California Environmental Protection Agency
Department of Pesticide Regulation

AIR MONITORING NETWORK RESULTS FOR 2014

Volume 4

October 2015

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Report AIR 15-02

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SUMMARY

In February 2011, DPR implemented a multi-year statewide air monitoring network to measure pesticides in various agricultural communities. This pesticide Air Monitoring Network (AMN) is the first multi-year air monitoring study conducted by DPR. The goals of the AMN are to provide data that assists in assessing potential health risks, developing measures to mitigate risks, and measuring the effectiveness of regulatory requirements. This report is the fourth volume of this study and contains AMN results from January 1, 2014 to December 31, 2014.

DPR monitored a total of 37 chemicals (i.e., 32 pesticides and 5 pesticide breakdown products) in three communities. Pesticides monitored in the AMN were selected based primarily on potential risk to human health. Higher-risk pesticides were prioritized and targeted for monitoring. Higher-risk pesticides were identified and prioritized based on higher use, higher volatility, and higher toxicity. DPR evaluated 226 communities in California as candidates for inclusion in the network. DPR selected one site each in Salinas (Monterey County), Shafter (Kern County), and Ripon (San Joaquin County) for monitoring based on pesticide use, demographic data, and availability of other exposure and health data.

One 24-hour sample was collected each week at each of the three sites. The starting day varied each week; the actual dates were randomly selected. Sampling start times were left to the discretion of the field sampling personnel, but sampling always started anywhere from 9:00 a.m. to 2:00 p.m. No state or federal agency has established health standards for pesticides in air. Therefore, DPR developed health screening levels and regulatory target concentrations for the monitored pesticides to place the results in a health-based context. Health screening levels are based on a preliminary assessment of possible health effects, and are used as triggers for DPR to conduct a more detailed evaluation. Regulatory target concentrations are levels that DPR's legal requirements are designed to stay below and are established after a complete assessment of possible health risks. DPR puts measures in place based on the regulatory target to limit exposures so that adverse effects can be avoided. Exceeding a regulatory target concentration does not mean an adverse health effect occurs, but it does indicate that the restrictions on the pesticide use may need to be modified.

Of the 5,966 analyses (number of samples times the number of chemicals analyzed) conducted, 91.7% had no detectable concentrations. 498 (8.3%) of the analyses had detectable (trace or quantifiable) concentrations, and 225 (3.8%) of the analyses had quantifiable concentrations. A quantifiable concentration refers to a concentration above the limit of quantitation (LOQ) for their respective pesticide. Fourteen of the 37 pesticides monitored by DPR were not detected.

Of the 37 pesticides monitored, 23 were detected in at least one sample. Of the 23 pesticides and breakdown products detected, 22 did not exceed their screening levels or regulatory target concentrations, indicating low health risk for these pesticides to the people in these communities. One pesticide, 1,3-dichloropropene which is classified as a probable human carcinogen by the EPA, showed results that require further evaluation. The data from the Shafter site showed that for the 4 years of monitoring, 1,3-dichloropropene was detected at an average concentration of 1,135 ng/m^3. If this level continued for 70 years, it would exceed DPR's cancer risk regulatory goal by 1.7 times. DPR is conducting more detailed evaluation of 1,3-dichloropropene, including analyzing the applications and weather conditions during the time

high concentrations were detected. DPR has also taken further actions to reduce exposures to 1,3-dichloropropene.

Of the 23 pesticides detected, 12 were detected at trace levels, and 11 had quantifiable concentrations. Seven of the 11 pesticides (including three breakdown products) detected at quantifiable concentrations in the AMN were either fumigants (1,3-dichloropropene, carbon disulfide, methyl bromide, chloropicrin, and MITC) or organophosphate insecticides (chlorpyrifos + its oxygen analog). In addition, chlorothalonil, chlorthal-dimethyl, diuron and EPTC were also detected at quantifiable concentrations. The chemicals with the highest number of detections were chlorothalonil (52%), carbon disulfide (48%), chlorpyrifos oxygen analog (26%), and MITC (25%).

ACKNOWLEDGMENTS

We would like to thank DPR's Air Program sampling crew—Clarice Ando, Shifang Fan, Parakrama Gurusinghe, Joanna Nishimura, Fabio Sartori, and Jing Tao—and DPR's West Sacramento crew for sample handling and equipment assistance: Sue Peoples, Christopher Collins, Roger Sava, Lillian Hayden, and Jesse Ybarra. We would like to thank Jay Schreider, retired DPR toxicologist, for all of his work on the health screening level evaluation. We also would like to thank all of the members of the Pesticide Registration and Evaluation Committee—Ann Prichard, Lynn Baker, Charles Salocks, David Ting, Crystal Reul-Chen, Brian Larimore, Rich Breuer, Dawit Tadesse, Valerie Mitchell, David Luscher, Rebecca Sisco, Matt Hengel, Stella McMillin, Amalia Neidhardt, Jeff Fowles, Tom Ineichen, Patti TenBrook, Eric Lauritzen, and James Seiber—for their scientific input. We also would like to thank the California Department of Food and Agriculture's analytical laboratory personnel— Elaine Wong, Stephen Siegel, Jane White, and Jean Hsu—for their hard work. We also would like to thank the Air Resources Board's monitoring and laboratory staff and the Quality Assurance team members. Staff from ARB's Monitoring and Laboratory Division audited the Air Monitoring Network at the request of the DPR. Special thanks to the Salinas Airport staff and to the cities of Shafter and Ripon. Finally, we would like to thank the Agricultural Commissioners of Monterey, San Joaquin, and Kern counties for their cooperation.

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GLOSSARY

Acute exposure: Short-term exposure. Acute toxicity can be defined as the toxicity manifested within a relatively short time interval. Acute exposure can be as short as a few minutes or as long as a few days, but is generally not longer than one day. In animal toxicity studies, exposure is usually for 24 hours or less.

ARB: California Air Resources Board, part of CalEPA

CalEPA: California Environmental Protection Agency. The Department of Pesticide Regulation is one of six boards and departments within CalEPA.

Chronic exposure: Long-term exposure. Chronic exposure is generally for a significant portion of an animal or human lifetime. Exposure may be through repeated single doses or may be continuous.

Co-located sampler: A second sampler located within 1 meter of the primary sampler.

Concentration: The amount of a chemical (by weight) in a given volume of air. Concentrations in air can be expressed in units of volume or weight. In this report, pesticide concentrations are expressed as nanograms per cubic meter (ng/m^3).

Detected: Pertains to a chemical that is found in a sample above the method detection limit (see MDL).

Detection limit: see MDL (method detection limit)

DPR: California Department of Pesticide Regulation, part of CalEPA

Duplicate sample: Same as a primary sample, but it is obtained from a co-located sampler as a replicate.

Exposure: Contact with a chemical. Common routes of exposure are dermal (skin), oral (by mouth) and inhalation (breathing).

Field spiked sample: A sample with a known amount of chemical spiked onto the sample media which is placed next to a primary sample that undergoes the same air flow and run time conditions. The field spiked sample, when compared to the primary sample, provides some information about any change in the ability to recover the analyte during air sampling.

FQPA: U.S. Food Quality Protection Act

Health screening level: The calculated air concentration based on a chemical's toxicity that is used to evaluate the possible health effects of exposure to the chemical. Screening levels can be used in the process of evaluating the air monitoring results although they are not regulatory standards. A measured air concentration that is below the screening level for a given pesticide generally would not undergo further evaluation, unless additional data presents the necessity to do so. A measured concentration that is above the screening level would not necessarily indicate a health concern but would indicate the need for a further and more refined evaluation. Different screening levels are determined for different exposure periods, i.e., acute, subchronic, and chronic. DPR develops a health screening level when a regulatory target has not been established. Also see definition of regulatory target.

HI: Hazard index. The sum of all hazard quotients (HQs). It is used to estimate the potential health risk for non-cancer effects from exposure to several chemicals for a given time period (acute, subchronic, or chronic). That is,

$$HI = HQ_1 + HQ_2 + HQ_{3+\ldots}$$

HQ: Hazard quotient. The HQ is the ratio of an exposure level for a chemical (measured air concentration of a pesticide) to a reference concentration for the chemical (screening level for that pesticide) over the same time period. An HQ less than 1 is generally considered to be health protective.

$$\text{Hazard Quotient} = \frac{\text{Air Concentration Detected } (ng / m^3)}{\text{Screening Level } (ng / m^3)}$$

LOQ: Limit of Quantitation. Similar to method detection limit (MDL), the LOQ is the smallest amount of the chemical that can be reliably measured. Samples with concentrations above the minimum detection limit but below the LOQ can be identified as containing a *trace* amount but the concentration cannot be measured reliably. When calculating average concentrations or other statistics, DPR assumes that samples with a trace concentration have a concentration at the midpoint between the MDL and the LOQ. As with the MDL, the LOQ is a characteristic of both the method and the chemical. Different methods can have different LOQs limits for the same chemical. The same method can have different LOQs for different chemicals.

Matrix: The substance in the sampling tubes, such as XAD resin or charcoal which traps and removes organic compounds from the atmosphere during sampling

MDL: Method detection limit. The MDL is the smallest amount of the chemical that can be identified (although not necessarily quantified) in a sample with the method employed. If nothing is detected, the sample may contain none of the chemical or may have a concentration less than the MDL. In either instance, the sample is designated as containing no detectable amount. When calculating average concentrations or other statistics, DPR assumes that samples with no detectable amount have a concentration of one-half the MDL. The MDL is a characteristic of both the method and the chemical. That is, different methods can have different MDLs for the same chemical. Similarly, one method can have different MDLs for different chemicals. (See also *LOQ, limit of quantitation*)

MLD: Monitoring and Laboratory Division. The MLD is the monitoring and laboratory division of the California Air Resources Board.

Monitored chemical: Refers to a chemical that was sampled for in air and analyzed to determine its possible concentration. Air sampling apparatus can consist of pumps and sampling tubes or vacuum canisters. Pumps draw air over sampling tubes containing absorptive media which trap chemicals from the air. The media is then chemically analyzed in the laboratory to determine if the monitored chemical was in the air. Vacuum canisters are air-tight metal containers which utilize a starting vacuum to draw air inside during the monitoring period. The air in the canisters is then subjected to chemical analysis in the laboratory to determine if the monitored chemical was in the air. In this study, air sampling periods were 24 hours long.

ND: None detected. This is the concentration below the method detection limit (MDL).

OA: Oxygen analog, also known as oxon. This is the breakdown product from certain organophosphate pesticides. Oxygen analogs usually are more toxic than the parent compound.

QAS: Quality Assurance Section of ARB.

OEHHA: California Office of Environmental Health Hazard Assessment, part of CalEPA.

QC: Quality Control

Primary sample: Sample collected in the field to measure pesticide air concentrations.

PUR: Pesticide use report. All agricultural pesticide use in California is required to be reported to the County Agricultural Commissioners. DPR collects these pesticide use reports; it evaluates and annually publishes the data.

RCD: Risk characterization document. DPR's human health risk assessment for a pesticide is presented in the RCD. The RCD explains the results of the risk assessment and assembles, critiques, and interprets all pertinent scientific data on a chemical's toxicology, human experience, and exposure.

RED: Reregistration eligibility document. Reregistration is U.S. EPA's reevaluation and relicensing of existing pesticides originally registered prior to current scientific and regulatory standards. U.S. EPA's human health risk assessment for a pesticide is presented as part of its RED.

Regulatory target: Regulatory target concentrations are levels that DPR's legal requirements are designed to stay below. DPR puts measures in place based on the regulatory target to limit exposures so that adverse effects can be avoided. Exceeding a regulatory target concentration does not necessarily mean an adverse health effect occurs, but it does indicate that the restrictions on the pesticide use may need to be modified. DPR normally establishes a regulatory target after completing a comprehensive risk assessment of a chemical's toxicity and potential exposures. DPR determines a regulatory target based on the risk assessment, as well as risk assessments from other agencies, pesticide use patterns, potential effects on use of alternative pesticides, and other factors. A regulatory target is based on a more comprehensive evaluation than a health screening level. Therefore, a regulatory target supersedes a health screening level (i.e. a specific pesticide and exposure duration will have either a regulatory target or a health screening level, but not both).

Risk: Risk is the probability that a toxic effect (adverse health effect) will result from a given exposure to a chemical. It is a function of both the inherent toxicity of the chemical as well as the exposure to the chemical.

Screening Level: see *Health Screening Level*

SOP: Standard operating procedure. This document describes the materials and methods used for various monitoring tasks.

Sorbent cartridge: A Teflon® cartridge filled with a measured amount of trapping media and sealed. The tube is attached to an air pump and ambient air is drawn through the trapping media in the tube.

Subchronic exposure: A medium time interval of exposure to a chemical. Subchronic exposure is longer than acute exposure, but shorter than chronic exposure. Subchronic exposure may be through repeated single doses or may be continuous. See *acute exposure*, *chronic exposure*.

Trace: see *Limit of Quantitation* (LOQ)

Trip blank sample: A clean sample cartridge capped and stored on dry ice with the rest of the samples collected from the monitoring site. The purpose is to determine if handling conditions in the field, sample transporting, or storage procedures may have contaminated the samples.

U.S. EPA: U.S. Environmental Protection Agency

VOC: Volatile organic compound

INTRODUCTION

Background

The Department of Pesticide Regulation (DPR) is the public agency responsible for protecting California and its residents from adverse health effects caused by the use of pesticides. In February 2011, as part of DPR's mandate for "continuous evaluation" of currently registered pesticides, DPR implemented its first multi-year statewide Air Monitoring Network (AMN) for measuring pesticides in various agricultural communities. Past and current studies by the Air Resources Board (ARB) and DPR for the Toxic Air Contaminant program usually consist of monitoring for short time periods (e.g., a few weeks) for individual pesticides. These studies produce data DPR uses to estimate seasonal pesticide exposures and local concentrations. However, since long-term data were not available, DPR would extrapolate the short-term concentrations detected to estimate concentrations associated with annual and lifetime exposures. AMN results provide the needed results to more accurately estimate chronic pesticide exposures. The goals of the AMN are to provide data that assists in assessing potential health risks, developing measures to mitigate risks, and measuring the effectiveness of regulatory requirements.

The AMN includes these scientific objectives:

- Identify common pesticides in air and determine seasonal, annual, and multiple-year concentrations.
- Compare concentrations to subchronic and chronic health screening levels.
- Track trends in air concentrations over time.
- Estimate cumulative exposure to multiple pesticides with common physiological modes of action in humans (e.g., cholinesterase inhibitors).
- Attempt to correlate concentrations with use and weather patterns.

As part of the monitoring station selection process for the AMN, DPR evaluated and prioritized 226 communities in California as candidates for inclusion in the network (Segawa, 2010). The 226 communities were prioritized based on pesticide use (both local and regional), demographic data (including: communities with higher populations of children, persons over 65, and number of persons living in close proximity to farms and agricultural areas with high pesticide use), and availability of other exposure and health data. DPR also considered other factors, including air sampling feasibility, weather patterns, and the potential for collaboration with other projects focused on environmental health (Segawa, 2010). Salinas (Monterey County), Shafter (Kern County), and Ripon (San Joaquin County) were selected as the sampling locations for the air network. DPR reevaluated community data in 2013 and expanded the number of candidate communities to 1,267 (Segawa et al., 2014). Using the same methodology as in 2010, the current three communities continued to remain areas of high use for many of the monitored pesticides and DPR staff recommended that monitoring should continue at the same three sampling sites.

