STAKEHOLDER ADVISORY FORUM MEETING

FEBRUARY 21, 2002

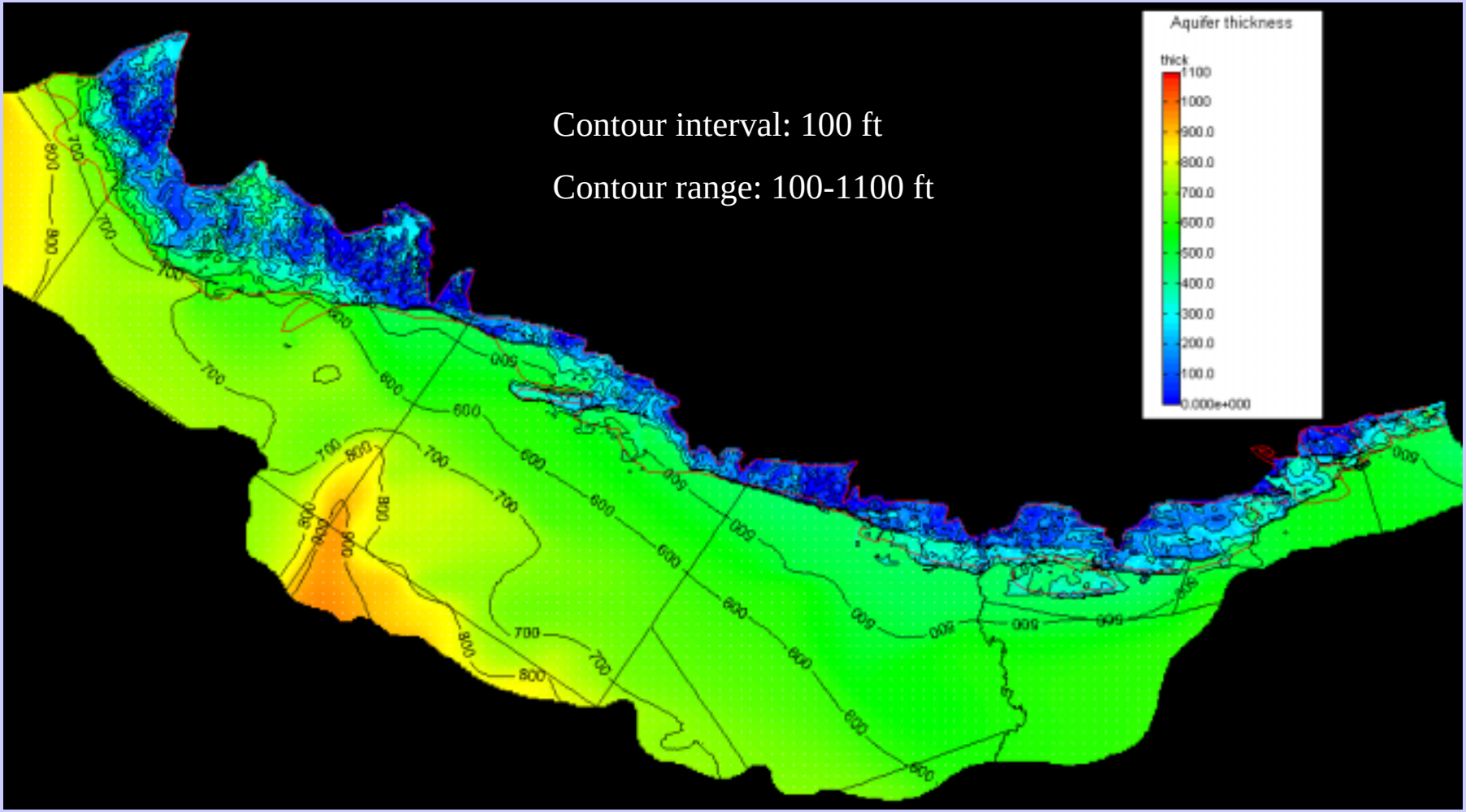
PRESENTATION

- AQUIFER PROPERTIES
- REVISIONS TO MODEL (since SAF on June 5, 2001)
- STEADY-STATE CALIBRATION
  - Calibration targets
  - Calibration results
- TRANSIENT DATA COMPILATION
- TRANSIENT CALIBRATION TARGETS
- PROJECT SCHEDULE

AQUIFER PROPERTIES

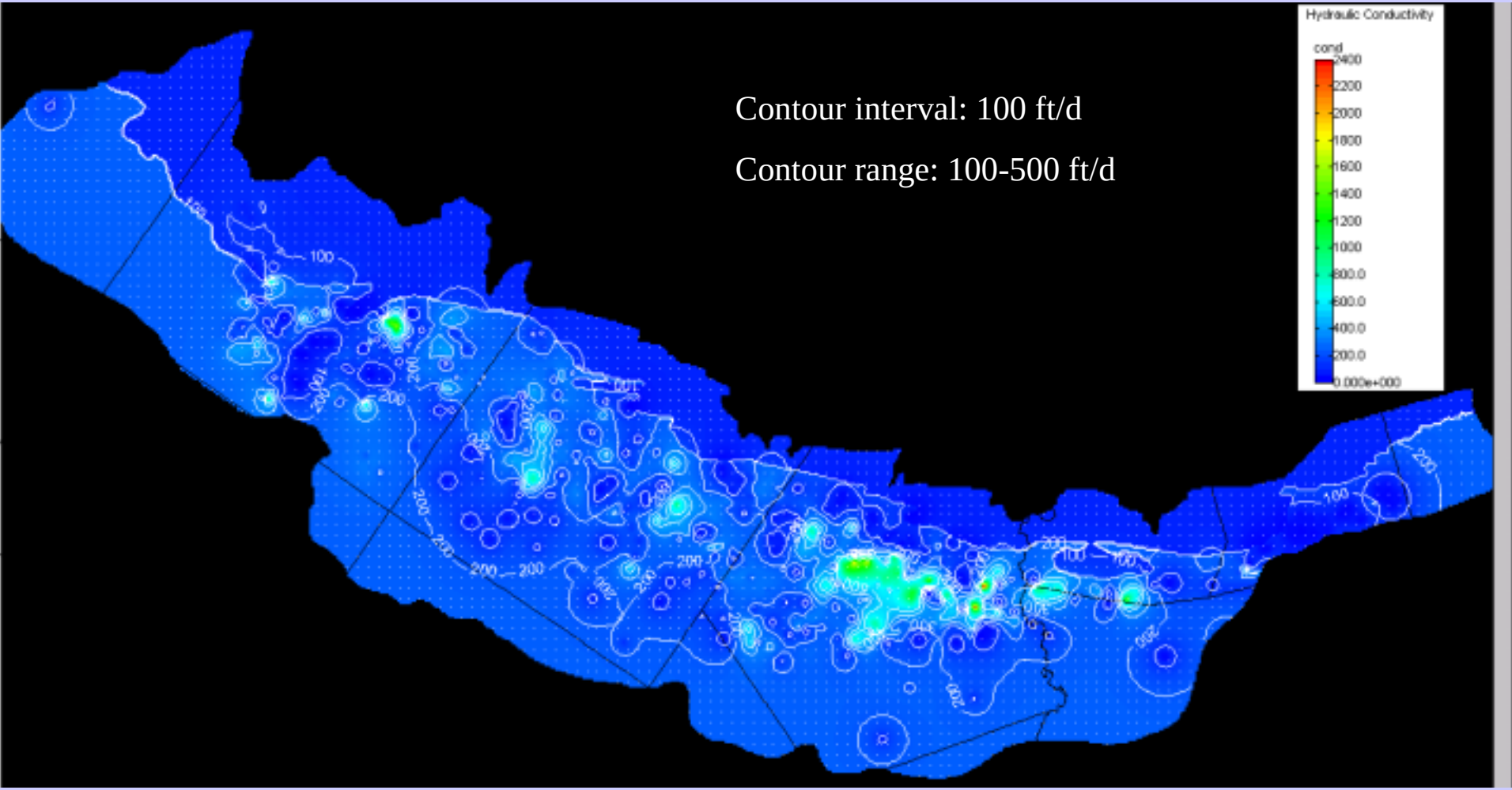
AQUIFER THICKNESS

(from BEG)



HYDRAULIC CONDUCTIVITY

(from SWRI)



REVISIONS TO MODEL

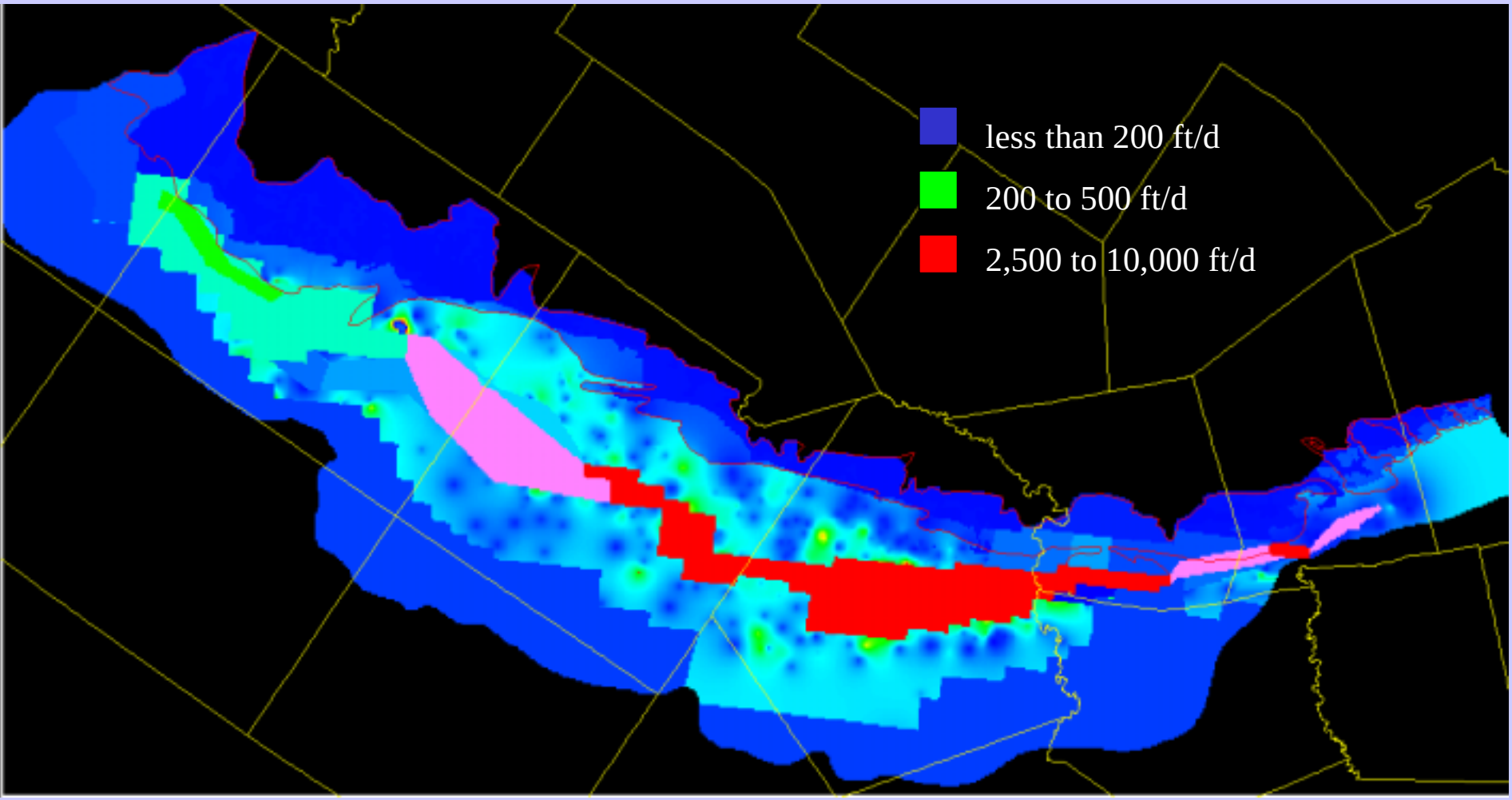
(since SAF on June 5, 2001)

