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Mr. William J. Wallace, Regional Manager
Washington State Department of Natural Resources
Northwest Region
919 North Township Street
Sedro-Wooley, WA 98284-9384

Dear Mr. Wallace:

At the request of the Northwest Ecosystem Alliance I reviewed the Draft Environmental Impact Statement (“DEIS”) for the Lake Whatcom Landscape Plan (“the Plan”). My review concentrates on the plan elements pertinent to my background and experience, which include water resources (wetlands, streams, and the lake), water quality and quantity, sediment-generating processes, and prevention or minimization of soil loss. After summarizing my background and qualifications in these areas, this letter presents my assessment of the DEIS.

PROFESSIONAL BACKGROUND AND QUALIFICATIONS

I have 37 years of professional experience, 33 teaching at the college and university level. For the last 26 years I have specialized in research, teaching, and consulting in the area of storm water runoff and surface water management. I received a Ph.D. in Civil and Environmental Engineering from the University of Washington in 1978, following two Mechanical Engineering degrees from the University of Pennsylvania. Although my degrees are all in engineering, I have had substantial course work and practical experience in aquatic biology and chemistry. For 12 years beginning in 1981 I was a full-time research professor in the University of Washington’s Department of Civil and Environmental Engineering. I now serve half time in that position and have adjunct appointments in two additional departments (Landscape Architecture and the College of Forest Resources’ Center for Urban Horticulture). While my research and teaching continue at a somewhat reduced level, I spend the remainder of my time in private consulting through a sole proprietorship. My full credentials are available upon request.

My research, teaching, and consulting embrace all aspects of stormwater management, including determination of pollutant sources; their transport and fate in the environment; physical, chemical, and ecological impacts; and solutions to these problems through better structural and non-structural management practices. A substantial area within the stormwater management field involving all of these considerations is the understanding of aquatic resource problems

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caused by runoff from sites of soil disturbance, like logging roads and other construction projects and the timber extraction sites themselves, and how best to avoid or minimize these problems.

I have conducted numerous research investigations and consulting projects on these subjects. Serving as a principal or co-principal investigator on more than 40 research studies, my work has produced two books, approximately 30 papers in the peer-reviewed literature, and over 20 reviewed papers in conference proceedings. I have also authored or co-authored more than 75 scientific or technical reports. In addition to graduate and undergraduate teaching, I have taught many continuing education short courses to professionals in practice. My consulting clients include federal, state, and local government agencies; citizens' environmental groups; and private firms that work for these entities, primarily in Washington, California, British Columbia, and Oregon but in some instances elsewhere in the nation.

I have been the principal investigator on two extended research projects relevant to the subjects of this letter. I led an interdisciplinary team for 11 years in studying the effects of human activities on freshwater wetlands of the Puget Sound lowlands. This work led to a comprehensive set of management guidelines to reduce negative effects and a published book detailing the study and its results. The second effort, nine years in length, involved an analogous investigation of human effects on Puget Sound's salmon spawning and rearing streams. These two research programs have had broad sponsorship, including the U.S. Environmental Protection Agency, the Washington Department of Ecology, and a number of local governments.

I have been active in the area of construction site stormwater management for approximately 18 years. During that time I have: (1) performed research on the performance of certain best management practices ("BMPs") intended to prevent soil erosion or interdict sediment transport, (2) functioned as an independent mediator on a sensitive road construction project, (3) served on a technical advisory committee for a very large research project of this type, (4) taught numerous courses on the subject, and (5) inspected many construction sites myself. My research pertained to the effectiveness of soil-covering mulches and blankets in preventing erosion and of silt fences and sedimentation ponds in stopping the transport of sediments entrained in runoff beyond the construction site. As a mediator, my responsibility was to reconcile and make judgments and recommendations based on the information coming from the contractor, the sponsoring city road agency, the city's environmental inspectors, independent consultants, and my own observations. On the advisory committee I had an oversight role on behalf of the plaintiffs for a federal court-ordered study sponsored by the California Department of Transportation as defendant. This study measured the effectiveness of 16 mulches and blankets and certain soil preparation techniques. I have taught continuing education courses on construction site pollution control, ranging from a half day to six days in length, more than 30 times to consultants, regulators, and contractors.