DPR previously determined that representative sampling could be obtained from one 24-hour air sample collected each week from each community selected (Vidrio et al., 2013a). The air samples were analyzed for 32 pesticides and 5 pesticide breakdown products.
This report is the fourth volume of this study and contains AMN results from January 1, 2014 to December 31, 2014.

Communities and Monitoring Site Locations

<u>Ripon</u>
Ripon, a town of 4.2 square miles in area, is located approximately 20 miles south of Stockton in San Joaquin County (Figure 1). The elevation is 69 feet, with approximately 13.8 inches of precipitation

annually. Average temperatures during summer range from 60º to 94º F and 47º to 62º F during winter. Based on US Census data, the estimated population in 2010 was 14,297, of which 28.8% was below 18 years of age and 11.8% was 65 years or older. Almond orchards, grapes and field crops are the major crops surrounding the community. The monitoring site is located in an open area behind the police station on N. Wilma Avenue near the western side of the middle of the city.

Shafter

Shafter is a small city (18 square miles in area) located approximately 18 miles west-northwest of Bakersfield in Kern County (Figure 1). The elevation is 351 feet, with approximately 7 inches of precipitation annually. Average temperatures range from 59º to 99º F in the summer and 35º to 64º F in winter. In 2010, the population was 16,988 of which 36.0% was below 18 years of age and 6.6% was above 65 years of age. The major crops in the immediate area around Shafter are almonds, grapes, and alfalfa some field crops. The monitoring site is located near a city well adjacent to Shafter High School in the northeastern edge of the city.

Salinas

Salinas is located in Monterey County approximately 15 miles northeast of Monterey and encompasses a total area of 19 square miles (Figure 1). In 2010, Salinas had a population of 150,441 of which 31.4% was below 18 years of age and 7.4% was above 65. The average rainfall is approximately 14.5 inches. Average temperatures range from 51º to 72º F in the summer and from 40º to 52º F in winter. Heavy morning fog often occurs during summer months. Salinas is surrounded mainly by strawberries, lettuce and other field crops. The monitoring site is located at the Salinas Airport in the southeastern section of the city.

Figure 1. Map showing the location of the three communities and monitoring sites.

Pesticides Monitored

DPR monitored a total of 37 chemicals (i.e., 32 pesticides and 5 pesticide breakdown products). Chemicals included in the AMN were selected based primarily on potential health risk. DPR gives higher-risk pesticides higher priority for monitoring. Pesticides were selected based on criteria described in Vidrio et al. (2013a).

Multi-Pesticide Residue Analysis

Multi-pesticide residue analysis using XAD-4 resin as the solid phase trapping medium were performed by the California Department of Food and Agriculture's (CDFA) Center for Analytical Chemistry laboratory using Gas Chromatography – Mass Spectrometry (GC-MS) and Liquid Chromatography – Mass Spectrometry (LC-MS) methods as described elsewhere (CDFA, 2008). This analysis can detect a variety of fungicides, insecticides, herbicides, and defoliants. The breakdown products of chlorpyrifos, diazinon, dimethoate, endosulfan and malathion were also included in the multi-residue analysis method. Table 1 lists the analytes that can be detected in multi-pesticide residue analysis with XAD-4 resin.

Table 1. Target analytes in multi-pesticide residue analysis with XAD-4 resin.

Chemical	Product Name	Pesticide Group	Chemical Class
Acephate	Orthene	Insecticide	Organophosphate
Bensulide	Prefar	Herbicide	Organophosphate
Chlorothalonil	Bravo	Fungicide	Chloronitrile
Chlorpyrifos	Dursban	Insecticide	Organophosphate
Chlorpyrifos Oxygen Analog	-		Organophosphate
Chlorthal-dimethyl	Dacthal	Herbicide	Phthalate
Cypermethrin	Demon	Insecticide	Pyrethroid
Diazinon	Various names	Insecticide	Organophosphate
Diazinon Oxygen Analog	-		Organophosphate
Dicofol	Kelthan	Insecticide	Organochlorine
Dimethoate	Cygon	Insecticide	Organophosphate
Dimethoate Oxygen Analog	-		Organophosphate
Diuron	Karmex	Herbicide	Urea
Endosulfan	Thiodan	Insecticide	Organochlorine
Endosulfan Sulfate	-		Organochlorine
EPTC	Eptam	Herbicide	Carbamate
Iprodione	Rovral	Fungicide	Dicarboximide
Malathion	Various names	Insecticide	Organophosphate
Malathion Oxygen Analog	-		Organophosphate
Methidathion	Supracide	Insecticide	Organophosphate
Metolachlor (S-metolachlor)	Dual	Herbicide	Chloracetanilide
Naled as dichlorvos (DDVP)	Dibrom, Vapona	Insecticide	Organophosphate
Norflurazon	Solicam	Herbicide	Pyridazinone
Oryzalin	Surflan	Herbicide	Dinitroaniline
Oxydemeton-methyl	Metasystox-R	Insecticide	Organophosphate
Oxyfluorfen	Goal	Herbicide	Diphenyl ether
Permethrin	Ambush	Insecticide	Pyrethroid
Phosmet	Imidan	Insecticide	Organophosphate
Propargite	Omite	Insecticide	Organosulfite
Simazine	Princep	Herbicide	Triazine
SSS-tributylphosphorotrithioate	DEF	Defoliant	Organophosphate
Trifluralin	Treflan	Herbicide	Dinitroaniline

Volatile Organic Compound Analysis

Air canisters were analyzed for the analytes listed in Table 2 using a volatile organic compound (VOC) GC-MS method similar to U.S. EPA's Method TO-15. DPR's standard operating procedure for this analysis is described in detail elsewhere (CDFA, 2008).

MITC

Samples collected on SKC Inc® coconut charcoal sample tubes were analyzed for residues of MITC by GC-MS as described by CDFA (2004). MITC extraction from the sorbent medium involves using carbon disulfide in ethyl acetate with subsequent analysis using gas chromatography-nitrogen phosphorous detector (GC-NPD).

Chloropicrin

SKC Inc® XAD-4 sample tubes were analyzed for residues of chloropicrin by gas chromatography-electron capture detector (GC-ECD) as described by CDFA (1999). Each tube was desorbed in hexane and analyzed by gas chromatograph equipped with GC-ECD.

Table 2. Target analytes in canister residue analysis.

Pesticide	Product Name	Pesticide Group	Chemical Class
1,3-Dichloropropene	Telone, Inline	Fumigant	Halogenated organic
Methyl Bromide		Fumigant	Halogenated organic
Carbon disulfide	Enzone	Fumigant	Inorganic
MITC*	Vapam, K-Pam, Dazomet	Fumigant	
Chloropicrin*		Fumigant	Halogenated organic

*are collected on individual sample tubes until CDFA is able to include in canister method.

MATERIALS AND METHODS

Air Sampling Equipment and Methods

Personnel from CDFA's Center for Analytical Chemistry washed, rinsed, and packed XAD-4 sorbent material into Teflon® sample cartridges and pre-evacuated SilcoCan® canisters to a pressure of -30"Hg. Chain of custody forms (COC), sample analysis request forms, and sample labels including the study number and sample identification numbers were supplied to field sampling personnel to be attached to sampling tubes, cartridges, and canisters prior to sampling. As the air sampling commenced at each monitoring site, the sample tracking number, date, time, staff initials, weather conditions, and air sampler flow rate were documented on the COC form (DPR, 2004). DPR personnel previously calibrated all pumps used for air sampling to their respective flow rate. DPR (2001) describes the use, operation, calibration and maintenance of air sampling pumps. Air sampler flow rates were measured using a DryCal® flow meter at the beginning and the end of sampling period. All sample pumps were checked and initially calibrated in the laboratory.

A protective shelter, placed at each air sampling location, housed Airchek HV30 pumps, SKC Inc® personal sample pumps, and SilcoCan® canisters. Air samples were collected via three different sampling methods (Segawa, 2010). The first method, which sampled for target analytes in the multi-pesticide residue analysis, used an AirChek® pump pulling air at a rate of 15 L/min attached to a hand-packed Teflon® cartridge containing 30 mL of XAD-4 sorbent resin material. The second method, which sampled for MITC and chloropicrin, used manufactured pre-packed 200/1800 mg coconut charcoal tubes (MITC) or manufactured pre-packed 400/200 mg XAD-4 tubes (chloropicrin) with sealed glass end tips were attached to a SKC Inc® personal sample pump set to a flow rate of 1.5 L/min for MITC or 50 mL/min for chloropicrin. The third method, which sampled for target analytes in the canister residue anlaysis, used a

vacuumed 6-L SilcoCan® canister with an attached flow controller to maintain a constant air flow for a 24-hour period.

Once samples were collected, open tube and cartridge ends were tightly capped with appropriate end caps and the air canister's valve was tightly closed. Sample tubes and cartridges were placed in an insulated storage container containing dry ice and remained frozen until transported to DPR's West Sacramento facility where they were checked-in and placed into a freezer until delivered to the CDFA's Center for Analytical Chemistry for analysis. SilcoCan® canister were transported to DPR's West Sacramento facility and stored at ambient conditions. Sample handling-shipping and tracking procedures were followed as defined elsewhere (DPR, 1999; DPR, 2005).

Sampling Procedure

This report includes AMN samples collected from January 1, 2014 to December 31, 2014. One 24-hour sample was collected each week at each of the three sites. The starting day varied each week with the actual dates being randomly selected. Actual sampling start times were left to the discretion of the field sampling personnel, but sampling always started anywhere from 9:00 a.m. to 2:00 p.m.

Quality Control Methods

Besides collecting field samples during monitoring, DPR collected additional quality control samples consisting of trip blank samples, field spikes and co-located duplicate samples.

A trip blank sample provides information on possible contamination of samples. For the manufactured pre-packed XAD-4 and charcoal sample tubes, the ends were broken open, capped and placed on dry ice with the field samples. The multi-pesticide residue XAD cartridges were opened in the field, capped, and placed on dry ice to be stored and shipped with the field samples. No air canister trip blanks were taken. Trip blanks collected from each sampling site were randomly selected and collected at least once every month of sampling. Trip blank samples containing detectable amounts of any of the pesticides would mean a problem with contamination during field and laboratory procedures had occurred.

A field spike is a laboratory spike sent to the field and placed on an air sampler with air flowing through the sorbent tube. Shipped on dry ice to the field, it is treated just like a field sample, undergoing the same storage and shipping conditions. The field spike, in comparison with the respective field sample, gives information about any change in the ability to recover the analyte during air sampling. DPR collected one field spike sample per month for each sample type. The multi-pesticide residue XAD cartridge was spiked with two different analytes every month. For chloropicrin and MITC spiked samples, spiked concentrations varied every month. VOC canister spike samples were collected at a randomly selected site every other month. Spike samples outside the control limits established from the validation data for each pesticide would trigger a reassessment of the field and laboratory procedures.

A duplicate sample is a sample that is co-located with a field sample. These samples evaluate overall precision in sample measurement and analysis. DPR collected one duplicate sample for each sample type once per month.

Laboratory Methods

Method calibration

The laboratory verified calibration by analyzing a series of standard samples (samples containing known amounts of analyte dissolved in a solvent). The linear range of calibration was determined by analyzing standards of increasing concentration. Within the linear range, the calibration was determined by

Method detection limits and limits of quantitation

The method detection limit (MDL) is the lowest concentration of a pesticide (analyte) that a chemical method can reliably detect. The laboratory determined the MDL for each analyte by analyzing a standard at a concentration with a signal to noise ratio of 2.5 to 5. This standard is analyzed at least 7 times, and the MDL is determined by calculating the 99 percent confidence interval of the mean.

The limit of quantitation (LOQ) is the level at which concentrations may be reliably measured and is set at a certain factor above the MDL. The level of interference determines the magnitude of this factor; the more interference, the higher the factor. Table 3 lists all of the quantitation limits for Air Monitoring Network samples.

Table 3. Quantitation limits for Air Monitoring Network samples.

Pesticide	Detection limit (MDL) (ng/m^3)	Quantitation limit (LOQ) (ng/m^3)
Acephate	1.0	9.2
Bensulide	1.4	9.3
Chloropicrin	222	2,778
Chlorothalonil	13.7	23.1
Chlorpyrifos	5.0	23.1
Chlorpyrifos OA	2.9	9.3
Cypermethrin	4.7	23.1
Chlorthal-dimethyl (DCPA)	1.7	9.3
DDVP	3.2	23.1
Diazinon	1.2	9.3
Diazinon OA	2.1	9.3
Dicofol	2.1	23.1
Dimethoate	2.3	9.3
Dimethoate OA	1.9	9.3
Diuron	5.1	9.3
Endosulfan	3.2	23.1
Endosulfan Sulfate	4.6	23.1
EPTC	1.7	23.1
Iprodione	1.1	23.1
Malathion	2.2	23.1
Malathion OA	1.3	9.3
Methidathion	1.4	9.3
Metolachlor	2.7	9.3
MITC	5.6	23.1
Norflurazon	3.8	9.3
Oryzalin	1.4	23.1
Oxydemeton methyl	2.3	9.3
Oxyfluorfen	6.4	23.1
Permethrin	7.2	23.1
Phosmet	8.0	9.3
Propargite	3.8	23.1
Simazine	1.2	9.3
SSS-tributyltriphosphorotrithioate (DEF)	1.8	9.3
Trifluralin	1.7	23.1
VOC Samples*		
Carbon Disulfide	--	311 (0.1 ppb); (31.1 (0.01 ppb)**
1,3-Dichloropropene (*cis* and *trans*	--	454 (0.1 ppb); (45.4 (0.01 ppb)**
Methyl Bromide	--	396 (0.1 ppb); (39.6 (0.01 ppb)**

*For VOC samples the detection limit is the LOQ, the level that can be reliably quantified

**On 10/15/2013, the quantification limit was lowered to 0.01 ppb.

Air concentration calculations

For the sorbent tube samples, air concentrations were calculated as an amount of pesticide captured from a volume of air moving through the sampling media. Analytical results are presented in micrograms per sample (µg/sample). The concentrations are converted from µg/sample to nanograms per cubic meter (ng/m^3) of sample air using the following calculations:

$$\frac{Sample\,results\,(\mu g)\times 1000\,L/m^3}{Flow\,rate\,of\ sampler\,(L/\min)\times Run\,time\,(\min)}\ \text{x 1000 } ng/\mu g = \ ng/m^3$$

The VOC concentrations were reported as parts per billion by volume (*ppb)* and converted to ng/m^3 using the following calculations:

$$\frac{Sample\,results\,(ppbv)\ \times\ Molecular\,weight\,(g\,mol^{-1})}{24.45}\ \text{x 1000} = \ ng/m^3$$

The calculation above assumes 1 atmosphere of pressure at 25 °C and 24.45 is obtained from multiplication of the Universal gas constant (82.06 atm cm^3 /mol K) and temperature in degrees Kelvin (273.15+25 ^oC =298 K) with appropriate unit conversions based on the ideal gas law.

