# AMBIENT AIR MONITORING FOR PESTICIDES IN LOMPOC, CALIFORNIA

## VOLUME 4: RESPONSE TO COMMENTS

STATE OF CALIFORNIA
Environmental Protection Agency

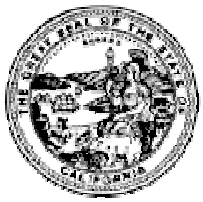
California Department of Pesticide Regulation

March 2003

EH03-02

State of California
Department of Pesticide Regulation

Paul E. Helliker
Director



Department of Pesticide Regulation
Environmental Monitoring Branch
1001 I Street
Sacramento, CA 95812

# FUMIGANT REPORT

Comments received by DPR on the February 8, 2002 "Ambient Air Monitoring of Fumigant Applications in Lompoc, CA" report submitted to members of the Technical Advisory Group of the Lompoc Interagency Work Group

**DPR responses are in bold.**
Comments which have been fully implemented have been removed.

March 13, 2002

MEMORANDUM

SUBJECT: Lompoc Draft Report on Ambient Air Monitoring of Fumigant Applications in Lompoc, CA, (QA Office Document Control Number TOXP068R02VSF1)

FROM: Mathew C. Plate, Environmental Scientist
Quality Assurance Office, PMD-3

THROUGH: Vance S. Fong, P.E., Manager
Quality Assurance Office, PMD-3

TO: Raymond Chavira, Environmental Scientist
Pesticides Program, CMD-4-3

The subject report, prepared by the California Department of Pesticide Regulation (DPR) and dated February 22, 2002, was reviewed.

This report does a good job of discussing background information and sampling logistics. Several concerns and comments are noted below. Of particular concern for the QA Office were some of the statistical conclusions, and the methodology supporting these conclusions presented. Because of the complexity of source emissions to the ambient air it is recommended that DPR not rely on a simple statistical model to estimate ambient fumigant concentrations.

**Major Concern**

Section 9.2 discusses DPR's attempt to model fumigant applications in the Lompoc area, and concludes that the model used did not show adequate correlation with the measured data. Without a mechanism to adequately model air dispersion we are left with the simple statistical assumption presented in Section 9.1 to evaluate metam-sodium and metam-potasium applications. This equation does not consider distance from Lompoc or meteorological conditions to in estimating the concentrations of MITC in the town of Lompoc. However, this equation is used to demonstrate that "all metam fumigations in 2001 are less than the methyl isothiocyante (MITC) acute and subchronic screening levels." It may not be reasonable to assume that the lack of a correlation between distance and concentration over 0.5 to 3 miles is reproducable for every fumigation. Additionally, other air models may be more appropriate than the one selected. Because the levels of MITC observed were within the same order of magnitude as the screening levels, adequate modeling of this data is important.

> **The discussion of the correlation of pesticide use and air concentrations had been removed from the report. An unsuccessful attempt was made to determine a correlation between the measured concentrations and modeled concentrations with the U.S.EPA ISCST3 dispersion model. Because of the poor correlation, it was decided that further attempts to model the data would be inappropriate.**

**None of the levels of MITC measured were within the same order of magnitude as the screening levels.**

**Other Concerns**

This section refers to research on metam-sodium degradation into methyl isothiocyanate (MITC). Because metam-potassium is also of concern this section should either, note research on metam-potassium degradation, if available, or state the expected properties of metam-potassium in relation to metam-sodium (e.g., unknown, similar, more, or less degradation into MITC).

**Metam-potassium also breaks down to MITC. Environmental fate is the same as metam-sodium.**

Section 9 states that "only MITC has sufficient monitoring data to conduct additional analysis." While this may be true for robust statistical analysis and modeling, this report should provide additional analysis in other areas. For example if there is sufficient methyl bromide data to conclude that these applications do not pose a significant risk, this information should be presented. Additionally, Section 9 or Section 10 should address areas where there are data gaps for particular fumigants, application methods used in the Lompoc area, and weather conditions.

**A health evaluation of the methyl bromide results is added. The computer modeling section addresses the data gaps, and how modeling can be used to fill the gaps.**

Section 8.0 should discuss for what samples, if any, independent raw data validation was conducted. Additionally, Sections 8.0 and 9.4 should discuss how individual data sets should be qualified based on quality control data, and how this qualification impacts the usability of the data.

**The data for validation is presented in the Quality Control Results section. We do not think the quality control results indicate that any of the data needs to be qualified.**

If you have any questions concerning this memorandum, please feel free to call me at (415) 972-3799.

USEPA Comments to February 22, 2002 CDPR Draft Report
"Ambient Air Monitoring of Fumigant Applications in Lompoc, CA"
April 15, 2002

## A. GENERAL COMMENTS

Were EPA and other TAG members FSAP comments integrated into a final FSAP? Draft FSAP comments should have been incorporated into a final FSAP. DPR did a great job in responding to comments from the first draft FSAP, yet I found instances where it was unclear that comments and suggestions to the draft FSAP that DPR agreed to change were amended into this draft.

**A request for comments on the final FSAP was sent out, and since no comments were received it was assumed the FSAP is the final version.**

The Risk Evaluation section is not consistent with current application of screening levels used by Cal EPA. In addition, the values are inconsistent within this draft.

**As noted in the memorandum from Jay Schreider dated June 5, 2002 (see appendix O)**

**Methyl Bromide: At the time the November 29, 1999 memorandum was written and the screening levels derived, the DPR risk assessment on methyl bromide was undergoing review by the National Academy of Sciences (NAS). OEHHA, in their comments on the screening levels, suggested that an additional uncertainty factor of 10 be included to account for the potential increased sensitivity of children. Since the NAS peer review was not completed, DPR incorporated the additional factor of 10 suggested by OEHHA for the purposes of reaching consensus. Since that time, the NAS review has been concluded. In that review, NAS was specifically asked to review the endpoints that DPR selected and whether an additional 10-fold factor was appropriate. The NAS agreed with the toxicological endpoints selected by DPR but clearly stated that the additional 10-fold factor was not appropriate. Therefore, it is appropriate to remove the additional factor of 10. This will raise the acute and subchronic (1-week) screening levels by a factor of 10, to 820,000 ng/$m^3$ and 27,000 ng/$m^3$, respectively. These levels will then be in accord with the Reference Exposure Levels (RELs) set forth in DPR's now peer reviewed Risk Characterization Document (RCD) for methyl bromide.**

