First Revised Volume No. 2

Fifteenth Revised Sheet No. 10

The proposed effective date is June 1, 1982.

Increased revenues from the rates as proposed by MDU would amount to $2,938,087 annually under MDU's Rate Schedules G–1, PR–1, X–1, I–1, X–5, and X–6.

The filing indicates that MDU has experienced increases in both purchased gas costs and most other areas of its cost of service. Consequently, MDU finds it necessary to file for an increase in its jurisdictional rates.

Any person desiring to be heard or to make any protest with reference to said filing should on or before May 25, 1982, file with the Federal Energy Regulatory Commission, 825 North Capitol Street, N.E., Washington, D.C. 20426, a petition to intervene or a protest in accordance with the requirements of the Commission's Rules of Practice and Procedure (18 CFR 1.8 or 1.10). All protests filed with the Commission will be considered by it in determining the appropriate action to be taken, but will not serve to make the protestants parties to the proceeding. Any person wishing to become a party to a proceeding or to participate in any hearing therein must file a petition to intervene in accordance with the Commission's Rules of Practice and Procedure.

Kenneth F. Plumb,

Secretary.

[FR Doc. 82–14205 Filed 5–24–82; 8:45 am]

BILLING CODE 6717–01–M

Oil Pipeline; Tentative Valuation

The Federal Energy Regulatory Commission by order issued February 10, 1978, established an Oil Pipeline Board and delegated to the Board its functions with respect to the issuance of valuation reports pursuant to Section 19a of the Interstate Commerce Act.

Notice is hereby given that a tentative valuation is under consideration for the common carrier listed below:

1978, 1979, 1980 Consolidated Report

(May 20, 1982)

Valuation Docket No. PV—1450–000

Seaway Pipeline, Inc., 370 Adams Building, Bartlesville, Oklahoma 74004

On or before June 28, 1982, persons other than those specifically designated in Section 19a(h) of the Interstate Commerce Act having an interest in this valuation may file, pursuant to rule 70 of the Interstate Commerce Commission's "General Rules of Practice" (49 CFR 1100.70), an original and three copies of a petition for leave to intervene in this proceeding.

If the petition for leave to intervene is granted the party may thus come within the category of "additional parties as the FERC may prescribe" under Section 19a(h) of the Act, thereby enabling it to file a protest. The petition to intervene must be served on the company at its address shown above and an appropriate certificate of service must be attached to the petition. Persons specifically designated in Section 19a(h) of the Act need not file a petition; they are entitled to file a protest as a matter of right under the statute.

Francis J. Connor,

Administrative Officer, Oil Pipeline Board.

[FR Doc. 82–14204 Filed 5–24–82; 8:45 am]

BILLING CODE 6717–01–M

ENVIRONMENTAL PROTECTION AGENCY

[OPTS 41009; TSH–FRL–2131–6]

Tenth Report of the Interagency Testing Committee to the Administrator; Receipt of Report and Request for Comments Regarding Priority List of Chemicals

AGENCY: Environmental Protection Agency (EPA).

ACTION: Notice.

SUMMARY: The Interagency Testing Committee (ITC), established under section 4(e) of the Toxic Substances Control Act (TSCA), transmitted its Tenth Report to the Administrator of EPA on May 10, 1982. This report, which revises and updates the Committee's priority list of chemicals, adds four chemicals to the list for priority consideration by EPA in the promulgation of test rules under section 4(a) of the Act. The four new chemicals are biphenyl, ethyltoluene, formamide, and 1,2,4-trimethylbenzene. The Tenth Report is included in this notice. The Agency invites interested persons to submit written comments on the Report, and to attend Focus Meetings to help narrow and focus the issues raised by the ITC's recommendations. Members of the public are also invited to inform EPA if they wish to be notified of subsequent public meetings on these chemicals.

DATES: Written comments should be submitted by June 24, 1982. Focus meetings will be held on July 12, and 13, 1982.

ADDRESSES: Send written submissions to: Document Control Office (TS–793), Office of Pesticides and Toxic Substances, Environmental Protection Agency, Rm E–409, 401 M St., SW., Washington, D.C. 20460.

Submissions should bear the Document Control Number OPTS–41009. The public record supporting this action, including comments, is available for public inspection in Rm. E–107 at the address noted above from 8:00 a.m. to 4:00 p.m. Monday through Friday, except legal holidays. Focus meetings will be held at Waterside Mall, in Rm. 3906, 401 M St., SW. Washington, D.C. If planning to attend one of the Focus Meetings and/or the subsequent public meetings on these chemicals, please notify the Industry Assistance Office at the address listed below.

FOR FURTHER INFORMATION CONTACT: Douglas G. Bannerman, Acting Director, Industry Assistance Office (TS–799), Office of Toxic Substances, Environmental Protection Agency, 401 M Street, SW., Washington, D.C. 20460, Toll Free: (800–424–9065). In Washington, D.C.: (554–1404). Outside the USA: (Operator—202–544–1404).

SUPPLEMENTARY INFORMATION:

I. Background

Section 4(a) of TSCA authorizes the Administrator of EPA to promulgate regulations requiring testing of chemical substances in order to develop data relevant to determining the risks that such chemical substances may present to health and the environment.

Section 4(e) of TSCA established an Interagency Testing Committee to make recommendations to the Administrator of EPA of chemical substances to be given priority consideration in proposing test rules under section 4(a). Section 4(e) directs the Committee to revise its list of recommendations at least every six months as it determines to be necessary. The total number of chemicals the ITC may designate for priority consideration within 12 months of the date of designation may not exceed 50 at any one time. EPA must either initiate rulemaking or publish in the **Federal Register** reasons for not requiring testing within that 12 months. The ITC's Tenth Report was received by the Administrator on May 10, 1982, and follows this Notice.

II. Written and Oral Comments and Public Meetings

EPA invites interested persons to submit detailed comments on the ITC's new recommendations. The Agency is interested in receiving information concerning additional or ongoing health and safety studies on the subject chemicals as well as information relating to the human and environmental

exposure to these chemicals. Focus Meetings will be held to discuss relevant issues pertaining to the chemicals and to narrow the range of issues/effects which will be the focus of the Agency's subsequent activities in responding to the ITC recommendations. The Focus Meetings will be held July 12 and 13 at Waterside Mall, 410 M St., SW., Washington, D.C., Room 3906. These meetings are intended to supplement and expand upon written comments submitted in response to this notice. In addition to discussing concerns and data, the Focus Meetings will explore the issues of negotiated testing versus issuance of a test rule. The schedule for the Focus Meeting is the following: July 12, 9:00 a.m.—biphenyl, 1:00 p.m.—ethyltoluene; July 13, 9:00 a.m.—formamide, 1:00 p.m.—1,2,4-trimethylbenzene.

Persons wishing to attend one or more of these meetings should call the Industry Assistance Office at the toll free number listed above.

In addition to the Focus Meetings, EPA will hold public meetings on each chemical after preliminary decisions have been made on the types of testing that are needed, considering any additional information provided in the written comments and the Focus Meetings. These meetings will be several months in the future, but separate notice of these meetings will not be published later. Therefore, anyone wishing to attend these later meetings should contact EPA now at the address given for the Industry Assistance Office in order to be notified in advance of the public meetings.

All written submissions should bear the identifying Docket No. OPTS–41009.

III. Status of List

In addition to adding four chemicals to the priority list, the Committee also noted the removal by EPA of a number of chemicals from the list based upon actions taken by the Agency. The current list contains 34 substances or categories of substances.

Dated: May 17, 1982.

Don R. Clay,

Acting Assistant Administrator for Pesticides and Toxic Substances.

Tenth Report of the TSCA Interagency Testing Committee to the Administrator, Environmental Protection Agency

Summary

Section 4 of the Toxic Substances Control Act of 1976 (TSCA Public Law 94–469) provides for the testing of chemicals in commerce that may present an unreasonable risk of injury to health or the environment. It also provides for the establishment of a Committee, composed of representatives from eight designated Federal agencies, to recommend chemical substances and mixtures to which the Administrator of the U.S. Environmental Protection Agency (EPA) should give priority consideration for the promulgation of testing rules.

Section 4(e)(1)(A) of TSCA directs the Committee to designate those chemical substances or mixtures to which the Administrator should respond within 12 months by either initiating a rulemaking proceeding under section (4)(a) or publishing the Administrator's reason for not initiating such as proceeding. Every 6 months, the Committee makes those revisions in the section 4(e) Priority List that it determines to be necessary and transmits them to the EPA Administrator.

As a result of its deliberations, the Committee is revising the TSCA section 4(e) Priority List by the addition of 4 entries and the removal of 14. The chemicals being added to the List are presented alphabetically, together with the types of testing recommended, as follows:

Chemical	Recommended studies
Biphenyl	Environmental Effects and Chemical Fate: Chronic toxicity to fish and aquatic invertebrates; toxicity to aquatic macrophytes; chemical fate.
Ethyltoluene	Health Effects: Mutagenicity; subchronic toxicity; chemical disposition and metabolism studies to determine the biological half-life in laboratory animals and the products formed.
	Environmental Effects and Chemical Fate: Acute and chronic toxicity to fish and aquatic invertebrates; toxicity to aquatic macrophytes and terrestrial plants; bioconcentration; chemical fate.
Formamide	Health Effects: Genotoxic effects; carcinogenicity; other chronic effects.
1,2,4-Trimethylbenzene	Health Effects: Subchronic/chronic effects to include neurotoxicity; reproductive effects; teratogenicity.
	Environmental Effects and Chemical Fate: Acute and chronic toxicity to fish and aquatic invertebrates; toxicity to aquatic macrophytes and terrestrial plants; bioconcentration; chemical fate.

Each of the new recommendations is being designated by the Committee for action by EPA within 12 months of the date of this report.

The following entries are being removed from the List because the EPA Administrator has responded to the Committee's recommendations regarding these chemicals and categories: alkyl phthalates, benzidine-based dyes, benzyl butyl phthalate, butyl glycolyl butyl phthalate, chlorinated napthalenes, 2-chlorotoluene, chlorinated paraffins, o-diaisidine-based dyes, diethylenetriamine, fluoroalkenes, hexachloroethane, phenylenediamines, polychlorinated terphenyls, and o-tolidine-based dyes.

