

ROSWELL BASIN GUIDELINES FOR REVIEW OF WATER RIGHT APPLICATIONS

**PREPARED BY THE OFFICE OF THE STATE ENGINEER
(FOR INTERNAL USE)**

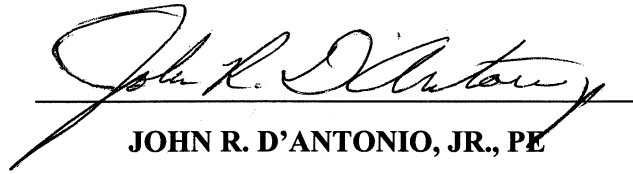


**Adopted February 9, 2005
JOHN R. D'ANTONIO, JR., PE
STATE ENGINEER**

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ADOPTED THIS NINTH DAY OF FEBRUARY, 2005

A handwritten signature in black ink, reading "John R. D'Antonio, Jr.", is written over a horizontal line. The signature is fluid and cursive.

**JOHN R. D'ANTONIO, JR., PE
STATE ENGINEER**

ROSWELL BASIN GUIDELINES

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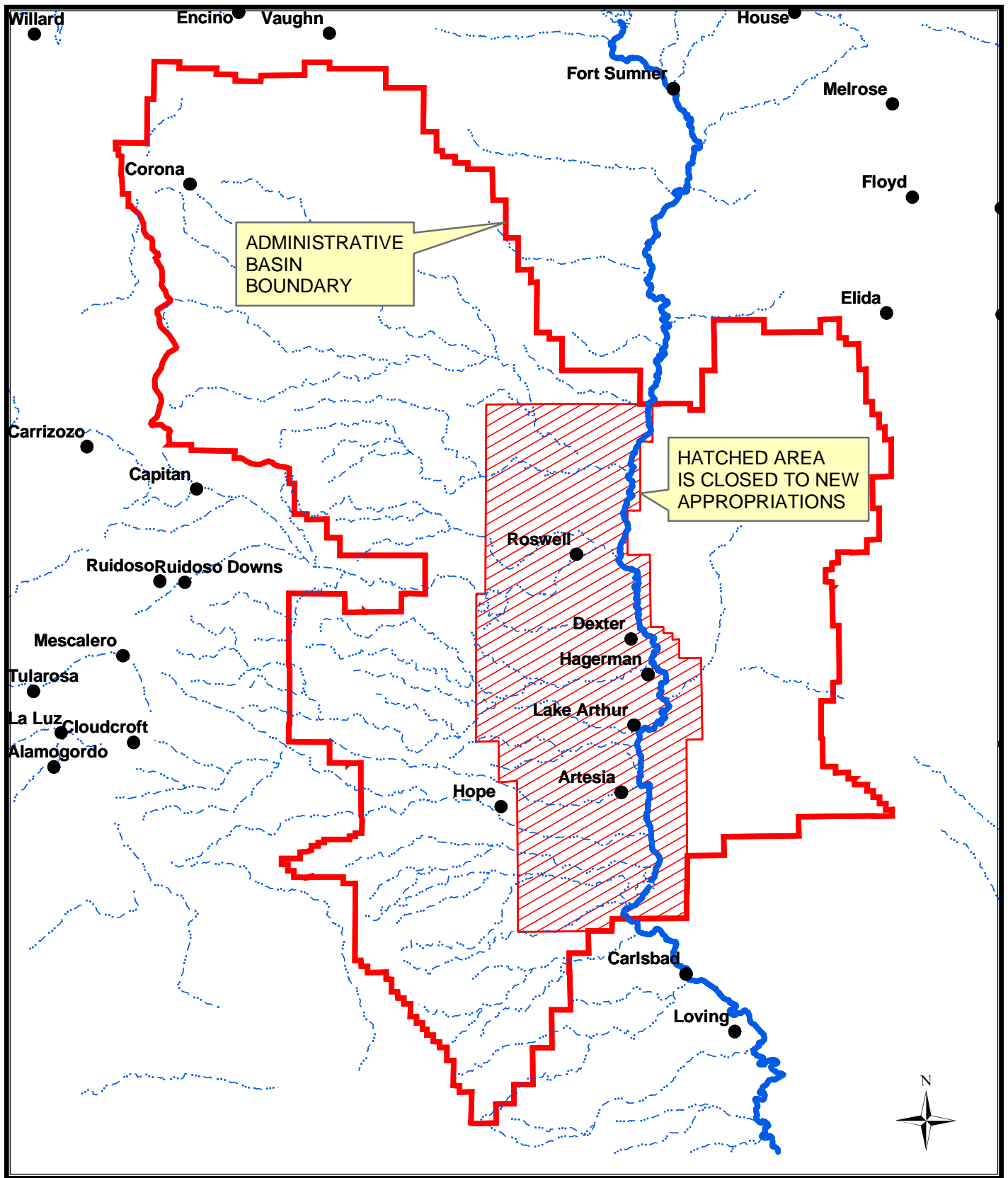
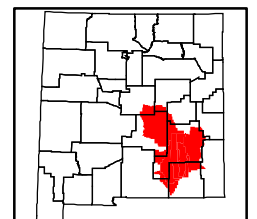


