Lippe Gaffney Wagner LLP www.lgwlawyers.com

SAN FRANCISCO • 329 Bryant St., Ste. 3D, San Francisco, CA 94107 • T 415.777.5600 • F 415.777.9809
SACRAMENTO • 9333 Sparks Way, Sacramento, CA 95827 • T 916.361.3887 • F 916.361.3897

Thomas N. Lippe
Brian Gaffney
Keith G. Wagner
Jennifer L. Naegele
Celeste C. Langille
Kelly A. Franger
Erin C. Ganahl

April 30, 2010

Via Email: commentletters@waterboards.ca.gov
Jeanine Townsend, Clerk to the Board
State Water Resources Control Board
1001 I Street, 24th Floor
Sacramento, CA 95814

Re: Proposed Policy for Maintaining Instream Flows in Northern California Coastal Streams

Dear Ms. Townsend:

This office represents Living Rivers Council ("LRC") with respect to the State Water Board Proposed Policy for Maintaining Instream Flows in Northern California Coastal Streams. Living Rivers Council objects to approval of this Policy for the reasons set forth below.

1. The Board is Not Complying with Legally Required Procedures.

The Board's process for considering the adoption of this policy, particularly the redline changes added on April 26, 2010 and April 27, 2010, does not comply with governing law in a number of respects.

On February 18, 2010, the Board posted notice on the Internet that it would consider adopting, at its April 27, 2010 meeting, the policy as proposed at that time. Then, on April 26, 2010, the Board posted notice on the Internet that it would consider adopting, at its April 27, 2010 meeting, the policy as amended by numerous redline changes added on April 26, 2010. This notice failed to comply with Water Code section 13147, because it did not give the North Coast and San Francisco Bay regional water quality control boards, as "affected regional boards," at least 60 days advance notice of this public hearing "respecting the adoption of such policy" as required by that section.[1]

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[1]Water Code section 13147 provides: "The state board shall not adopt state policy for water quality control unless a public hearing is first held respecting the adoption of such policy. At least 60 days in advance of such hearing the state board shall notify any affected regional boards, unless notice is waived by such boards, and shall give notice of such hearing by publication within the affected region pursuant to Section 6061 of the Government Code. The regional boards shall submit written recommendations to the state board at least 20 days in advance of the hearing."

Then, during the Board's April 27, 2010 meeting, the policy as amended by the redline changes added on April 26, 2010 was not "made available for public inspection at the meeting" in violation of the Bagley-Keene Open Meeting Act, Government Code section 11125.1, subd (b).[2]

At its April 27, 2010 meeting, the Board announced that (1) staff was amending the policy with even more redline changes during the meeting, (2) these redline changes would be made available before the "end of the day," (3) the Board would continue its consideration of adopting the policy to its meeting on May 4, 2010, and (4) the public could submit comments on the April 26 and April 27 "redline" changes by noon on April 30, 2010.

The Board's intent to consider adoption of the amended policy at its May 4, 2010 meeting violates several statutes.

The policy the Board is considering adopting at its May 4, 2010 hearing is different, due to numerous redline changes, from the policy that it had previously noticed on February 18, 2010. Therefore, the state board must give the North Coast and San Francisco Bay regional water quality control boards, as "affected regional boards," at least 60 days advance notice of this hearing unless notice is waived by such boards.

Further, the Board must "give notice of such hearing by publication within the affected regions (i.e., the North Coast and San Francisco Bay regions) pursuant to Section 6061 of the Government Code."

Pursuant to the Bagley-Keene Open Meeting Act, Government Code section 11125, subds (a) and (b), the Board must provide, on the Internet at least 10 days before the next meeting at which it considers the adoption of this policy, notice of said hearing that includes "a specific agenda for the meeting, containing a brief description of the items of business to be transacted or discussed."[3]

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[2] Government Code section 11125.1, subd (b) provides: "Writings that are public records under subdivision (a) and that are distributed to members of the state body prior to or during a meeting, pertaining to any item to be considered during the meeting, shall be made available for public inspection at the meeting if prepared by the state body or a member of the state body...."

[3]Gov. Code § 11125 provides: "(a) The state body shall provide notice of its meeting to any person who requests that notice in writing. Notice shall be given and also made available on the Internet at least 10 days in advance of the meeting, and shall include the name, address, and telephone number of any person who can provide further information prior to the meeting, but need not include a list of witnesses expected to appear at the meeting. The written notice shall additionally include the address of the Internet site where notices required by this article are made available.

(b) The notice of a meeting of a body that is a state body shall include a specific agenda for the meeting, containing a brief description of the items of business to be transacted or discussed in either open or closed session. A brief general description of an item generally need not exceed 20 words. A description of an item to be transacted or discussed in closed session shall include a citation of

Obviously there is not enough time to do so before May 4, 2010.

Also, the notice, including agenda, required by Gov. Code § 11125 for the Board's May 4, 2010 meeting has already been posted. Under section 11125, subd (b) "No item shall be added to the agenda subsequent to the provision of this notice, unless otherwise permitted by this article."

Moreover, the Board does not have the authority to require that written comments be submitted by noon on April 30, 2010 for an agenda item to be considered on May 4, 2010. Under Title 23, Cal Code Regs. Section § 647.3, subd (a), any person may submit written comments on any agenda item at any time "in advance of the meeting at which it is to be considered."[4]

Finally, Water Code section 13145 provides: "The state board shall take into consideration the effect of its actions pursuant to this chapter on the California Water Plan as adopted or revised pursuant to Division 6 (commencing with Section 10000) of this code, and on any other general or coordinated governmental plan looking toward the development, utilization, or conservation of the waters of the state. There is no evidence that he Board has complied with this statute. Neither the SED nor the Initial Study mention the California Water Plan.

2. The Policy is Not Scientifically Valid.

See the attached comment letter from Dennis Jackson dated April 28, 2010, which is incorporated herein by this reference.

3. **The Substitute Environmental Document Does Not Comply With CEQA.**

The many redline changes to the Policy represent significant changes in the Project description. A revised SED assessing the impacts of this revised Project is required.

The SED also fails to describe the current regulatory baseline for purposes of assessing the Project's environmental effects. The current baseline includes the fact that the Board has not, for many years, and is not approving many, if any, water rights applications that propose to reduce stream flow in the Policy area. Adoption of this Policy will change that state of affairs , leading to significant adverse effects on salmonids and their habitat. The SED ignores this fact.

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the specific statutory authority under which a closed session is being held. No item shall be added to the agenda subsequent to the provision of this notice, unless otherwise permitted by this article."

[4]Title 23, Cal Code Regs. Section § 647.3, subd (a) provides: "(a) Any person may submit comments in writing on any agenda item. Any person submitting such comments shall provide the Board with a copy of the comments in advance of the meeting at which it is to be considered. Such comments may be inspected by any interested person."

Thank you for your attention to this matter.

Very Truly Yours,

Thomas N. Lippe

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Dennis Jackson - Hydrologist

2096 Redwood Drive
Santa Cruz, CA 95060
(831) 295-4413
dennisjack01@att.net

April 28, 2010

Tom Lippe
329 Bryant Street, Suite 3D
San Francisco, CA 94107

Re: Proposed Instream Flow Policy for Northern California Streams Revised April 27, 2010

Dear Mr. Lippe:
You have asked me to comment on the *red-lined* version of the Revised Final Draft of the *Policy For Maintaining Instream Flows In Northern California Coastal Streams* (the Policy), dated February 17, 2010 and revised on April 27, 2010.

I served as the Hydrologist for the Mendocino County Water Agency from 1989 through 1994. I have a Master degree in Physical Science with an emphasis on Hydrology. I have been a private consultant since 1995.

Season of Diversion

Section B.2.1.4 item 2 incorrectly stated that the season of diversion in the Policy Area was October 1 through March 31. This error has been corrected.

> Revised Section B.2.1.4 item 2 states:
>
> Because irrigation of crops in the policy area typically does not begin before March 31, senior water rights authorizing direct diversion for irrigation before March 31 do not need to be considered part of the seasonal demand. However, since a postharvest irrigation may occur between October 1 and October 31, the October demand of senior water rights with an authorized season extending into this period should be included.