TSCA Interagency Testing Committee

Statutory Member Agencies and Their Representatives

Council on Environmental Quality

Gordon F. Snow, Member

Department of Commerce

Bernard Greifer, Member (1)

Environmental Protection Agency

Joseph Seifter, Member
Carl R. Morris, Alternate

National Cancer Institute

Elizabeth K. Weisburger, Member and Chairperson
Richard Adamson, Aletrnate
Jerrold Ward, Alternate

National Institute of Environmental Health Sciences

Dorothy Canter, Member

National Institute for Occupational Safety and Health

Vera W. Hudson, Member
Herbert E. Christensen, Alternate

National Science Foundation

Winston C. Nottingham, Member

Occupational Safety and Health Administration

Patricia Marlow, Member

Liaison Agencies and Their Representatives

Consumer Product Safety Commission

Arthur Gregory
Lakshmi Mishra

Department of Agriculture

Fred W. Clayton
Homer E. Fairchild

Department of Defense

Arthur H. McCreesh

Department of the Interior

None

Food and Drug Administration

Winston deMonsabert, Vice Chairperson
Allen H. Heim

National Toxicology Program

Dorothy Canter

Committee Staff

Martin Greif, Executive Secretary
Norma Williams, ITC Coordinator (acting)

Support Staff

Alan Carpien—Office of the General Counsel, EPA
Jon Cooper (2)—Office of Toxic Substances, EPA
James Dragun (3)—Office of Toxic Substances, EPA

References

(1) Dr. Greifer had previously served as an Alternate and was appointed to full-member status on December 18, 1981.

(2) Dr. Cooper was appointed on December 17, 1981, to fill the vacancy created by the resignation of Dr. Gary Dickson.

(3) Dr. Dragun resigned from the Committee on April 1, 1982.

The Committee acknowledges and is grateful for the assistance and support given to it by the staff of Dynamac Corporation (technical support contractor) and numerous personnel of the EPA Office of Toxic Substances.

Chapter 1—Introduction

1.1 *Background.* The TSCA Interagency Testing Committee (Committee) was established under section 4(e) of the Toxic Substances Control Act of 1976 (TSCA, Public Law 94-469). The specific mandate of the Committee is to recommend to the Administrator of the U.S. Environmental Protection Agency (EPA) chemical substances and mixtures in commerce that should be tested to determine their potential hazard to human health and/or the environment. TSCA specifies that the Committee's recommendations shall be in the form of a Priority List, which is to be published in the **Federal Register.** The Committee is directed by section 4(e)(1)(A) of TSCA to designate those chemicals to which the EPA Administrator should respond within 12 months by either initiating a rulemaking proceeding under section 4(a) or publishing the Administrator's reason for not initiating such a proceeding.

Every 6 months, the Committee makes those revisions in the section 4(e) Priority List that it determines to be necessary and transmits them to the EPA Administrator.

The Committee is comprised of representatives from eight statutory member agencies, five liaison agencies, and one national program. The specific representatives and their affiliations are named in the front of this report. The Committee's chemical review procedures and prior recommendations are described in previous reports (Refs. 1 through 10).

1.2 *Committee's previous reports.* Nine previous reports to the EPA Administrator have been issued by the Committee and published in the **Federal Register** (Refs. 2 through 10). Forty-nine entries (chemical substances and categories of chemicals) were designated by the Committee for priority consideration by the EPA Administrator. Five entries were removed (Ref. 10) after EPA responded to the Committee's recommendations for testing.

1.3 *Committee's activities during this reporting period.* The Committee has continued to review chemicals from its second and third rounds of scoring (see Ref. 2 for methodology) and completed a fourth scoring exercise. The chemicals selected in this exercise for review by the Committee were listed in the **Federal Register** (Ref. 11), and a public meeting was held April 22, 1982, to receive comments on these chemicals. The public was also invited to submit, in writing, comments and non-confidential unpublished data on exposure and biological effects of these chemicals.

The Committee made direct contact with more than 100 manufacturers of the chemicals being reviewed to rquest information that would be of value in its deliberations. Response by the industry has been excellent.

During this reporting period, the Committee has evaluated data on 109 chemicals for priority consideration. Four have been added to the section 4(e) Priority List; 75 were deferred from further consideration at this time.

1.4 *The TSCA section 4(e) Priority List.* Section 4(e)(1)(B) of TSCA directs the Committee to: "* * * make such revisions in the [priority] list as it determines to be necessary and * * * transmit them to the Administrator together with the Committee's reasons for the revisions." Under this authority, the Committee is revising the Priority List by adding four chemicals: biphenyl, ethyltoluene, formamide, and 1,2,4-trimethylbenzene. The testing recommended for these chemicals and the rationales for the recommendations are presented in Chapter 2 of this report.

Fourteen chemicals and categories have been removed from the Priority List because the EPA Administrator responded to the Committee's recommendations in accordance with TSCA section 4(e) requirements. The chemicals removed are indicated in Table 2 with an asterisk (*).

With the 4 designations and 14 removals in this report, 34 entries now appear on the Priority List (Table 1). The cumulative list of entries removed from the Priority List is presented in Table 2.

TABLE TABLE 1—THE TSCA SECTION 4(e) PRIORITY LIST

[April 1982]

Entry	Date of designation
1. Acetonitrile	April 1979.
2. Acrylamide	April 1978.
3. Alkyl expoxides	October 1977.
4. Anile and bromo-, chloro- and/or nitroanilines.	April 1979.
5. Antimony (metal)	April 1979.
6. Antimony (sulfide)	April 1979.
7. Antimony trioxide	April 1979.
8. Aryl phosphates	April 1978.
9. Biphenyl	April 1982.
10. Chlorendic acid	October 1981.
11. Chlorinated benzenes, mono- and di-	October 1977.
12. Chlorinated benzenes, tri-, tetra-, and penta-.	October 1978.
13. 4-Chlorobenzotrifluoride	October 1981.
14. Cresols	October 1977.
15. Cyclohexanone	April 1979.
16. 1,2-Dichloropropane	October 1978.
17. Ethyltoluene	April 1982.
18. Formamide	April 1982.
19. Glycidol and its derivatives	October 1978.
20. Halogenated aklyl epoxides	April 1978.
21. Hexachloro-1,3-butadiene	October 1977.
22. Hexachlorocyclopentadiene	April 1979.
23. Hydroquinone	November 1979.
24. Isophorone	April 1979.
25. Mesityl oxide	April 1979.
26. 4,4'-Methylenedianiline	April 1979.
27. Methyl ethyl ketone	April 1979.
28. Methyl isobutyl ketone	April 1979.
29. Pyridine	April 1978.
30. Quinone	November 1979.
31. Toluene	October 1977.
32. 1,2,4-Trimethylbenzene	April 1982.
33. Tris(2-chlorethyl)phosphite	October 1981.
34. Xylenes	October 1977.

TABLE 2.—CUMULATIVE REMOVALS FROM THE TSCA SECTION 4(e) PRIORITY LIST

[April 1982]

Chemical/category	FEDERAL REGISTER	
	Citation	Publication date
1. Alkyl phthalates*	46 FR 53775-53777	Oct. 30, 1981.
2. Alkyltin compounds**	47 FR 5458-5463	Feb. 5, 1982.
3. Benzidine-based dyes*	46 FR 55005-55006	Nov. 5, 1981.
4. Benzyl butyl phthalate*	46 FR 53775-53777	Oct. 30, 1981.
5. Butyl glycolyl butyl phthalate*	46 FR 54487	Nov. 2, 1981.
6. Chlorinated napthalenes*	46 FR 54491	Nov. 2, 1981.
7. Chlorinated paraffins*	47 FR 1017-1019	Jan. 8, 1982.
8. Chloromethane	45 FR 48524-48564	July. 18, 1980.
9. 2-Clorotolune*	45 FR 18172-18175	Apr. 28, 1982.
10. o-Dianisidine-based dyes*	46 FR 55005-55006	Nov. 5, 1981.
11. Dichloromethane	46 FR 30300-30320	June 5, 1981.
12. Diethylenetriamine*	47 FR 18386-18391	Apr. 29, 1982.
13. Flouroalkenes*	46 FR 53704-53708	Oct. 30, 1981.
14. Hexachloroethane*	47 FR 18175-18176	Apr. 28, 1982.
15. Nitrobenzene	46 FR 30300-30320	June 5, 1981.
16. Phenylenediamines*	47 FR 973-983	Jan. 8, 1982.
17. Polychlorinated terphenyls*	46 FR 54482-54483	Nov. 2, 1981.

TABLE 2.—CUMULATIVE REMOVALS FROM THE TSCA SECTION 4(e) PRIORITY LIST—Continued

[April 1982]

Chemical/category	Federal Register	
	Citation	Publication date
18. o-Tolidine-based dyes*	46 FR 55005–55006	Nov. 5, 1981.
19. 1,1,1-Trichloroethane	46 FR 30300–30320	June 5, 1981.

*Removal from the section 4(e) Priority List noted in this report.
**Removal by the Committee for reconsideration.

1.5 *Availability of testing facilities and personnel.* One of the factors listed in section 4(e)(1)(A) of TSCA that the Committee must consider in making its recommendations is the reasonably foreseeable availability of facilities and personnel for performing the recommended testing. The Committee addressed this issue in its first three reports (Refs. 2 through 4). In its Third Report to the EPA Administrator, the Committee recommended that a national survey be conducted to assess the availability of personnel and testing facilities.

EPA has recently completed a national survey to assess the capacity and resources of the Nation's toxicological testing industry in relation to the demands made upon that industry with and without the additional testing requirements imposed by TSCA (Ref. 12). The report is based upon data collected during June and July 1981 and represents the latest information available on the subject. The survey found that the industry's anticipation of increased testing requirements has prompted the rapid expansion of testing facilities in recent years, and excess capacity currently exists in the toxicological testing industry.

References

(1) Preliminary List of Chemical Substances for Further Evaluation. Toxic Substances Control Act Interagency Testing Committee, July 1977.

(2) Initial Report to the Administrator, Environmental Protection Agency, TSCA Interagency Testing Committee, October 1, 1977. Published in the **Federal Register** of Wednesday, October 12, 1977, 42 FR 55026–55080. Corrections published in the **Federal Register** of November 11, 1977, 42 FR 58777–58778. The report and supporting dossiers were also published by the Environmental Protection Agency, EPA 560–10–78/001, January 1978.

(3) Second Report of the TSCA Interagency Testing Committee to the Administrator, Environmental Protection Agency. TSCA Interagency Testing Committee, April 1978. Published in the **Federal Register** of Wednesday, April 19, 1978, 43 FR 16684–16688. The report and supporting dossiers were also published by the Environmental Protection Agency, EPA 560–10–78/002, July 1978.

(4) Third Report of the TSCA Interagency Testing Committee to the Administrator, Environmental Protection Agency. TSCA Interagency Testing Committee, October 1978. Published in the **Federal Register** of Monday, October 10, 1978, 43 FR 50630–50635. The report and supporting dossiers were also published by the Environmental Protection Agency, EPA 560–10–79/001, January 1979.

