Jackson Hole and Vicinity

The part of northwestern Wyoming most likely to experience development of additional water supplies is Jackson Hole and some of the valleys of tributaries to the Snake River. Additional data, therefore, are given for that part of the study area.

The contours on the water-table map indicate the configuration of the water table in Jackson Hole and in some of the valleys of tributaries to the Snake River. Control for the contours was altitude of water level in wells (shown on the map), altitude of water surface where streams coincide with the water table, and altitude of springs. A diagrammetric section across Jackson Hole shows the position of the water table. Because ground water generally moves in a direction perpendicular to water-table contours, the contours bending upstream indicate gaining streams (Snake River and Buffalo Fork) and those bending downstream indicate losing streams (Pilgrim and Cottonwood Creeks). Contours perpendicular to streams indicate neither gaining nor losing streams (Gros Ventre River). Streamflow measurements that indicate gains and losses in selected reaches of streams are shown on the streamflow data map. These measurements were made when streamflow was relatively low and steady.

In addition to well yields given on sheet 2, average expected well yields of the alluvium and glacial outwash in part of Jackson Hole can be estimated by using data from the maps and by making assumptions. Specific capacity of a well is approximately proportional to the transmissivity and the specific yield of the aquifer, assuming that the well is 100 percent efficient. Transmissivity is the rate at which water of the prevailing kinematic viscosity is transmitted through a unit width of the aquifer under a unit hydraulic gradient (Lohman and others, 1972, p. 13). Specific yield of a rock or soil is the ratio of (1) the volume of water which the rock or soil, after being saturated, will yield by gravity to (2) the volume of the rock or soil. The definition implies that gravity drainage is complete (Lohman and others, 1972, p. 12).

The dashed ground-water flow lines shown on the water-table map are drawn at right angles to the solid water-table contours through two points on the Snake River where streamflow measurements made during a period of low streamflow indicated a gain of 290 ft^3/s (8.2 m^3/s) from ground-water inflow. Darcy's law states that the flow of water through permeable media is proportional to the hydraulic gradient (Lohman, 1972, p. 10). Transmissivity, therefore, is equal to the ground-water inflow along the indicated reach divided by the width of the flow path and by the hydraulic gradient. The width of the flow path may be taken as the combined length of the 6,600-ft contour between the two dashed lines on both sides of the stream, which is about 11 mi (18 km). The hydraulic gradient averages about 70 ft/mi (13 m/km) in this segment of the valley. The average transmissivity (T) of the aquifer in this segment, therefore, is about:

$$T = \frac{(290\ \text{ft}^3/\text{s})\ (86{,}400\ \text{s/d})}{(11\ \text{mi})\ (70\ \text{ft/mi})}$$

