

Department of Pesticide Regulation
Pesticide Air Monitoring Network
Key Planning Issues

Overview

The Department of Pesticide Regulation (DPR) plans to set up a network to sample ambient air for multiple pesticides in several communities on a regular schedule, over the next five or more years. DPR will use data gathered to evaluate and improve protective measures against pesticide exposure. The project is expected to begin later this year.

DPR would like the Pesticide Registration and Evaluation Committee (PREC) to serve as a forum for discussing the scientific and technical aspects of the pesticide air monitoring network project. DPR is looking for PREC members to provide input regarding technical/scientific issues related to the planning and implementation of the project. We also welcome public comment at all PREC meetings. An outline of key scientific issues for the Pesticide Air Monitoring Network follows:

Project objectives:

The objectives define the scope of the project. As a starting point for discussion, DPR proposes the following scientific objectives:

- 1) Identify common pesticides in air and determine concentrations
- 2) Compare concentrations to health levels
- 3) Estimate cumulative exposure to multiple pesticides
- 4) Track trends in air concentrations
- 5) Correlate concentrations with use and weather patterns

Pesticide candidates for monitoring:

DPR proposes to monitor for most of the same pesticides as the Parlier project in 2006.

Candidate pesticides were selected based on the following criteria:

- 1) Statewide use
- 2) Volatility
- 3) DPR risk assessment priority
- 4) Feasibility of including in multi-residue monitoring method

DPR will reconsider pesticides for monitoring after selecting communities and reassessing pesticide use.

Sampling plan:

DPR proposes to monitor two to four communities, depending on the number of pesticides monitored, number of locations in each community, and sampling frequency. Key issues include:

- 1) Number of monitoring locations in each community
- 2) Number of days sampled each week
- 3) Number of weeks sampled each year
- 4) Consider longer sampling intervals to capture more days
- 5) Consider sampling alternate communities in alternate weeks or years
- 6) Other types of monitoring

Community selection:

DPR likely has sufficient resources to monitor two to four communities. DPR proposes to evaluate and select communities in the San Joaquin Valley and Sacramento Valley, using the following criteria:

- 1) Use of selected pesticides
 - a. Use within 1 mi of community
 - b. Use within 5 mi of community
- 2) Demographic criteria
 - a. Population density of people less than 18 yrs old
 - b. Population density of people greater than 65 yrs old
 - c. Population density of people greater than 5 yrs old with disabilities
 - d. Non-white population percentage
 - e. Hispanic population percentage
 - f. Median family income
- 3) Weighting of criteria
- 4) Suitable monitoring location identified – need permanent site
- 5) Consider communities with existing air monitoring station, complementary studies
- 6) Geographic distribution
- 7) Consider future changes in use, demographic factors, other criteria
- 8) Background or control community

Introduction

DPR plans to establish an air monitoring network to provide more systematic air monitoring and therefore will serve as a more robust foundation for exposure assessment. DPR conducted similar projects in Lompoc (Santa Barbara County) and Parlier (Fresno County). DPR designed the Parlier project to evaluate methods and approaches that it might use for an air monitoring network. As a follow-up, DPR plans to set up a network to sample ambient air for multiple pesticides in several communities on a regular schedule, over five or more years. DPR will use data gathered to evaluate and improve protective measures against pesticide exposure. The project is expected to begin later in 2009.

DPR plans to use its Pesticide Registration and Evaluation Committee (PREC) as one forum to invite comments for planning and setting up the air monitoring network. The PREC brings together representatives of all public agencies whose activities or resources may be affected by the use of pesticides.

In addition, DPR will post proposed project protocols and related documents on its Web site for public comment. To widen opportunities for public participation, DPR will hold a project scoping session in a San Joaquin Valley community. DPR expects that one or more of the communities in which it will conduct monitoring will be in the San Joaquin Valley. The Valley has significant air quality problems, and eight of the top 10 counties in pounds of pesticide used are in San Joaquin Valley. DPR will in particular seek public input on project objectives, pesticides to monitor, and community selection.

