BEFORE THE ENVIRONMENTAL AND LAND USE HEARINGS BOARD

FRIENDS OF GRAYS HARBOR and WASHINGTON ENVIRONMENTAL COUNCIL Appellants, v. CITY OF WESTPORT et al. Respondents	)	ELUHB 03-001 *ET SEQ.* **PRE-FILED TESTIMONY OF RICHARD R. HORNER, Ph.D.**

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1. I have personal knowledge of the facts stated in this testimony and would be competent to testify thereto. The remainder consists of my professional opinion based upon my expertise in relevant fields, as discussed below:

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BACKGROUND

Current Position and Experience

2. I have 38 years of professional experience, 36 teaching and performing research at the college and university level. For the last 27 years I have specialized in research, teaching, and consulting in the area of storm water runoff and surface water management.

3. 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.

4. 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.

5. 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.

6. 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

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literature, and over 20 reviewed papers in conference proceedings. I have also authored or coauthored more than 75 scientific or technical reports.

7. 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. I have considerable experience in the capabilities of stormwater management best management practices (BMPs) installed to control both the quantity and quality of runoff from urban areas.

8. Beginning in 1986, I have spent a major share of my time as the principal investigator on two extended research projects concerning the ecological responses of freshwater resources to urban conditions and the urbanization process. 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 extended for ten years and 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.

9. I helped develop stormwater management programs in Washington State, California, and British Columbia and studied such programs around the nation. I was one of four principal participants in a U.S. Environmental Protection Agency-sponsored assessment of 32 state, regional, and local programs spread among 14 states in the West and Southwest, as well as the Midwest, Northeast, and Southeast. This evaluation led to the 1997 publication of

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"Institutional Aspects of Urban Runoff Management: A Guide for Program Development and Implementation" (subtitled "A Comprehensive Review of the Institutional Framework of Successful Urban Runoff Management Programs").

10. I have substantial familiarity and experience with National Pollutant Discharge Elimination System (NPDES) municipal stormwater permits. I am also very familiar with the Washington Department of Ecology's (WDOE) Stormwater Management Manual for Western Washington. I served as a reviewer of the 2001 edition of the manual before its issuance and contributed advice on several of the runoff quality control BMP sections, recommendations that were incorporated in the final version.

11. My curriculum vitae are attached as **Attachment A.**

12. To develop the opinions stated herein, I reviewed numerous documents, reports, city ordinances and guidance documents, and various data, and engaged in discussions with people knowledgeable about the proposed development. I reviewed key documents related to the subjects of this testimony, including major project documents such as permit applications, SEPA documents, the Stormwater Pollution Prevention Plan, two drafts of the Natural Resources Management Plan (NRMP), correspondence related to the NRMP, the Western Washington Stormwater Manual, and miscellaneous other documents including those attached to this testimony.

EXPERT OPINION

13. All opinions stated herein are drawn from my review of the above described documents and my expertise in the fields. Unless stated otherwise, all opinions about project impacts refer to the project as conditioned by the 401 water quality certification issued by the Department of Ecology (401 Certification).

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14. It is my conclusion that the Half Moon Bay Golf Course project as conditioned does not include All Known and Reasonable Technology (AKART). It is my conclusion that the conditions imposed by the 401 Certification are inadequate to assure that water quality standards will be met or that beneficial uses will be retained.

ASSESSMENT

15. The Half Moon Bay Golf Course stormwater management proposal does not satisfy AKART standards. AKART includes collection and treatment from heavily managed golf course areas (greens and tees). The applicant previously proposed to capture stormwater from heavily managed areas of the golf course and treating such runoff before releasing it. That proposal was abandoned for an infiltration scheme that has not been analyzed in any comprehensive fashion and, in all likelihood, will not work.

16. The Natural Resources Management Plan (NRMP) was authored by Audubon International (AI), an organization that has no affiliation to the more well known environmental organization, the Audubon Society. The NRMP stated that the previously proposed subsurface drainage and treatment system would maximize protection of natural resources, including surface water and groundwater. (*Trial Ex. A3).* The applicant submitted plans for capturing and treating golf course stormwater, and then directing it so that the runoff leaves the pipes "as far away from existing wetlands as possible, with the water allowed to flow across the ground for the maximum distance possible." (*Trial Ex. A85, A92).* Where there was no room for detention areas, the proposal called for filter sumps. (*Trial Ex. A 92).*

17. The NRMP noted that "drainage water from the golf course will travel a minimum of 50 feet from the end of the pipe before entering any existing wetland or surface water body."