REVISIONS TO MODEL

- Hydraulic Conductivity
  - High K zones

REVISED HYDRAULIC CONDUCTIVITY

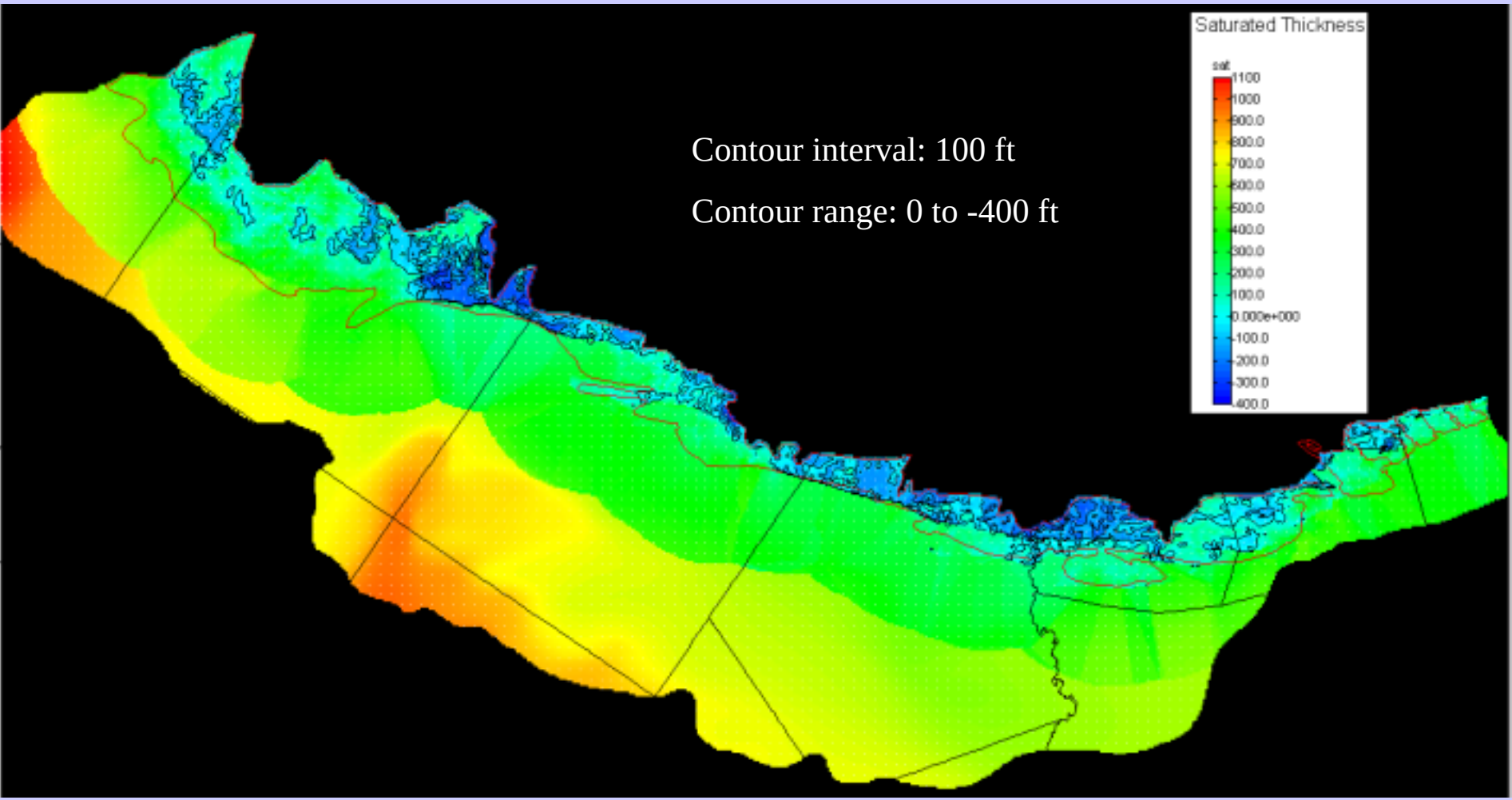
(As of 02/21/02 – To be revised)



REVISIONS TO MODEL

- Aquifer Thickness / Hydraulic Conductivity
  - Partial Trinity thickness added in recharge zone; K lowered

SATURATED THICKNESS



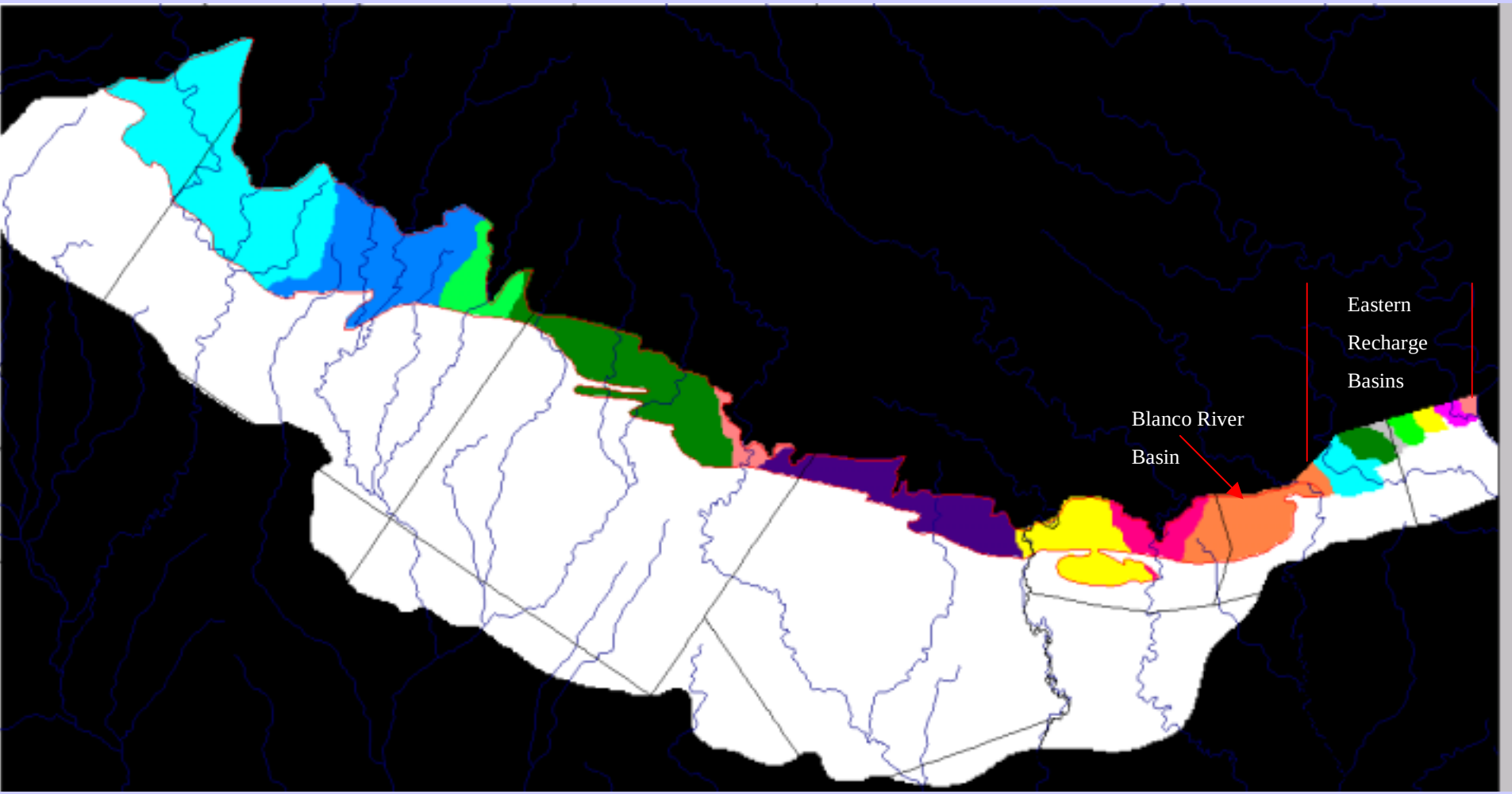
EXPECTED REVISIONS TO HYDRAULIC CONDUCTIVITY

- Revised K distribution from SWRI
  - based on aquifer tests and measured hydraulic heads and springflows
- Mapped narrow high K zones
  - based on potentiometric surface maps, sinking streams, geologic structures, and water chemistry
- Measured hydraulic heads and springflows (model calibration)

REVISIONS TO MODEL

- Recharge
  - Eastern (Barton Springs segment) recharge basins delineated

EDWARDS AQUIFER RECHARGE BASINS



EASTERN RECHARGE BASINS

- Recharge rates reported for 6 basins
  - reported by Slade and others (1986) [WRIR 86-4036]
- Basins:

  Onion Creek

  Little Bear Creek

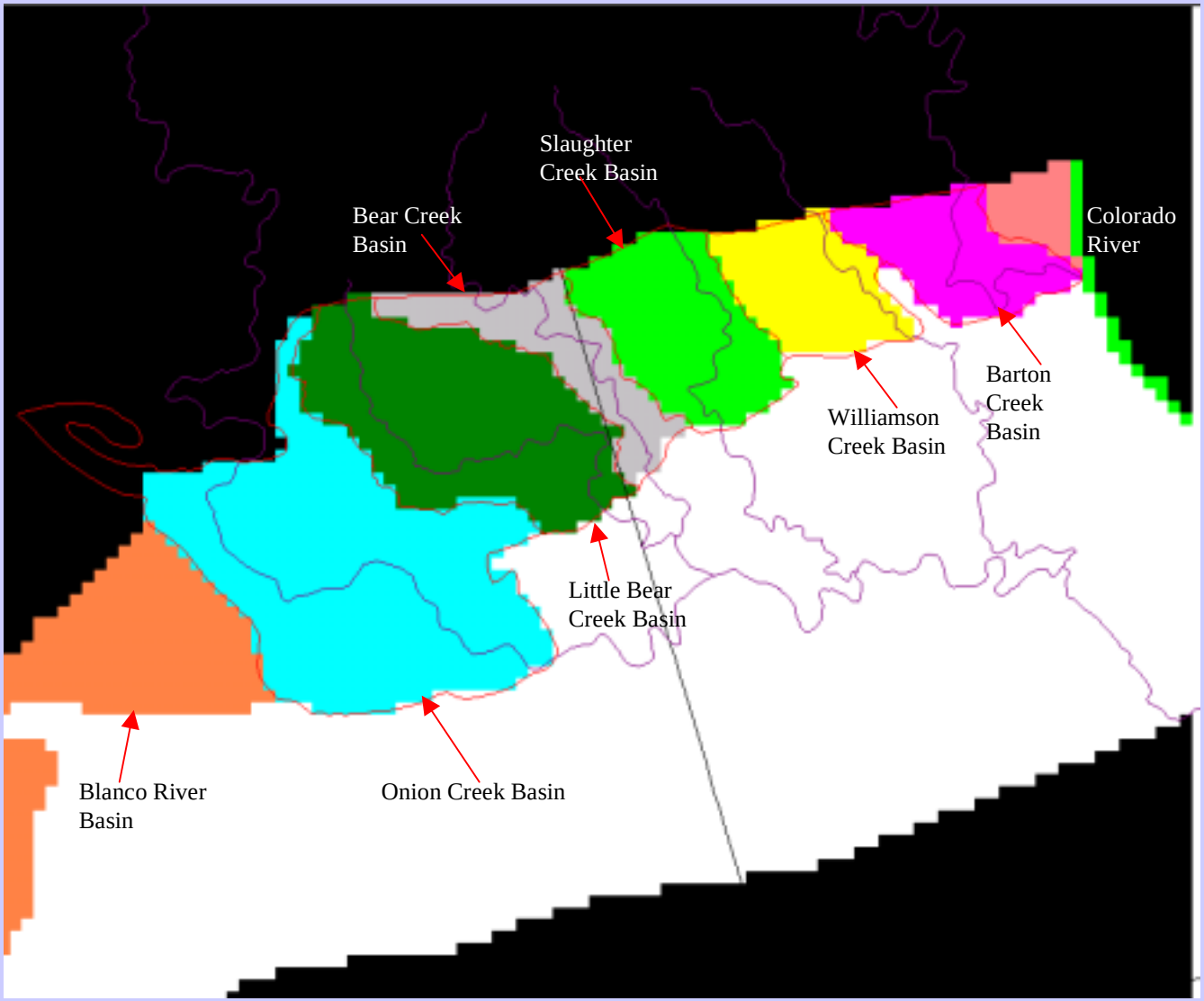
  Bear Creek

  Slaughter Creek

  Williamson Creek

  Barton Creek

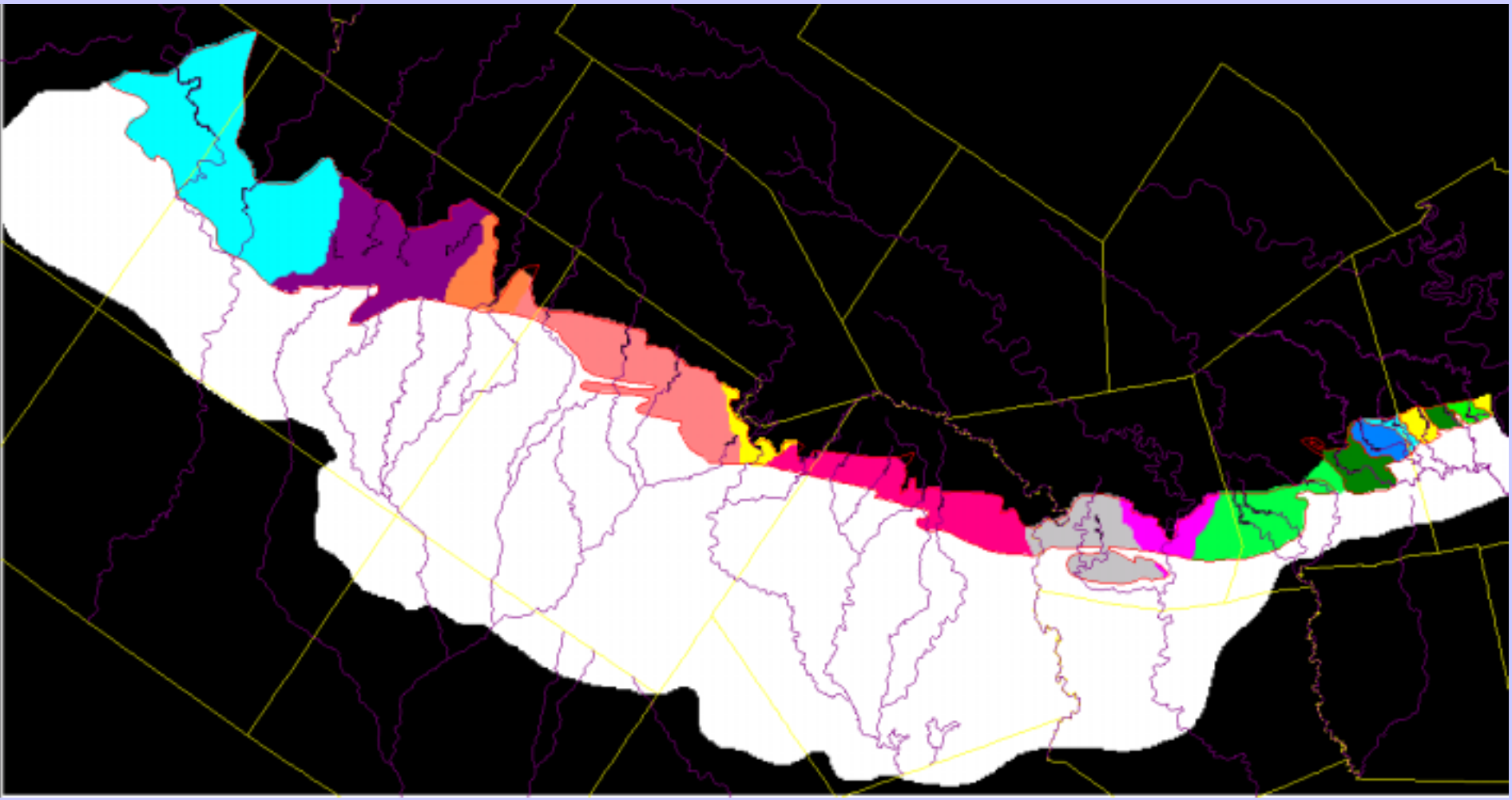
EASTERN RECHARGE BASINS



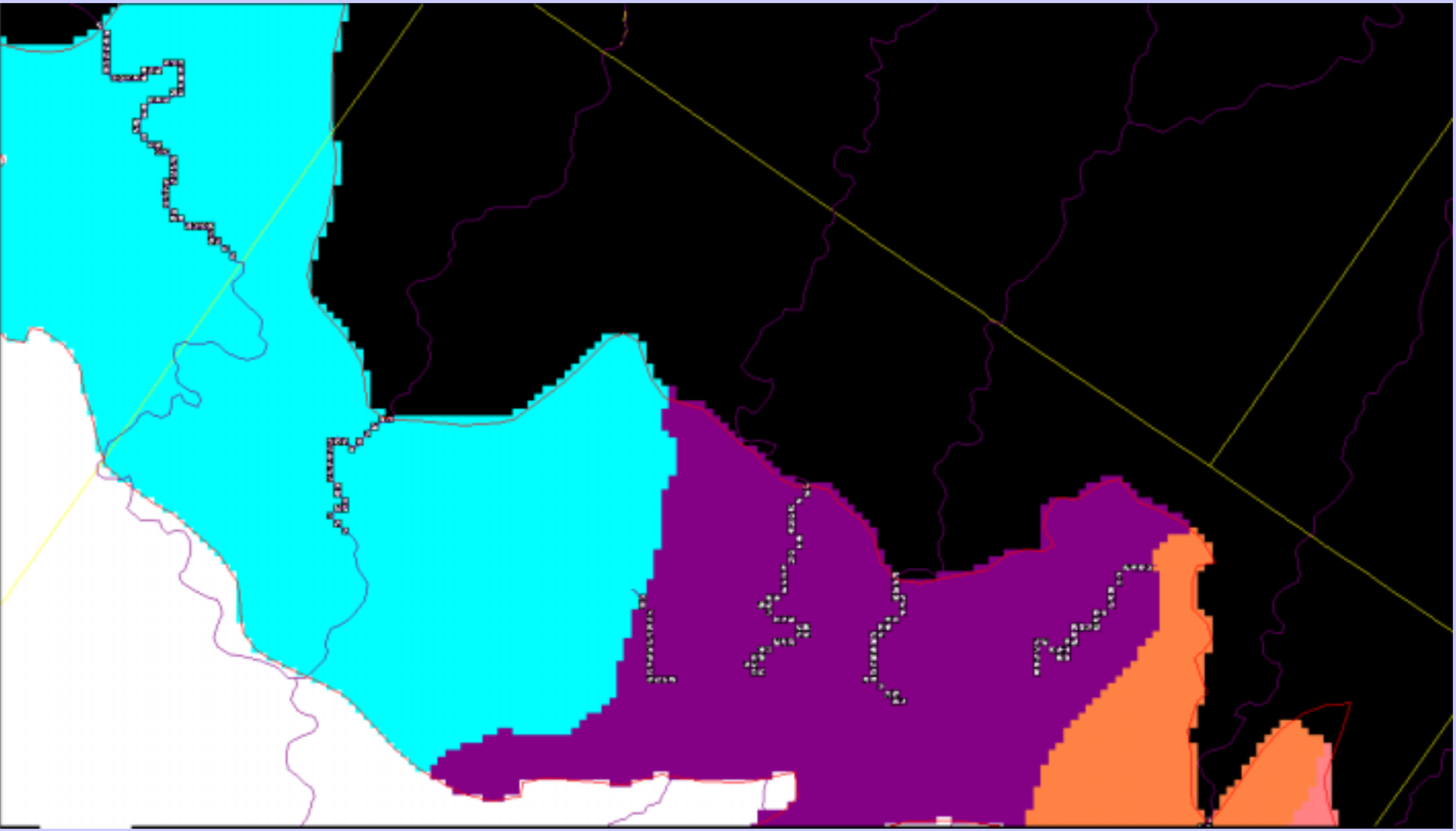
REVISIONS TO MODEL

- Recharge
  - Recharge redistributed
    - Stream channel 85%
      - upper part of stream channel only
    - Diffuse recharge 15%

RECHARGE ZONES



RECHARGE ZONES – STREAM CHANNELS



REVISIONS TO MODEL

- Boundary Conditions
  - Revised location for southern model boundary

REVISED SOUTHERN MODEL BOUNDARY

STEADY-STATE CALIBRATION

STAGES IN MODELING PROCESS

- Conceptual model
- Model construction
- Calibration
  - steady-state
  - transient
- Verification
- Prediction

STEADY-STATE CALIBRATION

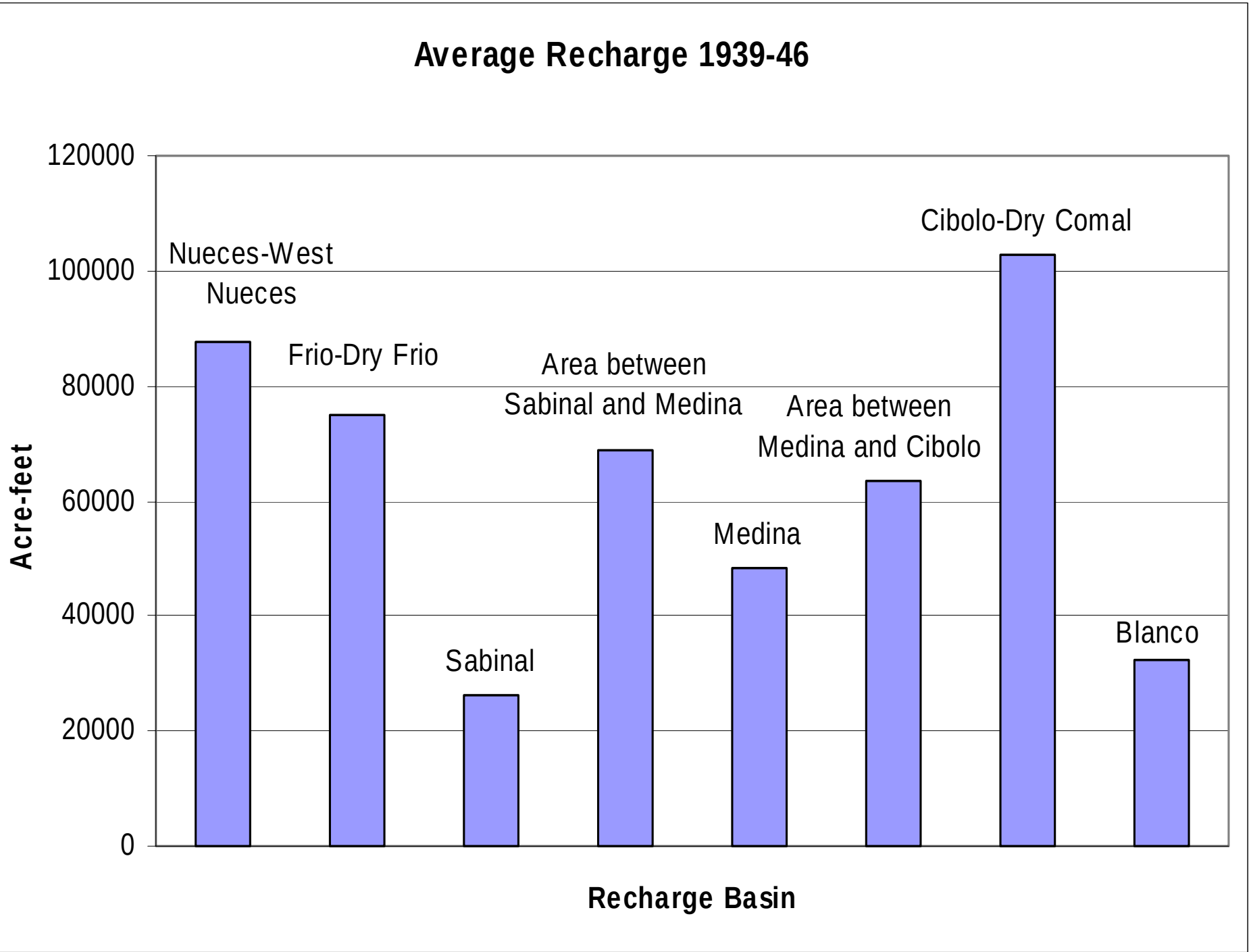
- Calibration period: 1939 – 1946
- Pre-1950's drought, minimal irrigation development
- Near-normal precipitation
- San Antonio precipitation:

  normal (1961-90) 30.98 in/yr

  average 1939-46 30.47 in/yr

STEADY-STATE CALIBRATION

- Average conditions 1939-46
- Recharge
- Discharge
  - Pumpage

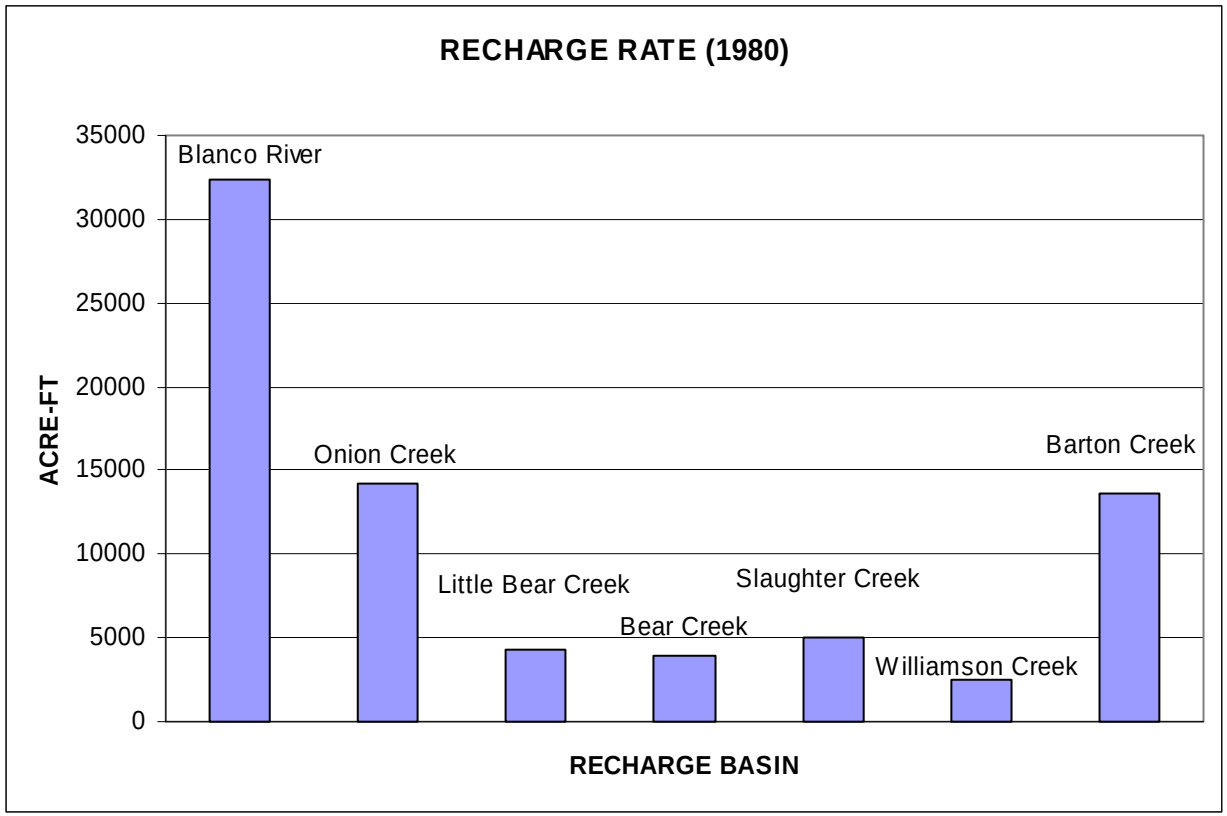

Average Recharge 1939-46
120000
100000
80000
60000
40000
20000
0
Acre-feet
Nueces-West Nueces
Frio-Dry Frio
Sabinal
Area between Sabinal and Medina
Medina
Area between Medina and Cibolo
Cibolo-Dry Comal
Blanco
Recharge Basin

EASTERN RECHARGE BASINS
STEADY-STATE RECHAGE RATES

- Recharge rates available for 1980-82
  - reported by Slade and others (1986) [WRIR 86-4036]
- Comparison with Blanco River basin recharge rates (in acre-ft):

1980	31,800
1981	67,300
1982	23,500
1939-46	32,375

- Use 1980 recharge rates to approximate 1939-46 steady-state rates


RECHARGE RATE (1980)
35000
30000
25000
20000
15000
10000
5000
0
ACRE-FT
Blanco River
Onion Creek
Little Bear Creek
Bear Creek
Slaughter Creek
Williamson Creek
Barton Creek
RECHARGE BASIN

PUMPING WELLS

STEADY-STATE CALIBRATION

ESTIMATION AND ALLOCATION OF PUMPING RATES

Steady State (1939-1947)

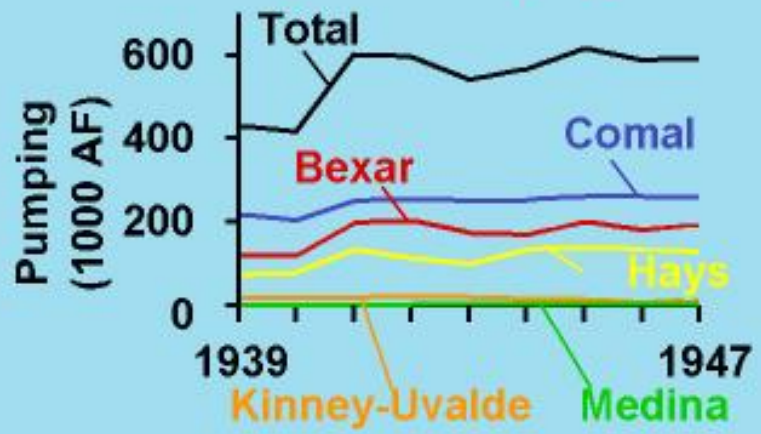
(1)

TBWE Report 5608 (1956)

County	Well	Drill date	Location	Use	Yield

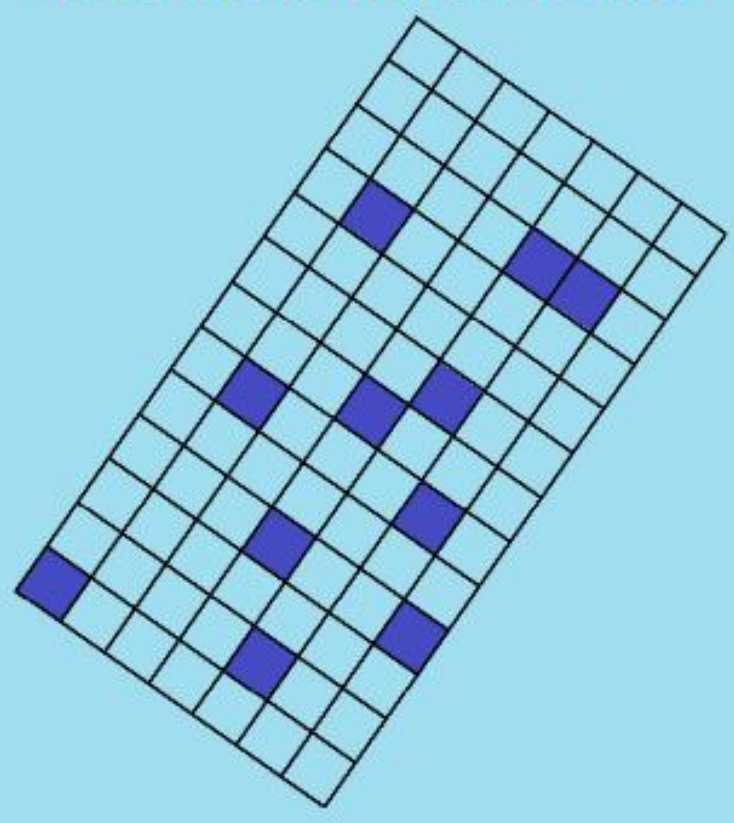
(2)

County Total Pumping Rates

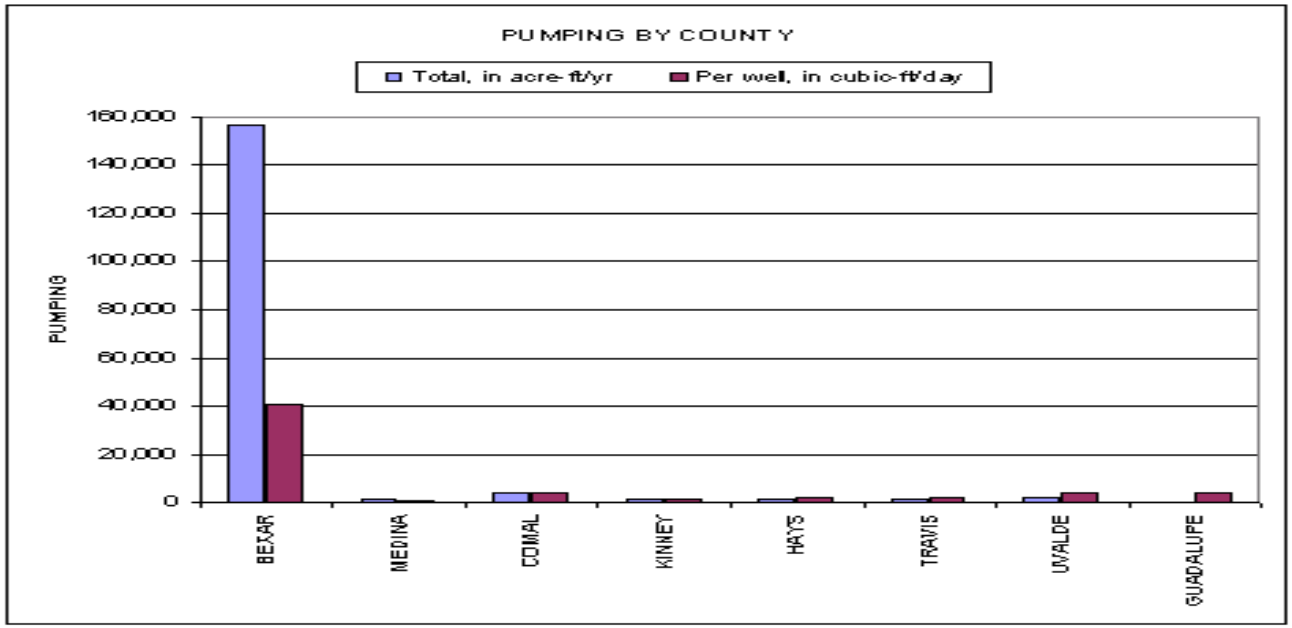


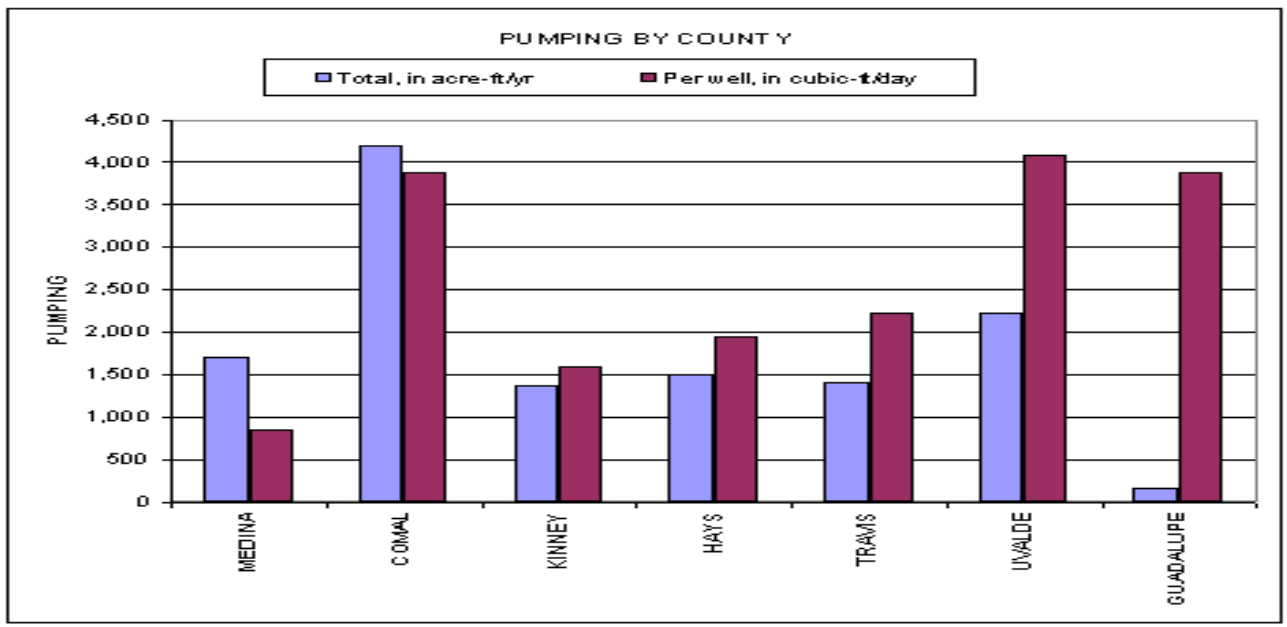
(3)