Project Objectives

The objectives define the scope of the project and are consistent with DPR's overall goals. The intent in developing the objectives was to make them simple, measurable, attainable, realistic, and timely. As a starting point for discussion, DPR proposes the following scientific objectives:

- 1) Identify common pesticides in air and determine concentrations
- 2) Compare concentrations to health levels
- 3) Estimate cumulative exposure to multiple pesticides
- 4) Track trends in air concentrations
- 5) Correlate concentrations with use and weather patterns

DPR will hold a project scoping session in a San Joaquin Valley community to gather additional input on project objectives and other issues.

Pesticide Candidates for Monitoring

DPR proposes to monitor for most of the same pesticides as the Parlier project in 2006, based primarily on potential health risk, with higher-risk pesticides having higher priority for monitoring. Candidate pesticides were selected based on the following criteria:

- 1) Statewide use
- 2) Volatility
- 3) DPR risk assessment priority
- 4) Feasibility of including in multi-residue monitoring method

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** NOTE: Risk assessments have been completed on several of the target pesticides. However, each was at some point assigned a priority for risk assessment based on a number of factors, including health concern. The risk assessment priority ranking assigned to the pesticide was therefore incorporated as a factor in selecting pesticides to be targeted in this project.*

Pesticide health risk is a function of exposure and toxicity. Use and volatility are surrogates for exposure. Risk assessment priority is a surrogate for toxicity. Priority was also given to pesticides that can be monitored as part of a suite of chemicals (that is, pesticides for which a laboratory method exists that allows detection of multiple pesticides in a single analysis).

Table 1 shows the pesticide candidates from the Parlier project, consisting of the top 100 pesticides used on agricultural sites statewide during 2002. DPR will update this table, reflecting more recent pesticide use and risk assessment priority once the selection criteria have been finalized, particularly what pesticide use data to include.

The California Department of Food and Agriculture's (CDFA's) Center for Analytical Chemistry will develop and validate the pesticide residue method(s), and analyze the samples collected by DPR, under its existing contract. CDFA developed a method to analyze for 29 pesticides and breakdown products in a single sample for the Parlier project.

The Air Resources Board (ARB) analyzed for additional pesticides that are volatile organic compounds (VOCs) or metals/elements for the Parlier project. DPR recently amended the contract with CDFA to purchase the instruments and materials, and develop the methods necessary to monitor VOCs, including the fumigants methyl bromide and 1,3-dichloropropene. DPR and CDFA should be able to include these compounds in the air network without ARB assistance.

DPR proposes to reconsider the pesticides for monitoring after selecting communities and reassessing pesticide use.

DPR proposes to include at least the following Parlier pesticides for the air monitoring network:

- 1) 1,3-dichloropropene
- 2) azinphos-methyl
- 3) chlorothalonil
- 4) chlorpyrifos and oxygen analog breakdown product
- 5) cypermethrin
- 6) diazinon and oxygen analog breakdown product
- 7) dicofol
- 8) dimethoate and oxygen analog breakdown product
- 9) diuron
- 10) endosulfan
- 11) eptc
- 12) malathion and oxygen analog breakdown product
- 13) methyl bromide
- 14) metolachlor
- 15) molinate
- 16) naled as dichlorvos (DDVP) breakdown product

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- 17) norflurazon
- 18) oryzalin
- 19) oxyfluorfen
- 20) permethrin
- 21) phosmet
- 22) propanil
- 23) propargite
- 24) S,S,S-tributyltriphosphorotrithioate
- 25) simazine
- 26) thiobencarb
- 27) trifluralin

Sampling Plan

DPR proposes to monitor two to four communities, depending on the number of pesticides monitored, number of locations in each community, and sampling frequency. Key issues include:

- 1) Number of monitoring locations in each community
- 2) Number of days sampled each week
- 3) Number of weeks sampled each year
- 4) Consider longer sampling intervals to capture more days
- 5) Consider sampling alternate communities in alternate weeks or years
- 6) Other types of monitoring

DPR is analyzing the Parlier data to provide information on the sampling issues above, for example the differences in detections among the three Parlier locations monitored.

