

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
 PHILIP DICKEY, PH.D.**

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PRE-FILED TESTIMONY OF PHILIP DICKEY,
 PH.D - 1

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1 Pollution Prevention Plan (SWPPP),⁷ reports and letters issued by the Washington State
2 Department of Fish and Wildlife,⁸ reports and letters issued by the Washington State Department
3 of Health,⁹ as well as various correspondence between the applicant and Department of Ecology,
4 technical memoranda, maps, photos and miscellaneous project documentation.

6 **EXPERT OPINION**

7 6. All opinions stated herein are drawn from my review of the above described
8 documents and my expertise in the fields. Unless stated otherwise, all opinions about project
9 impacts refer to the project as conditioned by the 401 water quality certification issued by the
10 Department of Ecology (401 Certification).¹⁰

11 7. It is my opinion that the project as conditioned is likely to cause unacceptable
12 impacts to water quality. The conditions imposed by the 401 Certification are inadequate to
13 assure that present water quality and beneficial uses of the waters will be retained for the reasons
14 stated below.

15 **Sensitivity of Site.**

16 8. This is an extensive development proposed for an extremely sensitive and unique
17 natural area.¹¹ The wetlands system on the site extends deep into Westport Light State Park. The
18 project site and Westport Light State Park are currently in a natural, undeveloped state, dominated
19 by the interdunal wetland system.

20 9. The beneficial uses of the wetland are extensive based upon the information in the
21 record. These include:

22 10. Groundwater recharge and purification. The project site and the largest wetland on
23 the site extend over the City's wellhead protection zone.¹² The site also drains into what the
24 Washington State Department of Fish and Wildlife (WDFW) has stated is a particularly fragile

1 area of the Grays Harbor Estuary.¹³ The receiving waters are already impaired in several
2 respects. They are listed on the 303(d) list for fecal coliform¹⁴ and suffer from eutrophication.¹⁵

3 11. Fish habitat. The project application and supporting documentation incorrectly
4 state that there is neither fish nor aquatic habitat on site. However, fish use of the site has been
5 documented by both WDFW¹⁶ and the applicant's own fisheries consultant.¹⁷ Coho salmon were
6 identified by WDFW¹⁸ and at least one private witness whose declaration I have reviewed.¹⁹

8 **General comments.**

9 12. Golf courses are intensively managed landscapes that receive large amounts of
10 fertilizers and pesticides, with the potential to significantly impact water quality.²⁰ This is well
11 known and repeatedly acknowledged in the project documents. For this reason, the proposed site
12 has many characteristics that make it particularly unsuitable for siting a golf course, including
13 extensive wetlands, sandy soil, high watertable, and heavy rainfall.

15 13. The Natural Resources Management Plan (NRMP)²¹ was authored by Audubon
16 International (AI), an organization that has no affiliation to the more well known environmental
17 organization, the Audubon Society. Although the NRMP devotes many pages of discussion to
18 how the pesticide and fertilizer impacts will be minimized, it does not provide reasonable
19 assurances that this plan will protect water quality and sensitive species. Indeed, the NRMP
20 permits the use of a large number of pesticides, including many that are potentially mobile in soil
21 and water. As described in more detail below, the monitoring plan detailed in the NRMP is not
22 designed to detect peak levels of pesticides and allows relatively high concentrations to occur
23 before use would be suspended. The conditions of the 401 certification do not add to these
24 protections. For example, while the permit states that water quality standards must be met, this
25 condition does not provide sufficient guidance because numerical water quality standards do not
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1 exist for most of the pesticides proposed for use on the golf course and narrative standards are too
2 general to be used as management protocol.

3 14. The proposed stormwater management plan is extremely unusual for a modern
4 golf course, and the monitoring plan would allow relatively high levels of pesticides to occur
5 before management changes would be required. During the environmental review processes and
6 in the first draft of the NRMP, the applicant relied upon a stormwater collection and treatment
7 system for the golf course as a primary means to protect water quality. This component of the
8 project has now been deleted and the applicant proposes to allow runoff from the golf course to
9 sheet flow directly onto the ground and into adjacent wetlands.
10

11 15. It is my opinion that unacceptable degradation in water quality is likely to occur as
12 a result of this project.
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14 16. Additional information would be needed about the existing and proposed water
15 regime to determine the extent of these impacts. Certainly this information would be required
16 before the Department of Ecology could have assurances that water quality and beneficial uses
17 would be protected. For example, neither the applicant nor Department of Ecology has mapped
18 open water components of the wetland systems nor modeled existing and proposed hydrologic
19 conditions. Such information would be necessary to determine the project's water quality impacts
20 in this type of aquatic environment, especially when the wetland system at issue provides aquatic
21 habitat, drains to sensitive aquatic sites, and sits above the City of Westport's wellhead protection
22 zone.
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1 **Inadequacy of conditions in 401 certification.**