**MITC: Since the November 29 memorandum, DPR has prepared a health evaluation of MITC for the Toxic Air Contaminant (TAC) Program. As part of the TAC program, there is an exhaustive review of the available toxicology information. This evaluation was submitted to, discussed, and accepted by the Science Review Panel. As a result of this evaluation and Panel review, a different inhalation study (than that discussed in the 1999 or 2001 memoranda) was selected for evaluating subchronic exposure to MITC in the air. The selected**

**study was a newly submitted 4-week rat inhalation study by Klimisch et al (1987). This study, which was considered superior to the previously used studies, examined the potential for irritation-induced damage to the respiratory system. The study demonstrated severe lung damage at the high dose of 34 ppm, accompanied by far milder expressions of such damage at 1.7 and 6.8 ppm. The final NOEL, was 100 ppb calculated by converting a 6-hours/day, 5 days per week exposure regimen to a 24-hours/day, 7-days/week regimen and imposing an uncertainty factor of three to estimate a NOEL from a LOEL. This resulted in a Reference Exposure Level for subchronic exposure of 1 ppb (3,000 ng/$m^3$). This is the value that should be used as the subchronic screening level to evaluate subchronic exposure to air levels of MITC.**

**The acute screening level (2.2 ppb, 6,600 ng/$m^3$) generated in the November 29 memorandum was based on the results of a human study, but incorporated an additional uncertainty factor of 10 at the request of OEHHA to address sensitive individuals, such as persons with asthma. However, the TAC document uses an acute REL of 22 ppb (66,000 ng/$m^3$). Therefore, it is appropriate to remove this extra uncertainty factor of 10 and to use an acute screening level of 66,000 ng/$m^3$. Alternatively, the screening level of 2.2 ppb (6.6 ug/$m^3$) could still be used, but should be considered very conservative when evaluating the significance of measured air levels. Another consideration for the acute screening value was that it was based on 8 hours exposure to humans, but the data indicated that the effect did not change between 1 and 8 hours of exposure. Therefore, the 8-hour value could arguably be used to evaluate a 24-hour air level. The 8-hour value should certainly be used to evaluate a measured 8-hour air level.**

## B. SPECIFIC COMMENTS

Regarding Appendix C, please explain why the outlier was not included in the totals.

**The outliers were not included in the totals because the records indicated a improbably high rate of use and the inaccuracy (whether the total use or acreage applied to) could not be determined.**

A 12,000 lb. MB application was missing for 1998. Was this included in the total pounds of MB used?

**It is not apparent where the 12,000 lb methyl bromide application discussed was previously noted. There is no indication of a 12,000 lb application in the pesticide use reports in 1998.**

Because EPA TO-15 method is used to sample methyl bromide and 1,3-D in air, EPA suggested using this validated and peer-reviewed method in this study. It was not primarily because MB was found in higher concentrations when compared with tubes.

Because of TO 15, EPA suggested using this method in lieu of the poor results obtained from sorbent tubes (our agencies have known for years the problems with using sorbent tubes with MB, MITC, and 1,3-D). This method was to be used for all fumigants with the exception of chloropicrin which is not amenable to the canister method. Now, we know that MITC can be sampled using Silco® canisters. Please rewrite to reflect the process of how we came to use canisters for this study. I would further add that canisters are now the preferred media for monitoring methyl bromide and 1,3-D by the CARB.

**Wording has been changed to indicate the reasoning behind the request by US EPA to use canisters for monitoring the fumigants. It is noted that the canisters are not without sampling problems. The flow regulators perform inconsistently and samples are often lost due to flow faults in the regulators.**

[4.7.3 Description of QA for sample equipment] Please clarify if flow rates were measured and recorded after each 8, 16, or 24-h sampling event.

**The text reads "The flow rate for each sampler was measured and recorded before and after each sampling interval." That is meant to mean every 8-hr, 16-hr or any sampling interval DPR used.**

It is not exactly clear what methods were developed. A discussion of the MITC method development is needed since CDHS spent over a year conducting method optimization on the sorbent tube method and develop a MITC canister method for this project.

**DPR does not have this information. Appendices I and J contain the laboratory methods for the CDHS laboratory.**

Table 6 differs from the draft FSAP. Please check for consistency.
Why are MB sub-chronic screening levels developed for Lompoc (27,000 ng/$m^3$) higher than the screening level (4,000 ng/$m^3$) DPR has used in other parts of California e.g. Monterey/Kern County ("Ambient Air Monitoring for Methyl Bromide and 1,3 Dichloropropene in Monterey and Santa Cruz Counties Fall 2000 and 2001). This is a major inconsistency.

**As was noted previously, this is not a major inconsistency. The question reflects a misinterpretation of the methyl bromide risk assessment. As noted in the memorandum from Jay Schreider dated June 5, 2002 (see appendix O), "It should be noted that the RCD presents three subchronic or intermediate-term reference concentrations, depending on the exposure time being evaluated. These are 70 ppb (27,000 ng/$m^3$) for one week as noted in the 1999 screening level document, 54ppb (21,000 ng/$m^3$) for two to five weeks, and 1 ppb (4,000 ng/$m^3$) for 8 weeks. Since fumigant sampling in the Lompoc project was initiated in each case in response to a single application and was conducted for three days, the appropriate value for comparison would be for one week. It is rare that enough data are available (as with methyl bromide) to support the development of different intermediate-term reference concentrations. In these cases, a single**

**subchronic value is derived and used for all intermediate-term time periods, as was done for the other fumigants."**

Please include other relevant applications-specific factors.

**All known relevant factors are located in the description of the individual applications monitored and the weather data summary for each application.**

Not all these applications were from the "same" area. However, they were all located west of our air monitoring sites.

**The text indicates that the applications all occurred 0.5 to 3 miles west of the city of Lompoc. The applications all occurred within a 3-square mile area (5 within a 2-square mile area).**

The weather data summaries do not support the statement that "all applications occurred under similar weather conditions.

**The applications all occurred during fall and winter months with average wind speeds ranging from 5.0 to 9.6 mph and average temperatures ranging from 46 to 58 °C.**

Table 16 showed at least for the 10/28/00 application a 0.99 r-squared. Please discuss a few of the reasons of why the "fit" was so high as compared to the other applications. Was the canister sampling data used?

