

ESHMC Meeting Notes October 27th, 2011

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

- **Rick Raymondi**
- **Allan Wylie***
- **Sean Vincent**
- **Jennifer Sukow**
- **Chuck Brockway**
- **David Blew**
- **Janak Timilsena**
- **David Hoekema**
- **John Koreny**
- **Jim Brannon**

***Present at meeting but did not sign attendance sheet.**

Willem Schreuder, Bryce Contor, Chuck Brendecke, Greg Sullivan, Stacey Taylor, Dave Colbin, Phil Gossi, Ken Ashley, and Gary Marquart joined the meeting via polycom.

Item 2 – Stacey Taylor began the meeting with a review of the data that she is assimilating for the model validation efforts. She went through the diversion data that had been collected and indicated what was still missing. Portions of the Northside Canal, Reno Ditch, Southwest Irrigation District, and BIA data were mentioned as incomplete. Stacey indicated she needs to enter the 2011 agricultural statistics into spreadsheets, summarize the crop mix data on a spreadsheet, and explore Agrimet data for 2009/2010. She said that perched river seepage data are nearly done, and all that is left for precipitation is to update the files. Stacey indicated she will run the water budget data through the ESPAM tools. Jennifer Sukow recommended that she use the newest version of the tools which will allow development of a record of what went into the files. Bryce and Jim Brannon agreed this was a good idea. Jim Brannon asked when the validation run will be performed, and Allan said as soon as we decide we are calibrated.

Bryce said that there has been no progress on the final report and that he is 90% done with the figures that are pre-PEST/pre-MKMOD. He said he is waiting for calibration to be done, and then the real work on figures and the text will start. Jim Brannon said he has been given the OK to start the MKMOD write-up. Allan said he has done some of the report preparation, but he and Jennifer are waiting for the completion of calibration. Greg Sullivan said he was not able to review the first draft, and Bryce responded by saying he could look at the draft that includes comments by Rick Raymondi and Sean Vincent. Bryce then said he has nearly completed the work regarding the direct use of METRIC interspersed with NDVI data for ESPAM version 3, and it should eliminate the use of ET adjustment factors.

Item 3 – Jennifer Sukow presented information regarding Three Springs, Weatherby Springs, Hoagland Tunnel, and Spring Creek Spring. She started by summarizing the problem brought forth in the September 2011 meeting and the committee recommendation to treat the springs as a B category spring complex. She also explained the available data and the new data obtained from John Koreny and hatchery records. Jennifer then presented an area diagram with the diversion and piping network and explained the points of measurement.

Next, Jennifer presented graphs of the Three Springs/Weatherby/Hoagland Tunnel complex and the Spring Creek system. Then she showed a graph in which the two were combined to develop the cell 1041013 calibration target. Chuck Brendecke asked if ‘Hoagland Tunnel’ represents the Hoagland Tunnel Ditch diversions. Jennifer said yes and agreed to revise the legend to read ‘Hoagland Tunnel Ditch’. Jim Brannon asked about the light blue line on the diagram in the Three Springs/Weatherby/Hoagland Tunnel complex, and Jennifer said it was a diversion for irrigation, fish propagation, and domestic use. Chuck Brendecke asked where the fish propagation is done, and Jennifer said at another hatchery (not Jones). John Koreny questioned Jennifer’s response, and there was some discussion on this issue. Chuck Brockway said that he thought there was another hatchery on the north side of the Jones hatchery. Jennifer then reaffirmed that the water goes to Billingsley Creek Ranch for fish propagation, irrigation, and domestic use.

Chuck Brockway said he was not able to locate additional data from a study of the hydropower potential that he had performed, so he had nothing new to add to Jennifer’s data. Jim Brannon asked if the pre-1990’s data were posted. Jennifer responded that the early data from the Jones hatchery were posted on the call web page. Pre-1995 data are not available for the other diversions included in the calibration target. Chuck Brockway asked about the diamonds that appeared on the figures presented by Jennifer, and she indicated they represent total flow measurements taken during IDWR inspections. John Koreny commented that the graphs presented look better than previous data. Jennifer thanked John for HDR’s assistance with data entry of the Jones hatchery records.