(5) Fourth Report of the TSCA Interagency Testing Committee to the Administrator, Environmental Protection Agency. TSCA Interagency Testing Committee, April 1979. Published in the **Federal Register** of Friday, June 1, 1979, 44 FR 31866–31889.

(6) Fifth Report of the TSCA Interagency Testing Committee to the Administrator, Environmental Protection Agency. TSCA Interagency Testing Committee, November 1979. Published in the **Federal Register** of Friday, December 7, 1979, 44 FR 70664–70674.

(7) Sixth Report of the TSCA Interagency Testing Committee to the Administrator, Environmental Protection Agency. TSCA Interagency Testing Committee, April 1980. Published in the **Federal Register** of Wednesday, May 28, 1980, 45 FR 35897–35910.

(8) Seventh Report of the TSCA Interagency Testing Committee to the Administrator, Environmental Protection Agency. TSCA Interagency Testing Committee, October 1980. Published in the **Federal Register** of Tuesday, November 25, 1980, 45 FR 78432–78446.

(9) Eighth Report of the TSCA Interagency Testing Committee to the Administrator, Environmental Protection Agency. TSCA Interagency Testing Committee, April 1981. Published in the **Federal Register** of Friday, May 22, 1981, 46 FR 28138–28144.

(10) Ninth Report of the TSCA Interagency Testing Committee to the Administrator, Environmental Protection Agency. TSCA Interagency Testing Committee, October 1981. Published in the **Federal Register** of Friday, February 5, 1982, 47 FR 5456–5463.

(11) Chemicals To Be Reviewed by the TSCA Interagency Testing Committee; Notice of Public Meeting and Request for Information. Published in the **Federal Register** of Thursday, February 25, 1982, 47 FR 8244–8246.

(12) Chemical Testing Industry Profile of Toxicological Testing. Prepared for U.S. Environmental Protection Agency, Office of Pesticides and Toxic Substances. Development Planning and Research Associates, Inc. NTIS 82–140773. EPA 560–4–81/003, October 1981.

Chapter 2—Recommendations of the Committee

2.1 *Chemicals recommended for action by the EPA Administrator.* As provided by section 4(e)(1)(B) of TSCA, the Committee is adding the following four chemicals to the section 4(e) Priority List: biphenyl, ethyltoluene, formamide, and 1,2,4-trimethylbenzene. The designation of these entries was determined after considering the factors identified in section 4(e)(1)(A) and other available relevant information, as well as the professional judgment of Committee members.

The studies recommended for these entries and the rationales to support the recommendations are given in section 2.2 of this report. In accordance with section 4(e) of TSCA, the Committee is designating these entries for action by EPA within 12 months of the date of issuance of this Tenth Committee Report.

2.2 *Recommendations and rationales.*

2.2.a *Biphenyl.*

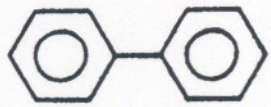
Summary of recommended studies. It is recommended that biphenyl be tested for the following:

A. Environmental Effects and Chemical Fate:

Chronic toxicity to fish and aquatic invertebrates
Toxicity to aquatic macrophytes
Chemical fate

Physical and Chemical Information

CAS Number: 92–52–4.
Structural Formula:



Empirical Formula: $C_{12}H_{10}$.
Molecular Weight: 154.
Melting Point: 71°C.

Solubility: Water, 7.5 mg/L; soluble in ethanol, diethyl ether, and benzene.

Log Octanol/Water Partition Coefficient: 4.02 (Hutchinson et al., 1980).

Description of Chemical: Colorless to pale yellow crystalline solid or flake.

Rationale for Recommendations

I. *Exposure information*—A. *Production/use/disposal information.* U.S. production of biphenyl in 1977 was reported in the TSCA Inventory to be between 126 million and 1.26 billion pounds (EPA, 1980a). Current annual production is estimated to be about 700 million pounds (Dow, 1981).

Biphenyl is used as as dye carrier (60 percent of production), as a heat-transfer fluid, and as a fungicide in

citrus fruit-wraps. Virtually all of the biphenyl used as a dye carrier is released from textile-finishing plant as air emission (about 5 percent) or in wastewater, where much of it is treated. As a heat-transfer fluid, biphenyl would be expected to be released to the environment through disposal. In fruit wrap, biphenyl would be partially volatilized or sorbed to citrus peel.

Biphenyl has been identified with: (1) Effluent from wood preservative, sewage treatment, and textile chemical plants; (2) influent to sewage treatment plants; (3) polyvinyl chloride smoke particulates; and (4) air in an aluminum reduction plant (Shackleford and Keith, 1976; Liao, 1978; Bjorseth, 1978). It has also been identified in the Thames River in England; in lakes, tapwater, and subterranean waters; in lake sediments in Zurich, Switzerland; and in the Merrimack River in Massachusetts (Commission of the European Communities, 1976; Giger and Schaffner, (1978). Measured concentrations of biphenyl have been detected: (1) in Athens, Georgia, drinking water at levels of 1–5 ng/L, (2) outside a specialty chemicals plant, (3) in river water at concentrations of 0.001–0.015 mg/L, (4) in river sediment at concentrations of 1–2 mg/kg, and (5) in tar balls found on the gravelly bottom of the river at undetermined concentrations (Thruston, 1978; Jungclaus et al., 1978; Guerin et al., 1978).

B. *Chemical fate information.* No studies on the overall environmental transport or persistence of biphenyl were found. This compound is expected to enter water and air, and sorb to soil and sediments. Biphenyl is expected to degrade under aerobic and anaerobic conditions. Biodegradation rates appear to be rapid in laboratory studies (Meylan and Howard, 1977; Willis and Addison, 1979). However, a study of the biodegradation of biphenyl in seawater indicated a persistence of greater than several months (Reichardt et al., 1981).

Biphenyl can react with chlorine in wastewater treatment plants to produce mono- and dichlorbiphenyls (Carlson et al., 1975). The extent of chlorination varies with pH, contact time, and the concentration of chlorine. At a pH of 5.5, which might might be expected at wastewater treatment plants, concentrations of 0.1–82 μg/L of mono- and dichlorobiphenyls were produced during 24–120 hours of contact.

II. *Biological effects of concern to human health*—The health effects of biphenyl have been studied, and no further health effects testing is recommended at this time.

III. *Environmental considerations*—A. *Short-term (acute) effects.* The acute toxicity (96-hr LC_{50}) reported for biphenyl is 1.5–5.3 mg/L for the fathead minnow (Kirk-Othmer, 1979; Dow, 1981). The 24-hr LC_{50}, the 48-hr LC_{50}, and the no-effect concentrations for daphnids are 27, 4.7, and 2.2 mg/L, respectively (Leblanc, 1980). The rate of photosynthesis was reduced by 50 percent in the algae *Chlamydomonas angulosa* and *Chlorella vulgaris* at 8.3 and 25 mg/L, respectively (Hutchinson et al., 1980).

B. *Long-term (subchronic/chronic) effects.* No studies on the long-term effects of biphenyl have been found for aquatic animals.

C. *Other effects (physiological/behavioral/ecosystem processes).* No studies on physiological, behavioral, or ecosystem effects of biphenyl have been found.

D. *Bioconcentration and food-chain transport.* There appears to be some bioconcentration with biphenyl. The predicted bioconcentration factor (based on the measured octanol/water partition coefficent) is 245 and agrees with the reported value of 195 for rainbow trout (Verschueren, 1977). In the two algae *C. angulosa* and *C. vulgaris*, the bioconcentration factors were 1.22 and 1.82, respectively (Hutchinson et al., 1980).

E. *Reasons for environmental effects recommendations.* The reported use/disposal pattern of biphenyl in dye-carrier applications indicates that the primary exposure of this compound is through wastewater discharge. At wastewater treatment plants, the biphenyl is expected to react with chlorine to form mono- and dichlorobiphenyls, which degrade slowly and have a high biconcentration potential. Mono- and dichlorobiphenyls are known to be toxic to aquatic organisms, and, by food-chain transport, to terrestrial organisms (EPA, 1980b). The concentrations of these chlorinated biphenyls that are produced in wastewater treatment plants are likely to exceed the EPA water quality standards for the protection of freshwater and saltwater aquatic life, which are 0.014 and 0.030 μg/L, respectively (EPA, 1980b).

The toxicity of biphenyl and its degradation products is of concern, and little is known of the fate of biphenyl in the environment. Consequently, chemical fate testing is recommended to better understand the persistence and transformations of the compound under environmental conditions. Studies of chronic toxicity to fish and aquatic invertebrates, and acute toxicity to aquatic macrophytes are recommended to further characterize the environmental effects of biphenyl.

Although biodergradation rates appear to be rapid in laboratory studies, the rate of biodegradation under environmental conditions needs to be studied more closely. In laboratory studies, acclimated cultures of microorganisms tend to degrade chemicals more rapidly than might occur in the natural environment. The study by Reichart et al. (1981) indicates that persistence of biphenyl in the environment is significantly greater than that found in the laboratory.

References

(1) Bjorseth A. 1978. Analysis of polycyclic aromatic hydrocarbons in environmental samples by glass capillary gas chromatography. IN: Jones PW, Freudenthal RI, eds. Carcinogenesis—A Comprehensive Survey, Vol. 3, New York: Raven Press, pp. 75–83.

(2) Carlson, RM, Carlson RE, Kopperman HL, Caple R. 1975. Facile incorporation of chlorine into aromatic systems during aqueous chlorination processes. Environ. Sci. Technol. 9(7):674–675.

(3) Commission of the European Communities. 1976. European Cooperation and Coordination in the Field of Schientific and Technical Research, COST-Project 64b, A Comprehensive List of Polluting Substances Which Have Been Identified in Various Fresh Waters, Effluent Discharges, Aquatic Animals and Plants and Bottom Sediments, 2nd Ed.

(4) Dow Chemical Co. 1981. Communication to M. Greif. May 1, 1981.

(5) EPA. 1980a. Environmental Protection Agency. TSCA Chemical Substance Inventory (public portion). Washington, DC: Environmental Protection Agency.

(6) EPA. 1980b. Environmental Protection Agency. Ambient water quality criteria for polychlorinated biphenyls. EPA 440/5–80–068.

(7) Giger H., Schaffner C. 1978. Determination of polycyclic aromatic hydrocarbons in the environment by glass capillary gas chromatography. Anal. Chem. 50(2):243–249.

(8) Guerin MR, Epler JA, Griest WH, Clark BR, Rao TK. 1978. Polycyclic aromatic hydrocarbons from fossil fuel conversion processes. IN: Jones PW, Freudenthal RI, eds. Carcinogenesis—A Comprehensive Survey, Vol. 3. New York: Raven Press, pp. 21–31.

