NIPPON PAPER INDUSTRIES USA

VIA E-Mail

January 18, 2012

Mr. Ted Sturdevant
Director, Washington Department of Ecology
PO Box 47600
Olympia, WA 98504-7600

RE: Nippon Paper comments on Ecology's "*Fish Consumption Rates Technical Support Document, A Review of Data and Information about Fish Consumption in Washington*," Publication No. 11-09-050

Dear Director Sturdevant:

FCR is complex and this will be a significant change in Washington. This TSD will become the basis for rulemaking in the Sediment Management Standards and in the Surface Water Quality Standards. Therefore we urge Ecology to be considerate and responsive to comments made on the TSD.

No doubt this will be a Significant Legislative Rule (SLR) (RCW 34.05.328) and require careful adherence to the elements necessary for promulgation of an SLR.

Technical Comments

1. Nippon endorses the comments submitted by NCASI dated January 11, 2012 on the FCR/TSD.

2. Inherent conservatism applied throughout risk models and methods used to determine sediment cleanup requirements and water quality standards make use of a high FCR unnecessary. See the report titled "Evaluation of the Fish Consumption Rate….." dated May 2003 by AMEC which is attached. The conservatism applied throughout the fish ingestion survey process and the ultimate human health risk analysis make selection of a FCR in the range of 157 to 267 grams per day (g/day) an excessive value for use in state wide cleanup decisions or water quality.

3. At many, if not all cleanup sites in Puget Sound, sediment PCB and dioxin concentrations would exceed cleanup criteria derived based on the current Model Toxics Control Act (MTCA) default fish consumption rate of 54 g/day. In fact, as noted by Jim West of Washington Department of

Fish and Wildlife in his presentation at Ecology's Technical Workshop on Fish Consumption, most Puget Sound fish included in the State monitoring program have PCB concentrations above a fish tissue PCB criterion based on even the 1980 AWQC fish consumption rate of 6.5 g/day (70% of English sole, 90% of coho, and 100% of Chinook and herring).[1] More than 50% of freshwater fish in the state would exceed such a criterion. Virtually all fish in State waters would exceed a PCB fish tissue criterion based on the current MTCA default fish consumption rate of 54 g/day and, by extension, virtually all sediments in State waters would exceed a PCB criterion based on the MTCA default fish consumption rate. Therefore, cleanup levels at these sites would default to background.

However, defining background for these chemicals provides a significant challenge to Ecology. This will require additional regional or site specific analyses that will be difficult and costly to perform. In addition, MTCA defines the site boundaries (WAC 173-204-560 (4)(b)(i)) to include those areas were the individual contaminants exceed the applicable sediment quality standards as defined in WAC 173-204-320 through 340. This includes chemical and biological criteria. If we establish background as the cleanup level for these chemicals then the definition of a site boundary becomes even more difficult.

A discussion should be provided in Chapter 7 regarding the impact that fish consumption rates have on the establishment of site cleanup criteria to background levels and the impact this has on developing site boundaries.

4. Chapter 3. Measures of Technical Feasibility, page 43.
   Ecology addresses in a general manner the technical appropriateness of the fish consumption studies it relied on. This section of the TSD topically addresses what elements go into a technically correct study but the TSD does not cite or describe any results of a thorough review (e.g. peer review) of high consumer fish consumption studies.

5. Chapter 4. Fish Consumption Survey Data
   This chapter identifies which studies Ecology believes provide a sound basis for establishing a new FCR. The studies should be provided in whole and with supporting data so that they are assessable to the public for review and analysis.

<u>Policy and Regulatory</u>

1. The application of a default FCR for the entire State of Washington in the range of 157 to 267 g/day is based on a small select group of high consumers. It is unlikely this high default value will serve to reduce actual contributing pollutant levels in sediments or fish tissue. Existing rules already drive sediment cleanups lower than is achievable in most cases because of the limits of

[1] Washington Department of Ecology technical workshop on fish consumption in Washington, December 12, 2011, University of Washington South Campus Center, Seattle.

technology, funding, and the high likelihood of recontamination due to stormwater runoff and a whole host of anthropogenic causes.