Next Jennifer showed the components of the Spring Creek Spring discharge and the total Cell 1041013 Calibration Target. She showed a comparison with the Rangen calibration target and commented that the seasonal trends track well. Jim Brannon mentioned that he needed to get the Rangen target data through 2010 to Stacey for the model verification runs. Allan said that he hoped that the new hydrologic database being developed by IDWR will handle the data used for the verification runs. Chuck Brendecke wanted to know the data format, and Jennifer said weekly recorded flows. Willem asked about the frequency of the measurements, and Jennifer indicated that the measurements were typically made and recorded once per week.

Willem expressed concern that a diversion could start and stop between measurements, and the impact on the flow measurements would not be recorded.

Jennifer agreed with Willem's concern and went on to say that the flow measurements at the Three/Weatherby complex were typically made the same day every week, and some components were measured at the same time. Chuck Brockway said what makes a difference is the elevation of the spring and the level of activity up on top of the rim nearby. Jennifer said that mid-summer peaks in the hydrograph could result from the activities Chuck mentioned. Chuck Brockway said that Jennifer had performed an in-depth evaluation of the springs in Cell 1041013 as a result of the Covington and Weaver estimates, and he asked if there were any other skeletons in the closet. Jennifer said she looked for other large issues by comparing Covington and Weaver estimates with water rights files, and none were found. She added that the Thousand Springs issues were addressed, and other significant problems were not found. Chuck Brockway expressed a desire to stop using Covington and Weaver.

Item 4 - Allan Wylie began a discussion of the scaling that was done to credit the discharge at the Magic Springs hatchery to either the cell containing the Thousand Springs discharge or the cell containing the National Fish Hatchery. He first showed an aerial of the National Fish Hatchery with an outline of the model cell and the Covington and Weaver mapped springs. He said the estimated discharge was 80 cfs. Then he showed the SeaPac springs in the same cell and indicated the discharge was 113 cfs. Thus, his recommended equations were: $(80 + 113)/193 = 2.4$; and the NtlFishHatch * 2.4 = Calibration Target. (Note: the first equation has a typo and should have been $(80 + 113)/80 = 2.4$.)

Allan began discussing the Thousand Springs cell showing an aerial of the spring complex, and he said that according to Covington and Weaver, the springs added up to 1,540 cfs. He felt that this did not make sense and subsequently called the USGS and Idaho Power. After discussions and review of the data with Idaho Power, it was decided that 500 cfs was a better representation of the spring flows. Chuck Brendecke asked if the total included Sand Springs, and Allan said no. Then Allan discussed the Magic Springs and the unused springs in the Thousand Springs cell and recommended the following equation for the scaling to account for Magic Springs: $(500 + 77.2)/500 = 1.15$; and Thousand Springs * 1.15 = Calibration Target. Chuck Brendecke asked what happened to the other springs that totaled approximately 1000 cfs, and Allan said he moved 1000 cfs out of the cell. John Koreny asked where the water went, and Allan said to Class C target springs.

A long discussion of the Magic Springs in the Thousand Springs cell and associated problems followed. Allan said that there are two springs identified in Covington and Weaver that are not springs and that there are only two Magic Springs in the cell, Bridal Veil Spring and Hatchery Spring.

Allan described four ungaged flows in the Thousand Springs and National Fish Hatchery cells, which include Minnie Miller, an unnamed spring, a spring used to irrigate the park on Ritter Island, and a diversion into the Brailsford pipe used for irrigation across the river. Chuck Brockway suggested measuring in the estuary on

the north channel along Ritter Island to measure some of the spring flow. Allan said that the flows entering the Thousand Springs Power Plant (less Sand Springs) plus the Magic Springs plus the National Fish Hatchery is less than the total discharge for two cells. Chuck Brendecke asked for an explanation regarding the Snow Bank and Lemmon springs. Allan said that Idaho Power measures Snow Bank Springs, and Gary Lemmon measures Ten Springs. He explained that he added Ten Springs to the Thousand Springs cell reasoning that it was part of the same complex but just south of the Thousand Springs cell boundary.

