

# NEW MEXICO RURAL WATER ASSOCIATION

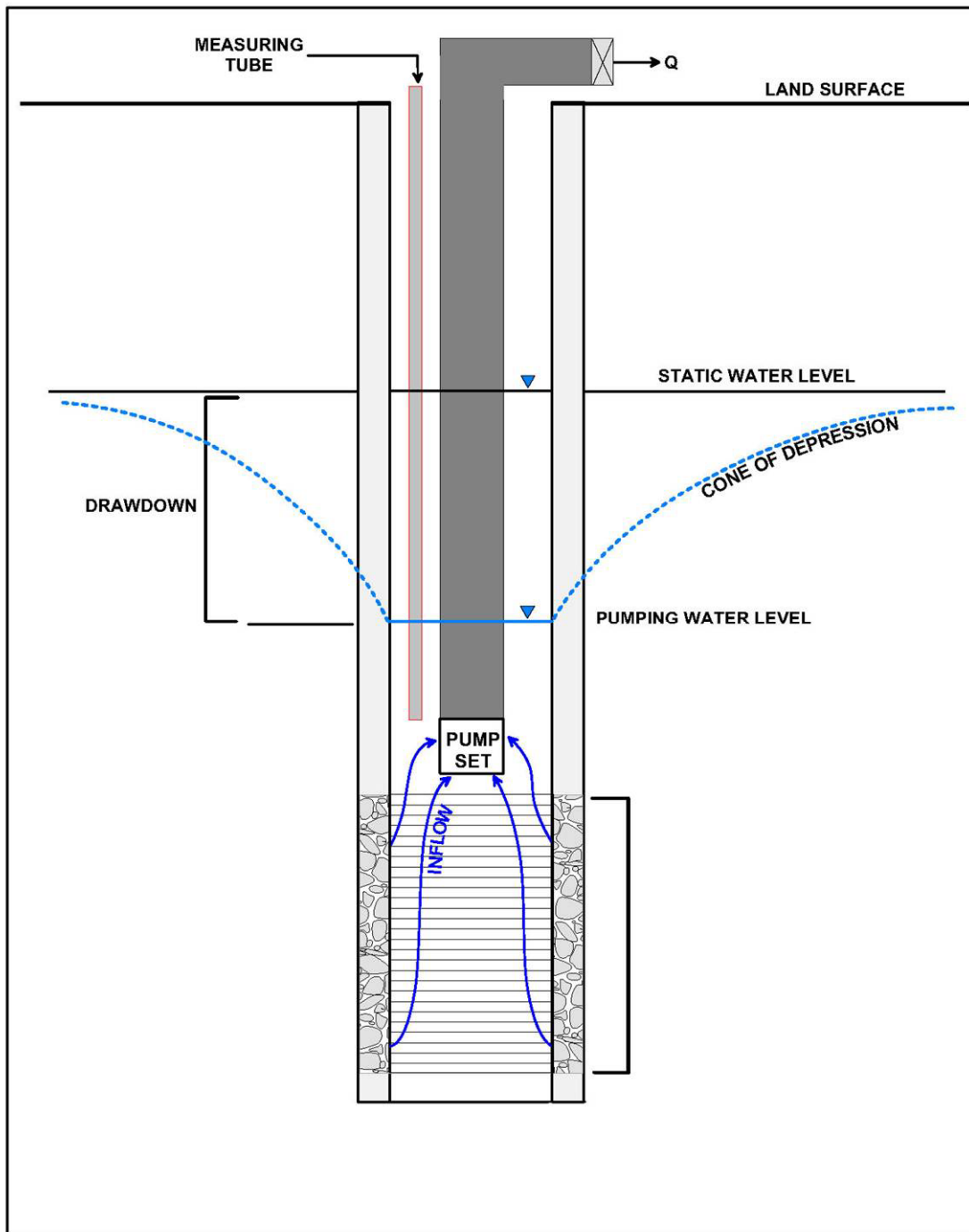
## *WELL AND AQUIFER PROBLEMS*

MARCH 22, 2005

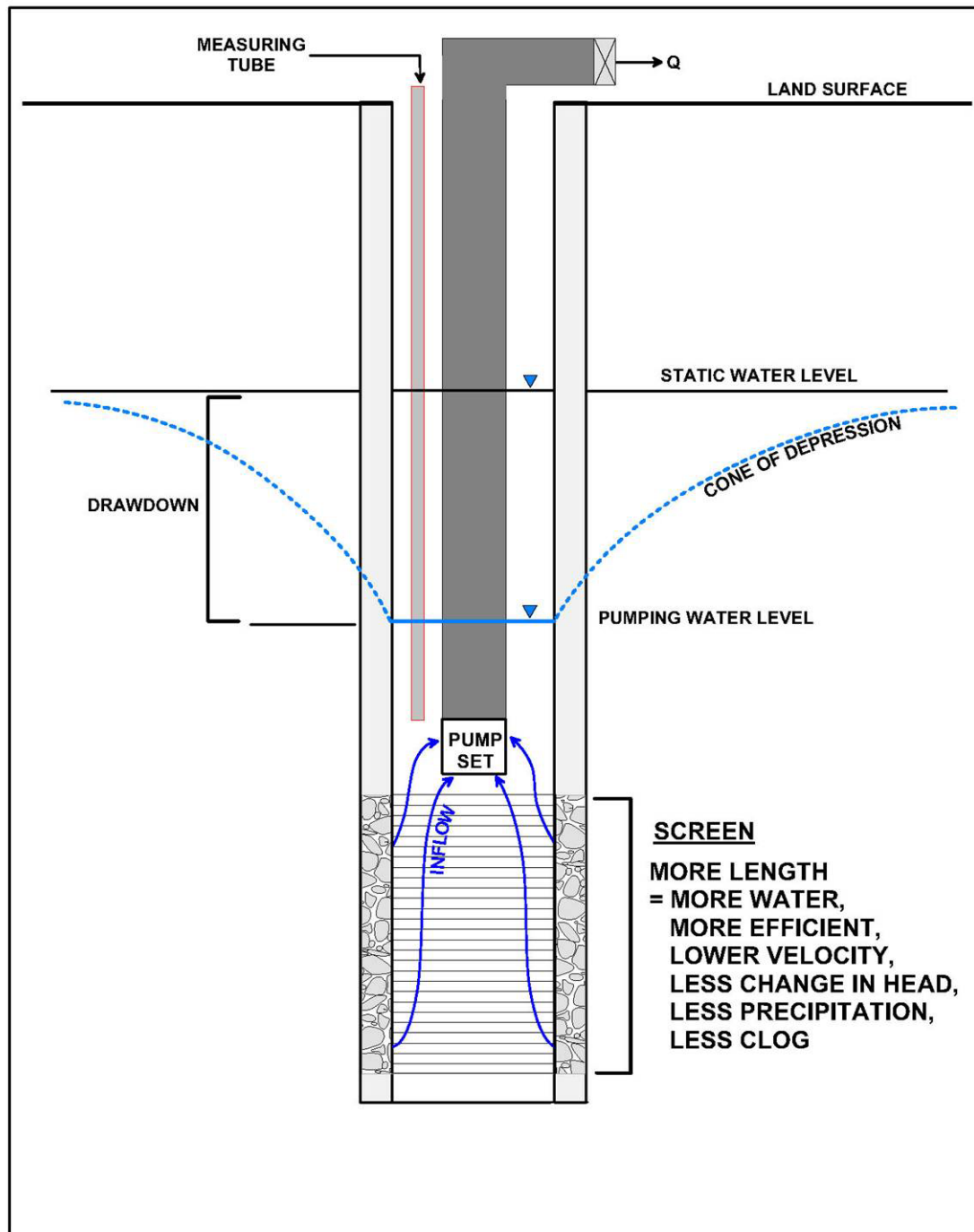


BALLEAU GROUNDWATER, INC.

