United States
Environmental Protection Agency
Region 10
1200 Sixth Avenue
Seattle, Washington 98101

TOTAL MAXIMUM DAILY LOADING (TMDL) TO LIMIT DISCHARGES OF 2,3,7,8-TCDD (DIOXIN) TO THE COLUMBIA RIVER BASIN

In compliance with the provisions of the Clean Water Act, 33 U.S.C. §1251 et seq., as amended by the Water Quality Act of 1987, P.L. 100-4, the Environmental Protection Agency is hereby establishing a TMDL to limit discharges of dioxin to the Columbia River basin.

This TMDL shall become effective immediately, and is incorporated into the water quality management plans for the states of Washington, Oregon, and Idaho under Clean Water Act §303(e). Subsequent state actions must be consistent with this TMDL.

Signed this 25th day of February, 1991.

Dana A. Rasmussen
Regional Administrator, Region 10
U.S. Environmental Protection Agency

TOTAL MAXIMUM DAILY LOAD (TMDL)
FOR 2,3,7,8-TCDD
IN THE COLUMBIA RIVER BASIN

Decision Document
February 25, 1991

Developed pursuant to the provisions of the Clean Water Act, 33 U.S.C. s 1251, *et seq*, as amended by the Water Quality Act of 1987, P.L. 100-4.

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Decision Document

1. SCOPE

This total maximum daily load (TMDL) addresses the following segments, pollutants, and source categories:

WATER QUALITY-LIMITED SEGMENTS:

RIVER SEGMENT		APPLICABLE WATER QUALITY RULES:[1]
Columbia River	(RM 0 - 745)	WAC 173-201-047 [2]
" "	(RM 0 - 309)	WAC 173-201-080(19) [3]
" "	(RM 309 - 596)	WAC 173-201-080(20) [3]
" "	(RM 596 - 745)	WAC 173-201-080(21) [3]
" "	(RM 0 - 86)	OAR 340-41-202 & 205(2)(p) [4,5]
" "	(RM 86 - 120)	OAR 340-41-442 & 445(2)(p) [4,5]
" "	(RM 120 - 147)	OAR 340-41-482 & 485(2)(p) [4,5]
" "	(RM 147 - 203)	OAR 340-41-522 & 525(2)(p) [4,5]
" "	(RM 203 - 218)	OAR 340-41-562 & 565(2)(p) [4,5]
" "	(RM 218 - 247)	OAR 340-41-602 & 605(2)(p) [4,5]
" "	(RM 247 - 309)	OAR 340-41-642 & 645(2)(p) [4,5]
Snake River	(RM 0 - 176)	WAC 173-201-047 [2]
" "	(RM 0 - 176)	WAC 173-201-080(97) [3]
" "		IDAPA 16.01.2120 & .2200 [6,7]
Willamette River	(RM 0 - 187)	OAR 340-41-442 & 445(2)(p) [4,5]

[1] In addition to the following, all waste load allocations and permit limits must ensure compliance with applicable water quality standards of downstream states [40 CFR §122.4(d)].
[2] WAC 173-201-047 describes Washington's applicable criteria for toxic substances.
[3] WAC 173-201-080 describes Washington's classification for specific waterbodies.
[4] OAR 340-41-xx2 describes beneficial uses designated by Oregon.
[5] OAR 340-41-xx5(2)(p) describes Oregon's applicable criteria for toxic substances.
[6] IDAPA 16.01.2120 describes the designated uses for the confluence of the Clearwater and Snake River in Idaho.
[7] IDAPA 16.01.2200 describes Idaho's criteria for hazardous and deleterious materials.

POLLUTANT CAUSING EXCEEDANCE OF WQ STANDARDS:

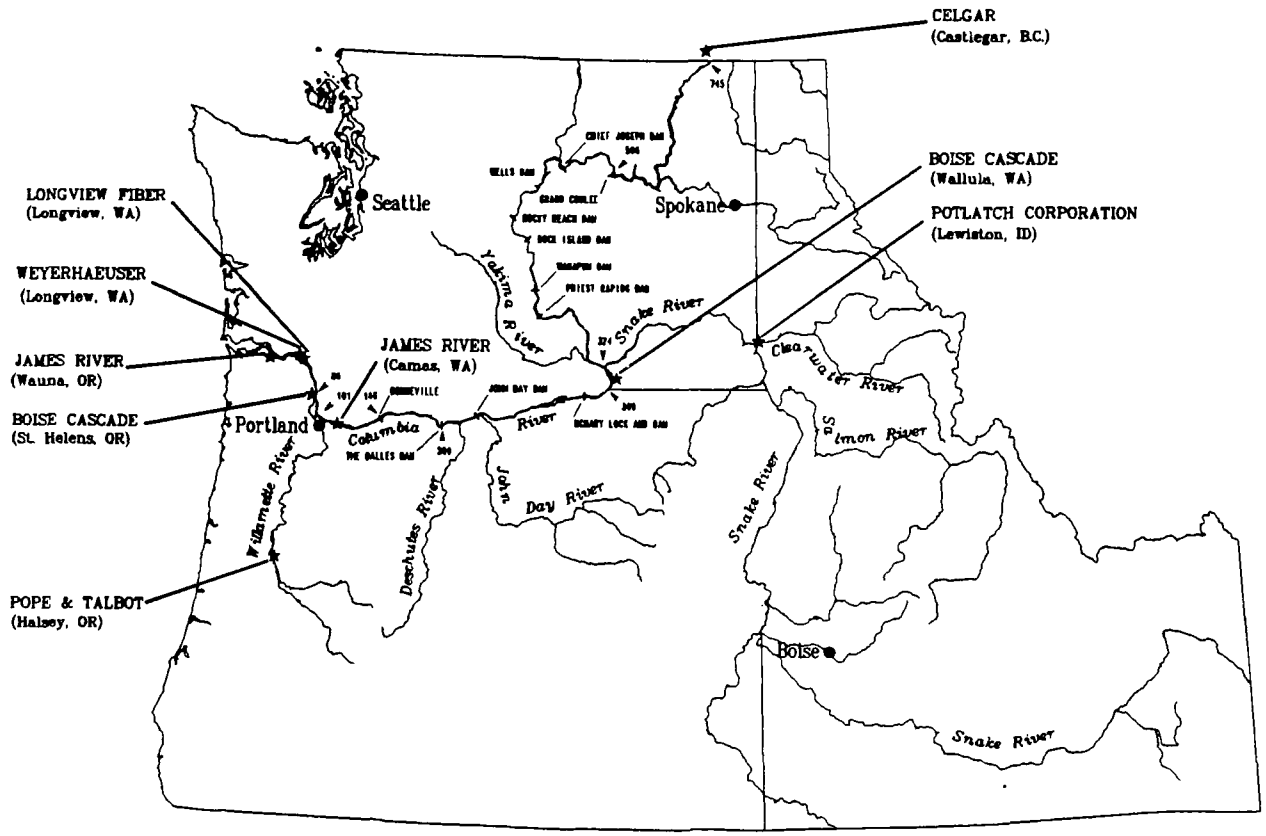
2,3,7,8 - tetrachlorodibenzo-para-dioxin (2,3,7,8-TCDD)

SOURCE CATEGORIES CONSIDERED:

Source Category	Allocation Type	Source Description
1	WLA [1]	Pulp & Paper Mills -- Chlorine Bleaching
2	Reserved	All Other Sources:

- Pulp & Paper Mills -- Non-Chlorine Bleaching
- Woodtreaters Using Pentachlorophenol
- Municipal Wastewater Treatment Facilities
- Canadian Sources
- Other Point Sources
- Port Activities
- Urban Areas
- Other Nonpoint Source
- Background

Figure 1-1. Columbia River Basin.



[1] WLA = waste load allocation

2. NEED FOR A TMDL

A. Overview

The Columbia River and segments of the Snake and Willamette Rivers are currently water quality-limited due to the presence of excessive levels of 2,3,7,8-TCDD. This pollutant is the most toxic of a group of compounds known as polychlorinated dibenzo-para-dioxins (dioxin). The concern over dioxin levels in the Columbia River is based on data describing concentrations of 2,3,7,8-TCDD in effluents and treatment plant sludges at chlorine-bleaching pulp mills as well as in fish tissue below these mills.

Section 303(d)(1)(C) of the Clean Water Act (CWA) and EPA's implementing regulations (40 CFR Part 130) require each state to identify waters for which existing required pollution controls are not stringent enough to attain applicable water quality standards. For these water quality-limited segments, each state is then to establish total maximum daily loads (TMDLs) for appropriate pollutants of concern. By definition (40 CFR, § 130.2), a TMDL is the sum of the individual waste load allocations (WLAs) for point sources and load allocations (LAs) for nonpoint sources and natural background. The CWA states that the TMDL:

> *"shall be established at a level necessary to implement the applicable water quality standards with seasonal variations and a margin of safety which takes into account any lack of knowledge concerning the relationship between effluent limitations and water quality."*

Thus, the TMDL is effectively an implementation plan for achieving water quality standards using an appropriate margin of safety. A margin of safety may be provided (1) by using conservative assumptions in the calculation of the loading capacity of the waterbody and (2) by establishing allocations that in total are lower than the defined loading capacity. The water quality standard being protected by this TMDL is 0.013 parts per quadrillion (ppq) 2,3,7,8-TCDD in the water (see Appendix A).

The national focus on toxics discharges as evidenced in the 1987 amendment to Section 304 of the CWA, 33 U.S.C. § 1314(l), gives additional urgency to the establishment this TMDL. Congress intended § 304(l) to focus state water quality protection programs on immediately addressing water quality problems due to point source discharges of toxic pollutants. States are required to develop lists of impaired waters, identify point sources and amounts of toxic pollutants they discharge,and to develop individual control strategies (ICSs) for each such point source. An ICS may be a draft or a final National Pollutant Discharge Elimination System (NPDES) permit. The § 304(l) lists developed for Washington, Oregon, and Idaho have identified dioxin levels in the Columbia, Snake, and Willamette Rivers as exceeding applicable water quality standards. Limits included in ICS's, developed under § 304(l), must be consistent with waste load allocations (WLAs) where a TMDL has been established.

B. The Concern

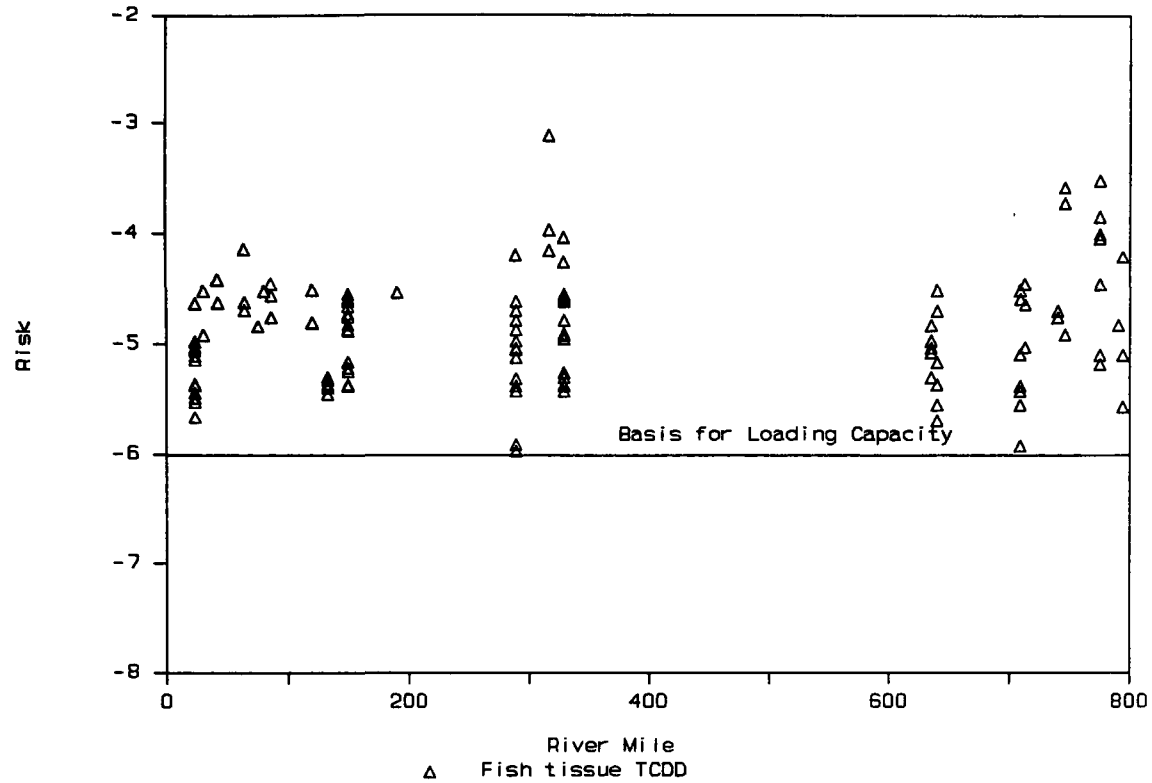
Dioxins are produced as a result of human activities, such as the manufacture of chlorinated herbicides, the combustion of domestic and industrial wastes, and the production of chlorine-bleached wood pulp. Both water column concentrations of dioxin in the Columbia River and the water quality standard for 2,3,7,8-TCDD are below levels which can be measured with current analytical technology. However, because some organisms, such as fish, accumulate dioxin in their bodies, 2,3,7,8-TCDD has been found at detectable levels in the tissue of fish taken from the Columbia River basin. As discussed below, these tissue levels are of concern and indicate that these waters exceed state water quality standards.

The state water quality standard applicable to 2,3,7,8-TCDD in the Columbia River basin has been determined to be 0.013 ppq (see Appendix A). The EPA criterion on which this standard is based was derived from human health concerns resulting primarily from consumption of contaminated fish. In establishing EPA's 1984 2,3,7,8-TCDD criterion values, the following factors were developed and used: a bioconcentration factor (this relates the concentration in fish tissue to the concentration in the water in which the fish lives), fish consumption rates, and a cancer potency factor. These factors relate water column concentrations to fish tissue concentration and cancer risk. A fish tissue concentration of 0.07 ppt and a water concentration of 0.013 ppq (the applicable water quality standard) are both estimated to result in a life-time cancer risk of 10^{-6} (one excess cancer per one million people).

In 1987, EPA initiated a National Bioaccumulation Study (NBS) designed to gather screening information on the prevalence and concentrations of selected toxic compounds in fish tissue and other aquatic organisms. This study was conducted on a broad scale across the United States and included testing for 2,3,7,8-TCDD. Sampling sites included relatively undisturbed background areas, streams below industrial, agricultural, and urban activities, and segments below mills using chlorine to bleach pulp. The NBS identified concerns related to chlorine-bleaching kraft pulp mills. Fish samples collected at several locations below chlorine-bleaching pulp mills on the Columbia River within EPA Region 10 (from the Canadian border to the mouth) have shown detectable concentrations of 2,3,7,8-TCDD. Another EPA study, the "104 Mill Study" (1988), subsequently confirmed, through testing of effluents and sludges, that chlorine-bleaching pulp mills are a significant source of 2,3,7,8-TCDD.

Figure 2-1 displays estimates of risk of excess cancer resulting from consumption of fish at various locations along the length of the river. The risk estimates were obtained by applying the fish consumption and cancer potency factors used in developing the EPA criterion for 2,3,7,8-TCDD to fish tissue concentrations actually measured. Fish tissue data used came from EPA's National Bioaccumulation Study (1987), the Northwest Pulp & Paper Associations's Columbia River Fish Study (Beak Consultants, 1989), the Washington Department of Ecology's work on Lake Roosevelt (1989-1990), and from efforts in Canada. The resulting risk estimates (Figure 2-1) are consistently higher than the 10^{-6} level, confirming that the water quality standard and, therefore, the loading capacity of the system, are being exceeded. This is consistent with, and supported by, predicted water column concentrations of 2,3,7,8-TCDD (based on in-stream dilution of pulp mill discharges as measured in the 104 Mill Study) which also exceed the water quality standard.

Figure 2-1. Columbia River Fish Tissue Data



C. Water Quality-limited Status

Oregon has identified the Columbia River (river miles 0 - 309) and the Willamette River (RM 0 - 187) as being water quality-limited for 2,3,7,8-TCDD. Washington has similarly identified the Columbia and Snake Rivers within that state as being water quality-limited for 2,3,7,8-TCDD. The state of Idaho has also identified the confluence of the Clearwater and Snake Rivers as being water quality-limited for 2,3,7,8-TCDD. On June 14, 1990, EPA approved these listings pursuant to CWA Section 303(d).

On March 21, 1990 the states of Oregon, Washington, and Idaho stated that they would not adopt a TMDL for dioxin in the Columbia River as state actions but rather requested that EPA establish this TMDL as a federal action. The states acknowledged that while the development of a TMDL has been a cooperative effort, the interstate nature of the Columbia River Basin and the desirability of consistency and equity in regulating dischargers in this basin necessitated that the TMDL be a federal action. Therefore, on June 14, 1990, pursuant to Section 303(d), EPA formally disapproved the expressed intent of Washington, Oregon, and Idaho to not submit TMDLs and, subsequently, developed this final TMDL for dioxin discharges to the Columbia River basin as a federal action.

This TMDL provides a framework to control 2,3,7,8-TCDD discharges to the Columbia River Basin and achieve compliance with water quality standards. The following sections of the decision document describe the established TMDL and the process used to develop it.

3. DEVELOPMENT OF THE TMDL

A. Overview

Development of a TMDL provides a process for weighing the needs of competing activities which affect water quality in a watershed and creating an integrated pollution control strategy for point and nonpoint sources. This process allows regulatory agencies to take a holistic view of water quality problems from the perspective of in-stream conditions.

The total load of a pollutant to a waterbody is attributable to point sources, nonpoint sources, and natural background. The TMDL process distributes portions of the stream's loading capacity to the various sources, including background conditions, in a way that will achieve water quality standards. The level of refinement reflected in actual allocations depends on the amount of available data. The Water Quality Management Regulations [40 CFR, s 130.2] state, for example, that:

> *"Load allocations are best estimates of the loading, which may range from reasonably accurate estimates to gross allotments, depending on the availability of data and appropriate techniques for predicting the loading."*

As previously pointed out, Section 303(d) states that a margin of safety should be used which takes into account any lack of knowledge concerning the relationship between effluent limitations and water quality. Thus, the law indicates that the TMDL process should move forward using available information. As new information becomes available in the future, the TMDL can be refined.

B. Process

The TMDL identifies the amount of a pollutant that may be discharged to a water quality-limited stream. TMDLs can be expressed in terms of either chemical mass per time, toxicity, or other appropriate measure. The TMDL for a particular waterbody is dependent on such factors as the location of sources, stream flow, water quality standards, background conditions, and in-stream pollutant reactions. The process of developing and implementing a TMDL for 2,3,7,8-TCDD in the Columbia River basin consists of several steps:

- **define the loading capacity** of the river at key points
- **identify sources** which potentially contribute loads of 2,3,7,8-TCDD
- **allocate loads** to point sources, nonpoint sources (NPS), and background
- **implement** the TMDL through Water Quality Management Plans and NPDES permits

C. Loading Capacity

WLAs and LAs represent the allocated portions of a receiving water's **loading capacity**. The loading capacity is the greatest amount of pollutant loading that the river can receive without violating water quality standards. A TMDL must not exceed the loading capacity of a waterbody.

Two fundamental issues must be determined at the outset when establishing a TMDL. These are (1) the definition of upstream and downstream boundaries of the waterbody for which the TMDL is being determined and (2) the flow conditions (design flow) appropriate for calculating the loading capacity or amount of pollutant which can be assimilated. Having defined the extent of the waterbody and the appropriate flow conditions, the loading capacity is calculated to achieve the applicable water quality standard (see Appendix A for discussion of applicable standards for dioxin and river flow rates occurring in the Columbia River Basin).

A loading capacity of approximately 6 mg of 2,3,7,8-TCDD per day has been calculated for the Columbia River at its mouth.

D. Sources

The Columbia River is over 1200 miles long and drains an area of about 259,000 square miles. Land use and terrain in the basin are diverse. General activities affecting water quality in the basin include areas of urban development, industry, agriculture, and forestry. In terms of 2,3,7,8-TCDD, chlorine bleaching pulp mills have been identified as a major source based on their effluent and sludge data.

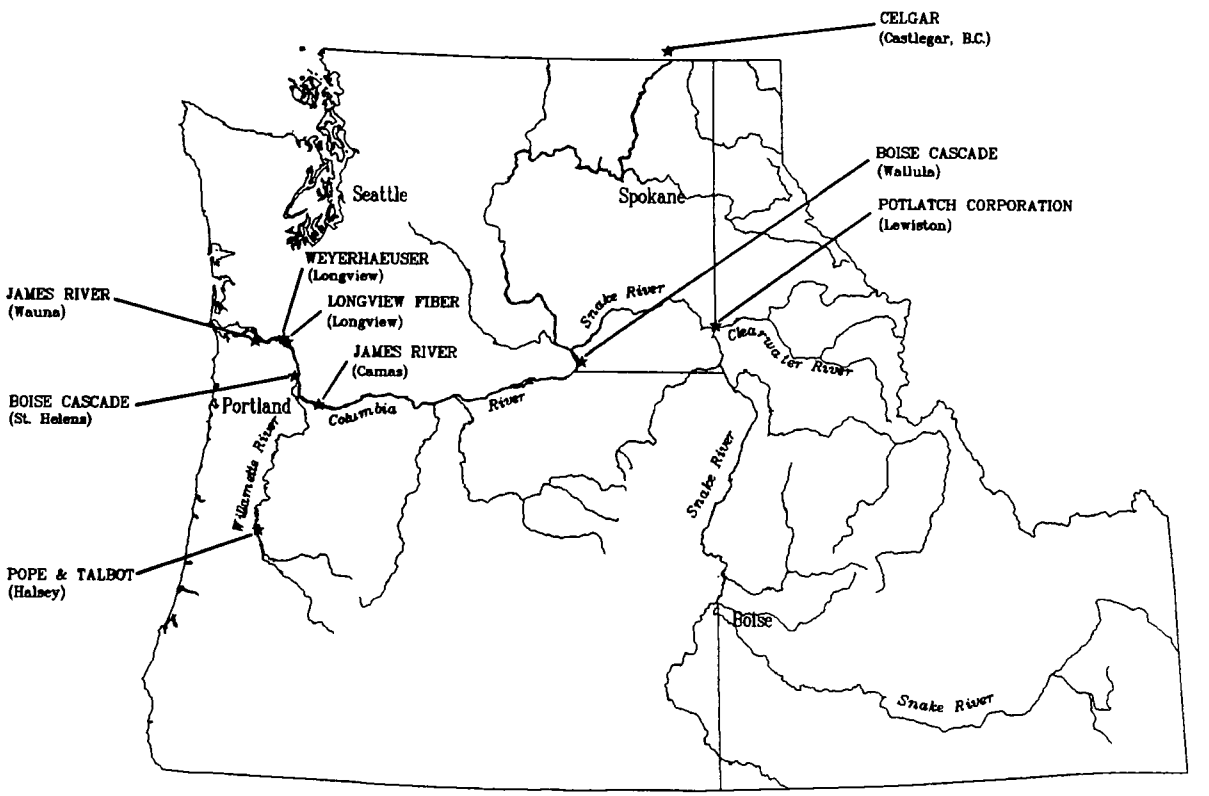
Within EPA Region 10, eight chlorine-bleaching pulp mills currently discharge to the Columbia River system. These mills, one in Idaho, four in Washington, and three in Oregon, are shown in Figure 3-1. The eight mills currently produce over 7,000 tons per day of bleached pulp. Another chlorine-bleaching pulp mill which discharges to the Columbia River is located near Castlegar, British Columbia, about 30 miles above the U.S. - Canadian border. Known sources of 2,3,7,8-TCDD are thus affecting the Columbia River within EPA Region 10, from the mouth near Astoria, Oregon to the Canadian border (river mile 745) and the Snake and Willamette Rivers, major drainages within the Columbia River system. Consequently, the entire Columbia River basin, including the Snake and Willamette Rivers, are included in the TMDL. Tributaries outside of EPA Region 10, such as the Clark Fork in Montana, have also been considered in developing the TMDL.

Besides chlorine bleaching pulp mills, other potential source categories include woodtreaters using pentachlorophenol, major municipal wastewater treatment plants, agricultural areas, industrial sites, urban areas, and release from bottom sediments. Data on dioxin discharges from these sources, however, are minimal or nonexistent for the following reasons:

- Concern over the extent of dioxin pollution is relatively recent.
- Many of the point sources have been considered minor dischargers in the past and had minimal monitoring requirements.
- It is difficult to characterize loadings from stormwater or nonpoint sources. These inputs are not continuous and are generally driven by weather related events such as rain storms or snow melt.
- There are analytical obstacles associated with measuring 2,3,7,8-TCDD. The water quality standard of 0.013 parts per quadrillion (ppq) is several orders of magnitude below a typical detection limit of 10 ppq for water column measurements.

The available data are not adequate to develop WLAs or LAs for these sources. However, current loadings for some of these other dioxin sources of concern in the Columbia basin are estimated in Appendix B and summarized later in the following section.

Figure 3-1. Location of Chlorine-Bleaching Pulp Mills in the Columbia River Basin



E. Allocation of Loads

Having identified major sources of 2,3,7,8-TCDD to the Columbia River basin, the TMDL must establish allocations sufficient to control discharges within the loading capacity. These allocations are made considering technical, socioeconomic, and institutional constraints. Historically, individual states have used various allocation schemes on a case-by-case basis or specified that a particular method be used. Technical guidance has been prepared which describes 19 potential approaches for allocation of loads ("Technical Guidance Manual for Performing Waste Load Allocations", U.S. Environmental Protection Agency, 1986). When evaluating various methods, conditions that favor one approach over another must be considered.

With respect to this TMDL there are some potential problems in using the more common methods described in the technical guidance:

- The geographic scale associated with the Columbia Basin and the number of potential sources is considerably larger than the scale typically encountered in most TMDL situations.
- Common methods focus on waste load allocations for point sources. Background sources (e.g. release from bottom sediments) and nonpoint source loads, however, may be significant considerations for 2,3,7,8-TCDD in the Columbia River basin.
- There are few data on 2,3,7,8-TCDD discharges from source categories other than chlorine bleaching pulp mills in the basin.
- There are complexities in addressing persistent and highly bioaccumulative pollutants such as 2,3,7,8-TCDD.

The last three of these points mean that data and methods of analysis (e.g. predictive models) are not available to adequately characterize all pollution sources at this time. However, the lack of information about some pollution sources or processes is not a reason to delay implementation of water quality-based controls for known sources contributing to violations of water quality standards. The key is to work within a logical framework that will lead to the attainment of water quality standards. After consideration of the above problems and the issues discussed in Appendix B, the following approach was developed for this TMDL:

- Identify watershed targets to be used as a framework to guide allocation decisions;
- Establish WLAs for the major source category for which there are currently sufficient data to do so;
- Estimate current loadings for other source categories;

- Reserve some of the unallocated loading capacity (beyond that necessary to cover the WLAs established and estimated current loadings for other sources) to provide an additional component of the margin of safety, some of which could be used for future growth.

This approach provides for further pollution reduction from known sources while additional data are collected to: (1) confirm that the reductions required by this TMDL are leading to water quality standards attainment; and (2) provide additional information necessary to refine estimates of assimilative capacities and TMDL allocations. This TMDL establishes WLAs that will form the basis of more stringent limits for dioxin discharges from confirmed point sources. It also estimates loadings from other sources and incorporates a margin of safety to account for existing uncertainties. Where new data show that modification of the TMDL is appropriate, the TMDL will be revised accordingly. By allowing future modification of the TMDL, regulatory agencies can avoid delays in controlling known sources while they continue to investigate other possible sources. Decisions on the use of the unallocated load will be made through a joint effort by the States and EPA.

Watershed Targets:

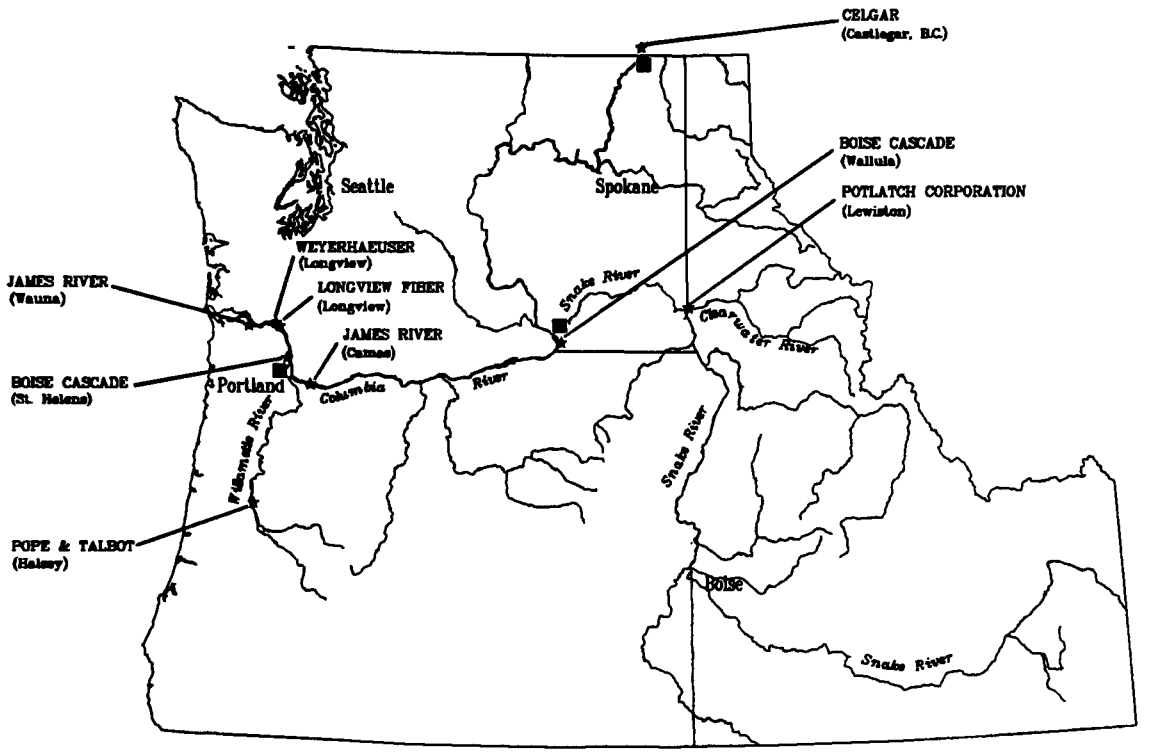
The Oregon Department of Environmental Quality (DEQ) has utilized the concept of watershed targets for developing TMDLs in Oregon. Watershed targets are particularly useful for TMDLs designed to achieve water quality standards in large waterbodies adversely affected by a pollutant coming from a variety of sources. Allocations for major sources are established after watershed targets are identified. The watershed targets serve as internal check points to determine that water quality standards will be met at key locations within the drainage. This same technique is also being used for the Columbia River in this TMDL.

Watershed targets can be set within the basin by simply identifying the loading capacity at key points in the drainage system. To determine these targets, the only data requirements are a water quality criterion and a design flow (in this case, the mean harmonic stream flow). The watershed targets focus on high priority tributaries. In the case of the Columbia, there are three logical points in addition to the lower Columbia near Bradwood (below Longview) for which loading capacities should be calculated. These locations are shown in Figure 3-2 and relevant data are summarized in Table 3-1.

The Willamette Basin is the most industrialized and populated area in the Columbia River system. There are high numbers of both industrial and municipal dischargers in the drainage compared to other sub-basins in the Columbia River system. The most logical approach is to establish the watershed target as equal to the loading capacity for the Willamette River at Portland (0.54 mg/day). The sum of all allocations to sources in the Willamette Basin must not exceed this watershed target. By the same token, loading capacity attributed to flow produced by the Willamette is not currently available for use in the mainstem Columbia.

