

ESHMC Meeting Notes June 26th, 2013

Item 1 - Introductions were made, and an attendance list was circulated. The following were present at the meeting:

- Rick Raymondi
- Allan Wylie
- Jae Ryu
- Harvey Walker
- David Blew
- Jennifer Johnson
- Danielle Favreau
- Jennifer Sukow
- David Hoekema
- Mike McVay
- Sean Vincent
- Harvey Walker
- Bryce Contor
- Chuck Brockway

* present but did not sign the attendance sheet

Greg Sullivan, Chuck Brendecke, Dave Colvin, Bob Loundsberry, Lyle Swank, Rob VanKirk, and Jon Bowling joined the meeting via polycom.

Item 2 - Rick Raymondi began the meeting by discussing 2 items of committee business. The first was the recent IDWR reorganization with the most significant change being the new Deputy Director position now held by Mat Weaver. The second was the intention of IDWR to contract for a hydrologist through IWRRRI to assist with ESPAM water budget data collection and preparation for the model. Rick indicated that the hydrologist would be stationed in Boise at the Idaho Water Center.

Item 3 - Rob Van Kirk, Senior Scientist with the Henry's Fork Foundation and former Professor of Mathematics at Humboldt State University presented the findings of recent hydrologic investigations in the Egin Bench area. He began the discussion by acknowledging the funds were provided by a USDA grant with coordination from the Henry's Fork Watershed Council, and contributions from others at Humboldt State University, Fremont-Madison Irrigation District, and Friends of the Teton River, and collaboration from Kevin Boggs, Bryce Contor, and Gary Johnson.

The topics researched in his investigations included the hydrogeology of shallow aquifers, watershed-scale water supply and budget, hydrology of the canal-served irrigation system, irrigated water budgets, stream reach gains and losses, and groundwater outflow from the basin. He showed an outline of the area of investigation and provided basic geographic, geologic, and hydrologic information.

Rob indicated that hydraulic conductivities are relatively higher in the alluvium and basalt/sediment systems and lower in the rhyolite. He said that the shallow aquifers are generally less than 500 ft thick and are hosted in the alluvium and basalt sediment systems. He added that the shallow aquifers generally coincide with canal irrigated areas, with the primary irrigated areas being the Teton Valley, North Fremont, Egin Bench, and Lower Watershed, and that groundwater is also used as a source of supply on the Rexburg Bench.

Chuck Brendecke asked where the cross-cut canal was, and Rob said downstream of the Fall River confluence with the Henry's Fork. Rob added that Henry's Fork water is diverted south down to the Teton River via the cross-cut canal, and this diversion is the primary mechanism for delivery of storage water to the Teton River. He said that there is no storage on the Teton River.

Rob said that there are two areas where there is significant interaction between surface water systems and the underlying aquifer. The first area mentioned is the upper Teton River and the underlying valley fill aquifer. This aquifer is underlain by low permeability material, and essentially all upper valley recharge discharges to the Teton River. Rob indicated this area was represented with a simple 1-D analytical model (unconfined). The second area of river aquifer interaction is in the lower Henry's Fork basin. In this area, the aquifer consists of alluvium and basalt/sediment systems. The aquifer discharges to the lower Henry's Fork and Teton River and via underflow to the regional aquifer, and Rob indicated it was represented with MODFLOW as a single-layer unconfined system.

Rob indicated that the model time frame was from 1979 to 2008. Chuck Brendecke asked what time step was used, and Rob indicated it was daily and that good data were obtained from the USGS and the IDWR accounting program. Rob then discussed his methods of calculating the water supply including natural flow and storage. He provided a detailed methodology for determining irrigation seepage that included 10 irrigation budget components. Greg Sullivan asked if he assume an irrigation efficiency of 100%, and Rob said yes. Greg asked if he performed a reality check of his canal seepage estimates with local land users. Rob said yes, and the rates calculated showed a conveyance loss of 45 to 50%. He indicated that he talked to ditch riders from local canal companies, and they agreed with his numbers.

The next area of discussion concerned irrigation practices. Rob indicated that 80% of cropland is still under flood irrigation, and that the conversion from flood to sprinkler was incorporated into the model.

