From:	Brownlee, Sasha J.@DWR
To:	DWR Water Use Efficiency
Subject:	FW: Draft Framework for Updating AWMP Requirements
Date:	Tuesday, October 18, 2016 9:38:55 AM
Attachments:	Note to DWR regarding efficiency.doc image003.jpg

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From: Avila, Andria@DWR
Sent: Tuesday, October 18, 2016 9:38 AM
To: Brownlee, Sasha J.@DWR
Subject: FW: Draft Framework for Updating AWMP Requirements

Sasha,

Please post/log/file the attachment as a comment. Thanks!

Andria Avila
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From: Charles M. Burt [mailto:cburt@calpoly.edu]
Sent: Monday, October 17, 2016 6:49 PM
To: Avila, Andria@DWR
Subject: RE: Draft Framework for Updating AWMP Requirements

Andria – Please share the attached with committee members tomorrow.

Thanks.

Charles M. Burt, Ph.D., P.E., D.WRE
Chairman

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From: Avila, Andria@DWR [mailto:Andria.Avila@water.ca.gov]
Sent: Monday, October 17, 2016 4:46 PM
Subject: Draft Framework for Updating AWMP Requirements

Dear Agricultural Advisory Group and Interested parties,

Please find attached the Revised DRAFT Framework for Updating AWMP Requirements. The following is a summary of the changes made to the framework since the last meeting:

Quantification of the Efficiency of Agricultural Water Use (current section 1)

- Revised to better identify water balance components

Water Management Section (current Section 3):

- Revised to have water suppliers select the water fraction method that ensures all water uses are taken into account

Drought Management Planning Section (current Section 4):

- Removed the 5 years of drought analysis
- Removed the drought stages
- Added information and organized for resilience plan and action plan

Section on Reporting, Compliance, and Enforcement (current Section 6)

- Added assistance along with information on types of assistance
- Added details to compliance section

Added section on changes to annual reporting requirements (Section 7)

We look forward to seeing you all and discussing this in greater detail.

Warmest Regards,

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Date: October 17, 2016

To: Stephanie Lucero
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From: Charles M. Burt, Ph.D., P.E.
ITRC Chairman
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Re: Updating AWMP Requirements (EO B-37-16)

Please provide these comments to participants of the October 18, 2016 meeting.

I have the following comments after reading the Oct. 17, 2016 "Proposed Framework…..":

1. It is good to see that there is a desire to better define water balances in California, because proper water balances are very important in understanding the water situation.
2. It is good that there is no requirement that there be on-farm or field-by-field water balances.
3. It is unfortunate that the water balance components for irrigation districts, as described on page 2, are incorrect. There are numerous and serious mathematical and conceptual errors, which I will discuss later.
4. While the idea of a water balance is great, and I support it, the spatial and temporal boundaries must be properly defined. I don't see that here.
5. A HUGE issue is this: Why isn't this coordinated with the Sustainable Groundwater Management Act (SGMA)? In spite of item 1.)d., this looks like a duplication of efforts, which is counter-productive. In almost all of California (perhaps with the exception of Imperial ID and a very few areas east of the Friant-Kern Canal), water management is conjunctive use. As I understand it, the SGMA programs, and the formation of groundwater management agencies, is to look more-or-less holistically at a complete groundwater basin. These AWMP requirements focus on POLITICAL units, not holistic hydrologic units. This draft completely ignores lateral flow of groundwater (yet, interestingly, includes surface outflows???????) – which is old and incorrect thinking.
6. Here is the reality: Irrigation districts receive surface water. Within irrigation districts, the district itself and/or farmers may also pump groundwater. BUT IT IS MORE THAN THE IRRIGATION DISTRICTS that rely on the surface water. Huge areas of cities, small ranchettes, and agriculture depend upon the irrigation district surface water to recharge their groundwater. The AWMP requirements, as presently envisioned, implicitly ignore or minimize this.
7. If the Oct. 17 AWMP Requirements are adopted and people decide to judge irrigation district "efficiencies" as this document is heading, then to be fair one could say that DWR and the State Board

should immediately require that all city, rural residential, unincorporated areas, and agriculture that do not receive surface water should immediately stop pumping. After all, these proposed requirements appear to lead one to the conclusion that the only entitled water brought into the district is water that will be consumed by agricultural crops within the district. CLEARLY, that would be crazy - there is something here that is mixed up.

My recommendations:

1. If DWR is going to call something a water balance, it needs to actually be a water balance. Please look at the ITRC web site – go specifically to http://www.itrc.org/papers/search.php and look for numerous papers dealing with how to properly compute a water balance.
2. We already have a requirement for water balances in California. The only way that the SGMA-GSA mandates will be successful is to have a correct 3-D water balance.
3. The first steps in determining a water balance are these:
    a. Define the 3-D spatial boundaries. These boundaries must be meaningful in the sense that good science can be applied to good data that can be collected in a reasonable and cost effective manner, with reasonable accuracy.
    b. Define the temporal boundaries. The bottom line is that single years are difficult to analyze and even more difficult to interpret. Our California systems go up and down every year with precipitation, groundwater storage, cropped acreage, etc. So it is usually necessary to look at 3-5 years, minimum average.
4. Second, all of the key components of inflow and outflow must be included in the computations. This is where the proposed Water Balance components are incorrect. The components for a district or basin are:
    a. Inflow
        i. ALL surface inflows, including streams, drains, and irrigation district inflows
        ii. All precipitation, not just "effective". First of all, there will be huge debates about what formulas to use to determine "effective" precipitation. Second, we now have the tools to accurately determine ACTUAL ET – which includes Evaporation and Transpiration from all sources – it does not distinguish between precipitation and irrigation sources. Third, by limiting precipitation to "effective", the water balance computation explicitly leaves out part of the precipitation. And, of course, there are details. Since the district boundaries encompass roads, houses, equipment yards, schools, etc, yet the term "effective precipitation" is generally only used for agriculture, and ….. I think you get the idea.
        iii. ALL <u>subsurface</u> inflow to the defined spatial 3-D boundary. This is absolutely not the same as groundwater pumping. The 3-D boundaries that are of concern are the bottom of the aquifer, the vertical side boundaries of the region, and the soil/plant/sky boundary. Counting gross pumping is interesting, but it is like counting marbles bouncing around in a box. If the marbles don't enter or leave the 3-D box boundaries, you are double counting.
    b. Outflow
        i. ALL consumptive use (ET) within the boundaries. This is not limited to agricultural fields. It also includes landscapes, weeds along roads, riparian habitat, city parks, evaporation from wet roads, etc. If you want a water balance, you can't arbitrarily exclude things. This consumptive use is of both irrigation and rainfall. I know the desire to look at IRRIGATION EFFICIENCY, for which we have well established definitions (which are not used in the draft I am reading – please see http://www.itrc.org/papers/efficiency.htm). But the document is getting mixed up between a water balance and irrigation efficiency.
        ii. All surface outflow from the 3-D boundaries. This includes drains, creeks, etc.
        iii. All subsurface outflow from the 3-D boundaries. This is completely missing.
    c. Change in storage. This is <u>completely missing</u>, and it is absolutely crucial. For example, if a district has a groundwater recharge program and successfully recharges the groundwater in wet years, the "water balance" as-is does not obviously recognize the benefits. On a regional basis, the root zone water storage changes within a 3 year span cancel out. So we ignore them. But we absolutely look at the changes in groundwater storage.

5. The bottom line is that the proposed "water balance" is geared toward a field – not for district or basin management and understanding. It is an old and common mistake, and must not be repeated in California with such an important effort. In an irrigation district or groundwater management area, individual field deep percolation values, and individual pump values are just marbles rolling around within the box. Counting them is not at all what is important – especially when the big items such as groundwater lateral movement and changes in groundwater storage are completely missing.

So, what is being proposed is labeled a "water balance" but it is incorrect both conceptually and mathematically. It ignores key items and includes others that should never have been included in a district or regional water balance computation.

Now – what do you do? Completely ignore the mandate and just go with the SGMA? That's a possibility.

But first, I look at the mandate:

1. Update requirements to ensure these plans identify and quantify measures to increase water efficiency and to plan for periods of limited water supply.
2. Require the submittal of agricultural water management plans from suppliers who provide water to more than 10,000 acres of land.

My impression is that updated AWMP Requirements are focusing on item #1. After all, there are already guidelines for AWMPs.

I do not read anything in the mandate that says an "EFFICIENCY" value needs to be computed. I do see words such as "identify" and "quantify". I also interpret item #1 of the mandate to indicate that it is very important to everyone that water resources be managed carefully. I will leave out the word "appropriately" because that brings in all sorts of interpretations.

So – where are the big needs to move things along? I believe that excellent water balances, on a groundwater basin scale, are very important and will be tremendously valuable toward properly understand efficiency, and properly defining solutions. It only after people understand things on this scale that we will truly move ahead appropriately with water management programs in California. We have a long way to go with this. (EO) B-37-16 should not be interpreted to mean that every problem needs to be solved in the new AWMP Requirements.

What is needed is specific guidance to irrigation water suppliers regarding what numbers they should collect, organize, and provide to support effective SGMA efforts. Let me emphasize that SGMA falls under the label of groundwater, but over the last 10 years just about any reasonable person now recognizes that the aquifer health is a key barometer of total water management within a groundwater basin – including both surface and groundwater.

<u>Groundwater modeling</u>. I just can't let this go, because I believe it is related. It is my personal impression that in California we have very serious problems with effective groundwater modeling. When I read water balance requirements such as "deep percolation" and "effective precipitation" and "well pumping", I sense that these values come directly from the script of a groundwater modeler. Indeed, I think that every groundwater modeler I have met thinks those values are needed as inputs to their models. The problem is that science has bypassed the groundwater models that require these inputs. Those specific inputs are extremely inaccurate, and partly as a result, groundwater models tend to be rather imprecise.

We need improved groundwater models that utilize correct information that gets at the required boundary conditions at the bottom of the root zone – which is the top of the vadose zone for groundwater modelers. ITRC provided the MAGPI study (eastern Merced County – mainly funded by Merced ID) with what is really needed – field level NET CONTRIBUTION TO GROUNDWATER values. In other words, it's not the gross pumped or gross applied that counts - the bottom line is whether there is net extraction or contribution from/to the aquifer. We utilize sophisticated remote sensing, plus irrigation district delivery records/estimates and GIS programs to develop these values.

But – the groundwater modelers apparently do not know how to modify their models to accept this “bottom line” type of information.

I see this as an area of improvement that DWR could support by improving its own internal groundwater modeling, because many of the consulting firms use the same model. This would be a great benefit to those who are seriously trying to implement SGMA goals. It would be a great and solid contribution to the intentions of EO B-37-16. But it does not appear that the impetus will come from the groundwater modeling community. But please do not rely only on my opinion - those on the committee who have invested millions of dollars in groundwater modeling should weigh in on their perceptions of the accuracy of the results that the received.

Congratulations (or sympathy?) if you actually made it through this whole discourse.