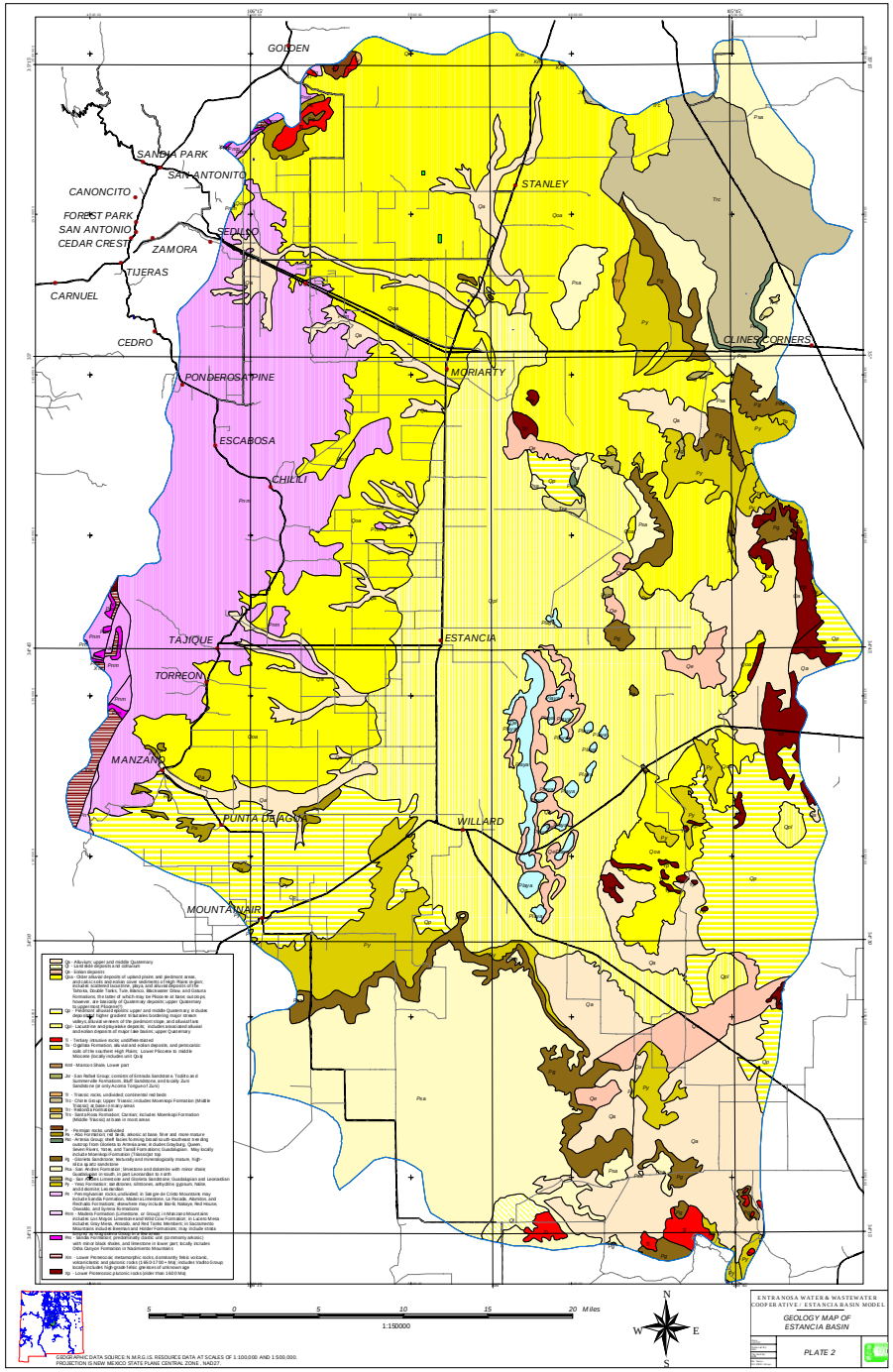
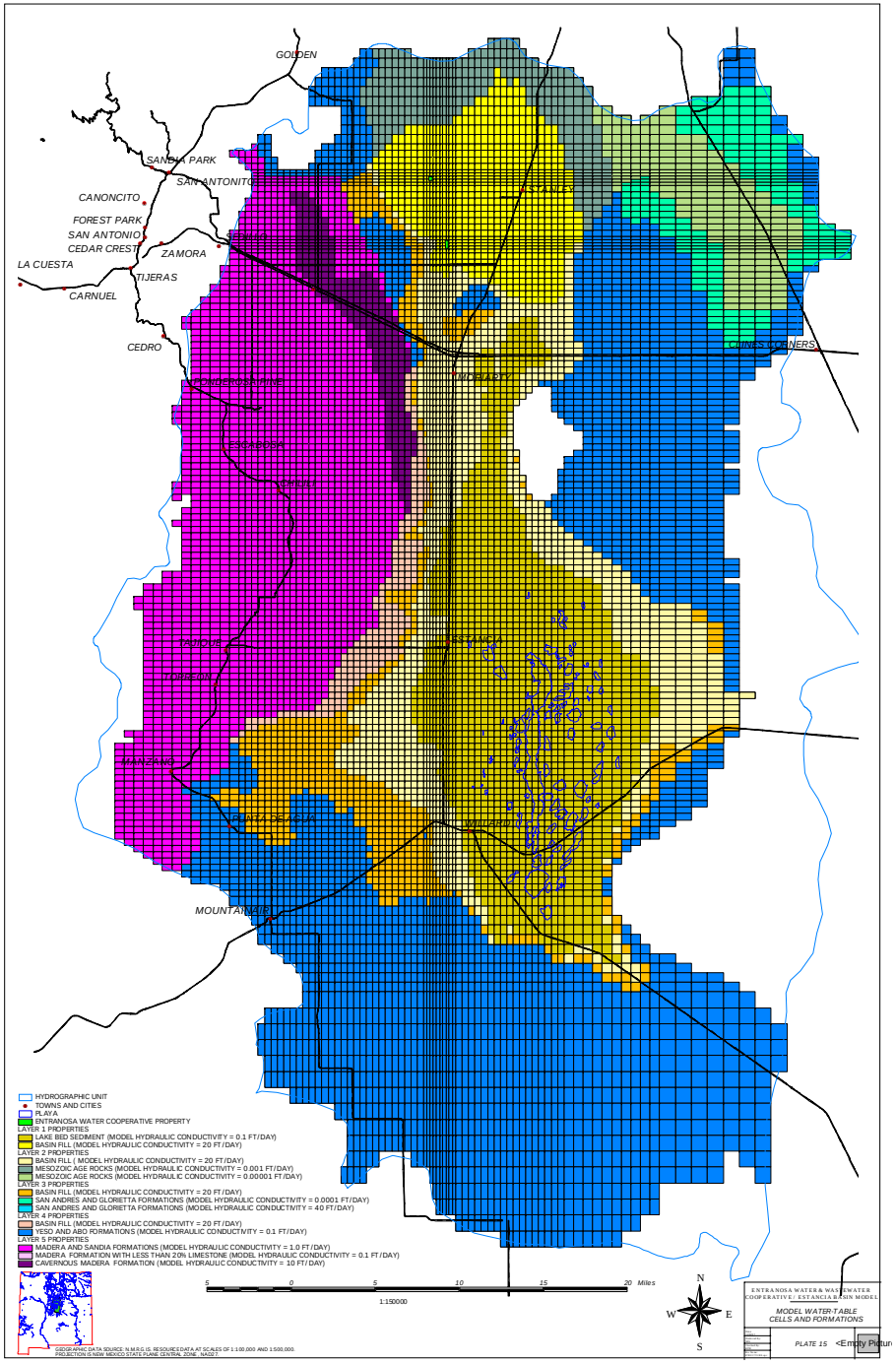
WATER FORUM

