

**Kansas Department of Agriculture
Division of Water Resources**

Technical Guidelines for determining the availability of groundwater for appropriation in the Lower Republican River Basin and Belleville Formation and the availability of surface water for appropriation in the Lower Republican River Basin

Adopted by: David L. Pope, P.E., Chief Engineer

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All applications for a permit to appropriate groundwater and surface water from the Lower Republican River Basin for any beneficial use, except for domestic use, temporary permits and short term permits for five years or less, shall be processed based on the following criteria:

I. Definitions

- A. "The Lower Republican River Basin" (hereinafter referred to as the "Basin") encompasses the entire drainage area of the Republican River and its tributaries from the Nebraska state line down to where the Republican River intersects the center line of Milford Dam, as shown on the attached map (Attachment A). The Basin includes the entire Belleville Formation, including that portion extending into the Little Blue River Basin. The Basin does not include the unconfined Dakota formation, the Meade formation, and any other areas located outside the effective alluvium located in this basin.
- B. The "Belleville Formation" is considered to be located in Sections 5, 6, 7, 8, 17 and 18, Range 2 West, all of Range 3 West and Range 4 West, excluding Sections 30, 31 and 32 in Range 4 West; and including Sections 1, 12, 13 and the northeast diagonal half of Section 24 in Range 5 West, all in Township 1 South.
- C. The "effective alluvial aquifer" is considered to extend up to one and one-half miles each side of the centerline of the Republican River unless the land surface has a slope of 2% or greater as determined from the latest U.S.G.S. seven and one half minute topographic map, in which case the boundary is 500 feet farther away from the river from the point where the land begins to slope at a grade in excess of 2% (not to exceed one and one-half miles from the centerline of the Republican River). This boundary shall be used unless better information is available to make a more precise determination in an individual case. If better or more site specific information is available, it may be used.
- D. The "effective recharge area" for a well is the circular area around the well where a specified draw-down occurs on the perimeter of the circle if the total proposed appropriation of water is assumed to be pumped continuously throughout a specified period, based on a Theis Non-Equilibrium Equation Analysis, as described in Groundwater and Wells, 1966, Edward E. Johnson, Saint Paul, Minnesota, pp. 108-113.

1. In the "effective alluvial aquifer" the specified draw-down limit is one-half foot. For all areas outside the effective alluvial valley, including the Belleville formation, the specified draw-down limit is 1/10 of a foot.
2. For the Belleville formation, a storage coefficient of 0.15 should be used. For all other areas, a storage coefficient of 0.20 should be used.
3. The average transmissivity for the effective alluvial valley is considered to be 100,000 gallons per day per foot.

The average transmissivity for the Belleville formation is considered to be 190,000 gallons per day per foot.

These values for transmissivity shall be used for all computations unless an acceptable stratigraphic log is available so that the lithologic codes in Table 1 (Attachment B) and the hydraulic conductivities in Table 2 (Attachment C) can be used, or other better or more site specific data is available.

II. Analysis to determine if groundwater is available for appropriation in the effective alluvial corridor.

- A. The sum of all groundwater vested rights, groundwater rights, and approvals of applications to appropriate groundwater in the effective alluvial valley of the Lower Republican Basin shall not exceed 60,200 acre feet.
- B.
 1. If the proposed well is located in the effective alluvial valley, a Theis Analysis shall be done to determine the one-half foot draw-down radius of the proposed well. A 60 day pumping period is assumed to be reasonable for irrigation unless there is clearly evidence to the contrary. For all other beneficial uses, a reasonable pumping time shall be assumed.
 2. Determine all senior wells whose one-half foot level draw-down radii intersect the one-half foot draw-down radius of the proposed well.
 3. Determine the total area in the overlapping draw-down circles.
 4. Determine the effective recharge from precipitation for this area by using the potential average annual recharge from precipitation shown in figure 1 (Attachment D).
 5. For each well in the total areas of overlapping draw-down circles the cumulative volume of stream depletion that occurs in the 365 day period after the day pumping began shall be determined by conducting a Jenkins Stream Depletion Analysis, as described in Jenkins, C.T., 1970, Computation of Rate and Volume of Stream Depletion by Wells, Techniques of Water-Resources Investigations of the United States Geological Survey, Book 4, Chapter D1, U.S. Government Printing Office, 17 pp. The same pumping period, T and S parameters used in the previous Theis Analysis shall be used. The distance from the center of a well to the nearest location of the centerline of the Republican River as shown on the most current U.S.G.S seven and one half minute topographic map shall be used.