When calculating average concentrations from multiple samples, samples with no detectable amount were assumed to contain one-half the MDL (ND=0.5*MDL), and samples with trace amounts were assumed to contain the value halfway between the MDL and the LOQ (Trace= 0.5*(MDL+LOQ)).

Health Evaluation Methods

Pesticides can cause a variety of health effects when present at concentrations above health-protective levels. The pesticides included in the AMN were selected in part because (1) risk assessments indicate the potential for high exposure or (2) they are high priority for risk assessment due to toxicity and/or exposure concerns. Some of the pesticides in the AMN can cause a variety of adverse effects, including respiratory illnesses, damage to the nervous system, cancer, and birth defects. Vidrio et al. (2013a) summarizes the potential health effects of each pesticide. No state or federal agency has established health standards for pesticides in air. Therefore, DPR in consultation with the Office of Environmental Health Hazard Assessment and others, compares the measured air concentrations to either health screening levels or regulatory target concentrations to place the results in a health-based context.

Health screening levels are based on a preliminary assessment of possible health effects, and are used as triggers for DPR to conduct a more detailed evaluation. A measured air concentration below the screening level for a given pesticide would not be considered a significant health concern and the pesticide would not undergo further evaluation at this time. A measured concentration above the screening level would not necessarily indicate a significant health concern, but would indicate the need for a further, more refined evaluation. Vidrio et al. (2013a) summarizes more information on DPR-determined screening levels including information on deriving screening levels for each pesticide.

Regulatory target concentrations are the levels that DPR's legal requirements are designed to stay below and are established after a complete assessment of possible health risks. DPR puts measures in place based on the regulatory target concentration to limit exposures so that adverse effects can be avoided. Exceeding a regulatory target concentration does not necessarily mean an adverse health effect occurs, but it does indicate that the restrictions on the pesticide use may need to be modified. DPR normally

establishes a regulatory target concentration after completing a formal risk assessment of a chemical's toxicity and potential exposures. DPR management determines a regulatory target concentration based on the risk assessment, as well as risk assessments from other agencies, pesticide use patterns, potential effects on use of alternative pesticides, and other factors. A regulatory target concentration is based on a more comprehensive evaluation than a health screening level. Therefore, a regulatory target concentration supersedes a health screening level (i.e. a specific pesticide and exposure duration will have either a regulatory target or a health screening level, but not both).

The cumulative exposure and risk were estimated using a hazard quotient and hazard index approach for pesticides that have a common mode of action. The potential risk of the measured concentrations of a pesticide in air was evaluated by comparing the air concentration measured over a specified time (e.g., 24 hours, 4 weeks, 1 year) with the screening level derived for a similar exposure (i.e., acute, subchronic, chronic). The ratio of measured air concentration of a pesticide to a reference concentration or screening level for that pesticide is called the hazard quotient (HQ). In this case,

$$\text{Hazard Quotient} = \frac{\text{Air Concentration Detected } (ng / m^3)}{\text{Screening Level } (ng / m^3)}$$

If the HQ is greater than 1, then the air concentration exceeds the screening level and would indicate the need for further and more refined evaluation. Similarly, the risk from multiple pesticides (cumulative risk) is evaluated using the hazard index (HI) approach, which sums all of the HQs for the pesticides monitored.

$$HI = HQ_1 \text{ (pesticide 1)} + HQ_2 \text{ (pesticide 2)} + HQ_3 \text{ (pesticide 3)}_{+\ldots} \text{ (and so forth)}$$

If the HI is greater than 1, this indicates that the cumulative toxicity of the multiple pesticides should be further evaluated and that potential health impacts may have been missed by only considering the pesticides individually.

The AMN collects samples for nine pesticides that may cause cancer, as designated by Proposition 65 (the Safe Drinking Water and Toxic Enforcement Act of 1986) or the U.S. Environmental Protection Agency's (EPA) B2 list. Proposition 65 is a program specific to California that identifies chemicals known to cause cancer, birth defects or other reproductive harm, and informs Californians about exposures to such chemicals while U.S. EPA's B2 list identifies "probable human carcinogen" chemicals. Chemicals on the Proposition 65 list for cancer are: carbon disulfide, oxydemeton methyl, and propargite while chemicals on EPA's B2 list are: 1,3-dichloropropene, chlorothalonil, DDVP, diuron, Iprodione, and propargite. Cancer risk is expressed as a probability for the occurrence of cancer (e.g., 1 in 1,000,000 or 10^{-6}, 1 in 100,000 or 10^{-5}, etc.), and was estimated based on the following calculation for each pesticide.

Risk of single pesticide = (cancer potency) X (exposure)

Exposure for single pesticide = (air concentration) X (respiratory rate)

Risk of single pesticide = (cancer potency) X (air concentration) X (respiratory rate)

Total risk for AMN pesticides = (risk of pesticide 1) + (risk of pesticide 2)…

It is a standard default assumption that exposure to a carcinogen takes place over a lifetime, so DPR uses a default respiratory rate for an adult of 0.28 m^3/kg-day. The cancer potency (also called cancer slope factor) is used to estimate the risk of cancer associated with exposure to a carcinogenic substance and expressed in units of proportion (of a population) affected per mg of substance/kg body weight-day. DPR uses a default cancer potency value of 0.055 $(mg/kg\text{-}day)^{-1}$. Risk in the range of 10^{-5} to 10^{-6} or less is generally considered to be at the limit of what is considered to be negligible.

DPR has issued risk management directives for some pesticides that specify air concentration levels as regulatory goals, and these goals have been footnoted in the appropriate tables. DPR will use the data from this monitoring, in part, to determine the effectiveness of its mitigation measures in meeting these goals.

AIR MONITORING RESULTS

Results for all Pesticides and Communities Combined

A total of 5,966 analyses were conducted on the air samples collected from all three sampling locations from January 1, 2014 to December 31, 2014. Of the 5,966 analyses, 8.3% (498) showed detectable concentrations, which included quantifiable and trace detections. Samples with quantifiable concentrations accounted for 3.8% (157) of all analyses conducted. Quantifiable detections refer to concentrations above the LOQ for their respective pesticide.

Twelve of the 32 pesticides and 5 pesticide breakdown products monitored by DPR were only detected at trace levels. Fourteen of the 32 pesticides and 5 pesticide breakdown products monitored by DPR were not detected. Table 4 lists the number of detections for each pesticide and pesticide breakdown products included in the AMN. The chemicals with the highest number of detections were chlorothalonil (52%), carbon disulfide (48%), chlorpyrifos oxygen analog (OA) (26%), and MITC (25%).

Tables 5 through 8 list the number of detections for each pesticide and pesticide breakdown products for each sampling location. Chlorthal-dimethyl (33), chlorothalonil (40), and chlorothalonil (35) were the chemicals with the highest number of detections in Salinas, Shafter, and Ripon, respectively.

Table 4. Percentage of positive samples per chemical.

Chemical	Number of possible detections	Total number of detections*	Number of quantified detections	Percent of possible detections	Percent of quantifiable detections
Acephate	157	0	0	0%	0%
Bensulide	157	0	0	0%	0%
Carbon Disulfide	157	75	75	48%	48%
Chloropicrin	157	7	3	4%	2%
Chlorothalonil	157	81	7	52%	4%
Chlorpyrifos	157	38	4	24%	3%
Chlorpyrifos OA	157	41	3	26%	2%
Cypermethrin	157	0	0	0%	0%
Chlorthal-dimethyl (DCPA)	157	33	1	21%	1%
DDVP	157	8	0	5%	0%
Diazinon	157	0	0	0%	0%
Diazinon OA	157	1	0	1%	0%
Dimethoate	157	0	0	0%	0%
Dimethoate OA	157	0	0	0%	0%
Diuron	157	11	1	7%	1%
Endosulfan	157	3	0	2%	0%
Endosulfan Sulfate	157	0	0	0%	0%
EPTC	157	7	3	4%	2%
Iprodione	157	4	0	3%	0%
Malathion	157	7	0	4%	0%
Malathion OA	157	21	0	13%	0%
Methidathion	157	0	0	0%	0%
Methyl Bromide	157	38	38	24%	24%
Metolachlor	157	0	0	0%	0%
MITC	157	40	30	25%	19%
Norflurazon	157	0	0	0%	0%
Oryzalin	157	1	0	1%	0%
Oxydemeton methyl	157	0	0	0%	0%
Oxyfluorfen	157	1	0	1%	0%
Permethrin	157	1	0	1%	0%
Phosmet	157	0	0	0%	0%
pp-Dicofol	157	0	0	0%	0%
Propargite	157	6	0	4%	0%
Simazine	157	4	0	3%	0%
SSS-tributyltriphosphorotrithioate (DEF)	157	0	0	0%	0%
cis-1,3-Dichloropropene	157	31	31	20%	20%
t-1,3-Dichloropropene	157	29	29	18%	18%
Trifluralin	157	10	0	6%	0%
Total	**5,966**	**498**	**225**	**8%**	**4%**

***Includes both quantified and trace detections**

Table 5. Percentage of positive samples per chemical in Salinas, California.

Chemical	Number of possible detections	Total number of detections*	Number of quantified detections	Percent of possible detections	Percent of quantifiable detections
Acephate	52	0	0	0%	0%
Bensulide	52	0	0	0%	0%
Carbon Disulfide	52	23	23	44%	44%
Chloropicrin	52	5	1	10%	2%
Chlorothalonil	52	6	0	12%	0%
Chlorpyrifos	52	1	0	2%	0%
Chlorpyrifos OA	52	0	0	0%	0%
Cypermethrin	52	0	0	0%	0%
Chlorthal-dimethyl (DCPA)	52	33	1	63%	2%
DDVP	52	6	0	12%	0%
Diazinon	52	0	0	0%	0%
Diazinon OA	52	0	0	0%	0%
Dimethoate	52	0	0	0%	0%
Dimethoate OA	52	0	0	0%	0%
Diuron	52	4	1	8%	2%
Endosulfan	52	1	0	2%	0%
Endosulfan Sulfate	52	0	0	0%	0%
EPTC	52	1	0	2%	0%
Iprodione	52	0	0	0%	0%
Malathion	52	6	0	12%	0%
Malathion OA	52	14	0	27%	0%
Methidathion	52	0	0	0%	0%
Methyl Bromide	52	14	14	27%	27%
Metolachlor	52	0	0	0%	0%
MITC	52	6	4	12%	8%
Norflurazon	52	0	0	0%	0%
Oryzalin	52	0	0	0%	0%
Oxydemeton methyl	52	0	0	0%	0%
Oxyfluorfen	52	0	0	0%	0%
Permethrin	52	0	0	0%	0%
Phosmet	52	0	0	0%	0%
pp-Dicofol	52	0	0	0%	0%
Propargite	52	0	0	0%	0%
Simazine	52	1	0	2%	0%
SSS-tributyltriphosphorotrithioate (DEF)	52	0	0	0%	0%
cis-1,3-Dichloropropene	52	2	2	4%	4%
t-1,3-Dichloropropene	52	1	1	2%	2%
Trifluralin	52	0	0	0%	0%
Total	**1,976**	**124**	**47**	**6%**	**2%**

***Includes both quantified and trace detections**

Table 6. Percentage of positive samples per chemical in Shafter, California.

Chemical	Number of possible detections	Total number of detections*	Number of quantified detections	Percent of possible detections	Percent of quantifiable detections
Acephate	52	0	0	0%	0%
Bensulide	52	0	0	0%	0%
Carbon Disulfide	52	26	26	50%	50%
Chloropicrin	52	0	0	0%	0%
Chlorothalonil	52	40	7	77%	13%
Chlorpyrifos	52	29	4	56%	8%
Chlorpyrifos OA	52	32	3	62%	6%
Cypermethrin	52	0	0	0%	0%
Chlorthal-dimethyl (DCPA)	52	0	0	0%	0%
DDVP	52	1	0	2%	0%
Diazinon	52	0	0	0%	0%
Diazinon OA	52	0	0	0%	0%
Dimethoate	52	0	0	0%	0%
Dimethoate OA	52	0	0	0%	0%
Diuron	52	5	0	10%	0%
Endosulfan	52	0	0	0%	0%
Endosulfan Sulfate	52	0	0	0%	0%
EPTC	52	6	3	12%	6%
Iprodione	52	3	0	6%	0%
Malathion	52	1	0	2%	0%
Malathion OA	52	3	0	6%	0%
Methidathion	52	0	0	0%	0%
Methyl Bromide	52	8	8	15%	15%
Metolachlor	52	0	0	0%	0%
MITC	52	22	16	42%	31%
Norflurazon	52	0	0	0%	0%
Oryzalin	52	1	0	2%	0%
Oxydemeton methyl	52	0	0	0%	0%
Oxyfluorfen	52	0	0	0%	0%
Permethrin	52	0	0	0%	0%
Phosmet	52	0	0	0%	0%
pp-Dicofol	52	0	0	0%	0%
Propargite	52	0	0	0%	0%
Simazine	52	2	0	4%	0%
SSS-tributyltriphosphorotrithioate (DEF)	52	0	0	0%	0%
cis-1,3-Dichloropropene	52	19	19	37%	37%
t-1,3-Dichloropropene	52	19	19	37%	37%
Trifluralin	52	2	0	4%	0%
Total	**1,976**	**219**	**105**	**11%**	**5%**

***Includes both quantified and trace detections**

Table 7. Percentage of positive samples per chemical in Ripon, California.

Chemical	Number of possible detections	Total number of detections*	Number of quantified detections	Percent of possible detections	Percent of quantifiable detections
Acephate	53	0	0	0%	0%
Bensulide	53	0	0	0%	0%
Carbon Disulfide	53	26	26	49%	49%
Chloropicrin	53	2	2	4%	4%
Chlorothalonil	53	35	0	66%	0%
Chlorpyrifos	53	8	0	15%	0%
Chlorpyrifos OA	53	9	0	17%	0%
Cypermethrin	53	0	0	0%	0%
Chlorthal-dimethyl (DCPA)	53	0	0	0%	0%
DDVP	53	1	0	2%	0%
Diazinon	53	0	0	0%	0%
Diazinon OA	53	1	0	2%	0%
Dimethoate	53	0	0	0%	0%
Dimethoate OA	53	0	0	0%	0%
Diuron	53	2	0	4%	0%
Endosulfan	53	2	0	4%	0%
Endosulfan Sulfate	53	0	0	0%	0%
EPTC	53	0	0	0%	0%
Iprodione	53	1	0	2%	0%
Malathion	53	0	0	0%	0%
Malathion OA	53	4	0	8%	0%
Methidathion	53	0	0	0%	0%
Methyl Bromide	53	16	16	30%	30%
Metolachlor	53	0	0	0%	0%
MITC	53	12	10	23%	19%
Norflurazon	53	0	0	0%	0%
Oryzalin	53	0	0	0%	0%
Oxydemeton methyl	53	0	0	0%	0%
Oxyfluorfen	53	1	0	2%	0%
Permethrin	53	1	0	2%	0%
Phosmet	53	0	0	0%	0%
pp-Dicofol	53	0	0	0%	0%
Propargite	53	6	0	11%	0%
Simazine	53	1	0	2%	0%
SSS-tributyltriphosphorotrithioate (DEF)	53	0	0	0%	0%
cis-1,3-Dichloropropene	53	10	10	19%	19%
t-1,3-Dichloropropene	53	9	9	17%	17%
Trifluralin	53	8	0	15%	0%
Total	**2,014**	**155**	**73**	**8%**	**4%**

***Includes both quantified and trace detections**

Table 8 lists the total number of detections of the monitored chemicals segregated by the sampling location. Detection percentages for the monitored chemicals ranged from 6.3% to 11.1% of all collected samples from all three sampling sites. These detections included both quantifiable (above LOQ) and trace detections (above the MDL but below the LOQ). Shafter had the highest percentage of samples with detections (11.1%) and the highest percent of quantifiable samples (5.4%). A total of 157 sample sets were taken from all three sampling locations (52 sample sets collected from both Salinas and Shafter and 53 sample sets collected from Ripon), 149 (94.9%) sample sets contained at least one detection. The percentage of sample sets with at least one detection ranged from 90.6% to 98.1% depending on sampling location.