(9) Hutchinson TC, Hellebust JA, Mackay DTD, Mascarenhas RA, Shiu WY. 1980. The correlation of the toxicity to algae of hydrocarbons and halogenated hydrocarbons with their physical-chemical properties. IN: Afghan BK, Mackay D, eds. Hydrocarbons and Halogenated Hydrocarbons in the Aquatic Environment. Environ. Sci. Res., Vol. 16. New York: Plenum Press, pp. 577–586.

(10) Jungclaus GA, Lopez-Avila V, Hites RA. 1978. Organic compounds in an industrial wastewater: a case study of their environmental impact. Environ. Sci. Technol. 12(1):88–96.

(11) Kirk-Othmer, 1974. Enclyclopedia of Chemical Technology, 3rd. ed. Vol. 7. New York: John Wiley and Sons, pp. 783–789.

(12) Leblanc GA. 1980. Acute toxicity of priority pollutants to water flea (*Daphnia magna*). Bull. Environ. Contam. Toxicol. 24(5):684–691.

(13) Liao JC. 1978. Determination of polynuclear aromatic hydrocarbons in poly (vinyl chloride) smoke particulates by high pressure liquid chromatography and gas chromatography-mass spectrometry. Anal. Chem. 50(12):1683–1686.

(14) Meylan WM, Howard PH. 1977. Chemical market input/output analysis of selected chemical substances to assess sources of environmental contamination, task II: biphenyl and diphenyl oxide. Washington, DC: Environmental Protection Agency. EPA 560/6–77–003.

(15) Reichardt PB, Chadwick BL, Cole MA, Robertson BR, Button DK. 1981. Kinetic study of the biodegradation of biphenyl and its monochlorinated analogues by a mixed marine microbial community. Environ. Sci. Technol. 15(1):75–79.

(16) Shackleford WM, Keith LH. 1976. Frequency of Organic Compounds Identified in Water, EPA, Athens, GA.

(17) Thruston AD Jr. 1978. High pressure liquid chromatography techniques for the isolation and identification of organics in drinking water extracts. Chromatog. Sci. 16:254–259,

(18) Verschueren K. 1977. Handbook of Environmental Data on Organic Chemicals. New York: Van Nostrand Reinhold Co., pp. 283–284.

(19) Willis DE, Addison RF. 1974. Hydroxylation of biphenyl in vitro by tissue preparations of some marine organisms. Com. Gen. Pharmacol. 5(1):77–81.

2.2.b *Ethyltoluene (mixed isomers).*

Summary of recommended studies. The Committee recommends that ethyltoluene be tested for the following:

A. Health Effects:

Mutagenicity
Subchronic toxicity
Chemical disposition and metabolism studies to determine the biological half-life in laboratory animals and the products formed.

B. Environmental Effects and Chemical Fate:

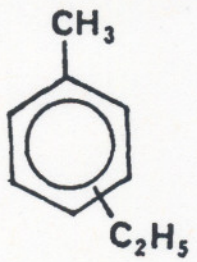
Acute and chronic toxicity to fish and aquatic invertebrates
Toxicity to aquatic macrophytes and terrestrial plants
Bioconcentration
Chemical fate

Physical and Chemical Information

CAS Number: 25550–14–5 (mixed isomers of ortho, meta, and para).

Synonyms: Ethylmethylbenzene; Methylethylbenzene.

Structural Formula:



Empirical Formula: C_9H_{12}.
Molecular Weight: 120.2.
Melting Point: −85° C.
Boiling Point: 161°C.

Specific Gravity: 0.86 g/ml at 25° C (Dow, 1981).

Solubility: Water, 75 mg/L at 25° C (Dow, 1981); soluble in organic solvents.

Vapor Pressure: 3.0 mmHg at 25°(estimated; PCR, 1978).

Log Octanol/Water Partition Coefficient: 3.6 (estimated; Leo et al., 1971).

Description of Chemical: Colorless liquid.

Rationale for Recommendations

I. *Exposure information—A. Production and use information.* U.S. production of ethyltoluene (mixed isomers) was reported to be between 100 and 200 million pounds per year in 1977 (EPA, 1980). Ethyltoluene is used as a component of solvent products (Exxon USA, 1982; Koch Refining Co. 1982; Charter International Oil, 1982) and as an intermediate in the production of vinyltoluene (Dow, 1981).

The use of ethyltoluene in commercial solvent products provides the potential for substantial human and environmental exposures to this substance. For example a commercial solvent containing 25 percent ethyltoluene is used as the volatile component in paint (Charter International Oil, 1982.). Other general commercial solvents, used in the manufacture of printing inks and in cleaning solutions for industrial laundries, contain as much as 40 percent ethyltoluene (Exxon USA, 1982; Koch Refining Co., 1982). Sittig (1976) also reported that a C_9 aromatic solvent is used in wire coatings. Ethyltoluene constitutes about 2.8 percent of regular gasoline and about 1.2 percent of premium gasoline (Sanders and Maynard, 1968).

The National Occupational Hazard Survey conducted between 1972 and 1974 indicated that the number of workers potentially exposed to ethyltoluene is 16,629 (NIOSH, 1981). No threshold limit value (TLV) has been designated for ethyltoluene by ACGIH, although one manufacturer has established an in-plant exposure limit of 10 ppm (Dow, 1981).

B. *Chemical fate information.* Ethyltoluene is a moderately volatile liquid that is slightly soluble in water (75 mg/L; Mackay et al., 1980), and has been identified in water and air (Dowty et al., 1975). The isomers appear to biodegrade in water in 6–11 days in laboratory experiments (Kappeler and Wuhrmann, 1978). In the air, ethyltoluene is expected to be rapidly oxidized by hydroxyl radicals in 0.24–2.4 hours (Darnall et al., 1976). The reaction products may be major components of smog.

C. *Evidence for exposure.* The identification in air, water, food, and natural products is, at least, indirect evidence that there is environmental exposure. For instance, concentrations of ethyltoluene in air, of 1.5 and 10.0 ppb, have been found in Houston, Texas, and in Zurich, Switzerland, respectively (Bertsch et al., 1974; Grob and Grob, 1971). Ethyltoluene has been identified in white bread crust (Folkes and Gramshaw, 1977), in volatiles from the cotton plant (Hedin et al., 1975), in Australian honeys (Graddon et al., 1979), in tuna oil and turkeys fed tuna oil (Crawford and Kretsch, 1970), in the distillable organics of grenache grape oil (Stevens et al., 1967), in roast beef (Min et al., 1979), in roasted filbert nuts (Kinlin et al., 1972), and in cellulose cigarette smoke condensate (Sakuma et al., 1979).

II. *Biological effects of concern to human health—A. Acute toxicity studies.* Acute toxicity studies of ethyltoluene in rats indicated an estimated LC_{50} of 4,000 ppm (Furnas and Hine, 1958). In male albino rats an oral dose of 5 ml/kg of ortho-ethyltoluene produced 100 percent mortality. The same dose of para-ethyltoluene caused 70 percent mortality (Gerarde, 1960).

B. *Subchronic toxicity studies.* No data on the subchronic toxicity of ethyltoluene were found.

C. *Mutagenicity.* No data on the mutagenic activity of ethyltoluene were found.

D. *Metabolism.* Metabolism studies of ethyltoluene have indicated that it is absorbed by rats after inhalation. Chin et al. (1980) found that 54 percent of carbon 14 (^{14}C) ring-labeled ethyltoluene (mixed isomers) at a concentration of 1 mg/L was absorbed by rats over a 6-hour period. Forty-two hours after the termination of the exposure, about 76 percent of the absorbed radioactivity was excreted by the rats. Some 0.32 percent of the 14_C

label remained in the animals' bodies, but the authors did not account for the remaining 25 percent of the radioactivity (Chin et al., 1980). The biotransformation of ethyltoluene (mixed isomers) was studied in both the dog and the rat (Chin et al., 1978; 1981). Metabolites of ethyltoluene were found in the urine of both species; however, the authors did not specify the metabolic products.

E. *Reasons for health effects recommendations.* Human exposure to ethyltoluene used in commercial solvent products is of concern. Very little is known about the metabolism and health effects of the compound. Other alkyltoluenes are known to have neurotoxic effects (Hine et al., 1954). Chemical disposition and metabolism studies are recommended to determine the metabolic products of ethyltoluene, and mutagenic and subchronic toxicity studies are recommended to provide a better understanding of the toxicity of the compound. The need for chronic studies would depend on the results of the metabolic, subchronic, and mutagenic studies.

III. *Environmental considerations—A. Acute toxicity.* No studies on the short-term effects of ethyltoluene have been found for either aquatic animals or plants.

B. *Subchronic/chronic effects.* No studies on the long-term effects of ethyltoluene have been found for either aquatic animals or plants.

C. *Other effects (physiological/behavioral/ecosystem processes).* Reduction of photosynthesis in the two algae *Chlamydomonas angulosa* and *Chlorella vulgaris* was reported by Hutchinson et al. (1980) for ortho-ethyltoluene at 155 and 340 mmol/m^3 (19 and 49 mg/L), respectively, and for para-ethyltoluene at 450 and 400 mmol/m^3 (54 and 48 mg/L), respectively.

D. *Bioconcentration and food-chain transport.* The log of the octanol/water partition coefficient, estimated by Leo et al. (1971) is 3.6. By the method of Veith et al. (1980), the bioconcentration factor is calculated to be 229 for ethyltoluene (mixed isomers).

E. *Reasons for specific environmental effects recommendations.* Ethyltoluene (mixed isomers) may enter aquatic systems through solvent and other industrial usage. Although ethyltoluene was found to biodegrade in laboratory tests, the rates of biodegradation under environmental conditions need to be more closely studied. In laboratory studies, acclimated cultures of microorganisms often tend to degrade chemicals more rapidly than might occur in the natural environment. Chemical fate testing under environmental conditions is needed to better characterize the transformations and persistence of ethyltoluene in the aquatic environment.

Because of the relatively high calculated log octanol/water partition coefficient, ethyltoluene is expected to bioconcentrate in fatty tissues of living organisms. This potential for bioconcentration also increases concern for the effects of food-chain transport of ethyltoluene. For these reasons and the expected environmental entry routes, it is recommended that testing be conducted to determine the bioconcentrations of ethyltoluene.

Environmental effects testing is recommended to characterize the toxicity of ethyltoluene. No studies were found on the acute or chronic toxicity of these mixed isomers. Therefore, acute and chronic toxicity studies to fish and aquatic invertebrates and to aquatic macrophytes and terrestrial plants are recommended because of anticipated exposure and insufficient toxicity data.

References

(1) Bertsch W, Chang RC, Zlatkis A. 1974. The determination of organic volatiles in air pollution studies: characterization of profiles. J. Chromatogr. Sci. 12:175–182.