Allan then showed a slide that demonstrated that the cell containing Thousand Springs averages 48.8 cfs higher discharge than the measured Thousand Springs flow plus 32% of the Magic. He added that the model target is 18.5 cfs higher than the sum of the measured flow. John Koreny asked how the unmeasured flow is treated, and Allan said they are represented using the equation $(500 + 77.2)/500 = 1.15$ as a scaling factor. Ken Ashley asked if the Brailsford pipe is in this cell, and Allan said no, it is in the cell containing the National Fish Hatchery. Ken then said that 18.5 cfs does not seem to be high enough to represent the unmeasured flow. Allan conceded that this was possible. John Koreny asked Ken to provide his opinion, and Ken thought it could be as much as 3 times what Allan showed. Chuck Brockway said that the difference between the red and the blue line on Allan's figure is about 3% and that he thinks Ken is right that there is more flow. Allan asked for guidance from the committee.

Ken suggested that Chuck Brockway had measured the Minnie Miller flows when the water right was filed. Chuck said that it was not a good measurement. Ken said he thought that the filing was for 50 or more cfs. He added that the vegetation prevents most of the flow from being observed, and he thought that more than 18 cfs is visible. Jennifer Sukow asked who filed for the flows, and Ken said it was Ken Ellis.

At this point John Koreny introduced Ken Ashley to the committee and indicated that he is one of the principals of SeaPac of Idaho. Chuck Brockway said there must be other data. Ken said he thought the Minnie Miller flow is about 50 cfs. Jim Brannon said the issue is that 1.15 as a scaling factor is not big enough. John Koreny said we could guess better, measure it, or do nothing. Chuck Brendecke asked if there were other data with the filing. Jennifer said she expects the filing could include a diversion rate higher than the actual flow, because the applicant might have wanted to tie up as much water as possible.

Jim Brannon asked if the spring elevation was known, and Ken said it is a high elevation spring. Jim said that it was his opinion that the flow has changed because it is a high elevation spring.

Allan showed the hydrograph for the cell containing the National Fish Hatchery and said that it averages 50.3 cfs higher than the measured National Fish Hatchery plus 68% of the Magic flows. John Koreny asked how much flow is discharged into the Brailsford pipe, and Ken said about 5 cfs. Sean Vincent asked if you could move 50

cfs from the National Fish Hatchery cell to the Thousand Springs cell. Allan said not that entire amount. Ken Ashley explained details about the springs feeding the Brailsford pipe, and he indicated that there is another spring underlying the Northside wasteway that adds approximately $\frac{1}{2}$ cfs to the return water.

John Koreny explained the flow records that are kept by SeaPac, and he asked how the spring flows are treated in the model. Allan said that in general, spring flows are represented by high and low elevation model drains and that PEST adjusts the conductance in both drains. He added that the drains don't represent actual springs, just flow to the cells. John responded that there are really good records for the SeaPac facility.

Ken Ashley recommended moving half of the 50 cfs from the National Fish Hatchery to the Thousand Springs cell. Allan liked the suggestion. Chuck Brendecke said that this would bring up the unengaged flows in the Thousand Springs cells to about 45 cfs. Ken Ashley said this seems pretty accurate. Jim Brannon agreed. Chuck Brendecke said that he likes Ken Ashley's recommendation, and his suggested reallocation seems reasonable. Chuck Brockway said that there is 113 cfs still in the equation as determined from Covington and Weaver, and Allan agreed.

Chuck Brendecke then referred to Allan's figure and asked if the blue line is the target for the cell containing the National Fish Hatchery. Allan said yes, but given the committee recommendation, the unmeasured flows will decrease by 25 cfs. Chuck Brendecke then said that the total unengaged flows in both cells are about 70 cfs, with 25 cfs in the National Fish Hatchery cell and about 60 to 80 cfs in the Thousand Springs cell. Sean Vincent asked if the 70 cfs is a large enough number to account for unengaged flows. Ken Ashley thought it was large enough.