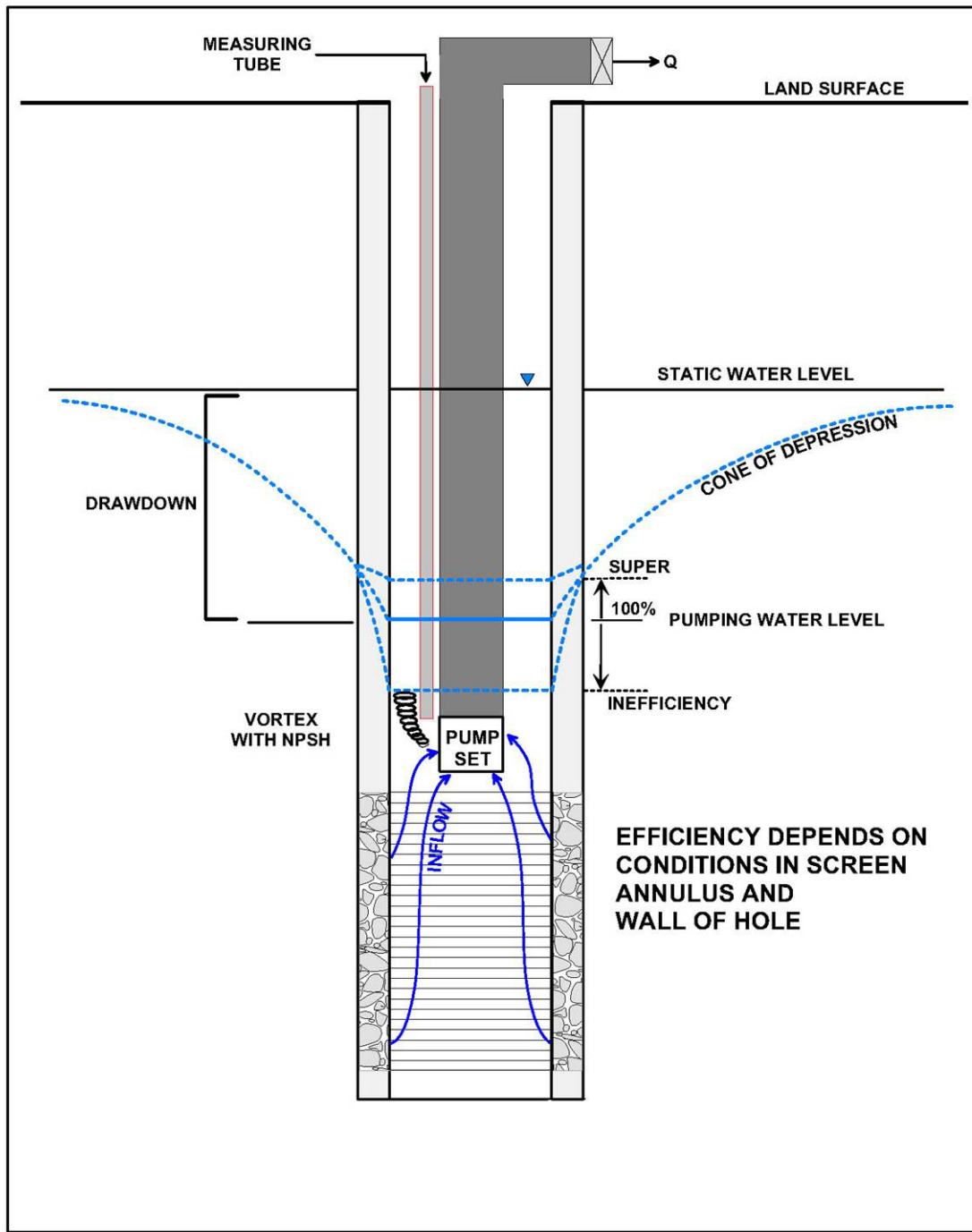
# WELL OPERATION



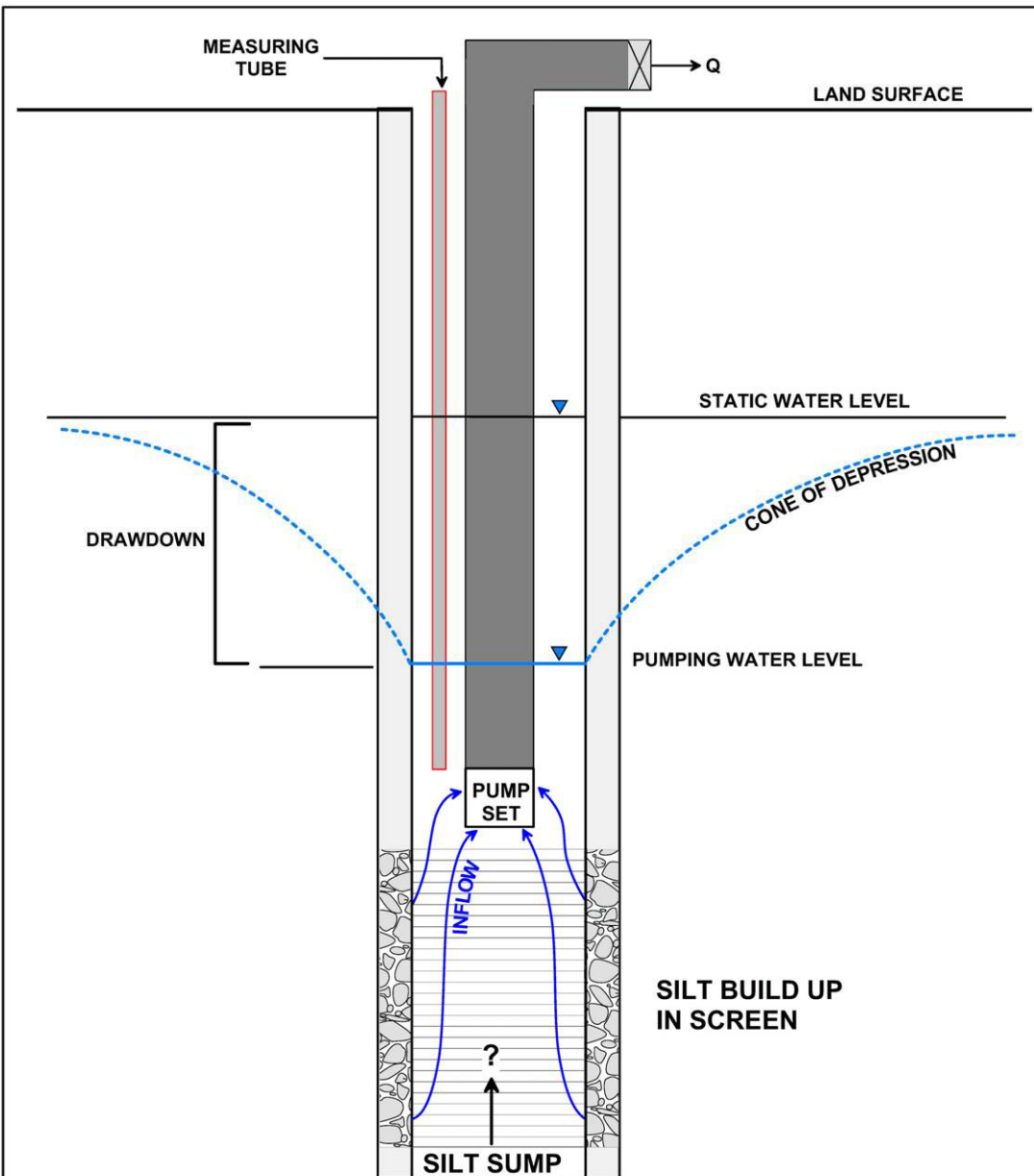
# LONG SCREEN

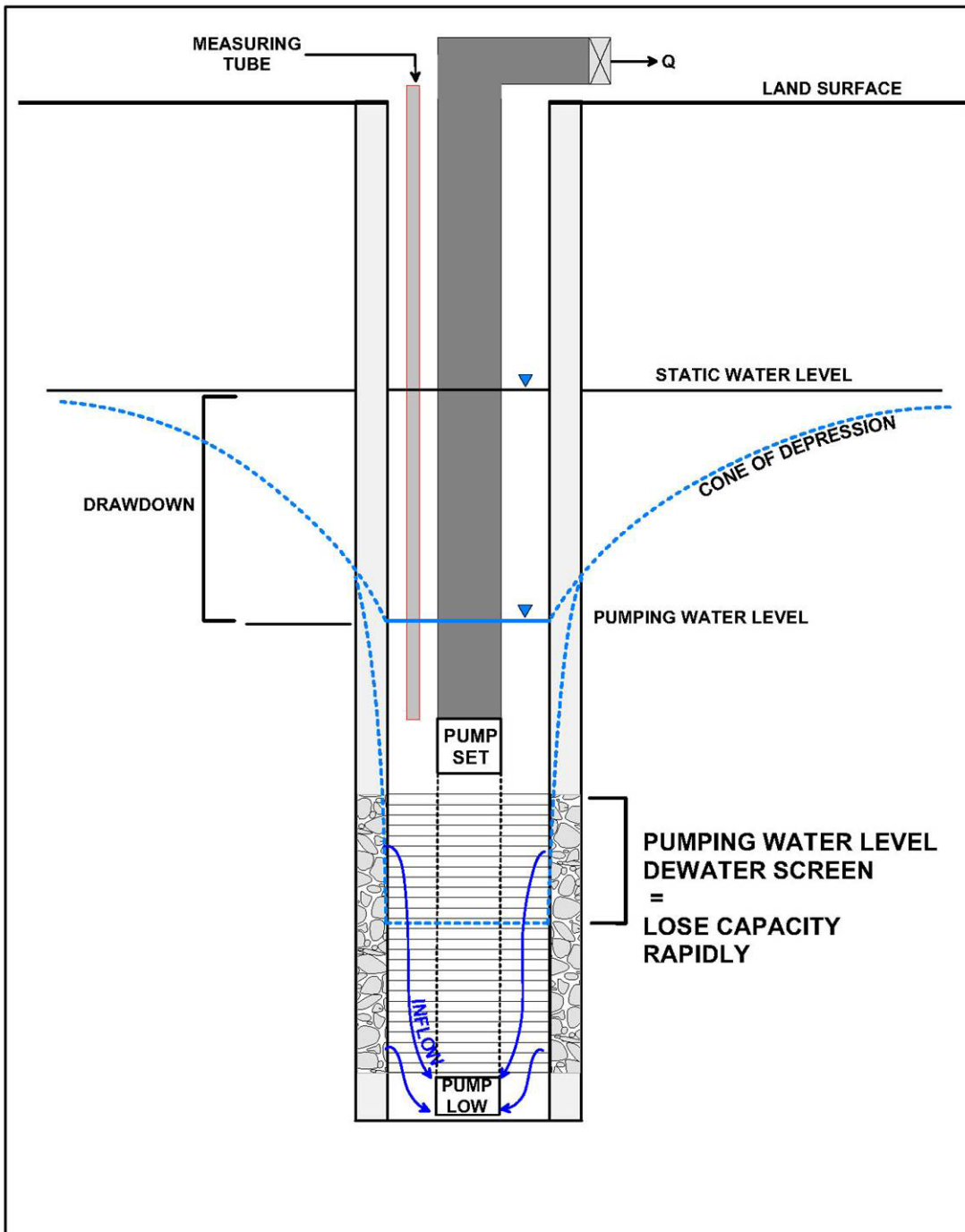


# EFFICIENCY



# SILT BUILD UP





# PUMP SETTING

# BASIC DATA

- Layout of well construction
- Screen top and bottom
- Pump setting
- Total depth
- Silt level
- Casing and screen material
- Gravel placement and gradation
- Screen slot type and size
- Video record

# TRACKING DATA

- Q
- Pumping water level
- Static water level (15-minute interval to monthly)
- $\Delta$  Static water level – pumping water level = drawdown in feet
- Specific capacity = gallons per minute/drawdown (ft)

