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Exhibit # 0∪
CWA- 307(a)
[1973-74]

Monsanto

MONSANTO INDUSTRIAL CHEMICALS CO.
800 N. Lindbergh Boulevard
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Phone (314) 694-1000

MAR 1 ...

In Re: PROPOSED TOXIC POLLUTANT EFFLUENT STANDARDS FOR ALDRIN-DIELDRIN, ET AL - FWPCA (307) - DOCKET NO. 1

State of Missouri)
County of St. Louis) ss:

W. B. Papageorge, being first duly sworn says:

My name is W. B. Papageorge and I am Manager, Product Acceptability for the Functional Product Groups, Monsanto Industrial Chemicals Company, an operating unit of Monsanto Company. I am a graduate of Washington University, St. Louis, Missouri with a Bachelor of Science degree in Chemical Engineering and have received a Master of Science degree in Chemical Engineering from the same institute. I am a Registered Professional Engineer in the state of Missouri.

I have been employed by Monsanto Company for approximately 22 years, during which period I have served as an engineer, maintenance superintendent, distribution superintendent, manufacturing superintendent, plant manager and manager of environmental protection. In my present position I am responsible for seeing that the quality of products produced by two business groups in Monsanto Company is properly maintained. One of the business groups within my area of responsibility is the Specialty Products Business Group which manufactures and markets polychlorinated biphenyl (PCB) products for use as dielectric fluids in transformers and capacitors. I am a member, and have served as chairman, of a committee of the National Electrical Manufacturers Association which has reviewed the environmental effects of PCBs and has recommended procedures to users of PCBs which should minimize the possibility of entry of PCBs into the environment.

MONSANTO COMPANY'S POSITION AND RECOMMENDATIONS

As a major producer and supplier of polychlorinated biphenyls (PCBs) to the electrical industry for fire resistant dielectric fluid applications, we have reviewed and evaluated the effluent standards for these materials in proposed Part 129, Subpart I, Chapter I of Title 40, Code of Federal Regulations. Pursuant to this review, we submit the following comments and recommendations:

1. The proposed effluent standards for PCBs are unwarranted and practically and economically unattainable.

2. Actions by Monsanto and its customers, which have resulted in limiting the use of PCBs only to electrical applications in hermetically sealed units, have dramatically reduced the quantities of the more persistent PCBs introduced directly into the environment.

3. The definition of PCBs in Section 129.09a, Subpart I should be changed to read:

   "Polychlorinated biphenyls (PCBs) means materials containing the biphenyl group which is chlorinated and which have been shown to persist and rapidly bioaccumulate in the aquatic environment. These chlorinated biphenyls are identified as those components having gas chromatographic retention times greater than 60, relative to p,p-DDE=100, under the standard conditions recommended in the EPA PCB test method."

4. The accuracy and reproducibility of results attainable between laboratories using currently available sampling and analytical techniques are questionable and further studies are recommended.

5. The proposed PCB effluent standard is based on inadequate toxicity information, on non-typical fish species and on an unusually high and artificial bioaccumulation factor. Fundamental scientifically-based data is lacking and no responsible standards can be developed at this time. We recommend that studies be conducted to obtain the relevant data and that effluent standards be established which are appropriate for the unique conditions existing at each point source.

6. We object to a limitation of 10,000 cubic feet per second being arbitrarily assigned as a maximum stream flow, without a sound technical basis demonstrating adverse effects.

7. The presence of background levels of PCBs at point sources should be considered when determining effluent levels. The following definition of "Background" should be added under Section 129.01a:

   " 'Background' means amounts of toxic pollutant (1) presently found in the waterways of the United States (including the intake waters of a discharger), or (2) arising out of operations subject to this Part that occurred before the effective date of this Part, but were not discharged to the waterways of the United States before the effective date of this Part."

8. Technology for the attainment of the proposed PCB effluent standard has not been demonstrated and is not available to the industry. Unachievement of the strict standard proposed would have the effect of a ban on the use of PCBs with serious economic and social consequences very thoroughly described in an impact statement submitted to the Agency on January 15, 1974, by the General Electric Company.

