Comments on Revised Draft Model Criteria for Groundwater Monitoring in Areas of Oil and Gas Well Stimulation. June 23, 2015 Draft document by SWRCB

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The revised draft of the SWRCB's Model Criteria for Groundwater Monitoring in Areas of Oil and Gas Well Stimulation, dated June 23, 2015, has been significantly improved from the earlier draft dated May 29, 2015.

I have several specific comments on the new draft of the document that I have provided to Ted Johnson, GRA President, and which are included in his comment letter to Ms. Jeanine Townsend at the SWRCB, dated today.

In addition, I have one significant comment and recommendation for the SWRCB's Final Model Criteria for Groundwater Monitoring in Areas of Oil and Gas Well Stimulation:

> The State's current draft guidance document is missing one very important element that is fundamental to cost-effective subsurface assessments and development of groundwater monitoring programs – development of site-specific Site Conceptual Models (SCMs).

There is, surprisingly, no mention of the importance of developing SCMs to guide SB4 groundwater monitoring activities. In fact, there is no mention of SCMs at all in the latest draft SB4 monitoring guidance. This is very surprising given the strong support that the SWRCB has expressed in the past for the use of SCMs to guide groundwater monitoring programs.[1]

Rather, the SWRCB's current SB4 draft guidance is *prescriptive* in stating that "at a minimum, one upgradient and two downgradient monitoring wells will be required..." to meet their goal of "adequately characterizing water quality in the vicinity of the stimulated well(s)."

The prescriptive approach to groundwater monitoring in the current SWCRB's draft SB4 guidance reminds me of the U.S. environmental industry in the late 1970s and early 1980s when groundwater monitoring was initiated at waste disposal and chemical release sites in the U.S. In fact, similar recommendations for "one up; two down" became synonymous with a prescriptive approach to site characterization and monitoring that was later shown to be inefficient and inconclusive. In response, the U.S. environmental industry gradually shifted to designing groundwater monitoring programs based on "The Scientific Method," whereby groundwater monitoring programs were designed based on the evolving Site Conceptual Model (SCM) for the subject site. Those efforts began in the 1990s with "Expedited Site Characterization" programs (there are ASTM & EPA documents on this) and have evolved into the EPA's current science-based Triad Program for supporting site assessments and groundwater monitoring (www.triadcentral.org<http://www.triadcentral.org>).

[1] For example, I have been a paid consultant to the SWRCB to provide technical training on SCM development to technical staff at the various RWQCBs throughout California.

That is what is missing most from the State's SB4 guidance – there is no mention of designing effective groundwater monitoring programs based on the SCM of the site. That should be changed. This is an easy fix, however. The LLNL Expert report has a thorough section on the importance of developing robust SCMs for site assessments and groundwater monitoring at WST sites in their guidance to the State. The State should simply include some of the language from the LLNL report and shift from making prescriptive recommendations on SB4 monitoring to basing groundwater monitoring networks and programs on the SCM for each WST site. This applies to both the area-specific and regional-scale SB4 groundwater monitoring programs.