6. Add: (a) the net effective recharge from precipitation for the overlapping wells and (b) the total recharge from stream depletion for the overlapping wells. From this total subtract the total quantity of water authorized, or proposed to be authorized, by the overlapping wells, including the proposed well. If the number is negative, there is not sufficient water available for the appropriation as proposed. If the number is zero or positive, the amount proposed for appropriation is available.

III. Analysis to determine if surface water is available from the Lower Republican River Basin.

- A. Each application to appropriate surface water for direct diversion from the Lower Republican River Basin, and its tributaries within the Lower Republican River Basin, shall be approved if it does not impair existing water rights nor prejudicially and unreasonably affect the public interest. No new permits to appropriate water shall be issued for appropriations that will be primarily dependent on surface water return flows from the Bostwick irrigation district.
- B. Every application to appropriate surface water for direct diversion which is approved by the chief engineer shall be subject to the following conditions:
The approval of application or water right for direct diversion of surface water shall not be exercised if:
 1. Exercising the approval of application or water right causes impairment of senior water rights or senior approvals of applications.
 2. The Kansas Water Office has requested that junior water rights be administered to meet the minimum desirable stream flow rates at the gage at Clay Center on the Lower Republican River;
 3. The proposed point of diversion is above the Concordia minimum desirable stream flow gage and the Kansas Water Office has requested that junior water rights be administered to meet the minimum desirable streamflows at Concordia; or
 4. the Chief Engineer is enforcing the terms of paragraph 6(b) of the Milford Water Reservation Right, identified as File No. 22,197-AR-6.
- C. Applications to appropriate surface water from tributaries to the mainstem of the Lower Republican by means of dams may be approved only if the approval will not result in impairment of existing rights, nor prejudicially and unreasonably affect the public interest. Any dam permitted on an ephemeral stream shall meet the requirements of K.A.R. 5-40-1 *et seq.* and be equipped with a controlled outlet with a minimum diameter of four inches. Any dam permitted on an intermittent or perennial stream shall be equipped with a controlled outlet with a minimum diameter of four inches. The controlled outlet shall be placed to allow water to pass through the dam at or near streambed elevation.

IV. Administration of direct diversion of surface water rights in Lower Republican River Basin.

A) Every application to directly divert surface water from the mainstem of the Lower Republican River Basin that has a priority on or after November 28, 1994 may be exercised unless:

1. use of the approval of application or water right causes impairment of other water rights;
2. the Kansas Water Office has requested that junior water rights be administered to meet the minimum desirable stream flow rates at the gage at Clay Center on the Lower Republican River;
3. the proposed point of diversion is above the Concordia minimum desirable stream flow gage and the Kansas Water Office has requested that junior water rights be administered to meet the minimum desirable streamflows at Concordia; or
4. the Chief Engineer is enforcing the terms of paragraph 6(b) of the Milford Water Reservation Right, identified as File No. 22, 197-AR-6.