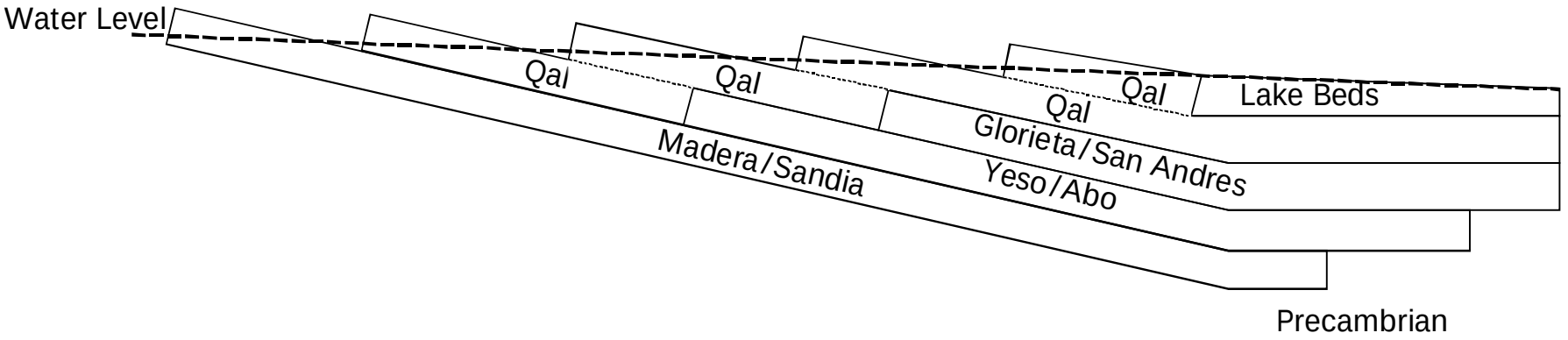
APRIL 5, 2003

THE ESTANCIA BASIN WATER MODEL AND WHAT IT CAN DO

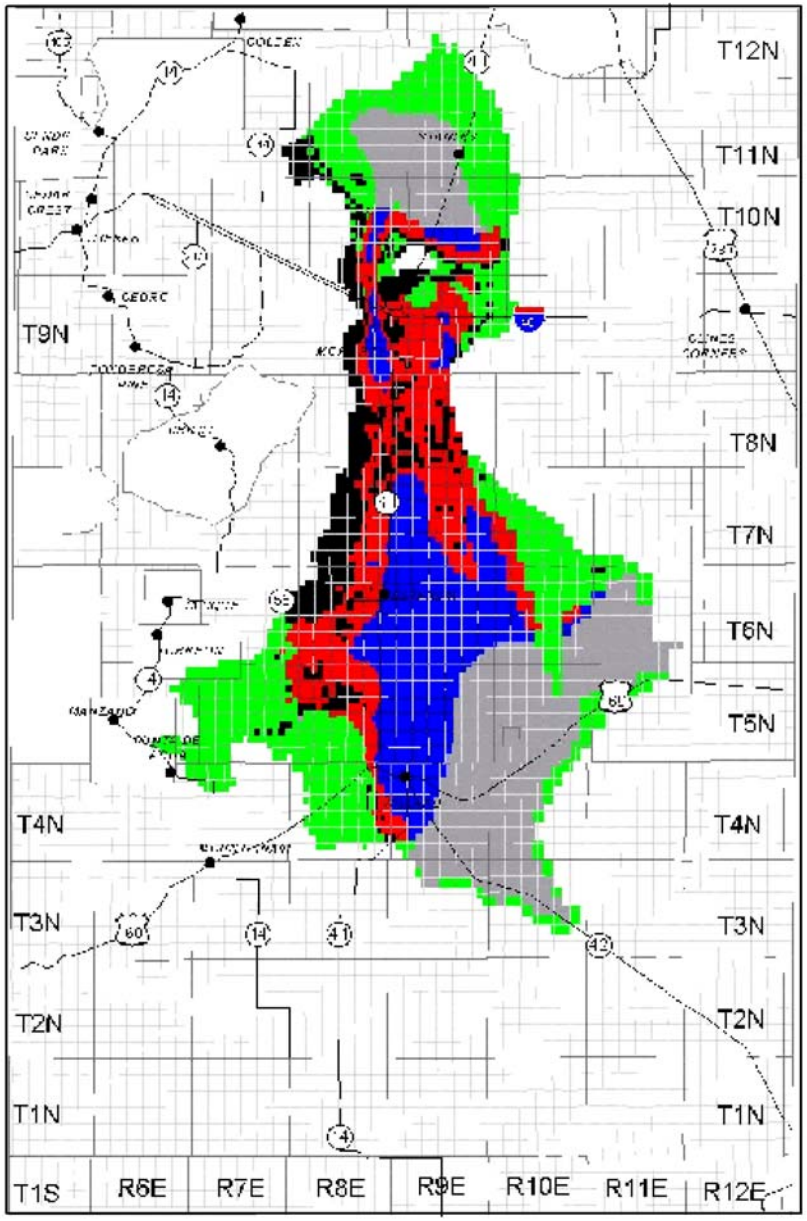
W. PETER BALLEAU


GOLDEN
SANDIA PARK
SAN ANTONITO
CANONCITO
FOREST PARK
SAN ANTONIO
CEDAR CREST
ZAMORA
SEDILLO
TIJERAS
CARNUEL
CEDRO
STANLEY
CLINES CORNERS
MORIARTY
PONDEROSA PINE
ESCABOSA
CHILILI
TAJIQUE
ESTANCIA
TORREON
MANZANO
PUNTA DE AGUA
WILLARD
MOUNTAINAIR
5 0 5 10 15 20 Miles
1:150000
N
W
E
S
ENTRANOSA WATER & WASTEWATER COOPERATIVE / ESTANCIA BASIN MODEL
GEOLOGY MAP OF ESTANCIA BASIN
PLATE 2
GEOGRAPHIC DATA SOURCE N.M.B.G.IS. RESOURCE DATA AT SCALES OF 1:100,000 AND 1:500,000.
PROJECTION IS NEW MEXICO STATE PLANE CENTRAL ZONE, NAD27.


GOLDEN
SANDIA PARK
SAN ANTONITO
CANONCITO
FOREST PARK
SAN ANTONIO
CEDAR CREST
ZAMORA
LA CUESTA
TIJERAS
CARNUEL
CEDRO
TORRANCE
ESTANCIA
TORREON
MANZANO
PLAZA DE LUNA
MOUNTAINAIR
HYDROGRAPHIC UNIT
TOWNS AND CITIES
PLAYA
ENTRANOSA WATER COOPERATIVE PROPERTY
LAYER 1 PROPERTIES
LAKE BED SEDIMENT (MODEL HYDRAULIC CONDUCTIVITY = 0.1 FT/DAY)
BASIN FILL (MODEL HYDRAULIC CONDUCTIVITY = 20 FT/DAY)
LAYER 2 PROPERTIES
BASIN FILL (MODEL HYDRAULIC CONDUCTIVITY = 20 FT/DAY)
MESOZOIC AGE ROCKS (MODEL HYDRAULIC CONDUCTIVITY = 0.001 FT/DAY)
MESOZOIC AGE ROCKS (MODEL HYDRAULIC CONDUCTIVITY = 0.000001 FT/DAY)
LAYER 3 PROPERTIES
BASIN FILL (MODEL HYDRAULIC CONDUCTIVITY = 20 FT/DAY)
SAN ANDRES AND GLORIETTA FORMATIONS (MODEL HYDRAULIC CONDUCTIVITY = 0.0001 FT/DAY)
SAN ANDRES AND GLORIETTA FORMATIONS (MODEL HYDRAULIC CONDUCTIVITY = 40 FT/DAY)
LAYER 4 PROPERTIES
BASIN FILL (MODEL HYDRAULIC CONDUCTIVITY = 20 FT/DAY)
YESO AND ABO FORMATIONS (MODEL HYDRAULIC CONDUCTIVITY = 0.1 FT/DAY)
LAYER 5 PROPERTIES
MADERA AND SANDIA FORMATIONS (MODEL HYDRAULIC CONDUCTIVITY = 1.0 FT/DAY)
MADERA FORMATION WITH LESS THAN 20% LIMESTONE (MODEL HYDRAULIC CONDUCTIVITY = 0.1 FT/DAY)
CAVERNOUS MADERA FORMATION (MODEL HYDRAULIC CONDUCTIVITY = 10 FT/DAY)
5 0 5 10 15 20 Miles
1:150000
N
W
E
S
GEOGRAPHIC DATA SOURCE: N.M.B.G.I.S. RESOURCE DATA AT SCALES OF 1:100,000 AND 1:500,000.
PROJECTION IS NEW MEXICO STATE PLANE CENTRAL ZONE, NAD27
ENTRANOSA WATER & WASTEWATER COOPERATIVE / ESTANCIA BASIN MODEL
MODEL WATER TABLE
CELLS AND FORMATIONS
PLATE 15
<Empty Picture>


Water Level
Qal
Qal
Qal
Qal
Lake Beds
Glorieta/San Andres
Yeso/Abo
Madera/Sandia
Precambrian