Because the Willamette Basin is entirely within Oregon, the Oregon Department of Environmental Quality (ODEQ) has the option, within the context of a TMDL, to adjust allocations for specific sources which would still meet this watershed target. In fact, Oregon has already initiated dioxin controls in the Willamette through issuance of an NPDES permit to Pope & Talbot at Halsey with effluent limits for 2,3,7,8-TCDD (0.19 mg/day). Furthermore, DEQ has committed to developing a TMDL for dioxin in the Willamette which will meet the watershed target.[1] A Willamette Basin TMDL could include different limits for Pope & Talbot, based on needs determined by ODEQ.

Figure 3-2. Location of Watershed Targets (▪) Relative to Pulp Mills



Watershed targets were also evaluated at two other locations in the Columbia system: 1) at the mouth of the Snake River and 2) at the U.S. – Canadian border. Far fewer sources exist upstream of these locations than is the case with the Willamette River basin. However, significant levels of 2,3,7,8-TCDD have been measured in tissue of fish taken from sites associated with each of these watersheds. The fish tissue concentrations indicate that the water quality standard and, therefore, the loading capacity for 2,3,7,8-TCDD is currently exceeded.

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[1] This TMDL will be reviewed by EPA in accordance with §303(d) of the Clean Water Act.

Based on currently available data, reductions in 2,3,7,8-TCDD loads are needed to meet all three of these watershed targets. These watershed targets must be achieved in order to ensure attainment of water quality standards where those watersheds enter the Columbia River. To the extent that the TMDL results in loading reductions beyond that necessary to meet the watershed targets, the difference is available for other downstream uses, future growth, or margin of safety.

Table 3-1. Loading Targets for 2,3,7,8-TCDD to Selected Watersheds in the Columbia River System

Watershed	Harmonic Mean Flow (cfs)	Loading Capacity (mg/day)
TOTAL COLUMBIA RIVER BASIN	188,000 [1]	5.97
SELECTED SUB-BASINS		
Watershed N. of WA/Canada Border	72,700 [2]	2.31
Snake River Watershed	37,000 [3]	1.18
Willamette River Watershed	17,100 [4]	0.54
TOTAL FOR SUB-BASINS		4.03

[1] Flow at Columbia River near Bradwood
[2] Flow at Columbia River at WA/Canada border
[3] Flow at Snake River below Ice Harbor Dam
[4] Flow of Willamette River at Portland

Establish WLAs

This TMDL focuses on developing waste load allocations for the chlorine bleaching pulp mills in the basin. These mills constitute the only source category in the Columbia River basin where site specific quantitative information exists describing effluent quality and waste loads for 2,3,7,8-TCDD. Nationally, the median 2,3,7,8-TCDD concentration in tissue of fish collected below pulp mills using chlorine bleaching was higher than for fish collected below any other source category studied in the National Bioaccumulation Study (1987). In addition, the §304(l) listings under the Clean Water Act specifically identified these mills in the Columbia River Basin as point sources requiring individual control strategies (ICS's). The basis of this listing was not only data describing concentrations of 2,3,7,8-TCDD in fish tissue below the mills but also measured concentrations of 2,3,7,8-TCDD in effluents and treatment plant sludges at these mills. The analysis undertaken in developing this TMDL indicates that this source category would lead to exceedance of water quality standards even if no other sources existed.

The proposed TMDL (public notice issued on June 15, 1990) discussed several alternative methods to establish waste load allocations for chlorine bleaching pulp mills. The waste load allocation methods evaluated are summarized in Appendix C. The proposed TMDL allocated approximately 2 mg/day (not including the Canadian Celgar mill or the planned expansion at Pope & Talbot) to the chlorine bleaching pulp mills. A major criterion for evaluating alternative methods for establishing WLAs for chlorine bleaching pulp mills was the need to verify compliance with resulting NPDES permits. Allocations for each mill were derived based on the lowest verifiable concentration (long term average of 4.7 ppq 2,3,7,8-TCDD in the bleached wastestream) in an assumed average wastewater flow per quantity bleached pulp produced (14,470 gallons/ton). Such an approach yields WLAs which are equal in terms of mass discharge per unit production of bleached pulp product (0.257 μg 2,3,7,8-TCDD/ton).

Table 3-2 displays WLAs based on updated production figures including planned production increases for Celgar [based on comments from R.W. Sweeney, Celgar Pulp Co.] and Pope & Talbot [based on comments from CH2M-Hill for James River and Pope & Talbot; July 20, 1990]. WLAs resulting from allowing 4 different quantities of 2,3,7,8-TCDD per ton of bleached pulp produced are given in the table. Three of the options reflect some of the comments received during the public comment period for the proposed TMDL.

Option 1. This option reflects the belief by the pulp and paper industry that they should be given the entire loading capacity of the river system. An allowed discharge rate of 0.68 μg 2,3,7,8-TCDD per ton of bleached product results in 100% of the calculated loading capacity being allocated to the existing pulp and paper mills in the basin.

Option 2. This option is generally equivalent to the WLAs proposed in the draft TMDL submitted for public comment. Two differences are noted: (1) the WLA for Pope & Talbot at Halsey is increased based on planned production increases and the NPDES permit recently issued by DEQ; and (2) a WLA has been calculated for the Celgar mill based on planned production increases and the discharge rate (0.257 μg 2,3,7,8-TCDD per ton of bleached product) allowed for the other mills. The calculated WLA for Celgar has no regulatory authority, but is used for comparison purposes and as an estimated loading which should be achievable by Celgar.

Option 3. This option reflects the concern by the local pulp mills that the proposed TMDL did not provide equity with the Celgar mill at Castlegar, British Columbia. Based on information submitted by both the Celgar mill and the British Columbia Ministry of Environment (see Appendix B), the proposed modernization project at Celgar will result in 2,3,7,8-TCDD discharges which are less than 0.05 mg/day (or 0.042 μg/day per ton bleached pulp). The technology planned for use at Celgar is being or has been installed at several bleached kraft mills in other parts of the world. Option 3 applies this discharge rate to all the affected mills and results in 7% of the calculated loading capacity being allocated to the existing pulp and paper mills in the basin.

Option 4. This is the zero discharge option requested by many commenters. The environmental community believes that zero discharge is the only viable option, because of dioxin's persistence and cumulative build-up in the sediments and biota.

Table 3-2. Waste Load Allocation Options for Chorine-Bleaching Pulp Mills

Pulp Mill -- Location	Production of Bleached Product		Waste Load Allocations (mg 2,3,7,8-TCDD/day, long term average)			
	(tons/day)	(%)	Option 1 (0.68)	Option 2 (0.257)	Option 3 (0.042)	Option 4 (0.00)
Potlatch -- Lewiston, ID	1,509	15.1	1.03	0.39	0.06	0.00
Boise Cascade -- Wallula, WA	957	9.6	0.65	0.25	0.04	0.00
James River -- Camas, WA	1,650	16.5	1.12	0.42	0.07	0.00
Longview Fibre -- Longview, WA	310	3.1	0.21	0.08	0.01	0.00
Weyerhaeuser -- Longview, WA	1,026	10.3	0.70	0.26	0.04	0.00
Pope & Talbot -- Halsey, OR	1,500	15.0	0.19	0.19	0.06	0.00
Boise Cascade -- St. Helens, OR	1,035	10.4	0.70	0.27	0.04	0.00
James River -- Wauna, OR	800	8.0	0.54	0.21	0.03	0.00
Celgar -- Castlegar, B.C.	1,200	12.0	0.82	0.31	0.05	0.00
TOTAL Source Category Allotment	9,987	100.0	5.96	2.38	0.40	0.00
% of Basin Loading Capacity			100%	40%	7%	0%

Note: a) The value shown parenthetically under each option represents the equivalent quantity of 2,3,7,8-TCDD discharged in μg per ton of bleached pulp produced.

b) The WLA listed for Pope & Talbot under Options 1 and 2 has been adjusted to the long term average of 0.19 mg/day identified in the NPDES permit issued by the Oregon Department of Environmental Quality (November 7, 1990). See discussion in "Watershed Targets" section.

c) The WLAs listed for Celgar are included for comparison purposes only. EPA has no authority to establish enforceable WLAs for a Canadian source.

All available information has been carefully considered. Based on that information the "zero discharge" option is not necessary to achieve water quality standards and would not be enforceable due to the fact that the analytical detection limit is significantly higher than zero. Option 3 has similar difficulties, especially with respect to measuring compliance. This leaves Options 1 and 2 as still reasonable. The existence of other sources (see below), the lack of information on processes affecting the distribution of 2,3,7,8-TCDD, and the concern over the potential release from 2,3,7,8-TCDD stored in sediments and aquatic biota make Option 1 inappropriate. Consequently, Option 2 is the most reasonable approach at this time and **the WLAs listed under that option are being established as final in this TMDL**. EPA has concluded that these WLAs are the lowest levels consonant with analytical practicalities at this time and, as discussed below, can be accommodated within the available loading capacity taking into account other existing sources. NPDES permits issued subsequent to this TMDL must be consistent with these waste load allocations.

EPA recognizes that, as NPDES permits are developed, some adjustment of the above WLAs to reflect differences in particular mill capabilities may be appropriate. Such adjustments, if needed, will be determined on a case-by-case basis in consultation with the affected states.

Estimated Loadings From Other Sources

There is insufficient information, at this time, to establish WLAs for other point sources or LAs for nonpoint sources. However, in order to be reasonably certain that total loadings under this TMDL will not exceed the loading capacity of the system, loadings from some of the most significant other source categories are evaluated in Appendix B and summarized below.

Canada:

The Celgar pulp mill is the only Canadian source of dioxin to the Columbia River for which 2,3,7,8-TCDD has been measured in the effluent. As pointed out in the previous section, however, EPA has no authority to establish an enforceable WLA for the Celgar pulp mill in Canada. In this TMDL, EPA estimates that 2,3,7,8-TCDD loadings from sources upstream of the U.S.-Canada border will be no more than the 0.31 mg/day which we would allocate to Celgar if it were a Region 10 mill (Table 3-2, Option 2). Since Celgar is expected to reduce its 2,3,7,8-TCDD loadings to 0.05 mg/day by 1994, the higher 0.31 mg/day estimate provides some room to cover other unidentified sources upstream of the U.S.-Canada border and/or a margin of safety for the possibility that Celgar may not fully achieve anticipated reductions in its 2,3,7,8-TCDD loading to the Columbia River.

Other U.S. Point Sources:

As detailed in Appendix B, woodtreating facilities and municipal wastewater treatment plants are estimated, in total, to contribute current loadings of less than 2.3 mg/day 2,3,7,8-TCDD. Establishing WLAs for these facilities is not feasible at this time due to the shortage of data. Recent Resource Conservation and Recovery Act (RCRA) regulations for woodtreaters and NPDES regulations and guidance for stormwater discharges will lead to better information and control of discharges from these sources in the future. WLAs will be established, if appropriate, for those point source discharges with existing NPDES permits when information becomes available.

Other Sources and Background:

The remaining 22% of the loading capacity (1.29 mg/day) will be held in reserve as part of the needed margin of safety. This will cover contributions from (1) nonpoint sources such as agricultural or atmospheric inputs, (2) other industrial sources such as non-chlorine bleaching pulp mills, (3) background levels of 2,3,7,8-TCDD stored in the sediments and aquatic biota, and (4) possible future growth.

Data Collection

The establishment of this TMDL is not the conclusion of EPA's efforts with respect to controlling dioxin in the Columbia River basin. A more comprehensive data collection program is planned to confirm assumptions made in the development of this TMDL. Monitoring efforts will be designed to obtain better baseline information and to fill recognized data gaps, particularly with respect to other potential sources of 2,3,7,8-TCDD and the role of sediments. If necessary, the TMDL will be revised based on new information.

EPA will work cooperatively with the states to take the following actions: [1]

- Develop a strategy to address water quality concerns related to 2,3,7,8-TCDD inputs from woodtreating facilities. The proposed strategy should identify individual sources in each state to be considered for allocations, a sampling plan for determining reductions needed, and a schedule for implementation of the strategy. This should be done in conjunction with activities required by NPDES regulations as implemented under recent guidance for controlling stormwater discharges.
- Address other point source concerns, such as other major industrial NPDES dischargers and major municipal NPDES facilities with formal pretreatment programs, by States forwarding to EPA existing state data on concentrations of dioxin in sludge.
- Develop a strategy that addresses the other source categories such as urban runoff and agriculture.

F. Judicial Review

Parties seeking to challenge this TMDL are advised that exclusive review of this TMDL might be in the United States Court of Appeals because arguments could be made that this TMDL includes "effluent limitations" or is part of a determination as to a State permit program, or is inextricably bound to the issuance or denial of NPDES permits. If that is the case, any petition for such review would have to be filed within 120 days of EPA's action in establishing the TMDL, as described in 40 CFR Section 23.2.

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[1] This information collection is exempt from the Paperwork Reduction Act because it is being sought from fewer than 10 sources.

4. SUMMARY

Although certain types of data are currently lacking, available information highlights several concerns. Concentrations of 2,3,7,8-TCDD in fish tissue in several areas of the Columbia River basin exceed levels protective of human health at the 10^{-6} risk level and indicate that the state water quality standards are currently being exceeded. Regional and national data strongly suggest that pulp mills which use chlorine to bleach are the most significant sources of 2,3,7,8-TCDD to surface waters. Direct measurements of effluent samples taken from chlorine-bleaching pulp mills in the Columbia River basin confirms 2,3,7,8-TCDD levels requiring control.

There is a remaining need to refine information on contributions from other potential sources such as woodtreaters, as well as to describe the effect of attenuation and the role of sediments. This TMDL reserves a portion of the calculated loading capacity as unallocated because of this need for information. The TMDL established herein for 2,3,7,8-TCDD discharges to the Columbia River Basin completes the following actions:

- Establishes waste load allocations to individual pulp mills which use chlorine bleaching, at this time. Use equal mass discharge per unit production (Table 3-2, Option 2) to allocate waste loads to individual pulp mills in that source category. NPDES permit limits for these pulp mills must be consistent with this TMDL.

- Estimates loading from Columbia River sources upstream from the U.S.-Canada border. The total loading reserved for this source category is 0.31 mg/day. By 1994 the Celgar pulp mill, is expected to reduce its contribution to approximately 0.05 mg/day. The remainder of the 0.31 mg/day is reserved as a margin of safety to cover other unidentified sources upstream of the U.S.-Canada border and/or a shortfall by Celgar in achieving anticipated reductions.

- Estimates loading from some Region 10 point sources other than the pulp mills for which WLAs were established. Appendix B describes the evidence suggesting a total 2,3,7,8-TCDD loading from these sources of less than 2.3 mg/day.

- Reserves the remaining loading capacity (1.29 mg/day, after subtracting the WLAs and estimated loadings for the sources identified above) for (1) other undesignated sources, (2) an additional margin of safety to account for uncertainties in the assumptions used in developing this TMDL, and (3) future growth. This reserved portion is equal to approximately 22% of the total loading capacity. As uncertainties are reduced, more of the reserved capacity could be allocated to new or existing sources.

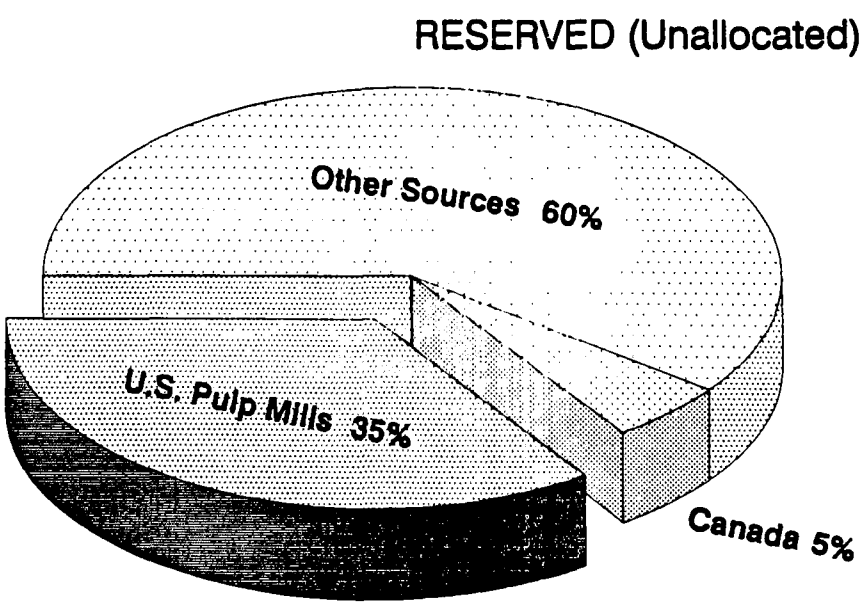
Table 4-1 and Figure 4-1 summarize the overall structure of the Final TMDL with the allocations based on currently available information.

Table 4-1. Waste Load Allocations for Chlorine-Bleaching Pulp Mills in Context of Watershed Targets

		2,3,7,8-TCDD (mg/d) WLA	Loading Capacity
LOADING CAPACITY FOR ENTIRE COLUMBIA RIVER BASIN			5.97
Columbia River Basin above Washington/Canada border			
Watershed target			2.31
Estimated Canadian Loading including Celgar mill		[0.31] [1]	
Snake River Basin above Ice Harbor Dam			
Watershed target			1.18
Pulp Mill WLAs:	Potlatch (Lewiston, ID)	0.39	
Willamette River Basin above confluence with Columbia R.			
Watershed target			0.54
Pulp Mill WLAs:	Pope & Talbot (Halsey, OR)	0.19 [2]	
Remainder of Columbia R. Basin			
Pulp Mill WLAs:	Boise Cascade (Wallula, WA)	0.25	
	James River (Camas, WA)	0.42	
	Longview Fibre (Longview, WA)	0.08	
	Weyerhaeuser (Longview, WA)	0.26	
	Boise Cascade (St. Helens, OR)	0.27	
	James River (Wauna, OR)	0.21	
	TOTAL	1.49	
SUM OF WLAs FOR REGION X PULP MILLS IN BASIN		2.07	

[1] This is not a WLA, but is included for purposes of comparison with the WLAs for U.S. mills.
[2] This is the same WLA identified in ODEQ's NPDES permit (issued 11/7/90) for this facility.

Figure 4-1. Overall Division of Columbia River Basin Loading Capacity



APPENDIX A. LOADING CAPACITY

Waste load allocations (WLAs) for point sources and load allocations (LAs) for nonpoint sources represent the allocated portions of a receiving water's **loading capacity**. The loading capacity is the greatest amount of loading that the river can receive without violating water quality standards. A TMDL must not exceed the loading capacity of a waterbody. To determine the appropriate loading capacity available for allocation requires:

- the **water quality standard** applicable to 2,3,7,8-TCDD and the Columbia River basin.
- the **river flows** used to calculate the loading capacity of the Columbia River basin at key locations.

1. Applicable Water Quality Standards

The pollutant of concern for this TMDL, 2,3,7,8-TCDD, is the most toxic of a group of compounds known as polychlorinated dibenzo-para-dioxins. These compounds are produced as a result of human activities such as the manufacture of chlorinated herbicides, the combustion of domestic and industrial wastes, and the production of chlorine-bleached pulp.

Oregon, Washington, and Idaho have adopted water quality standards for toxic substances which apply to parts of the Columbia River basin including the Snake and Willamette Rivers. Because the purpose of this TMDL is to provide a framework for attaining all applicable water quality standards for dioxin, this multi-state TMDL must be protective of the waters with the most stringent of those standards. A brief description of individual state standards follows.

Oregon has adopted a numeric criterion for 2,3,7,8-TCDD. Oregon Administrative Rules (OAR) Chapter 340, Division 41 summarizes water quality criteria for toxic substances applicable to all basins. This includes the Columbia River from its mouth to river mile 309 and the Willamette River from its mouth to river mile 187. OAR 340-41-205(p)(B), for example, states:

> *"Levels of toxic substances shall not exceed the most recent criteria values for organic and inorganic pollutants established by EPA and published in Quality Criteria for Water (1986). A list of the criteria is presented in Table 20."*

The ambient water concentration listed in Table 20 for protection of human health from carcinogenic effects caused by 2,3,7,8-TCDD is 0.000013 ng/L, or 0.013 parts per quadrillion (ppq). This value represents the 10^{-6} risk level, the concentration at which a lifetime exposure results in a probability of one excess cancer case per one million people. It considers the consumption of contaminated water as well as fish or other aquatic organisms.

Washington has identified the Columbia River from the mouth to river mile (RM) 596.6 as a Class A waterbody and from RM 596.6 to the Canadian border (RM 745) as a Class AA waterbody. Washington has also identified the Snake River from the mouth to RM 176.1 as a Class A waterbody. Washington's rules which apply to toxic substances are found in WAC 173-201-047. The narrative part of the rule indicates that:

> *"Toxic substances shall not be introduced above natural background levels in waters of the state which may adversely affect characteristic water uses, cause acute or chronic conditions to the aquatic biota, or adversely affect public health"*

WAC 173-201-047 also states that appropriate concentrations for toxic substances in Washington are to be determined in consideration with EPA's **Quality Criteria for Water** (1986). In the process of developing its lists of degraded waters as required by §304(l) of the Clean Water Act, Washington interpreted its standard for 2,3,7,8-TCDD in a manner consistent with Oregon's numeric standard, i.e. 0.013 ppq of 2,3,7,8-TCDD as an ambient water concentration needed to protect human health.

Idaho has narrative standards which are intended to protect the beneficial uses of its waters including the Snake River. The standard, found in IDAPA 16.01.2200, states:

> *"As a result of man-caused point or nonpoint source discharge, waters of the State must not contain: 01. Hazardous materials ... in concentrations found to be of public health significance or to adversely affect designated or protected beneficial uses. 02. Deleterious materials ... in concentrations that impair designated or protected beneficial uses without being hazardous."*

In the process of developing Idaho's §304(l) short list, EPA interpreted this standard also in a manner consistent with Oregon's numeric standard.

As stated above, this TMDL has been developed to achieve attainment of the water quality standards of all affected states. Although the wording of the applicable state standards for Idaho, Oregon, and Washington differs, EPA has interpreted these standards as being equally stringent. Even if this is not the case, however, 2,3,7,8-TCDD loading to upstream segments still must be restricted to levels ensuring the attainment of water quality standards applying to downstream segments.[1] Where this document refers to "the standard" or "the criterion" for 2,3,7,8-TCDD, this means the 0.013 ppq criterion at the 10^{-6} risk level and, by implication, the assumptions which form the basis of that criterion as established by EPA. That criterion, adopted by the State of Oregon, is the controlling water quality standard which this TMDL protects.

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[1] The Superior Court of Washington for Thurston County recently found that the manner in which the State applied their water quality standards to the listing under §304(l) of three pulp and paper mills was invalid. EPA believes that this decision does not affect the use of 0.013 ppq as the water quality standard for dioxin in developing this TMDL because all waste load allocations and permit limits must ensure compliance with applicable water quality standards of downstream states [40 CFR §122.4(d)]. Oregon's water quality standard is clearly stated as being 0.013 ppq for 2,3,7,8,-TCDD.

2. River Flow:

The loading capacity of a stream is determined using the water quality criteria value and a design flow for the receiving water. Typically, loads are expressed as chemical mass per time such as pounds per day. In the case of 2,3,7,8-TCDD, loads have been expressed as milligrams (mg) per day and are calculated as follows:

$$\text{Load (mg/day)} = 0.00245 * \text{Concentration (ppq)} * \text{Flow (cfs)}$$

The 0.00245 is the factor needed to convert the units of parts per quadrillion (ppq) and cubic feet per second (cfs) to milligrams per day (mg/day)

The design flow significantly affects the determination of the loading capacity. The choice of design flow used to calculate the loading capacity for the Columbia River basin was based on the characteristics of the 2,3,7,8-TCDD water quality criterion. That criterion, 0.013 ppq 2,3,7,8-TCDD, is based on human health concerns over a lifetime. In order to address human health concerns, the harmonic mean flow is recommended as the appropriate stream design flow (**Draft Technical Support Document for Water Quality-based Toxics Control**, U.S. Environmental Protection Agency, 1990).

The harmonic mean flow was used to develop this TMDL because it provides a more reasonable estimate than the arithmetic mean to represent long-term average river flow. Flood periods in naturally flowing rivers bias the arithmetic mean above flows typically measured. This overstates available dilution. The calculation of the harmonic mean, however, dampens the effect of peak flows. As a result, the bias is reduced. The harmonic mean is also an appropriate conservative estimate of long-term average flow in highly regulated river basins, such as the Columbia. In a regulated river basin, the harmonic mean and the arithmetic average are often much closer numerically.

Table A-1 summarizes the loading capacity for 2,3,7,8-TCDD in the Columbia River system at several key locations. A long-term flow record must be used in order to minimize the effect of either droughts or wet years. It is also important to recognize the effect that reservoirs have had on flows in the Columbia basin. Many of the major dams were constructed before 1950. Thus, flow records used to determine the loading capacity in the Columbia River were those reported by the U.S. Geological Survey from 1950 to present.

Table A-1. Loading Capacity for 2,3,7,8-TCDD in the Columbia River

Gage	Location	Drainage Area (sq.mi.)	Harmonic Mean Flow (cfs)	Loading Capacity (mg/day)
12399500	Columbia River at International Boundary	59,700	72,700	2.31
12472800	Columbia River below Priest Rapids	96,000	95,100	3.03
14019200	Columbia River at McNary Dam	214,000	143,000	4.54
14105700	Columbia River at The Dalles	237,000	152,000	4.83
14144700	Columbia River at Vancouver	241,000	159,000	5.04
14222880	Columbia River at Columbia City	254,000	180,000	5.73
14246900	Columbia River below Longview	256,900	188,000	5.97

Flows at three locations on the Columbia River were estimated because of inadequate long-term records. These locations are at Vancouver (gage #14144700), at Columbia City (gage #14222880), and below Longview (gage #14246900). The estimates were based on gaged flows from tributary rivers for the corresponding segments. Average flow yield from the tributaries for a particular segment was used to estimate flow from the ungaged portion of that segment. These gaged tributaries are listed in Table A-2.

Table A-2. Loading Capacity for 2,3,7,8-TCDD in the Columbia River Tributaries

Gage	Location	Drainage Area (sq.mi.)	Harmonic Mean Flow (cfs)	Loading Capacity (mg/day)
13343500	Snake River near Clarkston	103,200	35,700	1.14
13353000	Snake River below Ice Harbor Dam	108,500	37,000	1.18
14113000	Klickitat River near Pitt	1,297	1,207	0.04
14120000	Hood River near Hood River	279	612	0.02
14123500	White Salmon River near Underwood	386	951	0.03
14125500	Little White Salmon River near Cook	134	317	0.01
14128500	Wind River near Carson	225	514	0.02
14142500	Sandy River below Bull Run River	436	1,009	0.03
14143500	Washougal River near Washougal	108	234	0.01
14166000	Willamette River at Harrisburg	3,420	7,600	0.24
14211720	Willamette River at Portland	11,100	17,100	0.54
14220500	Lewis River near Ariel	731	2,396	0.08
14222500	East Fork Lewis River near Heisson	125	196	0.01
14223500	Kalama River near Kalama	198	618	0.02
14243000	Cowlitz River at Castle Rock	2,238	5,721	0.18

APPENDIX B. ALLOCATION ISSUES

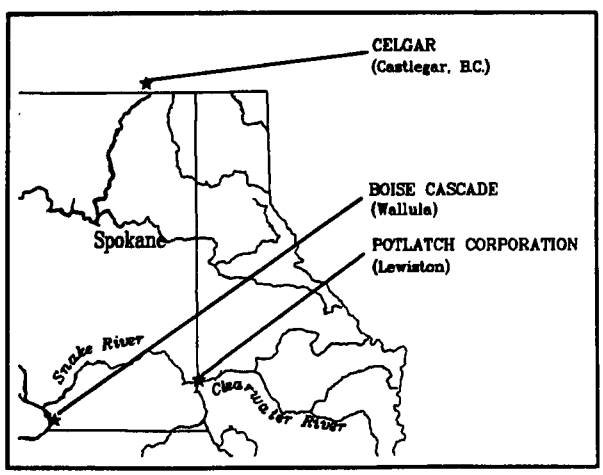
In determining appropriate allocation methods for the Columbia, several concerns have been identified that affect decisions on the TMDL. Issues identified which were considered in developing allocations for 2,3,7,8-TCDD to the Columbia River include:

- Loading from the **British Columbia pulp mill**
- Loading from **other potential sources** such as woodtreaters
- Fate, transport, and **attenuation**
- **Role of bottom sediments** (cumulative effects and resuspension)
- Framework for addressing **future allocations** (both growth within the pulp industry and allocations to other source categories)

1. British Columbia Pulp Mill

Celgar Pulp Company operates a bleached kraft pulp mill located in Castlegar, British Columbia. Wastewater from this mill is discharged to the Columbia River approximately 30 miles upstream from the United States - Canada border (Figure B-1). Studies conducted by Canadians have shown elevated concentrations of 2,3,7,8-TCDD in lake whitefish collected below the Celgar mill (Mah *et al.*, 1989; EVS, 1990). In addition, follow-up analyses by the Washington Department of Ecology of fish from Lake Roosevelt found elevated levels of TCDD and TCDF (Johnson, 1990). Lake Roosevelt is the impoundment formed by Grand Coulee Dam on the Columbia River downstream from the Celgar mill. Because of concern over the amounts of TCDD and TCDF detected in fish tissue, the Washington Department of Health took action in August 1990. A health advisory was issued that children under age four and under 40 pounds should not eat whitefish from Lake Roosevelt. Subsequent sampling by the Washington Department of Ecology suggests that concentrations of 2,3,7,8-TCDD may also be elevated in sturgeon as well.

Figure B-1. Location of Celgar Pulp Co. (Castlegar, B.C.)



The discovery of elevated levels of dioxins and furans below Celgar and other British Columbia pulp mills resulted in action by the Canadian government. New regulations under the Canadian Environmental Protection Act (CEPA) have been proposed to regulate the discharge of chlorinated organics. The Canadian federal government is proposing limits of non-detectable amounts of dioxins and furans by January 1994. In addition, the Province of British Columbia (B.C. Environment) has adopted regulations to control adsorbable organic halides (AOX) discharged from bleached kraft pulp mills. The control of AOX requires reductions in the use of chlorine which, in turn, decreases the formation of dioxins and furans. The new regulations require that, by 1993, AOX be limited to 2.5 kg per metric tonne of pulp produced.

Over the past decade, the B.C. Ministry of Environment has been trying to get various owners of the Celgar pulp mill to resolve water pollution problems caused by their failure to meet waste permit requirements. The identification of chlorinated organics as a health issue has resulted in increased urgency on the part of the Canadians to install pulping technology and effluent treatment works to resolve problems. To meet these government requirements, Celgar has proposed a mill modernization effort.

The most recent measurements of effluent quality discharged by the Celgar mill were obtained during the Canadian Pulp and Paper Association survey (CPPA, 1990). Information on present and projected levels of 2,3,7,8-TCDD and -TCDF have been provided by Celgar. These are summarized in Table B-1. The load measured in early 1990 from the Celgar pulp mill is less than 1.37 mg/day. Since this survey, the mill has made several improvements that were designed to further reduce dioxin and furan levels in the effluent. Results of the follow-up sampling will be available later this year. The amount of 2,3,7,8-TCDD measured from the Celgar mill in the 1990 survey is significantly less than the loading capacity of 2.3 mg/day for the Columbia River at the International Boundary. This does not consider other potential sources upstream of the border. However, no other sources have been identified where 2,3,7,8-TCDD has been detected.

