

## REPUBLICAN RIVER BASIN MODELING PROJECT

### November 19, 1997

#### Ground-Water Quality

We are currently inventorying the wells sampled in the Republican Basin last summer and adding them to our permanent data base. Documentation of basic well information for these sites includes well depth, screened interval, date drilled, owner name, location, aquifer code, and hydrologic unit code. When the inventories are complete (1.5 weeks) water-quality data will be transferred to this data base. When the transfer is completed, letters containing the results of the chemical analyses will be mailed to the Natural Resources Districts and to individual land owners. Additionally arrangements are being made to compile and integrate water-quality data collected in the eastern part of the Republican Basin during 1997 by the Nebraska Department of Environmental Quality (NDEQ).

A base map has been prepared for plotting locations and concentrations of water-quality data. Locations for next summer's water-quality sampling work are being identified. We will begin obtaining sampling permissions for these wells in February.

#### SW-GW Interaction

The ground-/surface-water interaction phase of the Republican River model is proceeding slower than had originally been anticipated. However, all three sites have been selected and all landowners have consented to participate with the project. The three sites are as follows:

- 1) Harlan County, Sappa Creek, 2N 20W 23 (eastern half of section)  
Lower Republican NRD
- 2) Hayes County, Frenchman Creek, 5N 34W 35  
Middle Republican NRD
- 3) Chase County, Frenchman Creek, 5N 39W 35  
Upper Republican NRD

The Southwest Nebraska RC&D has notified Burton Well Drilling, Bartley, Nebraska, (correspondence dated November 6, 1997) that their bid for the drilling has been accepted. Depending upon weather conditions, the starting date for the drilling is set at February 9, 1998. Although the work may commence prior to this date if scheduling arrangements can be made and dates are agreeable with the Contracting Officer's Representative (Greg Steele, hydrologist, U.S. Geological Survey).

Additional information—data loggers to record water levels in the monitoring wells have been ordered, but have not been received.

#### Model Preparation and Data Acquisition

The project is still in the intensive data collection and compilation phase. GIS hydrologic coverages for the Kansas part of the Basin have been transferred to our system in addition to land-use, land-cover, and irrigation-well coverages for Nebraska. Water-level data for the High Plains Aquifer project, which includes the Republican River Basin, are being used to supplement current, spring and fall 1996, potentiometric surfaces. Updated versions of the bedrock surface are being produced using more recent bedrock elevations where available have been produced. Selected maps are being digitized and stored in ARC/INFO files.

**General**

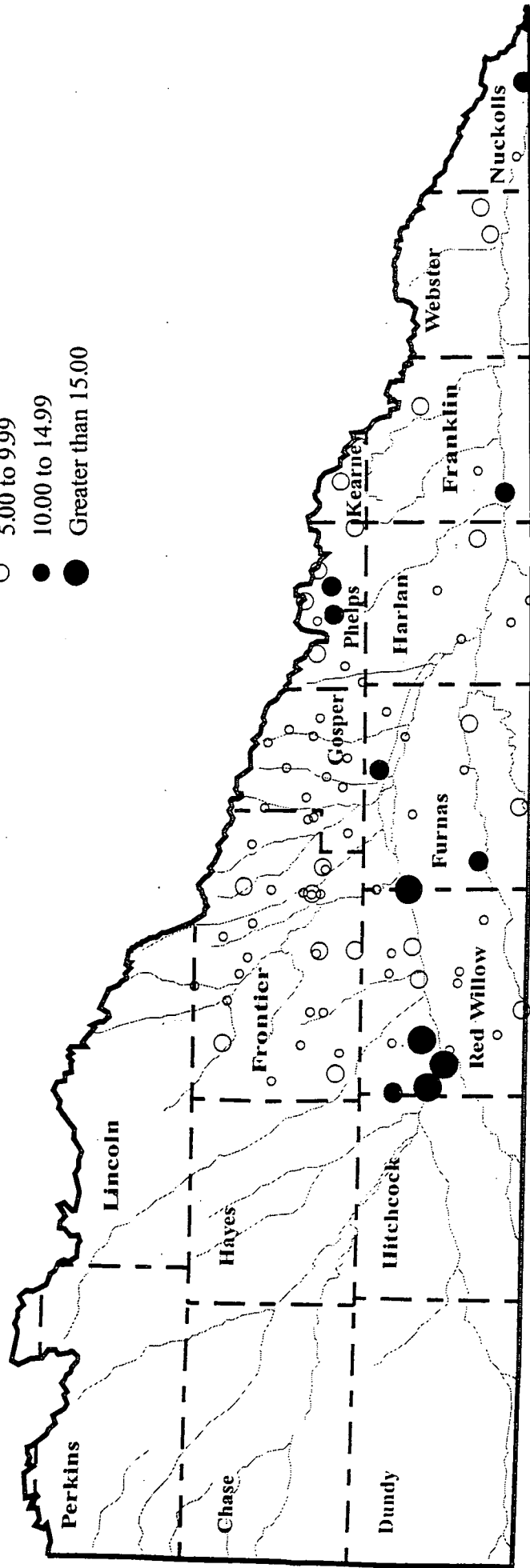
A liaison meeting to coordinate Republican Basin activities among the members of the USGS project team, the Conservation and Survey Division (CSD) investigators, and Marty Link (NDEQ) was not held on November 10<sup>th</sup> as originally scheduled because CSD people were performing aquifer tests in the Basin. A meeting will be rescheduled in December.

