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From: Bill Sikonia
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Date & Time: 3/14/96 10:36:09 AM
Pages: 7
Re: Truckee-Carson activities March 1-13, 1996.

If you have an email address, it would be much more convenient than fax. You could send it to me at my address, Bill_Sikonia@msn.com

I apologize if you've already sent one--I must have lost it if you did.

Also, if you don't care to receive these in the future, just let me know.

Best regards,
Bill Sikonia

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Truckee-Carson Activities, March 1-13, 1996

I spent most of this time moving into an office at the U.S. Bureau of Reclamation in Sacramento. I'm setting up my laptop computer to interface with the USBR computer network through a "docking station" in my office, and the computer bugs are hard at work making the process difficult. As one example, a USBR employee came around and said she needed to check my computer for viruses so I wouldn't infect their system when I hooked up. However, she used a virus checker that was incompatible with my Windows 95 operating system, and it recognized parts of the operating system as viruses and destroyed them. I later learned from Microsoft technical support that one should not under any circumstances use a virus checker that was designed for the older versions of Windows, because the result I experienced will happen if one does. Subsequently, I had to spend a great deal of time trying to put my computer back together. The lesson, as voiced by Microsoft support: do not use ANY software, especially a virus checker, that is not certified compatible with Windows 95.

I will be working most closely with Bill Greer, USBR in Sacramento, and with Tom Scott, USBR in Carson City (a little, as Tom's schedule permits), as the Federal representatives on a team to document and quality assure the Negotiations model. We will be working closely with Rod Hall, a consultant from Sierra Hydrotech working for Sierra Pacific Power Company (SPPC), and Ali Shahroody and others from Stetson Engineers, who are consultants working for the Pyramid Lake Tribe. Stetson Engineers have a subcontract for the model work from Orlob and Associates, who in turn have contracted the work from the U.S. Department of Justice.

We had hoped to have an initial meeting of the modeling team on March 7, but Rod Hall was so busy making runs with the model that he had to cancel. The next meeting is Monday, March 18. I'm hoping for a number of things: first, that we can arrange meetings on a frequent and regular basis—I'm suggesting a half day every week. Second, I hope that we can make the time for them, especially considering the busy schedules of Rod and Ali. Doing this will require the cooperation of SPPC and the Pyramid Lake Tribe to free up some time for the two. I think we all recognize the importance of having a documented, quality assured model that all parties can have confidence in. Third, I hope we can schedule the meetings for Tuesdays through Fridays and avoid Mondays. I must make plane reservations at least a month in advance if the fare is to be reasonable and am planning on four 10-hour days Tuesdays through Fridays each week. For the meeting on March 18, Ali has graciously agreed to have his people go over the previous day's discussions with me the next day.

On Friday, March 8, Bill Greer and I drove over Donner Pass to attend a meeting in Reno of the Truckee River Operating Agreement (TROA) work group on Operations. The group is chaired by Ali Shahroody and receives considerable input from Rod Hall, both of whom attended. At the meeting, Al Olson of the USBR presented an analysis he had worked up of losses in Lahontan Reservoir due to evaporation, seepage, and bank storage. Knowing these losses is important to the Truckee-Carson Irrigation District, because they must take these losses into account when calling for irrigation water. Rod Hall presented a preliminary draft of water accounting procedures, in particular those related to one party temporarily "borrowing" water from another party's allocation. The draft set forth procedures for paying the borrowed water back. The subgroup also discussed how to measure the flow at the downstream end of the model, which was nominally set at Derby Dam. The subgroup had voiced concern at earlier meetings about the accuracy of the gage on the Truckee Diversion Canal near Wadsworth, which measures flow in the canal after loss through the "Gilpin spill" below Derby Dam. The U.S. Geological Survey has upgraded the quality of the measurements at the gage by installing an acoustic velocity meter there, so the reported discharges are much higher quality than before. Based on this upgraded gaging, the concern about the amount of the Gilpin spill disappears (it can be deduced by subtraction). The subgroup decided to use gages on the Truckee River and the Truckee Diversion canal just below Derby Dam for control of river operations, and to use gages on the river and canal near Wadsworth for accounting purposes.

The following is a discussion I've had over email with John Sarna about ground-water/surface-water interactions in the Lake Tahoe Basin. I thought others might be interested in our electronic conversation as well. Immediately below are some comments of mine responding to John. John's email is below that, and the section of my February 26-29 activities report relating to these issues follows as the third section.

MY COMMENTS RESPONDING TO JOHN ARE AS FOLLOWS:

John—

First, an omitted qualifier in the quote makes it completely accurate, namely "IN THE LONG TERM, ON AN ANNUAL BASIS, ground-water pumping is essentially equivalent to a surface-water diversion."

