

EXECUTIVE ORDER FOR RECYCLED PAPER PRODUCTS

PHOTOCOPY
PRESERVATION



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A 20% POST CONSUMER PROCUREMENT STANDARD IS COMMERCIALLY VIABLE AND ECONOMICALLY BENEFICIAL

More than enough pulp is available to meet a 20% post-consumer standard: The federal Government purchases 300,000 tons of P & W paper annually, out of a total printing and writing grade market of 25 million tons per year. To achieve a 20% post consumer standard, 60,000 tons per year of P & W grade market pulp must be available. **In fact, 523,250 tons is currently on the market for printing and writing grades, almost ten times more than is needed to meet a 20% PC content standard.** Investments to produce an additional 1.1 million tons per year is planned for northeastern U.S.

The market will respond efficiently to a 20% post-consumer standard: The federal market is not adequate by itself to stimulate a major shift by the larger mills. (It represents only 300,000 tons out of a 25 million ton market.) This shift will occur as the demand for post-consumer paper spreads to advertising, publishing and catalogue grades. In the short term, immediately following the Executive Order, market pulp producers will supply manufacturers who sell to the federal market. As the demand for post-consumer paper spreads to advertising, publishing and catalogue grades, more larger mills will begin to invest. Thus, this

Executive Order must be seen as the first step in developing the post-consumer paper market. **A 20% post consumer standard will have absolutely no adverse effect on large mills, even as it preserves the viability of existing investments into de-inking capacity.** The industry will respond in stages:

Stage one: A 20% PC standard satisfies the federal requirement by preserving the financial viability of the post consumer market pulp producers;

Stage two: De-inking technology evolves, demand for post consumer paper spreads in response to this Executive Order, larger mills move into greater levels of post consumer use.

Ninety-eight percent of all the paper discarded in the U.S. last year was post-consumer paper. This is the market problem we need to correct. Hundreds of cities have established recycling programs and last year Americans spent \$11 billion getting rid of paper waste (out of a total waste disposal bill of \$30 billion). Seventy percent of all paper waste in the U.S. wound up at incinerators and landfills. Twenty five percent of the paper that was collected for recycling was exported to jobs abroad. According to a 1992 analysis by the Congressional Research Service, the U.S. ranks 15th of the 18 OECD countries in paper recycling.

Recycling post consumer paper will produce thousands of inner city jobs as well as manufacturing jobs at the plants that build de-inking technologies. It will make our production of paper less damaging to the environment and reduce the need to for costly and environmentally damaging incinerators and landfills. Recycling is politically popular. More than 4 out of five Americans want a federal recycling requirement.



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DEINKED MARKET PULP PRODUCERS, EXISTING @ 100% P.C.

COMPANY/LOCATION	DEINKED PULP CAPACITY (SHORT TPD)	INITIAL STARTUP DATE
Ponderosa, Santa Ana, Calif.	150	1966
Ponderosa, Augusta, Ga.	180	1970
Ponderosa, Oshkosh, Wis.	250	1972
Ponderosa, Memphis, Tenn.	240	1974
Desencrage Cascades, Breakeyville, Que.	110	1986
Mississippi River, Natchez, Miss.	160	1993
Kieffer Paper Mills, Brownstown, Ind.	110	1992
EcoFibre/Riverside Paper, De Pere, Wis.	75	1993
Fox River, De Pere, Wis.	220	1992
Total 1,495/day		

Equals 523,250 Tons/year @ 100% P.C.
available now: > 1 mil. tons/year at 50%.



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POTENTIAL VENTURES IN NORTHEASTERN U.S.
(Project financed depends on Demand)

		<u>Tons/Day</u>
<i>IRC - Fitchburg, Massachusetts</i>	<i>Project financed</i>	<i>400</i>
<i>Pejepscot - Topsham, Maine</i>	<i>Project financed</i>	<i>400</i>
<i>Stone and Webster - Auburn, Maine</i>	<i>Project financed</i>	<i>200</i>
<i>Wheelabrator - Concord, New Hampshire</i>	<i>Project financed</i>	<i>200</i>
<i>Ponderosa - Allentown, Pennsylvania</i>	<i>Corporate/Project financed</i>	<i>400</i>
<i>North American Recycling - Troy, New York</i>	<i>Project financed</i>	<i>300</i>
<i>Solar - Morrisville, Pennsylvania</i>	<i>Project financed</i>	<i>350</i>
<i>Delaware River Pulp - Camden, New Jersey</i>	<i>Project financed</i>	<i>300</i>
<i>Statler - Expansion in Augusta, Maine</i>		<i>150</i>
<i>Minnesota Pacific - N.E. U.S.</i>	<i>Project financed</i>	<i>400</i>
<i>Confidential Project - New York</i>	<i>Corporate/Project financed</i>	<u><i>400</i></u>
	TOTAL	3500

Total wastepaper economically available in the Northeast will support 800 tons/day - 1000 tons/day new capacity (S.D. Warren estimate).



August 30, 1993

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SUBJECT: EPA air and water standards for the pulp and paper
industry

Dear Debra and Penny:

As you finalize the preamble and draft air and water regulations for the pulp and paper manufacturing industry, we hope the following preliminary comments will be useful. We congratulate you on the degree of openness that EPA has maintained during the pre-proposal stages of these rules and hope to see it continue in future rulemakings.

I. "Availability" of TCF technologies for Kraft Mills

We continue to be unpersuaded by EPA's contention that there are inadequate data to support the development of a BAT regulation using TCF as the reference technology for kraft pulp and paper mills (for either softwood, hardwood or both furnishes).

EPA has taken the position that TCF pulp of an equivalent brightness to that of ECF pulp cannot yet be achieved for softwood pulp, and the "majority" of US facilities use softwood rather than hardwood furnish -- hence, TCF technology is not yet "available" under the meaning of BAT.¹

¹ Letter from Donald Anderson and Penny Lassiter, EPA, to Deborah Sheiman, NRDC (March 22, 1993). Earlier in the rulemaking process EPA had claimed that a lack of, inter alia, effluent data on dioxins and furans in the effluent from TCF mills made it impossible to develop a BAT analysis. We argued that these data were not necessary, since a TCF mill's effluent
(continued...)

It is a grave error to treat TCF technologies as futuristic and unproven when they clearly are already in use by industry leaders. It is estimated that today there are seven TCF bleach kraft pulp mills using ozone in operation or under design.² These mills are supplying a demand for products at high brightness levels today.

There is evidence that ISO brightness of 80 and above currently is being achieved using softwood furnish. For example, the Aspa Bruk mill in Sweden, which pioneered TCF production, reportedly achieves 83 ISO.³ The Metsa-Botnia mill in Sweden reports achieving 82-85% ISO using both softwood and hardwood, with equivalent strength properties to chlorine-using pulp.⁴

Second, even if equivalent brightness were being achieved only in hardwood-using mills, this would dictate the subcategorization of the industry and selection of TCF reference technologies for hardwood only -- not the rejection of TCF altogether.

Third, whatever EPA's view with respect to existing facilities, inadequate attention has been given to the selection of TCF reference technologies for New Source Performance

¹(...continued)

will not contain organochlorines.

Later in the rulemaking process, in attempting to identify incentives for facilities to install TCF technologies (even though the reference technology would be ECF), EPA has proposed to not require monitoring for these substances. This suggests agreement with our previously stated contention that organochlorine monitoring data for such facilities is not needed. It would appear that one previously-identified obstacle to the use of TCF reference technologies has been eliminated.

² "Technical and Economic Feasibility of the Effluent-Free Bleached Kraft Pulp Mill," presented by Richard Albert, Technical Staff Manager, Parsons Main, Inc., at the Non-Chlorine Bleaching Conference, Hilton Head, SC (March 1993) at 5. This and a number of other documents cited herein are attached. We ask that this letter and attachments be included in the rulemaking record.

³ "TCF Pulp at Aspa Mill - History and Future," presented by Hans Fasten, Mill Manager, at the Non-Chlorine Bleaching Conference, Hilton Head, SC (March 1993) (copy attached). Significantly, the Aspa mill is moving closer and closer to full mill process closure and has recognized such closure as the desired end goal that TCF makes achievable. Id.

⁴ "Experiences and Conclusions with TCF Bleaching at Metsa-Botnia," presented by Kosti Kukkonen, Director, R&D, et al. at Conference on Non-Chlorine Bleaching, Hilton Head, SC (March 1993) (copy attached). Like their counterparts at Aspa, this company's stated goal is the closure of the mill. Id.

Standards. Indeed, some evidence exists that, for greenfield facilities, TCF may be less expensive than ECF both to construct and to operate!⁵

In its March 1993 letter EPA (supra, n.1) requested that we provide any available information on the market shift towards lower "brightness" paper, which might lower the costs of compliance with BAT rules based on chlorine free technologies. We have no data per se to contribute, but ask that the rulemaking record include all letters sent by and records of the meetings held with paper industry executives who have opposed adoption of a Presidential Executive Order on Government Procurement that includes non-regulatory incentives for procurement of TCF paper products. These industry efforts to prevent the flourishing of the US TCF market cast doubt upon the economic analyses of the industry and should be factored into EPA's evaluation for purposes of the RIA.

II. Gaps in Proposal for Other Subcategories

In response to an EPA inquiry at the last public meeting about future mills now in the planning stages, an engineering consultant responded that most (or all) new facilities in the next few years will be secondary fiber plants. There appeared to be widespread agreement from all attendees that this was correct.

Yet, the current proposal will not include BAT rules for these facilities, and the last 304(m) plan established no timetable for proposal and promulgation of BAT or NSPS for them. (There are toxic pollutants in the effluent from secondary fiber mills, including paper, coating and ink contaminants.)

Many new secondary fiber plants may go on line without BAT/NSPS unless EPA acts swiftly. This would represent an important opportunity lost; NSPS, potentially more stringent than BAT, would be most effective now before the new facilities are built.

We strongly urge EPA to make a commitment to issue BAT and NSPS for secondary fiber facilities as rapidly as possible.⁶ EPA should publish a schedule for the rapid development of BAT and NSPS for secondary fibers in its next 304(m) plan, and announce its intent to do so in the October proposal.

⁵ "Process Technology for Production of TCF-bleached Market Kraft Pulps," presented by Gunnar Carre, Senior Process Engineer, Sunds Defibrator AB, et al., at Conference on Non-Chlorine Bleaching, Hilton Head, SC (March 1993) (copy attached). This company provided the fiberline equipment for the Union Camp mill in Franklin, Virginia. Id. at 6.

⁶ This issue has implications for several cases that have been the subject of EPA consent decrees; we reserve the right to raise it in the context of NRDC's court-supervised consent agreement in the 304(m) case.

III. Oxygen delignification as BAT

We are aware that certain industry representatives have argued that oxygen delignification (OD) is not an appropriate reference technology for BAT, claiming it is too costly and does not reap adequate environmental benefits. We strongly disagree.

In use since the early 1970s, oxygen delignification is a proven technology employed worldwide in many pulp and paper mills. There are about 120 kraft mills around the world operating with oxygen delignification systems.⁷ Approximately half of all kraft pulp produced worldwide is oxygen delignified.⁸ Even some Russian mills employ OD technology.⁹ There can be no doubt that OD is both technologically and economically achievable. Moreover, facilities that ultimately make the switch to TCF technologies must have OD. We oppose any plans to remove OD as a reference technology.

The inclusion of oxygen delignification systems has significant environmental and economic benefits. The addition of oxygen delignification before bleaching can reduce the quantity of BOD, color, AOX, and the degree of toxicity of bleach plant effluents, and has an overall lower operating cost. Therefore, any claim that oxygen delignification does not have significant environmental benefits is inaccurate.

The installation of oxygen delignification in bleached kraft mills reduces bleach plant BOD discharges by approximately 50% and color by 60%-67%¹⁰. Discharges of organochlorines are reduced by approximately 35%-50% using oxygen delignification.¹¹

⁷ McCubbin, N. Consultants Inc., 1992. Best available technology for the Ontario pulp and paper industry. Report prepared for: Water Resources Branch Ontario Ministry of Environment. Queen's Printer, PIBS 1847, p. 261. This document is not attached because we assume EPA has it already. If not we will supply it for the record.

⁸ "The reformed kraft process for bleached pulp," paper presented by Prof. Ingemar Croon, Croonconsult, Stockholm, at the Non-Chlorine Bleaching Conference, Hilton Head, SC (March 1993) (copy attached).

⁹ "Russian Mills Look to Non-Chlorine Bleaching as Key to Future Markets," Pulp and Paper Magazine (February 1993) by Harry L. Akim (copy attached).

¹⁰ Graves, J.W., T.W. Joyce, and H. Jameel, 1993. Effects of chlorine dioxide substitution, oxygen delignification, and biological treatment on bleach-plant effluent. TAPPI Journal 76:7, pages: 153-158.

¹¹ Id; see also Norstrom, H.A., 1987. Reducing the discharges to water technical objectives. Second IAWPRC Symposium on Forest Industry Wastewaters, June 9-12, 1987, Tampere, Finland.

A reduction of 50% in overall toxicity of bleach plant effluent using an oxygen delignification system has been reported.¹² Another study also reported reductions of 50% to 70% in acute toxicity to fish when oxygen delignification systems are used.¹³ Oxygen delignification, therefore, has significant positive effects on the environment.

The economics of oxygen delignification are dependent on local prices for oxygen relative to molecular chlorine dioxide. The E.B. Eddy mill in Espanola, Ontario has saved approximately 30% in bleaching chemical costs since the installation of its oxygen delignification capacity in 1977.¹⁴

The published data indicate that the operating costs for bleached kraft mills incorporating oxygen delignification stages are lower than the operating costs for traditional chlorine based systems. McCubbin Consultants, Inc. calculated that the average Ontario softwood kraft mill can save on the order of C\$8/tonne pulp in direct operating costs by installing an oxygen delignification system. This estimate was based on Ontario chemical prices prevailing in early 1991. (McCubbin, *supra* n.7, at 169.) The savings will vary according to local conditions and depend mostly on the ability of the existing bleach plant to produce satisfactory quality pulp.

IV. Degree of Chlorine Dioxide Substitution

Some industry representatives also have argued to EPA that it is not economically achievable, or the environmental benefits are not sufficiently large, for EPA to require that kraft mills eliminate all use of elemental chlorine. We continue to dispute the reliance on chlorine dioxide rather than TCF technologies; but to the extent that EPA plans to allow the use of chlorine dioxide it is clear that 100% substitution is both doable and worth doing.

ECF technology cannot be regarded as new or unproven. By one estimate, today there are more than 50 bleached kraft pulp mills that produce ECF pulp.¹⁵

¹² Arhippainen, B. and R. Malinen, 1987. Cost competitiveness of oxygen bleaching. TAPPI Proceedings International Oxygen Delignification Conference, pages: 23-27.

¹³ Inder, K., 1987. Oxygen bleaching of kraft pulp - high consistency vs medium consistency. TAPPI Proceedings 1987 International Oxygen Delignification Conference, pages 195-200.

¹⁴ Karl, W., 1988. New Pollution Control Phase means more than just dioxin prevention. Pulp and Paper Journal, 10, pages:18-21.

¹⁵ Pulp and Paper International, March 1992 at 50 (survey of mills) (copy attached).

Moreover, there are important environmental benefits that are attained by 100% ClO_2 substitution rather than only 70% ClO_2 substitution, such as lower toxicity levels, lower organochlorine discharge, and elimination of chloroform formations.

Chlorine dioxide substitution reduces bleach plant effluent toxicity.¹⁶ The rates of fish survival depends on the degree of chlorine dioxide substitution.

Unlike chlorine and hypochlorite, chlorine dioxide does not form chloroform in the bleach plant. Eliminating the hypochlorite stage and increasing the ClO_2 substitution effectively reduces chloroform formation.

In a study conducted by Crawford *et al.*, 1991, the chloroform in the untreated bleach plant effluent was reduced when going from 70% to 100% substitution and eliminating the hypochlorite stage at the same time. Figure 1 shows the amount of chloroform leaving the bleach plant at various chlorine dioxide substitution levels. The formation of chloroform is virtually zero at 100% chlorine dioxide substitution.¹⁷

FIGURE 1

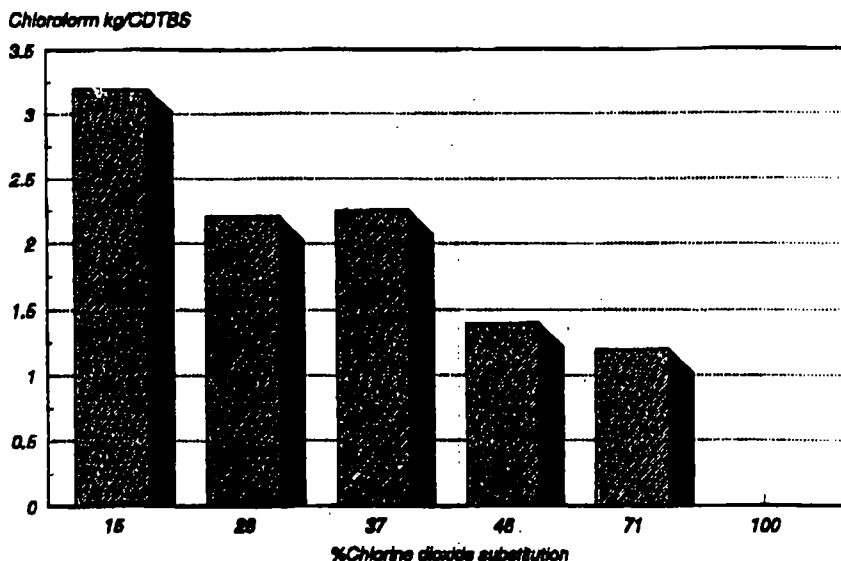


Figure 1: Chloroform generation vs. chlorine dioxide substitution (reproduced from Crawford *et al.*, 1991).

An increase in chlorine dioxide substitution also significantly decreases AOX in untreated bleach plant effluent. Figure 2 shows the effects on organochlorine discharge of substituting up to 100% of the molecular chlorine in a typical softwood kraft mill bleach plant effluents. (McCubbin Consultants, Inc., 1992, *supra* n.7, at p.129).

¹⁶ Liebergott, N., b. Van Lierop, A. Nolin, M. Faubert, and J. Laflamme, 1991. "Modifying the bleaching process to decrease AOX formation." *Pulp and Paper Canada*, 92:3, pp. T70-T75.

¹⁷ Crawford, *et al.*, 1991 [cite to be completed]

FIGURE II

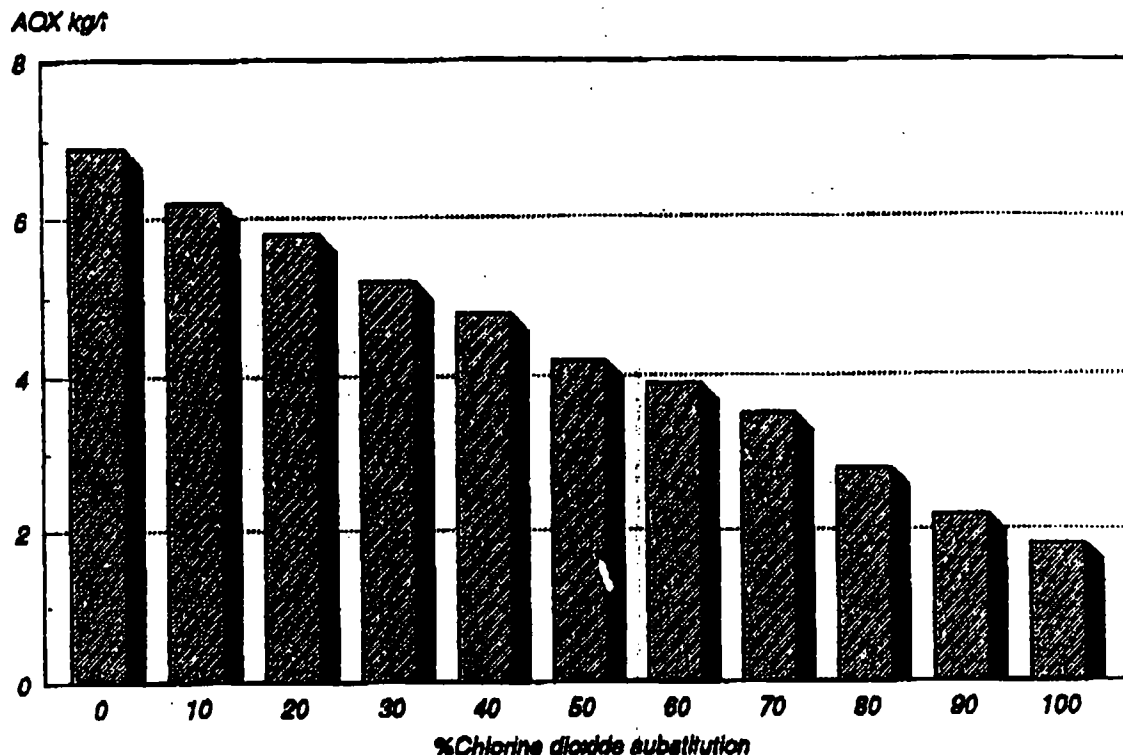


Figure 2: AOX discharges in untreated effluent at various levels of chlorine dioxide substitution from a conventional bleach plant using softwood (reproduced from McCubbin Consultant, Inc., 1992).

A paper presented recently by Weyerhaeuser concerning their conversion of the Grand Prairie, Alberta kraft mill to 100% substitution is a good example of the benefits of 100% ClO_2 substitution. Weyerhaeuser concluded that, in comparing 70% and 100% substitution:

- * Bleached pulp quality was unchanged with respect to viscosity, brightness, strength and other characteristics.

- * While bleaching chemical consumption (including all oxidizing chemicals) increased 5% and bleaching cost increased 4%, a decrease in sodium hydroxide and chlorine consumption nearly balanced the increased cost of chlorine dioxide, hydrogen peroxide and oxygen.

Still more significantly, Weyerhaeuser reported that effluent quality improved substantially with 100% substitution: color decreased 30%, AOX decreased 65%, highly chlorinated phenolic

compounds were "virtually eliminated" and chlorinated phenolic toxicity was decreased over 98%.¹⁸

It is essential to note that even 100% conversion did not resolve the organochlorine problem: 2378 TCDF was still detected at up to 12 ppq in mill effluent (although 2378 TCDD was at nondetect).¹⁹ Moreover, ClO₂ substitution does not reduce BOD or wood extractives.²⁰

IV. Steam Stripping and Incineration

Some industry representatives also have contended that it is not economically viable to require both steam stripping and then follow-on incineration of wastewater foul condensates. We disagree.

Steam stripping is a viable and accepted in-plant treatment method. It is used to remove compounds with high biochemical demand (BOD), (primarily methanol), and to remove odorous total reduced sulphur compounds (TRS) discharged with kraft mill foul condensates. The stripping process involves the vaporization of BOD-contributing compounds from the foul condensates and destroying these vapors by thermal oxidation. Potential incineration devices are: a lime kiln, power/steam boiler, or a dedicated incinerator.

The operating costs for steam stripping is mainly a factor of the cost of producing steam. One of the cost saving processes is to use methanol (which is collected in the steam stripping process) as fuel for a dedicated TRS incinerator.

Since 1988, Georgia-Pacific's mill in Palatka, Florida, has been stripping and reusing foul condensate and recovering fuel value from the methanol and TRS stripper products. Steady operating of their dedicated waste gas system enables Georgia-Pacific to continuously fuel their dedicated waste gas incinerator almost entirely with the stripper products. The operation of this mill shows that methanol and other components of the stripper overhead product are present in quantities sufficient to be of significant fuel value if properly handled.²¹

¹⁸ "The Impact of Chlorine Dioxide Delignification on Pulp Manufacturing and Effluent Characteristics at Grande Prairie, Alberta," paper presented by Pryke et al., at Non-Chlorine Bleaching Conference, Hilton Head, SC (March 1993) (copy attached).

¹⁹ Id.

²⁰ McCubbin Consultants, Inc., 1992, Supra n.7, at p.169.

²¹ Johnson, L.P., and Adams, V.L., 1993. Utilization of Methanol from Steam Stripping of Pulp Mill Foul Condensates as a Fuel. TAPPI Proceedings Environmental Conference, pp. 221-231.

The Louisiana-Pacific mill in Eureka, California has chosen to combine steam stripping and incineration in its pollution prevention program. The Louisiana-Pacific system is based on engineering designs for removal rates of 90% of methanol and 95% of TRS. As well, a thermal oxidizer provides 99.99% thermal destruction efficiency for reduced sulphur compounds and volatile organic hydrocarbons. The thermal incinerator is designed to handle non-condensable gases, turpentine stream and the product from steam strippers.²²

The addition of an incineration system after steam stripping in a plant has several major environmental advantages compared to not using incineration. As mentioned, the system is engineered for removal of 90% of methanol, which can then be used as an energy source for the plant. It also has a 95% removal rate for TRS, thus eliminating most of the foul odors. In addition, the removal of these pollutants results in less stress on the "end of pipe" wastewater treatment systems. This may result in beneficial economic spin-offs such as lower maintenance costs.

Also, clean stripped condensate can be re-used in the process for applications such as brown stock washing, which decreases water usage.²³

The claim that it is not economically viable to require both steam stripping and incineration of waste products is not valid since many mills are already using both processes. There are also significant positive environmental effects from using incineration after steam stripping.

V. Delay in Proposal of Air Regulations

There have been repeated claims that EPA has inadequate data and/or inadequate models to support proposal of the MACT rule in October, and requests for delay in publishing this component of the cluster rule. We oppose such a delay.

EPA has adequate experience in modelling emissions for purposes of proposing this rule, although we agree that additional field verification and monitoring will be helpful in finalizing the rule. Reliance on modelling is neither radical nor revolutionary and is well within EPA's Clean Air Act authority.

²² ENSR Consulting and Engineering, Alameda, California, and Fort Collins, Colorado, 1993. Draft Environmental Impact Report for the Louisiana-Pacific Corporation Pollution Prevention Project. A report prepared for County of Humboldt Planning and Building Department, Eureka, California, pp. 2-16 and 2-20.

²³ Zunich, J.L., Vora, V.M. and Venkataraman, B., 1993. Design Considerations for Steam Stripping of Kraft Mill Foul Condensates. TAPPI Proceedings Environmental Conference, pp. 201-207.

There are several air quality models which have been discussed by Turner, 1993.²⁴ The models discussed in this paper seem to be adequate to handle emissions from both point and fugitive sources of a pulp and paper mill. The EPA should consider these models for predicting likely emissions.

There are some measurements of field-verified air emissions from two Canadian mills included in reports by Environment Canada. Measurements of semi-volatile and volatile organic compounds, total particulate, hydrogen chloride and heavy metal emissions are indicated.²⁵

The industry also has conducted some in-house measurements of toxic air emissions. Industry representatives have stated at EPA's public meetings that they would be supplying EPA with additional monitoring data. EPA should use whatever qa/qc'd data are available from industry sources as soon as it is received, without halting the proposal process.

The EPA should also consider recent data from The Texas Air Control Board (TACB). The TACB requested the pulp and paper mills in Texas to submit air emission data for volatile organic compounds (VOCs) and Hazardous Air Pollutants (HAPs) from each mill, not later than December 1992. TACB is planning to use this data to provide input for the CAA's ozone study, to comply with the Texas Legislature's request for an HAP air quality assessment relative to health risk, and to establish an accurate baseline of emission.²⁶

Apart from believing that EPA is adequately prepared to propose the MACT regulations (and continue its data-gathering during the next two years) we oppose delay in proposing the MACT rule because it would defeat the purpose of allowing a joint assessment of costs if the air and water rules are proposed separately. There is a far greater likelihood that costs would be double-counted for equipment that is geared towards both air and water release reductions if the rules are proposed separately.

²⁴ Turner, D.B., 1993. Air Quality Modelling of Non-Point Source Emissions at Pulp and Paper Mills. TAPPI Proceedings Environmental Conference, pp. 565-572.

²⁵ Levelton & Associates Ltd., 1992. Characterization of Emissions from a Kraft Recovery Boiler. Prepared for Environment Canada, Pacific and Yukon Region Environmental Protection Service, Vancouver, B.C., p.65 (copy attached); Environment Canada and Ministry of Environment of British Columbia, 1989. A Test Burn of Chlorophenol contaminated Wood Wastes at Northwood Pulp Mill Prince George, British Columbia. Summary report, p.43 (copy attached).

²⁶ Cutbirth, J.W., 1993. Texas Air Emission Speciation Study. TAPPI Proceedings Environmental Conference, pp.27-34.

Furthermore, plant operators have made clear at EPA's public meetings that they wish to outfit (or retrofit) their pollution prevention and control equipment via a comprehensive planning, design and construction effort. Delay in proposing air pollution control/prevention requirements will result in delays in the development of water pollution prevention and control systems until the air rules are proposed. Hence, delay will infect both media, just as speedier joint proposal will benefit both.

As industry has acknowledged, a delay in the proposal of MACT regulations will translate into a delay in compliance deadlines for new sources (since proposal triggers a duty to comply for such sources -- however "new sources" ultimately are defined). This is still another reason for avoiding delay in the proposal.

VI. Broad "source" definition for CAA purposes

Industry representatives have argued for a very broad definition of "source" on the theory that this will encourage pollution prevention by enabling facilities to innovate and to upgrade air and water-impacting technologies in an integrated fashion. However, despite EPA's requests for specifics, no evidence was presented at the public meetings to show that this stated purpose will be served.

With respect to "new sources" subject to MACT regulation, the only proposed distinction between existing and new source standards for air is the inclusion of controls for deckers and screeners in MACT for new sources. The only impact of defining "new source" broadly (so that only large-scale upgrades qualify) will be to delay the compliance deadline for retrofitted components within pulp and paper plants. There is no environmental benefit to be gained from such delay.

Moreover, Clean Water Act "new source" definitions are not proposed to be consistent with the CAA definitions, so no case has been made for improving the ability to achieve cross-media pollution prevention or reduction through coordination.

In short, unless a more convincing case can be made for the environmental benefits of a broad "new source" definition, EPA should apply the definition as narrowly as possible to ensure that the maximum number of operating units falls within the proposed rule's purview under the accelerated new source timeline. Finally, a broad source definition is simply illegal under Section 112 of the Clean Air Act.

VII. Monitoring Requirements

The proposal says that the EPA will not propose any continuous monitoring for HAPs because at the moment there are no known techniques for continuously monitoring all of the HAPs.²⁷

NRDC strongly supports continuous emissions monitoring of HAPs. Congress created the enhanced monitoring requirements in order to cure the traditional problems of enforceability brought about by EPA's use of less stringent techniques. EPA should investigate the applicability of the relevant technologies (such as infra-red spectrometry) to the HAPs emitted in this industry. The final rule should require continuous monitoring of those HAPs which can be continuously monitored. Other monitoring can fill in any gaps. The lack of an ability to continuously monitor all HAPs does not bar continuous monitoring of those which are possible.

EPA also has stated that the monitoring of VOC or THC emissions from process vents is not appropriate because this monitoring might pick up emissions caused by the control device. This is an arbitrary argument. The public should know the actual emissions from the facility, including any caused by the control device. NRDC can accept adjustment of the control standard to take into account the emissions from the control device.

We also object to the use of a percentage reduction requirement as an emissions standard. A percentage reduction cannot be verified absent measurement both before and after control. Hence, the standard is largely unenforceable, since non-complying companies can avoid detection of actual violations by manipulating the estimate of pre-control emissions.

EPA should specify an emissions rate in pounds per hour wherever possible. While NRDC can understand choosing a percentage reduction requirement in the context of an enormous category of very diverse processes where determining achievable emissions rates for the sources is impossible (e.g. the HON rule), outside of such exceptional cases EPA should generally use a pounds per hour standard. Such a standard is verifiable and enforceable. If EPA retains the percentage reduction standard in the final rule, it must require measurement of emissions before and after control on a continuous basis.

The Clean Air Act requires control of all emissions from pollutants on the Clean Air Act's list. Yet, the wastewater standards provide for no control of streams without a concentration of 100 ppmw of methanol. This is inappropriate. NRDC continues to believe that exemptions are illegal in light of the express legislative history in the Clean Air Act disapproving of exemptions from MACT standards. If EPA must retain exemptions it must apply the cutpoint to all cumulative emissions and make

²⁷ "Pulp and Paper MACT and Effluent Guidelines Public Meeting," June 30, 1993, at 11 ("Rationale" column, option 1 - CEM for Process Vent Monitoring).

sure they are cumulatively de minimus. The benzene waste NESHAP has a 10 ppm cut-point. EPA must at least explain why it is being ten times as lenient with respect to emissions from pulp mills.

