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MEMORANDUM

TO: Planning Commission

FROM: Wade Horton, Public Works

SUBJECT: Vineyard Irrigation Rates

This memo clarifies concerns regarding Vineyard irrigation rates documented in *Table 10* of *the Paso Robles Groundwater Basin Model Update, December 19, 2014*, prepared by Geoscience in association with Todd Groundwater. The following summarizes the approach used to estimate vineyard irrigation rates for the model update, which is a combination watershed and groundwater basin model that works together to simulate the system.

Table 10 specifies two columns of data for each crop type, Irrigation Demand and Applied Water. Irrigation Demand is the calculated amount of water the crop requires from irrigation to satisfy needs not met by rainfall. Applied water is the amount of irrigation applied to the crop, which takes into account factors such as frost protection, deficit irrigation, and irrigation system efficiency.

IRRIGATION DEMAND

Irrigation Demands were calculated for each month from 1981 – 2011. The calculations took into account daily rain gauge data, monthly evapotranspiration, soil type, and acreage planted per crop type. From this information, soil moisture and evapotranspiration from leaves could be estimated and incorporated into the model on a monthly basis. The methodology included review and input from the Agricultural Commissioner's office, Central Coast Vineyard Team experts, Mark Battany and several vineyard industry professionals. As shown on Table 10, the resulting vineyard Irrigation Demand ranged from 0.8 to 1.6 acre-feet per acre per year over the 31 year timeframe modeled.

APPLIED WATER

Applied Water, or irrigation water, was estimated from Irrigation Demand by applying an irrigation system efficiency factor, as well as considering deficit irrigation and accounting for frost protection requirements.

The resulting vineyard Applied Water ranged from of 2.6 to 1.1 acre-feet per acre per year for the time period 1980 – 2011. It should be noted in Table 10 that the applied water values generally decreased over time as irrigation practices improved and became more efficient.

The bottom three rows of Table 10 provide minimum, maximum and average values as a summary for each column. For the Vineyard Applied Water Value, the average over the 31-year timeframe is 1.8 acre-feet per acre per year. This number is larger than the 1.25 acre-feet per acre per year recommended for the purpose of calculating 1:1 offsets for the Water Neutral New Development component of the proposed Countywide Water Conservation Program. However, the 1.8 number is simply an average and does not fully represent the modeling analysis. Data used to develop the model considered actual rainfall data on a daily basis, as well as the other specific monthly and annual factors discussed above. Applied water varied per year based on actual rainfall data, acreage planted, irrigation practices (deficit irrigation/ frost protection), and irrigation system efficiency. Moreover, the 1.8 average acre-feet per acre per year value was not used to extrapolate forward.

In Table 10, the 2010 and 2011 vineyard applied water rates, amounting to 1.3 and 1.1 acre-feet per acre per year, respectively, are representative of current, efficient irrigation practices. These rates and the 1.25 value for calculating offsets are comparable.

Furthermore, simulated Applied Water model results for 2010, 2011 and 2012 were compared to the field measured Applied Water values from the UC Extension study (see pages 52-53 of the *Model Update*, Table 3-18 and Figure 50). The numbers were reasonably close, providing additional reassurance that the model calculation methodology for the time period 1980 - 2011 was reasonable.

WAY FORWARD

It is important to note that under the Sustainable Groundwater Management Act, the State Department of Water Resources (DWR) will be determining whether there is a critical condition of overdraft for the Paso Basin. DWR will make this determination based on a finding of sustained groundwater level declines in all or part of the groundwater basin over a wet/dry cycle. The model is a tool that can be used to evaluate the projected effect of taking different actions for the purpose of stabilizing groundwater levels.

Reference:

http://www.slocountywater.org/site/Water%20Resources/Water%20Forum/Computer%20Modeling/index.htm