$$= 30{,}000\ \text{ft}^2/\text{d (rounded) or}$$

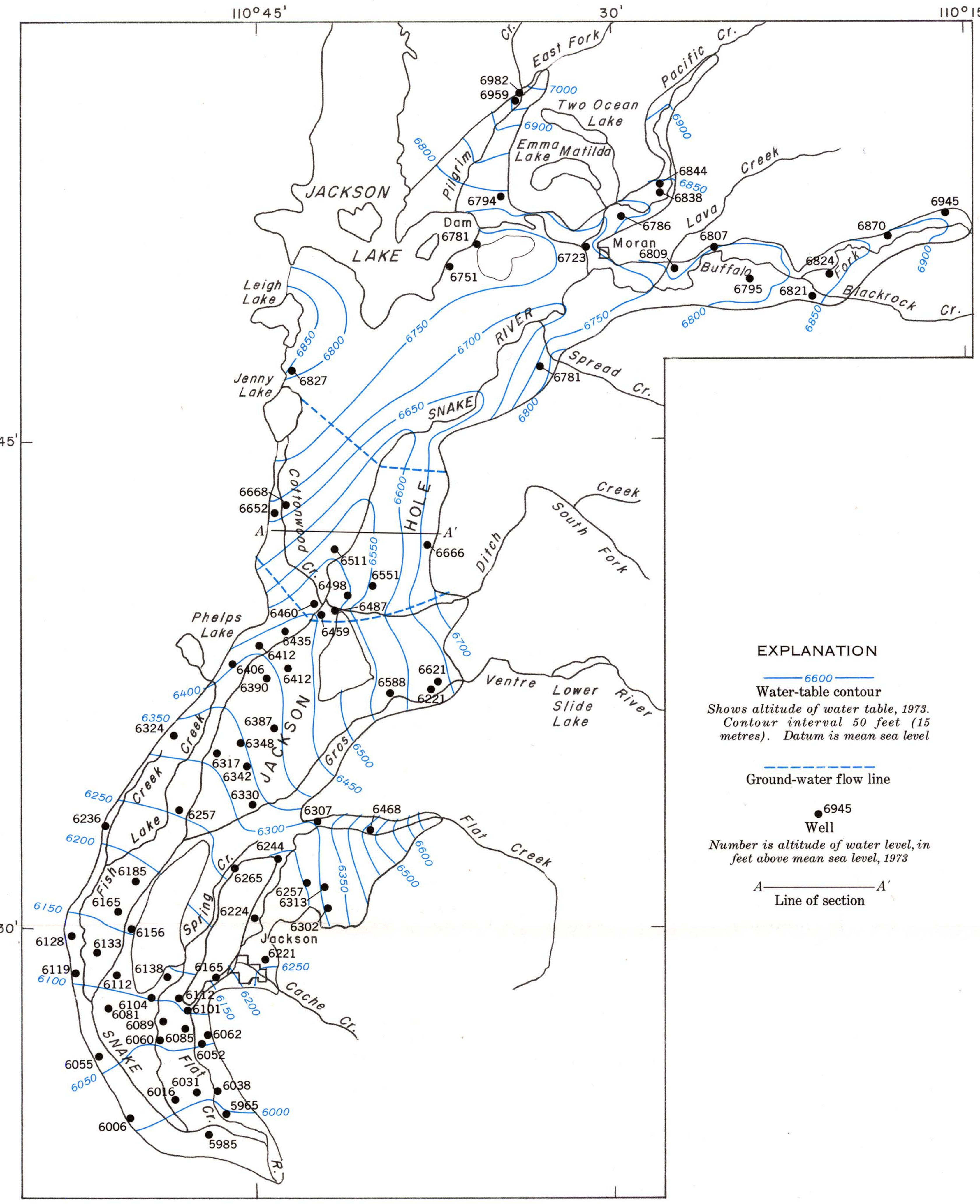
$$2{,}800\ \text{m}^2/\text{d}.$$

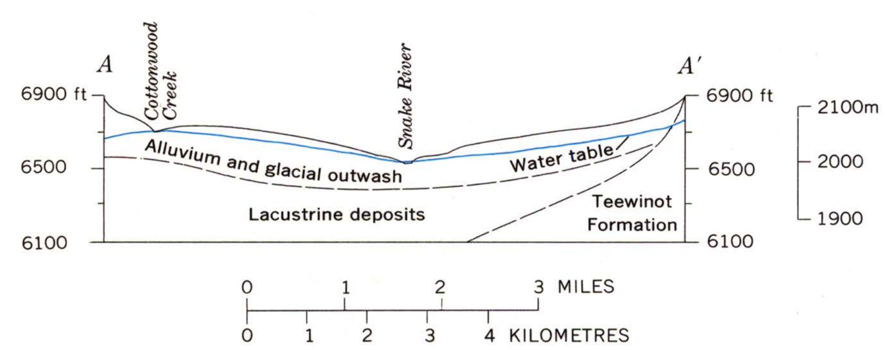
Specific yield of an unconfined aquifer generally ranges from 0.1 to 0.3 and averages about 0.2 (Lohman, 1972, p. 53, 54). Therefore, a specific yield of 0.2 is assumed for the segment of the aquifer in alluvium and glacial outwash delineated by the flow lines.

A method for estimating transmissivity from specific capacity of wells, or visa versa, (Meyer, 1963) uses a graph that involves well diameter and the storage coefficient. The storage coefficient is the volume of water an aquifer releases from or takes into storage per unit surface of the aquifer per unit change in head. In an unconfined aquifer, the storage coefficient is virtually equal to the specific yield (Lohman and others, 1972, p. 13). From Meyer's graph, the specific capacity at the end of 24 hours would be 130 gal/min (490 l/min) per foot of drawdown for a 12-in. (300-mm) diameter well. Based on this approximation, an average 12-in. (300-mm) diameter well drilled in the segment of the aquifer delineated by the flow lines on the water-table map would yield 1,300 gal/min (4,900 l/min) with a drawdown of 10 ft (3 m) at the end of 24 hours. These approximations assume that the well has 100 percent efficiency.