With respect to wastewater, NRDC agrees that continuous emissions monitoring may not be feasible at this time. EPA should, however, require frequent monitoring of the HAP content of the wastewater (option 2). We do not believe that the vague scheme described in option 3 will actually detect violations.

VIII. Use of "Building Block" Approach to Develop Effluent and Emission Limits

Some have objected to the use of emission estimates developed on a building block approach from a number of different plants as models for the rules. This issue has already been decided by the courts; EPA does have the authority to use a building block approach in developing effluent guidelines. See Chemical Mfrs Assn v. U.S. EPA, 885 F.2d 253 (5th Cir. 1989), cert. denied 495 U.S. 910.

In the air context, NRDC also supports the building block approach suggested by EPA. Such an approach is completely consistent with the maximum achievable emissions reduction requirement of Section 112(d).

IX. EPA Must Address the Issue of Limits of Detection

In evaluating the technologies and their relative advantages and disadvantages for the pulp and paper effluent guidelines, EPA has essentially treated the organochlorine controls achieved by various technology options as indistinguishable because of the 10 ppq analytical limit of detection. In short, the analysis finds no "measurable" difference between the dioxin discharge levels in the effluent for facilities using 70% ClO2 substitution, 100% ClO2 substitution and TCF technologies.

This is a major flaw in the analysis, and it infects EPA's overall regulatory approach by warping the comparison of the relative advantages of TCF. Only TCF technologies can assure compliance with water quality standards.

We attach and incorporate by reference an analysis of the limits of detection issue prepared by the Environmental Defense Fund, and ask that it become a part of the record along with these comments.

One final note regarding EPA's failure to base these rules on TCF reference technologies: Issuance of a rule which does not assure wildlife are protected (and here the issue of detection limits is all-important) may implicate the Endangered Species Act. Promulgation of a non-protective rule is a Federal action affecting endangered or threatened species, triggering a duty to consult with the Fish and Wildlife Service.

We request that EPA address the ESA issue in the preamble to the proposed rule in October.

Conclusion: EPA's and Industry's Long Term Objective Should Be Closed Mill Systems

A transition to TCF technology will make it possible to eliminate the discharge of effluent altogether from the pulp mill. Leading industry researchers and manufacturers are planning for and working towards this goal, which is mandated by the Clean Water Act.²⁸ Zero effluent ought to be embraced openly by both U.S. industry and EPA in charting a future path for the pulp and paper manufacturing sector.

We urge EPA to evaluate recent research into non-discharging mill options,²⁹ and consider their viability for NSPS and for future revisions to the overall industry effluent guidelines. At a minimum, this review should consider the feasibility of performance standards that address water consumption per pound of pulp produced or standards based on technologies that have ended effluent discharges from subunits of the pulp and paper production process.

It should also be noted that the "Methodology for determining BAT Pollutant Loadings for the Revision of Pulp and Paper Effluent Limitation Guidelines" (Radian Corp., June 2, 1993 at 2-1) identifies one bleached papergrade kraft pulp mill that does not discharge any wastewater at all. EPA should discuss that mill's technology in the development document to explain why it does not represent BAT, since the agency apparently has rejected it as a model technology.

Thank you for considering these comments as you complete the drafting of the proposed rules.

Sincerely,



Jessica Landman
Senior Attorney
Clean Water Program



David Dreisen
Project Attorney
Clean Air Program

²⁸ CWA sec. 101(a)(1). See papers cited in notes 3 and 4, supra.

²⁹ See "A Survey of Research and Development Activity in Bleached Kraft Mill Closed Cycle," by Peter Gleadow and Calvin Hastings, H.A. Simons Ltd., Vancouver, Canada, et al., presented at the Non Chlorine Bleaching Conference, Hilton Head, SC (March 1993) (copy attached).

Incentives for Production of Totally Chlorine Free Paper

The Executive Order on environmentally preferable paper purchasing should include a provision directing Federal agencies to set a goal for the purchase of Totally Chlorine Free paper by 1995.

This provision would offer a purely voluntary, non regulatory incentive to industry to begin installing environmentally preferable paper-making technology. Federal agencies could establish their purchasing goals based on the availability of domestic supplies.

Encouragement to purchase Totally Chlorine Free paper would send a powerful signal that we recognize the environmental advantages of chlorine free technologies and want to encourage domestic producers to develop and install these technologies to avoid a permanent loss to their European competitors.

Use of chlorine or chlorine compounds (e.g., chlorine dioxide or hypochlorite) in the pulping and papermaking process results in the release to the environment of highly toxic organochlorines, including dioxins and furans. These substances are harmful in minute quantities well below the level of detection in water. Dioxin, which bioaccumulates readily in fish tissues, is the cause of fish consumption advisories in 16 States. In Maine, for example, dioxin contamination by bleach kraft mills has caused the establishment of fish consumption advisories (including prohibitions on consumption for women of child bearing age) for over 230 river miles.

Dioxins and furans are already present in the environment and our body tissues at levels that can cause human health effects. Federal government actions to encourage more rapid elimination of further discharges of dioxins to the environment are essential.

Some paper companies have argued that simply reducing or eliminating the use of pure (elemental) chlorine deals with this problem. While substituting chlorine dioxide for pure chlorine reduces the dioxins released, it does not eliminate them. Chlorine free technologies, in contrast, both eliminate the generation of harmful dioxins and reduce other types of paper-making impacts: such as color pollution, the discharge of oxygen-depleting organic matter, and air emissions of chloroform. In addition, these new technologies allow for the recycling/reuse of water employed in paper-making, greatly reducing the amount of water consumed in the process.

There are a handful of U.S. producers who are making or could begin right away to make such paper. But the U.S. production capability is lagging behind European competitors. Most of the 104 kraft pulp and paper mills in the U.S. still use chlorine or chlorine compounds (such as chlorine dioxide or hypochlorite) in the paper-making process. The U.S. industry would benefit from incentives to adopt this innovative technology.

Ironically, U.S. paper producers have often pointed to a lack of domestic demand for chlorine free paper products as their rationale for not installing the new technology. The Executive Order could take the first step in helping to create reliable demand.

Chlorine free paper products may today be slightly less "bright" white than paper made with chlorine. But brightness may not have anything to do with performance. Moreover, it's the paper companies themselves who have encouraged the development of brightness standards and expectations at the ultrabright end of the spectrum. These standards, too, need to evolve with our new knowledge that "whiter" isn't necessarily "cleaner". And chlorine free technology is evolving and improving so rapidly that by 1995 the products may be utterly indistinguishable.

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PETITION

TO PROHIBIT THE DISCHARGE OF

2,3,7,8-TETRACHLORODIBENZO-P-DIOXIN

BY PULP AND PAPER MILLS

**filed by the Natural Resources Defense Council
and the Natural Resources Council of Maine
on behalf of**

**American Littoral Society
Calhoun County Resource Watch (Seadrift, Texas)
Cape Arago Audubon Society
Center for Marine Conservation
Chicago Media Watch
Citizens for Environmental Quality
Clean Ocean Action
Coalition for Health Concerns
Coast Alliance
Coastal Advocates
Columbia Gorge Audubon Society
Columbia River United
Communities Concerned About Corporations
Council on International and Public Affairs
Department of the Planet Earth
Jerry Edwards
Environmental Research Foundation
The Foundation for the Protection of the Common People
Government Purchasing Project
Great Lakes United
Greene Environmental Coalition
Greenpeace
Gulf Coast Fishermen's Environmental Defense Fund**

Heal the Bay
Indigenous Environmental Network-Great Lakes Region
Ironbound Committee Against Toxic Waste
Jersey Coast Angler's Association
League for Coastal Protection
Legal Environmental Assistance Foundation
Lincoln County Watershed Watch (Yachats, Oregon)
Maine People's Alliance
ManaSota-88
Mobile Bay Audubon Society
Don Muller
National Tribal Environmental Council
New York-New Jersey Harbor Baykeeper
NYPIRG
Northcoast Environmental Center
Penobscot Indian Nation
People for Puget Sound
River Network
San Diego Environmental Health Coalition
Patricia Sever
Sierra Club
Sierra Club-Alabama Chapter
Sierra Club-Midwest
Southern Environmental Law Center
Standish Citizens Opposed to Sludge
Surfrider Foundation
10-Mile Creek Association
Tri-State Environmental Council
United Fishermen's Association
USPIRG
Vietnam Veterans of America-New Jersey State Council
Washington Toxics Coalition

PETITION TO PROHIBIT THE DISCHARGE OF DIOXIN

INTRODUCTION

In this petition, filed by 57 environmental, Native American, and citizen organizations, and individuals,¹ representing over 225,000 members, we ask the Administrator of the Environmental Protection Agency to take the extraordinary step of issuing a prohibition on the discharge of all dioxin² from pulp and paper mills. We ask that this prohibition be accomplished by requiring that the use of chlorine and chlorine-containing compounds as inputs in the manufacturing process be prohibited. We believe that this step is warranted by the extraordinary dangers to human health and the environment posed by dioxin -- dangers which have been documented and evaluated exhaustively by the EPA for nearly a decade,³ including the soon-to-be-completed Dioxin Reassessment. Our petition relies on data assembled by the EPA for purposes of the Reassessment.⁴

Section 307(a)(2) of the Clean Water Act (CWA or the Act) provides the Administrator with the authority, in appropriate cases, to issue such a prohibition for a class or category of point sources. Ordinarily, the Clean Water Act's other authorities -- to set effluent guidelines based on Best Available Technology (BAT) on an industry-by-industry basis, or to issue water quality-based discharge permits on a facility-by-facility basis -- are adequate to address toxic pollutant dangers. But experience has shown that such is not the case with dioxin. Section 307(a)(2) was designed precisely for such situations: it can override the usual facility-by-facility approach with a national prohibition on the discharge of a particularly hazardous substance. As one former EPA official has explained,

¹ A complete list of petitioners' names, addresses and affiliations appears as Appendix B.

² 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD), the subject of this petition, is the most toxic of the many highly persistent and dangerous forms of dioxins that are of concern to human health and environmental quality. There are 75 known forms of chlorinated dioxins. Congress of the United States, Office of Technology Assessment, Technologies for Reducing Dioxin in the Manufacture of Bleached Wood Pulp, OTA-BP-O-54 (May 1989), at 31. For stylistic purposes, 2,3,7,8-TCDD is referred to as "dioxin."

³ See EPA, Ambient Water Quality Criteria for 2,3,7,8-tetrachlorodibenzo-p-dioxin, EPA/440/4-87-003, (1984), and EPA, Health Assessment Document for Polychlorinated Dibenzo-p-dioxin, EPA/600/8-84/014F (1985). While this petition is limited to one congener, namely 2,3,7,8-tetrachlorodibenzo-p-dioxin, the relief sought would also result in the elimination of other organochlorines of concern from effluent wastestreams.

⁴ Petitioners' reliance on data assembled by the EPA does not, in every instance, mean acceptance of EPA's interpretation of this data.

section 307(a) of the Act [is] for special situations where the BAT provision, because of economic or technical constraints, cannot provide adequate protection to human health and welfare.... [W]e believe there will be cases where BAT will lead to limitations that still leave an unacceptable threat to human health and welfare, and that the more stringent health based requirements under section 307(a) will be needed."⁵

Dioxin clearly meets the health-based and environment-based tests of section 307(a).⁶ EPA has identified dioxin as the most potent carcinogen it has ever evaluated.⁷ Moreover, the data that have been assembled by the EPA prove that it produces a variety of additional toxic effects, including reproductive disorders in laboratory animals at very low doses.⁸ EPA's Reassessment has further highlighted the hazards to humans, aquatic life and wildlife.⁹

Pulp and paper mills are a significant source of dioxin discharges into our nation's waters.¹⁰ The EPA/Paper Industry Cooperative Dioxin Study of 104 pulp and paper mills found the presence of dioxin widespread in treated effluent, wastewater sludges, and bleached pulps from mills that use chlorine-based bleaching processes.¹¹ EPA found dioxin present in fish and river sediments downstream from a number of pulp and paper

⁵ Administration Testimony at Senate Hearings, U.S. Senate, Committee on Environment and Public Works, Subcommittee on Environmental Pollution, 95th Cong., 2nd Sess., Vol. 4 (1977), Legislative History of the Clean Water Act of 1977 (1978), at 1104. (Statement of Thomas C. Jorling, Assistant Administrator for Water and Hazardous Materials, Environmental Protection Agency. Mr. Jorling testified about the need to retain the authority of section 307(a)).

⁶ Dioxin is a toxic pollutant listed under section 307(a)(1) of the Act. Substances so listed are eligible for effluent prohibitions under section 307(a)(2). See 45 Fed. Reg. 79318 (Nov. 28, 1980).

⁷ See discussion in Section III.A. of this Petition and in Section A of the Scientific Support Document (Appendix A).

⁸ Id.

⁹ Id.

¹⁰ See National Dioxin Study, EPA/530-SW-87-025 (Aug. 1987).

¹¹ See EPA, Integrated Risk Assessment for Dioxins and Furans for Chlorine Bleaching in Pulp and Paper Mills, EPA/560/5-90-011, at 3.

mills.¹² While dioxin discharges may have been reduced in a number of mills since these studies were conducted, remaining discharges of dioxin even below current levels of detection continue to pose a hazard due to dioxin's persistence and bioaccumulative nature.

A zero discharge standard for dioxin is the only means to assure the public's safety because, according to EPA's own analyses, this substance is hazardous at levels so minute that the most sophisticated testing equipment cannot confirm that it is being discharged only at "safe" levels. Indeed, with these limitations it is impossible to assure that dioxin discharges comply with water quality standards or permit limits. In light of that information gap, the only means for assuring that the environment is protected is through eliminating the use of chlorine or chlorine-containing compounds in the production of pulp and paper, which will in turn assure that the discharge of dioxin is halted.

To assure compliance with the zero discharge standard, EPA must establish a limitation on chemical inputs to the process: a certification that no chlorine or chlorine-containing compounds are used in the facilities that manufacture pulp and paper products.

Eliminating chlorine use would have additional benefits to environmental quality by ending the emission of chloroform into workplaces and mill communities, and the contamination of air, wastewaters, and mill sludges with a wide array of organochlorine bleaching by-products. Further, chlorine elimination offers substantial reductions in water use and in "conventional" pollutant discharges such as oxygen-demanding wastes (e.g. biological oxygen demand or BOD), and effluent color, odor, and foam.

Technology exists today to produce pulp and paper without the use of chlorine ("totally chlorine free" or TCF technology), which would eliminate dioxin from pulp and paper mill discharges.¹³ TCF technology will enable the pulp and paper manufacturing

¹² See EPA, National Dioxin Study, EPA/530-SW-87-025, at III-33.

¹³ See Richard Albert, Technical Staff Manager, Parsons Main, Inc., "Technical and Economic Feasibility of the Effluent-Free Bleached Kraft Pulp Mill," presented at the Non-Chlorine Bleaching Conference, Hilton Head, S.C. (Mar. 1993); Hans Fasten, Mill Manager, "TCF Pulp at Aspa Mill - History and Future," presented at the Non-Chlorine Bleaching Conference, Hilton Head, S.C. (Mar. 1993); Kosti Kukkonen, Director, R & D et al., "Experiences and Conclusions with TCF Bleaching at Metsa-Botnia," presented at the Non-Chlorine Bleaching Conference, Hilton Head, S.C. (Mar. 1993); Office of Technology Assessment, Technologies for Reducing Dioxin in the Manufacture of Bleached Wood Pulp, Congress of the United States (OTA-BP-054) (May 1989); Ants Teder, Technology to Meet the Environmental Restrictions for Bleach Plants (1988);
(continued...)

industry to continue to produce identical or nearly identical products that meet all reasonable performance standards without the release of dioxin or other highly toxic organochlorine compounds into the environment.

Despite the fact that TCF technologies are in use today, the Office of Water has recommended that TCF technology not form the basis for EPA's soon-to-be-proposed effluent guidelines under section 304(b)(2) of the CWA, due to perceived economic and technical constraints on Agency rulemaking authority under that section of the law.¹⁴

Whether or not those section 304(b) constraints are real, it is clear that economic and technological constraints do not limit EPA's authority to issue a zero discharge standard under section 307(a)(2). The information assembled and carefully reviewed for purposes of the Dioxin Reassessment support the need to go beyond the effluent guidelines and water quality-based permitting approaches of the Clean Water Act and issue such a prohibition. The lack of other effective authorities to carry out the Act's purposes creates a duty for the Administrator to invoke sec. 307(a).

Finally, while this petition is limited to the prohibition of dioxin in the pulp and paper industry, other industries have been identified by EPA as possible dioxin sources in need of regulation.¹⁵ Since dioxin releases from any source is dangerous to humans, wildlife and aquatic life, we also request that EPA develop a mechanism to add other industry sources to this prohibition as appropriate.

Below we set forth the legal and scientific authority for the actions requested.

¹³(...continued)

Kraft Mills in Ontario, Municipal/Industrial Strategy for Abatement (1988); Pulp and Paper Canada, Toward Preventing the Formation of Dioxins During Chemical Pulp Bleaching (1989). See infra note 14.

¹⁴ Letter from EPA's Donald Anderson, Office of Science and Technology and Penny Lassiter, Office of Air Quality Planning and Standards to Deborah Sheiman, NRDC, (Mar. 22, 1993). In this letter Anderson and Lassiter acknowledge that TCF technology is scheduled for use in Louisiana Pacific's Samoa, California kraft mill by 1995. See EPA, Meeting Announcement Effluent Guidelines and MACT Standards for the Pulp, Paper, and Paperboard Industry at 23 - 25, (Dec. 16, 1992). See also EPA, Public Meeting for the Proposed Pulp and Paper Integrated Rule: Clean Water Act Effluent Guidelines and Clean Air Act MACT Standards (May 19, 1993), at 8.

¹⁵ This petition will not address these other sources pending the resolution of the Consent Decree, EDF v. Thomas, No. 85-0973 (D.D.C., filed July 27, 1988). We reserve the right to amend the petition to include such sources at a later date.

I. LEGAL AUTHORITY FOR ACTIONS REQUESTED

This petition is filed pursuant to Section 553(e) of the Administrative Procedure Act (APA), 5 U.S.C. § 553(e).¹⁶ Section 307(a) of the Clean Water Act gives EPA the authority to promulgate an effluent prohibition for dioxin.

A. Authority to Establish an Effluent Prohibition

Section 307(a)(2) of CWA, 33 U.S.C § 1317(a)(2), authorizes the Administrator to promulgate an effluent standard or prohibition for a toxic pollutant listed under section 307(a)(1). (Dioxin is such a pollutant).¹⁷ Specifically, the standard must be based on ecological, health and safety factors:

Such published effluent standard (or prohibition) shall take into account the toxicity of the pollutant, its persistence, degradability, the usual or potential presence of the affected organisms in any waters, the importance of the affected organisms and the nature and extent of the effect of the toxic pollutant on such organisms, and the extent to which effective control is being or may be achieved under other regulatory authority.

Section 307(a)(4) further provides that any standard or prohibition established under this section be set at a level that "provides an ample margin of safety." Under this "directive, EPA's standard must protect against incompletely understood dangers to public health and the environment, in addition to well-known risks." Environmental Defense Fund v. E.P.A., 598 F.2d 62, 80-81 (D.C. Cir. 1978). See also Hercules Inc. v. Environmental Protection Agency, 598 F.2d 91, 106 (D.C. Cir. 1978). Section 307(a)(4) directs EPA "'to err' on the side of 'overprotection' with respect to known risks in order to provide safety from unknown dangers." Environmental Defense Fund, *supra*, at 80.

Unlike the effluent guidelines and pretreatment standards mandated by sections 304(b) and 307(b) of the CWA, effluent standards or prohibitions established under section 307(a)(2) are purely environmental- and health-based; they do not -- indeed, they must not -- take into consideration economic or technological factors. Hercules, Inc. v. E.P.A., 598 F.2d at 111-14.¹⁸

¹⁶ Section 553(e) of the APA requires each agency to give an interested person the right to petition for the issuance, amendment, or repeal of a rule.

¹⁷ See 40 C.F.R., Part 123, App. A (list of 126 Priority Pollutants).

¹⁸ Compare N.R.D.C v. U.S. E.P.A., 824 F.2d 1146, 1159, 1160 (D.C. Cir. 1987), footnote 6 (dicta).

B. Discretion to Fashion Timetable for Phaseout

Section 307(a)(6) provides that an effluent standard or prohibition shall take effect within one year of promulgation. In the event that such a timetable is technologically infeasible for a category of sources, the Administrator may set the effective date of the effluent prohibition at the earliest date compliance is possible, but in no event is this date to exceed three years after promulgation.

II. OTHER REGULATORY AUTHORITY IS INSUFFICIENT TO PROTECT HUMAN HEALTH AND THE ENVIRONMENT FROM THE EFFECTS OF DIOXIN

Section 307(a)(2) of the Act provides that an "effluent standard (or prohibition) shall take into account ... the extent to which effective control [of a toxic pollutant] is being or may be achieved under other regulatory authority."¹⁹ Dioxin currently is not regulated to the extent necessary to protect human health and the environment, and under EPA's current interpretation of the CWA it cannot be regulated effectively without establishing a health- and environment-based standard under section 307(a)(2). In light of this fact, the Administrator must act to ensure that water quality is protected.

A. BAT standards under Section 304(b)(2) will not result in effective control

According to EPA's analysis, the chlorine-free technologies necessary to eliminate the release of dioxin will not form the basis of proposed BAT standards for existing kraft mill point sources, because TCF technologies are not "available" within the meaning of section 304(b)(2).²⁰ Because other technologies which still result in the release of dioxin will serve as the reference technologies for the national effluent guidelines, these guidelines will not effectively control the discharge of dioxin.

¹⁹ 42 U.S.C. §1371(a)(2). This provision "merely directs the EPA to 'take into account' its 'other regulatory authority'; it create[s] no new threshold barrier in health-based regulation." *Hercules, supra*, 598 F.2d at 102.

²⁰ Letter from EPA's Donald Anderson and Penny Lassiter to Deborah Sheiman, NRDC, *supra* note 14. In this letter, written in response to comments on the status of the air/water cluster rulemaking, and in other discussions with petitioners, EPA staff have explained that they do not consider TCF technology "available" as that term of art has been interpreted by the courts in section 304 of the CWA. We reserve the right to contest this reading of the law.

B. Water quality standards and water quality-based permitting will not achieve effective control of dioxin in a timely fashion

"Delays that might be altogether reasonable in the sphere of economic regulation are less tolerable when human lives are at stake. This is particularly true when the very purpose of the governing Act is to protect those lives."²¹ The courts from time to time have required expedited rulemaking, even where an agency enjoys significant discretion under a statute, when a toxic substance poses a significant risk of grave danger.²² In determining reasonableness of delay, courts consider whether administrative delay is undermining the statutory scheme, "either by frustrating the statutory goal or by creating a situation in which the agency is 'losing its ability to effectively regulate at all.'"²³

The Clean Water Act provides for the invocation of section 307(a) in situations in which regulating pollutants under other provisions of the act will not effectively control the toxic of concern. In the exceptional circumstances where an expedited health-based standard is required to fulfill the purposes of the Act to protect human health and the environment, this section provides the only route to effective regulation.

It is in the light of these principles that the usual process of water quality-based permitting for dioxin discharges must be considered. Under this analysis, dioxin is not effectively controlled by the usual Clean Water Act standard setting and permitting scheme. This void triggers a duty for the Administrator to invoke sec. 307(a).

Water quality-based permitting requires a series of regulatory events: (a) issuance of an EPA water quality criterion or revised criterion under section 304(a) of the CWA; (b) revision of State water quality standards to be consistent with EPA's newly-issued criterion, under section 303(c) of the CWA; (c) translation of the States' new water quality standards into meaningful permit limits under sections 402 and 301(b) of the CWA, and (d) compliance with the new permit limits. This multi-stage process is ineffective in controlling dioxin since it unreasonably delays the elimination of this extremely toxic pollutant.

It is not inconceivable that, following the completion of the Dioxin Reassessment, EPA will revise its water quality criterion for dioxin. It is conceivable that EPA will then require states, in their next triennial reviews, to revise their dioxin water quality standards

²¹ Public Citizen Health Research Group v. Aucter, 702 F.2d 1150, 1157-58 (D.C. Cir. 1983) (referring to OSHA worker health and safety rules).

²² See id. (requiring expedited OSHA rulemaking, even in absence of statutory deadline, in light of agency's failure to promulgate either emergency or non-emergency rule in timely manner given danger of toxin at issue).

²³ Cutler v. Hayes, 818 F.2d 879, 898 (D.C. Cir. 1987).

to be consistent with the latest scientific information reflected in the new EPA criteria document. Some states may comply, while others take no action; further delay would ensue as EPA promulgated Federal water quality standards in laggard states.

It is also possible that State and EPA permit writers ultimately will revise permit limits based on the new State water quality standards to eliminate dioxin discharges, that dilution and mixing zone loopholes will have been closed, and that permittees eventually will come into compliance with new permit limits.²⁴ But this chain of events, if in fact it were to occur, is too slow to provide timely protection to aquatic life, wildlife and humans exposed to dioxin discharges. For this reason, the water quality standard-setting and permitting process does not provide effective control of dioxin.

C. Regulatory authority under other statutes has not been adequate to control dioxin

In evaluating whether effective control of a toxic substance may be available under other regulatory authority, the role of statutes other than the Clean Water Act, such as the Endangered Species Act (ESA) and the Toxic Substances Control Act (TSCA), merit brief mention.

Many aquatic organisms and wildlife are listed as endangered under the Endangered Species Act (ESA),²⁵ which means that they have been accorded special importance by the Federal government and their protection is a high priority.²⁶

²⁴ See 49 Fed. Reg. 5832, (Feb. 15, 1984) (EPA recommended that for maximum protection the ambient water concentration should be zero). See also State Compliance, supra note 10. Unless other significant changes have been made in applicable water quality standards and regulations governing such factors as dilutions and mixing zones, State water quality standards will vary and in a number of instances will not limit dioxin to levels necessary for protection of human health and the environment. And, as we discuss below, absent major changes, it will be impossible to gauge compliance with such standards through effluent monitoring.

²⁵ See Section 4 of the ESA, 16 U.S.C. § 1532. See also, Department of the Interior and the U.S. Fish and Wildlife Service, Endangered and Threatened Wildlife and Plants, 50 C.F.R. 17.11 and 17.12 (Aug. 29, 1992).

²⁶ See Tennessee Valley Auth. v. Hill, 437 U.S. 153, 174, 184 (1978). (The Court concluded from its examination of the language, history, and structure of the legislation for the Endangered Species Act that "Congress intended endangered species to be afforded the highest priority." Further, "[t]he plain intent of Congress in enacting this statute was to halt and reverse the trend toward species extinction, whatever the cost".)

The continuing discharge of dioxin from pulp and paper mills affects endangered and threatened birds, reptiles, fishes, clams, and crustaceans in many locations around the nation.²⁷ The denial of this petition would constitute continued endangerment of these species and would necessitate consultation with the Fish and Wildlife Service (FWS) pursuant to section 7 of the Endangered Species Act (ESA).²⁸ EPA must insure that its actions,²⁹ in relation to dioxin, do not contravene section 7 of the ESA.³⁰

While compliance with the ESA is required, the ESA is not an adequate measure to control or prohibit toxic pollutant discharges on a national scale since it fails to protect species not listed as endangered or threatened, and does not protect humans. Furthermore, the current scientific understanding of the adverse effect levels for dioxin in avian and mammalian wildlife -- and particularly endangered or threatened species -- remains incomplete.³¹ Thus, it is presently not possible to confidently protect endangered or threatened species from dioxin exposures at any level of discharge.

²⁷ See section on "Importance of Affected Organisms," *infra* at 14, and Scientific Support Document at 35.

²⁸ In particular, section 7(a)(2) of the ESA, 15 U.S.C. § 1536, provides that each Federal agency shall, in consultation with the Secretary, insure that any action authorized, funded or carried out by the agency is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat of such species. Section 7(a)(4) provides further, that the agency must confer with the Secretary on any agency action which is likely to jeopardize the continued existence of any endangered or threatened species (emphasis supplied).

²⁹ See 50 C.F.R. § 402.02 (agency "action" means all activities or programs of any kind authorized, funded or carried out, in whole or in part by Federal agencies.... Examples include, but are not limited to actions intended to conserve listed species or their habitats; the promulgation of regulations; the granting of licenses, contracts, leases, easements, rights-of-way, permits, or grants-in-aid; or actions directly or indirectly causing modifications to the land, water, or air). See also Lane County Audubon Society v. Jamison, 958 F.2d 290, 294 (9th Cir. 1992) (the court defines 'agency action' broadly).

³⁰ See EPA, Water Quality Guidance for the Great Lakes System and Correction: Proposed Rules, 58 Fed. Reg. 20802, 20848 (Apr. 16, 1993). (EPA initiated informal consultation with the FWS to insure that implementation of the Guidance by States and Tribes was not likely to cause jeopardy for species in the Great Lakes System.)

³¹ See EPA, Interim Report on Data, *supra* note 9. See also section F(c) Threatened or Endangered Species at 38, in the Scientific Support Document.

As for the Toxic Substances Control Act, section 9 of TSCA states that:

[i]f the Administrator determines that a risk to health or the environment associated with a chemical substance or mixture could be eliminated or reduced to a sufficient extent by actions taken under the authorities contained in such other Federal laws, the Administrator shall use such authorities to protect against such risk unless the Administrator determines, in the Administrator's discretion, that it is in the public interest to protect against such risk by actions taken under this chapter.³²

Action to eliminate the discharge of dioxin under Clean Water Act sec. 307(a) rather than the Toxic Substances Control Act is warranted because section 307(a) establishes a straightforward mechanism for evaluating the data on human health and ecological risks of dioxin, and a straightforward remedy in the form of a discharge prohibition.

The petitioners are aware that control or elimination of dioxin was the subject of an earlier TSCA petition.³³ TSCA was invoked in the earlier Petition because that statute provides remedies for eliminating the release of classes of compounds rather than taking action on a pollutant-by-pollutant basis.

In this petition the relief we seek, namely the elimination of chlorine inputs to the paper making process, is driven by a single dioxin congener that is a listed priority pollutant under section 307(a)(1). But that relief, if granted, will result in an end to the discharge of all other congeners which are not so listed. Thus, the Clean Water Act remedy is adequate and appropriate.

³² 15 U.S.C. § 2608(b); see also Environmental Defense Fund v. EPA, 598 F.2d 62, 76-78 (no merit in argument that TSCA was intended to constrain EPA authority under 1972 FWPCA).

³³ Petition of the Environmental Defense Fund and the National Wildlife Federation for Rulemakings to Prevent and to Reduce Environmental Contamination by Dioxins and Dibenzofurans [hereinafter Petition], Exhibit A, EDF v. Thomas, Civ. No. 85-0973 (D.D.C.) (filed March 25, 1985). The Petition was the subject of a Consent Decree, EDF v. Thomas, Civ. No. 85-973 (D.D.C.) (filed July 27, 1988) and modified on April 2, 1992. It is also the subject of a letter accompanying this petition (see Appendix C).

III. SCIENTIFIC BASIS FOR ACTIONS REQUESTED

Section 307(a)(2) of the Act requires that an effluent prohibition be based on substantial evidence. The courts have provided the Agency with considerable deference in meeting this requirement.³⁴ Moreover, the Administrator is to act with an "ample margin of safety" insuring against unknown dangers.³⁵ By any reasonable interpretation of the substantial evidence test, the Dioxin Reassessment has provided ample support for a decision to issue an effluent prohibition.

EPA has recognized for more than a decade that dioxin poses a serious risk to human and environmental health. However, since EPA's initial risk assessment of dioxin, the evidence of, and the concerns regarding, dioxin's extreme toxicity, persistence, bioaccumulation, and its widespread contamination of aquatic environments has continued to expand rapidly. In fact, the most current scientific information -- which EPA has assembled in the dioxin reassessment process -- casts considerable doubt on estimates of "safe" levels of dioxin and dioxin-like chemical exposures to wildlife and, significantly, provides no evidence of any "safe" exposure levels for humans.