I have substantial familiarity and experience with Whatcom County and Lake Whatcom, the physiography and biology of the environment in the vicinity, and the status of stormwater management in the area. In 1993 I served as a mediator on a proposed lakeshore development moratorium among county, water district, and local community representatives. Over the years I have reviewed a number of documents and proposals relating to management of the area's water

resources, most of which directly concerned Lake Whatcom. I presented related testimony to hearings boards on two occasions.

GENERAL ASSESSMENT OF THE DEIS

It is my opinion that the Preferred Alternative fails to apply fully and comprehensively the key objectives stated for the Lake Whatcom Landscape. The specification and analysis of this and any other alternative considered must adhere to the objectives, adopted after deliberation by the legislatively constituted Landscape Planning Committee, and must properly take into account all governing conditions in reaching conclusions. The unique status of a drinking water reservoir warrants strict attention to these objectives in the development, assessment, and adoption of an alternative. The remainder of my letter gives my specific comments on the DEIS and, in the course of doing so, elaborates on these opinions.

SPECIFIC COMMENTS

1. State legislation specifying the Plan states, "On unstable slopes, ... old road reconstruction shall be limited." Under the Preferred Alternative, reconstruction in unstable or potentially unstable locations would be determined according to evaluation by a "DNR specialist." Independence of the DNR's own employee is doubtful in making these sensitive determinations. An inter-jurisdictional committee and external specialists would be able to advance recommendations, but they need only be "considered" and not necessarily followed. The DEIS thus gives no sense of how and to what degree, or even if, the department would "limit" old road reconstruction on unstable slopes. The law further mandates, "Establishing riparian management zones along all [emphasis added] streams ...," without distinguishing among stream types. However, these zones along Type 5 streams can be cut for roads and yarding corridors. Also, buffer widths would be less for stream Types 4 and 5 than for Types 1-3.
2. The first eight objectives for the Lake Whatcom Landscape fit within the scope of this letter. The first objective is to ensure no significant risk from forest management-related mass wasting events. Objectives 2 to 6 and 8 express intentions to "maintain" (or "protect") and "restore" (or "increase") various aquatic resources or conditions supporting resources, specifically:
 - Objective 2—the sediment regime within the range of natural variability;
 - Objective 3—riparian and wetland habitat;
 - Objective 4—the forest hydraulic regime within the range of natural variability;
 - Objective 5—water quality;
 - Objective 6—diversity of habitat conditions; and
 - Objective 8—soil productivity and health.

Objective 7 is to retain features that support mature forest functions. As subsequent comments show, strategies under the Preferred Alternative are insufficient to achieve these objectives, particularly with respect to restoration. The Washington State Department of Health in its November 27, 2001 letter included in the Preliminary Draft Environmental Impact Statement (PDEIS) appendices says that, "Site-specific recommendations identified by that process [the Lake Whatcom Landscape Plan advisory committee] related to enhancing water quality should also be considered." I would go farther to say that the excellent objectives set by the committee should be an absolute foundation for guiding the EIS process and devising the management strategy for the watershed's forests.

3. The only provisions of the Preferred Alternative that could be considered to be restorative are, "Mitigation work on orphaned roads ... where a clear risk to public safety of potential for resource damage exists ..." (under Objective 2) and a strategy to, "Identify, prioritize, and replace fish-blocking culverts ..." (under Objective 6). However, neither plan comes with a commitment to a specific level or timing of action, according to which a certain amount of restoration would occur. The first provision appears to address each instance individually and takes no account of the cumulative effects of past poor practices. Blocking culvert replacement would be carried out only, "... during planned management activities or during implementation of the Road Maintenance & Abandonment Plan." There is no commitment to replace all blocking structures expeditiously, as there should be to achieve true fish passage restoration. Alternative 3, in contrast, gives important commitments to orphaned road mitigation and blocking culvert replacement within 3 years of the Plan's adoption.
4. DNR trust lands constitute 48 percent of Lake Whatcom's watershed and produce 35 percent of the lake's inflow, 96 percent of that quantity as surface runoff. This large presence gives the department the greatest controlling influence on the ecosystem and drinking water quality of any jurisdiction, a position demanding its responsibility in ensuring no further degradation originating in its zone. Since deterioration has occurred and is well documented, DNR is further obligated to perform restoration projects to reverse degradation trends. It has always been exceptionally ironic to me that, while much of even this rich nation subsists with relatively poor quality water sources requiring massive and costly treatment to reach minimal potable quality, the Whatcom County community has what until recently was a high quality source, which it has allowed to degrade for the short-term gains produced by allowing more and more intrusions into the watershed.
5. In the face of DNR's key role in the watershed and its hydrology and the recent history of water quality and ecological losses, the Preferred Alternative would allow 52.7 percent (8276 of 15707 acres) of the trust lands definitely to be open to timber harvesting, while up to an additional 19.7 percent (3098 of 15707 acres) in unstable areas could be logged, for a total of more than 72 percent of DNR's property as an economic zone. The DEIS states that clear cutting (euphemistically, "regeneration harvesting") would account for 47.3 percent of the logging (43 of 91 acres harvested annually). Subsequent research by Northwest Ecosystem Alliance revealed that DNR's actual plan for harvesting differs from this statement, with 75 of 86 acres harvested annually to be clear cut in the period 2001-2020, rising to 97 of 121

