179	5,140	5.102	5.064	5.026	4,989	4,952	4.915	4.878	4 842	4 806	4 770	4 735	4,699
	Armstrong	39.313	39.020	38,730	38,441	38,155	37,870	37,588	37,308	37,030	36,754	36,481	36,209	35,939	35,671	35,406	35,142	34,880	34,620	34,362	34.057	33.758	33 506	33.257	33 009	32,763	32,519
	Donley	73.015	72.471	71,931	71,395	70.864	70,336	69,812	69,291	68,775	68,263	67,754	67,250	66,749	66,251	65,758	65,268	64,782	64,299	63,820	63,344	62.873	62.404	61,939	61.478	61.020	995'09
	Oldham No district	4.387	4,354	4,322	4,290	4,258	4,226	4,195	4,163	4,132	4,102	4,071	4,041	4,011	3,981	3,951	3,922	3,892	3,863	3,835	3,806	3,778	3,750	3.722	3.694	3,666	3,639
	Wheeler	91,278	90,598	89,923	89,253	88,588	87,928	87,273	86,623	85,978	85,337	84,701	84,070	83,444	82,822	82,205	81,593	80,937	80,278	79,680	79,086	78,497	77,912	77,332	76,755	76,184	75,616
	Potter PGCD	29,820	29,598	29,378	29,159	28,942	28,726	28,512	28,300	28,089	27,880	27,672	27,466	27,261	27,058	26,856	26,656	26,458	26,261	26,065	25,845	25,618	25,428	25,238	25,032	24,845	24,660
THE PERSON NAMED IN	Gray	149,809	148,693	147,585	146,486	145,394	144,311	143,236	142,169	141,110	139,923	138,880	137,846	136,819	135,799	134,788	133,783	132,787	131,798	130,816	129,841	128,820	127,860	126,908	125,962	125,024	124,092
	Carson	157,794	156,618	155,451	154,293	153,144	152,003	150,870	149,747	148,631	147,524	146,425	145,334	144,251	143,176	142,110	141,051	140,000	138,957	137,922	136,894	135,874	134,862	133,857	132,860	131,870	130,888
	Roberts	304,497	302,228	299,976	297,742	295,523	293,322	291,136	288,968	286,815	284,678	282,557	280,452	278,363	276,289	274,231	272,187	270,160	268,147	266,149	264,166	262,198	260,245	258,306	256,382	254,472	252,576
	Hutchinson Total	124,754	123,824	122,902	121,986	121,076	120,176	119,279	118,350	117,468	116,593	115,725	114,815	113,921	113,073	112,231	111,359	110,452	109,628	108,756	107,945	107,094	106,174	105,383	104,494	103,715	102,942
	Hutchinson	11,377	11,292	11,208	11,124	11,041	10,959	10,877	10,796	10,716	10,636	10,557	10,478	10,400	10,323	10,246	10,169	10,094	10,018	9,944	9,870	962'6	9,723	9,651	9,579	9,508	9,437
	Hutchinson No district	68,440	67,930	67,424	66,922	66,423	62,929	65,437	64,950	64,466	63,986	63,509	63,036	62,566	62,100	61,638	61,178	60,723	60,270	59,821	59,375	58,933	58,494	58,058	57,626	57,196	92,770
	Hutchinson	44,937	44,602	44,270	43,940	43,612	43,288	42,965	42,604	42,286	41,971	41,659	41,301	40,955	40,650	40,347	40,012	39,635	39,340	38,991	38,700	38,365	37,957	37,674	37,289	37,011	36,735
	Year	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060

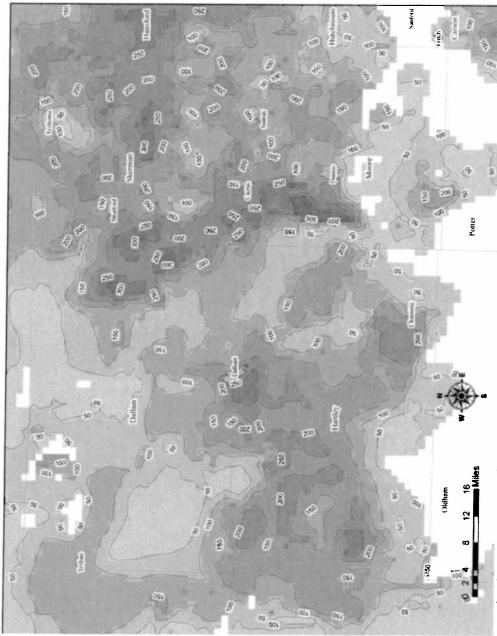


Figure 2: Baseline year showing saturated thickness on the western side of the northern portion of the Ogallala Aquifer. White cells are inactive and/or outside the boundary of the model.