FIGURE 1
THE ROSWELL UNDERGROUND WATER BASIN



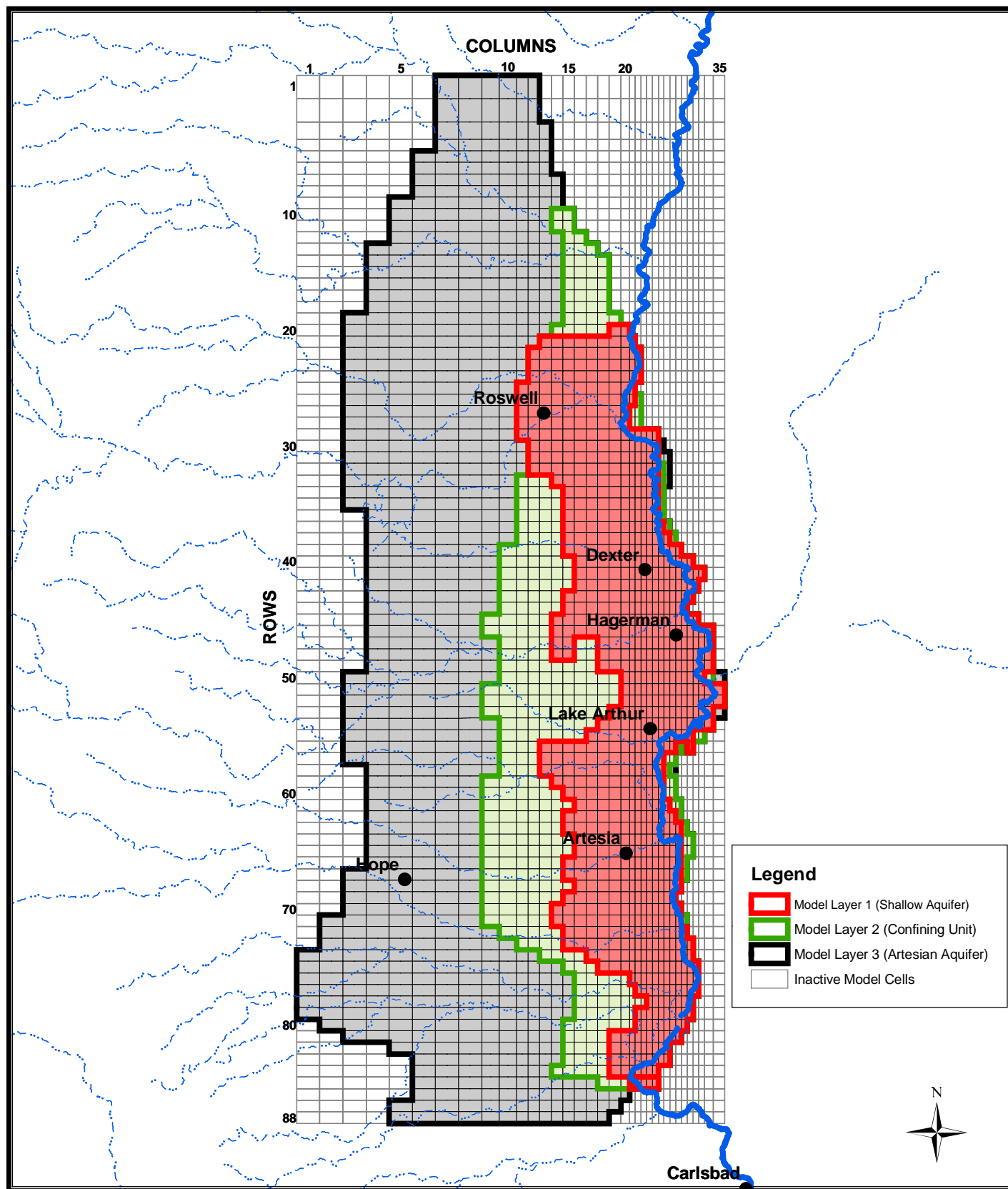
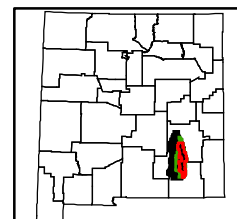