Higher FCR's should be applied where they are needed to protect actual consumers and on a case by case basis as is already enabled by current regulations. Applying a higher FCR state wide will likely produce numerous unachievable results that will serve no practical purpose for the regulated community or the agency. The long term goal already in place for improving Puget Sound and reducing contaminants will not be hurried along by setting this new FCR.

Any application of the revised FCR to water quality standards must be accompanied by a set of tools that allow dischargers to be in compliance. These tools should consider both the regulatory methods allowable by EPA as bona fide compliance pathways and the likely technical and economic methods available to treat discharges to extremely low levels. Without a clear path forward municipal and industrial dischargers will be out of compliance immediately because discharge levels of certain pollutants will be driven to near zero by the high FCR.

The TSD lacks a specific discussion on the potential changes to actual risk for state wide or high consumers because of the higher FCR. While the change in FCR may fulfill legal or policy objectives the *actual* risks presently experienced in the state due to fish consumption may not change for a very long time. Quantification of the *actual* risk change due to the proposed FCR should be addressed.

If current regulations are difficult to achieve will superimposing additional requirements result in any real improvement to water quality?[2] The questions begs an answer that deals with much broader efforts towards pollution reduction that involves infrastructure (stormwater control) and product toxics (pollutant input) requiring huge financial resources to achieve.

Sincerely,

Paul F. Perlwitz

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[2] Technical Support Document, page 110 "Water quality criteria based on human health provide long-term water-body based goals, and even current values are difficult to achieve."

Evaluation Of The Fish Consumption Rate Selected By Oregon DEQ For The Development Of Ambient Water Quality Criteria

Submitted to

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Evaluation Of The Fish Consumption Rate Selected By Oregon DEQ For The Development Of Ambient Water Quality Criteria

Oregon DEQ has proposed that a fish consumption rate of 17.5 g/day be used to establish Ambient Water Quality Criteria (AWQC) for Oregon's fresh waters. This consumption rate is an estimate of the 90th percentile per capita rate of consumption of freshwater and estuarine finfish and shellfish by the general population of United States, based on the USDA's CSFII data. It is recommended by EPA (2000) as a default fish consumption rate to represent the consumption of fish by the general population and sport anglers when deriving AWQC. Its selection as the basis for AWQC in Oregon is very conservative for several reasons. First, the data upon which it is based are not representative of the population of interest in that they include many types of prepackaged and imported fish that are not derived from local water bodies. Second, the use of short-term dietary recall data to estimate long term consumption rates for any population results in biased and high uncertain estimates. Finally, the conservatism in the selected fish consumption rate, along the numerous other conservative assumptions included in the derivation of the AWQC, ensures that the AWQC will be protective of high-end consumers.

Estimated Consumption Rates Based on USDA Data Are Highly Uncertain

Consumption rates that are based on USDA dietary data are highly conservative when applied to Oregon's AWQC methodology for a number of reasons. First, the data collected are not focused on the population of interest, i.e., individuals who consume freshwater fish from Oregon's ambient waters, and include many other types of fish. Second, the USDA rates, which are based on short-term dietary recall data collected from the general population of the U.S., overestimate long-term consumption for high-end consumers and underestimate it for "non-consumers", resulting in a high level of uncertainty in the estimates. However, available data can be used to evaluate the validity of the specific assumption of 17.5 g/day that is being proposed by DEQ.

Population of Interest for AWQC

The population of interest for the development of Oregon's AWQC are those individuals who consume freshwater fish obtained from Oregon's ambient waters. These include members of the general population of Oregon who purchase freshwater fish that has been obtained from commercial freshwater fishing sources in the state, sport anglers who catch their own fish, and Native American tribes who obtain fish through their commercial or recreational activities. The USDA data do not provide specific information about recreational or Native American populations. In addition, while EPA (2000) reports the results of USDA survey for consumers among the general population, it is not representative of all consumers within the population and does not provide information about freshwater fish only. Instead, results are presented for "freshwater/estuarine" fish and shellfish, which include many species and meals of fish that would not be found in the water bodies that will be subject to the AWQC. Furthermore, the USDA data include fish meals that are obtained from numerous sources. These include fresh, frozen and canned fish products that have been produced in other regions of the United States or imported from other countries and are not derived from local water bodies. Thus the USDA data overestimate the consumption of locally caught fish and certainly overstate consumption from individual water bodies that are regulated under the AWQC.