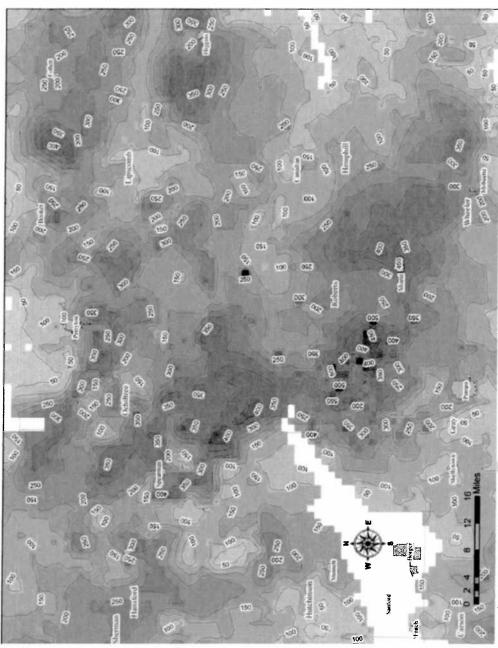


Figure 3: Baseline year showing saturated thickness on the eastern side of the northern portion of the Ogallala Aquifer. White cells are inactive and/or outside the boundary of the model.

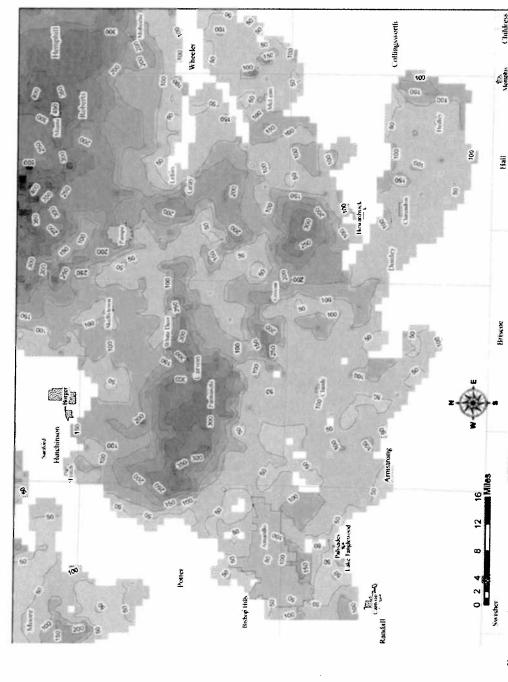


Figure 4: Baseline year showing saturated thickness on the south central side of the northern portion of the Ogallala Aquifer. White cells are inactive and/or outside the boundary of the model.

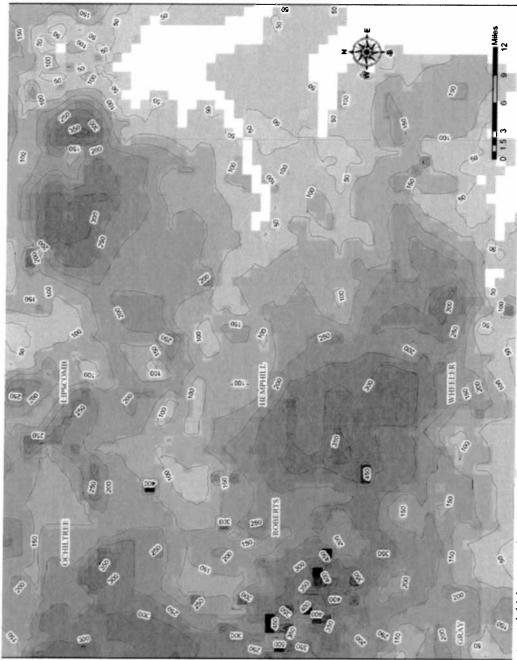


Figure 5: 2020 saturated thickness on the eastern side of the northern portion of the Ogallala Aquifer. White cells are inactive and/or outside the boundary of the model.

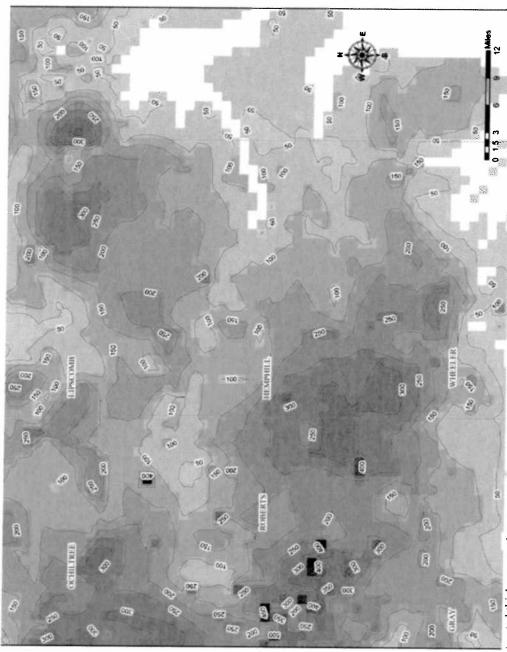


Figure 6: 2030 saturated thickness on the eastern side of the northern portion of the Ogallala Aquifer. White cells are inactive and/or outside the boundary of the model.