The following sections briefly summarize the scientific information assembled by, or otherwise available to, EPA on the effects, environmental fate, and importance of dioxin and related chemicals.³⁶ A full discussion of this information is provided in the Scientific Support Document accompanying this petition (Appendix A). In total, these sections provide compelling evidence that the only available means of ensuring that aquatic life, wildlife, and public health are adequately protected, and that the Clean Water Act is complied with, is to prohibit all discharges of dioxin.

³⁴ "Substantial evidence calls for deferential review of the agency's conclusions." Hercules, 598 F.2d at 106. See also, E.D.F. v. U.S. E.P.A. 598 F.2d 62, 82 (1978). ([W]hen an agency must resolve issues 'on the frontiers of scientific knowledge,' the reviewing court will uphold agency conclusions in lieu of factual determinations....")

³⁵ See Section I(A), supra, at 5. See also Hercules, 598 F.2d at 110. (Although EPA did not make an affirmative finding of carcinogenicity, its concern was relevant to the setting of a standard providing an "ample margin of safety,"....')

³⁶ The scientific documentation and conclusions presented below are based upon EPA's database as presented in the reassessment to date. Petitioners do not necessarily interpret the data in the same manner as EPA, and reserve the right to challenge EPA's interpretation.

A. Toxicity

The ability of dioxin and dioxin-like chemicals to cause a variety of severe adverse effects on aquatic life, wildlife, and humans at extremely low concentrations is well-established. Among the most pernicious of dioxin's effects are cancer, reproductive and developmental abnormalities, and immunotoxicity. Although EPA has estimated "safe" levels for dioxin exposure to humans and wildlife, these estimates are highly uncertain and do not, in any way, preclude continued identification of toxic effects at still lower levels. Moreover, those "safe" levels are so low that continued release of dioxin into the environment in any quantity risks exceeding the "safe" level. Finally, recent evidence of the lack of a "threshold" for effects and the existence of general body burdens which are at, or exceed, expected human effect levels, suggests that there is no level of dioxin exposure for humans that is truly "safe". A detailed discussion of dioxin's toxicity appears in the Scientific Support Document (Appendix A) at A-1.

B. Persistence

In aquatic environments, dioxin and related chemicals are generally either associated with sediments or the tissues of living organisms. In both of these "compartments," these chemicals are extremely persistent and therefore represent a continuing source of exposure to aquatic life, associated wildlife, and humans. Additionally, fish typically accumulate dioxin to levels in over 100,000 times greater than the waters they inhabit, and these levels can further increase 20 to 30-fold through food-chain biomagnification. These processes serve to increase the threat of dioxin contamination to the organisms accumulating dioxin as well as to the organisms that ultimately consume them (whether humans or other animals). A detailed discussion of dioxin's persistence appears in the Scientific Support Document (Appendix A) at A-20.

C. Degradability

Dioxin and related compounds are extremely resistant to degradation once formed. The only known physical mechanism for the breakdown of dioxin, photolysis, occurs only marginally, if at all, in aquatic environments. While biological breakdown or biotransformation of dioxin does occur, it too has little effect on levels of dioxin contamination. The remarkable persistence of dioxin in sediments is evidence of the inability of natural processes to act on this class of compounds. A detailed discussion of dioxin's degradability appears in the Scientific Support Document (Appendix A) at A-23.

D. Usual or potential presence of the affected organisms in any waters

All organisms associated with dioxin contaminated waters are exposed to dioxin and, therefore, may be at substantial risk of adverse effects. Information assembled by EPA documents the widespread contamination of aquatic organisms by dioxin and suggests that most, if not all, aquatic life, piscivorous wildlife, and human fish consumers

associated with these waters are exposed to dioxin. This information also supports the conclusion that effects associated with dioxin exposures may be particularly severe where waters receive discharges from the 104 U.S. chlorine-bleaching pulp and paper mills. A detailed discussion of the usual or potential presence of the affected organisms in any waters appears in the Scientific Support Document (Appendix A) at A-25.

E. Nature and extent of the effect of the toxic pollutant on such organisms

Data collected by EPA on the levels of dioxin in fish and Agency estimates of the levels at which such contamination constitute a significant risk indicate that dioxin and related chemicals pose a substantial risk to the health of aquatic life, wildlife, and humans. These risks are especially significant for waters receiving discharges from chlorine-bleaching pulp and paper mills. Further, when the presence of dioxin-like compounds, the existence of high-exposure human populations and "background" body burdens, and the uncertainties related to estimates of "safe" dioxin exposures are taken into account, the risk of severe effects on human fish consumers is substantial. A detailed discussion of the nature and extent of the effects of toxic pollutants on such organisms appears in the Scientific Support Document (Appendix A) at A-31.

F. Importance of the affected organisms

Information available to EPA provides strong evidence that recreational and commercial fisheries, aquatic ecosystems, endangered species, and public health are all threatened by dioxin contamination. For example, while information is sparse for endangered species, there is compelling evidence that dioxin and related chemicals are having severe impacts on these species. The evidence is also particularly compelling for humans and suggests that the public, and especially groups or sub-populations facing high exposures, are currently experiencing adverse effects due to dioxin and dioxin-like chemicals. A detailed discussion of the importance of the affected organisms appears in the Scientific Support Document (Appendix A) at A-35.

IV. METHODOLOGY FOR ENSURING COMPLIANCE WITH A ZERO DISCHARGE PROGRAM

The EPA is not currently requiring dioxin to be monitored at levels in effluent below 10 ppq.³⁷ In fact, EPA through informal guidance documents, has stated its intentions to enforce National Pollution Discharge Elimination System (NPDES) permits containing dioxin limitations at the 10 ppq level, the perceived "quantification limit" for dioxin analysis in pulp and paper mill effluents, even when actual permit limits were

³⁷ At a June 29, 1993 EPA meeting to discuss BAT rulemaking plans under sec. 304(b) of the Clean Water Act, this issue was considered.

considerably stricter.³⁸ By using a 10 ppq detection limit, EPA can not determine compliance with current water quality standards.

While dioxin can be detected well below 10 ppq,³⁹ methods do not exist that can measure compliance with zero discharge. In the absence of a method of measuring effluent to assure compliance with a zero discharge standard, an alternative to the end of pipe measurement method is necessary. The only available alternative method is to regulate the inputs to the paper making process: i.e., to prohibit the introduction of chlorine and chlorine-containing compounds during production.⁴⁰ Indeed, regulation of inputs is also the only means for assuring compliance with current water quality standards, since EPA has not promulgated an analytical method significantly sensitive to measure compliance with such standards. We request that pulp and paper mills be required to eliminate chlorine inputs, and so certify for purposes of compliance assurance.

Authority to establish such an input prohibition and certification requirement to ensure compliance is provided under section 501(a) of the CWA, which authorizes the Administrator to "prescribe such regulations as are necessary to carry out his functions" under the Act. Moreover, such a requirement is the only mechanism available to ensure that water quality standards are achieved, as required by sec. 301(b) of the CWA.

Section 308(a)(4)(A) of the CWA provides the Administrator with the authority to determine whether any effluent prohibition has been complied with by requiring the owner or operator of any point source to establish and maintain records and reports;

³⁸ See EPA, Technical Support Document For Water Quality-based Toxics Control, Office of Water, EPA/505/2-90-001 (March 1991), at 111-112; see also, EPA, "Final Guidance on Section 304(1) Listing and Permitting of Pulp and Paper Mills" (March 15, 1989); EPA, "Strategy for Regulation of Discharges of PHDDs and PHDFs from Pulp and Paper Mills to Waters of the United States" (May 21, 1990). EPA's Technical Support Document suggests that EPA may employ a "minimum detection level" which may differ from a quantification limit; however, for dioxin the agency continues to use 10 ppq.

³⁹ See EPA Interim Report on Data and Methods for Assessment of 2,3,7,8-Tetrachlorodibenzo-p-dioxin Risks to Aquatic Life and Associated Wildlife, ORD EPA/600/R-93/055 (March 1993), at 2-5. (EPA states that while the current detection limit for dissolved dioxin in water is 0.5 ppq, minimum levels of detection may be lowered by as much as a factor of 10^4 through large volume sampling, optimum sample clean-up, and maximum instrument sensitivity).

⁴⁰ For a detailed discussion of the limits of detection issue and EPA's duty to ensure compliance with water quality-based effluent limitations, see Appendix D which is attached and incorporated herein by reference.

install, use and maintain monitoring equipment or methods; sample effluents and provide such information as the Administrator may reasonably require. Further, section 308(a)(4)(B) of the CWA allows the Administrator or his authorized representative right of entry to any premises in which an effluent source is located or in which any records required to be maintained are located to inspect, monitor, or sample.

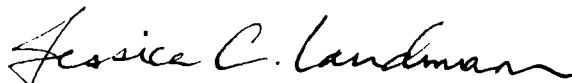
RESPONSE TIME FOR DECISION BY EPA

For purposes of judicial review,⁴¹ petitioners will consider this petition denied if the Administrator fails to respond within 90 days after the publication of the final dioxin reassessment by the Agency.⁴²

CONCLUSION

For all the reasons set forth above, the Administrator has a duty to invoke section 307(a)(2) to ensure that the requirements of the Clean Water Act are achieved. This petition to prohibit dioxin discharges should be granted.

Respectfully submitted,



Jessica C. Landman
on behalf of the Natural Resources Defense Council
and other petitioners.

⁴¹ See Environmental Defense Fund, Inc. et al. v. Hardin, 428 F.2d 1093, 1100 (D.C. Cir. 1970); Heckler v. Chaney, 470 US 821, 851, 84 L Ed 2d 714, 736, 105 S Ct 1649, 1666 (1985).

⁴² Petitioners reserve the right to amend this petition as additional information becomes available. Further, petitioners reserve the right to amend the petition pending the resolution of the Consent Decree, EDF v. Thomas, Civ. No. 85-0973 (D.D.C.) (filed July 27, 1988).

APPENDIX A

PETITION TO PROHIBIT THE DISCHARGE OF DIOXIN: SCIENTIFIC SUPPORT DOCUMENT

A. TOXICITY

By virtue of a common mechanism of action, minute amounts of dioxin and dioxin-like chemicals cause a variety of severe adverse effects on aquatic life, wildlife, and humans. These effects include cancer, reproductive and developmental abnormalities, and immunotoxicity. While estimates have been made of "safe" levels for dioxin exposure to these organisms, all such estimates are highly uncertain and do not, in any way, preclude the continued identification of toxic effects at still lower levels. Further, due to recent evidence of the lack of a "threshold" for effects and the existence of general body burdens which are at, or exceed, expected human effect levels, there is no evidence of any safe level of dioxin exposure for humans.

1. Effects

EPA and other federal regulatory agencies have recognized for many years that dioxin¹ causes a wide range of toxic effects in experimental animals.² It is now known that many other chemicals, notably other dioxins, furans and polychlorinated benzenes, exert the same toxic effects³ on animals because of the mechanism by which they act.⁴ The toxic effects of dioxin and related chemicals include, but are not necessarily limited to: lethality, liver dysfunction, reproductive toxicity, fetotoxicity, immunotoxicity, developmental toxicity, epidermal lesions and chloracne, and cancer. These effects are briefly summarized below:

¹ "Dioxin" is used here to refer to 2,3,7,8-tetrachlorodibenzo-p-dioxin, unless otherwise noted.

² See EPA, Ambient Water Quality Criteria for 2,3,7,8-tetrachlorodibenzo-p-dioxin, EPA/440/4-87-003, (1984) [hereinafter Ambient Water Quality Criteria]. See also EPA, Health Assessment Document for Polychlorinated Dibenzo-p-dioxin, EPA/600/8-84/014F (1985) [hereinafter Health Assessment].

³ Gallo, M.A., R.J. Scheuplein, K.A. van der Heijden (Eds.), Biological basis for risk assessment of dioxins and related compounds, Banbury Report 35, Cold Spring Harbor Laboratory Press, NY (1991).

⁴ See infra Section A.3., at A-15.

Lethality -- Dioxin causes death in experimental animals. High doses are required to cause death in short periods, but very low doses will result in a characteristic "wasting" over long periods. This effect is particularly notable in rainbow trout.⁵

Epidermal Lesions and Chloracne -- Skin disorders in experimental animals and humans have long been noted as an identifying characteristic of exposure to dioxin and related chemicals.⁶

Liver Dysfunction -- The normal balance of chemicals processed by and produced by the liver is altered by exposure to dioxin and dioxin-like chemicals.⁷

Fetotoxicity -- Dioxin administered during gestation can cause death and abnormal function in rat fetuses.⁸

Reproductive Toxicity -- Low doses of dioxin given to rhesus monkeys, rats, mice, fish and birds cause reproductive failures that include spontaneous abortions, low birth weight, egg inviability (fish), eggshell thinning (in birds).⁹

Developmental Toxicity -- A single dose of dioxin administered to the mother during gestation causes a range of developmental abnormalities in the offspring, including morphological and physiological impairment of the reproductive systems and impairment of neurological differentiation of the developing brain.¹⁰

⁵ Mehrle, P.M., D.R. Buckler, E.E. Little, L.M. Smith, J.D. Petty, P.H. Peterman, D.L. Stalling, G.M. Degraeve, J.J. Coyle, and W.J. Adams, Toxicity and Bioconcentration of 2,3,7,8-tetrachlorodibenzo-p-dioxin and 2,3,7,8-tetrachlorodibenzofuran in rainbow trout, *Environ. Toxicol. Chem.*, 7:47-62, (1988).

⁶ Ambient Water Quality Criteria, *supra* note 2.

⁷ Id.

⁸ Mably, T.A., D.L. Bjerke, A. Gordon-Fitzpatrick, R.W. Moore, and R.E. Peterson, In utero and lactational exposure of male rats to 2,3,7,8-tetrachlorodibenzo-p-dioxin, *Toxicol. Appl. Pharmacol.*, 114:188-226 (1992); Birnbaum, L.S., Developmental toxicity of TCDD and related component species sensitivities and differences, in Gallo et al., *supra* note 3, at 51-67.

⁹ EPA Ambient Water Quality Criteria, *supra* note 2.

¹⁰ Mably et al., *supra* note 8.

Immunotoxicity -- Immune systems of experimental animals do not respond effectively to disease challenges following exposure to dioxin.¹¹

Cancer -- Dioxin is recognized as a complete carcinogen, causing cancer in 17 experiments conducted thus far, using a wide range of experimental animals. Researchers have not found an animal that does not develop cancer following dioxin exposure (Table 1). Research on workers exposed to dioxin also reveals that dioxin is a human carcinogen.¹²

The carcinogenic nature of dioxin has been under investigation for some time, recently to determine if there is any direct evidence of dioxin causing cancer in humans. Fingerhut et al¹³ and Manz et al¹⁴ examined the cancer rate in workers exposed to dioxin and showed a significant increase in cancer rate among such exposed workers. The significance of these investigations is the clear identification via epidemiological investigation of dioxin as a cancer causing agent in humans, as stated before the House Subcommittee on Human Resources and Intergovernmental Relations.¹⁵

¹¹ Holsapple, M.P., D.L. Morris, S.C. Wood and N.K. Snyder, 2,3,7,8-tetrachlorodibenzo-p-dioxin induced changes in immuno competence, Ann. Rev. Pharmacol. Toxicol., 31:73-97, (1991).

¹² Fingerhut, M.A., W.E. Halperin, D.A. Marlow, L.A. Piacitelli, P.A. Honchar, M.H. Sweeney, A.L. Greife, P.A. Dill, K. Steenland, and A.J. Suruda, Cancer mortality in workers exposed to 2,3,7,8-tetrachlorodibenzo-p-dioxin, New Eng. J. Med., 324:212-218, (1991); Manz, A., J. Berger, J.H. Dwyer, D. Flesch-Janz, S. Nagel, and H. Wolfsgott, Cancer mortality in workers in chemical plant contaminated with dioxin, Lancet, 338:959-964, (1991); Statements of Drs. B. Johnson, M. Fingerhut and G. Lucier, Health Effects of Dioxin, Hearing Before the Human Resources and Intergovernmental Relations subcommittee of the Committee on Government Operations, U.S. House of Representatives, (June 10, 1992) [hereinafter Statements].

¹³ Fingerhut et al., supra note 12.

¹⁴ Manz et al., supra note 12.

¹⁵ Statements, supra note 12.

Table 1**Sites for Increased Cancer in Animal Bioassays**

Species/Strain	Sex	Site
Rats/Sprague-Dawley	male	tongue nasal turbinates/hard palate
	female	lung nasal turbinates/hard palate liver
Mice/Osborne-Mendel	male	thyroid adrenal cortex
	female	liver adrenal cortex subcutaneous fibrosarcoma
Mice/B6C3F1	male	liver
	female	subcutaneous fibrosarcoma liver thyroid
Mice/B6CeF1	male	thymic lymphomas
	female	liver
Syrian Golden	male	facial skin carcinoma

References: Kociba, R.J., D.G. Keyes, J.E. Beyer, et al., Results of a two-year chronic toxicity and oncogenicity study of 2,3,7,8-TCDD in rats, *Toxico. Appl. Pharmacol.*, 46:279-303 (1978); Della Porta, G., T.A. Dragani and G. Sozzi, Carcinogenic effects of infantile and long-term 2,3,7,8-TCDD treatment in the mouse, *Tumor*, 73:99-107 (1987); NTP (National Toxicology Program), Bioassay of 2,3,7,8-TCDD for possible carcinogenicity, U.S. DHHS. PHS. Research Triangle Park, NC., Tech. Report Ser. No. 201 (1982).

EPA has recognized that all of these toxic effects must be considered in setting a water quality criterion for dioxin.¹⁶ This water quality criteria guidance notes that although cancer is the toxic endpoint for which the criterion is to protect, other toxic effects, notably reproductive toxicity and immunotoxicity are observed at levels of dioxin not much different from those that cause cancer. Cancer is used in the guidance document as the most sensitive end-point because at the time the document was written, and under the assumptions used, (6.5 gm/day seafood consumption; 70 kg body mass; 2L/day water consumption; 10-6 risk; cancer potency= 1.56×10^5 ; lifetime exposure) protection against cancer required the lowest water concentration.

Conclusions about the toxicity of dioxin to humans are based on research on experimental animals; when the water quality criteria were prepared, most of the data were for cancer effects.¹⁷ Results of research on experimental animals (rats, mice, guinea pigs, and monkeys) have been used to infer some of the effects on humans. Inference is based on two important criteria: 1) knowledge of the underlying biological mechanism; and 2) ability to make the adjustment from experimental animals to humans. For non-cancer effects, the biological processes involved are the same in all animals examined. In the case of dioxin, the mechanism of carcinogenesis is the same in all animals, as explained below,¹⁸ and EPA has a well established procedure for adjusting between (or among) different species; EPA uses a body size scaling factor, as do other U.S. agencies that make similar interspecific adjustments.

The 1984 water quality criterion for dioxin addressed all the human health effects that were known at the time. Still, the criterion was lowest (most protective) for protection against cancer in humans for two simple reasons: the action of cancer causing agents was assumed to be linearly related to dose, and there was no dose known to have no effect, i.e. there was no known threshold. Both of these assumptions remain true.¹⁹ Although not complete, the present dioxin risk assessment acknowledges that there is no threshold for dioxin.²⁰

¹⁶ Ambient Water Quality Criteria, supra note 2.

¹⁷ Id.

¹⁸ See infra Section A.3., at A-15.

¹⁹ Bretthauer, E.W., Update on Dioxin Reassessment Activities, memorandum to EPA Administrator, William Reilly, (October 9, 1992) [hereinafter Memorandum]; Portier, C., A. Tritscher, M. Kohn, C. Sewall, G. Clark, L. Edler, D. Hoel, and G. Lucier, Ligand/receptor binding for 2,3,7,8-LCDD: Implications for risk assessment, Fundam. Appl. Toxicol., 20:48-56, (1993); Birnbaum, L.S. The Mechanism of dioxin toxicity: relationship to risk assessment, Enviro. Health Perspect. (in press).

²⁰ Memorandum, supra note 19.

2. Effect Levels

The toxicity of dioxin at minute levels has been recognized by EPA for more than a decade.²¹ As presented in this section, while data are limited -- especially with respect to avian and mammalian species -- the extreme toxicity of dioxin has been documented, or can be reliably inferred, for aquatic life and wildlife species representing a wide phylogenetic cross-section and geographic distribution.²² Equally, dioxin's extraordinary toxicity to humans has been documented or can be reliably inferred from animal studies.

a. Aquatic Life

Thus far, fish seem to be the aquatic organisms that are most sensitive to dioxin,²³ with the most sensitive effects occurring in fry after exposure of eggs before or shortly after fertilization. Data on commercially and recreationally important fish species such as salmon, rainbow trout, and lake trout, as well as important foodchain species, indicate that waterborne exposures are generally highly toxic to freshwater fish at ng/L (ppt) to low pg/L (ppq) levels.²⁴

For example, dioxin concentrations as low as 0.046 ng/L (ppt) and 0.0011 ng/L (ppt) have been calculated as LC50 (mortality) and no observed adverse effect levels (NOAEL; mortality, growth, and behavior), respectively, for juvenile rainbow trout following a 56-day exposure.²⁵

²¹ Ambient Water Quality Criteria, *supra* note 2; *see also* Health Assessment, *supra* note 2.

²² EPA, Interim Report on Data and Methods for Assessment of 2,3,7,8-Tetrachlorodibenzo-p-dioxin Risks to Aquatic Life and Associated Wildlife, EPA/600/R-93/055, (March, 1993) [hereinafter Interim Report].

²³ Id. at 4-42.

²⁴ Id. at 4-5 to 4-23.

²⁵ Mehrle, P.M., D.R. Buckler, E.E. Little, L.M. Smith, J.D. Petty, P.H. Peterman, D.L. Stalling, G.M. Degraeve, J.J. Coyle, and W.J. Adams, Toxicity and bioconcentration of 2,3,7,8-tetrachlorodibenzo-p-dioxin and 2,3,7,8-tetrachlorodibenzofuran in rainbow trout, *Environ. Toxicol. Chem.*, 7:47-62, (1988).

Dioxin exposures to lake trout eggs (waterborne, injection, and maternal transfer) cause 50% mortality of fry at egg concentrations of 47 to 65 pg/g egg.²⁶ A NOAEL for fry mortality of 34 pg/g lake trout egg was reported in these studies. In terms of toxic levels of dioxin in fish tissues, "significant" effects have been reported in freshwater fish at tissue concentrations of 500 pg dioxin/g tissue.²⁷

Dioxin toxicity data are apparently available for only three marine aquatic life species.²⁸ The effects of dioxin on fish fry after exposure of eggs before or shortly after fertilization (the most sensitive exposure period for freshwater fish) have been addressed in only one species (55% killifish embryo mortality, at 200 ng/L waterborne dioxin).²⁹ No study has addressed the effects of long-term dioxin exposures to marine fish species.³⁰

EPA has equated whole fish levels of dioxin greater than 50 pg/g with levels which cause significant adverse effects in sensitive aquatic organisms.³¹ Such levels of dioxin in fish are estimated to occur at water concentrations greater than 0.6 pg/L (at 0.2 mg/L particulate organic carbon).

²⁶ Walker, M.K., J.M. Spitsbergen, J.R. Olson, and R.E. Peterson, 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) toxicity during early life stage development of lake trout (salvelinus namaycush), Can. J. Fish. Aquat. Sci., 48:875-883 (1991); Walker, M.K., L.C. Hufnagle, Jr., M.K. Clayton, and R.E. Peterson, An egg injection method for assessing early life stage mortality of polychlorinated dibenzo-p-dioxins, dibenzofurans, and biphenyls in rainbow trout (Oncorhynchus mykiss), Aquat. Toxicol., 22:15-38 (1992); Walker, M.K., P.M. Cook, A.R. Batterman, D.B. Lothenback, C. Berini, L. Hufnagle, and R.E. Peterson, Early life stage mortality associated with maternal transfer of 2,3,7,8-tetrachlorodibenzo-p-dioxin to lake trout oocytes, EPA Environmental Research Laboratory, Duluth, MN, (in preparation) (1993).

²⁷ Interim Report, supra note 22, at 4-41.

²⁸ Id. at 4-31.

²⁹ Cooper, K.R., Effects of polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans on aquatic organisms, CRC Critical Rev. Aquat. Sci, 1:227-242, (1989); Prince, R. and K.R. Cooper, Differential embryo sensitivity to 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) in *Fundulus heteroclitus*, (Abstract), Toxicologist, 9:42 (1989).

³⁰ Interim Report, supra note 22, at 4-31.

³¹ Id. at 5-11.

Despite EPA's conclusion that dioxin levels yielding fish concentrations of 50 pg/g are a "low risk" to aquatic organisms,³² a number of factors cast doubt on this judgment. These include: greater sensitivity of untested fish species, the existence of more sensitive, yet untested endpoints, and greater sensitivity of aquatic ecosystem components other than fish.³³ Thus, there is considerable uncertainty at this time as to what level of dioxin exposure is truly "safe" to aquatic life.

b. Avian Wildlife

Few direct experimental data exist on the acute effects of dioxin on wild birds or on its long-term effects on avian reproduction.³⁴ However, existing data do demonstrate the extreme toxicity of dioxin to avian wildlife. LD50s from a single oral dose of dioxin for the birds bobwhite quail, mallard duck and turtledoves have been reported to as low as 15,000 pg/g.³⁵

A single intraperitoneal (i.p.) dose of dioxin has been associated with an LD50 of between 10,000 and 20,000 pg/g in pheasants.³⁶ Weekly dosing (i.p.) of ring-necked pheasant hens at 140 pg dioxin/g/day for 10 weeks caused a significant decrease in egg production and 100% embryo mortality.³⁷ A NOAEL (mortality) for dioxin was calculated as 100 pg/g/d for 21-day oral administration of TCDD to 3-day-old chickens.³⁸

³² Id. at 5-11.

³³ Id. at 4-42.

³⁴ Id. at 4-43 to 4-48.

³⁵ Hudson, R., R. Tucker, and M. Haegele, Handbook of toxicity of pesticides to wildlife, Second edition, U.S. Fish and Wildlife Service, Resources Publication No. 153 (1984).

³⁶ Interim Report, supra note 22, at 4-54.

³⁷ Nosek, J.A., S.R. Craven, J.R. Sullivan, J.R. Olson, and R.E. Peterson, Metabolism and disposition of 2,3,7,8-tetrachlorodibenzo-p-dioxin in ring-necked pheasant hens, chicks, and eggs, J. Toxicol. Environ. Health, 35:153-164 (1992).

³⁸ Schwetz, J.M., J.M. Norris, G.L. Sparschu, V.K. Rowe, P.J. Gehring, J.L. Emerson, and C.G. Gerbig, Toxicology of chlorinated dibenzo-p-dioxins, Environ. H. Per., 5:87-99, (1973).

EPA has equated TCDD doses exceeding 1.4 pg/g/day, based on pheasant data, to exposures that cause significant effects to sensitive avian wildlife.³⁹ The avian species with the highest exposure, and those EPA considers to be most sensitive, are piscivorous birds.⁴⁰ Thus, the significant effects dose was back-calculated to a fish tissue concentration, assuming contaminated fish as the exposure vehicle. This significant effects dose corresponds to TCDD concentrations in fish of 3 to 14 pg/g (an estimated water concentration of 0.07 pg/L at 0.2 mg/L particulate organic carbon), depending on the fish consumption rate of avian wildlife.⁴¹

Additional data exist in the form of population or epidemiological analysis of birds exposed to dioxin-related chemicals. There are limited data on peregrine falcons in California,⁴² but substantial information on birds in the Great Lakes. All of the effects of these chemicals are known to occur through the same receptor mechanism, described below. A linear dose dependent egg mortality was reported in double crested cormorants with increasing levels of PCB's in tissue.⁴³ Although the data are not strictly for dioxin alone, the known mechanism of action, and ability to convert the measured tissue contaminant levels to dioxin equivalents, provide a greater measure of confidence in the outcome of the analysis. The conclusion is that even low levels of dioxin-like compounds, as little as 10 pg/g TEQ, have a measurable effect on egg viability in sensitive bird species.

³⁹ Interim Report, *supra* note 22, at 4-55.

⁴⁰ Id. at 4-56.

⁴¹ Id. at 5-11.

⁴² Jarman, W.M., S.A. Burns, R.R. Chang, R.D. Stephans, R.J. Norstrom, M. Simon and J. Linthicum, Determination of PCDDs, PCDFs, and PCBs in California peregrine falcons (*Falco peregrinus*) and their eggs, Environ. Toxicol. Chem. (1993, in Press).

⁴³ Tillet, D.E., G.T. Ankley, J.P. Geisy, J.P. Ludwig, H. Kurita, D.V. Weseloh, C.A. Bishop, J. Larson, and T.J. Kubiak, PCB residues and egg mortality in double crested cormorants from the Great Lakes, Environ. Toxicol. Chem., 11:1281-1288 (1992).

A number of factors cast doubt on the conclusion that fish concentrations of 3 to 14 pg/g represent actual "low risk" levels for avian wildlife. Notably, although the avian database for dioxin is extremely small and the Agency notes appreciable data to suggest that pheasant are not the most sensitive bird species, no extrapolation factor was used for relative species sensitivity in arriving at EPA's avian effect level estimate.⁴⁴ Also, dioxin's dose-response curves, toxicokinetics, and toxicodynamics in avian species is poorly resolved.⁴⁵ Therefore, there is considerable uncertainty related to what level of dioxin exposure, if any, may actually be "safe" to avian wildlife at this time.

c. Mammalian Wildlife

There are very few data on dioxin toxicity in mammalian wildlife,⁴⁶ although these data demonstrate dioxin's extreme toxicity to these species. Studies on mink calculated a 28-day LD50 of 2,500 pg/g body weight for a single oral dose of TCDD.⁴⁷ Significant depressions in food consumption and body weights were also noted at this dose. Delayed, but significant (62%) mortality and reductions in body weights have been reported in newborn mink administered 100 pg dioxin/g for 12 days through i.p. injection.⁴⁸

No studies on the reproductive and developmental toxicity of dioxin to mammalian wildlife apparently exist. However, studies on rats and monkeys have calculated

⁴⁴ Interim Report, supra note 22, at 4-55.

⁴⁵ Id. at 4-55.

⁴⁶ Id. at 4-43 to 4-44.

⁴⁷ Hochstein, J.R., R.J. Aulerich, and S.J. Bursian, Acute toxicity of 2,3,7,8-tetrachlorodibenzo-p-dioxin to mink, Arch. Environ. Contam. Toxicol., 17:33-37 (1988).

⁴⁸ Aulerich, R.J., S.J. Bursian, and A.C. Napolitano, Biological effects of epidermal growth factor and 2,3,7,8-tetrachlorodibenzo-p-dioxin on developmental parameters of neonatal mink, Arch. Environ. Contam. Toxicol., 17:27-31 (1988).

NOAELs of 1 pg/g/d⁴⁹ and 0.13 pg/g/d,⁵⁰ respectively, for reproductive success and have been inferred by EPA to reflect mammalian wildlife toxicity.⁵¹

EPA used the laboratory experiments on rats to determine that dioxin doses exceeding 0.1 pg/g/d will cause significant effects to sensitive mammalian wildlife.⁵² As in the case of birds, EPA assumes that the major exposure route is via dietary uptake of contaminated fish.⁵³ This significant effects dose corresponds to dioxin concentrations in fish of 0.5 to 1.0 pg/g (a water concentration of 0.008 pg/L at 0.2 mg/L particulate organic carbon), depending on the fish consumption rate of mammalian wildlife.⁵⁴

As with aquatic life and avian wildlife, several factors cast doubt on the conclusion that fish concentrations of 0.5 to 1.0 pg dioxin/g represent actual "low risk" levels for mammalian wildlife. For instance, although an extrapolation factor was used for relative species sensitivity in arriving at EPA's mammalian effect level estimate, the reproduction study conducted on monkeys was not used as the basis for this extrapolation.⁵⁵ Also,

⁴⁹ Note that G.L. Kimmel, Appendix C. Reproductive and Developmental Toxicity of 2,3,7,8-TCDD, Reproductive Effects Assessment Group, EPA OHEA/ORD (1988), in EPA, A cancer risk-specific dose estimate for 2,3,7,8-TCDD. Appendices A-F. Review Draft, EPA/600/6-88/007Ab (1988), considered the data of Murray et al. (Murray, F.J., F.A. Smith, K.O. Nitschke, C.G. Huniston, R.J. Kociba, and B.A. Schwetz, Three-generation reproductive study of rats given 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) in the diet, Toxicol. Appl. Pharmacol., 50:241-252 (1979)) to suggest decreased offspring and survival and increased offspring renal pathology even at 1 pg/g/day.