The chemical structure of polychlorinated biphenyls (PCBs) has been known for nearly 100 years. It was not until the late 1920s that a use for PCBs was found -- as a dielectric fluid in transformers. The properties of PCB -- inertness, fire resistance and a non-conductor of electricity -- are perfectly suited to those electrical applications where high-voltage arcing could occur; possibly resulting in serious fires or damage to the equipment.

Commercial production of PCBs began in 1929. As the unique properties of the material became known, new uses were found. For example, their fire-resistant nature made them excellent choices for use in heat-transfer fluids. Their inertness gave long-lasting qualities to lubricants. Their use in surface coatings improved waterproofing characteristics.

Handling of the product at the manufacturing level has not presented problems as long as the normal industrial hygiene practices were followed and PCBs have always been considered less hazardous than many other chemicals in everyday use.

Therefore, it appeared that PCBs were a unique product which met important needs of industry.

When questions about the effect of PCBs on the environment first surfaced, Monsanto Company reviewed its product line and the applications for these products. As more data were developed concerning the effect of PCBs, Monsanto took steps to reduce the entry of PCB into the environment. The Company stopped the sale of PCBs for use in various applications, except where no acceptable alternatives were available. Today, PCBs manufactured by Monsanto Company are sold only to the electrical industry for use in closed systems as a dielectric fluid in transformers and capacitors -- applications for which there exist no acceptable substitutes.

Thus the situation today is drastically different from conditions which existed only three years ago. Today about 40 million pounds per year are being carefully used in the United States by less than 50 Monsanto customers in the manufacture of sealed electrical equipment. Prior to 1971, close to 80 million pounds per year were used by thousands of customers. This lends perspective to the current debate over modest losses of PCBs to waterways.

Our manufacturing and sales reduction program was a unilateral action taken by Monsanto and was based on our evaluation of developing environmental data.

The Interdepartmental Task Force on PCBs in its report (1)* concurs that the safety benefits derived justify the continued use in dielectric applications. Recommendation 6 under Findings, Conclusions and Recommendations reads as follows:

> "6. The use of PCBs should not be banned entirely. Their continued use for transformers and capacitors in the near future is considered necessary because of the significantly increased risk of fire and explosion and the disruption of electrical service which would result from a ban on PCB use. Also, continued use of PCBs in transformers and capacitors presents a minimal risk of environmental contamination. The Monsanto Company, the sole domestic producer, has reported voluntarily eliminating its distribution of PCBs to all except manufacturers of electrical transformers and capacitors."

*Numbers in parentheses refer to reference list attached.

Recognizing the need for proper controls in the handling and use of PCBs, representatives of the transformer and capacitor industries, utilities and governmental agencies under the initial auspices of the National Electrical Manufacturers Association formed American National Standards Institute Committee C-107. Proposed guidelines (30) for the handling and disposal of dielectric fluids have been published. These guidelines reflect the industry's understanding of the need for proper control and have contributed significantly toward achieving this objective.

Proposals for the control of PCBs internationally were considered by the member countries of the Organization for Economic Co-operation and Development (OECD) and in February, 1973, they adopted an agreement (31) which restricts the use of PCBs to dielectric applications, non-food related heat transfer fluid applications and hydraulic fluid applications in mining equipment. This agreement is less restrictive than Monsanto's sales policy since it supports the continued use of PCBs in heat transfer and hydraulic fluids.

We have reviewed with considerable interest the effluent standards proposed for polychlorinated biphenyls in new Part 129, Subpart I, Chapter I of Title 40, Code of Federal Regulations and have objections relating to the following:

1. Definition of polychlorinated biphenyls.
2. Sampling and analytical methods.
3. Toxicity data.
4. Bioaccumulation factors.
5. Safety factors.
6. Stream flow rates.
7. Background levels of polychlorinated biphenyls.
8. Economic considerations.

DEFINITION OF POLYCHLORINATED BIPHENYLS

Commercial polychlorinated biphenyl products, of which Aroclor® products are examples, are produced by direct chlorination of biphenyl; the degree of chlorination being chosen to provide desired properties. These products are in all cases multi-component mixtures and not single entities as implied by the commonly employed acronym "PCBs".

