KANSAS RIVER ALLUVIAL AQUIFER PROGRAM – FY2021 ACTIVITIES

KANSAS GEOLOGICAL SURVEY
The University of Kansas

The Kansas River corridor is projected to continue to be a major area of population and economic expansion in the coming decades, and the Kansas River alluvial aquifer will be utilized to help support that expansion. The aquifer provides groundwater from the Kansas River alluvium, the geologic material that surrounds the riverbed. Currently, we have insufficient information to reliably assess how water levels in the aquifer and the Kansas River will respond to an increase in pumping. Management of groundwater storage in the aquifer in conjunction with management of reservoir system storage requires this information. The Kansas Geological Survey (KGS) is carrying out a two-phase program to improve our understanding of the aquifer and its relationship to the Kansas River. The FY21 activities were focused on the first phase of the program (the development of an observation well network and related activities associated with the characterization of the Kansas River alluvium). Although the pandemic significantly impacted field work, we have continued to make good progress. The four major FY21 activities are described in the following section.

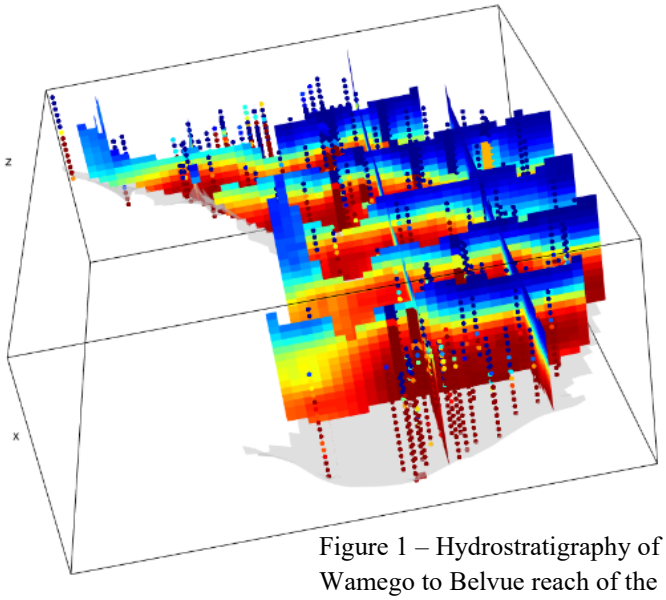

Figure 1 – Hydrostratigraphy of the Wamego to Belvue reach of the Kansas River valley.

FY21 Activities:

1. Hydrostratigraphic Analysis – Part 1

The purpose of the hydrostratigraphic analysis component of the project is to characterize the nature of the materials comprising the Kansas River alluvium through new analyses of existing information (Part 1) and the collection of new information (Part 2). The FY21 activities focused on Part 1 and the drillers' logs from over 4,800 wells in the Kansas River valley. These logs were analyzed by Geoff Bohling of the KGS using techniques that he has developed. Figure 1 is an example of the results of this work. The figure shows a series of cross-sections (north is to the right) through the Kansas River valley between Wamego and Belvue. Blues represent lower permeability materials, such as clays and silts, while reds represent higher permeability materials, such as sands and gravels. Notice how the river channel has cut through the lower permeability material in the front cross-section panel.

2. Well Installation

Currently, the well network consists of 11 wells, each of which is instrumented with a transducer-datalogger unit that records the water-level position in the well every hour. This unit is connected to a telemetry system that sends the information to the KGS where it is displayed in near real time on the

publicly accessible KGS website. The plan for the network is to have a series of observation wells spaced approximately evenly along the river channel with additional wells in transects extending from the river to the valley wall. Figure 2 shows the existing wells in the network (plus signs in circle) and planned FY21 wells to fill in gaps along the river channel (circles at St. Marys and Lecompton) and to complete a transect near Lawrence (ellipse). The installation of these new wells was delayed by the pandemic. However, we have obtained landowner permission at all three sites and will install the wells in mid-May using the KGS direct-push unit. All three wells will be developed and then instrumented with the same equipment as existing network wells.

Figure 2 – Existing network wells and wells to be completed in May 2021.

3. Water Sampling and Slug Tests

In FY21, we took water samples from 11 wells and analyzed them for major cations and anions. Following the installation and development of the three new wells, we will sample and analyze those as well. In June 2021, we will perform and analyze slug tests from each of the new wells to get information about the transmissive nature of the material in which the wells are screened.

4. Hydrograph Analysis

In FY21, we continued the analysis of the hydrographs (plots of water level in well versus time) collected at each of the wells. The objective is to assess the major drivers of water-level changes at each well. Figure 3 is a hydrograph from JF01 (Jefferson County Well 1) that also displays the stream stage and precipitation measured at the closest gaging and weather stations, respectively. We are working on methods to adjust both the stream stage and precipitation records for their distance from the well. We are instrumenting some of the wells with new modular weather stations to develop relationships between the precipitation at the well and that at the nearest weather station. We will develop these relationships well-by-well over the next year.

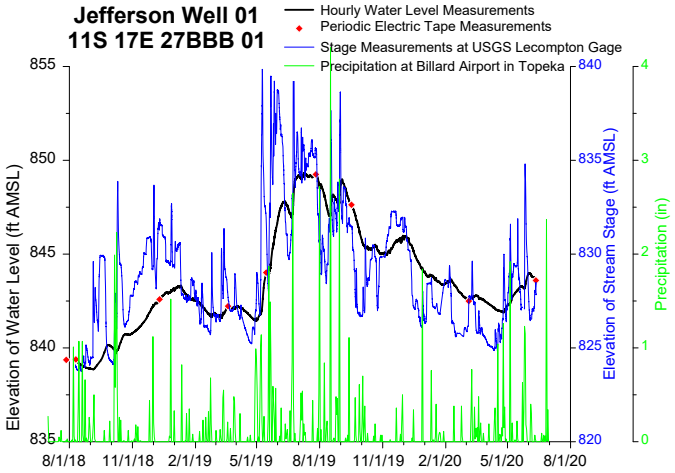

Figure 3 - Jefferson County well 1 hydrograph with stream stage and precipitation data.