The project chief, Matt Landon, will be physically posted in Nebraska on December 8<sup>th</sup>.

# PROVISIONAL Subject to Revision

**Explanation**  
Nitrate concentration,  
in milligrams per liter

- 0 to 4.99
- 5.00 to 9.99
- 10.00 to 14.99
- Greater than 15.00

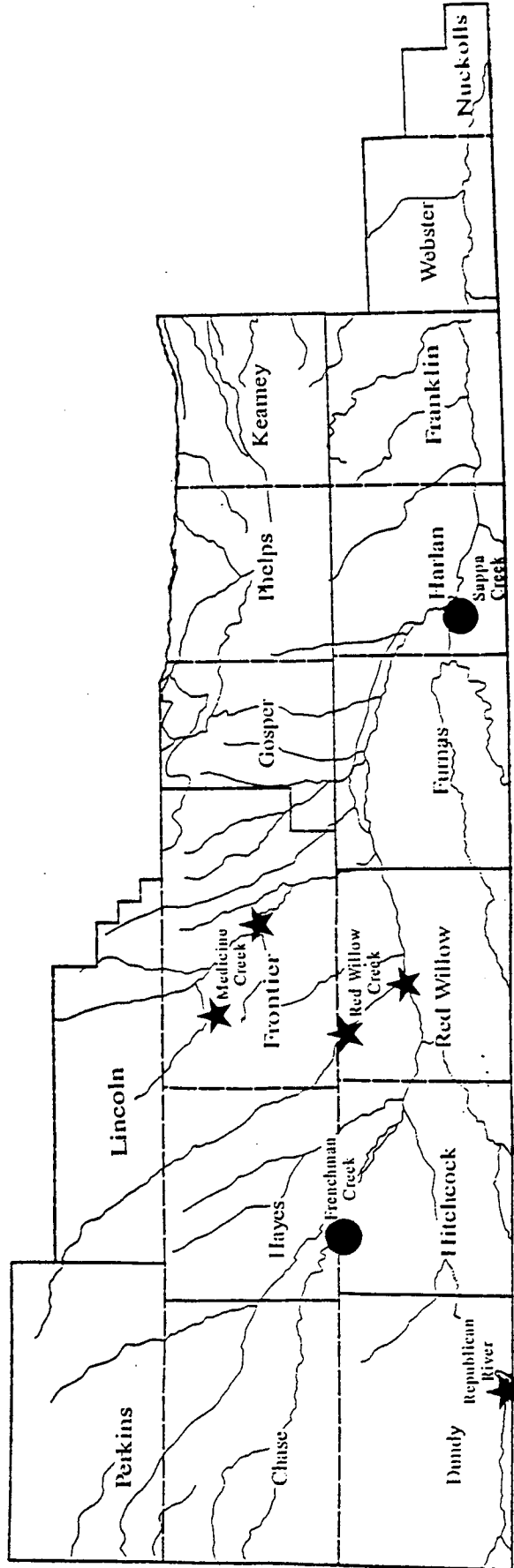


# Explanation

Locations of Sites for Ground Water and Surface Water Interaction Phase

● Landowners have granted permission.

★ Identified as a possible site. Landowner has been asked, but has not replied, or landowner has given tentative ok, or site is still being investigated.



## REPUBLICAN RIVER BASIN MODELING PROJECT SEPTEMBER 26, 1997

### Ground-Water Quality

The work plan calls for water-quality samples to be collected from 150 wells in the eastern half of the Republican River Basin during the summer of 1997. In identifying wells for sample collection we discovered that the Nebraska Department of Environmental Quality (NDEQ) was collecting water samples from 90 wells in the Lower Republican NRD during July and August which was in the second year of a two-year study. It was determined that the NDEQ objectives and protocols were similar to those of the Republican River Basin project and that the NDEQ data would be available to the characterization of water-quality of this area. Therefore, it was decided to collect USGS water samples in areas that were not as densely sampled by the NDEQ effort and to redirect "leftover" samples to the western half of the Republican River Basin next summer to achieve a similar sampling density.