DESIGNATED CRITICAL MANAGEMENT AREAS IN THE VALLEY FILL AQUIFER



Source : New Mexico Office of the State Engineer

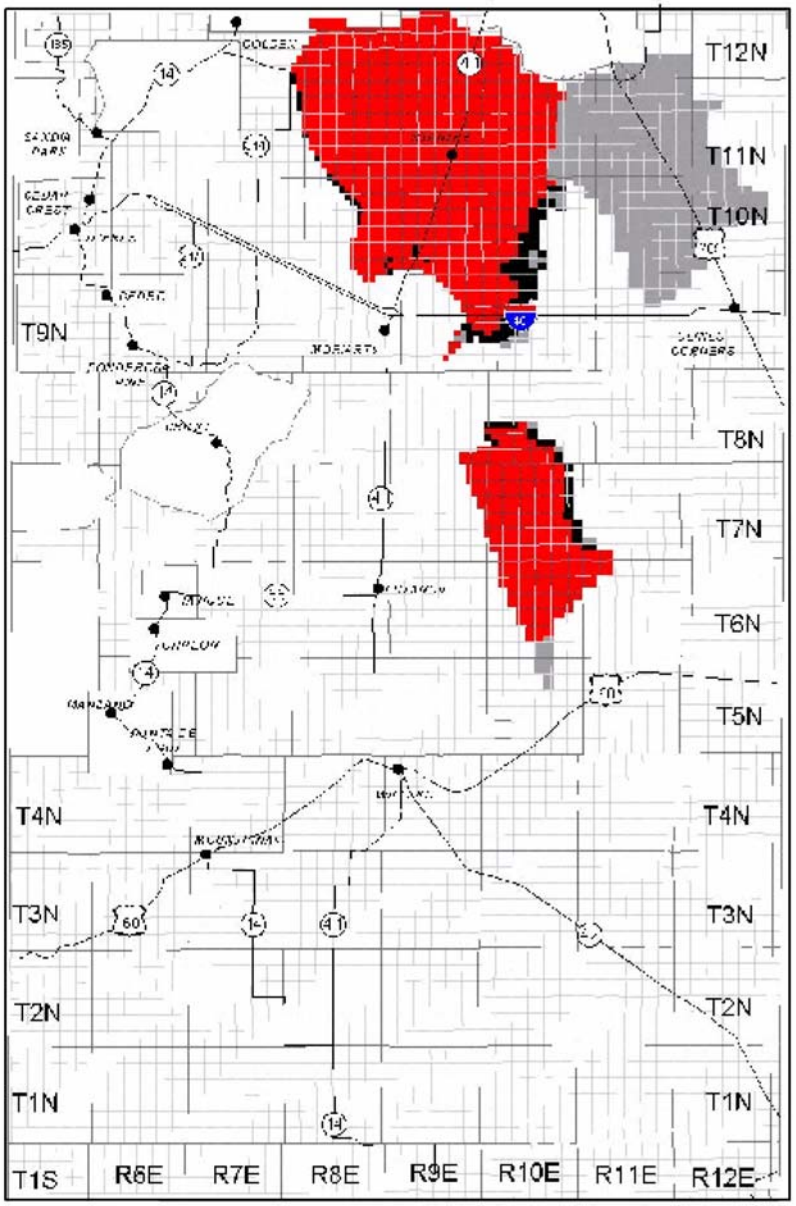
INACTIVE
NOT A CMA
CMA, CELL GOES DRY
CMA, SATURATED THICKNESS <= 80 FT
CMA, RATE OF DRAWDOWN > 1.5 FT/YR
CMA, BOTH SATURATED THICKNESS AND RATE OF DRAWDOWN