Limitations of the Use of Short-Term Dietary Data for the General Population

The USDA dietary data do not provide a strong basis for estimating a long-term fish consumption rate to be used in developing the AWQC because of the way that the data were collected. This is particularly problematic when one attempts to use them to estimate high-end consumption rates.

The USDA dietary data were collected from survey participants during two non-consecutive 24-hour periods (EPA, 2000). Because of the way in which sampling was conducted, the actual fish consumption behaviors reported are strongly biased toward those respondents who consume fish with a high frequency. All of the individuals included as fish consumers in the USDA estimate consumed fish at least once during the 2-day sampling period. To use these data to estimate long-term consumption rates, it is necessary to assume that the consumption behavior that occurred during the 2-day period is the same as the consumption behavior that occurs throughout every other 2-day period during the year. Thus, if an individual reported eating one fish meal during the sampling period, the extrapolation necessary to estimate long-term consumption requires the assumption that the individual continues to eat fish with a frequency of once every two days, or as many as 183 meals per year. If it is assumed that an individual eats one-half pound (227 g) of fish per meal, this results in a consumption rate of 114 g/day. However, the individual who consumed fish during that sampling period may not actually be a regular fish consumer. In fact, that fish meal could have been the only fish meal that the individual consumed in an entire year. Thus, that person's fish consumption rate would be substantially overestimated. Unfortunately, because of the way that the USDA data are collected, there is no way to determine if the behaviors reported by survey respondents during the sampling period are representative of their long-term behaviors. Thus, for the "consumers" in the population who were reported in these data, the reported consumption rates must have a minimum of one meal every two days.

Conversely, individuals who did not consume fish during the 2-day sampling period were assumed to be non-consumers of fish when instead those individuals may have been fish consumers who coincidentally did not consume fish during the 2-day sampling period. Because there are no data upon which to base consumption estimates for these individuals, they must be assumed to consume 0 g/day. However, they may in fact consume fish with a frequency ranging from as little as zero meals per year to as much as one meal per day (or even more than one meal per day) on all days except the two that USDA conducted the survey. As with the high consumers identified in the USDA database, there is no way to determine whether 0 g/day consumers are actually non-consumers or just individuals who consume with less frequency than once every two days.

To demonstrate the effect that length of sampling period can have on resulting fish consumption rates, one can compare the findings of other short-term dietary studies with long-term studies. For example, another USDA survey reported by Mertz and Kelsay (1984) asked 29 people to track the types and amounts of food they ate for a one-year period. Because the daily dietary records kept by the study subjects can be condensed into 52 discrete one-week periods, it is possible to investigate the relationship between annual and weekly average fish consumption rates. The mean yearlong fish consumption rate from the Mertz and Kelsey (1984) survey data can be estimated by summing the entire quantity of fish consumed by each survey respondent during the year and dividing by 365 days. The mean per capita "365-day" fish consumption rate developed using this approach is 26 g/day. In addition, the mean daily fish consumption rate

averaged over a one-week period, the "7-day" fish consumption rate, is estimated to be 26 g/day. Thus, the mean per capita consumption rate does not appear to be affected substantially by the recall period, suggesting that the per capita mean is a fairly robust and meaningful measure of the average consumption rate, regardless of the length of the survey period.

The same cannot be said, however, of the upper percentiles of the fish consumption rate distribution. When comparing the 7-day intake rates collected by Mertz and Kelsay (1984) with the 365-day intake rates, the upper percentiles are very different. For example, when looking at the 7-day intake rates, the maximum value reported is 228 g/day. However, when the 365-day averages are developed, by combining all of the 7-day periods throughout the year, the maximum consumption rate is 78 g/day. Thus, the short-term estimate overstates the actual long-term maximum by a factor of three. Similarly, when comparing the 95th percentiles reported for these two periods, the 7-day daily average (87.71 g/day) substantially overestimates the 365-day daily average (51.13 g/day) by 72 percent, again demonstrating that the 7-day recall period does not provide a reliable surrogate for long-term consumption behavior at the upper end of the distribution. It is very likely that extrapolating results from a 2-day sampling period would further overestimate long-term behavior.