The first phrase, "IN THE LONG TERM" is there because initially all wells draw their water from ground-water storage. After pumping for some time, though, the storage is depleted (there's no free lunch), and the wells in most cases draw the pumped water almost entirely from capture of surface water. The phase of drawing from storage is probably not as long as most people think. I've heard statements like "this water we're pumping is 10,000 years old." That could very well be true, but does not imply that the well is not capturing water from surface sources. It's like a long transportation pipeline—one puts oil, water, or whatever in one end, and what one draws out at the other end is what has been displaced by the incoming flow. They are not the same molecules of the transported substance that one entered at the inflow end of the pipe. We've done modeling runs, which I plan to send over, that show the surface-water capture can start a few days after the well starts pumping, and that the well may be getting most of its water from surface capture after only a year or two.

The other qualifier is "on an annual basis." The timing of the effect on basin surface-water resources may not be as immediate as with a direct diversion of water from the stream. It takes a bit of time for cones of depression to develop, or to alter themselves to adjust to a changed pumping rate. Thus, people seem to hope that the effect will serendipitously capture water from the streams only during the high-flow season. I think that's asking for a lot of luck. For one thing, we can expect domestic wells to be operating pretty much year round. For another thing, we've seen that ground-water heads can respond very quickly—in a few days in some cases—to changes in pumping. I think these shorter response times will be a natural outcome of the relatively confined hydrogeologic settings in the Lake Tahoe basin. Thus, we can say two things: First, it may be wishful thinking to hope that wells will draw all there water from only high flows—one has only to look at the dry Sinking Creek in Washington State to see what can happen. Second, even if the timing is altered within the year, ON AN ANNUAL BASIS, the well will capture essentially all its water from surface sources. There's no free lunch, conservation of mass still applies, and the water one pumps has to come from somewhere. In this context, for example, the Pyramid Lake Tribe can expect less water flowing into Pyramid Lake every year by an amount equal to the annual consumptive-use portion of California's 22,000 acre-foot ground-water allocation.

The analogy to a large storage tank leaves out important characteristics of the combined ground-water and surface-water systems. It assumes, for example, a hydraulic conductivity approaching infinity compared to real ground-water hydraulic conductivities. Thus, ground-water withdrawals from the storage tank are felt almost immediately everywhere in the tank, whereas we've seen that changes in heads in response to pumping take a little while to develop. The analogy also assumes that water levels in rivers follow a ground-water level that is constant everywhere in the basin. In reality, stream water levels can vary only a few feet from the lowest flows to the highest flood flows, whereas ground-water levels can vary by hundreds of feet. One effect of this is that seepage into rivers from the ground-water system, or seepage from the rivers into the ground-water system, is not constant throughout the year, as assumed, and may very well reverse

direction throughout the seasons. In the rainy season, ground-water levels typically rise in response to the added recharge, and ground-water levels may rise higher than stream levels, so the gradient is towards the stream and water seeps into the stream. In the dry summer season, ground-water levels typically drop because of lack of recharge and may drop below stream levels, in which case the gradient is away from the stream, and water seeps out of the stream into the ground-water system.

We have to keep in mind that the subtraction caused by pumping from annual streamflows depends on consumptive use of the pumped water. Any return flows, as through septic tanks, is not lost to the system and will eventually flow downstream. The timing of the flow downstream will usually be modified by routing the flow to the surface and back again to ground water, as compared to just leaving it, without pumping, in the ground-water system. However, I would expect that non-consumptive domestic use that returns flows to septic tanks would be much more stable throughout the year. Increased summer use often is consumptive use of water—by evaporation—for irrigation (including lawns and golf courses). Also, except for direct returns to the river, any changes in flow from the tanks will not cause immediate changes to flow into or out of the river, but will be delayed somewhat by the slower process of altering heads in the ground-water system to accommodate the changes. These considerations, coupled with the lack of recharge to the ground-water system, very often results in reduced summer flows to streams, not increased flows. Indeed, one would have to do some calculations to check the net effect—keeping careful track of consumptive versus non-consumptive use, ground-water heads compared to stream levels, variable recharge rates throughout the year, and the timing of return flows. Doing so may require at least a rudimentary ground-water model of some typical sub-basin of the Lake Tahoe Basin. I really doubt that we would see increased summer flows compared to undeveloped conditions as ground-water pumping increases (I'd expect the opposite), and, on an annual basis, it doesn't matter what the timing is—the flow into Pyramid Lake will be decreased by the total annual consumptive ground-water use.

So that others don't get the wrong impression from another quote, my introductory phrase to the quote should be included: "BUT IT IS, I THINK ASKING TOO MUCH TO ASSUME THAT summer pumping will always come completely from ground water recharged during high flows in the winter." I didn't presume what isn't capitalized, and don't think one can expect this to happen. I'm not sure how one would check things out using statistics—I think, as I've indicated above, that we would need a ground-water model.