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18. AI has correctly referenced the previous stormwater plan as a "Stormwater BMP" – meaning a best management practice. (*Trial Ex. A91).* This general treatment approach is standard throughout the country. (*Trial Ex. A86, A3*). Indeed, the US Golf Association considers capturing and treating stormwater flow from heavily managed areas of golf courses to be standard practice. (*Trial Ex. A86).* This is a recognized BMP for protecting water quality. (*Trial Ex. A84).* The NRMP acknowledges that the most effective way to manage surface water is by using a comprehensive systems approach that includes integration of preventative practices and structural controls. (*Trial Exhibit A3 at 22).*

19. Given the high groundwater table on the site, wastewater may need to be pumped to the treatment system, or greens and tees may have to be raised in order to install a treatment system. These requirements are not unreasonable and do no remove collection and treatment from AKART.

20. Although it is clear that the previous stormwater system has been abandoned, it has not been replaced by a plausible new plan for treating stormwater from the golf course and other amenities (restrooms, cart paths, etc.) that meets AKART standards and protects water quality and beneficial uses.

21. Instead, the Applicant proposes to modify its NRMP to reflect that "BMP treatment trains and soft engineering will be used to treat stormwater by allowing the stormwater to infiltrate and/or migrate over the turf, thatch layer, native vegetation, and so forth." (*Trial Ex. A3).*

22. These vague statements do not describe a system that reasonably can be relied upon, especially given the sensitivity and hydrology of the site and the vast department between the summarized system and established AKART standards.

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23. In previous testimony, the applicant's consultants acknowledged that this project does not follow standard practices for managing stormwater from golf courses and that this proposal is experimental. Specifically, personnel from AI admitted that this would be the only golf course in their Signature Program completely free of a subsurface drainage collection system. (*Trial Ex. A58).* The applicant's golf course designer stated:

> [T]his would probably be the first golf course in my experience and in my colleagues through the American Society of Golf Course Architects, of which I am a full member, in the last 20 years that had no pipeline. It's a very unique exercise. And what it does is it allows water on the golf course to travel in its natural form rather than putting it into artificial devices.

Id. Mr. Howie, the applicant's stormwater engineer who is designing the new system, acknowledged that this is his first project involving a golf course and at the time of the shoreline hearing, he had not consulted any more experienced stormwater engineers and was unfamiliar with the water quality issues in the receiving waters. *Id.*

24. This type of experimentation does not comply with AKART nor is it reasonable to rely upon such an untested system to protect water quality and beneficial uses in such a sensitive environment.

25. It is my conclusion that the current proposal does not meet the standards of Stormwater Management Manual for Western Washington (SMMWW), which requires treatment for pollution-generating pervious surfaces such as golf courses. (*Trial Ex. 136*). The SMMWW sets forth a comprehensive, step-by-step process to select treatment facilities. This process involves analyzing the receiving waters and pollutants of concern and special potential problems and factors. Included among these analyses is a determination if infiltration is practicable. The manual contains specific guidelines for managing the quantity and quality of

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water discharged to wetlands. There is no evidence that the proponents have performed the SMMWW analyses.

26. The SMMWW contains strict standards for infiltration. These criteria include setbacks, groundwater protection measures, and limits on a host of hydrogeological and soil physical and chemical properties. As one particularly relevant criterion in this instance, separation from infiltration surface to seasonal high water table must be more than 3 ft in all cases, and more than 5 ft unless analyses indicate high probability of success with 3 ft minimum. Here there is no showing that these standards are met, as is clear from the 401 approval, which states that a study must be completed to determine if infiltration is feasible.

27. The proponent cannot rely on infiltration as the main stormwater management tool and at the same time acknowledge that it may or may not work. Its potential success appears to be extremely questionable, since during much of the year the water table is so high that it is above the surface, ponds in wetland, and flows from the site into the estuary. These conditions exist during the time of greatest runoff, when infiltration capacity will be most needed. Under these circumstances, infiltration is unlikely to protect resources. Accordingly, infiltration does not satisfy the treatment requirement.

28. In addition to the improbability of infiltration working as a stormwater management tool, the intermingling of contaminated stormwater runoff and groundwater is likely to pollute the latter. This prospect is of particular concern, because the wetlands sit atop Westport's wellhead protection zone. While the Applicant has determined that groundwater flows to the ocean during the dry period of the year, there has been no analysis to determine the groundwater flow during the wet periods of the year, when the groundwater table is at or above

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surface level. It is not clear how much water will be moving towards the wellhead protection zone or towards the estuary during the wet season. (*Trial Ex. A1).*

29. The proposal suggests that treatment will occur as runoff passes over vegetated filter strips before infiltrating. However, there is insufficient analysis to determine if filter strips would satisfy treatment requirements. Here, there is an implicit suggestion that a 25-ft no-spray zone between the golf course and wetlands would create sufficient treatment to protect water quality.

