July 27, 2011

Mr. Fethi Benjemaa
California Department of Water Resources
Water Use Efficiency Branch
SBX7-7 Program
P.O. Box 942836
Sacramento, CA 94236-0001

SUBJECT: Proposed Methodology for Quantifying the Efficiency of Agricultural Water Use

Dear Mr. Benjemaa,

Glenn-Colusa Irrigation District (GCID) appreciates the opportunity to respond to Manucher Alemi's July 14 email requesting proposals on the A1 process. Please find below recommendations for participants in the A1 process including subject matter experts (SME), documents for consideration in the development of the A1 methodology, and general discussion and recommendations on how to proceed with A1 compliance and an approach that is consistent with the referenced documents.

A1 SME and Subcommittee Recommendations

For the A1 subcommittee, GCID recommends the following individuals as SME's, all who have significant educational, technical, and actual field experience:

1. Dr. Charles Burt, Professor, Cal Poly SLO
2. David Zoldoske, Professor, Fresno State
3. Grant Davids, President, Davids Engineering
4. Tim O'Halloran, General Manager, Yolo County Flood Control and Water Conservation District

Additionally, I would also like to participate in the A1 subcommittee and designate my alternate as Tim O'Halloran, only if the Department chooses does not appoint him as an SME.

Documents for A1 Subcommittee Consideration

Agricultural Water Use Efficiency (WUE) has been a subject of much discussion and debate over the past decades, and recently with the passage of SBX7-7, Ag WUE is now viewed by some as the solution that could generate more water supply for California. Whether this viewpoint is right or wrong, what we do know is that pursuit of Ag WUE in a vacuum will create unintended consequences and impacts. The State Water Resources Control Board July 20, 2011 workshop Ag WUE was an excellent venue on approaches, methodologies, and concerns that exist when evaluating Ag WUE.

The following documents, attached hereto or referenced by web links, provide a much needed framework in which Ag WUE should be considered through the A1 process.

1. Efficient Water Management for Regional Sustainability in the Sacramento Valley, NCWA, July 2011 (http://www.norcalwater.org/wp-content/uploads/2011/07/efficient-water-management.pdf). This report explores water use efficiency in the Sacramento Valley to help guide efforts of water users and agencies within the valley and also inform the public of approaches and actions that are currently being implemented.
2. Suggestions for Developing a Methodology for Quantification of Agricultural Water Use Efficiency, Grant Davids, July 2011 (attached hereto). This document provides valuable insight and suggestions the Department should consider for this A1 process.
3. Basin Impacts of Irrigation Water Conservation Policy, Brinegar and Ward, 2009 (http://agecon.nmsu.edu/fward/water/EE%20oct%202009%20Basin%20scale%20water%20conservation%20ecol%20econ.pdf). This academic journal article evaluates the impacts of irrigation efficiency projects at the field level on a broader water basin and identifies the trade-offs that occur with increasing irrigation efficiencies. The authors evaluate a basin located in New Mexico, however, the actions taken and basin characteristics are very similar to California.
4. Irrigation Efficiency Programs, Victorian Auditor General, June 2010 http://download.audit.vic.gov.au/files/09062010_Irrigation_Full_Report.pdf. This report examines how effectively, efficiently and economically irrigation-related programs have been planned and managed to achieve intended outcomes.
5. "Irrigation Sagacity: A measure of Prudent Water Use," Ken Solomon and Charles Burt, *Irrigation Science 18.3 (1999)* (http://digitalcommons.calpoly.edu/cgi/viewcontent.cgi?article=1016&context=baefac) This paper introduces a new performance parameter, irrigation sagacity (IS) that is broader than the traditional irrigation efficiency (IE) term. Determination of

sagacity involves checking alternate irrigation practices for practical, technical, economic and environmental feasibility.

A1 General Discussion and Recommendations

1. Process.
   The ASC learned some valuable experiences from the A2 measurement process, especially as it related to having experts develop measurement and performance criteria. The A2 subcommittee struggled with appropriate measurement standards and it was not until we received information from these experts were we able to begin development of the actual Measurement Regulation through the broad stakeholder process.

   DWR should evaluate lessons learned from the A2 process and apply that knowledge of process to develop an A1 strategy. As a recommendation, GCID suggests that the SME's, for which DWR is seeking recommendations, be part of a select A1 subcommittee tasked with development of an initial methodology for Ag WUE that then would be reviewed, discussed, amended and approved by the broader A1 subcommittee. This approach would allow for documents and materials to be generated in a more expeditious manner, which will be necessary in order to meet the December 31, 2011 deadline.

