AP42 Section: **9.2.2 Pesticide Application**

Title: **Comments and correspondence to January 1995 5th edition**

Note: This material is related to a section in *AP42, Compilation of Air Pollutant Emission Factors, Volume I Stationary Point and Area Sources.* AP42 is located on the EPA web site at www.epa.gov/ttn/chief/ap42/

The file name refers to the file number, the AP42 chapter and then the section. The file name "rel01_c01s02.pdf" would mean the file relates to AP42 chapter 1 section 2. The document may be out of date and related to a previous version of the section. The document has been saved for archival and historical purposes. The primary source should always be checked. If current related information is available, it will be posted on the AP42 webpage with the current version of the section.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Office of Air Quality Planning and Standards
Research Triangle Park, North Carolina 27711

JUL 21 1994

Mr. Jack J. Lonsinger
Director, Regulatory and Community Affairs
Miles Inc.
Agriculture Division
8400 Hawthorn Road
Kansas City, Missouri 64120-0013

Dear Mr. Lonsinger:

Thank you very much for the letter dated July 1, 1994 regarding Miles evaluation of the data presented in two papers at the Air and Waste Management Association (AWMA) Annual Meeting in Cincinnati, Ohio. As I am sure you have noted in the May 1994 draft version of the proposed AP-42 Section 9.2.2 -- Pesticide Application and the accompanying background report, a very limited data base exists in the literature. Therefore, the model used to develop the emission estimate model could only be based on this limited data base. It is gratifying for the Agency to see that additional studies are being conducted to measure VOC loss from pesticide formulations following application. A heightened interest in studies of this nature by industry, academia, and governmental agencies, such as the U.S.D.A., will serve to broaden the available data base and provide additional data to use in the model. As additional studies, such as the one cited for trifluralin, are conducted and the results combined with the studies of Dr. Glenn Rice of U.S.D.A., a significantly larger data base will become available. This larger data base will allow the Agency the opportunity to evaluate the current model and, if appropriate, refine the model to incorporate the additional data.

In your letter, reference is made to the use of Henry's constant as a possible modeling parameter to estimate VOC emissions. As I am sure you have noted, the potential for the use of Henry's constant was addressed on page 4-19 of the current draft document. When the quantity of available data becomes significantly larger, the use of Henry's constant may be one of the alternative parameters of interest to the model. The Agency has an interest in evaluating, in the future, any potential use of Henry's constant that would be developed based on a substantially larger data base. As you are aware, an AP-42 section is a "living document" and, as such, a file is maintained of all AP-42 sections. When sufficient information and resources become available, the existing sections are updated to reflect the current status.

The letter also states that the inerts are assumed to be 100% VOC and 100% volatile. While this assumption was made in one of the earlier drafts, the current draft document addresses this subject on pages 4-27, 4-40 (Section 4.3.3.2), 4-41 (Section 4.3.4, item 3), and in Table 4-4. The current document provides default percentage values for only that portion of the inerts considered to be volatile. This corrects the earlier assumption that 100% of all inerts are considered to be volatile.

I appreciate the interest that Miles Inc. has shown in this topic and would like the opportunity to review future experimental test data that Miles develops in an effort to create a larger data base from which to assess this subject area. The Agency strives to maintain open lines of communication with industry and I appreciate your show of interest. If you should have any further questions, please contact me at (919) 541-5371.

Sincerely,

Dallas Safriet

Dallas Safriet
Emissions Inventory Branch

Draft

TO: Lydia

RE: Toxic emissions from the application of pesticides and fertilizers to farms

At the last Task Force meeting, I had a concern that the application of pesticides and fertilizers to farms could potentially exceed the 10/25 ton per year threshold for toxic emissions. I indicated I would look into the matter and get back to you. My preliminary conclusion, based on information from TSD, is that the 10/25 TPY thresholds would rarely, if ever, be exceeded on an annual basis from the application of pesticides or fertilizers.

I did learn that OAQPS has access to a pesticide application data base that provides estimates of the amount of pesticides that are being applied on a State by State basis, and in some cases, on a county by county basis. The data base includes pesticide application information on about 13-14 different pesticides on a crop by crop basis.

I talked to Bill Benjey, who is on a rotational assignment to TSD from AREAL. He apparently is the one who is most familiar with the data base. He felt that it would be unlikely that the HAP thresholds would be exceeded from the application of pesticides. He did indicated that hexane, which is on the list of the 189 HAPs, is used as a "carrier" for the pesticides and that he did have a question as to whether the amount of hexane could exceed these limits. Offsetting this concern was the notion that if hexane was mixed with water it would probably not be emitted to the atmosphere as hexane. He was looking further into this question.

With respect to fertilizers, the primary components are nitrogen and phosphorous which are not on the list of HAPs. Jim Southerland does not believe the application of fertilizers would present a problem.

In summary, the contacts I have made since the last OPTF meeting led me to believe that the application of pesticides and fertilizers would rarely, if ever exceed the 10/25 TPY thresholds for HAPs.

Ed Lillis

cc: J. Southerland, B. Benjey, K. Blanchard, F. Dimmick, Kirt, Ray, Leo

OPTIONAL FORM 99 (7-90)

FAX TRANSMITTAL # of pages ▸ 1

To DALLAS	From Leo
Dept./Agency	Phone # X 2402
Fax #	Fax #

NSN 7540-01-317-7368 5099-101 GENERAL SERVICES ADMINISTRATION

Crop	Approx. # of Appl. per Yr.	Ave. Rate of AI per Appl. (lb/ac)	Total Acres Planted (millions)
Corn	1	0.92	68.6
Upland Cotton	1	0.45	10.9
Peanuts	1	0.78	1.5
Fall Potatoes	1.5	1.14	1.1
Rice	1	0.99	1.9
Sorghum	1	0.81	8.1
Soybeans	1	0.50	53.2
Winter Wheat	1	0.16	34.1
Durum Wheat	1	0.29	2.9
Other Spring Wheat	1	0.32	13.5

Assumptions: (1.) 40% of all Pesticides are VOC's. Very, very conservative because this virtually disregards all solid pesticide applications, which are major pesticide products.

(2) All VOC's are HAP's

(3.) There are 3 pesticide applications per growing season.

Crop	Ave. Application Rate (lbs/ac) AI	VOC
Corn	0.92	0.6
Upland Cotton	0.45	0.3
Soybeans	0.50	0.33
Winter Wheat	0.16	0.11

Number of Acres Required Per Farm to qualify as a major source (10 tons/yr): 10 Tons/yr = 20,000 lbs/yr.

	Acres
Corn =	~ 10,000
Cotton =	~ 22,000
Soybeans =	~ 20,000
Winter Wheat =	~ 60,000

Source: Agricultural Chemical Usage 1991 Field Crops Summary
U.S. Dept. of Agriculture
Nat'l. Ag. Statistics Service

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
ATMOSPHERIC RESEARCH AND EXPOSURE ASSESSMENT LABORATORY
RESEARCH TRIANGLE PARK
NORTH CAROLINA 27711

December 14, 1993

MEMORANDUM

SUBJECT: Review of Revised Draft Report "Emission Factor Documentation for AP-42, Section 6.2.2"

FROM: William G. Benjey WB
ACMD/MSAB (MD-80)

TO: Dallas Safriet
OAQPS/TSD/EIB (MD-14)

I have completed review of the above referenced document. In general, the report is a good initial step in introducing estimation of pesticide emissions to AP-42. Given the great difficulty imposed by highly variable field conditions, the methodology presented in the proposed section should provide estimates within a factor of two or three of reality. I agree that it is probably not realistic to expect users to apply the original complicated volatilization algorithms without simplifications, given the difficulty of obtaining site-specific input data. I offer the following minor comments.