Table B-1. Concentrations of TCDD and TCDF from Celgar Pulp

	2,3,7,8-TCDD		2,3,7,8-TCDF	
	Concentration (ppq)	Load (mg/day)	Concentration (ppq)	Load (mg/day)
CPPA 1990 Survey	ND (14)	< 1.37	310	30.4
Projected after modernization (from bleach plant)		< 0.0485		< 0.0485

Celgar is also seeking government approval to increase the mill's production from 560 to 1200 air dried metric tonnes of pulp per day. B.C. Environment recently completed public hearings regarding the proposed Celgar pulp mill expansion project. Modifications to the mill's production process are being proposed which include oxygen delignification, 70% substitution of chlorine dioxide for chlorine, and hydrogen peroxide bleaching followed by primary and secondary effluent treatment. The improvements to the Celgar mill are expected to be in place by 1994. Concentrations of TCDD and TCDF in the bleach plant effluent are expected to be below detection limits of 10 ppq. Maximum daily discharges after modernization are expected to be <0.05 mg/day for TCDD and <0.05 mg/day for TCDF (Celgar, 1990). Recognizing problems in the past, B.C. Ministry of the Environment has stated that: "Either Celgar will have to significantly upgrade pollution control technology in their existing mill to achieve compliance or they will face heavy penalties for breaking the law."

Several of the U.S. mills criticized the proposed TMDL (June 15, 1990) for a perceived lack of equity with Canada. The final TMDL estimates a loading of 0.31 mg/day from Celgar. This is equal to the loading which would be allocated to Celgar if it were a mill in Region 10. This accounts for Celgar's planned production after modernization (see Table 3-2) and applies a factor of 0.257 μg/day of 2,3,7,8-TCDD discharged per ton of bleached pulp. This is the same factor used to calculate the WLAs for the Region 10 mills. This is not a WLA but rather an estimated loading. This estimate provides a margin of safety to cover other unidentified sources in Canada and/or a possible shortfall in Celgar's attainment of the projected 0.05 mg/day loading. As additional information is assembled, this preliminary estimate may be refined.

2. Other Potential Sources

The development of the TMDL needs to consider all potential sources of 2,3,7,8-TCDD in the Columbia drainage. Besides chlorine bleaching pulp mills, other potential source categories include woodtreaters, major municipal wastewater treatment plants, agricultural areas, industrial sites, and urban areas. Table B-2 summarizes potential sources of TCDD in the Columbia, the type of available information on loading rates, and median fish tissue concentrations from the National Bioaccumulation Study (NBS) associated with the source category. The NBS was conducted as a screening investigation to determine the prevalence of selected bioaccumulative pollutants in fish. One of the study objectives was also to identify general correlations between fish tissue concentrations and sources of these pollutants.

The NBS results, listed in Table B-2, clearly indicate that the highest levels of TCDD contamination in fish were found in areas below chlorine bleaching pulp mills. However, two other site categories from the NBS in the Columbia basin which were not immediately below pulp mills had elevated levels of TCDD in fish. Both sites are located in the north Portland area. One of the sites, Columbia Slough, is affected by nonpoint sources, predominantly urban runoff and a landfill. The other site is located below a major woodtreating operation (McCormick & Baxter) which uses pentachlorophenol (PCP). TCDD contamination has been associated with PCP.

Table B-2. Potential Sources of 2,3,7,8-TCDD in the Columbia Basin

Source Category	Availability of Data for Region 10	National Bioaccumulation Study Comparative Results (from draft report) Median Conc. (ppt)
Chlorine Bleaching Pulp & Paper	104 mill study	4.73
Non-Chlorine Bleaching Pulp & Paper	N/A	1.30
Superfund Sites	Remedial Investigations	1.47
Woodtreaters, Incinerators, etc.	TRI , DMR	1.39
Other Industrial Sites	N/A	1.27
Urban Areas	N/A	1.27
Municipal Wastewater Treatment Plants	Sewage Sludge Survey	0.64
Agricultural Areas	N/A	0.56
Other Sites	N/A	0.63

Note: N/A - Not Available
TRI - Toxics Release Inventory (PCP)
DMR - NPDES Discharge Monitoring Reports (PCP)

Woodtreaters:

A number of current and former wood treatment facilities exist in the Columbia River basin where pentachlorophenol (PCP) has been used as a preservative. A potential source of 2,3,7,8-TCDD from woodtreating facilities is contaminated PCP. Thirteen sites near former or existing woodpreserving facilities were sampled during the National Bioaccumulation Study. The median 2,3,7,8-TCDD concentration in fish tissue at these sites was 1.39 ppt (compared to 4.73 for the chlorine bleaching pulp mills). Of the thirteen sites sampled nationally near woodtreaters, only one was in the Columbia River basin: the Willamette River at Portland (below McCormick & Baxter). Three species of aquatic organisms were sampled at that site with the following results:

Species	2,3,7,8-TCDD
Largemouth Bass	0.74 ppt
Sucker	2.22 ppt
Crayfish	2.61 ppt

The values for this site are higher than the median for the NBS. However, organisms collected from this location are also influenced by other potential sources of 2,3,7,8-TCDD, such as urban runoff.

These measured values reflect the need to evaluate information on the potential discharge of 2,3,7,8-TCDD from woodtreating facilities. EPA has recently developed a data system which contains information from the Toxics Release Inventory (TRI). A retrieval of reported releases of PCP for 1987 identifies seven facilities (woodtreaters) in the Columbia Basin (Table B-3). Five of these facilities are located in the Willamette drainage. Although the TRI information does not contain data on TCDD, the indicated releases of PCP lead to concern over woodtreaters, particularly in the Willamette basin. DMR data and inspection reports describing PCP discharges are also available for

several woodpreserving facilities with NPDES permits in the Columbia basin.

Table B-3. PCP Discharges from Columbia Basin Woodtreating Facilities

Cataloging Unit	Facility Name	Location	NPDES DMR Data	TRI Data (lbs. PCP released) 1987 (Water)	1987 (Total)	1988 (Water)	1988 (Total)
17010214	B.J. Carney	Sandpoint, ID					
17010214	L.D. McFarland	Sandpoint, ID		C	1,850	C	500
17010216	Poles, Inc.	Oldtown, ID					
17010305	B.J. Carney Industries, Inc.	Spokane, WA					
17020003	Chewelah Log and Post	Chewelah, WA					
17020003	Colville Post and Pole	Colville, WA					
17040201	Garland Pole Co.	Idaho Falls, ID					
17040219	Penta Post	Gooding, ID					
17050114	Pressure Treated Timber	Boise, ID				C	7
17050114	Roundy Pole Fence Co.	Eagle, ID					
17070105	J.H. Baxter & Co.	The Dalles, OR					
17080001	Allweather Wood Treaters	Washougal, WA					
17080001	Exterior Wood, Inc.	Washougal, WA					
17080001	Pacific Wood Treating	Ridgefield, WA	I/R	250	2,300	B	1,500
17080003	International Paper Co.	Longview, WA					
17090001	Jasper Wood Treating	Jasper, OR					
17090003	J.H. Baxter & Co.	Eugene, OR	X	250	1,250	200	202
17090003	L.D. McFarland	Eugene, OR	X	250	1,500	B	750
17090008	Taylor Lumber & Treating	Sheridan, OR	o	250	13,488	B	2,150
17090010	Dant & Russell	North Plains, OR					
17090010	Permapost	Hillsboro, OR		0	250		
17090012	McCormick & Baxter	Portland, OR	X	31	6,999	150	154

Notes TRI data for releases of PCP to: Water (discharge)
Total (includes water, air and land disposal)

B : 1 - 499 lbs.
C : No discharge to water identified
I/R : Inspection Report
X : Loads calculated for PCP
o : Only PCP concentration reported

The preamble to a proposed RCRA rule relating to the wood preserving industry (53 FR 53292, December 30, 1988) describes ranges of chlorinated dibenzodioxin and chlorinated dibenzofuran as well as PCP concentrations in wastewaters from woodtreating facilities. Thus, an estimate of potential 2,3,7,8-TCDD releases from woodtreating facilities can be made based on data on PCP discharges. The TRI data were considered in estimating TCDD wastewater releases from woodtreaters. However, there are some apparent problems. Several facilities, for instance, reported zero discharge to water while others reported the same value of 250 pounds. DMR data, on the other hand, appear to provide better information on PCP discharges. Applying assumed ratios of 2,3,7,8-TCDD per unit PCP (derived from Table 7, 53 FR 53292) to the DMR data, EPA estimates that 1 - 2 mg/day 2,3,7,8-TCDD could be originating from woodtreating operations in the Columbia basin. This estimate includes the potential release from facilities where no DMR or TRI data exists.

Levels of 2,3,7,8-TCDD observed in fish and sediments below one major woodtreating operation plus estimates of potential loads point to the need for additional data. Any allocation scheme used to develop the TMDL must leave room for these facilities. Using available information, a range of 1 - 2 mg/day appears to be a reasonable estimate. However, this estimate is preliminary and data are still being generated. As additional information is assembled, this estimate may be refined. Most of the released 2,3,7,8-TCDD is associated with site run-off during rainfall. Thus, the loading from woodtreaters could be reduced by implementing stormwater controls.

Municipal Wastewater Treatment Facilities:

National data demonstrate that the sludges removed from some municipal wastewater treatment plants contain dioxins and furans. Generally, octa-chlorinated forms predominate the dioxins found in these sludges, although 2,3,7,8-TCDD has also been detected. Where sludges are contaminated, the wastewater discharges could also contain 2,3,7,8-TCDD. Testing performed for 2,3,7,8-TCDD in sludge nationally included five municipal wastewater treatment plants in the Columbia basin ("National Sewage-Sludge Survey Facility Analytical Results", U.S. Environmental Protection Agency, 1989). Results for these five facilities are listed in Table B-4.

Table B-4. Columbia Basin Sludge Testing for 2,3,7,8-TCDD

Cataloging Unit	Facility Name	Location	2,3,7,8-TCDD (ng/kg)	Detection Limit
	Municipal WWTP's			
17050114	West Boise STP	Boise, ID	ND	(4.7)
	" " "	" "	ND	(6.1)
17080001	Columbia Blvd. STP	Portland, OR	ND	(16.0)
	" " "	" "	ND	(8.9)
17090005	Stayton STP	Stayton, OR	ND	(23.0)
17090006	Lebanon STP	Lebanon, OR	3.3	---
	" "	" "	2.2	---
17090012	Tryon Creek STP	Lake Oswego, OR	ND	(57.0)
	" " "	" " "	ND	(43.0)
	Chlorine Bl. Mills			
17060306	Potlatch Corp.	Lewiston, ID	78.0	---
17070101	Boise Cascade	Wallula, WA	70.0	---
17080001	James River	Camas, WA	12.0	---
17080003	Boise Cascade	St. Helens, OR	4.2	---
17080003	Longview Fibre	Longview, WA	69.0	---
17080003	Weyerhaeuser	Longview, WA	25.0	---
	" "	" "	35.0	---
17080003	James River	Wauna, OR	19.0 (pri.)	---
	" "	" "	89.0 (sec.)	---
17090003	Pope & Talbot	Halsey, OR	31.0	---

Of the five municipal facilities whose sludges were examined in the Columbia basin, only one had detectable levels of 2,3,7,8-TCDD. This indicates that the TMDL should leave some room for potential allocations to municipal sewage treatment plants. Analytical results for this treatment plant, however, show that the detected concentration was at levels much lower than sludge tested at chlorine bleaching pulp mills (Table B-4). Thus, it can be expected that load estimates for municipal facilities will be much lower than the loads allocated to the pulp mills based on the sludge data.

Initial estimates of 2,3,7,8-TCDD discharged from municipal wastewater treatment facilities can be made using available data. Permitted total suspended solids for each facility and an assumed average 2,3,7,8-TCDD concentration in municipal sludge form the basis of these calculations. The analysis also assumes that chlorinated dioxins / furans found in municipal sludge are associated with effluent solids at the same concentrations. The average 2,3,7,8-TCDD concentration detected was 2.8 ng/kg. The permitted total suspended solids load from Region 10 municipal wastewater treatment plants in the Columbia Basin is over 170,000 pounds per day. Based on this information, these municipal wastewater treatment facilities could, as a group, contribute an average of 0.2 mg/day 2,3,7,8-TCDD. As additional information is assembled, this preliminary estimate may be refined.

Other Industrial Sources:

Non-chlorine bleaching pulp mills (Table B-5) and other potential industrial sources also need to be considered in the allocation process. No data has been presented on 2,3,7,8-TCDD concentrations in either wastewater or sludges for Columbia basin non-chlorine bleaching pulp mills. Another potential industrial source of 2,3,7,8-TCDD is Rhone-Poulenc, located in north Portland. This plant has produced chlorophenolic herbicides since 1956. The facility discharges boiler blowdown, cooling water, site runoff, and treated groundwater to the Willamette River (across from McCormick & Baxter). The effluent is known to contain chlorinated phenols, although 2,3,7,8-TCDD was not detected during a National Dioxin Study.

Table B-5. Non Chlorine Bleaching Pulp Mills in the Columbia Basin

Cataloging Unit	Facility	Location
17010305	Inland Empire Paper Co.	Spokane, WA
17080001	Boise Cascade Corp.	Vancouver, WA
17090003	Willamette Industries	Albany, OR
17090004	Weyerhaeuser	Springfield, OR
17090007	Smurfit Newsprint	Newberg, OR
17090012	James River II	West Linn, OR
17090012	Smurfit Newsprint	Oregon City, OR

An estimate of loadings from these sources cannot be determined at this time. With respect to non-chlorine bleaching pulp mills, an analysis cannot be conducted because no data has been identified which describes 2,3,7,8-TCDD in either effluents

or sludges. As to Rhone-Poulenc, available data from the National Dioxin Study showed non-detect for 2,3,7,8-TCDD. However, the detection limits were higher than present day limits. As additional information is gathered, it will be possible to estimate loadings from these sources.

3. Fate, Transport, and Attenuation

Losses of 2,3,7,8-TCDD in the water column can occur through sedimentation (see discussion in next section), photolysis, and volatilization, as well as through uptake by aquatic organisms. 2,3,7,8-TCDD's structural properties, laboratory bioconcentration experiments, and field observations also indicate a strong potential for bioaccumulation. Thus, the role of these processes needs to be expressed in terms of potential bioavailability. Limited information exists which can be used to provide initial estimates on the effects of fate, transport and attenuation in the Columbia River system. Readily available, quality data have been considered. This includes information from the Northwest Pulp & Paper Association's Columbia River Fish Study (1989), from EPA's National Bioaccumulation Study (1987), from the Washington Department of Ecology's work on Lake Roosevelt (1989-90), and from efforts in Canada.

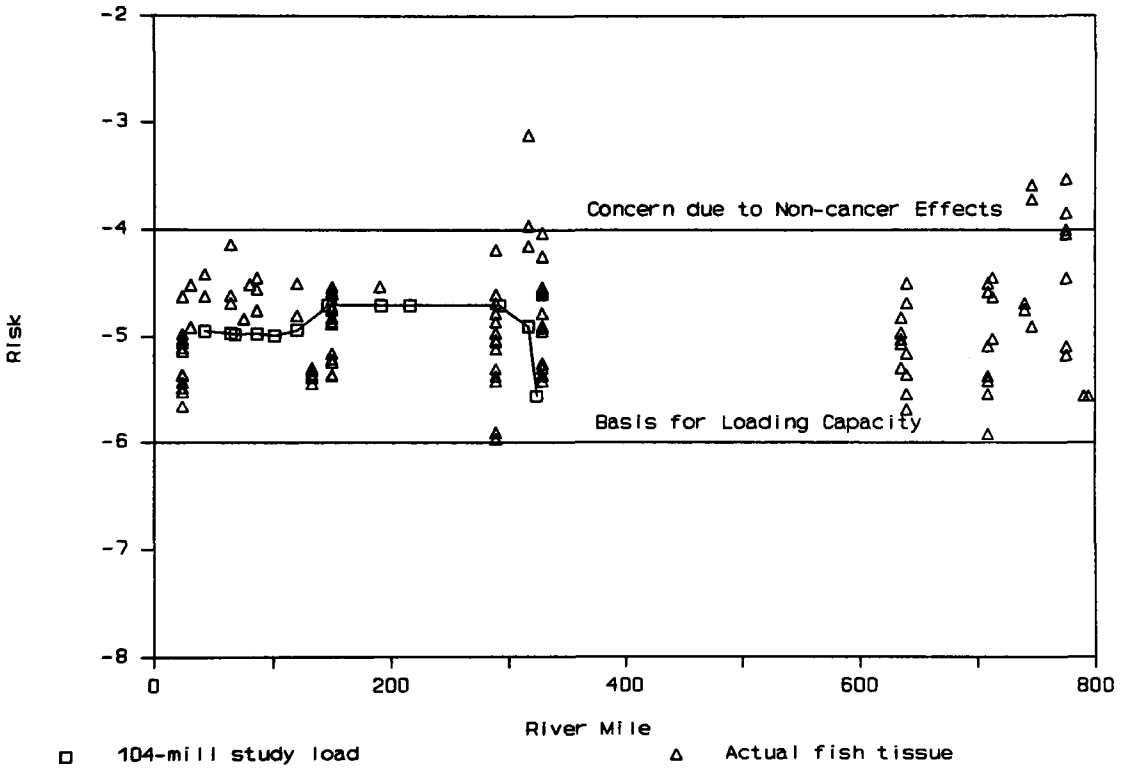
Several approaches exist to evaluate the effects of fate, transport, and attenuation. Water quality models, using a variety of assumptions, can be used to assess ambient data and to evaluate the need for additional controls. Available analytical tools range from simple estimates to complex data-intensive dynamic models. Analyses can include a loss rate which considers potential adsorption of TCDD on particulate matter within the water column. The potential release of TCDD from the sediment to the overlying water or the potential effect of sediment bound TCDD on the benthic and aquatic life food chain must also be considered. However, quantitative predications of bioaccumulation for specific cases and regulatory actions are complicated by many uncertainties. These uncertainties include the degree of partitioning between dissolved and bound phases, definition of the food chain structure plus bioenergetic parameters, and the relative importance of other fate and transport phenomena.

The Clean Water Act specifically states that TMDL's shall be established with a margin of safety which takes into account any lack of knowledge. Based on the lack of knowledge concerning attenuation of TCDD in the Columbia River basin, assumptions must be made with respect to attenuation in determining the loading capacity of the system and allocations of that capacity. A review of comments received on the proposed TMDL did not provide conclusive evidence that **net** attenuation occurs. Although TCDD may be lost to the sediments, that loss may only be temporary because of resuspension, desorption, or biological uptake directly from the sediments.

Figure B-2 superimposes predicted fish tissue concentration data on a graph of the actual (measured) fish tissue data plotted in Figure 2-1 in Section 2 of this document. Water column concentrations of 2,3,7,8-TCDD were modeled based on (1) the results of TCDD sampling in source effluents (the "104-Mill Study), (2) receiving

water dilution calculated from the harmonic mean flows at the discharge points, and (3) an assumption of no net attenuation. Predicted fish tissue concentrations were then calculated using a bioconcentration factor of 5,000 (the factor used in developing the water quality criterion). As in Figure 2-1, all fish tissue concentrations (both measured and predicted) are displayed in terms of estimated cancer risk based on the factors used to calculate EPA's water quality criterion for 2,3,7,8-TCDD. Both the 10^{-6} and 10^{-4} risk levels are identified. The 10^{-6} risk level corresponds to the 0.013 ppq ambient 2,3,7,8-TCDD concentration which is the basis of the TMDL, while 10^{-4} represents a level of possible concern due to non-cancer effects. Note that the line plotted between data predicted based on an assumption of no net attenuation closely follows the data points based on directly measured fish tissue concentrations.

Figure B-2. Columbia River Fish Tissue: TCDD



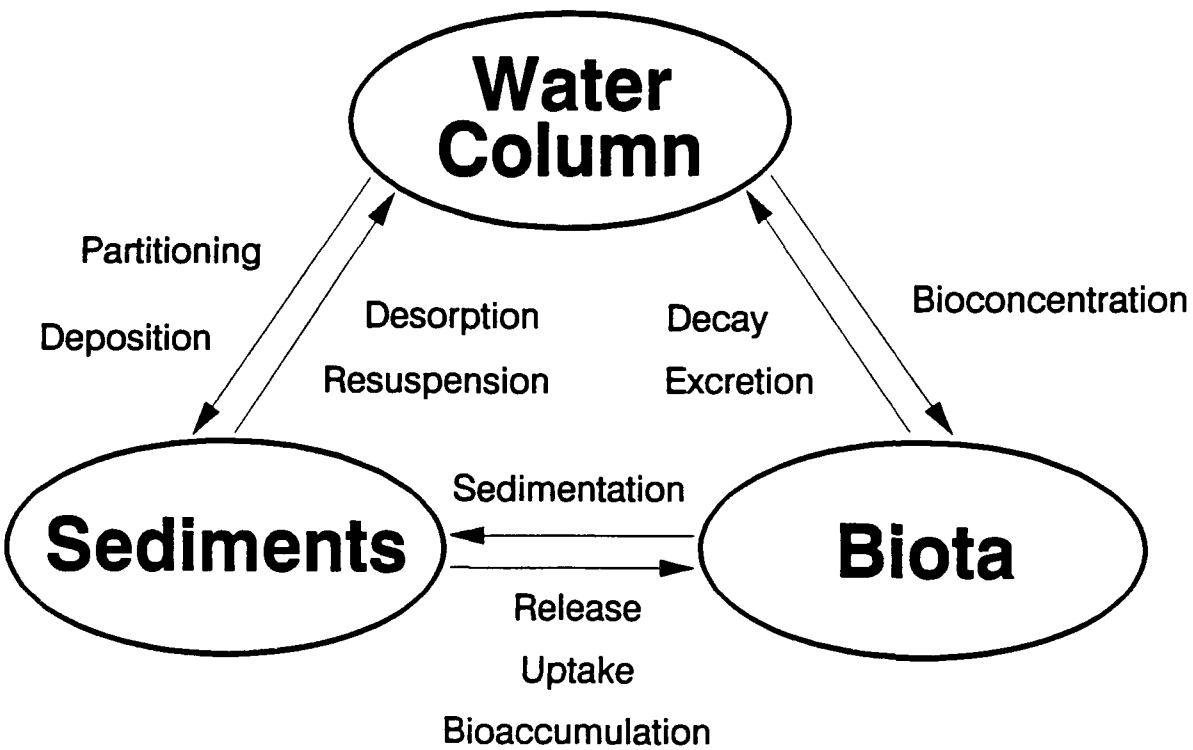
Based on the comparison in Figure B-2 of predicted tissue concentrations with observed values, an assumption of no net attenuation appears to be reasonable. Thus, for purposes of developing this TMDL, all 2,3,7,8-TCDD discharged is assumed to remain in the water column and remain biologically available. Because this is a conservative assumption, this TMDL should lead to the attainment of water quality standards regardless of the actual level of attenuation. If future studies quantify a net attenuation rate, allocations can be modified to reflect this. This capacity could be used to provide an increased margin of safety to account for unknown sources, increase allocations for existing sources, or accommodate future growth needs. By the same token, if studies indicate that TCDD releases from historical accumulations in

the sediments constitute a problem, tighter controls may be needed (see discussion in following section).

4. Role of Bottom Sediments

Sediment concentrations are the result of a complex series of interactions between TCDD, the overlying water column, solids, aquatic organisms, and the external loading of TCDD. Because of the hydrophobic nature of dioxin, there is a tendency for TCDD to move from the water column to the sediments and aquatic biota. Although attenuation may result in a net loss of TCDD from the water column, the potential also exists for the sediments to act as a source of dioxin through the release of TCDD which has accumulated (Figure B-3).

Figure B-3. Exchange of TCDD Between Water Column, Sediments, and Biota



Some fraction of the TCDD which enters a river is quickly associated with solids. The adsorption of TCDD to particulate matter may ultimately determine levels in fish tissue. There are a number of different theories about the role of equilibrium partitioning and bioaccumulation from contaminated sediments. The fate of TCDD in the aquatic environment is increasingly being discussed in terms of food chain mechanisms. Dioxins are believed to be adsorbed to bacteria, fungi, and organic sediment particles. These particles are eaten by filter-feeding benthic invertebrates which in turn are consumed by fish.

In addition, solids tend to settle to the bottom of the receiving water. In areas where the river is not filling in, these particles (and the TCDD associated with them) will continue to be carried downstream as either bedload or resuspended sediments. In areas of sediment accretion, typically where river velocities are diminished, TCDD will tend to accumulate in the bottom sediments where it may be available to aquatic organisms. Resuspension of sediments either through high streamflows, boat traffic, or dredging activities must also be considered.

Current knowledge of the Columbia system is not adequate to determine the availability of TCDD associated with particulate matter to benthic organisms or fish on a basin-wide basis. Existing sediment concentrations probably reflect a combination of both current and historical discharges of TCDD. Because the Region's pulp mills have implemented some process changes recently, such as the use of different defoamers, it is unlikely that existing sediment contamination levels are in equilibrium with current loadings to the basin. Also, if desorption of dioxin occurs slowly, it may take several years to observe the effect of reduced discharges in sediments and in biota.

Limited sediment sampling for dioxin has been done in the Columbia system. Data collected in the mainstem Columbia River below Bonneville Dam have not detected 2,3,7,8-TCDD. However, current detection limits may be above the level of concern considering the low organic content of the sediments analyzed. TCDD has been detected in Willamette River sediments below a woodtreating operation. These spatial differences reflect both physical characteristics and the influence of specific sources. Thus, future studies on the effect of sediments should address site-specific concerns.

Given these conditions it would not be appropriate to assume a permanent loss of 2,3,7,8-TCDD through sedimentation. Indeed, a portion of the loading capacity should remain unallocated to account for potential release from the sediments and from TCDD currently stored in the food chain. As indicated in the discussion on attenuation, tighter controls will be needed if data show that the cumulative effects of historical discharges significantly delay attainment of TCDD standards under the reduced loadings required by this TMDL.

5. Future Allocations

TMDLs may provide a framework for dealing with future allocations. Examples include the assignment of any unallocated portion of the loading capacity to specific point or nonpoint sources. Future growth of the pulp industry in the Columbia River basin, either expansion of existing mills or new mills, is a possibility which should be considered in this TMDL.

Developing an equitable framework for future allocations is not an easy task. This TMDL reserves a portion of the loading capacity as unallocated for 2,3,7,8-TCDD to account for uncertainties and to provide for future growth. As uncertainties are reduced, the amount held back can be made available to other sources or for additional future growth. Decisions on the use of the unallocated load will be made on

a case-by-case basis by EPA in consultation with the affected States. If proposed projects are not consistent with this TMDL, a revised TMDL would need to be established before the proposed increased loadings could be allowed.

APPENDIX C. WASTE LOAD ALLOCATION METHODS CONSIDERED

In developing the proposed TMDL, several alternative waste load allocation methods were considered for allocating portions of the loading capacity to chlorine bleaching pulp mills. These alternatives were presented in the Decision Document for the proposed TMDL to illustrate the effect of assumptions made on resulting WLAs and to stimulate public consideration of the pros and cons of alternative allocation scenarios. Included in the presentation of options was one preferred alternative.

There was no information received during the public comment period which has caused EPA to change its decision about the preferred allocation method (Option 4, Table C-2). Two additional options were suggested, however. These were: (1) allocate the entire loading capacity to the bleaching pulp mills, and (2) require zero discharge of dioxin from the pulp mills. The first suggestion is clearly inappropriate since other sources, which are presently difficult to control, would cause the loading capacity of the system to be exceeded. Appendix B includes additional discussion and estimates of sources other than chlorine bleaching pulp mills which supports the likelihood of this exceedence. The zero discharge option is also further discussed in this document and in the response to comments. Zero discharge is not necessary in order to meet water quality standards for dioxin in the Columbia River basin.

For the convenience of the public, the discussion of options contained in the Decision Document for the proposed TMDL is repeated here. The alternative approaches considered fall into several different categories which include:

- Equal Effluent Concentrations
- Equal Mass Discharge per Unit Production
- Equal Percent Reduction

Equal Effluent Concentrations:

One allocation option is to set an equal effluent concentration for each pulp mill which uses chlorine bleaching. The resultant cumulative load is the portion of the loading capacity allocated to chlorine bleaching pulp mills located in EPA Region 10. Some margin of safety is then provided by the difference between the loading capacity and the WLAs to the chlorine bleaching pulp mills in the Columbia basin of Region 10. The unallocated amount depends directly on the effluent concentration selected.

A starting point is to look at a long term average effluent limit of 10 ppq (the current general method detection limit) at each mill. This limit is initially applied at the

point of discharge. Total plant effluent flows are used as a basis to calculate loads. Discharge monitoring report (DMR) data have been summarized and includes average effluent discharge rates.

Using a long term average effluent limit of 10 ppq applied at the point of discharge and current estimates of monthly average flow at each mill, the cumulative load from all the mills equals 11.7 mg/day (Table B-1). This is greater than the loading capacity of 5.97 mg/day. Consequently, this option must be rejected because water quality standards would not be met under conservative assumptions, such as no attenuation. In addition, this would not account for any 2,3,7,8-TCDD from other sources. Thus, more restrictive controls are needed.

A permit condition set at a level below the general analytical detection limit creates a situation where it is difficult, if not impossible, to determine compliance. Because dioxins and other chlorinated organic compounds are produced in the bleach plant, concentrations of 2,3,7,8-TCDD are higher in the combined bleach plant flow than in the total plant effluent. This means that waste load allocations which result in total plant effluent concentration limits that are below the general analytical detection limit could be monitored for compliance by measuring concentrations in the combined bleach plant waste stream. Using **estimates** of bleach plant flows and a long term average limit of 10 ppq in the combined bleach plant flow, the cumulative load is 3.7 mg/day or approximately 62 percent of the total loading capacity (Table B-1). Although this option yields a cumulative load from chlorine bleaching pulp mills which is less than the loading capacity, several concerns exist:

- there is very little room for allocations to other potential sources, such as woodtreaters or the mill in British Columbia (estimates described in Appendix B indicate current loadings from other sources would exceed the unallocated portion of the loading capacity)
- there would be no margin of safety
- future growth in the pulp & paper industry is not addressed

For these reasons, the possibility of yet lower effluent limits was evaluated. This was accomplished by setting a "maximum" concentration of 10 ppq, rather than using a long term average of 10 ppq. To understand how this results in a lower allocation, the relationship between the waste load allocation (WLA) and the actual permit limits must be examined. In certain cases, permit limits will be different than WLA values. Because the criteria for 2,3,7,8-TCDD is set to protect human health, the loading capacity (and WLAs) reflect a long term average. It is important to consider how the WLAs address variability in effluent quality. Permit limits are set at the upper bounds of acceptable performance and are values not to be exceeded. Requirements are usually expressed using two types of permit limits, either daily maximum or monthly average. Procedures have been developed for computing monthly average permit limits from long term average WLAs in EPA's TSD ("Technical Support Document for Water Quality-based Toxics Control", U.S. Environmental Protection Agency, 1985).

Assuming a coefficient of variation (C.V.) of 0.6 describes the effluent variability for 2,3,7,8-TCDD from pulp mills[1] and one sample required to be taken per month, a monthly average permit limit of 10 ppq converts to a long term average WLA value of 4.7 ppq. Using estimates of bleach plant flows and 4.7 ppq as the long term average concentration limit for the combined bleach plant flow, the cumulative load is 1.8 mg/day or just over 30 percent of the total loading capacity. This leaves nearly 70 percent of the loading capacity available to cover loadings from other potential sources. This approach also results in more than a 95 percent reduction in 2,3,7,8-TCDD discharged from these pulp mills when compared to estimates of current loading based on results of the 104 mill study.

