Message

From: Kay, Robert [rtkay@usgs.gov]
Sent: 6/20/2017 4:35:10 PM
To: Nordine, John [nordine.john@epa.gov]
Subject: Ex. 6 Personal Privacy (PP) Pumping Implications

John--per your request I've made some calculations for the effects of pumping from the Ex. 6 Personal Privacy (PP) Well on time of travel in the glacial drift aquifer in the Techalloy area. I'm going to go at this from a couple of different perspectives. Note that Techalloy's calculation of time of travel based on "natural" conditions will increase (has increased) under the influence of the Ex. 6 Personal Privacy (PP) well pumping.

1. If the well pumps at 130 gallons per minute that comes out to (130 gpmX1440 min/d) 187,200 gallons per day. This is equal to 25,025 cubic feet of water removed from the glacial drift aquifer every day the well is pumped.

The equation for the volume of a cylinder, which conservatively approximates the shape of a drawdown cone (it'll actually be distorted somewhat in the upgradient direction)

is V=pi*r squared*height

Assuming the aquifer is 85 ft thick and solving for r we get 9.7 ft if the cylinder was nothing but water. Because the cylinder has a porosity of 30 percent we get an cylinder radius of about 32 ft, which means that every day all of the water within a radius of 32 ft from the pumped wells is removed, so the groundwater velocity is as much as 32 ft/d at the pumped well,

2. If we assume a pumping rate of 130 gpm and 24 hours of pumping (Techalloy estimates there is continuous pumping for up to 120 hours per week), a transmissivity of 22,100 feet squared per day, at a storage coefficient of 0.17, we can calculate drawdown 1 ft from the pumped well as 1.1 ft. The nearest distance at which there is 0 ft of drawdown in this scenario is about 800 ft--roughly the location of GP-23. The groundwater velocity calculated from these parameters is about 1.4 ft/d, meaning that under the hydraulic conditions produced by 24 hours of pumping from the Ex. 6 Personal Privacy (PP), groundwater velocity 800 ft from the pumped well is about 1.4 ft/d.

at 500 ft drawdown in 0.05 ft, and velocity is 1.8 ft/d.

at 200 ft, the velocity is about 3.9 ft/d

As you can see, velocity under the pumping scenario increases with decreasing distance from the pumped well.

GP-29, which has an MCL exceedence, is about 500 ft from the pumped well. Therefore, the water that was at GP-29 last summer should reach the Ex. 6 Personal Privacy (PP) after the well has been pumped for no more than 277 days, with the clock starting last August. Note there will be some delay in the timing of VOC movement to the pumped well and that an MCL exceedence in the pumped well within this time frame is unlikely. However, 277 days of pumping since last August is a minimum time frame for impacts to the Ex. 6 Personal Privacy (PP) well.

--
Robert T. Kay
U.S. Geological Survey
650G Peace Road
DeKalb, IL 60115
815-752-2041
rtkay@usgs.gov