1. The assumption that most volatilization of pesticides will occur within 30 days of application is true on a very general basis. Volatilization rates for different pesticides and conditions indicate that 60 to 90 days is a better range for lower vapor pressure compounds. However, few new pesticides are "long-lived", as were many of the more persistent, now banned, pesticides.

2. The assumption of 58 percent and 35 percent active ingredient volatilization after 30 days for high and medium vapor pressure pesticides, respectively, is sufficient if <u>one</u> very rough number is desired. Alternative, the user could compute a range of volatilization based on the range of experimental values. (page 4-15)

3. It is both necessary and a definite service to the user to include Tables 6.2.2-1 and 6.2.2-2 in the AP-42 section. These data, particularly the vapor pressures, can be difficult to obtain from the literature. Publication of solubility data from the same source as for the vapor pressure data would also be helpful to those attempting computations.

4. Presumably, the assumption that 100 percent of inert volatile organic compounds (VOCs) are volatilized is based on the generalization that most inert VOCs have a high vapor pressure. Can this be referenced, or is there a table of inert ingredient VOC vapor pressures that would allow users to be more specific? (page 4-21)

5. In addition to the current work on volatilization and drift of aerially-applied pesticide, we anticipate research during the next two years which may allow the user to account for the effect of plant cover during pesticide application. This information should help future revisions of AP-42 Section 6.2.2

Please call me 541-0821 if there are any questions concerning these comments.

cc: J. Novak

CONTACT REPORT--MRI Project No. 4601-08

From: Tom Lapp, Environmental Engineering Department

Date of Contact: June 20, 1994

Contacted by: Telephone

Company/Agency: National Agricultural Chemicals Association (NACA)

Telephone Number: (202) 296-1585

Person(s) Contacted/Title(s)

Mr. Thomas J. Gilding, Director of Environmental Affairs

CONTACT SUMMARY:

Mr. Gilding was contacted with regard to the status of the review comments from NACA for the proposed AP-42 Section 9.2.2 -- Pesticide Application. The request for comments was sent to NACA on May 9, 1994. Tom stated that 6 or 7 members had been contacted for comments but he had not received any response from them. He feels that, in view of the time they have had to respond, the reviewers do not have any major comments on the revised draft section and view it as a low priority item.

In view of this, NACA officially has no comments on the Revised Draft Section 9.2.2 -- Pesticide Application.

California Environmental Protection Agency
James M. Strock, *Secretary for Environmental Protection*

State of California
Pete Wilson, *Governor*

DEPARTMENT OF PESTICIDE REGULATION
James W. Wells, *Director*

1020 N Street, Room 100
Sacramento, California 95814

May 27, 1994

Mr. Dallas Safriet
Emissions Inventory Branch (MD-14)
Office of Air Quality Planning and Standards
Research Triangle Park, North Carolina 27711

Dear Mr. Safriet:

Thank you for the opportunity to review the revised draft version of the pesticide application section of AP-42, Compilation of Air Pollutant Emission. I have taken over coordination of our Department's work in emission reductions for volatile organic compounds, and was provided background information on this matter by Tobi Jones and the other departmental staff to whom you sent copies of the draft.

Attached are comments provided to me by John Stutz. We have primarily focused our comments on the section of AP-42 that describes how our program came up with the initial estimates of volatile emissions from pesticide use (pages 4-27). In providing you the comments of John Stutz, we want to encourage you to accurately reflect the process that was used by the Department.

If you have any questions about our comments, please feel free to contact me at (916) 445-3984.

Sincerely,

Paul H. Gosselin
Assistant Director
Division of Enforcement, Environmental
Monitoring and Data Management
(916) 445-3984

Attachment

cc: Ms. Tobi Jones
Mr. John Stutz

Printed on Recycled Paper

State of California

Memorandum

To : Tobi Jones
Special Assistant

Date: May 23, 1994

Place: Sacramento

Phone: 324-3906

From : **Department of Pesticide Regulation** - John Stutz, Information Systems Analyst
Pesticide Registration Branch

Subject : Comments on AP-42, Section 9.2.2

The calculation of emissions due to inert ingredients is the portion of AP-42 that I initially had concern with. I have a few more comments that I would like to see inserted into the document. These suggestions are based on my familiarity with the Inerts Database, and with the formulations of the products in the database.

Page 4-27, paragraph 2, sentence 3: change to-

Most liquid formulations contain amounts of water as a portion of the inert ingredients. The percentage of water may range from several percent to as high as 95+%. Solid formulations ...

Paragraph 3: change to-

These estimated average VOC percentages were calculated by analyzing the inert formulations of approximately 9,000 products registered in the State of California. The nonvolatile portions of the inert formulations were subtracted out and the remaining(assumed) volatile portions averaged across each formulation type. The list of nonvolatile ingredients was arrived at by review of nearly 3,200 individual ingredients in California's chemical database. This cursory review, conducted by staff in the Pesticide Registration Branch of the California Department of Pesticide Regulation, determined if a component was volatile or nonvolatile. No attempt was made to establish the degree of volatility. Of the 3,200 ingredients, 981 were flagged as being nonvolatile or exempt (e.g., selected CFCs are exempt) and were subtracted out when the VOC emissions were calculated. Many inert ingredients were not identifiable as to their chemical composition and by default categorized as volatiles. This may explain the rather high averages calculated for many of the solid formulation types. An inert ingredient contribution factor to VOC emissions was calculated for each individual product. Using a unique factor for each product allows for a more accurate estimate of emissions because of variations in reported individual product usage. The formulation averages are only used when inert formulation information is unavailable.

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This estimation methodology is conservative, assuming that each ingredient, unless excluded as nonvolatile or exempt, is 100 percent volatilized.

Section 4.3.4

The initial comments I made on the Example Estimation were taken into account in this draft.

California Environmental Protection Agency
James M. Strock, *Secretary for Environmental Protection*

State of California
Pete Wilson, *Governor*

DEPARTMENT OF PESTICIDE REGULATION
James W. Wells, *Director*

1220 N Street, P.O. Box 942871
Sacramento, California 94271-0001

December 6, 1993

Mr. Dallas W. Safriet
Environmental Engineer
Emission Inventory Branch (MD-14)
U.S. Environmental Protection Agency
Office of Air Quality Planning and Standards
Research Triangle, North Carolina 27711

Dear Mr. Safriet:

Thank you for providing us the opportunity to comment on your draft Section 6.2.2, Pesticide Application, supplement to AP-42, Compilation of Air Pollutant Emission Factors.

I am enclosing the technical comments prepared by the staff who are developing our Department's approach to reducing emissions from pesticides. We are particularly interested in making sure that information previously provided to MRI regarding inerts be used in an appropriate context. The memorandum from John Stutz discusses this concern in detail.

