

Submitted by David Beech

[Markup response to EXHIBIT 14-E by Judy and David Beech August 19,2012]

MONTEREY PENINSULA WATER MANAGEMENT DISTRICT

Item 14

- One part of this discussion that is directly relevant to the Beech Appeal concerns demonstrated non-compliance with the Procedures for Drawdown and Recovery.
- Other parts bear on the options available to the Board, where Step 2 below specifies that “an evaluation of the test will be conducted by the District”. The final evaluation could be carried out by the Board, and it is strongly suggested below that the evaluation should be on the basis of demonstrated 95% recovery and use of actual test data for the derivation of well capacity.
- Finally, the problems identified in the Procedures could be addressed later by the Rules and Regulations Committee, and we would be glad to offer any insights that we have gained.

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MEMORANDUM

AUG 20 2012

**Date:** August 6, 2012  
**To:** David Stoldt, General Manager  
**From:** Joe Oliver, Water Resources Division Manager  
**Subject:** Response Comments to Technical Items in August 1, 2012 Appeal Letter from Judy and David Beech, re: Flores and Pisenti Water Distribution System (WDS) Applications

MPWMD

- **Page 2, Background.** Regarding the pumping tests of the Flores/Pisenti Wells #1 and 2 that were conducted in October 2010, it is important to note that these tests were conducted simultaneously for 72

According to the pumping tests that were being conducted, the city season demand rates for the WDSs are greater than the anticipated operating conditions for these WDSs. <sup>[1]</sup>

- **Not relevant to compliance with Documentation of Drawdown and Recovery, which reads:**

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- “Step 2, Documentation of Drawdown and Recovery. ... Water level recovery data shall be measured until the recovering water level in the pumping well reaches 95% of the pre-test static water level. If 95% percent recovery is not achieved after two times the pumping period has elapsed, then an evaluation of the test will be conducted by the District to determine whether or not the calculated yield should be reduced.

- **Page 3, Failure to Comply with Documentation of Drawdown and Recovery.** The discussion states recovery measurements were not continued until 95% recovery was achieved. MPWMD concurs that the wording in the “Documentation of Drawdown and Recovery” section of the *Procedures* document does not clearly convey the intended requirement. The intention of the statement in question is clarified by the

highlighted additional phrase as follows:

Water-level recovery data shall be measured until the recovering water level in the pumping well reaches 95% of the pre-test static water level or two times the pumping period has elapsed, whichever occurs first.

- **But this escape clause does not appear in the approved *Procedures*, which (bottom p.1) “outline the minimum requirements for production testing, analysis, and reporting of groundwater information to comply with the MPWMD rules and regulations.” Your suggested additional phrase is an unauthorized lowering of the bar below the minimum requirements.**

It was not the intention that water-level recovery measurements must be made for an indefinite period of time until the recovering water level reaches 95% of pre-test level, as in practice this could require a considerably longer period than twice the pumping period and be difficult to achieve in some instances for reasons that would not affect the validity of the pumping test calculations (e.g., existence of other documented or undocumented pumping affecting the well’s recovery measurements, natural seasonal water-level declines of the groundwater system superimposed on the recovery curve).

- **This is a good point to note the corresponding requirement in Monterey County, based on**
- **Water Works Standards in Chapter 15 of Title 22 of the California Code of Regulations**
- **<http://www.cdph.ca.gov/services/DPOPP/regs/Pages/R-14-03-RevisionofWaterworksStandards.aspx>**
- 
- **“ ii. 72 hour or 10 day test**
- **a. 0-240 minutes – measure every 30 minutes**
- **b. 240 -480 minutes – measure every 60 minutes**
- **c. After 480 minutes, measure every 12 hours until either the water level in the well recovers to within two feet of the static water level measured at the beginning of the well capacity test or to at least ninety-five percent of the total drawdown measured during the test, which ever occurs first. “**
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- **This has now been adopted by Monterey County EHD. In October 2010, however, MCEHD did allow “evaluation”, and used the same formula as MPWMD, but with one important difference: the pumping rate fed into the formula was the one actually used in testing, rather than a recomputed higher rate as in MPWMD, before the reduction of the formula was applied. In the case of**

**Flores/Pisenti Well #2, the adjusted rate in the Bierman report was 3.03 gpm, barely achieving the mandated minimum of 3.0 gpm. Given the unjustified nature of the estimating formula, a scientist would want to see the retesting demonstrate that with an actual rate of 3.03 gpm, 95% recovery was truly achieved.**

It is important to note that there is no certainty that a given well's recovery rate (fast or slow) is directly relatable to the sustainability of the well's yield. For example, it can be argued through hydraulic theory that a well tapping a relatively small effective storage system of a fractured-rock network could achieve a higher post-test recovery rate due to the faster refilling rate of this smaller volume system, compared to another well tapping into a relatively large effective storage system that achieves a slower post-test recovery rate due to the larger storage volume in that system. Which of these two wells is more reliable in terms of a sustainable supply? Regardless of this uncertainty as to whether a well's recovery rate is a valid and appropriate gauge of a well's sustainability, MPWMD has opted for consideration of reducing the calculated well yield in cases where 95% recovery has not been achieved after two times the pumping period, as an additional conservative measure to hedge against this uncertainty.