**The poor fit of the other application data indicates that the model does not accurately estimate the movement of the pesticides in Lompoc. It is extremely difficult to determine the exact reason the model does or doesn't fit. Only sorbent tube data was used in the analysis, since it is inappropriate to mix different types of data in a model.**

Please follow-up using canister data to determine flux rate. Also, there are flux rates in the literature derived form physicochemical parameters that should be used to develop a "worst case" scenario.

**Using the canister data will not make a significant difference in the "sigificance" of the model analysis. In addition, canister data is only available for three sites during two applications. The poor "fit" of the model indicates that it is inappropriate to use it in the analysis of the data for Lompoc.**

Another exercise would be to use the 10/28/00 application as the application to model a "worst case." Model the $C_{max}$ from this worst-case application location and include variability in flux, amount, weather, etc. Drip rates can be found from the label or as reported on the "Fumigation Summary" or other application specific information. Drip application studies have been conducted by the MSTF.

**The poor "fit" of the model indicates that it is inappropriate to use it in the analysis of the data for Lompoc. No further efforts will be made to model the data.**

Please include an estimated seasonal margin-of-exposure for the general public in Lompoc from ambient exposure to MITC and how does compare with other MITC monitored communities. One may want to normalize each application by pounds applied.

**Screening level incorporates an uncertainty factor in the HQ approach making a MOE superfluous.**

There are many monitoring uncertainties such as location of applications that may bias the ambient pesticide levels. Knowing up front that the design may not provide representative applications, how did DPR ensure that the locations of applications are representative within the study area.

**It is not possible to ensure that application locations are representative of a study area if the design specifically biases the locations, as was done for this study. The TAG (including U.S. EPA) specifically designed the study to select application locations biased to higher air concentrations. For the fall monitoring, U.S. EPA required DPR to change the application criteria to make it more stringent (closer to Lompoc) as well as consult with ARB and U.S. EPA prior to monitoring.**

**Comments to Figures/Tables**

| Figure/ Table | Comment |
|---|---|
| F8 | Please indicate for which sampling media these quantitation levels apply (sorbent tubes?) **Limits are for sorbent tubes. (The limit is higher for canister.)** |
| F9 | Please indicate for which sampling media these quantitation levels apply (sorbent tubes?). Check screening levels for accuracy and consistency. **Limits are for sorbent tubes. Levels have been changed.** |

**From:** Lynn Baker
Air Resources Board
4/16/02

Section 3.1 summarizes the study of hospital discharges from 1991-94. Since OEHHA later updated that information through 1997, I'd recommend also including the updated information.

**OEHHA did not think an update was necessary.**

On page 32, table 11 presents regional 3-day average concentrations for each application monitored. These 3-day averages are averages of all five sites for the three day monitoring periods. I'd recommend deleting this table because these averages dilute the higher sites with data from the lower sites. Table 9 presents more relevant information, the highest 3-day average from any site for each of the fumigations monitored.

**Other TAG members requested the table information.**

Section 9.1 states that since the fumigant monitoring was all conducted in the fall or winter, the correlation between use and air concentrations "assumes that weather during the spring and summer is similar to fall and winter . . ." Section 9.2 presents computer modeling, which unfortunately did not show a significant relationship for most sampling intervals. Since the study protocol had stated that we'd include modeling if we didn't feel we'd monitored a worst-case scenario, I would still recommend including an analysis using the best estimate of the emission rate in a qualitative way backcalculated from the six monitored applications and use summer meteorological conditions and the closest application to town in recent years to estimate how the summer air concentrations might compare qualitatively to what were measured in fall and winter.

**Since the modeling resulted in such poor regression significance, it was decided that additional attempts would be inappropriate.**

Figures 17-22 present the metam sodium application rates in gallons/acre. While I think Figure 26 is a great way of presenting where all of the metam applications occurred during the year, these other applications are presented in pounds/acre. For comparison with Figures 17-22, I'd recommend that these be consistent in either gallons or lbs/acre.

**DPR felt that adding another column of data for each application date would be too much for the figure. DPR thought it was more important to know the total amount being used during each application.**

# FUMIGANT REPORT

Comments received by DPR on the August 15, 2002 "Ambient Air Monitoring of Fumigant Applications in Lompoc, CA" report submitted to members of the Technical Advisory Group of the Lompoc Interagency Work Group

**DPR responses are in bold.**

Comments which have been fully implemented have been removed.

Additional comments by Martha Harnly –DHS
were received and were fully implemented

## A. GENERAL COMMENTS

Data Validation/QA] Canisters are an alternative collection media and based on method validation studies are assumed to be as accurate as the sorbent media methods. My understanding is that primary samples are usually taken when the collection media are the same. Since two different media were used for the MITC sampling in applications 5 and 6 the canister data are valid samples and presented on equal footing as other samples and should be used in the risk assessment.

**Since the canister data is not complete for all site and time periods the canister data can only be used for the acute exposure evaluation but not the subchronic exposure evaluation.**

Again. An attempt should be made to use MITC emission or flux rates calculated from physicochemical parameters or from the literature.

**Refer to answer to Specific Comments 1.**

## B. SPECIFIC COMMENTS

[Computer Modeling] Please describe and list what emission rates were used in attempting to model MITC. I suggest using emission rates taken from previous application specific monitoring conducted by DPR or the Metam Sodium Task Force.

**In the back-calculation techniques for determining accurate emission rates, a arbitrary emission rate of 100 ug/$m^2$/sec is used. The resulting modeled concentrations are then analyzed by regression with the measured concentration. The slope of the regression indicates the true emission rate for that application. The modeling analysis did not result in a significant regression equation therefore indicating that the model did not work for the situation. Therefore, no emission rate will result in a correlation between measured and modeled concentrations.**

Since actions and decisions are based on the maximum concentration, please show (statistically) if the maximum concentrations were in fact captured at these monitoring sites.

**An analysis has been completed and is attached to this "response to comments".**

Again. The recovery is only one variable assessed. What other variables were assessed to support the statement that "the difference in recoveries appears to account for most of the difference between the canister and tube concentrations." May need to have a spiked sample for each sample to make this statement plus other variables such as atmospheric conditions, fumigant use, etc, would need to be evaluated as well.