2. Approach
   GCID has reviewed the Department's Discussion Paper 1: Initial Draft for Quantifying the Efficiency of Agricultural Water Use which proposes scales and methodologies for meeting the SBX7-7 language. While the paper may address Ag WUE from a traditional standpoint, the paper fails to identify how WUE will be evaluated at the scales identified and at what cost or timeframe. To avoid a similar problem we had with development of the A2 regulations, the Department and the SME's need to focus their efforts on methodology that may (if authorized by the Legislature) be implemented at an affordable cost and a sensible timeframe. Absent this outcome, this process will result in an exercise that will fail to advance the Ag WUE discussion. As an example, the Discussion Paper includes suggested spatial scales and methodologies at the farm, district, and regional scale, which if all are examined would result in a tremendous amount of work, data, and to the outsider will appear to be in conflict, since efficiencies will be inherently different at the scales. The question will be asked which is correct or should be used? A related question that should also be examined and answered at the beginning of the process is, what values, goals and objectives are intended be achieved as a result of the development and implementation of the WUE methodologies.

As a surrogate for this process, GCID suggests the Department and SME's examine the RWQCB Ag Waiver monitoring program. With that program, the issue was that the Board was looking at regulating non-point water quality discharges from individual fields which would have resulted in a very expensive and almost impossible program to implement. Further, it was questionable if there were water quality issues at every field. As an alternative, the ag water community developed regional monitoring Coalitions which developed their own local and regional monitoring program based on watersheds and discharge locations. During the monitoring season if exceedances were found, the Coalition then work "upstream" into the watershed to determine if the cause could be determined or add additional monitoring sites to try and find the location of the exceedance.

For Ag WUE and A1 process, the methodology could be configured similar to the ag waiver program as follows:

1. Beginning at a Regional or basin level, Ag WUE could be evaluated using the information described in the Discussion Paper or using traditional water balances with the goal being to identify and set objectives mutually developed by the Department and the water users within that basin.
2. If objectives aren't being met or cannot be met at the Basin level, move "upstream" or into a smaller sub-basin or water supplier scale and set objectives mutually developed by the Department and sub-basin/supplier water users within that basin.
3. If objectives aren't being met or cannot be met at the sub-basin/supplier level, move "upstream" to the field level scale and set objectives mutually developed by the Department and landowners users, with assistance by local water suppliers and potentially counties where a water supplier may not exist, for example with groundwater users.

GCID would also like to point out that in the latest version of the Delta Stewardship Council Delta Plan (4th Draft, Page 64) there is a focus on regional sustainability and water balances. Certainly, water use efficiency could be a component of the programs and projects that could help bring a region into balance.

Evaluation of regional water balance: Provide an assessment of the long-term sustainability of the water supplies available to meet projected demands within the supplier's hydrologic region, as defined by the 2009 California Water Plan Update, over the 20-year planning period. If the region's demand exceeds available supplies, identify the steps being taken through the Integrated Regional Water

Management Plan to bring the region into long-term balance. If the region's demand exceeds available supplies and it does not have an Integrated Regional Water Management Plan or the Plan does not address the steps being taken to bring the region into balance, then describe how the supplier's programs and projects are helping to bring the region into balance.

GCID looks forward to working with the Department in this A1 process, and should you have any questions, please contact me at 530-934-8881.

Sincerely,

Thaddeus L Bettner, PE
General Manager

DAVIDS
ENGINEERING, INC

Suggestions for Developing a Methodology for Quantification of Agricultural Water Use Efficiency

Grant Davids, P.E.
July 27, 2011

Background

Over recent decades, a huge amount of work has been done pertaining to quantification of agricultural water use efficiency. Initially, this work concentrated primarily on the farm/field level, aimed at helping farmers understand how much water they were using in relation to crop water requirements and assessing opportunities to apply irrigation water more efficiently and uniformly, while maintaining and improving crop yields. Much of this work was centered in the San Joaquin Valley where water supplies were most limited relative to other regions of California, natural soil drainage is poor or water could be lost to salt sinks. One of the revelations stemming from this initial work was that the manner in which water is delivered by suppliers in some cases constrains efficiency improvements at the farm level. Consequently, attention has broadened to address the relationship between on-farm and delivery system operations, with the view of increasing efficiency at both levels. All kinds of water supplier and on-farm efficiency measures, in the form of both new equipment and technologies and improved management, have grown out of these efforts and have been widely adopted, though more needs to be done.