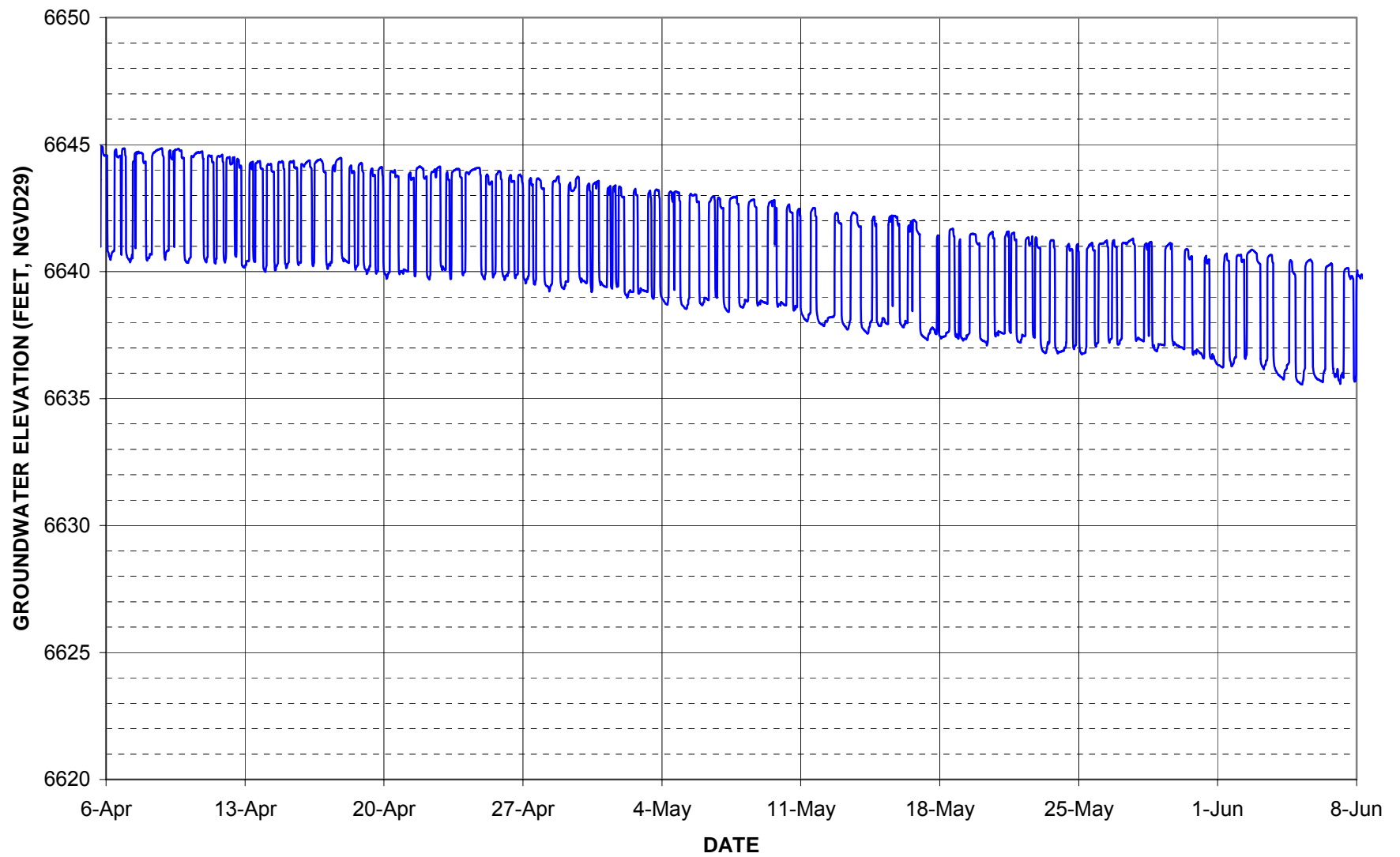
Reduction in specific capacity = problem