I hope these comments are of assistance to you in preparing your final report. We would appreciate receiving the final version of AP-42 when it is published.

Sincerely,

Tobi Jones

Tobi Jones
Special Assistant
(916) 657-4490

Enclosures

cc: Ron Oshima
Paul Gosselin

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State of California

Memorandum

To : John S. Sanders, Branch Chief
Environmental Monitoring and Pest Management

Date : December 6, 1993

Place : Sacramento

Phone : 4-1141

From : **Department of Pesticide Regulation** - Kean S. Goh, Ag. Program Supervisor IV
Environmental Hazards Assessment Program

Subject : Review of USEPA Emission Factor Documentation for AP-42, Section 6.2.2

Judy Pino and Heinz Biermann have reviewed the revised draft report of the *Emission Factor Documentation for AP-42, Section 6.2.2* of October 1993 prepared under contract by Midwest Research Institute for U.S. Environmental Protection Agency (USEPA), Office of Air Quality Planning and Standards Emission Inventory Branch. Their comments follow:

General Comments

Midwest Research Institute's approach to quantifying pesticidal emissions is commendable. Among the many sources of variables are application technique, soil and plant surface characteristics, meteorologic conditions, and others. Some of these are controllable and others are not.

Certainly, we need to increase our knowledge of these variables, especially the controllable ones, since they will allow some measure of control in the application of pesticides where a grower/applicator may have some leeway in application of a pesticide. This may include temporal considerations, but most importantly, the nature of the product applied. In weighing these choices, it will be essential to have means of estimating effect of changing those variables. Then, a pragmatic choice can be made with the goal of controlling a pest while at the same time meeting air quality standards. This adds a new dimension to pesticide application, and having good numbers to start with is of utmost importance, since bad numbers will haunt future efforts and may have long lasting negative effects on them.

Although the effort is in the right direction, this report has several flaws that need to be addressed before the report is finalized:

1) Incomplete data review for field measurements that are the basis for calculation of *Emission Factors for Active Ingredients as a Function of Application Method and Vapor Pressure* (Table 4-3).

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	Goh		

The authors acknowledge that most of the 31 references from their literature search on field tests of pesticide volatilization from soil surfaces present data for a single pesticide. The decision to examine a subset of only 16 of these references does not seem logical, since they produced a meager 39 data points for active ingredient loss. Some of these products may no longer be registered (statistically are no longer part of a "sample" of the "population"). I would strongly encourage examination of all 30 documents that exist to obtain as much data as possible, since all modeling are dependent on input of averages of these data.

The underlying premise that this small dataset of field observations may be extrapolated to generate quantitative data on each agricultural-use pesticide is unjustified. After the training set is improved by including a wider range of field data the model should also be validated.

2) Erroneous use of active ingredient vapor pressure to produce quantitative prediction of pesticidal volatility.

Vapor pressure is a colligative property that, by Raoult's Law, holds only for ideal solutions and may deviate significantly in a nonideal situation, which would best describe pesticide formulations. There is not much danger of a product being miscategorized in this model which distinguishes only three vapor pressure categories; however, invalid use of vapor pressure here may lead to future inconsistencies (see 3) below, and should be avoided.

3) Midwest Research Institute has supplied an ideal example to substantiate points (1) and (2) above. The "Average inert VOC content" entries in Table 4-4 (page 4-23), which are traced to our Department in Reference 23 on page 4-38, are incomplete and misleading. Please refer to the memorandum by John Stutz on the specifics.

Section 2. Industry Description

This overview of the pesticide industry should be omitted or rewritten to include some factual material. It does not relate in any way to the issues at stake or the goals of the proposed AP-42 section.

Page 3-4. Define "source category" for agricultural pesticide industry.

Page 3-4 and 3-5. There is reference to "the final set of documents" and "these reports." Need reference numbers for these vague statements.

Section 3. General Data Review and Analysis Procedures

Include definition of evaluation criteria. This section includes a very cursory description of the literature search and an ingenious discussion of volatility testing.

Section 4. AP-42 Section Development

Table 4-1 should include "Report Date," "Report Rating," and [+/-] for whether it was used in the report.

Page 4-12. Section 4.3, Algorithm Development. There are some major scientific problems:

■ For soil incorporated pesticides, two formulas are used to calculate volatilization rates. Then, as stated in the report, "Emission factors were developed for the pesticides by multiplying the pesticide volatilization rate by the time after application and then dividing the product by the pesticide application rate." This approach is valid only when used with Equation 2 (page 4-16), because this formula yields a volatilization rate that is independent of time.

In Equation 1 (page 4-15), however, the rate is proportional to the square root of 1/time. In this case, calculating the rate for day 30 and then multiplying by 30 to obtain the total amount volatilized is mathematically incorrect. The correct approach would be to integrate the rate function to obtain the amount volatilized.

If one does this integration, however, some serious drawback in the two equations becomes apparent: for both functions the total amounts volatilized will approach infinity for long enough time periods. There is no boundary check in these formulas that will prevent them from returning volatilization amounts that are larger than the amount originally applied! These formulas may fit experimental data over a limited time span, but they definitely do not describe the physical process properly.

■ We were unable to verify the calculations that lead to the actual emission factors listed in Table 4-3 (page 4-21). Table 2 lists vapor pressures of some pesticides, but only some of those were used to generate Table 4-3. They are not identified in the report. More important, two crucial values needed for the calculation (Henry's constant and organic carbon partition coefficient) are not provided. Those values should have been listed in Table 4-2 to make it useful.

■ Table 4-3 (page 4-21) instructs to use the soil incorporation factor for surface applied formulations if the vapor pressure of the A.I. is less than 10^{-6} mmHg. That leads to the curious sequence of 58% volatilized for $>10^{-4}$ mmHg, 35% for 10^{-4} to 10^{-6} and then 0.25% volatilized for $<10^{-6}$ mmHg. It does seem strange that the first two categories differ by less than a factor of two while the next category drops by more than two orders of magnitude. So just by changing the vapor pressure of a compound from 1.0×10^{-6} mmHg to 9.9×10^{-7} mmHg one can reduce the calculated emissions from 700 lbs. per ton to 5 lbs. per ton.

■ The calculation of the emissions of VOC inert ingredients is not handled very well. The instructions on page 62.2-5 read: "Multiply the percent VOC content by the total quantity of applied formulation to obtain the total quantity of VOC inert ingredients. If the VOC content is not known, use a default value from Table 6.2.2-3 appropriate to the formulation." This recipe can lead to some weird results. Assume that an emulsifiable concentrate contains 30% inert ingredients, but does not specify how much of it is considered to be VOCs. According to the instructions one then had to use the value from Table 6.2.2-3 which is 42%. Clearly, it is absurd to say that 42% of the formulation are VOCs from the inerts if there are only 30% inert ingredients in the first place. I think the Table would have been much more useful if the numbers would represent the percent VOCs relative to the total amount of inerts, not relative to the whole formulation. Then one could easily say that 42% of the 30% inerts are VOCs. This approach would be a vast improvement over the current method and only involve one additional multiplication step in the procedure.

Page 4-14 (bottom). No justification for use of soil factor. The other surface effects are 20-30 times the soil factors.