Table 8. Detections of monitored chemicals by location.

Location	Number of possible detections	Total number of detections*	Number of quantified detections	Percent of possible detections	Percent of quantifiable detections		Number of sampling sets	Number of sets with at least one detection	Percent of sample sets with at least one detection
Salinas	1,976	124	47	6.3%	2.4%		52	50	96.2%
Shafter	1,976	219	105	11.1%	5.3%		52	51	98.1%
Ripon	2,014	155	73	7.7%	3.6%		53	48	90.6%
Total	**5,966**	**498**	**225**	**8.3%**	**3.8%**		**157**	**149**	**94.9%**

***Includes both quantified and trace detections**

Table 9 presents the highest 24-hour concentration at any site for each pesticide monitored. None of the pesticides monitored exceeded their acute screening level; all were below 30% of their screening levels. Detected concentrations of chlorpyrifos were the highest relative to its screening level with a maximum concentration of 337.9 ng/m^3, which is 28.2% of its acute screening level. Chlorpyrifos OA was the next highest pesticide relative to its screening level with a concentration of 109.6 ng/m^3 or 9.1% of its acute screening level. Figures 2 through 7 illustrate the highest 24-hour concentrations detections in all three sampling sites for selected fumigant and organophosphate pesticides due to pesticidal use.

While the results of the 24-hour samples and acute exposure are discussed in this report, the AMN best measures subchronic and chronic exposures. Estimating acute exposures is not one of the AMN objectives. The AMN's ambient air monitoring in communities is the standard method DPR uses to estimate subchronic and chronic exposures. Application-site monitoring in the immediate vicinity of a treated field is normally used to estimate acute exposure, and these air concentrations are typically several times higher than acute exposures measured from ambient air monitoring since they are collected 100 feet or less from the application, whereas ambient samples may be collected a mile or more away. It's likely that the maximum acute exposure is higher than indicated by these data.

Table 9. Highest 24-hour concentration for chemicals monitored.

Chemical	Highest 24-hour concentration (ng/m^3)†	24-hour acute screening level (ng/m^3)	% of screening level‡
1,3-Dichloropropene	9250.5	160,000	5.872%
Acephate	Not Detected (0.5)	12,000	0.004%
Bensulide	Not Detected (0.7)	259,000	0.000%
Carbon Disulfide	691.0	1,550,000	0.045%
Chloropicrin	4809.0	491,000	0.979%
Chlorothalonil	117.7	34,000	0.346%
Chlorpyrifos	337.9	1,200	28.155%
Chlorpyrifos OA	109.6	1,200	9.137%
Cypermethrin	Not Detected (2.4)	113,000	0.002%
Chlorthal-dimethyl (DCPA)	10.32	23,500,000*	0.000%
DDVP	Trace (13.2)	11,000	0.120%
Diazinon	Not Detected (0.6)	130	0.446%
Diazinon OA	Trace (5.7)	130	4.377%
Dimethoate	Not Detected (1.2)	4,300	0.027%
Dimethoate OA	Not Detected (1.0)	4,300	0.023%
Diuron	14.4	170,000	0.008%
Endosulfan	Trace (13.2)	3,300	0.399%
Endosulfan Sulfate	Not Detected (2.3)	3,300	0.070%
EPTC	216.3	230,000	0.094%
Iprodione	Trace (12.1)	939,000	0.001%
Malathion	Trace (12.7)	112,500	0.011%
Malathion OA	Trace (5.3)	112,500	0.005%
Methidathion	Not Detected (0.7)	3,100	0.023%
Methyl Bromide	3062.5	820,000	0.373%
Metolachlor	Not Detected (1.4)	85,000	0.002%
MITC	202.8	66,000	0.307%
Norflurazon	Not Detected (1.9)	170,000	0.001%
Oryzalin	Trace (12.3)	420,000	0.003%
Oxydemeton methyl	Not Detected (1.2)	39,200	0.003%
Oxyfluorfen	Trace (14.8)	510,000	0.003%
Permethrin	Trace (15.2)	168,000	0.009%
Phosmet	Not Detected (4.0)	77,000	0.005%
pp-Dicofol	Not Detected (1.9)	68,000	0.002%
Propargite	Trace (13.5)	14,000	0.096%
Simazine	Trace (5.3)	110,000	0.005%
SSS-tributyltriphosphorotrithioate (DEF)	Not Detected (0.9)	8,800	0.010%
Trifluralin	Trace (12.4)	1,200,000	0.001%

†Number in parentheses is one-half the MDL for samples with no detectable amount, and a value halfway between the MDL and the LOQ for trace samples.

‡A percentage greater than 100% of the screening level suggests the need for further evaluation.

*On previous reports, an erroneous screening level was mistakenly reported.

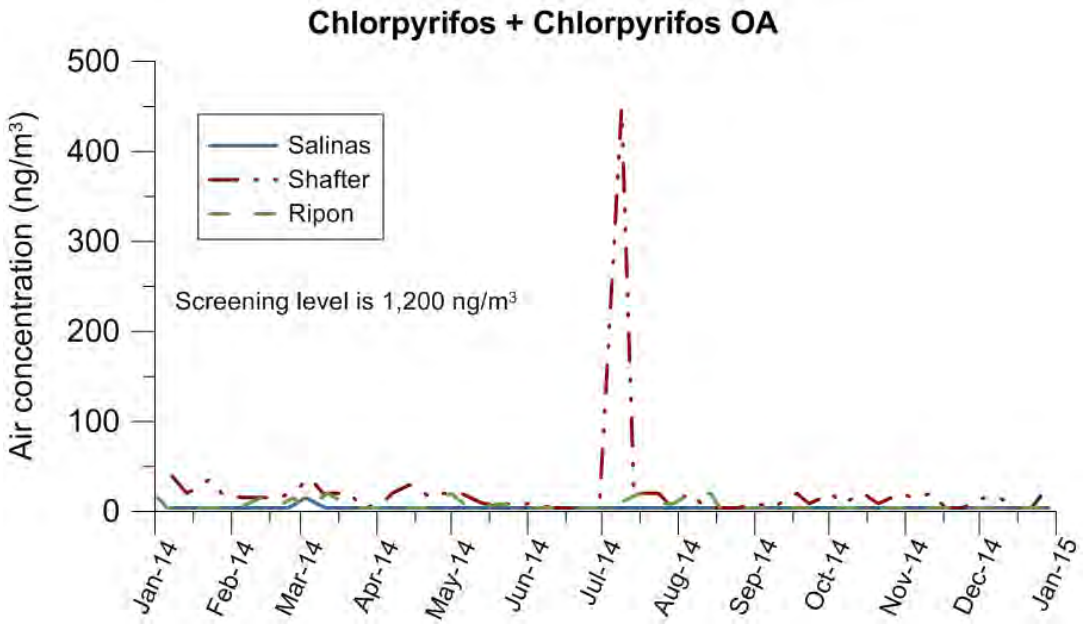

Figure 2. Highest 24-hour (acute) chlorpyrifos + chlorpyrifos OA concentrations detected at each of the three sampling locations.

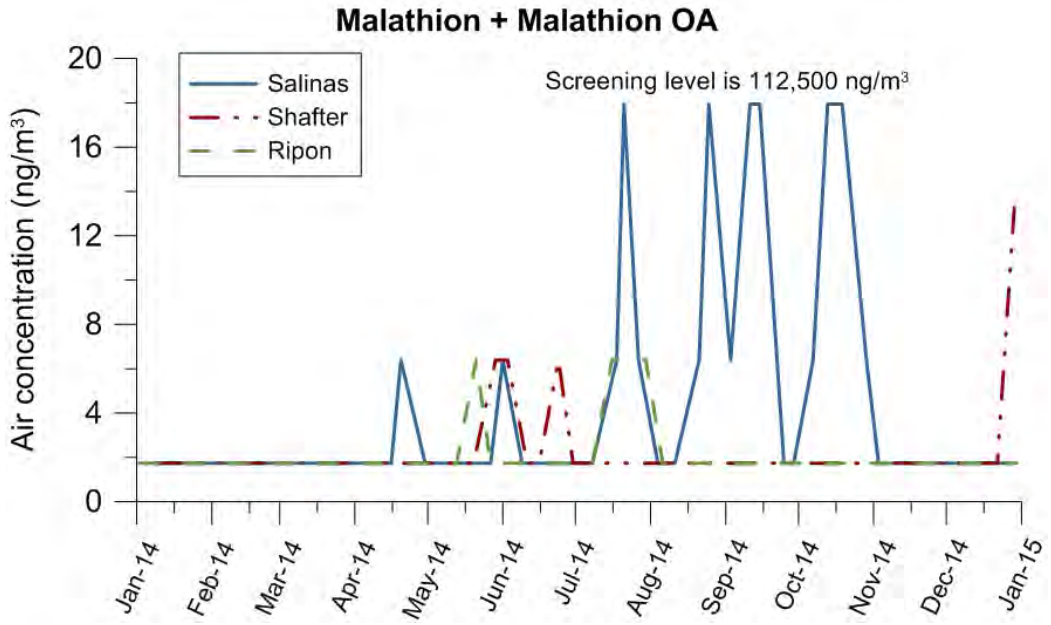

Figure 3. Highest 24-hour (acute) malathion + malathion OA concentrations detected at each of the three sampling locations.

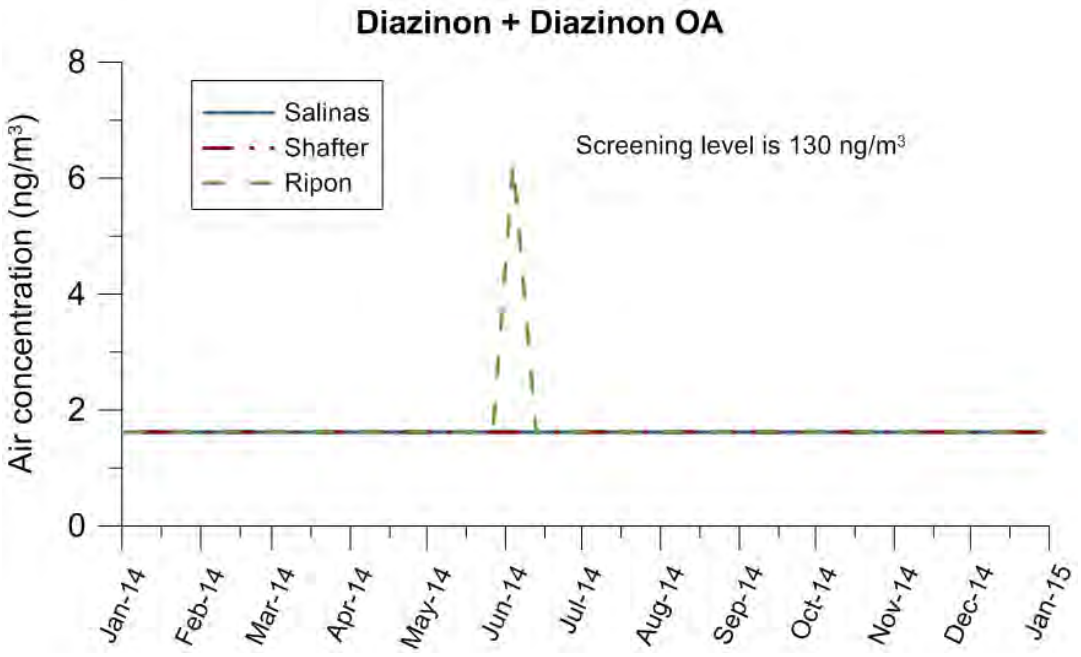

Figure 4.Highest 24-hour (acute) diazinon + diazinon OA concentrations detected at each of the three sampling locations.

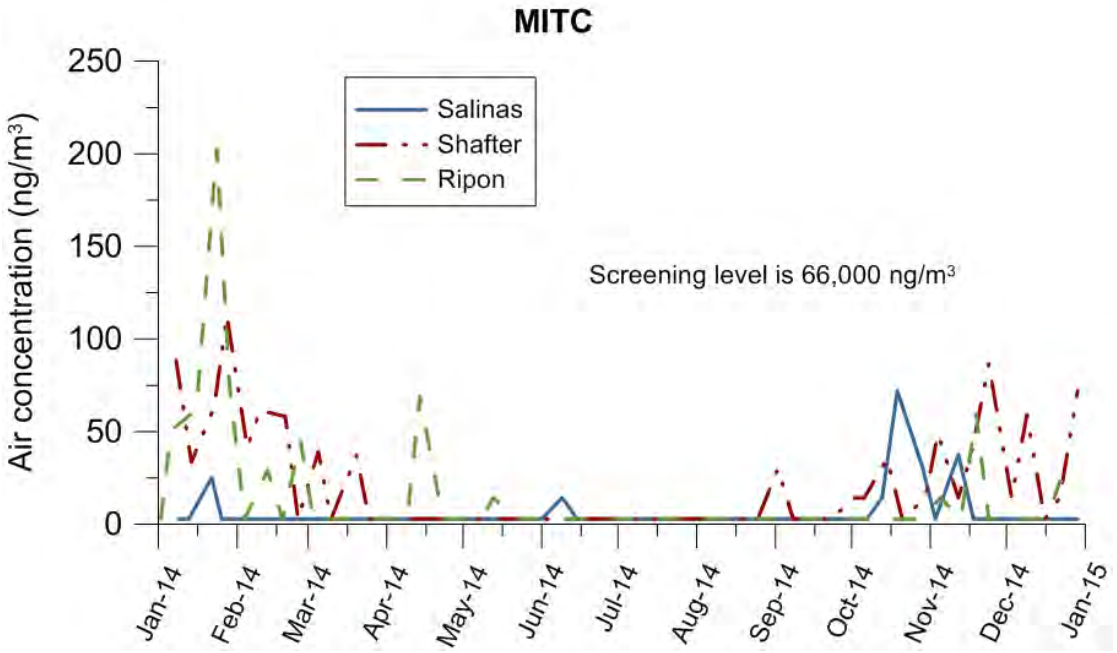

Figure 5. Highest 24-hour (acute) MITC concentrations detected at each of the three sampling locations

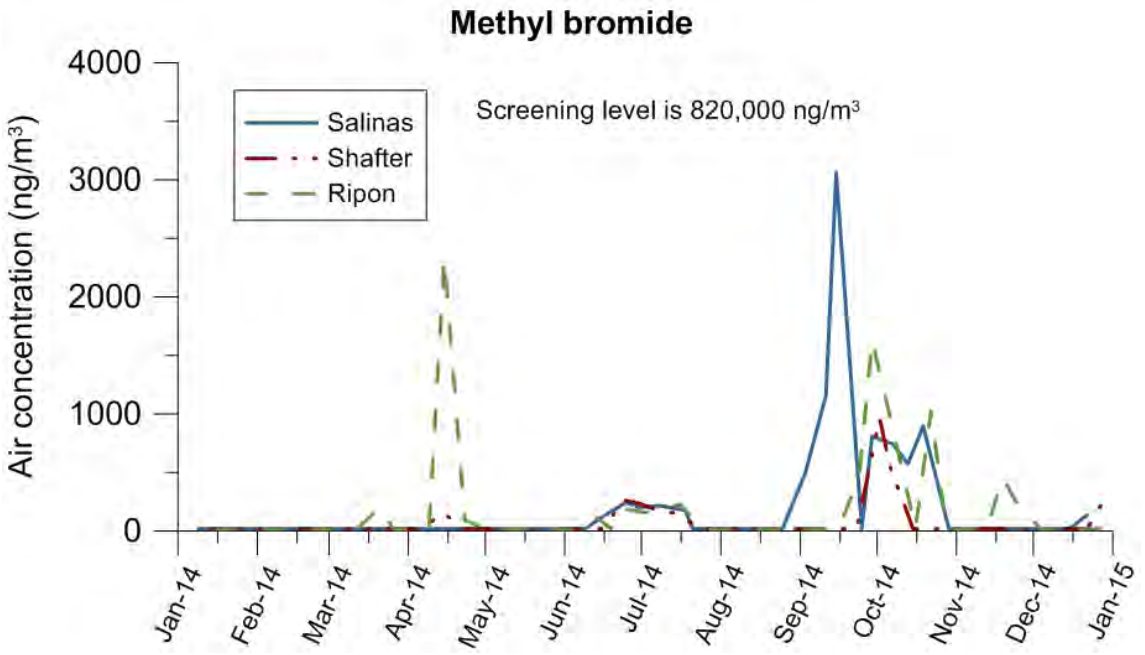

Figure 6. Highest 24-hour (acute) methyl bromide concentrations detected at each of three sampling locations.