Reduction in static water level = aquifer problem

Reduction in pumping water level = well problem



### EXAMPLE 15 MINUTE DATA



# MANAGEMENT BY TREND ANALYSIS

SWL

SUSTAINABLE

PWL

Pump Setting

*No Change = No Problem*

REGIONAL TREND

*Change in SWL = Aquifer*

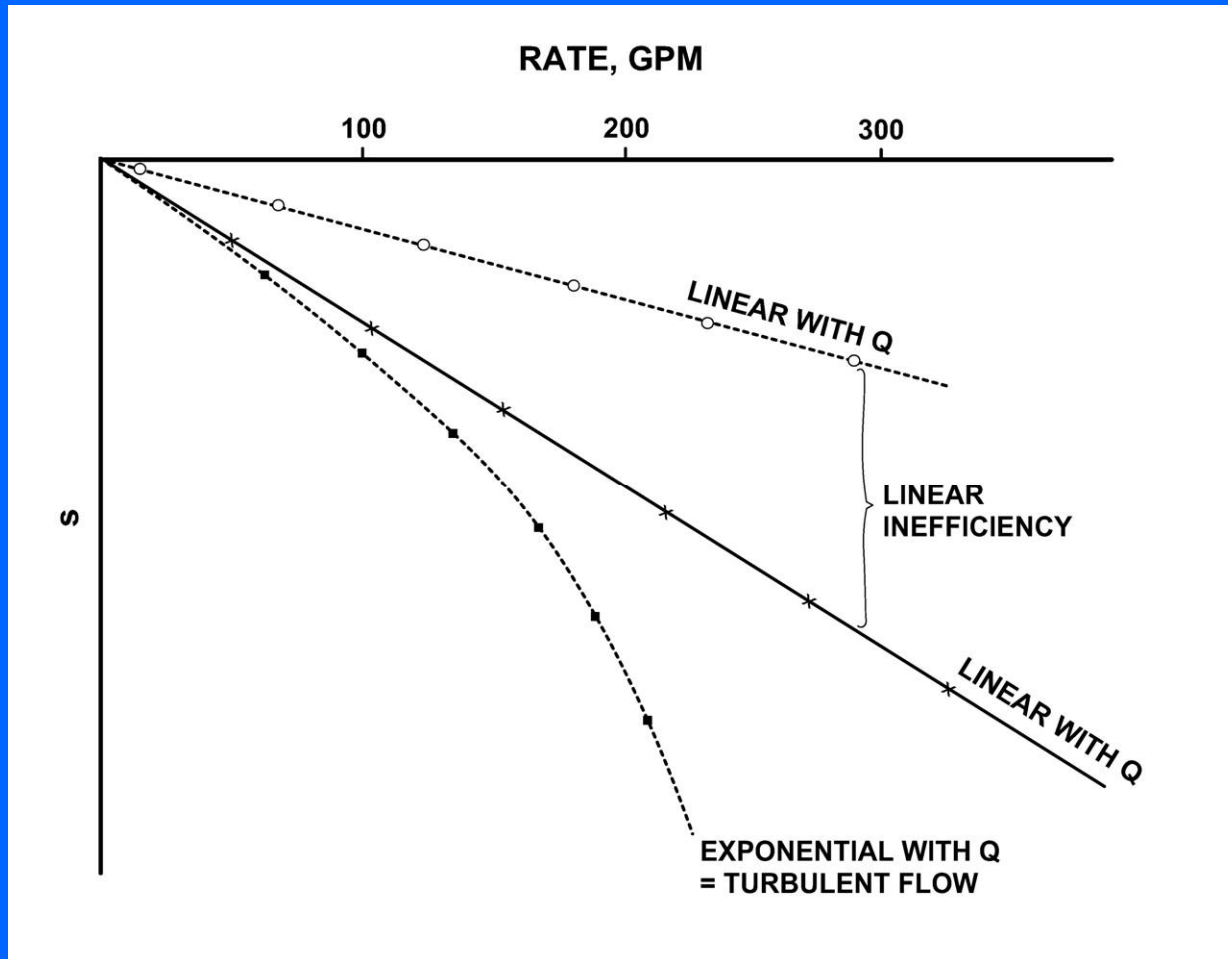
LOSE EFFICIENCY

*Change in PWL = Well*

DEWATER SCREEN, FRACTURE OR PWBS

*Abrupt Change*

# STEP TEST



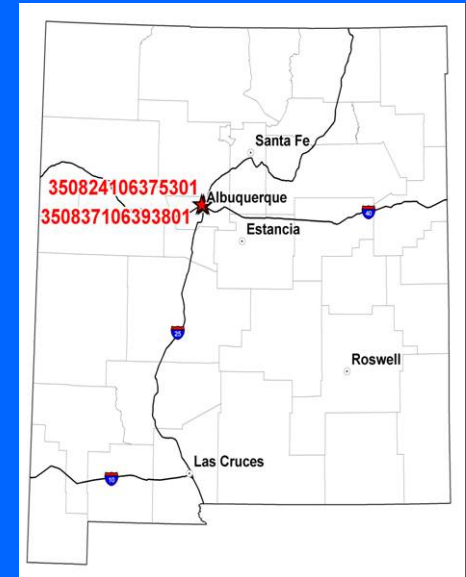
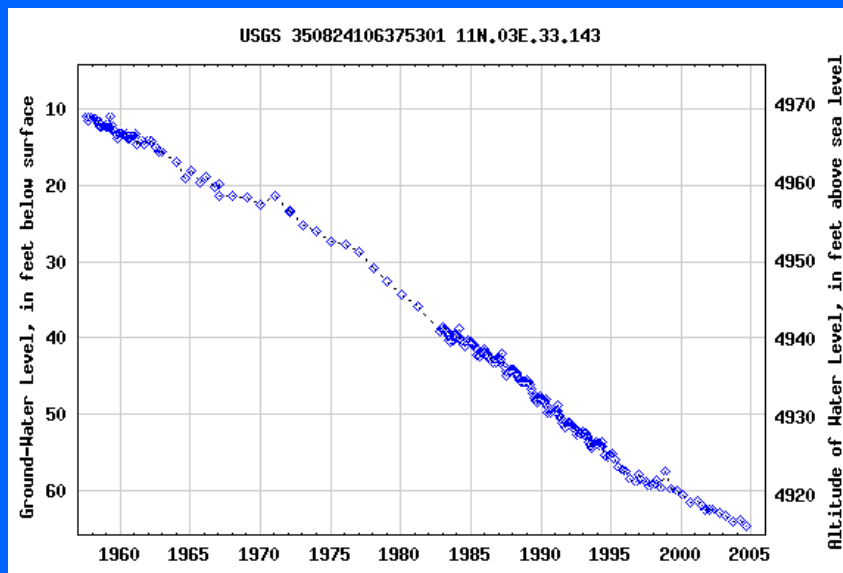
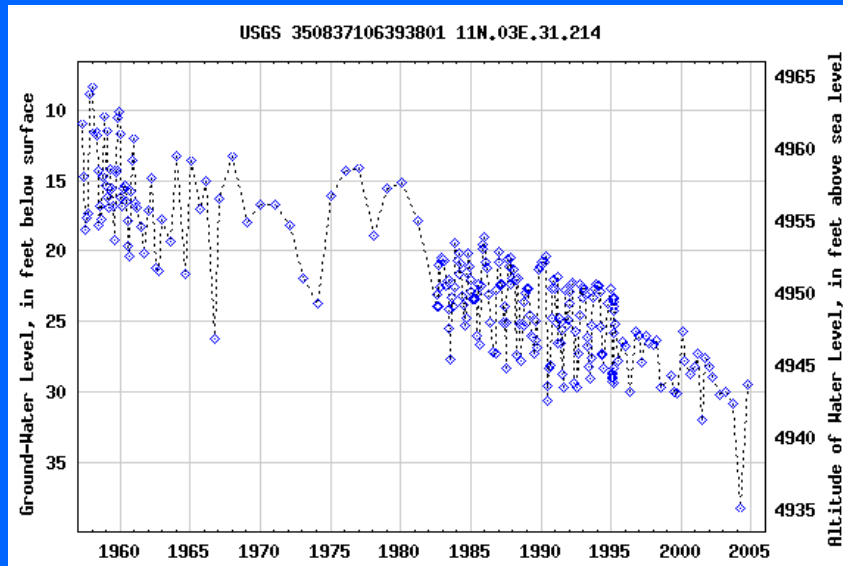