(2) Charter International Oil. 1982. Unpublished information on ethyltoluene provided by Mr. A. Wouens, March 9, 1982.

(3) Chin BH, Sullivan LJ, Kozbelt SJ, Calisti LJ. 1978. Excretion and urinary metabolic profiles of ethylbenzene, ethylcyclohexane, and methylethylbenzene in rats and dogs. Toxicol. Appl. Pharmacol. 45:240 (Meeting abstract).

(4) Chin BH, McKelvey JA, Tyler TR, Calisti LJ, Kozbelt SJ, Sullivan LJ. 1980. Absorption, distribution and excretion of ethylbenzene isomers in rats. Bull. Environ. Contam. Toxicol. 14:477–483.

(5) Chin BH, McKelvey JA, Calisti LJ, Kozebelt SJ, Sullivan LJ. 1981. A comparison of *in vivo* and *in vitro* (tissue explant) techniques: Metabolic profile of methylethylbenzene isomers in rats and dogs. Bull. Environ. Contam, Toxicol. 26:621–625.

(6) Crawford L, Kretsch MJ. 1970. GC–MS identification of the volatile compounds extracted from roasted turkeys fed a basal diet supplemented with tuna oil: Some comments on fishy flavor. J. Food Sci. 42(6):1470–1478.

(7) Darnall KR, Lloyd AC, Winer AM, Pitts JN Jr. 1976. Reactivity scales for atmospheric hydrocarbons based on reaction with hydroxyl radicals. Environ. Sci. Technol. 10(7):692–696.

(8) Dow. 1981. Dow Chemical Co. Unpublished exposure data on ethyltoluenes (CAS No. 25550–14–5) provided by C.M. Bowman, May 1, 1981.

(9) Dowty BJ, Carlisle DR, Laseter JL. 1975. New Orleans drinking water sources tested by gas chromatography-mass spectrometry. Environ. Sci. Technol. 9(8):762–765.

(10) EPA. 1980. Environmental Protection Agency, Office of Toxic Substances. TSCA Chemical Substance Initial Inventory—1977 (public portion). Washington, DC: Environmental Protection Agency.

(11) Exxon USA. 1982. Unpublished information on ethyltoluene provided by Mr. Starky and Mr. Rohrer, March 11, 1982.

(12) Folkes DJ, Gramshaw JW. 1977. Volatile constituents of white bread crust. J. Food Technol. 12:1–8.

(13) Furnas DW, Hine CH. 1958. Neurotoxicity of selected hydrocarbons. A.M.A. Arch. Ind. Health 18:9–15.

(14) Gerarde HW. 1960. Toxicology and Biochemistry of Aromatic Hydrocarbons. Amsterdam: Elsevier Publishing Co.

(15) Graddon AD, Morrison JD, Smith JF. 1979. Volatile constituents of some unifloral Australian honeys. J. Agric. Food Chem. 27:832–837.

(16) Grob K, Grob G. 1971. Gas-liquid chromatographic-mass spectrometric investigation of C_6–C_{20} organic compounds in an urban atmosphere. J. Chromatogr, 62:1–13.

(17) Hedin PA, Thompson AC, Gueldner RC. 1975. Survey of the air space volatiles of the cotton plant. Photochemistry 14:2088–2090.

(18) Hine CH, Ungar H, Anderson HH, Kodama JK, Critchlow JK, and Jacobson NW. 1954. Toxicological studies on p-tertiary-butyltoluene. A.M.A. Arch. Ind. Hyg. Occ. Med. 9:227–244.

(19) Hutchinson TC, Hellebust JA, Mackay DTD, Mascarenhas RA, Shiu WY. 1980. The correlation of the toxicity to algae of hydrocarbons and halogenated hydrocarbons with their physical-chemical properties. IN: Afghan BK, Mackay D, eds. Hydrocarbons and Halogenated Hydrocarbons in the Aquatic Environment. Environ. Sci. Res., Vol 16. New York: Plenum Press, pp. 577-586.

(20) Kappeler TH, Wuhrmann K. 1978. Microbial degradation of the water-soluble fraction of gas oil. II. Bioassays with pure strains. Water Res. 12:335–342.

(21) Kinlin TE, Muralidhara R, Pittet AO, Sanderson A, Walradt JP. 1972. Volatile components of roasted filberts. J. Agric. Food Chem. 20:1021–1028.

(22) Koch Refining Co. 1982. Unpublished data on ethyltoluenes provided by Mr. D. Janes, March 1, 1982.

(23) Leo AE, Hansch C, Elkins D. 1971. Partition coefficients and their uses. Chem. Revs. 71:525–616.

(24) Mackay D, Bobra A, Shiu WY. 1980. Relationships between aqueous solubility and octanol/water partition coefficients. Chemosphere 9:701–711.

(25) Min DBS, Ina K, Peterson RJ, Chang SS. 1979. Preliminary identification of volatile flavor compounds in the neutral fraction of roast beef. J. Food Sci. 44(3):639–642.

(26) NIOSH. 1981. National Institute for Occupational Safety and Health. National Occupational Hazard Survey, conducted 1972–74. Cincinnati: National Institute for Occupational Safety and Health.

(27) PCR. 1978. Chemicals for Research Scientists General Catalog. PCR Research Chemicals, Inc. Gainesville, FL., p. 1.

(28) Sakuma H, Ohsumi T, Sugawara S. 1979. Ether-soluble neutral portion of cellulose cigarette smoke condensate. Agric. Biol. Chem. 43(12):2619–2621.

(29) Sanders WN, Maynard JB. 1968. Capillary gas chromatographic method for determining the C_5–C_{12} hydrocarbons in full-range motor gasolines. Anal. Chem. 40(3):527–235.

(30) Sitting M. 1976. Aromatic Hydrocarbons: Manufacture and Technology. Park Ridge, NJ: Noyes Data Corp., p. 9.

(31) Stevens KL, Bombon JL, McFadden WH. 1976. Volatiles from grapes *Vitis vinifera* (Linn.) *cultivar* Grenache. J. Agric. Food Chem. 15(3):378–380.

(32) Veith GD, Marek KJ, Petrocelli SR, Carroll J. 1980. An evalution of using partition coefficients and water solubility to estimate bioconcentration factors for organic chemicals in fish. IN: Aquatic Toxicology, Eaton JG, Parrish RP, Hendricks AC, eds., ASTM STP 707. Philadelphia: American Society for Testing and Materials, pp. 116–124.

2.2.c *Formamide.*

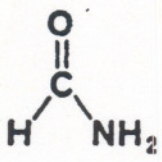
Summary of recommended studies. It is recommended that formamide be tested for the following:

A. Health Effects:

Genotoxic effects
Carcinogenicity
Other chronic effects

Physical and Chemical Information

CAS Number: 75–12–7.
Synonym: Methanamide.
Structural Formula:



Empirical Formula: CH_3ON.
Molecular Weight: 45.04.
Melting Point 2.6° C.
Boiling Point: 210° C (decomposes).
Vapor Pressure: 1mmHg at 70.5° C.
Log Octanol/Water Partition Coefficient: −1.64 (estimated; Leo et al., 1971).

Description of Chemical: Formamide is clear, viscous, hydroscopic liquid with a faint oder of ammonia. It is soluble in water and in most polar solvents. It is a good solvent for proteins due to its high dielectirc constant (Kirk-Othmer, 1980).

Rationale for Recommendations

I. *Exposure information—A. Production/use/disposal information.* U.S. production and importation of formamide totaled 1–11 million pounds in 1977 (EPA, 1980). Formamide has a wide variety of applications, both as a chemical intermediate and as a solvent. As an intermediate it is used in the manufacture of formic acid, hydrogen cyanide, imidazoles, pyrimidine, 1,3,5-triazine, and other compounds. As a solvent it is used in the crystallization of penicillin and dihydrostreptomycin sulfate, manufacture and processing of plastics, spinning of acrylonitrile copolymers, separation of chlorosilanes, and purification of fats and oils. It is also used as a nonaqueous electrolytic solvent, an ink solvent in felt-tipe pens, a swelling agent for cellulose, a coagulating agent for sodium silicate in grout, a softner in paper and glues, an additive in hydraulic fluids, and as a reaction medium (Kirk-Othmer, 1980; Codd, 1972; Kirk-Othmer, 1979, Merck, 1976).

The National Ococupations Hazard Survey conducted between 1972 and 1974 indicated that approximately 6,500 workers are potentially exposed to this chemical (NIOSH, 1981). The principal routes of human exposure to formamide appear to be inhalation and ingestion (Ketchen and Porter, 1979). Dermal exposure is also expected. The American Conference of Governmental Industrial Hygienists (ACGIH) recommends a threshold limit value/time-weighted average (TLV/TWA) of 20 ppm (30 mg/m^3), and a threshold limit value/short-term exposure limit (TLV/STEL) of 30 ppm (45 mg/m^3) (ACGIH, 1980).

B. *Chemical fate information.* Formamide hydrolyzes slowly at room temperature, Hydrolysis is accelerated by acids, bases, and elevated temperatures (Kirk-Othmer, 1980). No test data on the environmental transport of formamide have been found. It is not expected to partition to sediments or to bioaccumulate. Formamide is oxidized by activated sludge (Malaney and Gerhold, 1969), and the half-life is estimated to be less than 4 days. It has also been shown to serve as a growth medium and nitrogen source for fungi, algae, bacteria, and vascular plants (Hynes, 1970; Trotsenko and Loginova, 1973; Gresshoff, 1981; Chandra and Shethna, 1977; Fishbein, 1977).

II. *Biological effects of concern to human health—A. Chemical disposition/metabolism studies.* Formamide is absorbed directly through the skin of guinea pigs (Patty, 1963) and rabbits (ACGIH, 1980). Formamide hydrolyzes to its corresponding carboxylic acid both in vivo and in vitro. The site of formamide hydrolysis is the liver in the dog and rabbit, and the liver and kidneys in sheep (Bray et al., 1949).

B. *Acute toxicity.* In an acute toxicity study, the LD_{50} for rats was 6.1 g/kg (Zaeva et al., 1967). In a 2-week feeding study, six rats were fed 1.5 g/kg of formamide each day. Before the 10th dose, four of the rats had died and no further dosing was administered. Two additional rats died 2 days after the 10th day (Du Pont, 1978). Formamide is classified as slightly toxic when given by the oral route (Gosselin et al., 1976). Formamide alone has no significant effects on the central nervous system of the mouse. However, it increased by 800 percent the sleeping time induced by chloral (Chanh et al., 1972). The mechanism of this effect was undefined.