This problem has also been demonstrated and discussed by Ebert et al. (1994) who compared reported rates of self-caught fish consumption based on the duration of the recall period. Ebert et al. reported that when a one-day recall period was used by Pierce et al. (1981) and Puffer et al. (1981), "high-end" (95th percentile) intakes ranged up to 339 g/day for consumers. When Pao et al. (1982) used a 3-day recall period, the 95th percentile intake for consumers was reported to be 128 g/day. Using a 30-day recall period, Javitz (1980) reported a 95th percentile intake of 42 g/day, and when a recall period of one year (365 days) was used (Fiore et al., 1989; Ebert et al., 1993), the 95th percentile estimates for sport-caught fish consumers ranged from 26 to 37 g/day.

EPA (1997; 1998a, p. 108) has acknowledged that short-term dietary records are problematic when attempting to estimate long-term rates of consumption. In its review of fish consumption studies for the *Exposure Factors Handbook*, EPA (1997, p. 10-13) stated, "the distribution of average daily intake reflective of long-term consumption patterns cannot in general be estimated using short-term (e.g., one week) data." Specifically in its discussion of the limitations of the West et al. (1993) study of Michigan sport anglers, which used a one-week recall period, EPA (1997 pp. 10-16 to 10-17) stated that "since this survey only measured fish consumption over a short (one week) interval, the resulting distribution will not be indicative of the long-term fish consumption distribution and the upper percentiles reported from the EPA analysis will likely considerably overestimate the corresponding long term percentiles. The overall 95th percentile calculated by U.S. EPA (1995) was 77.9; this as about double the 95th percentile estimated using year long consumption data from the 1989 Michigan survey." In addition, when discussing the USDA methodology, EPA (1998a, p. 106-107) stated that "[t]he non-consumption of finfish or shellfish by a majority of individuals, combined with consumption data from high-end consumers, resulted in a wide range of observed fish consumption. This range of fish consumption data would tend to produce distributions of fish consumption with larger variances than would be associated with a longer survey period, such as 30 days."

While the USDA data are associated with a high level of uncertainty due to the substantial biases introduced by the use of short-term dietary data, the evaluation of the work by Mertz and Kelsey, indicates that the arithmetic mean "per capita" estimate of 17.5 g/day, being proposed

by DEQ, is a conservative but supportable estimate of consumption by the target population. In addition, a review of longer term and more relevant data indicates that the proposed rate of 17.5 g/day is reasonable for use in developing Oregon's AWQC.

In the results provided by Rupp et al., average consumption rates over the entire population were provided along with the numbers of surveyed individuals who actually consumed each type of fish in each region. According to Rupp et al. (1980), a total of 2,141 adults were surveyed in the Pacific region, which includes Washington, Oregon, California, Alaska and Hawaii. The surveyed individuals consumed an average of 0.39 kg/year of freshwater finfish over the year. Of those, 14.1 percent (300 individuals) were "consumers" of these fish. Considering the total population surveyed, it appears that 835 kg of freshwater finfish were consumed (2,141 persons x 0.39 kg/person-year = 835 kg/year). If this total amount of fish consumed is divided equally among the 300 individuals who actually consumed the fish, the result is an average of 2.8 kg of fish per consumer per year. On an annualized daily basis, this equates to an average of 7.6 g/day for each consumer. Similarly, the average rate of shellfish consumption by those 2,141 persons was 1.48 kg/year, for a total of 3,169 kg/year. Of the individuals surveyed, 49.2 percent were consumers. Dividing the total amount of shellfish consumed by the number of actual consumers results in an average daily fish consumption rate of 3.0 kg/year or 8.2 g/day. Combining the average finfish and shellfish consumption rates results in a combined consumption rate of 15.8 g/day. Because of the length of the recall period (1-month), these estimates can be considered more reliable than rates based on the USDA data. In addition, this estimate is more relevant to one of the populations of interest in Oregon (i.e., freshwater fish consumers within the general population of the state). These results indicate that the 17.5 g/day estimate proposed by DEQ is a reasonable surrogate.

EPA's (2000) methodology for the development of AWQC recommends that, when available, consumption rates for populations of concern should be drawn from local or regional survey data. Given that sport anglers are one group of fish consumers that are most likely to consume a large portion of their fish from a single watershed, it is appropriate to select a fish consumption rate that is protective of this subpopulation.

EPA's (1998a) Technical Support Document for AWQC derivation provides a summary of fish intake rates by sport anglers from different regions of the country. Among those there were two studies of Columbia River anglers in Washington State. Average consumption rates for these two studies ranged from 1.8 to 7.7 g/day.