$$s = bQ + cQ^n \text{ (Jacob, 1947)}$$

- Not a Management Tool

# DECLINING YIELD

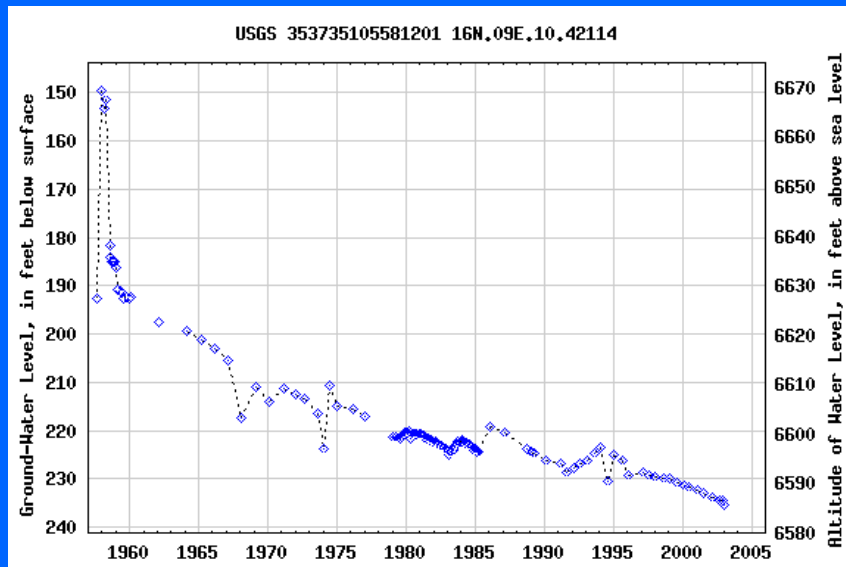
- Case-by-case
- Well: Shallow
  - Short screen
  - Open-area
  - Clogging
  - Encrustation
  - Bacteria
  - Silt up
  - Impeller wear
- Aquifer: Regional trends (0-2 ft/yr)
  - Drought allowance (10-30 ft)
  - Local interference
- Properly Constructed Well: 60 to 100 ft
  - Submergence of pumping water level

# REGIONAL TREND EXAMPLE

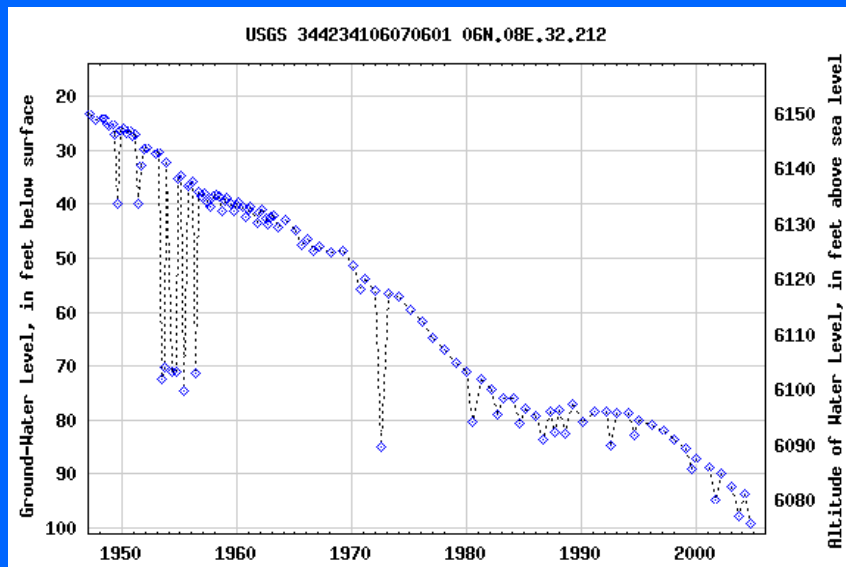
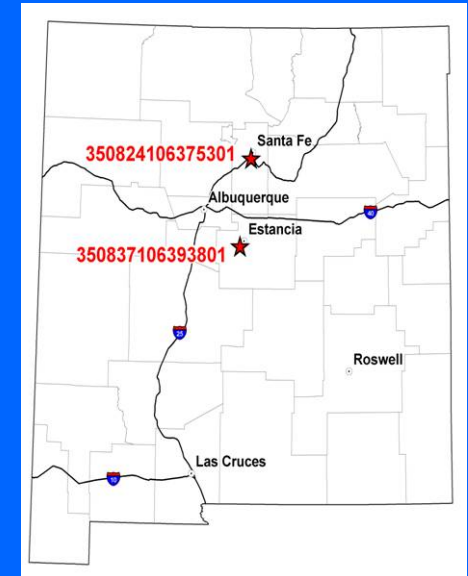