Monitoring sites must meet the following minimum criteria:

- The location of sample collection meets all U.S. EPA ambient air siting criteria
 - 2 to 15 meters above ground
 - At least 1 meter horizontal and vertical distance from supporting structure
 - Should be at least 20 meters from trees
 - Distance from obstacles should be at least twice the obstacle height
 - Unobstructed air flow for 270°
- Accessible to sampling personnel during time of sampling
- Accessible to electrical outlets
- Secure from equipment loss or tampering
- Permission of site operator/owner
- All communities can be sampled in one day by DPR staff

Preferred monitoring sites also meet the following criteria:

- School, day care center, or other “sensitive site”
- Located on the edge of the community and/or adjacent to agricultural fields

This project focuses on pesticide air monitoring. However, DPR will consider suggestions for monitoring of other media. Monitoring for other toxic compounds would require the assistance of other agencies or organizations.

Community Selection

DPR likely has sufficient resources to monitor two to four communities. DPR proposes to select communities based on objective data, using criteria that can be quantified, validated, and verified. This provides a more transparent and fair selection process. DPR proposes to evaluate and select communities in the San Joaquin Valley and Sacramento Valley, using the following criteria:

- 1) Use of selected pesticides
 - a. Use within 1 mi of community
 - b. Use within 5 mi of community
- 2) Demographic criteria
 - a. Population density of people less than 18 yrs old
 - b. Population density of people greater than 65 years old
 - c. Population density of people greater than 5 yrs old with disabilities
 - d. Non-white population percentage
 - e. Hispanic population percentage
 - f. Median family income
- 3) Weighting of criteria
- 4) Suitable monitoring location identified – need permanent site
- 5) Consider communities with existing air monitoring station, complementary studies
- 6) Geographic distribution
- 7) Consider future changes in use, demographic factors, other criteria
- 8) Background or control community

Category Descriptions:

DPR proposes to assign a factor of 1 to 4 (a few subcategories may be assigned rating factors from zero to 4). Four represented the highest priority for monitoring. For each subcategory, the 149 San Joaquin Valley communities and 72 Sacramento Valley communities will be divided into four groups (quarters). In most cases, the top quarter communities with the highest values (or lowest values where appropriate) were rated four, the second highest quarter communities were rated three, and so forth. In most cases, the subcategory ratings are based on density per square mile rather than numerical totals. This minimizes the effect of the size of the community in the ratings. Without this adjustment, large communities such as Fresno would show much greater child population and pesticide use in comparison to communities with small areas.

Pesticide use will be compiled for two different area sizes, regional and local use. *Regional use density* will be expressed as pounds reported per square mile within five miles of the community boundary. *Local use density* will be expressed as pounds reported per square mile within one mile of the community boundary. For each pesticide, the communities will be divided approximately into four groups (quarters), usually with the top quarter communities with the highest pesticide use density rated four, the second highest quarter communities rated three, and so forth. Communities with no use for certain pesticide will be rated zero. After discussion with the PREC, DPR will select the single most recent year or multiple years of pesticide use data to compile.

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The demographic factors, *population density of people less than five years old, population density of people greater than 65 years old, population density of people greater than five years old with disabilities, non-white population percentage, Hispanic population percentage, and median family income* will all be determined from the 2000 Census. The various population densities will be expressed as number of people per square mile of the community. For each criterion, the 149 San Joaquin Valley and 72 Sacramento Valley communities will be divided into four groups and rated one to four, as described above.

Weighting of criteria:

For air monitoring of individual pesticides, the PREC recommended weighting pesticide use more than demographic factors in selecting communities, and to include monitoring of the community with highest use for an individual pesticide. Since this project will monitor for multiple pesticides, no single community will have the highest use for all pesticides, so the weighting requires more discussion.

Suitable monitoring location identified:

For most previous projects, monitoring at any one location occurred for a few weeks or months. This project will establish long-term monitoring locations, so a permanent structure with easy access, electricity, security, and other requirements are necessary. Most ambient pesticide monitoring has occurred at schools. Schools may or may not be feasible as permanent monitoring locations.

Consider communities with existing air monitoring station, complementary studies:

As part of a cumulative impacts evaluation, monitoring in communities where complementary work is being conducted would be valuable (e.g. ARB criteria air pollutants monitoring station). However, this may or may not be an overriding factor in selecting communities for pesticide monitoring.