2 17. In response to Ecology’s criticism, Audubon International stated, “In reference to
3 the 100-ft buffer zone requirements around the wetlands, the majority of golf course falls within
4 this 100-ft buffer.” *January 16, 2002 letter, Trial Ex. A3.* AI proposed to treat the entire golf
5 course as a “limited spray zone,” which would eliminate the use of a few of the more toxic
6 chemicals, and to eliminate the chemical thiram. It also proposed more stringent standards for
7 fertilizer application, including limitation on water soluble fertilizers, and limitations on when
8 fertilizers may be applied and rate of application. *Id.*

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10 18. The 401 certification did not incorporate any of these “proposals” as conditions to
11 protect water quality. Instead, the certification only requires compliance with the August 1, 2001
12 version of the NRMP, which does not include these protections. As discussed below, the
13 conditions suffer from other defects.

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15 19. In addition, even if water quality standards are violated, the 401 certification
16 merely states that “Ecology *may* determine the project to be in violation of this Order, and
17 additional treatment conditions and/or mitigation *may* be required.”²²

18
19 **Pesticide Use**

20 20. According to the NRMP, an initial candidate list of pesticides was screened to
21 eliminate those posing risks to human health or water quality. However, the screening approach
22 as described is inadequate for the reasons enumerated below and in fact eliminated only nine
23 pesticides for use, still allowing at least 40 active ingredients to be used on all or part of the golf
24 course. In addition, the 25-foot no-spray zones are insufficient to protect surface water from
25 pesticide applications.
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1 21. The NRMP assumed that there was no aquatic habitat or salmon on site and this
2 inaccurate assumption undermines its analysis and the sufficiency of its pesticide screening
3 criteria.²³ It has been established that some of the pesticides proposed to be used on the golf
4 course do adversely affect salmon. In *Washington Toxics Coalition v. EPA, Matter C01-132C*
5 (*W. Dist. WA*), the U.S. District Court ruled that there was sufficient evidence to conclude that 54
6 active ingredients of pesticides adversely impact salmon. The Court required 60 foot no-spray
7 buffers for ground application to protect salmon from the effects of these pesticides, until such
8 time as the EPA could conduct further analysis and determine that any of these chemicals were
9 unlikely to adversely affect salmon. Some of the pesticides that EPA has determine day affect
10 salmon are proposed for use on the golf course. Even if no listed species are present at the
11 Westport project site, the ruling demonstrates that the proposed pesticides do negatively impact
12 salmon and much wider no-spray zones would be necessary to keep pesticides out of sensitive
13 surface waters.²⁴

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16 22. The 25 foot buffers are also inappropriate because they are measured from the
17 edge of jurisdictional wetlands, without regard to the presence of water or potential aquatic
18 habitat. In the *Washington Toxics Coalition* case, discussed above, the Federal Court determined
19 that the no-spray zones should be measured from the ordinary high water mark. The applicant
20 has never mapped the ordinary high water mark on this site, or the areas of open water, so it is
21 impossible to determine where the no-spray zone is in relation to open waters. It is possible, for
22 example, that spraying would be permitted in areas that are completely inundated and yet do not
23 qualify as wetlands.
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1 **Inadequate Screening Process**

2 23. It is my opinion that the screening process adopted by the applicant is inadequate
3 to protect water quality and beneficial uses. The initial screening step involved running two EPA
4 models (GENEEC and SCI-GROW) to predict pesticide concentrations in water. These models
5 are claimed by EPA to be conservative in their predictions, thus providing a margin of safety.
6 However, if the version of GENEEC used was version 1.0 or 1.2 rather than the newer version 2.0
7 introduced in 2001,²⁵ the model does not account for the amount of organic matter in the soil and
8 would greatly underestimate pesticide movement in sandy soils.
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10 24. Similarly, EPA’s description of the SCI-GROW model states, “The SCI-GROW
11 value is usually only likely to be exceeded under exceptional circumstances in a small percentage
12 of the use area (unless, for example, the pesticide is used only in areas with sandy soils and high
13 rainfall or irrigation.)”²⁶ Since the proposed Links site does have sandy soils and high rainfall,
14 the model results cannot be assumed to be conservative.
15