acres per year during 2021-2040. According to this plan, then, an average of 104 acres per year would be harvested in the 40-year period, of which an average of 86 would be clear-cut (representing 82.7 percent of the total cut).

With its 48 percent ownership of the watershed, that means that as much as 35 percent of the entire lake catchment could eventually be mostly stripped of forest cover. If the average clear-cutting pace prevails overall, ultimately 28.6 percent of the lake's watershed could be clear cuts (based on the plan differing from the DEIS), or 16.3 percent taking the figures in the DEIS. The DEIS does not report how much of the DNR land has been logged (and the breakdown of clear cut and thinning) up to the present, a point at which Lake Whatcom has already suffered considerably; but the amount surely would be dwarfed by what could be cut in the future. The document takes pains to make the point in several places that impacts would not be the same as in the past with more environmentally benign practices in the future. However, even if improved procedures decrease pollutant yields and other forms of environmental harm, greater presence is very likely to undo much or all of the benefits and lead to undiminished, or even increased, burdens on the aquatic resources.

6. The DEIS notes that, under conditions characteristic of the area, substantial overland flow occurs only when the forest duff is removed, as it would be in road building and highly disruptive logging operations. As noted below, the increased surface runoff to the streams and lakes would carry with it eroded sediments and the nutrients they contain. The Preferred Alternative does not outline sufficient improvements in practices to counteract the proposed great expansion of its economic activities.
7. The Preferred Alternative is predicated on the construction of 43 miles of new logging roads, doubling the 44 miles now active and adding to the 42 miles of orphaned roads (representing overall a 50 percent increase in total road disturbance over the present state). It is stated that only 35 miles of roads will remain permanently active, but without any indication of how abandoned roads will be treated. They will either not be restored or, seemingly at best, be subject to the very weak restoration commitment given under Objective 2 (see comment 3). Grizell, in his 2001 report included in the PDEIS appendices, stated that almost all forest-related surface erosion is associated with forest roads. While better road building and maintenance practices might stem some of the erosion that occurred in the past, it is most improbable that methods can be improved enough to prevent a substantial net increase associated with an approximate doubling of the road presence.
8. Grizell additionally noted that orphaned forest roads are the primary trigger of mass wasting episodes on timber harvesting lands. Thus, DNR should institute a strong program to mitigate these sources quickly, instead of taking the non-committal approach of the Preferred Alternative, which abrogates its charge under Objective 1. Its obligation to do so is heightened in the context of its plans to expand logging and the road system so much, in that mitigation of the orphaned road sources of sediment contribution to the lake could compensate, at least in part, for the increases that will follow its expansion. Mass wasting is estimated to account for sediment yield 2.3 times the background amount, a far greater and hence more crucial anthropogenic source to bring under control than surface erosion.

