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23 March 2005

Mr. Roger Briggs, Executive Officer
Central Coast Regional Water Quality Control Board
895 Aerovista Place, Suite 101
San Luis Obispo, Ca. 93401

RE: Request for Comments on Proposed Monitoring and Reporting Program for Regulated Timber Harvest Operations.

Dear Mr. Briggs,

This letter is in response to a request from the Board to provide comments on the proposed Monitoring and Reporting Program (MRP) for Regulated Timber Harvest Activities.

VISUAL MONITORING:

The Visual Monitoring proposed by staff should be adequate to answer questions about implementation and effectiveness of proposed activities and their resultant effectiveness. The frequency and scope of proposed visual monitoring will most be most helpful in evaluating the implemented management measure.

Recommendation:

No changes to staff proposal.

PHOTO-POINT MONITORING:

Photo-point Monitoring should be limited to agreed upon sites that will have significant potential to impact water quality. These sites will be best located on the Pre-Harvest Inspection where mitigations and potential impacts can be discussed on site.

Photo points have limited utility for post harvest evaluation of impacts and will not, in of themselves, provide any more protection for water quality or precipitate any more timely remediation of any observed problems. This is a redundant and expensive exercise with little functional value beyond that of visual monitoring alone.

Photos can be taken at Post Harvest inspections by Board staff or other agency personal to document problems.

Recommendation:

I would recommend that photo documentation be limited to the forensic monitoring. This will limit the collection, storage and processing of photos to problem sites, or those sites that need additional monitoring.

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FORENSIC MONITORING

Forensic Monitoring as proposed by staff should be adequate to detect and isolate and repair any failed management measures. Some clarification would be helpful to establish when a failed measure needs to be reported to the board. For example, a single water bar that may not be functioning properly could trigger a forensic MRP, though no damage or impact occurred as a result.

Recommendation:

I recommend that language be included to define what constitutes a failed management measure, triggering further monitoring and reporting.

The Water Quality Compliance Monitoring component as proposed would be used to determine temperature and/or sediment impacts.

WATER TEMPERATURE MONITORING:

With regards to temperature, selection of a fixed watershed temperature criterion may not accurately represent local conditions or natural fluctuations as they relate to salmonids.

There are several issues to consider:

1. What are acceptable temperature levels, historic temperature levels and how do they relate to fish?

Acceptable water temperature levels have been theoretically determined through laboratory tests, but have very little relationship to field conditions. According to discussions with Dr. Alice Rich regarding THP 1-01-189 SCR, whether or not water temperatures are stressful can only be determined by a site specific bio-energetic study which includes many factors including food supply. ¶ Water temperatures in the Pescadero Marsh reach 77°F, but the food supply is excellent and the fish do well. Dr. Jerry Smith has reported similar findings in Gazos Creek where more light improved food supply,¹ so that numerically high "unsuitable" temperatures still resulted in good growth of fish. The east branch of Soquel Creek has MWATs² in 1998 greater than 63°F for at least two periods of one week in length.³ The County measurement near the mouth of Kings Creek show a MWAT maximum of 63.3°F for 2 different days. Corralitos Creek had higher peak and greater daily variations in stream temperatures⁴ than Browns Creek in 1998, yet fish productivity in these streams appears to be stable within the expected range of population fluctuations.⁵ Gazos

¹ "Distribution and abundance of steelhead and coho in Gazos Creek," Jerry J. Smith. 15, July 2001.

² SDSF, 1998 MWAT is the maximum weekly average temperature. It is currently considered more closely related to fish stress and survival than other water temperature measurements. The highest MWAT for the southern evolutionary unit (S of San Francisco) apparently is unknown.

³ The highest MWATs in Gamecock showed 62.6° F for 2 days.

⁴ CDF THP records for THP 1-96-074

⁵ Alley D. W. & Associates.

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Creek, which has water temperatures significantly higher than the "desired"⁶ still has good steelhead runs, and some coho age classes; and in Gazos, fish achieve better growth where there are openings in canopies.⁷

Historic water temperatures are likely to be tied to environmental temperatures.⁸ If this is true, then many watercourses are more shaded now and must have lower water temperatures than any time during the past 30 years.⁹ Water temperature appears NOT to be a limiting factor, and higher temperatures may favor fish growth and 1-year smolting. Water temperature changes have complex interactions, and salmonids have a significant range of tolerance under natural stream conditions.¹⁰ There is no local data that indicate water temperature is significant or limiting to fish.