Stream Classification

In my March 22, 2010 comments I noted that the stream classification system was based on the presence or absence of fish but that fish was not defined. The following definition has been added to the Glossary (Appendix I).

> **Fish** – Wild fish, mollusks, crustaceans, invertebrates, or amphibians, including any part, spawn, or ova thereof (California Fish and Game Code section 45). For the purposes of stream classification fish are defined as finfish.

In my March 22, 2010 comments I noted that:

> The historic presence of fish is part of the definition of a Class I stream but no guidance is given on what constitutes acceptable historical evidence. What documentation of historic presence of fish in a particular stream reach is required in the absence of a historic stream survey from DFG clearly stating the presence of fish at a particular location? A given land owner may have recently

purchased the property and may not be aware that twenty years ago a creek on his/her property supports fish but no longer does. Does a statement regarding the presence/absence of fish from a neighbor constitute acceptable historic evidence that fish had inhabited a stream reach? The Policy provides no standard for historical evidence of the presence of fish in a stream reach.

Section A.1.6.1 offers this vague definition of *historical evidence* of fish in a stream reach.

> Historical evidence can include fishery agency reports or other scientific studies that provide evidence that a stream reach may have supported fish or fish habitat.

This wording is vague and does not clearly allow the use of citizen observations or photographs to demonstrate the historical presence of fish which it should.

The Policy definition of a Class II stream has been revised to allow for consideration for the historic presence of such habitat. This change adequately meets my concern.

> Class II streams, which may include intermittent or ephemeral streams, may be indicated by the presence of aquatic non-fish vertebrates or aquatic benthic macroinvertebrates or combinations of other indicators, such as free water, aquatic plants, or hydric soils. Historical information may be used in areas where habitat is suspected to be degraded. However, in Class II streams fish are never present, either currently or historically.

Section A.1.6.1 defines a Class III stream as follows.

> Ephemeral streams having defined channels with defined banks (slope break) that show evidence that sediment transport processes occur may indicate a Class III stream. For instance, evidence of periodic scour and deposition of sediment are indicators that a Class III stream exists. Class III streams also meet both of the following conditions: (1) fish are never present, either currently or historically, nor does habitat to sustain fish exist, and (2) the stream does not provide habitat for aquatic non-fish vertebrates and/or aquatic benthic macroinvertebrates.

A degraded Class II stream might be misidentified as a Class III stream. Therefore, item (2) in the definition of a Class III stream should be modified to say that "…habitat for aquatic non-fish vertebrates and/or aquatic benthic macroinvertebrates is never present, either currently or historically."

The following comments from my March 22, 2010 letter have not been addressed.

> Over what distance in the stream channel will the State Water Board make their determination of Stream Class? Will the State Water Board use the same methodology as described in Section A.1.6.2 in making their determination of Stream Class? How will the State Board make a determination that fish were historically presence in the affected stream reach? Will the State Board make a search of DFG's files for each diversion application? Will the State Board interview neighbors?
>
> If the applicant challenges the State Water Boards Stream Classification they may elect to makes their own Stream Class determination by conducting a stream survey as described below in Section 1.6.2. If the State Water Board's Stream Classification of the project reach is done in a rigorous manner according to a standard methodology how, will the applicant be able to come to a different Stream Class determination? The Policy does not appear to have a mechanism for deciding which of the two competing Stream Classification for the project reach should prevail.
>
> Section A.1.6.2-1 requires that the Stream Classification stream survey be done over a reach that is 50 bankfull widths long. The bankfull width is a fluvial geomorpholgical parameter. The qualifications for a Fisheries Biologist, in Section A.1.5, do not guarantee that fisheries biologist with minimal acceptable experience would have sufficient training in determining the bankfull width. The Policy gives no guidance in how to determine the bankfull width in the field.

> The Stream Classification stream survey is to be 50 bankfull widths long. Will an applicant have legal access to the 50 bankfull channel widths of stream channel? Jackson (1999) did a statistical analysis of 50 bankfull widths measured by DFG stream survey crews or determined at USGS stream gauges in the Russian River watershed. Jackson (1999) determined that an upper bound for bankfull widths of the measured channels is given by:
>
> Bankfull Width = 13.1 (Watershed Area) $^{0.5}$ $R^2 = 0.760$; Sample Size = 50
>
> According to this formula, the bankfull width for a 1.0 sq-mile watershed would be approximately 13.1 feet or less and a 50 bankfull width length would be up to 655 feet. At many project sites a stream survey 655 feet long would require access from multiple landowners. The Policy does not give guidance on how to proceed with the required field stream assessment work when access is blocked by a neighboring landowner.
>
> Section A.1.6.2-A does not consider historical presence of fish in determining if a reach is a Class I stream. The habitat that supported fish historically could have been destroyed by channel changes.
>
> Sections A.1.6.2-A-2 and B-2 rely on "...habitat suitability criteria provided by the qualified fisheries biologist" instead of requiring that habitat suitability criteria be set by the Policy. Section A.1.6.2-4-C, which designates Class III streams, does not specify who establishes the habitat suitability criteria.

Section A.1.6.2-A lists the criteria for deciding if a reach is a Class I based on a stream survey however, historical presence of finfish is not among the criteria listed.

Regionally Protective Criteria

I concentrated my March 22, 2010 review on the question of whether the Regionally Protective Criteria always set diversion parameters that would err on the side of resource protection, that is always protect anadromous salmonids and their habitat. I found that the Regionally Protective Criteria relied on what I call the Scaling Method to transfer flow parameters such as the mean annual discharge, February median flow, the average seasonal flow and the 1.5-year instantaneous discharge from a reference stream gauge to an ungauged watershed upstream of a Point of Diversion (POD) or a Point of Interest (POI).

If the Regionally Protective Criteria do not *always* produce diversion parameters that err on the side of the resource then they can not be relied on to protect anadromous salmonids and their habitat. There is nothing in the Policy that would allow the SWRCB staff to predict when the Regionally Protective Criteria would err on the side of *not* protecting the resource. However, my March 22, 2010 analysis reveals a potential approach to improve the ability of the Scaling Method to make better estimates by choosing reference stream gauges based on the similarity of watershed characteristics instead of simply choosing the closest gauge.

The State Water Board has revised the Policy in response to my comment by adding the following text to Sections B.2.1.3 and B.5.2.1:

> Applicant shall select a stream flow gauge with a period of record no less than 10 water years for their analysis. The streamflow gage used to prorate unimpaired flow should share characteristics of the watershed being examined. Characteristics include, but are not limited to, geology, soils, topography, vegetation, land use, and precipitation runoff processes.

The Policy was also revised by deleting references to using the closet stream gauge.

In my opinion, the State Water Board response to my comment regarding the selection of a reference stream gauge is a good start but it is not sufficient to guarantee that flow estimates made based on the selected reference stream gauge always err on the side of resource protection. There are two issues to be considered. First, does knowledge about the watershed characteristics above a reference stream gauge and above an ungauged POI/POD actually result in sufficiently accurate flow estimates that will produce diversion parameters that are always protective of the fishery resources? That is, the use of watershed characteristics to select a reference stream gauge needs to be validated. Second, if knowledge of the watershed characteristics does improve the reliability of the flow estimates for an ungauged location, what process can be used to select the best reference stream gauge?

The State Water Board has not validated that using reference stream gauge with similar watershed characteristics to an ungauged watershed. In my March 22, 2010 letter I pointed out that the State Water Board had not validated that the Adjustment of Stream Gauge Records (Scaling Method) would produce flow estimates that would always be protective of the resource. Table 2 of my March 22, 2010 letter demonstrated that the Adjustment of Stream Gauge Records (Scaling Method) was not always protective of the fishery resource.

In my March 22, 2010 comments I stated that:

> I do not have enough information to determine if my recommend procedure would actually be protective of the resource in all cases. Therefore, if the SWRCB pursues my recommendation it must be validated to always err on the side of resource protection.

I also noted on page 11 of my comments that:

> The above discussion shows that simply using the closest reference stream gauge will not result a protective MBF at some sites. Therefore, I recommend that the State Board undertake a study to relate the runoff efficiency of the watershed (Eq-4) above a large sample of gauging stations to watershed characteristics such as geology, soils, topography, vegetation type, and land use including the volume of diversion. The result of this type of study should allow selection of an appropriate reference stream gauge based upon the similarity watershed characteristics upstream of the reference gauge to the watershed characteristics upstream of a given POD or POI.