While it is well understood and accepted that polychlorinated biphenyl isomers have a unique set of physical and chemical properties, it is apparently not understood that they bioaccumulate, dissipate and biodegrade at different rates.

This lack of understanding is reflected in the definition proposed in the EPA Toxic Pollutant Effluent Standards (Federal Register, Vol. 38, No. 247, page 35393, Section 129.09a) and we quote:

> "As used in this Subpart, the term: Polychlorinated biphenyls (PCB's) means materials containing the biphenyl group which have been chlorinated to varying degrees. There are 210 possible different PCB compounds."

We object to this definition because it implies that all polychlorinated biphenyl isomers are of equal environmental concern, i.e., that they all persist and bioaccumulate in the same manner in our environment. It has been well established by academic, government, and industrial researchers that this is simply not true. Environmental monitoring programs have clearly demonstrated that, with the exception of direct high-level controllable release near points of manufacture or use, the PCBs found in our environment are the more highly chlorinated ones, i.e., those containing predominantly five or more chlorine atoms per biphenyl molecule (2 thru 13).

This is true even though the lower polychlorinated biphenyls have constituted more than 65% of all the PCBs manufactured over the years. This is strong evidence that the lower polychlorinated biphenyls degrade rapidly. It further demonstrates that even under conditions of unlimited use, and without special precautions to avoid release into our environment (which is not the case now), that the lower polychlorinated biphenyls degrade rapidly enough to prevent bioaccumulation (4, 5, 6, 27, 28).

More recently, it has also been demonstrated in laboratory experiments that chlorinated biphenyl isomers, readily undergo bacterial degradation at rates dependent upon the number of chlorines per biphenyl molecule (17, 18, 19, 20, 21 and 37). There are also good indications that ambient environmental PCB levels are decreasing at rates more rapidly than predicted (14, 15, 16).

The rapid metabolism of these chlorinated isomers and their lack of importance as contributors to the chlorinated biphenyl tissue burdens is evidenced in the results of numerous studies. Risebrough (2) reported that the chlorine composition of the PCBs detected in Atlantic Ocean zooplankton was approximately 54%. He concluded "U.S. production of Aroclor 1254 in 1970 amounted to 12 million pounds -- only one quarter of the production of 49 million pounds of Aroclor 1242. It might be expected therefore that biphenyls with fewer chlorine atoms would predominate in planktonic samples unless these compounds were selectively degraded." Similar findings in fresh water and marine fishes were reported by Zitko (3) and Jensen, et al., (4). The disappearance of the lower chlorinated homologs in extracts of tissues from birds (5, 34) and mammals (6, 33) indicate rapid metabolism or excretion of the lower chlorinated homologs. As a result of the metabolism and/or excretion of the chlorinated biphenyls containing less than five chlorine atoms per molecule, their contribution to the effluent should not be used in measuring polychlorinated biphenyl effluent from a facility.

On the basis of these data it is unrealistic to consider all polychlorinated biphenyls equivalent in terms of persistence and bioaccumulation as does the proposed regulation. Therefore, for environmental purposes, the definition of PCBs should focus upon those which are of concern and we recommend that the following definition be substituted for that proposed in Section 129.09a, Subpart I, Title 40, Code of Federal Regulations:

> "Polychlorinated biphenyls (PCBs) means materials containing the biphenyl group which is chlorinated and which have been shown to persist and rapidly bioaccumulate in the aquatic environment. These chlorinated biphenyls are identified as those components having gas chromatographic retention times greater than 60, relative to p,p-DDE = 100, under the standard conditions recommended in the EPA PCB test method."

ANALYTICAL METHODOLOGY

We have no reason to doubt that the recommended EPA PCB test method is capable of detecting parts per trillion (ppt) levels of PCBs in waste waters. However, our experience with analyzing industrial waste waters for PCBs at the parts per billion (ppb) level prompts us to be concerned about the following areas, some of which are not covered adequately in the test procedure.