⁶ Nelson, J. 3/10/99. Gazos Creek had 67° to 68° F temperatures which exceeded the 59° "desired."

⁷ "Distribution and abundance of steelhead and coho in Gazos Creek," Jerry J. Smith. 15, July 2001.

⁸ Forest Science Project page 4. Daily mean stream temperature at equilibrium tracks daily mean air temperature. FSP 4.14 August average air temperatures 1990-1998 for the Central Coast Province were about 65.7° F or about 3° greater than the County water temperature record of concern. Primer on the Physics of Forest Stream Temperature, page 47 "the stream temperature always seeks a level that is in equilibrium with the surrounding environment."

⁹ Increasing forest growth is improving shade, and for a small stream this cools water temperatures. Average volume per acre reported for second growth forests in San Mateo County in 1973 was 7MBF/ac. Vande Pol (2001) page 82 reports USFS (PNW-RB-221, 3/97) studies which showed 110 MMBF annual growth and only 27 MMBF annual removals (including parks). Santa Cruz County Draft Timber Management Plan (1982) lists total Volume including Parks at 28 MBF/acre. We have measured 56 MBF/acre in Sleeper Creek prior to the 1997 harvest. Most of Kings Creek is timbered and with WLPZs that have not been cut, so shade in the watershed is at high levels and increasing annually.

¹⁰ "Apparently salmonids are tolerant of the extremes in temperature they are likely to encounter over their life spans and geographic ranges. In particular, the life stages of salmonid species that rear in freshwater seem especially tolerant of extreme high temperatures (extreme in the sense that most species can tolerate temperatures that are many degrees higher than any they are likely to encounter)." Beschta et al 1987 p 212-213 "There are many reasons why the observed logging-related temperature increases have not had significant deleterious effects on resident salmonids. Among these are (1) the wide thermal tolerances of the freshwater forms of most of the resident salmonid species, (2) the natural diurnal cycling of stream temperatures, which limits exposure to maximum temperatures, (3) the occurrence of localized cool-water sources, which fish seem readily able to locate and utilize, (4) the inability to extrapolate tolerance limits determined under homogeneous laboratory conditions to the spatially and temporally complex thermal environments of streams, and (5) the ability of fish to migrate to other locations or to curtail activities temporarily when temperatures become stressful. Although increased summer temperatures remain a concern to fisheries managers, it appears that fish are generally able to tolerate such increases without major adverse impacts on growth or mortality." Beschta et al 1987 p 222

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2. Can an individual THP conforming to The Forest Practice Rules modify shade canopy sufficiently to affect the temperatures of a Class I or II watercourse? [Board Rules 14 CCR 916.9(a) and 916.9(a)(1)]

Vertical canopy requirements for class I watercourses under these rules are a minimum of 85% for the first 75 feet and 65% for the subsequent 75 feet of the mandatory 150 foot Watercourse and Lake Protection Zone. Class II watercourses have a required minimum of 50% canopy over the ground. Canopy as measured by CDF enforcement protocols, must be translated from overhead canopy to angular canopy density (ACD) in order to measure shade protection afforded to the watercourse. This means that canopy retention generally referenced in scientific literature is referring to ACD¹¹ not vertical canopy. CDF, for enforcement reasons, insists upon overhead canopy without translation to ACD creating some confusion about the adequacy of the CDF retention standards and their protection levels. Eighty percent Solar Pathfinder (radiation weighted ACD) and seventy-five percent ACD roughly translates to fifty percent vertical canopy density as measured using enforcement protocol.¹² This closely matches the *Coho Considerations* and Board Rules for Class II watercourses.

The available literature that has been reviewed on water temperature refers to Angular Canopy Density or ACD, and does not refer to overhead canopy as a measure of shade. For instance “. . . [t]he canopy density along the path of incoming solar radiation best describes the ability of the buffer strip to control stream temperature.”¹³ Buffer strip width of 17 meters would provide “90% of the maximum ACD.”¹⁴ The authors did not say what that ACD would be for these clearcut buffers, but *Coho Considerations*... on page 32 states “For Class II watercourses that contain surface waters anytime during May through August and stream temperatures in nearby coho habitat areas are above desirable levels, an 80% shade level on the watercourse should be maintained.”¹⁵ There can be little question but that “shade level” means ACD. In local attempts to correlate vertical and angular canopy, we

¹¹ P. Cafferata in “Watercourse Temperature Evaluation Guide” recognizes Angular Canopy Density (ACD) but goes on to recommend use of the Solar Pathfinder which measures weighted ACD which gives more emphasis to mid-day than a strict ACD measurement; Berbach, Cafferata, Robards & Valentine in “Forest Canopy Measurements in Relation to Watercourse and Lake Protection Zone Shade Requirements” refer to shade as angle to the sun, and gloss over the obvious difference between vertical measurements to the sky and angular measurements to the sun; Beschta cites old growth stands in western Oregon with 80% to 90% ACD, and 75% average ACD in northern California (page 205).