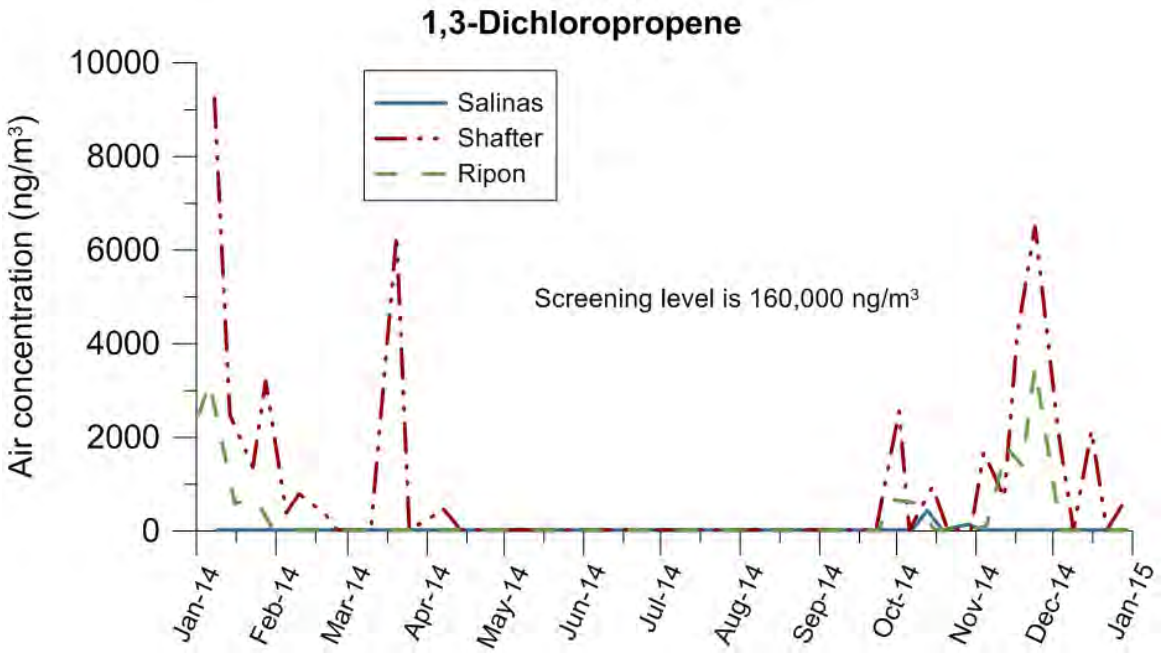

Figure 7. Highest 24-hour (acute) concentrations detected for the aggregate of *cis*- and *trans*-1,3-dichloropropene at each of three sampling locations.

Table 10 shows the highest rolling 4-week average concentrations, the subchronic screening levels, and the percent of the subchronic screening levels for each pesticide monitored. Thirty-five of the pesticides and breakdown products monitored had a highest rolling 4-week average concentration that was 10% or less of their subchronic screening levels. The pesticide with the highest subchronic exposure was chloropicrin, with a maximum rolling 4-week average concentration equivalent to 94.0% of its screening level. Chlorpyrifos and methyl bromide were the next highest, with maximum rolling 4-week average concentrations equivalent to 10.8% and 6.5% of their screening levels, respectively. 1,3-Dichloropropene had the highest rolling 4-week average concentration of 4,077.4 ng/m^3 but it only corresponds to 3.4% of its subchronic screening level. Figures 8 through 14 present the highest rolling 4-week average concentrations measured in any sample for each of the pesticides with a quantifiable detection that was from pesticidal use, compared with the subchronic screening level for the pesticide. The concentrations in figures are presented as rolling or moving averages (i.e., average of weeks 1,2,3, and 4; average of weeks 2,3,4, and 5, etc.). Figure 14 presents the highest rolling 4-week average concentrations measured for the sum of *cis*-1,3-dichloropropene and *trans*-1,3-dichloropropene from all three sampling locations. The rolling 4-week average concentrations were calculated using one-half the MDL for samples with no detectable amount, and a value halfway between the MDL and the LOQ for samples with trace (unquantifiable) concentrations.

Table 10. The highest of 4-week rolling air concentrations, subchronic screening levels, and percent of the subchronic screening level.

Chemical	Highest 4-week rolling concentration (ng/m^3)†	Subchronic screening Level (ng/m^3)	% of screening level‡
1,3-Dichloropropene	4077.4	120,000	3.398%
Acephate	0.5	8,500	0.006%
Bensulide	0.7	24,000	0.003%
Carbon Disulfide	420.2	800,000	0.053%
Chloropicrin	2,161.5	2,300	93.978%
Chlorothalonil	76.6	34,000	0.225%
Chlorpyrifos	92.1	850	10.839%
Chlorpyrifos OA	32.0	850	3.764%
Cypermethrin	2.3	81,000	0.003%
Chlorthal-dimethyl (DCPA)	6.7	470,000*	0.001%
DDVP	13.2	2,200	0.599%
Diazinon	0.6	130	0.446%
Diazinon OA	2.2	130	1.694%
Dimethoate	1.2	3,000	0.039%
Dimethoate OA	1.0	3,000	0.032%
Diuron	7.9	17,000	0.046%
Endosulfan	4.5	3,300	0.137%
Endosulfan Sulfate	2.3	3,300	0.070%
EPTC	85.7	24,000	0.357%
Iprodione	6.3	286,000	0.002%
Malathion	9.8	80,600	0.012%
Malathion OA	5.3	80,600	0.007%
Methidathion	0.7	3,100	0.023%
Methyl Bromide	1,261.6	19,400	6.503%
Metolachlor	1.4	15,000	0.009%
MITC	97.6	3,000	3.255%
Norflurazon	1.9	26,000	0.007%
Oryzalin	3.6	230,000	0.002%
Oxydemeton methyl	1.2	610	0.189%
Oxyfluorfen	6.1	180,000	0.003%
Permethrin	6.5	90,000	0.007%
Phosmet	4.0	26,000	0.015%
pp-Dicofol	1.1	49,000	0.002%
Propargite	13.5	14,000	0.096%
Simazine	1.8	31,000	0.006%
SSS-tributyltriphosphorotrithioate (DEF)	0.9	8,800	0.010%
Trifluralin	9.5	170,000	0.006%

†Concentrations are presented as rolling or moving averages (i.e., average of weeks 1,2,3, and 4; average of weeks 2,3,4, and 5, etc.).

‡A percentage greater than 100% of the screening level suggests the need for further evaluation

*On previous reports, an erroneous screening level was mistakenly reported.

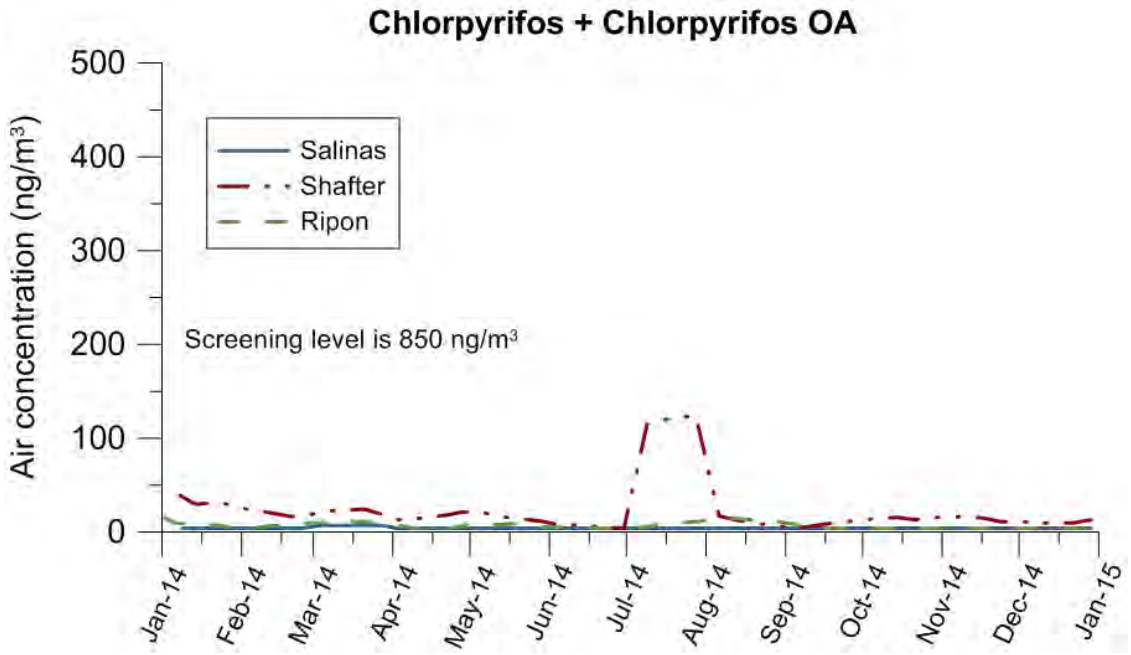

Figure 8. Rolling 4-week average (subchronic) chlorpyrifos + chlorpyrifos OA concentrations detected at each of the three monitoring locations.

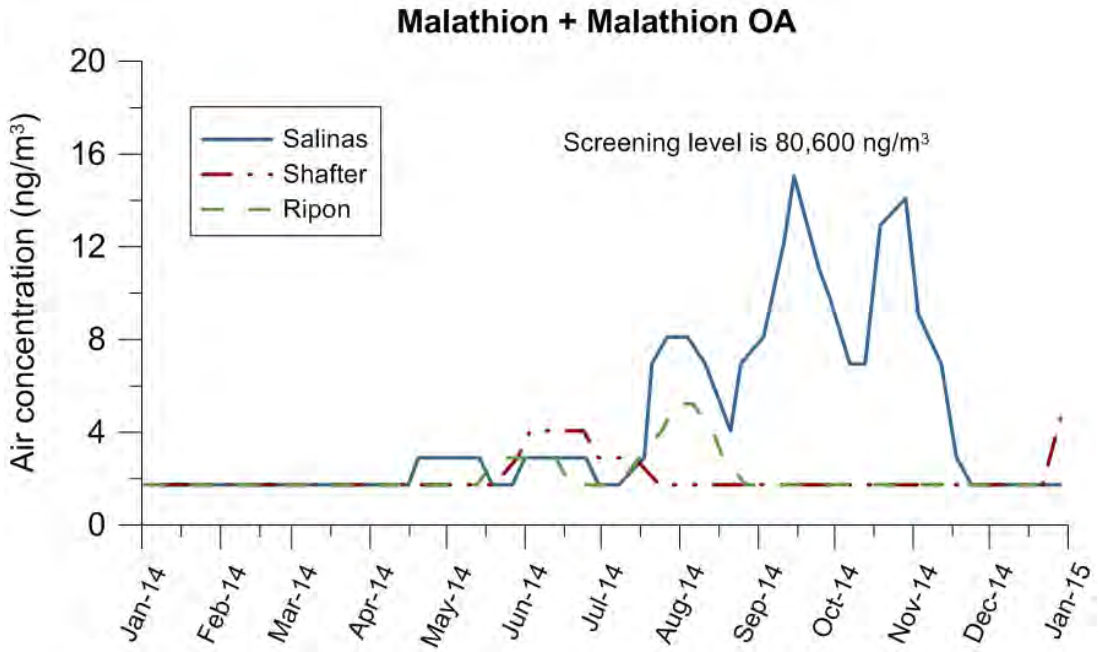

Figure 9. Rolling 4-week average (subchronic) malathion + malathion OA concentrations detected at each of the three monitoring locations.

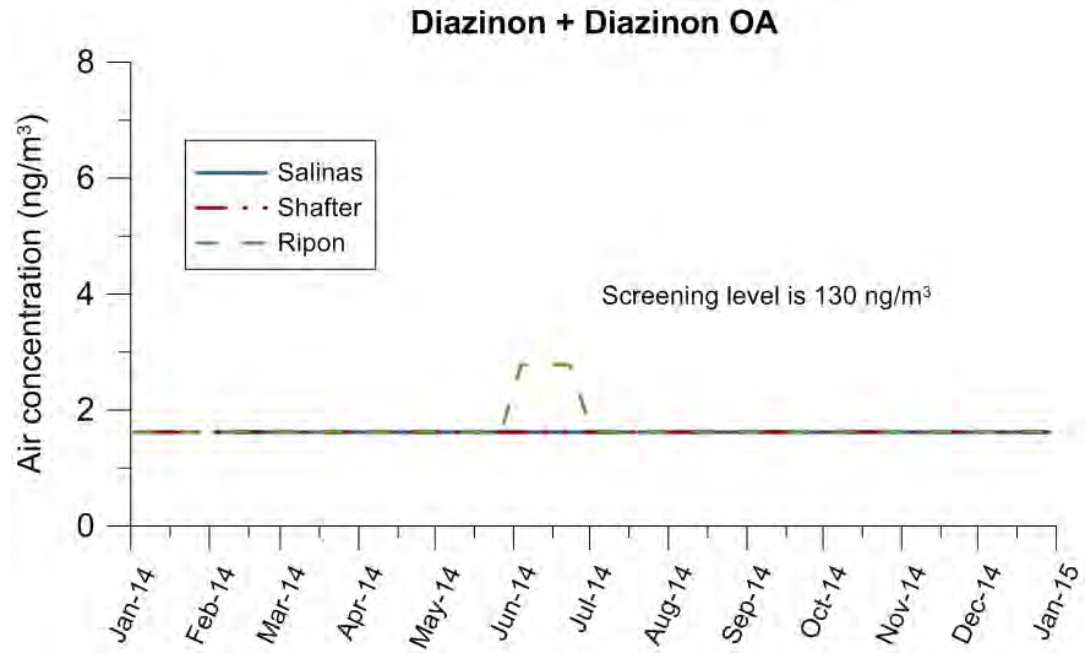

Figure 10. Rolling 4-week average (subchronic) diazinon + diazinon OA concentrations detected at each of the three monitoring locations.