The revised Policy has adopted the idea of using watershed characteristics to select a reference stream gauge but has not validated the concept. Furthermore, the revised Policy gives no guidance on how to use watershed characteristics to select a reference stream gauge. That is, the revised Policy does not address the problem of how to find the reference stream gauge with the most similar watershed characteristics so that the error of estimating the various flow parameters is minimized.

It is necessary to devise a screening procedure that could help guide the process of selecting a reference stream gauge for a given POI/POD. The problem I see is that professional judgment of whether the set of watershed characteristics above a POI/POD are similar to the watershed characteristics above a reference gauge may not be good enough in all situations to ensure protection of the resource.

I recommend that a GIS study be done of the watersheds above all the USGS stream gauges in the Policy Area to determine the watershed characteristic above each gauge. Once the GIS database for each USGS gauge in the Policy was compiled a statistical analysis (e.g. correlation analysis and multiple regression) could be conducted to relate the watershed characteristics to the runoff efficiency for each USGS stream gauge in the Policy area. The correlation analysis would test the validity of using watershed characteristics to select a reference stream gauge. If meaningful correlations between watershed characteristics and runoff efficiency were found a multiple regression analysis could be performed.

If a multiple regression model with adequate goodness-of-fit statistics was found it could be used to guide the selection of a reference stream gauge for a given POI/POD. It may take several tries before a set of watershed characteristics with good correlation to runoff efficiency was found.

The GIS study should focus on hydrologically meaningful parameters for the different watershed characteristics that would be expected to correlate with runoff efficiency. For example, geology might be simplified to broad classes of rock types such as sedimentary, metamorphic and igneous. Soils might be simplified to the hydrologic soil group (A, B, C, or D). Topography might be simplified to the percentage of the area of the watershed with slopes in excess of 30%. Land use might be simplified to parameters such as road density, impervious area or urbanized area. Vegetative cover might be simplified to percentage of forest, grassland, or agricultural land.

Finally, the level of error in the flow estimates from using watershed characteristics to guide the selection of a reference stream gauge should be explored with pairs of USGS gauges where one gauge acts as the "ungauged" location and the other gauge acts as the reference gauge. That is perform the analysis I demonstrated in Table 2 of my March 22, 2010 letter. This step is crucial in verifying the methodology and for refining the selection of a reference gauge.

Once a reference gauge is found that is likely to have a runoff efficiency similar to the POI/POD of interest then, the rainfall and precipitation ratios are used as described in the revised Policy Sections B.2.1.3, B.5.2.1 and B.5.3.1 to predict the streamflow.

Precipitation Based Streamflow Models

Sections B.2.1.3-B and B.5.2.1-B in the Revised Policy are identical to the February 2010 draft I commented on. Both state sections state:

> Subject to State Water Board approval, the applicant may propose using standard hydrologic techniques or public domain computer models for estimating the mean annual unimpaired flow at the POI. This analysis shall be based on a ten-year simulation period, at a minimum. **Model results shall be validated by comparison with recorded flows on or near the POD watershed**. The recorded flows do not have to be unimpaired but the applicant shall take the impairment into consideration when calibrating the model. Model submittal requirements are described in Appendix A Section A.1.1.1. (Emphasis Added)

The Policy gives no guidance on what constitutes an acceptable validation of a precipitation-based streamflow model. The Policy should give objective guidance on the goodness-of-fit that a precipitation-based streamflow model must achieve when it is validated against the reference stream gauge's flow record.

The Policy also assumes that the closest reference stream gauge is the best gauge to validate the precipitation-based streamflow model for POD/POI. I have demonstrated that watershed similarity is more important than proximity. The Policy has not applied the concept of watershed similarity to the validation of precipitation-based streamflow models. My March 22, 2010 comments, quoted below, have not been addressed.

> Section B.2.1.3 B allows precipitation-based streamflow modeling, using a minimum of 10-years of precipitation data, to estimate the unimpaired average seasonal flow. Transferring the results of a precipitation-based streamflow model that is calibrated to adequately replicate the unimpaired flow at a reference stream gauge to an ungauged watershed upstream of a POD will likely not give a reliable estimate of the unimpaired average seasonal discharge if the model is not adjusted to for any difference in watershed characteristics, such as soils, topography, geology, vegetation cover

and land use, between the reference gauge watershed and the POD watershed. In other word, a precipitation-based streamflow model that does not account for differences in Runoff Efficiency between the reference gauge and the ungauged watershed above a POD or POI will not produce reliable flow estimates. In addition, all assumptions and all input data should be readily available to the public in order for the public to be able to evaluate the reliability of a precipitation-based streamflow model.

Another Method

Appendix B, *Guidelines for Preparation of Water Supply Report and Cumulative Diversion Analysis*, of the Policy allows streamflow at a POD/POI to be estimated by Method (C) *Another Method Acceptable to the State Water Board.* Method (C) is arbitrary and is so poorly defined that there is no way to objectively assess what it means. Method (C) appears to have a large potential to be misused. This comment was not addressed in the Response to Comments.

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Water Supply Report

The water supply report is based on the estimates of stream flow at the ungauged POD/POI. I have shown that the Adjustment of Streamflow Records (Scaling Method) and the Precipitation-Based Streamflow model both require knowledge of the watershed characteristics of both the watershed above the POD/POI and for the reference stream gauge. Accordingly, B.2.1.3 *Estimate the Average Seasonal Unimpaired Flow Volume at Each Senior POD Identified for Analysis Along the Flow Path* should be modified to require that a description of the watershed characteristics such as geology, soils, topography, vegetative cover, and land use be give for each POD or POI where flow is to be analyzed.

Similarly, the water supply report should also require that the watershed characteristics for the reference stream gauge also be described. And a discussion should be included describing how the reference stream gauge was chosen and why it is superior to any other possible reference stream gauge.

Maximum Cumulative Diversion Rate

My criticism of estimating the regionally protective maximum cumulative diversion rate has only been partially addressed. The regionally protective maximum cumulative diversion rate depends on estimating the 1.5-year instantaneous streamflow at the POI/POD based on data from a reference stream gauge (adjustment of Streamflow Records or Scaling Method). The change in language in Sections B.2.1.3 and B.5.2.1 are improvements but do not fully address my criticism and do not change my opinion that the regionally protective criteria do not protect the resource in all situations.

The State Water Board must validate the watershed characteristics approach as described in the discussion on Regionally Protective Criteria above and undertake a statistical analysis to relate watershed characteristics above the USGS gauges in the Policy area to the runoff efficiency of the USGS gauges (see section on Regionally Protective Criteria).

The language used in describing the maximum cumulative diversion rate (MCD) is still confusing. In my March 22, 2010 comments I quoted Section 2.2.1.3. The recent revisions to the Policy are noted in *italicized red type*.

2.2.1.3 Maximum cumulative diversion

The **bankfull flow** is the flow at which channel maintenance is the most effective. The 1.5-year return peak flow is a hydrologic metric that can be used to estimate bankfull flow and effective

channel maintenance flows. The **1.5-year instantaneous peak flow** is the annual maximum instantaneous peak streamflow that is equaled or exceeded, on average over the long term, once every one and a half years. The frequency at which this peak flow is expected to occur is referred to as the **recurrence interval**. Limiting the maximum rate at which water is withdrawn by all water diverters in a watershed so that peak streamflows are reduced by no more than a small fraction of the 1.5-year instantaneous peak flow will result in a relatively small change to channel geometry, and will ensure that natural flow variability and the various biological functions that are dependent on that variability are protected.

To ensure maintenance of natural flow variability and protection of the biological functions dependent on it, ***the maximum cumulative diversion rate is set at the largest value of the sum of the rates of diversion of all diversions upstream of a specific location in the watershed***. . (Emphasis Added)

The maximum cumulative diversion rate ***regionally protective*** criterion is equal to: five percent of the 1.5-year instantaneous peak flow.