¹² Cajun James. CLFA Workshop 3/4/05. Based on her Board of Forestry study of sun-shade-water temperature relationships in stream protection zones of varying widths.

¹³ Page 12. National Council for Air and Stream Improvement. 1998 “Riparian Vegetation Effectiveness.” Draft Technical Bulletin.

¹⁴ Ibid. P 12.

¹⁵ Anthony, Craig. 1997. “Coho Salmon Considerations for Timber Harvesting Under the California Forest Practice Rules.” California Department of Forestry and Fire Protection.

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found that 57% canopy over the ground yielded 82% protection from solar radiation,¹⁶ and even greater ACD. On this basis and professional experience, I would estimate that 75% ACD is probably in most cases near 50% canopy over the ground.

The required vertical retention of 85% and 65% pursuant to §916.9 for class I watercourses has equated to 90% to 97% solar protection. As measured on another local watercourse (class I), 89% vertical canopy equated to an average of 94% ACD (weighed) as calculated for the month of September.¹⁷

The Primer on the Physics of Forest Stream Temperature states that streams warmed in a clearcut “returns quickly to its pre-clearcut pattern, meaning that it returns to equilibrium with its surroundings after establishing a different equilibrium within the clearcut.”¹⁸ “Larger streams take longer to equilibrate.”¹⁹ Furthermore, “[t]he temperature always tries to ‘relax’ toward the local equilibrium temperature...” and “the response (or relaxation) time depends on the depth of the stream...”. A small volume of water has low temperature inertia and equilibrates more quickly.²⁰ *Coho Considerations...* is conservative in that it would permit very little change in temperature, and it would quickly return to the temperature that of its local surroundings.²¹

3. Could these effects combine with other stressors to cumulatively and significantly effect salmonids?

¹⁶ I submitted documentation of this to CDF as part of the record on THP 1-96-275. It also should be noted that 82% protection against solar radiation was measured using the Solar Pathfinder which provides a mid-day weighted percentage of ACD. ACD could be measured with the Solar Pathfinder by counting all units equally rather than weighting the units heavily toward mid-day when solar radiation is most intense.

¹⁷ In Gamecock canyon RWE measured 57% vertical canopy = 82% Solar Pathfinder canopy (weighted ACD), and 63% vertical canopy = 86% weighted ACD. In Sleeper Creek 75% vertical canopy = 90% weighted ACD (Solar Pathfinder). 50% vertical graphs to 80% weighted ACD (limited data). CDF Inspection Report # 7 for THP 1-02-064 SCR, vertical and ACD were measured for the same reach of Class I watercourse.

¹⁸ Primer on the Physics of Forest Stream Temperature. October 7, 1999. Terry N Adams, Ph.D. Page 48

¹⁹ Ibid page 49

²⁰ Page 10.2. Lewis, T. E., D. W. Lamphear, D. R. McCanne, A. S. Webb, J. P. Krieter, and W. D. Conroy. 2000. Forest Science Project Regional Stream Temperature Assessment Report. Humboldt State University Foundation, Arcata, CA. 400 pp.

²¹ Using the formula in Section IV of “Watercourse Temperature Evaluation Guide” by Peter H. Cafferata (1990) and estimated parameters, I calculated that if the canopy was reduced to 80% shade the temperature would rise 1.4° F. Such a small volume of water increases in temperature relatively quickly, but will return to the temperature of its environment also relatively quickly.

The above statements and conclusions are also supported by Zweiniecki and Newton who say "our findings, like those of Sullivan (1990), *do not support the above presumption that warming trends from harvest are strictly cumulative or more than very localized* (emphasis added)." "Although there is a minor warming trend within harvest units with very narrow tree buffers, the increases are not significantly different from the background temperature increases; shortly down-stream temperatures merge with those of the closed-canopy signature trend."²²

The above information indicates temperature is not a limiting factor, let alone a primary limiting factor in the upper reaches of local watersheds. The vertical canopy requirements under § 916.9 have been equated to Angular Canopy Density, and compared to those suggested by the *Coho Considerations*, which recommends shade restrictions very close to those currently required by the Board of Forestry. Forest growth is increasing the shade over local watersheds, and is a thermal offset to any possible canopy disruptions allowed under the Forest Practice Rules. The potential threat of temperature increase from harvest activity is very low. Any actual increase would be localized, and then revert quickly to its environmental equilibrium temperature.