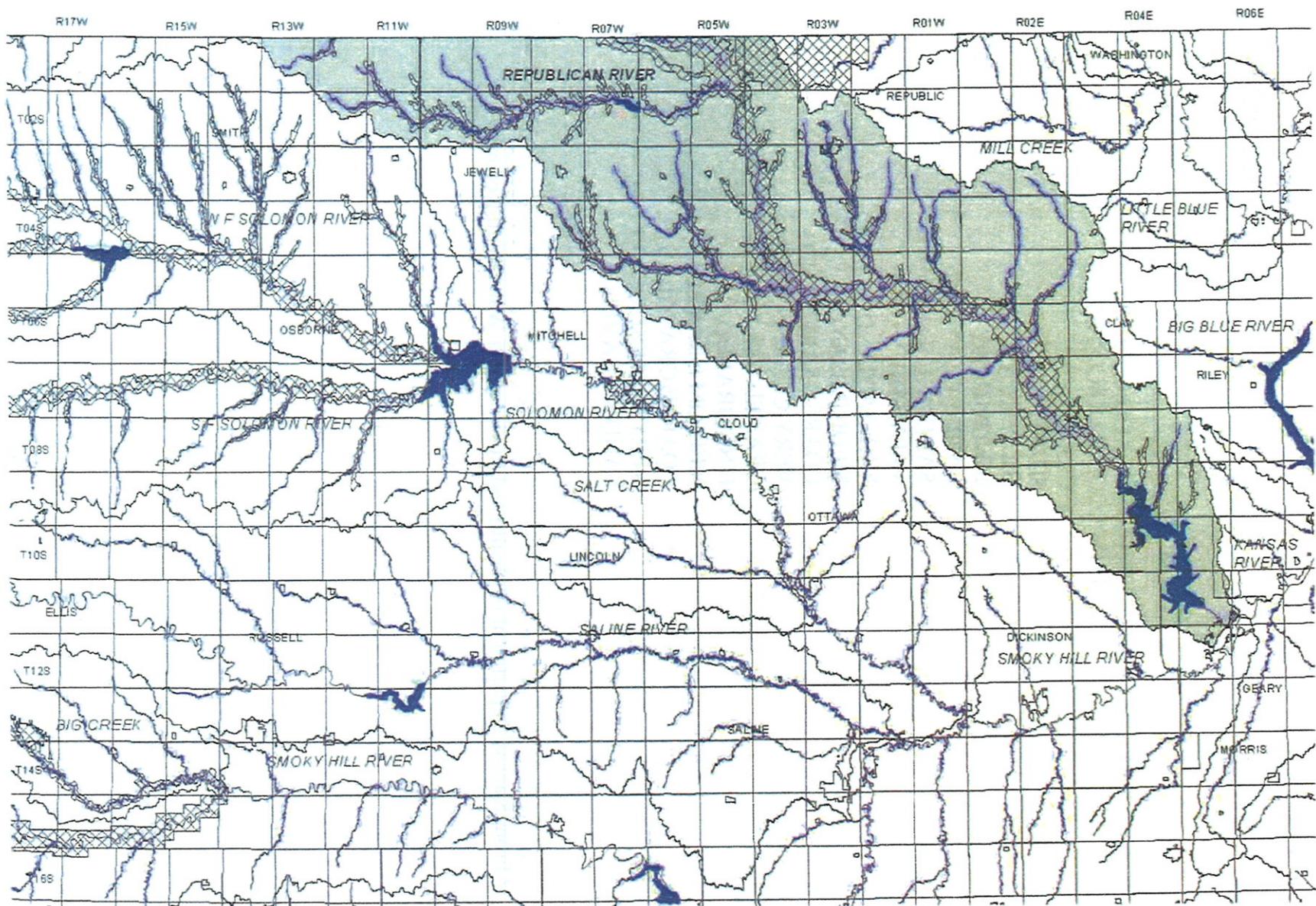


Table 1

LITHOLOGIC LOG CODES'

CLAY
SILT
SILTY CLAY
SANDY CLAY
SAND
VERY FINE SAND
FINE SAND
MEDIUM SAND
COARSE SAND
VERY COARSE SAND
GRAVEL
FINE GRAVEL
MEDIUM GRAVEL
COARSE GRAVEL
VERY COARSE GRAVEL
SAND & GRAVEL

* From Kansas Department of Health and Environment Water Well Records.

Table 2

Hydraulic Conductivities Assumed
for the
Lower Republican River Basin
and Belleville Formation

<u>Lithologic Code</u>	<u>Hydraulic Conductivity (feet per day)</u>	
Clay	1	
Silt	1	*
Silty Clay	1	*
Sandy Clay	1	*
Sand	105	**
Very Fine Sand	3	
Fine Sand	15	
Medium Sand	50	
Coarse Sand	250	
Very Coarse Sand	700	
Gravel	800	
Fine Gravel	900	
Medium Gravel	950	
Coarse Gravel	1000	
Very Coarse Gravel	1050	
Sand and Gravel	528	***(587 in Belleville formation)

* Assumed to be not much different than Clay.

** Average of Fine Sand, Medium Sand, and Coarse Sand.

*** Average of Fine Sand, Medium Sand, Coarse Sand, Fine Gravel, Medium Gravel and Coarse Gravel. Belleville formation hydraulic conductivity of 587 feet per day is previously described in the report.

Figure 1

Potential Mean Annual Precipitation Recharge