John Koreny said that he could help with spring flow measurements, and he added that the measurements would give us more confidence in the model. Jim Brannon asked if quantifying the Minnie Miller flows will change the cell targets. He thought that it would not. Allan said that there still would be scaling factors in developing the overall cell target flows. John said that the results would help determine the distribution of the flows to the cells. Chuck Brockway said that it will help firm up the distribution between the cells, but he still was concerned how the unengaged flow numbers are obtained. John conceded that even with quantifying the Minnie Miller flows, there will still be unengaged flows in the targets. Chuck Brockway said that are unengaged flows locked into scaling factors using Covington and Weaver, and he recommended what John suggested regarding measuring Minnie Miller should be done. Allan said in a practical matter that if there was a delivery call at SeaPac, the sum of flows in both cells would be used in the determinations.

Ken Ashley said that he thought the unmeasured flows in the upper cell (Thousand Springs) are too low, and the unmeasured flows in the lower cell (National Fish Hatchery) are too high in Allan's hydrographs. Chuck Brockway said that taking time to make the additional measurements as John suggested results in a trade-off

between time and risk. Chuck Brendecke summed up his thoughts by saying that we are using lots of real numbers in these cells, and all agree that for the unaged flows, it is beneficial to get a good set of numbers. He added that Covington and Weaver have given us a start, but their distribution is wrong.

John Koreny suggested a memo that will explain what is being done with flows in the two cells. Chuck Brockway said that more documentation would be better, and he expressed a concern that flow measurements obtained at Minnie Miller may not be representative. John said we should make the measurements and then develop a memo. Chuck Brockway asked what other documentation will be developed besides the PowerPoint. Allan agreed that developing the flows presented in the PowerPoint might have been hasty, and he added that some spreadsheets have been posted. Allan said that he will change the distribution of unmeasured flows as agreed upon and post new spreadsheets.

Chuck Brockway said that if the committee looks at the big picture, there are two cells with a total discharge of about 700 cfs, and 25 cfs is only 5% of the total flow. He added that the adjustments won't make a lot of difference for the model, but it could affect a delivery call. Allan said that if the delivery call is at Ten Springs or the National Fish Hatchery, the adjustments will make a difference. He then said that the adjustments won't affect SeaPac because both model cells would be involved in a delivery call. Ken Ashley questioned whether the scaled up representation of Minnie Miller is high enough, but he doesn't think that the model is highly improved by moving the flows.

Chuck Brendecke proposed that the committee accept the reallocation of 25 cfs of the unmeasured flows between the two cells. The committee was in agreement on this proposal. Chuck Brendecke added that if new information was found, then it should be addressed in the model, and that he was not sure how to improve the 70 cfs total for unaged flows in both cells. Chuck Brockway said he is not concerned with the distribution of unaged flows, but he is concerned with the value because it will affect the amount of water owed in a mitigation plan. Allan said that we are going with the best information at a given point in time. Allan then asked if river measurements could be done in this reach. Dave Blew said the problem with measuring the river this time of year is that there is too much water in the river.

John Koreny proposed that the committee document the discharge from the springs (measured and unmeasured) in the two model cells containing Thousand Springs and the National Fish Hatchery by creating a memo. John offered his help in creating the memo. The committee agreed with John's proposal.

- Item 5 -** Stacey Taylor presented a review of river cells in the American Falls Reservoir area and what was done to address an issue raised by Willem Schreuder in the previous committee meeting (September 13, 2011). William had noticed a problem during his review of the results of a model calibration run. Stacey said that the issue occurred over several stress periods, and the cells that were causing the problem were not

intended to be “wetted” by the reservoir during lower stage levels. As part of the remedy, Allan identified the cells and the stage elevation when the problem occurred. Stacey indicated that the issue occurred most often when the reservoir stage was between 4300 ft and 4349 ft, and never when it was above 4350 ft (essentially full). She said that when cells in the reservoir were not intended to be covered by the extent of the reservoir for a certain stress period, the R_{bot} value was adjusted (+30 ft) to the actual elevation of the reservoir bed surface. Stacey then said that this change fixed most cells that were not intended to be wetted, but other cells on the outer edges of the reservoir still created a problem.

Willem said that when the cell is dry, it can gain water but it cannot lose water. He differentiated between stage and dry for these cells. Allan said that to fix other cells, he built a program, and for a dry cell, he set $R_{bot} = R_{stage}$. Willem asked if stage at ground surface, and Allan responded yes, and he added that stage can never be lower than ground surface.