Temperature impairment has not been noted in upper watersheds where timber harvest activity is the highest. This, in conjunction with existing stream temperature data, does not support the necessity of a temperature monitoring component in a general waiver. The current Board of Forestry rules on watercourse canopy retention generally equate to the suggested retention standards in the above referenced materials concerning fisheries habitat requirements.

Recommendation:

I would recommend that temperature monitoring be removed as a waiver requirement.

TURBIDITY MONITORING:

Regarding the collection of turbidity samples, staff has attempted to isolate those activities that could have the highest potential to impact to water quality. Staff has also stated that these measurements will be used to "ground truth" the visual and compliance monitoring portions of the MRP. Considerable amounts of local turbidity data exist, some of which provide significantly better comparative and analytical opportunities than the proposed sampling. This information should be analyzed in conjunction with current waiver data to determine if, in fact, significant turbidity issues exist in the heavily forested portions of local watersheds. This information will be important in the future analysis of any turbidity samples that will be required under this waiver or other future waivers.

A common theme of presenters at the Water Quality Workshop was that the collection of meaningful turbidity data is a very difficult and expensive task. It is important to demonstrate that this cost will produce results robust enough to base decisions upon. Bases upon the high

²² Maciej A. Zwieniecki and Michael Newton. "Influence of Streamside Cover and Stream Features on Temperature Trends in Forested Streams of Western Oregon." *Western Journal of Applied Forestry* 14(2): page 109-110.

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levels of watershed variability, project parameters and natural fluctuations it does not seem that the data collected as proposed, will provide this decision making information any more effectively than visual monitoring.

The Little Creek Study will be providing some useful information on the effects of local timber harvest practices on watersheds. Results and data should be examined closely to help guide future waiver conditions and monitoring priorities as they relate to timber harvest as a land use. Turbidity monitoring may have some function in the forensic monitoring portion of the MRP. It might be useful in determine the length of time required for continuing implementation and effectiveness monitoring of the failed management measure.

Recommendation:

I recommend that turbidity be removed as a waiver requirement, except as it pertains to forensic monitoring

DATA LOGGING AND REPORTING

The requirement of maintaining a log book is redundant if all collected data will be sent to the Board in the annual report. If the annual report requirement is dropped, then the log book could be retained.

Road Inventory Program; This is a useful inclusion into the waiver as long as it remains flexible enough to be broadly applied to the varying conditions and landowners that it will encompass.

Annual Report: Reports should be triggered by a violation or a failed management measure. The report is a redundant re-statement of the requirements of the waiver. In addition it negates the need for a log book, if all monitoring data will be sent to the Regional Board annually. The need to accumulate and store considerable numbers of reports and data over time should be examined further.

General Waiver Eligibility Criteria: The criteria provides an excellent and transparent tool for staff to prioritize work load and assist in focusing available resources on projects that present an elevated risk to water quality. Even if the Criteria and associated values can be tuned to incorporate more empirical data, it should not supplant the site specific analysis provided during the review process. There should be flexibility provided into the criterion to account for on the ground conditions. If the criterion broadly mischaracterize the threat of a project, then the usefulness is lost.

The THP process is designed to identify, assess and mitigate impacts to insignificance. The continued participation of Regional Board staff at this level should be the tool in which the Board relies on to provide these inputs.

A uniform set of proven, accepted methods for ensuring that harvest operations are not significantly impacting water quality should be implemented. Staff has proposed many of these in this current MRP.

Recommendation:

I recommend that the Eligibility Criteria be retained as an internal tool for staff, and that the General Waiver be uniform in requirements for all approved harvest plans. This provides

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certainty for the Board, transparency for the public and the regulated community as to what will be required and how it will be implemented, inspected, documented and monitored.

I appreciate this opportunity to interact with the Board and staff on this topic and would be happy to answer any questions.

Sincerely,

A handwritten signature in black ink that reads "David Van Lennep". The signature is written in a cursive style with a large, sweeping flourish at the end.

David Van Lennep

RPF # 2591