Geographic distribution:

It's likely that some communities in proximity to each other will have similar ratings, particularly for pesticide use due to similar cropping patterns. To evaluate a variety of cumulative pesticide exposures, the selected communities should represent different cropping and pesticide use patterns. If two or more highly rated communities are within a few miles of each other, DPR proposes to only select one of the communities.

Consider future changes in use, demographic factors, other criteria:

DPR proposes to evaluate historical pesticide use and Census data to select the communities. There is no assurance that the selected communities will continue to be highly rated in the future (e.g., pesticide use could decrease). DPR is uncertain if or how to consider these possible future changes in the current community selection. DPR welcomes suggestions for other criteria to select the communities.

Background or control community:

The highest rated communities will be those that have high pesticide use in the vicinity. DPR is uncertain if some of the limited resources should include monitoring of community with low use for comparison.

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DPR monitored for multiple pesticides in Parlier during 2006. Since DPR is proposing similar community selection criteria, Parlier will probably be highly rated again. DPR is uncertain if monitoring should continue at Parlier, or if Parlier should be excluded from the air network due to sufficient data.

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Table 1. Preliminary pesticide candidates for DPR’s air monitoring network. Each category is rated one to four, with four representing the higher priority for monitoring (see key following table). Total Rating represents the sum of the use rating, volatility rating, and risk assessment rating. Ratings will be updated with more recent data.

Pesticide	2002 Statewide Use Rank	2002 Statewide Use (lbs)	Volatility	DPR Risk Assessment Priority	Monitor Method	Use Rating	Volatility Rating	Risk Assess Rating	Total Rating	TAC	Prop 65
1,3-DICHLOROPROPENE	6	5,412,503	High	High	VOC	4	4	4	12	yes	yes
CHLOROPICRIN	8	4,339,662	High	High	DPR-single	4	4	4	12	no	no
METAM-SODIUM [MITC]	3	15,518,465	High	High	DPR-single	4	4	4	12	yes	yes/no
METHYL BROMIDE	4	6,594,515	High	High	VOC	4	4	4	12	yes	some
POTASS N-METHYLDITHIO CARBAMATE [MITC]	18	1,267,737	High	High	DPR-single	4	4	4	12	yes	no
CHLORPYRIFOS	16	1,446,547	Med	High	DPR-Parlierc	4	3	4	11	no	no
MOLINATE	22	881,605	Med	High	DPR-Parlier	4	3	4	11	no	no
PROPARGITE	21	977,039	Med	High	DPR-Parlier	4	3	4	11	no	yes
SULFURYL FLUORIDE	9	3,045,084	High	Med	ARB-single	4	4	3	11	yes	no
2,4-D, DMA SALT	41	452,155	Med	High	DPR-single	3	3	4	10	yes	no
ACROLEIN	59	283,541	High	High	ARB-single	2	4	4	10	yes	no
CHLOROTHALONIL	32	630,275	Med	High	DPR-Parlier	3	3	4	10	no	yes
DIAZINON	29	689,603	Med	High	DPR-Parlier	3	3	4	10	no	no
DIURON	17	1,303,745	Med	Med	DPR-Parlier	4	3	3	10	no	no
MALATHION	33	619,811	Med	High	DPR-Parlier	3	3	4	10	no	no
MANEB	25	852,435	Low	High	Unsuccessful	4	2	4	10	no	yes
PARAQUAT DICHLORIDE	24	869,244	Low	High	Unsuccessful	4	2	4	10	no	no
PROPANIL	15	1,470,535	Low	High	DPR-Parlier	4	2	4	10	no	no
TRIFLURALIN	19	1,103,442	Med	Med	DPR-Parlier	4	3	3	10	yes	no
ACEPHATE	61	258,955	Med	High	DPR-single	2	3	4	9	no	no
ALDICARB	65	244,786	Med	High	DPR-single	2	3	4	9	no	no
CAPTAN	47	394,104	Low	High	Unsuccessful	3	2	4	9	yes	yes
CARBARYL	62	256,030	Med	High	DPR-single	2	3	4	9	yes	no
DIMETHOATE	52	332,543	Med	High	DPR-Parlier	2	3	4	9	no	no
IPRODIONE	64	251,521	Med	High		2	3	4	9	no	yes
MANCOZEB	46	396,344	Low	High	Unsuccessful	3	2	4	9	yes	yes
MCPA, DMA SALT	50	347,377	Med	Med	DPR-single	3	3	3	9	no	no
NALED	73	201,504	Med	High	DPR-Parlier	2	3	4	9	no	yes/no
OXYFLUORFEN	44	425,817	Med	Med	DPR-Parlier	3	3	3	9	no	no
PERMETHRIN	48	385,403	Med	Med	DPR-Parlier	3	3	3	9	no	no
PHOSMET	45	405,088	Med	Med	DPR-Parlier	3	3	3	9	no	no