Chuck Brendecke asked if the problem was that a dry reservoir was losing to the aquifer, and Willem responded yes. Allan said that the change did not significantly change the model water balance. Chuck Brockway asked where the 30 ft adjustment came from, and Allan said Garabedian.

Item 6 - Allan Wylie presented the results of the most recent model calibration run. He pointed out that the calibrated model transmissivity moves water toward Box Canyon. He said the S_y is high in the Malad area, and the river bed conductance is low beneath American Falls Reservoir, and high in the Near Blackfoot to Neeley reach which he attributed in part to gains in the lower Portneuf River. Allan noted that tributary underflow was high at the Henry’s Fork, Little Lost River valley, Clover Creek, and Silver Creek. He said that the modeled spring flow matches the improved measured flow to the Jones cell.

Chuck Brockway asked why Fort Hall has deficit irrigation. Allan said he did not know, but he expected AFRD2 and the Dietrich and Richfield tracts to have deficit irrigation. He said that he still questions the deficit irrigation at Mud Lake. He went on to say that Egin, Aberdeen, AFRD2, and the Rexburg bench all show high leakage vs. diversion rates.

Item 7 - Bill Kramber presented an analysis of METRIC ET data from the Northside and AFRD2 irrigation districts. [Note: Bill was asked to perform this work to determine if there is an increase in ET in the western end of the ESPA in the years from 2006 to 2008 that may not be reflected in the model data and could be an explanation for lower measured vs. modeled spring flows.] Bill showed a hydrograph of the modeled vs. measured divergence for the Rangen spring flows that are apparent in recent model runs. He said that the purpose of his work was to investigate the ET in the 2006 and 2008 irrigation seasons, and he pointed out that processed METRIC data are available for 2000, 2002, 2006, and 2008. He added that the original irrigated lands for 2000 were processed using classifications from LANDSAT data and not directly

comparable to the work done for the other years, which were processed using CLU data. An irrigated land layer for 2000 was developed from CLU data for this analysis. The irrigated land layer from 2002 was overlain on the 2000 METRIC ET data and any polygons with ET less than 1.5 ac-ft/acre were deleted. This should be considered preliminary data because, due to time constraints, it was not developed with the same procedures as the irrigated land layers for 2002, 2006, and 2008.

Bill presented his results in tabular formats and on a chart, and the results show that there is an increase in ET over the period from 2002 – 2006 - 2008. Chuck Brockway said the difference could be from climate rather than irrigated area, and he asked Bill how comfortable he is with the 2000 data. Bill said he is comfortable with the data, but he said it should be used with caution. Brockway asked Bill if for ET that is less than 1.5 ft per acre, if he considers it to be non-irrigated, and Bill confirmed this statement. Chuck Brendecke said that the data do not inform us about crop distribution, and Bill said yes. Chuck Brendecke then asked Bill to confirm that he does not need crop data of any kind, and Bill said yes.

Sean Vincent indicated that the question at hand is whether the data in the model explain the divergence. Allan said that an average of the 2000 and 2002 METRIC data were used to develop ET adjustment factors. Chuck Brendecke asked if there was one factor per entity for the entire calibration, and Allan said yes. Jennifer Sukow said that there is some allowance for change in climate because the ET Idaho data are used in the model. She also said that she pulled up the NAS crop land data layer and compared it to what Bryce had prepared for the crop mix, and she said it compared well. Chuck Brockway asked if this analysis shows that ET could have caused the divergence. Sean replied that we don't know and that we would have to take the ET datasets in the model, convert them to rasters, and perform the analysis. He added that the analysis has not been done.

Jim Brannon said the divergence in spring flows might be from a change in canal losses. Allan agreed that this would impact the springs, and he added that canal leakage rate does not change over time. Chuck Brockway asked if this divergence could be a result of lining canals. Allan said probably not, but the canal managers could have filled sink holes resulting in lower seepage. Chuck Brockway asked if it impacted numerous springs, and Allan said Clear Lakes, Rangen, Crystal, and Devil's Washbowl. He added that some springs show more divergence than others. Jennifer Sukow said you could see the divergence in some well targets along the rim in the Northside service area.