9. The preceding comments have dwelled on the proposed extension of disturbance and absence of restoration commitments. This and subsequent comments are concerned with environmental factors that make these faults of special concern. Several physiographic features of the area are highly conducive to relatively large amounts of sediment and related pollutant generation associated with disturbance.
10. First, the DNR lands are very wet, with an annual average of up to 80 inches of precipitation, which is potential surface runoff when tree interception, forest duff storage, infiltration, and evapotranspiration opportunities are gone. Furthermore, a large share of the trust lands lie in the "rain-on-snow" zone (approximately 1600 to 2600 ft in elevation). This zone can receive either snow or rain, depending on temperature, and is prone to very large runoff volumes and peak flow rates caused by a lot of rain falling on accumulated snow. Grizell attributed the greatest potential for hydrologic effects to this condition.
11. Secondly, the area's soils are relatively thin and composed of cohesionless gravels, sands, and fines. Such soils produce a rapid surface runoff response to precipitation without duff and the other features and mechanisms of a Pacific Northwest forest that largely attenuate runoff production. When exposed to precipitation and runoff, these soils are highly erosive. Once in transport, the finer fractions settle reluctantly. All of these factors make substantially increased sediment transport to the lake likely with more roads and timber harvest.
12. Some 50 streams feed into Lake Whatcom, the majority flowing from the DNR lands via steep ravine courses. High velocity flow on steep gradients without flood plains produces great shear stresses that erode the beds and banks, adding to the sediment load and offering no opportunity for settling and sediment storage. Far worse, most of the mass wasting occurs in these channels.
13. Grizell acknowledged the relatively low large woody material presence in the Lake Whatcom feeder streams, generally a consequence of past debris torrents that swept logs away. The attendant destruction of the riparian zones, along with past logging up to streams, provides a poor source of new wood. This feature also inhibits sediment settling and storage. Overall, then, meteorology, plus erosive soil characteristics and mass wasting vulnerability, plus efficient sediment transport add up to a high sediment input to Lake Whatcom when its watershed is disturbed.
14. The issue most threatening to drinking water quality from the Lake Whatcom source is increased phosphorus loading, which stimulates algal growth and sets in motion the whole damaging process of eutrophication. Larger algal production not only means more plankton in the water, but generally also leads to a change in forms from predominantly diatoms at low enrichment, to filamentous green algae, and then to blue-green types at the highest nutrient concentrations. This succession has many negative ecological and aesthetic effects, but from the drinking water standpoint, it can mean a greater filtering requirement to remove suspended matter, treatments to adjust unpleasant tastes and odors created by algae, and,

most worrisome, health-threatening organochlorine chemical production when disinfecting chlorine contacts organic compounds in algal cells. Some of these by-products are recognized carcinogens, and others may be.

15. Large algal biomass dying and sinking to the bottom of the lake decreases dissolved oxygen as bacteria use it up in the decay process. A fully or nearly anaerobic state permits chemical reactions that release into soluble forms of both phosphorus and mercury that had been sequestered with the lake's sediments. Phosphorus release accelerates eutrophication. Mercury is a virulent toxin to all life and thus another concern in drinking water. The situation described is well known to exist in Basin 1 of Lake Whatcom, from which drinking water is drawn. Phosphorus and mercury are two of the four water pollutants (along with PCBs and bacteria) identified by the Washington Department of Ecology as leading matters of concern in the lake.
16. Phosphorus is a constituent of soil and vegetative tissue. It enters water when runoff erodes soil and when both soil and vegetation enter water through mass wasting. These additions greatly raise phosphorus concentrations. The PDEIS acknowledges, for example, that Smith Creek experienced an approximate ten-fold increase following a mass-wasting event. When it is considered that the flow would also have been much elevated, and that loading equals concentration times flow volume, the total phosphorus mass entering the lake must have been orders of magnitude above background levels during an equivalent period. In fact, 43 percent of the entire sediment loading expected from forestry activities over 90 years, and presumably a similar amount of phosphorus export, was estimated to be from mass wasting during one event in January 1983.
17. Through the course of the EIS process, the proponent has attempted to make several points establishing that, in its view, all of the issues just recounted amount to little with respect to drinking water and ecological concerns in Lake Whatcom, opining that: (1) large inputs occur rarely, for example only during an 80- to 100-year frequency event like that in January 1983; (2) this pollution of the lake and other episodes in the past were functions of poor practices and will not recur, at least at such magnitude, with better operations; (3) these additions are remote from the drinking water intakes, into the voluminous Basin 3, isolated from the remainder of the lake by a sill; (4) phosphorus export mainly occurs in the winter, when algae are growing little; and (5) sediment phosphorus is already so abundant that new additions will not increase releases during low oxygen conditions. These arguments are speculations that are disputable through other speculations or refuted by logic. Actually, with the high stakes existing with this resource, the proponent should measure and thoroughly analyze these points instead of speculate.
18. Relative to the point about rarity, the event in question was responsible for sediment and related pollutant loading that would have occurred naturally only over decades (43 percent of 90 years contribution would take about 40 years in an undisturbed watershed). Furthermore, the mass wasting producing the sediment loading was triggered mostly by orphaned roads, which will not necessarily be remeditated soon, or ever, under the Preferred Alternative. Moreover, something like the January 1983 event, although probably smaller, happened less