N
W
E
S

0 5 10 20 Miles

Projection: State Plane, Central Zone
Datum NAD 83

DESIGNATED CRITICAL MANAGEMENT AREAS IN THE SAN ANDRES/GLORIETA



Source : New Mexico Office of the State Engineer

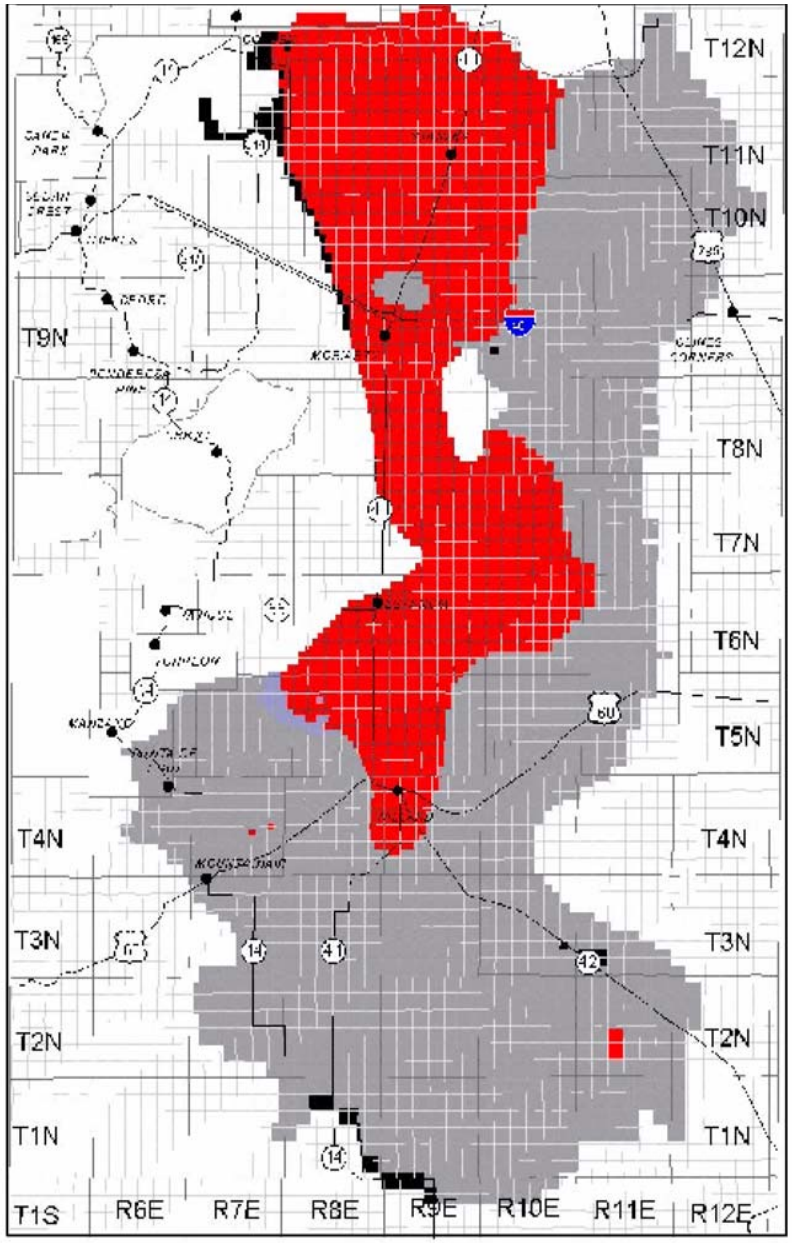
INACTIVE
NOT A CMA
CMA, CELL GOES DRY
CMA, RATE OF DRAWDOWN > 1.50 FT/YR

N
W
E

0 5 10 20 Miles

Projection: State Plane, Central Zone
Datum NAD 83

DESIGNATED CRITICAL MANAGEMENT AREAS IN THE ABO/YESO



Source : New Mexico Office of the State Engineer

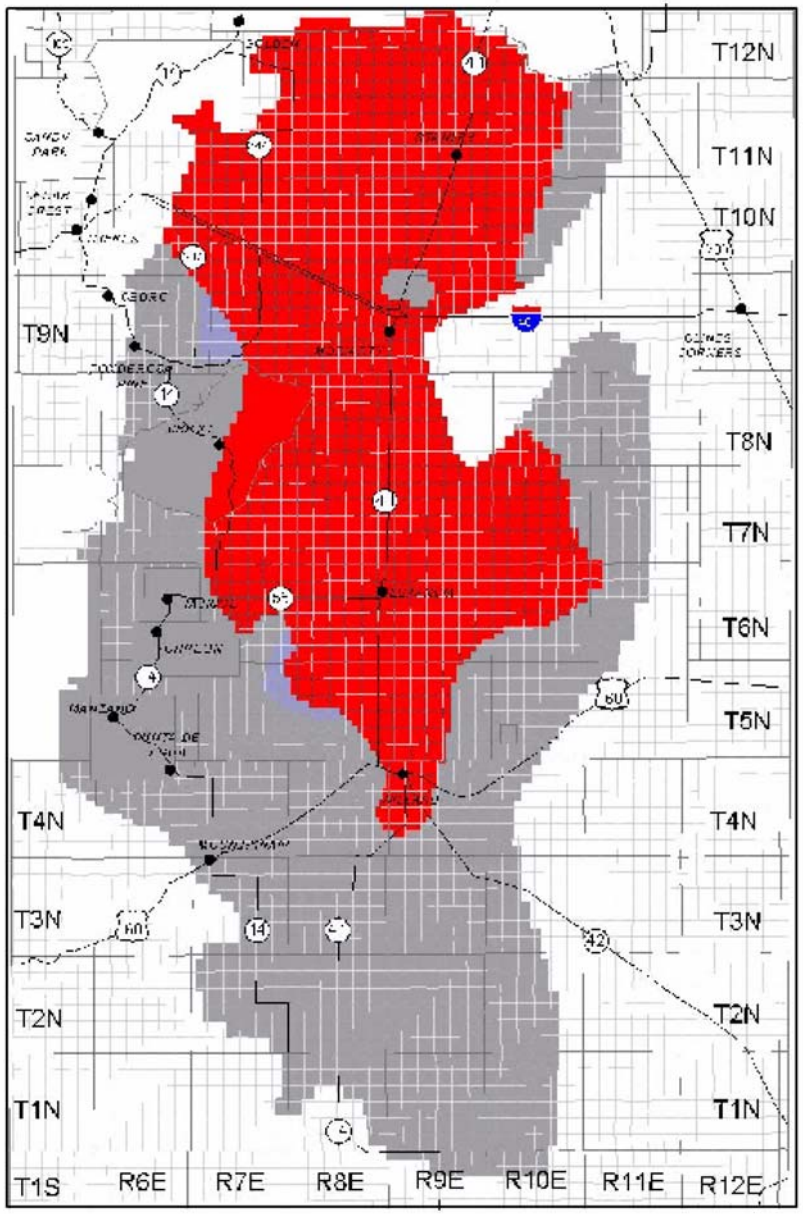
- INACTIVE
- NOT A CMA
- CMA, CELL GOES DRY
- CMA, RATE OF DRAWDOWN > 1.5 FT/YR
- CMA, MODEL CAUTION AREA