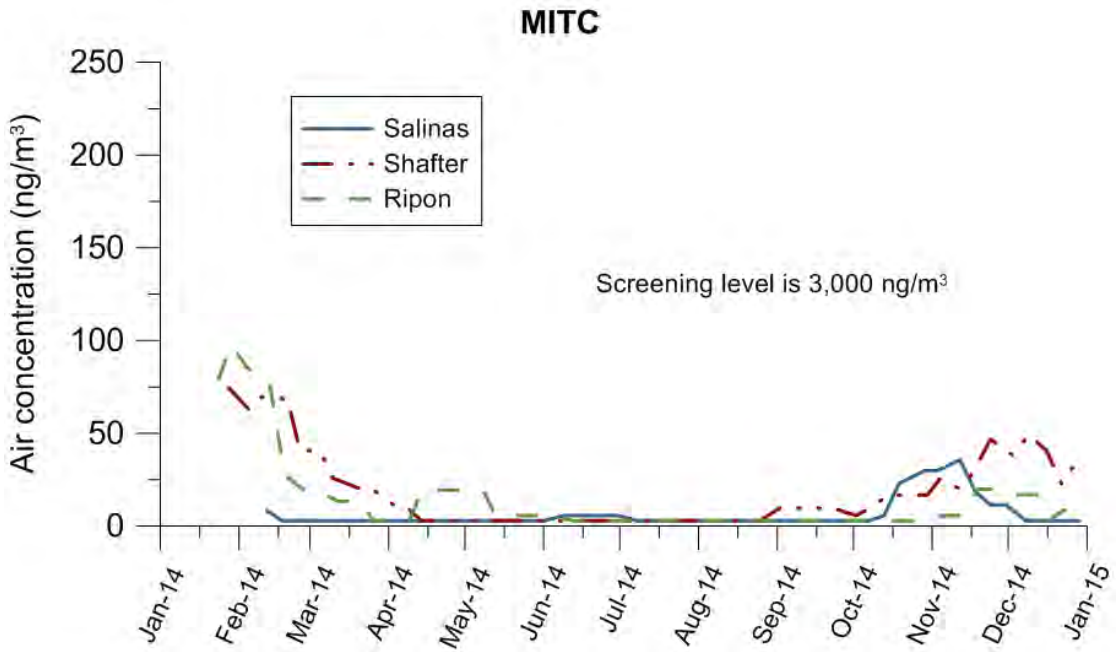

Figure 11. Rolling 4-week average (subchronic) MITC concentrations detected at each of the three monitoring locations.

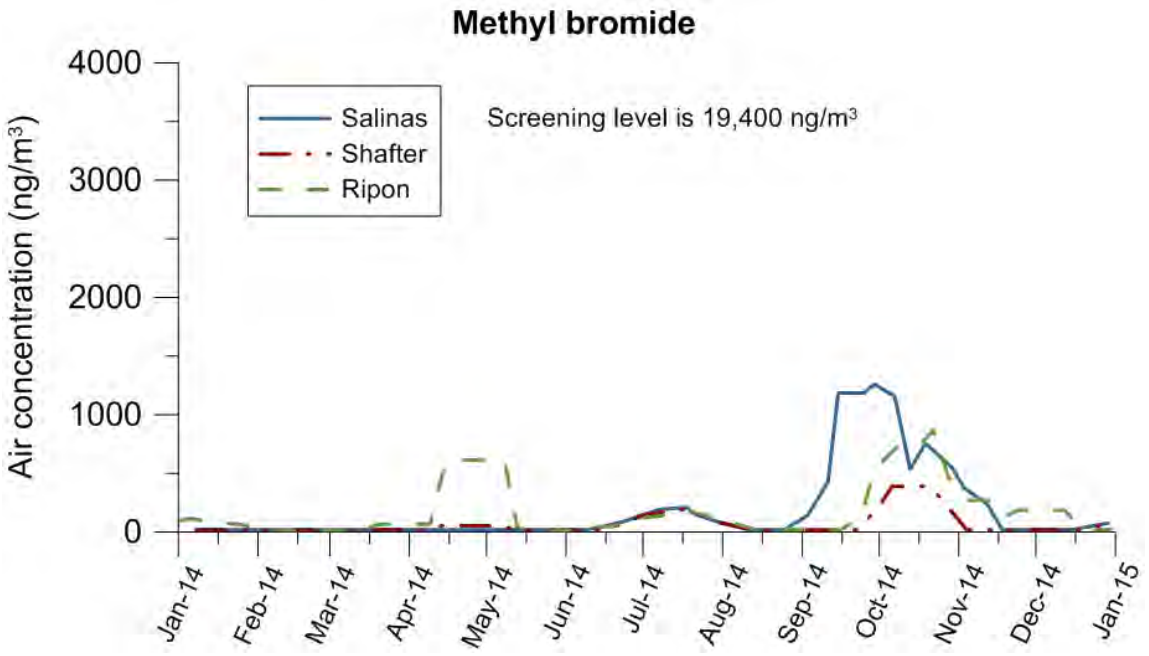

Figure 12. Rolling 4-week average (subchronic) methyl bromide concentrations detected at each of the three monitoring locations.

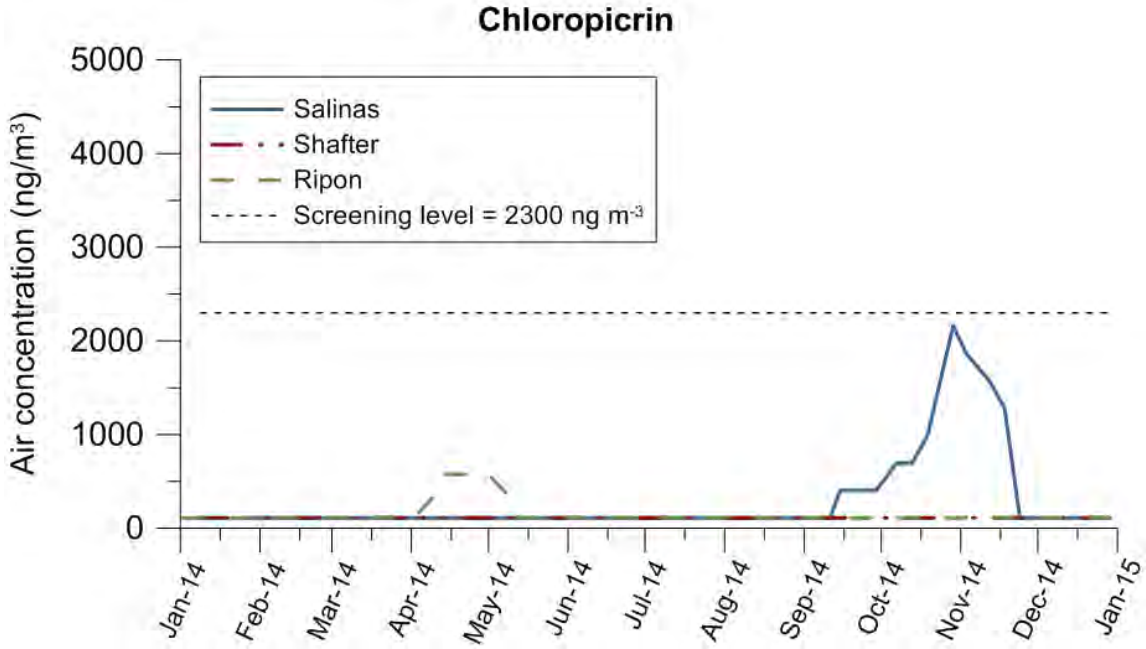

Figure 13. Rolling 4-week average (subchronic) chloropicrin concentrations detected at each of the three sampling locations.

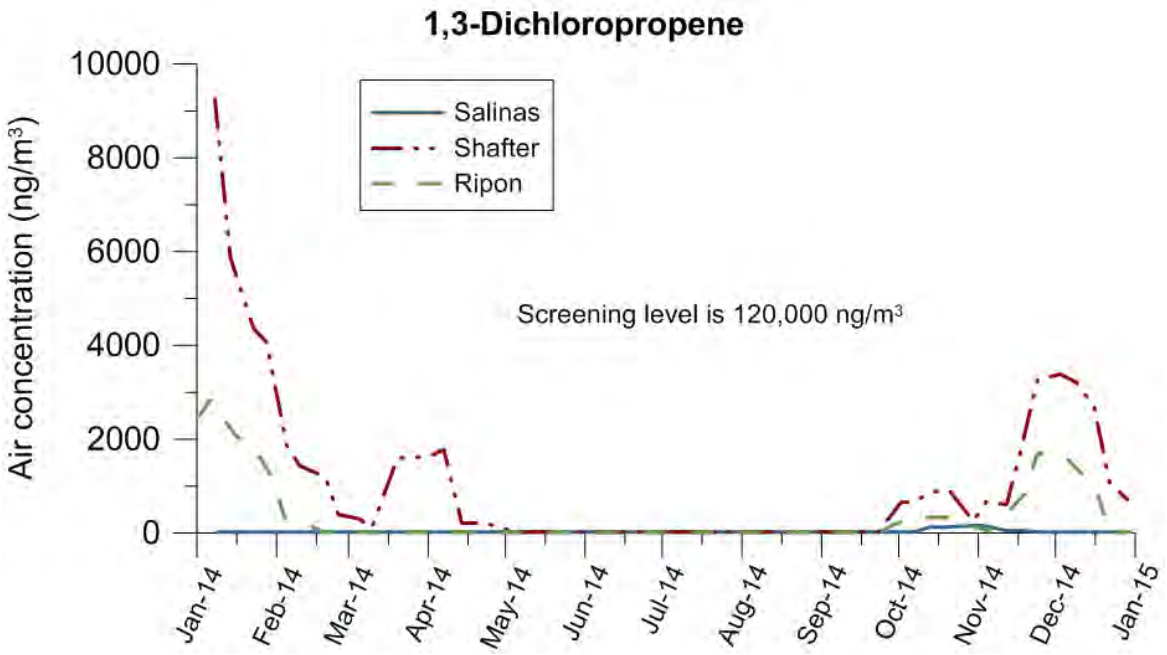

Figure 14. Rolling 4-week average (subchronic) concentrations detected for the aggregate of cis- and trans-1,3-dichloropropene at each of the three sampling locations.

Table 11 shows the 1-year average concentrations for all samples collected from January 1, 2014 to December 31, 2014. Average concentrations were calculated using one-half the MDL for samples with no detectable amount, and a value halfway between the MDL and the LOQ for samples with trace (unquantifiable) concentrations. None of the pesticide 1-year average concentrations exceeded the screening levels for the chronic exposure period; all pesticides monitored had 1-year average concentrations that were 10% or less of their chronic screening level. However, the 2014 average concentration for 1,3-dichloropropene exceeded DPR's cancer risk goal for a 70-year lifetime exposure at the Shafter site (see cancer risk section for more information). The pesticide with the highest chronic exposure was chloropicrin, with concentration of 182.6 ng/m^3 (10.1% of its chronic screening level), followed by MITC with a concentration of 13.9 ng/m^3 (4.6 % of its screening level). The highest 1-year average concentration measured for any pesticide was 414.0 ng/m^3 for 1,3-dichloropropene (0.4 % of its chronic screening level).

Table 11. The 1-year average concentration for all chemicals from samples collected from January 1, 2014 through December 31, 2014.

Chemical	1-year average concentration (ng/m^3)	Chronic screening level (ng/m^3)	% of screening level†
1,3-Dichloropropene	414.0	120,000	0.345%
Acephate	0.5	8,500	0.006%
Bensulide	0.7	24,000	0.003%
Carbon Disulfide	82.2	800,000	0.010%
Chloropicrin	182.6	1,800	10.143%
Chlorothalonil	14.8	34,000	0.044%
Chlorpyrifos	7.7	510	1.503%
Chlorpyrifos OA	3.5	510	0.685%
Cypermethrin	2.3	27,000	0.009%
Chlorthal-dimethyl (DCPA)	1.8	47,000*	0.004%
DDVP	2.2	770	0.287%
Diazinon	0.6	130	0.446%
Diazinon OA	1.1	130	0.823%
Dimethoate	1.2	300	0.385%
Dimethoate OA	1.0	300	0.323%
Diuron	2.9	5,700	0.052%
Endosulfan	1.8	330	0.558%
Endosulfan Sulfate	2.3	330	0.702%
EPTC	3.2	8,500	0.038%
Iprodione	0.8	286,000	0.000%
Malathion	1.6	8,100	0.020%
Malathion OA	1.3	8,100	0.016%
Methidathion	0.7	2,500	0.029%
Methyl Bromide	143.0	3,900	3.668%
Metolachlor	1.4	15,000	0.009%
MITC	13.9	300	4.624%
Norflurazon	1.9	26,000	0.007%
Oryzalin	0.8	232,000	0.000%
Oxydemeton methyl	1.2	610	0.189%
Oxyfluorfen	3.3	51,000	0.006%
Permethrin	3.7	90,000	0.004%
Phosmet	4.0	18,000	0.022%
pp-Dicofol	1.1	20,000	0.005%
Propargite	2.3	14,000	0.017%
Simazine	0.7	31,000	0.002%
SSS-tributyltriphosphorotrithioate (DEF)	0.9	NA - Seasonal	NA
Trifluralin	1.6	41,000	0.004%

†A percentage greater than 100% of the screening level suggests the need for further evaluation.

*On previous reports, an erroneous screening level was mistakenly reported.

Table 12 summarizes the magnitude of the air concentrations relative to the screening levels for the 11 pesticides and breakdown products that had quantifiable concentrations in at least one sample from all sampling locations. No pesticide exceeded its screening levels for any of the exposure periods. Chlorpyrifos and its OA had the highest acute risk, with maximum 24-hour concentrations that were 28.2% and 9.1% of their acute screening level, respectively. Chloropicrin had the highest subchronic risk, with a highest rolling 4-week average concentration that was approximately 94.0% of its subchronic screening level. Chlorpyrifos had the second highest rolling 4-week average concentration which was approximately 10.8% of its subchronic screening level Chloropicrin and MITC had the highest chronic risk, with 1-year average concentrations that were 10.1% and 4.6% of their chronic screening levels, respectively.

Table 12. Air concentrations relative to the screening levels for chemicals with quantifiable concentrations for all sampling locations.