16 25. Dr. Tom Hruby, Senior Ecologist of the Washington State Department of Ecology,
17 has stated that the groundwater model is not conservative in sandy soils with high precipitation
18 levels, which are conditions present at the proposed site. (Trial Exhibit A87)²⁷ As he said, “We
19 cannot rely on the models alone to determine that the pesticide levels in groundwater will be
20 below thresholds.” In fact, more than half (22 of 40) of the pesticides allowed for use on the
21 course are on the State of California’s list of chemicals with chemical or physical properties that
22 make them potential threats to groundwater,²⁸ and many have been noted by EPA as being mobile
23 or having mobile metabolites (see below under Concerns Regarding Specific Pesticides). Several
24 pesticides that will be used (e.g. carbaryl, 2,4-D, MCP, dicamba, triclopyr) are widely detected
25 in surface water around the Pacific Northwest.²⁹ The site conditions at Westport—sandy soils,
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1 high precipitation, and high watertable—are highly conducive to pesticide mobility, so the use of
2 chemicals inherently prone to movement at a site like this one poses real risks for groundwater
3 and surface water.

4 26. The next step in the Audubon International screening process compared model-
5 predicted pesticide concentrations to three toxicity benchmarks. Peak runoff concentrations were
6 compared to lethal aquatic concentrations (LC50), average 21-day concentrations were compared
7 to 1/10th of lethal concentrations, and output from the SCI-GROW model was compared to US
8 EPA Health Advisory Levels for each chemical. AI's screening process is invalid for the
9 following reasons:
10

11 • It is not stated what species were considered for evaluation of lethal concentrations.
12 Typically, EPA requires pesticide manufacturers to submit data on a limited number of standard
13 species. Data are usually not available for threatened or endangered species. The U.S. Fish and
14 Wildlife Service has stated that standard test species are not appropriate surrogates for threatened
15 or endangered species because of their inherent ecological sensitivity.³⁰
16

17 • Given the observation expressed earlier that the GENEEC model is not conservative for
18 the proposed site conditions, the use of the lethal concentration (LC50) as the reference point for
19 acute exposure cannot be characterized as identifying “negligible risk.” At this concentration,
20 50% mortality of the test species occurs in a 96-hour exposure.
21

22 • It is invalid to assume that 1/10th of the LC50 is a safe level of chronic exposure to a
23 chemical. Recent research by Scholz *et al.* documented toxic effects of diazinon on salmon at
24 much lower, environmentally relevant levels, and the researchers stated that similar effects can be
25 expected in other insecticides that affect the nervous system.³¹ Altered antipredator behaviors
26 were statistically significant at 1 ug/L and observed but not significant at 0.1 ug/L. Based on the
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1 lowest LC50 in a related species (rainbow trout), these effect levels correspond to 1/90th and
2 1/900th of the LC50, far less than the 1/10th threshold assumed in the NRMP.

3 • Evaluation of chronic risk should be based on studies that measure the results of chronic
4 exposure, not by arbitrarily scaling lethal concentrations. For example, in the U.S. EPA's recent
5 re-registration risk assessments for PCNB, a chemical proposed for use on the Links, the
6 Agency's more sophisticated aquatic risk assessments found levels of concern exceeded by up to
7 8.3 times for freshwater fish and up to 6.0 times for freshwater invertebrates. Chronic effects in
8 estuarine and marine fish and invertebrates could not be evaluated due to lack of data. Audubon
9 International's simplified risk assessments, in contrast, found negligible acute and chronic risk for
10 PCNB.³²

13 • Chronic toxicity testing is also recommended to evaluate potential impacts of golf courses
14 on sediment quality, as acute toxicity standards may fail to adequately evaluate such impacts.³³ A
15 recent study found pyrethroid insecticides in 75% of sediment samples collected near agricultural
16 sites where these chemicals were used.³⁴ Pyrethroid concentrations were high enough to
17 contribute to the toxicity of 40-70% of samples that exhibited toxicity to amphipods and midges.
18 Several pyrethroids, including two detected in this study, are on the list of chemicals that may be
19 used on the golf course.