**The recovery is the only quantitative variable available for comparison. Atmospheric conditions, use, etc. cannot be correlated to air concentrations.**

**Comments to Figures/Tables**

| Figure/ Table | Comment |
|---|---|
| T15 | Again, please include in parentheses the canister results for MITC 5 and MITC 6. **As discussed with EPA, the change is not necessary.** |
| T17 | Please include MITC results from 1998 Lompoc monitoring. **As discussed with EPA, the change is not necessary.** |

**From:** Lynn Baker
**Date:** 10/10/02

Pesticide use - Table 2 summarizes fumigant use from 1996-2000. I'd suggest updating this through 2001 only if there is a change in the trend (e.g., additional use of Telone).

> **There was no significant change in use for the fumigants in 2001. In addition, there were no telone applications in 2001.**

Table 13 - The temp. ranges for two days show low temps. of 28 degrees F. I question whether this is accurate.

> **The temperature is accurate. The field crew remembers sampling on icy rooftops in very cold weather.**

Modeling - On page 29, the report notes that the DPR weather data was used for the modeling, that there were differences between the DPR weather data and the APCD weather data, and that differences in weather conditions between the ag. area (where the DPR weather data were collected) and the town (where the APCD weather data were collected) may account for the lack of correlation between the modeled and monitored data. I'd recommend stating whether DPR attempted to use the APCD weather data in the modeling.

> **An attempt was made to model the sixth MITC application with the data from the APCD weather station. The regression results were similar to the results from the DPR weather data. Therefore, no further attempts were made.**

Table 17 - Table 17 lists the highest 24-hr. MITC concentrations from Lompoc and other areas. Since the QA team's report recommended using the MITC canister data for any risk assessment, I'd recommend including the highest MITC canister result 1292 ug/m3 in this table, not the highest charcoal tube result (677 ug/m3).

> **The other concentrations measured were on sorbent tubes. The sentence above the table clearly states the highest canister result in Lompoc.**

**From:** George Rauh
**Date:** 10/30/02

I have been reading through the A. Fan, Dowd (both of OEHHA) 1995 article on the state of risk assessment. I would like to see that all tox discussion in the upcoming reports makes explicit the limitations, data gaps, etc. outlined in the article as they regard Lompoc.

Just one important example here: immunotoxicity. Fan notes that low doses can be worse than high doses in that they may induce chemical sensitivity. She writes of the respiratory system as a problematic route of exposure. Lompocans breathe low level, multiple pesticides daily yearround She also notes that most pesticide reference doses (so-called "safe" doses) are not based on immunotoxic endpoints--no data yet. Is this true of MITC? Also, any MITC discussion needs to include the 1992 metam sodium spill on the Sacto. River and the ongoing health problems--particularly respiratory--that have been experienced by Dunsmuir residents.

**DPR added text to the report dealing with immunotoxicity. A discussion of the Dunsmuir spill is not appropriate in this report and will not be added.**

Moreover, the World Research Institute released Russian studies a few years ago that documented immune system dysfunction and respiratory symptoms in areas of high pesticide use. This too should be included in the Lompoc study discussion as an obvious parallel.

USEPA Preliminary observations regarding CDPR Report
"Ambient Air Monitoring of Fumigant Applications in Lompoc, CA"
November 13, 2002

## A. PRELIMINARY OBSERVATIONS

**The monitoring, although limited, provides exposure information. The main preliminary observations are:**

- Metam sodium is converted to MITC, MIC (methyl isocyanate) and $H_2S$ (hydrogen sulfide), carbon disulfide ($CS_2$) and methylamine. Only MITC was measured. MIC and $H_2S$ are highly toxic respiratory irritants. The risk assessment is based only on MITC inhalation exposure and not to the "mixture" of metam sodium/potassium generated compounds following metam fumigations. No assessment of overall potential toxicity or exposure was conducted for the mixture of other pesticide airborne contaminants generated from concurrent applications. Risk assessments based only on MITC may underestimate human health risks.

  **A brief description of the other breakdown products of metam sodium has been added to the text. The risk for the other breakdown products was not determined, rather than underestimated**.

- Applications monitored may not have been representative of the applications in the Lompoc Valley.
  - About 49 MITC generating fumigations were reported in the Lompoc Study area in 2000. Nearly 140,000 pounds of metam sodium was reported used on over 621 acres (about one-square mile). Approximately 20,000 pounds of MITC-generating fumigants were reported used during the six monitoring events{15 percent of the years' reported total}. During the first MITC monitoring period the rate used, 20 ga/ac, was less than the minimum label rate 37.5 ga/ac. The corresponding use rate of 85 lb/ac was both less than the average 1996-2000 reported use of 127 lbs/ac for artichokes. This application cannot be considered representative.

    **The revised conclusions section discusses the size of the fumigations, both monitored and not monitored. DPR feel that the air concentrations are more correlated with the total amount applied, rather that the application rate. No additional changes to the report will be made**.

  - With the exception of monitoring event #1, the MITC applications monitored were approximately 75 percent of the maximum label rate of the two products used. The risk assessment does not account for use at the maximum label rates.

    **The application monitored are typical for the applications in Lompoc, no higher label rates were used in 1999 or 2000. Again**, **DPR feel that the air**

**concentrations are more correlated with the total amount applied, rather that the application rate.**

- Sampling occurred during less than optimal weather conditions (wind direction, precipitation, etc) for three of six MITC monitored applications and all MB applications and cannot be taken as representative of worst case exposure scenarios.

  **The conclusion section addresses the possibility of underestimating air concentrations during storms. No addition changes will be made to the report.**

- Only the risk from the inhalation pathway was assessed.

  **We have included a discussion of this uncertainty with conclusions.**

- No modeling for worst-case scenario was attempted. MITC emission or flux rates calculated from physicochemical parameters or from the literature were not used.

  **Modeling was attempted, but was unsuccessful. Additional modeling attempted with data provided by the APCD weather station was also unsuccessful**.

- No quality assurance or control data were acquired at the CDPR weather site located outside of Lompoc proper. No field audit was conducted. Weather data from the Phase-2 pesticide monitoring showed large differences between the H-street site supported by the Santa Barbara County Air Pollution Control District and which undergoes yearly field audits and the DPR temporary weather site.

  **The report discusses the calibration and checks of the DPR weather station. Text has been added to note the lack of an audit. As noted above, the weather data from the APCD station also provided unsuccessful modeling results.**

- The risk assessments conducted did not account for multiple same-day metam applications. From 1996-2000, there were 15 reported instances where at least 2 metam fumigations occurred on the same day; there were 3 reported instances were at least 3 metam fumigation occurred on the same day.