Chemical	% of acute screening level*	% of subchronic screening level*	% of chronic screening level*
1,3-Dichloropropene	5.782%	3.398%	0.345%
Carbon Disulfide	0.045%	0.053%	0.010%
Chloropicrin	0.979%	93.978%	10.143%
Chlorothalonil	0.346%	0.225%	0.044%
Chlorpyrifos	28.155%	10.839%	1.503%
Chlorpyrifos OA	9.137%	3.764%	0.685%
Chlorthal-dimethyl (DCPA)	0.000%	0.001%	0.004%
Diuron	0.008%	0.046%	0.052%
EPTC	0.094%	0.357%	0.038%
Methyl Bromide	0.373%	6.503%	3.668%
MITC	0.307%	3.255%	4.624%

*A percentage greater than 100% of the screening level suggests the need for further evaluation.

Results for Salinas

Tables 13 through 15 give the highest 24-hour, 4-week rolling, and 1-year average concentrations for pesticides monitored in Salinas. None of the pesticides exceeded any of their screening levels. Chloropicrin was the pesticide with the highest concentration relative to its screening level with a highest rolling 4-week average air concentration of 2,162 ng/m^3 (94% of its subchronic screening level). Seven pesticides were detected at quantifiable concentrations in Salinas: 1,3-dichloropropene, carbon disulfide, chloropicrin, chlorthal-dimethyl, diuron, methyl bromide, and MITC. Eight additional pesticides (or breakdown products) were detected at trace levels only. Twenty-two pesticides (or breakdown products) were not detected. Chloropicrin was the pesticide with the highest 24-hour, 4-week rolling, and 1-year average concentrations of 4,809 ng/m^3 (1.0% of its acute screening level), 2,162 ng/m^3 (94.0% of its subchronic screening level), and 291.2 ng/m^3 (16.2% of its chronic screening level), respectively. Cumulative exposure to organophosphate is discussed in a later section.

Table 13. Highest 24-hour concentrations for pesticides monitored in Salinas, California.

Chemical	Highest 24-hour concentration (ng/m^3)‡	24-hour acute screening level (ng/m^3)	% of screening level†
1,3-Dichloropropene	440.1	160,000	0.275%
Acephate	Not Detected (0.5)	12,000	0.004%
Bensulide	Not Detected (0.7)	259,000	0.000%
Carbon Disulfide	691.0	1,550,000	0.045%
Chloropicrin	4809.0	491,000	0.979%
Chlorothalonil	Trace (18.4)	34,000	0.054%
Chlorpyrifos	Trace (14.1)	1,200	1.173%
Chlorpyrifos OA	Not Detected (1.5)	1,200	0.122%
Cypermethrin	Not Detected (2.3)	113,000	0.002%
Chlorthal-dimethyl (DCPA)	10.3	23,500,000*	0.000%
DDVP	Trace(13.2)	11,000	0.120%
Diazinon	Not Detected (0.6)	130	0.446%
Diazinon OA	Not Detected (1.1)	130	0.800%
pp-Dicofol	Not Detected (1.1)	68,000	0.002%
Dimethoate	Not Detected (1.2)	4,300	0.027%
Dimethoate OA	Not Detected (1.0)	4,300	0.023%
Diuron	14.4	170,000	0.008%
Endosulfan	Trace (13.2)	3,300	0.399%
Endosulfan Sulfate	Not Detected (2.3)	3,300	0.070%
EPTC	Trace (12.4)	230,000	0.005%
Iprodione	Not Detected (0.6)	939,000	0.000%
Malathion	Trace (12.6)	112,500	0.011%
Malathion OA	Trace (5.3)	112,500	0.005%
Methidathion	Not Detected (0.7)	3,100	0.023%
Methyl Bromide	3062.5	820,000	0.373%
Metolachlor	Not Detected (1.4)	85,000	0.002%
MITC	71.9	66,000	0.109%
Norflurazon	Not Detected (1.9)	170,000	0.001%
Oryzalin	Not Detected (0.7)	420,000	0.000%
Oxydemeton methyl	Not Detected (1.2)	39,200	0.003%
Oxyfluorfen	Not Detected (3.2)	510,000	0.001%
Permethrin	Not Detected (3.6)	168,000	0.002%
Phosmet	Not Detected (4.0)	77,000	0.005%
Propargite	Not Detected (1.9)	14,000	0.014%
Simazine	Trace (5.3)	110,000	0.005%
SSS-tributyl...(DEF)	Not Detected (0.9)	8,800	0.010%
Trifluralin	Not Detected (0.8)	1,200,000	0.000%

†A percentage greater than 100% of the screening level suggests the need for further evaluation.

‡Number in parentheses is one-half the MDL for samples with no detectable amount, and a value halfway between the MDL and the LOQ for trace samples.

*On previous reports, an erroneous screening level was mistakenly reported.

Table 14. Highest 4-week rolling concentrations for pesticides monitored in Salinas, California.

Chemical	Highest 4-week rolling concentration (ng/m^3)†	Subchronic screening level (ng/m^3)	% of screening level‡
1,3-Dichloropropene	157.7	120,000	0.131%
Acephate	0.5	8,500	0.006%
Bensulide	0.7	24,000	0.003%
Carbon Disulfide	319.1	800,000	0.040%
Chloropicrin	2161.5	2,300	93.978%
Chlorothalonil	12.6	34,000	0.037%
Chlorpyrifos	5.4	850	0.637%
Chlorpyrifos OA	1.5	850	0.172%
Cypermethrin	2.3	81,000	0.003%
Chlorthal-dimethyl (DCPA)	6.7	470,000*	0.001%
DDVP	13.2	2,200	0.599%
Diazinon	0.6	130	0.446%
Diazinon OA	1.0	130	0.800%
pp-Dicofol	1.1	49,000	0.002%
Dimethoate	1.2	3,000	0.039%
Dimethoate OA	1.0	3,000	0.032%
Diuron	7.9	17,000	0.046%
Endosulfan	4.5	3,300	0.137%
Endosulfan Sulfate	2.3	3,300	0.070%
EPTC	4.7	24,000	0.020%
Iprodione	0.5	286,000	0.000%
Malathion	9.8	80,600	0.012%
Malathion OA	5.3	80,600	0.007%
Methidathion	0.7	3,100	0.023%
Methyl Bromide	1261.6	19,400	6.503%
Metolachlor	1.4	15,000	0.009%
MITC	35.7	3,000	1.190%
Norflurazon	1.9	26,000	0.007%
Oryzalin	0.7	230,000	0.000%
Oxydemeton methyl	1.2	610	0.189%
Oxyfluorfen	3.2	180,000	0.002%
Permethrin	3.6	90,000	0.004%
Phosmet	4.0	26,000	0.015%
Propargite	1.9	14,000	0.014%
Simazine	1.8	31,000	0.006%
SSS-tributyl...(DEF)	0.9	8,800	0.010%
Trifluralin	0.8	170,000	0.000%

† Concentrations are presented as rolling or moving averages (i.e., average of weeks 1,2,3, and 4; average of weeks 2,3,4, and 5, etc.).

‡ A percentage greater than 100% of the screening level suggests the need for further evaluation

*On previous reports, an erroneous screening level was mistakenly reported.

Table 15. 1-year average concentrations for pesticides monitored in Salinas, California.

Chemical	1-year average concentration (ng/m^3)	Chronic screening level (ng/m^3)	% of screening level†
1,3-Dichloropropene	33.1	120,000	0.028%
Acephate	0.5	8,500	0.006%
Bensulide	0.7	24,000	0.003%
Carbon Disulfide	84.2	800,000	0.011%
Chloropicrin	291.2	1,800	16.177%
Chlorothalonil	8.2	34,000	0.024%
Chlorpyrifos	2.7	510	0.539%
Chlorpyrifos OA	1.5	510	0.286%
Cypermethrin	2.3	27,000	0.009%
Chlorthal-dimethyl (DCPA)	3.9	47,000*	0.008%
DDVP	3.0	770	0.383%
Diazinon	0.6	130	0.446%
Diazinon OA	1.0	130	0.800%
pp-Dicofol	1.1	20,000	0.005%
Dimethoate	1.2	300	0.385%
Dimethoate OA	1.0	300	0.323%
Diuron	3.1	5,700	0.054%
Endosulfan	1.8	330	0.558%
Endosulfan Sulfate	2.3	330	0.702%
EPTC	1.1	8,500	0.012%
Iprodione	0.5	286,000	0.000%
Malathion	2.4	8,100	0.030%
Malathion OA	1.9	8,100	0.023%
Methidathion	0.7	2,500	0.029%
Methyl Bromide	186.8	3,900	4.790%
Metolachlor	1.4	15,000	0.009%
MITC	6.2	300	2.062%
Norflurazon	1.9	26,000	0.007%
Oryzalin	0.7	232,000	0.000%
Oxydemeton methyl	1.2	610	0.189%
Oxyfluorfen	3.2	51,000	0.006%
Permethrin	3.6	90,000	0.004%
Phosmet	4.0	18,000	0.022%
Propargite	1.9	14,000	0.014%
Simazine	0.7	31,000	0.002%
SSS-tributyl...(DEF)	0.9	NA - Seasonal	
Trifluralin	0.8	41,000	0.002%

†A percentage greater than 100% of the screening level suggests the need for further evaluation.

*On previous reports, an erroneous screening level was mistakenly reported.

Results for Shafter

Tables 16 through 18 list the highest 24-hour, highest 4-week rolling, and 1-year average concentrations for pesticides monitored in Shafter, respectively. No pesticide exceeded any of the screening levels. However, the 2014 average concentration for 1,3-dichloropropene was detected at a level that if continued for a lifetime of 70 years would be above DPR's cancer risk goal (see cancer risk section for more information).

Nine pesticides were detected at quantifiable concentrations: 1,3-dichloropropene, carbon disulfide, chloropicrin, chlorothalonil, chlorpyrifos + OA, EPTC, methyl bromide, and MITC. Eight additional pesticides were detected at trace levels. Twenty pesticides (or breakdown products) were not detected. Chlorpyrifos, chlorpyrifos OA and 1,3-dichloropropene had the highest 24-hour concentration relative to their screening levels with values of 28.2%, 9.1% and 5.8 %, respectively. Moreover, chlorpyrifos, 1,3-dichloropropene, and chlorpyrifos OA had the highest 4 week rolling concentrations relative to their screening level with values of 10.8%, 7.7% and 3.8% of its screening level, respectively. MITC had the highest 1-year average concentration relative to its screening level with a value of 6.9% (or 21 ng/m^3). Cumulative exposure to organophosphates is discussed in a later section.

Table 16. Highest 24-hour concentration for pesticides monitored in Shafter, California.

Chemical	Highest 24-hour concentration (ng/m^3)†	24-hour acute screening level (ng/m^3)	% of screening level‡
1,3-Dichloropropene	9250.5	160,000	5.782%
Acephate	Not Detected (0.5)	12,000	0.004%
Bensulide	Not Detected (0.7)	259,000	0.000%
Carbon Disulfide	547.9	1,550,000	0.035%
Chloropicrin	111.0	491,000	0.023%
Chlorothalonil	117.7	34,000	0.346%
Chlorpyrifos	337.9	1,200	28.155%
Chlorpyrifos OA	109.6	1,200	9.137%
Cypermethrin	Not Detected (2.3)	113,000	0.002%
Chlorthal-dimethyl (DCPA)	Not Detected (0.8)	23,500,000*	0.000%
DDVP	Trace(13.2)	11,000	0.120%
Diazinon	Not Detected (0.6)	130	0.446%
Diazinon OA	Not Detected (1.1)	130	0.800%
pp-Dicofol	Not Detected (1.1)	68,000	0.002%
Dimethoate	Not Detected (1.2)	4,300	0.027%
Dimethoate OA	Not Detected (1.0)	4,300	0.023%
Diuron	Trace (7.2)	170,000	0.004%
Endosulfan	Not detected (1.6)	3,300	0.049%
Endosulfan Sulfate	Not Detected (2.3)	3,300	0.070%
EPTC	216.3	230,000	0.094%
Iprodione	Trace (12.1)	939,000	0.001%
Malathion	Trace (12.6)	112,500	0.011%
Malathion OA	Trace (5.3)	112,500	0.005%
Methidathion	Not Detected (0.7)	3,100	0.023%
Methyl Bromide	962.6	820,000	0.117%
Metolachlor	Not Detected (1.4)	85,000	0.002%
MITC	112.6	66,000	0.171%
Norflurazon	Not Detected (1.9)	170,000	0.001%
Oryzalin	Trace (12.3)	420,000	0.003%
Oxydemeton methyl	Not Detected (1.2)	39,200	0.003%
Oxyfluorfen	Not Detected (3.2)	510,000	0.001%
Permethrin	Not Detected (3.6)	168,000	0.002%
Phosmet	Not Detected (4.0)	77,000	0.005%
Propargite	Not Detected (1.9)	14,000	0.014%
Simazine	Trace (5.3)	110,000	0.005%
SSS-tributyl...(DEF)	Not Detected (0.9)	8,800	0.010%
Trifluralin	Trace (12.4)	1,200,000	0.001%

†Number in parentheses is one-half the MDL for samples with no detectable amount, and a value halfway between the MDL and the LOQ for trace samples.
‡A percentage greater than 100% of the screening level suggests the need for further evaluation.
*On previous reports, an erroneous screening level was mistakenly reported.

Table 17. Highest 4-week rolling concentrations for pesticides monitored in Shafter, California.

Pesticide	Highest 4-week rolling concentration (ng/m^3)†	Subchronic screening level (ng/m^3)	% of screening level‡
1,3-Dichloropropene	9250.5	120,000	7.709%
Acephate	0.5	8,500	0.006%
Bensulide	0.7	24,000	0.003%
Carbon Disulfide	420.2	800,000	0.053%
Chloropicrin	111.0	2,300	4.826%
Chlorothalonil	76.6	34,000	0.225%
Chlorpyrifos	92.1	850	10.839%
Chlorpyrifos OA	32.0	850	3.764%
Cypermethrin	2.3	81,000	0.003%
Chlorthal-dimethyl (DCPA)	0.8	470,000*	0.000%
DDVP	4.5	2,200	0.205%
Diazinon	0.6	130	0.446%
Diazinon OA	1.0	130	0.800%
pp-Dicofol	1.1	49,000	0.002%
Dimethoate	1.2	3,000	0.039%
Dimethoate OA	1.0	3,000	0.032%
Diuron	6.1	17,000	0.036%
Endosulfan	1.6	3,300	0.049%
Endosulfan Sulfate	2.3	3,300	0.070%
EPTC	85.7	24,000	0.357%
Iprodione	6.3	286,000	0.002%
Malathion	4.0	80,600	0.005%
Malathion OA	3.0	80,600	0.004%
Methidathion	0.7	3,100	0.023%
Methyl Bromide	389.3	19,400	2.007%
Metolachlor	1.4	15,000	0.009%
MITC	74.5	3,000	2.483%
Norflurazon	1.9	26,000	0.007%
Oryzalin	3.6	230,000	0.002%
Oxydemeton methyl	1.2	610	0.189%
Oxyfluorfen	3.2	180,000	0.002%
Permethrin	3.6	90,000	0.004%
Phosmet	4.0	26,000	0.015%
Propargite	1.9	14,000	0.014%
Simazine	1.8	31,000	0.006%
SSS-tributyl...(DEF)	0.9	8,800	0.010%
Trifluralin	3.7	170,000	0.002%

†Concentrations are presented as rolling or moving averages (i.e., average of weeks 1,2,3, and 4; average of weeks 2,3,4, and 5, etc.).