In the last decade or two, agricultural water use efficiency has come to the forefront as a critical component of balancing water demands and supplies at the regional level. In this context, water planners generally understand the importance of distinguishing between recoverable and irrecoverable irrigation losses. This is because in areas where irrigation return flows are truly lost to salt sinks or degraded water bodies, efficiency improvements can achieve real water savings, thereby helping to close the gap between water supplies and demands. In contrast, in areas where irrigation return flows are not lost but instead flow back to the hydrologic system as surface water flow or groundwater recharge, efficiency improvements will not increase additional supplies, but, importantly, may help address water quality, flow timing, energy consumption, and other issues. These understandings are institutionalized in the conventions adopted for statewide and regional water planning.

SBx7-7 and DWR's July 22, 2010 Draft Discussion Paper

Recently enacted SBx7-7 requires that the Department of Water Resources (DWR) develop a methodology for quantifying the efficiency of agricultural water use, working in consultation with the Agricultural Water Management Council, academic experts and other stakeholders. Furthermore, SBx7-7 requires that, on or before December 31, 2011, the department shall report to the Legislature on a proposed methodology and a plan for implementation.

DWR initiated work on the methodology in 2010 including preparation of *Discussion Paper 1: Initial Draft Methodology for Quantifying the Efficiency of Agricultural Water Use (Project A1),* September 22, 2010 (draft Discussion Paper). The draft Discussion Paper serves as a good starting point for further technical discourse among stakeholders for several reasons, chief among them being recognition of the following points concerning agricultural water use efficiency (WUE):

- WUE varies with spatial scale due to the potential for reuse of water among water users. DWR suggests that three spatial scales be included in the methodology: field, supplier and regional. These are appropriate because they generally align with the different levels at which water is managed.

- WUE cannot be described at all spatial scales and for all purposes with a single quantitative indicator; rather, different quantitative indicators are appropriate at the different spatial scales and for different analytic purposes.

- Quantifying WUE requires reliable data, the lack of which is presently a significant constraint to better understanding existing agricultural water use and advancing WUE improvements.

Implicitly, the draft Discussion Paper acknowledges that quantifying agricultural WUE is not an end in itself but is one water management tool, to be used among others, for achieving identified objectives. This view is strongly held by agricultural water managers in all regions of the state.

Suggestions for Moving Ahead

Building on the positive technical foundation put forth in the draft Discussion Paper, the following suggestions are offered for DWR's consideration.

1. Although the legislation does not define the purposes for which an efficiency quantification methodology might be used, and despite acknowledgement in the draft Discussion Paper of a variety of potential purposes, the methodology should link the anticipated various quantitative indicators with particular purposes to the extent possible. This is suggested to guide investments in agricultural WUE improvements, beginning with the necessary data collection. For example, if water quality improvement is the principal concern in a particular area, that would point to farm-scale quantitative indicators and associated data collection. Alternatively, if net water savings were the main concern, that would point to regional scale indicators and associated data collection, with investments in farm-scale data collection potentially carrying less importance. In short, the methodology should be accompanied by an objective-driven "user's guide" for applying the methodology. General objectives may

include: net water savings (to improve water supply reliability), water quality improvement, energy conservation, and environmental enhancement, among others.

2. With regard to improving water supply reliability, the distinction between recoverable and irrecoverable losses presently institutionalized in statewide and regional planning processes should be embodied in the methodology. Given the current and likely future emphasis on improving water supply reliability statewide, and the common misperception that increased efficiency translates to water savings in all locations and situations, maintaining this distinction is critically important to setting appropriate policies, establishing realistic expectations and identifying cost-effective WUE projects.

3. The regional Targeted Benefits and Quantifiable Objectives developed pursuant to the CALFED Agricultural WUE Program should be considered as a beginning point for defining regional WUE objectives and goals, although this level of detail might not be appropriate for incorporation directly into the quantification methodology.

4. The methodology for quantifying efficiency should be based on water balance techniques, which are useful for understanding the potential effects of efficiency changes. Water balances are applicable at different spatial and temporal scales and can be used to reveal potential consequences, intended and unintended, of contemplated efficiency changes.