Chuck Brockway said that the apparent anomaly indicates that it is not measurement error and that this is an important question to answer. He said that people routinely ask if the aquifer has stabilized. Jim Brannon said he wants to look at the Rangen data for the last two years. David Hoekema asked if the divergence phenomena follows any aquifer properties, and Jennifer Sukow said this has not been analyzed.

Allan said he could overlay the transmissivity map. Chuck Brendecke said this might show if there is a spatial pattern.

Chuck Brockway asked what will be done next. Sean Vincent said IDWR will look at traditional ET for 2006 and 2008 in the model to see if it explains the divergence. Allan said the ascii file data in the model would be converted to rasters and clipped to the irrigated lands data, and then summed. Jim Brannon asked if the surface water deliveries were examined, and Allan said that this level of detail is hard to see in the diversion data because the volumes are so large, but he agreed that Jim had a good thought. IDWR agree to present the diversion and model ET data in the next meeting.

Chuck Brockway asked if the transient well data had been reviewed, and Jennifer said that we would look at ET first. Jim Brannon said that he is thinking about the surface to ground water split, but he did not think that this would affect the divergence in spring flows. Allan said a shift from surface water to ground water could explain the divergence, but he did not think this was happening.

Item 8 - Chuck Brockway showed a video and presented information related to Dye Tracer Testing that Brockway Engineering performed for the City of Twin Falls. He began with background information on the management of Blue Lakes Spring. Chuck said that there is no surface flow out of Blue Lakes, and that water exits via fissures, sinkholes, the “orifice”, and around boulders upstream of the weir. He added that springs emerge to form Alpheus Creek.

Chuck indicated that a computer model showed that an inflow of 130 to 140 cfs is needed to maintain the level of the lower lake. He added that data indicate that the inflow has decreased from approximately 250 cfs in 1950 to approximately 140 cfs now, and the country club is worried about aesthetics. Chuck Brendecke asked if the numbers represent the total flow or just the surface flow at the gage, and Chuck Brockway said it is the total flow.

Chuck showed a graph of the USGS, IDWR, Brockway Engineering flow data from 1950 through 2010 at the gage. A red line in the data represents the 365 day centered moving average. Then he showed the USGS daily values from 1995 to 2011 for Blue Lakes Spring. He also indicated that the maximum daily pumping by the City of Twin Falls at the head of Blue Lakes Spring is 25 cfs and down from 31 cfs in 1993, and that with the pumping, the natural spring inflow has to be 155 to 165 cfs to achieve effective lower lake control.

Then Chuck presented solutions to the problem. Component 1 was to replace the USGS gage station with a new measuring device. He said that the +/- 30 cfs margin of error is not adequate for managing the lake level because the daily natural spring inflow guides how much can be pumped by the City of Twin Falls. The second component of the solution that Chuck discussed was reducing the seepage from the

lower lake. Then he discussed performing dye tracer tests with the following objectives:

- 1) To identify high seepage areas in lake bottom (other than orifice)
- 2) Define flow paths, travel times, and mass balance
- 3) Determine whether all water reaches Alpheus Springs, or if some bypasses the system
- 4) Determine effect of seepage reduction actions on distribution of flow from Alpheus Springs

Chuck summarized the dye tracing plan as follow:

- Four injection locations, “slug” injections
- Measured dye concentration curve at four locations:
 - Alpheus Springs, Alpheus Creek at BL Trout weir
- Measured presence/absence of dye in Snake River
- Dye: Rhodamine WT

Breakthrough curves, arrival time comparison graphs, and time to peak graphs were presented as well as mass balance results for the monitoring points. Then Chuck discussed 5 scenarios to reduce seepage and the basic findings and conclusions of the tracer study. Finally he outlined the elements of the proposed plan.

Item 10 - The committee agreed that the next meeting would be held on December 12th, 2011.