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Table 1 continued

Pesticide	2002 Statewide Use Rank	2002 Statewide Use (lbs)	Volatility	DPR Risk Assessment Priority	Monitor Method	Use Rating	Volatility Rating	Risk Assess Rating	Total Rating	TAC	Prop 65
S,S,S-TRIBUTYL PHOSPHOROTRITHIOATE	76	190,149	Med	High	DPR-Parlier	2	3	4	9	yes	no
SIMAZINE	31	634,888	Med	Med	DPR-Parlier	3	3	3	9	no	no
ZIRAM	30	654,062	Low	High	Unsuccessful	3	2	4	9	no	no
AZINPHOS METHYL	88	153,200	Med	High	DPR-Parlier	1	3	4	8	no	no
BENSULIDE	74	196,249	Med	Med		2	3	3	8	no	no
CHLORINE	39	502,944	High		ARB-metal	3	4	1	8	no	no
CHLORTHAL-DIMETHYL	72	201,919	Med	Med	DPR-single	2	3	3	8	no	no
CYPERMETHRIN	55	302,983	Med	Med	DPR-Parlier	2	3	3	8	no	no
DICOFOL	79	182,464	Med	High	DPR-Parlier	1	3	4	8	no	no
ENDOSULFAN	89	150,954	Med	High	DPR-Parlier	1	3	4	8	yes	no
ETHEPHON	38	538,553	Med	Low		3	3	2	8	no	no
GLYPHOSATE, IPA SALT	5	5,625,732	Low	Low		4	2	2	8	no	no
IMIDACLOPRID	70	224,730	Med	Med	DPR-single	2	3	3	8	no	no
METHOMYL	54	321,476	Med	Med	DPR-single	2	3	3	8	no	no
NITROGEN, LIQUIFIED	36	561,505	High			3	4	1	8	no	no
PENDIMETHALIN	42	447,032	Med	Low		3	3	2	8	no	no
PETROLEUM HYDROCARBONS	37	554,623	High			3	4	1	8	no	no
SODIUM HYPOCHLORITE	35	568,308	High			3	4	1	8	no	no
SODIUM TETRATHIO CARBONATE [CS2]	49	352,342	High		ARB-VOC	3	4	1	8	yes	yes
THIOBENCARB	27	844,565	Med	Low	DPR-Parlier	3	3	2	8	no	no
(S)-METOLACHLOR	57	299,992	Med	Low	DPR-Parlier	2	3	2	7	no	no
CALCIUM HYDROXIDE	13	1,861,117	Low			4	2	1	7	no	no
COPPER HYDROXIDE	11	2,592,460	Low		ARB-metal	4	2	1	7	no	no
COPPER SULFATE (BASIC)	23	876,722	Low		ARB-metal	4	2	1	7	no	no
COPPER SULFATE (PENTAHYDRATE)	10	2,916,477	Low		ARB-metal	4	2	1	7	no	no
CRYOLITE	20	1,101,802	Low			4	2	1	7	no	no
MINERAL OIL	7	5,044,900	Low			4	2	1	7	no	no
NORFLURAZON	78	188,032	Med	Med		1	3	3	7	no	no
ORYZALIN	81	179,886	Med	Med		1	3	3	7	no	no
PETROLEUM DISTILLATES	14	1,554,311	Low			4	2	1	7	no	no