22 • If more than one pesticide is present in water at the same time, comparing chemical
23 concentrations individually to toxicity benchmarks is not a valid evaluation of safety, especially if
24 the chemicals have the same mode of toxicity. Chemicals in a mixture that have the same mode
25 of toxicity can be expected to have additive toxicity.³⁵ Groups of pesticides on the allowed list
26 have similar modes of action and should be considered together as groups (e.g. all pyrethroids, all
27 chlorinated phenoxy herbicides, etc.). In addition, there is evidence that some combinations of
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1 pesticides with nitrate (resulting from nitrogen fertilizer) are more toxic than either the pesticides
2 or the nitrate alone.³⁶

3 • The use of HALs as a test for human health effects is very narrow in focus because it
4 considers only one route of exposure to pesticides: drinking water. The inadequacy of this
5 approach can be illustrated by comparing it to U.S. EPA’s risk assessment process, which
6 computes a supposedly safe level of exposure from multiple sources including diet, drinking
7 water, and residential or occupational exposure. Consider PCNB, a fungicide that may be used up
8 to five times per year at the Links. Audubon International calculated a drinking water level of
9 1.04 ppb, well below the HAL of 21 ppb, indicating “negligible risk” according to the procedures
10 used. EPA, in contrast, calculated dietary plus drinking water chronic risks alone that exceeded
11 their levels of concern slightly for adults and by up to threefold for infants. In addition, direct
12 exposure to treated turf added risks that, taken by themselves, exceeded Agency levels of concern
13 for adults golfing (by a factor of two) and for adult high contact lawn activities (by a factor of
14 more than 30). The vastly different results obtained by EPA and by Audubon International for
15 this typical chemical indicate that Audubon’s methods are not accurate.

16 • In addition, these methods are not appropriate for carcinogens where there is no threshold
17 or “safe” dose below which adverse effects cannot occur. The NRMP treatment of carcinogens is
18 inconsistent in that mancozeb was deleted from the allowed use list because its metabolite ETU is
19 a “suspected carcinogen”,³⁷ yet three other likely carcinogens (thiophanate methyl, iprodione, and
20 carbaryl), one probable carcinogen (etridiazole), and eight possible carcinogens (propiconazole,
21 triadimefon, PCNB, oxadiazon, pendemethalin, isoxaben, 2,4-D, and MCPP) remain on the list
22 (see Table 1). This inconsistency demonstrates that human health effects are not being
23 adequately considered.

Table 1. Carcinogenicity determinations for proposed allowed pesticides

<u>Active ingredient</u>	<u>EPA cancer determination</u> ¹
thiophanate methyl	likely human carcinogen
iprodione	likely human carcinogen
carbaryl	likely human carcinogen ²
etridiazole	Group B2, probable human carcinogen
propiconazole	Group C, possible human carcinogen
triadimefon	Group C, possible human carcinogen
PCNB	Group C, possible human carcinogen
oxadiazon	Group C, possible human carcinogen
pendimethalin	Group C, possible human carcinogen
isoxaben	Group C, possible human carcinogen
2,4-D	Group D, not classifiable*
MCPP	Group D, not classifiable*

*Note: 2,4-D and MCPP are both phenoxy herbicides, which have been listed as possible human carcinogens by the International Agency for Research on Cancer.

1. USEPA Office of Pesticide Programs. List of chemicals Evaluated for Carcinogenic Potential, 1999.

2. USEPA Office of Pesticide Programs. IRED for Carbaryl, 2003

- Inert ingredients are not considered in any way in the NRMP. Inert ingredients frequently comprise more than half of pesticide formulations and are not necessarily benign. EPA does not evaluate their potential chronic human and aquatic toxicity during registration, either alone or in combination with active ingredients. It is impossible to conclude that use of a pesticide is safe when more than half of the product is unknown.

27. The proposed list of pesticides contains two that have been identified by the US EPA³⁸ and the Washington State Department of Ecology³⁹ as persistent, bioaccumulative, toxic chemicals: PCNB and pendimethalin. The proposed use of these two compounds, as well as the many listed by the State of California as potential leachers, contradicts a statement made by Dr. Charles Peacock, a consultant to the Audubon International program. On September 10, 2003, at a public hearing before the City of Westport Planning Commission, Dr. Peacock stated, “And we’ve eliminated for use any of those materials which have shown to be – have possibility of

1 being persistent in the environment or leach into groundwater or to be lost in the site and surface
2 water flow.”⁴⁰ That statement is simply not in accord with the proposed list of pesticides.

3 Consider, for example, PCNB, a chemical which is currently undergoing reregistration by the
4 U.S. EPA. In its risk assessment for PCNB, EPA characterized it as follows:

5
6 “PCNB is highly toxic to freshwater fish and invertebrates and is very highly toxic
7 to estuarine/marine fish and invertebrates on an acute exposure basis.

