Rick Raymondi
Idaho Water Resources Department
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October 24, 2006

Dear Mr. Raymondi:

Thank you for the opportunity to provide comments on the uses and applicability of the ESPA model.[1] This information was requested by IDWR during an Eastern Snake Hydrologic Modeling Committee (ESHMC) meeting on October 2, 2006 and by email on October 3, 2006. We understand that this information is to be conveyed to the Water Resources Board to aid in understanding how the model can be used to provide technical information for aquifer management.

BACKGROUND ON ESPA CONDITIONS

- The ESPA provides a common water supply for ground water users and natural flow surface water users that rely on reach gains and spring flow users. Natural river flow and reach gains above Milner were fully allocated by the 1920s. Spring flow below Milner was fully allocated by the 1960s. There was insufficient ground water outflow from the aquifer after this period to fully meet all of the water supply demands at all times. Ground water pumping after the 1950s to 1960s depleted an already insufficient common water supply for senior spring flow and surface water users. Declining incidental recharge from more-efficient surface water irrigation practices causes a further reduction in available ground water supplies to meet all water demands. These facts are widely acknowledged in publications and documents prepared by the USGS and IDWR since the 1980s.
- A combination of declining incidental recharge and ground water pumping has severely reduced the net aquifer recharge. The change in net aquifer recharge is the result of these factors and is not the result of natural hydrologic variability. Natural hydrologic variability simply causes variation in a new state of net aquifer recharge imposed on the aquifer by declining incidental recharge and ground water pumping.
- Declining net aquifer recharge has caused a decline in aquifer ground water levels and aquifer storage. The impact of these declines is greatest near the western, south-western and southern areas of the aquifer where the aquifer discharges to the Snake River and in key tributaries that also have important surface-ground water connections.
- River reach gains and spring flows are declining during the critical period from June to September in most river reaches above Milner. Spring flow in the reach below Milner the declines are occurring February to June. The areas where declining reach gains and spring flows are most severe are closely correlated to areas where ground water pumping and changing irrigation practices have decreased the net aquifer recharge.

[1] John Koreny of HDR Engineering, Inc., Chuck Brockway of Brockway Engineering, Inc., John Bowling of Idaho Power and Willem Schreüder of Principia Mathematica serve as technical participants in the ESHMC and represent the Surface Water Coalition, Idaho Power Co. and Clear Springs Foods.

model calibration has been problematic at some of the river reaches. More attention is needed to evaluate the model calibration in these reaches. Listed below are some suggestions for techniques that may improve calibration:

- There may be a better way to represent some of the stream reaches in the model for areas where calibration has been difficult. One option is to allow the stream stage to change over time either as a user specified stage or calculated as a function of stream flow. Although stream stage in the Snake River does not change dramatically over time, the stream-aquifer interaction changes in the model requires the aquifer to change since the river remains unchanged. Give the size and high transmissivity of the aquifer, stage changes of a few feet may be significant.

- The American Falls reservoir reach representation may need to be refined. The reservoir is currently represented using the river package, but due to its size effectively acts as a constant head boundary in the model. The stage in the reservoir changes by approximately 50 feet through the year, yet observations near the reservoir does not show dramatic fluctuations. This suggests that the reservoir may have limited hydraulic connection with the aquifer, and discharges from springs are primarily responsible for the reach gains observed. If the stage in the reservoir is varied with time, the springs will likely have to be explicitly represented and the reservoir-aquifer conductance lowered or treated as perched.

5. **Evaluate and Improve the Ability of the Model to Predict Flow Depletion at Specific Springs Below Milner:** The model is able to simulate the reach-by-reach spring flow conditions below Milner, but is unable to replicate the flow response at some of the larger springs with recorded declines in flow. Further refinement is needed below Milner prior to understand the flow response at specific springs from various aquifer management alternatives. Two suggestions are listed below:

- The treatment of springs could be refined to include multiple drains to represent multiple springs within a model cell. For example, the model currently uses a single drain to represent all springs in a model cell. This makes the behavior inherently linear since the discharge is represented as a single head difference times conductance. In reality, each model cell may contain numerous springs with discharge locations (potentially) varying across a large vertical range. This makes the cumulative spring discharge behavior nonlinear because the springs at higher elevations will see larger flow declines than springs at lower elevations for the same head decline in the aquifer. Since an analysis of spring flows at individual springs may be desired, whatever refinements can address those spring flows more directly would be advantageous.

- The model grid in the reach below Milner is too coarse for representation of individual springs. We recommend uniformly decreasing the grid size throughout the domain and/or using a telescoped grid or MODFLOW-LGR (Local Grid Refinement) or some other technique that reduces the grid-size in the southwestern domain where spring flow is a significant concern. Our tests of the model indicate that the model grid could be reduced without significantly expanding model run times.

Information Sharing and Consultation

We have appreciated that IDWR and IWRRI have provided the opportunity to ask questions and to obtain clarity on various aspects of the modeling. We also appreciate that there has been some opportunity for data sharing. We suggest that as this process goes further- technical work groups will be necessary to allow for opportunities to ask questions and to obtain clarification in an efficient manner. If we are going to make progress, it is imperative that the information sharing be open and not limited by all parties involved. While recognizing that privilege information disclosure can not be imposed, all participants should be, to the extent possible, free from information disclosure limitations imposed by legal counsel. Otherwise, the desired goals of the ESHMC process will not be met. Additional resources need to be made available to organize and share data. The process would benefit by each iteration of model improvement or refinement being accompanied by information and files that document the process used to develop information and modeling data. We suggest that this should be made part of the procedure of collaboratively developing a work product through consensus via the ESHMC.

Thank you for the opportunity to provide these comments.

Sincerely,

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