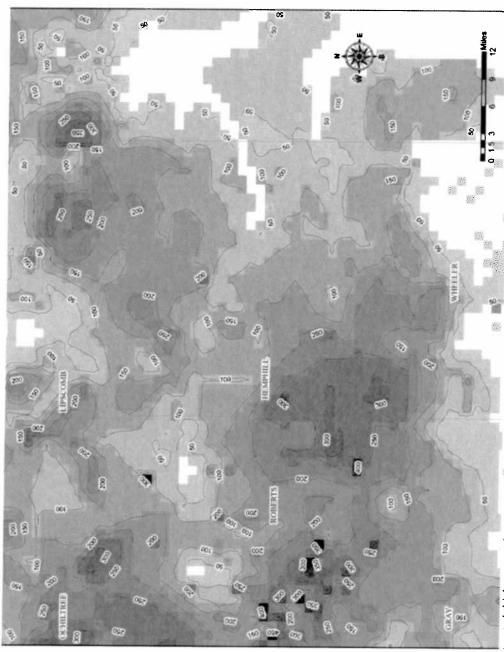
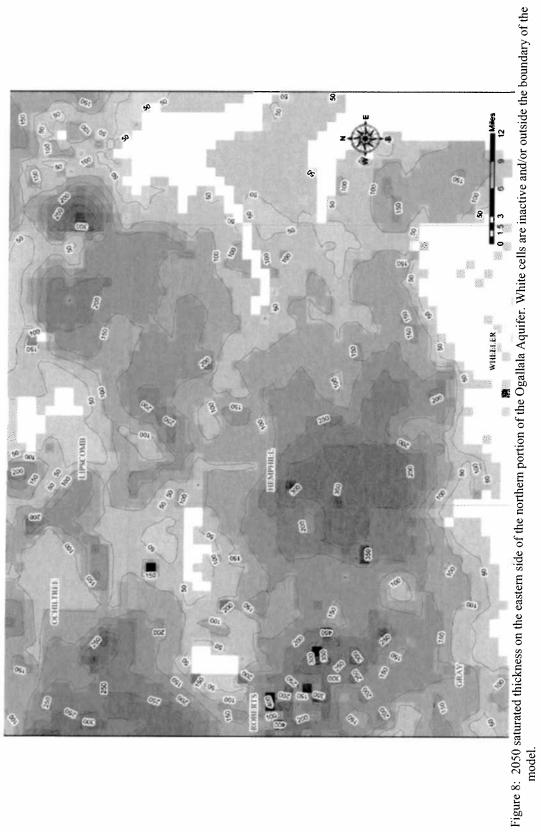


Figure 7: 2040 saturated thickness on the eastern side of the northern portion of the Ogallala Aquifer. White cells are inactive and/or outside the boundary of the model.



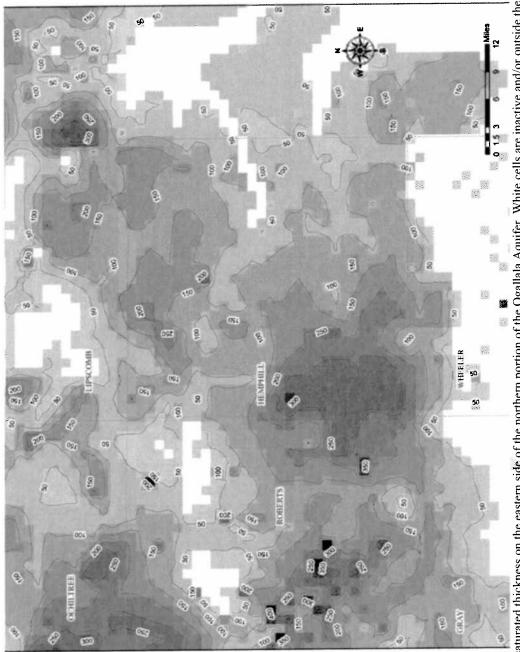


Figure 9: 2060 saturated thickness on the eastern side of the northern portion of the Ogallala Aquifer. White cells are inactive and/or outside the boundary of the model.