8 Chronic risk levels of concern were exceeded for freshwater fish and invertebrates;
9 chronic effects include reduced number of eggs produced and reductions in the number of
10 young surviving. Data are lacking on chronic effects in estuarine/marine fish and
11 invertebrates.

12 PCNB and its degradates persist in the aquatic environment and tend to
13 bioconcentrate (bioconcentration factors as high as 22,000X in algae). The presence of
14 PCNB and degradate in benthic (bottom) sediments is expected to serve as a likely route
15 of exposure to bottom-dwelling fauna. This may also serve as a means of entry into
16 aquatic food chains where the compound and/or its degradates may biomagnify.”⁴¹

17
18 28. Later in the same hearing, Dr. Peacock stated that, “When the depth of the
19 groundwater is shallow is when there would be no pesticide application needed at all because it
20 would be winter conditions and we simply wouldn’t be putting those materials out.” However,
21 the 401 certification provides no the timing of pesticide application and the NRMP shows that
22 pesticides and fertilizers may be applied during March and April, when water tables are still high.
23 For example, the suggested optimum control periods for crane fly are stated as April 1-15 and
24 possibly in the fall.⁴² Salmon have been identified in open water wetlands of the Links site
25 during early April. Average monthly rainfall in March and April is 8.9 and 5.8 inches,
26 respectively, so groundwater levels will still be high at that point and the potential for leaching
27 high due to precipitation rates, as would also be the case in the fall. Although treatment of the
28 pest under the NRMP requires detection of larvae at levels exceeding damage thresholds, the
29 stated damage threshold of 25 grubs/*sq yd* is very low and suggests that insecticide treatments on

1 greens will very likely occur. In comparison, Washington State University recommended damage
2 thresholds for residential lawns are 25-50 grubs/*sq ft*, 9 to 18 times higher.⁴³ Thus, the NRMP is
3 not environmentally conservative in this respect.

4 **Concerns Regarding Specific Pesticides**

5 29. I am particularly concerned about the possible use of the insecticide carbaryl. In
6 the interim reregistration eligibility decision (IRED) for carbaryl, EPA made the following
7 observations that show carbaryl poses a significant potential risk to aquatic species.⁴⁴

- 8 • “In surface water, based on the United States Geological Survey (USGS) National
9 Ambient Water Quality Assessment (NAWQA) database, carbaryl is the second most widely
10 detected insecticide, with a significant portion apparently transported to streams.”
- 11 • “Carbaryl is fairly mobile, but is not likely to persist or accumulate in the environment.
12 • As such, it is difficult for monitoring studies to detect peak concentrations that can occur.”
- 13 • In their aquatic risk assessments EPA found that the level of concern for endangered
14 freshwater fish was exceeded for all modeled uses. Acute and chronic risk quotients were
15 exceeded for freshwater invertebrates and marine/estuarine invertebrates.

16 30. In their recent analysis of risks to endangered salmon and steelhead from carbaryl,
17 EPA found that carbaryl may affect 20 of 26 “evolutionary significant units” (ESUs).⁴⁵ EPA
18 admits that they do not have data to quantify use on noncrop sites, but they presume that such
19 uses could contribute to the exposure and risks of at least some of these ESUs. In the few cases
20 where EPA did not determine that carbaryl may affect endangered salmon, it was only because
21 they did not identify sufficient use of the chemical in the watersheds, not because the chemical is
22 inherently benign. This analysis supports our contention that use of carbaryl in a sensitive area
23 would harm aquatic life.
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31. As was mentioned earlier, many of the pesticides have been identified by the State of California as potential groundwater risks or by the US EPA as mobile in soil. Table 2 identifies these compounds and gives notes from EPA registration documents.

Table 2. Potentially Mobile Pesticides

Active Ingredient	CA list ¹	Excerpts from EPA comments ²
<i>Fungicides</i>		
Azoxystrobin	yes	
Fenarimol	yes	
Flutolanil	yes	
fosetyl-Al	yes	Fosetyl-Al may possibly leach to ground water in cases where an unexpected heavy rainfall closely succeeds application due to its high aqueous solubility, susceptibility to leaching, and stability to abiotic hydrolysis.
Iprodione	yes	Iprodione [is] very mobile in sand soil:calcium chloride solution slurries. It was also mobile in sandy loam and loamy sand and somewhat mobile in clay soil solutions. Iprodione has some potential to persist and leach under certain conditions. (i.e. highly permeable soils)
Metalaxyl	yes	Metalaxyl and its degradates readily leach in sandy to sandy clay loam, soils low in organic matter.
propiconazole	yes	
thiophanate-methyl	yes	TM entering the aquatic environment is expected to convert rapidly to MBC. MBC has potential to leach to groundwater in highly sandy soils with low organic matter.
triadimefon	yes	
vinclozolin		Vinclozolin and its principal degradates are potentially very mobile to slightly mobile in soil. Metabolites B, E, and 3,5-DCA are potentially very mobile to slightly mobile and may be transported with water through the soil profile or with surface runoff. Residues are likely to be most mobile in sandy soils low in organic matter. Because degradates of vinclozolin are mobile and can be persistent under certain environmental conditions the chemical has the potential to contaminate ground water. Vinclozolin and its degradation products could be available for runoff for several weeks to months post-application.