1. Sampling Procedures
2. Correction for Laboratory and Reagent Background
3. Correction for Non-PCB Sample Interferences
4. Absolute Verification

5. Physical State of PCBs (Adsorbed/Dissolved)

6. Quantitation

7. Precision and Accuracy

Our concern lies in the fact that any method, especially one as complex as a PCB analytical method, which is to be used for effluent control purposes must be thoroughly evaluated and its accuracy and reproducibility proven. If this is not done, the effectiveness of any effluent limit, no matter what the level, will prove to be difficult, if not impossible to determine.

For example, we have found that if waste water streams are not sampled properly, the PCB levels found depend on the sampling procedure employed and bear no relationship to the amount of PCBs discharged. For this reason, sampling procedures used must be designed for the discharge in question and clearly stated. To our knowledge, this has not been done.

We also note that no provisions are recommended for correcting the apparent PCB level found in a sample for laboratory and reagent/ background. It is our experience that as one approaches the ppt level, this background can significantly affect the observed PCB level.

With regard to correction for non-PCB sample interferences, we feel that, while the procedure notes many of the possible interferences, it does not really address itself to those which are more likely to be in industrial waste water streams. For this reason, if the electron capture chromatogram does not match the PCB being manufactured or used, complete absolute verification of all components counted as PCB must be validated via an alternate technique such as gas chromatography/mass spectrometry.

We also note that the recommended EPA PCB test method does not specify a means of differentiating between dissolved and adsorbed PCBs. We believe this should be done since there is a definite difference in the toxicity and availability for bioaccumulation of dissolved and adsorbed chlorinated hydrocarbons (24, 35, 36).

While the scheme proposed for estimation (quantitation) of PCBs is logical, it suffers from the same shortcoming as do the multitude of other procedures which have been proposed. It is an empirical estimate and only a reflection of the real PCB level. Therefore, it should be determined via an alternate, more-elaborate procedure how closely the calculated PCB levels (for each of the cases) are to the real PCB levels so that they may be corrected.

Last, but not least, the precision and accuracy of any procedure proposed as a standard method should undergo a thorough inter-laboratory evaluation. If this has not already been done, it must be carried out prior to the use of the procedure for enforcement purposes. The accuracy and precision of the Monsanto PCB procedure has been subjected to a preliminary evaluation. Prior to this evaluation, we probably would have overestimated the precision and accuracy of our procedure. The exact details of the evaluation are available.

Briefly, samples were prepared by spiking distilled water with 500 ppb PCBs. Individual preparations include blanks (no PCBs), Aroclor® 1242 only, Aroclor® 1254 only, Aroclor® 1260 only, all 50-50 two-component mixtures, and a 1/3, 1/3, 1/3 preparation containing all three components. Six samples of each mixture were prepared and analyzed by two experienced analytical laboratories.

Each result, expressed in ppb of the individual Aroclor®, was converted to percent of the total added. Analysis of variance was run on all data taken together and on each laboratory independently.

- The 95% confidence limits observed for individual results/ were:

Either Lab	87.5 ± 55.2%
Lab A	81.3 ± 46.4%
Lab B	93.7 ± 19.2%

- The repeatability for the individual labs, based on repeat tests of samples having identical prepared compositions was:

Lab A	± 42.0%
Lab B	± 11.6%

We feel that these results demonstrate the importance of evaluating the precision of any PCB procedure. Note that the test did not include sampling problems, used distilled water free of interferences, and was carried out at a relatively high PCB level (500 ppb; 500,000 ppt) by two experienced laboratories. It is expected that, if sampling problems were involved, and the level of PCB present was extremely low, the accuracy and precision of any PCB method would decrease considerably.

BACKGROUND FOR PROPOSED EPA EFFLUENT STANDARD

In the establishment of the proposed effluent standard the primary basis for toxicological consideration came from the Water Quality Criteria, October, 1973, (Federal Register, Vol. 38, pages 29646 et seq., Friday, October 26, 1973). These criteria were, in turn, based on Water Quality Criteria, 1972, by the National Academy of Sciences and the National Academy of Engineering.

The Water Quality Criteria, October, 1973, have not undergone the normal review, criticism, comment and revision before final adoption. We object to the use of challengeable portions of a proposed publication in the development of critical effluent standards.