For projects located above anadromy, the maximum cumulative diversion rate criterion shall be evaluated at POIs at and/or below anadromy in order to identify the allowable rate of diversion at project PODs. The maximum cumulative diversion rate puts limitations on the cumulative rate of water withdrawal in a watershed, not necessarily the rate of withdrawal at a point of diversion. The rate of diversion *limitation* for a project is not necessarily equal to the maximum cumulative diversion rate *limitation* in a watershed. This is because the project's rate of diversion *limitation* is based on an evaluation of whether the project, together with existing diversions, causes an exceedance of the maximum cumulative diversion rate criterion at points of interest at and/or below the upper limit of anadromy. Guidelines for calculating the maximum cumulative diversion rate criterion and for determining whether a limit on the rate of diversion is needed are provided in Appendix A, Section A.1.8 and Appendix B Section B.5.2.3.

In the second paragraph of Section 2.2.1.3 quoted above, the phrase, "…the maximum cumulative diversion rate is set at the largest value of the sum of the rates of diversion of all diversions upstream of a specific location in the watershed" is in conflict with paragraph three of Section 2.2.1.3 which states that, "The maximum cumulative diversion rate criterion is equal to: five percent of the 1.5-year instantaneous peak flow."

The phrase, "…the largest value of the sum of the rates of diversion of all diversions upstream of a specific location in the watershed" does not make sense. There is *only one*, "…sum of the rates of diversion of all diversions upstream of a specific location in the watershed".

A specific diversion might be subject to a maximum rate of diversion, in cubic feet per second (cfs). A group of diversions upstream of a specific point (POI/POD) are also subject to a maximum *cumulative* diversion rate (MCD). The sum of the project-specific maximum diversion rates, for all diversions in the group, is less than or equal to the regionally protective maximum cumulative diversion rate.

I recommend that the phrase "…the maximum cumulative diversion rate is set at the largest value of the sum of the rates of diversion of all diversions upstream of a specific location in the watershed" be replaced by

"…the sum of all the project-specific maximum diversion rates upstream of a POI/POD shall not exceed the regionally protective maximum diversion rate".

Another issue that has not been addressed in the Policy revisions is the inconsistent use of the term *instantaneous* with regard to flow. My March 22, 2010 comments are quoted below.

> The Policy document appears to have an inconsistent use of the term *instantaneous* with regard to flow. In hydrology, the term instantaneous flow means the flow over a very short period of time such as 15 minutes or less. The USGS typically collects streamflow data with digital instruments that average the flow over a 15 minute period. Instantaneous flood peaks tends to occur for less than 15 minutes. The instantaneous maximum flow during a flood peak may occur over only a few minutes of time. In flood hydrology, the 1.5 year instantaneous peak flow is calculated from an analysis of the series of the maximum instantaneous flow from each year of record.
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> The sample calculation of 1.5 year channel maintenance flows posted on the SWRCB AB-2121 website (*Attachment 2 sample calculation of 1.5 year channel maintenance flows*) demonstrate a calculation based on daily *average* discharges instead of *instantaneous* discharges. The data used in the sample calculation of 1.5 year flow (Attachment 2) were clearly obtained from the daily average data used in *Attachment 1 Sample Water Availability Calculation*.
>
> Using daily *average* values to calculate the 1.5-year flood will always result in estimates that are significantly lower than if the 1.5-year discharge was calculated with *instantaneous* data. Using the maximum annual daily average streamflow to calculate the 1.5-year discharge will provide a more conservative (lower) value of the MCD. Therefore, I recommend that the Policy be changed to define the MCD as 5% of the 1.5-year discharge calculated using *daily average* data instead of maximum annual instantaneous flow. However, the resulting discharge will significantly be less than the 1.5-year discharge defined by using the annual maximum instantaneous peak discharge that has been related to the bankfull discharge.
>
> It is standard hydrologic practice to calculate the 1.5-year flood flow using the maximum *instantaneous* discharge (maximum annual flood) for each year of record. Alternatively, the partial duration series can be used to calculate the 1.5-year instantaneous flow. The partial duration series is composed of ***independent*** *instantaneous* flows above a threshold. The USGS used to post the partial duration series for gauges with flood records on their NWIS web site. However, the USGS now only reports the maximum annual instantaneous flow for each water year of record.

The Response to Comments acknowledges the above comments and is quoted below.

> Staff used average daily flow in the development of the sample flow calculations. It is our understanding that the most common data that will be available to the Applicants and their consultants is the average daily data available through the USGS. Staff agrees with your suggestion that references to instantaneous flow data be replace with average daily data. There are more gages being added to the Policy area streams and many of those gages do record flow instantaneously. In the future as shorter time step data becomes available the Division may wish to require Policy calculations be made using data with a shortened time step.

Section 5.3.1 of the revised Policy states

> Collect the daily streamflow data records for the gage selected for analysis in method A of section B.5.2.1. Estimate the time series of daily flow at the POI by multiplying the daily flow at the gage by the ratio of the drainage area and precipitation using the methods described in method A of section B.5.2.1 Most gage data is available on a daily time step; however, gages with shorter time steps are being added to streams in the Policy area. Applicants shall use a stream gage located in a watershed having characteristics similar to the watershed being examined. Applicants are encouraged to use the stream gage with the shortest time step available.

It will be quite some time before non-USGS stream gauges will have the 10 years of data required by the Policy to be used in setting diversion parameters. The biggest obstacle in maintaining a stream gauge for the minimum 10 years is funding. There are numerous USGS gauges throughout the Policy area that have been discontinued due to a lack of funding.

The USGS typically collects its digital streamflow data on a 15-minute time-step (96 readings per day). The USGS real-time reporting stream gauges do provide 15-minute data for the most recent six months of record. The USGS summarizes the data to daily average values before reporting them on the internet or in report form. The State Water Board might be able to enter into an agreement with the USGS to obtain 15-minute data for several years of record for some stream gauges.

The Policy should acknowledge that the State Water Board will accept calculations of the MCD based on daily average streamflow instead of instantaneous streamflow. The Policy should explain that the use of instantaneous flow data may be required in the future if it becomes widely available. Failure to address this issue now may result in distrust if applicants feel that the rules have been arbitrarily changed. The Policy should also explain that the estimate of the MCD based on daily data will be significantly less than the MCD based on instantaneous data.

My March 22, 2010 comments noted that:

> Section B.5.2.3-A, quoted above, recommends the use of the *Peaks Over a Threshold* (Partial Duration Series) to calculate the 1.5 year instantaneous flow. Part B.5.2.3-A.1 says to select a threshold so that an average of three peaks a year will be selected. However, it is not mentioned in Part B.5.2.3-A.1 that the peaks should be from *distinctly* different flood events, that is, the peaks over the threshold should be independent. The use of "peaks" from the same flood event will bias the result.

This comment has been incorporated into Section B.5.2.3-A.

However, I noted that the there is a difference in the meaning of the recurrence interval between the annual maximum flood series and the partial duration series (peaks over a threshold). The revised Policy has not acknowledged the fact that the value of the 1.5-year event based on the annual maximum flood series is different from the value of the 1.5-year event based on the peak-over-a-threshold (partial duration series) method.

The Policy has ignored the following comment from my March 22, 2010 letter. The State Water Board acknowledges that the bankfull discharge is approximated by the 1.5-year instantaneous discharge and that the MCD is based on the 1.5-year instantaneous discharge but that typically only daily data is available. Using daily streamflow data to estimate the MCD will give a lower value than if instantaneous streamflow data is used.

> Dunne and Leopold (*Water in Environmental Planning*, 1978) remind us that the recurrence interval of the partial duration series (peaks over a threshold) is not the same as the recurrence interval for the annual flood series.
>
> > But there is a distinction between the meaning of the recurrence interval of floods obtained from the two series. For the annual-maximum series the recurrence interval is the average interval within which a flood of a given size will occur as an *annual maximum*. The recurrence interval obtained from the partial-duration series (peaks over a threshold) is the average frequency of occurrence between floods of a given size irrespective of their relation to the year. It is the average time between flows equal to or greater than a give discharge. The usual method of obtaining return periods for the partial duration series (peaks over a threshold) is to obtain them for the maximum annual series and then convert the frequencies by use of Table 10-13.