After its review of the available sport-caught fish consumption data, EPA (1997) recommended fish consumption rates for freshwater recreational anglers. The average consumption rates recommended 5 g/day, based on both the Ebert et al. (1992) and Connelly et al. (1996) studies, 12 g/day (West et al., 1989) and 17 g/day (West et al., 1993). The upper percentiles recommended were 13 g/day (a 95th percentile based on a one-year recall survey by Ebert et al. 1993), 18 g/day (a 95th percentile based on a one year recall survey by Connelly et al., 1996) and 39 g/day (a 96th percentile based on a one-week survey conducted by West et al., 1989, which was extrapolated to long-term consumption using general questions about consumption during the remainder of the year). No upper percentile value was reported for the West et al. (1993) study because EPA (1997) recognized that the upper percentile value was unreliable and likely overstated due to the short length of the recall period, as discussed previously. It is likely that the rates reported by Ebert et al. (1993) and Connelly et al. (1996) are more reliable estimates of long-term consumption as they are based on long-term data. In addition, the West

et al. (1989) estimate included fish from commercial as well as recreational sources. According to West et al. (1989), 39 percent of the fish consumed by Michigan anglers were sport-caught fish. If one applies this percentage to the mean and 96th percentile of the West et al. study, the results are 5 g/day and 15 g/day, respectively, for consumption of sport-caught fish only. These results are very consistent with the rates reported for recreationally-caught fish by Ebert et al. (1993) and Connelly et al. (1996) and also support DEQ's proposed conservative default value of 17.5 g/day..

Use of the 17.5 g/day Consumption Rate, Along with Other Conservative Assumptions, Results in Highly Protective AWQC

AWQC are used as environmental benchmarks and as objectives in the development of environmental permits. While they are applicable to all ambient waters in Oregon, they are most often considered for individual water bodies when Oregon DEQ is developing permitting and effluent limits. Thus assumptions that are already judged and selected to be conservative when one is attempting to develop statewide criteria, become extremely conservative when considering individual water bodies.

In light of the way in which AWQC are applied in permitting, the approach used to develop AWQC includes a number of highly conservative assumptions, particularly for constituents that are limited and localized. The conservative assumptions used in the development of AWQC in Oregon include:

- The fish consumption rates include the combined consumption of freshwater and estuarine fish and shellfish;
- 100 percent of the fish consumed are assumed to be from a single water body;
- Fish are consumed by individuals every year for 70 years;
- No loss of compounds occurs due to cooking or preparation methods;
- Concentrations of compounds in fish are in equilibrium with compound concentrations in the water body; and,
- The allowable risk level is one in one million (10^{-6}).

Inclusion of Freshwater and Estuarine Fish and Shellfish

In developing AWQC, the fish consumption rates that are used include the ingestion of freshwater and estuarine finfish and shellfish. This is because AWQC need to be applied to a number of different types of water bodies throughout the state. However, this assumption is very conservative when one considers permitting of individual discharges that occur in specific areas of individual water bodies and usually affect either freshwater or estuarine areas, not both. If there is a permitted discharge to a freshwater body, the consumption of estuarine fish and shellfish is likely to be irrelevant. Similarly, if there is a discharge to an estuarine area, the freshwater fish upstream will likely not be affected. Thus, inclusion of rates of consumption of freshwater and estuarine finfish and shellfish is a very conservative assumption for these specific applications.

As discussed previously, the Rupp et al. (1980) analysis of fish consumption in the Pacific region indicated that the average rate of shellfish consumption by consumers was 8.2 g/day and the average rate of freshwater fish consumption by consumers was 7.6 g/day. Thus, when considering the application of AWQC to freshwater bodies, where shellfish are not likely to be

consumed, consumption will be overestimated by more than a factor of two when a combined consumption rate is used.

Assumption that 100 Percent of Fish Are From a Single Water Body

When the AWQC are applied for permitting, it is implicitly assumed that all fish are consumed from a single water body. This is a very conservative assumption for most of the water bodies that receive discharges.