We note in Water Quality Criteria, 1972, in those sections pertaining to polychlorinated biphenyls, the frequent use of unpublished data and the disturbing use of qualifying phrases such as "...may adversely affect...", "...apparently related...", or "...the work...suggest..." In our opinion, none of the discussions present adequate data to support establishment of responsible effluent standards for PCBs.

On page 5 of Water Quality Criteria, 1972, the Committee emphasized the importance in understanding that there is a distinction between criteria and standards and that the words were not interchangeable nor or they synonyms for words such as objectives or goals. The report further states that it is necessary to establish scientifically-based recommendations for each assignable water use, implying availability of practical methods of detecting and measuring which can be applied to monitoring. Once these fundamentals are available, political, social and economical factors enter into the decision-making process to establish standards. In our opinion, these procedural steps were not followed in arriving at the proposed effluent standards for PCBs.

The maximum acceptable concentration in fresh water that would be permitted by the proposed standard is 0.002 mg/l. The rationale described in the Statement of Basis and Purpose, Toxic Pollutant Effluent Standards is based on results of a preliminary study which have suggested (not yet proven) a threshold PCB level for salmon egg mortality. We cannot accept the selection of salmon as representing organisms which are usual or may potentially be present in water systems near facilities described in Section 129.09, Code of Federal Regulations.

The cumulative sales of PCBs in the United States since 1930 has been estimated to be about 500,000 tons and that total world production was probably 1,000,000 tons (1). About one-half of the PCBs were used in applications where containment was difficult and losses into the environment were common. With this amount of material discharged into the environment, it is of considerable importance to note that extensive harm predicted by some theories has not been found and documented.

This lack of evidence indicates that all of the PCBs do not persist in the environment as a result of factors such as the biodegration we have discussed previously. Also, the PCBs that do persist may not be available because of some factors not clearly understood at present. One characteristic which undoubtedly is of significant importance is the ability of PCBs to adsorb tenaciously to particulate matter. Under these conditions, can PCBs be rightfully considered to be environmentally active and, if so, to what degree? There exists at present a critical need for data relating to partition coefficients between water and sediments and diffusion coefficients in sediment (1, 22, 39, 40).

Although many reports have been published on the subject of polychlorinated biphenyls and living organisms, the majority of these describe the presence of PCBs in the environment. Presence should not be assumed to imply adverse effect. To our knowledge, no published report exists which conclusively relates the mortality of any wildlife species to the presence of PCBs. The only reported mortalities are those achieved in laboratory studies. Not enough is known about the fate and effect of PCBs in the natural and diverse aquatic and marine environments to properly design laboratory studies. Results from such studies are not extrapolatable to the natural situations and any conclusions derived from such studies must still be considered speculative. Fundamental scientifically-based data is lacking and, in its absence, the establishment of effluent standards for polychlorinated biphenyls cannot be made intelligently and responsibly.

In the establishment of the PCB effluent standard for freshwater systems a bioaccumulation factor of 200,000 was selected. This factor has no extrapolatable relationship to either the residues of PCB in salmon eggs or to PCB residues of fresh water forage fish. The only published report (27) of an accumulation factor of the magnitude selected was that for the hepatopancreas of the pink shrimp, Penaeus durarum. Even though an accumulation of 204,000 in the hepatopancreas has occurred, a nearly complete elimination of PCB from that tissue was achieved when the shrimp were placed in water free of added PCB. The equilibrium whole body accumulation plateau indicated an approximate accumulation factor of 22,000. These results are in agreement with those reported by Stallings and Mayer (29), and with the studies of Ryther (28), Greichus et al (24) and Crump-Weisner, et al (22) showing equilibrium biomagnification factors between water and fish ranging between 1,000 and 75,000 depending on the presence and absence of sediment and the specific PCB mixture present. These data would support the selection of a factor considerably lower than the factors which were applied.