Table C-1. Waste Load Allocations for Chlorine-Bleaching Pulp Mills

Production (tons/day)	Percent	Option 1 TCDD WLA (mg/day)	Option 2 TCDD WLA (mg/day)	Option 3 TCDD WLA (mg/day)	Mill
1,509	17.2	1.42	0.71	0.33	Potlatch -- Lewiston, ID
957	10.9	0.76	0.14	0.06	Boise Cascade -- Wallula, WA
1,650	18.8	2.20	0.87	0.41	James River -- Camas, WA
310	3.5	2.37	0.23	0.11	Longview Fibre -- Longview, WA
1026	11.7	2.01	0.57	0.27	Weyerhaeuser -- Longview, WA
1500	17.1	0.19	0.19	0.19	Pope & Talbot -- Halsey, OR [2]
1,035	11.8	1.29	0.64	0.30	Boise Cascade -- St. Helens, OR
800	9.1	1.44	0.36	0.17	James River -- Wauna, OR
7,837	100.0	11.67	3.72	1.84	TOTAL Source Category Allotment

Option 1: Set Equal Long Term Average Effluent Concentration of 10 ppq at Point of Discharge

Option 2: Set Equal Long Term Average Effluent Concentration of 10 ppq at Bleach Plant

Option 3: Set Equal Long Term Average Effluent Concentration of 4.7 ppq at Bleach Plant

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[1] A C.V. of 0.6 is recommended in EPA's TSD ("Technical Support Document for Water Quality-based Toxics Control", U.S. Environmental Protection Agency, 1985) for situations where there is insufficient data to estimate a C.V. for a specific pollutant from a specific industrial process. In the fact sheet accompanying the public notice for the draft TMDL, EPA solicited information of use in developing a more appropriate C.V., if available, from the public. No such information was provided.

[2] The WLAs listed for Pope & Talbot under all options have been adjusted to the long term average of 0.19 mg/day identified in the NPDES permit issued by the Oregon Department of Environmental Quality (November 7, 1990).

Equal Mass Discharge per Unit Production:

A disadvantage of equal effluent concentrations based on current flow rates is that it may not be equitable for all mills. A common approach for industrial permits is to consider production levels in establishing effluent limits. To provide for more equity, each mill could be allocated an equal amount of 2,3,7,8-TCDD for discharge per quantity of bleached pulp produced. One way to accomplish this is to associate bleach plant flow rates with production quantity of bleach pulp. In estimating bleach plant flows, the Washington Department of Ecology used 14,470 gallons of wastewater generated per ton of bleached pulp produced. Applying this figure to calculate bleach plant flows and 4.7 ppq as the long term average concentration limit for the combined bleach plant flow, the cumulative load is 2.07 mg/day (Table B-2) or approximately 35% of the total loading capacity.

Table C-2. Waste Load Allocations for Chorine-Bleaching Pulp Mills

(**Option 4:** Set Equal Long Term Average Effluent Concentration of 4.7 ppq at Bleach Plant and Set Flows at 14,470 gallons / ton bleached pulp)

Production (tons/day)	Percent	TCDD WLA (mg/day)	Mill
1,509	17.2	0.39	Potlatch -- Lewiston, ID
957	10.9	0.25	Boise Cascade -- Wallula, WA
1,650	18.8	0.42	James River -- Camas, WA
310	3.5	0.08	Longview Fibre -- Longview, WA
1026	11.7	0.26	Weyerhaeuser -- Longview, WA
1500	17.1	0.19	Pope & Talbot -- Halsey, OR [1]
1,035	11.8	0.27	Boise Cascade -- St. Helens, OR
800	9.1	0.21	James River -- Wauna, OR
7,837	100.0	2.07	TOTAL Source Category Allotment

Although this is an increase of 0.13 mg/day over that shown in Table 5-5, the approach does address one major problem with using current bleach plant flows. Mills have been encouraged to recycle internal waste streams to the maximum extent possible. One example, Boise Cascade at Wallula, practices extensive recycling. Under the equal effluent concentration method, a mill that does a high level of recycling receives a lower allocation. However, a mill that does not make efficient use of water in the bleach plant benefits from a high allocation. This is a major reason for relating bleach plant flows to pulp production when determining allowable loads. This

[1] The WLA listed for Pope & Talbot has been adjusted to the long term average of 0.19 mg/day identified in the NPDES permit issued by the Oregon Department of Environmental Quality (November 7, 1990).

approach still results in more than a 95 percent reduction in 2,3,7,8-TCDD discharged from these mills when compared to results of the 104 mill study. Based on the evaluation in Appendix B, this reduction, although less than obtained by Option 3, is still sufficient to achieve total 2,3,7,8-TCDD loadings to the basin which are less than the loading capacity.

Equal Percent Reduction:

Another option considered is **equal percent reduction for all source categories**. Because there is an absence of specific data for loadings of TCDD to the Columbia, this approach can be viewed in several different ways. The first could use information on the relative magnitude of 2,3,7,8-TCDD in fish collected below potential sources of dioxin. Using median tissue concentrations summarized in Table A-1 as a general indicator of these relative contributions, thirty-six percent (36%) of the loading capacity could be attributed to chlorine bleaching pulp production. The remaining sixty-four percent (64%) could be attributed to other sources, such as municipal wastewater treatment plants or agricultural areas. This analysis excludes refineries because this industry is not known to be a significant source in the Columbia drainage. Although this approach does offer some advantages by accounting for other source categories, there are some major drawbacks. These include:

- NBS was intended as a screening study and not to describe source category loadings
- fish sampled nationally were collected from streams of varying sizes and did not account for dilution
- results of NBS associated with certain source categories may also include other sources (i.e. a site directly below a municipal wastewater treatment plant may also be 30 miles below a bleached kraft pulp mill)

Another option suggested is to use values of 2,3,7,8-TCDD measured in Columbia River fish and the bioconcentration factor used to develop the water quality criterion (0.013 ppq) to "back calculate" current TCDD loads. Although it may be possible to estimate the relative magnitude of present plus historic TCDD loading by looking at tissue concentrations, other factors besides a weighted average bioconcentration factor of 5000 must be considered. For instance, bioconcentration factors specific to the species should be evaluated. The age of the fish and lipid content of the samples must also be taken into account. The 5000 bioconcentration factor used to develop the criterion is intended to represent the weighted average factor for the species mix and lipid content in the "average" American fish / shellfish diet. The lack of species-specific bioconcentration data, as well as the difficulty in distinguishing the effects of historic versus current loading, makes using this approach inappropriate for this TMDL at the present time.

Region 10 Fact Sheet *February 25, 1991*

DIOXIN LOADING TO WATERS IN THE COLUMBIA RIVER BASIN

BACKGROUND

The water quality of the Columbia River and segments of the Snake and Willamette Rivers is currently considered impaired due to concentrations of a form of dioxin. The pollutant, 2,3,7,8-TCDD, is the most toxic of a group of compounds known as polychlorinated dibenzo-para-dioxins. These compounds, although occuring naturally at very low concentrations, can be found at elevated levels as a result of human activities such as the manufacture of chlorinated herbicides, the combustion of domestic and industrial wastes, and the production of chlorine-bleached pulp. Concentrations of TCDD measured in fish tissue in several areas of the Columbia River basin exceed levels protective of human health. Pulp mills which use chlorine to bleach paper products have been associated with some of the highest concentrations of TCDD in surface waters. Information also exists quantifying levels of TCDD in effluents from chlorine-bleaching pulp mills in the Columbia River basin. In order to reduce discharges of TCDD to acceptable levels in the Columbia River basin, additional controls are needed on known sources.

WHAT IS A TMDL?

Section 303(d) of the Clean Water Act requires each state (1) to identify waters for which effluent limitations normally required are not stringent enough to attain water quality standards and (2) to establish total maximum daily loadings (TMDLs) on such waters for the pollutant(s) of concern.

The process of developing a TMDL involves the calculation of the loading capacity (the amount of loading that the river can receive without violating water quality standards) and the allocation of allowable loads to point sources, nonpoint sources, and background. A TMDL, by definition, is the sum of the individual allocations to point sources, nonpoint sources and background. It is effectively an implementation plan for achieving water quality standards which includes an appropriate margin of safety which takes into account any lack of knowledge concerning the relationship between source concentrations and water quality.

Concern about issues of equity in the multi-state basin led the states of Oregon, Washington, and Idaho to request that EPA establish the TMDL for dioxin in the Columbia River basin as a federal action. EPA issued a public notice of the proposed TMDL and solicited comments on June 14, 1990, pursuant to the requirements of §303(d).

THE FINAL TMDL

EPA has considered oral and written testimony received during the public comment period, and is now establishing a final TMDL, effective February 25, 1991, which provides a framework to control dioxin discharges to the Columbia River basin. The TMDL defines the loading capacity of the entire basin to be about 6 milligrams of 2,3,7,8-TCDD per day. This value was derived based on an allowable concentration of .013 parts per quadrillion for 2,3,7,8-TCDD and the volume of water in the Columbia River.

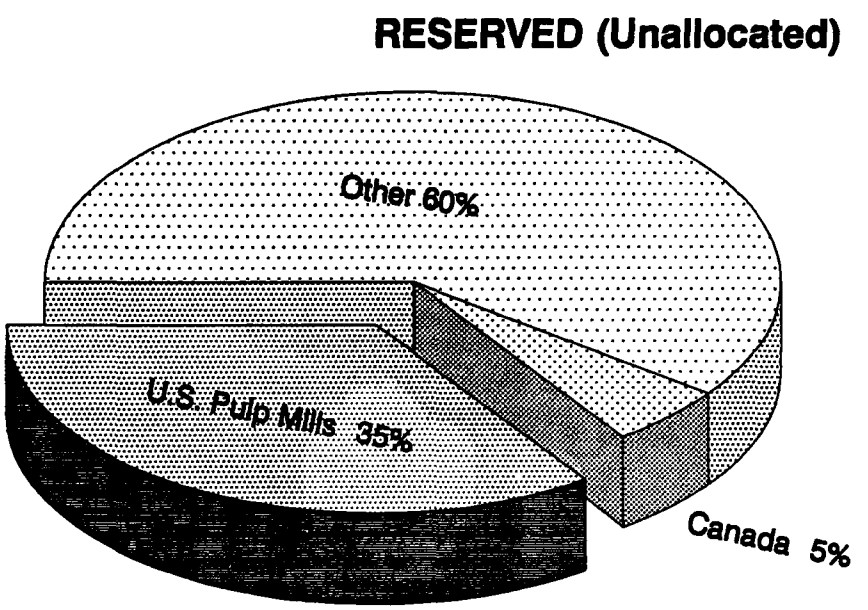
Because of the vastness of the Columbia River basin and the need to ensure attainment of water quality standards for TCDD at all points, the TMDL establishes key checkpoints within the system. Loading capacities, or "watershed targets," have been established for the Willamette River basin (0.54 mg TCDD/day) and the Snake River basin (1.18 mg TCDD/day). Allocations to sources within each of those watersheds must fit within these watershed targets.

EPA has also established specific wasteload allocations for the eight chlorine-bleaching pulp mills located in the Columbia River basin in Oregon, Idaho, and Washington. These allocations lead to an estimated 95% reduction in dioxin discharges from these facilities relative to the levels discharged in 1988. Wastewater discharge permits issued by EPA and the states of Washington and Oregon must be consistent with this TMDL. EPA also estimated future dioxin discharges for the Celgar pulp mill in Castlegar, Canada (expected to be less than 5% of the loading capacity).

EPA believes that other sources of dioxin exist in the Columbia River basin. In the final TMDL, EPA has identified other major sources and estimated their loadings of TCDD. Accordingly, the remainder of the loading capacity (3.59 mg/day or 60 percent) is reserved to account for

these other sources, for future growth, and as a margin of safety until adequate data has been collected and evaluated which either confirms the adequacy of the margin of safety or supports the establishment of additional or modified allocations. In order to obtain this additional data, EPA expects that the states will work in cooperation with EPA to develop strategies to collect the needed information. If future data identifies the need to make additional allocations, or to reduce any existing allocations, a modified TMDL will be established.

The following figure summarizes the overall structure of the TMDL:



WASTE LOAD ALLOCATIONS

PUBLIC COMMENTS

The public comment period for the proposed TMDL closed on July 20, 1990. In addition, a public hearing to discuss the TMDL was held July 17, 1990, in Vancouver, Washington.

A number of substantive comments were received concerning the proposed TMDL. Major revisions to the proposed TMDL, which were based upon comments received, were:

- estimates of the loadings from major sources other than chlorine bleaching pulp mills were made to be reasonably sure that the final TMDL will result in the achievement of water quality standards.

- an estimate of the projected loadings from the Celgar pulp mill in Castlegar, Canada, was incorporated into the TMDL (this replaced the assumption that the entire TCDD loading available for the Columbia River at the U.S.-Canada border be reserved for Canadian sources)

Other issues which were raised during public comment but which did not result in changes to the TMDL were:

- expanding the TMDL to include dioxins and furans other than 2,3,7,8-TCDD

- estimating the attenuation or availability of TCDD in the sediments

- alternative allocation approaches for the pulp mills (including allocations of zero for the mills, as well as allocation of the entire load for the mills)

EPA has developed responses to all significant comments received on the proposed TMDL. Copies of the final TMDL or the responses to comments can be obtained by writing EPA Region 10, WD-139, 1200 Sixth Avenue, Seattle, WA, 98101, or calling (206) 553-1086.

RESPONSE TO COMMENTS RECEIVED CONCERNING THE PROPOSED DIOXIN TMDL FOR THE COLUMBIA RIVER BASIN

February 25, 1990

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RESPONSE TO COMMENTS RECEIVED CONCERNING THE PROPOSED DIOXIN TMDL FOR THE COLUMBIA RIVER BASIN

ANALYTICAL CAPABILITIES

Comment. Several comments were received concerning the measurement of dioxin: who can measure it, at what levels can it be detected, can compliance with WLAs be reliably monitored?

Response. Nationally there are a limited number of analytical laboratories EPA is aware of which are capable of reliably measuring dioxins at levels of approximately 10 ppq in water samples. The Weyerhaeuser laboratory at the Weyerhaeuser Technology Center in Federal Way, Washington, is one of those facilities. Although one of the commenters supplied a Weyerhaeuser Canada article referring to the Federal Way facility having a "mass spectrometer capable of detecting molecules of chemical compounds to the parts per quintillion range," Kari Doxsee (Manager of the Analytical Chemistry Laboratories, Weyerhaeuser Technology Center) has confirmed (July 25, 1990) that their typical limit of detection for 2,3,7,8-TCDD is approximately 10 parts per quadrillion (ppq).

The limit of detection for any given sample will vary above and below the 10 ppq level depending on the interferences present in the sample. For example, Weyerhaeuser can frequently measure down to the 1 - 4 ppq range. Improvements in methodology and technology should further reduce the limit of detection in the future.

The TMDL provides the framework for achieving water quality standards in the basin by allocating permissible dioxin loadings from various sources. The ability to measure compliance with waste load allocations was a major concern during the development of this TMDL. If pulp mills exceed their long term average WLAs established in this TMDL, then, based on the assumptions made in the TMDL, individual samples from their bleached effluent would exceed 10 ppq 2,3,7,8-TCDD (i.e. they would contain measurable concentrations of 2,3,7,8-TCDD) more than 5% of the time. New NPDES permits for the pulp mills covered by the TMDL will specify effluent limits necessary to assure compliance with state water quality standards and must be consistent with this TMDL (see response to comment in "PERMIT LIMITS" section). Effluent sampling location, frequency, and analytical methods are specified in the permit, as well as any ambient monitoring requirements. The permittees are financially responsible for all monitoring required under the NPDES permits.

ANTIBACKSLIDING

Comment. What are the antibacksliding effects of the TMDL? It could be a mistake to start out with such a strict TMDL and find out later it wasn't necessary, but can't then loosen it.

Response. The TMDL itself is a management tool which is developed from available information. The TMDL may be refined as better information becomes available. Thus, allocations may be adjusted as the TMDL becomes more refined.

The concern expressed in this comment relates to whether the NPDES permit limits based on WLAs in a TMDL may be relaxed if the TMDL is revised to include a higher WLA. The most important provision of the Clean Water Act (CWA) relating to backsliding from water quality-based effluent limitations is Section 303(d)(4). This section has two parts: paragraph (A) applies to "non-attainment waters" and paragraph (B) applies to "attainment waters." The reach of the Columbia River that the TMDL applies to is currently considered to be a non-attainment water.

For non-attainment waters, the statute provides that a permittee may be allowed to backslide from a water quality-based effluent limitation if certain conditions are met. First, the existing permit limit being revised must be based on a TMDL or waste load allocation established under Section 303. Second, the revised permit limit must assure attainment of the water quality standard. These conditions would be met if, for example, after the TMDL and waste load allocations were finalized and NPDES permit limits based on the TMDL were developed, but before all the controls were implemented (to bring the waterbody into the attainment category), contributions from one of the sources was found to be less than previously estimated. Then some other allocation(s) and the permit limits based on those allocations could be increased as long as the revised TMDL would still ensure that water quality standards would be met.

In the case where the TMDL and waste load allocations have been implemented, the waterbody has become an "attainment water," and subsequent information shows that a less stringent TMDL would be adequate to meet water quality standards, waste load allocations may still be relaxed if certain conditions are met. Specifically, Section 303(d)(4)(B) provides for backsliding from water quality-based permit limitations if revisions are consistent with the state's approved antidegradation policy. In general, the national antidegradation policy states that an attained water cannot be degraded below the level necessary to protect waterbody uses that existed after 1975. In addition, an attained water cannot be degraded, unless the state finds, after satisfying public participation procedures, that the degradation is necessary to accommodate important

social or economic development. However, in this case, the water still cannot be degraded to below levels necessary to support propagation of fish, shellfish and wildlife and recreation in and on the water. In addition, waters designated by states as "Outstanding National Resource Waters" may not under any circumstance suffer long-term degradation of water quality. States are required to adopt antidegradation policies consistent with the Federal policy as a part of their water quality standards. Under §303(d)(4), establishment of a new TMDL based on updated information, and recalculation of waste load allocations, could be allowed if consistent with the state's antidegradation requirements.

BEST AVAILABLE TECHNOLOGY (BAT)

Comment. There is no evidence that proposed WLAs are achievable by BAT.

Response. Waste load allocations in a TMDL are established at levels necessary to ensure attainment of water quality standards. They are not based on any given level of treatment technology and are developed because BAT has been inadequate to protect water quality [Section 303(d)]. Existing effluent guidelines for the pulp and paper industry do not address dioxin. Effluent guidelines for BAT relating to dioxin discharges from pulp mills are scheduled to be proposed in 1993 and become final in 1995. At this point we do not know whether BAT limits based on those guidelines will be more or less stringent than the limits now necessary to conform with the TMDL. Absent promulgated effluent guidelines for dioxin from pulp mills, permits are to contain Best Professional Judgement (BPJ) limits reflecting BAT. Permit limits contain limits based on WLAs only if such limits would be more stringent than those based on BPJ BAT.

Comment. 100% chlorine dioxide substitution at Weyerhaeuser Longview may not assure compliance with the proposed WLA.

Response. As pointed out above, the WLAs in the TMDL are established at levels to ensure attainment of water quality standards. They are not based on a given treatment technology. Chlorine dioxide substitution is not the only alternative to chlorine bleaching. Other alternatives such as oxygen delignification and hydrogen peroxide bleaching may be used to assist in the reduction of dioxin contamination in pulp mill effluents while still producing a white product. It is also possible that some products currently bleached need not be bleached at all.

Comment. Since there are alternative bleaching processes, no discharge of dioxins should be allowed.

Response. EPA disagrees. Regardless of the existence of alternative processes which may lead to zero dioxin discharge, WLAs established pursuant to CWA §303(d) need not be set at zero unless that is required to meet water quality standards. EPA has determined in this TMDL that water quality standards can be met while allowing small but definable WLAs to the pulp mills in the basin.

Comment. There is no established BAT for dioxin discharges from pulp mills, so no defensible 303(d) listing could be made by states.

Response. CWA Section 303(d) requires that "each State shall identify those waters within its boundaries for which the effluent limitations required by section 301(b)(1)(A) and section 301(b)(1)(B) are not stringent enough to implement any water quality standard applicable to such waters."

While this section specifically provided for listing of waters under Section 303(d) when BPT and secondary treatment requirements are not stringent enough to implement water quality standards, EPA has interpreted the section as not requiring listing under Section 303(d)(1) if existing required pollution controls (including BAT requirements) are sufficiently stringent to implement water quality standards (50 FR 1775). In the absence of national effluent guidelines establishing BAT for dioxin from pulp mills, the relevant technology-based requirements which EPA reviews to determine whether a water should be listed under Section 303(d)(1) are the BPJ requirements in existing permits. BAT/BPJ effluent limits in existing permits have failed to achieve water quality standards for 2,3,7,8-TCDD. It would be too speculative to base a determination of whether water quality standards will be achieved based on BAT/BPJ limits or effluent guidelines to be developed in the future. If these technology-based limits developed in the future are more stringent than the WLA-based limits, then those limits must be complied with and the WLAs established here will have no practical effect.

Until the effluent guidelines are revised, it is not reasonable to assume that technology-based limits based on the revised guideline will result in attainment of the water quality standards for dioxin. Based on the current effluent guideline development schedule, such an assumption could lead to the water quality standard being violated for another 5 years before improvements in discharge rates were even initiated. Then, after waiting for BAT to be implemented, additional controls could still be needed, resulting in further delays. This is contrary to the very essence of Section 303(d). EPA believes that the purposes of the Act and the intent

of Section 303(d) are best achieved by its interpreting that section as requiring TMDLs where existing required pollution controls are failing to meet water quality standards.

CANADA

Comment. Several comments were received concerning the level of dioxin loading coming from Canada and the method we proposed to handle that loading in the proposed TMDL. There was considerable confusion evidenced by comments that it was unfair that EPA was proposing to allocate 2.3 mg/day to the Celgar pulp mill.

Response. EPA does not have the authority to regulate dischargers in Canada. This TMDL does not attempt to do so. However, it does recognize that there are sources of dioxin to the Columbia River basin above where the river enters Washington State. Available data indicate that as the river crosses the border it exceeds Washington's water quality standards with respect to 2,3,7,8-TCDD based upon levels observed in Lake Roosevelt fish. This would mean that past upstream loadings and sediment accumulations exceeded the loading capacity for 2,3,7,8-TCDD of the Columbia River as it crosses the border into Washington State. EPA and Washington State are currently working with Canada to reduce those dioxin loads north of the border. The Celgar mill is the only source on the Canadian side for which confirmation of 2,3,7,8-TCDD loading to the Columbia is available.

Both the Celgar mill and the British Columbia Ministry of Environment have commented that this mill will be modernizing, resulting in 2,3,7,8-TCDD discharges in 1994 which are less than 0.05 mg/day. The final TMDL reserves a higher loading of 0.31 mg/day to cover Celgar. This is not a WLA but rather an estimated loading. This estimate provides a margin of safety to cover a possible shortfall in Celgar's attainment of the projected 0.05 mg/day loading and other possible upstream sources. As additional information is assembled, this preliminary estimate may be refined.

COMPLIANCE DATE

Comment. When will compliance with the TMDL be achieved?

Response. Upon the establishment of the TMDL, the TMDL is automatically incorporated into the states' current water quality management plans [see 40 CFR §130.7(d)]. Subsequent actions, including effluent limits in NPDES permits, must be consistent with the TMDL [40 CFR §§122.44(d)(1)(vii); 122.44(d)(6); 130.12(a)]. There is no compliance date set in the TMDL,

but NPDES permits which are individual control strategies (ICSs) under CWA Section 304(l) must be designed to achieve compliance with established WLAs within three years of establishment of the ICSs. All the chlorine bleaching pulp mills for which WLAs are established in this TMDL were listed under §304(l) and are subject to these requirements.

Comment. The proposed TMDL will result in delayed attainment of standards beyond Section 304(l) deadline.

Response. The Section 304(l) deadline for attainment of water quality standards in affected waters is as soon as possible but not later than three years after the establishment of the ICSs. As explained above, establishment of this TMDL does not alter that time frame.

ECONOMY

Comment. Several comments concerned the effect of the proposed TMDL on the NW economy: that it would make region's mills uncompetitive; have a negative affect on balance of trade; and cause a loss of jobs.

Response. As pointed out above, the section of the CWA which requires TMDLs is based solely on the need to achieve water quality standards. Economic considerations are not a necessary part of the process.

ENDANGERED SPECIES

Comment. The proposed TMDL will adversely affect bald eagles & therefore violates Endangered Species Act. EPA has not consulted with U.S. Fish & Wildlife Service (USFWS) about the potential effects of the continued discharge of dioxins on bald eagles in the Lower Columbia River which are listed as "threatened" by the USFWS.

Response. EPA has consulted with the USFWS regarding the effects on bald eagles of the TMDL for dioxin discharges to the Columbia River basin. While USFWS suggested that EPA participate with them in further investigations concerning the accumulation of dioxin in Columbia River eagle eggs, the USFWS concluded that there are insufficient data at this time to determine whether this species has been affected by past discharges of 2,3,7,8-TCDD, much less whether bald eagles will be affected by the reduced dioxin discharges allowed by the final TMDL. The USFWS commended EPA's action to reduce existing discharges of dioxin to the

Columbia River basin. There is insufficient information at this time to determine the impact of dioxin on eagles. However, it is EPA's position that the reduction of the existing discharges of dioxin to the system that should result from implementation of the TMDL will not adversely affect any endangered species. USFWS agreed with this position and did not indicate that any further consultation was necessary under Section 7 of the Endangered Species Act with respect to issuing the TMDL.

GENERAL APPROACH

Comment. Several commenters suggested that the TMDL is overly conservative and/or is not based on a valid scientific analysis of the issue.

Response. The legislation requiring TMDLs clearly anticipated that TMDLs be established expeditiously even in situations where there may be insufficient information. This includes uncertainty with regard to sources and their relationship to concentrations of contaminants in the receiving water. A margin of safety is to be utilized to compensate for such lack of knowledge. The focus of this comment was the fact that EPA did not use a model which predicted attenuation (losses) of dioxin from the water column through sedimentation. All information and methodology available, including evidence of attenuation, was considered in the development of this TMDL. However, inconclusive data led EPA to make conservative assumptions with respect to issues such as mechanisms of loss of dioxin from the system. The Decision Document for the Final TMDL evaluates existing and modeled fish tissue data as evidence of net attenuation and concludes that these data support the use of a conservative model at this time.

Comment. Non-CWA authorities, such as Clean Air Act, Federal Insecticide, Fungicide & Rodenticide Act, Resource Conservation and Recovery Act (RCRA), Toxic Substances Control Act, and Superfund Amendments and Reauthorization Act, need to be used to control all sources.

Response. Although this TMDL is established under the provisions of the CWA, EPA agrees that all applicable authorities should be utilized to reduce the production and discharge of dioxins where it is demonstrated to be present at levels of concern. Three wood-preserving wastes, for example, were listed as hazardous wastes under RCRA Subtitle C in November 1990. Control of nonpoint sources may also require utilization of state law and/or local ordinances.

Comment. Tissue sample data in the National Bioaccumulation Study (NBS) are not adequate to describe relative contributions from the various sources studied.

Response. EPA agrees. The NBS is primarily useful to demonstrate the range of dioxin contamination present in our nation's waters and to give a first cut at which types of activities are typically associated with the highest levels observed.

Comment. Attenuation/sedimentation will result in problems being localized in areas below major sources. Therefore, developing the TMDL on basin wide basis is inappropriate. It would be more appropriate to rely on BAT or attack problems on more local basis.

Response. EPA disagrees. A solution to the problem of dioxin contamination in the Columbia River basin requires that the problem be evaluated at several levels (local, sub-basin, and whole basin) to account for multiple sources in the entire basin. While it is necessary to look at localized areas of contamination, such as through the NPDES permitting process, it is not sufficient to do so in isolation. Dioxin, due to its persistence, may be transported for considerable distances and has been measured in fish tissue taken from areas away from pulp mills. The TMDL provides for an equitable distribution of the loading capacity throughout the basin rather than allowing the entire loading capacity to be allocated to any one source to the detriment of others.

BAT limits based on BPJ, existing at the time the Columbia River was listed and approved as a §303(d) water, were not adequate to attain water quality standards. Whether BPJ limits to be developed in the future, or limitations based on future effluent guidelines for BAT, will be sufficient to attain water quality standards cannot be ascertained at this time.

GROWTH

Comments. Several comments were received relating to concerns about how future new sources or growth of existing sources would be handled through the TMDL process.

Response. EPA believes that economic growth can be accommodated in the Columbia River basin through the TMDL process. Indeed, without a plan, such as a TMDL, to achieve necessary reductions in dioxin loadings to the system, no new discharges of dioxin could be allowed. As further information is developed on the existing sources, uncertainties should

diminish and thereby lessen the magnitude of the margin of safety needed. This combination of factors may lead to further room for growth.

Proposals for activities leading to increased dioxin loadings will need to be evaluated on a case-by-case basis to determine whether allowance of the loadings is consistent with this TMDL and the requirements of the Act.

Assuming proposals meet water quality standards, additional factors which could be considered in evaluating relative priorities include the anticipated dioxin loading, efforts taken to minimize dioxin contaminated wastes, and the social/economic benefits of the proposed activity.

HEALTH RISK

Comment. One commenter expressed concern that toxics may be responsible for a number of cancers among the population on Puget Island in the lower Columbia River.

Response. EPA is not aware of any evidence linking the cancers described to any specific cause. It is a goal of the CWA and state water quality standards to protect human health as well as the environment from adverse impacts caused by contaminants in surface waters. The applicable state water quality criteria and the dioxin TMDL were established to reduce risks associated with dioxin contamination in the Columbia River basin.

Comment. Fish are being contaminated by dioxin; there is a disproportionate health risk to Indians; Indian treaties give rights to have fish to take; the federal trust responsibility requires protection of fish; commenters recommend zero dioxin discharge for WLAs for pulp mills.

Response. EPA recognizes the increased risk to people who consume greater than average amounts of fish from the Columbia River system. Estimates of those risks were given in a draft EPA report by Cleverly and McCormick ("Analysis of the Potential Populations at Risk From the Consumption of Freshwater Fish Caught Near Pulp Mills," April 23, 1990) and follow-up work is in progress. The TMDL being established for dioxin loading to the Columbia River basin is developed based on current state water quality standards. If those standards are not sufficiently protective of Indian health, changes in those standards should be sought. The states triennial review process provides one avenue for seeking such changes. See also responses to previous comments relating to the zero dioxin discharge option.

Comment. An industry sponsored study by ChemRisk (1989) confirms that there is no human health reason or environmental reason to require such strict limits. Each mill could be given WLA equivalent to 10-30 ppq in its final effluent without exceeding a risk of 1 in a million based on this study and industry modeling.

Response. EPA Region 10 does not agree with the risk estimates provided by the pulp mill industry. The goal of the TMDL is to ensure that state water quality standards are attained in the Columbia River system. The WLAs in the final TMDL, substantially lower than those which this comment suggests, are necessary to meet water quality standards according to EPA Region 10's evaluation. The Decision Document for the final TMDL provides the basis of EPA's determination. See also the response for the comment relating to the industry sponsored study under the "OTHER SOURCES" heading. Included in the administrative record for this TMDL is a letter dated March 16, 1990 from Laurence R. Foster (State Epidemiologist, Oregon Department of Human Resources, Health Division) to Llewellyn Matthews (Executive Director, Northwest Pulp and Paper Association) which summarizes several serious concerns (with which we concur) about the referenced study.

LAW

Comment. The waste load allocations (WLA) in the TMDL violate Washington state law provision RCW 90.54.020(3)(b).

Response. Section 303(d) of the CWA, 33 U.S.C. 1313(d), requires the states or EPA (upon disapproval of state submissions) to identify waters within a state's boundaries for which effluent limitations under Section 301(b)(1)(A),(B), are not stringent enough to implement water quality standards applicable to such waters. Section 303(d) also requires the establishment for these waters of a TMDL which is necessary to implement the water quality standards. A TMDL establishes allowable loadings for point source discharges into these waters (WLA) and load allocations (LA) for nonpoint sources. NPDES permits are then developed with effluent limitations, consistent with the WLA, which are designed to meet the water quality standards.