Item 11 - Allan Wylie presented the results of an uncertainty test in which stress was applied in a centroid of irrigated lands within WD 110, and the impact on Clear Lakes Springs was observed. Allan indicated that the test results tell us how tightly the assumptions and calibration data constrain the prediction, and the results of the maximum stress showed the prediction was constrained within a range of + 0.17%, and the minimum stress showed the prediction was constrained within a range of – 3.9%. Jim Brannon asked if a constant steady state stress was applied, and Allan said yes.

Jim Brannon then asked what do you adjust, and Allan responded that all parameters that you can adjust and remain calibrated. Allan proceeded to draw a diagram and provide additional explanation to Jim. Allan said there were two model runs, and that for the first run, he used a transient fully populated model in calibration mode. For the second run, he converted to a steady state superposition model and applied stress to run the prediction. Chuck Brendecke asked how you weight the prediction in the calibration run, and Allan said there are no weights applied.

Greg Sullivan asked what criteria are used to determine that the model is in calibration. Allan said there are two criteria: 1) for the calibration run, the sum of the squared residuals (ϕ) is within 1.5% of the calibrated ϕ ; and 2) whether the committee likes the parameters derived. Greg commented that both criteria are subjective, and Allan said yes. Greg asked if the committee discussed how big the ϕ is or should be, and Allan said no, the 1.5 % value is suggested in the PEST

documentation. Greg said it is an important item that should be discussed, and Allan agreed.

Allan said the sum of residuals for the calibrated model (ϕ) is 2,400. He thought that the ϕ for most springs was in the 200 to 500 range. Dave Colbin asked if bigger springs have larger ϕ values. Allan said Group C target springs are weighted the lowest; A and B targets have higher weights. Allan said that the results of the uncertainty analysis showed that Group C target springs were primarily affected. Jim Brannon asked what will be done with the uncertainty numbers. John Koreny said we should figure this subject - the predictive uncertainty analysis, first. Allan said that a recent predictive uncertainty run in WD 120 showed 12 % change in impact at Clear Lakes Spring.

Greg Sullivan said all of the predictive uncertainty appears to be in the low weighting for class C spring targets, and we should be thinking about this. Allan said the model is allowing the targets we have less confidence in adsorb some misfit and it is dependent on our how we assigned weights to these targets. He then said we are interested in how irrigation affects reach gains and spring discharge, and we consider that our data concerning both are good. We expect predictive uncertainty to be low because or field observations naturally constrain the predictions. Allan said one of the things we are exploring with the uncertainty analysis is what additional observations we need to collect to strengthen the model, and our weights are assigned pragmatically based on our confidence in the field observations.

John Koreny said that he felt that the math behind the uncertainty analysis is elegant, but he wondered how practical the method is and how the results will be used. John Koreny does not agree with the uncertainty analysis methods being used.

Jim Brannon said he believed that the uncertainty analyses could be used to develop the spatial distribution of uncertainty. Dave Colbin said that if we have to go to a linear prediction of uncertainty, we will lose the non-linearity piece. Dave went on to say that if we could get the spatial distribution of uncertainty, we could relate it to model construction, and we would know where the error is contributing to uncertainty. Allan Wylie said that the analyses being performed are often used to identify sources of uncertainty or what contributes to it. The analyses are being done to answer a question such as – would nailing down tributary underflow lower predictive uncertainty.

Chuck Brockway said that the Director asked for an analysis of uncertainty, but he doesn't know what is involved. Then he asked if this analysis will answer the Director's question. Allan said there are other sources of uncertainty that the committee is not investigating. Greg said the number would be larger if we could consider other sources of uncertainty. Jim Brannon asked where are we going with this analysis and can we use these numbers. Allan said the uncertainty analysis is very spatially dependent. He said we have to do it, finish it, and it takes a lot of time. Allan then said we divided the analysis up by water district.

Chuck Brendecke said there are more degrees of freedom or fewer constraints in Water District 120 than in 110 or 130. Chuck said he had two conclusions: 1) this effort is largely an exploration of calibration rather than uncertainty, and we are finding tight constraints on the calibration; 2) if we assume the data are fine, then with this stress in Water District 110, we could be under-predicting an impact on Clear Lakes by 0.17% or over-predicting by 4%. Chuck referred to this as potential over or under predictions. Allan added that it assumes our weighting scheme accurately reflects our confidence in our field observations.