FIGURE 2
THE ROSWELL BASIN MODEL AREA



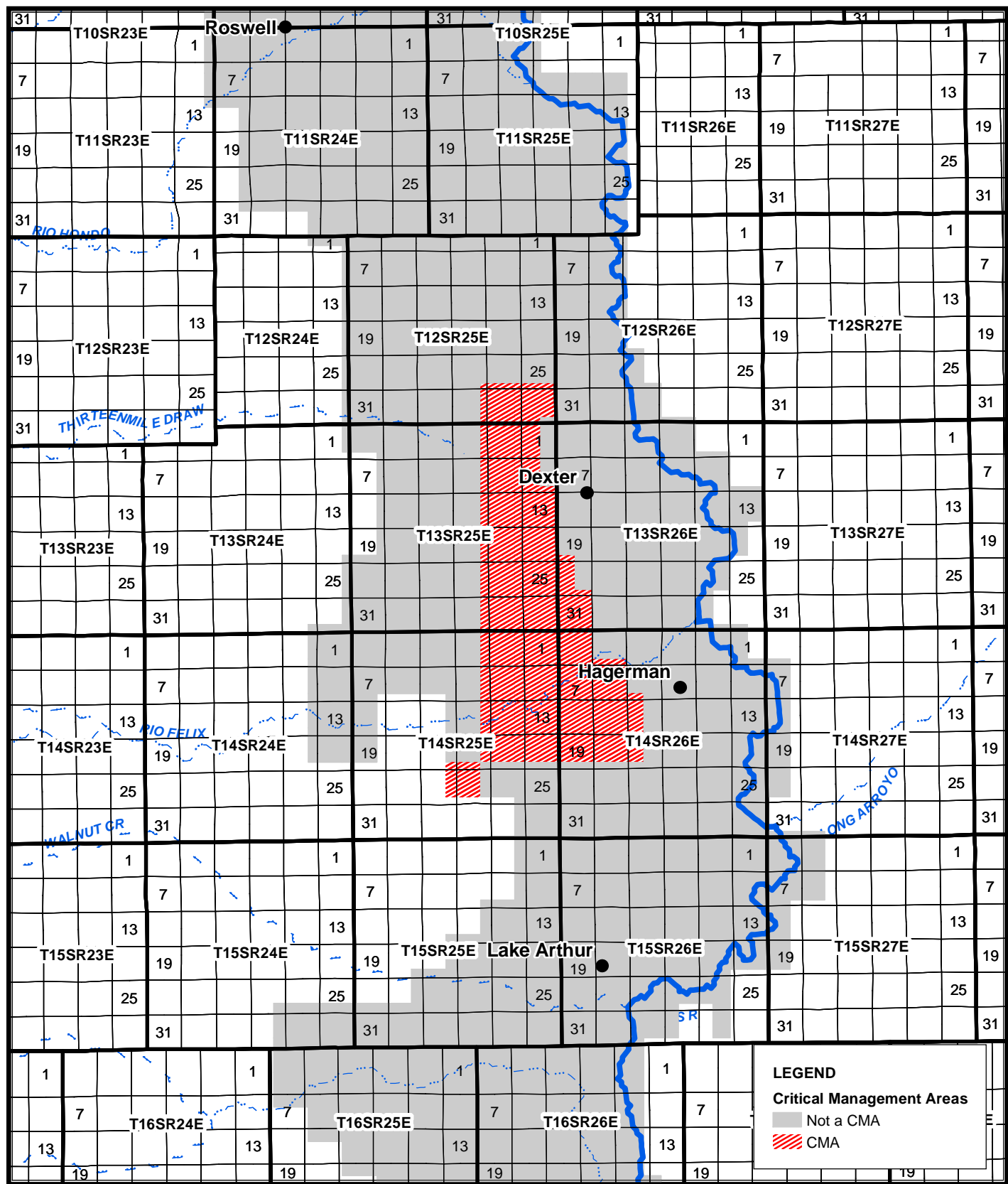


FIGURE 3
DESIGNATED CRITICAL MANAGEMENT AREAS
IN THE SHALLOW AQUIFER OF THE ROSWELL BASIN MODEL

ROSWELL UNDERGROUND WATER BASIN GUIDELINES FOR REVIEW OF WATER RIGHTS APPLICATIONS

I. INTRODUCTION

The purpose of this document is to provide guidelines to Office of the State Engineer (OSE) personnel on general procedures to follow for processing pending and future water rights applications filed within the Roswell Underground Water Basin (Roswell Basin). The basin policies for the Roswell Basin previously developed and applied by the OSE have been revised to incorporate new or refined administrative tools and procedures that better address current issues and to protect existing water rights while meeting statutory responsibilities.

The extent of the Roswell Basin is shown in Figure 1. The OSE has developed administrative guidelines in order to assure the orderly conjunctive management of the surface and underground water resources within the Roswell Basin, while meeting statutory obligations regarding non-impairment to existing water rights, availability of water for transfer, conservation of water within the state, and the public welfare of the state.

The main section of the Roswell Basin, composed of 750 square miles of land, was declared on August 21, 1931. Subsequent declarations have extended the Roswell Basin to 10,779 square miles. The Roswell Underground Water Basin covers portions of Chaves, Otero, Eddy, Lea, Roosevelt, De Baca, Lincoln, Guadalupe and Torrance Counties.

Under State Engineer Order Number 7, signed August 1, 1937, the Roswell Basin was "closed for an indefinite period of time to the filing of applications for the appropriation of underground water for additional acreage to that now granted under permits or applications pending approval in this office." The Roswell Basin has been declared under the following State Engineer Orders:

<u>Order Number</u>	<u>Date</u>	<u>Status</u>
2	8/21/1931	Closed under Order 7 dated 8/1/1937
4	2/4/1935	Closed under Order 7 dated 8/1/1937
9	2/13/1940	Closed under Order 15 dated 4/27/1946
10	1/6/1941	Closed under Order 15 dated 4/27/1946
13	10/1/1942	Closed under Order 15 dated 4/27/1946
16	8/21/1946	Closed under Order 17 dated 8/21/1946
21	1/12/1948	Declared and closed in same order
26	1/31/1950	Declared and closed in same order
42	9/1/1953	Open
45	5/10/1954	Declared and closed in same order
77	7/20/1959	Open
96	10/2/1964	Open
147	2/8/1993	Open
147-A	5/7/1993	Corrects Order 147

The Roswell Basin is shown in Figure 1.

For administrative purposes, the Roswell Basin has been separated into three primary sources of water: the Pecos River stream system, the shallow aquifer and the artesian aquifer/intake area. The three sources are considered interrelated, with groundwater diversions in the Roswell Basin impacting the surface flows of the Pecos River stream system. The surface water and underground water resources of the Roswell Basin are to be conjunctively managed to prevent impairment to existing water rights, to protect the public welfare of the state of New Mexico, to meet the administrative objectives of the Office of the State Engineer, and to promote conservation of water within the state of New Mexico.

The Pecos River and its tributaries are considered a fully appropriated stream system in the state of New Mexico. No new appropriation of surface water is currently allowed on this stream system. The administration of the Pecos River is governed in part by the Pecos River Compact that sets the amount of river water that must be delivered by New Mexico to Texas. The impacts to surface water from new groundwater diversions must also be offset.

The surface rights in the Roswell area were adjudicated in the Hope Decree, Cause 712 Equity, entered on May 8th, 1933. The surface and underground water rights of the Roswell area are being adjudicated in Chaves County Cause Number 20294 and 22600 Consolidated (State of New Mexico ex rel. State Engineer and Pecos Valley Artesian Conservancy District v. L.T. Lewis et al. and State of New Mexico ex rel. State Engineer and Pecos Valley Artesian District v. Hagerman Canal Company et al.). The Lewis Case, (State of New Mexico ex rel. State Engineer, and Pecos Valley Artesian Conservancy District v. L.T. Lewis et al., No 20294, Chaves County District Court, New Mexico, filed April 9, 1956) and the Hagerman case (State of New Mexico ex rel. State Engineer and Pecos Valley Artesian District v. Hagerman Canal Company et al., No 22600, Chaves County District Court, New Mexico, filed October 21, 1958), were consolidated on September 22, 1965.

Nothing in these guidelines shall limit the State Engineer's authority to take alternative or additional actions relating to the management of the water resources of the Roswell Basin as provided by New Mexico Statutes, orders of the court, or the Rules and Regulations of the Office of the State Engineer. These guidelines will be modified as needed to assist in the management and administration of the Roswell Basin. Removal of a guideline or a section of these guidelines, whether by the court or by the State Engineer, shall not affect the validity of the remaining guidelines.

While detailed guidelines are not presented in this document to describe all analyses that may potentially be required, analyses should be performed to ensure statutory requirements are met. These considerations may include impacts to surface water, impairment, water conservation, public welfare, water quality changes and the preservation and continuation of senior water rights.