Model Grid Pumping Allocation

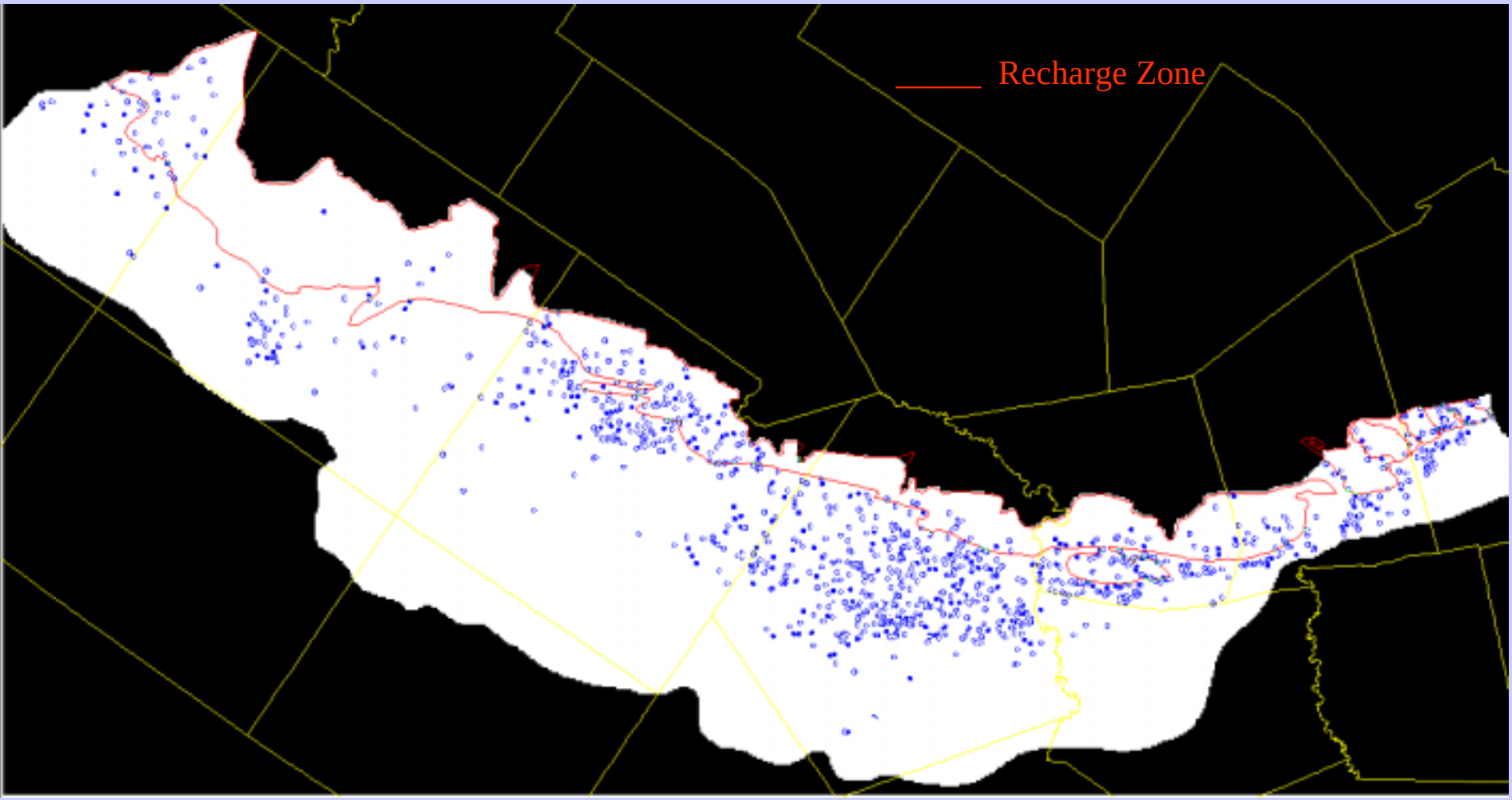


STEADY-STATE PUMPING RATES (1939-46)





STEADY-STATE PUMPING WELLS (1939-46)



STEADY-STATE CALIBRATION TARGETS

STEADY-STATE
CALIBRATION TARGETS

- Calibration targets

(1) Average water levels during 1939-46

(2) Springflow

- 1939-46 averages

STEADY-STATE CALIBRATION TARGETS

- Average water levels for 1939-46

  (1) Winter water levels

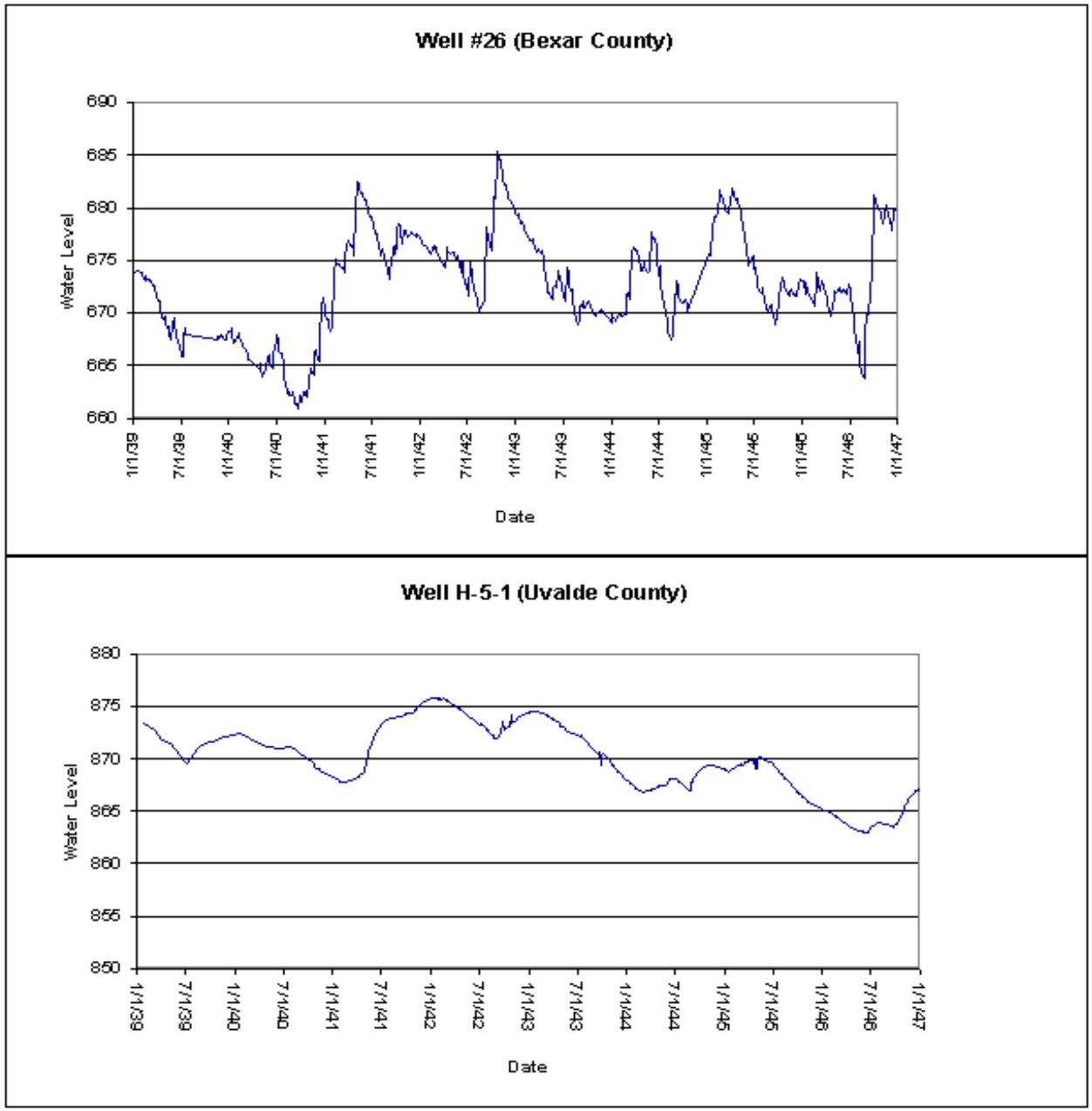
  (2) Time periods with “average” levels

  - determined from index wells (2)

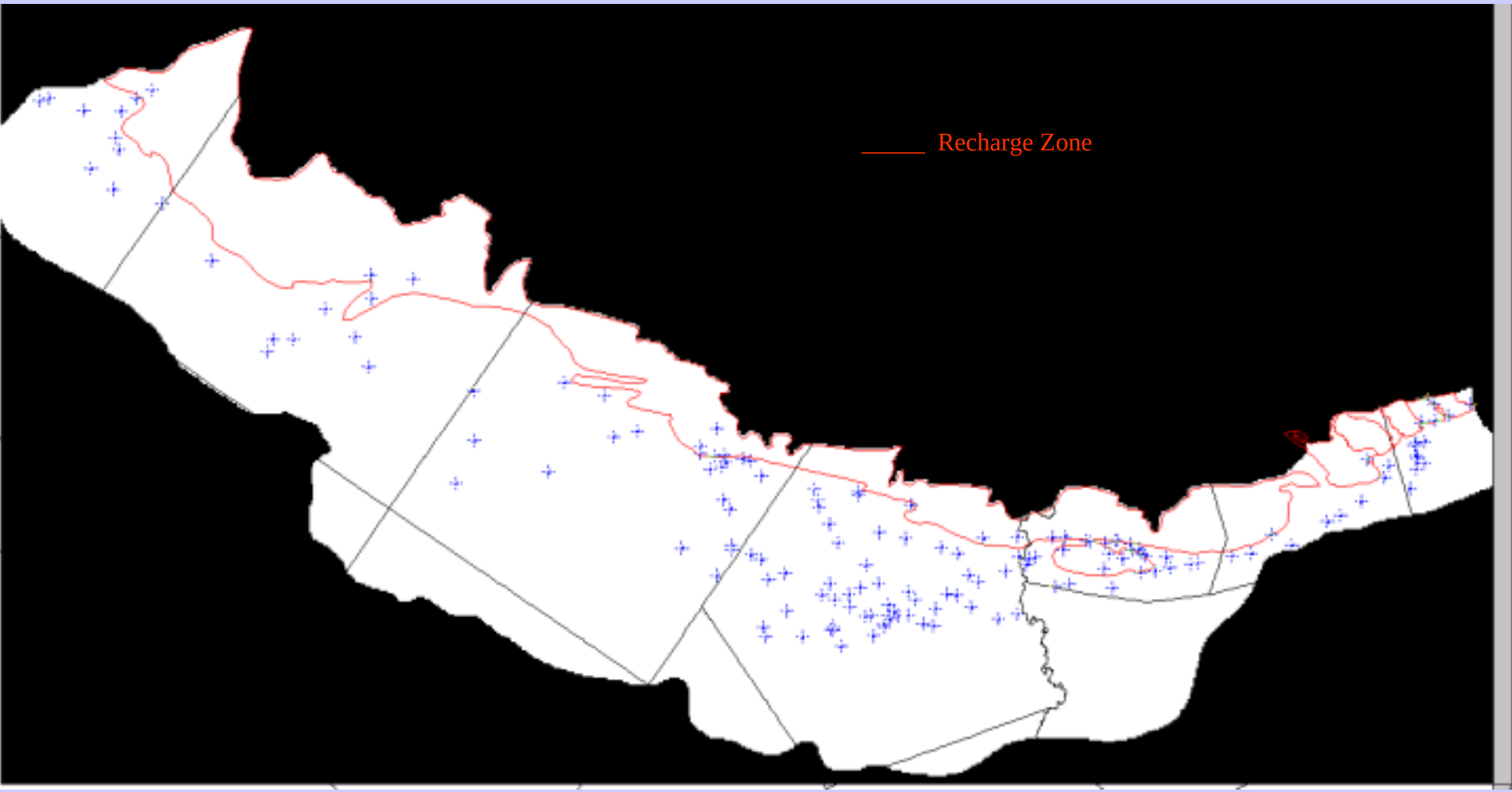
  - used middle 50% of measurements

  (3) Average of all measurements for 1939-46

  - Shortcoming: wells with only 1 or 2 measurements


Well #26 (Bexar County)
Water Level
690
685
680
675
670
665
660
1/1/39
7/1/39
1/1/40
7/1/40
1/1/41
7/1/41
1/1/42
7/1/42
1/1/43
7/1/43
1/1/44
7/1/44
1/1/45
7/1/45
1/1/46
7/1/46
1/1/47
Date
Well H-5-1 (Uvalde County)
Water Level
880
875
870
865
860
855
850
1/1/39
7/1/39
1/1/40
7/1/40
1/1/41
7/1/41
1/1/42
7/1/42
1/1/43
7/1/43
1/1/44
7/1/44
1/1/45
7/1/45
1/1/46
7/1/46
1/1/47
Date

STEADY-STATE TARGET WELLS



STEADY-STATE CALIBRATION TARGETS

- 5 springs simulated:

1939-46 FLOWS

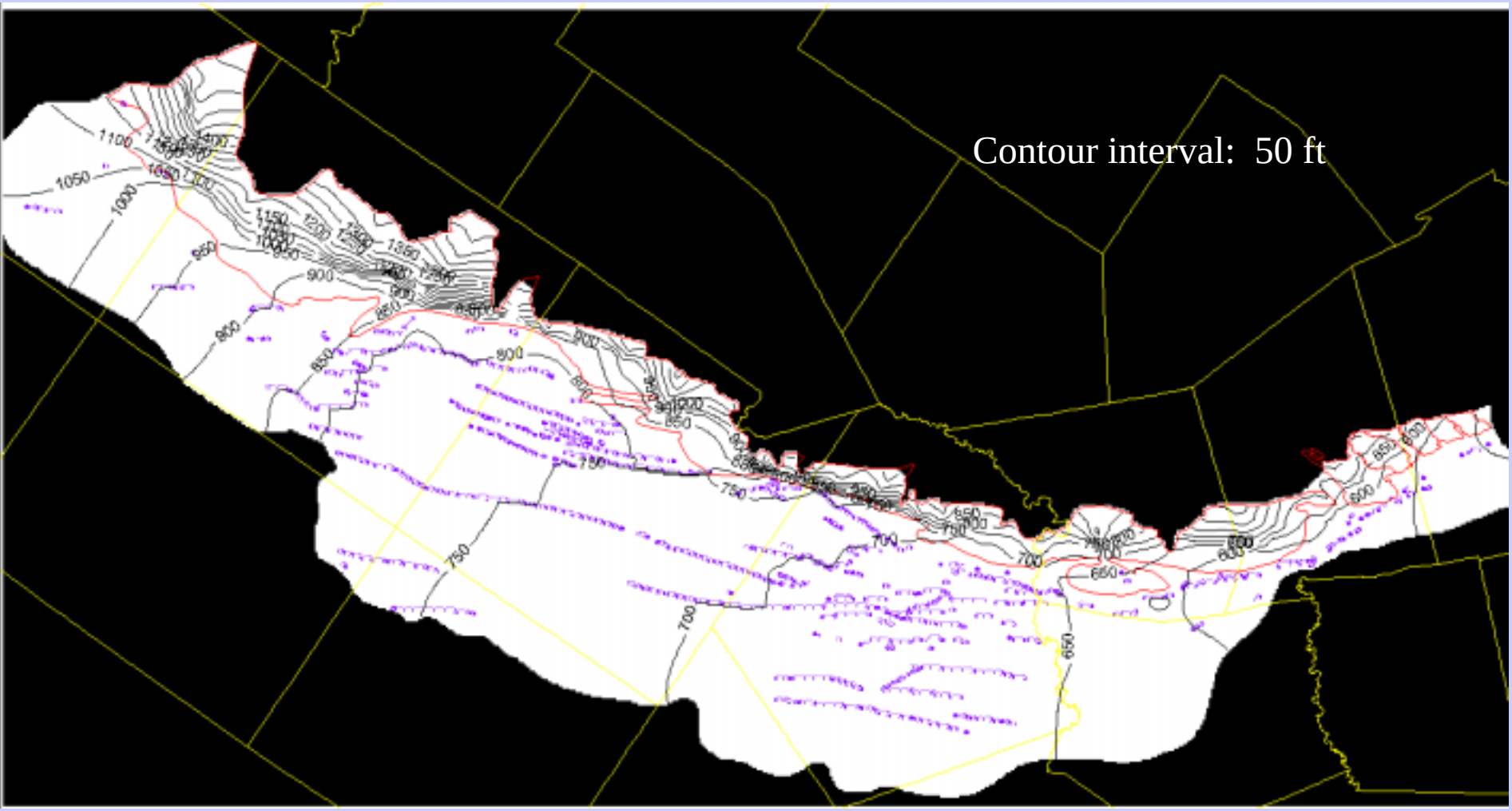
(in cfs)

	MEAN	MEDIAN
San Marcos	156	152
Comal	333	330
Leona	16.2	15.5
San Pedro	6.6	6.3
San Antonio	15.4	10.2

STEADY-STATE CALIBRATION RESULTS

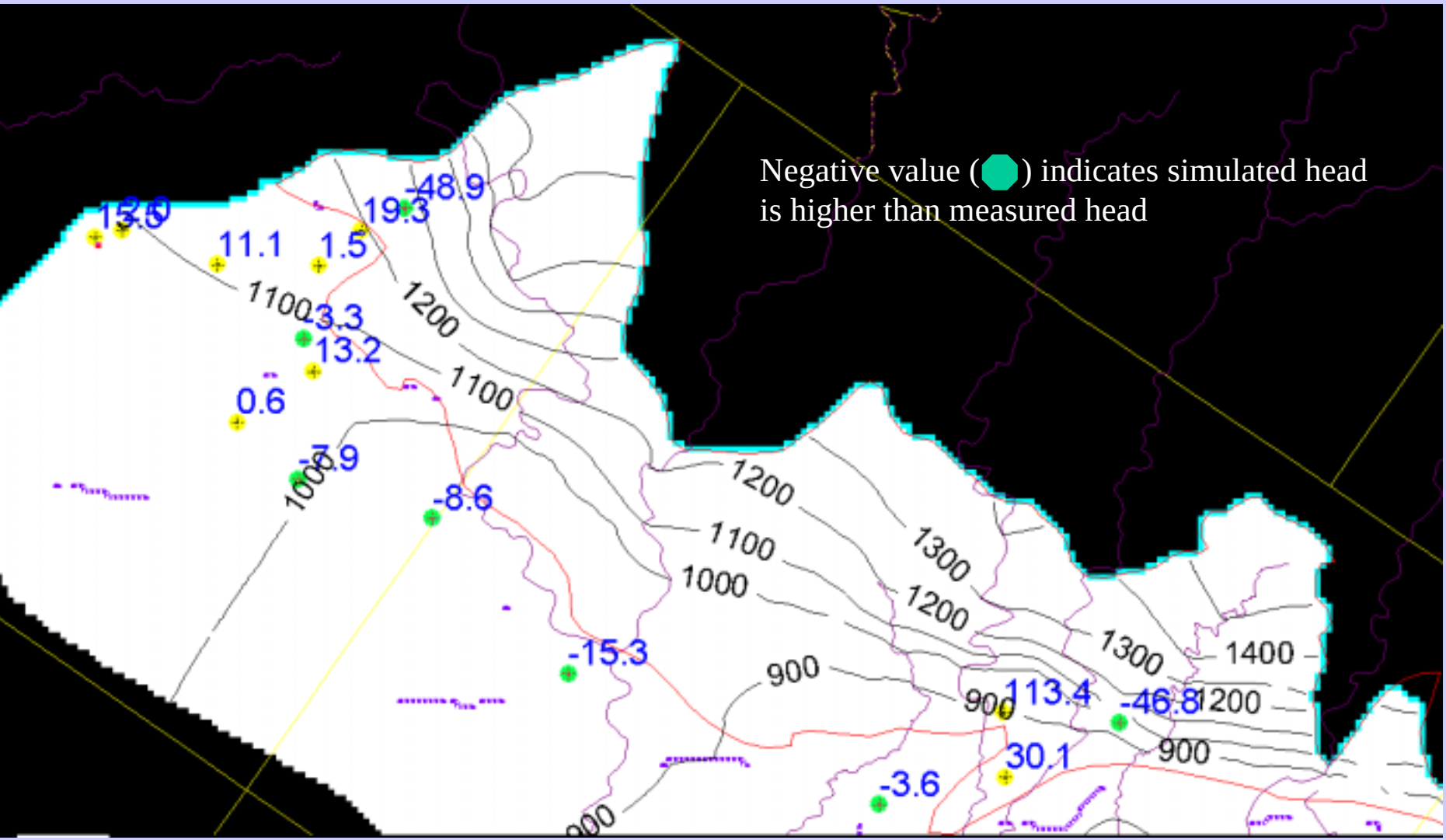
SIMULATED POTENTIOMETRIC SURFACE

(As of 02/21/02 – To be revised)



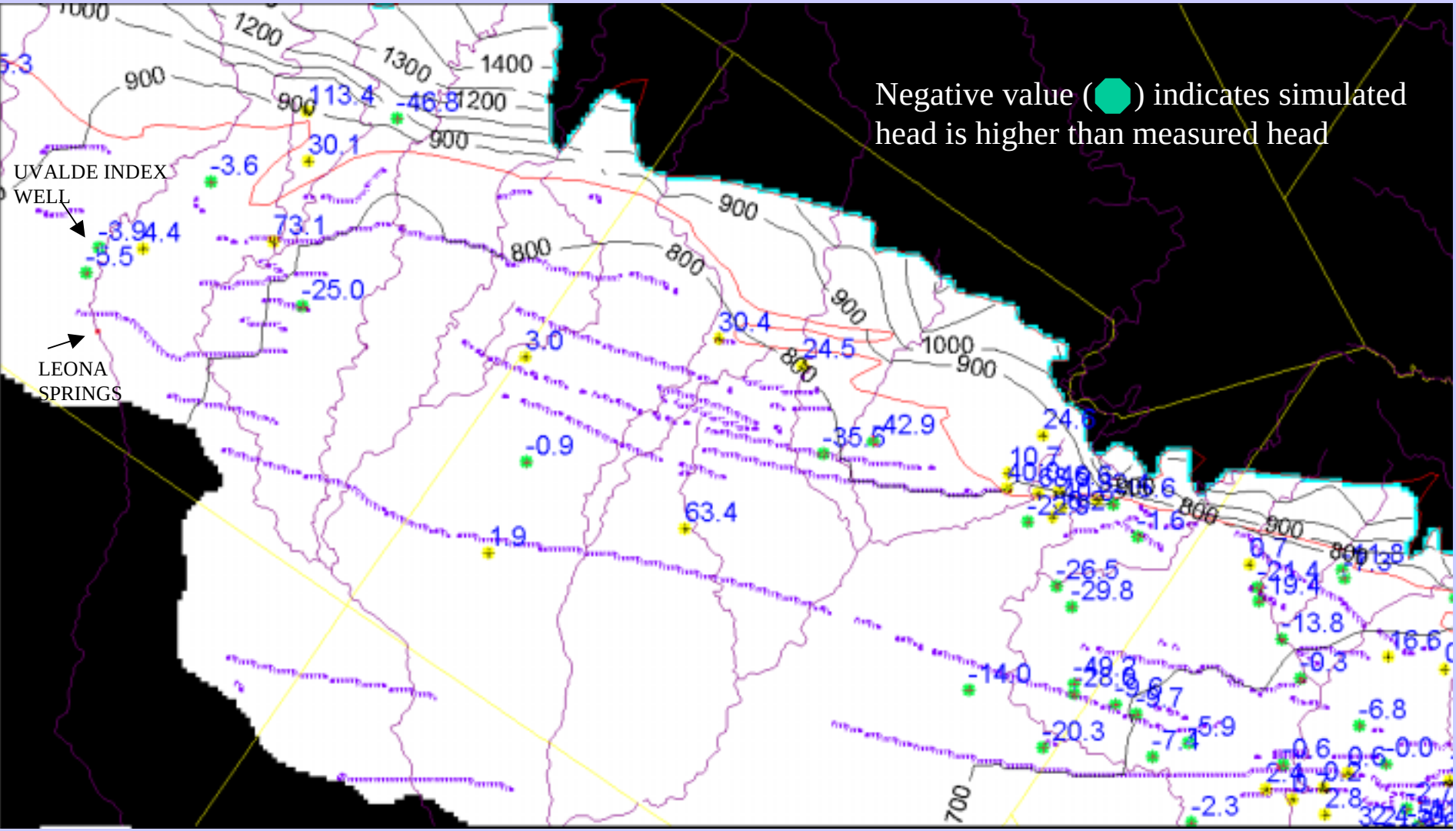
HYDRAULIC HEAD RESIDUALS

(As of 02/21/02 – To be revised)