http://cesanluisobispo.ucanr.edu/newsletters/Grape_Notes46823.pdf

Table 10

Estimated Annual Agricultural Irrigation Demand and Applied Water Rates

Water Year	Annual Precip[1] (inches)	Alfalfa		Citrus		Deciduous		Nursery		Pasture		Vegetable		Vineyard	
		Irrigation Demand	Applied Water	Irrigation Demand	Applied Water	Irrigation Demand	Applied Water	Irrigation Demand	Applied Water	Irrigation Demand	Applied Water	Irrigation Demand	Applied Water	Irrigation Demand	Applied Water
1981	12.4	3.2	5.1			3.0	4.7	1.8	2.9	3.4	5.4	2.7	4.3	1.3	2.3
1982	16.3	2.9	4.7			2.8	4.4	1.6	2.5	3.1	4.9	2.7	4.2	1.3	2.2
1983	28.9	2.9	4.6			2.7	4.2	1.5	2.3	3.0	4.8	2.7	4.2	1.2	2.1
1984	7.3	3.5	5.5			3.1	4.9	1.9	3.0	3.6	5.7	2.8	4.4	1.5	2.6
1985	9.6	3.3	5.2			3.0	4.8	1.7	2.8	3.4	5.5	2.7	4.3	1.4	2.3
1986	20.5	3.2	4.9			2.9	4.4	1.7	2.6	3.4	5.2	2.7	4.1	1.1	1.9
1987	8.4	3.4	5.2			3.1	4.5	1.9	2.9	3.5	5.5	2.7	4.2	1.4	2.2
1988	12.7	3.2	4.9			2.9	4.2	1.7	2.5	3.4	5.2	2.7	4.2	1.2	2.0
1989	9.1	3.3	5.1			3.0	4.5	1.8	2.8	3.5	5.4	2.6	4.1	1.4	2.3
1990	7.3	3.3	5.1			3.0	4.4	1.9	2.8	3.5	5.3	2.7	4.1	1.6	2.6
1991	12.8	3.2	4.8			3.0	4.2	1.8	2.8	3.4	5.1	2.7	4.1	1.4	2.0
1992	12.5	3.3	4.9			3.1	4.3	1.8	2.7	3.5	5.3	2.8	4.1	1.3	1.9
1993	23.3	3.2	4.7			3.0	4.1	1.7	2.5	3.4	5.1	2.7	4.1	1.1	1.7
1994	11.3	3.2	4.7			2.9	4.1	1.5	2.3	3.4	5.1	2.6	3.9	1.3	1.9
1995	31.4	3.2	4.7			2.9	4.1	1.6	2.3	3.3	5.0	2.7	4.0	1.0	1.5
1996	15.3	3.3	4.6			3.0	4.0	1.7	2.4	3.4	4.9	2.7	3.9	1.3	1.8
1997	17.6	3.5	4.8			3.2	4.2	1.9	2.7	3.7	5.3	2.8	3.9	1.2	1.7
1998	26.8	3.0	4.2			2.7	3.6	1.4	1.9	3.1	4.5	2.6	3.6	1.0	1.4
1999	9.4	3.4	4.8			3.0	3.9	1.5	2.1	3.4	4.8	2.7	3.8	1.4	1.9
2000	13.2	3.3	4.7	1.6	2.2	3.0	4.0	1.7	2.3	3.5	4.9	2.8	3.8	1.3	1.7
2001	15.4	3.3	4.8	1.7	2.3	3.1	4.0	1.7	2.4	3.6	5.1	2.8	3.8	1.2	1.6
2002	8.3	3.4	4.9	1.8	2.4	3.1	4.1	1.7	2.3	3.6	5.1	2.7	3.8	1.2	1.7
2003	13.8	3.1	4.5	1.6	2.0	2.9	3.7	1.5	2.0	3.3	4.7	2.7	3.5	1.1	1.4
2004	9.5	3.4	4.9	1.9	2.5	3.2	4.1	1.8	2.3	3.7	5.3	2.8	3.6	1.3	1.6
2005	33.2	2.8	4.0	1.5	1.9	2.6	3.4	1.5	1.9	2.9	4.2	2.5	3.3	0.9	1.2
2006	18.3	2.9	4.2	1.6	2.1	2.8	3.6	1.6	2.1	3.0	4.3	2.7	3.6	1.0	1.4
2007	6.6	3.5	5.1	2.0	2.6	3.2	4.1	1.9	2.5	3.6	5.1	2.7	3.5	1.4	1.9
2008	13.8	3.6	5.1	2.1	2.7	3.3	4.2	2.0	2.5	3.8	5.4	2.8	3.5	1.2	1.6
2009	9.1	3.7	5.3	2.1	2.6	3.4	4.3	1.9	2.5	3.8	5.4	2.8	3.6	1.3	1.7
2010	21.0	3.0	4.2	1.6	2.0	2.7	3.5	1.6	2.0	3.2	4.6	2.6	3.4	1.0	1.3
2011	22.0	2.8	4.0	1.5	1.9	2.6	3.4	1.4	1.8	3.0	4.2	2.4	3.0	0.8	1.1
Min	6.6	2.8	4.0	1.5	1.9	2.6	3.4	1.4	1.8	2.9	4.2	2.4	3.0	0.8	1.1
Max	33.2	3.7	5.5	2.1	2.7	3.4	4.9	2.0	3.0	3.8	5.7	2.8	4.4	1.6	2.6
Ave	15.4	3.2	4.8	1.7	2.3	3.0	4.1	1.7	2.4	3.4	5.0	2.7	3.9	1.2	1.8

Notes:

All irrigation demand and applied water values in acre-feet per acre per year (or feet per year)

Vineyard consumptive use and applied water rates reflect the combined RDI and non-RDI rate weighted according to the assumed percentage of vineyards under each irrigation management method

1 – Annual Rainfall at Paso Robles rain gage (46730)