II. WATER BUDGETING AND ACCOUNTING

A. Farm Delivery and Consumptive Irrigation Requirements: The farm delivery requirement (FDR) for the Roswell Basin is 3.0 acre-feet per acre per year. The historic average basin-wide consumptive irrigation requirement is 2.1 acre-feet per acre per year.

B. Carriage Loss: The District Court entered an amended Order on May 28, 1970, to allow irrigators using underground water a carriage loss of two acre-inches for each acre-foot diverted. The annual diversion of underground water for irrigation - including carriage loss - is therefore 3.5 acre-feet per acre (the annual crop irrigation requirement remains at 2.1 acre-feet per acre). Carriage loss is a diversion of groundwater permitted by the district court to account for losses that occur in the carriage of water from the well to the irrigated lands (including the storage of water in irrigation reservoirs). No water right is associated with the carriage loss allowance. Carriage loss is only allowed for irrigation purposes and then only when it has been authorized by the District Court. Carriage loss shall not be granted for diversion from a supplemental well if the primary right does not have any authorized carriage loss.

C. Five-Year Accounting Period: An Order entered on September 3, 1969, amended the Partial Final Decree in the Lewis Case. The Order required the groundwater under each sub-file in the consolidated cases to be administered on a five consecutive year accounting period. The first accounting period started on January 1, 1967, and ended on December 31, 1971. Under the five-year accounting period the diversion of underground water may exceed the duty in any given year or years, provided the diversion made during the five-year accounting period does not exceed five times the allowable annual diversion. The five-year accounting period has also been adjudicated under Lewis et al., entered April 4, 1988, to the Pecos River Pumpers and the Hagerman Irrigation

Company for supplemental underground water.

The District Court Order dated April 25, 1972, amending the Partial Final Judgment and Decree, required the accounting period to be based on the hydrologic year. The accounting period now begins on November 1st of the first year and ends five years later on October 31st. The 2001-2006 accounting period began on November 1, 2001 and ends on October 31, 2006.

D. Use of Water During Accounting Period: The Office of the State Engineer will administer all water rights on a one-year accounting period, unless the water right has been adjudicated by the District Court with a five-year accounting period. For water rights administered on a five-year accounting period, each water right owner may divert the water as permitted during the five-year accounting period provided the following requirements are met:

- (1) The total amount diverted during the five-year accounting period does not exceed five times the allowable annual diversion;
- (2) The diversion of water each year does not result in waste of water; and
- (3) The diversion of water each year is not contrary to the public welfare of the state and is not contrary to the conservation of water in the state.

E. Carry-Over Allowance: On September 3, 1969, that District Court authorized a carry-over allowance for irrigation under the five-year accounting period. The carry-over allowance is equal to that portion of water not diverted during the previous five-year accounting period. The maximum carry-over allowance shall not exceed two-thirds of the authorized annual duty. The carry-over allowance may only be used during the subsequent accounting period at the adjudicated or currently permitted place of use.

F. Overuse of Water - Penalty: For a water right administered on a five-year accounting period, the Watermaster shall assess the following penalties for all over-diversions made during an accounting period (see Lewis et al., entered August 28, 1975):

- (1) The water right owner shall pay back twice the over-diversion amount during the subsequent five-year accounting period. The pay back shall be made by reducing pumping during the subsequent accounting period or by a permit to transfer or retire a valid, existing water right acceptable to the OSE, and;
- (2) The water right owner fine is based on the following court established schedule:

FINE FACTOR	FINE
0-1	\$0
1-10	\$100
11-20	\$200
21-50	\$300
51-100	\$400
OVER 100	\$500

The fine factor is based on the following equation:

$$\begin{aligned}\text{Fine Factor} &= (\text{Excess diversion during accounting period})(\text{over-use factor})(100) \\ \text{Over-Use Factor} &= \frac{(\text{Excess diversion during accounting period})}{(\text{One-year adjudicated limit})}\end{aligned}$$

For a water right administered on an annual basis, the water right owner shall pay back twice the over-diversion amount during the following year. The pay back shall be made by reducing pumping during the following year or by acquiring a permit from the OSE to transfer or retire another valid, existing water right.

The Watermaster will issue a compliance order (see Section 72-2-18 NMSA) if a water right owner fails to pay back an over diversion in a reasonable period. The compliance order will state the specific nature of the violation as well as the required compliance, including the specified period of time for pay back and fines.

G. Watermaster of the Roswell Underground Water Basin: The Office of the Watermaster of the Roswell Underground Water Basin was created under the Lewis Case, Partial Final Decree, Paragraph 7. The Watermaster and his officers assist in the administration and enforcement of the judgment and decree. The first Roswell Underground Water Basin Watermaster was appointed on February 2, 1966.

H. Metering: Partial Final Judgment and Decree of December 1970, (paragraph 2, Page 6), State v. Lewis, Nos. 20294 and 22600 (Consolidated), entered December 23, 1970, states that adjudicated wells in the Roswell Basin must be metered. The metering requirement is restated in State Engineer Order Number 42. All wells permitted after the adoption of these guidelines will require meters. The metering requirement is typically waived on wells permitted under Section 72-12-1 NMSA used solely for domestic use serving one household or used solely for livestock purposes. The metering requirement may also be waived on monitoring wells or other wells where no diversion of water is being made.

The meter location, the manner of installation and the type of meter must be acceptable to the Roswell Basin Watermaster. The permit holder shall provide, in writing, the make, model, serial number, date of installation, initial reading, units and date(s) of recalibration for each meter and any replacement meter, used to measure the diversion of water. A well providing water to more than one purpose shall typically be required to have multiple meters to allow the water for each purpose of use to be separately measured.

III. APPLICATION REVIEW

A. Applications Reviewed on a Case-by-Case Basis: Pursuant to the adoption of these guidelines, the following types of applications will be reviewed on a case-by-case basis:

- Pending applications will be processed in accordance with these guidelines.
- Applications filed pursuant to Section 72-12-1 NMSA.
- Applications for exploratory or monitoring purposes.
- Applications to change point of diversion and/or place of use and/or purpose of use.
- Applications to combine and/or commingle water rights.
- Applications to replace, repair, deepen or supplement an existing well.
- Applications to appropriate groundwater within areas of the Roswell Basin that are open to new appropriation.