N
W
E

0 5 10 20 Miles

Projection: State Plane, Central Zone
Datum NAD 83

DESIGNATED CRITICAL MANAGEMENT AREAS IN THE MADERA



Source : New Mexico Office of the State Engineer

INACTIVE
NOT A CMA
CMA, CELL GOES DRY
CMA, RATE OF DRAWDOWN > 1.5 FT/YR
CMA, MODEL CAUTION AREA

N
W
E

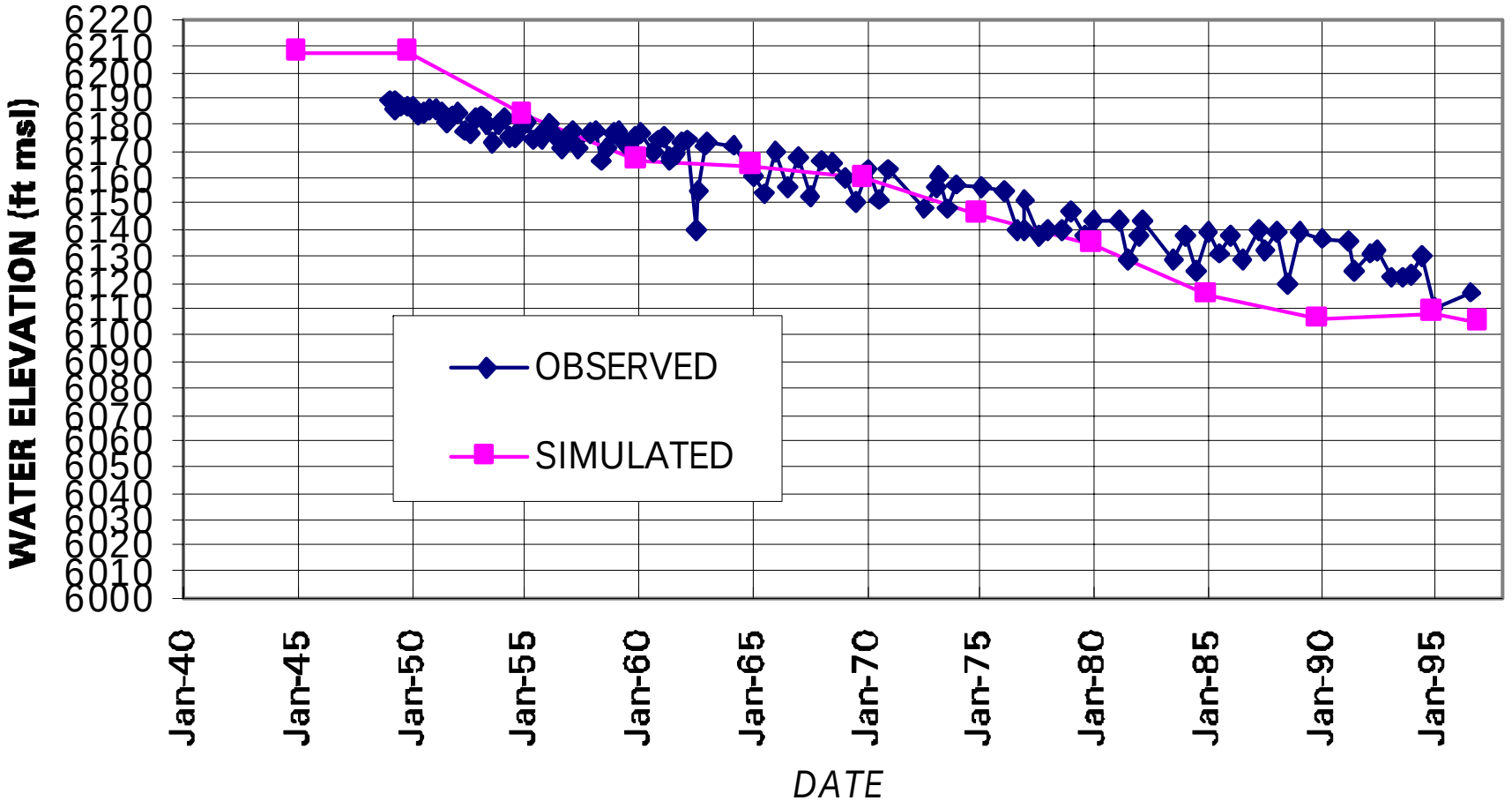
0 5 10 20 Miles

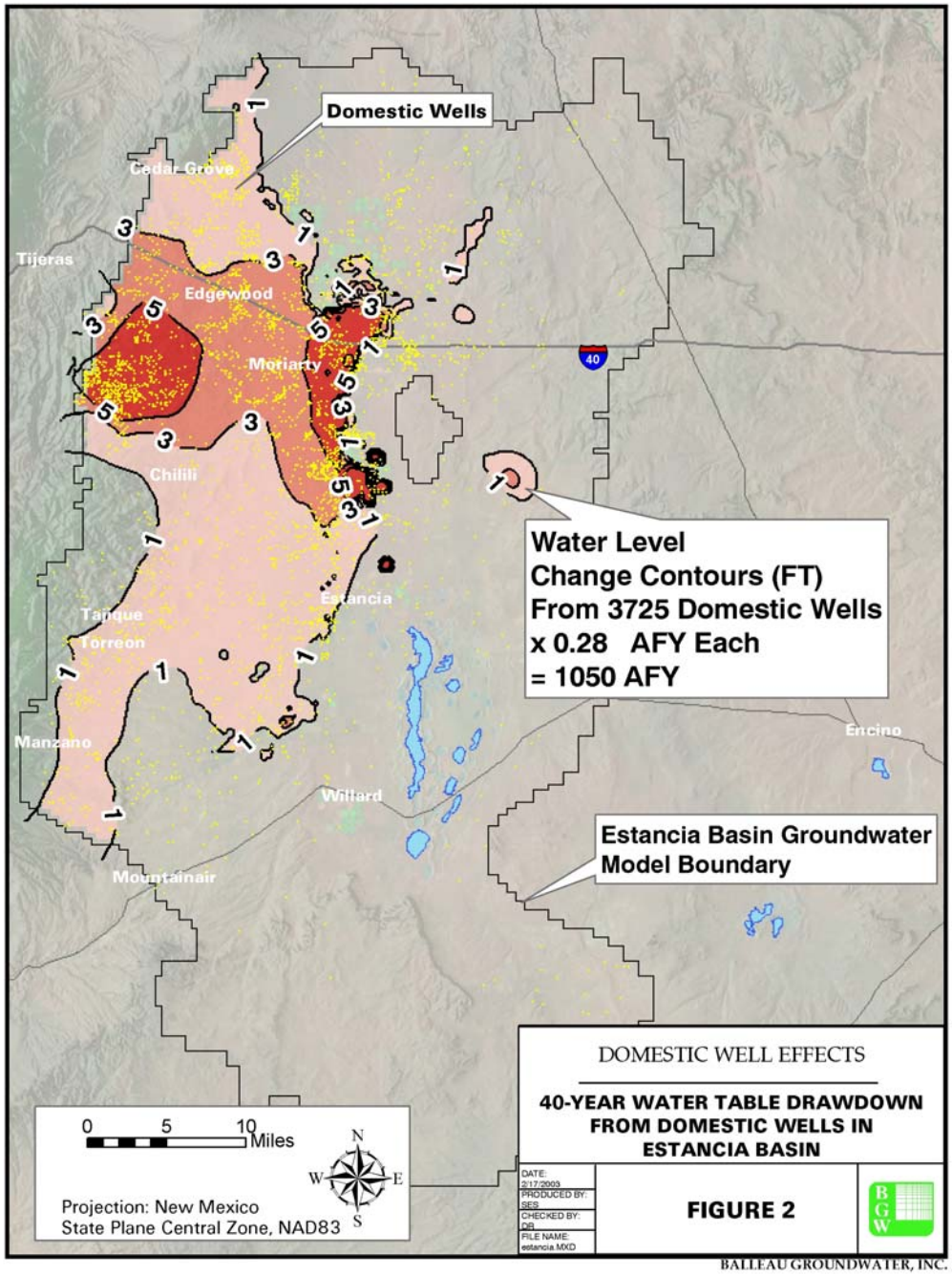
Projection: State Plane, Central Zone
Datum NAD 83

What Can the Model Do?

1. **Calculate water-level drawdown from pumping.**
2. **Calculate source of water to pumping.**
3. **Calculate impact on existing wells.**
4. **Calculate yield for desired aquifer conditions.**

OBSERVED AND SIMULATED WATER ELEVATIONS AT OBSERVATION WELL #286





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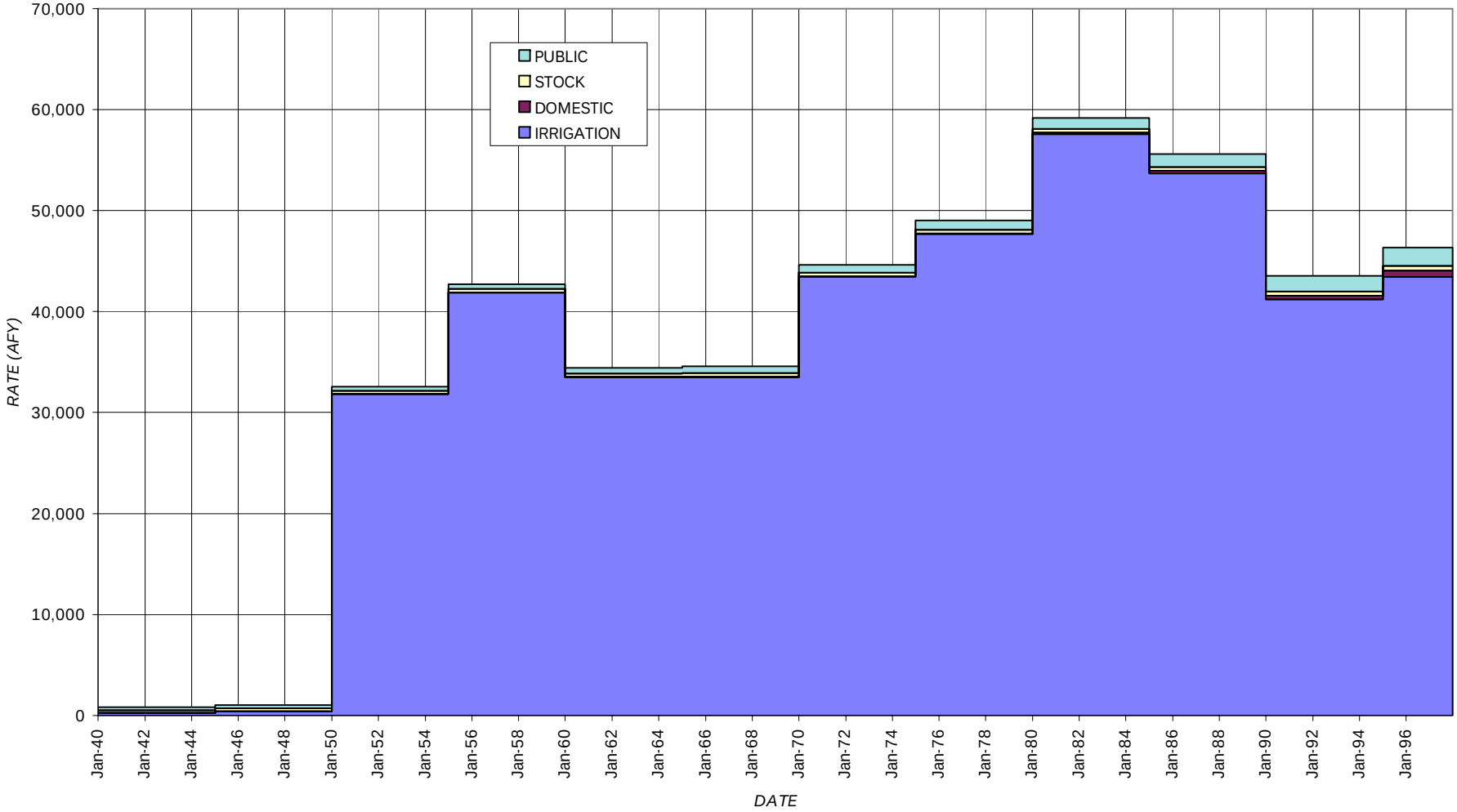
What Can the Model Do?

1. Calculate water-level drawdown from pumping.
2. **Calculate source of water to pumping.**
3. Calculate impact on existing wells.
4. Calculate yield for desired aquifer conditions.

FIGURE 7
NET PUMPING WITHDRAWAL IN MODEL



COMPARISON OF STEADY STATE AND 1996 WATER BUDGETS

Budget Component	Steady State Flow (AFY)	Revised Model End of 1996 Change in Flow (Δ AFY)
Storage	0	Δ 26,451
Evaporation	-26,441	Δ 19,676
Boundaries	-4344	Δ 0
Pumping	0	Δ -46,255

Conclude: 1996 Use is 150% of natural flow because use is supported partly by stored water.

What Can the Model Do?

1. Calculate water-level drawdown from pumping.
2. Calculate source of water to pumping.
3. **Calculate impact on existing wells.**
4. Calculate yield for desired aquifer conditions.