Arbitrary safety factors were applied to the tolerable chronic limit to establish the so-called "critical chronic limit" which was then used to compute the maximum allowable effluent. These safety factors were proposed to account for a multitude of variables, including non-point sources, multiple discharges and industrial growth. The safety factors proposed were identical for 7 of the 9 materials for which effluent standards were prepared. These safety factors, resulting in approximately two-fold reductions, are so small as to be of no beneficial toxicological consequence. We recommend that no safety factor be applied.

In establishing the effluent standards, an attempt was made to distinguish between types of receiving waters by classifying them as streams, lakes and impoundments, estuaries and coastal waters. We do not believe this attempt to distinguish water bodies is by any measure adequate. Water bodies are universally known to be complex systems with no two systems alike. With a complex material such as polychlorinated biphenyls, the determination of possible adverse effects in each water body becomes exceedingly difficult. The uniqueness of each water system at each point source must be considered.

A key parameter used to further describe the water body is the flow rate which was limited to the probable low rate of stream flow occurring during a seven-consecutive-day period once in ten years. We do not agree that this is realistic or appropriate. In our opinion, appropriate control is achieved using average stream flow rates.

Further, the maximum flow rate that can be used in calculating the daily discharge permitted has been arbitrarily set at 10,000 cubic feet per second. This limit is based on a nondegradation philosophy which tolerates limited diffusion and on a desire to discourage industry from locating facilities on large main inland waters and coastlines. This limitation deprives our society of the judicious use of an important great natural resource. Discharge limitations should be based on the effects a material will have on a water system, giving consideration to its size and flow rate. For PCBs, proper control will not occur by imposing maximum flow rate conditions, but by applying results from scientific studies which properly define how each water system responds to the presence of PCBs.

RESIDUAL POLYCHLORINATED BIPHENYLS

Because of their chemical and physical properties, PCBs can be found in soils and waters at point sources long after a discharge has occurred. This source of PCBs to the environment will diminish with time but its presence will distort and mask results from current control activities. To maintain control of losses, emphasis should be directed toward discharges resulting from current and future uses of PCBs.

Since this problem of background levels occurs with all materials in varying degrees, we propose the following revisions:

From Section 129.01c(b), delete the words "in intake waters for a discharger".

Add an additional definition in Section 129.01a:

" 'Background' means amounts of toxic pollutant (1) presently found in the waterways of the United States (including the intake waters of a discharger), or (2) arising out of operations subject to this Part that occurred before the effective date of this Part, but were not discharged to the waterways of the United States before the effective date of this Part."

ECONOMIC CONSIDERATIONS

At our PCB manufacturing facility, we developed and instituted an aggressive control program which we described before the Effluent Standards and Water Quality Information Advisory Committee, EPA (41). Yet, in spite of all our efforts, we cannot today meet the proposed effluent standard.

In response (42) to an inquiry from the U.S. Department of Commerce, we emphasized that technology has not been developed to the point that facilities could be designed to meet a reasonable standard. However, analytical techniques suggest a conceptual design using adsorption, settling and filtration of aqueous waste, followed by incineration of the adsorbent, probably carbon. We estimate the capital cost of such a facility, sized to handle our plant waste, at $600,000, not including a dedicated incinerator for the disposal of the adsorbent material. Annual operating cost would approximate $150,000.

The value of Monsanto's annual PCB production is about $8 million, while the value of the electrical devices made therefrom is an order of magnitude larger. If Monsanto were to cease production of PCBs, the jobs of 55 employees would be eliminated directly, while those of an additional 47 employees in a supporting facility would be in jeopardy. The total payroll involved is on the order of $1.5 million.

The impact of a PCB ban on our customers can best be described by them. However, it is apparent that capacitors or transformers made without PCBs will be less fire-resistant than present products, thus leading to an undeterminable incidence of fires, higher insurance rates, and additional protection facilities. In the case of capacitors, the replacements are likely to be larger and less efficient, thus consuming more of the resources required in their manufacture. A more complete analysis of the consequences of a PCB ban was developed by the General Electric Company and addressed to Dr. Martha Sager, Chairman, Effluent Standards and Water Quality Advisory Committee, EPA (43). We concur with the General Electric Company's conclusions.