In all of the key studies of recreational anglers discussed by EPA (1997), the consumption rates represented the total amount of sport-caught fish consumed by the survey respondents. The fish were obtained from a number of fisheries and thus generally overestimated consumption from single water bodies. The approach used to develop the AWQC assumes that the vast majority of the population consumes all of their fish from a single source. This is not likely to be the case for most water bodies.

Assumption of Equilibrium

The AWQC approach uses a factor for bioaccumulation. That factor assumes that the concentrations of constituents in fish are in equilibrium with constituent concentrations in the water body of interest. This is not likely to be the case for the most popular fish species harvested. According to the CRITFC (1994), the species of fish consumed most often by Columbia River tribal members were anadromous species (salmon, trout, lamprey and smelt), with the average rate of consumption for anadromous species nearly three times higher than the rates of consumption of resident species. Most anadromous species spend only a small fraction of their lifetime in the Columbia River. For example, after hatching, juvenile Chinook salmon spend several months in the river before they begin their out-migration to marine feeding areas. They generally return to the river to spawn between the ages of two and six years (ODFW, 1989) and do not generally feed during their spawning run. Thus these fish, which provide a substantial portion of the freshwater fish harvested both commercially and recreationally from the river, are clearly not at equilibrium with their surroundings. These migratory fish can spend much of their time in portions of the river not affected by discharges and only "pass through" river reaches that have discharges and associated higher concentrations of regulated compounds. Because of this exposure to varying concentrations of regulated compounds, migrating fish likely do not spend adequate time in a particular reach to achieve equilibrium with concentrations in the water column and, hence, have lower concentrations of a regulated compound than assumed by the AWQC. Thus, the AWQC likely overestimates the resulting tissue concentrations in such fish.

Duration of Consumption

The AWQC calculation assumes that individuals consume fish from a single source every year of their lives for 70 years. This assumption is highly conservative. Individuals are likely to move many times during their lifetimes and, as a result of those moves, may change their fishing locations and thus the sources of the fish they consume. In addition, it is likely that most anglers will not fish every year of their lives. Health issues and other demands, like work and family obligations, will likely result in no fishing activities or reduced fishing activities during certain periods of time that they live in a given area. Thus, to assume that an individual

consumes all fish from a single water body, every year throughout his/her lifetime is certainly a conservative and protective assumption that adds an additional level of protection to the AWQC.

Cooking and Preparation Loss

The AWQC does not account for the fact that levels of many contaminants, especially the lipophilic constituents like PCBs and dioxins and furans, are substantially reduced when individuals prepare and cook their fish. Thus for these constituents, the assumption that there is no loss due to cooking and preparation provides an additional level of protection to the AWQC.

Risk Level

In the EPA (2000, p. 2-6) methodology document, it is clear that the States and Tribes have the discretion to establish risk levels and to consider subpopulations of interest and concern. It states that "EPA believes that both 10^{-6} and 10^{-5} may be acceptable for the general population and that highly exposed populations should not exceed a 10^{-4} risk level." It goes on to say that "if the State or Tribe determines that a highly exposed population is at greater risk and would not be adequately protected by criteria based on the general population and by the national 304(a) criteria in particular, EPA recommends that the State or Tribe adopt more stringent criteria using alternative exposure assumptions" (EPA, 2000; p. 2-2). Furthermore, it states that "[I]n cases where fish consumption among highly exposed population groups is of a magnitude that a 10^{-4} risk level would be exceeded, a more protective risk level should be chosen." (EPA, 2000; p. 2-6)

Oregon DEQ is planning to use a one in a 10^{-6} risk level as the basis for the AWQC. This is at the conservative end of EPA's (2000) recommended risk range of 10^{-5} to 10^{-6} for the general population. Also discussed in the methodology document is the fact that subpopulations of concern should not be at a risk greater than 10^{-4}. If a 10^{-4} risk level is used to evaluate potential sensitive subpopulations, then these individuals could consume 100 times more fish than the general population of the state (which is being evaluated using a 10^{-6} risk level) and still be within acceptable exposure levels.

Oregon DEQ has proposed the use of a consumption rate of 17.5 g/day to protect the general population of Oregon and its recreational anglers. Higher-level consumers could consume 100 times that amount, or 1,750 g/day every day and still not exceed the benchmark level of 10^{-4} established by EPA (2000) for high consuming subpopulations.