B. Applications Denied: Pursuant to the adoption of these guidelines, the following types of applications will be denied:

- Applications to appropriate groundwater within areas of the Roswell Basin that have been closed to new appropriation, except applications filed pursuant to Section 72-12-1 NMSA.
- Applications to appropriate surface water.
- Applications proposing to increase diversions from a Critical Management Area, except applications filed pursuant to Section 72-12-1 NMSA.

The OSE will deny any application if it is found that the granting of the application would be contrary to state statute or the rules and regulations of the OSE.

C. New Appropriation of Underground Water: An application for new appropriation of underground water will not be accepted in closed areas of the Roswell Basin. An application filed to make a new appropriation from an open area of the Roswell Basin will be reviewed and - if approved - conditioned to require that any new effects to the Pecos River from granting the application be fully offset.

D. Change Point of Diversion and/or Place of Use and/or Purpose of Use within the Closed Basin: For applications to change point of diversion, the permitted amount may be limited by the requirements of balancing effects to the Pecos River, the shallow aquifer and the artesian aquifer/intake area. Additionally, for applications to transfer rights from irrigation use to a different purpose of use, only the consumptive irrigation requirement will be considered available for transfer.

E. Temporary Transfer: Temporary transfers may be issued for a period of time not to exceed ten years (unless a different time period is authorized under state law - like for a 40-year planning entity). For water rights administered under the five-year accounting period, the end of a temporary permit will generally be issued to coincide with the ending of a five-year accounting period. A temporary permit shall expire as set forth in the conditions of approval. After a temporary permit expires, all rights shall revert to the original place and purpose of use. An applicant may reapply for a temporary transfer if the situation requires a transfer for a period of time in excess of

the authorized times listed above. The temporary transfer of an irrigation water right will require the retirement of the previously irrigated land to which the transferred right was appurtenant. The hydrologic effects of a temporary transfer shall be evaluated in a manner to reflect the actual diversion of water applied for.

F. Permit for a Transfer to Dairy Use: The use of water at a dairy for a purpose of use other than irrigation is generally considered as 100% consumptive use. Water used for irrigation purposes at the dairy may be granted a duty of 3.0 acre-feet per year and may also be granted the associated carriage loss, if authorized. The permit holder must measure all direct diversion and dairy effluent waters that are used for irrigation purposes. The effluent used for irrigation purposes shall be measured when it is placed to beneficial use on the lands, not when effluent water leaves the dairy. The diversion charged to a dairy is typically calculated as follows:

$$\text{Diversion} = \text{Direct diversion for irrigation} + (1.43)(\text{diversion to dairy}) - (0.43)(\text{dairy wastewater used for irrigation})$$

G. Replacement Well - Change Point of Diversion: A well may be replaced in the Roswell Basin, provided the applicant provides reasonable justification for the request as part of the application. To determine the effects to the three sources from pumping the proposed replacement well, the SKL Model will be used to calculate the effects from pumping the full requested diversion from the replacement well. Pumping restrictions will be imposed on a replacement well, when necessary, to ensure no additional effects will occur to the Pecos River and— for the closed area of the basin – to the shallow aquifer and the artesian aquifer/intake area. Pumping restrictions will be imposed, when necessary, to protect valid, existing water rights from impairment as a result of drawdowns or water quality degradation created by use of the replacement well. This requirement does not apply to wells authorized under Section 72-12-1 NMSA.

H. Supplemental Well: For an application to supplement an existing water right, the quantity of water that has been adjudicated, subsequently permitted or historically applied to beneficial use, whichever is less, will be taken as the maximum amount of water that may be supplemented. When applying for a supplemental well, the applicant shall place a maximum pumping limit on the well at the time the application is filed. If the applicant does not list a pumping limit for the supplemental well, the OSE will assume that the full diversion is being requested from the supplemental well. If the supplemental well causes the pumping center of the well field to shift or if it appears that additional effects may result, then the effects to the three sources will be determined using the SKL Model. Pumping restrictions will be imposed on a supplemental well, when necessary, to ensure no additional effects will occur to the Pecos River and – for the closed area of the basin – to the shallow aquifer and the artesian aquifer/intake area. Pumping restrictions will also be imposed, when necessary, to protect valid, existing water rights from impairment as a result of drawdowns or water quality degradation created by use of the supplemental well.

- (1) **Supplemental Well to Hagerman Irrigation Company:** Irrigators using water supplied by the Hagerman Irrigation Company may only drill and use a supplemental well if the Hagerman Irrigation Company fails to furnish water in the amount of three acre-feet per acre per year at the farm headgate. Any

supplemental right, when combined with the waters tendered or furnished by the Irrigation Company, shall be limited to a duty of water of three acre-feet per acre per year. The Hagerman Irrigation Company shall be a co-applicant for the supplemental well.

I. Commingling Water Rights: Commingling water rights allow the water user to combine the places of use while not changing the diversion limits from each authorized point of diversion. Water rights are typically commingled to allow blending and mixing of water or to provide more efficient irrigation practices. When an application requesting to commingle water rights is approved, the diversion from each point of diversion shall be limited to the currently authorized amount. Each applicant shall justify their request to commingle water rights.

J. Combining Water Rights with Different Points of Diversion: An application filed to combine water rights will be analyzed as being the equivalent of the filing of multiple applications to change point of diversion, place and/or purpose of use. For example, if a farmer desires to combine three distinct water rights from separate points of diversion, the farmer is actually requesting to make the following change in point of diversion, place of use, and purpose of use:

- Water Right A into Water Right B
- Water Right A into Water Right C
- Water Right B into Water Right A
- Water Right B into Water Right C
- Water Right C into Water Right A
- Water Right C into Water Right B

An application filed to combine water rights shall list the benefits derived from combining the rights. When requesting to combine water rights, the applicant shall place a maximum pumping limit on each point of diversion. If the applicant does not set a pumping limit for each point of diversion, the maximum combined diversion will be modeled from each point of diversion. A separate filing fee will be required for each request to change point of diversion, place and/or purpose of use. In the example above, a combination of three water rights requires the review of six applications to change point of diversion, place and/or purpose of use.