Our purpose in commenting on the proposed standards is to aid the Agency in the development of realistic effluent standards which will achieve the intended objectives without serious technical, social and economic disruptions. We recognize the seriousness of this endeavor and find a statement made by Mr. John R. Quarles, Jr., Deputy Administrator, Environmental Protection Agency, of considerable interest. At a recent conference, Mr. Quarles (26) stated:

> "We have found it virtually impossible to devise intelligent standards which specify an appropriate degree of control over toxic pollutants irrespective of the sources of those pollutants and factors affecting the feasibility and timing of their abatement."

The difficulties which could be anticipated in establishing effluent standards were recognized by the National Academy of Science in its preparation of Water Quality Criteria, 1972. In a review which appeared in the Environmental Reporter (38) dated August 24, 1973, the following pertinent statements highlight some of the areas of concern:

> "Knowledge of local environmental conditions is essential prior to application of any water quality recommendations for marine aquatic life and wildlife..."

> "NAS said application of recommendations to a local situation is unique because it requires an understanding of the circulation of water and the resultant mixing and dilution of pollutants, a knowledge of biological species and determination of the most sensitive species, and an evaluation of the transport of materials through the food web."

> "NAS said it is not practical to make recommendations for the relatively persistent organic pollutant based on water concentration, especially when partition coefficients are unknown."

We can appreciate Mr. Quarles' concern, particularly as it applies to PCBs. Lacking good scientific information on the fate and effects of PCBs in complex water systems each having unique characteristics, we urge extreme care be taken to avoid the promulgation of effluent standards which are unattainable and unwarranted.

W B Papageorge

W. B. Papageorge

Subscribed and sworn to before me this 14th day of March 1974.

Patricia Ann Foegen

Notary Public

My Commission expires July 18, 1975

REFERENCES CITED

1. Interdepartmental Task Force on PCBs, "Polychlorinated Biphenyls and the Environment", COM-72-10419, May, 1972

2. Risebrough, R.W., Vreeland, V., Bulletin of Environmental Contamination and Toxicology, 8: 345 (1972)

3. Zitko, V., Bulletin of Environmental Contamination and Toxicology, 6: 464 (1971)

4. Jensen, S., Johnels, A.G., Olsson, M., Otterlind, G., Nature, 224: 247 (1969)

5. Bailey, S., Bunyan, P.T., Nature, 236: 34 (1972)

6. Grant, D.L., Phillips, E.J., Villeneuve, D.C., Bulletin of Environmental Contamination and Toxicology, 6: 102 (1971)

7. Iwata, Y., Westlake, W.E., Gunther, F.A., Bulletin of Environmental Contamination and Toxicology, 9: 204 (1973)

8. Crosby, D.G., Moilanen, K.W., Bulletin of Environmental Contamination and Toxicology, 6: 372 (1973)

9. Panel on Hazardous Substances, Environmental Research, 5: 249 (1972)

10. Koeman, J.H., et al., Nature, 221: 1126 (1969)

11. Sissons, D., Welti, J., Journal of Chromatography, 60: 15 (1971)

12. Bagley, G.E., et al., Journal of the Association of Official Analytical Chemists, 53: 251 (1970)

13. Bidleman, F.F., Olney, C.E., Science, 183: 516 (1974)

14. Food Chemical News, October 1, 1973, p. 2: "No PCB residues 'that could be quantitated' have been found in FDA's last 10 market basket surveys, FDA says...."

15. Statement obtained from Dr. George Harvey, Woods Hole Oceanographic Institute 1/9/74; permission to quote given.

   "In the summer and fall of 1972 the surface waters of the Eastern and Western North Atlantic ocean had an average PCB concentration of 30 parts per trillion. By the summer and fall of 1973, the average PCB concentration in the same areas had decreased to about 1 part per trillion.

   "Since the suspended solids fall out and mixing rates of the ocean are constant, the observed reduction in surface layer concentrations indicate a reduced PCB input."