EPA is establishing a TMDL for 2,3,7,8-TCDD in the Columbia River for the states of Oregon, Idaho, and Washington. NPDES permit limits for dioxin discharges to the Columbia River basin must be consistent with the TMDL [40 C.F.R. 122.44(d)(1)(vii)(B); 122.44(d)(6); 130.12(a)]. However, Sections 301(b)(1)(C) and 510 of the CWA allow the state to implement

any more stringent limits necessary to meet state requirements.

The portion of the Washington law referred to states:

> *"Notwithstanding that standards of quality established for the waters of the state would not be violated, wastes and other materials and substances shall not be allowed to enter such waters which will reduce the existing quality thereof, except in those situations where it is clear that overriding considerations of the public interest will be served."* (emphasis added)

It is EPA's position that the TMDL does not violate this law for two reasons. The TMDL does not authorize the discharge of dioxin to the Columbia River; that can only be done in NPDES permits. These permits must contain water quality based effluent limits consistent with the TMDL. While a permit authorizing the discharge of dioxin must be consistent with the TMDL, it may also be made more stringent to the extent the state determines that effluent limits based on the TMDL would not be sufficient to protect water quality standards or to implement other provisions of state law. CWA §301(b)(1)(C); §401(a).

Secondly, effluent limits based on the TMDL do not reduce the existing water quality. The reduction of the discharge of dioxin resulting from the implementation of this TMDL will improve the existing quality of the waters not degrade it.

Comment. One commenter challenges EPA's authority to promulgate this TMDL because there is no support in the record that the affected states determined not to establish a TMDL for dioxin on the Columbia River.

Response. Section 303(d)(2) of the CWA requires EPA to either approve or disapprove submissions by states regarding the establishment of lists of water quality limited waters and load allocations for point source discharges to these waters.

On March 21, 1990, the states of Oregon, Washington, and Idaho sent letters to the Director of the Water Division, EPA Region 10, expressly stating that they would not establish state issued TMDL's for dioxin on the Columbia River and requesting that EPA establish a TMDL as a federal action. This was based on the states' desire for consistency and equity in regulating discharges to waters in the multi-state Columbia River basin. Based on these submissions EPA, in accordance with Section 303(d)(2), disapproved these submissions and established the TMDL.

EPA has statutory authority to take this action. As a matter of law, under CWA §303(d)(2), an explicit state determination to set no TMDLs must be reviewed by the EPA and the EPA is required to approve or disapprove the submission. If EPA disapproves it must set its own TMDLs. Certainly a state's decision to not act should not defeat the intent of Congress that TMDLs be established for waterbodies meeting the listing criteria under CWA §303(d).

Comment. One commenter raised questions as to the effect of the TMDL on NPDES permits and the reviewability of the TMDL in a state forum challenge to the permit.

Response. NPDES permit limits must be consistent with the waste load allocations in the TMDL. Judicial review of the TMDL must be reviewed in federal court and EPA believes that any such review would be based on the administrative record. Challenges to NPDES permits must be pursued administratively through the agency which issued the permits. See discussion under "Judicial Review" in the decision document.

Comment. The phased approach is contrary to law.

Response. See response to comments on "Phased Approach."

Comment. Weyerhaeuser (p.12 of a letter dated July 20, 1990) suggested "that a reasonable response to the data gaps in the TMDL decision document would be to postpone adoption of a 'final' TMDL ... and [instead] adopt a set of load and waste load allocations expressly labeled as provisional for the purposes of permitting only. Compliance with these provisional waste load allocations (if retained or as modified) would be due three years after permit issuance." An effective period of one year for the provisional permit was suggested during which additional information would be gathered.

Response. EPA agrees that the TMDL should be established regardless of the need for further information. However, the procedural mechanism suggested is not provided for in the CWA and EPA believes it is important that these dioxin controls be final agency action even if later modified. The TMDL developed may be modified later if new information is obtained which supports revision (see also response to comment under "ANTIBACKSLIDING"). Further studies are planned but a commitment to revising the TMDL at a specific future date would be premature at this time. The waste load allocations in the TMDL will be implemented through NPDES permits. The compliance date for dioxin in the case of the mills affected by this TMDL is dictated by Section 304(l).

LOSSES

Comment. Several commenters criticized the lack of consideration of processes leading to loss of dioxin from the system. Others commented, however, that delaying regulatory action to improve knowledge of these processes would be inappropriate.

Response. EPA agrees that the implementation of this TMDL should proceed while further data are gathered. Appendix B of the final TMDL includes an expanded discussion of available information on attenuation and the sediments as a loading source to the river system. See also the responses in the "GENERAL APPROACH" section.

MARGIN OF SAFETY

Comment. Several comments were received that the concept of a margin of safety needs clarification and that the margin of safety incorporated into the proposed TMDL was too large or too small.

Response. Section 303(d)(1)(C) of the Clean Water Act and EPA implementing regulations require each state to identify waters for which existing pollution control requirements are not stringent enough to attain water quality standards applicable to such waters. Total maximum daily loads (TMDLs) are then to be established on such water quality limited segments for appropriate pollutants of concern. This provision states that the TMDL:

> *"shall be established at a level necessary to implement the applicable water quality standards with seasonal variations and a margin of safety which takes into account any lack of knowledge concerning the relationship between effluent limitations and water quality."* (emphasis added)

The margin of safety reflects uncertainties in the development of the TMDL. Such uncertainties may relate to, for example, (1) potential sources for which measurements of pollutant loadings are not available, and (2) the uncertain fate of pollutants once introduced into the waterbody. Conceptually it involves establishing WLAs and LAs such that, even if some of the assumptions made are in error, implementation of those allocations will still result in attainment of the water quality standard.

The size of the margin of safety needed in, or that is actually provided by, a given TMDL is not easily determined and may depend to a large degree

on professional judgement. The margin of safety is not something that can be precisely calculated. For instance, using a conservative model to estimate pollutant transport and fate results in a cautious estimate of the system's loading capacity. This provides a margin of safety, but since we do not precisely know the "true" loading capacity we cannot quantify the magnitude of this component of the total margin of safety. Similarly, the fact that some sources may not fully utilize their allocation provides an additional unquantifiable margin of safety. In any TMDL, some margin of safety may be provided by establishing allocations that in total are lower than the defined loading capacity.

In the final TMDL we use a conservative model to describe transport, fate and attenuation, thus providing part of the needed margin of safety. The total of the only allocations established (the WLAs for the existing pulp mills in the basin) is also significantly less than the estimated loading capacity. The unallocated portion of the loading capacity also provides a margin of safety as noted in the Decision Document. Of course, EPA recognizes that there are existing sources of dioxin to the basin other than the chlorine bleaching pulp mills. Thus, only a fraction of the unallocated amount constitutes a margin of safety. The final TMDL estimates loadings attributable to additional sources (woodtreaters, municipal wastewater treatment facilities, and Canadian sources) to demonstrate their ability to fit within the currently unallocated portion of the TMDL. See also responses to comments in the "OTHER SOURCES" category.

MIXING ZONE

Several comments related to the relationship between the TMDL and mixing zone policies:

Comment. The water quality standard should be achieved at the point of discharge. The bioaccumulative nature of dioxin makes assumptions of dilution unreasonable; the TMDL will not adequately address "hot spots."

Comment. TMDL should include analysis of compliance with mixing zone policies.

Comment. Proposed WLAs will result in violations of standards at edge of Boise Cascade mixing zone and downstream for 1500 meters downstream.

Comment. Potlatch WLA will result in violation of the water quality standard for a considerable distance downstream.

Response. While effluent limits in NPDES permits need to be consistent with WLAs in an established TMDL, WLAs are not effluent limits. States establish mixing zone policies as a part of their water quality standards process. Where a state allowed mixing zone is less than the entire river flow, NPDES effluent limits may need to be more restrictive than the WLA would require. An

analysis of this issue, if appropriate, occurs as a part of the NPDES permitting process.

The is no evidence in the record to support assertions of nonattainment of standards outside of state allowed mixing zones. Development of analyses needed for such determinations would require time and money. In light of §304(l) and §303(d) deadlines, EPA believes it should move forward now, rather than duplicate efforts which the state should conduct during the permitting process.

One comment was that no mixing zone should be allowed due to the bioaccumulative nature of this persistent pollutant. However, this issue more directly relates to the appropriateness of existing water quality standards of the states in which the pulp mills are located and thus is not addressed in the TMDL.

MODELING APPROACH

Comment. The geometric mean flow is a better measure of average dilution available in flow regulated systems. This results in a loading capacity of 0.75 mg/day vs. 0.54 mg/day used in the proposed TMDL for the Willamette River basin.

Response. EPA's evaluation of available data suggests that the more conservative measure of the mean, the harmonic mean, more accurately represents the average dilution available in the river. EPA's Draft "Technical Support Document for Water Quality-based Toxics Control" (1990) recommends general use of the harmonic mean for this purpose. The harmonic mean is an appropriate estimate of long-term average flow in highly regulated river basins, such as the Columbia and Willamette. In a regulated river basin, the harmonic mean and the geometric mean are reasonably close. The differences suggested in the comment appear to be the result of differences in the period of record used for flow data. Flow records used to determine the loading capacity in the Columbia Basin were those reported by the U.S. Geological Survey from 1950 to present.

Comment. The TMDL should utilize available models to reflect the flow dynamics of the system, as well as the transport & fate of dioxin; at the very least a sensitivity analysis should be done.

Response. The more sophisticated a model is, the more information is needed to use it. Unfortunately, EPA does not at this time have sufficient information to justify using models requiring estimates of the dynamic processes referred to. While some parameters could perhaps be reasonably estimated,

others (such as loading from historical deposits in the sediment) would need to be given such wide ranges of values that the results from such a model would be of negligible value. Thus, EPA has chosen to use a conservative approach which reflects the amount of available data.

Comment. Less dioxin should be discharged during dry (low river flow) seasons.

Response. The water quality standard which is the basis of the TMDL is based on the human health effects of a long term (70 year) exposure to dioxin through consumption of contaminated fish and drinking water. Seasonal variations in river flow are thus not of great significance. The TMDL, therefore, calculates the loading capacity of the system based on harmonic mean flows which reflect the average dilution provided by the river.

OTHER SOURCES

Comment. Dioxins/furans in Portland Harbor are not from the Pope & Talbot, Halsey Pulp Mill (based on "fingerprinting").

Response. Region 10 acknowledges that there are likely to be sources of dioxin loading to the Willamette basin in addition to the Halsey mill. One such source may be contributions from sediments contaminated by past dischargers. However, this does not reduce the need to control the discharges from current known sources, including the Pulp & Talbot mill. It does, however, support the acknowledged need to gather further information to quantify the contributions from these other sources.

Comment. There is a clear need for additional evaluation of other sources, including dredging and nonpoint sources.

Response. Region 10 agrees. As controls on the pulp mills are being implemented, further information will be collected concerning other possible sources (see discussion on phased approach). The Corps of Engineers is considering work which will evaluate the effects of dredging.

Comment. Site specific data on sources such as woodtreaters in the Columbia basin are not needed to estimate the magnitude of their dioxin discharges relative to the unallocated portion of the total loading capacity. National data can be used for this purpose.

Response. Region 10 agrees that information describing loadings from similar activities in other locations would be useful in evaluating the potential magnitude of contribution from those same activities in the Columbia River basin. The final TMDL uses some national data combined with small amounts of Regional data to estimate dioxin loadings from two additional source categories.

Besides chlorine bleaching pulp mills, the source for which the best information exists is municipal wastewater treatment facilities. National data demonstrate that the sludges removed from some municipal plants contain dioxins and furans. Octa-chlorinated forms predominated the dioxins found in these sludges. Presumably where sludges are contaminated, the wastewater discharges (which contain suspended solids) would also contain these compounds. Of the five municipal facilities whose sludges were examined in the Columbia basin only one had detectable levels of 2,3,7,8-TCDD. The highest 2,3,7,8-TCDD concentration measured for that facility was 3.3 ng/kg. The national average was similar at 2.8 ng/kg. If we assume that the suspended solids in the effluent from the facilities in our Region also contain that concentration of 2,3,7,8-TCDD, a loading can be estimated based on the Total Suspended Solids (TSS) discharge data reported for the facilities in the basin. This approach results in an estimated loading of 0.2 mg/day 2,3,7,8-TCDD to the entire basin from these facilities (see Appendix B of the Decision Document for the Final TMDL). As additional information is assembled, this preliminary estimate may be refined.

Another likely source of dioxins is the woodtreating industry. We know that pentachlorophenol (PCP), one of the chemicals used in this industry, is frequently contaminated with varying amounts of dioxins. This is one of the source categories which we plan to study further in our efforts to control dioxin loadings to the Columbia R. At this time, however, we have no direct information on how much dioxin from these facilities may ultimately be transported to surface waters. Process wastewaters from these sources are generally not permitted for discharge. The most likely mechanisms of transport of 2,3,7,8-TCDD contaminated PCP are stormwater and subsurface flow from retention ponds near surface waters. PCP has been monitored, but not limited, under NPDES permits covering stormwater discharges from some of these facilities. Based on that data and an assumed ratio of 2,3,7,8-TCDD to PCP in the discharge, it is estimated that 1 - 2 mg 2,3,7,8-TCDD/day could be originating from woodtreating operations in the Columbia River basin (see Appendix B of the Decision Document).

A third potential source category is non-chlorine bleaching pulp mills and other potential industrial sources. An estimate of loadings from these

sources cannot be determined at this time because no data has been identified which describes 2,3,7,8-TCDD in either effluents or sludges. As additional information is gathered, it will be possible to estimate loadings from these sources. See also Appendix B of the Decision Document for the Final TMDL.

Comment. EPA is ignoring available information of other sources of dioxin. EPA must use existing data to estimate waste loads from these sources.

Response. The public notice of the proposed TMDL specifically requested that any relevant information in the possession of commenters be provided. We have carefully reviewed the supplied information and have found little additional data of use in establishing WLAs for sources outside of the pulp mill category. However, the final TMDL estimates potential contributions from two additional source categories (see response above).

Comment. Lack of dates and commitments for State and EPA action regarding collection of further data on other sources, indicates that the phased approach is a pretense.

Response. The phased approach results from EPA's recognition that needed reductions in loadings from the pulp mills should not be delayed while gathering information on other sources. The high expense of analyzing dioxins, budgetary constraints, and uncertainties relating to the results of future monitoring, make it difficult to predict the rate of progress in gathering further information and making any necessary adjustments to the TMDL. (See also the response to comments in the "Phased Approach" category.) EPA has developed this TMDL recognizing the limited information available, and has incorporated a margin of safety into the analysis such that, not withstanding the current limits on information, water quality standards are expected to be attained.

Comment. An industry sponsored fish study (Beak Consultants, 1989) shows higher fish tissue concentrations above the mills than below; other sources need to be accounted for.

Response. The existence of other sources is recognized by EPA and is the reason that WLAs to the pulp mills were limited to less than loading capacity of the system. The industry sponsored study had several weaknesses in its design which make it difficult to draw conclusions about the relative significance of pulp mill discharges versus other sources of dioxin to the system. The most critical problem with this study was the location of sampling sites. For example, the referenced study took no samples from

the reservoir above McNary Dam directly downstream of Wallula. The nearest downstream samples were taken from below McNary Dam. Based on the 104 Mill Study, however, the Boise Cascade mill at Wallula contributed the highest dioxin loading to the river of any mill in the Region. Fish from the reservoir above McNary Dam, into which this mill discharges its wastewater, also had some of the highest tissue concentrations of TCDD in the Pacific Northwest.

Comment. The proposed TMDL does not address how much dioxin toxicity is in the river system already (e.g. available from sediments), as well as loading from all sources.

Response. The final TMDL has an expanded discussion of other sources of dioxin to the system including bottom sediments (see Appendix B of the TMDL).

Comment. What input might there be from pulp mill air emissions to the Columbia River?

Response. Since dioxins are formed in combustion processes, one would expect them to be produced in the boilers at pulp mills. The Region is aware of the analysis of dioxins and furans in one sample of boiler fly ash (from an Alaskan pulp mill). The results of that analysis showed total TCDD levels of ~74.6 ppb; 2,3,7,8-TCDD was not analyzed separately. Thus, although air emissions are likely to contain dioxins and other chlorinated organics, we do not know enough to estimate potential contributions to the Columbia River from these air emissions. Given the probable wide dispersal of the air particulates, only a small fraction would be expected to fall on water directly. Dioxin's affinity for solids would also mean that direct erosion would be required to transport dioxin contaminated solids settling on land to surface waters. Thus, the transport of dioxin contaminated pulp mill boiler emissions is probably a minor source relative to their direct wastewater discharges. EPA believes that any contribution from this source is more than adequately covered by the margin of safety built into the TMDL.

Comment. Application of the TMDL concept to dredging and disposal activities is inappropriate as these activities are sufficiently regulated under Section 404 and 401 of the CWA of 1977 and Section 103 of the Ocean Dumping Act of 1972.

Response. The TMDL process should take into consideration all sources of the pollutant of concern. To the extent that dredging of sediments results in the transfer of dioxin from those sediments to the water column, that

activity is using some of the loading capacity which is, therefore, not available for other users of the system. Of course, if dredging and disposal activities are regulated under Section 404 such that there are no associated discharges of dioxin, then any future TMDL would have no effect on these activities.

The Corps of Engineers (COE) recently completed analyses of TCDD in sediments in areas to be dredged in the Columbia River. Columbia River sediment had non-detect TCDD in areas with mostly sandy, silty sand, or sandy silt sediments. TCDD was found at two stations in the Willamette River in low ppt concentrations. These stations, however, also contain other pollutants at levels of concern, which will be considered in making dredging and dredged material disposal decisions.

The Final TMDL emphasizes the control of point source discharges of dioxin through NPDES permits. While uncertainty about the release of dioxin from sediments contributes to the need for a significant margin of safety, the Final TMDL does not provide specific allocations for dredging activities.

Comment. The TMDL must identify quantities assigned to WLAs, LAs, margin of safety, and reserve capacity.

Response. The final TMDL identifies WLAs for chlorine bleaching pulp mills, estimates loadings from other sources, and leaves unallocated a portion of the loading capacity. As described in response to the "MARGIN OF SAFETY" comment, the margin of safety cannot be precisely quantified as it is comprised of a variety of conservative assumptions made in estimating the loading capacity and evaluating contributions from the various sources as well as the unallocated loading capacity.

PERMIT LIMITS

Comment. Concentration and flow limits could unfairly penalize mills that practice extensive recycling.

Response. The Final TMDL includes no concentration or flow limits for pulp mills. The TMDL specifies allowable loadings (WLAs) for the pulp mills in the basin. In order to be equitable, the WLAs are proportional to quantities of bleached product produced. The factor (0.257 μg/ton) used to arrive at the WLA was based on an assumed concentration of 2,3,7,8-TCDD (10 ppq maximum or 4.7 ppq long term average) and an average flow of 14,470 gallons of wastewater discharged per ton of bleached product. If a

mill uses extensive wastewater recycling to reduce discharge flows from the chlorinated wastestreams, they could have higher concentrations of 2,3,7,8-TCDD in the discharged wastewater while still being in compliance with the loading limit and the WLA. NPDES permits based on this TMDL should include dioxin load limitations consistent with the WLAs, not the concentration which was assumed in its derivation.

Comment. The TMDL should be specific about how permit limits should be derived from WLAs and how compliance will be measured. How will below detection or below quantitation limit results be handled?

Response. The TMDL is specific in describing WLAs as a long term average loading limit. There are several ways in which the states could translate the WLAs into permit requirements. As long as the NPDES permits include limits consistent with the TMDL and compliance is effectively monitored, the states will be allowed flexibility in how they achieve that goal. WLAs have been established at levels such that inadequate plant performance will lead to individual samples having concentrations which are measurable.

Comment. If 2,3,7,8-TCDD is the only pollutant addressed by the TMDL, polluters will be liable for CWA penalties for discharging other chlorinated organics.

Response. The response to comments under the heading "TEC vs TCDD" addresses the reasons why this TMDL focuses on 2,3,7,8-TCDD. The CWA liability of dischargers for various pollutants in their wastestreams is a question of compliance with the limits in their NPDES permit(s).

PHASED APPROACH

Comment. Several comments were received relating to the legality, timing, and effects of the phased approach discussed in the proposed TMDL.

Response. It appears that the "phased approach" terminology led to considerable confusion. The TMDL now being established is "final." It reflects EPA's best professional judgement given the information available at this time. The law requires that a TMDL be established at a level which reflects existing uncertainties. As further information is obtained, however, the TMDL may also be modified or revised through the same process used to develop it in the first place. The levels of uncertainty involved in this TMDL are not insignificant. Therefore, EPA chose to not only acknowledge those uncertainties, but to also state its intention to actively gather additional data to improve our knowledge with respect to certain issues. There is no required time frame for this next "phase" and, given budgetary

constraints and other uncertainties, we cannot at this time predict when this TMDL might be revised.

One concern expressed was whether a revised TMDL could conceivably result in reduced WLAs to the pulp mills. If new information indicates that, contrary to our present evaluation, other uncontrollable sources of dioxin are more significant than the present TMDL assumed, further reductions would be necessary in the existing WLAs.

Another comment was that, while this TMDL is in effect, further efforts should be undertaken to eliminate chlorine bleaching. As EPA begins to implement its pollution prevention initiative, this would seem to be a possible direction for the future. However, EPA does not believe at this time that it is necessary to eliminate all chlorine bleaching of paper products to meet water quality standards.

PRODUCTION

Comment. Weyerhaeuser Longview produces 407 tons per day (TPD) of bleached fine paper grades and 639 TPD of bleached paper board = 1046 TPD total bleached product (1026 TPD was used in proposed TMDL).

Response. Our production estimates are based on those used by the Washington Department of Ecology in developing their draft permit for Weyerhaeuser Longview. As of August 31, 1990, Ecology was still estimating Kraft fine paper production at 400 TPD and 626 TPD of Kraft paperboard production. These are the only products listed which are bleached at the plant. The suggested change represents only a 2% difference and would need to be corroborated before it could be accepted. No change in production figures is justified at this time.

Comment. Boise Cascade, St. Helens, produces over 1100 tons/day pulp and is in the midst of a $400 million renovation which will increase production.

Response. The 1035 ton/day figure used in the TMDL is based on Oregon Department of Environmental Quality's draft permit dated May 25, 1990, for the City of St. Helens. A final permit just issued was consistent with this figure. Boise Cascade has submitted no information to revise this estimate and made no comment relating to its production rates during the comment period.

PUBLIC PARTICIPATION

Comment. Several comments were received about the adequacy of the public comment process for the proposed TMDL. Those making these comments felt that a longer comment period was needed or that workshops with industry should have been held to discuss technical issues.

Response. EPA and the states have been very open in the process of developing the proposed TMDL. Both industry and environmental groups have had copies of earlier drafts (December 22, 1989 and April 20, 1990) of the TMDL which were very similar to the proposed version. In fact we received informal comments on these drafts. The effective comment period for these parties was, therefore, much longer than the formal 35 day period held after the Public Notice on June 15, 1990, and more than adequate in the opinion of EPA. EPA also believes that the 35 day period was itself adequate in light of statutory deadlines for Agency action on such matters under CWA §303(d) and §304(l).

Although industry and others were able to provide information and comment to EPA, as were all parties, we did not feel it was appropriate to hold workshops with industry. The only way that industry workshops could have served any useful function, other than that already available, was if EPA provided information to industry which was not publicly available. That would clearly have been inappropriate.

REFERENCES

Comment. The TMDL needs more reference information to support river flows used, effluent flows, TCDD data used, justification for Coefficient of Variation used.

Response. The final TMDL decision document contains more complete references for data and assumptions used.

RESEARCH

Comment. Additional research on sources, effects, and analytical methods should be done by an independent group, but funded by those who are contaminating public waters.

Response. Additional research is planned by a number of entities on related subjects.

Such work will include, but not be limited to, monitoring by the pulp mills given WLAs in the final TMDL.

STATE PLANNING

Comment. EPA needs to clarify how the TMDL fits in with state water quality planning efforts.

Response. Upon the establishment of the TMDL, it automatically becomes a part of the Water Quality Management Plans of the affected states. Subsequent NPDES permitting actions requiring state or federal approval will need to be consistent with the TMDL. State water quality planning efforts will also need to be consistent with the TMDL. Since the TMDL is subject to change as further knowledge is gained, state water quality planning efforts will need to react to future changes in the TMDL or, in some cases, may cause such changes.

TCDD VS TEC

Comment. Several comments related to the appropriateness of regulating just 2,3,7,8-TCDD at this time. Some thought that other organochlorines, including other dioxins and furans, should be covered by the TMDL.

Response. EPA Region 10 does not believe it is appropriate to use a toxicity equivalency concentration (TEC) approach for including other compounds in the TMDL for the following reasons:

- 2,3,7,8-TCDD is the most toxic of all dioxin and furan compounds, and thus is the chemical of greatest concern. Controlling 2,3,7,8-TCDD discharges will greatly reduce the risk posed by dioxins and furans in general.

- It is expected that actions taken to reduce 2,3,7,8-TCDD discharges will also reduce the production of other dioxins and furans. This is supported by recent information supplied by three pulp and paper mills in the Columbia River basin (Boise-Cascade at Wallula, Potlatch at Lewiston, and James River at Camas) indicating that as effluent concentrations of dioxins have decreased, the concentrations of furans have also decreased.

- There does not appear to be sufficient information available on other dioxin/furan congeners upon which to base a numeric water quality

criterion or a TMDL for TEC. For example, while relative toxicities of other dioxins/furans have been estimated, little is known regarding their tendency to be taken up and bioconcentrated in fish tissues. Additionally, little is known regarding whether or not other dioxins and furans are metabolized by fish or other organisms, which would affect their persistence.

- It is not clear that states intend to regulate carcinogenic substances in wastewater discharges at a cumulative level of one increased incidence of cancer for all (or a group of) chemicals. For example, in Oregon's Water Quality Standards, water quality criteria for carcinogenic substances are set at a concentration which would result in one additional cancer per one million people on a chemical by chemical basis. Thus permit limits are generally based on a chemical by chemical basis using the "one in a million increased cancer risk" criteria. Historically, carcinogenic substances have been regulated in Washington and Idaho on a chemical by chemical basis as well, rather than attempting to regulate for all chemicals on a cumulative basis. While regulation on a cumulative basis may be desirable at some point in the future, states must first develop methodologies for such actions, as well as a determination as to whether cumulative evaluations would be based on the same cancer risk endpoint of one additional cancer per million people.

- EPA also does not believe there is adequate information available at this time to factor PCBs, DDTs, or other related compounds into a single toxicity equivalency approach.

WATERSHED APPROACH

Comment. Several people commented on the TMDL approach of evaluating the whole Columbia River basin and the use of watershed targets for major sub-basins. For the most part, commenters were supportive of this broad approach. One commenter, however, felt that the WLAs for the pulp mills were inequitable, since they constituted differing fractions of the loading capacity for each of the watersheds. Another commenter thought that since the Willamette River basin was entirely within Oregon, that state should have the responsibility to allocate loadings in that basin.

Response. It is true that the sum of the WLAs to the pulp mills in the various watersheds varied as a percentage of the loading capacity for the watershed. This resulted from treating each of the pulp mills equitably based on existing bleached pulp production. This approach should not, however, give any one state an economic advantage over others, beyond

that which accrues from having greater water volumes available for dilution. To the extent that existing pulp mills utilize more of the loading capacity in a given watershed, there will be less room for other sources or growth in that watershed.

This TMDL establishes a WLA to one source on the Willamette River (Pope & Talbot at Halsey). However, because the Willamette Basin is entirely within Oregon, the Oregon Department of Environmental Quality has the option, within the context of a TMDL, to adjust allocations for specific sources which would still meet this watershed target. See also discussion under "Watershed Targets" in the Decision Document.

WLA APPROACH

Comment. The most equitable allocation method to pulp mills is that based on production rates.

Response. EPA Region 10 agrees and has followed this approach.

Comment. WLAs are inequitable since they result in differing concentration limits for the various pulp mills.

Response. Since the pulp mills in the Columbia River basin differ in the efficiency with which they use water, WLAs cannot be established which are equitable on both a production rate basis and a concentration in effluent basis. Since the ultimate goal of the TMDL is to control mass loading to the basin, not the concentration in the effluent, the production basis was selected for establishing the WLAs for pulp mills. Use of a concentration basis for the WLAs would also be counterproductive with respect to a general EPA goal of minimizing water usage in and pollutant discharge from industrial processes.

Comment. WLAs should be based on production capacity rather than actual production.

Response. Basing WLAs purely on production capacity would allow plants with substantial unused capacity to discharge greater amounts of dioxin per amount of bleached product produced than would be allowed for mills operating at capacity. This would be counter to EPA's effort to be equitable to the mills while establishing WLAs that will lead to attainment of water quality standards. Where plans for substantial production increases are proposed and confirmed, however, EPA will consider changing WLAs on a case-by-case basis within the context of this TMDL. See also the

response to comment in the "GROWTH" section.

Comment. Each mill should be given WLA equivalent to 10-30 ppq in final effluent; this would have risk less than 1 in a million based on industry modeling. Process for further refinement of TMDL could be incorporated.

Response. See response under "Health Risk."

Comment. The allowable discharge should be based on ability to avoid discharge rather than receiving water's capacity.

Response. EPA agrees that ability to avoid discharges should be considered in establishing effluent limits. That is the technology-based approach to regulating point sources and is the goal of BAT. For the pulp mill industry EPA plans to promulgate in 1995 revised BAT effluent guidelines which will minimize the production and discharge of dioxin based upon technological consideration. The TMDL, in accordance with Section 303(d) of CWA, is required to achieve water quality standards in waters where existing pollution control requirements (including existing technology-based limits) have not been adequate to do so. (See also response under "BAT").

Comment. Proposed WLAs will not achieve a sufficient reduction of 2,3,7,8-TCDD, based on fish tissue concentrations, to fit within defined loading capacity.

Response. The water quality standard which is the basis of this TMDL is itself based on the health effects of 2,3,7,8-TCDD. Although the standard is expressed as a concentration of 0.013 ppq in the water, it is primarily based on a fish tissue concentration (0.07 ppt) which is predicted to cause one excess cancer per one million people (10^{-6}) who consume an assumed quantity of this fish over 70 years. Thus, the 10^{-6} risk level, a fish concentration of 0.07 ppt and a water concentration of 0.013 ppq are, in the context of the 2,3,7,8-TCDD criterion, equivalent. This comment points out the fact that measured dioxin levels in fish sampled in the National Bioaccumulation Study in many cases exceeded the acceptable level (0.07 ppt) by a greater factor than that required by the TMDL as a reduction in the pulp mill discharges. This interpretation of the data is one which EPA was aware of in its development of the TMDL. It is one of the reasons that the agency chose to conservatively assume no net attenuation in its model of the system. However, the dioxin loadings the NBS fish tissue data reflect are not known. They may, in fact, be the result of even higher historic loadings than were measured in the "104 Mill Study." EPA, therefore, chose not to estimate needed loading reductions based on the fish tissue data.

Comment. The proposed TMDL is inconsistent in that it assumes pulp mills are only 34% of the current dioxin loading and yet a 95% reduction in loading by that category alone will result in meeting standards.