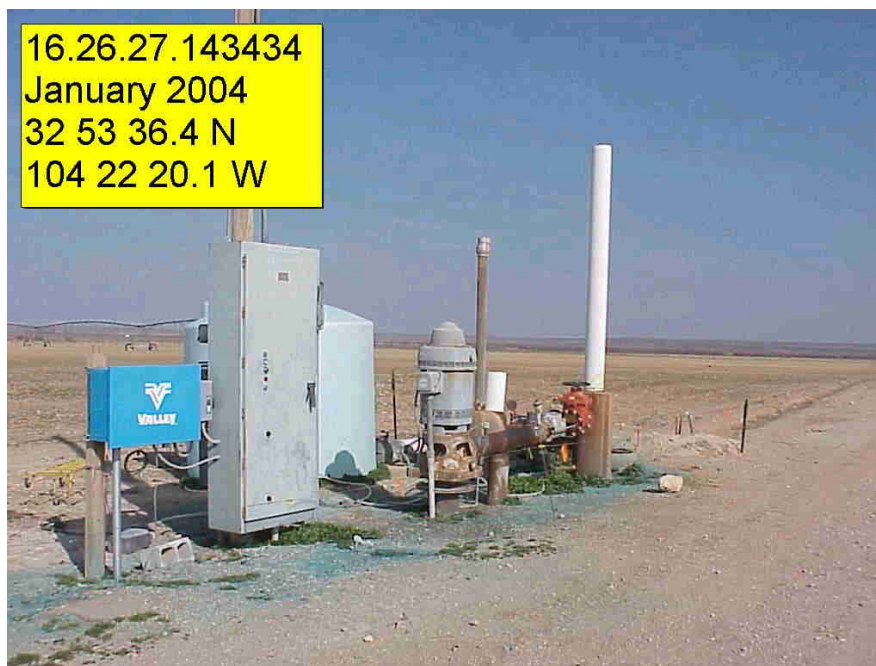
The net effects will be determined for each of the three sources. Pumping restrictions will be imposed on any or all of the combined points of diversion when necessary to ensure no new net effects will occur to the Pecos River and – for the closed area of the basin – the shallow aquifer and the artesian aquifer/intake area. Pumping restrictions may also be applied to protect valid, existing water rights from impairment as a result of drawdowns or water quality degradation.

K. Stacked Irrigation Rights: An application for stacking irrigation water rights will be considered in the Roswell Basin provided a valid reason is given for stacking the rights, that the stacking does not constitute a waste of water, and that the stacking is not contrary to the conservation of water within the state or detrimental to the public welfare. When irrigation water rights are stacked, the OSE may establish a new duty for the irrigated lands based on the existing duty and the stacked water. Once a stacked water right is permitted, the stacked portion of the right will become appurtenant to the land upon which it has been stacked. For example, if 100 acre-feet

per year of water right are requested to be stacked on 100 acres of land with an existing duty of 3.0 acre-feet per year, the OSE may permit the stacking of water rights at the move-to lands with a duty of 4.0 acre-feet per year. Once a water right is stacked upon a property, the stacked right shall only be separated from the original right if the water right owner applies to sever the stacked right from the land and provides justification as to why the move-from lands no longer require the additional water provided for by the stacked right. A water right may be stacked for a temporary period of time (a common practice at the end of a five year accounting period to prevent or offset an over diversion).

L. Enlarging the Place of Use of an Irrigation Water Right: Enlarging the place of use of an irrigation water right, commonly referred to as “spread irrigation”, is permitted in the Roswell Basin. Granting of a water right spread application is based on the following requirements:

1. The crop irrigation requirement, generally 2.1 acre-feet per acre before enlargement, shall be the permitted diversion for spread irrigation;
2. No return flow from spread irrigation is allowed (water use is considered to be 100% consumptive use);
3. Carriage loss will not be permitted.



IV. CALCULATING, BALANCING, AND OFFSETTING EFFECTS

A. SKL Model: The Stephens Keyes Larson Model (SKL Model) will be used to evaluate the effects from the majority of proposed transfers and changes in the Roswell Basin. Figure 2 is a map of the model area. An application for a well located outside of the area covered under the SKL Model will be considered on a case-by-case basis. Standard models to be used for areas not covered under the SKL include the Akin Rao Groundwater Model, the Theis Equation Model and the Glover-Balmer Model (for additional info on these models see appendix A).

For all applications, diversion rates will be used in the model to make calculations. For calculation purposes, the state engineer will consider diversion to be fully consumed. There will be times when the effects calculated by the model need to be adjusted to take into account what is actually occurring.

The OSE will evaluate local effects of pumping the proposed diversion in the Roswell Basin upon nearby wells on a case-by-case basis. Local effects to be reviewed include potential changes in water quality and water level declines. Local effects may be determined using the SKL Model or the Theis Equation Model. Due to the unique issues that may be associated with a water right application, other case-by-case evaluations or considerations may be required.

If the SKL Model is found to be inappropriate to characterize the site-specific conditions for an application, an alternate method should be used for analysis.

B. Calculating Hydrologic Effects: In order to determine the effects of pumping a well on the Pecos River, the shallow aquifer and the artesian aquifer/intake area, the SKL Model will be used. Net effects of a transfer can be determined with the SKL Model by finding the difference in effects on the sources from pumping at the move-from point(s) of diversion and at the move-to point(s) of diversion. An application for a well located outside of the area covered under the SKL Model will be considered on a case-by-case basis.

For applications to change point of diversion, the historic pumping at the move-from point of diversion shall be defined as the quantity of water that has been adjudicated, subsequently permitted or historically applied to beneficial use, whichever is less. For calculation purposes, the move-to well will be pumped at the maximum requested diversion.

C. Balancing Effects to the Pecos River: Results from the SKL Model will be analyzed for the Pecos River to determine the net effects the proposed transfer or change would have to the Pecos stream system. The net effects to the Pecos River for each year must always be equal to or less than zero. The permitted diversion at the move-to well will be reduced, when necessary, to meet this condition.