TABLE 3
IMPACTS ON PERMITTED IRRIGATION WELLS IN YEAR 2040
FROM PROJECTIONS OF EXISTING AND FULLY DEPLOYED PUMPING

	COUNT OF WELLS EXAMINED[1]	COUNT OF DRY WELLS[1]	%	COUNT OF WELLS WHERE LESS THAN 100 FT OF WATER COLUMN REMAINS[1]	%
SIMULATED YEAR 2000 WATER LEVELS					
BASIN FILL	413	4	1%	43	10%
MADERA	84	12	14%	37	44%
SAN ANDRES/GLORIETA	54	2	4%	18	33%
OTHER	8	0	0%	4	50%
TOTAL	***559***	***18***	***3%***	***102***	***18%***
40 YEAR PROJECTION OF EXISTING PUMPING					
BASIN FILL	413	18	4%	68	16%
MADERA	84	21	25%	41	49%
SAN ANDRES/GLORIETA	54	11	20%	23	43%
OTHER	8	0	0%	5	63%
TOTAL	***559***	***50***	***9%***	***137***	***25%***
40 YEAR PROJECTION OF FULLY DEPLOYED PUMPING					
BASIN FILL	413	187	45%	323	78%
MADERA	84	39	46%	59	70%
SAN ANDRES/GLORIETA	54	10	19%	27	50%
OTHER	8	5	63%	7	88%
TOTAL	***559***	***241***	***43%***	***416***	***74%***

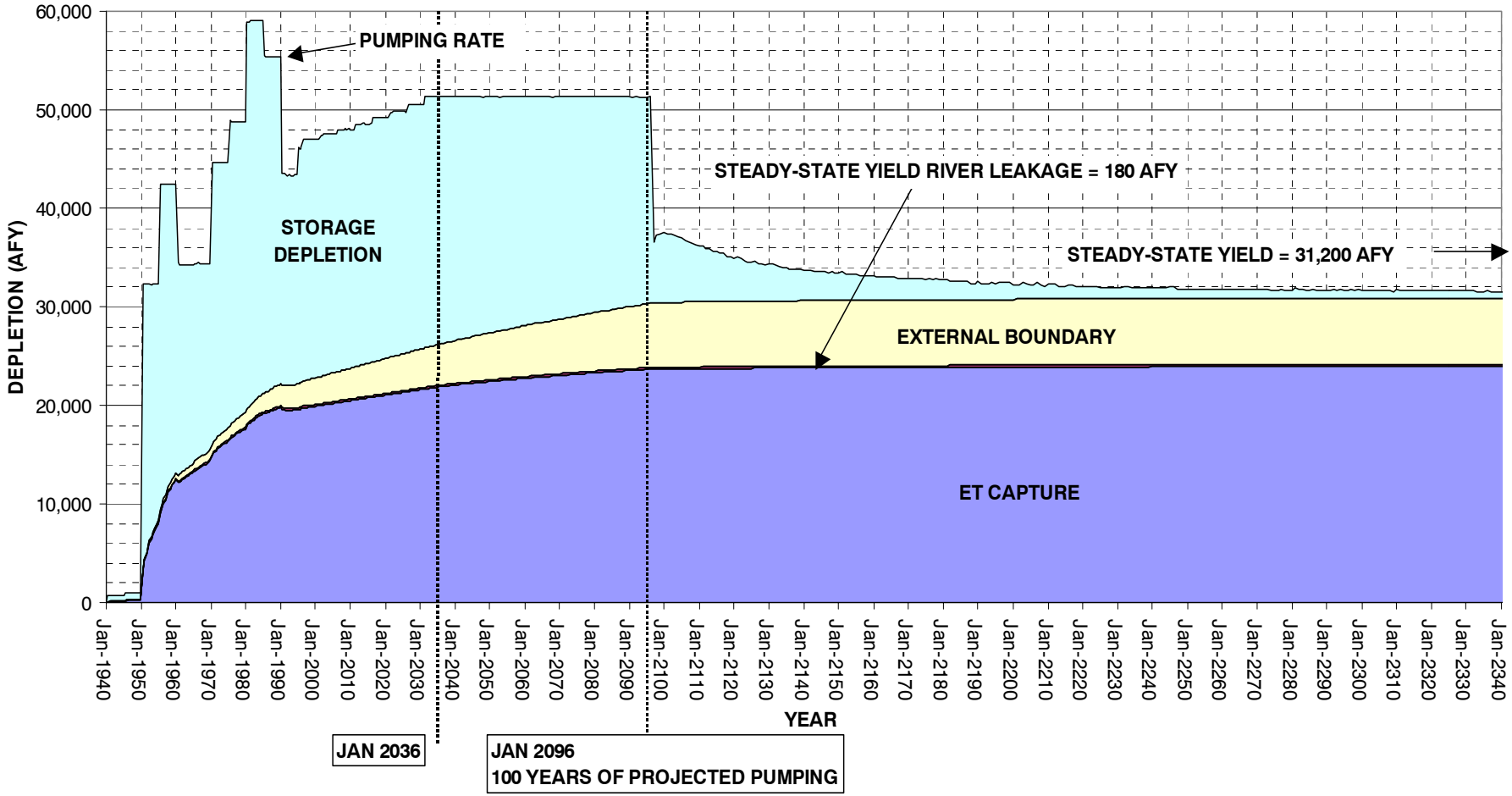
[1]based on permitted irrigation wells with depth data

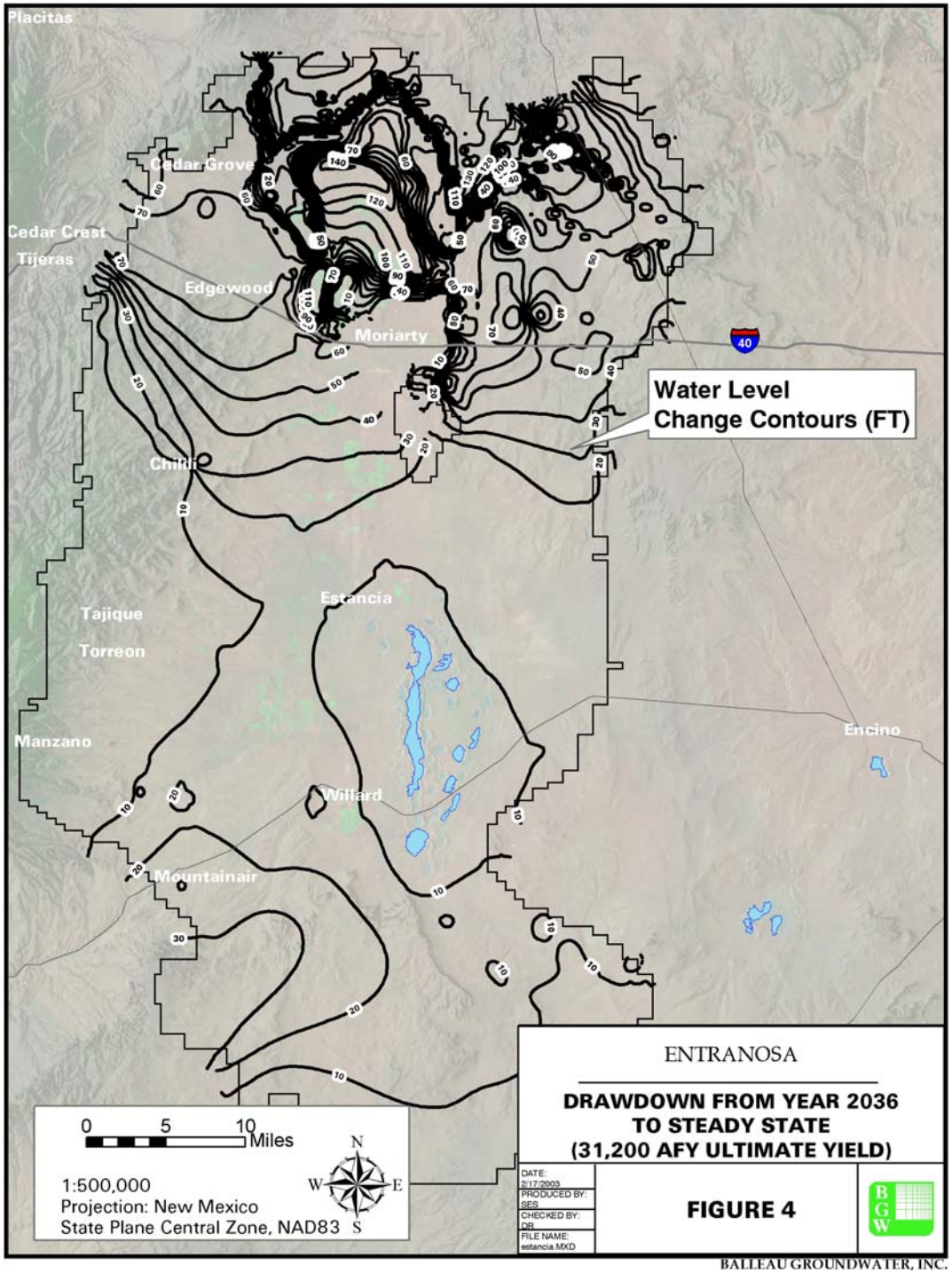
Source: Keyes E. and Frost J., 2001, The Estancia Basin Ground Water Flow Model, OSE Model Design and Future Scenarios. NMOSE Technical Division Hydrology Report 01-3, Table 3.

What Can the Model Do?