⁵⁰ Murray et al., supra note 49. See also Bowman, R.E., S.L. Schantz, M.L. Gross, and S.A. Ferguson, Behavioral effects in monkeys exposed to 2,3,7,8-TCDD transmitted maternally during gestation and for four months of nursing, Chemosphere, 18:235-242, (1989) [hereinafter Behavioral effects in monkeys exposed to dioxin]; Bowman, R.E., S.L. Schantz, N.C.A. Weerasinghe, M.L. Gross, and D.A. Barsotti, Chronic dietary intake of 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) at 5 or 25 parts per trillion in the monkey: TCDD kinetics and dose-effect estimate of reproductive toxicity, Chemosphere, 18:243-252 (1989) [hereinafter Chronic dietary intake of dioxin].

⁵¹ Interim Report, supra note 22, at 4-52 to 4-54.

⁵² Id. at 4-54.

⁵³ Id. at 4-56.

⁵⁴ Id. at 5-11.

⁵⁵ Id. at 4-53.

there is debate as to whether effects actually occurred at the 1 pg/g/day "no effect" level reported in the rat study.⁵⁶

Further, the database for dioxin's effects on mammalian wildlife is extraordinarily small, and dose-response curves, toxicokinetics, and toxicodynamics of dioxin in mammalian wildlife species is poorly resolved.⁵⁷ These limitations in the database are especially important considering that effects on the immune system, the developing immune system, and the developing fetal nervous system are presently considered among the most, if not the most sensitive end points for dioxin and related compounds that act via the Ah receptor.⁵⁸ At this time, therefore, an estimate of a true "safe" level for dioxin exposure to mammalian wildlife is very uncertain.

d. Humans

As mentioned previously, exposures to dioxin and dioxin-like chemicals are known to cause, or inferred to cause through animal bioassay,⁵⁹ a number of adverse toxic effects in humans, including cancer, reproductive and developmental toxicity, teratogenicity, immunotoxicity, epidermal lesions and chloracne.

In terms of dioxin's teratogenicity (i.e., its ability to cause developmental abnormalities in fetuses), more than 11 studies on rats, mice, rabbits, and monkeys have shown dioxin to be the most potent teratogen known.⁶⁰ Doses as low as 1 ug/kg/day have been shown to cause adverse effects such as cleft palate and kidney anomalies, hydrocephali, and edema in mice. Kidney malformations, subcutaneous edema and hemorrhage have been produced in rats at levels as low as 0.1 ug/kg/day.⁶¹

Reproductive performance in laboratory animals is extremely sensitive to the toxic properties of dioxin.⁶² As noted above, studies of the reproductive effects of dioxin

⁵⁶ Id. at 4-53.

⁵⁷ Id. at 4-55.

⁵⁸ Birnbaum, supra note 8.

⁵⁹ The scientific basis and justification for using animal data for defining the human toxicity of dioxin and other chemicals is well-established.

⁶⁰ Health Assessment, supra note 2.

⁶¹ Id.

⁶² Birnbaum, supra note 19.

have calculated NOAELs of 1 pg/g/day⁶³ (or lower⁶⁴) for rats and of 0.13 pg/g/day for monkeys.⁶⁵ A single dose as low as 64 pg/g to pregnant rats has been reported to permanently compromise sperm production and alter reproductive behavior in male offspring.⁶⁶ Epidemiologically, data on reduced testosterone levels in workers exposed to TCDD occupationally -- which mirror responses and effect levels observed in rodents⁶⁷ -- suggest the initiation of adverse reproductive effects in male humans at levels as low as 39 pg/g.⁶⁸ These findings are consistent with those of the Ranch Hands study of Air Force Vietnam veterans showing reduced testosterone.⁶⁹

Dioxin is highly toxic to the immune system of mice,⁷⁰ where the most sensitive response is the suppression of primary antibody response (the combined response of

⁶³ Murray et al., supra note 49.

⁶⁴ Kimmel, supra note 49.

⁶⁵ See Behavioral effects in monkeys exposed to dioxin, supra note 50. See also Chronic dietary intake of dioxin, supra note 50.

⁶⁶ See Mably, T.A., R.W. Moore, and R.E. Peterson, In utero and lactational exposure of male rats to 2,3,7,8-tetrachlorodibenzo-p-dioxin: 1. Effects on androgenic status, Toxicol. Appl. Pharmacol., 114:92-107 (1992); Mably, T.A., R.W. Moore, P.W. Goy, and R.E. Peterson, In utero and lactational exposure of male rats to 2,3,7,8-tetrachlorodibenzo-p-dioxin: 2. Effects on sexual behavior and the regulation of luteinizing hormone secretion in adulthood, Toxicol. Appl. Pharmacol., 114:108-117 (1992). See also Mably et al., supra note 8.

⁶⁷ Moore, P.W., C.L. Potter, H.M. Theobald, J.A. Robinson, and R.E. Peterson, Androgenic deficiency in male rats treated with 2,3,7,8-tetrachlorodibenzo-p-dioxin, Toxicol. Appl. Pharmacol., 79:99-111 (1985).

⁶⁸ Egeland, G., M. Sweeney, M. Fingerhut, W. Halperin, K. Willis, and T. Schnorr, Serum dioxin (2,3,7,8-TCDD) and total serum testosterone, and gonadotropin in occupationally exposed men, Am. J. Epidemiology, (Proceedings) (in press).

⁶⁹ Roegner, R.H., W.D. Grubbs, M.B. Lustik, A.S. Brockman, S.C. Henderson, D.E. Williams, W.H. Wolfe, J.E. Michalek and J.C. Miner, Air Force Health Study: An Epidemiological Investigation of Health Effects in Air Force Personnel Following Exposure to Herbicides. Serum Dioxin Analysis of 1987 Examination Results, NTIS #AD A-237-516 through AD A-237-524.

⁷⁰ Holsapple, supra note 11.

B-cells, T-cells, and macrophages).⁷¹ However, studies have shown that lymphocytes of mice, monkeys, and humans are sensitive to dioxin immunotoxicity.⁷² Although no studies have addressed dioxin's immunotoxic effects directly in people,⁷³ children of Inuit women with high levels of dioxin-like chemicals in their breast milk appear to have a high rate of infections and a low take rate for primary vaccinations.⁷⁴

EPA has stated that TCDD is the most carcinogenic chemical it has ever evaluated.⁷⁵ Seventeen studies in laboratory animals have demonstrated that dioxin was a positive animal carcinogen in the rat, mouse, and hamster, and that it causes tumors at multiple sites and in both sexes.⁷⁶ Table 1 provides a description of some of the species and strains, sexes, and sites of increased cancers reported in animal bioassays. Recent epidemiological studies involving occupational exposures⁷⁷ have demonstrated dioxin to be a carcinogen in humans as well as in laboratory animals.⁷⁸ Using a linear model, EPA has used a cancer potency factors of $1.56 * 10+5$ (mg/kg/day)-1 and $7.5 * 10+4$

⁷¹ Birnbaum, supra note 19.

⁷² Id.

⁷³ Id.

⁷⁴ Id.

⁷⁵ 45 Fed. Reg. 79318 (Nov. 28, 1990).

⁷⁶ See Huff, J.E., A.G. Salmon, N.K. Hooper, and L. Zeise, Long-term carcinogenesis studies on 2,3,7,8-tetrachlorodibenzo-p-dioxin and hexachlorodibenzo-p-dioxins, Cell Bio. Toxicol., 7:67-94 (1991); see also Birnbaum, supra note 19.

⁷⁷ See Zober, A., P. Messerer, and P. Huber, Thirty-four-year mortality follow-up of BASF employees exposed to 2,3,7,8-TCDD after the 1953 accident, Int. Arch. Occup. Environ. Health, 62:139-157 (1990); Fingerhut et al., supra note 12; Manz et al., supra note 12.

⁷⁸ Ahlborg, U.G., A. Brower, M.A. Fingerhut, J.L. Jacobson, S.W. Jacobson, S.W. Kennedy, A.A.F. Kettrup, J.H. Koeman, H. Poiger, C. Rappe, S.H. Safe, R.F. Seegal, J. Tuomisto and M. van den Berg, Impact of dibenzo-p-dioxins, dibenzofurans, and biphenyls on human and environmental health, with special emphasis on application of the toxic equivalency factor concept, Euro. J. Pharmacol.- Enviro. Tox. Pham. 228: 179-199 (1992).

(mg/kg/day)-1 as the basis of federal⁷⁹ and proposed Great Lakes⁸⁰ water quality criteria for TCDD, respectively.

The available toxicological information on dioxin provides strong evidence that exposures to dioxin cause adverse effects in humans. While there was some hypothesizing of the existence of an Ah-receptor-based "threshold" level below which dioxin and dioxin-like chemical exposures would cause no adverse effects,⁸¹ recent evidence provides no evidence of such a threshold for Ah-mediated responses.⁸² As summarized by Birnbaum,⁸³ these studies demonstrate that "there cannot be a dose which, by definition, will have no response" (emphasis added). Therefore, there is growing evidence that no level of dioxin exposure may be "safe" for humans.

3. Mechanism of Action

The toxicity of dioxin and related chemicals is inseparable from the mechanism by which they act in all animals, including humans. This mechanism is important because it explains why dioxin has numerous toxic end points, including cancer, affects aquatic life and wildlife, and is active at such low doses. Furthermore, the mechanism explains why the related chemicals (other dioxins, the furans and PCB's) also act like dioxin, albeit less effectively in some cases. The receptor-based mechanism of action is, in fact, the basis once used to suggest that dioxin has a threshold for action, a suggestion that has since been refuted as untenable and without supporting evidence.⁸⁴

⁷⁹ Ambient Water Quality Criteria *supra* note 6.

⁸⁰ EPA, Great Lake Water Quality Initiative technical support document for human health criteria and values, NTIS PB93-154698 (1993).

⁸¹ Gallo et al. *supra* note 3.

⁸² Tritscher A.M., J.A. Goldstein, C.J. Portier, Z. McCoy, G.C. Clark, and G.W. Lucier, Dose-response relationships for chronic exposure to 2,3,7,8-tetrachlorodibenzo-p-dioxin in a rat tumor promotion model: Quantification and immunolocalization of CYP1A1 and CYP1A2 in the liver, Cancer Res., 52:3436-3442 (1992); Portier, C., A. Tritscher, M. Kohn, C. Sewall, G. Clark, L. Edler, D. Hoel, and G. Lucier, Ligand/receptor binding for 2,3,7,8-TCDD: Implications for risk assessment, Fundam. Appl. Toxicol., 20:48-56 (1993); Devito M.J., J.J. Diliberto, and L.S. Birnbaum, Comparative ability of TCDD to induce hepatic and skin cytochrome P-450 1A1 activity following 13 weeks of treatment, Chemosphere (submitted).

⁸³ Birnbaum, *supra* note 19.

⁸⁴ See Portier et al., *supra* note 82. See also Stone, R., Dioxin: Still Deadly, Science 260:31 (1993).

Basically, dioxin acts on an existing system to alter the normal processes that take place in cells on a regular basis. The different toxic effects of dioxin are manifested by cells that have active cellular processes specific to that tissue type. The pre-set biological process is stimulated once dioxin (or related chemicals) acts on a cell.⁸⁵

Dioxin acts on cells via a protein receptor, known as the Ah receptor, located in the cell. Dioxin enters a cell by dissolving in the cell membrane (dioxin and related chemicals are highly soluble in lipids and therefore readily pass through membranes), then binds to the receptor. Once the receptor and dioxin bind, a third chemical, a protein, binds, forming a trimeric complex that is translocated into the cell nucleus. In the nucleus, the entire complex interacts with specific DNA elements to change the transcription of DNA. The result of this alteration in DNA transcription can be envisioned as a change in a product or process that is controlled, regulated or affected by DNA. It is not surprising then that dioxin causes such a wide range of effects,⁸⁶ including cancer in numerous tissues,⁸⁷ rather than a single tissue.

The Ah receptor has been identified in every experimental mammal thus far examined and in every species of vertebrate tested.⁸⁸ Only the invertebrates seem to have no exact duplicate of the receptor within their cells,⁸⁹ but the search for this receptor in invertebrates has been cursory and no one has looked for either homologues or analogues within the invertebrates. The Ah receptor complex, once activated, is capable of altering a wide range of biological processes.

Dioxin is so toxic because it is active at lower doses than other chemicals that have thus far been examined.⁹⁰ The explanation for this low dose activity is based on the mechanism of action. The Ah receptor that binds dioxin has a high affinity for dioxin molecules, meaning that very low levels of dioxin are needed to result in successful attachment to the receptor. Furthermore, there are numerous receptors per cell. Only a single dioxin molecule is required to successfully bind to the receptor and complete the

⁸⁵ Ahlborg et al., supra note 78

⁸⁶ See supra Sections A.1. at A-1, and A.2.d. at A-12.

⁸⁷ See supra Table 1, at A-4.

⁸⁸ Ahlborg et al., supra note 78.

⁸⁹ Interim Report, supra note 22.

⁹⁰ NTP (National Toxicology Program), Bioassay of 2,3,7,8-tetrachlorodibenzo-p-dioxin for possible carcinogenicity, U.S. DHHS, PHS, Research Triangle Park, NC., Tech Report Ser. No. 201. (1982); ATSDR (Agency for Toxic Substances and Diseases Registry), Toxicology Profile for 2,3,7,8-TCDD, ATSDR/TP-88/23 (1989).

above described process in order to exert an effect. Once the dioxin-receptor- protein complex forms and interacts with DNA, it activates another mechanism, DNA transcription, thus magnifying its effect.

The effectiveness of any of the dioxin-like chemicals to cause toxic effects in any species is determined by intrinsic and extrinsic factors that affect the interaction between the Ah receptor and the chemical.⁹¹ None of these factors can be controlled by regulatory action. The intrinsic factors include the affinity of the receptor for the chemical (dioxin and related compounds); the concentration of dioxin, the receptor and the other binding protein; and the properties of the DNA that determine susceptibility. Extrinsic factors include temperature and the concentration of other chemicals. These extrinsic factors can explain the variation in sensitivity observed among species and among individuals within the same species. The important point here is that these variables cannot be regulated and cannot be reliably predicted in any species. In fact, the complexity of the mechanism means it is virtually impossible to predict a priori the sensitivity of any one individual to dioxin.

The significance of the receptor-based mechanism of action is threefold. First, any chemical or agent that can interact with the receptor (bind to the receptor) is capable of causing the same suite of toxic effects as does dioxin. Therefore, all the chemicals acting via this receptor must be controlled as a class, not one by one. Second, so long as dioxin is present, it is capable of exerting these effects. Existing body burdens can continue to cause harm. Finally, the wide distribution and general occurrence of the receptor among tissue types and species belies an ability to influence biological processes that is far greater than any other chemical or group of chemicals thus far identified. EPA can only protect against these effects by taking actions to eliminate the release of the chemicals.

The innate toxicity of dioxin and related chemicals is determined by the receptor-based mechanism of action. As noted by numerous researchers,⁹² binding of the dioxin molecule to the receptor is a necessary early step in the mechanism by which toxic effects are caused.⁹³ As a result of the wide distribution of the Ah receptor, and the diverse biological activities that the receptor is capable of affecting, it is understandable that dioxin and dioxin-like chemicals display the effects noted here.⁹⁴

⁹¹ Ahlborg et al., supra note 78.

⁹² Birnbaum, supra note 19; Gallo et al., supra note 3; Statements, supra note 12.

⁹³ Notwithstanding the necessity of receptor binding, Holsapple et al., supra note 11, have described immunologic responses to TCDD and congeners that do not require receptor binding, albeit at much higher TCDD doses.

⁹⁴ See supra sections A(1) at A-1, and A(2) at A-6.

As noted, the receptor is found in all types of tissues in mammals, birds and fish. Under real world conditions, body burden, persistence and exposure are all taken into consideration when determining toxicity.

4. Background Levels

Human risk assessments of exposures to dioxin contaminated fish have historically considered these exposures in isolation,⁹⁵ i.e., assessments have not accounted for existing levels of dioxin in humans to which exposures of dioxin or dioxin-like chemicals through fish consumption may add and thereby, significantly escalate the total dioxin risk. However, recent estimates of both "background" body burdens and doses of dioxin and dioxin-like chemicals indicate that these exposures are important and a critical consideration in assessing the "safety" of additional dioxin exposures.

Several studies have found similar levels of 2,3,7,8-TCDD and 2,3,7,8-TCDF in U.S. citizens. A study of blood plasma in 100 New York State blood bank volunteers predicted an average 2,3,7,8-TCDD concentration of 5.20 pg/g and a total PCDD/PCDF equivalent (TEQ) of 40.5 pg/g.⁹⁶ An occupational study performed by NIOSH⁹⁷ found similar levels in blood serum; an average 2,3,7,8-TCDD concentration of 7 pg/g and a TEQ of 34.6 pg/g. Finally, EPA's National Adipose Tissue Survey⁹⁸ reported levels of 5.38 pg/g and 27.9 pg/g for 2,3,7,8-TCDD and a TEQ, respectively, in body fat samples designed to be representative of the general U.S. population.

"Background" body burdens of 2,3,7,8-TCDD in adults of industrialized countries are roughly 6 ng/kg, on a lipid-adjusted basis.⁹⁹ Accounting for the TEQ for all of the

⁹⁵ Ambient Water Quality Criteria, *supra* note 2.

⁹⁶ Schecter, A., Dioxins and Related Compounds in Humans and in the Environment, in Gallo et al., *supra* note 3.

⁹⁷ Piacitelli, L.A., M. Haring-Sweeney, M.A. Fingerhut, D.G. Patterson Jr, W.E. Turner, L.B. Connally, K.K. Wille, and B. Tompkins, Serum levels of PCDDs and PCDFs among workers exposed to 2,3,7,8-TCDD contaminated chemicals, *Chemosphere*, 25:251-254 (1992).

⁹⁸ Stanley, J.S. and J. Orban, Chlorinated dioxins and furans in the general U.S. Population: NHATS FY87 results, EPA/5-91/003 (1991).

⁹⁹ Needham L.L., D.G. Patterson, Jr., and V.N. Houk, Levels of TCDD in selected human populations and their relevance to human risk assessment, in Gallo et al., *supra* note 3.

chlorinated dioxins and furans, this body burden approximates 30 ng/kg.¹⁰⁰ This level would be further increased if the body burdens and toxicity of dioxin-like PCBs were included.¹⁰¹

In terms of daily dioxin doses, estimates of exposure to 2,3,7,8-TCDD in industrialized countries indicates an average background dose of about 0.2-0.4 pg/kg/day.¹⁰² Market basket surveys indicate an average daily intake of roughly 1-3 pg/kg/day of total dioxin/furan equivalents in industrialized countries.¹⁰³ This dose would be approximately 3-10 pg/kg/day with the inclusion of dioxin-like PCBs.¹⁰⁴

These "background" body burdens and doses in the general population are of grave concern because they are at or near those levels where health effects are expected to occur in humans.¹⁰⁵ Moreover, many people have higher exposures than the general population. For instance, the dioxin exposures of people who consume dioxin-contaminated fish, and particularly subsistence consumers, may be significantly higher than the general public.¹⁰⁶ Also, nursing infants have been estimated to receive daily dioxin doses 10-20 times higher than the general population due the elimination of dioxin and dioxin-like chemicals in breast milk.¹⁰⁷

¹⁰⁰ Birnbaum, supra note 19.

¹⁰¹ Id.

¹⁰² Fuerst, P., C. Fuerst, and K. Wilmers, Body burden with PCDD and PCDF from food, in Gallo et al. supra note 3; Theelan, R.M.C., Modelling of human exposure to TCDD and I-TEQ in the Netherlands: Background and Occupational, in Gallo et al. supra note 3.

¹⁰³ Fuerst et al. supra note 102; Birmingham, B., B. Thorpe, R. Frank, R. Clement, H. Tosine, G. Fleming, J. Ashman, J. Wheeler, B.D. Ripley, and J.J. Ryan, Dietary intake of PCDD and PCDF from food in Ontario, Canada, *Chemosphere*, 19:507-512 (1989); Gilman, A., R. Newhook, and B. Birmingham, An updated assessment of the exposure of Canadians to dioxins and furans, *Chemosphere*, 23:1661-1667 (1991).

¹⁰⁴ Birnbaum, supra note 19.

¹⁰⁵ Memorandum, supra note 19; Birnbaum, supra note 19.

¹⁰⁶ Birnbaum, supra note 19.

¹⁰⁷ Id.

B. PERSISTENCE

Dioxin-like chemicals and especially dioxin, persist in the aquatic environment for at least decades.¹⁰⁸ The evidence for this persistence¹⁰⁹ is derived from studies in two aquatic systems: the Great Lakes (primarily in Lake Ontario) and Newark Bay, NJ. Maximum concentrations in Lake Ontario were 500 parts per trillion (ppt), deposited in 1962, and 7,600 ppt in Newark Bay, from mid-60's deposition. In both Lake Ontario and Newark Bay, sediment samples were used to identify the temporal trends of deposition and loss in aquatic sediments. While recent deposition of dioxin has decreased, shown by surface sediment concentrations, there has been little change in the concentrations in deeper sediments.¹¹⁰ The recently released EPA document on the effects of dioxin on wildlife and aquatic life¹¹¹ indicates that dioxin released thirty years ago and longer remains in the system as a source of contamination of the aquatic systems.

This report concludes that sediment contamination is, in several cases, the primary source of contamination of the aquatic system generally and aquatic biota specifically. The ongoing discharge of dioxin thus continues to contaminate sediments in the Great Lakes, Newark Bay and other waterways in the U.S. Dioxin currently released will contaminate waterways for decades to come.

The basic chemical nature of dioxin and related compounds make them extremely persistent, and account for the accumulation in animal tissues and activity via the aforementioned receptor mechanism. These chemicals are remarkably stable, resist biological or chemical breakdown and dissolve readily in lipids (fats) such as found in all animals and that make up the cell membrane of animal cells.¹¹² These unalterable properties arise from the basic benzene structure with chlorine atoms substituted in the key positions (the 2,3,7,8 positions on dioxin). The same is true for related compounds.

¹⁰⁸ Interim Report, supra note 22.

¹⁰⁹ Id.; Bopp, R.F., M.L. Gross, H. Tong, H.J. Simpson, S.J. Monson, B.L. Deck, and F.S. Moses, A Major Incident of Dioxin Contamination: Sediments of New Jersey Estuaries, Environ. Sci. Technol., 25:951-956 (1991).

¹¹⁰ Interim Report, supra note 22.

¹¹¹ Id.

¹¹² The chemical and physical properties of TCDD and related compounds are described in numerous EPA documents, including Ambient Water Quality Criteria, supra note 2; Gallo et al., supra note 3; and Interim Report, supra note 22.

So long as such compounds are released, they will persist and exert their toxic effects.¹¹³

1. Physical Persistence

Dioxin and related chemicals persist in the environment in two general compartments: the physical and the biological, both serving to contribute to ongoing damage from these chemicals. In the physical environment, dioxin exists principally in sediments, contaminating the bottom substrate. In sediments, dioxin and related compounds are almost entirely (more than 99%) associated with the organic carbon (carbon derived from living material rather than from non-living sources) part of the sediment. Dioxin discharged into water associates rapidly with organic particles and then much of this organic fraction is incorporated into bottom sediments.

EPA notes¹¹⁴ that the present distribution of dioxin in the Fox River, WI, in fact, is a function of sediment organic carbon content. Thus, once dioxin and related chemicals are released into the water, the general fate of the chemicals can be predicted but never controlled. Dioxin in sediments will remain until physically washed out or taken up by an aquatic organism.

2. Biological Persistence

The other compartment for dioxin in the aquatic environment is the living tissues, primarily animals, that harbor substantial quantities of these chemicals.¹¹⁵ This compartment includes all living organisms in the system, regardless of sensitivity to the effects of dioxin and related compounds. Dioxin and related chemicals, are, however, primarily found in animal tissues, especially the lipid or fat. Two recent EPA documents¹¹⁶ note that catfish, mink and bald eagles take up and retain dioxin and related compounds because of their feeding mode, fat content and metabolism. Thus, the biological uptake does not represent a loss or breakdown, but merely a shift from

¹¹³ Interim Report, supra note 22; Schechter, A., H. McGee, J. Stanley and K. Boggess, Chlorinated dioxin, dibenzofuran, coplanar, mon-ortho, and di-ortho substituted PCB congener levels in blood and semen of Michigan Vietnam veterans compared with levels in Vietnamese exposed to Agent Orange, Chemosphere (in press).

¹¹⁴ Interim Report, supra note 22.

¹¹⁵ Id.; Schechter, A., J. Startin, C. Wright, O. Papke, and M. Ball, Dioxin levels in food from the United States with estimated daily intake, Accepted for Dioxin '93, Vienna, Austria (proceedings in press).

¹¹⁶ Interim Report, supra note 22; EPA, Wildlife Criteria Portions of the Proposed Water Quality Guidance for the Great Lakes System, EPA-822-R-93-006 (1993).

one compartment, the physical, to another, the biological, where the chances of harm are increased.

3. Bioaccumulation

The significance of the biological uptake and retention of dioxin by aquatic animals such as fish and mink is that concentrations in living tissues increase. As a result, biomagnification increases concentrations by 20 to 30 fold,¹¹⁷ posing greater danger to the organisms themselves, as well as to animals that feed on them (either predators on live animals or scavengers on dead ones). This uptake and accumulation, together referred to as bioaccumulation, is greater for these chemicals -- the chlorinated dioxins, furans and benzenes¹¹⁸ -- than any others.

Basically, the three methods¹¹⁹ (bioconcentration, bioaccumulation and sediment/tissue bioaccumulation, respectively) of estimating the magnitude of the bioaccumulation are 1) by determining the ratio of the amount in water to that in a fish or other animal; 2) by determining the ratio between the dioxin in food and in the animal consuming the food, e.g. mink, eagle or human; or 3) by determining a similar ratio between sediment and fish. The first method, bioconcentration, yields substantially larger values (by orders of magnitude) because the solubility of dioxin is so low in water and high in animal tissue, and because of the tendency for these chemicals to associate with organic carbon in sediments. Bioaccumulation takes into account all sources and routes of uptake, food being the greatest for dioxin and related chemicals. The third method is under development by EPA and others, and the other two are used for regulatory purposes. Considering water the source of dioxin, bioconcentration factors (BCF) exceed 100,000 for whole fish, as reported by EPA for several species (see infra Table 2, at 24).

The significance of the chemical, physical and biological properties is the knowledge that these chemicals are remarkably stable and resistant to breakdown processes.

C. **DEGRADABILITY**

¹¹⁷ Braune, B.M. and R.J. Norstrom, Dynamics of organochlorine compounds in herring gulls; III. Tissue distribution and bioaccumulation in Lake Ontario gulls, *Environ. Toxicol. Chem.* 8:957-968 (1989).

¹¹⁸ Interim Report, supra note 22; Nendza M., QSARS of Bioconcentration: Validity Assessment of log Pow/lof BCF Correlations, pp 51-66, in R. Nagel and R. Loskill (Eds.), Bioaccumulation in Aquatic Systems, VCH, Weinheim, Germany (1992); Mill T., Environmental Chemistry, in G.W. Suter, II (Ed.), Ecological Risk Assessment, Lewis Pub., Michigan (1993).

¹¹⁹ These three methods are discussed and explained in Interim Report supra note 22, at 3-1 to 3-23.

There is only one known natural mechanism for the breakdown of PCDD's (polychlorinated dioxin's) and PCDF (polychlorinated furan's): photolytic. This mechanism cannot operate effectively in water because water absorbs radiant energy that breaks down the chemical bonds. Even under the most ideal natural conditions, in air, photolytic breakdown is less than 100% of ideal. Real world conditions include numerous factors that reduce breakdown. Exposure time, temperature, association with other materials (organic carbon), and shielding from light are just some of the factors¹²⁰ that restrict photolytic breakdown to a fraction of the total amount released. Furthermore, as noted, photolytic breakdown occurs in air, and is not a relevant process for consideration in aquatic systems.

Biological breakdown of dioxin and the other dioxins and furans is limited to a few fish¹²¹ and possibly some marine mammals.¹²² In the case of forage fish, EPA refers to biotransformation of dioxin, but this process only accounts for lack of build-up of dioxin above predicted levels; dioxin still accumulates as predicted for a passive process. The biotransformation process itself may also produce metabolic end products that are toxic. Unlike some PCB's that can be detoxified by bacteria, such bacteria have yet to be identified for dioxin or TCDF breakdown. The remarkable persistence of dioxin in sediments¹²³ is evidence of the inability of natural processes to act on this class of compounds.

D. USUAL OR POTENTIAL PRESENCE OF AFFECTED ORGANISMS

All organisms associated with dioxin contaminated waters are exposed to dioxin and may face high risk from its severe adverse effects. Available information -- including fish tissue surveys and epidemiological studies -- indicate that most, if not all, aquatic life, piscivorous wildlife, and human fish consumers associated with dioxin-contaminated waters are affected by the presence of dioxin. This appears to be particularly true for those waters receiving discharges from the 104 U.S. chlorine-bleaching pulp and paper mills.

TABLE 2

¹²⁰ Ambient Water Quality Criteria, *supra* note 2.

¹²¹ Interim Report, *supra* note 22.

¹²² Norstrom, R.J., D.C.G. Muir, C.A. Ford, M. Simon, C.R. MacDonald and P. Beland, Indications of P450 monooxygenase activities in Beluga (*Delphinapterus leucas*) and Narwhal (*Monodon monoceros*) from patterns of PCB, PCDD and PCDF accumulation, Mar. Environ. Res., 34:1-6 (1992).

¹²³ Interim Report, *supra* note 22.

Predicted Bioconcentration Factors (BCF) Factors*

FISH	BCF
Rainbow trout	39,000
fathead minnow	97,000-159,000
carp	66,000
medaka	344,000

* BCF is based on the whole fish, adjusted for lipid content given by EPA; Interim Report, supra note 22.

References: Mehrle et al., supra note 25.; Cook et al, in Gallo et al., supra note 3, at 143-167.

1. Exposure of Organisms

The animals or individuals most affected by dioxin will be those that fall into one or more of the following three categories:

- a) those with a high exposure to dioxin, essentially aquatic animals living in the vicinity of discharge points, and animals associated with those habitats and ecosystems, e.g. fish eating mammals and birds;
- b) highly sensitive animals or animal species that receive even low or average exposures to dioxin and related compounds;
- c) animals that retain dioxin for a long period because of their longevity, life history or physiology; some aquatic animals retain more than others because of a higher lipid (fat) content.

However, all organisms associated with aquatic systems will be exposed to dioxin and related chemicals and therefore subject to the toxic effects of these chemicals.

Even those animals that do not succumb to dioxin's toxic effects¹²⁴ will serve as repositories for these chemicals. Much of the concern over the toxic effects of dioxin on aquatic systems has focused on overt and acute effects, ignoring both the long term and indirect effects. The long term chronic effects are seen in animal populations that are affected slowly or through mechanisms that appear with some delay, such as developmental toxicity that is only manifested after the fetus is born and reaches maturity.¹²⁵ Indirect effects are similar to chronic ones, but the target or affected organism is the one that consumes the animal that is directly exposed.

The continued discharge of dioxin at even low levels will expose a wide range of aquatic and terrestrial animals, including humans, to a powerful modulator of biological activity that we are just beginning to understand. All of the known biological responses to dioxin and related chemicals are associated with harmful effects. Many of these effects turn out to be slow to appear, as in the wasting syndrome,¹²⁶ or transgenerational, as is the effect of dioxin on male reproductive function.¹²⁷

Colburn et al.¹²⁸ assembled information on the general phenomenon of chemical disruption of the hormonal systems of animals. These chemicals that mimic hormones or interact with endocrine systems have the ability to alter development, feeding, growth, reproduction and other normal functions that are controlled by hormones over long periods at low levels.¹²⁹ As a result of the large number of hormonally active chemicals, Sharpe and Skakkebaek recently (1993) argued that the "increasing incidence

¹²⁴ Pruell, R.J., C.B. Norwood, R.D. Bowen, W.S. Boothman, P.F. Rogerson, A.T. Macket, and B. Butterworth, Geochemical study of sediment contamination in New Bedford Harbor, Massachusetts, Mar. Enviro. Res., 29:77-101 (1990).