  **DPR analyzed the pesticide use data, including the daily total pounds applied. The analysis accounts for multiple applications on the same day. No additional changes to the report will be made.**

# MULTIPLE PESTICIDE REPORT

Comments received by DPR on the October 9, 2002 "Ambient Air Monitoring for Pesticides in Lompoc, CA – Volume 2: Multiple Pesticides" report submitted to members of the Technical Advisory Group of the Lompoc Interagency Work Group

Comments which were made during a December 11, 2002 Technical Advisory Group conference call have been implemented with the exception of a request to create a correlation of the concentration, humidity, water solubility and particulate matter. An attempt was made but was unsuccessful.

# FINAL DRAFT REPORT

Comments received by DPR on the final draft of "Ambient Air Monitoring For Pesticides in Lompoc, CA" Volume 1-Executive Summary, Volume 2-Fumigants and Vol 3- Multiple Pesticides submitted to members of the Lompoc Interagency Work Group.

**DPR responses are in bold.**

All comments have been included.

**From:** Lynn Baker
**Date:** 2/14/03

I reviewed the revised executive summary, fumigant and multiple pesticide reports for Lompoc, dated Jan. 22. All of my prior comments have been addressed. I think you and Pam have done a great job on these reports. I have a few additional comments/corrections.

Executive summary:

1. The Introduction poses the three questions that the TAG was directed to answer. The first paragraph of the Results and Discussion section answers these questions, but without referring back to the three questions. I think the first paragraph of the Results section could easily be revised to address the three questions. Please consider this. I'd suggest something like: "As stated in the Introduction, the Technical Advisory Group was directed to examine three questions. Results of the fumigant and multiple pesticide monitoring provide answers to these questions as follows: 1) Are residents of Lompoc exposed to pesticides? Yes, based on the results of the air monitoring, residents of Lompoc are exposed to pesticides in air. 2) If so, which pesticides and in what amounts? Of the 31 pesticides or breakdown products monitored in the two study parts combined, 27 pesticides were detected in one or more of the 451 samples collected and analyzed (Table 1). While many pesticides were detected, and some frequently, air concentrations were low. 3) Do measured levels exceed levels of concern to human health? No, air concentrations for individual pesticides and cumulative exposure were well below acute, subchronic, and chronic health screening levels." (Then I'd continue with the third sentence of the first paragraph of the Results section.)

**Summary was changed.**

Fumigant report:

2. Table 16 lists metam-sodium use by county during the year of prior studies. I'd recommend including units (I assume pounds) on the metam-sodium use.

**Changed.**

3. Table 17 lists the acute hazard quotient for MITC canister data. This is listed as 1885. This is actually the air concentration. The acute HQ should be 0.029.

**Changed.**

Multiple pesticide report:

4. In Figure 8, "cumulative" is misspelled in the title.

**Changed.**

5. Table 25 presents hazard indices for each monitoring site for acute, subchronic, and chronic exposure. The text on page 53 indicates that these are cumulative hazard indices, representing exposure to all detected pesticides. I'd recommend including "cumulative" in the title of Table 25.

**Changed.**

6. On page 113, paragraph 1 - "As and indication . . ." should be "As an indication . . ."

**Changed.**

Please call/email me with any questions regarding these comments.

**From:** Joy Wisniewski - OEHHA
**Date:** 2/26/03

In the Table 1 of the Exec. Summary and Figure 10, fumigant report, the MDL for chloropicrin is 1000 ng/m3. However, in Table 5 of the fumigant report, the MDLs are 111 and 56 ng/m3 for an 8-hr and 16-hr sample, resp. How did this get to be 1,000 ng/m3?

**The 111 and 56 are correct, the 1,000 ng/m$^3$ was incorrect. The table and figure have been corrected**.

**M E M O R A N D U M**

**TO:** Randy Segawa, Ph.D.
Senior Environmental Research Scientist
Department of Pesticide Regulation
P.O. Box 4015
Sacramento, California 95812-4015

**FROM:** Anna M. Fan, Ph.D., Chief
Pesticide and Environmental Toxicology Section
Office of Environmental Health Hazard Assessment

**DATE:** March 27, 2003

**SUBJECT:** REVIEW OF DRAFT DPR REPORT "AMBIENT AIR MONITORING FOR PESTICIDES IN LOMPOC, CALIFORNIA, VOLUMES 1-3"

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The Office of Environmental Health Hazard Assessment (OEHHA) completed its review of the Department of Pesticide Regulation (DPR) preliminary draft report, "Ambient Air Monitoring for Pesticides in Lompoc, California, Volumes 1-3," dated January 22, 2003. The comments below represent input from OEHHA scientists who have served as members of the Lompoc Interagency Working Group (LIWG) and those who have not been involved in Lompoc-related activities. Our comments are focused on the Executive Summary, but we have prepared general and specific comments on the fumigant and multiple pesticide monitoring volumes, as well. Many of the comments on the Executive Summary are also applicable to the corresponding sections in the main report.

We commend DPR staff on their efforts to produce this report on pesticide air monitoring in Lompoc. As discussed among the LIWG, multiple pesticide air monitoring data of this extensive nature have not been obtained for any other area in California, so this report begins to fill a large data gap. Additionally, many of the problems associated with pesticide air sampling and analysis have been resolved because of this project.

We agree with the DPR report that the health risk to Lompoc residents from inhalation exposure to the majority of the monitored pesticides is considered low, based on the hazard quotients that DPR staff calculated from the individual pesticide air concentrations and the screening levels that were developed by members of the Technical Advisory Group (TAG) of the LIWG. The major exception to this is the estimated risk for chronic MITC exposure; the hazard quotient, although less than one, is very close to one (0.8) and warrants further monitoring. Additionally, the methyl bromide monitoring results are insufficient to make any definitive conclusions about health risk.

VOLUME 1: EXECUTIVE SUMMARY

General Comments

1. The DPR report should address the major charge to the TAG to specifically address the three questions, "1) Are residents of Lompoc exposed to pesticides? 2) If so, which pesticides and in what amounts? 3) Do measured levels exceed levels of concern to human health?" has not been fulfilled in that the three questions were not directly answered. We suggest that DPR staff provide the answers in the Executive Summary in a question/answer format so that the reader is able to obtain this information easily. In addition, DPR could prepare a 1 to 2-page document targeted to Lompoc residents with the question/answer format, which could be distributed at the April 10, 2003 public meeting in Lompoc. Providing concise answers to these questions would be directly relevant for concluding the TAG's activities and completing the charge.