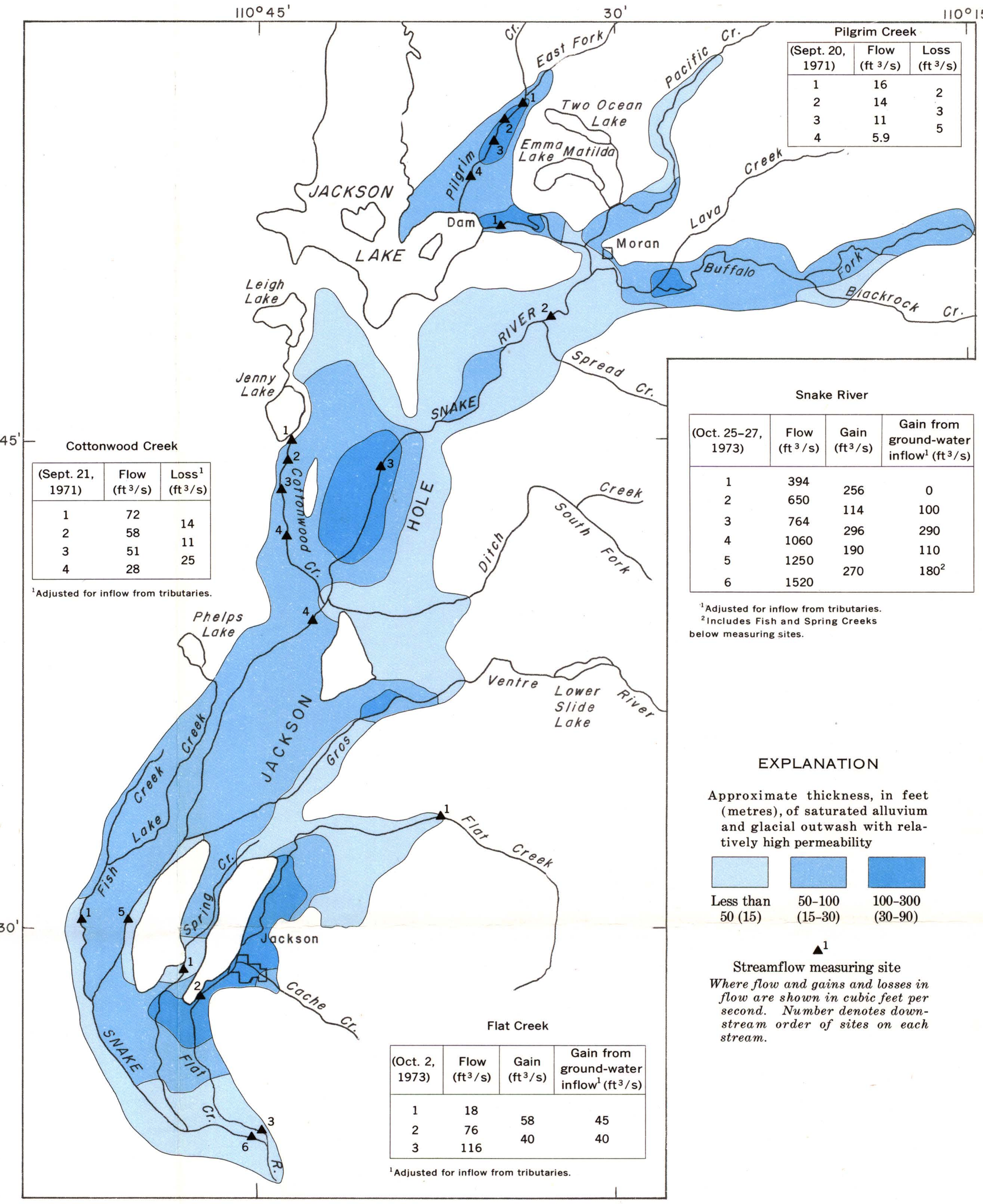
Specific capacities of wells vary because of several factors, including well construction and characteristics of the aquifer. One factor that probably has considerable effect on specific capacities of wells in alluvium and glacial outwash in Jackson Hole is the saturated thickness of the aquifer, which limits the length of a well that can be opened to the aquifer. In much of Jackson Hole, alluvium and glacial outwash are underlain by lacustrine and other finer grained, less permeable material that, if tapped by wells, would result in low specific capacities. Logs of wells were examined to determine the approximate thickness of saturated alluvium and glacial outwash with relatively high permeability. Areas of greater thickness are generally more favorable for wells with higher specific capacities. Most of the wells in Jackson Hole were drilled only deep enough to obtain water for domestic use, and only a few penetrate the entire thickness of saturated material with relatively high permeability; consequently, the thickness of saturated material shown on the thickness map is generalized.

Deep test wells in Jackson Hole and subsequent aquifer tests would provide additional information on the thickness of saturated alluvium and glacial outwash, aquifer characteristics, and specific capacities of wells.





WATER TABLE IN JACKSON HOLE AND NEARBY STREAM VALLEYS



Pilgrim Creek

(Sept. 20, 1971)	Flow (ft^3/s)	Loss (ft^3/s)
1	16	
		2
2	14	
		3
3	11	
		5
4	5.9	

Cottonwood Creek

(Sept. 21, 1971)	Flow (ft^3/s)	Loss[1] (ft^3/s)
1	72	
		14
2	58	
		11
3	51	
		25
4	28	

[1]Adjusted for inflow from tributaries.

Snake River

(Oct. 25–27, 1973)	Flow (ft^3/s)	Gain (ft^3/s)	Gain from ground-water inflow[1] (ft^3/s)
1	394		
		256	0
2	650		
		114	100
3	764		
		296	290
4	1060		
		190	110
5	1250		
		270	180[2]
6	1520		

[1]Adjusted for inflow from tributaries.
[2]Includes Fish and Spring Creeks below measuring sites.

Flat Creek

(Oct. 2, 1973)	Flow (ft^3/s)	Gain (ft^3/s)	Gain from ground-water inflow[1] (ft^3/s)
1	18		
		58	45
2	76		
		40	40
3	116		

[1]Adjusted for inflow from tributaries.

THICKNESS OF SATURATED ALLUVIUM AND GLACIAL OUTWASH AND STREAMFLOW DATA IN JACKSON HOLE AND NEARBY STREAM VALLEYS

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