MEMO

November 14, 2002

To: Helen Harrington

From: Bill Ondrechen

Subject: Reexamination of consumptive use estimation methods, crop distribution data and water balance, Mountain Home plateau

EVAPOTRANSPIRATION

Newer methods of estimating crop consumptive use (evapotranspiration or ET) have been developed since the 1982 report. The Sutter & Corey Blaney-Criddle method used in the the 1982 report has been superseded by the Allen-Brockway FAO Blaney-Criddle and the Agrimet Kimberly-Penman. Both new methods were calibrated to local conditions using lysimeter data from USDA-ARS research center at Kimberly, Idaho.

The Agrimet ET uses the Kimberly-Penman method, which is the most robust procedure for estimating ET because it uses the observed temperature, solar radiation, humidity and wind data in a physically based approach. The Agrimet system was developed specifically for computing ET in irrigation scheduling and daily data are available on a real-time basis. Also, since the system is used on a real time basis, the crop coefficients, planting dates and other parameters of the method receive continual refinement. The Allen-Brockway method needs to be modified slightly to reflect the latest crop coefficients. The limitations of the Agrimet method compared to a temperature based approach like the Allen-Brockway are that the number of locations for which the data are available is smaller and the available period of record is shorter. The closest stations to the Mountain Home plateau are located at Grandview and Glenns Ferry. Data for both stations are available from 1993 to present.

Using the Grandview site to estimate crop water use in the Mountain Home vicinity will require an adjustment to reflect the slightly cooler conditions of the Mountain Home plateau. Based on the seasonal Allen-Brockway ET totals for the two locations, a downward adjustment of 7 percent seems warranted (i.e., Grandview times 0.93 equals Mtn. Home). In addition, based on communication with Mir Seyedbagheri, Elmore County Ag Extension agent, water use by alfalfa should be reduced by about 10 percent from the Agrimet values to reflect the fact that many growers do not irrigate it fully through the season as the Agrimet values assume. The fact that county-wide yields of alfalfa are less (and correspondingly water use is less) than the Kimberly lysimeters has been noted by Allen and Brockway and other researchers. Also, the Agrimet system does not calculate an effective precipitation amount, which is a necessary component for

the calculation of consumptive irrigation requirement or CIR. CIR is computed as ET minus effective precipitation. Effective precipitation is defined as rainfall which contributes toward meeting the ET requirement of a crop and is calculated from precipitation data, crop cover and growing season information. It does not include precipitation from heavy storms which produce surface runoff or saturate the root zone such that subsurface drainage takes place. Effective precipitation can be determined from the Allen-Brockway data set by subtracting seasonal CIR from ET for each crop.

The following table displays the seasonal Agrimet ET averages by crop for the 1993-2001 period, the ET adjusted to Mountain Home, the effective precipitation from Allen-Brockway and the resulting consumptive irrigation requirement or CIR.

(Units AcFt/Ac)

Crop	Grandview Agrimet ET	Mountain Home ET	Effective Precip	CIR
Alfalfa	3.23	2.75	0.28	2.47
Sugar beets	2.60	2.42	0.25	2.17
Potatoes	2.18	2.03	0.17	1.86
Grains	2.00	1.86	0.19	1.81
Dry beans	1.59	1.48	0.12	1.36
Pasture	2.54	2.36	0.27	2.09

CROP DISTRIBUTION

Data from the 1997 Census of Agriculture for Elmore County were used as a starting point for the crop distribution of the study area since data specific to the lands in the study were not available. According to the county extension agent, the lands in the study area have less alfalfa and more beets and potatoes than the county wide average, which include lands irrigated by gravity diversion or low pump lifts from the Snake River. The reported irrigated area in the county in 1997 was listed as 91,153 acres. This compares with 38,277 acres in the study area. The following table lists the 1997 Ag Census data and the adjusted crop distribution:

Crop	Acres	Published Fraction of total	Adjusted Fraction
Alfalfa	38,899	0.43	0.33
Sugar beets	10,280	0.11	0.16
Potatoes	11,324	0.12	0.17
Wheat	19,124	0.21	0.21
Barley	3,007	0.03	0.03
Beans	2,311	0.03	0.03
Other (by subtraction)	6,208	0.07	0.07
Total	91,153	1.00	1.00

These data indicate there has been a change in crop distribution from the 1980 data in the original study. In 1980, grains (wheat and barley) comprised 48 percent of the total; in the 1997 data they declined to 24 percent. Row crops (beans, beets and potatoes) remained about the same at 26 percent in both instances. Alfalfa showed a large increase in the 1997 data to 44 percent of total, whereas in 1980 it was only 17 percent. Ag census data for 1987 and 1992 indicate that alfalfa acreage increased after 1992.

Combining the CIR with the adjusted crop distribution yields the crop weighted CIR, a quantity that when multiplied by the number of irrigated acres represents the consumptive use.

(Units AcFt/Ac)

Crop	Fraction	CIR	Weighted
Alfalfa	0.33	2.47	0.82
Sugar beets	0.16	2.17	0.35
Potatoes	0.17	1.86	0.32
Grains	0.24	1.81	0.43
Dry beans	0.03	1.36	0.04
Other	0.07	1.90	0.13
Total	1.00		2.09

WATER BALANCE

The total water use by irrigated lands in the study area was determined by taking the weighted CIR times the ground water and surface water irrigated acreages. The weighted CIR for the surface water acres was subjectively reduced by 30 percent to reflect the fact that these lands do not have a full supply every year and suffer from periodic major shortages of irrigation water.

	Acres	CIR (AcFt/Yr)
Canyon Creek (surface water)	4,353	6,368
Ground water	33,924	70,900
Total	38,277	77,268

WATER BALANCE (AcFt/Yr)

Source	Supply/Use
Canyon Creek yield	20,900
Little Camas Creek (imported)	9,500
Rattlesnake Creek yield	3,800
Ditto Creek and adjacent areas	4,100
Precipitation on rocky areas	4,400
Total	42,700

Use	
Loss to Snake River	1,500
Use by irrigated crops	77,270
Use by Municipal and Air Base	2,500
Total	81,270

Source Less Use	-38,570