Table 10-13. Relation between recurrence intervals of the annual-maximum series and the partial-duration series (peaks over a threshold). (From Langbien, 1960)

Recurrence Interval (Yr)	
Annual Maximum Series	**Partial Duration Series**
1.16	0.5
1.50	0.9
1.58	1.0
2.00	1.5
2.54	2.0
5.52	5.0
10.50	10.0
20.50	20.0
50.50	50.0
100.50	100.0

According to Dunne and Leopold, the annual maximum flood recurrence interval of 1.5-years corresponds to a partial-duration series (peaks over a threshold) recurrence interval of 0.9 years. The use of the partial-duration series (peaks over a threshold) procedure can produce good estimates of the 1.5-year discharge, but only if (a) independent peaks are used and (b) the recurrence interval is appropriately corrected by the use of Table 10-13 from Dunne and Leopold (1978).

Winter Low-Flow

The Revised Policy defines the winter low flow as the February median discharge.

The Revised Policy arbitrarily allows a 10 percent reduction in the number of days that the winter low flow is exceeded before an impact is declared significant, for Class II streams.

Section B.5.3.6

4. Is the number of days the winter low flow is exceeded affected by senior diverters and the proposed project by more than 10 percent in each month of the diversion season over the period of record?

Table 1 below shows the number of days the winter low flow (February median discharge) was exceed during each month of the diversion season fro the Redwood Creek near Napa stream gauge (USGS gauge number 11458200). The 15-year period of record for the Redwood Creek near Napa gauge is 1958-1973. The February median discharge is 12 cfs. On average, the flow equaled or exceeded the winter low flow (February median discharge) on 43.3 days per year. The flow was less than winter low flow (February median discharge) 63.7 days per year on average.

Table 1. The number of days the winter low flow (February median discharge) is exceeded, by month, for Redwood Creek near Napa based on 15 years of record.

Redwood Creek near Napa						
February Median Flow = 12						
	Number of Days >= Feb Median	Number of Days < Feb Median	Total Days in Record	Average Number of Days >= Feb Median per Month	Average Number of Days < Feb Median per Month	Average Days
December 15-31	74	181	255	4.9	12.1	17
January	182	283	465	12.1	18.9	31
February	214	210	424	14.3	14.0	28.3
March	184	281	465	12.3	18.7	31
Total Days	654	955	1609	43.6	63.7	107.3
Days per Year	43.6	63.7	107.3			

Table 1 Continued. The number of days the winter low flow (February median discharge) is exceeded, by water year, for Redwood Creek near Napa based on 15 years of record.

Water Year	Number of Days >= Feb Median	Number of Days < Feb Median	Total Days in Record
1959	16	91	107
1960	28	80	108
1961	28	79	107
1962	50	57	107
1963	40	67	107
1964	10	98	108
1965	40	67	107
1966	46	61	107
1967	41	66	107
1968	46	62	108
1969	85	22	107
1970	80	27	107
1971	50	57	107
1972	9	99	108
1973	85	22	107

No evidence is offered that demonstrates that the aquatic habitat of Class II streams will not be impacted by this arbitrary change in the number of days the winter low flow (February median) is exceeded. Class II streams can supply food to fish in Class I streams. So, a reduction of aquatic habitat in Class II streams has the potential to adversely impact salmonids.

The procedure in Section B.5.3.6 of the Policy looks at the number of days the winter low flow (February median discharge) is exceeded by month. The second part of Table 1 above shows that the number of days the winter low flow (February median discharge) is exceeded by water year for the diversion season. The number of days the winter low flow is equal or exceeded, by water year, range from 9 days to 85 days for Redwood Creek near Napa.

The procedure in Section B.5.3.6 of the Policy looks at the number of days the winter low flow (February median discharge) is exceeded by month. The State Water Board has not demonstrated that the allowed 10 percent reduction of the number of days that the winter low flow is exceeded will not be concentrated in dry years thereby reducing flow in Class II streams during times of stress which has the potential to decrease the production of food for salmonids at a critical time.

Upper Limit of Anadromy

Section A.1.4 defines the determination of the Upper Limit of Anadromy (ULA). The ULA is defined as the most upstream end of the current or historical range of anadromous fish. The ULA must be downstream of all Class II and Class III streams. The ULA will be in the upstream most Class I stream reach that supports or historically supported anadromous fish. There could be a Class I stream reach above the ULA where non-anadromous fish reside.

Diversions on Class III Streams

Section A.1.8.1 describes how diversions on Class III streams will be analyzed. I criticized the following language in Section A.1.8.1-1;

> There is error associated with the estimation of daily flows. Because of this, on a case-by-case basis, the State Water Board may consider this condition to be satisfied when analyses show a minor change to the numbers of days the February median is exceeded, provided that the minor change is due to a slight variability in the estimation of flow.

The Revised Section A.1.8.1-1 and A.1.8.1-2 have replaced the above language with

> 1. Cumulatively the project and all senior diverters of record will not reduce the number of days the unimpaired winter low flow is exceeded at the POIs located on downstream Class II streams by more than 10 percent in each month during the diversion season over the period of record for the analysis. This analysis shall be performed using the method described in Appendix B Section B.5.3.6; AND
>
> 2. Cumulatively the project and all senior diverters of record will not reduce the number of days the unimpaired flow needed for spawning, rearing, or passage occurs at the POIs located at and below anadromy by more than 10 percent in each month during the diversion season over the period of record for the analysis. This analysis shall be performed using the method described in Appendix B Section B.5.3.4. Regional criteria or site specific criteria for the minimum bypass flow may be used in the analysis of flows at the POIs; AND

As discussed above in the Section on *Winter Low Flow* the arbitrary decision to allow a 10 percent reduction in the number of days the winter low flow (February median discharge) has not been demonstrated to be protective of the resource. No evidence is offered that demonstrates that the aquatic habitat of Class II streams will not be impacted by this arbitrary change in the number of days the winter low flow (February median) is exceeded. Class II streams can supply food to fish in Class I streams. So, a reduction of aquatic habitat in Class II streams has the potential to adversely impact salmonids.

Table 1 shows the number of days the winter low flow (February median discharge) was exceed during each month of the diversion season for the Redwood Creek near Napa stream gauge (USGS gauge number 11458200). The 15-year period of record for the Redwood Creek near Napa gauge is 1958-1973. The February median discharge is 12 cfs for this stream gauge. On average, the flow equaled or exceeded the winter low flow (February median discharge) on 43.3 days per year. The flow was less than the winter low flow (February median discharge) 63.7 days per year on average.

The procedure in Section B.5.3.6 of the Policy looks at the number of days the winter low flow (February median discharge) is exceeded by month. The second part of Table 1 shows that the number of days the winter low flow (February median discharge) is exceeded by water year for the diversion season. The number of days the winter low flow is equal or exceeded, by water year, range from 9 days to 85 days for Redwood Creek near Napa. The State Water Board has not demonstrated that the allowable 10 percent reduction of the number of days that the winter low flow is exceeded will not be concentrated in dry years thereby reducing flow in Class II streams during times of stress which has the potential to decrease the production of food for salmonids at a critical time.

Arbitrarily allowing a 10 percent reduction in the number of days that the winter low flow (February median discharge) is exceeded on Class II streams does not err on the side of resource protection.

Similarly, no evidence has been offered that demonstrates that the language of Section A.1.8.1 part 2 which allows reducing, "*...the number of days the unimpaired flow needed for spawning, rearing, or passage occurs at the POIs located at and below anadromy by more than 10 percent in each month...*" is protective of the resource.

The procedures used to perform the calculations required by Section A.1.8.1 part 1 *Diversions on Class III Streams* are described in Section B.5.3.6 *Additional Analysis Step for Class III Points of Diversion - Does the proposed project affect the winter low flow at POIs on downstream Class II streams?*

Section B.5.3.6 applies to Class II streams downstream of the project. Section B.5.3.6 part 4 (quoted below) sets the allowable impact from the combined diversion of the project and senior diverters to a 10 percent reduction in the number of days that the winter low flow (February median discharge) is exceeded.

> 4. Is the number of days the winter low flow is exceeded affected by senior diverters and the proposed project by more than 10 percent in each month of the diversion season over the period of record?

The procedure outlined in Section B.5.3.6 part 4(a-e) allows a 10 percent reduction in the number of days the winter low flow (February median discharge) is exceed for each month of the diversion season. The State Water Board has not demonstrated that there will be no impact to the aquatic habitat in the Class II streams and that, furthermore, there will be no impact to the habitat of downstream Class I streams or to the fish using the downstream Class I streams.