C. *Carcinogenicity.* No standard bioassays on the carcinogenicity of formamide were found.

D. *Teratogenic/reproductive effects.* Teratogenic and reproductive effects have been observed in rats, mice, and rabbits at doses ranging from 0.07 g/kg to 2 g/kg. These effects include malformation of palate and limbs, syndactyly of the toes, and reversible changes in the testes (Thiersch, 1971; von Kreybig, 1967; Chanh et al., 1973; Gleich, 1974). Formamide administered orally to pregnant rats (in 2 g/kg doses) on the 7th day of gestation led to resorption of one-half of all implanted rat fetuses, with stunting of 26 percent of the survivors (Thiersch, 1962). When formamide was administered to pregnant rabbits by gavage (70 µl/kg doses) from the 6th to the 18th day of gestation, embroyotoxic and weak teratogenic effects such as cleft palate and skeletal malformations were noted (Merkle and Zeller, 1980). In mice, after two dermal applications of 76 µg/animal, a 36 percent increase in the rate of malformation of the fetus was observed (Gleich, 1974).

E. *Mutagenicity.* Formamide was tested (as one of 14 solvents) for compatibility with the Salmonella mutagenicity test (Maron et al., 1981). The compound was nonmutagenic in the Ames assay, using the TA 100 strain. The investigators suggest that formamide may be used as a solvent in place of dimethylsulfoxide (DMSO). Other strains and concentrations were not tested. This compound has been described as "inactive in vivo" and also inactive in a cell transformation test using rat embryo cells infected with Rauscher leukemia virus (Freeman et al., 1973).

Formamide can denature and renature DNA at room temperature (Gillespie and Gillespie, 1971; McConaughy et al., 1969; Roussel and Chabbert, 1978). Exposure of roots of *Vicia faba* to the compound did not increase the chromatid aberration rate (Nicoloff, 1976). Mitotic anomalies were observed in the chick (Messier, 1976).

F. *Health effects recommendations.* Formamide is widely used as a chemical intermediate and as a solvent. Worker

exposure is likely from its use in grout, inks, glues, and paper. Although mutagenicity testing of formamide has been conducted, the data are insufficient to determine its genotoxic potential. In several studies, teratogenic effects have been observed in laboratory animals. Very little is known about the chronic toxicity, and no data were found on carcinogenicity. Based on these considerations, formamide is recommended for appropriate genotoxicity tests in conjunction with carcinogenicity and other chronic effects tests.

III. *Environmental considerations*—Because formamide is highly soluble in water and has low volatility, it is expected to partition into the aqueous compartment with no bioaccumulation. Furthermore, the compound has been shown to be readily biodegraded by activated sludge (Malaney and Gerhold, 1969) and to serve as a growth medium and nitrogen source for bacteria, algae, fungi, and vascular plants (Chandra and Shethna, 1977; Hynes, 1970; Trotsenko and Loginova, 1973; Fishbein, 1977; Gresshoff, 1981). For these reasons, formamide is not exptected to persist in the environment and no environmental testing is recommended.

References

(1) ACGIH. 1980. American Conference of Governmental Industrial Hygienists. Documentation of the Threshold Limit Values, 4th ed., 1980. Cincinnati.

(2) Bray HG, James SP, Thorpe WV, Wasdell, MR, Wood PB. 1949. The fate of certain organic acids and amides in the rabbit. 9. Lower aliphatic amides. Biochem. J. 45(4):467–471.

(3) Chandra TS, Shethna YI. 1977. Oxalate, formate, formamide, and methanol metabolism in *Thiobacillus novellus*. J. Bacteriol. 131(2):389–398.

(4) Chanh PH, Azum-Gelade MC, Bac NV, Xuong ND. 1972. Effect of formamide and its N-methyl and N-ethyl derivatives on the activity of convulsant and hypnotic dogs. Therapie 27(5):873–880 (In French; summary in English).

(5) Chanh PH, Azum-Gelade MC, Bac NV, Xuong ND. 1973. Toxicological studies of the N-n-propyl and N-n-butyl derivatives of formamide. Toxicol. Appl. Pharmacol. 26(4):596–605.

(6) Codd LW, ed. 1972. Chemical Technology: an Encyclopedic Treatment, Vol. IV, New York: Harper and Row.

(7) Du Pont, 1978. Du Pont Formamide, Information Bulletin.

(8) EPA. 1980. Environmental Protection Agency. TSCA Chemical Substance Initial Inventory—1977 (public portion). Washington, DC: Environmental Protection Agency.

(9) Fishbein WN. 1977. Formamide: the minimum-structure substrate for urease. Biochem. Biophys. Acta. 484(2):433–442.

(10) Freeman AE, Weisburger EK, Weisburger JH, Wolford RG, Maryak JM, Huebner RJ. 1973. Transformation of cell cultures as an indication of the carcinogenic potential of chemicals. J. Natl. Cancer Inst. 51(3):799–808.

(11) Gillespie S, Gillespie D. 1971. Ribonucleic acid-deoxyribonucleic acid hybridization in aqueous solutions and in solutions containing formamide. Biochem. J. 125(2):481–487.

(12) Gleich J. 1974. Influence of simple acid amides on fetal development of mice. Naunyn-Schmiedeberg's Arch. Pharmacol. 282 (Suppl.):R25.

(13) Gosselin RE, Hodge HC, Smith RP, Gleason MN. 1976. Clinical Toxicology of Commercial Products. Baltimore: Williams and Wilkins.

(14) Gresshoff PM. 1981. Amide metabolism of *Chlamydomonas*. Arch. Microbiol. 128:303–306.

(15) Hynes MJ. 1970 Induction and repression of amidase enzymes in *Aspergillus nidulans*. J. Bacteriol. 103(2):482–487.

(16) Ketchen EE, Porter WE. 1979. Material Safety Data Sheets. The Basis for Control of Toxic Chemicals. Oak Ridge, TN: Oak Ridge National Laboratory. ORNL/TM–6981.

(17) Kirk-Othmer. 1979. Encyclopedia of Chemical Techonology. Chemical grouts. IN: Grayson M. ed., Vol. 5, 3rd ed. New York: John Wiley and Sons.

(18) Kirk-Othmer. 1980. Encyclopedia of Chemical Technology. Formic acid and derivatives. IN: Grayson M, ed., Vol. 11, 3rd ed. New York: John Wiley and Sons.

(19) Leo A, Hansch C, Elkins D. 1971. Partition coefficients and their uses. Chem. Revs. 71(6):525–615.

(20) Malaney GW, Gerhold RM. 1969. Structural determinants in the oxidation of aliphatic compounds by activated sludge. J. Water Pollut. Control Fed. 41:(2)R19–R33.

(21) Maron D, Katzenellenbogen J, Ames BN. 1981. Compatibility of organic solvents with the Salmonella/microsome test. Mutat. Res. 88:343–350.

(22) McConaughy BL, Laird CD, McCarthy BJ. 1969. Nucleic acid reassociation in formamide. Biochemistry 8:3289–3295.

(23) Merck. 1976. The Merck Index. Windholz M., ed. Rahway, NJ: Merck and Co., Inc.

(24) Merkle J, Zeller H. 1980. Studies on acetamides and formamides for embryotoxic and teratogenic activities in the rabbit. Arzneim Forsch. 30:1557–1562.

(25) Messier PE. 1976. Effects of formamide on neuroepithelial cells and interkinetic nuclear migration in the chick embryo. J. Embryol. Exp. Morphol. 35(1):197–212.

(26) Nicoloff H. 1976. Effects of formamide on the induction of chromosome structural changes by ethylenimine in *Vicia faba*. Mutat. Res. 41:249–254.

(27) NIOSH. 1981. National Institute for Occupational Safety and Health. National Occupational Hazard Survey, conducted 1972–74. Cincinnati: National Institute for Occupational Safety and Health.

(28) Patty FA, ed. 1963. Organic acids and related compounds. IN: Industrial Hygiene and Toxicology. Vol. 3. New York: Interscience Publishers.

(29) Roussel AF, Chabbert YA. 1978. Taxonomy and epidemiology of gram-negative bacterial plasmids studied by DNA–DNA filter hybridization in formamide. J. Gen. Microbiol. 104:269–276.

(30) Thiersch JB. 1962. Effects of acetamides and formamides on the rat litter in utero. J. Reprod. Fertil. 4:219–220 (Abstract).

(31) Thiersch JB. 1971. Investigations into the differential effect of compounds on rat litter and mother. IN: Tuchmann-Duplessis H, ed. Malformations congenitales des mamiferes. Paris: Masson (In French; translation).

(32) Trotsenko YA, Loginova NV. 1973. The methylamine metabolism of *Pseudomonas* sp. Microbiology 42(5):695–700.

(33) Verschueren K. 1977. Handbook of Environmental Data on Organic Chemicals. New York: Van Nostrand Reinhold Co.

(34) von Kreybig T. 1976. Chemical composition and teratogenic effect of several groups of compounds. Naunyn-Schmiedeberg's Arch. Pharmacol. 257:296–298 (In German).

(35) Zaeva GN, Vinogradova KL, Savina MYa, Osipenko, NI. 1967. Toxicity of formamide. Toksikol. Norykh. Prom. Khim. Veshchestv 9:163–174 (In Russian; Chemical Abstracts 70:18516).

2.2.d *1,2,4-Trimethylbenzene. Summary of recommended studies.* It is recommended that 1,2,4-trimethylbenzene be tested for the following:

A. Health Effects:

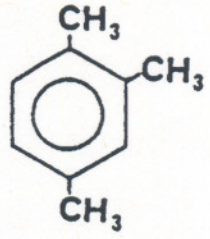
Subchronic/chronic effects to include neurotoxicity
Reproductive effects
Teratogenicity

B. Environmental Effects and Chemical Fate:

Acute and chronic toxicity to fish and aquatic invertebrates
Toxicity to aquatic macrophytes and terrestrial plants
Bioconcentration
Chemical fate

Physical and Chemical Information

CAS Number: 95–63–6.
Synonym: Pseudocumene.
Structural Formula:



Empirical Formula: C_9H_{12}.
Molecular Weight: 120.2.
Specific Gravity: 0.889.

Freezing Point: −43.8°C.
Boiling Point: 169–171°C.
Vapor Pressure: 2 mmHg at 25°C (estimated).
Solubility: Water, 57 mg/L; soluble in ethanol, benzene, and ether.
Log Octanol/Water Partition Coefficient: 3.6 (estimated; Leo et al., 1971).
Description of Chemical: Colorless liquid.