than 8 years later, in November 1990. It surely again delivered to the lake a quantity of sediments that would have only entered over years at a natural rate, if the triggering abandoned roads were not there or were restored to forest. This period of time, in the 1980s and early 1990s, on the whole had less than average precipitation in most years, and hence may not even represent a worst case.

19. Regarding the second point enumerated in comment 17, I have already argued above that the mitigating effects of better future practices may very well be lost with many more miles of roads and areas disturbed by logging. The only way that the share of deterioration from forest exploitation can be reversed is through some combination of restoration of past damage, limitation on new disturbance, and implementation of substantially improved practices to mitigate what new disturbance does occur. This philosophy is embedded in the objectives but was not applied in developing the Preferred Alternative. There was no analysis of what is necessary to stop degradation and what strategies of restoration, limitation, and better practices can contribute to this end.
20. Concerning the third point about remoteness from water intakes, the proponent has admitted that the large hydraulic loading during the big 1983 and 1990 precipitation events pushed water from Basin 3 into the remainder of the lake, at a time of massive pollutant inputs. Also, Basin 3 is itself a resource, and the state has an anti-degradation policy, although a weak one little known or honored. The DEIS envisions policies applying for generations (a term of up to 140 years). Is the implication that it is fine to allow preventable contamination over all of those years until the condition of Basin 3 approximates that of Basin 1?
21. The fourth point enumerated under comment 17 ignores the realities of lake hydrology. In a body of water that does not exchange its contents for years, it is much more crucial what the contaminant loading is in relation to its flushing rate and morphometry than what happens in any one year.
22. The final point implying that things are already so bad that the DNR's plans for taking out much more timber could not make them worse is a unique argument in my experience. Lake trophic status is rated on degree of enrichment from oligotrophic (low enrichment), to mesotrophic (medium), to eutrophic (high), and in extreme cases to hypereutrophic. Lake Whatcom is by no means eutrophic yet, and could get much worse with carelessness. Future phosphorus additions will contribute to increased water column concentrations, supporting algal blooms in the short-term. It is inconceivable to me that all phosphorus binding sites in the sediments are consumed or isolated from contact with water column phosphorus. I strongly believe that sediment phosphorus build up will continue unless inputs decline. I further believe that phosphorus releases from sediments will grow as low oxygen conditions extend in time and space.
23. The Preferred Alternative would perpetuate a poor practice from the past, allowing yarding of logs across streams. It is difficult to trust that the future will be bright with good practices when a non-essential environmentally harmful one is retained.

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24. The Preferred Alternative provides no buffer zones for wetlands smaller than 0.25 acre in area. Nowhere is it given how much of the total wetlands habitat is provided by these smallest wetlands, but it may be a considerable fraction. Small wetlands offer primary productivity, plant biodiversity, and habitat for at least the smaller consumers in the food web (invertebrates and amphibians). Amphibians are in regional and worldwide decline, in part because of habitat disappearance, which is significantly aggravated by cumulative small individual losses. There was no analysis of how much impact of this type the Preferred Alternative will produce.

In conclusion, the Preferred Alternative omits readily available and fully feasible aquatic resource protection strategies. Worse, its restoration strategies are very few, ill-defined, and lacking any solid commitments. With such a valuable natural and societal resource at stake, I advise the DNR to adopt a philosophy of first stopping and then soon reversing lake degradation originating its territory. I recommend that the department apply that philosophy initially by maximizing restoration and implementation of a full suite of state-of-the-art forest practices, and then by setting its harvest targets and road extensions within boundaries that will ensure cessation of deterioration from its operations. The Preferred Alternative falls far short of these standards and, to be acceptable, must be greatly enhanced in terms of protections and, even more so, restoration commitments. I would be pleased to answer any questions you may have and invite you to contact me if you wish.

Sincerely,

Richard R. Horner, Ph.D.