Page 4-21. All the careful analysis in the references is boiled down to a 2 x 3 table. This should be described as the goal very early in the report.

Ibid. Surface $< 10^{-6}$ states "Use soil incorporation factor." The justification for this needs to be strengthened.

Ibid. The algorithm: The assumptions about inerts need much more justification. Since inerts are from 50-99% of the formulation, they will dominate the "emission total" in the proposed model. Small changes in treatment of inerts will have a large effect on "total emission."

cc: Tobi Jones

State of California

Memorandum

To : Tobi Jones, Special Assistant
Department of Pesticide Regulation

Date: November 17, 1993

Place: Sacramento

Phone: 4-0533

From : **Department of Pesticide Regulation** - John Stutz, Information Systems Analyst
Pesticide Registration Branch

Subject : Review of AP-42 Section 6.2.2

The only sections that I can comment on are Table 4-4 page 4-23, and "Emissions of VOC Inert Ingredients" and "Example Calulation" found on page 6.2.2-5.

Table 4-4 Inert VOC Content By Formulation Type - was developed by MRI using data that I had sent them from the Inerts Database. The data was not product specific, and was very limited in scope. The data excluded any information on water content and only detailed inert chemicals that performed a certain functionality in the product. The functionality data was skewed towards potential for higher volatility and could not be used to average in the non-volatile ingredients. Out of the 100+ function types that we describe in the database, this exercise only included 26. The data was sorted by formulation type, function, chemcode, common name, and percent (found in any product, not product specific). The explanation of their analysis of the data on page 4-23, reference 23 is not sufficient, and we never were provided with the methodologies that I requested (computer programs, etc.).

I have included, on page two of the attachment, the formulation type averages that I calculated using the entire set of inert data. Generally, the volatility factors are lower than those calculated by MRI. This attachment also describes the methodology that I used.

"Emissions of VOC Inert Ingredients" - To properly calculate the inert VOC contribution, you must also use the percent of inerts that are in the formulated product in the calculation. The paragraph should read:

"The total quantity of emissions due to the VOC's in the inert ingredient portion of the formulation can be obtained by using; the percent of the inert portion contained in the formulated product, the percent of VOC's contained in that portion, and the total quantity of formulation applied to the crop. Multiply the percent of inerts by the percent of VOC, in the inerts, by the total quantity of applied formulation to obtain the total quantity of VOC inert ingredients. If the VOC content is not known, use a default value from Table 6.2.2-3 appropriate to the formulation. The emission factor for VOC inert ingredients is

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assumed to be 100 percent within 30 days after application of the formula."

"Example Calculation", Part 3. - These instructions should read:

3. From Table 6.2.2-3, it can be estimated that 42 percent of the inert ingredients in the emulsifiable concentrate(EC) is VOC.

Total quantity of emissions due to inert ingredients:

% Inerts in formulation		% VOC's est. in EC's(6.2.2-3)		Total Lbs. Applied		Total VOC Inerts Applied
0.42	•	0.42	*	8000	=	1,411 lb. (not 3,360)

I would suggest, that the table of Average Inert VOC's by Formulation; calculated from our database be used in lieu of Table 6.2.2-3.

DEVELOPMENT OF INERT VOC FORMULATION AVERAGES

On page 2 is a list of the formulation types and VOC inert averages used by the California Department of Pesticide Regulation. These averages were calculated using the specific inert formulation breakdowns of the products registered in California. The methodology used for this calculation is as follows: (this is excerpted from the methodology document which describes the emissions inventory development for the three NAA's in California)

Step 1 - Determination of Non-Volatile Chemical Ingredients

Every application reported in the PUR data is based on a specific product, identified by it's USEPA product number. Formulation data on these products, for both active and inert ingredients, are contained in two DPR databases. These are the Product/Label (27,000 products) and the Inert Ingredients (11,000 products) databases. These systems, in turn, are supported by a Chemical Ingredients database that contains information on approximately 3,200 chemicals.

Of these 3,200 chemicals, 981 were flagged as either non-volatile or excluded (CFC's) by the Consumer Products Regulation (CARB). The review of these chemicals was conducted by the Chief Chemist of the Pesticide Registration Branch. The review of this list was cursory, due to the mandated timeframes, and represents an estimate of the precise nature of each ingredient. There was no attempt made to determine the relative volatility of each compound.

When calculating emissions, these **flagged chemicals were excluded** from addition to the emission totals.

Step 2 - Calculation of the Inert Ingredients VOC Contribution

An inert ingredient contribution factor to VOC emissions has been calculated for each individual product. Using a unique factor for each product, rather than an average by formulation type, allows for a more accurate estimate of emissions. The estimate is very conservative, assuming that each ingredient, unless flagged non-volatile, is volatilized 100%.

Because development of the Inert Ingredients database began in the fall of 1991, many products reported in the 1990 baseline year were no longer active and not included in the initial input effort; in fact, many had been inactive for a number of years. This is not unusual or unexpected with an estimated 10-15% turnover of products each year. For those products for which an inert formulation had not been input, an **average factor of emissions potential** was calculated using all of the products in the database. This average, by formulation type, was used to fill the product gaps between the inerts database and the 1990 use data. Future years will yield better correlation between the databases.

The inert contributions were calculated by taking the total use of each product from the extracted PUR data, multiplying this by the total inert percentage in that product, and multiplying that figure by the contribution factor.

Formulation VOC Averages

The following table lists the number of products analyzed for each formulation type, and the average VOC emissions developed in the analysis. In addition, the MRI generated average is compared.

Formulation Code	Product Count	DPR Avg.	MRI Avg.	Formulation Name
K0 Count:	2	Avg. : 0.0000	75.0	Pressurized Dust*
Q0 Count:	23	Avg. : 15.0000		Suspensions
N0 Count:	172	Avg. : 12.0000	22.0	Soluble Powder
T0 Count:	4	Avg. : 17.0000	8.0	Other Dry
O0 Count:	3149	Avg. : 20.0000	54.0	Solution/Liquid(ready-to-use)
U0 Count:	25	Avg. : 21.0000	50.0	Other Liquid
S0 Count:	688	Avg. : 21.0000	33.0	(Aqueous) Concentrate
L0 Count:	38	Avg. : 29.0000	33.0	Pressurized Gas
C0 Count:	144	Avg. : 21.0000	31.0	Flowable (Aqueous) Concentrate
G0 Count:	11	Avg. : 23.0000	29.0	Microencapsulated
J0 Count:	506	Avg. : 27.0000	16.0	Pellet/Tablet/Cake/Briquet
P0 Count:	344	Avg. : 25.0000	15.0	Wettable Powder
A0 Count:	367	Avg. : 21.0000	13.0	Dust/Powder
R0 Count:	53	Avg. : 28.0000	12.0	Dry Flowable
E0 Count:	1053	Avg. : 25.0000	11.0	Granular Flake
M0 Count:	1279	Avg. : 39.0000	27.0	Pressurized Liquid/Sprays/Fog.
F0 Count:	253	Avg. : 38.0000	18.0	Impregnated Material
D0 Count:	73	Avg. : 40.0000	33.0	Gel, Paste, Cream
B0 Count:	961	Avg. : 56.0000	42.0	Emulsifiable Conc.
I0 Count:	202	Avg. : 64.0000		Paint/Coatings
H0 Count:	39	Avg. : 66.0000	95.0	Oil

* There are very few pressurized dusts registered in California. They contain CO_2 and CFC's(exempt ozone depleters), and inert non-voc carriers.