   **Text added.**

2. Under the definition for screening level (page 3), DPR states that a [pesticide in air] concentration that is below the screening level [i.e., hazard index <1] is not considered to represent a significant health concern…, but also should not automatically be considered "safe." We agree with this statement, and therefore, suggest that the discussion of the hazard quotients for methyl isothiocyanate (MITC) of 0.29 (subchronic) and 0.81 (chronic) be modified to reflect a greater level of health concern for MITC exposure. We have had ample experience with MITC drift incidents (i.e., Dunsmuir, Earlimart, Arvin) to know that chronic respiratory health effects can result from a high acute exposure to this breakdown product of metam sodium.

   **Conclusions already state that "Only MITC had measured air concentrations that approach its screening levels."**

3. DPR reports that 27 of 31 pesticides were detected in one or more of the 451 samples collected. Six of the pesticides that were detected were not used (no reported agricultural use) during the monitoring period. While the Lompoc study provides much data on air concentrations of multiple pesticides during high-use season, which is critical information that has not been obtained elsewhere in the state, it still leaves many questions unanswered. For example, what were the air concentrations of the pesticides that were used and not monitored? Would the overall hazard quotients for these pesticides result in the cumulative hazard index being greater than one? Figure 6 points out clearly the discrepancy in the amount or number of pounds of pesticides used in Lompoc that were monitored compared to those that were not monitored. Unfortunately, these questions cannot be answered without additional data.

   **No response necessary.**

Technical/Editorial Comments

1. Page 1, paragraph 1: Suggest rewording the first two sentences under Introduction to: "Lompoc is a small *agricultural* city located in a coastal valley of Santa Barbara County, California (Figure 1). Five major crops or crop groups are grown *in the area between Lompoc and the coast*: cole crops (broccoli, cabbage, and cauliflower), lettuce, dried beans, celery, and flowers."

   **Changed.**

2. Page 1, paragraph 2: Suggest rewording the second sentence to: An *earlier* analysis of hospital discharge data suggested that certain respiratory illnesses *occurred* in Lompoc at *rates higher* than in comparison areas."

   **Changed.**

3. Page 2, last paragraph; also page 13: The symbol for the weather station in Figure 1 is difficult to see. We suggest using a bolder symbol that will show up well in the darker shades of the fields.

   **Changed.**

4. Page 3, paragraph 1: The exposure durations listed for the subchronic and chronic screening levels (3-14 days and 10 weeks or greater, respectively) are inconsistent with the exposure values listed under "Exposure periods" in the left-hand column, i.e., 30-90 days for subchronic and one year or more for chronic or long-term. This may cause some confusion to the reader.

   **Changed to "Subchronic is generally up to a significant portion of a year.**

5. Page 3, last paragraph: We suggest adding a sentence or two describing what we know about synergistic interactions (can be excerpted from Vol. 3). Lompoc residents' interest in this topic was expressed at numerous times and particularly when OEHHA organized a workshop on pesticide toxicity in Lompoc in December 2001.

   **That information is included in side bar.**

6. Pages 4-5, left-side column under Pesticides Monitored: We suggest revising the chloropicrin description to "fumigant, usually mixed with methyl bromide; *agricultural and structural use.*" We are unaware of any "home" use of chloropicrin. Likewise, for the other pesticides listed, we suggest changing the use descriptions to "*agricultural use, residential use*" instead of "used in agriculture and homes."

   **Changed.**

7. Page 4, paragraph 3: This paragraph should include a caveat that although the cumulative hazard index for all of the pesticides monitored was less than one, it was near one (0.8), which indicates some level of concern, particularly for MITC exposure.

**Subject is discussed in Conclusions and Recommendations.**

8. Page 4 paragraph 4: The separation of the carcinogenic pesticides into two groups due to different mechanisms of action is somewhat confusing. Are the mechanisms really firmly established and known? It would be appropriate to add more detail here on the putative "threshold" versus "non-threshold" mechanisms, such as what is provided in Volume 3. In addition, is the evidence solid enough for dicofol, dimethoate, metolachlor, PCNB, and vinclozolin to be classified as "threshold" carcinogens?

**The detail needed to discuss the "threshold" versus "non-threshold" mechanisms is too much for the executive summary. The discussion can be found as noted in Volume 3. The "threshold" classification is based on U.S.EPA classification and the RED.**

Also, "ethalfluralin" is misspelled in the 9th line of this paragraph, and the "of" after "different" needs to be deleted in the 10th line.

**Changed.**

9. Page 5, paragraph 1: We suggest adding a sentence on whether the methyl bromide/chloropicrin applications are typically to the east side of town, or if this is an unusual use pattern.

**Changed.**

10. Page 5, paragraph 2: We suggest modifying the first sentence to: "Overall, pounds of pesticides used *in Lompoc* have increased…"

**Changed.**

11. Page 5, paragraph 3: We suggest this paragraph be modified as follows:

*It was not possible to estimate air concentrations of pesticides using computer modeling and statistical techniques for time periods and locations that were not monitored. This is due to the lack of information for some factors that influence air concentrations of pesticides, such as the rate of volatilization. However, comparing pesticide use patterns during the monitoring period to those in the non-monitored months may provide a qualitative estimate of the air concentrations during the non-monitored months. Generally, the greater the amount of pesticides applied each day, the greater the daily air concentration of pesticides and thus, acute exposure. For example, the highest amount of metam sodium or metam potassium applied in one day during the monitoring period was 5,104 pounds. In contrast, the highest amount of*

*metam use reported for any day between 1996 and 2000 was 18,626 pounds. This would indicate that exposure on the non-monitored days may have been three-fold higher, and could have exceeded the screening levels for MITC. For the remaining monitored pesticides combined, the highest amount of multiple pesticides applied on any individual day during the monitoring period was 294 pounds. Similarly, the highest amount of multiple pesticides applied on any day for all of 2000 was 361 pounds. For the individual pesticides, chlorothalonil, cycloate, iprodione, MITC, permethrin, and vinclozolin, some non-monitored days during 2000 had two to four times more use than monitored days, which may indicate a higher air concentration and thus higher exposure to these six pesticides on those particular days.*

**Changed.**

12. Page 6, last paragraph: We suggest changing "occur" to "*occurred*."

**No Change.**

13. Page 7, sentence 1: We suggest modifying the sentence to: "*With the available data, it will be problematic to estimate the fumigant air concentrations and the probability that the wind direction will be opposite of normal.*" In addition, because the data do not allow good estimates of risk, further air monitoring for methyl bromide and chloropicrin on the west side of town and in town following a west-side application may be warranted.