1. Calculate water-level drawdown from pumping.
2. Calculate source of water to pumping.
3. Calculate impact on existing wells.
4. **Calculate yield for desired aquifer conditions.**

FIGURE 1
FLOW COMPONENTS CONTRIBUTING TO PUMPING IN ESTANCIA BASIN





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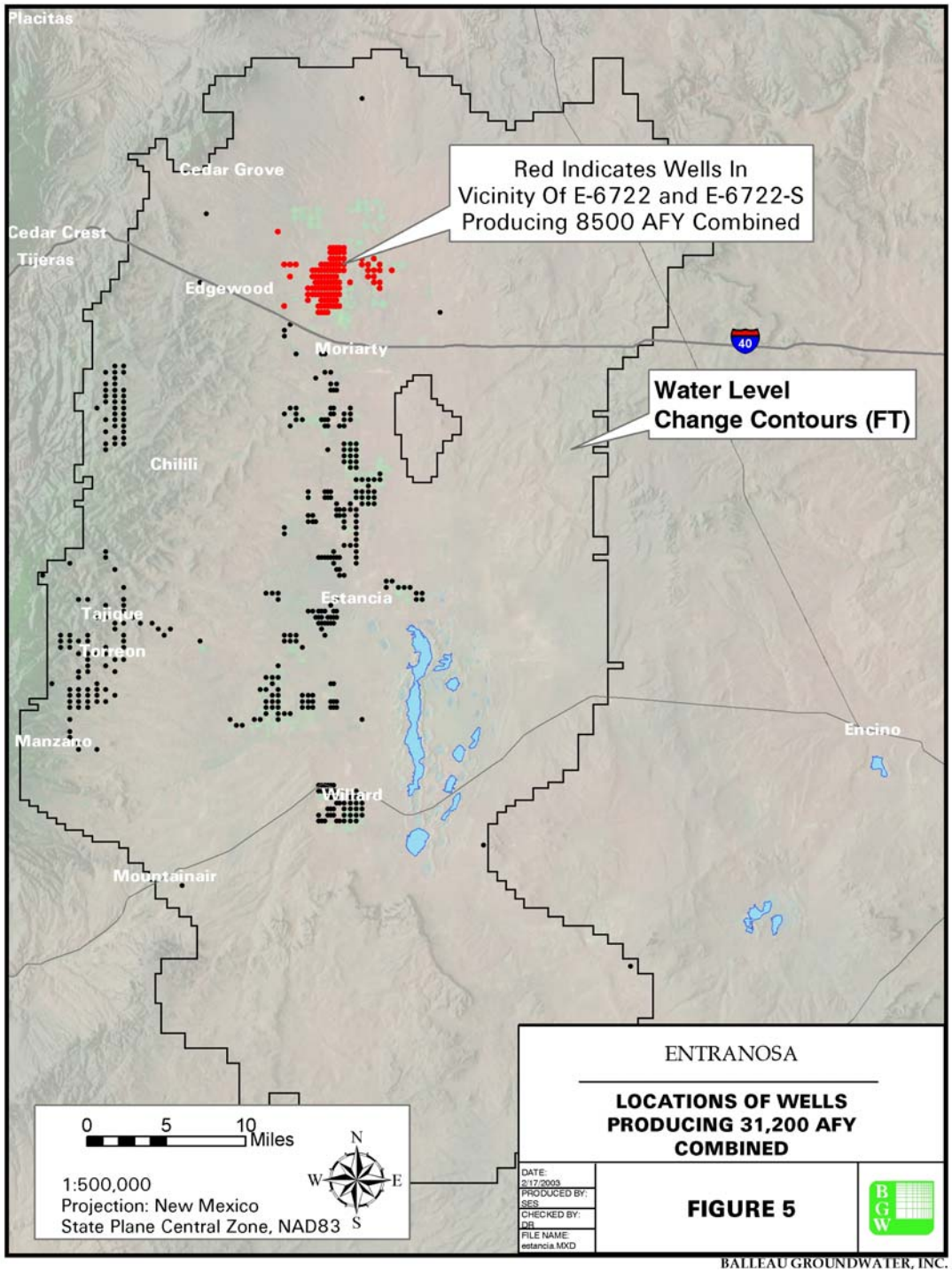

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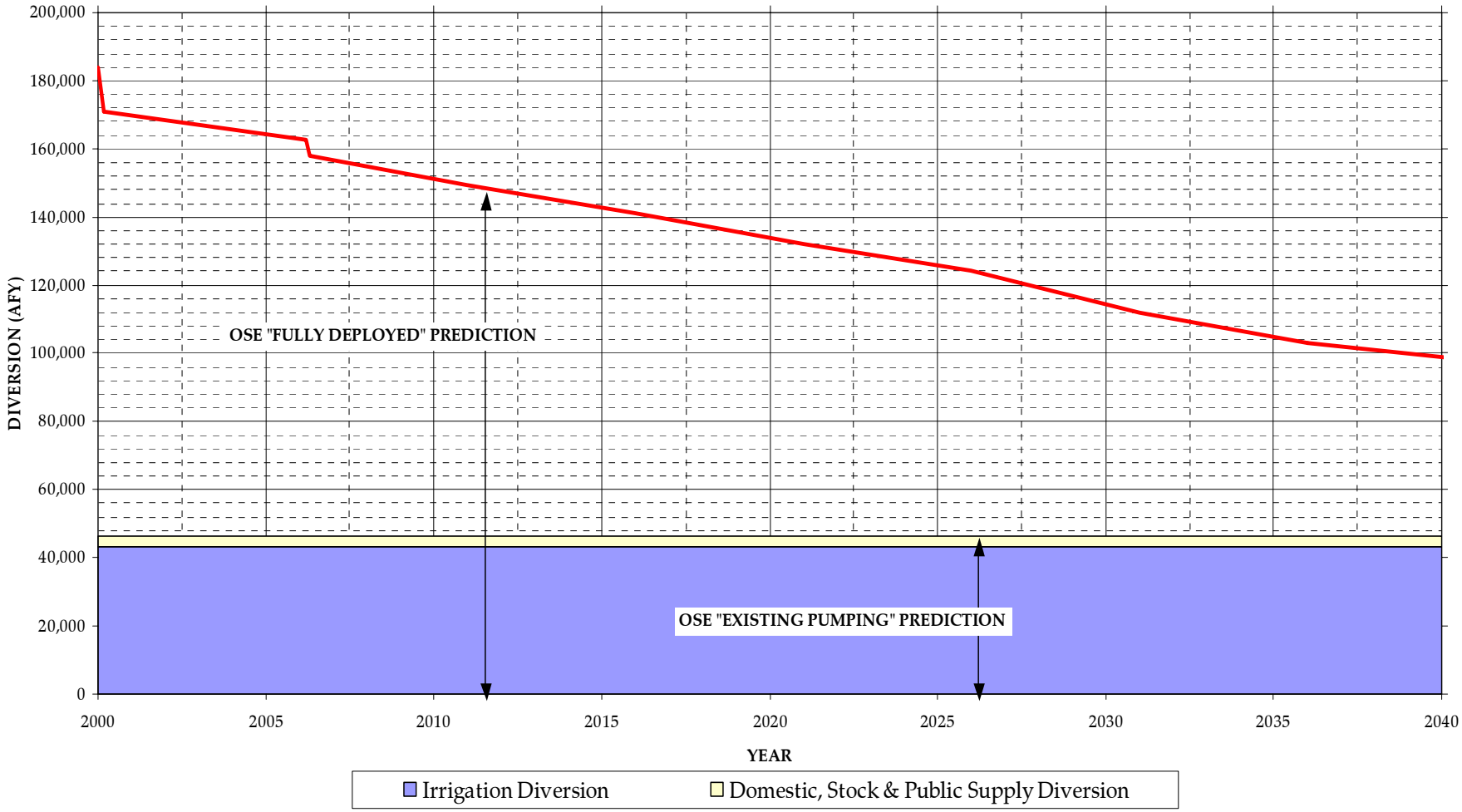
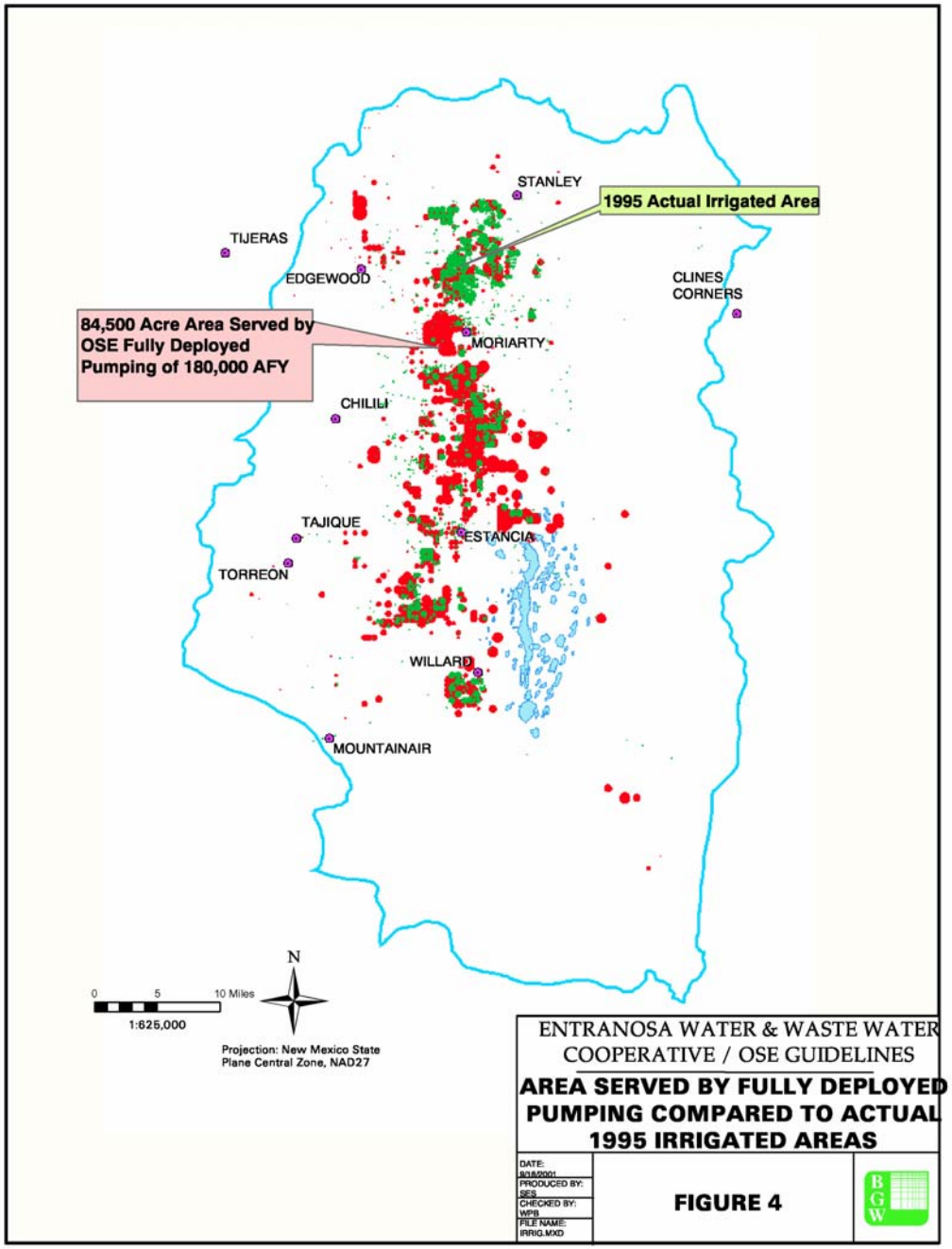
What Can the Model Do?