EFMS V-17 (93)

DF 1078 20,000

50,000
45,000
20,000
~~$~~25,000

50,000
20,000 93
30,000

NATIONAL AGRICULTURAL CHEMICALS ASSOCIATION
THE MADISON BUILDING
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December 20, 1993

Dallas W. Safriet
Environmental Engineer
Emission Inventory Branch (MD-14)
U.S. Environmental Protection Agency
Research Triangle Park, NC 27711

Re: Draft Section 6.2.2, Pesticide Application to AP-42, Compilation of Air Pollutant Emission Factors

Dear Mr. Safriet:

The National Agricultural Chemicals Association (NACA)* appreciates the opportunity to comment on the draft Section 6.2.2, Pesticide Application that EPA is proposing as a supplement to AP-42. With the increasing attention being given to sources of air emission, NACA believes it is critical for EPA to assure that air emission estimates are realistic and science-based.

As such, the focus of our review of Section 6.2.2 was on the technical quality of the proposed methodology for estimating emissions from pesticide application. These comments have been coordinated with the Western Agricultural Chemicals Association (WACA), an industry trade association representing companies that manufacturer, formulate, distribute and retail crop protection chemicals used in the Western region of the U.S.

NACA supports methodologies for determining pathways in which pesticides degrade or transport within the different environmental media, e.g. air, soil and water. With this information, the potential risks from pesticide use can be more realistically assessed and, therefore, effectively managed. Our industry is committed to working with EPA in bringing the best science forward for making these kinds of determinations available in regulating pesticide use under FIFRA.

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* NACA is a not-for-profit national trade association representing companies that manufacture, formulate and distribute crop protection chemicals used in U.S. agriculture.

Our comments address Section 6.2.2 from two perspectives; 1) potentials for misuse in regulating pesticides, and 2) technical quality of the proposed emissions estimating model. Overall, our primary concerns lie not so much with the document itself, but more with the likelihood for misuse of the estimates in arbitrary attempts to restrict or ban pesticides that may result in unwarranted loss of pesticides and, therefore, their economic benefits to agriculture. Our comments are as follows:

POSSIBILITY FOR MISUSE

From reading the Introduction statements to Section 6.2.2, NACA understands the intended uses for the emissions estimates from pesticide application will be to:

a. Estimate area-wide emissions;
b. Estimate emissions for a specific facility (How is "facility" defined for pesticide application? Is it at the farm level?); and
c. Evaluate emissions relative to ambient air quality.

We believe the methodology for estimating emissions from pesticide application in Section 6.2.2 to be technically a step in the right direction. However, the fact still remains that the estimates themselves are, at best, very gross by nature of design. Therefore, it is important that EPA clearly point out to the users of AP-42 that any estimates made can be expected to be no more than generic, simplified substitutes for the actual complex processes involved in pesticide volatilization. Unfortunately, too often numbers that are based on rough estimates tend to assume a perception of "authority" that far exceeds their limitations and originally intended uses.

As a result, we are concerned that the emission estimates from Section 6.2.2 will be subject to a high potential of misrepresentation or misuse in ways counter to sound risk management judgements. The use of pesticides is strictly regulated under FIFRA by EPA and designated state agencies according to science-based risk assessment and management protocols. Air emission "estimates" could be viewed by those state and local agencies not experienced in agriculture and pesticide regulations to be valid justification for taking actions against pesticides outside of the FIFRA regulatory jurisdiction.

NACA supports FIFRA regulation of pesticides that protects public health and the environment, and maintains our high level of agricultural productivity. The protection of human health and the environment, along with the continued safe and beneficial use of agricultural pesticides are major commitments of NACA. We strongly oppose regulations, or attempts to regulate, where needs are not demonstrated that could result in arbitrary loss of

pesticides as viable economic tools for agriculture.

In addition to inappropriate regulatory actions, non-government entities, i.e the news media, special interest groups, etc., frequently present their own interpretations of emission estimates in attempts to raise public concern with sensational reporting of unscientific exaggerations of risks. A good example of this situation can be illustrated by the attached article that just recently appeared in several California newspapers. This article with its vividly illustrated map, gross assumptions that pesticide emissions equates to pesticide use, and highly sensational statements like "bombardment of poisons," "nerve poisons developed by Nazi scientists before World War II," and "cancer hot-spots," is an injustice to the public it serves. Furthermore, this type of reporting is counter to responsible risk communications.

In order to minimize the occurrence of such actions, NACA believes Section 6.2.2 must contain two qualifying attributes. First, to provide the users with a certain understanding of pesticide volatilization and factors influencing, at least to the level necessary for making "estimations." Second, clear statements on limitations of emission estimates that are derived from Section 6.2.2 and precautions against any intended uses beyond "preliminary screening." We believe that the first attribute has been fairly well incorporated in Section 6.2.2. However, much more needs to added in order to sufficiently satisfy the second attribute.

TECHNICAL COMMENTS ON SECTION 6.2.2

1. General Assessment

As written, Section 6.2.2 provides a good overview of the pesticide formulation types, their application and factors that influence volatilization. This information is important background for AP-42 users to help them develop decision-making scenarios for estimating emissions from pesticide application within their specific locations being addressed.

Although NACA has not had time to make a detailed evaluation of the research used in developing Section 6.2.2, EPA is to be commended for its attempts to utilize a technical basis from which to frame methodology for estimating emissions. Most important is that EPA recognizes the need to minimize arbitrary assumptions as much as feasible, even for making simplified estimates. The use of existing research on field behavior of pesticides will help extract pertinent information to guide AP-42 users towards making more informed assumptions in estimating emissions.

Section 6.2.2 presents a good discussion of critical factors that influence the volatilization of pesticides. Unfortunately, the actual model that establishes emission factors ignores most of these scientific considerations in favor of simplification. NACA recognizes the need for a certain "level of simplification" for estimating in the absence of actual data, but believe that the model is too simplified in only including pesticides vapor pressures and mode of application (surface versus soil incorporation). Our suggestions for this concern are presented below in comments on Section 4.

2. Section 2 - Industry Description

We find the information in Section 2 to describe fairly well the agricultural pesticides industry, the types of pesticide formulations used and methods of applications. As identified above, the important aspect of the information provided is on the multiple factors that influence pesticide volatilization. These understandings are key to maximizing "informed" emission estimates within the constraints of limited data.

In Section 2, a statement is specifically made on page 2-8 that "most pesticides are either semi-volatile or essentially non volatile." NACA believes this statement accurately represents the general volatilization characteristics of pesticide active ingredients. However, in Section 6.2.2-2, this perspective is changed by a statement "... most (pesticides active ingredients) are considered semi-volatile organic compounds (SVOC) for analytical purposes, but some are volatile." It is this latter, over-estimating perspective that appears to be the basis for Table 4-3.