Response. EPA disagrees with the interpretation of the proposed TMDL made by this commenter. WLAs in the TMDL do not represent EPA's assumptions of existing dioxin discharges by industry, but rather an apportioning of the load they will be allowed to contribute in the future. The proposed TMDL pointed out that there were several weaknesses in trying to use the NBS data to estimate relative loadings of various source categories. EPA does not assume that the pulp mills have contributed 34% of the past or current loading to the system. Based on currently available information, EPA believes that the pulp mills have contributed a higher share of the loading in the past and that other sources will fit within the reserved capacity. However, EPA does not now have sufficient information to accurately estimate the exact fraction of the total dioxin loading to the Columbia River contributed by the pulp mills in the past. The final TMDL allocates approximately 35% of the loading capacity to chlorine bleaching pulp mills in the Region. If future information shows that other sources can not be controlled to the levels estimated in the final TMDL as adequate to cover their loadings, the TMDL will need to be modified. In the mean time, EPA believes that the requirements of the TMDL (approximately a 95% reduction in pulp mill dioxin discharges relative to the year 1988) will result in water quality standards being met. See response to comments on "Other Sources."

Comment. Pulp mill allocations for the main part of the Columbia River (that excluding the Snake River, Willamette River and Canada) should not exceed 34%.

Response. It is not clear why the commenter proposed the 34% figure as a maximum, but it seems to be based on either (1) the belief that pulp mills contribute about 34% of the current loading to the basin, or (2) that the proportion of the mainstem part of the Columbia allocated to pulp mills should not exceed the proportion of the loading capacity for the entire basin allocated to Region 10 pulp mills.

(1) As pointed out in responses to other comments, although the NBS data might seem to indicate that pulp mills contribute approximately 34% of the total load, this results from an inappropriate assumption. Region 10 believes that in the Columbia River Basin, pulp mills are, in fact, the most significant contributor of 2,3,7,8-TCDD (even after the reductions in their contribution they have already achieved).

(2) Although the proposed TMDL allocated about 34% of the basin loading capacity to Region 10 pulp mills, Canadian sources should be considered if one is trying to look at the industry's allocated proportion of the total loading capacity. Including Celgar's loading raises the total pulp mill contribution on a basin-wide basis to about 40% of the loading capacity. In any event, the fact that there is a concentration of mills along the lower Columbia River combined with equity of WLAs among the pulp mills, leads to a higher proportion of the loading capacity in that area allocated to the pulp mills than in other basins with fewer pulp mills.

Comment. The proposed TMDL allocation of 34% to mills is inconsistent with 304(l) determination that receiving water for Longview Fibre's discharge (& other mills) is water quality limited "due entirely or substantially" to its discharge.

Response. The allocation of 34% of the loading capacity to the future discharges from pulp mills in Region 10 does not imply that 34% is the portion of current or past loading contributed by those sources. Although even 34% would constitute a substantial proportion of the total loading, EPA believes that pulp mills have been responsible for a greater share in the past.

WATER QUALITY LIMITED STATUS

Comment. No state submissions of water quality limited segments were ever made.

Response. Since the National Bioaccumulation Study results became known, it has been generally acknowledged that the fish tissue concentrations indicated that the Columbia, Willamette, and Snake Rivers were water quality limited for dioxin (2,3,7,8-TCDD). This, combined with dilution analyses of measured pulp mill waste concentrations, was the basis for the states initiating the TMDL process. When Ecology, ODEQ, and IDEQ each requested that EPA Region 10 establish the TMDL as a federal action, the letters (dated March 21, 1990) they sent each recognized "the designation of this river as water quality limited for dioxin ..." The 1990 Water Quality Assessment (Section 305(b)) reports from both Washington and Oregon also list the applicable portions of the Columbia, Willamette, and Snake Rivers as water quality limited under Section 303(d) of the Clean Water Act due to dioxin contamination.

Comment. The Washington state water quality standard is not equal to .013 ppq.

Response. While it is true that Washington has not adopted a numeric criterion for

2,3,7,8-TCDD, it currently has what is called a "narrative standard" which applies to most toxic substances including dioxin. The state has interpreted this standard consistently with EPA's water quality criterion at the 10^{-6} risk level in both their section 304(l) and 305(b) listing processes. In accordance with the EPA criteria, this corresponds to a concentration of 0.013 ppq. See response to previous comment.

Furthermore, even without a narrative criterion for the state of Washington, EPA would have used .013 ppq as the basis for the TMDL because of the need to ensure that the TMDL will protect the waters of the state of Oregon, where the .013 ppq criterion is a part of the state's water quality standards. See the discussion in Appendix A of the Decision Document for the final TMDL.

Comment. There is no established BAT for dioxin discharges from pulp mills, so no defensible §303(d) listing could be made by states.

Response. See response to comment under BAT section.

WATER QUALITY STANDARD

Comment. Several comments were received concerning the appropriateness of the water quality standard for dioxin used in the development of the TMDL.

Response. The existing state standards are the legal basis for the whole TMDL process. As such, the TMDL must be designed to ensure compliance with those standards. Comments on the appropriateness of water quality standards are best addressed to the respective states for consideration in their triennial review process. As a regional authority, EPA Region 10 is responsible for ensuring that all state water quality standards are met. In the case of the Columbia River system, that means that Washington state's standards affect activities in Idaho. It also means that along the Washington-Oregon border, where water travels back and forth between those states, the most stringent of the state standards must be achieved. As the Decision Document for the proposed TMDL explained, Oregon has explicitly adopted a standard of 0.013 parts per quadrillion for 2,3,7,8-TCDD. Washington has a narrative standard which the Department of Ecology has indicated should be interpreted as equal to EPA's federal criterion at the 10^{-6} risk level, the same as Oregon's standard. (See also comment and response under "WATER QUALITY LIMITED STATUS" section.)

Comment. Bioaccumulation factor should be 0.03 to 0.8 rather than 5,000 as used in EPA criterion derivation.

Response. The bioconcentration factor of 5000 referenced in the comment was that used by EPA in the development of its water quality criterion for 2,3,7,8-TCDD. This bioconcentration factor relates the concentration of 2,3,7,8-TCDD in the water to concentrations in fish tissue. Since the state of Oregon has adopted EPA's criterion in its water quality standards, and the states of Washington and Idaho are using EPA's criterion as the basis for implementing their narrative criteria for toxic substances, EPA Region 10 must use the national criterion, and the bioconcentration factor used in its derivation, as the basis for the TMDL.

The commenter cites an EPA study on TCDD in Lake Ontario sediments, water, and fish as the basis for his comments. However, this study used an approach which is different from, and not directly comparable to, that used in developing EPA's water quality criterion for 2,3,7,8-TCDD. The bioaccumulation factor (BAF) recommended by the commenter (0.03 to 0.8) was based upon the relationship between 2,3,7,8-TCDD concentrations in sediments to those observed in fish tissue, rather than comparing water and fish tissue. In order to apply BAFs based upon sediment/fish tissue relationships, the concentrations of dioxin in the sediments must be known, as well as the contribution of specific discharges to the overall 2,3,7,8-TCDD concentration in the sediments. This information is not available at this time. In addition, the results of the referenced study in Lake Ontario indicate that the study results, including the BAFs, are site-specific, even within Lake Ontario. Thus it would not be appropriate to apply the bioaccumulation factors from that study directly to a system such as the Columbia River, which has very different dynamic processes than Lake Ontario.

As a final note, the authors of the Lake Ontario study reach a very different conclusion from their data than does the commenter. The study reports a bioaccumulation factor of 11,000 (relating the concentrations of TCDD in water to fish tissue) based on their laboratory studies, and a bioconcentration factor of 140,000 based on field results. The authors further note that "...If the laboratory BAFs are applied to best estimates of Lake Ontario water dioxin concentration, rather than to the laboratory exposure water TCDD concentrations, lake trout TCDD residues are under estimated by a factor of fourteen. Since the best available models indicate that a large proportion of TCDD present in Lake Ontario water should be bioavailable, the reported Lake Ontario BAF of 140,000 is a reasonable estimate. A Lake Ontario lake trout BAF based on the predicted dissolved TCDD concentration would be 180,000."

PROPOSED TOTAL MAXIMUM DAILY LOAD

FOR

TCDD IN THE COLUMBIA RIVER BASIN

TMDL Decision Document
June 15, 1990

Developed pursuant to the provisions of the Clean Water Act, 33 U.S.C. § 1251, *et seq*, as amended by the Water Quality Act of 1987, P.L. 100-4.

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PROPOSED TOTAL MAXIMUM DAILY LOAD FOR TCDD IN THE COLUMBIA RIVER BASIN

Decision Document

1. SCOPE

This TMDL addresses the following segments, pollutants, and source categories:

WATER QUALITY LIMITED SEGMENTS:

RIVER SEGMENT		APPLICABLE WATER QUALITY RULES:
Columbia River	(RM 0 - 745)	WAC 173-201-047 [1]
" "	(RM 0 - 309)	WAC 173-201-080(19) [2]
" "	(RM 309 - 596)	WAC 173-201-080(20) [2]
" "	(RM 596 - 745)	WAC 173-201-080(21) [2]
" "	(RM 0 - 86)	OAR 340-41-202 & 205(2)(p) [3,4]
" "	(RM 86 - 120)	OAR 340-41-442 & 445(2)(p) [3,4]
" "	(RM 120 - 147)	OAR 340-41-482 & 485(2)(p) [3,4]
" "	(RM 147 - 203)	OAR 340-41-522 & 525(2)(p) [3,4]
" "	(RM 203 - 218)	OAR 340-41-562 & 565(2)(p) [3,4]
" "	(RM 218 - 247)	OAR 340-41-602 & 605(2)(p) [3,4]
" "	(RM 247 - 309)	OAR 340-41-642 & 645(2)(p) [3,4]
Snake River	(RM 0 - 176)	WAC 173-201-047 [1]
" "	(RM 0 - 176)	WAC 173-201-080(97) [2]
" "		IDAPA 16.01.2120 & .2200 [5,6]
Willamette River	(RM 0 - 187)	OAR 340-41-442 & 445(2)(p) [3,4]

[1] WAC 173-201-047 describes Washington's applicable criteria for toxic substances.
[2] WAC 173-201-080 describes Washington's classification for specific waterbodies.
[3] OAR 340-41-xx2 describes beneficial uses designated by Oregon.
[4] OAR 340-41-xx5(2)(p) describes Oregon's applicable criteria for toxic substances.
[5] IDAPA 16.01.2120 describes the designated uses for the confluence of the Clearwater and Snake River in Idaho.
[6] IDAPA 16.01.2200 describes Idaho's criteria for hazardous and deleterious materials.

POLLUTANT CAUSING EXCEEDANCE OF WQ STANDARDS:

2,3,7,8 - tetrachlorodibenzo-para-dioxin (2,3,7,8-TCDD)

SOURCE CATEGORIES CONSIDERED:

Source Category	Allocation Type	Source Description
1	WLA	Pulp & Paper Mills -- Chlorine Bleaching
2	Reserved	All Other Sources:
		• Pulp & Paper Mills -- Non-Chlorine Bleaching
		• Municipal Wastewater Treatment Plants
		• Other Point Source
		• Port Activities
		• Urban Areas
		• Other Nonpoint Source
		• Upstream Inputs

2. BACKGROUND

Overview

The Columbia River and segments of the Snake and Willamette Rivers are currently water quality limited due to the presence of excessive levels of dioxin (2,3,7,8-TCDD). The concern over dioxin levels in the Columbia River is based on data describing concentrations of 2,3,7,8-TCDD in fish tissue below chlorine-bleaching pulp mills as well as in effluents and treatment plant sludges at these mills.

Section 303(d)(1)(C) of the Clean Water Act (CWA) requires each state to identify waters for which technology-based effluent limitations are not stringent enough to attain water quality standards applicable to such waters and to establish total maximum daily loads (TMDLs) on such water quality limited segments for appropriate pollutants of concern. This provision states that the TMDL:

> "shall be established at a level necessary to implement the applicable water quality standards with seasonal variations and a margin of safety which takes into account any lack of knowledge concerning the relationship between effluent limitations and water quality."

The TMDL is effectively an implementation plan for achieving water quality standards using an appropriate margin of safety. The TMDL process defines the allocation of loads to point sources, nonpoint sources, and background.

Oregon has identified the Columbia River (river miles 0 - 309) and the Willamette River (RM 0 - 187) as being water quality limited for 2,3,7,8-TCDD. Washington has similarly identified the Columbia and Snake Rivers within that state as being water quality limited for 2,3,7,8-TCDD. The state of Idaho has also identified the confluence of the Clearwater and Snake Rivers as being water quality limited for 2,3,7,8-TCDD. EPA has approved these listings persuant to CWA Section 303(d).

On March 21, 1990 the states of Oregon, Washington, and Idaho stated that they would not adopt a TMDL for dioxin in the Columbia River as state actions but rather requested that EPA establish this TMDL as a federal action. The states acknowledged that while the development of a TMDL has been a cooperative effort, the interstate nature of the Columbia River Basin and the desirability of consistency and equity in regulating dischargers in this basin necessitated that the TMDL be a federal action. Therefore, persuant to Section 303(d), EPA formally disapproved the expressed intent of Washington, Oregon, and Idaho to not submit TMDLs and is proposing a TMDL for dioxin in the Columbia River basin as a federal action.

The urgency of establishing this TMDL is supported by the national focus on toxics discharges as evidenced in the recent amendment to Section 304 of the CWA, 33 U.S.C. § 1314(l). In 1987, Congress amended this section to focus state water quality protection programs on immediately addressing water quality problems due to point source discharges of toxic pollutants. States are required to develop lists of impaired waters, identify point sources and amounts of toxic pollutants they discharge, and to develop individual control strategies (ICSs) for each such point source. An ICS may be a draft or a final NPDES permit. The §304(l) lists developed for Washington, Oregon, and Idaho have identified dioxin levels in the Columbia, Snake, and Willamette Rivers as exceeding water quality standards for dioxin. Limits included in ICSs, developed under §304(l), must be consistent with waste load allocations (WLAs) where a TMDL has been established.

This TMDL provides a framework to control dioxin discharges to the Columbia River Basin. The following sections of the decision document describe the proposed TMDL and the process used to develop it.

Process

The TMDL identifies the amount of a pollutant that may be discharged to a water quality limited stream. TMDLs can be expressed in terms of either chemical mass per time, toxicity, or other appropriate measure. The TMDL for a particular water is dependent on such factors as the location of sources, streamflow, water quality standards, background conditions, and in-stream pollutant reactions. The process of developing and implementing a TMDL for 2,3,7,8-TCDD in the Columbia River basin consists of several steps:

- **define the loading capacity** of the river at key points
- **identify sources** which potentially contribute loads of 2,3,7,8-TCDD
- **allocate loads** to point sources, NPS, and background
- **implement** the TMDL through WQ management plans and NPDES permits

Section 303(d) states that a **margin of safety** should be used **which takes into account any lack of knowledge** concerning the relationship between effluent limitations and water quality. Thus, the law indicates that the TMDL process should move forward using available information. As new information becomes available in the future, the TMDL can be refined.

Two fundamental issues must be determined at the outset when establishing a TMDL. These are (1) the definition of upstream and downstream boundaries of the waterbody for which the TMDL is being determined and (2) the flow conditions (design flow) appropriate for calculating the loading capacity or amount of pollutant which can be assimilated.

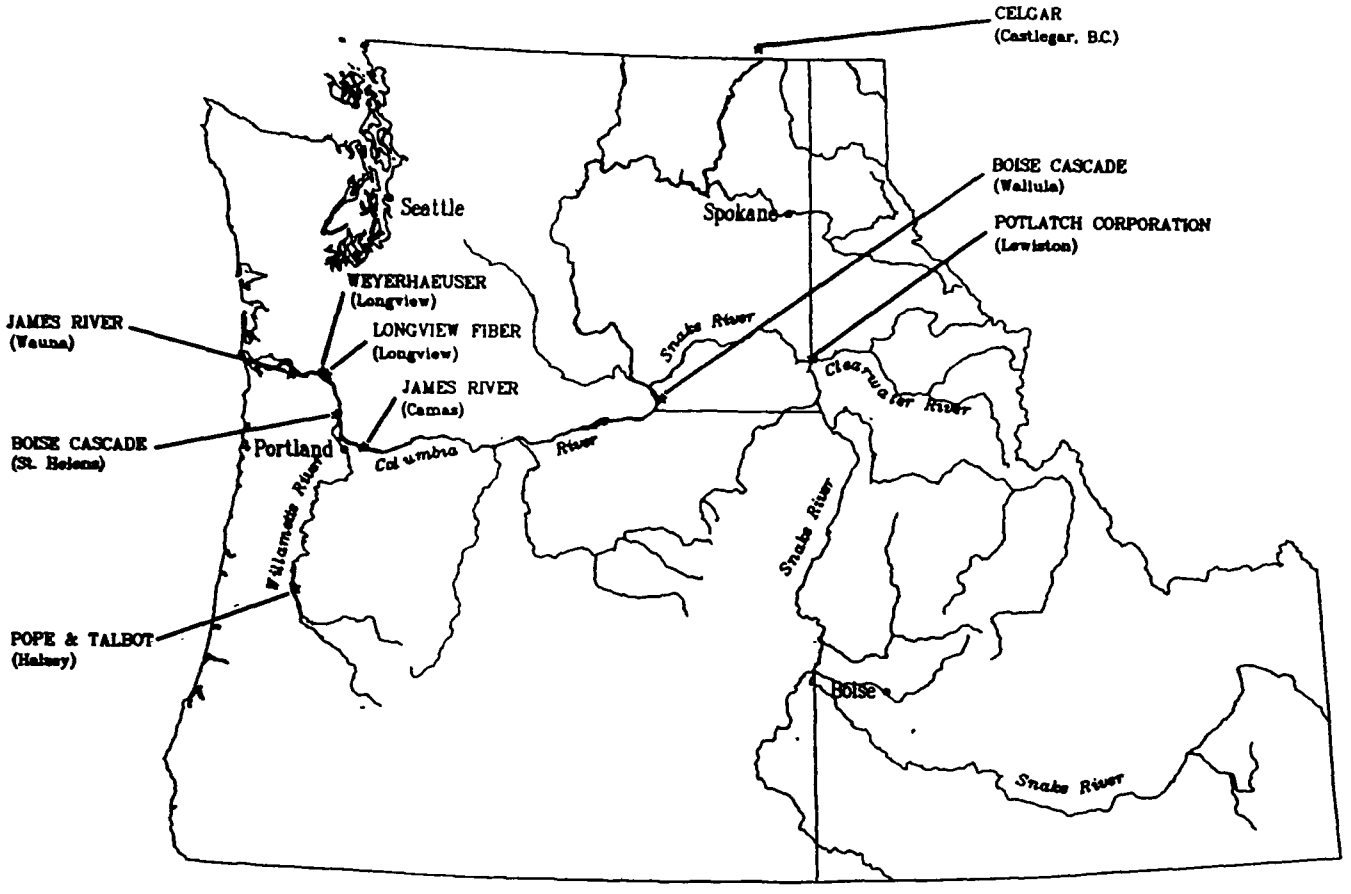
3. BOUNDARIES

Areas of Concern

The pollutant, 2,3,7,8-TCDD, is the most toxic of a group of compounds known as polychlorinated dibenzo-para-dioxins. These compounds are produced as a result of human activities such as the manufacture of chlorinated herbicides, the combustion of domestic and industrial wastes, and the production of chlorine-bleached pulp. In 1987, EPA initiated a National Bioaccumulation Study (NBS). This effort was designed to gather screening information on the prevalence and concentrations of selected toxic compounds in fish tissue and other aquatic organisms. This study was conducted on a broad scale across the United States and included testing for 2,3,7,8-TCDD. Sampling sites included relatively undisturbed background areas, streams below industrial, agricultural, and urban activities, and segments below mills using chlorine to bleach pulp. The National Bioaccumulation Study identified concerns related to bleached kraft pulp mills. Fish samples collected at several locations below chlorine-bleaching pulp mills on the Columbia River within EPA Region 10 (from the Canadian border to the mouth) have shown detectable concentrations of 2,3,7,8-TCDD. Another EPA study, the "104 Mill Study," subsequently confirmed (through testing of effluents and sludges) that chlorine-bleaching pulp mills are a significant source of 2,3,7,8-TCDD.

Within EPA Region 10, eight chlorine-bleaching pulp mills currently discharge to the Columbia River system. These mills, one in Idaho, four in Washington, and three in Oregon, are shown in Figure 1. The eight mills currently produce over 7,000 tons per day of bleached pulp. Another chlorine-bleaching pulp mill which discharges to the Columbia River is located near Castlegar, British Columbia, about 20 miles above the U.S. - Canadian border. Known sources of 2,3,7,8-TCDD are thus affecting the Columbia River within EPA Region 10, from the mouth near Astoria, Oregon to the Canadian border (river mile 745) and the Snake and Willamette Rivers, major river basins within the Columbia River drainage basin. Consequently, the entire Columbia River basin, including the Snake and Willamette Rivers, are included in the proposed TMDL. Tributaries outside of EPA Region 10, such as the Clark Fork in Montana, have also been considered in developing the proposed TMDL.

Figure 3-1. Location of Region 10 Chlorine-Bleaching Pulp Mills in the Columbia River Basin



4. LOADING CAPACITY

By definition (40 CFR, § 130.2), a TMDL is the sum of the individual wasteload allocations (WLAs) for point sources and load allocations (LAs) for nonpoint sources and natural background. WLAs and LAs represent the allocated portions of a receiving water's **loading capacity**. The loading capacity is the greatest amount of loading that the river can receive without violating water quality standards. A TMDL must not exceed the loading capacity of a waterbody. To determine the appropriate loading capacity available for allocation requires the following information:

- the **water quality standard** applicable to 2,3,7,8-TCDD and the Columbia River basin.
- the **river flows** used to calculate the loading capacity of the Columbia River basin at key locations.

A. Water Quality Standard

Oregon, Washington, and Idaho have adopted water quality standards for toxic substances which apply to parts of the Columbia River basin including the Snake and Willamette Rivers. Since the purpose of this TMDL is to provide a framework for attaining all applicable water quality standards for dioxin, this multi-state TMDL must be protective of the waters with the most stringent of those standards. A brief description of the individual state standards follows.

Oregon has adopted numeric criteria for 2,3,7,8-TCDD. Table 20 of Oregon Administrative Rules (OAR) Chapter 340, Division 41 summarizes water quality criteria for toxic substances applicable to all basins. This includes the Columbia River from its mouth to river mile 309 and the Willamette River from its mouth to river mile 187. The concentration for 2,3,7,8-TCDD listed in Table 20 is based on EPA's **Quality Criteria for Water** (1986). For 2,3,7,8-TCDD, the criterion identified is 0.000013 ng/L, or 0.013 parts per quadrillion (ppq). This value represents an ambient water concentration needed to protect human health. It considers the consumption of both contaminated water as well as fish or other aquatic organisms. The criterion adopted by Oregon is based on the 10^{-6} risk level, the concentration at which a lifetime exposure results in a probability of one excess cancer case per one million people.

Washington has identified the Columbia River from the mouth to river mile 596.6 as a Class A waterbody and from river mile 596.6 to the Canadian border (RM 745) as a Class AA waterbody. Washington has also identified the Snake River from the mouth to river mile 176.1 as a Class A waterbody. Washington's rules which apply to toxic substances are found in WAC 173-201-047. The narrative part of the rule indicates that:

> "Toxic substances shall not be introduced above natural background levels in waters of the state which may adversely affect characteristic water uses, cause acute or chronic conditions to the aquatic biota, or adversely affect public health"

WAC 173-201-047 also states that appropriate concentrations for toxic substances in Washington are to be determined in consideration with EPA's **Quality Criteria for Water** (1986). In the process of developing its §304(l) short list, Washington interpreted its standard in a manner consistent with Oregon's numeric standard, i.e. 0.013 ppq of 2,3,7,8-TCDD as an ambient water concentration needed to protect human health.

Idaho has narrative standards which are intended to protect the beneficial uses of its waters including the Snake River. The standard at IDAPA 16.01.2200 states:

> "As a result of man-caused point or nonpoint source discharge, waters of the State must not contain: 01. Hazardous materials ... in concentrations found to be of public health significance or to adversely affect designated or protected beneficial uses. 02. Deleterious materials ... in concentrations that impair designated or protected beneficial uses without being hazardous."

In the process of approving Idaho's §304(l) short list, EPA interpreted this standard in a manner consistent with Oregon's numeric standard, i.e. 0.013 ppq of 2,3,7,8-TCDD as an ambient water concentration needed to protect human health.

As stated above, this TMDL has been developed to achieve attainment of the water quality standards of all affected states. Although the wording of the applicable state standards for Idaho, Oregon, and Washington differs, EPA has interpreted these standards as being equally stringent. Even if this had not been the case, however, 2,3,7,8-TCDD loading to upstream segments would still need to be restricted to levels ensuring the attainment of water quality standards applying to downstream segments.

B. River Flow

The loading capacity of a stream is determined using the water quality criteria value and a design flow for the receiving water. Typically, loads are expressed as chemical mass per time such as pounds per day. In the case of 2,3,7,8-TCDD, loads have been expressed as milligrams (mg) per day which are calculated as follows:

$$\text{Load (mg/day)} = 0.00245 * \text{Concentration (ppq)} * \text{Flow (cfs)}$$

The 0.00245 is the factor needed to convert the units of parts per quadrillion (ppq) and cubic feet per second (cfs) to milligrams per day (mg/day)

The design flow significantly affects the determination of the loading capacity. The river flow used to calculate the loading capacity focuses on the rationale behind the development of the criteria for 2,3,7,8-TCDD. The water quality criteria for 2,3,7,8-TCDD, 0.013 ppq, is based on human health concerns. In the case of design flows for human health protection, the harmonic mean flow rather than the arithmetic mean flow has been recommended as the basis for TMDLs due to the fact that the it better reflects average available dilution ("Draft Technical Support Document for Water Quality-based Toxics Control", U.S. Environmental Protection Agency, 1990). Table 1 summarizes the loading capacity for 2,3,7,8-TCDD in the Columbia River system at several locations for which flow data are available.

Table 4-1. Loading Capacity for TCDD in the Columbia River System

Location	Harmonic Mean Flow (cfs)	Loading Capacity (mg/day)
Columbia R. below Priest Rapids	95,400	3.03
Columbia River at McNary Dam	143,000	4.54
Columbia River at The Dalles	152,000	4.83
Columbia River at Vancouver	159,000	5.04
Columbia River at Columbia City	180,000	5.73
Columbia River below Longview	188,000	5.97
Snake River near Clarkston	35,700	1.14
Snake R. below Ice Harbor Dam	37,000	1.18
Willamette River at Harrisburg	7,600	0.24
Willamette River at Portland	17,100	0.54

5. ALLOCATION APPROACH

A. Overview

The total load of a pollutant to a waterbody is attributable to point sources, nonpoint sources, and natural background sources. The TMDL process distributes portions of the stream's loading capacity to various sources including background conditions in a way that will achieve water quality standards. Decisions on actual allocations depend on the amount of available data. The Water Quality Management Regulations [40 CFR, § 130.2] state that:

> "Load allocations are best estimates of the loading, which may range from reasonably accurate estimates to gross allotments, depending on the availability of data and appropriate techniques for predicting the loading."

Allocation of the loading capacity is made considering technical, socioeconomic, and institutional constraints. Historically, individual states have used various allocation schemes appropriate to their needs and may even specify that a particular method be used. Technical guidance has been prepared which describes 19 potential approaches for allocation of loads ("Technical Guidance Manual for Performing Waste Load Allocations", U.S. Environmental Protection Agency, 1986). When evaluating various methods, conditions that favor one approach over another must be considered.

In terms of TCDD and the Columbia River, there are some potential problems in using the more common methods described in the technical guidance:

- Common methods focus on wasteload allocations for point sources. Background sources and nonpoint source loads are not adequately addressed due to the difficulty associated with measuring these inputs.

- The geographic scale associated with the Columbia Basin and the number of potential sources is considerably larger than the scale typically encountered in most TMDL situations.

- There are complexities in addressing persistent and highly bioaccumulative pollutants such as TCDD.

As a result of these concerns regarding common methods, a different approach towards developing a TMDL for the Columbia is needed. This approach should consider major issues identified for TCDD in the Columbia as well as the pros and cons associated with various alternatives for allocating the loading capacity. The key is to work within a logical framework that will lead to the attainment of water quality standards. The following sections discuss general issues affecting the allocation process (Section B), development of general framework of the TMDL (Section C), wasteload allocation methods considered (Section D), the proposed wasteload allocation approach (Section E), and the development of information on other sources (Section F).

B. Issues

In determining appropriate allocation methods for the Columbia, a number of issues have been identified that affect decisions on the TMDL. Issues identified to date which need to be considered in developing allocations for 2,3,7,8-TCDD to the Columbia River include:

- Loading from the **British Columbia pulp mill**
- Loading from other potential sources such as **woodtreaters**
- **Attenuation**
- **Role of bottom sediments** (cumulative effects and resuspension)
- Framework for addressing **future allocations** (both growth within the pulp industry and allocations to other source categories)

British Columbia Pulp Mill:

Celgar Pulp Company operates a bleached kraft pulp mill located in Castlegar, British Columbia. Wastewater from this mill is discharged to the Columbia River approximately 30 miles upstream from the United States - Canada border. Studies conducted by Environment Canada showed elevated concentrations of 2,3,7,8-TCDD in lake whitefish collected below the Celgar mill (Mah et al, 1989). Follow-up sampling by the Washington Department of Ecology found elevated levels of TCDD in fish collected from Lake Roosevelt on the upper Columbia River which is also below the Celgar mill (Johnson, 1990).

The discovery of elevated levels of dioxins and furans below Celgar and other British Columbia pulp mills resulted in action by the Canadian government. New regulations under the Canadian Environmental Protection Act have been proposed to strictly control the discharge of chlorinated organics. The B.C. government is proposing adsorbable organic halogens limits of 2.5 kg/ton and 1.5 kg/ton be met by 1991 and 1994 respectively. The Canadian federal government is proposing limits of non-detectable amounts of dioxins and furans by January 1994. Celgar is currently seeking government approval to increase the mill's production from 560 to 1200 air dried metric tonnes of pulp per day. Modifications to the mill's production process are also being proposed which include oxygen delignification and maximum substitution of chlorine dioxide for chlorine. Improvements to the Celgar mill are expected to be in place by 1992 which will meet proposed limits for chlorinated organics. TCDD concentrations in the effluent are expected to be reduced to below detectable levels using approved analytical methods. Although major reductions in TCDD loads are anticipated, some type of allocation must be identified to account for the upstream Canadian sources.

Woodtreaters & Other Potential Sources:

The development of the TMDL needs to consider all potential sources of 2,3,7,8-TCDD in the Columbia drainage. Besides chlorine bleaching pulp mills, other potential source categories include woodtreaters, major municipal wastewater treatment plants, agricultural areas, industrial sites, and urban areas. Table 5-1 summarizes potential sources of TCDD in the Columbia, the type of available information on loading rates, and median fish tissue concentrations from the National Bioaccumulation Study (NBS) associated with the source category. The NBS was conducted as a screening investigation to determine the prevalence of selected bioaccumulative pollutants in fish. One of the study objectives was also to identify general correlations between fish tissue concentrations and sources of these pollutants.

Table 5-1. Potential Sources of 2,3,7,8-TCDD in the Columbia Basin

Source Category	Availability of Data for Region 10	National Bioaccumulation Study Comparative Results
		Median Conc. (ppt)
Chlorine Bleaching Pulp & Paper	104 mill study	5.02
Non-Chlorine Bleaching Pulp & Paper	N/A	1.22
Superfund Sites	Remedial Investigations	1.51
Woodtreaters, Incinerators, etc.	N/A	0.66
Other Industrial Sites	N/A	1.53
Urban Areas	N/A	1.53
Municipal Wastewater Treatment Plants	Sewage Sludge Survey	1.08
Agricultural Areas	N/A	0.71
Other Sites	N/A	0.63

Note: N/A Not Available

The NBS results, listed in Table 5-1, clearly indicate that the highest levels of TCDD contamination in fish were found in areas below chlorine bleaching pulp mills. However, two other sites from the NBS in the Columbia basin which were not immediately below pulp mills had elevated levels of TCDD in fish. Both sites are located in the north Portland area. One of the sites, Columbia Slough, is affected by nonpoint sources, predominantly urban runoff and a landfill. The other site is located below a major woodtreating operation (McCormick & Baxter) which uses pentachlorophenol (PCP). TCDD contamination has been associated with PCP.

