UNIVERSITY of VIRGINIA
DEPARTMENT of ENVIRONMENTAL SCIENCES

February 5, 2014

Peer Review of Draft Volume Depletion Approach Study:

Below is my determination of whether the scientific portion of the Volume Depletion Approach Study is based upon sound scientific knowledge, methods, and practices.

Overview:

The purpose of the Volume Depletion Approach Study is to provide scientific evaluation of the protectiveness of alternate criteria to the State Water Board Policy for Maintaining Instream Flows in Northern California Coastal Streams regional criteria for season of diversion, minimum bypass flow and maximum cumulative diversion. Given this, the specific conclusions that I have been asked to make a determination on are 1. Allowing no restrictions on season of diversion, 2. Allowing limited or no restrictions on minimum bypass flow requirements, and 3. Allowing no restrictions on maximum cumulative diversion. In addition to addressing these specific conclusions, I have also addressed (a) any additional scientific conclusions that are part of the scientific basis that are not described in the summary of proposed actions with respect to the statute language, and (b) if, taken as a whole, the scientific portion of the proposed rule is based upon sound scientific knowledge, methods, and practices.

Methods and Analysis used within the Volume Depletion Approach Study and their Scientific Basis:

The Volume Depletion Approach Study (throughout, referred to as the 'Study') chose three representative study basins within the Policy area with regard to basin geomorphology, hydrology and fisheries habitat. As part of this review, Stetson Engineers and R2 Resource Consultants considered impairments, soils, topography, existing diversions, and existing information on habitat to determine potential study sites. Final sites were chosen after confirming feasibility of obtaining access to enough study locations. Overall, their rationale for site selection and study area was scientifically reasonable.

Flow and habitat studies were conducted within these three representative study basins. The flow analysis and stage-discharge curves were produced using standard, scientifically appropriate techniques, using pygmy meters to quantify water velocities, and Manning's equation to predict velocities at higher flow conditions. A Hydrologic Simulation Program-Fortran (HSPF) hydrologic model was used to generate unimpaired

291 McCormick Rd.• P.O. Box 400123 • Charlottesville, VA 22904 • Phone: 434-243-4937 • Fax: 434-982-2137
E-mail: reidenbach@virginia.edu • http://www.faculty.virginia.edu/reidenbach/

flows at points of interest (POI) and potential points of diversion (POD) within the study basin. Scientifically appropriate methods were used to determine precipitation, evapotranspiration and wetting-drying of the soils within the basins. Habitat suitability was considered either fully suitable for spawning or not at all, in terms of water depth, velocity and bed substrate. Flows necessary for habitat suitability were based upon a minimum depth criterion for upstream passage flow needs. Direct measurements of water depths, combined with modeling velocity distributions at higher flows, were analyzed using Physical Habitat Simulation software (PHABSIM). The criterion for suitable habitat in terms of minimum depths, favorable velocities, and usable substrate for both steelhead and coho were used (as listed in Table 3-2). These criteria and their analysis are scientifically reasonable and are based on sound scientific principles.

A protectiveness analysis was completed to compare impairments made under the Policy guidelines to unimpaired conditions. This protectiveness analysis included computation of passage and spawning days for both unimpaired and multiple diversion scenarios. Diversion scenarios consisted of distributed diversions in headwaters, diversions at existing PODs, lumped diversions just upstream of ULA and mixed diversions in headwaters and at ULA. I believe this to be a reasonably complete set of possible scenarios that needed to be tested for possible outcomes. Results from these scenarios were used to identify the limiting scenarios for protectiveness analysis, which showed that the lumped scenario (D3) had the highest calculated diversion volume. This scenario was used to test the protectiveness for class II streams for a range of depletions. The distributed scenario (D1) was also analyzed further to assess how diversions on Class III streams impact habitat at POIs. These diversions estimate the highest calculated diversion that may be expected on Class III streams within each study basin. This protectiveness analysis was, in my judgment, based upon sound scientific knowledge, methods, and practices.