<i>Insecticides</i>		
Carbaryl	yes	(see previous discussion regarding carbaryl)
imidacloprid	yes	

<i>Herbicides</i>		
2,4-D	yes	
Bentazon		Bentazon may contaminate surface waters in use areas through runoff waters. Bentazon exceeds LOC for ground-water quality. (High dissolved runoff potential)
Besulide	yes	
Clopyralid	yes	
Dicamba	yes	
ethofumesate	yes	
halosulfuron	yes	
Isoxaben	yes	
MCP	yes	
MSMA	yes	
Quinclorac	yes	
Triclopyr	yes	The principal degradate, TCP, is relatively mobile and persistent and has the potential to contaminate ground water.

1. Clayton, M. Reference 5.
2. Source for comments: USEPA Reregistration Eligibility Decision documents for each active ingredient. <<http://www.epa.gov/pesticides/reregistration/status.htm>>

32. Four other pesticides proposed for use on the golf course have been identified by EPA in their Registration Eligibility Decisions (REDs) as exceeding levels of concern for fish, aquatic invertebrates, or aquatic plants: bensulide, iprodione, pendimethalin, and triclopyr (see Table 3). In addition, EPA's pending draft risk assessment for 2,4-D finds that risk quotients exceed the Agency's levels of concern for endangered and threatened freshwater fish and invertebrates, estuarine invertebrates, birds, mammals, aquatic vascular plants, and terrestrial non-target plants at many sites.⁴⁶ Thus, EPA has found that harm may occur to aquatic species at allowed use rates.

1 **Table 3. Pesticides Exceeding EPA Levels of Concern***

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Active ingredient	freshwater fish	freshwater aquatic. invert.	semi-aquatic plants	aquatic plants
3 bensulide	x	x		x
4 iprodione	x	x		
5 pendimethalin	x			x
6 triclopyr	x	x	x	x

7 *Source: USEPA Reregistration Eligibility Decision (RED) documents for each active
8 ingredient. <<http://www.epa.gov/pesticides/reregistration/status.htm>>

9 33. Even at levels that do not harm fish directly, pesticides can have adverse effects on
10 more sensitive species such as aquatic invertebrates that support the higher animals in the
11 ecosystem. As stated in *Freshwater Wetlands in Washington State, vol 1: A Synthesis of the*
12 *Science*,⁴⁷ "General studies on the impacts to invertebrates in wetlands of Puget Sound found that
13 increased levels of toxic contaminants and changes in the water regime resulted in declines in
14 taxa richness among the scraper and shredder functional feeding groups and the Chironomidae
15 family (small, mosquito-like flies) (Ludwa and Richter 2001)." These authors found declines in
16 richness and abundance of invertebrate groups whose presence is seen as an indicator of the
17 general health or quality of a water body. A second study in the Pacific Northwest also showed a
18 direct and negative correlation between urbanization and the abundance and richness of
19 macroinvertebrates (Hicks 1995) primarily through impacts to water quality. The concerns raised
20 by these studies place the burden on the proponents of development to show that their projects
21 will not affect sensitive resident species.

22 **Drainage System**

23 34. The current plan appears to call for no subsurface drainage system to remove
24 pesticides or fertilizers, but instead allows normal surface flow and percolation.⁴⁸ At the
25 Westport public hearing, golf course architect Mr. Rick Robbins stated that this is the first golf

1 course in his experience to have no underlying pipeline. For pesticides, the design seems to rely
2 on environmental degradation to break down these chemicals. Although Dr. Peacock states that
3 pesticides have never been detected in surface water or ground water at golf courses in the
4 Signature Program, the monitoring program described in the NRMP is not designed to capture
5 peak pesticide levels. Moreover, the Westport site is unique in its soil conditions, rainfall, and
6 relatively low summer temperatures. Pesticide degradation may well be slower in the cool, sandy,
7 water-saturated soils at this site than in other locations around the country. The stormwater
8 management aspect of this project appears to be largely experimental, and the monitoring
9 program will therefore be the first and only line of defense against potential contamination. Once
10 pesticides have been detected, however, the monitoring plan allows considerable time to elapse
11 before corrective actions can be taken.