30. The SMMWW contains standards for using filter strips as treatment. These standards include limits on slopes, velocity, water residence time, flow depth, and dimensions. Designing filter strips according to these standards requires hydrologic and other site analyses. There has been no hydrologic study of the site, mapping of open water components of wetlands, fate and transport of pollution, or the ability of vegetation anticipated in the no-spray zone to remove pollutants. Furthermore, there has been no consideration of the sensitivity of resources to be protected. For example, AI assumed that no aquatic habitats are involved, but coho and other fish are found in the wetlands. In addition, there has been no consideration of the probability of pesticides being kept out of the 25-ft strips, given the complexity of the site configuration, the existence at times of high winds and heavy rain, and the large open water components of the wetland systems.

31. Without this analysis, it cannot be assumed that 25 ft would provide effective treatment. Moreover, it is inconsistent to assume both that infiltration will occur before surface runoff proceeds to wetlands and that there will be sufficient residence time in contact with vegetation to remove pollutants. For example, filter strips are typically engineered to assure that they provide sufficient resident time, an analysis that requires consideration of factors such

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as runoff volume, vegetation density and slope. The proposal that surface water flow will be allowed to sheet flow in its natural direction acknowledges that undeniable fact that this proposal is not engineered to provide treatment. The 25-ft dimension seems to have been chosen for convenience instead of being based upon adequate analysis or AKART standards.

32. To satisfy AKART, it is necessary to provide adequate buffers around wetlands. Buffers help to protect wetlands in a number of ways, including separating the wetland ecosystems from excessive quantities and reduced quality of stormwater runoff. However, according to the SMMWW and regulations, they do not substitute for treatment and cannot serve to provide the treatment function. Treatment must occur before discharge to designated wetland buffers.

33. The best available science indicates that 150 ft wide buffers are necessary to protect interdunal wetlands from high intensity land uses like golf courses. (*Trial Ex. 35)*

34. The receiving waters represent extremely sensitive environments. Salmonid fish use the wetlands. (*Trial Ex. A150).* The largest wetlands on the site rest on top of the City's wellhead protection zone and the site drains into the estuary, where oyster growing and herring spawning occur. (*Trial Ex. A1, A150).* The receiving waters already have eutrophication problems and are on the 303(d) list for fecal coliforms. (*Trial Ex. A80, A81)*

35. The golf course stormwater has significant potential to negatively impact such resources. Pesticides and fertilizers will be applied and subsequently exposed to runoff. As reasoned above, this runoff is highly likely to enter receiving waters before infiltrating and without adequate treatment.

36. Wetland biota are subject to alterations of water quantity and well as water quality. The applicant acknowledges that the project will modify hydrology but has not

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studied how the water regime will be altered. Wetland hydroperiod (depth, frequency, and duration of water inundation) is an important determinant of plant and animal biodiversity. More dynamic water level fluctuations, such as occur with watershed development, tend to reduce biodiversity. The wetlands management guidelines in the SMMWW specify limits on hydroperiod alterations. There is no evidence that the proponent has consulted those guidelines, nor performed the hydrologic studies necessary to apply them.

37. It is possible for the applicant to model the project's interaction with surface and groundwater. (*Trial Ex. A95)* This is necessary to determine fate and transport of stormwater runoff as well as to quantify the full extent of the project's impacts on ground water and surface water quality and the beneficial uses discussed above.

CONCLUSION

38. Providing wetland buffers and adequate treatment constitute AKART. No wetland buffers have been proposed, only 25-ft wide no-spray zones through which any stormwater not infiltrating by that point will be treated by vegetation. It is extremely unlikely with the seasonally high water table that infiltration will actually occur, especially during the wet season. There has been no analysis to indicate otherwise. Furthermore, there has been no assessment of the ability of 25-ft wide filter strips to satisfy design criteria and provide adequate treatment. Golf course runoff is very likely to flow to wetlands with little or no treatment or mitigation of volume. The project is almost certain to modify the wetland hydroperiod and reduce biodiversity. It will further transport pollutants to groundwater in a wellhead protection area, wetlands, and the estuary to which the wetlands flow. Salmonid fish, oysters, and herring will all be subject to the negative effects of this contamination.

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39. There has hence been no showing that the 401 provisions will protect water quality and beneficial uses.

40. In reaching the conclusions stated herein, I relied upon the above-referenced exhibits and documents attached hereto, which I consider to be authentic and reliable. The underlying facts and data within these sources are of a type reasonably relied upon by experts in my field in reaching the types of conclusions set forth in this testimony.

Stated under oath this 8th day of August, 2005, in Seattle, Washington.

Richard R. Horner, Ph.D.

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