Rob showed a series of slides to describe the water supply/budget incorporated into the groundwater models including a schematic of the water budget, a 30-year hydrograph of the mean water supply, a detailed tabulation of the water budget, a diagram of the mean annual shallow groundwater recharge in the valley areas, a diagram of the mean annual water budget for the surface and shallow groundwater system, a diagram of the mean annual water budget for the surface irrigation system, a time series of diversions

in four primary regions, a mean irrigation hydrograph for the four primary region, irrigation budgets by region, river reach gains/losses for the Teton and Henry's Fork, and reach gain hydrographs for the same rivers. He said that a total of 809,135 AF of groundwater outflows from the basin either by discharging to streams (239,994 AF) or leaving via underflow to the ESPA aquifer (571,099 AF). Rob indicated that ¼ of the diversions are consumptively used and that drainage is not a problem in the area. He also said that diversions have decreased with time, and that reach gains to the Teton and Henry's Fork have declined substantially since 1979. Rob finished this portion of the presentation indicating that the water table is perched seasonally in the Egin Bench area, and during the irrigation season some groundwater flows away from the Henry's Fork to the west, and some flows back to the Henry's Fork.

Rob then showed a series of slides describing the modeling effort. He began with the model domain that included the North Fremont service area, the Egin Bench and the Lower Basin. He showed the simulated hydraulic head at the end of Water Year 2005 and the simulated reach gains in the lower Henry's Fork and Teton River between 1980 and 2008. The next slide provided MODFLOW model results demonstrating the difference in hydraulic head between current conditions and "natural" hydrology (no irrigation scenario).

After Rob provided his conclusions, Allan asked if the area west of Rexburg would be a natural wetland. Rob responded that the lower forks of the Teton River gain flow from irrigation and there are lots of wetlands in this area enhanced by irrigation. Rick Raymondi asked if there is groundwater pumping in the area of investigation. Rob said that there is not a whole lot of groundwater pumping. He said that there is more in the upland areas where canals do not reach and added that there are some exchange wells in the lower model domain.

Chuck Brockway asked for verification that there is no real groundwater contribution from the upper Teton Valley. Rob said yes, the river is incised through the alluvium below the upper valley. Then Chuck asked if there is mountain front recharge. Rob said yes there is a deep contribution from the mountain from the Island Park Caldera and other highlands. Rob added that the model doesn't represent the mountain front recharge well because the time scales of the deep system are much slower and not captured in a single layer shallow aquifer model. Chuck then asked how the boundary between the Egin Bench and Mud Lake is treated. Rob said this is a weak part of the model, and some areas are treated as fixed head boundaries, and some areas are treated as fixed flux boundaries. Rob added that the model reflects irrigation seepage which was the main objective.

Chuck Brockway continued by asking where is the least reliable groundwater data, and Rob said in the canyons to the east where streams are incised. He also said there are locally perched aquifers in the eastern area where heads don't match the river elevation. He added that the geology is difficult, and a single layer model doesn't represent the system well in these areas. Chuck Brendecke first stated that in the water budget, the table shows the net withdrawal from storage in the study period is a small number.

Then he asked if the small number is corroborated. Rob said it is corroborated by the current water level which has not declined significantly. Rob concluded his presentation by indicating that he would make the thesis available when completed.

Item 4 - Allan Wylie presented the prioritization efforts for the eventual development of ESPAM2.2. Allan outlined his presentation indicating he would discuss his efforts to compile suggested improvements, obtain ESHMC feedback via rankings by committee members, assign scores to rankings, and to develop recommendations to the ESHMC. Allan said he first read through past meeting notes to extract and compile suggested improvements. Then he emailed the list to the committee and requested additional suggestions and a ranking of suggested improvements. Allan said that eight ESHMC members responded and provided rankings.

Allan described his methodology used to compile and score the committee feedback, and then he showed a bar graph of the total score. He mentioned that some of the new, recently received suggestions did not rank well, and as an example, Allan showed that calibrating ESPAM to tracer tests, a suggestion by Chuck Brendecke, had a relatively low overall rank. Including the Portneuf River and the Menan Gage in the next version of ESPAM had the highest rankings.