3. Section 3 - General Data Review and Analysis Procedures

NACA agrees with the importance of rating research studies and emission factor models that EPA presents in the Section 3. Equally important, however, is that the quality and limitations of emission estimates be clearly understood by those making and using the estimates. By knowing the quality and relevance of the research used, boundaries are better defined as to the limitations for which the emissions estimates can appropriately be used.

4. Section 4 - AP-42 Section Development

In Section 2, EPA discusses the multiple factors that influence the volatilization of pesticides. These include other pesticide properties, moisture, air and soil temperature, wind, soil properties, etc. However, of these

factors only vapor pressure of pesticides and method of application, e.g. surface applied or soil incorporated, are used for establishing emission factors of pesticide active ingredients.

NACA recognizes the need for simplifying the model around those factors having the greatest influence on volatilization. However, we suggest that an additional parameter be added to account for extremes in weather conditions (temperature and rain/irrigation events) when considering the U.S. on a national scale. Perhaps, regional perspectives with temperature and moisture profiles, could be considered.

The research cited in Section 4 is the technical basis from which EPA develops the model for emission factors in Table 4-3. Accordingly, in this model, pesticide active ingredients are grouped under one of three broad vapor pressure ranges. Active ingredients within the same group are assigned equivalent emission factors. The only further distinction that is made on the emission factors for these "grouped" pesticides are whether they are soil incorporated or surface applied.

An obvious question is how representative and valid the conclusions from these limited studies, which were conducted mostly on older organo-chlorine pesticides, are to the more currently used pesticides listed in Table 2-1. NACA recognizes that the transfer of generic assumptions on vapor pressures may be adequate for the level of accuracy intended for "screening" estimations. However, we do suggest that EPA should further verify whether other research, preferable more direct on currently used pesticides, may be available to supplement EPA's technical rational for consolidation around vapor pressures.

NACA agrees with the need for a specifying a time period after which no further emissions are considered in the emission factors. Whether the 30 day cut-off period that EPA has selected is appropriate or not can be argued either way. We do have concerns that in using 30 days, EPA places too much emphasis on air as a loss pathway for pesticides and, in addition, an unrealistic time profile for transport and fate of many pesticides. Specifically, the affects of the "holding" properties resulting from plant up-take, soil adsorption, and biological/physical degradation that occur during the 30 days after application are basically ignored.

The 30 day cut-off issue again raises the question on the amount of detail and accuracy intended for these "screening" estimates. NACA's concerns with "short-cuts" to these estimates are that they will be used as substitutes where

only more detailed technical assessments are appropriate.

The title and instructions on using Table 4-4 needs further clarification. First, that it is to be used as a default in the absence of information from the product label or manufacturer. Second, that the figures in the Table represent the percent of inert ingredients in the pesticide formulation that volatize. As written, it is confusing whether the total formulation weight or just the weight of the inert should be multiplied by the figures in this Table. If it is intended that the total formulation weight be multiplied by the Table 4-4 figures, then NACA questions the accuracy of the figures. From that perspective, Table 4-4 appears to seriously overestimate the volatile nature of the "inert" ingredients of many formulation types.

Also, NACA does not agree with EPA's assumption that 100 percent of the "inert" liquid portion of pesticide formulations volatizes, let alone in 30 days. Many of the same or similar ingredients are not considered volatile by other industries. This assumption unduly penalizes pesticides.

Section 5 - Proposed Section 6.2.2

Since the content of Section 6.2.2 is basically a summary of the "preamble" Sections 2, 3 and 4, NACA reiterates the applicable comments presented above. In addition , our comments specific to Section 6.2.2 are as follows.

The actual wording in Section 6.2.2 states that emission factors calculated using the model are E-rated. The definition for "E-rated" and an explanation of its significance is noticeably absent in Section 6.2.2. NACA believes that it is critical that these qualifications be clearly visible to users of Section 6.2.2. Perhaps this information is contained elsewhere in AP-42, but we suggest that it be physically located in Section 6.2.2. so that it is read by those making emission estimates from pesticide application.

In the suggestions presented on page 6.2.2-5 regarding sources of information for the six steps in estimating emissions, EPA should also provide guidance on estimating pesticide use quantities for geographic locations for which emissions estimations are being calculated.

CONCLUSION

NACA hope that EPA finds these comments of assistance in developing methodology for estimating emissions from pesticide applications in agriculture. We recognize the difficulties that

EPA faces in assuring that these estimates are realistic and technically-sound, and not misused in ways that are counter to effective risk management and communications. NACA stands ready to work with EPA towards improving these emission estimates.

Sincerely

Thomas J. Gilding
Director
Environmental Affairs

cc: Jennifer Ryder Fox - WACA

United States Department of Agriculture | Agricultural Research Service | Beltsville Area Beltsville Agricultural Research Center | Beltsville, Maryland 20705

December 15, 1993

Dallas W. Safriet
U.S. Environmental Protection Agency
Emission Inventory Branch (MD-14)
Research Triangle Park
North Carolina 27711

Dear Mr. Safriet:

I have completed a cursory review of the document sent to me on Nov. 22, 1993, "Emission Factor Documentation for AP-42, Section 6.2.2 - Pesticide Application (Revised Draft Report)." While the survey of the literature appears reasonably complete, I've listed a few omissions which might improve the coverage.

I have a serious problem with the overall approach. I feel strongly that the physical property driving the emission approach should be the Henry's law constants (HLCs) for the chemicals and that just looking at vapor pressure ignores much of the recent advances which have been made concerning the importance of the water phase in doing environmental phase processes. I really think you and your contractor should step back and develop some of the same generalized concepts using HLCs. The Jury Model uses HLCs to classify pesticides and I notice the MRI did mention this in their report.

At the least, I would like to see a justification for not using this approach. I can come up with several reasons why I think using HLCs should be used. For both surface applied and soil incorporated pesticides the water phase is very important. Perhaps immediately upon application is the only time that the applied material may not water phase dispersed, but after 1-2 days, water in the soil and even on leaf surface should become a very important parameter to consider. I would not release this document before you have at least given careful consideration to my comments.

References to be further considered:

MacKay, D., S. Paterson and W.Y. Shiu. Generic Models for evaluating the regional fate of chemical. *Chemosphere*, 24(6): 695-717. 1992.

Jury, W.A., W.F. Spencer, and W.J. Farmer. (1984c). Behavior assessment model for trace organics in soil: IV. Review of experimental evidence. *J. Environ. Qual.* 13:350-585.

Paterson, S., and D. Mackay. 1991. Correlation of the equilibrium and kinetics of leaf-air exchange of hydrophobic organic chemicals. *Env. Sci. Technol.* 25(5):866-871.

Sincerely,

Clifford P Rice

Clifford P. Rice, PhD.
Research Chemist
Env. Chem. Lab., USDA.

Rec'd 7/18/94 TR

MILES

Agriculture Division

July 1, 1994

Miles Inc.
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P.O. Box 4913
Kansas City, MO 64120-0013
Phone: 816 242-2000

Dallas W. Safriet (MD14)
Emission Inventory Branch
U.S. Environmental Protection Agency
Office of Air Quality Planning and Standards
Research Triangle Park, NC 27711

Re: Emissions Factor Documentation for AP-42 Section 6.2.2 Pesticide Application

Dear Mr. Safriet:

Miles Inc. has reviewed the materials in new section 6.2.2 Pesticide Application for AP-42 and we have several comments.