1. Also Run Paper Claims to Water Rights or Actual Use of Water Rights
2. Show the Area in either case that meets OSE Guideline Criteria.

FIGURE 3
COMPARISON OF EXISTING PREDICTION
TO FULLY DEPLOYED PREDICTION





ENTRANOSA WATER & WASTE WATER COOPERATIVE / OSE GUIDELINES

AREA SERVED BY FULLY DEPLOYED PUMPING COMPARED TO ACTUAL 1995 IRRIGATED AREAS

DATE: 9/18/2001 PRODUCED BY: SES CHECKED BY: WPB FILE NAME: IRRIG.MXD	**FIGURE 4**	B G W

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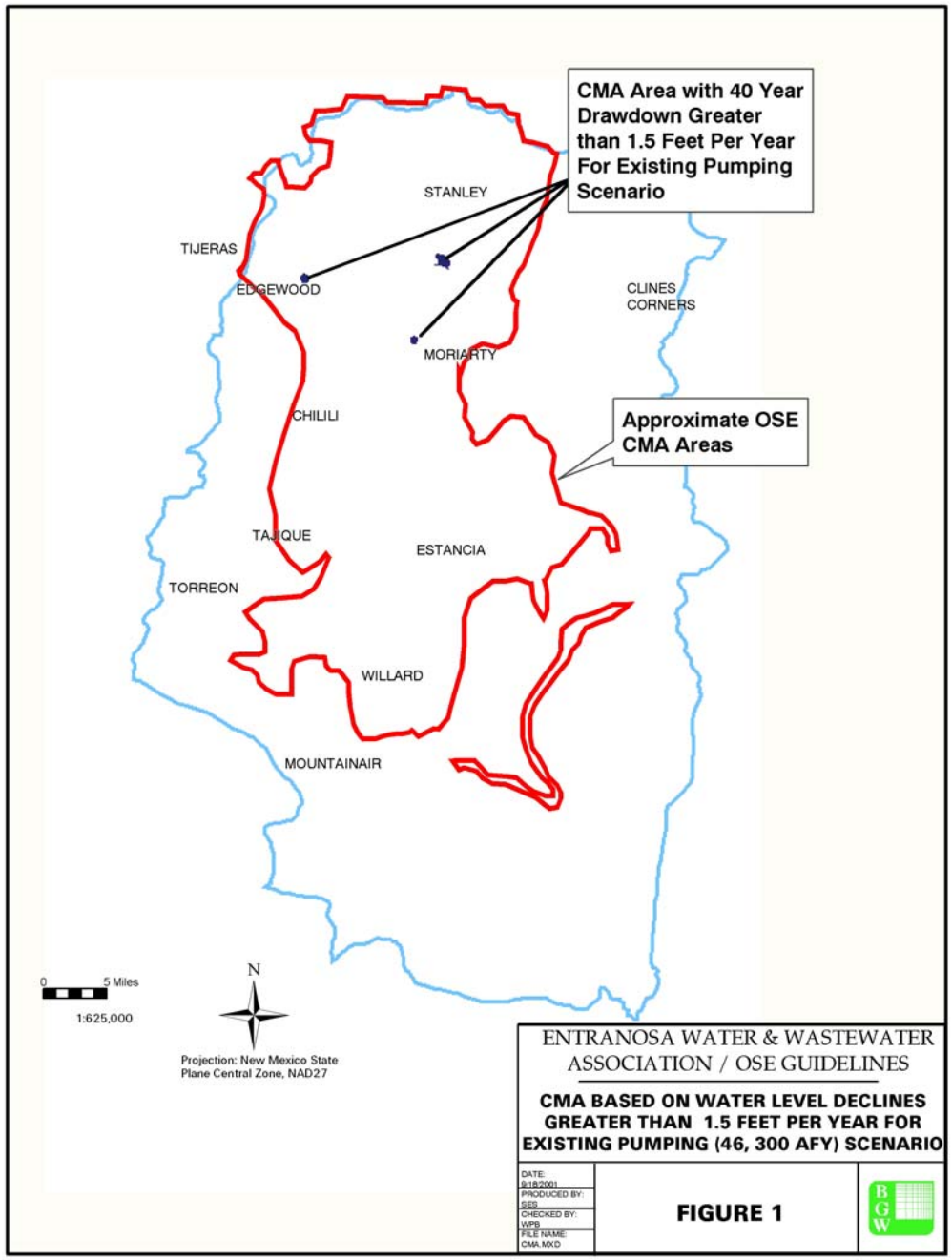

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Conclusions

1. **About 30,000 AFY flows through 5 million AF of water stored in the first 100 feet below the Estancia Basin water table.**
2. **Over 50,000 AFY can be used for 100 years and over 30,000 AFY can be used forever without drying up or reversing salt water in the basin.**
3. **The OSE administrative model can show the hydrologic response to old and new pumping wells.**
4. **Properly-constructed wells can provide a full-service life throughout the basin.**
5. **OSE administrative basin guidelines lock up the resource in most of the basin to protect 150,000 AFY of paper claims unused since 1950.**
6. **Actual use at 46,000 AFY satisfies the OSE guidelines in 99% of the basin.**
7. **For the sake of current and future water demands in the basin, the OSE must proceed rapidly to remove the invalid claims from his files and to reduce the overreaching extent of the Critical Management Area.**