When necessary, a diversion schedule will be established for each of the first five five-year accounting periods during which a permit is valid. The diversion schedule will be calculated using the SKL Model. The diversion amount for the fifth accounting period will allow for no new effects to the Pecos River in any given year during or after the fifth accounting period. The final diversion amount shall become the permanent authorized diversion under the permit.

D. Balancing Effects to the Shallow Aquifer and the Artesian Aquifer/Intake Area for the Closed Basin: Results from the SKL Model will be analyzed for both the shallow aquifer

and the artesian aquifer/intake area to determine the net effects the proposed transfer or change would have to each underground source. At fifty years after the transfer, the net effects to the shallow and artesian aquifer/intake areas must be equal to or less than zero. The permitted diversion at the move-to well will be reduced, when necessary, to meet this condition. The permitted diversion at the move-to well will generally not be reduced when the net effect to the shallow or artesian aquifer/intake is considered de minimis.

By balancing effects at year 50, the Office of the State Engineer protects the fully appropriated groundwater of the Roswell Basin without severely restricting water rights transfers in the Roswell Basin.

E. Offsetting an Impact to a Source of Water: To ensure the effects to the Pecos River, the shallow aquifer, and the artesian aquifer/intake area are not increased, a permit holder may choose to offset a new effect to a source by retiring a valid, existing water right - acceptable to the Office of the State Engineer - to replace water in the source(s) depleted as a result of the proposed transfer or change. The permit holder shall make any required offset before the withdrawal of underground water commences under a permit.

An application filed to offset an effect to one or more of the sources of water in the Roswell Basin will be treated like an application to transfer a water right. The SKL Model will be run to estimate the accretions to the Pecos River, the shallow aquifer and the artesian aquifer/intake area that will occur as a result of the retirement of that water right.

F. Local Impacts: Applications (other than those authorized under Section 72-12-1 NMSA) shall be evaluated in detail to assess impacts to nearby wells of other ownership. Local impact assessments will evaluate declines at least 40 years from the year of OSE evaluation and will be performed on a case-by-case basis taking into consideration available water columns and principle water bearing formations in wells, impacts from existing and proposed uses, the ability to deepen wells to sustain a freshwater supply, priority of water rights of nearby wells, and other site-specific information. Calculations may be performed using the SKL Model or the Theis equation. The method resulting in the greater impact will govern unless site-specific information indicates that a particular method is more reasonable (if the results vary significantly, then additional review may be necessary). Aquifer parameters used to calculate drawdowns on nearby wells may be obtained from approved groundwater flow models or from reasonable site-specific information.



V. WATER QUALITY

A. General: Ground water quality assessments, including groundwater capture and migration patterns, shall be performed when necessary. The evaluation technique to assess potential water quality degradation will be selected on a case-by-case basis. OSE personnel may seek consultation with the New Mexico Environment Department (NMED) on water quality assessments.

Beneficial and negative impacts associated with applications proposing to divert non-potable water will be taken into consideration in assessing the application. A permit may be conditioned to comply with water quality requirements imposed by governmental entities.

B. Chloride Concentration Ratio: To limit transfers out of poor water quality regions into zones of better water quality, the state engineer may utilize the chloride concentration ratio method. The chloride concentration ratio may be calculated by the State Engineer when all of the following three conditions exist:

1. The move-from well is located in a high transmissivity zone of the artesian aquifer ($T \geq 120,000$ gallons/day/ft).

2. The chloride concentration at the move-from location is 500 mg/L or greater. Chloride concentrations are based on field measurement, if available, or the Chloride Concentration Map (part of the USGS report referenced below).
3. The water at the move-to well has a lower chloride concentration than the water at the move-from well.

The permitted diversion at the move-to well may be calculated using the chloride concentration ratio as follows:

$$\text{Permitted Diversion (move-to)} = \frac{(\text{Amount diverted, move-from})(\text{Conc. of Cl, move-to})}{(\text{Conc. of Cl, move-from})}$$

The permitted diversion may be less than the requested diversion when conditions require the use of the chloride concentration ratio. The chloride concentration ratio is based on information from the USGS Open File Report of December 1962 titled, *Possibilities of Retarding Saline-Water Encroachment in the Roswell Basin by Retirement of Water Rights*.

The State Engineer may allow waivers when proposed applications do not significantly change the rate of chloride encroachment.

VI. CRITICAL MANAGEMENT AREA

A Critical Management Area (CMA) is an area that deserves special protection because the water resources may be inadequate for sustained well production. CMAs are protected by preventing additional appropriations in the critical areas. A CMA will generally include any area of a ground water source that has a life expectancy of less than 40 years based on an allowable rate of decline of water level (critical rate of drawdown). See Appendix B for more information on CMAs.

For an area with a life expectancy of less than 40 years, moves in the shallow aquifer shall be governed by the following criteria:

- There shall be no transfer of water rights from outside of a CMA to inside of a CMA.
- A water right may be transferred out of a CMA, but the life expectancy of the water right shall be established and the transferred water right will expire when the water at the move-from lands would have been exhausted.
- The best available data for the thickness of the shallow aquifer shall be used.
- Water level declines shall be calculated using the best available data.
- Wells located in areas adjacent to a CMA (the non-CMA) may create additional water level declines in the CMA. The impact on any model cell in the CMA from a new diversion made outside of the CMA shall not exceed 0.05 foot/year.
- An artesian water right may be transferred into a critical management area as long as the effects to the shallow aquifer do not exceed a drawdown of 0.05 foot/year.

The CMA boundaries presently defined by the OSE for the Roswell Basin are shown in

Figure 3. The OSE has the sole responsibility of determining the boundaries of the CMA and may modify these boundaries, if observed or predicted water level declines are viewed as excessive or as otherwise deemed necessary by the OSE.

The only applications accepted in a CMA are applications to replace, repair, deepen or supplement an original well or for wells authorized under Section 72-12-1 NMSA. An application to transfer a water right may also be considered when the move-from and move-to points of diversion are all located within a CMA.