We have taken data from two sources and have applied your suggested protocol for estimating emissions. The first source studied is a paper presented the week of June 19-24, 1994, at the Air & Waste Management Association's 87th Annual Meeting in Cincinnati, Ohio. The paper, 94-MP5.03, titled "Pesticide Volatilization Model Comparison with Field Measurements" by M.T. Scholtz, E.C. Voldner, and E. Pattey studied the application of two herbicides, triallate and trifluralin, on bare soil without soil incorporation. Both of the herbicides have a vapor pressure of 1.1×10^{-4} mm Hg. The water solubility of triallate is 4 ppm at 25°C and < 1 ppm at 27°C for trifluralin. The second source studied is a paper titled "Volatilization Behavior of Pesticides in Field Trials" by R. Fritz, E. Kersting, and K.H. Kuck, Bayer AG, Institute of Metabolism Research. They studied several pesticides using radioactively labelled pesticides.

In the Scholtz, Voldner, and Pattey paper, they report both actual concentrations of technical materials and modelled concentrations. Actual concentrations are determined using polyurethane foam (PUF). Using actual concentrations, 9% of the triallate volatilizes in the first 5 hours. Another 9% volatilizes in five days (120 hours). The same analysis of the trifluralin data shows the initial loss of technical material to be 11% in 7 hours. Another 3% is lost by the end of the third day. The rate of loss of technical trifluralin is 0.03% per hour. The total cumulative loss of trifluralin is 33.7%. Using your emission factors from Table 4.-3 and 4-4 the trifluralin loss is 1160 lb/ton or 58% in 30 days. Using the first study data the actual emission lost is 33.7% x 2000 lb or 674 lb/ton. This is 42% lower than predicted by your model.

We studied the second paper to determine a possible cause of the problem for the poor correlation between your model and actual emissions. In the second study, the pesticides have a wide range of vapor pressures and water solubilities. The active ingredient (AI) parathion-ethyl is the closest to the two herbicides in the first study in physical properties. The pesticides with low vapor pressures do not volatilize within 24 hours. The pesticides

with higher vapor pressures and high water solubilities do not volatilize. The compounds with higher vapor pressures and low water solubilities have the higher volatilities.

Your AP-42 section has got to factor in the Henry's Law effect which requires both vapor pressure and water solubility data for the technical material.

Your section also greatly overstates VOC's from pesticide applications since the inerts are assumed to be 100% VOC and 100% volatile.

Should you have any questions about this request, please contact me at (816) 242-2464 or Ron Huffman at (816) 242-2676.

Sincerely,

MILES INC.
AGRICULTURE DIVISION

Ronald P. Huffman

For Jack Lonsinger
Director, Regulatory and Community Environmental Affairs

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FAX TRANSMISSION

TO: Dallas Safeiet

FROM: Tom LAPP

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THIS FAX CONSISTS OF 3 PAGES (INCLUDING THIS PAGE)
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COMMENTS:

Dallas -- For your Review & Comments

Jim

Mr. Jack J. Lonsinger
Director, Regulatory and Community Affairs
Miles Inc.
Agriculture Division
8400 Hawthorn Road
Kansas City, Missouri 64120-0013

Dear Mr. Lonsinger:

Thank you very much for the letter dated July 1, 1994 regarding Miles evaluation of the data presented in two papers at the Air and Waste Management Association (AWMA) Annual Meeting in Cincinnati, Ohio. As I am sure you have noted in the May 1994 draft version of the proposed AP-42 Section 9.2.2 -- Pesticide Application and the accompanying background report, a very limited data base exists in the literature. Therefore, the model used to develop the emission estimate model could only be based on this limited data base. It is gratifying for the Agency to see that additional studies are being conducted to measure VOC loss from pesticide formulations following application. A heightened interest in studies of this nature by industry, academia, and governmental agencies, such as the U.S.D.A., will serve to broaden the available data base and provide additional data to use in the model. As additional studies, such as the one cited for trifluralin, are conducted and the results combined with the studies of Dr. Glenn Rice of U.S.D.A., a significantly larger data base will become available. This larger data base will allow the Agency the opportunity to evaluate the current model and, if appropriate, refine the model to incorporate the additional data.

In your letter, reference is made to the use of Henry's constant as a possible modeling parameter to estimate VOC emissions. As I am sure you have noted, the potential for the use of Henry's constant was addressed on page 4-19 of the current draft document. When the quantity of available data becomes significantly larger, the use of Henry's constant may be one of

the alternative parameters of interest to the model. The Agency has an interest in evaluating, in the future, any potential use of Henry's constant that would be developed based on a substantially larger data base. As you are aware, an AP-42 section is a "living document" and, as such, a file is maintained of all AP-42 sections. When sufficient information and resources become available, the existing sections are updated to reflect the current status.

The letter also states that the inerts are assumed to be 100% VOC and 100% volatile. While this assumption was made in one of the earlier drafts, the current draft document addresses this subject on pages 4-27, 4-40 (Section 4.3.3.2), 4-41 (Section 4.3.4, item 3), and in Table 4-4. The current document provides default percentage values for only that portion of the inerts considered to be volatile. This corrects the earlier assumption that 100% of all inerts are considered to be volatile.

I appreciate the interest that Miles Inc. has shown in this topic and would like the opportunity to review future experimental test data that Miles develops in an effort to create a larger data base from which to assess this subject area. The Agency strives to maintain open lines of communication with industry and I appreciate your show of interest. If you should have any further questions, please contact me at (919) 541-5371.

Sincerely,

Dallas Safriet
Emissions Inventory Branch

State of Wisconsin
Department of Agriculture, Trade and Consumer Protection

Alan T. Tracy, Secretary

801 West Badger Road • PO Box 8911
Madison, WI 53708-8911

November 30, 1993

Ms. Gwendolyn Judson
Bureau of Air Management
Department of Natural Resources
101 South Webster Street
Box 7921
Madison, WI 53707

SUBJECT: Emissions from Pesticide Application

Dear Gwen:

I have reviewed the draft EPA report on emissions related to pesticide application. I have the following comments:

- It's of some concern that much of the test data reports referenced in section 4.1 are for "old" compounds that are no longer used. Only 2,4D, EPTC and trifluralin are still used in Wisconsin and were limited in 1990 to about 12% of the total agricultural acreage treated. I don't know if this will result in correct estimations or not.

- The data needed to use the algorithm under 6.2.2.5 may be difficult to get, especially related to application method and quantity applied. I'm not aware of an accurate source for all the information required since there is considerable variation in use practices. For example;

  Atrazine is the AI in many different formulation types including dry flowables, flowable liquids, liquids, water dispersible granules and wettable powders. It is applied both pre and post emergence. It is sometimes incorporated into the soil and sometimes not. It can be applied in a band covering the crop row only or broadcast over the entire field. It can be applied as early as late April or as late as July.

  How is this information going to accurately obtained considering the many products and scenarios involved?

- We don't have the expertise or data to critically evaluate much of the document. I hope that the pesticide manufacturers who formulate these products have had a chance to review the report since they have first hand knowledge of the formulation chemistry.