## ALBUQUERQUE

# REGIONAL TREND EXAMPLE

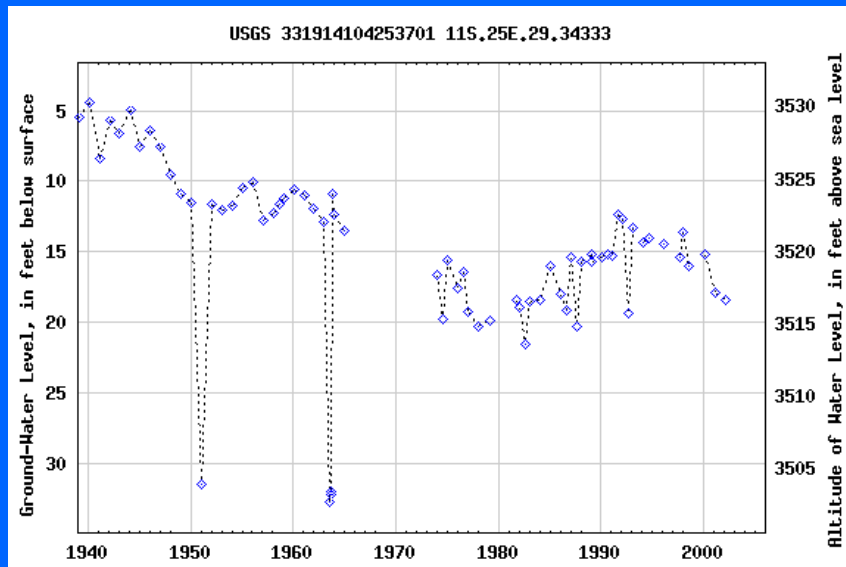


SANTA FE

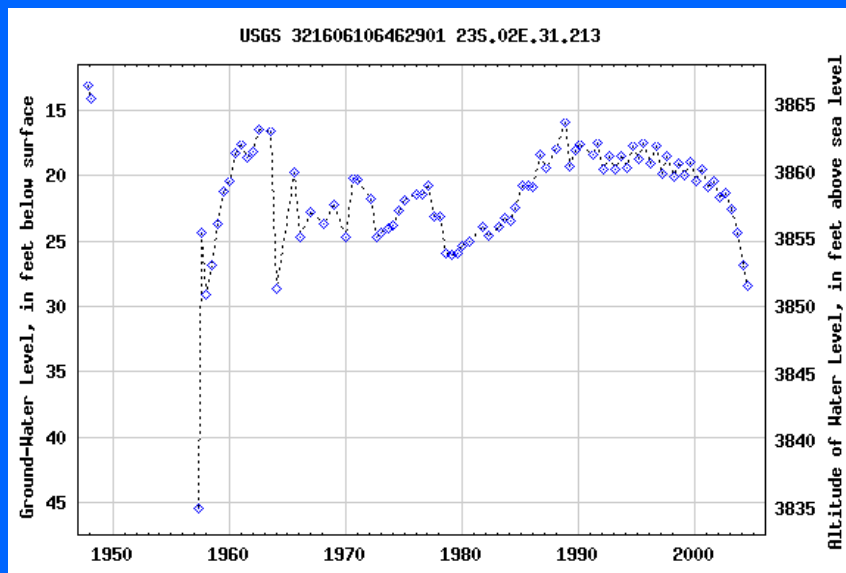
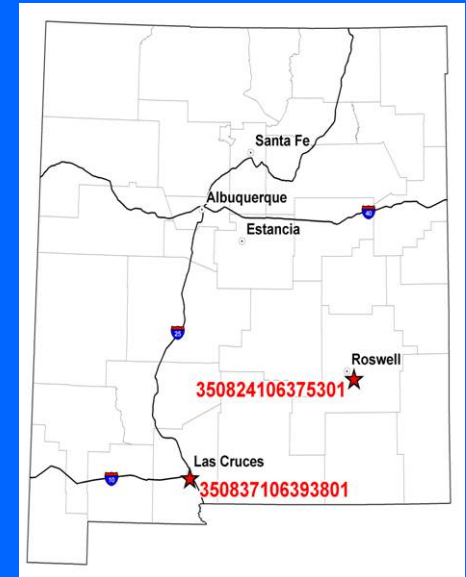


