**Friends of the Environment Report – Scenarios 5-6**

Groundwater Modelling, HWRS518

Jake Ridlinghafer, Ben Mitchell, Danielle Tadych

4/28/2020

### Scenario 5: Post agriculture model with seasonality - future projection

### *Objective:*

Add the proposed agricultural element (pumping and localized recharge) for growing pistachios to your post-development model with seasonality. Agriculture starts now, 100 years after the end of the burn-in. Both pumping and recharge related to agriculture occur at the rates described and are continuous throughout the year.

* How can you quantify the impacts of the proposed agricultural element on the hydrologic system 100 years into the future?
* How do these impacts compare with the impacts of the town's pumping?
* How will the agricultural element affect the town's ability to meet its water demand (both for quantity and quality?) Describe your metrics as precisely as you can and quantify the impact(s).

***Results:***

To quantify the impacts, we investigated heads at the monitoring wells. The added agricultural element had a greater affect on the head values than the town pumping. From our head profiles at each of our observation wells and the towns pumping well we can find that the addition of agriculture will lead to decreseased head across the board and will continue to drop even after the 100 year period. Towns pumping seems to decrease head gradually if you look at figures 1, 2 &3 the first 100 years represents head from just town pumping and if continued by itself would yield much higher head values at the end of the model time than with agriculture. If this downward trend continues at a constant rate it will be much harder for the town to get water as they will have to dig wells deeper into the earth. The availability of clean drinking water may be hindered because the towns well is directly down head gradient from the agriculture recharge zone (Figure 4) and the increased pumping will have a further reach of where water comes from. To limit contamination, it would be ideal to have the agriculture zone down head gradient from the towns pumping well or across the river. To better understand the impact of pumping from the agricultural well on the environmental area, a plot and quantification of leakage from the river and evapotranspiration at the riparian area would better show the effect on the hydrological system.

A picture containing comb, object

Description automatically generated

Figure 1. Head values at the town well for just pumping at the town well (200-300 years) and with added agricultural pumping (300-400 year)

A picture containing comb, object

Description automatically generated

Figure 2. Head values at the Monitoring well for just pumping at the town well (200-300 years) and with added agricultural pumping (300-400 year)

A close up of a mans face

Description automatically generated

Figure 3. Head values at the Monitoring well 2 for just pumping at the town well (200-300 years) and with added agricultural pumping (300-400 year)

A screenshot of a cell phone

Description automatically generated

Figure 4. Head profile of last time step of town well Agriculture recharge zone is in columns 19 & 20 of this figure

### Scenario 6: Is seasonality necessary

***Objective:***

Moving forward, we will be running more models to try to decide whether to allow the agricultural activity and/or whether to propose changes to its design. Whenever you are faced with running many models (or calibrating a model), it is worth considering carefully whether the model can be simplified. Can we justify ignoring seasonality in ET? If so, we could use a constant rate which would make our model less dynamic and probably faster-running. But, we want to make sure that we don't misrepresent any important impacts of the farm. Consider the question of ignoring seasonality from the point of view of four stakeholders: the agricultural company proposing the new facility, the town, a local environmental group, and the Environmental Protection Agency. Provide a one paragraph support of your position.

***Discussion:***

If preserving the aquifer was the only consideration, ignoring seasonality in ET could be beneficial, especially regarding preserving computational time. However, the model has shown a sensitivity to ET seasonality on leakage and recharge in previous scenarios. Also, seasonality is especially important when trying to understand the response of the riparian area. Thus, Friends of the Environment believe ignoring seasonality would be detrimental in quantifying the effects of changes to the system.