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AIR MANAGEME

I hope this is helpful and thanks for the opportunity to review the report.

Sincerely,

Ned T. Zuelsdorff
Director, Bureau of Agrichemical Management

Rec'd from Dallas
2/2/94 RL

WISCONSIN
DEPT. OF NATURAL RESOURCES

George E. Meyer
Secretary

State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES

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December 8, 1993

File Code: 4519-17

Ms. Dallas Safriet
United States Environmental Protection Agency
Emission Inventory Branch (MD-14)
Research Triangle Park, NC 27711

SUBJECT: Emission Factor Documentation for Pesticide Application

Dear Ms. Safriet:

I have reviewed the new draft Section 6.2.2, Pesticide Application, proposed for publication in a supplement to AP-42, Compilation of Air Pollution Emission Factors. In addition to my comments which follow, I have enclosed the comments of Ned Zuelsdorff. Mr. Zuelsdorff is the Director for the Bureau of Agrichemical Management, Wisconsin Department of Agriculture, Trade and Consumer Protection.

I developed Wisconsin's emission estimate for pesticide application submitted as part of its 1990 Base Year State Implementation Plan Emission Inventory for Precursors of Ozone, and I wrote Wisconsin's pesticide application white paper submitted to the Lake Michigan Air Director's Consortium (LADCO). Subsequently, my principal concern is the efficacy of this document. While comments regarding data collection are specific to Wisconsin, I would expect that other states would have the same or comparable issues in applying this guidance.
Your cover letter mentioned the importance for information published in AP-42 have as sound a technical basis as possible. I think this is especially crucial for pesticide application because there are significant emissions in many states and there are also far-reaching political implications due to farm economics. Therefore, I have several reservations with the scientific basis and guidance offered in this document as follows:

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- There is **no guidance** given for pesticides that are aerially applied. Some alternative must be given for those states that have a significant amount of aerial application. Moreover, Wisconsin's data give the percent aerially applied per active ingredient. There is no way to know which formulations or at which time this method was used.

- *Table 4-3. Emission Factors for Active Ingredients as a Function of Application Method and Vapor Pressure* gives emission factors for surface application and soil incorporation. There is no way for Wisconsin to discern which application methods were used for different formulations.

- The methodology applied to derive the emission factors listed in Table 4-3 assumed vapor pressures of pesticides for temperatures ranging from 20° to 25°C. However, in the Wisconsin nonattainment area, the weighted average hot summer day temperature is 31°C (88.4°F). The document does not include scientific evidence showing that these emission factors hold for an average hot summer day, or alternatively offer guidance for states to adjust the emission factors based on temperature.

- The method described in this draft document calculates the total quantity of emissions during a 30-day interval following application. Wisconsin has no data describing when specific pesticides are applied. There needs to be some guidance as to how states should calculate summer throughput. This information is crucial to the development of the Reasonable Further Progress (RFP) Inventories and modeling efforts.

- *Table 4-1. Summary of Field Tests of Pesticide Volatilization* lists the references used to develop the emission factors. Most of these compounds are no longer used and there is no discussion supporting their applicability to current agricultural practices. Moreover, there is no scientific verification of the results of this method. It is one thing to come up with a model but does it mean anything in practice? There is repeated mention of the "algorithm" used to calculate the emission factors but there is no evidence offered that its use results in an accurate estimate of pesticide emissions for a region.

  The reports used for this guidance make up a very small data set, and I am concerned with the practice of averaging the percentage losses. The discussion concedes that there is "considerable variability of field conditions from one field test to the other so that the average percentage loss is subject to considerable uncertainty" (p. 4-15). This uncertainty is exacerbated by the small amount of data used and lack of statistical analysis. **If, at this time, the best approach is still not a scientifically valid approach, I do not see what is gained by states spending a lot of resources reevaluating pesticide emissions only to come up with another estimate that is not defendable for regulatory purposes.** These loss times are specific to the parameters defined in the experimental method for each report.

Subsequently, it is a questionable practice to average these losses by vapor pressure in order to calculate an emission rate. Given the wide range of loss times and the use of cause/effect assumptions, there needs to be statistical verification of this methodology.

- The guidance provided in this document assumes that the information needed to use the algorithm is readily available. I have attempted to apply this guidance to Wisconsin's pesticide data and have discovered several problems. In Wisconsin, information about total quantities of formulation applied are not kept. The only data available is the amount of active ingredient (AI) applied per acre and percentages of formulation types for each AI. I have had numerous discussions with staff from the Department of Agriculture, Trade and Consumer Protection; several pesticide manufacturers; local agricultural co-ops; and the University Extension office. Moreover, I have looked at every label for the active ingredients sold in Wisconsin. None of these sources has the information necessary to follow the guidance provided in this draft report.

  Data regarding formulation types are often entered by field staff. Labels do not always provide a definitive description of formulation type. Therefore, some formulations are misreported and sometimes those listed are not even available for a given AI. Even discussions with manufacturers have revealed some confusion as to which formulation category should be used to describe a certain product.

  Without the data for total product applied, there is almost no way to estimate what was used and how it was applied. This problem is confounded since products may contain more than one AI or several products may be mixed before application.

  To reiterate: **the information needed to use the algorithm for estimating volatilization emissions cannot be found directly from the weight purchased or used, from the pesticide container labels, from the manufacturer, from the end-use formulator, or a local distributor.**

It is clear that current USEPA guidance does not adequately address emissions from pesticide application. However, the solution needs to solve that problem and not create a new one. I understand the considerable effort that has been made to reevaluate this category, but it is not clear that the implementation effort that this methodology would require will result in a more reliable estimate. The current level of knowledge is just not sufficient to support dependable guidance. I would hope that pesticide manufacturers could be encouraged to work with USEPA to develop more accurate methods for estimating emissions from pesticide application and that USEPA could take a proactive role in this endeavor.

In the interim, I believe a more reasonable approach would be to provide states with an alternative percentage to apply to the total amount of AI applied that is less than the 100% suggested in current guidance. Alternatively, this category could be dropped until an accurate methodology is available based on the assumption that no emissions are more accurate than inflated emissions. There needs to be an analysis performed of which would have a more realistic effect on the modeling and regulating efforts by the states.

For states interested in regulating pesticide application as part of their control strategy to meet the requirements of the Clean Air Act Amendments, there needs to be a scientific, reproducible approach which has a satisfactory degree of certainty. Until that point has been reached, there is a questionable gain made by implementing a new methodology which may be as inaccurate as the methodology it replaces.

Sincerely,

Gwendolyn J. Judson

Gwendolyn J. Judson
Air Management Specialist
Bureau of Air Management

cc: Larry Bruss--AM/7
Mike Majewski--AM/7
Jens Laas--AM/7
Ned Zuelsdorff--DATCP

Attachment:

State of Wisconsin
Department of Agriculture, Trade and Consumer Protection

Alan T. Tracy, Secretary

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Madison, WI 53708-8911

November 30, 1993

Ms. Gwendolyn Judson
Bureau of Air Management
Department of Natural Resources
101 South Webster Street
Box 7921
Madison, WI 53707

SUBJECT: Emissions from Pesticide Application

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Sincerely,

Ned T. Zuelsdorff
Director, Bureau of Agrichemical Management