

ES473 In-Class Exercise

Monmouth-Independence Groundwater Problem

Attached is a base map of the Monmouth-Independence area showing water wells with static groundwater elevations. The wells are set in a shallow sand-gravel aquifer that is 20 feet thick and that is capped by 30 ft of silt and clay.

Task 1. Using a contour interval of 10 ft, draw a groundwater contour map of the Monmouth-Independence area.

Task 2. Assuming isotropic and homogenous aquifer conditions, draw a set of four groundwater flow lines perpendicular to the groundwater contours, depicting the regional flow.

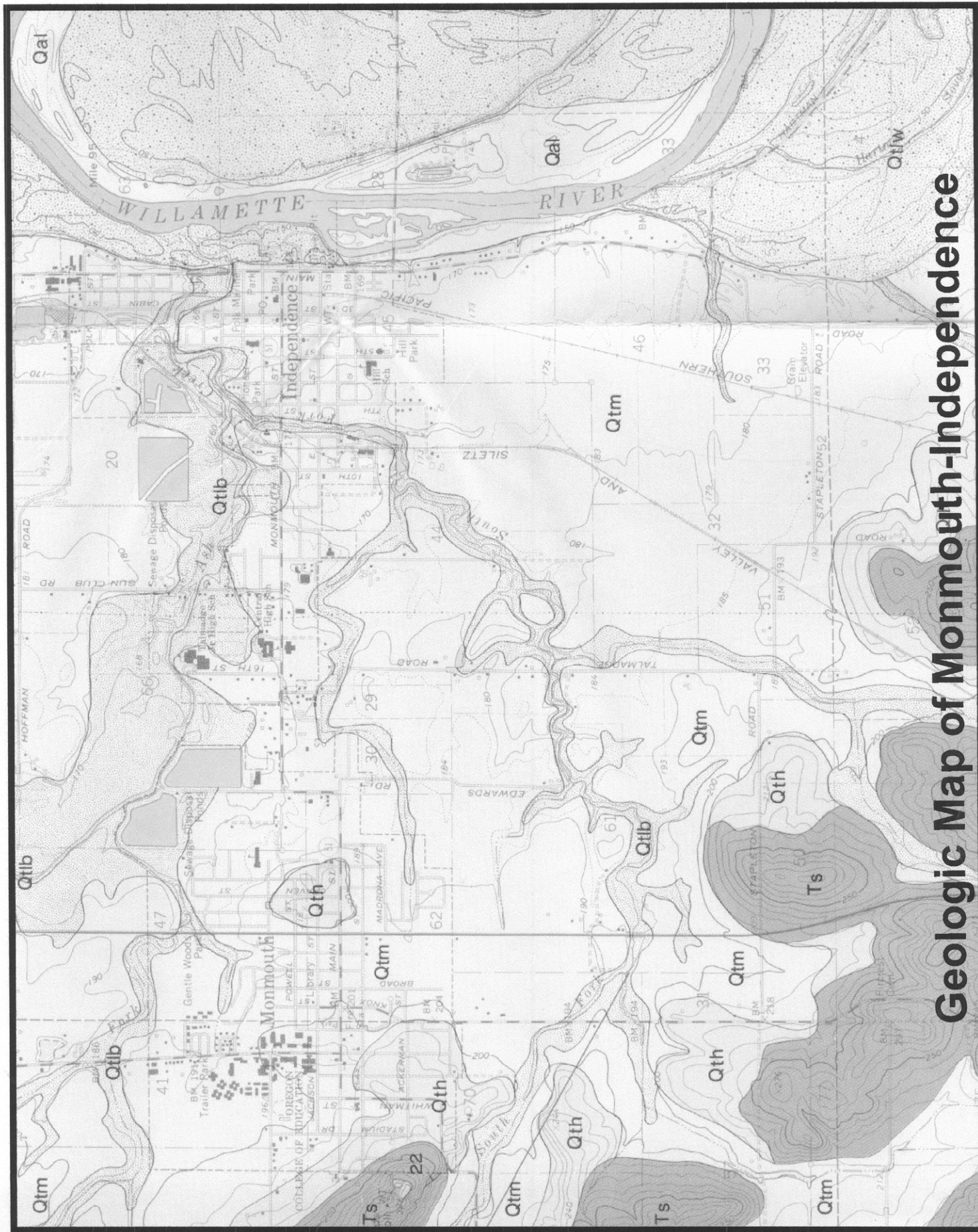
Questions for Thought

What direction is groundwater flowing in the Monmouth – Independence area? Is groundwater flow towards or away from the Willamette River?