¹²⁵ Mably et al., supra note 66, have demonstrated effects on the developing rat fetus that only appear when the male offspring reach sexual maturity.

¹²⁶ Ambient Water Quality Criteria, supra note 2; Health Assessment, supra note 2.

¹²⁷ Mably et al., supra note 8.

¹²⁸ See Colburn, T. and C. Clement. 1992. Chemically-induced Alterations in Sexual and Functional Development: The Wildlife/ Human Connection. Advances in Modern Environmental Toxicology Vol. XXI, Princeton Sci. Pub., NJ., Chapter I, pp 1-8, The Statement of Consensus.

¹²⁹ Id.

of reproductive abnormalities in the human male may be related to increased oestrogen exposure in utero,...."¹³⁰

2. Dioxin Contamination Associated with Chlorine-bleaching Pulp and Paper Mills

A total of 104 pulp and paper mills using chlorine or its derivatives to bleach pulp are located in the U.S.¹³¹ These mills occur in each EPA region except for Region VII. The immediate receiving waters for wastewaters, and therefore waters subject to direct dioxin contamination, from these mills include rivers, lakes, estuaries, and coastal waters.¹³² However, due to transport in water and/or in association with sediments,¹³³ dioxin contamination often reaches far beyond the immediate discharge point.

For example, in Maine, dioxin contamination by kraft-bleach pulp and paper mills has caused the establishment of fish consumption advisories – which include prohibitions on consumption by women of childbearing age – for over 230 river miles.¹³⁴ In the U.S. as a whole, a total of 7,226 river miles, 2,489,834 lake acres, 836 square estuary miles, and 4,808 Great Lake shore miles were subject of fish consumption advisories in 1990.¹³⁵ Dioxin is associated with fishing restrictions/bans in 16 states and PCBs (a dioxin-like chemical) is associated with restrictions/bans in 30 states. Figures 1 and 2 depict the geographical distribution of concentrations of 2,3,7,8-TCDD and total dioxins in fish from U.S. waters.¹³⁶

¹³⁰ Sharpe, R.M. and N.E. Skakkebaek, Are oestrogens involved in falling sperm counts and disorders of the male reproductive tract?, Lancet, 341:1392-1395, (1993).

¹³¹ EPA, Risk assessment for 2378-TCDD and 2378-TCDF contaminated receiving waters from U.S. chlorine-bleaching pulp and paper mills, prepared for EPA OWRS, prepared by Tetra Tech, Inc., pgs. C-1 to C-5, (August 1990) [hereinafter Risk Assessment].

¹³² Id. at L-1 to L-4.

¹³³ Interim Report, supra note 22, at 2-6; See supra Section B, at A-20, and references therein.

¹³⁴ Maine Department of Environmental Protection, State of Maine 1992 Water Quality Assessment. A report to Congress prepared pursuant to Section 305(b) of the Federal Water Pollution Control Act as amended (1992), at 21.

¹³⁵ EPA, National Water Quality Inventory. 1990 Report to Congress, EPA/503/9-92/006 (April 1992) at 90-91.

¹³⁶ EPA, National study of chemical residues in fish, EPA/823/R-92/008a, (September 1992) [hereinafter National Study] (sites near pulp and paper mills bleaching with chlorine accounted for 28 of the top 39 sites for 2,3,7,8-TCDD contamination and 31 of the top 39 sites for 2,3,7,8-TCDF contamination).

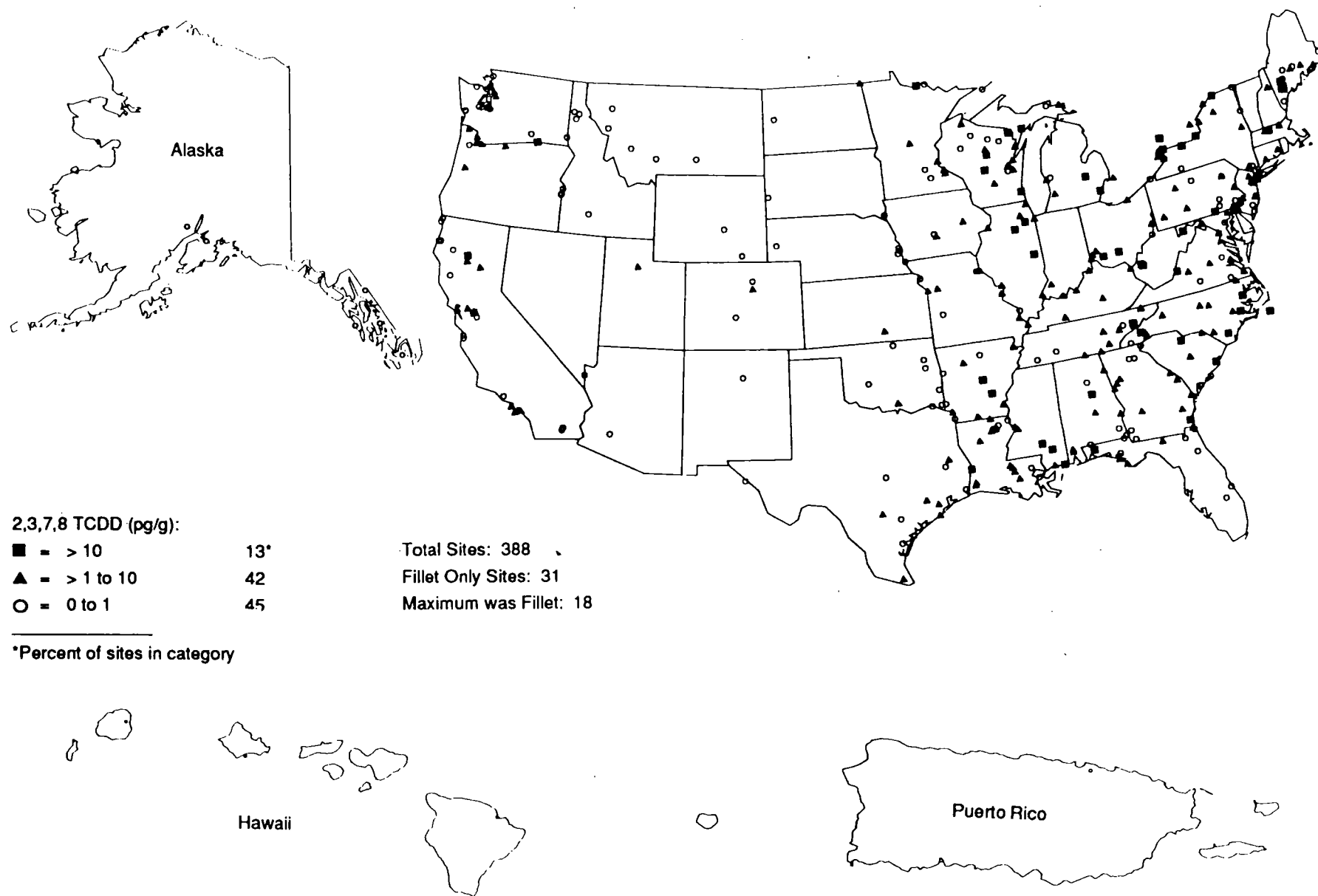


Figure 1. Map showing geographical distribution of various concentration ranges of 2,3,7,8 TCDD in fish tissue.

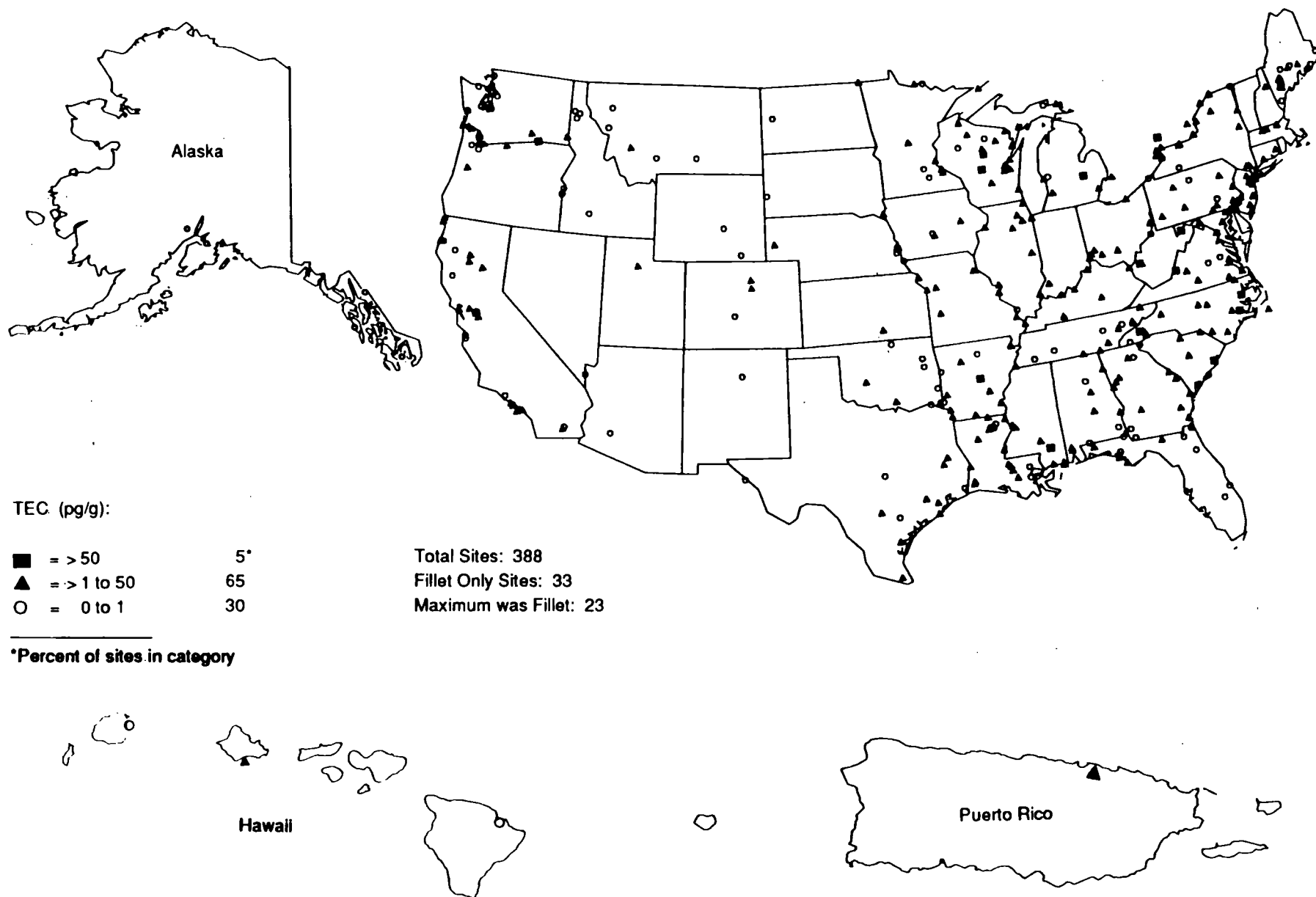


Figure 2. Map showing geographical distribution of various concentration ranges of TEC in fish tissue.

2. Organisms Usually or Potentially Affected by Dioxin Discharges by Chlorine-bleaching Pulp and Paper Mills

The broad geographic distribution of chlorine-bleaching pulp and paper mills in the U.S. and the associated wide-spread transport of dioxin from these sources -- coupled with dioxin's extreme toxicity,¹³⁷ and high persistence and bioaccumulation¹³⁸ -- serves to create a risk to all the aquatic life, wildlife, and humans associated with these waters.

a. **Aquatic Life**

While a complete listing of all the aquatic life usually or potentially impacted by dioxin contamination would be exhaustive, data from the National Study of Chemical Residues in Fish (NSCRF)¹³⁹ documents the vast range of species affected by dioxin discharges from chlorine-bleaching pulp and paper mills.

The species reported to be contaminated by dioxin (expressed as total dioxin/furan equivalents) include: blue catfish in Arkansas (42.36 pg/g, fillet); bowfin and sea catfish in Florida (19.12 pg/g, wholebody, and 3.94 pg/g, wholebody, respectively); carp in Tennessee (28.27 pg/g, wholebody); largemouth bass in North Carolina (2.30 pg/g, fillet); white suckers in Maine (14.03 pg/g, wholebody); carp in Wisconsin (32.93 pg/g, wholebody); walleye in Michigan (2.29 pg/g, fillet); whitefish in Washington (7.54 pg/g, fillet); rainbow trout in California (21.54 pg/g, fillet); brown trout in Pennsylvania (4.36 pg/g, fillet); largemouth bass in Georgia (3.54 pg/g, fillet); spot in Georgia (26.02 pg/g, wholebody); white bass in Kentucky (2.28 pg/g, wholebody); channel catfish in Mississippi (103.32 pg/g, wholebody); shortnosed gar in Virginia (1.42 pg/g, fillet); creek chubsucker in North Carolina (184.24 pg/g, wholebody); and soft-shelled clams in Washington (1.33 pg/g, wholebody).

Although the NSCRF study focused on fish, and in some cases, shellfish,¹⁴⁰ contamination, aquatic worms, crustaceans, reptiles, and plants are also known to accumulate dioxin and related chemicals.¹⁴¹ Marine clams in Newark Bay, NJ and annelid worms at the Mud Dump Site off New York serve as the route of exposure for

¹³⁷ See supra Section A.2., at A-6.

¹³⁸ See supra Section B, at A-20.

¹³⁹ National Study, supra note 136, Appendix D.

¹⁴⁰ Id. at 4.

¹⁴¹ Interim Report, supra note 22, at 2-9 to 2-11 and 4-4 to 4-5.

blue crabs and fish, respectively.¹⁴² Therefore, the study's findings of extensive contamination associated with chlorine-bleaching pulp and paper mill discharges indicate dioxin impacts on other species of fish and aquatic life.¹⁴³

b. Wildlife

Because fish represent a major food source (and therefore, chemical exposure route) for many avian and mammalian wildlife, the extensive and substantial dioxin contamination of fish associated with chlorine-bleaching pulp and paper mills¹⁴⁴ also describes a substantial threat to a wide variety of fish-eating wildlife species. Wildlife contamination data are very limited, especially for mammals,¹⁴⁵ and, consequently, little information exists on the specific types of birds and mammals affected or potentially affected by dioxin.

However, epidemiological studies provide direct evidence of the affects of dioxin and related chemicals on wildlife associated with contaminated waterbodies. For example, dioxin-like chemicals in the waters of the Great Lakes have been causally linked to mortality, edema, growth retardation, and deformities, and other adverse biological effects in colonial bird species such as herring gulls, Forster's terns, double-crested cormorants, and Caspian terns.¹⁴⁶ Other researchers have observed equally severe dioxin-associated effects on avian wildlife in the Great Lakes.¹⁴⁷ Concerns regarding the impact of dioxin and dioxin-like compounds on Maine's bald eagle population --

¹⁴² Pruell et al., supra note 124.

¹⁴³ National Study, supra note 136, at 1.

¹⁴⁴ See Id., Appendix D.

¹⁴⁵ Interim Report, supra note 22, at 4-49 to 4-51.

¹⁴⁶ Gilbertson, M., T. Kubiak, J. Ludwig, and G. Fox, Great Lakes embryo mortality, edema, and deformities syndrome (GLEMEDS) in colonial fish-eating birds: Similarity to chick-edema disease, J. Toxicol. Environ. Health, 33:455-520, (1991); Tillitt, D.E., G.T. Ankley, J.P. Giesy, J.P. Ludwig, H. Kurita, D.V. Weseloh, C.A. Bishop, J. Larson, and T.J. Kubiak, PCB residues and egg mortality in double crested cormorants from the Great Lakes, Environ. Toxicol. Chem., 11:1281-1288 (1992).

¹⁴⁷ Fox, G.A., Epidemiological and pathobiological evidence of contaminant-induced alterations in sexual development in free-living wildlife, at 147-158, in Colburn et al. supra note 128.

which has consistently lagged behind that of other recovering U.S. bald eagle populations over the last decade -- have been expressed by the U.S. Fish and Wildlife Service.¹⁴⁸

Certainly, significant concerns over the effects of dioxin on piscivorous mammalian wildlife species associated with contaminated waterbodies, such as mink and river otter, are also warranted.¹⁴⁹

c. **Humans**

A potentially large segment of the U.S. population is put at risk due to the widespread and appreciable contamination of fish species by dioxin indicated by the NSCRF, and associated with chlorine-bleaching pulp and paper mills.¹⁵⁰ More specifically, due to the substantial cancer, reproductive and developmental, and immunological risks,¹⁵¹ and due to the high "background" levels of dioxin and related chemicals carried by the general population,¹⁵² there is good reason to conclude that human health is jeopardized in many, if not all, waters where dioxin contamination occurs and fish, shellfish, or other species are caught and consumed by the public.¹⁵³ These risks are particularly severe for human consumers of large amounts of fish, e.g., avid anglers or subsistence fishers, nursing infants, and when the co-exposure to dioxin-like chemicals, and of existing background human body burdens/doses of dioxin and dioxin-like chemicals, is taken into account in estimating total human exposures.¹⁵⁴

¹⁴⁸ Letter from M. Amaral and K. Carr (USFWS New England Field Office) to G. Papadopoulos and D. Pinkham (EPA Region I), re: Meeting Summary: Lincoln Pulp and Paper/Dioxin/Bald Eagles, pg. 3, (Jan 14, 1993) [hereinafter Amaral Letter].

¹⁴⁹ Interim Report, supra note 22, at 5-8; EPA, Water Quality Guidance for the Great Lakes System and Correction: Proposed Rules, 58 Fed. Reg. 20824, (April 16, 1993).

¹⁵⁰ National Study, supra note 136, Appendix D.

¹⁵¹ See supra Section A.1.d., at A-12.

¹⁵² See supra Section A.4., at A-18.

¹⁵³ Memorandum, supra note 19; Birnbaum, supra note 19.

¹⁵⁴ Birnbaum, supra note 19.

E. NATURE AND EXTENT OF EFFECTS

As discussed previously, minute levels of dioxin and related chemicals are extremely toxic to humans as well as a diverse range of aquatic life and wildlife species. These discussions present considerable evidence of the severe nature and extent of dioxin's adverse effects. However, comparisons of levels of dioxin in fish associated with chlorine-bleaching pulp and paper mills and the dioxin levels that EPA has attributed to adverse impacts also predict widespread and significant adverse effects on aquatic life, piscivorous wildlife, and human fish consumers. Dioxin-like compounds are common in fish, there are high-exposure human populations and substantial "background" body burdens, and no evidence for a dioxin effect threshold. Considering these factors, it is clear that dioxin is affecting all human fish consumers associated with these waters.

1. Aquatic Life and Associated Wildlife

EPA's National Study of Chemical Residues in Fish (NSCRF) investigated the contamination of fish by dioxin, dioxin-related compounds, and other toxic chemicals at 388 sites in waterbodies throughout the country.¹⁵⁵ The NSCRF study found that roughly 50% of the fish samples (a mixture of wholebody and fillets) were contaminated with levels of dioxin exceeding 1.0 pg/g.¹⁵⁶

Moreover, at those sites associated with chlorine-bleaching pulp and paper mills, the study found wholebody concentrations of dioxin in fish ranging from 0.45 to 160.4 pg/g, with a mean of 17.39 pg/g.¹⁵⁷ Total dioxins and furans, as measured by toxicity equivalent concentrations (TECs), in these fish ranged from 0.03 to 180.32 pg/g, with a mean level of 23.48 pg/g.¹⁵⁸ Even greater TECs would have resulted if PCBs, which the study identified in high levels in fish,¹⁵⁹ were to be added to this TEC.

¹⁵⁵ National Study, supra note 136.

¹⁵⁶ Id. at 21 to 39.

¹⁵⁷ Id. at 42. EPA notes that "statistical analyses of various source categories show that pulp and paper mills using chlorine appear to be the dominant (statistically significant) source category of 2,3,7,8-TCDD and 2,3,7,8-TCDF found in fish tissue." See also EPA, National study of chemical residues in fish fact sheet, EPA/823/F-92/001 (Nov. 1992), at 2.

¹⁵⁸ National Study, supra note 136, at 45.

¹⁵⁹ Id. at 57.

As mentioned above,¹⁶⁰ EPA has judged that fish containing levels of dioxin greater than 50, 3, and 0.5 pg/g represent a significant risk to sensitive aquatic life, birds, and mammalian wildlife, respectively.¹⁶¹ Comparing these risk estimates to NSCRF data for fish collected at sites associated with chlorine-bleaching pulp and paper mills indicates that average levels of dioxin contamination exceed "safe" levels for sensitive avian and mammalian wildlife by roughly an order of magnitude or more. Estimated "safe" levels to sensitive aquatic life are also exceeded in fish at a substantial number of sites.

EPA has acknowledged the substantial dioxin risks demonstrated by these data, noting that the "comparison of [NSCRF] fish survey results and wildlife effects data does raise significant concerns about the risk of [dioxin] to piscivorous wildlife" (emphasis added).¹⁶² However, in expressing these concerns, EPA did not address either the additional risks posed by the contamination of fish with other polychlorinated dioxins/furans and PCBs,¹⁶³ or the considerable uncertainty related to estimates of "safe" exposures for aquatic life and fish-eating wildlife.¹⁶⁴ Therefore, significant adverse effects due to exposures of these species to dioxin and related chemicals may be occurring in most, if not all, contaminated waters.

2. Human Health

In 1990, EPA conducted a human health risk assessment for dioxin contaminated waters associated with chlorine-bleaching pulp and paper mills.¹⁶⁵ This risk assessment estimated that dioxin levels downstream, from up to 20% of these U.S. mills, posed an increased cancer risk greater than one in 10,000 (10⁻⁴) to average consumers of fish from downstream of the mills.¹⁶⁶ It also estimated that the consumption of fish associated with up to 30% of the mills would equal or exceed doses associated with non-carcinogenic liver effects among these consumers. From these results, EPA concluded that a "potential for high 2,3,7,8-TCDD and 2,3,7,8-TCDF contamination" existed in waters associated with mills employing chlorine bleaching, and that the related fish

¹⁶⁰ See supra Section A.2.a. at A-6, A.2.b. at A-8, and A.2.c. at A-10.

¹⁶¹ Interim Report, supra note 22, at 5-11.

¹⁶² Id. at 5-8.

¹⁶³ See supra section A.3. at A-15.

¹⁶⁴ See supra Sections A.2.a. at A-6, A.2.b. at A-8, and A.2.c. at A-10.

¹⁶⁵ Risk Assessment, supra note 131.

¹⁶⁶ EPA noted that the risks estimated by the study were "potentially greater" for avid sports anglers and subsistence fishers.

contamination "could represent significant implications for human health and aquatic life".¹⁶⁷

The National Study of Chemical Residues in Fish (NSCRF)¹⁶⁸ documents high dioxin and related chemical concentrations in fish from geographically diffuse sites, particularly those associated with chlorine-bleaching pulp and paper mills. Dioxin concentrations ranging from 0.17 to 52.90 pg/g [mean of 4.88 pg/g] and TECs ranging from 0.01 to 56.3 pg/g [mean of 6.40 pg/g] were measured in fish fillets at sites near these mills.¹⁶⁹

Assuming a fish consumption rate of 15 g/day¹⁷⁰ and a body weight of 70 kg,¹⁷¹ human consumers of fish contaminated with the mean level of dioxin measured in these fish would receive an estimated dose of 1.1 pg dioxin/kg/day. Using these same assumptions, the total dose of dioxins and furans (TEC) estimated for human consumers would be 1.4 pg/kg/day.

Significantly, the estimated TEC dose,¹⁷² derived from the average level of dioxin in the tissues of fish at sites associated with chlorine-bleaching paper mills, exceeds an "acceptable daily exposure" of 1.3 pg/kg/day¹⁷³ for reproductive effects. Both the dioxin and TEC doses also exceed by roughly an order of magnitude a "risk associated dose" for cancer of 0.13 pg/kg/day at a non-conservative 10-5 risk level.¹⁷⁴ In fact, fish tissue concentrations of dioxin and related compounds would need to be less than 0.06 pg/d (TEC) -- a non-detectable level in fish tissues -- to avoid a 1 in 1,000,000 cancer risk to people consuming fish at even moderate levels.

¹⁶⁷ Risk Assessment, *supra* note 131, at 34.

¹⁶⁸ National Study, *supra* note 136.

¹⁶⁹ *Id.* at 42. Again, note that PCBs measured in fish in this study were not included in the calculation of the total equivalent dioxin concentration.

¹⁷⁰ EPA, Great Lake Water Quality Initiative technical support document for human health criteria and values, NTIS PB93-154698, (1993) [hereinafter GLI - human health criteria].

¹⁷¹ *Id.*

¹⁷² The estimated TEC dose does not include dioxin-like PCBs. These chemicals were measured at high levels in the NSCRF study.

¹⁷³ GLI - human health criteria, *supra* note 170.

¹⁷⁴ *Id.*

While these comparisons demonstrate widespread and significant risks of dioxin to human fish consumers, it should be recognized that exposures, and therefore effects, among certain populations may be much greater than estimated above. For example, EPA has acknowledged that fish consumption rates of 30 g/day and 140 g/d are more representative of average sport angler consumption, and the high sports angler and subsistence consumers, respectively.¹⁷⁵ The risks of cancer, reproductive and developmental effects, immunotoxicity, and other impacts of dioxin exposure will be 2 to roughly 10 times greater for these high fish consuming populations. Also, nursing infants may receive dioxin doses 10-20 times higher than the general population through the transfer of dioxin and dioxin-like chemicals in breast milk.¹⁷⁶

Further, the risks estimated above do not account for the presence of human "background" body burdens of dioxin and dioxin-like chemicals. As noted above,¹⁷⁷ daily doses of dioxin and dioxin-like chemicals among the general public, e.g., not high fish consumers or nursing infants, are approximately 3-10 pg/kg/day. These "background" doses themselves exceed the 1.3 and 0.13 pg/kg/day identified by EPA as unacceptable risk levels for reproductive and cancer effects,¹⁷⁸ respectively. Therefore, the human consumption of fish contaminated with dioxin and related chemicals from most, if not all, waterbodies to which chlorine-bleaching pulp and paper mills discharge may likely be exasperating existing adverse effects occurring as a result of dioxin exposures.

3. Summary

Data collected by EPA on the levels of dioxin in fish and Agency estimates of the levels at which such contamination constitute a significant risk, indicate that the dioxin and related chemicals pose a substantial risk to the health of aquatic life, wildlife, and/or humans associated with many of the waters receiving discharges from chlorine-bleaching pulp and paper mills. Further, when the presence of dioxin-like compounds, the existence of high-exposure human populations and "background" body burdens, and the uncertainties related to estimates of "safe" dioxin exposures are taken into account, it is clear that dioxin is affecting all human fish consumers associated with these waters.

¹⁷⁵ EPA, Exposure factors handbook, EPA/600/8-89/043 (1989); Interim Report, supra note 22.

¹⁷⁶ Birnbaum, supra note 19.

¹⁷⁷ See supra Section A.4. at A-18.

¹⁷⁸ GLI - human health criteria, supra note 170.

F. IMPORTANCE OF AFFECTED ORGANISMS

Available information indicates that recreational and commercial fisheries, aquatic ecosystems, endangered species, and public health are all affected by dioxin contamination. In the case of endangered species, data provide compelling evidence that dioxin and related chemicals are having severe impacts. The evidence is also compelling for humans, indicating that the public, and especially groups or sub-populations, face high exposures and experience adverse effects from dioxin and dioxin-like chemicals.

1. Recreation and Commercial Fisheries

Preceding sections strongly suggest that levels of dioxin may be having important adverse impacts on U.S. recreational and commercial fisheries. For example, EPA has suggested that dioxin is still impeding the attainment of sustainable reproduction in Lake Ontario's recreationally and commercially important lake trout population.¹⁷⁹ Other researchers¹⁸⁰ have provided convincing evidence of the role of hormonally-active toxicants (e.g., dioxin and dioxin-like compounds) in abnormalities in sexual development and disease incidence affecting the whole of the Great Lakes' important salmonid fishery.¹⁸¹

Given the widespread nature of significant dioxin contamination in fish and shellfish from U.S. rivers, lakes, and coastal waters,¹⁸² the above findings are ample cause for concern about the health of the important, yet less well-researched, commercial and recreational fisheries.

In addition to the impact of dioxin contamination on the health of fisheries themselves, dioxin's impact on recreational and commercial fishing, and the related economies, is a critical consideration. According to EPA,¹⁸³ 998 advisories and 50 total bans related to toxic pollution currently restrict fishing in the United States and affect

¹⁷⁹ Ambient Water Quality Criteria, supra note 2; Health Assessment, supra note 2, at 4-38.

¹⁸⁰ Leatherland, J.F., Endocrine and reproductive function in Great Lakes salmon, in Colburn et al., supra note 128, at 129-145.

¹⁸¹ In 1991, Great Lakes salmon drew 721,000 anglers for 5 million days of fishing. See U.S. Department of the Interior, 1991 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation (March 1993) [hereinafter National Fishing Survey], at 15.

¹⁸² National Study, supra note 136.

¹⁸³ EPA, National Water Quality Inventory. 1990 Report to Congress, EPA/503/9-92/006 (April 1992), at 90.

7,226 river miles, 2,489,834 lake acres, 836 square estuary miles, and 4,808 Great Lake Shore miles. While not all of the above restrictions are due to dioxin contamination,¹⁸⁴ dioxin certainly plays a significant role in the loss of recreational and commercial fishing opportunities currently occurring in U.S. waters due to toxic pollution.

The economies related to recreational and commercial fishing, and that are potentially affected by dioxin contamination, are significant. For example, recreational fishing in the Great Lakes involves 2.6 million people¹⁸⁵ and has an estimated 2 to 4 billion dollar economic impact on the region annually.¹⁸⁶ In Maine, the total economic value of inland and marine sport fishing is estimated at up to roughly \$500 million and \$300 million, respectively.¹⁸⁷ Nationally, 35.6 million people fished U.S. inland and marine waters recreationally in 1991 and spent \$24 billion on fishing-related expenses.¹⁸⁸

The value of commercial fisheries potentially impacted by dioxin contamination are equally great. Domestic commercial landings of marine/freshwater finfish and shellfish totaled over \$2 billion and \$1.5 billion, respectively, in 1992¹⁸⁹ The inclusion of fishing-related expenses would increase the economic worth of these commercial fisheries many-fold.

Calculations of the direct economic impacts of dioxin on recreational and commercial fishing -- through either effects on important fish species or fishing restrictions -- have not been performed.¹⁹⁰ However, it is clear that fishing is extremely

¹⁸⁴ 16 of the reporting states identified dioxin as the cause of fishing restrictions. PCBs were reported as associated with restrictions by 30 states.

¹⁸⁵ National Fishing Survey, *supra* note 182, at 15.

¹⁸⁶ Great Lakes Fishery Commission. Great Lakes Fishery Commission welcomes GAO review, News Release, Ann Arbor, MI (March 12, 1992).

¹⁸⁷ Boyle, K.J., S.D. Reiling, M. Teisl, and M.L. Phillips, A study of the impacts of game and nongame species on Maine's economy, Report to the Commission to Study the Impact of Game and Nongame Species on Maine's Economy (Dec. 1990), at E-2.

¹⁸⁸ National Fishing Survey, *supra* note 182, at 10.

¹⁸⁹ See National Marine Fisheries Service, Fisheries of the United States, 1992, Current Fishery Statistics No. 9200 (May 1993).

¹⁹⁰ EPA, however, has indicated that toxic discharges to surface waters cause losses of roughly \$800 million per year in sport fishing and other water-related recreational opportunities in the U.S. See U.S. General Accounting Office, Water Pollution: Stronger

important for both economic and recreational reasons. Thus, the adverse and persistent effects of dioxin contamination should be taken very seriously since even a zero discharge standard or a ban will not reverse its effects in our lifetime.

