

Tuesday, October 06, 2009 (file cac240)

To: Dan Breedon

Fr: Ed Miller

Subj: California Model water efficient landscape ordinance effect on the general plan

Ref A: California natural resources agency department of water resources, A report to the legislature pursuant to AB 1881 Section 65595 (a) (2), Jan 14, 2009

Ref B: H. Hacking, Water Wise, ER Oct 5, 2009, pp1-11

Ref C: Ward, Environmental Hydrology, 2nd Ed, Lewis Pub/CRC press 2004, Chapter 4- Evapotranspiration

D.Fetter, Applied Hydrogeology, 3 ed, McMillan 94 (Now available in Ed 4), Chap 2-Evaporation and precipitation

E. Hornberger et-al, Elements of Physical hydrology, John Hopkins Press 1994

Highlights and commentary:

1. Ref A is primarily concerned with outside residential irrigation efficiency per AB1881 and the wider application of AB325 that includes storm water reuse/retention. The Pacific Institute estimates that 360,000 to 580,000 AF/yr can be conserved using proven approaches. The goals are defined in AB 1881 and 325. The model ordinance is still in a state of flux. Studies at U.C Berkeley and Fresno State are due out by the end of 2009. A list of alternatives from DWR and from governmental entities is included in Ref A. The maximum applied water allowance is based on the landscape area, reference evapotranspiration and a specific vegetation factors. It is not clear what reference ET is meant. In many cases in agriculture, short grasses are used as a reference. Most of the counties reported were not conforming to the 1881 standard. Many counties showed a "best effort" with some specifics and many motherhood statements. You are left with the feeling that the state wants to see an irrigation system in place that has the capability to limit the total water usage by vegetation selection and tight irrigation schedules that are tied in some manner to a fraction of the potential ET. The Actual ET (AET) is used on agriculture to guide planting and irrigation schedules. Adapting some of these measurement techniques to residential/business property should be the primary thrust for the general plan Butte County limiting demand by using isolated native plants, reducing summer upward capillarity driven ET using gravel/coarse organic mulch, avoidance of spray irrigation to improve irrigation efficiency and storm water wells to enhance ground water percolation and limit plant excess water damage above field capacity. Tree selection should favor conifers. Winter-summer sun switching should emphasize large roof overhangs, louvers in lieu of close-in broad leaf trees near structures. Establishing realistic goals and quantifying efficiency is the name of the game without placing too much emphasis on tiered rate schedules and draconian inspection. Exotic

vegetation fed underground from salvaged tire leaky pipes with idealized irrigation schedules may play a part in the mix. Soil Drainage using drain pipe and engineering cloth combined with roof runoff feeding dry wells can be a part of new construction design requirements.

2. Ref B from The Chico arborists Denise Britton comes up with a Butte County yearly ET of 41.36 inches corresponding to 80% of a maximum in response to the requirements of AB1881. This document was generated in 2006.
3. Ref C describes the options for measurement of ET. Much of this work centers on the work of M.E.Jensen that is covered in ASCE89, 15-44, ASAT, 14: 954-959 and the American society of Civil Engineers irrigation requirements papers. Per Ref C and fig 4.9 based on lysimeter measurements, an ET of 50 inches in the west is typical so the 41.36 inches of Ref B may not be far off. From the Butte County point of view it appears desirable to publish in the ER or online current standard pan evaporation derived ET values at a variety of locations/elevations.
4. Ref D provides good insight into fresh water usage and trends. The earth heat balance of the earth shows that averaged over the year, the Northern Hemisphere above 38 deg latitude has a net heat loss that is equilibrated by the movement of air masses and water vapor that drives the hydrologic cycle through sublimation/condensation. Figure 2.2 shows the typical potential and actual evapotranspiration over the year for soils with limited and ample soil moisture storage with a summer drought and uniform rainfall typical of Butte County. Studies by Hibbert (Forest Ecology, Pergamon Press) has shown that forest thinning and associated reduced ET has resulted in increased stream runoff. Section 114 describes ground-water monitoring programs for wells and the vadose (root zone) depths.
5. Ref E section 2.4 provides good insight into the process of evapotranspiration on the basis of energy balance. Time domain relectometry is shown to be a reasonably economic method for in determining ET that competes with the more idealistic/expensive lysimetry involving massive soil weight measurements ...