Rationale for Recommendations

I. *Exposure information*—A. *Production/use/disposal information.* Current U.S. production of 1,2,4-trimethylbenzene is in excess of 10–50 million pounds per year (EPA, 1980; personal communication with manufacturers). The principal use of the isolated compound is as an intermediate in the manufacture of trimellitic anhydride, dyes, and pharmaceuticals (Hawley, 1977). The trimellitic anhydride is used in the production of plasticizers, alkyd resins, unsaturated polyesters, and other industrial chemicals (Cerf et al., 1980). Trimethylbenzene can be used as an ultraviolet stabilizer in plastics. Dyshinevich (1979) reported that trimethylbenzene is released from polymeric material, thus suggesting migration from the polymers. The isolated compound is also used as a dye-carrier solvent and as a scintillation-counter solvent (SPPC, 1982).

In addition to the amount produced as an isolated compound, as reported in the TSCA Inventory (EPA, 1980), 1,2,4-trimethylbenzene is produced as a component of the C_9 aromatic fraction of petroleum (Sittig, 1976). This fraction is used as a general solvent (e.g., in paint thinners; Cerf et al., 1980) or as a component of gasoline (SPPC, 1982; Lee et al., 1974). This increases the potential for human and environmental exposure to the compound through solvent usage and disposal, and through gasoline evaporation during transportation, storage, and spills.

The National Occupational Hazard Survey conducted between 1972 and 1974 indicated that approximately 3,000 workers are potentially exposed to this chemical (NIOSH, 1981). The most probable routes of exposure are by inhalation of the vapor or mist and by skin contact with the liquid (Lazarew, 1929; Gerarde, 1960). A threshold limit value of 25 ppm and a short-term exposure limit of 35 ppm have been recommended by ACGIH (1980).

B. *Chemcial fate information.* 1,2,4-Trimethylbenzene is slightly soluble in water (57 mg/L; Mackay et al., 1980). It appears to be biodegraded in water in 7 days in a laboratory experiment (Kappeler and Wuhrmann, 1978). 1,2,4-trimethylbenzene is expected to partition to air, where it will oxidize rapidly (Kuntz et al., 1973; Darnall et al., 1976); the reaction products can be a component in smog. It is a constitutent of the water-soluble component of crude oil (Lee et al., 1974) and refined gasoline (Sanders and Maynard, 1968).

C. *Evidence for exposure.* The identification of 1,2,4-trimethylbenzene in air is indirect evidence that there is environmental exposure. Examples of concentrations of 1,2,4-trimethylbenzene reported in air are: 9.0 ppb in Zurich, Switzerland (Grob and Grob, 1971), 1–13 ppt in a rural Australian town (Nelson et al., 1977), and unspecified concentrations in Houston, Texas (Bertsch et al., 1974), and in six Soviet cities (Ioffe et al., 1978). The compound has also been observed in cooked chicken meat volatiles (Nonaka et al., 1967); fermented eggs (Bullard et al., 1978); volatiles from roasted filberts (Kinlin et al., 1972); and volatiles from roast beef (Min et al., 1979).

II. *Biological effects of concern to human health*—A. *Acute/short term effects.* The acute toxicity of the compound has been well studied (Gerarde, 1960; Cameron, 1938; Litton Bionetics, 1976; Lazarew, 1929; Dyshinevich, 1979). It has been shown to have a moderate to low order of acute toxicity by various routes of administration; i.e., oral, intraperitoneal, inhalation, and subcutaneous in rats, mice, and guinea pigs.

Rats and mice were exposed by inhalation at 2,000 ppm for 8 hours per day for 14 days, and no adverse effects were reported (Cameron, 1938). In another study, eight rats were exposed by inhalation to the compound at 1,000 and 2,000 ppm for 15 and 12 exposures of 6 hours each, respectively (Gage, 1970). At the higher concentration, nose and eye irritation, respiratory difficulty, lethargy, tremors, and low weight increase were observed; however, at both concentrations, blood test results were normal and organs were also normal at necropsy.

B. *Subchronic effects.* Dyshinevich (1979) reported effects on the functional state of the central nervous system, blood enzyme composition, and the liver of rats exposed by continuous inhalation for 4 months to 20 mg/m^3 (4 ppm) of 1,2,4-trimethylbenzene. These effects were not observed at 0.4 ppm. No histopathological end-points were reported.

C. *Carcinogenity/chronic effects.* A 2-year feeding study in rats designated to assess the carcinogenic potential of 1,2,4-trimethylbenzene was cancelled before testing was initiated (EPA, 1981). No data on carcinogenicity or other chronic effects were found in the literature.

D. *Mutagenicity.* The genetic activity of 1,2,4-trimethylbenzene was tested by microbial assay with and without addition of mammalian metabolic activation. It was tested and found negative in *Salmonella typhimurium* strains TA 1535, TA 1537, TA 1538, TA 98, and TA 100, and in *Saccharomyces cerevisiae* strain D4 (Litton Bionetics, 1977).

E. *Teratogenicity and reproductive effects.* No data on teratogenic or reproductive effects were found.

F. *Observations in humans.* Battig et al. (1956) studied 27 workers exposed for several years to the paint thinner "Fleet-X-DV-99," the hydrocarbon vapor concentration of which ranged from 10 to 60 ppm. The paint thinner contained trimethylbenzene (50 percent 1,2,4- and 30 percent 1,3,5-trimethylbenzene) and a small proportion of benzene. This exposure caused blood coagulation disturbances, asthmatic bronchitis, hypochromic anemia, headache, fatigue, and drowsiness. Dowty and Laseter (1976) reported trimethylbenzene (unspecified isomers) in eleven maternal-cord blood samples collected at birth. The purpose of the study was to identify the presence of transplacentally-acquired compounds, the source of which was not identified.

G. *Rationale for health effects recommendations.* In view of the exposure potential of 1,2,4-trimethylbenzene and the lack of sufficient information on subchronic and chronic health effects, the Committee recommends that appropriate subchronic/chronic testing, to include neurotoxicity, be conducted. In addition, teratogenic and reproductive effects should be studied.

Three trimethylbenzene isomers and a mixture of the isomers are reported to be in commerce in the United States (EPA, 1980). Of these 1,2,4-trimethylbenzene has the largest production volume and potential for exposure; therefore, it was singled out for this testing recommendation. A preliminary review of health data on the other isomers discloses that, biologically, all three isomers may behave similarly. Consequently, the Committee recommends that EPA study the testing needs of the other isomers for both health and environmental effects, while giving priority consideration to 1,2,4-trimethylbenzene.

III. *Environmental considerations*—A. *Short-term (acute) effects.* The 24-, 48-, 72-, and 96-hour CL_{50} values for an

isomer of 1,2,4-trimethylbenzene (1,3,5-trimethylbenzene) to goldfish were 20.57, 16.17, 13.65, and 12.52 mg/L, respectively (Brenniman et al., 1976). The 24-, 48-, and 96-hour LC_{50} values for 1,2,4-trimethylbenzene to the marine amphipod *Elasmopus pectenicrus* were 5.23, 4.91, and 4.35 mg/L, respectively (Lee and Nicol, 1978).

B. *Long-term (subchronic/chronic effects.* No studies on the long-term effects of 1,2,4-trimethylbenzene have been found for either aquatic animals or plants.

C. *Other effects (physiological/behavioral/ecosystem/processes).* 1,2,4-trimethylbenzene caused complete inhibition of nitrogen fixation in arctic marine sediments, and partial inhibition of carbon dioxide production from glucose (Knowles and Wishart, 1977). Donahue et al. (1977) reported that a 15 percent saturated solution of 1,2,4-trimethylbenzene in seawater reduced the swimming activity of the larvae of the barnacle *Balanus amphitrite.* Increased levels of the microsomal enzymes were observed in the southern armyworm after oral treatment with the compound (Brattsten and Wilkinson, 1973).

D. *Bioconcentration and food-chain transport.* The log of the octanol/water partition coefficient for 1,2,4-trimethylbenzene, estimated by Leo et al. (1971), is 3.6. By the method of Veith et al. (1980), the bioconcentration factor is calculated to be 229.

E. *Rationale for environmental effects recommendations.* 1,2,4-Trimethylbenzene may enter aquatic systems through solvent and other industrial usage. Although trimethylbenzene was found to biodegrade in laboratory tests, the rates of biodegradation under environmental conditions need to be studied more closely. In laboratory studies, acclimated cultures of micro-organisms often tend to degrade chemicals more rapidly than might occur in the natural environment. Chemical fate testing under environmental conditions is needed to better characterize its transformations and persistence in the aquatic environment.

Because of the relatively high calculated log octanol/water partition coefficient, 1,2,4-trimethylbenzene is expected to bioconcentrate in the fatty tissues of living organisms. This potential for bioconcentration also increases the concern for the effects of food-chain transport. For these reasons and the expected environmental release, it is recommended that testing be conducted to determine the bioconcentration of 1,2,4-trimethylbenzene.

Environmental effects testing is recommended to characterize the toxicity of 1,2,4-trimethylbenzene. The acute studies that have been conducted on its toxicity are not adequate to make an environmental assessment. Goldfish are not considered a sensitive species, and the relative sensitivity of *Elasmopus* has not been studied. No studies on the chronic toxicity of this compound were found. Therefore, studies on the acute and chronic toxicity to fish and aquatic invertebrates, and toxicity to aquatic macrophytes and terrestrial plants are recommended because of anticipated exposure and insufficient toxicity data.

References

(1) ACGIH. 1980. American Conference of Governmental Industrial Hygienists. Documentation of the Threshold Limit Values, 4th ed., 1980. Cincinnati.

(2) Bättig K, Grandjean E, Turrain V. 1956. Gesundheitsschäden nach langdauernder Trimethylbenzol-Exposition in einter Malerwerkstatt. Z. Präventiv. Med. 1:389–403.

(3) Bertsch W, Chang RC, Zlatkis A. 1974. The determination of organic volatiles in air pollution studies: Characterization of profiles. J. Chromatogr. Sci. 12:175–182.

(4) Brattsten LB, Wilkinson CF. 1973. Indication of microsomal enzymes in the southern armyworm (*Prodenia eridania*). Pestic. Biochem. Physiol. 3:393–407.

(5) Brenniman G, Hartung R, Weber WJ Jr. 1976. A continuous flow bioassay method to evaluate the effects of outboard motor exhausts on selected aromatic toxicants on fish. Water Res. 10:165–169.

(6) Bullard RW, Leiker TJ, Peterson JE, Kilburn SR. 1978. Volatile components of fermented egg, an animal attractant and repellent. J. Agric. Food Chem. 26(1):155–159.

(7) Cameron GR, Peterson JLH, DeSavam GSW, Thomas JC. 1938. The toxicity of some methyl derivatives of benzene with special reference to pseudocumene and heavy coal tar naphtha. J. Pathol. Bact. 46–95:107.

(8) Cerf J, Potvin M, Laham S. 1980. Acidic metabolites of psuedocumene in rabbit urine. Arch. Toxicol. 45:93–100.