EPA has recently developed a data system which contains information from the Toxics Release Inventory (TRI). A data retrieval of reported releases of PCP for 1987 identifies seven facilities (woodtreaters) in the Columbia Basin. Five of these facilities are located in the Willamette drainage. Although the TRI information does not contain data on TCDD releases, the indicated releases of PCP lead to concern over woodtreaters, particularly in the Willamette basin. Because of the lack of information on TCDD releases, it is difficult to currently assign an allocation to woodtreaters. However, the allocation scheme used does need to leave room for these facilities as

further information becomes available. Other users of PCP not included in the TRI data will also have to be considered in the allocation process. Furthermore, non-chlorine bleaching pulp mills and former mill sites as well as other potential sources listed in Table 5-1, which are present in the Columbia basin, will also have to be considered in the allocation process.

Testing has also been performed for 2,3,7,8-TCDD in sludge at five municipal wastewater treatment plants in the Columbia basin ("National Sewage-Sludge Survey Facility Analytical Results", U.S. Environmental Protection Agency, 1989). Only one facility had any detectable amount of TCDD and it was at levels much lower than sludge tested at chlorine bleaching pulp mills. This indicates that the TMDL should leave some capacity for allocations to municipal sewage treatment plants. However, it can be expected that the allocations will be much lower than that for the pulp mills based on the sludge data.

Attenuation:

Losses of 2,3,7,8-TCDD in the water column can occur through sedimentation and through uptake by aquatic organisms. There is very little data to quantitatively describe net attenuation in the Columbia River system and how it affects bioavailability. Water quality models, using a variety of assumptions, have been used by some groups to assess the need for control of TCDD discharges. Some such analyses have used a loss rate of TCDD which considers potential adsorption of TCDD on particulate matter within the water column. However, the potential release of TCDD from the sediment to the overlying water or the potential effect of sediment-bound TCDD on the benthic and aquatic life food chain has not been considered in these models.

The Clean Water Act specifically states that TMDL's shall be established with a margin of safety which takes into account any lack of knowledge. Based on the lack of knowledge concerning attenuation of TCDD in the Columbia River basin, assumptions must be made in determining allocations of loading. For the purposes of this analysis, it is assumed that net attenuation does not occur. Thus, all 2,3,7,8-TCDD discharged is assumed to remain biologically available. Because this is a conservative assumption, a TMDL designed under this scenario should lead to the attainment of water quality standards regardless of the actual level of attenuation. If future studies quantitatively document net attenuation rates, allocations can be modified to reflect this. This capacity could be used to provide an increased margin of safety to account for unknown sources or could be used to accommodate future growth needs. By the same token, if studies indicate that TCDD releases from historical accumulations in the sediments constitute a problem, tighter controls may be needed (see discussion in following section).

Role of Bottom Sediments:

Attenuation generally implies a net loss of TCDD from the system. However, attenuation through deposition of sediments does raise other issues, namely cumulative effects and pollutant build-up. Bottom sediments in portions of the Columbia River basin are known to be contaminated with 2,3,7,8-TCDD. Sediment concentrations are the result of a complex series of interactions between TCDD, the overlying water column, sediments, aquatic organisms, and the external loading of TCDD. Because the Region's pulp mills have implemented some process changes recently, such as the use of different defoamers, it is unlikely that existing sediment contamination levels are in equilibrium with current loadings to the basin. Existing sediment concentrations probably reflect a combination of both current and historical discharges of TCDD.

Some fraction of the TCDD which enters a river is associated with particulates. These solids tend to settle to the bottom of the receiving water. In areas where the river is not filling in, these particles (and the TCDD associated with them) will continue to be carried downstream as either bedload or resuspended sediments. In areas of sediment accretion, typically where river velocities are diminished, TCDD will tend to accumulate in the bottom sediments.

Current knowledge of the Columbia system is not adequate to estimate the availability of TCDD associated with sediments to benthic organisms or bottom feeding fish. There are a number of different theories about the role of equilibrium partitioning and bioaccumulation from contaminated sediments. It is also difficult to estimate the effects of resuspension of these sediments either through high streamflows, boat traffic, or dredging activities. It is noteworthy that routine dredging is required in precisely those areas where there is net sediment accretion. Given these conditions it would not be appropriate to assume a permanent loss of 2,3,7,8-TCDD through sedimentation. As indicated in the discussion on attenuation, tighter controls will be needed if data shows that the cumulative effects of historical discharges significantly delay attainment of TCDD standards under the reduced loadings required by this TMDL.

Future Allocations:

The TMDL adopted by the regulatory agencies may provide a framework for dealing with future allocations. Examples include the assignment of any "reserve" or "other source" allotment to specific point or nonpoint sources. Future growth within the pulp industry, either expansions or new mills, must also be considered. This framework is needed within EPA Region 10 so that the states, industry, and the public can know generally what to expect. Such a framework could define the boundaries on future permitting of loads from pulp mills in each state. Without a framework, there could be a "first come, first serve" approach to industry expansion.

Developing an equitable framework for future allocations is not an easy task. The methods of allocating the loading capacity between the permitting authorities (i.e. the states and EPA) are as numerous as those for allocating among existing sources. Approaches could include proportions based on existing production capacity, per capita basis, and various hybrid methods. Because this issue is of interest to the public, this proposed TMDL recognizes the need to develop such a framework. A presentation of several alternatives for allocating the loading capacity is also intended to stimulate comments during the public notice period.

C. Development of the TMDL

General Framework:

A TMDL, by definition, is the sum of the individual allocations (WLAs for point sources and LAs for nonpoint sources and background). TMDLs are to be established with a margin of safety which takes into account any lack of knowledge concerning the relationship between effluent limitations and water quality. The margin of safety is to take into account uncertainties in the development of the TMDL, including uncertainties in ambient and effluent monitoring data and the existence of unregulated and unknown sources. In the proposed TMDL, the margin of safety has two main components: (1) the total of the allocations made is significantly lower than the defined loading capacity, and (2) that loading capacity itself was calculated using a conservative model which excluded any factors for loss of TCDD from the system.

Thus, the margin of safety recognizes situations where more data is needed to develop comprehensive TMDLs which cover all sources, such as nonpoint source inputs. With respect to the Columbia River and TCDD, several factors contribute to the shortage of data. First, it is often difficult to characterize nonpoint source loads. These inputs are not continuous and are generally driven by weather related events such as rain storms or snow melt. The second reason leading to a present lack of assessment data focuses on the analytical obstacles associated with measuring 2,3,7,8-TCDD. The water quality standard of 0.013 parts per quadrillion (ppq) is several orders of magnitude below a typical detection limit of 10 ppq for water column measurements. Lastly, issues described in the previous section such as inputs from Canada, potential inputs from other sources, and attenuation also contribute to the lack of hard data. All of these factors support currently defining a relatively large margin of safety associated with the TMDL for TCDD in the Columbia River.

There is, however, enough information to identify some significant sources. In response to concerns over insufficient information, particularly the lack of data on sources of 2,3,7,8-TCDD other than the pulp mills, the TMDL will be developed using a **phased approach**. In the first phase, the TMDL is established with a margin of safety large enough to account for any lack of knowledge. As additional data is collected, the TMDL can be refined and allow for a lower margin of safety.

The first phase of this TMDL provides an initial focus on chlorine bleaching pulp mills. Results of the National Bioaccumulation Study showed that fish collected below pulp mills using chlorine bleaching had the highest median TCDD concentration of any source category. In addition, the §304(l) listing under the Clean Water Act specifically identified these mills as point sources requiring ICS's. The basis of this listing was not only data describing concentrations of 2,3,7,8-TCDD in fish tissue below chlorine bleaching pulp mills but also measured concentrations of 2,3,7,8-TCDD in effluents and treatment plant sludges at these mills. The first phase of TMDL development for 2,3,7,8-TCDD in the Columbia will also initiate a more comprehensive data collection program. Monitoring efforts will be designed to obtain better baseline information and to fill recognized data gaps, particularly on other potential sources of TCDD. The following two concepts were used in developing the proposed TMDL for the Columbia River basin:

- Watershed Targets
- Source Control

Watershed Targets:

The Oregon Department of Environmental Quality (DEQ) has created a logical framework for establishing TMDLs designed to achieve water quality standards in waterbodies affected by both point and nonpoint source pollution. In the Tualatin River DEQ applied the concept of defining watershed targets on major tributaries. Wasteload allocations for point sources are established after watershed targets are identified. The watershed targets serve as internal check points to determine that water quality standards will be met at key locations within the drainage. This same technique can also be used for the Columbia River.

Watershed targets are set within the basin by simply identifying the loading capacity at key points in the drainage system. To determine these targets, the only data requirements are a water quality criterion and a design flow (in this case, the mean harmonic stream flow). The proposed watershed targets focus on high priority tributaries. In the case of the Columbia, there are three logical starting points in addition to the lower Columbia near Bradwood (below Longview). These locations are summarized in Table 5-2 and shown in Figure 5-1.

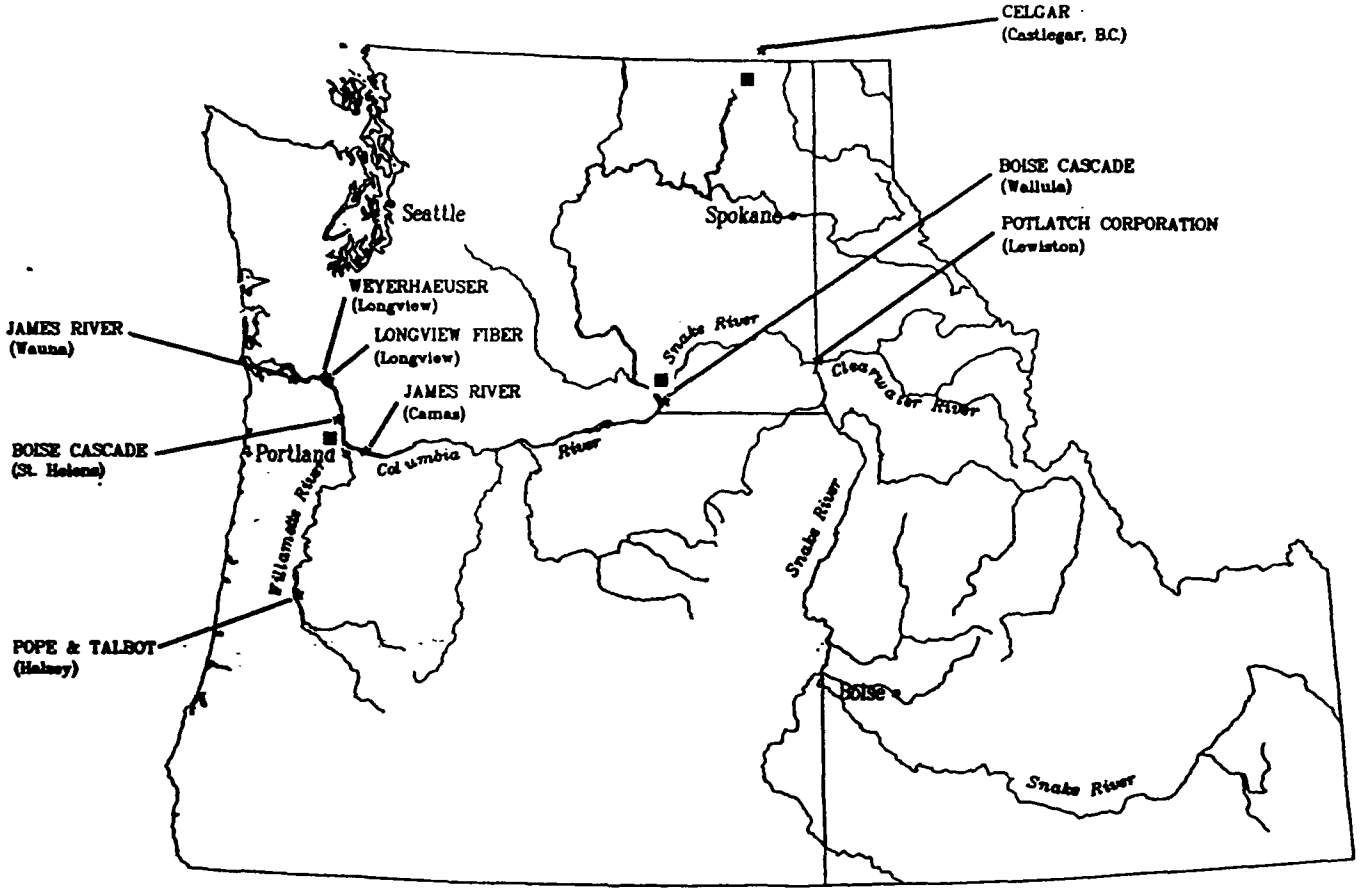
Table 5-2. Loading Targets for TCDD to Selected Watersheds in the Columbia River System

Watershed	Harmonic Mean Flow (cfs)	Loading Capacity (mg/day)
TOTAL COLUMBIA RIVER BASIN	188,000[1]	5.97
SELECTED SUB-BASINS		
Watershed N. of WA/Canada Border	72,200[2]	2.30
Snake River Watershed	37,000[3]	1.18
Willamette River Watershed	17,100[4]	0.54
TOTAL FOR SUB-BASINS		4.02
REMAINDER AVAILABLE FOR MAINSTEM COLUMBIA RIVER BASIN		1.95

[1] Flow at Columbia River near Bradwood
[2] Flow at Columbia River at WA/Canada border
[3] Flow at Snake River below Ice Harbor Dam
[4] Flow of Willamette River at Portland

Detectable levels of TCDD have been measured in tissue of fish taken from sites associated with these watershed target locations. Because these fish tissue concentrations are above the 10^{-6} risk level, the loading capacity for TCDD is currently exceeded. Consequently, reductions in TCDD loads are needed to meet these watershed targets. Furthermore, these watershed targets must be met in order to ensure attainment of water quality standards in the Columbia. It is also impractical to allocate any of this upstream loading capacity to downstream sources at this time because there is no extra load currently available. Therefore, the loading capacity at each of these three points should be subtracted from the basin total of 5.97 mg/day.

Figure 5-1. Location of Watershed Targets (■) Relative to the Pulp Mills



The Columbia River at the International Boundary also includes flow from both Canada and from the Pend Oreille River. In addition to TCDD loads from the Canadian mill on the upper Columbia River, the Clark Fork / Pend Oreille basin has potential TCDD sources in Montana (Stone Container pulp mill in Missoula and Superfund sites near Butte). At a minimum, the loading capacity for TCDD at the border cannot be exceeded without violating water quality standards. Thus, the entire loading capacity available at the border has been allotted to the upstream sources. The TCDD loading capacity provided by streamflow at the border cannot be allocated to downstream sources until the upstream sources of TCDD (particularly the Celgar mill in British Columbia) are controlled.

The Willamette Basin is the most industrialized and populated area in the Columbia River system. The most logical approach is to establish the watershed target at the loading capacity for the Willamette River at Portland. The sum of all allocations to sources in the Willamette Basin must not exceed the watershed target. By the same token, loading capacity attributed to flow produced by the Willamette is not currently available for use in the mainstem Columbia. The same logic applies to the Snake River and the Potlatch mill.

Source Control:

The first phase of this TMDL provides an initial focus on developing allocations to those major source categories for which adequate data exists, such as chlorine bleaching pulp mills. The remainder of the loading capacity will be held as a margin of safety for other potential sources of TCDD where current data are insufficient to estimate specific wasteload allocations. Alternatives need to consider the portion of the loading capacity to be allocated to chlorine bleaching pulp mills relative to the size of the margin of safety.

The chlorine bleaching pulp and paper industry is the only source in Region 10 for which we have site specific quantitative information on effluent quality which is sufficient to describe wasteloads. This industry also happens to be the source category associated with the highest TCDD concentration observed in fish tissue (NBS). As shown in Table 5-1, there is little or no information available concerning loadings from other potential sources of 2,3,7,8-TCDD. Thus, the first phase will focus on wasteload allocations to the chlorine bleaching pulp industry. As further information becomes available, allocations can be identified for other source categories. Having established watershed target allocations, the following sections discuss methods to establish wasteload allocations within the chlorine bleached pulp mill source category.

D. Wasteload Allocation Methods Considered

In developing the proposed TMDL, several alternative wasteload allocation methods have been considered. Options focus on different approaches for allocating portions of the loading capacity to chlorine bleaching pulp mills. These alternatives are presented in the following sections to illustrate the effect of assumptions made on resulting WLAs and to stimulate public consideration of the pros and cons of alternative allocation scenarios. Included in the presentation of options is one preferred alternative. Following the public notice period on the proposed TMDL, other options may also be considered as a result of comments. Alternative approaches currently considered fall into several different categories which include:

- Equal Effluent Concentrations
- Equal Mass Discharge per Unit Production
- Equal Percent Reduction

Equal Effluent Concentrations:

One allocation option is to set an equal effluent concentration for each pulp mill which uses chlorine bleaching. The resultant cumulative load is the portion of the loading capacity allocated to chlorine bleaching pulp mills located in EPA Region 10. The margin of safety is then the difference between the loading capacity and the WLAs to the chlorine bleaching pulp mills in the Columbia basin of Region 10.

A starting point is to look at a long term average effluent limit of 10 ppq (the current general method detection limit) at each mill. This limit is initially applied at the point of discharge. Total plant effluent flows are used as a basis to calculate loads. Discharge monitoring report (DMR) data has been summarized and includes average effluent discharge rates.

Using a long term average effluent limit of 10 ppq applied at the point of discharge and current estimates of monthly average flow at each mill, the cumulative load from all the mills exceeds 12 mg/day (Table 5-3). This is greater than the loading capacity of 5.97 mg/day. Consequently, this option must be rejected because there is no guarantee that water quality standards will be met under conservative assumptions, such as no attenuation. In addition, this would not account for any 2,3,7,8-TCDD from other sources. Thus, more restrictive controls are needed.

Table 5-3. Waste Load Allocations for Chlorine-Bleaching Pulp Mills

(Option 1: Set Equal Long Term Average Effluent Concentration of 10 ppq at Point of Discharge)

Production (tons/day)	Percent	TCDD WLA (mg/day)	Mill
1,509	19.5	1.42	Potlatch -- Lewiston, ID
957	11.7	0.76	Boise Cascade -- Wallula, WA
1,650	20.7	2.20	James River -- Camas, WA
310	3.8	2.37	Longview Fibre -- Longview, WA
1026	13.5	2.01	Weyerhaeuser -- Longview, WA
550	7.1	0.99	Pope & Talbot -- Halsey, OR
1,035	13.4	1.29	Boise Cascade -- St. Helens, OR
800	10.3	1.44	James River -- Wauna, OR
7,837	100.0	12.47	TOTAL Source Category Allotment

A permit condition set at a level below the general analytical detection limit creates a situation where it is difficult, if not impossible, to determine compliance. Because dioxins and other chlorinated organic compounds are produced in the bleach plant, concentrations of 2,3,7,8-TCDD are higher in the combined bleach plant flow than in the total plant effluent. This means that waste load allocations which result in total plant effluent concentration limits that are below the general analytical detection limit could be monitored for compliance by measuring concentrations in the combined bleach plant waste stream. Using **estimates** of bleach plant flows and a limit of 10 ppq in the combined bleach plant flow, the cumulative load is 4.0 mg/day or approximately 67 percent of the total loading capacity (Table 5-4).

Table 5-4. Waste Load Allocations for Chlorine-Bleaching Pulp Mills

(Option 2: Set Equal Long Term Average Effluent Concentration of 10 ppq at Bleach Plant)

Production (tons/day)	Percent	TCDD WLA (mg/day)	Mill
1,509	19.5	0.71	Potlatch -- Lewiston, ID
957	11.7	0.14	Boise Cascade -- Wallula, WA
1,650	20.7	0.87	James River -- Camas, WA
310	3.8	0.23	Longview Fibre -- Longview, WA
1026	13.5	0.57	Weyerhaeuser -- Longview, WA
550	7.1	0.49	Pope & Talbot -- Halsey, OR
1,035	13.4	0.64	Boise Cascade -- St. Helens, OR
800	10.3	0.36	James River -- Wauna, OR
7,837	100.0	4.02	TOTAL Source Category Allotment

Using a long term average of 10 ppq at the bleach plant to develop the waste load allocations for chlorine bleaching pulp mills yields a cumulative load which is less than the loading capacity. However, several concerns exist which include:

- the margin of safety is small (33% of the loading capacity)
- there is very little room for allocations to other potential sources, such as woodtreaters or the mill in British Columbia, once these loads are quantified
- future growth in the pulp & paper industry is not addressed

For these reasons, the possibility of yet lower effluent limits should be evaluated. This can be accomplished by setting a "maximum" concentration of 10 ppq, rather than using a long term average of 10 ppq. To understand how this results in a lower allocation, the relationship between the wasteload allocation (WLA) and the actual permit limits must be examined. In certain cases, permit limits will be different than WLA values. Because the criteria for 2,3,7,8-TCDD is set to protect human health, the loading capacity (and WLAs) reflect a long term average. It is important to consider how the WLAs address variability in effluent quality. Permit limits are set at the upper bounds of acceptable performance and are values not to be exceeded. Requirements are usually expressed using two types of permit limits, either daily maximum or monthly average. Procedures have been developed for computing monthly average permit limits from long term average WLAs in EPA's TSD ("Technical Support Document for Water Quality-based Toxics Control", U.S. Environmental Protection Agency, 1985).

Table 5-5. Waste Load Allocations for Chlorine-Bleaching Pulp Mills

(Option 3: Set Equal Long Term Average Effluent Concentration of 4.7 ppq at Bleach Plant)

Production (tons/day)	Percent	TCDD WLA (mg/day)	Mill
1,509	19.5	0.33	Potlatch -- Lewiston, ID
957	11.7	0.06	Boise Cascade -- Wallula, WA
1,650	20.7	0.41	James River -- Camas, WA
310	3.8	0.11	Longview Fibre -- Longview, WA
1026	13.5	0.27	Weyerhaeuser -- Longview, WA
550	7.1	0.23	Pope & Talbot -- Halsey, OR
1,035	13.4	0.30	Boise Cascade -- St. Helens, OR
800	10.3	0.17	James River -- Wauna, OR
7,837	100.0	1.88	TOTAL Source Category Allotment

Effluent monitoring requirements for 2,3,7,8-TCDD in the pulp mill permits is proposed as monthly sampling. With a coefficient of variation of 0.6 (as recommended in the technical support document) and one sample per month, a monthly average permit limit of 10 ppq converts to a long term average WLA value of 4.7 ppq. Using estimates of bleach plant flows and 4.7 ppq as the long term average concentration limit for the combined bleach plant flow, the cumulative load is 1.9 mg/day or just over 30 percent of the total loading capacity. This leaves a margin of safety of nearly 70 percent of the loading capacity to account for the lack of information on other potential sources. This approach also results in more than a 95 percent reduction in TCDD discharged from these pulp mills when compared to estimates of current loading based on results of the 104 mill study.

Equal Mass Discharge per Unit Production:

A disadvantage of equal effluent concentrations based on current flow rates is that it may not be equitable for all mills. A common approach for industrial permits is to consider production levels in establishing effluent limits. To provide for more equity, each mill could be allocated an equal amount of 2,3,7,8-TCDD for discharge per quantity of bleached pulp produced. One way to accomplish this is to associate bleach plant flow rates with production quantity of bleach pulp. In estimating bleach plant flows, the Washington Department of Ecology used 14,470 gallons of wastewater generated per ton of bleached pulp produced. Applying this figure to calculate bleach plant flows and 4.7 ppq as the long term average concentration limit for the combined bleach plant flow, the cumulative load is 2.01 mg/day (Table 5-5) or approximately 34% of the total loading capacity.

Table 5-6. Waste Load Allocations for Chorine-Bleaching Pulp Mills

(Option 4: Set Equal Long Term Average Effluent Concentration of 4.7 ppq at Bleach Plant and Set Flows at 14,470 gallons / ton bleached pulp)

Production (tons/day)	Percent	TCDD WLA (mg/day)	Mill
1,509	19.5	0.39	Potlatch -- Lewiston, ID
957	11.7	0.25	Boise Cascade -- Wallula, WA
1,650	20.7	0.42	James River -- Camas, WA
310	3.8	0.08	Longview Fibre -- Longview, WA
1026	13.5	0.26	Weyerhaeuser -- Longview, WA
550	7.1	0.14	Pope & Talbot -- Halsey, OR
1,035	13.4	0.27	Boise Cascade -- St. Helens, OR
800	10.3	0.21	James River -- Wauna, OR
7,837	100.0	2.01	TOTAL Source Category Allotment

Although this is an increase of 0.13 mg/day over that shown in Table 5-5, the approach does address one major problem with using current bleach plant flows. Mills have been encouraged to recycle internal waste streams to the maximum extent possible. One example, Boise Cascade at Wallula, practices extensive recycling. Under the equal effluent concentration method, a mill that does a high level of recycling receives a lower allocation. However, a mill that does not make efficient use of water in the bleach plant actually receives a high allocation. This is a major reason for relating bleach plant flows to pulp production when determining allowable loads. Again, the margin of safety exceeds 65 percent of the loading capacity. This approach also results in more than a 95 percent reduction in TCDD discharged from these mills when compared to results of the 104 mill study.

Equal Percent Reduction:

Another option considered is <u>equal percent reduction for all source categories</u>. Because there is an absence of specific data for loadings of TCDD to the Columbia, this approach can be viewed in several different ways. The first could use information on the relative magnitude of 2,3,7,8-TCDD in fish collected below potential sources of dioxin. Using median tissue concentrations summarized in Table 5-1 as a general indicator of these relative contributions, thirty-six percent (36%) of the loading capacity could be attributed to chlorine bleaching pulp production. The remaining sixty-four percent (64%) could be attributed to other sources, such as municipal wastewater treatment plants or agricultural areas. This analysis excludes refineries because this industry is not known to be a significant source in the Columbia drainage. Although this approach does offer some advantages by accounting for other source categories, there are some major drawbacks. These include:

- NBS was intended as a screening study and not to describe source category loadings
- fish sampled nationally were collected from streams of varying sizes and did not account for dilution
- results of NBS associated with certain source categories may also include other sources (i.e. a site directly below a POTW may also be 30 miles below a bleached kraft pulp mill)

Another option suggested is to use values of 2,3,7,8-TCDD measured in Columbia River fish and the bioconcentration factor used to develop the water quality criteria (0.013 ppq) to "back calculate" current TCDD loads. Although it may be possible to estimate the relative magnitude of present plus historic TCDD loading by looking at tissue concentrations, other factors besides a weighted average bioconcentration factor of 5000 must be considered. For instance, bioconcentration factors specific to the species should be evaluated. The age of the fish and lipid content of the samples must also be taken into account. The 5000 bioconcentration factor used to develop the criteria is

intended to represent the weighted average factor for the species mix and lipid content in the "average" American fish / shellfish diet. The lack of species-specific bioconcentration data, as well as the difficulty in distinguishing the effects of historic versus current loading, makes using this approach inappropriate for this TMDL at the present time.

E. Proposed Wasteload Allocation Approach

Although certain types of data are currently lacking, available information highlights several concerns. Concentrations of TCDD in fish tissue in several areas of the Columbia River basin exceed levels protective of human health at the 10^{-6} risk level. Regional and national data strongly suggest that pulp mills which use chlorine to bleach are the largest source of TCDD to surface waters. Information also exists quantifying levels of TCDD in effluents from chlorine-bleaching pulp mills in the Columbia River basin.

Remaining data needs must address upstream inputs from Canada, contributions from other potential sources such as wood treaters, attenuation, and the role of sediments. A margin of safety will be defined to account for any lack of information. Region 10's proposed alternative for developing a TMDL for 2,3,7,8-TCDD on the Columbia River is the following phased approach:

- Establish the watershed targets identified in Table 5-2 as the basis for allocation decisions which will lead to attainment of water quality standards. Shifting of loads from upstream areas will not even be considered until solid technical information shows either that these targets are met or that the targets can be achieved as the result of enforcable control actions.

- Establish wasteload allocations to individual dischargers in one source category, pulp mills which use chlorine bleaching, at this time. Use equal mass discharge per unit production (Table 5-6) to allocate waste loads to individual pulp mills in that source category. In addition to a long term average concentration of 4.7 ppq at the bleach plant, flow limits need to be set to ensure compliance with wasteload allocations. NPDES permit limits for these pulp mills can not be less stringent than the loadings listed in Table 5-7.

- Reserve the remainder of the loading capacity (3.96 mg/day or 66 percent) as a margin of safety. Additional data will be collected and evaluated to confirm the adequacy of the margin of safety and, possibly, to support additional or modified allocations.

The table on the followin page summarizes the overall structure of the proposed TMDL with the allocations based on currently available information.

Table 5-7. Waste Load Allocations for Chlorine-Bleaching Pulp Mills in Context of Watershed Targets

		TCDD (mg/day) WLA	TCDD (mg/day) Loading Capacity	WLA as % of Watershed	Watershed as % of Total Basin Loading Cap.
LOADING CAPACITY FOR ENTIRE COLUMBIA RIVER BASIN			5.97		100
Columbia River Basin above Washington/Canada border					
Watershed target			2.30		38.5
Snake River Basin above Ice Harbor Dam					
Watershed target			1.18		19.8
Pulp Mill WLAs:	Potlatch (Lewiston, ID)	0.39		33.1	
Willamette River Basin above confluence with Columbia R.					
Watershed target			0.54		9.0
Pulp Mill WLAs:	Pope & Talbot (Halsey, OR)	0.14		25.9	
Remainder of Columbia R. Basin					
Watershed target			1.95		32.7
Pulp Mill WLAs:					
	Boise Cascade (Wallula, WA)	0.25			
	James River (Camas, WA)	0.42			
	Longview Fibre (Longview, WA)	0.08			
	Weyerhaeuser (Longview, WA)	0.26			
	Boise Cascade (St. Helens, OR)	0.27			
	James River (Wauna, OR)	0.21			
	TOTAL	1.49		76.4	
Sum of WLAs for Region 10 pulp mills		2.01			

F. Development of Information on Other Sources

In order to confirm that TCDD loadings from other sources fit within the margin of safety provided in the proposed TMDL, EPA proposes the following actions to be taken by the states in cooperation with EPA:[1]

- Develop a strategy to address water quality concerns related to TCDD inputs from woodtreating facilities. The proposed strategy should identify sources to be considered for allocations, a sampling plan for determining reductions needed, and a schedule for implementation of the strategy.

- Address other point source concerns, such as other major industrial NPDES dischargers and major municipal NPDES facilities with formal pretreatment programs, by forwarding existing state data on concentrations of dioxin in sludge.

- Develop a strategy that addresses the other source categories such as urban runoff and agriculture.

[1] This information collection is exempt from the Paperwork Reduction Act because it is being sought from fewer than 10 persons.

United States Environmental Protection Agency
Region 10
1200 Sixth Avenue, WD-139
Seattle, Washington 98101

NOTICE OF PROPOSED ESTABLISHMENT OF A TOTAL MAXIMUM DAILY LOADING (TMDL) TO LIMIT DISCHARGES OF DIOXIN TO THE COLUMBIA RIVER BASIN

Public Notice Issuance Date: June 15, 1990
Public Hearing Date: July 17, 1990
End of Public Comment Period: July 20, 1990

1. Background

The Columbia River and segments of the Willamette and Snake Rivers contain amounts of a toxic chemical, 2,3,7,8 TCDD (dioxin), which exceed applicable water quality standards. The Clean Water Act requires, in such cases, that the states calculate the maximum amount of the pollutant that the affected waterbody can safely receive. This loading capacity is used to establish a total maximum daily load which allocates allowable loads to point sources, nonpoint sources, and background. The TMDL is effectively an implementation plan for achieving water quality standards.