According to data collected by the Columbia River Intertribal Fish Commission (CRITFC, 1994), the average rate of consumption for the Columbia River tribes was 58.7 g/day and the 95th percentile consumption rate was 170 g/day (EPA, 1997). This is well below the allowable consumption rate of 1,750 g/day associated with the 10^{-4} risk level, as discussed above, and is also below the consumption rate associated with the 10^{-5} risk level. Even if the maximum value reported from the CRITFC (1994) survey, 972 g/day, is considered, risks will still be well below the benchmark of 10^{-4} that has been recommended by EPA (2000) for highly exposed subpopulations.

The CRITFC (1994) data are consistent with other data for subsistence populations. In Table 2.3.9 of its *Ambient Water Quality Criteria Derivation Methodology Human Health Technical Support Document* (EPA, 1998a), EPA summarizes seven studies of subsistence

populations (Kmiecik, 1994; CRITFC, 1994; Degner et al., 1994; Hovinga, 1992-1993; EPA, 1992; Peterson et al., 1995; and Nobmann et al., 1992). While EPA (1998a) reported that the mean fish intake rates reported for those studies ranged from 23 to 351 g/day, the highest value, which was reported by Kmiecik (1994), was based on a personal communication, not a published or peer-reviewed study. Thus the methodology behind it and its reliability as an estimate of consumption cannot be established. (It should be noted that when EPA reviewed subsistence studies for its 1997 *Exposure Factors Handbook*, this study was not included.) If one eliminates the mean consumption rate presented by Kmiecik (1994), the range of mean intake rates from the six remaining studies is 23 to 109 g/day, with an average of 56 g/day. This is very similar to the average rate of 58.7 g/day reported by CRITFC (1994) for all tribal members surveyed.

This indicates that the use of a default fish consumption rate of 17.5 g/day, as is being proposed by Oregon DEQ, is also protective of the Columbia River tribes. The 95th percentile consumption rate reported by CRITFC for that population is approximately associated with a risk level of 10^{-5} and thus falls at about the mid-point of the EPA's acceptable risk range. Based on EPA's (1998a) evaluation of other studies of subsistence populations, this consumption rate also appears to be protective of any other potential subsistence populations that may be consuming fish from Oregon waters.

Summary and Recommendation

Oregon DEQ is proposing to revise its AWQC using a fish consumption rate of 17.5 g/day, based on USDA short-term dietary data. While a high level of uncertainty is associated with these data, the selected consumption rate appears to be a reasonable and conservative default when compared with other relevant consumption data.

Use of this consumption rate for the general and recreational population is very conservative when the AWQC is applied to the permitting of discharge limits. The AWQC approach is based on a 10^{-6} risk level, which is very protective of the entire state of Oregon and is likely to be overly protective of the much smaller populations that obtain fish from individual water bodies. In addition, the approach assumes that all freshwater finfish and shellfish consumed throughout a lifetime are obtained from a single water body and that there is no reduction of contaminant levels due to cooking and preparation methods. There are a very small number of individuals, if any, to whom such conservative assumptions would apply.

EPA (2000) has based its national AWQC on a 10^{-6} risk level. It also supports use of a 10^{-5} risk level when States or Tribes are establishing AWQC. EPA (2000) "also believes that criteria based on a 10^{-5} risk level are acceptable for the general population as long as States and Authorized Tribes ensure that the risk to more highly exposed subgroups (sport or subsistence anglers) does not exceed the 10^{-4} level." (EPA 2000; p. 1-12) Thus, the critical issue to consider is whether the use of a consumption rate of 17.5 g/day for the general population of Oregon is also protective for subpopulations of high consumers.

Based on EPA's recommended risk range and available fish consumption data, this consumption rate is also protective of recreational anglers and the Columbia River tribes. The proposed rate of 17.5 g/day (at a 10^{-6} risk level) can be increased by 100 times, to a rate of 1,750 g/day and still be within EPA's acceptable risk limit of 10^{-4}. Local and regional fish consumption data indicate that this consumption rate is substantially higher than even the

maximum fish consumption rate reported for the Native American population (CRITFC, 1994) and is also higher than the rates reported for other fish consuming subpopulations. Thus, an AWQC based on a consumption rate of 17.5 g/day is protective of the general population, recreational anglers, and the Native American population within the state, and falls well within EPA's guidelines for acceptable risk levels.

References

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