Flood frequency was also computed and compared for unimpaired and impaired flows for multiple diversion scenarios. The change in the 1.5 year flood magnitude was evaluated for the distributed diversion and lumped diversion scenario and it was found that the lumped scenario had a significantly larger impact on 1.5 year flood magnitudes (average of 17% reduction at a 10% maximum cumulative volume depletion) compared to the distributed scenario (average of 3.8% reduction at a 10% maximum cumulative volume depletion). Reductions in critical grain size were also calculated relative to the size estimate for unimpaired flood using a standard scientific method.

The Policy established is that loss in passage and spawning days be no greater than 10% per month to be protective. Given scenarios of maximum cumulative volume depletion between 0% and 10% (in increments of 1%), the number of impaired passage and spawning days were compared to the number of unimpaired passage and spawning days to determine if impaired passage will meet these Policy requirements. Overall, the data collection methods and analysis used within the Volume Depletion Approach Study to determine impacts on passage and spawning days was, in my judgment, based upon sound scientific knowledge, methods, and practices.

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Results based upon the Volume Depletion Approach Study:

-Results indicate that the guidelines for Class III streams are likely to be regionally protective of passage and spawning. In addition the guidelines are protective for maximum cumulative volume depletion for up to 5% and for between 5 and 10%.

-Results indicate that guidelines for Class II streams are likely to not be regionally protective and significant percentages (>10%) of passage and spawning days are lost in October and November due to diversions. In addition the guidelines are not protective for maximum cumulative volume depletion for up to 5% or for between 5 and 10%.

Determination of Conclusions:

1. Allowing no restrictions on season of diversion

To determine if restrictions on season of diversion should be put in place, the conclusion from the Study found that for Class III streams, the A.1.8.3 guidelines appear to be regionally protective for maximum cumulative volume depletions ranging from 0% to 10% and no additional restrictions on season of diversion is needed. For Class II streams, the A.1.8.3 guidelines were found not protective for all cases. Final conclusions recommended no restrictions on season of diversion for Class II streams. However, this is under additional conditions that, for maximum cumulative volume depletions greater than 5% but no more than 10%, a regionally protective minimum bypass flow (MBF) and a maximum cumulative diversion (MCD) equal to the February median unimpaired flow are required. These findings are based upon sound scientific knowledge, methods, and practices. I do not recommend any additional scientific conclusions that are not described in the summary of proposed actions.

2. Allowing limited or no restrictions on minimum bypass flow requirements

The findings regarding minimum bypass flow requirements suggest that for Class III streams, the A.1.8.3 guidelines appear to be regionally protective utilizing no MBF for <=5% maximum cumulative volume depletion and the February median unimpaired flow for MBF for a maximum cumulative volume depletion of >5% but <=10%. However, for Class II streams, the February Median Unimpaired Flow is not regionally protective and additional conditions are recommended. A conclusion provided by the Study is to use a higher MBF, such as the regionally protective MBF, as given in Section 2.2.1.2. This regionally protective MBF is greater than the February Median Unimpaired Flow on average by a factor of 4. Adding a higher MBF was found to protect sensitive passage and spawning and lead to fewer lost passage and spawning days than a combined use of a February median MBF and diversion season. This was accomplished through application of multiple scenarios of individual Policy elements. Taken as a whole, this conclusion is based upon sound scientific knowledge, methods, and practices. I do not recommend any additional scientific conclusions that are not described in the summary of proposed actions.

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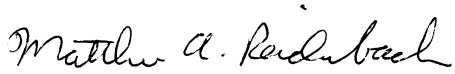
3. Allowing no restrictions on maximum cumulative diversion

Given the tested scenarios previously outlined, the Study determined that for Class II streams, for maximum cumulative volume depletions of >5% but <=10% an MCD equal to the February median unimpaired flow rate is protective of passage and spawning days when combined with an MBF computed using the regionally protective criteria in Policy section 2.2.1.2. For class III streams, no restrictions on maximum cumulative diversion was found necessary if the February median flow MBF criterion is observed. These findings are based upon sound scientific knowledge, methods, and practices. I do not recommend any additional scientific conclusions that are not described in the summary of proposed actions.

Recommended Changes:

It appears that there is a typo in the final report in Section 6.1 Protective Conditions for Class III Streams. The first sentence references Class II streams, but this should instead reference Class III streams.

Sincerely,



Matthew Reidenbach
Associate Professor
Department of Environmental Sciences
University of Virginia

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