Recognizing the interstate nature of the Columbia River and the desirability of consistency and equity in regulating dischargers in this multi-state river basin, the involved states decided not to adopt a Columbia River dioxin TMDL as a state action. Instead, they requested that EPA establish one as a federal action.

2. Tentative Determination

Region 10 is hereby proposing to establish a TMDL for 2,3,7,8 TCDD in the Columbia River Basin. Development of the proposed TMDL has been a cooperative effort by EPA Region 10, the Oregon Department of Environmental Quality, the Washington Department of Ecology, and the Idaho Division of Environmental Quality.

Based on state standards for TCDD and river flows in the basin, loading capacities are calculated for various points in the system. The calculated loading capacity is about 6 milligrams (mg) TCDD/day at a point downstream of Longview, Washington. This point is below the major sources of dioxin to the basin. Watershed targets, similarly calculated for four major segments of the entire basin, are: 2.3 mg/day for the Columbia River as it crosses the Washington-British Columbia border; 1.18 mg/day for the Snake River Basin above Ice Harbor Dam; 0.54 mg/day for the Willamette River Basin; and 1.95 mg/day for the remainder of the basin.

The vast majority of data on sources of TCDD in the Columbia basin has focused on pulp mills using chlorine bleaching processes. Additionally, national data indicate these mills are the most significant sources of 2,3,7,8 TCDD to the nation's waters. As a result, Region 10 is currently proposing a TMDL that identifies specific wasteload allocations only for these chlorine bleaching pulp mills. A total of 2 mg/day is allocated to the existing pulp mills in Region 10. The remainder of the loading capacities for each identified watershed is held in reserve, as a margin of safety, pending development of information on other potential source categories. The Agency is also proposing a process for obtaining that information. After reviewing and responding to comments EPA will issue a final TMDL.

3. Public Comments

Persons wishing to comment on the tentative determinations contained in the proposed TMDL may do so by writing to EPA at the above address to the attention of the Director, Water Division. Copies of the Fact Sheet and Development Document for the proposed TMDL may be requested at no charge from the above address or by calling John Gabrielson at (206) 442-4183. Written comments must be postmarked on or before July 20, 1990 to be considered in the formulation of final determinations regarding the TMDL. All comments should include the name, address and telephone number of the commenter and a concise statement of the comment and the relevant facts upon which it is based.

A public hearing is scheduled for 7 pm, July 17, 1990, at the P.U.D. Community Room, 1200 Fort Vancouver Way, in Vancouver, Washington. You may submit oral or written statements about the TMDL at the hearing.

4. Administrative Record

The Fact Sheet, TMDL Development Document, and other related documents are on file at the above address and at the following locations: EPA Idaho Operations Office, 422 W. Washington Street, Boise, Idaho; EPA Oregon Operations Office, 811 S.W. Sixth Avenue, 3rd Floor, Portland, Oregon; and EPA Washington Operations Office located at the St. Martins College Campus, Lacey, Washington. The administrative record may be reviewed any time between 8:30 a.m. and 4 p.m., Monday through Friday.

EPA

Region 10 Fact Sheet *June 15, 1990*

TOTAL MAXIMUM DAILY LOADING FOR DIOXIN IN THE COLUMBIA RIVER BASIN

BACKGROUND

The water quality of the Columbia River and segments of the Snake and Willamette Rivers is currently considered impaired due to concentrations of a form of dioxin. The pollutant, 2,3,7,8-TCDD, is the most toxic of a group of compounds known as polychlorinated dibenzo-para-dioxins. These compounds, although occuring naturally at very low concentrations, can be found at elevated levels as a result of human activities such as the manufacture of chlorinated herbicides, the combustion of domestic and industrial wastes, and the production of chlorine-bleached pulp. Concentrations of TCDD measured in fish tissue in several areas of the Columbia River basin exceed levels protective of human health. Regional and national data indicate that pulp mills which use chlorine to bleach paper products are associated with some of the highest concentrations of TCDD in surface waters. Information also exists quantifying levels of TCDD in effluents from chlorine-bleaching pulp mills in the Columbia River basin.

WHAT IS A TMDL?

Section 303(d) of the Clean Water Act requires each state (1) to identify waters for which effluent limitations normally required are not stringent enough to attain water quality standards and (2) to establish total maximum daily loads (TMDLs) on such water quality limited segments for the pollutant(s) of concern.

The process of developing a TMDL involves the allocation of allowable loads to point sources, nonpoint sources, and background. A TMDL, by definition, is the sum of the individual allocations to point sources, nonpoint sources and background. It is effectively an implementation plan for achieving water quality standards using an appropriate margin of safety which takes into account any lack of knowledge concerning the relationship between source concentrations and water quality.

Concern about issues of equity in the multi-state basin led the states of Oregon, Washington, and Idaho to request

that EPA establish the TMDL for dioxin in the Columbia River basin as a federal action. In order to do so under Section 303(d), EPA must first take the formal actions of approving the listing of the affected waters as impaired and disapproving the states' expressed intent to not submit the required TMDL. This is being done concurrent to the issuance of the public notice for the federally proposed TMDL.

THE PROPOSED TMDL

The proposed TMDL provides a framework to control dioxin discharges to the Columbia River Basin. In developing a TMDL, the loading capacity (the greatest amount of loading that this river can receive without violating water quality standards) must first be calculated. The proposed TMDL defines the loading capacity of the entire Columbia River basin to be about 6 milligrams of 2,3,7,8-TCDD per day. This value was derived based on a simple model which conservatively assumed no net losses of TCDD from the system. This assumption was made because, although it was recognized that sedimentation occured, EPA could not confidently assume that the TCDD bound to bottom sediments was not still biologically available.

Because of the vastness of the Columbia River basin and the need to ensure attainment of water quality standards for TCDD at all points, the proposed TMDL establishes three checkpoints within the system. Loading capacities, or "watershed targets," have been established for the Willamette River basin (0.54 mg TCDD/day), the Snake River basin (1.18 mg TCDD/day), and the portion of the Columbia River basin which drains through Canada into Washington (2.3 mg TCDD/day). Allocations to sources within each of those watersheds must fit within these watershed targets.

EPA is also proposing specific wasteload allocations for the eight chlorine-bleaching pulp mills located in the Columbia River basin in Oregon, Idaho, and Washington. These allocations, as proposed, would lead to an estimated 95% reduction in dioxin discharges from these facilities.

United States
Environmental Protection
Agency

Region 10
1200 Sixth Avenue
Seattle WA 98101

Alaska
Idaho
Oregon
Washington

EPA

JUN 14 1990

Reply to
Attn of: WD-139

Re: Proposed Dioxin Controls for the Columbia River Basin

To All Interested Parties:

The Environmental Protection Agency, Region 10, is proposing to establish a total maximum daily loading (TMDL) for 2,3,7,8-TCDD (dioxin) in the Columbia River basin.

TMDL development is generally a state responsibility. However, the states of Idaho, Oregon and Washington have requested that EPA establish this TMDL because of the desirability of consistency and equity in regulating dischargers in this multi-state river basin. Therefore, although the TMDL development was a cooperative process with the states, EPA has taken the following final actions concurrent with proposing the attached TMDL:

- EPA has approved the listing of the Lower Columbia River (mouth to RM 397), Lake Roosevelt (upper Columbia River), the Willamette River (mouth to RM 187) and the Snake River (mouth to the confluence of the Snake and Clearwater Rivers) as water quality limited for 2,3,7,8-TCDD under Section 303(d) of the Clean Water Act (CWA).

- EPA has disapproved, under Section 303(d) of the CWA, the expressed intent by the states of Washington, Oregon, and Idaho to not submit a TMDL for the waters listed above.

- EPA hereby proposes to establish the attached TMDL for dioxin in the Columbia River basin.

Enclosed is the Public Notice, published in several daily newspapers today, seeking public comment on this action. Also enclosed is (1) a Fact Sheet that summarizes the TMDL and identifies specific issues on which we would like public input and (2) the TMDL Decision Document including the technical basis of the proposed TMDL. EPA has scheduled a public hearing on the TMDL in Vancouver, Washington, on July 17, 1990. The public comment period will end on July 20, 1990.

If you have any questions on these actions, or if you would like a copy of the TMDL Decision Document, please contact John Gabrielson at (address) or call him (206) ~~442~~ 553-4183.

Sincerely,

Thomas P. Dunne

Thomas P. Dunne
Acting Regional Administrator

Enclosures

The following table summarizes the overall structure of the proposed TMDL:

Table 1. Waste Load Allocations for Chlorine-Bleaching Pulp Mills in Context of Watershed Targets

		TCDD (mg/day) WLA	TCDD (mg/day) Loading Capacity	WLA as % of Watershed	Watershed as % of Total Basin Loading Cap.
LOADING CAPACITY FOR ENTIRE COLUMBIA RIVER BASIN			5.97		100
Columbia River Basin above Washington/Canada border					
Watershed target			2.30		38.5
Snake River Basin above Ice Harbor Dam					
Watershed target			1.18		19.8
Pulp Mill WLAs:	Potlatch (Lewiston, ID)	0.39		33.1	
Willamette River Basin above confluence with Columbia R.					
Watershed target			0.54		9.0
Pulp Mill WLAs:	Pope & Talbot (Halsey, OR)	0.14		25.9	
Remainder of Columbia R. Basin					
Watershed target			1.95		32.7
Pulp Mill WLAs:					
	Boise Cascade (Wallula, WA)	0.25			
	James River (Camas, WA)	0.42			
	Longview Fibre (Longview, WA)	0.08			
	Weyerhaeuser (Longview, WA)	0.26			
	Boise Cascade (St. Helens, OR)	0.27			
	James River (Wauna, OR)	0.21			
	TOTAL	1.49		76.4	
Sum of WLAs for Region 10 pulp mills		2.01			

EPA suspects that other sources of dioxin exist in the Columbia River basin. Accordingly, the remainder of the loading capacity (3.96 mg/day or 66 percent) is reserved in this phase of the TMDL as a margin of safety until adequate data has been collected and evaluated which either confirms the adequacy of the margin of safety or supports the establishment of additional or modified allocations. In order to obtain this additional data, EPA proposes that the states in cooperation with EPA develop strategies to collect the needed information. If future data identifies the need to make additional allocations, a modified TMDL would be established.

PUBLIC COMMENTS

A Public Hearing for the proposed TMDL is scheduled for 7 p.m., July 17, 1990, at the P.U.D. Community Room, 1200 Fort Vancouver Way, in Vancouver, WA. Written comments, postmarked no later than July 20, 1990, may also be sent to EPA, 1200 Sixth Avenue, WD-139, Seattle, WA 98101.

Although all substantive comments are welcome, EPA is especially interested in comments on the following specific issues:

- the appropriateness of limiting the proposed TMDL to 2,3,7,8-TCDD instead of including other forms of dioxin
- the adequacy of the margin of safety held in reserve relative to other unquantified sources
- present and projected pulp mill production rates
- reasonable quantities of process water to be discharged per ton of bleached paper product produced
- data on the variability of TCDD in pulp mill effluent
- present and projected magnitude of other sources including those in Canada
- the appropriateness of proposed efforts to evaluate the significance of other sources
- the appropriateness of calculating loading capacity without estimating attenuation or availability of TCDD in the sediments (data quantifying these processes for TCDD would be most appreciated)
- analytical detection limits for dioxins by methods currently available through commercial laboratories

ENVIRONMENTAL LAW
FEDERAL/STATE RESEARCH
TOOLS

LEXIS NEXIS LEXIS NEXIS

FEDERAL CASELAW

LIBRARY	FILE	DESCRIPTION
environ	cases	federal environmental case law and agency decisions
	lit	selected state & federal cases from Environmental Law Institute
	pendlt	abstracts of briefs & pleadings from ELI
	alllit	combination lit & pendlt
	courts	federal environmental caselaw

STATE CASELAW

states	omni	state appellate caselaw

STATUTORY RESEARCH -- FEDERAL

LIBRARY	FILE	DESCRIPTION
environ	uscs	titles 7, 15, 16, 21, 30, 33, 42
	stat	federal environmental statutues; includes Cercla with Sara imposed search: sara and cerla
genfed	publaw	full text; all public laws 1988 -- to retrieve Clean Air Act of 1990 type: lxe 1990 S. 1630

STATUTORY RESEARCH -- STATE

environ	allcde	48 states environmental codes through most recent legislative session (S. C. and N. D. excluded)

REGULATORY RESEARCH -- FEDERAL

LIBRARY	FILE	DESCRIPTION
environ	fedreg	Federal Register -- environmental regs
		updates to NPL cfr (40 and 300)
		updates to hazardous mats cfr (40 and 261)
	cfr	titles 21, 33, 40, 42 43, 49, 50
		to retrieve the NPL title (40) and part (300) and appendix B
		to retrieve hazardous waste list title (40) and part (261)
genfed	allcfr	CFRs from 1981 --

ADMINISTRATIVE LAW RESEARCH -- FEDERAL

LIBRARY	FILE	DESCRIPTION
environ	rcra	ALJ opinions on RCRA
	tsca	ALJ opinions on TSCA
	fifra	ALJ opinions on FIFRA
	epacaa	ALJ opinions on Clean Air Act
	npdes	ALJ opinions on National Pollution Discharge – Elimination System
	epapsd	ALJ opinions on Prevention of Significant Deterioration
	epauic	ALJ opinions on Underground Injection Control
	condec	EPA consent decrees
	ibla	Interior Board Land Appeals
	intdec	Interior Department Decisions
	noaa	NOAA & Interior Coastal Zone Decisions
	oshrc	Occupational Safety & Health Review Commission decisions
	admin	ELI's administrative law collection; includes RODs (abstracted); EPA Policy & Guidance Stmts. Preambles to EPA regs. Begins 1971 --

ADMINISTRATIVE LAW RESEARCH -- STATE

LIBRARY	FILE	DESCRIPTION
environ	caenv	Cal. Water Resources Control Bd. decisions
	flenv	Florida Environmental & Land Use decisions
	ilenv	Illinois Pollution Control Board decisions
	njenv	N. J. Dept. Environ-mental Protection decisions
	gaenv	Georgia Baord of National Resources decisions
	laenv	Louisiana Dept. of Envirn Quality decisions
	mienv	Michigan Dept. Natural Resources decisions
	nyenv	N. Y. Dept. of Environ Conservation decisions
	paenv	Penn. Environmental Hearing Board decisions
	allenv	Combined above-listed files

ADMINISTRATIVE LAW RESEARCH -- STATE

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environ	caenv	Cal. Water Resources Control Bd. decisions
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	mienv	Michigan Dept. Natural Resources decisions
	nyenv	N. Y. Dept. of Environ Conservation decisions
	paenv	Penn. Environmental Hearing Board decisions
	allenv	Combined above-listed files

LEGISLATIVE RESEARCH -- FEDERAL

LIBRARY	FILE	DESCRIPTION
environ	news	monthly journal from ELI *monitors legislative, regulatory,* judicial developments; includes CR cites; scholarly examination of proposed law
	bnaenv	weekly monitoring Cong. actions
	record	Congressional Record; 1985 --
legis	bltext	102nd Cong.
	bltrck	Track record for each bill and resolution 102nd Congress
	blt101	Track record for each bill and resolution 102nd Congress
	btx101	Text for each bill and resolution all versions 101st Congress
	cercla	complete legislative history; includes hearings, comm. reports, conf. report, debates, bills, public law
	nepa	complete legislative history; includes hearings, comm. reports, conf. report, debates, bills, public law
	sara	complete legislative history; includes hearings, comm. reports, conf. report, debates, bills, public law
	caa	complete legislative history; includes hearings, comm. reports, conf. report, debates, bills, public law (1977 Act)
	envlh	combination of legislative histories listed above
	news	Dec. 1986 article on legislative path of SARA to retreive: sara and legislative

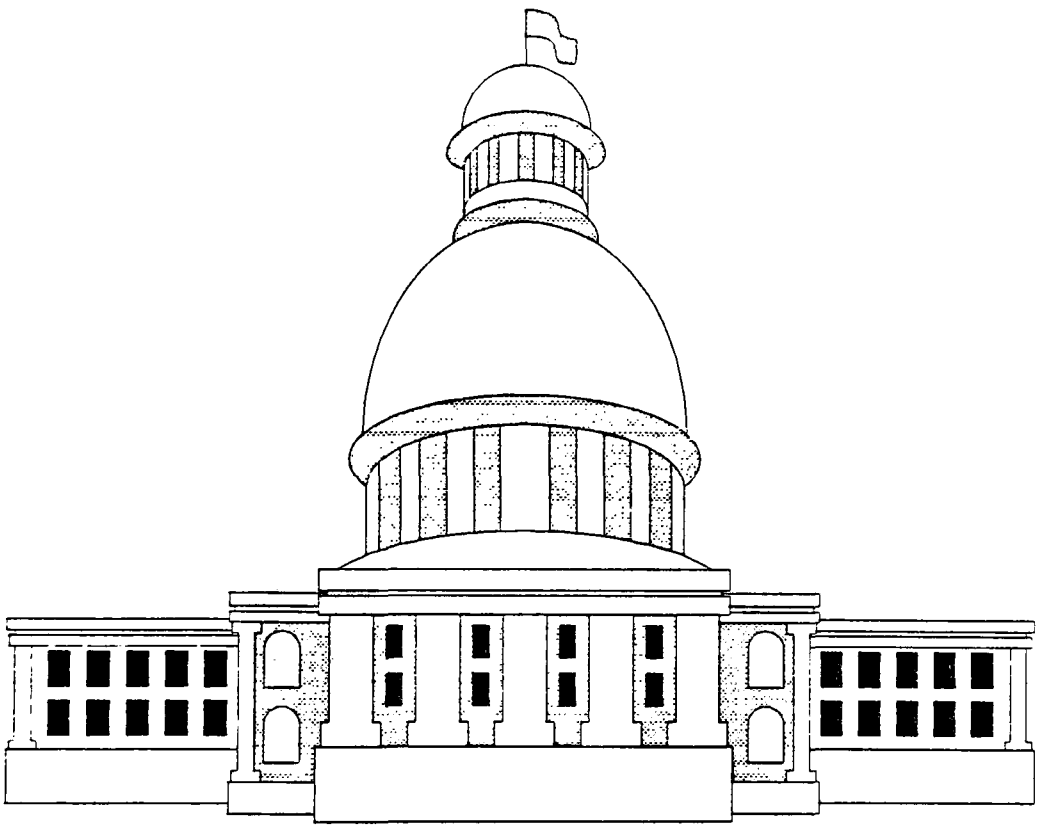
LEGISLATIVE RESEARCH -- STATE

LIBRARY	FILE	DESCRIPTION
codes	sttrck	bill tracking file for each state includes: synopsis of proposed legislation; legislative steps completed; index terms
	pubs	updates on significant state legislative initiatives

Melinda Beard
1-800-368-5868

LEXIS FOR

LEGISLATIVE RESEARCH



THE NATIONAL GOVERNOR'S ASSOCIATION SUPPORTS ONBOARD VAPOR RECOVERY

ONBOARD VAPOR CANISTERS ARE UNRELIABLE NHTSA

FEDERAL LEGISLATIVE HISTORIES--TOOLS OF THE TRADE

TOOL	LIBRARY/FILE	DESCRIPTION
Public law	genfed/publaw	slip laws within 4 weeks of signature
Bills	legis/bltext	Current Congress-all bills & resolutions; all versions
	legis/btx101	101st Congress--all bills & resolutions; all versions
	legis/bltrck	Track record for each bill & resolution--101st Congress
	legis/blt101	Track record for each bill & resolution--101st Cong.
Hearings	nexis/fednew	Complete transcript selected hearings-- 101st Congress to present
Committee reports	legis/cmtrpt	Committee reports 1990- to present
Debate	legis/record	Congressional Record-- 1985 to present
Conference reports	legis/cmtrpt	Conference reports 1990- to present
	or	
	legis/record	Most conference reports printed in Cong. Record
Presidential message	genfed/presdc	Weekly Compilation of Presidential Documents
Agency intent	genfed/fedreg	Federal Register
Political	nexis/currnt	Press coverage

Does the Clean Air Act mandate "onboard vapor recovery systems" and if so, how? How did the mandate become part of the final legislation?

THE LAW

Does the law mandate onboard vapor recovery systems? (Current vapor recovery systems recover vapor at the gas hose--not in the vehicle itself.)

Lxe 1990 S. 1630 or Lxe 101 pl 549 or Lxe 104 stat 2399
(Each Lexsee is a separate entry)

focus vapor recovery

If the bill number or the public law number, or the Statutes at Large cite are known, the law may be retrieved using the Lexsee feature. The focus feature retrieves words or phrases within that law. (Bill numbers may be lexseed IF the bill becomes the final law.)

To read the entire section star page to section 202.

.fu;p*202

If neither the bill number, nor the public law number, is known:

library:legis file:publaw search: vapor or fumes

The publaw file collects all public laws beginning in 1988. Over time, the words by the regulators may become more common than those used by the legislators. A broad beginning with synonyms is therefore best, unless the researcher is positive about the statutory language.

HISTORY OF THE BILL

What is the history of the bill's passage through the 101st Congress?

Lib:legis File: blt101 Search: s. 1630

The track record for S. 1630 will be retrieved, as will the track record for the House bill, and House and Senate resolutions which affected S. 1630. Blt101 will reveal date

of introduction and last action date, (the last action date provides clues as to how much action there has been--if the last action date and date of introduction are the same--the bill has gone nowhere). It includes sponsor, committee(s) to which bill is referred, committee actions, such as hearings, amendments and their sponsors, publication of a committee report and its number. It also includes the CRS Digest and Index terms. CRS or Congressional Research Service provides the legislative research for the Congress. CRS digests and indexes each version of each bill. Because the detail is great, the digest will not be online as quickly as the other elements of the bill track records. Index terms are more current. Blt101 provides legislative history for bills introduced in the 101st Congress.

SPONSOR

What did the legislator behind the legislation intend for it to accomplish?

Lib: legis File:101st Search: speaker(Baucus) and clean air or s. 1630

To proceed to the introductory speech, retrieve the earliest documents.

COMMITTEE MEMBERSHIP

Does Senator Baucus sit on the Environment and Public Works Committee? If so, what is his rank and on what sub-committee does he serve?

library:legis file:comtee search:baucus and environment

One of the aspects of successful legislation is the rank of the sponsor on the committee to which the bill is referred.

COMMITTEE

What can be gleaned from the committee(s)? What legislative language was added there? Were hearings held which influenced the shape of the legislation? Was a committee report issued which might explain where particular ideas came from and what the committee had in mind?

Subcommittee action information is rarely available.

HEARINGS

Were there hearings which helped shape the Act?

Library:nexis File:fednew Search:(clean air w/5 amendments or act) or s. 1630 or (hr or h.r. pre/3 3030)

focus vapor or onboard

Fednew includes the complete transcript of every hearing it covers, online next day. Fednew will cover hearings where agency administrators testify, and hearings of major public interest. It also includes White House, Dept. of State and Pentagon press statements. The executive branch can lobby through press conferences--thus retrieve both and then narrow to hearings.

m; and headline(hearing)

COMMITTEE REPORTS

Sometimes committee reports answer such questions as what did the Committee have in mind with regard to intent, what amendments were offered, included, discarded? What other bills were worked into the final reported version?

Library: legis File: blt101 Search: S. 1630

Blt101 provides extensive information about committee actions, including issuance of a report and its number. Sometimes, as legislation proceeds through Congress, names of legislators providing amendments become common language. Their names can be searched in bltrck, to ascertain whether they provided amendments in committee or on the floor.

To retrieve the report:

Lib: legis File: cmtrpt Search: clean air

focus onboard or vapor

Cmtrpt collects both conference and committee reports beginning in 1990.

To retrieve press coverage of committee activities.

Lib: nexis File: currnt Search: environment public works w/25 clean air w/5 amendments

Because Nexis includes industry-specific newsletters which may cover aspects of legislation, there may be coverage of

committee actions, about which little is known.

DEBATE

The bill track record reveals the date on which the measure reached the floor.

file:blt101 search:s. 1630

The Senate debated the Clean Air Act on page S205. Did it include onboard vapor recovery?

lxe 136 Cong Rec S 205

focus onboard or vapor

Lxe may retrieve more than one document, as the Cong. Rec. may have more than one document on a page. Use the star page feature to read an inside page.

p*S206

During the debate on the Clean Air Act, Congressman Bliley commented on the onboard vapor recovery systems. What did he say, and on what page is his statement to be found?

Lib; legis File: 101st Search: Speaker(Bliley) and onboard or gasoline or vapor w/8 recover! and bliley

The speaker segment search retrieves documents wherein Cong. Bliley actually speaks, and is not simply spoken of. The Congressional Record is paginated from hard copy and looks like [*h12865] The **h** stands for House section of the Record, **e** for Extension of Remarks, **d** for Digest, **s** for Senate.

BILL LANGUAGE

What bills did the committee have in front of it which may provide clues as to where the idea of vapor recovery systems may have emanated?

Lib:legis File: btx101 Search: onboard or gasoline or vapor w/8 recover!

Committees sometimes will, from one bill, create a separate

Committees sometimes will, from one bill, create a separate title for the reported bill. Note from the cite display that each document includes the version of the bill. After retrieving the bills, the committee report file might explain what the committee did.

CONFERENCE REPORTS

Was there one? Were onboard systems, or the section in which they are located, or the title discussed? To retrieve the report & debate:

Lib:legis File:101st Search: conference w/5 report or agreement w/8 s. 1630 or clean air

focus title ii or vapor or sec. 202 or onboard

Most conference reports are reprinted in the Congressional Record. They are sometimes referred to as conference agreements. Once the report and debates about it are retrieved, focus on the specific language, including section numbers, title numbers and or words or phrases.

The conference report by itself may be retrieved from:

Lib:legis File:cmtrpt Search: clean air

PRESS COVERAGE

Press coverage of particular legislation and the steps that legislation has taken can be invaluable in understanding the sometimes less than clear steps Congress takes.

What did the press say about the onboard vapor recovery options?

Lib: nexis File: currnt Search: onboard or on-board w/5 recovery

Because the issue of onboard vapor recovery is a technical one, the broad Nexis collection may be best, particularly its collection of technology and trade journals. No date restriction is needed; the issue is precise, and legislative history may begin before the Congress which passed the legislation. Note the use of **on-board** as an alternative to **onboard** because reporters use different spellings.

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If the question of press coverage is to be the legislation itself,

Lib:nexis File: currnt
Search: date aft 1988 and date bef 1991 and (clean air w/5 legislation or measure or bill or act or amendment or propos!) or (h.r. or hr w/3 3030) or s. 1630.

Such a comprehensive search is necessary because the press does not necessarily use a bill number and may refer to legislation as "measure" or "bill" or "act" or a "proposed or proposal." The press is also not consistent in using h.r. or hr.

PRESIDENTIAL SIGNATURE

Did the President, at signing, make any comments which might be helpful in interpreting intent of this legislation? Did he say anything about vapor recovery?

library: genfed file: presdc search: Clean air w/5 amendments or act

.fo vapor or fumes or onboard

The Presdc file (the Weekly Compilation of Presidential Documents) will include statements the president makes at signing (or not signing) legislation.

REGULATIONS

Have any agencies begun to issue regulations as a result of this new law?

Lib:Genfed File: Fedreg Search: date is 1991 and clean air or 101-549

Because the act was passed late in 1990, we cannot expect any regulations that year, thus the date restriction. Agency "preambles" are excellent sources of intent language.

PRIOR LEGISLATION

Was the issue of onboard vapor recovery systems raised during debate on the 1977 Clean Air Amendments?

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Lib: legis File: caa Search; vapor recovery

The envirn library contains 4 complete legislative histories, one of which is for the Clean Air Act.

FUTURE LEGISLATION

Is the issue of the Clean Air Act and automobile emissions back before the current Congress?

library:legis file:bills search:clean air and automo! or vehicle w/10 emission.

The bills file combines the track record and the full text of all bills and resolutions and all versions thereof for the current Congress.

STATE LEGISLATION

What legislation is currently, or recently, been before state legislatures which address the issue of clean air as it is affected by gasoline? Have any of the bills been signed into law? Retrieve the California bills.

Lib: legis File: sttrck Search: clean air

The sttrck file provides bill number, synopsis, index terms, and sponsor. Note the index terms used and add them to the search:

m;or air quality and gasoline or petroleum
.fo governor or overrid!

Always begin the search with as few words as possible note the index terms and thereby broaden the number of documents. Then add the second issue.

California bill No. 2521 was signed by the Governor on September 22, 1990. Does it mention onboard vapor recovery systems?

lxe to signed legislation using bill number as cite

.fo vapor or onboard

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BILL VERSION DEFINITIONS

Agreed to House/Senate: A House/Senate resolution that has been agreed to by the House/Senate.

Engrossed Amendment: A House or Senate bill or resolution that has passed one chamber and been referred to the other. That chamber, in passing (engrossing) the measure, has amended it. The measure must then return to the other chamber, which must agree to it, before the measure proceeds to the President.

Engrossed in the House/Senate: Passed by the House/Senate. For simple resolutions, action is complete.

Enrolled: A bill or resolution has passed by both chambers and thus cleared for Presidential signature.

Held at Desk: A bill not yet referred to committee or ready for floor action.

Introduced in the House/Senate: A bill or resolution introduced, read, and referred to committee.

Placed on Calendar: A Senate measure (or one from the House ready for Senate action) scheduled for debate.

Public Print: A bill with amendments incorporated into its text, as opposed to the Engrossed Amendment version, where only the text of the amendment is printed.

Received in House/Senate: A bill or resolution received from the opposite chamber.

Referred in House/Senate: A bill or resolution received from the opposite chamber and referred to committee.

Reported in House/Senate: A bill or resolution reported from the committee(s) to which it was referred.

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STATE LEGISLATIVE RESEARCH--A TASK-ORIENTED APPROACH

I. RESEARCH WHEN SPECIFIC INFORMATION IS KNOWN:

A. Washington State Representative Talmadge has sponsored a bill which seeks to change certain requirements for local initiatives. How far has it progressed?

lib: codes file: watrck search:sponsor(talmadge) and initiative

Watrck includes progress of each bill through the state legislative process. The sponsor segment contains only the legislator's last name.

B. Washington House bill 1025--who sponsored it? Has it progressed beyond introduction?

lib: codes file: watrck search: 1025

C. Did House Bill 2929 ever pass the legislature? If it did, did the final bill define "agricultural land?"

lib: codes file: watrck search: 2929
lxe 1990 wa hb 2929
.fo agricultural land

For all legislation signed by the governor, or overriden by the legislature, the full text of the final bill can be retrieved through Lexsee. Any particular phrases or words can be retrieved through Focus.

II. TRACKING LEGISLATION WHEN TOPICS ARE KNOWN

A. The issue of a waiting period prior to purchase of a handgun is before the Congress. Has the Washington state legislature ever considered such a law?

lib: codes file: watrck firearm or handgun

In retrieving a collection of bills, any search should use a minimum or words; note the subject terms used by Statenet--add them with a modification using the "or" connector.

.fo waiting period

B. What bills has the Washington state legislature considered which addressed the issue of nuclear waste storage? Which were signed by the governor?

lib: codes file: watrck search:nuclear or radioactive or atomic w/10 stor!

.fo governor or overrid!

C. Retrieve notice of both federal and Washington state legislation which addresses the issue of toxic waste disposal.

lib: codes file:bltrck,watrck search: hazard! or toxic w/10 material or waste

State and federal bill tracking can be followed through stacking the federal and all the state, or particular states.

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