14 **Wellhead Protection Zone**

15 35. The NRMP does not adequately consider the potential for chemicals used on the
16 golf course to find their way into Westport's drinking water. The large wetland that surrounds
17 much of the golf course extends to the designated Wellhead Protection Zone for the City's
18 aquifer. (Trial Ex. A79). Pollution entering the wetlands can be easily transported across the
19 wetland system. The Department of Ecology's Coastal Sand Dune Study noted that in interdunal
20 wetlands, "During the wet season the extensive open water surfaces are highly susceptible to
21 contamination and spreading of pollutants."⁴⁹ Without a full study of existing and proposed
22 hydrologic conditions, one cannot rule out the possibility that pollution entering the wetlands or
23 groundwater on the site may impact Westport's aquifer. Rather, given the site conditions, it
24 seems likely that an impact may occur.

1 **Pesticide Monitoring Plan**

2 36. As stated earlier, the existence of a pesticide monitoring plan cannot be relied upon
3 to assure protection of water quality. This is especially true with regard to this project, where
4 large number of chemicals may be used on the site, in close proximity to extremely sensitive
5 aquatic resources. In addition, the monitoring plan outlined in the NRMP is neither sufficiently
6 responsive nor is the corrective action plan aggressive enough in removing offending chemicals
7 from use. If a chemical is detected but at levels below the selected toxicological trigger points,
8 the response involves retesting and review of management practices but requires no further
9 action. The sampling allows continued detection of pesticides at these levels without requiring
10 any changes in application procedures. Even if detection levels exceed toxicological criteria,
11 termination of that pesticide is temporary and use can continue if levels drop below criteria but
12 detections continue to be observed. Additionally, the monitoring and response plan includes no
13 recognition or consideration of the risks posed by the presence of multiple pesticides or pesticides
14 and nutrients together in the water samples. Finally, there is no provision for monitoring
15 potentially mobile or persistent metabolites or any inert ingredients, such as surfactants, in the
16 pesticides. Many surfactants are toxic to aquatic organisms, and surfactants applied with
17 pesticides can enter freshwater ecosystems by runoff and other means.⁵⁰ Some surfactants
18 commonly used in pesticide products can break down into endocrine-disrupting compounds such
19 as nonylphenol,⁵¹ which has been shown to feminize male fish and affect their reproductive
20 organs at extremely low concentrations.⁵²

25 37. A memorandum from Audubon International Institute dated January 16, 2002
26 agrees to an Ecology request that all chemicals, not just those with the highest predicted risk, used
27 in the preceding six months be monitored.⁵³ That is an improvement, but the sampling frequency
28

1 of four times/year for surface water is inadequate to detect possible spikes in surface water
2 concentration that may occur immediately after a pesticide application. Such spikes could occur
3 especially with short-lived chemicals such as carbaryl, as was noted earlier by EPA. Thus, the
4 monitoring plan does not generally capture peak levels of pesticides, which could exceed
5 monitoring criteria or even lethal levels.
6

7 38. The conditions added by the 401 certification are also inadequate to protect water
8 quality. These conditions are extremely vague, requiring a future plan for monitoring to be
9 submitted, but containing no requirements about the frequency of the specific location of
10 monitoring. Therefore, this condition does little to assure that the monitoring would disclose any
11 water quality impacts. For example, Tom Hruby recommended that that monitoring occur daily
12 and more often during high rains. This is necessary to monitor peak concentrations of chemical
13 pollutants. Mr. Hruby's recommendations did not make their way into the 401 certification.
14

15 **Nutrient Loading**

16 39. Runoff from the site will enter a portion of the Grays Harbor Estuary that is
17 already suffering from (Trial Ex. A80).⁵⁴ This area is also listed on the 303(d) list for fecal
18 coliform pollution. (Trial Ex. A81)⁵⁵ Further introduction of nutrients into this area poses a threat
19 to existing beneficial uses, including herring spawning and oyster farming.
20

21 40. Relatively small amounts of concentration of nitrates can have a significant
22 impact. For example, it is reported that nitrate concentrations as low as 0.100 mg/L induced
23 significant phytoplankton blooms in estuarine waters. (Trial Ex. A84)¹ One study showed that
24 nitrate-nitrogen levels, while passing through a golf course, increased from as low as .005 to as
25
26
27

28 ¹ R.Y. George et al, Buffer Zones promoting oligotrophication in golf course runoffs: fiddler crabs as estuarine health
29 indicators, *Trial Ex. A84*.