VII. ADDITIONAL GUIDELINES

A. Reasonable Quantity of Water - Well Production Capacity: Applications will be reviewed to determine whether the quantity of groundwater requested can be reasonably produced from the proposed well. Each proposed well shall be reviewed to ensure the well can sustain the quantity of water sought for 40 years from the date of OSE review, unless a shorter length of time has been requested in the application. A determination of the long-term availability of water from a particular well will be based on the transmissivity and storativity of the aquifer at that location, the casing diameter of the well, the water column in the well, and the estimated future water level declines from the exercise of existing water rights.

B. Monitoring: A permit may be conditioned to require monitoring, including the installation of monitoring wells, as deemed necessary by the OSE.

C. Conservancy District: Any transfer into, within, or out of a conservancy district, including for the purposes of water conservation, banking, or storage, shall be applied for with the State Engineer, unless such transfer is specifically exempted from OSE jurisdiction under state law.

D. Use of the Pecos River to Transport Water: When the Pecos River is used to transport water, the non-native water being carried in the river will be subject to a reduction to account for the prorated share of all evaporative, channel, and infiltration losses incurred.

E. Notice of Publication: The notice of publication shall be published pursuant to Section 72-12-3 or Section 72-5-4 NMSA. In the Roswell Basin, the following papers are considered of general circulation for the counties listed:

Chaves County:	Roswell Daily Record
Otero County:	Alamogordo Daily News
Eddy County:	Carlsbad Current-Argus
De Baca County:	De Baca County News
Lincoln County:	The Ruidoso News
Guadalupe County:	Guadalupe County Communicator
Torrance County:	Albuquerque Journal

F. Augmentation Pumping: When water from a well is pumped into the Pecos River

for the sole purpose of augmenting the surface water flow in the river, the effects to the Pecos River calculated using the SKL Model will be adjusted to account for the water being discharged into the Pecos River.



Appendix A – Stephens Keyes Larson Model

The Stephens Keyes Larson Numerical Groundwater Flow Model (SKL Model) was developed by D.B. Stephens and Associates and modified by the Hydrology Bureau of the Office of the State Engineer and S.S. Papadopoulos & Associates. The SKL Model will continue to be updated as needed. The SKL Model is used to calculate the effects on the Pecos River, the shallow aquifer and the artesian aquifer/intake area from pumping groundwater in the Roswell Basin. The SKL Model may also be used to calculate drawdowns at nearby wells. Figure 2 is a map of the model area.

The SKL model is based on a grid pattern where each block or model cell is assigned a set of aquifer parameters. The smallest cell size is 0.5 mile by 1.0 mile, and the largest model grid size is 2.0 miles by 2.0 miles on each side. Three model layers are used to represent the geologic formations vertically. The shallow alluvial aquifer is represented by model layer 1 and the artesian aquifer is represented by model layer 3. Model layer 2 represents the confining beds of the basin between the shallow and artesian aquifers. The areal extents of the shallow and artesian aquifers in the model are shown in figure 2.

An application for a well located outside of the area covered under the SKL Model will be considered on a case-by-case basis. Standard models to be used for areas not covered under the SKL include the Akin-Rao Groundwater Model, the Theis Equation Model, and the Glover-Balmer Model.

- (1) The Akin-Rao Groundwater Model is an analytical groundwater flow model. This model was initially developed in the early 1960s prior to the advent of modern computers. This model requires simplification of the Roswell Basin groundwater flow system into a two-dimensional system and does not calculate drawdowns.
- (2) The Theis Equation Model (or the Theis Equation) is generally used in conjunction with the Akin-Rao Groundwater Model or Glover-Balmer Equation Model to calculate drawdowns. The Theis Equation Model assumes a homogeneous and infinite aquifer. It does not consider spatial variations in aquifer parameters.
- (3) The Glover-Balmer Model is used to compute stream depletions due to pumping a well. This model assumes a fully-penetrating river and does not consider spatial variations in aquifer parameters.

Appendix B - Critical Management Area

Critical Management Areas (CMA) were designated in the Roswell Basin by using the digital model of the basin (S.S. Papadopoulos & Associates, 2004) and projecting fully permitted pumping (using water rights on file as of February 23, 2004). The permitted pumping file was constructed from a water right summary spreadsheet compiled by Balleau Groundwater, Inc. The fully permitted projection was run for 40 years. Irrigation return flow was simulated as 33% of irrigation diversion.

No return was prescribed for other uses. These are the same rates of return used in the calibration of the model. The projection is seasonal. The total pumping in the projection period is 500,000 acre-feet per year and the return flow is 155,000 acre-feet per year. The total pumping in the projection period is greater than what has historically been pumped in the basin. The 40-year fully permitted pumping projection shows drawdown in most parts of the model area. This differs from observations for the last twenty years, where many areas of the basin have shown an increase or very little change in water levels. The projection conservatively estimates drawdown if all water rights in the basin were to be pumped.

The critical rate of drawdown for determining the CMA was set at 1.5 feet per year. This was determined as follows: Average water columns in wells for the basin were obtained from the WATERS database on February 23, 2004. The average water column for a domestic well in the area of the model grid is 84 feet. The area of the model grid is shown in Figure 2. A critical average annual rate of drawdown in the Roswell Basin of *1.5 feet/year* over a 40-year projection period would reserve a column of 20 feet in the average domestic well water column and constrain drawdown of the average water column to less than 70% of the initial column.

Figure 3 shows the designated critical management areas of the shallow aquifer of the Roswell Basin model. For a 40-year projection with all permitted pumping, areas with an average rate of drawdown of 1.5 feet/year are flagged. The 10-mile long area is to the west of the Towns of Dexter and Hagerman. It has a heavy concentration of pumping. The *Hagerman depression*, west of the Town of Hagerman, is an area where supply for wells have historically been problematic. This area has also been defined as critical in the basin. Cells were added to the CMA to fully enclose the Hagerman Depression. If a *model cell went dry* during the 40-year projection it was defined as a critical cell. An edge cell in the shallow aquifer that goes dry in the projection was also added.

There is no designated CMA in the deep carbonate aquifer. The average rate of drawdown in any area of the carbonate aquifer over the 40-year projection period does not exceed 1.0 ft/yr.