United States Department of the Interior

U. S. GEOLOGICAL SURVEY
OREGON WATER SCIENCE CENTER
10615 SE Cherry Blossom Drive
Portland, Oregon 97216

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Office of Senator Ben Westlund
900 Court St. NE, S-211
Salem, OR 97301

Dear Mr. Selvaggio:

This letter is in response to your e-mail to me in which you pose two questions relating to the ground-water hydrology of the Metolius River Basin in central Oregon.

Your first question was: “Will a well drilled in a particular area (i.e: The Metolius Basin) ONLY have measurable effects downflow from the well... or will the effects be measurable upflow in other areas of the water table?” The effects of ground-water pumping spread in all directions from the well, both up gradient and down gradient. When a well is pumped, the altitude of the water table (the hydraulic head) is lowered in the vicinity of the well, this is known as the *cone of depression*. This effect spreads out radially in all directions from the well, with the magnitude and geometry varying according to the local geology, flow directions, and boundaries of the ground-water system. It is this reconfiguration of the water table that redirects ground-water flow toward the well as pumping takes place. The cone of depression stabilizes when sufficient ground-water flow is intercepted to supply the pumping. Once the cone of depression stabilizes, the discharge of ground water from the well must be offset by diminished discharge of ground water to springs, streams, and wetlands elsewhere, or by increased flow to the aquifer system from other boundaries.

This leads to your second question: “Would these possible effects relate to the flow strength of springs in the area... especially the Metolius headwaters?” As mentioned above, water pumped from a well will eventually result in a reduction of discharge elsewhere in the basin and/or increased flow to the aquifer from other boundaries. In the Metolius River Basin, ground-water pumping most likely will result in diminished discharge at principal spring complexes that occur at the head of the Metolius, along the main stem, along many of the tributaries, and near the confluence of the Metolius and Deschutes Rivers. Some additional ground-water flow could possibly be induced into the basin from the boundary at the crest of the Cascade Range, but the amount would likely be relatively small. The way in which pumping effects are distributed between the various spring areas in the basin would depend on the location and depth of the pumping well, with the closest springs generally being affected the most. Hydrogeologic boundaries, such as major faults, can affect the way in which pumping effects are geographically distributed, but such features are of limited extent in the Metolius River Basin and are not entirely impermeable. There are no known geologic structures that serve to hydrologically isolate one part of the Metolius River Basin from other parts.

I hope this information adequately answers your questions. Please don’t hesitate to contact me if any part of my response needs clarification, of if you have additional questions.

Sincerely,

Marshall Gannett
Hydrologist