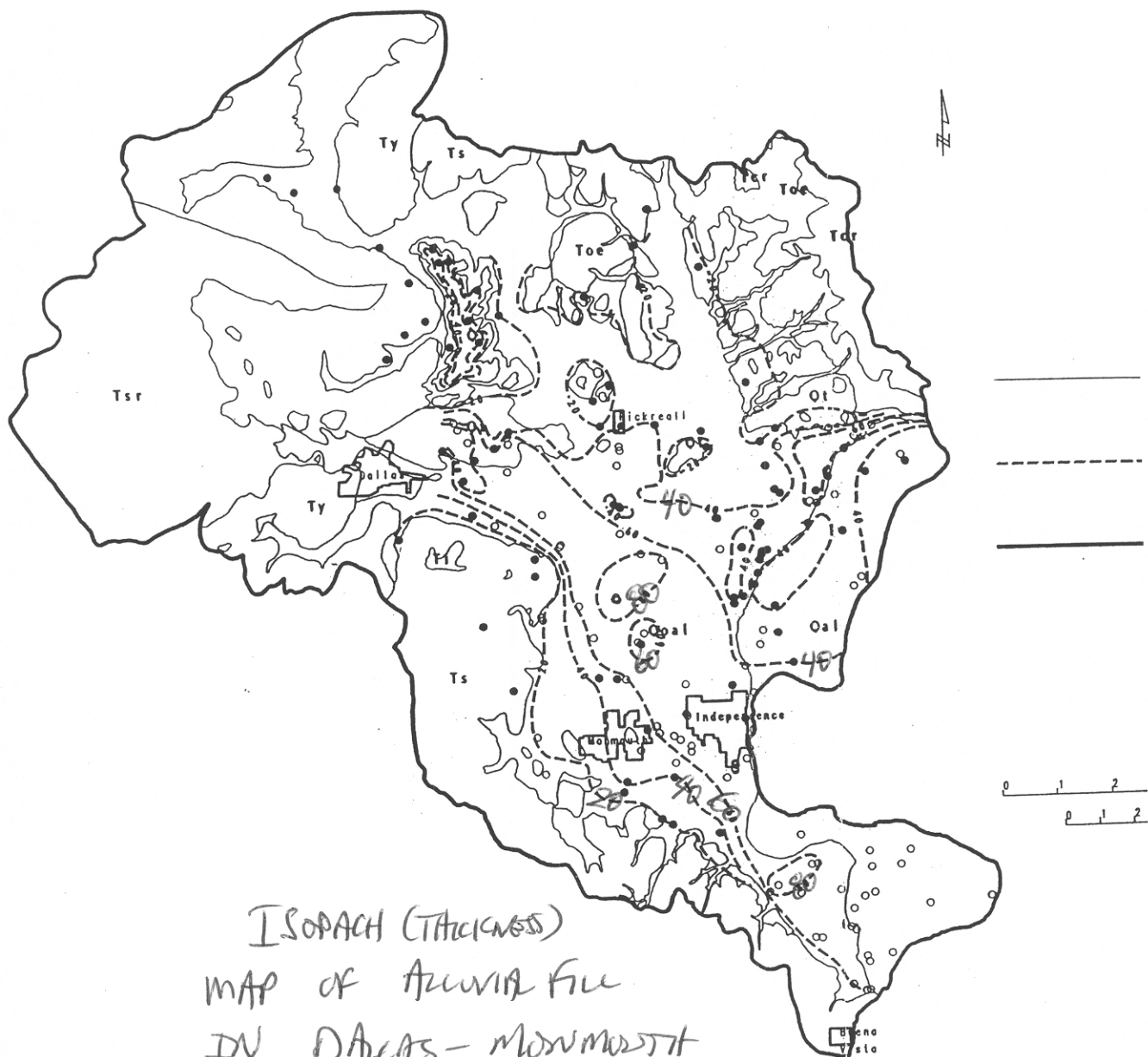
What type of aquifer is located beneath the Monmouth-Independence area?

Task 3. Calculate the groundwater gradient in ft/ft between the Natural Science Bldg. and the Willamette River banks, adjacent to Independence. Show all of your math work and unit algebra.

Task 4. Assuming a hydraulic conductivity of 100 ft/day in the sand and gravel aquifer, calculate the total ground water discharge in gal/day, that is flowing through the aquifer towards the Willamette River, across the full North-South width of the map area (Hint: application of Darcy's Law). Show all of your math work and unit algebra.



Geologic Map of Monmouth-Independence



ISOPACH (THICKNESS)
 MAP OF ALLUVIAL FILL
 IN DAVIS-MONMOUTH
 AREA

(Thickness in ft, C.I. = 20 ft)

Figure 7. Isopach map of alluvial f

TABLE VII
HYDROGEOLOGIC CHARACTERISTICS OF THE GEOLOGIC/AQUIFER UNITS

AQUIFER	WELL DEPTH (ft) MEAN	STATIC WATER LEVEL (ft) MEAN	YIELD (gpm)		no. of wells	SPECIFIC CAPACITY (gpm/ft)				HYDR. CONDUCT. (ft/d) MED.	STORAGE COEFFICIENT	RECHARGE (ft)
			MEAN	MED.		LOW	HIGH	MEAN	MED.			
Qal	48	19.5	302	75	36	1.10	607.1	59.9	40.0	170.0	0.2	8-15
Qoal	68	21.1	79	30	80	0.02	175.0	7.3	2.0	19.0	.001-.0.2	2-5
Qt	95	12.8	13	8	13	0.04	2.4	0.5	0.3			
Toe	119	34.8	15	10	20	0.01	2.3	0.5	0.2			
Ts	134	37.9	11	8	41	0.01	30.0	1.6	0.1	0.3	.00001-.001	2-5
Ty	174	22.1	22	9	33	0.01	1.7	0.3	0.1			
Tsr	171	36.4	18	8	16	0.01	12.5	1.1	0.1	0.2	.00001-.001	2-5

*From Gonthier (1963)

The specific capacity of a well is defined as the pumping rate divided by the drawdown in the well (Freeze and