- **The present debate is not about whether 95% recovery is an appropriate criterion. That is the rule. MPWMD does not make conservative adjustments to it – quite the reverse. The State and County (even in 2010) only allow one pumping period for recovery, whereas MPWMD allows twice as long.**

It should also be noted that the precise role that post-test recovery data should play in evaluating a well's yield is not well defined and agreed upon in the professional hydrogeologic community. MPWMD plans to continue research and explore refinement of this aspect of well source assessments as part of future planned updating of the *Procedures*. As part of this update, the language associated with the time period during which recovery measurements must be made will also be clarified.

- **Page 4, Relief Requested.** Item 3 requests 95% recovery within 6 days shall be demonstrated by actual measurements for Well #1 and 2 with no use of estimates. See Page 3 response comment above. Also, it should be noted that the relative efficiency of water-level recovery after pumping only affects the well-yield calculation; it does not affect the calculation of predicted drawdowns (i.e., offsite water-level effects) in the vicinity of the pumping well.

- **Agreed – our appeal addresses both areas.**

- **Page 5, Relief Requested.** Item 4 requests that “well capacity shall be determined by the actual pumping rates chosen for tests, with no use of estimates”. This request does not conform to standard hydrogeologic practice and may reflect a misunderstanding of well hydraulics and aquifer analysis. It is the principle purpose of aquifer testing to utilize actual pumping test derived data (pumping rate, water-level drawdown, specific capacity)
  - **Yes, this is exactly the point we were making – that the inputs to the computation should be “actual” and not estimated after recovery failure. Thanks for the clarification – we were not concerned with how those test data are used later in the process. We will edit our request to use your words and say “well capacity shall utilize actual**

**pumping test data for the wells, with no substitution of estimated values.” Is that OK?**

- to calculate hydraulic characteristics of the aquifer (transmissivity, hydraulic conductivity, storativity) in order to determine well yield and predict drawdowns from well operations (i.e., by its nature this and time and distance drawdown relationships. Setting a well yield equal to the rate that was achieved during a short-term pumping test is not standard hydrogeologic practice and can result in erroneous well-yield determinations that could be greater than the recommended well yield based on calculations from the pumping test data. [2]
- **Page 6, Detailed Grounds for Appeal.** The exercise provided under “Failure to comply with Documentation of Drawdown and Recovery” ignores important hydrogeologic considerations. The example calculations on Page 6 show changing percent recovery, but this example does not consider that other hydrogeologic parameters used to calculate well yield would be expected to change as the percentage recovery declines. Both Specific Capacity and the late-time to early-time transmissivity ratio (affected by the steepening slope of the drawdown curve) would be expected to decline under such circumstances, and would result in lower calculated well yields. In other words, it is incorrect and misleading to hold the calculated well yield “static” while reducing the percentage recovery, as the parameters used to calculate well yield would not be expected to remain static under changing recovery conditions, such as is assumed in the example provided.
  - **Agree, but the only parameter that appears changeable in the formula is the “adjusted 24-hour specific capacity of 0.283 gpm/ft. This alone adjusted the actual pumping rate from 6.25 up to an estimated 41.27 gpm, so it is no wonder that the ”reduction” due to the formula still produced an estimated post-recovery rate of 24.52 gpm, nearly four times the original actual pumping rate, to be fed into the well capacity calculations. What kind of conservative reduction is this? What is your own expectation of how low a percentage recovery would still pass, allowing for lower adjusted 24-hour specific capacity?**

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[1]

dry-Well #1 test pumping rate = 6.6 gpm, 6.6 times dry-season demand rate of 1.23 gpm; Well #2 test pumping rate = 6.3 gpm, 5.4 times

[2]

Suggested reference sources for well hydraulics and pumping applications include:

Kruseman, G.P. and N.A. de Ridder, 1994. *Analysis and Evaluation of Pumping Test Data*, 2<sup>nd</sup> Edition; see page 27.