1 high as 1.462 mg/L.² Nitrate-nitrogen runoff from golf courses can induce eutrophication and
2 trigger algal blooms.³

3 41. There are inadequate assurances to believe that the golf course will not add
4 nutrient loading to this area thereby increasing eutrophication. The NRMP provides no adequate
5 plan or analysis as to removal of nutrients from stormwater before runoff enters the wetlands and
6 the estuary. Moreover, there has been no assessment of potential impacts of nutrient loading on
7 the wetland systems themselves. The Biological Assessment acknowledges that pesticides and
8 fertilizers may enter this area of the estuary.⁵⁶

11 CONCLUSION

12 42. The Grays Harbor wetlands are sensitive areas that perform important ecological
13 functions and harbor species that are extremely sensitive. These functions can be impaired by
14 excess nutrient and toxic chemical releases. Substantial quantities of nutrients and toxic
15 chemicals will be used on the proposed Links golf course.

16 43. The models used to predict chemical exposure are not valid under the conditions at
17 the site, which favor pesticide movement from the point of application. EPA has identified some
18 of the particular chemicals proposed for use as posing unacceptable risks for aquatic species, and
19 more than half of these chemicals have properties that contribute to mobility in soil. Without
20 additional study, the possibility of impacts to Westport's aquifer cannot be ruled out.
21

22 44. The existence of a pesticide monitoring program cannot be relied upon to assure
23 protection of water quality. The monitoring plan as proposed will not measure peak pesticide
24 levels and would allow continuous levels of pesticides that far exceed background levels without
25 requiring that use of the pesticides be curtailed. There are many unknowns related to the behavior
26
27

28 ² *Id.*

29 ³ *Id.*

1 of pesticides at this site, and the proponents have not demonstrated that water quality can be
2 preserved.

3 45. The golf course may contribute to an existing eutrophication impairment in the
4 receiving waters in Grays Harbor.

5 46. The conditions of the 401 certification are inadequate to protect water quality.
6 They incorporate a NRMP that was written based upon a false assumption that there was no on-
7 site fish or aquatic habitat and that is inadequate in pesticide screening and grants to future
8 grounds keepers almost unlimited discretion over the selection, timing and application rates for
9 fertilizers and pesticides. Although the NRMP contains “guidelines” and “recommendations” for
10 application rates, frequency, and timing, it states that the Superintendent will ultimately be
11 authorized to make these decisions. The monitoring, as conditioned, remains inadequate to
12 protect water quality.
13

14 47. Finally, the certification’s condition requiring discontinuation of the use of
15 chemicals in certain situations is inadequate. It only applies to pesticides, and provides no
16 mandatory response for nutrient loading. And it requires a pesticide to be discontinued only if
17 they exceed human health standards or acute or chronic toxicity criteria set by the U.S. EPA.
18 However, these standards have been set for only a few of the proposed pesticides.
19

20 48. It is my opinion that significant degradation in water quality is likely to occur as a
21 result of this project.
22

23 49. In reaching the conclusions stated herein, I relied upon the above-referenced
24 exhibits and documents attached hereto, which I consider to be authentic and reliable. The
25 underlying facts and data within these sources are of a type reasonably relied upon by experts in
26 my field in reaching the types of conclusions set forth in this testimony.
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Stated under oath this 8th day of August, 2005, in Seattle, Washington.

Philip Dickey, Ph.D.

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¹ Trial Exhibit A4.

² Trial Exhibit A3.

³ Trial Exhibit A1.

⁴ Trial Exhibit A3.

⁵ Trial Exhibit A134.

⁶ Trial Exhibit A5.

⁷ Trial Exhibit A135.

⁸ Trial Exhibits A149, A150.

⁹ Trial Exhibit A154.

¹⁰ Trial Exhibit A134.

¹¹ Trial Exhibit A16 (US Army Corps of Engineers. Public Notice of Application for Permit. Reference 200301009. June 15, 2004).

¹² Trial Exhibit A1.

¹³ Trial Exhibit A2.

¹⁴ Trial Exhibit A81.

¹⁵ Trial Exhibit A80.

¹⁶ Trial Exhibit A150.

¹⁷ Trial Exhibit A3.

¹⁸ Trial Exhibit A150.

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