16. Department of the Environment, Water Pollution Research 1972, Report of the Director of Water Pollution Research, London

17. Evans, W.C., Lunt, D., Biochemical Journal, 118: 54P (1970)

18. Catelani, D., Sorline, C., Trecean, V., Experientia, 27: 1174 (1971)

19. Ahmed, M., Focht, D.D., Can. J. Microbiol., 19: 47 (1973)

20. Ahmed, M., Focht, D.D., Bulletin of Environmental Contamination and Toxicology, 10: 70 (1973)

21. Tucker, E.S., Saeger, V.W., Hicks, O., "Biodegradation of Polychlorinated Biphenyls", submitted to editor Bulletin of Environmental Contamination and Toxicology, February, 1974

22. Crump-Wiesner, H.J., Feltz, H.R., Yates, M.L., J. Res. U.S. Geo. Survey, 1: 603 (1973)

23. Duke, T.W., Lowe, J.I., Wilson, A.J.,Jr., Bulletin of Environmental Contamination and Toxicology, 5: 171 (1970)

24. Greichus, Y.A., Greichus, A., Emerick, R.J., Bulletin of Environmental Contamination and Toxicology, 9: 321 (1973)

25. Hansen, D.J., Parrish, P.R., Lowe, J.I., Wilson, A.J.,Jr., Wilson, P.D., Bulletin of Environmental Contamination and Toxicology, 6: 113 (1971)

26. Quarles, J.R.,Jr., Remarks to Conference on Industry and Clean Water, Midwest Research Institute, Kansas City, Missouri, January 17, 1974

27. Nimmo, D.R., Blackman, R.R., Wilson, A.J.,Jr., Forester, J., Marine Biology, 11: 191 (1971)

28. Ryter, J.H., "The Use of Flowing Biological Systems in Aquaculture, Sewage Treatment, Pollution Assay, and Food Chain Studies." Woods Hole Oceanographic Institute, Woods Hole, Massachusetts. Unpublished Manuscript. (1972)

29. Stallings, D.L., Mayer, F.L.,Jr., Environmental Health Perspectives, 1: 159 (1972)

30. Proposed American National Standard Guidelines for Handling and Disposal of Capacitor- and Transformer-Grade Askarels Containing Polychlorinated Biphenyls, C107.1-( ), Pub. No. CP-P1-1973, Pub. No. TR-P6-1973, National Electrical Manufacturers Association, January 25, 1973

31. Decision of the Council on Protection of the Environment by Control of Polychlorinated Biphenyls, Organization for Economic Co-operation and Development, February 20, 1973

32. Tucker, E.S., Litschgi, W.J., Mees, W.M., "Migration of PCBs in Soil Induced by Percolating Water", submitted to editor Bulletin of Environmental Contamination and Toxicology, March, 1974

33. "Presentation to the Interdepartmental Task Force on PCBs", Monsanto Company, May 15, 1972

34. Bagley, G.E., Cormartie, E., Journal of Chromatography, 75: 219 (1973)

35. Ferguson, D.E., Goodyear, C.P., Copeia, 2: 467 (1967)

36. Nimmo, D.R., Wilson, P.D., Blackman, R.R., Wilson, A.J.,Jr., Nature, 231: 50 (1971)

37. Baxter, R.A., Gilbert, P.E., Lidgett, R.A., Mainprize, J.H., Vodden, H.A., "The Degradation of Polychlorinated Biphenyls by Micro-organisms", submitted to editor Biochemical Journal, March, 1974

38. Environmental Reporter, pages 700-703, August 24, 1973

39. Haque, R., Schmedding, D.W., Freed, V.H., Environmental Science and Technology, 8: 139 (1974)

40. Gustafson, C.G., Environmental Science and Technology, 4: 814 (1970)

41. "Polychlorinated Biphenyl (PCB)", A Presentation to the Effluent Standards and Water Quality Information Advisory Committee, EPA, by Monsanto Industrial Chemicals Company, November 29, 1973

42. Correspondence, W. B. Papageorge, Monsanto Industrial Chemicals Company to Dr. Sidney R. Galler, U.S. Department of Commerce, February 21, 1974

43. Correspondence, J. S. Nelson, General Electric Company to Dr. Martha Sager, Effluent Standards and Water Quality Information Advisory Committee, EPA, November 21, 1973