Ground-water samples were collected from 86 wells in the eastern half of the Nebraska part of the Republican River Basin (Frontier, Gosper, Helps, Kearney, Red Willow, Furnas, Harlan, Franklin, Webster, and Nuckolls counties). All samples were analyzed for nitrate concentrations by Olsen's Laboratory in McCook. A map showing the well locations and relative concentrations of nitrate for the 86 wells are attached to this document. Water samples from 21 (25%) of these also were analyzed for major ions and 8 water samples (10%) were analyzed for nitrate for quality-assurance purposes by the U.S. Geological Survey's National Water-Quality Laboratory in Arvada, Colorado. Additionally, duplicate water samples were collected at each site for Ed Harvey (C&SD) for isotopic analysis.

The mean and median nitrate concentrations for the 86 water samples was 5.53 and 4.26 mg/L, respectively. The minimum concentration observed was 0.04 mg/L and the maximum was 24.6 mg/L. Twenty-five percent of the water samples had nitrate concentrations larger than 7 mg/L and most concentrations larger than 10 mg/L were in the Republican River alluvial aquifer.

### SW-GW Interaction

Sites have been identified by our staff and permissions have been granted by local land owners for the installation of paired observation well transects for two of the three required sites (see attached map). The first site, Harlan County (2N 20W Sec. 23 & 24), will be on the south side of Sappa Creek, southeast of the town of Stamford. The two transects will run in a north-south direction (the eastern most transect will be in the western edge of section 24 and the western most one will be in section 23), are about 1 mile in length, and will be about 0.2 miles apart. Several irrigation wells are located within these two sections. Arrangements are being made to keep records of pumpage time from some of these irrigation wells to facilitate determination of hydraulic conductivity in the vicinity of the observations wells.

The site for the second pair of observation well transects is in Hayes County (5N 34W Sec. 25) and will be located on the south side of Frenchman Creek about 3 miles upstream of the town of Palisade and the confluence of Frenchman and Stinking Water Creeks. This area, owned by the Schroeder Cattle Company, is pastureland and contains no irrigation wells. The transects will run in a north-south direction, will be about 0.3 miles in length, and will be about 0.15 miles apart. The

land owner has requested that one of the observation wells have a 4-inch inside diameter for possible use as a stock well when the project is completed.

Five other sites have been identified as possible choices for the location of the third pair of observation well transects and negotiations are underway. These sites are shown on the attached map and include the Republican River just above the confluence with the South Fork of the Republican near Benkelman, Medicine Creek in Frontier County, and Red Willow Creek in Red Willow County. The Benkelman site is preferable to the others.

Installation of the observation wells is scheduled for later this fall.

### Model Preparation and Data Acquisition

Boundaries for the model were determined to be the South Platte and Platte Rivers on the north, the northern and eastern boundaries of the Lower Republican River NRD on the northeast, the eastern boundary of the High Plains aquifer and Prairie Dog Creek on the east, the boundary of the High Plains aquifer to the south with a break running through Cheyenne County, Colorado, and Wallace County, Kansas, and the western boundary of the High Plains aquifer on the west. A grid orientation has been selected and base maps have been produced for incorporation into the finite-difference model (ModFlow). A single layer model will be produced.

The project is in the intensive data collection and compilation phase. Reports for previous studies in the area (Nebraska, Kansas, and Colorado) have been collected and data from them are being processed. These data include bedrock topography, alluvial-interface boundaries with the Ogallala Formation, potentiometric surfaces, previous seepage runs and low-flow data, irrigated acres, crop types, phreatophyte coverage, and meteorological data including precipitation, temperature, and evapotranspiration. Updated versions of the bedrock surface are being produced using more recent bedrock elevations where available. Current, spring and fall 1996, potentiometric surfaces have been produced. Selected maps are being digitized and stored in ARC/INFO files.

### General

A meeting was held on August 8<sup>th</sup> at the USGS District office in Lincoln between members of the C&SD Republican River investigation team, Marty Link (NDEQ), and members of the USGS Republican Basin project team to coordinate water-quality sampling activities and observation well placement.

Matthew Landon will be replacing Pat Emmons as principle modeler and project chief of the Republican River Basin project.