The State Water Board does not appear to have considered that the reduction in the number of days that the winter low flow is exceeded will be concentrated in the drier years, thereby adding more stress to the aquatic habitat of Class II streams during a stressful period. Section B.5.3.6 does not err on the side of resource protection.

The procedures used to perform the calculations required by part 2 of Section A.1.8.1 *Diversions on Class III Streams* are described in Section B.5.3.4 *Evaluate whether the proposed project contributes to reductions in instream flows needed for spawning, rearing, and passage.* Section B.5.3.4 arbitrarily declares that a 10 percent reduction in the number of days that the MBF is equal or exceeded, during each month of the diversion season, is not significant.

The State Water Board has offered no proof that reducing the number of days that the minimum bypass flow is equaled or exceeded by 10 percent is protective of the resource. This is particularly troubling since the Glossary in Appendix I defines the Minimum Bypass Flow (MBF) as follows:

> **Minimum bypass flow —** The minimum instantaneous flow rate of water at any location in a stream that is adequate for fish spawning, rearing, and passage. In applying the minimum bypass flow to a diversion, it is the minimum instantaneous flow rate of water that must be moving past the point of diversion before water may be diverted under a permit.

Allowing the flow to be reduced below the MBF flies in the face of the very concept of the MBF and is clearly does not err on the side of resource protection.

Section B.5.3.4 calculates the reduction in the number of days that the MBF is equaled or exceeded for each month of the diversion season. The State Water Board has not demonstrated that the proposed procedure will not concentrate all of the allowed reduction of the number of days that the MBF is equaled or exceeded in the drier years. This could result in some years where the flow never reaches the MBF but diversions are allowed.

Sections A.1.8.1, B.5.3.4 and B.5.3.6 of the Policy are not regionally protective of the salmonid resource.

Class III Exemption

In my March 22, 2010 letter I noted the following:

> Class III streams are an important source of spawning gravel. Allowing diversions on Class III streams to operate without a maximum diversion rate will interfere with the sediment transport process. Class III streams have small watersheds and the bankfull flow, estimated by the 1.5-year instantaneous discharge, tends to be on the order of a few tens of cubic feet per second. Any significant decrease in the 1.5-year instantaneous discharge will reduce the caliber of the bedload transported by the impaired discharge and will also reduce recruitment of large woody debris. A reduction in the 1.5-year instantaneous discharge on a Class III stream will tend to result in a higher proportion of fine material being transported down to Class II and Class I streams. Fine sediment is detrimental to aquatic habitat.
>
> The Policy exempts diversions on Class III streams from a setting a MBF and MCD if the diversion meets all three requirements of Section A.1.8.1. A qualifying diversion on a Class III stream is also exempted from the onstream dam provisions contained in Policy Section 2.4.3. The Policy has not demonstrated that the Class III exemption will adequately protect the fisheries resource.

A.1.8.1.1 Class III Exemption

> If the analysis in Section A.1.8.1 shows a project can meet all three conditions without a minimum bypass flow and without a maximum rate of diversion limitation, that project shall also be exempted from the policy's season of diversion regional criteria and the onstream dam provisions contained in Policy Section 2.4.3.

Comment Number L-37 in the Response to Comments dated April 2010 responded to my comment and states that:

> The policy intends to only exempt diversions on Class III watercourses where it is demonstrated that the project will not cause an impact to flows necessary downstream to maintain fisheries resources, as described by the requirements of Section A.1.8.1.

The fact that a project was judged to not have an impact on downstream flows, as specified in Sections A.1.8.1 parts 1, 2 and 3, does not necessarily demonstrate that no sediment from upstream of the proposed project is being transported past the location of the project downstream. Transport of coarse sediment, suitable for spawning gravel, tends to happen only during periods of storm runoff. The stormwater discharge will pass through a small onstream reservoir with little to no attenuation in its magnitude. However, the coarse sediment load carried by the stormwater discharge will be captured in the onstream dam; the finer sediment load will be passed through the onstream dam. This process will result in downstream "fining" of the sediment load. The finer caliber of the sediment load below an onstream dam on a Class III stream has the potential to adversely impact downstream fish habitat.

For projects on Class III streams, Section A.1.8.1 part 1 of the Policy allows for a 10 percent reduction in the number of days that the unimpaired winter low flow (February median flow) is equaled or exceeded on Class II streams before an impact is considered to happen. For projects on Class II streams, Section A.1.8.1 part 2 allows a 10 percent reduction in the number of days that unimpaired flow need for spawning, rearing and passage is equaled or exceeded on streams below the upper limit anadromy before an impact is considered to happen. The State Water Board has not demonstrated that either of these arbitrarily conditions will be protective of the fishery resource.

Since there is no scientific evidence showing that a 10 percent reduction in the number of days that the winter low flow (February median flow) is equaled or exceeded does not cause a significant impact to the fishery resource and since there is no scientific evidence demonstrating that a 10 percent reduction in the number of days that the flow needed for spawning, rearing and passage does not cause a significant impact to the fishery resource, he exemption to the regionally protective diversion season should only be granted if the project results in no reduction in the number of days that the winter low flow is equaled or exceeded and if the project results in no reduction in the number of days that the flow needed for spawning, rearing and passage is equaled or exceeded.

Diversions on Class II Streams

Section A.1.8.2 describes how diversions on Class II streams will be analyzed. I criticized the following language in Section A.1.8.2-1;

> There is error associated with the estimation of daily flows. Because of this, on a case-by-case basis, the State Water Board may consider this condition to be satisfied when analyses show a minor change to the numbers of days the February median is exceeded, provided that the minor change is due to a slight variability in the estimation of flow.

The Revised Section A.1.8.2-1 has replaced the above language with

> 1. Cumulatively the project and all senior diverters of record will not reduce the number of days the unimpaired flow needed for spawning, rearing, or passage occurs at the POIs located at and below anadromy by more than 10 percent in each month during the diversion season over the period of record for the analysis. This analysis shall be performed using the method described in Appendix B Section B.5.3.4. Regional criteria or site specific criteria for the minimum bypass flow may be used in the analysis of flows at the POIs; AND

No evidence has been offered that demonstrates that the language of Section A.1.8.2 part 2 which allows reducing, "*…the number of days the unimpaired flow needed for spawning, rearing, or passage occurs at the POIs located at and below anadromy by more than 10 percent in each month during the diversion season over the period of record for the analysis.*" is protective of the resource.

The procedures used to perform the calculations required by part 2 of Section A.1.8.2 *Diversions on Class II Streams* are described in Section B.5.3.4 *Evaluate whether the proposed project contributes to reductions in instream flows needed for spawning, rearing, and passage.* Section B.5.3.4 arbitrarily declares that a 10 percent reduction in the number of days that the MBF is equal or exceeded, during each month of the diversion season, is not significant.

The State Water Board has offered no proof that reducing the number of days that the minimum bypass flow is equaled or exceeded by 10 percent is protective of the resource. This is particularly troubling since the Glossary in Appendix I defines the Minimum Bypass Flow (MBF) as follows:

> **Minimum bypass flow —** The minimum instantaneous flow rate of water at any location in a stream that is adequate for fish spawning, rearing, and passage. In applying the minimum bypass flow to a diversion, it is the minimum instantaneous flow rate of water that must be moving past the point of diversion before water may be diverted under a permit.

Allowing the flow to be reduced below the MBF flies in the face of the very concept of the MBF and is clearly does not err on the side of resource protection.

Section B.5.3.4 calculates the reduction in the number of days that the MBF is equaled or exceeded for each month of the diversion season. The State Water Board has not demonstrated that the proposed procedure will not concentrate all of the allowed reduction of the number of days that the MBF is equaled or exceeded in the drier years. This could result in some years where the flow never reaches the MBF but diversions are allowed.

Sections A.1.8.2 and B.5.3.4 of the Policy are not regionally protective of the salmonid resource.

Diversions on Class I Streams

Section A.1.8.3 describes how diversions on Class II streams will be analyzed. I criticized the following language in Section A.1.8.3-1;

> There is error associated with the estimation of daily flows. Because of this, on a case-by-case basis, the State Water Board may consider this condition to be satisfied when analyses show a minor change to the numbers of days the February median is exceeded, provided that the minor change is due to a slight variability in the estimation of flow.