ESTANCIA

# REGIONAL TREND EXAMPLE

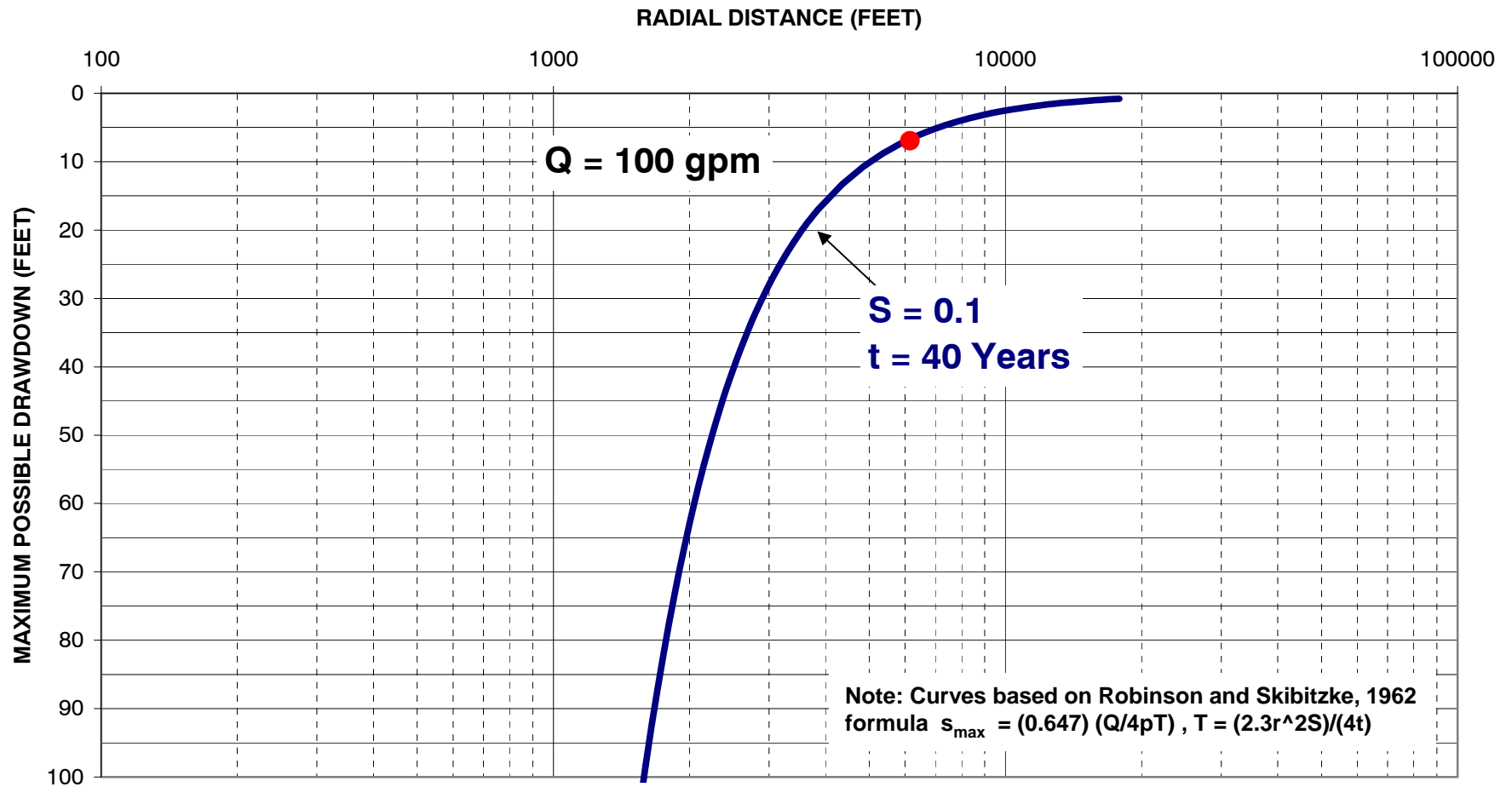


ROSWELL



LOWER RIO GRANDE

## MAXIMUM INTERFERENCE





# REDEVELOPMENT

- Hydraulic: Surge  
Jet  
Air-lift  
Hydro-frac  
Rawhide  
Explosive
- Chemical: Acid  
Chlorine
- Reconstruct

# DATA SHEETS, ASCE (1996)

## FORM 1 – WELL DATA SHEET

WELL NAME: \_\_\_\_\_

STATE PERMIT/DESIGNATION NO.: \_\_\_\_\_

WELL HEAD COORDINATES: \_\_\_\_\_

WELL HEAD GROUND ELEVATION: \_\_\_\_\_

WELL HEAD REFERENCE ELEVATION FOR MEASUREMENTS: \_\_\_\_\_

DATE DRILLING COMPLETED: \_\_\_\_\_

GRAVEL PACK INFORMATION: \_\_\_\_\_

COMPLETED STRING INFORMATION:

	<u>DIAMETER</u>	<u>DEPTH BELOW SURFACE</u>	<u>PLAIN PIPE, SCREEN OR PERFORATIONS</u>
SURFACE CASING:	_____	_____ FT TO _____ FT	_____
WELL CASING:	_____	_____ FT TO _____ FT	_____
	_____	_____ FT TO _____ FT	_____
	_____	_____ FT TO _____ FT	_____
	_____	_____ FT TO _____ FT	_____
	_____	_____ FT TO _____ FT	_____

SURFACE CASING MATERIAL: \_\_\_\_\_

WELL CASING MATERIAL: \_\_\_\_\_

SCREEN OR PERFORATION INFORMATION: \_\_\_\_\_

WELL HEAD CONFIGURATION:

SURFACE DISCHARGE HEADER:

BASE DIAMETER: \_\_\_\_\_ COLUMN DIAMETER: \_\_\_\_\_

MATERIAL: \_\_\_\_\_

DISCHARGE PIPE DIAMETER: \_\_\_\_\_

PITLESS ADAPTER:

DIAMETER: \_\_\_\_\_ DISCHARGE PIPE DIAMETER: \_\_\_\_\_ MATERIAL: \_\_\_\_\_

# DATA SHEETS, ASCE (1996)

## FORM 2 – EQUIPMENT DATA SHEET

WELL DESIGNATION: \_\_\_\_\_

DATE OF INSTALLATION: \_\_\_\_\_

### PUMP INFORMATION:

SERIAL NO.: \_\_\_\_\_

MODEL: \_\_\_\_\_

NO. OF STAGES: \_\_\_\_\_

MANUFACTURER: \_\_\_\_\_

PUMP INTAKE SETTING DEPTH: \_\_\_\_\_

PUMP RPM: \_\_\_\_\_

SUBMERGENCE REQUIREMENT: \_\_\_\_\_

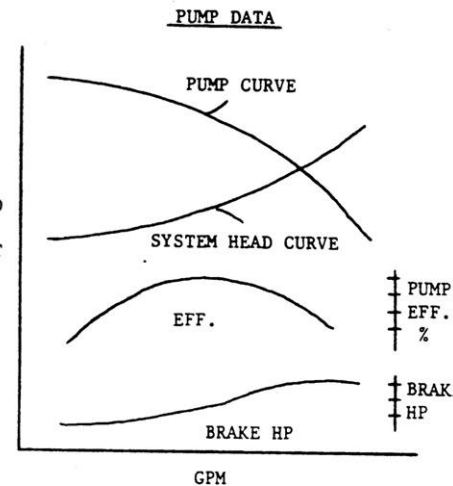
IF VERTICAL TURBINE

OIL OR WATER LUBRICATED

DIAMETER: \_\_\_\_\_ LENGTH: \_\_\_\_\_

WEIGHT: \_\_\_\_\_

HEAD  
IN  
FEET



### MOTOR INFORMATION:

SUBMERSIBLE OR SURFACE MOTOR

SERIAL NO. \_\_\_\_\_ MODEL: \_\_\_\_\_

H.P.: \_\_\_\_\_ NAMEPLATE AMPERAGE: \_\_\_\_\_

MANUFACTURER: \_\_\_\_\_ NO. OF PHASES: \_\_\_\_\_

FREQUENCY: \_\_\_\_\_ RPM: \_\_\_\_\_ POWER FACTOR: \_\_\_\_\_

DIAMETER: \_\_\_\_\_ LENGTH: \_\_\_\_\_ WEIGHT: \_\_\_\_\_

### DROP PIPE:

MATERIAL: \_\_\_\_\_ JOINT LENGTH: \_\_\_\_\_ SIZE: \_\_\_\_\_ THREAD: \_\_\_\_\_

### CABLE (SUBMERSIBLE MOTORS):

SIZE: \_\_\_\_\_ VOLTAGE: \_\_\_\_\_

### WATER LEVEL SENSOR:

AIRLINE MATERIAL/DIAMETER: \_\_\_\_\_ SETTING DEPTH: \_\_\_\_\_

DOWNHOLE TRANSDUCER TYPE: \_\_\_\_\_ SETTING DEPTH: \_\_\_\_\_

DOWNHOLE CHECK AND/OR DRAIN VALVES: \_\_\_\_\_

# DATA SHEETS, ASCE (1996)

## FORM 3 – PUMP STARTUP / TEST DATA

WELL DESIGNATION: \_\_\_\_\_ PUMP: \_\_\_\_\_  
 TEST DATA: \_\_\_\_\_ MOTOR: \_\_\_\_\_  
 STATIC WATER LEVEL: \_\_\_\_\_ (MEASURE BEFORE STARTUP)  
 LENGTH OF DROP PIPE: \_\_\_\_\_ C FACTOR USED: \_\_\_\_\_  
 SURFACE VOLTAGE: a/b) \_\_\_\_\_ a/c) \_\_\_\_\_ b/c) \_\_\_\_\_  
 SURFACE AMPERAGE: a/b) \_\_\_\_\_ a/c) \_\_\_\_\_ b/c) \_\_\_\_\_  
 WATER QUALITY RESULTS OF INTEREST: \_\_\_\_\_  
 TIME AFTER TEST STARTED AND PUMPING RATE WHEN  
 WATER SAMPLE WAS TAKEN: \_\_\_\_\_

	TEST 1	TEST 2	TEST 3	TEST 4
TEST VALUES:				
DATE				
PUMPING RATE (GPM)				
HOURS OF TEST				
TYPE OF TEST				
DRAWDOWN WATER LEVEL				
SURFACE AMPS				
SURFACE VOLTS				
SURFACE PSI (FT)				
SAND (PPM)				
SELECTED W.Q. PARAM.				
ESTIMATED VALUES:				
MINOR LOSSES (FT)				
DROP PIPE H.L.				
CALCULATED VALUES:				
SPECIFIC CAPACITY				
TDH				
SYSTEM EFFICIENCY				

# NEW MEXICO RURAL WATER ASSOCIATION

## *SUBDIVISION WATER AVAILABILITY*

MARCH 22, 2005



BALLEAU GROUNDWATER, INC.

## 47-6-9 SUBDIVISION REGULATION: COUNTY AUTHORITY

- "A. The board of county commissioners of each county shall regulate *subdivisions* within the county's boundaries. In regulating *subdivisions*, the board of county commissioners of each county shall adopt regulations setting forth the county's requirements for:
- (2) Quantifying the maximum *annual water requirements of subdivisions*, including water for indoor and outdoor domestic uses;
  - (3) *Assessing water availability* to meet the maximum annual water requirements of *subdivisions*;
  - (4) Water conservation measures;"

## 47-6-11 PRELIMINARY PLAT APPROVAL; SUMMARY REVIEW

- "F. The board of county commissioners shall, within ten days after the preliminary plat is deemed complete, *require opinions from:*
- (1) *The state engineer to determine:*
    - (a) *Whether the subdivider can furnish water sufficient in quantity to fulfill the maximum annual water requirements of the subdivision, including water for indoor and outdoor domestic uses; and*
    - (b) *Whether the subdivider can fulfill the proposals in his disclosure statement concerning water, excepting water quality;*
- H. If, in the opinion of the appropriate public agency, a subdivider cannot fulfill the requirements of Subsection F of this section, or if the appropriate public agency does not have sufficient information upon which to base an opinion on any one of these subjects, the subdivider shall be notified of this fact by the board of county commissioners, and the procedure set out below shall be followed:
- (1) If the appropriate public agency has rendered an adverse opinion, the board of county commissioners shall give the subdivider a copy of the opinion;
  - (2) The subdivider shall be given thirty days from the date of notification to submit additional information to the public agency through the board of county commissioners; and
  - (3) The public agency shall have thirty days from the date the subdivider submits additional information to change its opinion, or issue a favorable opinion when it has withheld one because of insufficient information. *Where the public agency has rendered an adverse opinion, the subdivider has the burden of showing that the adverse opinion is incorrect either as to factual or legal matters."*

(That procedure has never been followed).

## OSE GUIDELINES

"Community Water System	Any existing or proposed water supply system which relies upon surface and/or groundwater diversions other than wells permitted by the State Engineer under Section 72-12-1 NMSA, and which consists of common storage and/or distribution facilities operated for the delivery of water to multiple service connections.
Certificated Utility	A utility which operates under the conditions of a certificate of convenience and necessity issued by the New Mexico Public Utilities Commission.
Non-Certificated Utility	A utility exempt from mandatory registration with the new Mexico Public Utilities Commission, including special districts, cooperatives, municipal owned and homeowner association owned utilities."



## OSE GUIDELINES

“(E) For community water systems in which existing utility companies are proposed as the source of water supply the subdivider shall submit a water supply plan which meets the following requirements:

(1) For all water utilities:

(a) name of the utility proposed as the source of supply. *Letter of intent from the utility that they are ready, willing, and able to provide the maximum annual water requirements for the subdivision for at least [Note<sup>15</sup>] years. The letter must also state any requirement for the subdivider to provide water rights.*

(d) *Any other information, including any or all of the requirements of subsections C or D, required by the board of county commissioners to make a determination that the utility has the capability to meet the water requirements of the proposed subdivision. [Note<sup>20</sup>].”*

# OSE GUIDELINES

## Water Supply Plan and Geohydrologic Report

### Other Information Subsection C

"(1) ...the maximum annual water requirement of the subdivision is physically available and can be practically recovered to sustain the development for a continuous period of [Note15] years...take into account the production of existing wells.

(2) ...drill sufficient exploratory wells...to adequately characterize the aquifer...aquifer tests, performed on site, which are adequate for predicting long-term water availability.

(3) ...schedule of effects on the proposed subdivision's production well(s) which may result from existing demands and from the increase of groundwater withdrawals for the subdivision...These calculations shall include estimates of future water uses.

(4) ...the lowest practical pumping water level in the proposed subdivision pumping wells...account for seasonal fluctuations, drought allowance, reduction of well efficiency over time, and peak production requirements...to 70% of the initial water column.

(5) ...present all hydrologic information pertinent to the study area...maps and cross-sections showing geology, depth to the water bearing formation, water level contours and estimated thickness of saturation in the aquifer...a technical narrative; spreadsheets, tables, graphs, maps and cross-sections shall be included."

*OSE informal requirement: All existing connections plus new subdivisions must show water availability for County planning periods of 40 to 100 years.*

## HOW TO SHOW SUBDIVISION WATER AVAILABILITY TO OSE AND COUNTY?

1. Wells built
2. Wells tested with submergence margin
3. Regional trend allowance 40 to 100 years by history and model projection
4. Prove capacity remaining after trend removes water column.  
(Intractable)
5. Yield capacity for existing commitments plus new proposed uses
6. (Some Counties) Acceptable impact on neighbors

### *Issues:*

- Why build capacity not needed for up to 100 years?
- Why build wells designed for 100-year water levels (casing off much of water column) and not take advantage of current water column?
- 300,000 AFY Public Supply Delivery in New Mexico with over \$1 Billion infrastructure.

# HISTORICAL AND FUTURE PROJECTION OF WATER COLUMNS