**Changed.**

14. Page 7, paragraph 2: We suggest modifying the bolded statement to: *Some individual pesticides may have air concentrations higher than reported here because the amount (pounds) applied on days or months that were not monitored was higher than on the days or months that were monitored*.

**Changed.**

15. Page 8, last sentence: We disagree with the last statement that no further pesticide monitoring is warranted. While we do not recommend a full-scale effort of the multiple pesticides monitored in this study, we do suggest that additional monitoring of the fumigants, methyl bromide, chloropicrin, and metam/MITC be conducted as part of the Air Resources Board/DPR ambient air monitoring program. These pesticides are known to cause respiratory-related health problems, so any efforts to monitor and reduce exposure to these fumigants is warranted.

**We agree that additional monitoring for fumigants is warranted. DPR has requested that ARB and pesticide registrants conduct additional monitoring in areas of highest use.**

16. Table 1: We suggest switching the columns "Screening level" and "Air Concentration" since the title lists "air concentration" first and the calculation for hazard quotient uses air concentration first. Also, a Hazard Quotient (HQ) or Adjusted Hazard Quotient for chloropicrin was not calculated and included in the table because the method detection limit is high (1,000 ng/$m^3$), which would mean the HQ would be artificially high for a pesticide that was not detected (500 ng/$m^3$ / 10,000 ng/$m^3$ = 0.05). While we understand this rationale, we believe that the conservative nature of the screening levels and choice of air concentrations that DPR has used in the risk estimates should be continued by using the estimated HQ for chloropicrin of 0.05. This would raise the Hazard Index to 0.139 and the Adjusted HQ to 0.289, assuming that there is no adjustment for children's sensitivity. These values are still below the HQ of one.

**Columns were switched. The acute HQ has been corrected and calculated for chloropicrin.**

17. Table 2 and 3: We suggest switching the columns "Screening level" and "Air Concentration" since the titles list "air concentration" first and the calculation for hazard quotient uses air concentration first.

**Columns were switched.**

18. Tables 1, 2, and 3: We recommend that DPR check the calculations for hazard quotient. For fonofos OA, the value for acute HQ should be 0.000009, if rounded up and for subchronic and chronic HQs, 0.000088, not 0.000078. This discrepancy may be a result of rounding figures, so please confirm the values in the tables.

**Extended decimal points of number in table to clarify.**

19. Figures 2 and 3: We find these graphics especially useful for visualizing the health risks of pesticide use in Lompoc.

VOLUME 2: FUMIGANTS

General Comments

1. Two applications of methyl bromide/chloropicrin were monitored. Both application sites were east of the town. During both of these application periods, the prevailing winds were from the west (Figures 19, 20), tending to carry fumigants away from the town. Thus, it is not surprising that only trace amounts were detected in town. However, for the following reasons, these results are not necessarily representative of the other applications of methyl bromide/chloropicrin in the Lompoc area. First, 13 percent of the methyl bromide applied in 2000 was applied at two sites west of the town (Figure 25). In these two cases, winds from the west (the prevailing direction) would have carried the fumigants into town rather than away from town. Second, if

winds from the east were prevailing during any of the other applications made east of town, the fumigants would have been carried into town. The weather data presented in the draft document show that winds from the east are not uncommon during fall and winter months (Figures 15, 16, 17).

**No response necessary.**

2. The draft document presents data from other fumigant monitoring studies conducted in other counties in California. In a number of rural counties, levels of methyl bromide were up to 24-fold higher than the urban background concentrations (page 57). In addition, subchronic exposures in Monterey and Santa Cruz counties exceeded the subchronic screening level for methyl bromide in 2000 (page 57). These levels were much higher than the trace levels detected within the town of Lompoc by the DPR study. Those levels measured in other counties within California, along with issues discussed above (that the two applications monitored by DPR represent only a subset of the applications made during 2000, both in terms of location and wind direction), suggest that the conclusion stated on page 71 of the draft document that "No further fumigant monitoring or investigation in the Lompoc area is warranted" is premature with regard to methyl bromide/chloropicrin. OEHHA recommends additional monitoring of methyl bromide/chloropicrin within town limits, especially following applications made west of the town when the prevailing winds are from the west, and following applications made east of the town when the prevailing winds are from the east. Monitoring during such conditions would provide the most conclusive data as to whether screening levels for methyl bromide/chloropicrin within the town limits were exceeded.

**We agree that additional monitoring is warranted, but monitoring should occur in the highest use areas of the state.**

Technical/Editorial Comments

1. Page 13, paragraph 2: We suggest stating if rooftop measurements yield different readings than ground level measurements.

**Changed.**

Figure 7: We suggest modifying the labeling of the abscissa, for example "Direction from Which Wind Originates."

**No change.**

2. Page 28, paragraph 2: The chronic REL for chloropicrin is listed on OEHHA's Web site as 0.4 $\mu g/m^3$, not 1 $\mu g/m^3$, as stated here.

**Changed.**

3. Page 30: There are two pages numbered "30."

**Changed.**

Table 7: The subchronic screening level for methyl bromide in the table does not match the value cited in the text on page 29 (i.e., 70 ppb or 270,000 ng/$m^3$). Likewise, the value on page 31, Figure 9 should be 270,000 ng/$m^3$. (7 ppm/100 = 7000 ppb/100 = 70 ppb; 27 mg/$m^3$/100 = 27,000 µg/$m^3$/100 = 270 µg/m3 = 270,000 ng/$m^3$).

**Changed.**

4. Page 33, first sentence: We suggest modifying this sentence, since one application peaked on "day 2-day", while another peaked on "day 3-day." For example, "The peak concentrations for five of the six fumigations occurred within the first two days of monitoring, indicating that the … ."

**Changed.**

5. Page 33, paragraph 2: DPR mentions that the pesticide levels detected were "consistent with the wind direction." However, comparing Figures 17 and 18, where similar amounts of MITC were applied to sites that were geographically close, the measured levels east of the application sites were similar (800 mg/$m^3$ in Figure 17 and 920 ng/$m^3$ in Figure 18) even though the wind direction was northwest in one case and southeast in the other. We recommend discussing possible reasons for this apparent inconsistency.