The Revised Section A.1.8.3-1 has replaced the above language with

> 1. Cumulatively the project and all senior diverters of record will not reduce the number of days the unimpaired flow needed for spawning, rearing, or passage occurs at the POIs located at and below anadromy by more than 10 percent in each month during the diversion season over the period of record for the analysis. This analysis shall be performed using the method described in Appendix B Section B.5.3.4. Regional criteria or site specific criteria for the minimum bypass flow may be used in the analysis of flows at the POIs; AND

No evidence has been offered that demonstrates that the language of Section A.1.8.3 part 1 which allows reducing, "*...the number of days the unimpaired flow needed for spawning, rearing, or passage occurs at the POIs located at and below anadromy by more than 10 percent in each month during the diversion season over the period of record for the analysis.*" is protective of the resource.

The phrase, "...the unimpaired flow needed for spawning, rearing, or passage" describes the MBF as defined by Section 2.2 of the revised Policy:

> The minimum bypass flow is the minimum instantaneous flow rate of water that is important for managing the protection of steelhead and salmon life history needs, such as: (1) maintaining natural abundance and availability of spawning habitat; (2) minimizing unnatural adult exposure, stress, vulnerability, and delay during adult spawning migration; and (3) sustaining high quality and abundant juvenile salmonid winter rearing habitat.

The procedures used to perform the calculations required by part 1 of Section A.1.8.3 *Diversions on Class I Streams* are described in Section B.5.3.4 (*Evaluate whether the proposed project contributes to reductions in instream flows needed for spawning, rearing, and passage).* Section B.5.3.4 arbitrarily declares that a 10 percent reduction in the number of days that the MBF is equal or exceeded, during each month of the diversion season, is not significant.

The State Water Board has offered no proof that reducing the number of days that the minimum bypass flow is equaled or exceeded by 10 percent is protective of the resource. That is, there is no scientific base to the claim that reducing the number of days that the flow is less than or equal to the flow needed for spawning, rearing, or passage occurs at the POIs located at and below anadromy by up to 10 percent in each month during the diversion season over the period of record for the analysis without a significant impact occurring.

Allowing the flow to be reduced below the MBF flies in the face of the very concept of the MBF and is clearly does not err on the side of resource protection.

Section B.5.3.4 calculates the reduction in the number of days that the MBF is equaled or exceeded for each month of the diversion season. The State Water Board has not demonstrated that the proposed procedure will not concentrate all of the allowed reduction of the number of days that the MBF is equaled or exceeded in the drier years. This could result in some years where the flow never reaches the MBF but diversions are allowed.

Sections A.1.8.3, B.5.3.4 of the Policy are not regionally protective of the salmonid resource.

Daily Flow Study

Section B.5.3 describes what is required for a Daily Flow Study. The following quote is from the beginning of Section B.5.3

The Daily Flow Study assesses the effects of the proposed project, in combination with senior diversions, to instream flows required for fishery resources at each POI located at and below the upper limit of anadromy. Proposed projects on Class III streams will also need to demonstrate that the project will not cause reductions in the number of days the unimpaired winter low flow is exceeded on downstream Class II streams. The analysis requirements vary depending on the stream classification at the proposed project's POD. Regional criteria or site specific criteria shall be used to establish protective streamflows at the POIs at and/or below anadromy. There are no regional criteria for Class II and III streams; however, applicants shall demonstrate, by applying project-selected minimum bypass flows and maximum rates of diversion in this analysis that project operation will not result in impacts to instream flow needs of fishery resources at the POIs at and/or below anadromy.

Proposed projects located on Class III streams: The analysis is iterative. Successful completion of the analysis will be demonstrated when the applicant finds the minimum bypass flow and rate of diversion for the project that results in (1) at POIs located at and below anadromy, no more than a 10 percent change per month over the period of record to the number of days unimpaired flow exceeds the minimum flow needs of fishery resources; (2) either no more than a 5 percent change to the stream's natural flow variability or no change to the existing flow variability; and (3) at POIs on Class II streams, no more than a 10 percent change per month over the period of record to the number of days the unimpaired winter low flow is exceeded. The analysis shall follow the procedures found in sections B.5.3.1 through B.5.3.6.

Proposed projects located on Class II streams: The analysis is iterative. The analysis shall be performed with a minimum bypass flow at the POD that is at least equal to the winter low flow estimated at the POD. Successful completion of the analysis will be demonstrated when the applicant finds the minimum bypass flow and rate of diversion for the project that results in the following for POIs located at and below anadromy: no more than a 10 percent change per month over the period of record to the number of days unimpaired flow exceeds the minimum flow needs of fishery resources; and either no more than a 5 percent change to the stream's natural flow variability or no change to the existing flow variability. The analysis shall follow the procedures found in sections B.5.3.1 through B.5.3.5. Procedures for calculating the winter low flow are provided in Section B.5.3.6, part 1.b.

Proposed projects located on Class I streams may apply either the regional criteria or site specific criteria when analyzing effects at the proposed POD. Depending on the level of impairment and the hydrology of the watershed, the analysis may be iterative. The analysis shall follow the procedures contained in sections B.5.3.1 through B.5.3.5.

The revised Policy now allows (1) a 10 percent reduction of the number of days that the unimpaired flow exceeds the minimum flow needs of fishery resources and (2) at POIs on Class II streams, no more than a 10 percent change per month over the period of record to the number of days the unimpaired winter low flow is exceeded.

As pointed out in the discussion of diversions on Class I, Class II and Class III streams, no proof has been provided by the Sate Water Board that a reduction of up to 10 percent in the number of days that the minimum flow need of fishery resources, by month, is protective of the fishery resource.

Likewise, no proof has been offered that up to a 10 percent reduction in the number of days that the flow equal or exceeds the winter low flow, by month, is protective of the fishery resource.

Furthermore, the State Water Board has not demonstrated that the reduction in the number of days that the number of days that the minimum flow need of fishery resources will not be concentrated in dry years which would add additional stress to a stressful situation. See the above discussions regarding diversions from the different stream classes for more details.

Flow Estimates

The following quote is from my March 22, 2010 letter critiquing the Policy. The entire Policy rests on the assumption that the flow at an ungauged POI/POD can be estimated with sufficient accuracy to allow crafting of diversion parameters that protect the fishery resource and allow a diverter to capture a useful amount of water. My comments have not been incorporated into the revised Policy. I summarize my concerns after the quote from my March 22, 2010 letter.

> The Policy allows estimates of the flow at ungauged PODs and POIs to be made by one of three methods. The methods are (A) *Adjustment of Streamflow Records* (Scaling Method) (B) *Precipitation-Based Streamflow Model* and (C) *Another Method Acceptable to the State Water Board.*
>
> The Policy sets no standard that can be used to judge if a particular method to estimate flow performs well or poorly. The most accurate method of estimating streamflow at an ungauged site is required in order to meet the Policy's goal of always erring on the side of resource protection. As I have previously demonstrated, to err on the side of resource protection requires overestimating the MBF and underestimating the MCD. Simple methods to estimate flow at an ungauged location will either overestimate both the MBF and the MCD or will underestimate them both. In either case, one of the diversion parameters will tend to err on the side of resource protection while the other diversion parameter errs on the side of adversely impacting the resource.
>
> I have demonstrated that, at some sites, method (A) *Adjustment of Streamflow Records* (Scaling Method) can generate flow estimates that error significantly in comparison to measured values. The Policy failed to analyze the ability of method (A) *Adjustment of Streamflow Records* (Scaling Method) to estimate streamflow at an ungauged site.
>
> The Policy allows the use of method (B) Precipitation-Based Streamflow Models to estimate streamflow. Section B.2.1.3 describes the general requirements of a Precipitation-Based streamflow model. And Section A.1.1.1 describes Model submittal requirements.
>
> Section B.2.1.3-B Precipitation-Based Streamflow Model
>
> Subject to State Water Board approval, the applicant may propose using standard hydrologic techniques or public domain computer models for estimating the average seasonal unimpaired flow volume. Precipitation input data shall be provided over a minimum of ten complete and continuous water years. Model results shall be validated by comparison with recorded flows on or near the POD watershed. The recorded flows do not have to be unimpaired but the applicant shall take the impairment into consideration when calibrating the model. The modeled output flows shall be summed in units of acre-feet to obtain an average seasonal unimpaired volume. Model submittal requirements are described in Appendix A Section A.1.1.1 of the policy.
>
> A.1.1.1 Data Submissions
>
> The raw data, spreadsheets, and models used to perform the water supply report and cumulative diversion analysis shall be provided for State Water Board review and approval, and shall meet the following requirements.
>
> 1. Analysis reports shall describe the assumptions used, and include a functional electronic version of the spreadsheet(s) that was used to perform the analysis, including the equations, input data and assumptions, and outputs used to complete the analysis.
>
> 2. Input files, calibration results, validation results, and output files shall be provided in electronic format with supporting documentation that describes the model's assumptions, underlying modeling principles, and operation.