2. Ecosystems

It has been shown above¹⁹¹ that the discharge of dioxin and related chemicals into aquatic environments results in the accumulation of these chemicals in the sediments. EPA has concluded¹⁹² that the accumulation of dioxin in sediments represents a major source of contamination of fish in the Great Lakes and in Newark Bay, two of the best studied systems. The two major points that EPA reached in examining these two ecosystems are:

- a) Even a 90% reduction in dioxin loading into Lake Ontario will not result in elimination from the system or from fish, but will cause a rapid decrease of about 50%, followed by an increase above that level for the subsequent 30 years, to a new steady-state. The new steady-state, according to EPA estimations, may be no more than 30% lower than the present contamination under the 90% load reduction scenario. Even a 100% loading reduction will only yield a 50% estimated decrease in fish tissue concentrations in 20 years.¹⁹³
- b) The ability of dioxin (and related chemicals) to move through the trophic system, concentrate in living tissues and remain in the physical and biological system means that the entire system will remain contaminated for many years, long after dioxin sources have been eliminated. The movement and accumulation of dioxin and related organochlorine chemicals has been modeled by Thomann and coworkers.¹⁹⁴ According to these models, while some part of the trophic system may show only modest increases in dioxin levels from one feeding level to the next, other

Efforts Needed by EPA to Control Toxic Water Pollution, GAO/RCED-92-212 (1991).

¹⁹¹ See supra Section B at A-20.

¹⁹² Interim Report, supra note 22.

¹⁹³ Id. at 3-17 to 3-18.

¹⁹⁴ Thomann, R.V., Bioaccumulation Model of Organic Chemical Contamination in Aquatic Food Chains, Environ. Sci. Tech., 23:699-707, (1989); Thomann, R.V., J.P. Connolly and T.F. Parkerton, An Equilibrium Model of Organic Chemical Accumulation in Aquatic Food Webs with Sediment Interaction, Environ. Toxicol. Chem., 11:615-629 (1992).

animals, such as herring gulls and alewife (an important food-chain fish species) accumulate dioxin in tissues to levels a factor of 20 to 30 greater than levels in their food.¹⁹⁵

The result of dioxin release into the aquatic environment is a widespread and persistent contamination of the sediments. The sediments then serve as the source of continuing contamination of the aquatic biota through uptake and accumulation in the food web. The transfer continues into terrestrial animals that feed on fish and other aquatic animals (e.g., raccoons consume bivalves and crayfish), as well as to humans. This has clearly been the case with organochlorine pesticides such as DDT, aldrin, chlordane, and mirex, which have been banned for a decade or more, yet continue to be found in water, soil, sediment, and the tissues of fish, birds, mammals, and humans.¹⁹⁶

Through persistence in the environment and accumulation in organisms, the adverse effects of dioxin in ecosystems may continue over time, and may be delayed sometimes over generations. The result can be damaging to ecosystems by directly eliminating sensitive species or indirectly causing increased incidence of disease in the remaining species.¹⁹⁷

3. Threatened or Endangered Species

As noted previously, EPA has indicated that levels of dioxin in fish tissues raise "significant concerns" about its effects on sensitive wildlife, especially fish-eating birds and mammals.¹⁹⁸ While this determination is profound and very disturbing for all wildlife species exposed to dioxin and dioxin-like chemical contamination, it is particularly so with respect to those wildlife populations whose heightened sensitivity to human impacts have resulted in a threatened or endangered status.¹⁹⁹

As an example, there is considerable concern that dioxin contamination of waterways -- either alone or in combination with other toxic pollutants -- is causing reproductive failure and other adverse effects in bald eagles. For Maine's bald eagle population, reproductive productivity is significantly less than 1 young per nesting pair,

¹⁹⁵ Interim Report, supra note 22, at 7-21; Braune, B.M. and R.J. Norstrom, Dynamics of organochlorine compounds in herring gulls; III. Tissue distribution and bioaccumulation in Lake Ontario gulls. Environ. Toxicol. Chem. 8:957-968 (1989).

¹⁹⁶ Report to Congress, supra note 184, at 86.

¹⁹⁷ Id.

¹⁹⁸ Interim Report, supra note 22, at 5-8.

¹⁹⁹ See Endangered Species Act, 16 U.S.C. § 1531.

and lags behind populations in other areas of the country by 10 to 40% on average.²⁰⁰ The U.S. Fish and Wildlife Service has expressed serious concerns regarding the role of dioxin contamination in the observed lower reproductive success of Maine bald eagles²⁰¹, and notes that these endangered species may be exposed to dioxin levels in fish 12-times greater than those estimated to cause adverse effects.²⁰²

In Oregon and Washington, fledgling young were produced in only 35% and 39% of occupied bald eagle breeding territories in each state, respectively, between 1985 and 1990 on the lower Columbia River²⁰³ -- a river where appreciable dioxin contamination has been documented.²⁰⁴ These rates of breeding success are significantly lower than those of eagle populations occupying other areas of the two states.²⁰⁵ Again, these findings suggest that dioxin and dioxin-like chemicals are causing significant adverse effects on bald eagle populations.²⁰⁶

Peregrine falcons in California carry sufficient dioxin and dioxin related compounds that falcon eggs have a TEC level of 120 ng/kg (ppt),²⁰⁷ enough to cause a greater egg mortality in California populations than elsewhere. The egg mortality due to

²⁰⁰ Amaral Letter, supra note 148, at 2.

²⁰¹ Id., notes that "bald eagles are not the only one of many fish eating birds and mammals present in the [Penobscot River] watershed. Loons, osprey, mergansers and other diving ducks, as well as great blue herons may be exposed to fish containing elevated levels of dioxin. These species are protected under the Migratory Bird Treaty Act."

²⁰² Id. at 3.

²⁰³ Letter from Russell D. Peterson, Supervisor, Portland (OR) Field Station (USFWS) to Robert S. Burd (Region 10 EPA), re: Section 7 Consultation for Columbia River TMDL (Nov. 21, 1990).

²⁰⁴ Id.

²⁰⁵ Id.

²⁰⁶ Id.

²⁰⁷ Jarman, W.M., S.A. Burns, R.R. Chang, R.D. Stephans, R.J. Norstrom, M. Simon and J. Linthicum, Determination of PCDDs, PCDFs, and PCBs in California peregrine falcons (*Falco peregrinus*) and their eggs, Environ. Toxicol. Chem. (1993) (in press).

these toxic chemicals is restricting the recovery of this endangered species in California.²⁰⁸

EPA has recently estimated levels of dioxin in fish that are ostensibly "safe" to wildlife.²⁰⁹ However, as discussed previously,²¹⁰ abundant uncertainties exist as to whether these levels are actually protective of wildlife. Given the widespread dioxin contamination of the nation's waters and its extraordinary persistence and accumulation,²¹¹ the fact that the levels at which effects are expected remains uncertain justifies the "significant concerns" raised about the effects of dioxin on wildlife.²¹² As suggested by the evidence of dioxin's impact on bald eagle populations, these concerns may be particularly important for threatened and endangered species.

Public Health

As presented earlier,²¹³ the contamination of fish and shellfish in large numbers and the contamination of large areas of U.S. waters, presents grave cancer, reproductive and immunological risks to people who consume fish. Dioxin contamination is a widespread and pernicious problem for human health.

Despite the general high risk to public health, however, the health of people who consume large amounts of fish is particularly threatened by dioxin. Such people include Native Americans and other ethnic minorities, anglers and subsistence fishing communities.²¹⁴ This group's exposure to dioxin has been routinely underestimated

²⁰⁸ Id.

²⁰⁹ Interim Report, supra note 22, at 5-8.

²¹⁰ See supra Sections A.2.b. at A-8, and A.2.c. at A-10.

²¹¹ See supra Section A.2.a., b., and c.

²¹² Interim Report, supra note 22, at 5-8.

²¹³ See supra Section E at A-32.

²¹⁴ EPA recently issued a joint public notice of a draft NPDES permit for Lincoln Pulp and Paper Company, Inc. to discharge effluent in the Penobscot River. In this draft notice, EPA acknowledged that the Penobscot Indian Nation had a fish consumption rate nearly twice the national average fish consumption rate assumed in deriving EPA's criterion. U.S. EPA Water Management Division, Compliance Branch, Region 1 and Maine Department of Environmental Protection, Bureau of Water Quality Control, August 23, 1993.

because their consumption of fish greatly exceeds the national average, the figure used to determine such exposure.²¹⁵

The current ambient water quality standard for 2,3,7,8-TCDD assumes that people receive their dioxin exposures through the consumption of no more than 6.5 g/day²¹⁶, or roughly one 8 ounce fish meal per month on average. This value, which is also commonly used by EPA to estimate dioxin's health risks, is based on estimates of the average fish consumption rate of freshwater and estuarine fish across the U.S. However, EPA has indicated that values of 30 g/day and 140 g/day represent average consumption rates appropriate for avid sport anglers and subsistence consumers, respectively.²¹⁷ This substantial underestimation of the amount of fish consumed by these groups means they have been habitually provided less protection from the effects of dioxin than other segments of the public.²¹⁸

Furthermore, ethnic minorities, anglers and subsistence fishing communities are more likely to eat fish with the skin and without trimming the fat.²¹⁹ A higher than average consumption of fish, combined with the ingestion of the skin and fat, is likely to lead to an even greater exposure to dioxin.

As an illustration of the above, in Alabama, 10 bleach kraft paper mills discharge dioxin into all the State's major river systems.²²⁰ Dioxin has been found in fish from at

²¹⁵ See EPA, Environmental Equity Reducing Risk for All Communities, Vol. 1.: Workgroup Report to The Administrator, EPA230-R-92-008 (June 1992), at 15-16; EPA, Environmental Equity Reducing Risk for All Communities, Vol. 2: Supporting Document, EPA230-R-92-008A (June 1992), at 12.

²¹⁶ Ambient Water Quality Criteria, *supra* note 2.

²¹⁷ EPA, Exposure Factors Handbook, EPA/600/8-89/043 (1989).

²¹⁸ Fish consumption rate estimates are usually designed to be protective against the long-term adverse effects of dioxin, e.g., an averaged 70-year exposure for cancer. Recent studies, however, indicate that shorter duration exposures, including single doses, are capable of causing reproductive, developmental, and other effects. Therefore, fish consumption rates based on long-term, averaged consumption estimates may not be protective for people who consume large amounts of fish over short periods.

²¹⁹ Workgroup Report and Supporting Document, *supra* note 215 (dioxin tends to accumulate in the fatty portions of fish).

²²⁰ See Risk Assessment, *supra* note 131.

least 8 sites along Alabama rivers and lakes.²²¹ Studies show that African-American Alabamians depend more heavily on fishing as a food source than other groups in the state.²²² One study found that a particular African-American community ate fish at a rate three to seven times the national average.²²³ Another study found that African-American anglers rated the importance of their fishing catch to their family's diet twice as often as did white anglers.²²⁴ Given the importance of fish to African-American Alabamians, this group will experience higher levels of exposure to dioxin than other Alabamians.²²⁵

It is clear that all exposures to dioxin and related chemicals accord a clear and present danger to general public health, a danger that is exacerbated in certain populations.

²²¹ Letter from Robert Adler, Senior Attorney, NRDC, Diane Cameron, Environmental Engineer, NRDC, and Al Mills, Environmental Director, Bass Anglers Sportsman Society, to Greer Tidwell, Administrator, EPA Region IV (Sept. 14, 1990).

²²² Kreiss, K.; Zack, M.; Kimbrough, R.; Needham, L.; Smrek, A.; and Jones, B., "Cross-sectional Study of a Community with Exceptional Exposure to DDT," Journal of the American Medical Association, Vol. 245, No. 19, pp. 1926-1930 (1981); Morse, S., Destination and Importance of the Recreational Harvest to Anglers on the Alabama Gulf Coast. Master's Thesis, Auburn University, Auburn, Alabama (1988).

²²³ Kreiss et al., supra note 222.

²²⁴ Morse, supra note 222.

²²⁵ The Clinton Administration has expressed support for efforts to protect minority communities from toxic pollutants. See BNA, Administration Drafts Executive Order to Protect Minority, Low Income Citizens, Daily Environment Report, August 10, 1993, at AA1 (Federal agencies would be required to promulgate regulations to address disparate effects of pollution on low-income and minority communities under an executive order on environmental justice).

APPENDIX B

PETITION TO PROHIBIT THE DISCHARGE OF DIOXIN:

Names and Addresses of Petitioning Organizations and Individuals

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APPENDIX C

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September 13, 1993

The Honorable Carol Browner
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Re: Wastewater discharges of dioxin from the Pulp & Paper Industry

Dear Administrator Browner:

We are writing in conjunction with a Petition filed with EPA by the Natural Resources Defense Council (NRDC) and other environmental groups requesting that EPA promulgate a dioxin effluent prohibition under the authority granted by Section 307(a)(2) of the Clean Water Act. We, like NRDC and others, are concerned with the direction that EPA is apparently taking, as set forth in the Petition, in developing proposed BAT and MACT guidelines for the pulp & paper industry, as well as recent actions taken by EPA with respect to management of dioxin in pulp and paper mill sludges. As you know, pursuant to Part IV of the Consent Decree in EDF & NWF v. Thomas (No. 85-0973, D.D.C.) and to subsequent extensions to which we agreed, EPA is required to publish proposed BAT guidelines by October 31, 1993, and was required to act on sludge proposals by December 1992.

In the context of discussing requests for extensions to the deadlines in this Decree, EPA staff have made numerous representations to us that EPA was actively considering totally chlorine free (TCF) technologies as BAT, as well as critical treatment processes such as oxygen delignification which would be consistent with implementation of TCF technology in the future. However, a series of recent actions by EPA imply that the agency is now considering altering that course of action.

We have been previously informed by your staff that the dioxin sludge rules have been indefinitely postponed, apparently based on the assumption that the BAT guidelines will resolve dioxin contamination in sludge. Despite our continued requests, EPA has refused to provide any information on the basis of the delay for the sludge rules, or any future compliance date. In the meantime, EPA staff have consistently discussed BAT proposals which do not evaluate dioxin discharge elimination strategies among existing mills because of

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a perceived analytical "limit of detection," and which have not evaluated even existing state-of-the-art facilities

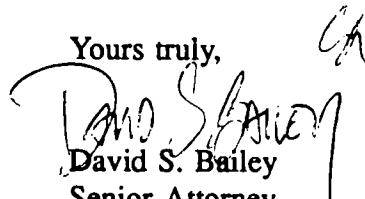
which have greatly reduced the use of all chlorine compounds, e.g. Union Camp. Just recently, we are informed that EPA is seriously considering proposing for comment a BAT strategy which would require nothing more than 100% chlorine dioxide substitution. This is a process modification which does not reflect current available technology, does not address the dioxin problem or a host of other chemical pollutants, and is not even cost-efficient for the paper industry over the long term.

We have carefully reviewed the petition for an effluent prohibition against dioxin discharges filed by NRDC, et al. We have concluded that this petition offers EPA an effective opportunity to implement TCF technologies and eliminate dioxin discharges. Therefore, we recommend that EPA grant this Petition and begin implementation of a technology strategy for the paper industry that eliminates dioxin discharges in the paper-making process. It is also crucial that you recognize the potential for such technologies (unlike chlorine substitution) to all, or nearly all, paper mill discharges through wastewater recycling, in conjunction with other BAT and MACT control strategies. The benefits of such a technology go far beyond the immediate advantages of dioxin elimination and enable the industry to solve both present and future water quality problems.

Should EPA continue on its present course of action, with respect to chlorine dioxide substitution as BAT and unsupported delays in sludge rulemaking, we will have to review other options, including joining as co-petitioners in the NRDC, et al., Petition as well as seeking additional relief from Judge Green pursuant to the Consent Decree.

Thank you for your time and consideration.

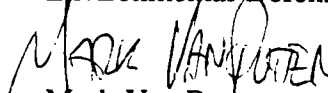
Yours truly,



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APPENDIX D

ENVIRONMENTAL DEFENSE FUND COMMENTS ON LIMIT OF DETECTION FOR DIOXIN

Over two years ago, EPA proposed to publish revised methods for the detection of 2,3,7,8-TCDD ("dioxin") [56 FR 5090 (February 7, 1991)].¹ Although EPA has long known that methods existed to detect dioxin at very low part per quadrillion (ppq) levels, the agency has failed to revise existing methods of analytical detection. Furthermore, EPA, through informal guidance documents, has stated its intentions to enforce NPDES permits containing dioxin limitations at 10 ppq, the perceived "quantification limit" for dioxin analysis in pulp and paper mill effluents². This is the case even where applicable permits and water quality standards require a lower level of discharge for dioxin.³

EPA has further aggravated this situation by applying the same 10 ppq analytical limitation to its technology evaluations for the proposed BAT and MACT guidelines under the Clean Water Act and the Clean Air Act.

Such EPA actions violate both the letter and the intent of the Clean Water Act by failing to ensure compliance with applicable water quality standards. Furthermore, EPA's position is not supported by the current state of analytical science, or even EPA's own published technical documents.

^{1/} Joint comments to the EPA proposal were submitted by the Natural Resources Council of Maine, EDF and NRDC (April 10, 1991) and are incorporated herein by reference.

^{2/} EPA, Technical Support Document For Water Quality-based Toxics Control, Office of Water, EPA/505/2-90-001 (March 1991) 111-112; See also, EPA, "Final Guidance on Section 304(l) Listing and Permitting of Pulp and Paper Mills" (March 15, 1989); EPA, "Strategy for the Regulation of Discharges of PHDDs and PHDFs from Pulp and Paper Mills to Waters of the United States" (May 21, 1990). EPA's Technical Support Document suggests that EPA may employ a "minimum detection level" which may differ from a... quantification limit; however, for dioxin the agency continues to use 10 ppq.

^{3/} Supra, note 2.

THE CLEAN WATER ACT REQUIRES
COMPLIANCE WITH WATER
QUALITY STANDARDS

It has long been established, by the plain language of the Clean Water Act, that each and every NPDES permit must meet either (1) applicable technology-based effluent requirements or (2) applicable water quality requirements, whichever is more stringent.⁴ Federal court decisions are consistent with the language of the Act. NRDC v. EPA, 915 F.2d 1314, 1317 (CA 9th 1990) (Congress supplemented the "technology-based" limitations with "water-quality-based limitations) and 1318 (renewed emphasis on water-quality-based standards [in 1987 amendments]); Arkansas v. Oklahoma, 112 S.Ct. 1046, 1056 (1992) (Since 1973, EPA regulations have provided that an NPDES permit shall not be issued when the imposition of conditions cannot ensure compliance with the applicable water quality requirements of all affected states [citing 40 CFR § 122.4(d)]); S. Rep. No. 414, reprinted in 1972 U.S. Code Cong. & Admin. News 3668, 3710 (EPA under specific obligation...to implement existing water quality standards without regard to the limits of practicability); Arkansas v. Oklahoma, 908 F.2d 595, 613, n.23 (CA 10th 1990), rev'd on other grounds, 503 U.S. ___, 112 S.C. 1046 (1992) (violations of water quality-based effluent limitations are not subject to a technology-based upset defense).

It logically follows that if EPA is not authorized to issue a permit which fails to include applicable water quality conditions, there also can be no authority to issue a permit containing water quality requirements that are neither enforceable, nor where the discharger is incapable of demonstrating compliance. The unmistakable intent and purpose of the Act is to achieve and maintain water quality standards, not to be side aside by present technical shortcomings, including arbitrary limits of detection.

Throughout the Act's implementation, both legislative history and the courts have confirmed that water quality standards must be complied with, even if current technology or economic conditions are not available to existing discharges. See, Mississippi Comm. on Natural Resources v. Costle, 625 F.2d

⁴/ Section 301(b) states "In order to carry out the objective of this Act there shall be achieved- (1)(A) not later than July 1, 1977, effluent limitations for point sources...which shall require the application of the best practical control technology...or, (C)...any more stringent limitation, including those necessary to meet water quality standards....". U.S.C. §1311(b)(1)(A) and (C).

1269, 1277 (1980); NRDC v. EPA, 915 F.2d 1314, 1317; S. Rep. No. 414 supra. EPA is without authority to subvert the Act's plain language by excusing compliance with water quality standards because of detection limitations. EPA's view that dischargers who cannot meet water quality standards because of a lack of treatment technologies must close, but dischargers who cannot meet standards, or demonstrate attainment of standards for analytical detection reasons, are immune from the Act's conditions is illogical. If EPA is responsible for "forcing technology" to meet water quality limitations, it is certainly equally responsible for forcing technology to meet analytical requirements. "Furthermore, when Congress wanted economics and cost to be considered, it explicitly required it." Mississippi Comm. at 1277.

EPA regulations also plainly state that water quality standards serve as the regulatory basis for treatment controls:

Such [water quality standards] serve the dual purposes of establishing the water quality goals for a specific water body and serve as the regulatory basis for the establishment of water-quality-based treatment controls and strategies beyond the technology-based levels of treatment required by sections 301(b) and 306 of the Act.

40 C.F.R. §130.3, 131.2 (emphasis added). See also, A Legislative History of the Water Pollution Control Act Amendments of 1972, H. Serial No. 93-1, January 1973 at 792.

If EPA, or the discharger, cannot analyze or otherwise evaluate compliance with applicable water quality limitations, then neither can demonstrate compliance with the Act's basic requirements. EPA's view, apparently, that it must show noncompliance with the standard by monitoring is a perversion of the Act's language. EPA has a duty, in conjunction with the States, to develop and adopt appropriate standards (See generally, Sections 304 [EPA to promulgate criteria], 313 [states to adopt standards using criteria with EPA approval]; the "requirement of the Act is that EPA formulate these policies for water quality criteria [citing §1314(a)]", Mississippi Comm. at 1266; and these standards must protect stream uses [§1313(c)]. EPA is further obligated to "require that level of effluent control" to demonstrate compliance with water quality standards. S. Rep. No. 414 at 3710. That burden is not met by merely reporting a discharge below a limit of detection which may be orders of magnitude above required permit limitations.⁵

⁵ It is possible that routine compliance monitoring may present a series of problems with regard to cost, laboratory availability, or reliability of pollutant measurements. These

Should EPA deem it necessary to institute other control mechanisms to assure compliance, it is authorized to do so:

Whenever...discharges of pollutants from a point source or group of point sources...would interfere with the attainment or maintenance of that water quality in a specific portion of the navigable waters which shall assure protection of public health, public water supplies, agricultural and industrial uses, and the protection of a balanced population of shellfish, fish and wildlife,...effluent limitations (including alternative effluent control strategies) for such point sources shall be established which can reasonably be expected to contribute to the attainment or maintenance of such water quality.

33 U.S.C. §1312(a).

EPA's legal authority to implement additional monitoring requirements, or to seek additional information about discharge compliance has already been confirmed. Texas Municipal Power Agency v. EPA, 836 F.2d 1482 (CA 5th 1988) (EPA has authority under the Clean Water Act to regulate internal wastewater streams if "it is impractical to assure [compliance] by monitoring only the discharges to [the receiving water]"); Mobile Oil Corp. v. EPA, 716 F.2d 1187 (CA 7th 1983) (EPA may sample a permittee's untreated wastewater to help it detect trace amounts of toxic pollutants in the discharge to the receiving water). EPA regulations provide explicitly for such situations: "When permit effluent limitations...imposed at the point of discharge are impractical or infeasible, effluent limitations...for discharges may be imposed on internal waste streams." 40 CFR §122.45(h).

Furthermore, EPA's Technical Support Document for Water Quality-based Toxics Control⁶ recognizes that water quality requirements must be met in substance, not merely in window-dressing permit limits:

problems are best addressed in the permit issuance stage where minimum monitoring needs for enforcement of NPDES discharges can be structured as appropriate. The need for routine monitoring for compliance enforcement is distinguishable, however, from the need to demonstrate a basic ability to meet water quality standard conditions with the existing treatment system. Without such demonstration, the applicant fails to meet the initial requirements to obtain a permit in the first instance.

⁶/ Supra, note 2.

Where water quality-based limits are below analytical detection levels placed in permits, EPA recommends that special conditions also be included in the permit to help ensure that the limits are being met and that excursions above water quality standards are not occurring. Examples of such special conditions include fish tissue collection and analysis, limits and/or monitoring requirements on internal waste streams, and limits and/or monitoring for surrogate parameters.

EPA Technical Support Document at 112.

While it may be possible to ensure compliance with effluent limitations through biological monitoring, internal sampling or surrogate parameter analysis, EPA has not published any guidance with respect to such devices for dioxin. To date, EPA has only vaguely alluded to individual state effluent monitoring or toxicity evaluation programs, without identifying the special conditions or procedures required to effectively monitor dioxin's known delayed toxicity, generational toxicity or chronic long-term immune, reproductive and developmental toxicity. Without such guidance and implementation, biological monitoring is not an adequate substitute for chemical analysis. EPA has been requested, and has agreed, to explore the use of surrogate chemicals such as the dichlorodibenzo-furans but has so far failed to identify any suitable surrogate to ensure compliance with water quality standards.⁷

Even accepting, arguendo, that a consistently reliable methodology is needed for routine enforcement monitoring, that does not abdicate EPA's, and the discharger's, responsibility to demonstrate a basic ability to achieve water quality standards (§§301; 302). The capability of a treatment system to comply with applicable standards can be determined by detailed, site-specific studies. Such site-specific evaluations can, and must use the most advanced detection methods available as necessary to demonstrate treatment removal efficiencies for target pollutants. Where such evaluations demonstrate that pollutant levels cannot be reasonably expected to meet water quality standards, no permit to discharge may issue [§301(b)(1)(C)].

The Act provides EPA with numerous alternatives to apply in cases such as this: EPA may (1) require the discharger to demonstrate appropriate analytical capability to measure compliance; (2) permit the discharger to demonstrate compliance by alternate means [such as nonuse of the applicable pollutant in process, i.e., "chlorine-free" technology in the case of dioxin]; (3)

^{7/} See, Consent Decree, EDF & NWF v. Thomas (No. 85-09073, DDC; extended by order of April 2, 1992).

apply the use of "surrogate" pollutant analysis which can be shown to equate to compliance for the applicable standard; or (4) prohibit the discharge of the particular pollutant under of the Act.⁸ To date, EPA has been unable, or unwilling, to do any of the above. EPA cannot, however, evade its responsibility under the Act by relying solely upon detection limitations.

EPA HAS FAILED TO DEMONSTRATE
THAT ANALYTICAL DETECTION
FOR DIOXIN AT WATER QUALITY
COMPLIANCE LEVELS IS NOT
ACHIEVABLE.

The so-called "quantification limit" of detection which apparently drives present EPA action is not a real "limit of detection". A quantification limit represents a level of analysis believed to be consistently reproducible and within acceptable variance levels of reporting for various laboratories. It is a term applied and used for routine enforcement monitoring purposes and other compliance monitoring.⁹ It is not the lowest level at which a particular pollutant may be detected or identified. See, EPA Technical Support Document, supra, note 2.

It is clear, by EPA's own technical documents, that dioxin can be detected at levels well below 10 ppq. EPA recently published a final report on dioxin data and assessment methods which flatly states that while current detection limits for dissolved dioxin in water is 0.5 ppq, minimum levels of detection may be lowered by as much as a factor of 10^4 through large volume sampling, optimum sample clean-up, and maximum instrument sensitivity.¹⁰

The fact that dioxin can be detected at levels below 10 ppq has been known for years. Even the consultant/expert witness for the paper industry, Dr. Yves Tondour (Research Triangle Park), noted that future dioxin analysis detection limits "can be increased by several orders of magnitude by using

⁸/ EPA has authority to prohibit the discharge of pollutants, based on certain findings, under Sections 301(b)(2)(A) and 307(a)(2) of the Act.

⁹/ See, "Defining Detection and Quantitation Levels". Water Envir. & Tech., 41-44 (Jan. 1993).

¹⁰/ "Interim Report on Data and Methods for Assessment of 2,3,7,8-Tetrachlorodibenzo-p-dioxin Risks to Aquatic Life and Associated Wildlife," EPA ORD EPA/600/R-93/055 (March 1993, page 2-5).

special polymeric substances capable of retaining organic pollutants from large volumes (100 L to 1000 L) of wastewater from which the contract laboratory could extract and isolate 2,3,7,8-TCDD."¹¹

Even assuming, arguendo, that current detection limits cannot be lowered by a factor of 10^4 in pulp and paper effluents, it is indisputable that lower detection limits are obtainable. Paper industry officials made public announcements at EPA's pulp and paper technology conference in 1992 that they had reduced dioxin levels to 1 ppq or less, and had confirmed such reductions by analytical techniques with limits of detection at 1 ppq. The Lincoln Pulp & Paper Mill submitted chemical analysis data to the Penobscot Indian Tribe asserting that no TCDD was found in their effluent at a detection limit of 1.9 ppq.¹²

At the most recent EPA pulp and paper meeting in North Carolina (June 29, 1993), EPA officials referred to dioxin sampling procedures below 10 ppq as cumbersome and inconvenient.¹³ Neither physical difficulty nor increased costs, however, are valid reasons for failing to determine compliance with water quality limitations. Nor is the selective use of limit of detection to hide discernable levels of TCDD and TCDF in effluents acceptable. Again, if dischargers may be denied permits because of technology limitations which may involve millions of dollars, it can hardly be said that a little inconvenience in sampling and analysis is an adequate basis for negating water quality standards. Furthermore, EPA has never made any finding, much less documented, that such sampling and analytical procedures are technically or practically infeasible. Rather, EPA has published documents, referenced herein, which contradict such arguments.

¹¹/ "Status Report on the State-of-the-Art for the Analysis of Minute Quantities of 2,3,7,8-Tetrachlorodibenzo-p-dioxin in Paper Mill Effluents." Prepared by Triangle Laboratories for Hunton & Williams (March 1990). Testimony submitted to the Virginia State Water Control Board, quote from page 16.

¹²/ Triangle Laboratories of RTP, Inc., 1613A TCDD/TCDF Analysis (DB-5). Final Effluent Lincoln Pulp and Paper Co., Inc., collected 12/22/92, analyzed 12/29/92. Report dated 12/30/92. (The sample contained 9.5 ppq 2,3,7,8-TCDF.)

¹³ EPA has also indicated that it may consider accepting comments on the use of biological assessment methods for dioxin in mill effluent. While it may be possible for EPA to develop such methodologies, as already noted, there is no evidence that present whole effluent tests are adequate for such purposes. Biological assessment methods could be potential surrogates for specific dioxin measurement in water, but only if it can be shown that such tests adequately assure compliance with WQS.

ANALYTICAL DETECTION ISSUES
CAN BE A BASIS FOR EPA
PROHIBITING POLLUTANT DISCHARGES

The Act provides EPA with explicit authority to prohibit the discharge of any toxic pollutant [§1311(b)(2)(A); §1317(a)(2)]. Dioxin is a toxic pollutant. Given the fundamental requirement to meet water quality standards, any pollutant which contravenes such standards but which can not be practically or technically measured at compliance levels should be a prime candidate for prohibition ab initio.

In the case of dioxin, of course, analytical problems are the least of concerns. EPA interim reports and Senior Scientist comments have already confirmed that the dioxin reassessment is showing dioxin toxicity at even lower levels, and that current body burdens of dioxin reach or exceed, when combined with other TEQs, effect levels demonstrated in laboratory animals¹⁴. It is highly likely that by the time the dioxin reassessment is completed and new information on wildlife toxicity, fish consumption and other pertinent factors are considered, the current criteria of 0.013 ppq will be lowered considerably. Already EPA has proposed or published dioxin limitations for fish and wildlife protection below 0.013 ppq.¹⁵

It is abundantly clear, as a matter of common sense, much less legal necessity, that allowable discharges of dioxin will be so low that continued use of chlorine in the manufacture of paper is no longer practical. In such an instance, both EPA and the Paper Industry's interest, time and resources are better served by focusing on chlorine-free technologies rather than continued efforts to demonstrate the absence or presence of a few molecules of dioxin in their wastewater.

¹⁴/ "Ligand/Receptor Binding for 2,3,7,8-TCDD: Implications for Risk Assessment". C. Portier, et al. *Fundamental & Applied Tox.* 20, 48-56 (1993) [No apparent threshold for dioxin toxicity; considerable concern for the high levels of TCDD already present in human tissues]. "Scientists from Europe and the United States agreed...that data indicate dioxin contamination levels in human blood are near the level expected to cause adverse health effects". *Chemical Regulation Reporter*, 2413-14 (March 19, 1993), quoting Dr. Linda Birbaum, Senior Scientist, EPA's Health Research Laboratory.

¹⁵/ See, EPA Proposed Great Lakes Water Quality Guidance, 58 FR 20802, 21031- (TCDD limits proposed at 0.0096 ppq); and EPA Interim Report on Data and Methods, supra (TCDD limits proposed at 0.0008 ppq).

If, however, EPA insists on determining dioxin detection limits, it is our view that the Act requires that (1) compliance with water quality standards be demonstrated; (2) that analytical techniques are available to make such demonstrations; and (3) that any attempt to negate demonstrated compliance with water quality standards by use of "quantification limits" is not authorized by the Act and subject to legal challenge.