**Added: "Although the wind pattern during the fifth metam sodium application (figure 17) was mainly to the north west, the relatively high concentrations detected were probably due to slower wind speeds and more stable conditions during the nighttime sampling period."**

6. Figures 21-24: If possible, we suggest presenting the wind directions in terms of north, south, east and west.

**Changed.**

7. Page 60, Table 17: The Hazard Quotient for acute/MITC/canister is incorrect (should be 0.028).

**Changed.**

8. Page 70, last paragraph: "Almost all methyl bromide and chloropicrin is applied east of Lompoc, …" According to Figures 19, 20 and 25, 13 percent of methyl bromide was applied to the west of the town. We recommend substituting this value for "almost all."

**No Change. Historically most of the methyl bromide use is to the east of Lompoc.**

VOLUME 3: MULTIPLE PESTICIDES

General Comments

As mentioned in the draft document, some pesticides were detected during the monitoring period even though they were not applied during that time. Diazinon, which falls in this category, is noteworthy in that it contributes a large fraction of the relative health risk from all pesticides (Figure 9 and Tables 22-24). The question that must be considered is would diazinon levels in Lompoc have exceeded the screening levels if they had been monitored during a period of diazinon application. The data in Table 21 indicate that the acute screening level for diazinon was exceeded in Fresno County in 1997. We recommend providing any available information about that period of monitoring in Fresno County, to determine whether the diazinon screening level was exceeded only during a period of diazinon application. If so, this would suggest that the diazinon monitoring carried out at Lompoc was not sufficient.

**It appears that use reports do not provide sufficient information regarding diazinon applications. For example, most non-agricultural uses are not reported. Additional data regarding diazinon use in Fresno County will not provide any further information regarding Lompoc use or air concentrations**.

Health Effects/Screening Level Comments

1. Page 26, cycloate: We recommend checking whether the acute and subchronic values are from oral studies, rather than from inhalation studies as stated in the text. Also, the chronic screening level is 25-fold higher than the subchronic screening level. We recommend that the text be modified to clarify that the subchronic screening level of 340 $ng/m^3$ has been used for both the subchronic and chronic toxicity endpoints and in the calculation of the hazard quotients (see Tables 2 and 3, Volume 1).

   **Acute study was oral. Text was modified as requested.**

2. Page 27, diazinon: We recommend explaining why cholinesterase inhibition (serum and RBC) is considered not to be a systemic effect. Also, since the rat inhalation study involved seven day per week exposure, we recommend removing the 5/7 correction factor for subchronic and chronic screening level calculations.

   **Changed.**

3. Page 27, dicofol: The "Available Toxicology Summaries" from DPR list two acceptable developmental toxicity studies for dicofol. The rat study identified a

NOEL of 0.25 mg/kg-day and the rabbit study a NOEL of 0.4 mg/kg-day, both based in part on maternal liver effects at the next highest dose level. If the lower NOEL (0.25 mg/kg-day) were used to calculate the human acute screening level, rather than the NOEL identified in the draft DPR document (4.0 mg/kg-day), the screening level would be 16-fold lower. Nevertheless, this would have little impact on the hazard quotient for dicofol (from 0.000058 to 0.000941), or more importantly, on the total hazard index for acute exposure (from 0.0886 to 0.0895), since only a trace amount of dicofol was measured in Lompoc air.

**The NOEL comes from the Re-registration Eligibility Document.**

4. Page 29, methomyl: Because of method development problems, DPR did not analyze for methomyl in Lompoc air. Therefore, methomyl was not included in the hazard quotient or hazard index calculations; thus, it is not necessary to include its screening level derivation in the report.

**Text has been added to identify the chemicals which were not monitored. It was decided to leave the information in the report for future reference.**

5. Page 30, oxamyl: Because of method development problems, DPR did not analyze for oxamyl in Lompoc air. Therefore, oxamyl was not included in the hazard quotient or hazard index calculations; thus, it is not necessary to include its screening level derivation in the report.

**Text has been added to identify the chemicals which were not monitored. It was decided to leave the information in the report for future reference.**

6. Page 30, oxydemeton-methyl: Although OEHHA would use an extra uncertainty factor of 3 for calculating subchronic and chronic screening levels from the 4-hour acute NOAEL, we acknowledge that applying this factor to the subchronic or chronic screening levels will not significantly impact the oxydemeton-methyl hazard quotient or total hazard index for either exposure estimates, since oxydemeton-methyl was not detected in Lompoc air.

**The NOAEL comes from the Re-registration Eligibility Document.**

7. Page 31-2, thiodicarb: Because of method development problems, DPR did not analyze for thiodicarb in Lompoc air. Thiodicarb was not included in the hazard quotient or hazard index calculations; therefore, it is not necessary to include its screening level derivation in the report.

**Text has been added to identify the chemicals which were not monitored. It was decided to leave the information in the report for future reference.**

**Editorial Comments**

1. Page 24: We suggest adding that when the critical toxic effect is irritation rather than systemic effects, there should be no correction for differences in breathing rates between laboratory animals and humans.

   **No Change. If a pulmonary irritant, it would still depend on the amount of material inhaled**.

2. Page 25, chlorothalonil: We suggest stating on what clinical signs the acute rat LOEL was based. If any were irritative rather than systemic, we recommend removing the conversion to human equivalent NOAEL.

   **Additional descriptive words added.**

3. Page 26: It is stated in the report "The lowest NOAEL for a developmental toxicity study was 200 mg/kg in a pilot rabbit study that demonstrated maternal toxicity. Since the period of exposure was 13 days, this is a very health protective value for an acute exposure." This is only true if the maternal toxicity did not occur within the first day of dosing. We suggest stating when the maternal toxicity was first observed.

   **Additional descriptive words added.**

4. Table 12 title: We suggest adding the word "highest."

   **Added.**

5. Page 47, paragraph 1: "All pesticide concentrations measured during both the Phase One and Phase Two studies were highest during Phase One." We suggest adding an explanation here as to why the Phase One values were not used to calculate the HQs in Table 22, since the Phase One measurements were higher.

   **Added.**

6. Page 51, last paragraph: We suggest that the following statement be explained "A more realistic approach would be to chose a single point in time that had the highest 24-hour air concentration."

   **Changed.**

We appreciate the opportunity to review this report. If you have any questions, please contact me at (510) 622-3165 or Dr. Joy Wisniewski at (916) 327-7324.