(9) Darnall KR, Lloyd AC, Winer AM, Pitts JN Jr. 1976. Reactivity scales for atmospheric hydrocarbons based on reaction with hydroxyl radicals. Environ. Sci. Technol. 10(7):692–696.

(10) Donahue WH, Wang RT, Welch M, Nicol JA. 1977. Effects of water-soluble components of petroleum oils and aromatic hydrocarbons on barnacle larvae. Environ. Pollut. 13(3):187–202.

(11) Dowty BJ, Laseter JL. 1976. The transplacental migration and accumulation in blood of volatile organic constituents. Pediat. Res. 10:696–701.

(12) Dyshinevich NE. 1979. An experimentally based hygienic standard proposed for trimethylbenzenes contained in polymeric building material. Gig. Sanit. 5:15–18. (In Russian).

(13) EPA. 1980. Environmental Protection Agency. TSCA Chemical Substance Inventory (public portion). Washington, DC: Environmental Protection Agency.

(14) EPA. 1981. Environmental Protection Agency. Personal communication with W.E. Grube, Jr., Director, Program Operations Staff. Cincinnati: Environmental Protection Agency, July 1981.

(15) Gage JC. 1970. The subacute inhalation toxicity of 109 industrial chemicals. Brit. J. Ind. Med. 27:1–18.

(16) Gerarde HW. 1960. Toxicology and Biochemistry of Aromatic Hydrocarbons. Amsterdam: Elsevier Publishing Co.

(17) Grob K, Grob G. 1971. Gas-liquid chromatographic-mass spectrometric investigation of C_6–C_{30} organic compounds in an urban atmosphere. J. Chromatogr. 62:1–13.

(18) Hawley GG. 1977. The Condensed Chemical Dictionary, 9th ed. New York: Van Nostrand Reinhold Co.

(19) Ioffe, BV. Isidorov VA, Zenkevich IG. 1978. Some principles of the composition of volatile organic impurities in the atmosphere of cities. Dokl. Akad. Nauk SSSR 243(5):1186–1189. (In Russian, taken from Chem. Abs., 90:209135a, 1979).

(20) Kappeler TH, Wuhrmann K. 1978. Microbial degradation of the water-soluble fraction of gas-oil. II. Bioassays with pure strains. Water Res. 12:335–342.

(21) Kinlin TE, Muralidhara R, Pittet AO, Sanderson A, Walradt JP. 1972. Volatile components of roasted filberts. J. Agric. Food Chem. 20:1021–1028.

(22) Knowles R, Wishart C. 1977. Nitrogen fixation in arctic marine sediments: effects of oil and hydrocarbon fractions. Environ. Pollut. 13:133–149.

(33) Kuntz RL, Kopczynski SL, Bufalini JJ. 1973. Photochemical reactivity of benzaldehyde-NO_x and benzaldehyde-hydrocarbon-NO_x mixtures. Environ. Sci. Technol. 7(13)1119–1123.

(24) Lazarew NW. 1929. Uber die Giftigkeit verschiedener Kohlenwasser-stoffdämpfe. Naunyn-Schmiedeberg's Archive für Experimentelle Pathologie und Pharmakologie 143:223–233.

(25) Lee CC, Craig WK, Smith PJ. 1974. Water-soluble hydrocarbons from crude oil. Bull. Environ. Contam. Toxicol. 12(2):212–217.

(26) Lee WY, Nicol JAC. 1978. Individual and combined toxicity of some petroleum aromatics to the marine amphipod *Elasmopus pectenicrus.* Marine Biol. 48:215–222.

(27) Leo AE, Hansch C, Elkins D. 1971. Partition coefficients and their uses. Chem. Revs. 71:525–616.

(28) Litton Bionetics, Inc. 1976. Unpublished data submitted by W.E. Grube, Jr. Cincinnati: Environmental Protection Agency, July 23, 1981.

(29) Litton Bionetics, Inc. 1977. Unpublished data submitted by W.E. Grube, Jr. Cincinnati: Environmental Protection Agency, July 23, 1981.

(30) Mackay D, Bobra A, Shiu WY. 1980. Relationships between aqueous solubility and octanol/water partition coefficients. Chemosphere 9:701–711.

(31) Min DBS, Ina K, Peterson RJ, Chang SS. 1979. Preliminary identification of volatile flavor compounds in the neutral fraction of roast beef. J. Food Sci. 44(3):639–642.

(32) Nelson PF, Smith MY, Mulchahy MFR. 1977. Alkylbenzenes in the atmosphere at Bawley Point, a rural settlement on the south

coast of New South Wales. Clean Air 1977 (February):2–5.

(33) NIOSH. 1981. National Institute for Occupational Safety and Health. National Occupational Hazard Survey, conducted 1972–74. Cincinnati: National Institute for Occupational Safety and Health.

(34) Nonaka M, Black DR. Pippen EL. 1967. Gas chromatographic and mass spectral analysis of cooked chicken meat volatiles. J. Agric. Food Chem. 15(4):713–716.

(35) Sanders WN, Maynard JB. 1968. Capillary gas chromatographic method for determining the C_5–C_{12} hydrocarbons in full-range motor gasolines. Anal. Chem. 40(3):527–235.

(36) Sittig M. 1976. Aromatic Hydrocarbons: Manufacture and Technology. Park Ridge, NJ: Noyes Data Corp, p. 9.

(37) SPPC. 1982. Sun Petroleum Products Corporation. Communication to Dynamac Corporation, January 6, 1982.

(38) Veith GD, Marek KJ, Petrocelli SR, Carroll J. 1980. An evaluation of using partition coefficients and water solubility to estimate bioconcentration factors for organic chemicals in fish. IN: Aquatic Toxicology, Eaton JG, Parrish RP, Hendricks AC, eds., ASTM STP 707. Philadelphia: American Society for Testing and Materials, pp. 116–124.

[FR Doc. 14200 File 5–24–82; 8:45 am]
BILLING CODE 6560–50–M

FEDERAL COMMUNICATIONS COMMISSION

Forms Under Review by the Office of Management and Budget

May 17, 1982.

Public Information Collection Requirements Submitted to Office of Management and Budget for Review.

On May 12 the Federal Communications Commission submitted the following public information collection requirement to OMB for review and clearance under the Paperwork Reduction Act of 1980, Pub. L. 96–511.

Copies of this submission are available from Richard D. Goodfriend, Agency Clearance Officer, (202) 632–7513. Comments should be sent to Edward H. Clarke, Office of Management and Budget, OIRA, Room 3201 NEOB, 726 Jackson Place, NW., Washington, D.C. 20503.

Title: Annual Report of Cable Television Systems
Form No.: FCC 325
2 forms:
Schedule 1—Community Unit Data
Schedule 2—Physical System Data
Action: Extension
Burden: 20,000 Responses; 80,000 Hours

Federal Communications Commission.

William J. Tricarico,

Secretary.

[FR Doc. 82–14149 Filed 5–24–82; 8:45 am]
BILLING CODE 6712–01–M

FEDERAL MARITIME COMMISSION

Agreements Filed

The Federal Maritime Commission hereby gives notice that the following agreements have been filed with the Commission for approval pursuant to section 15 of the Shipping Act, 1916, as amended (39 Stat. 733, 75 Stat. 763, 46 U.S.C. 814).

Interested parties may inspect and obtain a copy of each of the agreements and the justifications offered therefor at the Washington Office of the Federal Maritime Commission, 1100 L Street, NW., Room 10327; or may inspect the agreements at the Field Offices located at New York, N.Y.; New Orleans, Louisiana; San Francisco, California; Chicago, Illinois; and San Juan, Puerto Rico. Interested parties may submit comments on each agreement, including requests for hearing, to the Secretary, Federal Maritime Commission, Washington, D.C. 20573, on or before June 14, 1982. Comments should include facts and arguments concerning the approval, modification, or disapproval of the proposed agreement. Comments shall discuss with particularity allegations that the agreement is unjustly discriminatory or unfair as between carriers, shippers, exporters, importers, or ports, or between exporters from the United States and their foreign competitors, or operates to the detriment of the commerce of the United States, or is contrary to the public interest, or is in violation of the Act.

A copy of any comments should also be forwarded to the party filing the agreements and the statement should indicate that this has been done.

Agreement No.: 9988–14.

Filing Party: Howard A. Levy, Esquire, Suite 727, 17 Battery Place, New York, New York 10004.

Summary: Agreement No. 9988–14 modifies the geographical scope of the Continental/U.S. Gulf Freight Association Agreement No. 9988 to reduce the range of U.S. ports covered from the Brownsville, Texas—Cape Canaveral, Florida range to the Brownsville, Texas—Key West, Florida range.

Agreements Nos.: 10392–2 and 10410–1

Filing Party: Ronald C. Rasmus, President, American Atlantic Lines, One World Trade Center, Suite 1067, New York, New York 10048.

Summary: Agreements Nos. 10392 and 10410 authorize discussions between American Atlantic Lines and Frota Amazonica, S.A. regarding the establishment of subsequent agreements for cargo distribution and traffic rationalization in the trades between the Brazilian Amazon Basin and the U.S. Atlantic and Gulf ranges respectively. The subject modifications extend the term of their respective agreements for a period of six months to expire with January 10, 1983, and eliminates obsolete language within the agreements. Agreement No. 10410–1 also provides for reporting the substance of all discussions to the Federal Maritime Commission within 30 days.

By Order of the Federal Maritime Commission.

Dated: May 19, 1982.

Francis C. Hurney,

Secretary.

[FR Doc. 82–14157 Filed 5–24–82; 8:45 am]
BILLING CODE 6730–01–M

Independent Ocean Freight Fowarder License; Applicants

Notice is hereby given that the following applicants have filed with the Federal Maritime Commission applications for licenses as independent ocean freight forwarders pursuant to section 44(a) of the Shipping Act, 1916 (75 Stat. 522 and 46 U.S.C. 841(c)).

Persons knowing of any reason why any of the following applicants should not receive a license are requested to communicate with the Director, Bureau of Certification and Licensing, Federal Maritime Commission, Washington, D.C. 20573.

Armco International Shipping Corp., 9341 S.W. 53rd Street, Miami, FL 33165
Officers: Silvia A. Escobar, President/Sole Stockholder

By the Federal Maritime Commission.

Dated: May 19, 1982.

Francis C. Hurney,

Secretary.

[FR Doc. 82–14159 Filed 5–24–82; 8:45 am]
BILLING CODE 6730–01–M

[Independent Ocean Freight Forwarder License No. 1620]

Trade Express, Inc.; Order of Revocation

On April 12, 1982, Trade Express, Inc., P.O. Box 91090, World Way Postal Center, Los Angeles, CA 90009 surrendered its Independent Ocean Freight Forwarder License No. 1620 for revocation.