File exists —

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THE WHITE HOUSE

WASHINGTON

August 8, 1993

MEMORANDUM FOR KATIE MCGINTY
KEN CONOLLY

FROM: Peter Yu

SUBJECT: Comments on Draft Executive Order on
the Use of Recycled Products

Thank you for sharing with me the current draft of the Executive Order. I would offer three comments.

1. The Federal Task Force on Environmental Progress

The draft Order would create a new Federal Task Force on Environmental Progress, with related "committees and work groups" and a minimum of "four full-time staff." While I appreciate the planned duties of the Task Force, I wonder whether those duties might better be fulfilled without the creation of a new entity. One of the principles animating the National Performance Review (NPR) is the streamlining of the federal government, and I am concerned that the creation of a new layer of federal authority over acquisitions and office management is in tension with that principle. The NPR relies on "performance-based management"—perhaps in this case the government might be better served by articulating goals and benchmarks for recycling and waste prevention, rather than creating a new Federal Task Force.

2. Minimum Content Standards

I have received numerous comments from industry criticizing Sections 503(a) and (b) of the draft Order, as, I gather, have many others in the Administration. With regard to the 15-percent minimum content for "white paper," the industry claims that only a small proportion of their plants can produce such paper and that a 10-percent standard would be preferable.

- Georgia-Pacific, for example, contends that less than 4 percent of its current capacity can produce 15-percent paper, but that all of its capacity can produce 10-percent paper.
- The American Paper Institute indicates that, industry-wide, between 4 and 8 percent of all high-volume machines can produce 15-percent paper, although virtually all can produce 10-percent paper.

This differs from what appears in the briefing papers

PHOTOCOPY
PRESERVATION

This creates the paradoxical situation in which a 15-percent standard will actually lead to *less* recycling than a 10-percent standard. If these facts are true, perhaps a phase-in of the 15-percent standard is desirable in order to allow for retooling.

With regard to the 50-percent total recovered content, the industry claims that such a standard is not likely to increase the level of recycling. One study reports that 98 percent of all printing-writing paper scrap is currently recycled and thus indicates that a higher content requirement will not substantially increase recycling.

3. The TCF Goal

Finally, industry strenuously objects to the articulation of goals for totally chlorine-free (TCF) paper. The industry contends that such production is not currently feasible in the US, and points to recent remarks by EPA Administrator Browner to that effect. If, as the industry claims is historical practice, other consumers adopt federal goals and standards, the US paper industry will lose, while foreign paper manufacturers (who currently claim to have TCF capacity) will gain. If these facts are true, perhaps it would be better not to mention the TCF goals in the Executive Order.

I hope these comments are helpful; please call me if I can be of further assistance.

Brian Burke -
Let's discuss
this. CDR

INTERNATIONAL PAPER

(202) 785-3666

September 30, 1993

Honorable Carol Rasco
Assistant to the President for Domestic Policy
Domestic Policy Council
Executive Office of the President
1600 Pennsylvania Ave., 20500

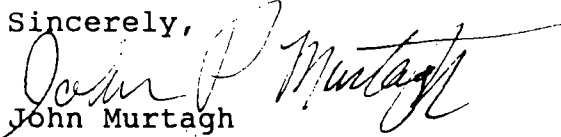
Dear Ms. Rasco:

Thank you for the opportunity to meet with you to discuss the proposed executive order regarding recycled content printing and writing papers.

As you probably are aware, International Paper was not invited initially to respond to the questions sent out by Ken Connolly or to attend the meeting that was held at OMB on September 27. Since we are one of the largest producers of printing and writing papers as well as a large producer of recycled-content printing and writing papers, we are extremely interested in this order. Therefore, I obtained a copy of the questions and have attached a copy of my response to them for your information.

If you or your staff have additional questions, please feel free to call.

Sincerely,


John Murtagh
Director
Recycling Programs

cc: A. Burke
B. Burman
J. MacRae
P. Yu
K. Zoi

Recycling
executive
order

INTERNATIONAL PAPER

John Murtagh
Director
Recycling Programs

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September 23, 1993

Mr. Ken Connolly
White House Office on Environmental Policy
Room 360 Old Executive Office Building
Washington, D.C. 20501

FAX (202) 456-2710

Dear Ken:

Introduction and General Observations

Before getting into the "questions regarding recycled paper", I need to cover some important matters. First, International Paper's response is based on its actions and experience, not theory and policy concerns. We are one of the largest producers of printing and writing papers in the world and we have added recycled fiber products to virtually all of our printing and writing product lines. We would like to continue that progress. To do that, we must not only consider the products we are making today, but the products we may be able to make in the future. We are very concerned that the Executive Order will limit our opportunities for the future.

Second, we have continued to emphasize to you that the effect the Executive Order on private sector markets for recycled content paper could be devastating. I first raised this issue personally in 1990 with EPA about its 1988 guidelines when we found that they were hurting marketing of coated papers contained deinked fiber from postconsumer sources. EPA recognized that it probably had included coated papers in its guidelines inadvertently, even though the government buys virtually none of this product, and that its guideline was being used by private sector purchasers. However, EPA was powerless, because of the rulemaking process, to make any adjustment. That is a critical point. If you make a mistake and it causes negative effects in the private sector, it cannot be adjusted easily. Moreover, the EPA guideline has been carried into state purchasing guidelines, compounding the problem. Even today, after 3 more years, we continue to encounter customers who resist buying recycled content paper because of government purchasing guidelines which do not apply to private transactions and which were never intended to cover their type of paper products.

Third, you may have some misinformation about our recently announced plans for a project in Alabama. Based on my conversation with you last week, and on a subsequent conversation with

Lauren Blum of EDF, I think you were both under the impression that we were planning to construct a facility to produce recycled content paper with 18 - 20% deinked fiber from postconsumer sources. That is incorrect. Apparently someone made their own calculations from the size of the deinking facility to be installed and the final paper machine capacity. They must have assumed that all the deinked fiber would be used on those paper machines. The actual situation is far different. The existing paper machine at Riverdale is one of our largest and fastest machines, and the new paper machine to be installed will be one of largest and fastest in the world. We have no experience running deinked fiber on these types of machines, although we do have some experience with levels up to 10% on some of our larger machines. Based on that, we have some confidence we can run at the 10% level when the machine begins operating in 1996. We know that deinked fiber can require the machines to be run at slower speed, but we are not sure at what level that effect will become a problem. Whoever was trying to calculate what we would do at the Riverdale mill apparently failed to recognize that the existing mill produces two products, paper and market pulp. As a result, we are able to add a deinking facility larger than the mill's needs. We will then have the capacity to send deinked pulp to our other facilities or to sell it on the market. Regardless, your attention should not be directed at new capacity or major construction projects because most of the paper purchased by the government and sold in the private sector will continue to be made at the existing, large, integrated paper machines in our system and other companies around the company. It is the effect on these mills, and whether your proposal helps or hurts their chances to use recycled fiber, that should be your primary focus.

Finally, I do not believe you or some of the advocates of higher percentages of recycled content understand the effect of those levels on these existing paper mills. It is far greater than "only" increasing from 10 to 15%. Recognize that 10% purchased deinked fiber substituted at an existing, integrated paper mill can raise fiber costs by 30 to 40%. That effect alone can decrease potential operating profit by over 20%. As a result, recycled fiber use at these largest and most efficient producers has been limited. Where we do make recycled content paper at these mills, it has primarily been done in limited production runs at low volumes. We have found a few opportunities, by taking other actions such as changing product mixes for our paper mills, to reduce that effect, and we have expanded recycled fiber into larger scale production at some of our mills at the 10% level. What is the effect of going to 15%? It is far larger than you suspect. In addition to increasing the fiber cost, it also begins to effect total mill operation requiring less efficient operation of existing pulp mills, increased chemical cost, and reduced paper machine productivity. The combination of those factors, based on studies we have conducted, can reduce potential profitability by over 60%. While we may be creative enough to overcome some of the cost problems associated with adding recycled fiber at these large existing mills, 60% is too big a hurdle. Even if we have the capital and can obtain necessary approvals to install deinking capability at one of these mills, the cost of going to a 15% standard can still approach a 50% operating profit penalty.

How do you expect us to make progress at these existing mills against this kind of cost obstacle? Especially when the content levels you select spread into the private sector, we will be right back

where we were three years ago. Instead of leading, the government will be regressing. We will be in a situation where customers will want a product which meets the "government-approved standard", but it is cost prohibitive either for us to make or for them to purchase. As a result, less recycled fiber will be used at the largest paper machines resulting in less recycled fiber being used in the aggregate in printing and writing papers.

Definitions

With regard to the definition of "recycled content", we recommend that the term "processed recovered fiber", currently under development by ASTM, or an equivalent term, be used to describe the deinked and processed material for the paper products. However, you should recognize that some companies have geared their current production to meet the existing 1988 EPA guideline of "50% wastepaper". I do not think this would be a particular problem for International Paper, because all of our recycled content papers contain deinked fibers.

"Processed recovered fiber" includes postconsumer and other printed or contaminated materials which need to be processed prior to reusing to make printing papers. I have heard the environmental groups argue we must use only "postconsumer" in order to ensure that material going into the waste stream is used the products. They have never run a paper mill, especially a large one, where fiber costs are a major component. At those mills, we will use postconsumer recovered paper if we can. Now and in the future, mills will use the lowest cost, acceptable-quality recovered paper to make their products. The non-postconsumer printed material generated at printing plants and converting operations is easier to collect and more uniformly contaminated. As a result, it commands a premium in the wastepaper markets. Wastepaper from office buildings, even when sorted, is generally less homogenous and a lower cost raw material for mills that are able to use it.

As recycling expands and more mills, especially printing and writing mills, are seeking this source of recovered paper, it will be increasingly difficult in the future to find "pure postconsumer". Think of your own building. What happens to out-of-date booklets and reports? What about materials that are produced and never distributed? How is the wastepaper from a copy center in your building any different from wastepaper from a quick printer or a small printing operation? In your building, all those materials probably end up in the same collection system. Trying to then separate them and keep them separated all through the collection and transportation system to the paper mill incurs a cost that will only hurt recycling efforts. You cannot only focus on the current situation, but you have to look to the future. We need a larger, more efficient system to deliver recovered paper to mills, like our project in Alabama, if we are to be successful in marketing commercially-viable, recycled content paper products.

I know a number of the cities are concerned about postconsumer materials and tend to focus their activities and their advocacy on the use of postconsumer materials. As I hope you realize, and as every technical person and even some of the environmental groups have concluded, the paper in municipal waste of concern to cities is paper from residences, called residential mix. That is not a recovered paper fiber source for printing and writing grades, especially the large mill, large-volume products. However, as the printing and writing grades pull more suitable recovered paper into their operations, paper mills making packaging and other paper products will continue, as they are already doing, to look for opportunities to use the more mixed grades of paper suitable to their operations. That is exactly what we are trying to accomplish; set the stage so the largest printing and writing mills can begin to use some recycled fiber thus increasing total recycling of paper and more diversion of paper from landfill disposal.

Capacity

With regard to capacity, as I said above, this is not a new capacity/new construction issue. Given expected growth, most of the paper will continue to be made at the existing paper mills. We and the other companies have billions of dollars invested in existing equipment and hundreds of thousands of employees making paper products. Especially if the Executive Order spills into the private sector, which is likely, a 15% or higher "postconsumer material" standard, as early as 1995 or 1996, will jeopardize the competitive position of these paper mills if they try to make paper for yours and private sector requirements. We are the world leader in the production of paper; we have the most efficient paper production system in the world. Moreover, we are a major force in the international markets with 60% of the total industry's growth in the last several years coming from export business. By going to standards as high as 15% and above, you will create one of two unacceptable scenarios. First, if existing mills try to make papers meeting your standard, they will harm their competitive position in national and international markets. Second, and much more likely, the mills will not add recycled capability because the standard you have set is too high for them to do so profitably.

At International Paper, the consequences of a 15% or higher standard could be worse. As noted above, we have already added deinked fiber from postconsumer sources to a number of our product lines. Just as a result of the preliminary news reports about the proposed Executive Order, we are already getting calls from customers using those products (in the private sector) concerned about whether they can continue to do so in the future if the government is going to change the definition of a recycled product. We will be back where we were a few years ago with private sector customers wanting a product which meets the "government standard" yet not willing to pay anything more for it. At the worst, and this seems totally insane, it may mean that we would drop our recycled content product line and go back to a non-recycled paper product.

Employment

With regard to jobs, I mentioned above the competitive position of our paper mills both in the national and international markets. Those existing, large paper mills are a tremendous asset, usually the largest employer in a region and a generator of a tremendous amount of revenue in capital, employment, and other spending during the year. I believe that with a 10% standard for federal purchases you will continue to see investment at these existing mills as they attempt to find ways to add recycled fiber while continuing to maintain acceptable levels of profitability to support operations. At levels of 15% and above, the barrier is too great and this major opportunity to use recycled fiber will be lost. In addition, you should recognize that paper prices are at a low level and have been depressed for some time. Imposing additional cost requirements for recycled content papers at a level out of reach will only hurt the ability to continue paper mill operation.

Federal Budget

Costs to the federal government will increase if all government agencies purchase recycled content papers, probably at any of the selected levels. That cost increase will be minimized at the 10% level because it fits closer to the existing mill operating parameters and will ensure greater competition for government purchases. As you can see from the above information, if our costs increase so much to achieve a 15% level, we are very unlikely to produce that paper unless the government is willing to pay a premium, and a very substantial one, for the paper. If this administration is serious about "reinventing government", including government purchasing, you should have concerns similar to large purchasers in the private sector. You should want most of your products made on the most modern and efficient, high quality paper machines. You should understand your suppliers' cost structures, and you should be interested in the long term viability of your supply relationship. To put it in the Administration's words:

- "• shift from rigid rules to guiding principles;
- end unnecessary regulatory requirements;
- foster competitiveness and commercial practices;
- shift to a new emphasis on choosing "best value" products;
- develop more effective process to listen to...
vendors who do business with the government...
- rely more on the commercial marketplace."

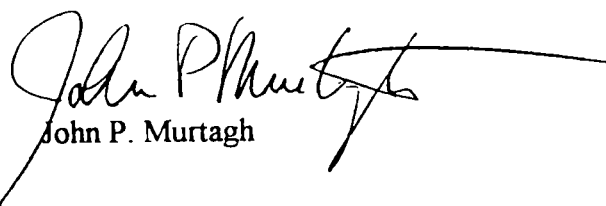
Furthermore, as noted above, your policy objective, increasing the use of recycled fiber in printing and writing papers, can be achieved at lower costs both to your suppliers and to you. What you have proposed will not only cost much more, it will achieve less recycling.

Conclusion

I believe I have covered whether your proposals are the correct incentives to "ensure mills of differing sizes begin to use postconsumer material in the production of paper". International Paper is an example of a company with a wide variety of paper mills. We have small non-integrated mills producing high quality premium papers with levels of deinked content ranging from 10 to 25%. We also have large, integrated, world-class machines producing high volume commodity products such as copy paper and offset printing paper. By selecting an alternative at the 15% level or higher, you foreclose or at least make it extremely difficult for those largest mills to begin using any recycled fiber. If your objective is to use government leadership to promote the purchase of recycled content printing and writing papers, I suggest you focus on increasing your "recycled" purchases, not setting percentages. The last report I saw from Al Burman included information through 1991 showing that the federal government agencies purchase less than 25% of their paper requirements with recycled content. I am assuming that most of the paper purchased is printing and writing grades, but I am not sure. Regardless, that should be your focus and your incentive. Increase that percentage to 50% or 75% in the near term, with paper made using postconsumer materials, probably at varying levels. Without creating disruptions in the private sector, without imposing barriers impeding increased recycling, and without greatly increased costs to the federal government, you could both put the government in a leadership position and help promote more recycling.

Contrary to the headlines in the press reports, we are not trying to "weaken" the recycling effort. We are trying to make it work better, and to avoid its interference with existing and future private sector recycling efforts.

Very truly yours,



John P. Murtagh

ken9-23
sk

— Interact'l Symposium on Paper & Pulp

— Send EPA data to AIL (Sally's office)

**AMERICAN
FOREST &
PAPER
ASSOCIATION**

**Red Cavaney
President**

September 3, 1993

**The President
The White House
Washington, D.C. 20500**

Dear Mr. President

A September 1, 1993 letter to you from environmental groups, and others interested in the draft Executive Order pertaining to federal procurement of recycled goods, contains several misstatements, including the following:

- The letter asserts that "a standard of at least 15 percent post-consumer content ... is the lowest level of recycled content that will provide an incentive to the paper industry to increase investments in recycling." This stands in stark contrast to the facts. Currently, there is no federal standard pertaining to post-consumer content in printing and writing paper, yet the paper industry has 200 mills operating in the United States which rely exclusively on recovered paper for their raw material. Again, with no federal action on the horizon, the paper industry in 1990 embarked upon a voluntary increase in recycling capacity which, by 1995, will encompass more than 130 facilities and involve approximately \$7.5 billion in investments over the 1988-1995 investment cycle.**
- The writers contend that, "Adopting a procurement policy that requires less than 15 percent post-consumer content would be worse for recycling than no action at all." As was noted in AFPA's August 6 letter to Peter Yu of your staff, requiring a 15% post-consumer content in printing and writing papers will result in less recovered paper being used, not more. Only five to ten commodity machines are likely to produce on a regular basis paper meeting the 15 percent level. At the levels suggested by the printing-writing producers, approximately twice as much post-consumer/processed recovered fiber could be used — and possibly much more, with an optimal industry forecast of 50% percent industry participation (see attached chart).**
- The letter provides no supporting data that, "the supply of...post-consumer paper significantly exceeds demand..." Increases in the use of recovered paper in the printing-writing grades will come primarily from used office paper, which is currently being recovered in line with growth in recycling capacity. EPA's consultant, Bill Franklin, projects a shortage of many types of recovered paper, including newspapers and corrugated containers, by 1995, and office papers beyond. Over the longer term, the industry has very real concerns about the supply of quality, source-separated recovered paper.**

**1250 Connecticut Avenue, N.W. Second Floor, Washington, D.C. 20036
Phone: 202-463-2700 Fax: 202-463-2785**

- The printing-writing producers are not suggesting that the Executive Order change or expand the definition of "post-consumer". Rather, they are asking that a larger universe of recovered paper - clearly identified as "post-consumer/processed recovered fiber" - be included in the Executive Order.

In its recent news release, the Natural Resources Defense Council (NRDC), a signator of the earlier referenced letter, also makes numerous errors. Among them that the U.S. ranks below the European Community in paper recycling. The facts are as follows:

- The U.S. is the world's largest recycler of paper. We recover more paper than any other region of the world. In 1991, the last year for which worldwide data were available, the U.S. recovered 28 million tons of paper. The entire European Community accounted for 20 million tons (with Germany at 7.5 million) and Japan recovered 14.7 million tons. Our rate of recovery essentially matched the average of all EC countries at 37%. Only two EC countries exceeded a recovery rate of 40% (where the U.S. will be this year), and over half the EC was under the U.S. recovery rate. In 1991, the U.S. accounted for one-third of all paper recovery. Source: Pulp and Paper International, October 1992, page 32.
- The U.S. paper industry is not where the auto industry was 20 years ago. During a time of economic difficulty, the industry has invested at an unprecedented rate on modernization, new capacity - including recycling capacity - and in environmental improvement. To that end, in its recent survey, Fortune rated only two industries as earning an "A" on their report card for international competitiveness; the U.S. forest and paper industry was one.

It is also worth noting, that while well over 90% of the projected increase in U.S. paper recovery will be from post-consumer sources, no other country outside North America makes the pre-/post-consumer distinction. In other countries, "post-consumer" paper is anything outside the paper mill.

- Contrary to NRDC's contention, a rush to impose totally chlorine free (TCF), a technology whose time has not come, will hurt, not help, American industry's competitiveness in the world. The U.S. pulp and paper industry's efficient use of environmentally sound bleaching practices using chlorine compounds has allowed it to become the world's top producer of pulp, paper and paperboard. In fact, exports are the major engine of the industry's demand growth. Sixty percent of production increases since 1988 were derived from foreign demand.
- NRDC's contention that demand for TCF products is growing is just not true. The fact is that demand has stabilized at a very low level. The reasons are primarily related to the inability of current TCF technology to meet customer requirements. First, as EPA Administrator Browner acknowledged, "the technology is not fully developed" and "no kraft mills have yet succeeded in making high-brightness pulp from southern softwoods without using chlorine." Second, there are other customer needs, such as high absorbency, low dirt counts and superior strength, that cannot be met without bleaching with chlorine compounds.

What NRDC refuses to acknowledge is that while the industry has every reason to feel confident of maintaining its international competitiveness, TCF paper purchasing goals will jeopardize its position in our country. The only announced U.S. manufacturer of TCF bleached kraft pulp recently decided to shut down operations for the remainder of 1993. As a consequence, the Federal government would find itself buying virtually all its purchases from foreign suppliers and underwriting solely foreign jobs.

- NRDC's allusion to "chlorine-free recycled paper" also is misleading: there simply is no such product. The fact is that since chlorine compounds are found in cellulose fibers in wood, they are a component of all paper—including TCF paper. Since there is no commercially available method to remove chlorinated compounds from any paper, regardless of the process used, no paper products can be literally chlorine free.
- It is equally important to know that paper made from conventionally bleached pulp is actually more desirable for recycling than TCF paper because chlorine or chlorine compounds only minimally impact cellulose fibers as they remove the lignin and other unwanted components from wood. Chemicals used in TCF processes, in contrast, are far less gentle, producing paper with weaker fibers. This difference is critical because the stronger fibers found in conventionally bleached paper make that paper stronger and amenable to being recycled numerous times. On the other hand, TCF paper fibers make it weaker and limit its recycling potential.

We hope you will find these clarifications helpful in your consideration of the pending Executive Order, and wish to renew the industry's request to meet with you prior to signing the Order.

Respectfully,



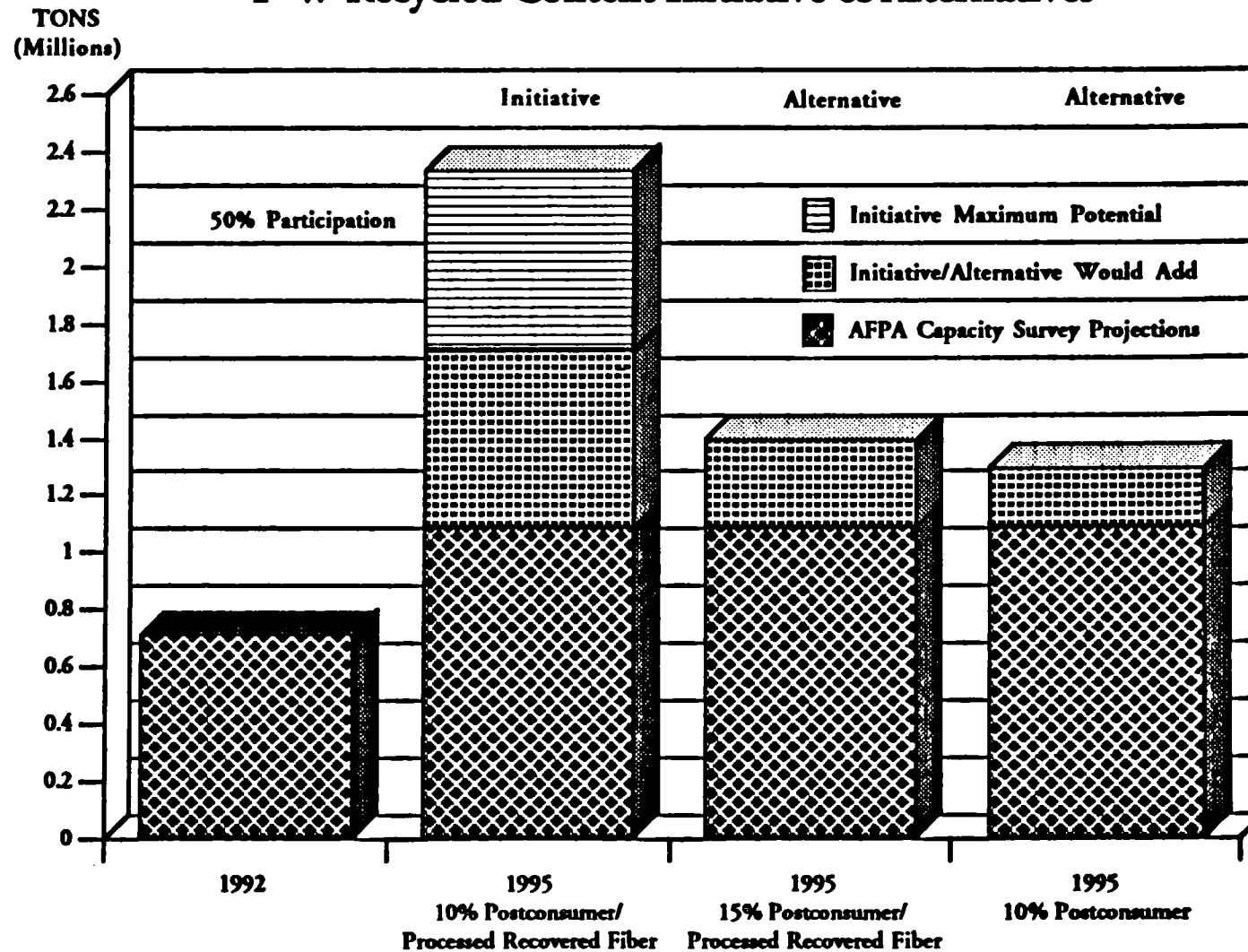
Red Cavaney

ltr0903.pre

cc: Vice President Al Gore
Thomas F. McLarty, Chief of Staff
Leon E. Panetta, Director of OMB
Robert E. Rubin, Assistant to the President for Economic Policy
EPA Administrator Carol Browner
Carol H. Rasco, Assistant to the President for
Domestic Policy
Alice Rivlin, Deputy Director of OMB
Kathleen McGinty, Director, Office of Environmental Policy

Printing-Writing Use of Postconsumer/Processed Recovered Fiber

P-W Recycled Content Initiative & Alternatives



**AMERICAN
FOREST &
PAPER
ASSOCIATION**

August 18, 1993

**The President
The White House
Washington, D. C. 20500**

Dear Mr. President:

The members of the pulp and paper industry earlier requested a meeting with you to discuss your proposed Executive Order on Federal Recycling. Your staff indicate that the draft Order is on a "fast track." The need for your personal and timely attention to the industry's concerns before the Order is signed therefore is critical.

You have heard from a number of Chief Executive Officers of our companies and from Members of Congress, Governors, and the United Paperworkers International Union on the far-reaching implications of the Order as currently drafted. A meeting will enable us to clearly explain how certain provisions of the draft Order will result in: the loss of American jobs to foreign pulp and paper manufacturers; increased imports of foreign pulp and paper; and the loss of competitiveness by a vital U.S. industry. We believe these are issues that merit your personal involvement and, consequently, reiterate our request that you meet with members of the American Forest & Paper Association Ad Hoc CEO Workgroup on these issues at the earliest possible time.

Thank you for your consideration.

Respectfully,



**Red Cavaney
President**

**John W. Creighton, Jr.
President & CEO
Weyerhaeuser Company
and
AFPA Chairman**

**A. D. "Pete" Correll
President & CEO
Georgia-Pacific Corp.**

**John A. Georges
Chairman & CEO
International Paper Company**

**Ronald M. Gross
Chairman, President & CEO
ITT Rayonier Inc.**

**Philip E. Lippincott
Chairman, President & CEO
Scott Paper Company**

**John A. Luke, Jr.
President & CEO
Westvaco Corp.**

**Steven C. Mason
Chairman & CEO
Mead Corp.**

**George W. Mead
Chairman & CEO
Consolidated Papers, Inc.**

**Thomas C. Norris
Chairman, President & CEO
P. H. Glatfelter Company**

AMERICAN
FOREST &
PAPER
ASSOCIATION

August 9, 1993

The Honorable Alice Rivlin
Deputy Director
Office of Management and Budget
OEOB, Room 252
17th Street & Pennsylvania Avenue, N.W.
Washington, D.C. 20503

Dear Alice,

Thank you for the courtesy of your time today and for your interest in our concerns. As we discussed, the Presidential Executive Order draft we've seen contains very costly and far-reaching ramifications for the U.S. forest and paper industry -- impacts which will put at risk our industry's international competitiveness. To underscore this concern, we and one hundred other industry chief executives wrote President Clinton and requested that he defer consideration of the Executive Order until such time as a full and formal public review process, a cost/benefit analysis and an environmental impact assessment could be conducted. We hope you will urge that similar such review is warranted before issuance of the draft Executive Order.

The BAT/MACT Cluster rulemaking underway at EPA is the proper venue to address the bounds of current technology within our industry. We support that effort and have offered a constructive proposal to Administrator Browner as part of that process. EPA also has an effort underway on federal procurement guidelines for recycled content printing-writing papers. The Executive Order prejudices that outcome. Additionally, we and many other industries are concerned about reliance on Life Cycle Assessment (LCA) methodologies to determine *environmentally preferable* products as a category of "products or services that are less harmful to human health and the environment..." Neither the totally chlorine-free (TCF) nor the environmentally preferable issues have had the benefit of full public review and comments. Affixed is a copy of a letter to the President sharing these concerns from a group of southern senators knowledgeable about our industry, representing states with an industry presence. Other Senators have written individually to the President.

We also thought it helpful to commit to writing our response to your question about TCF pulping being available in Europe but not in the U.S.

The mere mention of TCF, even as a goal, in the Executive Order in the absence of a cost/benefit analysis is cause for concern because of the historical linkage between the purchase behavior of the private sector toward printing-writing papers and the federal government "guidelines" regarding recycled content. The private sector market beyond just printing-writing papers is already anticipating the change that will flow from the issuance of the Executive Order, and the incorporation of TCF as a "goal" will be accepted as a "guideline" by the private sector in the same way they have treated the recycled content

The Honorable Alice Rivlin
August 9, 1993
Page 2

guidelines. TCF will become a de facto standard among many potential purchasers. Virtually everyone involved in the printing-writing portion of the industry -- from mill owners, to union and non-union employees, to vendors and suppliers -- believe this issue of linkage to be true for printing-writing papers.

Almost all mainland European TCF production is from sulfite mills, not the environmentally superior kraft type of mills which make up 95% of the U.S. bleached pulp production capacity. There are TCF kraft pulp mills in Scandinavia, but the fiber they rely upon is very different from our U.S. southern pine. It is also important to note that not more than 5% of the world's bleached paper grade pulp capacity is TCF, and those mills are not running anywhere near capacity in TCF grades. TCF pulp quality is inferior, and a cost premium must be recovered in the marketplace. Given current technology, it is a niche product in a niche, mainly German, market. The enclosed four-page backgrounder on this topic may be helpful.

The worldwide pulp and paper market is significantly over capacity, and the countries of Sweden and Finland (home of some of our fiercest competition) recently devalued their currency to spur their forest products exports -- big businesses for both countries. Were the President to set goals for TCF in his Executive Order, our foreign competitors, like those in Scandinavia, will quickly move into U.S. markets and take advantage of a TCF buying spurt, in order to fill up their order books and establish a stronger overall presence within our attractive domestic market. Once in they are very hard to dislodge, making profit and employment losses not insignificant for U.S. producers over the short and longer term.

Additionally, given our country's strong reliance on southern pine and the kraft pulping process, the U.S. pulp and paper industry cannot immediately mount a counter offensive to reclaim lost domestic markets, even if the financial resources were available. Our government's decades long regulatory path for our industry -- to utilize secondary, biological treatment -- has produced mills meeting the world's most stringent overall environmental regulations. Our government should not now break faith with this history and force us to a new standard, which is an outgrowth of a different pollution control strategy employed in Scandinavia.

As EPA Administrator Carol Browner has acknowledged by not including TCF in the BAT/MACT Cluster Rulemaking, "...totally chlorine-free processes have great appeal. Yet I understand the technology is not fully developed. While some mills in the U.S., Canada, Europe and Scandinavia have developed processes that are chlorine-free, no kraft mills have yet succeeded in making high-brightness pulp from southern softwoods, without using chlorine." The only U.S. kraft mill to announce a totally chlorine-free pulp advertises that it will not be in full production until well into 1995, and they are producers of pulp, not makers of paper. Additionally, this mill is the only kraft mill in the lower forty-eight states not to have made the very significant investments necessary to install secondary treatment.