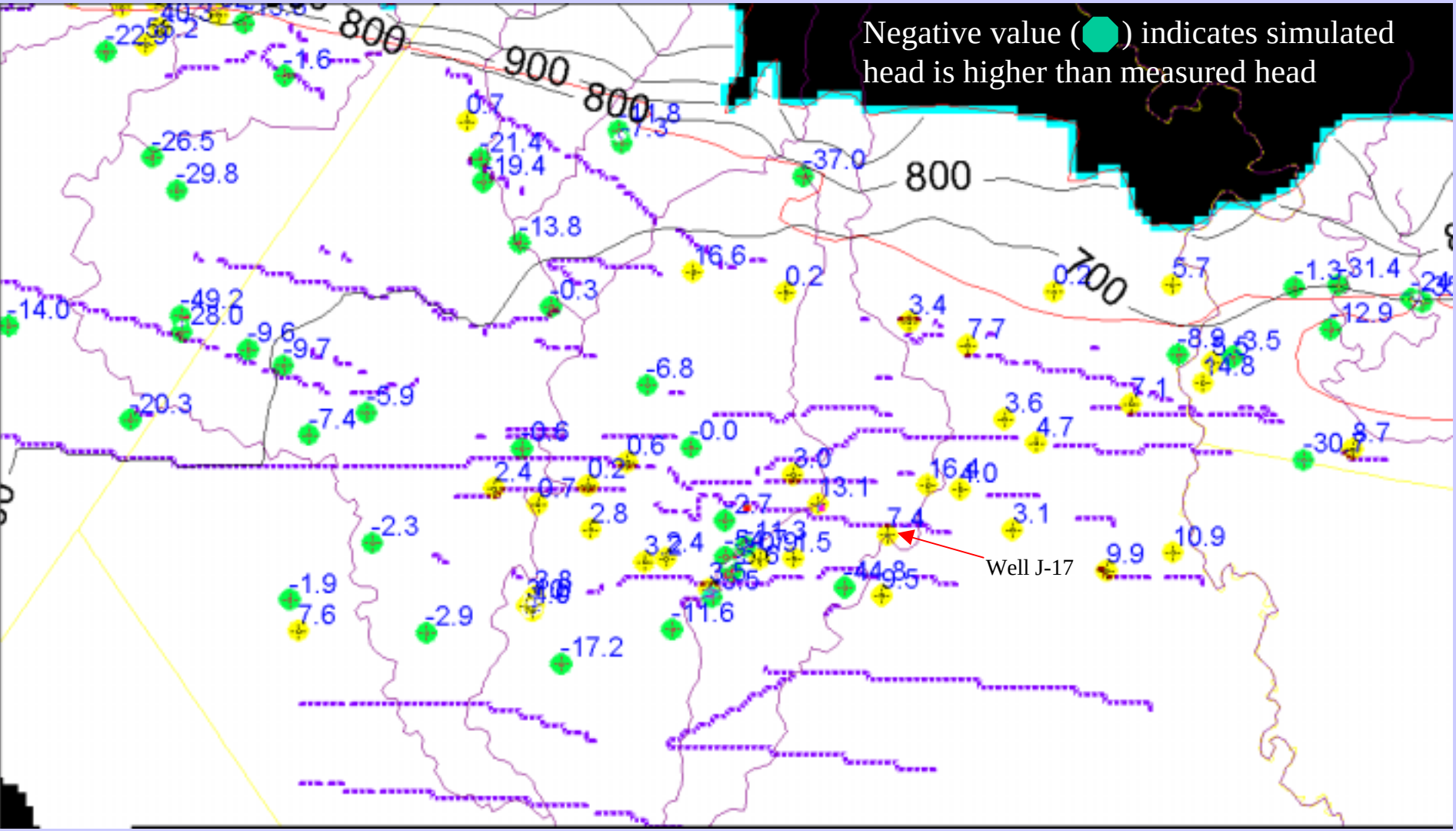
HYDRAULIC HEAD RESIDUALS

(As of 02/21/02 – To be revised)



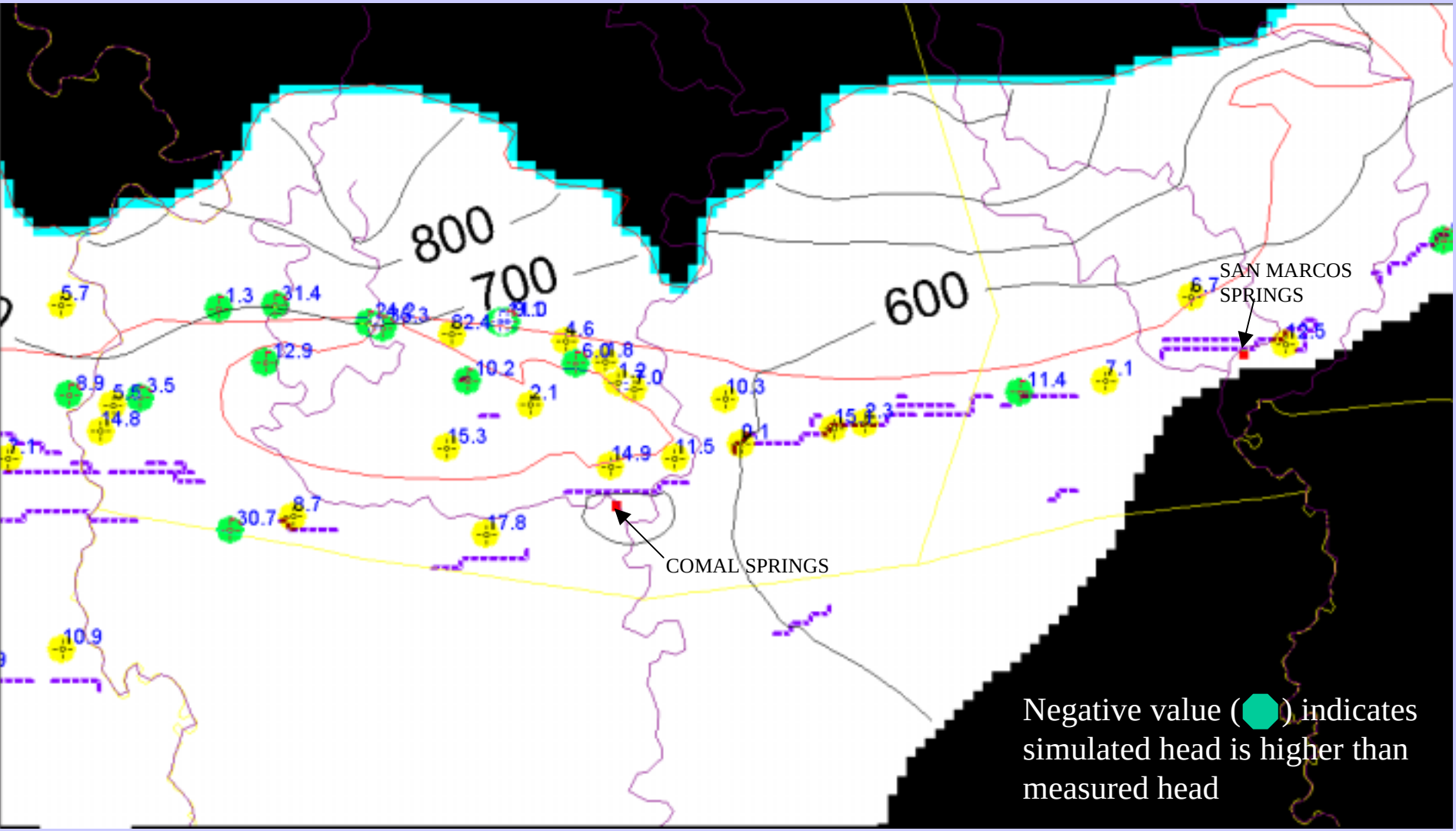
HYDRAULIC HEAD RESIDUALS

(As of 02/21/02 – To be revised)

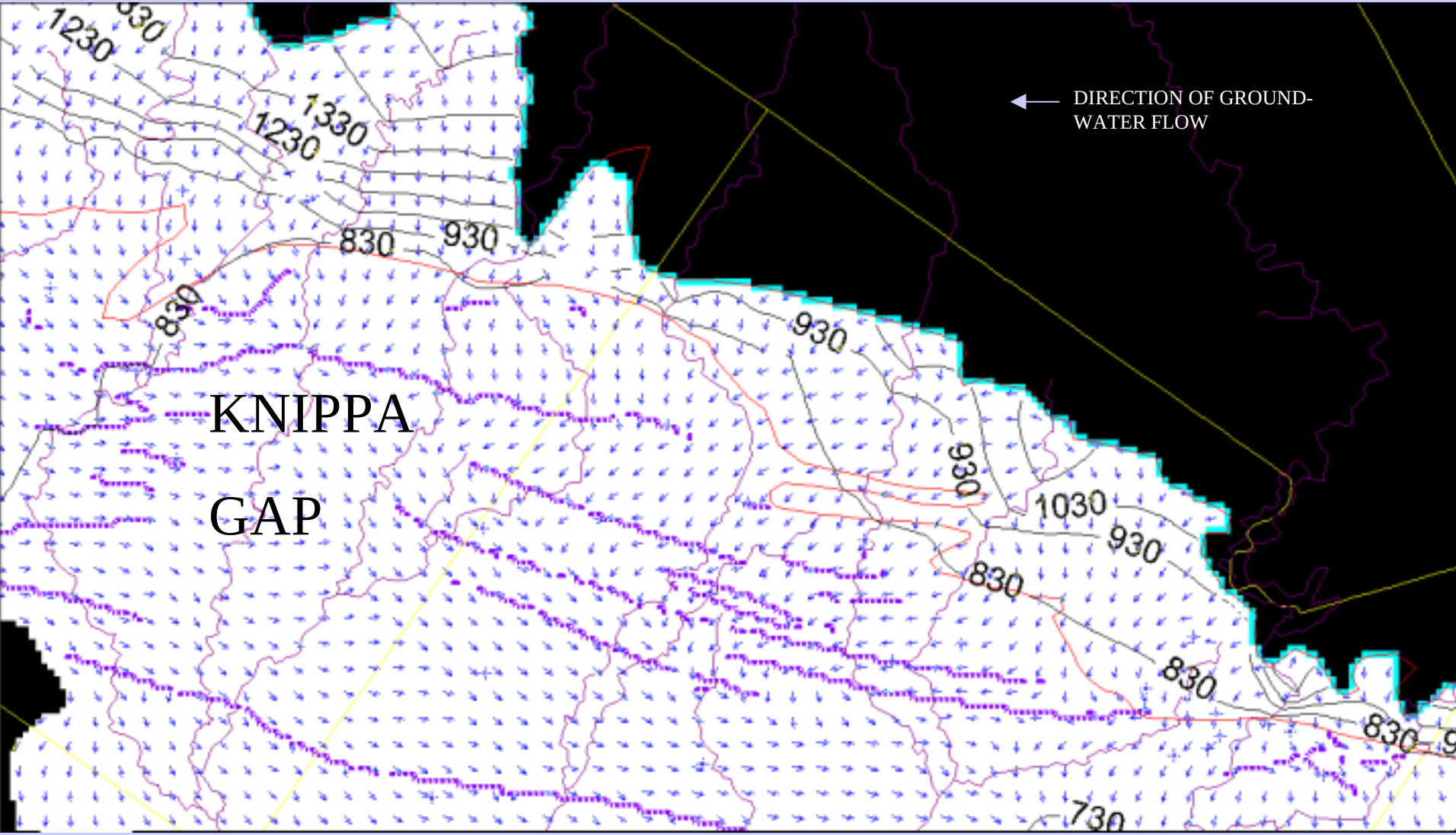


HYDRAULIC HEAD RESIDUALS

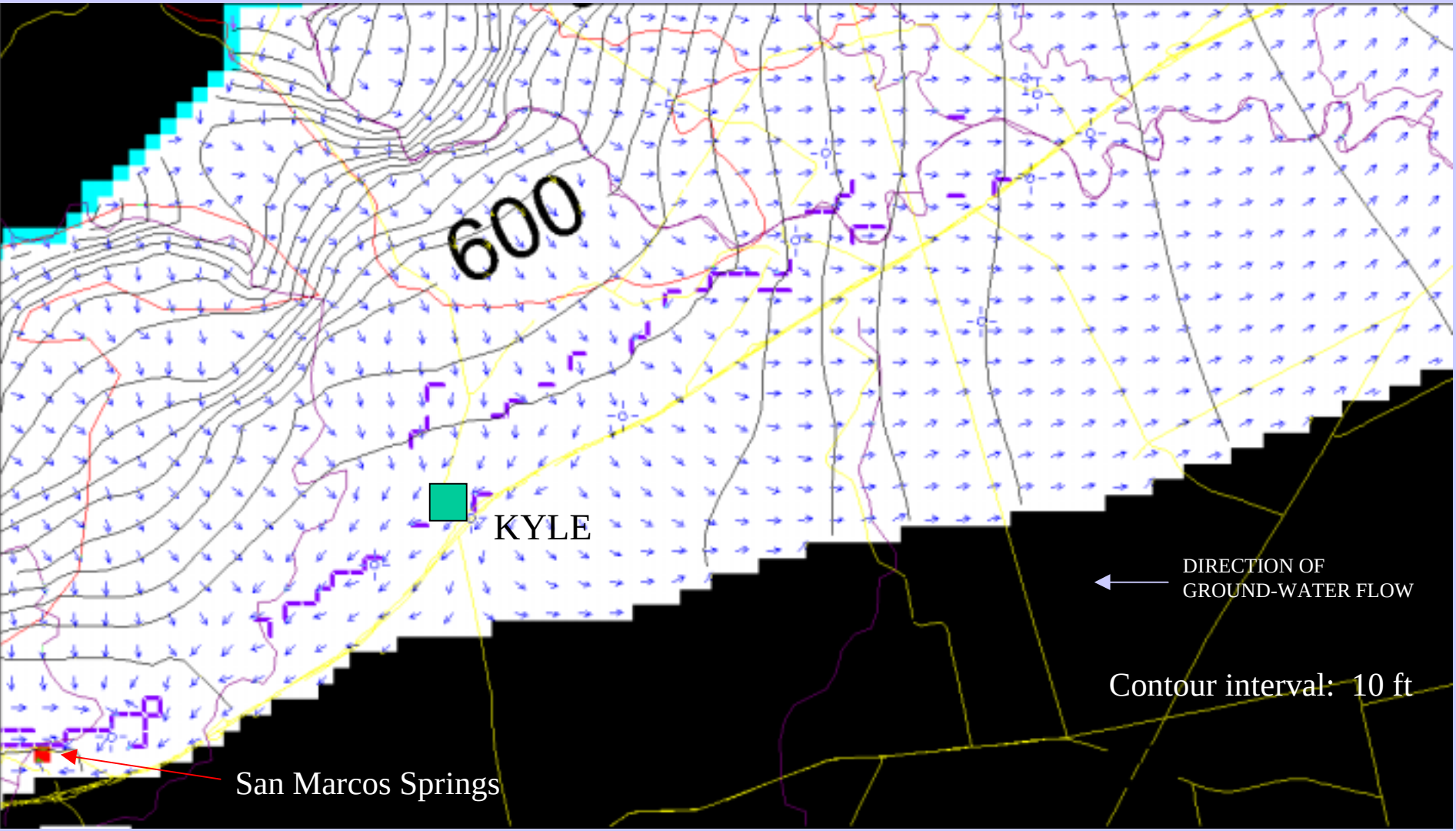
(As of 02/21/02 – To be revised)