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Table 1 continued

Pesticide	2002 Statewide Use Rank	2002 Statewide Use (lbs)	Volatility	DPR Risk Assessment Priority	Monitor Method	Use Rating	Volatility Rating	Risk Assess Rating	Total Rating	TAC	Prop 65
PETROLEUM DISTILLATES, REFINED	60	276,457	High			2	4	1	7	no	no
PETROLEUM OIL, UNCLASSIFIED	2	17,673,122	Low			4	2	1	7	no	no
SODIUM CHLORATE	12	2,385,103	Low			4	2	1	7	no	no
SULFUR	1	53,614,583	Low		ARB-metal	4	2	1	7	no	no
SULFUR DIOXIDE	75	190,362	High		ARB-single	2	4	1	7	no	no
ALUMINUM PHOSPHIDE	84	165,230	High			1	4	1	6	yes	no
CARBON DIOXIDE	91	137,057	High			1	4	1	6	no	no
DISODIUM OCTABORATE TETRAHYDRATE	26	846,422	Low			3	2	1	6	no	no
EPTC	63	253,887	Med		DPR-Parlier	2	3	1	6	no	no
FOSETYL-AL	58	298,150	Low	Low	Unsuccessful	2	2	2	6	no	no
GLYPHOSATE-TRIMESIUM	90	147,402	Low	Med		1	2	3	6	no	no
HYDROGEN CYANAMIDE	77	188,376	High			1	4	1	6	no	no
LIME-SULFUR	28	761,536	Low			3	2	1	6	no	no
OLEIC ACID, METHYL ESTER	71	212,198	Med			2	3	1	6	no	no
PROMETRYN	82	176,882	Med	Low		1	3	2	6	no	no
UREA DIHYDROGEN SULFATE	34	589,897	Low			3	2	1	6	no	no
ALKYLARYL POLY(OXYETHYLENE) GLYCOL	40	501,085				3	1	1	5	no	no
ARSENIC PENTOXIDE	67	233,506	Low			2	2	1	5	yes	yes
CHROMIC ACID	53	326,645	Low			2	2	1	5	yes	no
COPPER OXIDE (OUS)	68	229,214	Low		ARB-metal	2	2	1	5	no	no
GLYPHOSATE	86	157,872	Low	Low		1	2	2	5	no	no
KAOLIN	43	438,548				3	1	1	5	no	no
MOLASSES	99	108,567	Low			1	3	1	5	no	no
PETROLEUM OIL, PARAFFIN BASED	51	343,916	Low			2	2	1	5	no	no

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Key to Pesticide Candidate Ratings

Statewide Use (DPR Pesticide Use Report Database)

4 = 852,435 – 53,614,583 lbs during 2002 (top 25 pesticides)

3 = 347,377 – 846,422 lbs during 2002 (2nd 25 pesticides)

2 = 190,149 – 343,916 lbs during 2002 (3rd 25 pesticides)

1 = 108,518 – 188,376 lbs during 2002 (4th 25 pesticides)

Volatility (DPR Pesticide Chemistry Database)

4 = $>10^{-2}$ mm Hg (high)

3 = 10^{-6} – 10^{-2} mm Hg (medium)

2 = $<10^{-6}$ mm Hg (low)

1 = volatility unknown

DPR Risk Assessment Priority (SB950 – Birth Defect Prevention Act report)

4 = high priority

3 = medium priority

2 = low priority

1 = no priority assigned

Monitor Method

DPR-Single = DPR/CDFR has a validated method as a single analyte

DPR-Parlier = Pesticide included in DPR's multi-chemical method for the Parlier project

VOC = Pesticide included in ARB's standard volatile organic compound method

ARB-Metal = Pesticide included in ARB's standard metal method

ARB-Single = ARB has a validated method as a single analyte

Unsuccessful = Previous attempts to develop a method were unsuccessful

Blanks indicate that neither DPR or ARB have attempted to monitor

TAC

yes = listed as a toxic air contaminant

no = not listed as a toxic air contaminant

Prop 65 – pesticides that cause cancer or reproductive effects

yes = listed under Proposition 65

no = not listed under Proposition 65

some = some uses listed under Proposition 65

yes/no = parent compound is listed, but the primary breakdown product is not, or vice versa