

Regional Water Quality Control Board Response to Written Comments Regarding the General Order for In-Situ Groundwater Remediation

The following are responses to written comments received from interested parties in response to the Initial Study, Mitigated Negative Declaration and Waste Discharge Requirements (WDRs) for In-Situ Groundwater Remediation at Sites Impacted by Volatile Organic Compounds, Nitrogen Compounds, Perchlorate, Some Pesticides, Semi-Volatile Compounds, and/or Petroleum Hydrocarbons.

Bruce K. Marvin, P.E., Vice President, Aquifer Solutions, Inc.

Comment 1. Provision 7 - Bench-scale and/or small-scale pilot tests should be mandatory for the amendments covered by this General WDR. Having been involved with over 50 in situ remediations across the country, Canada, Japan and Australian - I can not stress enough the value of site-specific testing prior to site-wide in-situ remediation. At a minimum evaluation of kinetics of amendment consumption is required to establish a site-specific basis for amendment dosage. See comment on provision D3.

Response: We concur that bench-scale and pilot-scale tests will provide valuable data for conducting projects covered by the WDRs. The proponent is required to submit a significant amount of information in the Notice of Intent for coverage under the WDRs, including information from bench-scale and pilot-scale tests to justify the project specifics. There may be instances whereby there is sufficient information based on other projects at the site, or adjacent sites, that would not necessitate conducting additional studies. In most cases, the studies will need to be completed in order to obtain coverage under the WDRs.

Comment 2. Provision 16 - While I understand the issue of salts is particular to the Central Valley region, this provision as written severely limits the available amendments to the in-situ remediation designer. All solid and most aqueous remediation agents contain salts. I recommend the CVRWQCB clarify the word "demonstrate" to provide a more meaningful and consistent application of this provision.

Response: The demonstration must be made that the degradation caused salts being added to the aquifer are justified when compared to the utilization of amendments that do not contain salts, or contain lower concentrations of salts. As an example, it has been demonstrated that a wide range of amendments are capable of sufficiently degrading perchlorate and it would not make sense to utilize a salt-bearing amendment if the benefits of using it (reduced costs, better effectiveness) do not effectively balance the costs (additional degradation). This will be determined on a site-specific basis.

Comment 3. Provision A.5.a - Please define "Fenton's reagent". This loose terminology should be defined in a parenthetical such as "(hydrogen peroxide and an iron catalyst at pH less than 4)". Stabilized catalyzed hydrogen peroxide propagations (CHP) is a valuable in-situ chemical oxidation process that contains no salts that may otherwise be inappropriately categorized as "Fenton's chemistry" and has been referred to as "Fenton-like chemistry" prior to the coining of term CHP by Dr. Rick Watts.

Response: We agree with the comment and have modified the language to exclude the term "Fenton's reagent" and simply refer to amendments that may cause a violent exothermic reaction. We have had more than one site attempt to use a Fenton's reagent reaction that resulted in unacceptable effects such as liquids from the injection well being forced out onto the ground surface and entering a surface water body due to the reaction down the well.

Comment 4. Provision D3 - This provision should be eliminated or revised due to the potential for dire effect on in-situ remediation effectiveness and performance. The most common mode of failure for in-situ remediation is inadequate volume, and dose secondary to volume, of amendment. While management of excessive dose or volume is a valid concern with respect to secondary chemical effects and displacement of impacted water, the provision as written could result in numerous failed in-situ remediations. It is common practice to inject the highest concentration and lowest volume of an amendment under good intentions (save the client money) but with little consideration of chemical and physical effects of this decision. When small volumes of amendment are used, a nominal volume of the target zone is contacted or influenced. When high concentrations are used the kinetics of amendment consumption are typically increased that leads to faster amendment consumption, less efficient use of the amendment, less radial transport, and less residence time in the formation leading to an overall decrease in performance/effectiveness. The CVRWQCB could encourage Dischargers to minimize the dose (i.e. product of the concentration and volume) however that too will likely lead to an increased frequency of poor field performance. I have attached slides from a recent presentation on this topic by Aquifer Solutions at the 5th Intl Conference on Oxidation and Reduction Technologies for In-Situ Treatment of Soil and Groundwater. Wilson Clayton also spoke to this issue at the recent DTSC Remediation Conference in Sacramento - http://ftp.dtsc.ca.gov/Remediation/Symposium_051508_Disk3of4_WilsonClayton.

Response: We concur with the discussion provided in the comment. However, the Provision in question does not limit the amount of amendment that will effectively remediate the groundwater. The project proponent must justify the amendment application amount and rate in the Notice of Intent information. We want proper evaluation by the project proponent prior to bringing the proposal forward for WDRs. We will add the "effectively remediate the groundwater" language to the Provision.

Comment 5. Provision E3 - I recommend the CVRWQCB increase the threshold on ten (10) percent to twenty (20) percent. Ten percent is less than the variability associated with duplicate sample analysis. Decision criteria concerning compliance with Groundwater Limitations should not be more precise than the sensitivity and reproducibility of the methods by which the criteria are measured.

Response: We also concur with this comment and share the concern with sample variability. We have changed the threshold to twenty percent, but maintained the Water Quality Objective as the upper bound even if the increase is less than twenty percent.