3. Generally, no proprietary spreadsheets or proprietary computer models will be accepted; however output from proprietary programs used solely to visually summarize or demonstrate the output data or results from public domain spreadsheets or public domain computer programs that meet the above two requirements may be accepted by the State Water Board if the underlying data and assumptions are also submitted.

Section B.2.1.3-B requires that, "Model results shall be validated by comparison with recorded flows on or near the POD watershed" but the Policy gives no guidance on what metric to use to determine if the Precipitation-Based model has been adequately validated against the reference stream gauge record. Validating a Precipitation-Based streamflow model means that the "best" set of model parameters have been found in the sense that some metric shows the least overall error in the estimates of flow at the site with a record of stream flow (reference gauge). Validating the Precipitation-Based streamflow model does not require meeting some specified level of accuracy. So, an applicant could chose a Precipitation-Based Streamflow model that is validated against a reference stream gauge but produces significant errors in its estimate of the flow at the gauge.

The Policy does not require that the Precipitation-Based streamflow model account for the watershed characteristics of the watershed being modeled or of the watershed used to validate the model. As I demonstrated in my critique of method (A) the *Adjustment of Streamflow Records* (Scaling Method), failure to account for the difference in Runoff Efficiency between the reference stream gauge and the ungauged watershed upstream of the POD (POI) has the potential to result in large errors in the estimated flow at the POD (POI).

Method (C) *Another Method Acceptable to the State Water Board* is arbitrary and is so poorly defined that there is no way to objectively assess what it means. Method (C) appears to have a large potential to be misused.

All methods to estimate flow at an ungauged site will produce estimates that differ from the true flow. The Policy must set objective criteria for deciding if a proposed method to estimate streamflow has sufficient accuracy in estimating the flow at an ungauged site.

Flow models produce results that need to be verified against real data. Even models that have been calibrated can have significant bias. For example, in October of 2008 I critiqued the use of the WinTR-55 to estimate various return period flood discharges (paper attached). I found that the model did not agree with USGS flood measurements at an adjacent stream gauge. The WinTR-55 model gave significantly higher results.

The Policy allows estimates of the flow at ungauged PODs and POIs to be made by one of three methods. The methods are (A) *Adjustment of Streamflow Records* (Scaling Method) (B) *Precipitation-Based Streamflow Model* and (C) *Another Method Acceptable to the State Water Board.*

My comments on Method (A) *Adjustment of Streamflow Records* (Scaling Method) are in the Regionally Protective Criteria section of this letter. The essence of those comments are that (1) the revised Policy has not validated whether the use of watershed characteristics will improve the selection of a reference stream gauge and (2) the State Water Board has not done a statistical analysis of the runoff efficiency of the USGS gauges in the Policy area using GIS derived indexes of watershed characteristics and (3) examine the level of prediction error by using pairs of USGS gauges similarly to what was done in Table 2 of my March 22, 2010 letter.

Section B.2.1.3, B.5.2.1 and B.5.3.1 allow the use of Method (B) *Precipitation-Based Streamflow Model.* Section B.2.1.3-B requires that, "Model results shall be validated by comparison with recorded flows on or near the POD watershed". Validating a precipitation-based model against the flow data of a nearby stream gauge replicates the mistake of the Policy's Method (A) *Adjustment of Streamflow Records*

(Scaling Method) in that it does not take into account the difference in watershed characteristics between the reference stream gauge and the ungauged POI/POD. The ungauged watershed above the POI/POD of interest may not respond to precipitation the same way as the watershed above the reference gauge used to calibrate and validate the precipitation-based streamflow model. The same methodology I have recommend be used to select a reference stream gauge for estimating the regionally protective criteria using Method (A) should be applied when choosing a reference stream gauge for Method (B) *Precipitation-Based Streamflow Model*, after the proposed methodology has been validated.

Section B.2.1.3, B.5.2.1 and B.5.3.1 allow the use of Method (C) *Another Method Acceptable to the State Water Board.* No discussion of what constitutes what is acceptable is given. No substantive response was given in the *Response to Comments* document. In my opinion, Method (C) *Another Method Acceptable to the State Water Board* is arbitrary and is so poorly defined that there is no way to objectively assess what it means. Method (C) appears to have a large potential to be misused. I recommend that references to Method (C) *Another Method Acceptable to the State Water Board* be stricken from the Policy.

Summary

Problems with Regionally Protective Criteria.

- The State Water Board has not validated the use of watershed characteristics as a method to select reference stream gauges.
- The State Water Board has not done a GIS based statistical analysis relating the watershed characteristics above the USGS stream gauges to their runoff efficiency to provide an objective basis of determining which reference stream gauge to use in estimating flow at a POI/POD.

Problems with Flow Estimates.

- The State Water Board should use the same methodology I recommend in my Regionally Protective Criteria section, of this letter, to select reference stream gauges to be used to calibrate and validate precipitation-based streamflow models.
- The proposed Method (C) Another Method Acceptable to the State Water Board in Sections B.2.1.3, B.5.2.1 and B.5.3.1 should be stricken from the Policy.

The Stream Classification System has the following problems.

- The wording of Section A.1.6.1 is vague and does not clearly allow the use of citizen observations or photographs to demonstrate the historical presence of fish which it should.
- Item (2) in the definition of a Class III stream (Section A.1.6.1) should be modified to say that "…habitat for aquatic non-fish vertebrates and/or aquatic benthic macroinvertebrates is never present, either currently or historically."
- Section A.1.6.2 parts 1 through 4 do not include a section on doing a search for historical evidence of past finfish presence.
- Section A.1.6.2 part A defines a Class I stream but does not include allowance for historical presence of finfish.
- Stream Class definitions are not clear. Some key portions of definitions are scattered about the Policy document, for example the word *finfish* should replace the word *fish* in Sections A.1.6.1 and A.1.6.2.

- The methods that the State Water Board will use in determining Stream Class are not specified. Will the State Water Board use the same methodology as described in Section A.1.6.2 in making their determination of Stream Class?
- No guidance is given for how to determine bankfull width in the field. No minimum qualifications are set regarding determination of the bankfull width.
- No alternative provision is made for field work blocked by lack of legal access to the stream channel.
- Section A.1.6.2-4-B-2 relies on "habitat suitability criteria provided by the qualified fisheries biologist" instead of requiring that habitat suitability criteria be set by the Policy.

Problems with diversion analysis on different Class streams.

- Accurate flow estimates are essential. The Policy does not set objective standards for methods to predict ungauged flow.
- There is confusion about the meaning of the 1.5-year instantaneous flow. The calculation example uses the 1.5-year daily average flow.
- The diversion analysis procedures (Sections A.1.8.1 and B.5.3.4) insert a clause that allows for a 10 percent reduction in the number of days that the unimpaired flow needed for spawning, rearing, or passage occurs.
- The diversion analysis procedures (Sections A.1.8.1 and B.5.3.6) insert a clause that allows for a 10 percent reduction in the number of days that the winter low flow (February median discharge) occurs.
- The conditions of Sections A.1.8.1.1 do not demonstrate that allowing construction of onstream reservoirs for qualifying projects will be protective of the fishery resource. Allowing onstream dams on Class III streams is likely to decrease the caliber of sediment transported down to Class II and Class I streams which will reduce the delivery of spawning gravel and adversely impact habitat.
- The Policy has not demonstrated that the Section A.1.8.1.1 Class III Exemption is protective of the fisheries resource.

Sincerely,

Dennis Jackson

Dennis Jackson
Hydrologist