The Honorable Alice Rivlin
August 9, 1993
Page 3

On the issue of recycling, the U.S. printing-writing paper producers began conversations with EPA and the Office of Environmental Policy with the objective of providing those offices with their division's recommendation as to how to maximize paper recovery for recycling in their specific paper grades.

It has been difficult for those not knowledgeable about the dynamics of the printing-writing business to understand the "less-is-more" concept. Less recycled content per printing-writing sheet at this stage will bring many more commodity grade paper machines into the recycled-content market and, thereby, produce significantly more total tons of recycling in the printing-writing grades and in the overall paper industry. This is because the commodity machines, representing two-thirds of the installed grade capacity, are the most cost efficient and the least involved in the current manufacture of recycled content printing-writing papers.

More than 90% of all paper recycling gains since 1988 and into the foreseeable future will be "post-consumer," since virtually all pre-consumer recovered paper grades are already in use. Whatever increases overall paper recycling will result in at least 90% of that increase coming from the post-consumer waste stream, keeping more paper from going to landfills.

A 15% minimum post-consumer content standard for paper produced by machines at vertically integrated printing-writing mills will prevent many producers from making the necessary capital investments in expensive, specialized equipment to process recovered fiber for use in commodity printing-writing papers. While a greater minimum content level of recycled fiber per sheet of paper may sound better, a 10 percent minimum will result in greater consumption of recovered fiber.

Please contact any of us if you have questions on the materials provided you at the meeting or regarding the contents of this letter. Again, thank you for meeting with us today.

Sincerely,



Red Cavaney
President
American Forest & Paper Association

Mr. Thomas C. Norris
Chairman, President & CEO
P.H. Glatfelter Company

Mr. John A. Luke, Jr.
President & CEO
Westvaco Corporation

Mr. Steven C. Mason
Chairman & CEO
Mead Corporation

cc: T. J. Glauthier (OMB)

HOWELL HEFLIN
ALABAMA

United States Senate

WASHINGTON, DC 20510-0101

August 6, 1993

President Bill Clinton
The White House
1600 Pennsylvania Avenue, N.W.
Washington, D.C. 20500

Dear Mr. President:

It is our understanding that an Executive Order on federal recycling will be finalized and submitted to you for signature in the very near future. We have concerns with the economic impact of several provisions in the Order and with the process for consideration. For example, while we support the setting of federal procurement guidelines for recycled content, we are concerned that the Executive Order pre-judges an ongoing EPA rulemaking proceeding on this very same issue. We have a similar concern with regard to totally chlorine-free provisions in the Order.

The draft proposal is extremely far-reaching and we regard further action on this Executive Order with great concern.

The measure contains language establishing federal agency goals for the purchase of totally chlorine-free (TCF) by 1995. We understand these goals would also apply to state agencies receiving federal funds. If accepted, this measure would be a severe economic hardship for the American paper industry. It would result in a shift of government and private sector purchases to foreign sources and, consequently, displace large number of American workers.

The potential consequences of this action are so wide-ranging that broad public discussion, and economic and environmental impact analysis is needed before the Order is seriously considered. Any endorsement of TCF would be contrary to established facts.

For example, EPA Administrator Carol Browner has rejected the feasibility of applying a totally chlorine-free regulation on United States kraft pulp mills. In a July magazine article, she acknowledged, "no kraft mills have succeeded in making high-brightness pulp from southern softwoods without using chlorine."

Again, we urge you to withhold the issuance of this Order until the full range of economic impacts surrounding the entire Executive Order can be fully considered.

Sincerely,

Howell Hight

Dale Burmgen

Brenda Ford

Mark Lott

Bob Gratham

James Faircloth

Paul Colman

Chuck Roll

Art M. Cornell

Sam Nunn

A COST/BENEFIT ANALYSIS OF TOTALLY CHLORINE FREE
(TCF) BLEACHING OF PAPERMAKING WOOD PULPS

1. Wood provides the fibrous raw material for 92% of the world's paper-making pulp; (more than 99% in the US.) US wood pulp capacity represents more than one-third of the world total, almost exceeding the sum of the capacity in the next four countries -- Canada, Japan, the former USSR and Sweden. The US is the largest supplier of bleached chemical paper grade pulp to the global market

2. Chemical wood pulping processes - dominated by the "kraft" or sulfate process - account for two-thirds of the world's wood pulping technologies. The recovery boiler system associated with the kraft process recaptures the original pulping chemicals while burning spent pulping liquors which contain non-fibrous residues extracted from the wood. This process makes it possible for kraft pulp mills to be largely bio-energy self-sufficient. Additionally, the kraft process produces pulp fibers which make papers with stronger performance characteristics such as burst, tear and fold. (Indeed the word "kraft" means "strong" in German.)

The other but minor chemical pulping process - sulfite - does not commonly have a recovery system and poses an environmental problem in the disposal of its waste pulping liquors. In the global mix of chemical pulping technologies, sulfite capacity has declined in both absolute and proportional terms.

Mechanical pulping processes comprise the remaining one-third of the world's wood pulping processes. While they produce so-called "high yield" pulps - retaining the non-fibrous materials such as lignin which discolors when exposed to sunlight - they do not have the strength, durability and longevity of chemical pulps.

3. About half of the world's wood pulp manufacture is bleached in order to brighten the naturally brown color of wood. A whiter paper provides sharper contrast and clarity for black and colored printing and writing. Further, by removing most of the remaining natural wood impurities, bleaching adds to the inherent strength of papermaking pulps and enhances the archival capability of the papers made from chemical pulp.

4. For many years, chlorine gas (elemental chlorine) has been the traditional agent for bleaching wood pulps. It has been not only the lowest cost option but, of the currently available commercial wood pulp bleaching agents, it is the most "gentle" to the papermaking fibers and to the mill machinery. Substitution

of chlorine dioxide for elemental chlorine, coupled with extended delignification with oxygen, has been increasingly practiced in order to reduce or eliminate the potential for generating chlorinated organic compounds believed to result from a reaction of excess elemental chlorine with precursors, including lignin. Pulps bleached without elemental chlorine but with chlorine dioxide are referred to as "ECF," i.e., elemental-chlorine-free.

5. Certain pulp bleaching processes which use no chlorine-based compounds at all are referred to as "TCF" i.e., totally-chlorine-free. These processes can involve oxygen, ozone, hydrogen peroxide and even pre-treatment of unbleached pulp with enzymes. Ozone is the most "aggressive" of the alternative non-chlorine bleaching agents and calls for particularly sensitive process controls as well as sophisticated metallurgy in the bleaching plant.

The TCF bleaching processes typically result in a kraft pulp which is less bright, has a higher dirt count and produce a weaker papermaking fiber than from the ECF processes. Indeed, papermakers in the primary pulp markets served by US producers reject TCF kraft pulps because of these deficiencies.

6. The global market for bleached kraft paper grade pulp is currently estimated at 29 million short tons, with global market demand for TCF bleached kraft pulp currently amounting to perhaps 1.6 million short tons or a little more than 5% of total world demand for bleached kraft paper grade pulps. Theoretical market capacity to produce TCF bleached kraft paper grade pulps is reported to be approaching 2.5 million short tons but clearly actual production and capacity utilization rates reflect the much lower level of current world demand.

None of the 12 bleached kraft pulp mills in 5 countries reported to have TCF bleaching capability has committed all of its bleaching capacity to TCF processes and regularly produce ECF pulp. While one company has announced its intention to install TCF kraft capacity in an existing US mill, there are currently no commercial supplies of TCF bleached kraft pulp available from domestic sources.

7. TCF demand is purely a European market phenomenon, created largely by the German pulp and paper industry in response to a Greenpeace initiative. The German industry itself could readily accommodate the TCF stipulation because it already manufactured a TCF pulp in its otherwise obsolete sulfite mills - a pulp which produces a lower strength paper and which has significant environmental problems.

8. Those producers of bleached wood pulps in other countries - largely in neighboring Sweden and Finland - who have responded to the German market demand for TCF kraft pulp, (since Germany must import 60% of its papermaking wood pulp), have done so at considerable capital costs in order to develop a "niche" market for their exportable pulps. Prior to the recent 30% devaluation of the Nordic currencies, those were the highest cost market pulps in the world. However, in a currently weak global pulp market, consumers are increasingly unwilling to recompense those producers for their higher TCF pulp production costs.

9. When, in 1985, the association of chlorinated organic compounds with the bleaching of wood pulp was first detected, the Swedish pulp sector elected to respond by modifying its production processes because - unlike the US industry - it had not previously installed effective, secondary treatment of mill effluents. As a result, the US industry's success in addressing the environmental quality of mill effluents is already ahead of the Swedish industry which, incidentally, is able to comply with its regulation of AOX - (a quantitative measure of chlorinated organics in mill effluents) - on merely an average basis and not on a "not to exceed" basis as would be required of US bleached pulp mills.

10. Despite widespread research and development and the apparent success of some TCF production runs, the consensus from the March 1993 Worldwide Conference on Non-Chlorine Bleaching was that TCF "has not gained the status of an environmentally sound, proven technology." TCF processes are clearly more energy intensive than ECF processes. It remains to be seen whether non-chlorine bleaching processes would in fact result in any meaningful environmental improvement over ECF processes since TCF processes themselves generate unwanted and potentially harmful pollutants. In that regard, scientific comparisons of bleaching process options made by the Pulp and Paper Research Institute of Canada have revealed that "the effluents from totally chlorine free sequences.....were found to have the greatest chronic toxicity" to fathead minnow larvae.

11. The proposed White House Executive Order which would direct federal agencies to set future goals to purchase TCF papers absolutely contradicts EPA's recent judgement that the best available technology economically achievable (BAT) for US bleached kraft wood pulp mills by 1998 is one based on a combination of modified continuous cooking (MCC), the use of oxygen delignification and the substitution of chlorine dioxide for elemental chlorine, all designed to result in substantial reduction of AOX per metric tonne of bleached pulp produced. Pointedly, EPA did not choose TCF.

The US pulp sector is already moving voluntarily in the direction of the BAT prescription but the cost of converting all of the existing US bleached kraft wood pulp capacity to meet EPA's water-related proposal has been estimated by the Stanford Research Institute (SRI) to approach \$5 billion.

12. It is important to understand that the process changes required by the water-related aspects of EPA's proposed BAT prescription would not provide an incremental step towards TCF bleaching should that process ultimately be required of US bleached kraft pulp mills. Indeed, if the entire US bleached pulp sector were to implement the proposed BAT prescriptions by 1998 and then subsequently have to switch to totally independent TCF technologies, at least half of the estimated \$5 billion cost of meeting the water-related aspect of BAT through chlorine dioxide substitution will have been entirely wasted.

In addition, a substantial portion of the \$1 billion already spent by the industry over the last few years on process modifications to reduce its discharges of chlorinated organic compounds - which relied heavily on chlorine dioxide substitution - would also be wasted.

13. If US government agencies were to specify TCF-based paper in their purchases, they would be obliged to seek supplies from foreign sources at significantly higher cost, incurring the additional penalty of reducing domestic employment and a widening of the nation's trade imbalance. Foreign producers with excess TCF pulp capacity would welcome such a "Trojan Horse" as a means to enter the US market for bleached kraft pulp in the world.

14. From an overall environmental perspective, there is the very real prospect that a requirement of TCF bleaching processes on the US pulp and paper industry would lead to reduced paper recycling. Given the weaker performance characteristics of wood fibers bleached with non-chlorine agents, their ability to withstand the rigors of repeated recycling would be impaired.

15. The bleached kraft pulp sector of the US pulp and paper industry has already voluntarily made significant strides in improving the environmental performance of its mills. Should the White House send a signal through federal agencies endorsing TCF - after the EPA contemporaneously promulgated BCF as BAT - it would certainly add confusion to the domestic marketplace, increase uncertainty in the development of environmentally sound US regulations and impose a competitive disadvantage on the world's largest wood pulp and paper industry.

July 28, 1993



UNITED PAPERWORKERS INTERNATIONAL UNION

WAYNE E. GLENN
President

JAMES H. DUNN
Secretary - Treasurer

July 26, 1993

President Bill Clinton
The White House
1600 Pennsylvania Ave., NW
Washington, DC 20500

Dear Mr. President:

I have been informed that a proposed Executive Order on federal procurement of recycled paper will include some form of requirement for the federal government to purchase chlorine-free paper. This concerns a great deal.

If the contents of the proposed order are such that it ignores the economic and technological realities of this industry, the price will be high. Only two mills in the U.S. are able to produce paper without using chlorine chemicals. This means the order could force the government to rely on imports to meet its needs for paper. Hundreds, perhaps thousands of jobs could be shipped overseas. Dozens of small and medium-sized communities throughout the United States could be damaged, perhaps fatally.

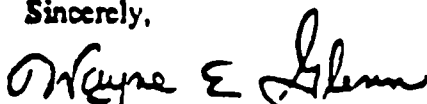
The delegates to our 1988 Convention called for the phase-out of harmful chemicals in the pulping process. We believe this must be done in ways that preserve our jobs and the nation's industrial base, as well as protect the environment. I urge you to very carefully consider whether or not your order, as presently proposed, meets this criterion.

It is impossible for me to comment in more detail since neither I nor my staff have been informed of the details of this proposed order. It troubles me that a policy move which could affect so many of our members and determine the direction of the American pulp and paper industry for the next decade or longer was not brought to my attention sooner. This is a policy issue which needs and deserves more, not less, than the usual level of public input. And again, let me emphasize, this is no time to even appear to be shipping America's industrial jobs overseas. Buy American should be the theme of our federal government.

I look forward to the opportunity to speak with you on this issue. If I can be of any additional assistance, please let me know.

My best regards for your continued success.

Sincerely,


Wayne E. Glenn
President



UNITED PAPERWORKERS INTERNATIONAL UNION

WAYNE E. GLENN

Office of the President

August 5, 1993

**President Bill Clinton
The White House
1600 Pennsylvania Avenue, NW
Washington, D.C. 20500**

Dear Mr. President:

When I wrote you July 26, I expressed my union's concern that a proposed executive order, originally developed by your environmental policy staff to regulate and encourage the federal government's use of recycled paper, contained provisions related to government purchases of totally chlorine-free paper (TCF).

Since then, I have had a chance to review a draft of that order. Sec. 503 of this draft would require each federal agency under the control of the executive branch to set specific goals for the amount of TCF paper it plans to purchase by 1995. I would like to know where they will get the paper? As of now, there is only one small sulfite mill in the entire United States that can produce TCF paper. By 1995, only one other mill in the U.S. will be producing TCF pulp. If the agencies were forced to observe the TCF goals in this proposed order, *they would have to buy paper from foreign producers--if they could buy it at all.*

This is not my only concern. The recycling issue is entirely separate from the question of chlorine vs. elemental chlorine-free (ECF) vs. TCF. Even if it were appropriate to begin encouraging the use of TCF paper, an executive order on recycling is not the way to do it.

The chlorine-bleaching issue is a subject of intense controversy, both in the scientific community and in the political arena. Whatever the environmental merits of switching to ECF or TCF, there is no question it will cost the paper industry billions of dollars to make such a change. It is not simply a matter of taking chlorine out of the bleaching pot and putting ozone in. It is a matter, rather, of changing significant components of bleaching processes that as a whole can cost hundreds of millions of dollars.

Again, an issue this significant for the pulp and paper industry should not be decided through an executive order, particularly one designed to address a different problem. The chlorine-bleaching issue needs to have a public airing on its own merits before any executive or legislative action is taken.

Page Two (2)

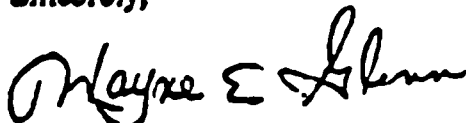
When I wrote to you in July, I expressed my concern that we had received no notice of this proposal until it was within days of being finalized. This issue is of direct and immediate concern to the vast majority of our 225,000 members. There is no question we should have been consulted much earlier in the process of designing the proposal. There was a failure to communicate here. Your administration needs to be open to workers, not closed.

Therefore, I respectfully request you remove all references of any kind to TCF pulp or paper from the proposed executive order on recycling. I ask further that, if the federal government wishes to set goals and standards related to the purchase of chlorine-free paper, it do so only after a full public hearing involving all points of view on the issue carried out in conjunction with a thorough cost-benefit analysis by the OMB.

I would be pleased to meet with you and appropriate members of your staff at the earliest reasonable time to discuss this issue in more detail. It is of crucial importance to the pulp and paper industry, and to our members who have worked to contribute to the success of your administration.

Thank you for the opportunity to share these comments. And again, best wishes for your continued success.

Sincerely,



Wayne E. Glenn
PRESIDENT

WEG:pme

cc: UPIU International Executive Board

AMERICAN
FOREST &
PAPER
ASSOCIATION

August 6, 1993

Mr. Peter Yu
National Economic Council
The White House
Washington, D.C. 20500

Dear Peter,

This letter attempts to respond to your inquiry on three items. If you need more information, please don't hesitate to call. Over the weekend, I can be reached at 703/683-7547.

As I understand, your first question is, "Why will there be an impact on the industry if the TCF issue is characterized as a goal, not a standard, in the Presidential Executive Order?"

The first aspect involves the linkage and historical purchase behavior of the private sector toward printing-writing papers and the federal government "guidelines" regarding recycled content. Private sector printing-writing purchasers have fixed on the current 50 percent total recovered fiber "guideline" recommended by EPA and, therefore, little else is accepted in the U.S. marketplace as a recycled-content printing-writing paper. EPA will verify, if asked, that the large preponderance of industry sales materials for recycled content printing-writing papers focus on 50 percent as a key criteria.

The private sector market is already anticipating the change that will flow from the issuance of the Executive Order, and the incorporation of TCF as a "goal" in an Executive Order covering recycling will be accepted as a "guideline" by the private sector in the same way they have treated the recycled content guidelines. TCF will become a de facto standard among many potential purchasers. Virtually everyone involved in the printing-writing portion of the industry -- from mill owners, to union and non-union employees, to vendors and suppliers -- believe this issue of linkage to be true for printing-writing papers.

A second aspect is also important. The worldwide pulp and paper market is significantly over capacity, and the countries of Sweden and Finland (home of some of our fiercest competition) recently devalued their currency to spur their forest products exports -- big businesses for both countries. Our foreign competitors, like those in Scandinavia, will sweep into U.S. markets and take advantage of the TCF buying spurt to fill up their order books and establish a stronger presence within our attractive domestic market. Once in, they

are very hard to dislodge, making profit and employment losses not insignificant for U.S. producers over the short and longer term.

Additionally, given our country's strong reliance on southern pine and the kraft pulping process, the U.S. pulp and paper industry cannot immediately mount a counter offensive to reclaim lost domestic markets, even if the financial resources were available. Our government's regulatory path for our industry -- to utilize secondary, biological treatment -- has produced mills meeting the world's most stringent overall environmental regulations. Our government should not now break faith with this history and force us to a new standard, which is an outgrowth of a different pollution control strategy employed in Scandinavia.

As EPA Administrator Carol Browner has acknowledged by not including TCF in the BAT/MACT Cluster Rulemaking, "...totally chlorine-free processes have great appeal. Yet I understand the technology is not fully developed. While some mills in the U.S., Canada, Europe and Scandinavia have developed processes that are chlorine-free, no kraft mills have yet succeeded in making high-brightness pulp from southern softwoods, without using chlorine." The only U.S. kraft mill to announce a totally chlorine-free pulp advertises that it will not be in full production until well into 1995, and they are producers of pulp, not makers of paper. Additionally, this mill is the only kraft mill in the lower forty-eight states not to have secondary treatment.

As I understand, your second question involved the percentage of mills that would not be able to comply with the 15 percent post-consumer recycled content requirement. In response, there are 120 machines defined as high productivity or commodity machines producing printing-writing grades -- machines with 76,000 short tons or more of annual capacity (see page 22 of the 1992 American Paper Institute's *Annual Capacity Survey* attached) These commodity machines manufacture 64% of the total printing-writing tonnage and are the primary source of supply for the grades of paper the government purchases such as copy paper, business forms, envelopes, etc. The remaining smaller machines produce text and cover, heavy weight papers and many other niche-type papers.

Based on a survey with member companies, it was determined that at the 15 percent post-consumer content level, from five to ten commodity machines could possibly produce on a regular basis paper meeting the 15 percent level. Weighing all large machines to an average tonnage/year basis, the "average" machine could be statistically "normed" to produce 136,000 tons/year. At five machines, a total of 680,000 tons/year would be produced from the machines. Assuming the recycled content to be across the machine's total spectrum, the total recovered paper used for five average machines would be 115,000 tons/year: for ten machines, it would be 230,000 tons/year.

Therefore, from a total annual capacity of 17,617,000 tons (1995 level) for the commodity grade machines, if five machines are able to produce 15 percent post-consumer content levels, 94 percent of the commodity machine capacity will not produce 15 percent post-consumer recycled content papers. If ten machines produce 15 percent content level

paper, 88 percent of the commodity machines will not produce 15 percent papers. It is difficult to peg the number of machines much closer than this, since so much relies on the potential investment return by the company considering the conversion.

As I mentioned, your third question involved whether or not we could obtain the reference to a Franklin Associates study contained in a letter to Katie McGinty from Don Kummerfeld of the Magazine Publishers of America. We have determined that the referenced study is entitled *Evaluation of Proposed New Recycled Paper Standards and Definitions* prepared for the Recycling Advisory Council and issued in February, 1992 by Franklin Associates. I'm sure Bill Franklin would be pleased to respond to any questions you may have and he would be glad to forward you a copy of his study. His telephone number is 913/649-2225. Additionally, we are attempting to get a local copy in case you need one on Monday.

The 98 percent refers to data contained in Table A-1 of the report on page A-2 of the Appendix. Specifically, the 98 percent represents printing-writing converting scrap recovered as a percent of generation in the year 1990. Converting scrap is not to be confused with mill broke, which is in-mill scrap and is not counted as a recovered material. The figure is based on estimates of how much printing-writing paper is recovered from converting operations including commercial printing, magazines, envelopes, business forms, etc. Clearly, the data supports the fact that little additional pre-consumer printing-writing scrap can be made available from converting operations. Franklin believes that the total of three million tons of unrecovered printing-writing scrap is from small print shops and not easily collected or too contaminated to use. Attached is the referenced page from the report.

If you need additional materials, please give a call. Many thanks for your assistance.

Sincerely,

A handwritten signature in black ink, appearing to read 'Red Cavaney', with a stylized, cursive script.

Red Cavaney

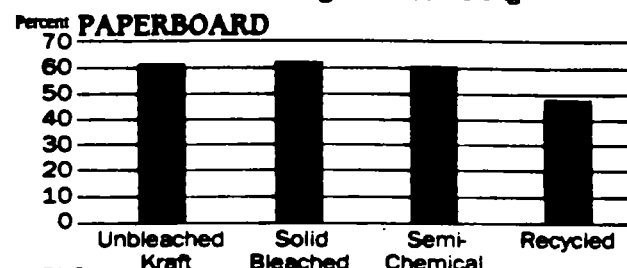
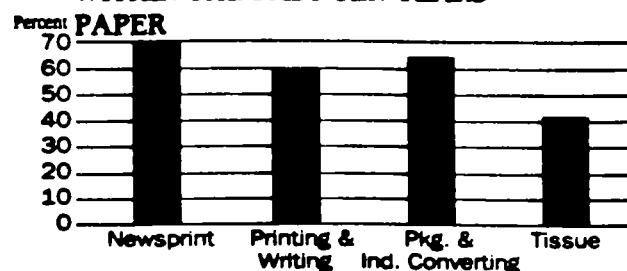
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Attachment

22

MILL SIZE-PAPER, PAPERBOARD & WOOD PULP

ANNUAL CAPACITY RANGE*	PAPER & PAPERBOARD		WOOD PULP	
	Number of Mills	Share of Total Capacity	Number of Mills	Share of Total Capacity
TOTAL	844	100%	207	100%
0-25	121	1.9	11	0.2
26-50	93	4.0	12	0.7
51-75	64	4.8	6	0.6
76-100	41	4.1	14	1.8
101-125	27	3.5	12	2.0
126-150	19	3.0	6	1.2
151-175	14	2.6	6	1.4
176-200	17	3.6	11	3.1
201-250	39	10.0	20	6.5
251-300	14	4.4	15	6.0
301-350	13	4.7	7	3.4
351-400	11	4.6	15	8.3
401-450	13	6.3	10	6.3
451-500	14	7.6	13	9.1
over 500	44	35.3	49	49.5

* Thousands short tons

SHARE OF MACHINE CAPACITY
INSTALLED OR REBUILT
WITHIN THE PAST TEN YEARS

* PAPER

MACHINE ANNUAL CAPACITY	TOTAL ALL GRADES		NEWSPRINT		PRINTING & WRITING		PACKAGING & IND. CONV.		TISSUE	
	Total	Share of	Number	Share of	Number	Share of	Number	Share of	Number	Share of
	Thousands short tons Number of Machines	Total Capacity	of Machines	Total Capacity	of Machines	Total Capacity	of Machines	Total Capacity	of Machines	Total Capacity
TOTAL	1,213	100%	44	100%	407	100%	171	100%	210	100%
0-5	90	—	—	—	35	—	28	1	13	1
6-10	102	1	—	—	30	1	39	5	25	3
11-15	72	1	—	—	18	1	21	5	23	5
16-20	76	2	—	—	16	1	20	6	22	6
21-30	154	4	—	—	54	5	22	9	39	15
31-40	114	5	1	1	42	6	6	4	28	16
41-50	95	5	1	1	30	5	6	4	24	17
51-75	159	11	4	4	62	15	6	6	29	28
76-100	84	8	3	4	42	14	3	4	7	9
101-125	44	6	1	2	20	9	5	9	—	—
126-150	48	8	12	24	19	10	5	12	—	—
151-200	66	13	10	25	22	16	7	20	—	—
201-250	42	11	10	33	11	9	1	4	—	—
251-300	22	7	2	8	5	5	1	4	—	—
301-400	30	12	—	—	1	1	1	6	—	—
over 400	15	8	—	—	—	—	—	—	—	—

SIZE OF
MACHINES
BY PRINCIPAL
GRADE
PRODUCED

PAPERBOARD

MACHINE ANNUAL CAPACITY	UNBLEACHED KRAFT		SOLID BLEACHED		SEMICHEMICAL		RECYCLED		CONSTRUCTION GRADES	
	Number	Share of	Number	Share of	Number	Share of	Number	Share of	Number	Share of
	Thousands short tons of Machines	Total Capacity	of Machines	Total Capacity	of Machines	Total Capacity	of Machines	Total Capacity	of Machines	Total Capacity
TOTAL	69	100%	26	100%	37	100%	192	100%	87	100%
0-5	—	—	—	—	—	—	7	—	7	1
6-10	—	—	—	—	—	—	2	—	6	3
11-15	—	—	—	—	—	—	5	1	5	3
16-20	—	—	—	—	—	—	12	2	6	5
21-30	—	—	—	—	—	—	33	8	6	8
31-40	—	—	—	—	1	1	29	10	7	13
41-50	—	—	1	1	—	—	23	11	10	24
51-75	—	—	3	4	4	4	46	28	5	16
76-100	2	1	2	3	2	3	19	16	4	20
101-125	3	2	—	—	8	15	7	8	—	—
126-150	2	1	—	—	6	15	3	4	1	7
151-200	8	7	10	33	6	17	3	5	—	—
201-250	8	9	5	22	5	19	2	4	—	—
251-300	9	12	1	5	3	14	1	3	—	—
301-400	24	40	2	13	2	12	—	—	—	—
over 400	13	29	2	19	—	—	—	—	—	—

All data based on 1. in January 1991.

PAPER AND PAPERBOARD FLOW IN MUNICIPAL SOLID WASTE, 1989

	New Supply (1)	Converting Scrap(2)	Converting Scrap(2)	Net Consumption (11)	Returns/Over Issue (12)	Returns/Over Issue (12)	Diversion (13)	Adj. for Imports/Stock (14)	PC Generation (15)	Total Recovery (16)	% Total Recovery (17)	Postconsumer Recovery (18)	PC Disposal (19)	% PC Recovery
	%	%	%	%	%	%	%	%	%	%	%	%	%	%
Newsprint	13,338	3.9	520	98	510	12,816	7.0	897	88	789	0.5	64		
Corrugated Boxes	24,830	8.0	1,970	96	1,872	22,860								
1 Paper	5,698	5.0	295	98	289	5,603								
Printing-writing papers (2)														
Magazines	3,343	12.0	401	98	393	2,942	20.0	588	17	100	7.0	208		
Commercial printing	9,308	15.0	1,368	96	1,368	7,912								
Telephone directories (3)	820	13.5	84	98	82	638	3.0	16	40	6	7.0	38		
Books	1,180	12.0	138	98	135	1,012	15.0	152	50	78	7.0	71		
• Office reprographics	2,981	12.0	358	98	351	2,623								
Envelopes	1,277	22.5	287	98	282	990								
Business forms	3,361	3.0	101	98	99	3,260	12.0	391	75	283	7.0	228		
Stationery & tablet	481	12.0	59	98	58	432								
Related papers (4)	1,840	10.0	164	98	161	1,688								
Other (5)	898	12.0	120	98	117	878								
Total Printing-Writing (6)	25,057	12.4	3,057	98	3,035	21,970	1,147	41	476	6.9	1,524	1,080		
Bosboard and Other Paperboard (7)														
carton and food service	1,481	17.0	248	70	174	1,213								
Folding-coiled bleached	1,818	18.0	345	85	294	1,473								
Folding-unbleached	970	18.0	165	85	132	815								
Folding-recycled	2,410	18.0	388	85	328	2,024								
Set-up boxes	290	17.0	48	85	42	241								
Other paperboard	4,148	17.0	705	97	684	3,441								
Total bosboard	11,085	17.0	1,889	88	1,653	9,208								
Paper Packaging/Other Converting														
Unbleached kraft paper	2,377	5.0	119	98	116	2,258								
Bleached kraft paper	484	4.5	22	98	21	462								
Specialty paper pkg	583	5.0	28	98	28	535								
Special Industrial Papers	1,163	5.0	58	70	40	1,085								
Total paper pkg. spec. ind.	4,577	4.9	228	91	208	4,351								
Construction Paper (8)	1,700	7.0	119	70	83	1,581								
Subtotal—non-GMP, OCC	48,337	11.8	5,828	94	5,288	42,711	1,147	41	476	13.3	5,883	1,080		
Total All Grades	86,303	9.4	8,117	94	7,648	78,186	2,045	82	1,285	7.4	8,747	2,310		

Notes on Table A-1:

- (1) New Supply = Production + Imports - exports. These figures are preliminary; API "1991 Statistics of Paper Paperboard & Wood Pulp" not available when table was prepared.
- (2) The National Office Paper Recycling Project, "Supply of and Recycling Demand for Office Waste Paper, 1990 to 1995."
- (3) Estimated by Franklin Associates; classified as part of commercial printing by API.
- (4) Mostly bleached bristols (e.g., file folders).
- (5) Includes labels & wraps and other converting papers.
- FAL allocations for NOPRP; slightly higher than API total.
- (7) Production figures not adjusted for imports and exports.
- Estimated; 1990 figure not available.
- Converting scrap rates partially from EPA MSW studies, partially from limited telephone survey by Franklin Associates.
- (10) Converting scrap/returns recovery estimated based on industry sources.
- (11) Net Consumption = New supply - converting scrap.
- (12) Returns/overissues of newspapers, magazines, telephone directories, books, and business forms were estimated by Franklin Associates with input from RAC members.
- (13) Diversion accounts for papers that do not enter MSW, such as files stored in offices, construction and automotive products not classified as MSW, and toilet tissue discarded in the wastewater system. Percentage diversions from EPA MSW studies. Toilet tissue from NOPRP report.
- (14) Containerboard used for imported goods estimated by Franklin Associates with industry input. Retrieval of office file stock from NOPRP report.
- (15) Postconsumer Generation = Net consumption - over issue - diversion + adjustment for packaging of imports or retrieval of file stock.
- (16) Total Recovery = Recovery reported by API for use in domestic mills, other uses, and exports.
- (17) % Total Recovery = total recovery divided by new supply x 100.
- (18) Postconsumer Recovery = Total recovery - converting scrap recovery - over issue recovery.
- (19) Postconsumer disposal = Postconsumer generation - postconsumer recovery.
- % Postconsumer Recovery = Postconsumer recovery divided by generation x 100.
- add to due to rounding.