Dave Colvin said that he did not understand the benefit of including tracer tests and water quality data in calibrating ESPAM, otherwise he might have ranked them higher. Chuck Brockway asked for an explanation of what was involved in including two drains for every spring target, and Allan said that in each spring cell, there are usually 2 drains, one at the lowest and one at the highest spring elevation. He added that the benefit of 2 drains is that it allows a better adjustment to the seasonality of the discharge. Dave Blew asked how long should a tracer flow path be in order to allow for a reasonable calibration target, and Allan said at least 2 cells.

Allan summarized the suggested improvement rankings by total score, number 1 votes, and number 2 votes. He listed improvements voted on by one individual, and then went through the recommendations that will be done as a ‘no brainer’. He provided his recommendations indicating that all low effort/high ranking improvements will be done as part of the development of ESPAM2.2. He added that intensive effort/high priority improvements will be done as part of ESPAM3.0.

Chuck Brockway asked for an explanation of the suggestion to convert the ESPAM MODFLOW computer code to MODFLOW USG. Allan explained that the USG code is an unstructured grid version of MODFLOW allowing the modeler to refine the grid and focus the resolution in a particular area and leave other areas alone. Allan added that there also is an improvement on the solver. Greg Sullivan said that USG could be especially good in the springs area. Chuck Brockway asked if anyone has experience with USG, and Allan said no, but John Doherty had good comments. Chuck Brendecke said that an AMEC person is an author of USG, and he could get him involved in the model development. Greg then said that there are conditions that we were not able to capture with the regional model, and USG would give us the flexibility to apply the

model on a local level. Allan responded that he believes that the finer grid would not make the model better and that the current 1 x 1 mile grid provides what the committee needs.

Sean said that MODFLOW USG has a different input file structure. Allan said that many aspects of USG are the same. Greg said that the grid refinement could occur in both horizontal and vertical planes and that the refinement could be done in a local area and not carried out to the whole aquifer. Allan asked why are additional layers needed, and Greg said to simulate underflow and spring discharge. Allan said that the need is not apparent to him, but there are areas with a poor calibration match. Bryce said there is anecdotal evidence of local multiple layers. Allan said there are multiple layers such as the hydrothermal flows at the base of the aquifer, but he is not sure if the contribution is significant. Greg said that Allan may convince us that multiple layer refinement may not make a significant difference, but if we convert to USG, the grid could be refined in the future. Allan agreed.

Dave Colvin said that he recently attended a MODFLOW conference, and based on the discussions, he thinks that USG is the wave of the future. He added that it is not fully developed and does not yet have wide acceptance. Dave then said that we would be better served with a stable version of MODFLOW now. Allan Wylie suggested that perhaps we should upgrade to MODFLOW 2005 for ESPAM2.2, and then go with USG for ESPAM3.0. Allan said he would experiment with USG. Dave Colvin said he is worried about misfires in the development of USG and that more time is needed. Allan said he is intrigued by the fact that USG will allow an unconfined aquifer simulation.

Allan said he would send out a table to allow the committee to vote again for the final rankings and not allow any additional suggested improvements. Chuck Brockway recommended using a consistent ranking system. Chuck then asked for an explanation regarding the suggestion to convert the Snake River representation from the river (RIV) package to the stream (STR) package. Allan said the STR package incorporates a simple accounting system to track the volume of water in the river.

Item 5 - Jennifer Sukow presented a refinement of the ESPAM water budget in the Big Wood and Milner Gooding canal systems delivery areas. She began with a map showing how she proposed to split out a number of irrigation entities from what was previously irrigation entity 59, and she indicated that ESPAM2.1 had some difficulty matching aquifer heads in this area. Jennifer indicated she met with staff of the Big Wood Canal Company and discussed return flows that the company has been measuring and reporting to Water District 37/37M. She indicated that with these measurements, she was able to abandon an overall water budget method for the Richfield and Dietrich tracts, and account for more local diversions and returns. Jennifer indicated that the data will allow some refinement of perched river seepage in some areas.

Jennifer showed maps of the Richfield and Dietrich tract diversions and the returns that she would be able to incorporate into the water budget. Mike McVay asked how she

was able to determine canal seepage, and she indicated that canal seepage fractions from ESPAM2.1, which was based on IWRR discussions with canal managers continue to be used. There are some data regarding losses from the upper portion of the Richfield Canal that are consistent with the ESPAM2.1 numbers. Chuck Brockway asked if there was a hydro plant on the Richfield Canal, and Jennifer was not aware of a plant. (In a recent email conversation, Kevin Lakey indicated the only hydro plant in this area is below Magic Reservoir.)