The timing of the effect of pumping on the ground-water and surface-water systems is not important if one is concerned just with the total annual effect of consumptive ground-water use, but is important if one is concerned with low summer streamflows as well. I think one has to be careful—at times the conceptual model assumed instantaneous connection, as with the storage-tank analogy and returns from septic tanks. At other times it assumed an effect evenly spread out throughout the year, as in the second-to last paragraph about the timing of the effect of pumping on surface flows. One would have to make sure that the same assumptions and conceptual model apply to all parts of the routing.

In any case, I'm appreciative of the interest and thinking on these issues. Take care and keep up the inquisitive work!

Best regards,
Bill Sikonia

JOHN'S COMMENTS OF MARCH 8, 1996, FOLLOW:

In regard to the California ground water vs surface water paridigm in your report, I believe you are as wrong to state that "ground water pumping is essentially equivalent to a surface water diversion" as others are wrong to state that "summer pumping will always come completely from ground water recharged during high flows in the winter".

I believe the best analogy is that of a large storage tank with a hole in the bottom. The tank holds the ground water supply. The flow out of the hole is analogous to baseflow of ground water into the surface water of the basin. Wells in the basin pump out of the tank itself, and return flows either go back into the tank (septic tanks) or add to the flow out of the tank (public sewage systems going to the TTSA waste treatment plant).

Under this analogy, the long-term effect of ground water pumping is, like you implied, a subtraction to the total surface water flow. However, because water use in the summer is greater than water use in the winter, the sewage augmentation of surface water flows in the summer is greater than those in winter. However, the decrease in base-flow (caused by increased use) is relatively constant throughout the year. Hence, while the total expected surface water flow out of the basin will decrease by the amount of ground water consumptively used, this will affect the winter flows more than the summer flows. Its even possible, I suppose, that the expected summer flows could increase as more wells are put in and their waste water flows to the TTSA treatment plant. However, I'd need to do some calculations to check this.

So, the presumption that "summer pumping will always come completely from ground water recharged during high flows in the winter" may be a misinterpretation of an effect that can be predicted using statistics.

Of course, I know my analogy doesn't work if the (major portion of the) effect of a well on the surface water flow occurs within a few months. I'm fairly certain that is not the case in the Truckee area, but, as I recall, we argued a bit about this before.

Please let me know your perspective on this. I'm preparing some information for the TROA Test Group (the watermaster test), and I must make some such presumptions based on future use. So, I'd like to hear any arguments against my analogy.

Thanks for any thoughts on this.

John Sarna jsarna@water.ca.gov

COMMENTS I INCLUDED IN MY TRUCKEE-CARSON ACTIVITIES REPORT FOR FEBRUARY 26-29, 1996, RELATED TO GROUND-WATER/SURFACE-WATER INTERACTIONS IN THE LAKE TAHOE BASIN FOLLOW:

Another lengthy discussion involved ground-water pumping in the Lake Tahoe Basin. California has a surface-water diversion allocation of 10,000 acre-feet per year, plus a ground-water diversion allocation of 22,000 acre-feet per year. John Sarna, Neil Eskind, and others went with the philosophy of trying to minimize short-term impacts on streams by prohibiting wells within 200-500 feet from streams. In many cases this is likely to cause practical difficulties, because the practical drilling locations in valleys are often not much wider than this. In addition, I think there is a very real danger that people will interpret this restriction to mean that if people drill wells outside this zone, there is no impact on streams. We know that after the initial transient period of taking water from storage to develop the cone of depression around a well, that essentially all water pumped from a well comes from capture of surface water, no matter how far the well is from a stream. The timing of the capture may be altered a bit from what it would be with a direct diversion of surface flow, but it is, I think, asking too much to assume that summer pumping will always come completely from ground water recharged during high flows in the winter. That would be tricky to arrange, or very fortuitous. One has only to look at Sinking Creek in Washington State to realize that pumping may very well have the effect of drying up the stream. In any case, in the long term, on an annual basis, ground-water pumping is essentially equivalent to surface-water diversion. Thus, in a discussion about the 22,000 acre-feet of ground-water allocation, people were unwilling to realize that if this is consumptively used, 22,000 acre-feet less of water will flow down the Truckee River each year. (It probably will not be all consumptively used, however.) On an annual basis, the consumptively used ground-water pumping is essentially equivalent to surface-water diversion and consumptive use of the same amount of water. Only the timing within the year of the diversion may be altered somewhat from a direct surface diversion, and that timing is very difficult to control so it works completely to your advantage.

FOR ANYONE TRYING TO CONTACT ME, USE THE FOLLOWING ADDRESSES:

For Tuesdays through Fridays, use

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Phone (406) 587-7615
Fax to Kinkos two blocks away (406) 586-0396
Telephone at Kinkos (406) 586-8999

(On the fax cover sheet, indicate it's for me and that they should call me so I know the fax is there.)

My email address for either place is Bill_Sikonia@msn.com

That's all for now.

Best regards,
Bill Sikonia