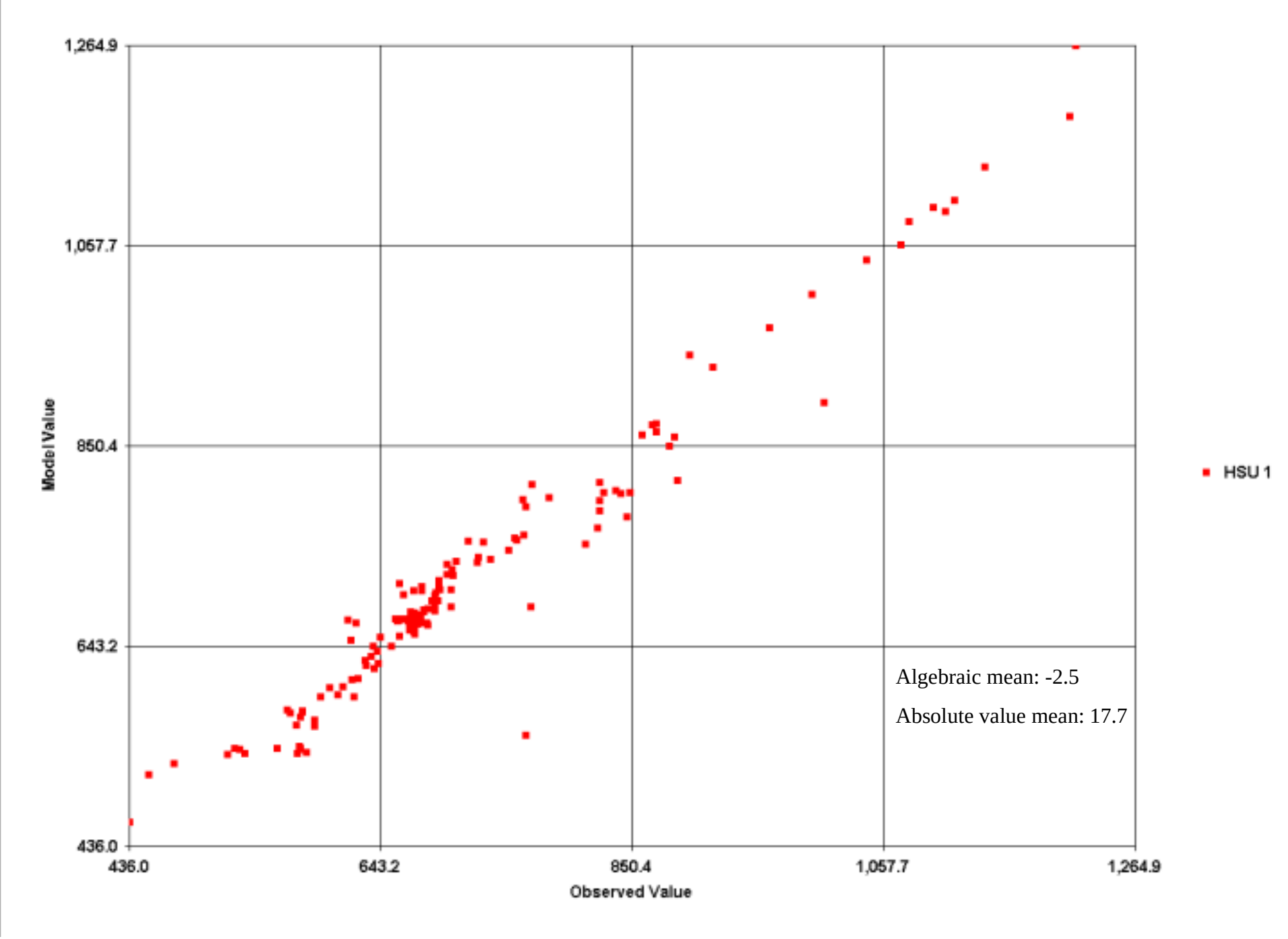


KNIPPA GAP AREA



GROUND-WATER DIVIDE NEAR KYLE




1,264.9
1,067.7
850.4
643.2
436.0
Model Value
436.0
643.2
850.4
1,057.7
1,264.9
Observed Value
HSU 1
Algebraic mean: -2.5
Absolute value mean: 17.7

STEADY-STATE CALIBRATION RESULTS SPRINGFLOW

- 5 springs simulated:

	Measured (cfs)	Simulated* (cfs)	Difference (percent)
San Marcos	152	142	6.6
Comal	330	347	5.2
Leona	15.5	18.4	18.7
San Pedro	6.3	10.6	68.3
San Antonio	10.2	11.9	16.7

*(As of 02/21/02– To be revised)

TRANSIENT DATA COMPILATION

TRANSIENT DATA COMPILATION MODEL INPUTS

- STORAGE COEFFICIENT/SPECIFIC YIELD

  (1) Maclay and Land (1988)

  - Confined zone of aquifer – $1x10^{-4}$
  - Unconfined zone of aquifer – 0.05
- RECHARGE
- PUMPAGE

TRANSIENT DATA COMPILATION MODEL INPUTS

- RECHARGE

  (1) San Antonio segment

  (a) USGS monthly recharge rates by basin

  (2) Barton springs segment

  (a) Scanlon and others (2000)

  (b) monthly recharge rates by basin

  - streamflow loss between gages = 85% of basin recharge

TRANSIENT DATA COMPILATION MODEL INPUTS

- STORAGE COEFFICIENT/SPECIFIC YIELD
- RECHARGE
- PUMPAGE
  - Data set being developed by BEG

TRANSIENT DATA COMPILATION CALIBRATION TARGETS

- HYDRAULIC HEADS
- SPRINGFLOW

TRANSIENT CALIBRATION TARGETS HYDRAULIC HEADS

- Calibration targets

(1) Long-term record wells

- County Index wells
- match hydrographs

(2) Selected time periods

- periods of above- and below-normal precipitation
- match hydraulic heads for a set of wells

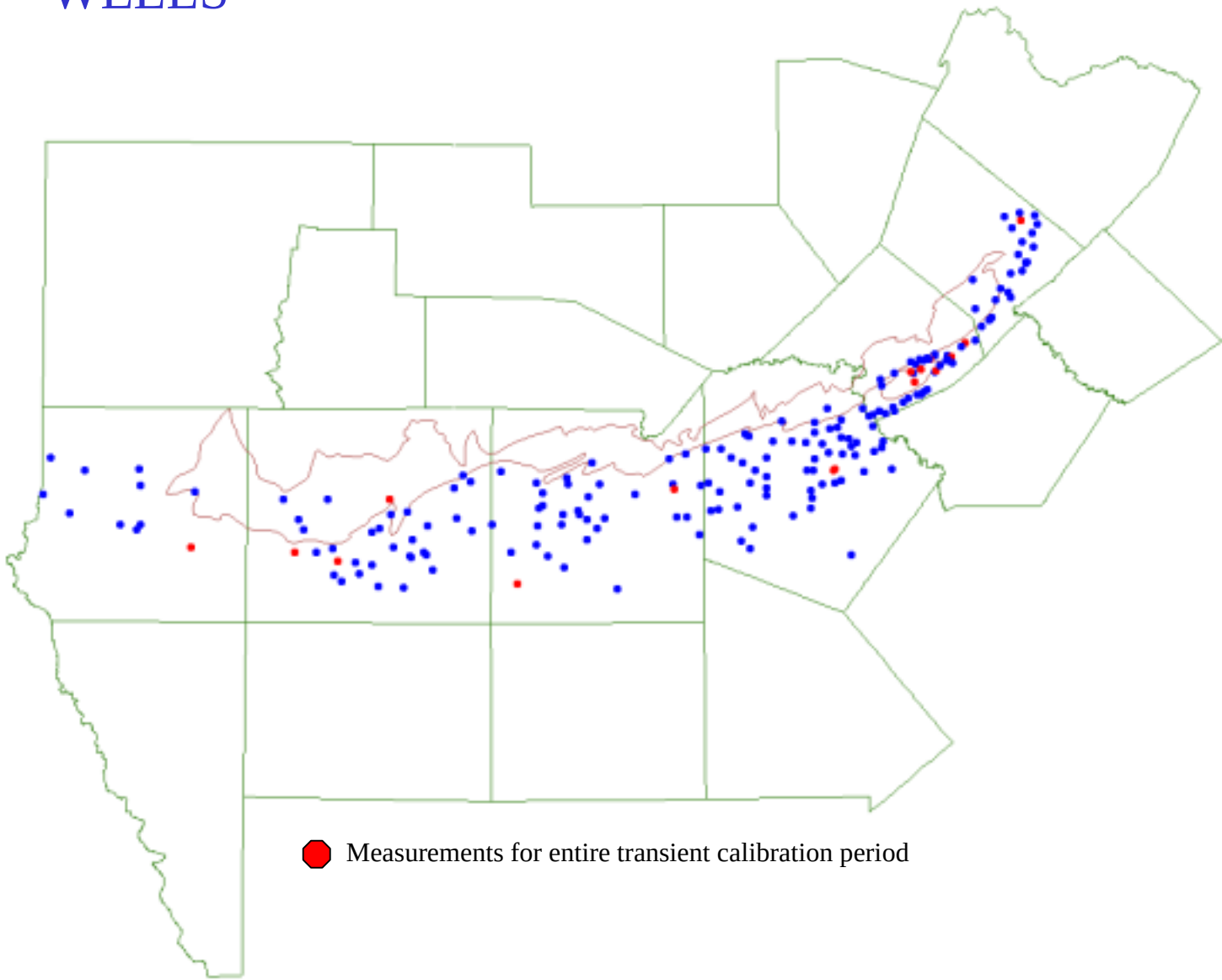
POTENTIAL HYDROGRAPH WELLS

	Wells (partial)	Wells (full)
Kinney	11	1
Uvalde	33	3
Medina	36	2
Bexar	61	1
Comal	40	7
Hays	26	1

Partial – measurements for at least a 10-year period

Full – measurements for entire transient calibration period

POTENTIAL HYDROGRAPH WELLS



TRANSIENT CALIBRATION TARGETS HYDRAULIC HEADS

- Selected time periods

  (1) Below-normal precipitation

  (a) 1952-57

  (b) 1982-84

  (2) Above-normal precipitation

  (a) 1973-77

  (b) 1990-94

TRANSIENT CALIBRATION TARGETS SPRINGFLOW

- 5 springs simulated:

San Marcos	compiled
Comal	compiled
Leona	compiled
San Pedro	compiled*
San Antonio	compiled*

*Based on relation with index well J-17

PROJECT SCHEDULE

• Develop conceptual model	June – Nov 2000
• Construct model	Dec 2000 – June 2001
• Steady-state calibration	July – Nov 2001
• Transient calibration and verification	*Dec 2001 – June 2002
• Report preparation	July – Nov 2002
• Draft report due	Dec 2002
• Final report due	July 2003