Next Jennifer showed a representation of the Gooding area water balance with inflows, outflows and canal seepage fractions. She indicated that she still needed a water budget approach on Gooding tract, because of unmeasured return flows. Then Jennifer presented a map showing the Northside Y and Z canal service area, with diversions and returns. She proposed this area be split from the rest of the Northside irrigation entity, because the Y and Z canals have a discrete service area north of the Malad River.

The next slide showed the upper Little Wood River diversions (37-M, 37-N, and 37-U diversions), and the perched river seepage reach along the Little Wood (Carey to Richfield). David Blew indicated that the Little Wood River no longer flows below Carey, and the only water in the Little Wood is from Silver Creek. David also said that the Little Wood River is diverted to a recharge site that is not in the model, and the recharge site was constructed by LSRARD.

Finally, Jennifer showed a map of the Richfield to Shoshone perched river seepage reach of the Little Wood River with the locations of diversions and returns. She also showed two gage sites at WM#10 and WM#14 that allow the calculation of the Richfield to Shoshone perched River seepage. She summarized the revisions to model files as follows:

- CNL – reassign BWCC canals to new entities; add Y and Z canals
- DIV – delete IESW059; add IESW060, IESW061, IESW062, IESW063
- ENT - delete IESW059; add IESW060, IESW061, IESW062, IESW063
- IAR – revise surface water polygons (delete IESW059, add IESW060, IESW061, IESW062, IESW063; revise extents of IESW032 and IESW000)
- PCH – deduct diversions from Little Wood River (Carey to Richfield); split Little Wood River (Richfield to Shoshone) from the Big and Little Wood (below Shoshone) rivers; combine the Malad River with the Big and Little Wood (below Shoshone) rivers
- Return flow targets – reassign Z End return flow to IESW063

She also suggested the following potential future improvements:

- Instrumentation of additional return flow measurement sites within the Big Wood Canal Company areas would assist with separating net diversions from perched seepage during the irrigation season in IESW060 Gooding entity.

- Measurement of winter flows on the Little Wood River at Shoshone would provide better data for calculation of perched seepage.
- Acquire Water District 37 & 37M records electronically to reduce delay in acquiring and entering data.
- Canal seepage values may be reconsidered if information becomes available. Richfield canal seepage could be refined spatially.
- Improvements could be made to calculations of diversions from Silver Creek (for IESW025) and the Wood Rivers (for IESW061 and IESW062) with extensive data entry of historic Water District 37 & 37M records. (However, Jennifer said that because these diversions are quite small, she believes such an effort is not warranted.)

Item 6 - (The following notes are from the ET Subcommittee discussions.) Bill Kramber discussed the need to send letters to Idaho congressional representatives requesting their help and support for the planning and development of LANDSAT 9. Draft letters were prepared to be sent to Senator Crapo and Representative Simpson for committee review and comment. Bill also said that LANDSAT 8 is up and running with 2 thermal bands (split window) which provides more accuracy. Greg Sullivan mentioned an article that indicated a demise of satellites, including weather, because of age/life expectancy.

Mike McVay then discussed a decision tree that will be followed in determining what ET data to incorporate into ESPAM for years with and without LANDSAT imagery covering the ESPA. Bryce commented that there are years when the data are not suitable for METRIC processing, but NDVI data will be acceptable in those years. Mike agreed. Then Bryce said that IDWR should focus on an interpolation method using the best available data. He also expressed the need for Bill to complete the METRIC processing for 1986.

Item 7 - The committee agreed that the next meeting should be either September 23rd or 24th, 2013.

DECISION POINT SUMMARY

The following was agreed upon:

- 1) IDWR agreed to send out a final table of rankings using the same ranking system as presented in the June 26th meeting.
- 2) IDWR agreed to experiment with applying MODFLOW USG to become the basic model framework for ESPAM.
- 3) The committee agreed that the next meeting should be either September 23rd or 24th, 2013.