Chuck Brockway said then we are getting close for that location of stress on the Clear Lakes Complex. Jim Brannon asked if you increased the size of the stress, will it impact the target differently. Allan said not for injecting but it could for pumping by causing the springs to go dry. He added that the size of the stress generally won't impact the target differently, but where we put the stress could affect the target differently.

John Koreny said he is uncomfortable that the analysis will tell us the uncertainty of some action is 4 or 5%. Allan said that what the analysis is telling us is that it can't be or is not 40%. Sean said it also says that the uncertainty on the prediction from Water District 120 is higher than 130 on Clear Lakes.

Greg Sullivan said he would like a description of the uncertainty analysis including what it is doing, what it considers, what it doesn't consider, etc. Greg then asked what if you varied the weights, and Allan responded that there is nothing to say that we can't. Jim Brannon said he is nervous about how this analysis will be used and how sensitive it is to the phi within 1.5 %. Allan Wylie said he has a different perspective with no fear of uncertainty. Rather, he has a curiosity of what it will tell us. Allan thought there will be a battle in a hearing regarding how the information will be used.

Item 12 - Subsequent the meeting, John Koreny sent the attached email:

From: Koreny, John S.
To: Wylie, Allan
Cc: Raymondi, Rick; Sukow, Jennifer
Subject: Elevations of Jones and SeaPac Springs
Date: Monday, October 31, 2011 2:02:49 PM

Hi Allan-

At the ESHMC meeting on Thursday- I forgot to bring up the question we discussed last week about whether we need to measure the elevations of the springs at SeaPac and Jones. If you think that needs to be done- we can send a guy out there with a survey-grade GPS and do

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that. It's about a day's effort- so not a big deal. If you feel like this parameter is sufficiently well-constrained using the existing data- than it's probably not an issue.

Please let me know what you think.

Thanks-
John

John Koreny

HDR

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IDWR responded with the following email:

From: Wylie, Allan
Sent: Wednesday, November 02, 2011 8:24 AM
To: 'Koreny, John S.'
Cc: Raymondi, Rick; Sukow, Jennifer
Subject: RE: Elevations of Jones and SeaPac Springs

John

Rick is out in the field this week. I think surveying the elevations would be OK, but we need to make sure that we try to survey the spring elevation, not the elevation of the water. The person doing the surveying should be a hydrologist so that they know that the lowest elevation at which water exits the aquifer is the elevation of the spring, and the elevation that we need in the model. If there is a lot of talus between the first exposure of the water and the cliff face, the spring elevation is unknowable and I don't see a need to update the C&W values. With that in mind, would it be possible to coordinate with one of our IDWR employees?

Allan

The spring elevation survey was performed. Jennifer Sukow posted the elevations and related information on the committee web site at

http://www.idwr.idaho.gov/Browse/WaterInfo/ESPAM/meetings/2011_ESHMC/October27_2011/

DECISION POINT SUMMARY

The following was agreed upon:

- 1) Jim Brannon agreed to provide the Rangen calibration target data through 2010 to Stacey for the model verification runs.
- 2) The committee agreed to move approximately half of the unmeasured flow represented in the model cell containing the National Fish Hatchery (approximately 25 cfs) to model cell containing Thousand Springs. IDWR agreed to post revised spreadsheets for these calibration targets.
- 3) The committee agreed to document the discharge from the springs (measured and unmeasured) in the two model cells containing Thousand Springs and the National Fish Hatchery by creating a memo. (Note: IDWR sent out a memo produced by Jennifer Sukow on Wed 11/2/2011 9:50 AM for comment by the committee. This memo was subsequently revised on 11/17/2011 to address comments received. Related information and comments received can be found at:
http://www.idwr.idaho.gov/Browse/WaterInfo/ESPAM/monitoring_data/Springs/Current_Data/Thousand_Magic_NatlFishHatchery/
- 4) IDWR agreed to present diversion data and the model ET data for 2006 and 2008 in the western end of the ESPA to see if it explains the divergence in modeled vs. measured spring discharges.
- 5) The committee agreed that the next meeting would be held on December 12th, 2011.