‡A percentage greater than 100% of the screening level suggests the need for further evaluation

*On previous reports, an erroneous screening level was mistakenly reported.

Table 18. 1-year average concentrations for pesticides monitored in Shafter, California.

Pesticide	1-year average concentration (ng/m^3)	Chronic screening level (ng/m^3)	% of screening level†
1,3-Dichloropropene	909.1	120,000	0.758%
Acephate	0.5	8,500	0.006%
Bensulide	0.7	24,000	0.003%
Carbon Disulfide	86.3	800,000	0.011%
Chloropicrin	111.0	1,800	6.167%
Chlorothalonil	21.8	34,000	0.064%
Chlorpyrifos	16.0	510	3.146%
Chlorpyrifos OA	6.8	510	1.332%
Cypermethrin	2.3	27,000	0.009%
Chlorthal-dimethyl (DCPA)	0.8	47,000*	0.002%
DDVP	1.8	770	0.239%
Diazinon	0.6	130	0.446%
Diazinon OA	1.0	130	0.800%
pp-Dicofol	1.1	20,000	0.005%
Dimethoate	1.2	300	0.385%
Dimethoate OA	1.0	300	0.323%
Diuron	3.0	5,700	0.053%
Endosulfan	1.6	330	0.491%
Endosulfan Sulfate	2.3	330	0.702%
EPTC	7.8	8,500	0.092%
Iprodione	1.2	286,000	0.000%
Malathion	1.3	8,100	0.016%
Malathion OA	0.9	8,100	0.011%
Methidathion	0.7	2,500	0.029%
Methyl Bromide	70.1	3,900	1.798%
Metolachlor	1.4	15,000	0.009%
MITC	20.7	300	6.888%
Norflurazon	1.9	26,000	0.007%
Oryzalin	0.9	232,000	0.000%
Oxydemeton methyl	1.2	610	0.189%
Oxyfluorfen	3.2	51,000	0.006%
Permethrin	3.6	90,000	0.004%
Phosmet	4.0	18,000	0.022%
Propargite	1.9	14,000	0.014%
Simazine	0.8	31,000	0.003%
SSS-tributyl...(DEF)	0.9	NA - Seasonal	
Trifluralin	1.3	41,000	0.003%

†A percentage greater than 100% of the screening level suggests the need for further evaluation

*On previous reports, an erroneous screening level was mistakenly reported.

Results for Ripon

Tables 19 through 21 show the highest 24-hour, highest 4-week rolling, and 1-year average concentrations for pesticides monitored in Ripon, respectively. None of the pesticides exceeded any of the screening levels. Five pesticides were detected at quantifiable concentrations in Ripon: 1,3-dichloropropene, carbon disulfide, chloropicrin, methyl bromide, and MITC. Fourteen additional pesticides were detected at trace levels. Eighteen pesticides were not detected. Diazinon had the highest 24-hour concentration relative to its screening level (4.4%). Chloropicrin had the highest rolling 4-week average concentration relative to its screening level (25.1% or 577.5 ng/m^3). Chloropicrin was also the pesticide with the highest 1-year average concentration relative to its screening level with a value of 8.1% (146.2 ng/m^3).

Table 19. Highest 24-hour concentrations for pesticides monitored in Ripon, California.

Chemical	Highest 24-hour concentration (ng/m^3)†	24-hour acute screening level (ng/m^3)	% of screening level‡
1,3-Dichloropropene	3511.5	160,000	2.195%
Acephate	Not Detected (0.5)	12,000	0.004%
Bensulide	Not Detected (0.7)	259,000	0.000%
Carbon Disulfide	370.4	1,550,000	0.024%
Chloropicrin	1150.4	491,000	0.234%
Chlorothalonil	Trace (18.4)	34,000	0.054%
Chlorpyrifos	Trace (14.1)	1,200	1.173%
Chlorpyrifos OA	Trace (6.1)	1,200	0.509%
Cypermethrin	Not Detected (2.3)	113,000	0.002%
Chlorthal-dimethyl (DCPA)	Not Detected (0.8)	23,500,000*	0.000%
DDVP	Trace(13.2)	11,000	0.120%
Diazinon	Not Detected (0.6)	130	0.446%
Diazinon OA	Trace (5.7)	130	4.377%
pp-Dicofol	Not Detected (1.1)	68,000	0.002%
Dimethoate	Not Detected (1.2)	4,300	0.027%
Dimethoate OA	Not Detected (1.0)	4,300	0.023%
Diuron	Trace (7.2)	170,000	0.004%
Endosulfan	Trace (13.2)	3,300	0.399%
Endosulfan Sulfate	Not Detected (2.3)	3,300	0.070%
EPTC	Not Detected (0.8)	230,000	0.000%
Iprodione	Trace (12.1)	939,000	0.001%
Malathion	Not Detected (1.1)	112,500	0.001%
Malathion OA	Trace (5.3)	112,500	0.005%
Methidathion	Not Detected (0.7)	3,100	0.023%
Methyl Bromide	2328.9	820,000	0.284%
Metolachlor	Not Detected (1.4)	85,000	0.002%
MITC	202.8	66,000	0.307%
Norflurazon	Not Detected (1.9)	170,000	0.001%
Oryzalin	Not Detected (0.7)	420,000	0.000%
Oxydemeton methyl	Not Detected (1.2)	39,200	0.003%
Oxyfluorfen	Trace (14.8)	510,000	0.003%
Permethrin	Trace (15.2)	168,000	0.009%
Phosmet	Not Detected (4.0)	77,000	0.005%
Propargite	Trace (13.5)	14,000	0.096%
Simazine	Trace (5.3)	110,000	0.005%
SSS-tributyl...(DEF)	Not Detected (0.9)	8,800	0.010%
Trifluralin	Trace (12.4)	1,200,000	0.001%

†Number in parentheses is one-half the MDL for samples with no detectable amount, and a value halfway between the MDL and the LOQ for trace samples.

‡A percentage greater than 100% of the screening level suggests the need for further evaluation.

*On previous reports, an erroneous screening level was mistakenly reported.

Table 20. Highest 4-week rolling concentrations for pesticides monitored in Ripon, California.

Chemical	Highest 4-week rolling concentration (ng/m^3)†	Subchronic screening level (ng/m^3)	% of screening level‡
1,3-Dichloropropene	2837.8	120,000	2.365%
Acephate	0.5	8,500	0.006%
Bensulide	0.7	24,000	0.003%
Carbon Disulfide	226.5	800,000	0.028%
Chloropicrin	577.5	2,300	25.109%
Chlorothalonil	18.4	34,000	0.054%
Chlorpyrifos	14.1	850	1.656%
Chlorpyrifos OA	6.1	850	0.719%
Cypermethrin	2.3	81,000	0.003%
Chlorthal-dimethyl (DCPA)	0.8	470,000*	0.000%
DDVP	4.5	2,200	0.205%
Diazinon	0.6	130	0.446%
Diazinon OA	2.2	130	1.694%
pp-Dicofol	1.1	49,000	0.002%
Dimethoate	1.2	3,000	0.039%
Dimethoate OA	1.0	3,000	0.032%
Diuron	3.7	17,000	0.022%
Endosulfan	4.5	3,300	0.137%
Endosulfan Sulfate	2.3	3,300	0.070%
EPTC	0.8	24,000	0.003%
Iprodione	3.4	286,000	0.001%
Malathion	1.1	80,600	0.001%
Malathion OA	4.1	80,600	0.005%
Methidathion	0.7	3,100	0.023%
Methyl Bromide	866.6	19,400	4.467%
Metolachlor	1.4	15,000	0.009%
MITC	97.6	3,000	3.255%
Norflurazon	1.9	26,000	0.007%
Oryzalin	0.7	230,000	0.000%
Oxydemeton methyl	1.2	610	0.189%
Oxyfluorfen	6.1	180,000	0.003%
Permethrin	6.5	90,000	0.007%
Phosmet	4.0	26,000	0.015%
Propargite	13.5	14,000	0.096%
Simazine	1.8	31,000	0.006%
SSS-tributyl...(DEF)	0.9	8,800	0.010%
Trifluralin	9.5	170,000	0.006%

†Concentrations are presented as rolling or moving averages (i.e., average of weeks 1,2,3, and 4; average of weeks 2,3,4, and 5, etc.).

‡A percentage greater than 100% of the screening level suggests the need for further evaluation.

*On previous reports, an erroneous screening level was mistakenly reported.

Table 21. 1-year average concentrations for pesticides monitored in Ripon, California.

Chemical	1-year average concentration (ng/m^3)	Chronic screening level (ng/m^3)	% of screening level†
1,3-Dichloropropene	301.9	120,000	0.252%
Acephate	0.5	8,500	0.006%
Bensulide	0.7	24,000	0.003%
Carbon Disulfide	76.3	800,000	0.010%
Chloropicrin	146.2	1,800	8.123%
Chlorothalonil	14.5	34,000	0.043%
Chlorpyrifos	4.3	510	0.837%
Chlorpyrifos OA	2.2	510	0.441%
Cypermethrin	2.3	27,000	0.009%
Chlorthal-dimethyl (DCPA)	0.8	47,000*	0.002%
DDVP	1.8	770	0.239%
Diazinon	0.6	130	0.446%
Diazinon OA	1.1	130	0.867%
pp-Dicofol	1.1	20,000	0.005%
Dimethoate	1.2	300	0.385%
Dimethoate OA	1.0	300	0.323%
Diuron	2.7	5,700	0.048%
Endosulfan	2.1	330	0.623%
Endosulfan Sulfate	2.3	330	0.702%
EPTC	0.8	8,500	0.010%
Iprodione	0.7	286,000	0.000%
Malathion	1.1	8,100	0.013%
Malathion OA	1.0	8,100	0.012%
Methidathion	0.7	2,500	0.029%
Methyl Bromide	171.6	3,900	4.401%
Metolachlor	1.4	15,000	0.009%
MITC	14.8	300	4.917%
Norflurazon	1.9	26,000	0.007%
Oryzalin	0.7	232,000	0.000%
Oxydemeton methyl	1.2	610	0.189%
Oxyfluorfen	3.4	51,000	0.007%
Permethrin	3.8	90,000	0.004%
Phosmet	4.0	18,000	0.022%
Propargite	3.2	14,000	0.023%
Simazine	0.7	31,000	0.002%
SSS-tributyl...(DEF)	0.9	NA - Seasonal	
Trifluralin	2.6	41,000	0.006%

†A percentage greater than 100% of the screening level suggests the need for further evaluation

*On previous reports, an erroneous screening level was mistakenly reported.

Cumulative Exposure Estimates

Cumulative exposures were only calculated for organophosphate pesticides because these are the only pesticides in the AMN that have a common mode of action and were detected at quantifiable concentrations. While organophosphates can have additional potential health effects, they all inhibit cholinesterase, an enzyme in the nervous system. Although EPTC, an N-methyl carbamate herbicide, inhibits cholinesterase, it has a different mechanism of toxicity and toxicity profile than the organophosphate insecticides; therefore, it would not be appropriate to group it with the organophosphates in a cumulative exposure calculation. As described in the Materials and Methods section, the cumulative exposure was estimated using a hazard quotient and hazard index approach that relies on the ratio between the detected air concentration and the screening level. The organophosphate cumulative exposures were estimated for each community and exposure period.

As shown in Table 22, none of the hazard indices exceeded a value of 1.0 at any of the sampling locations, indicating that the screening levels were not exceeded for all organophosphates combined. Shafter had a higher hazard index than Salinas and Ripon for all exposure periods. The acute hazard indices were higher for Shafter and Ripon in comparison to the subchronic and chronic hazard indices.

Table 22. Summary of organophosphate cumulative exposure.

Community	Acute hazard index†	Subchronic hazard index†	Chronic hazard index†
Salinas	0.027	0.030	0.031
Shafter	0.387	0.159	0.067
Ripon	0.067	0.050	0.036

† A hazard quotient or hazard index greater than one suggests the need for further evaluation.

As shown in Tables 23 through 31, Shafter was the only sampling location with at least one quantifiable concentration of an organophosphate: chlorpyrifos and its oxygen analog were the only detected organophosphates at quantifiable concentrations. All three communities had trace levels for several organophosphates. Six of the 14 organophosphates or OAs were detected in at least one sample: Chlorpyrifos, chlorpyrifos OA, DDVP, diazinon OA, malathion, and malathion OA. Acephate, bensulide, diazinon, dimethoate, dimethoate OA, oxydemeton-methyl, phosmet, and DEF were not detected. Chlorpyrifos (plus its OA) accounted for most of the organophosphate cumulative exposure for all exposure periods. Chlorpyrifos and its oxygen analog accounted for 25.1%-96.2% of the organophosphate cumulative exposure, depending on the community and exposure period.

Table 23. Highest 24-hour concentration of organophosphates monitored in Salinas, California

Chemical	Highest 24-hour adjusted concentration (ng/m^3)†	24-hour acute screening level (ng/m^3)	Acute Hazard quotient‡
Acephate	Not Detected (0.5)	12,000	0.000
Bensulide	Not Detected (0.7)	259,000	0.000
Chlorpyrifos	Trace (14.1)	1,200	0.012
Chlorpyrifos OA	Not Detected (1.5)	1,200	0.001
DDVP	Trace(13.2)	11,000	0.001
Diazinon	Not Detected (0.6)	130	0.004
Diazinon OA	Not Detected (1.1)	130	0.008
Dimethoate	Not Detected (1.2)	4,300	0.000
Dimethoate OA	Not Detected (1.0)	4,300	0.000
Malathion	Trace (12.6)	112,500	0.000
Malathion OA	Trace (5.3)	112,500	0.000
Oxydemeton methyl	Not Detected (1.2)	39,200	0.000
Phosmet	Not Detected (4.0)	77,000	0.000
SSS-tributyl...(DEF)	Not Detected (0.9)	8,800	0.000
Hazard Index			**0.027**

† Number in parentheses is one-half the MDL for samples with no detectable amount, and a value halfway between the MDL and the LOQ for trace samples.

‡ A hazard quotient or hazard index greater than one suggests the need for further evaluation.

Table 24. Highest 4-week rolling concentration of organophosphates monitored in Salinas, California.

Chemical	Highest 4-week rolling concentration (ng/m^3)†	Subchronic screening level (ng/m^3)	Subchronic Hazard quotient‡
Acephate	0.5	8,500	0.000
Bensulide	0.7	24,000	0.000
Chlorpyrifos	5.4	850	0.006
Chlorpyrifos OA	1.5	850	0.002
DDVP	13.2	2,200	0.006
Diazinon	0.6	130	0.004
Diazinon OA	1.0	130	0.008
Dimethoate	1.2	3,000	0.000
Dimethoate OA	1.0	3,000	0.000
Malathion	9.8	80,600	0.000
Malathion OA	5.3	80,600	0.000
Oxydemeton methyl	1.2	610	0.002
Phosmet	4.0	18,000	0.000
SSS-tributyl...(DEF)	0.9	8,800	0.000
Hazard Index			**0.030**

† Concentrations are presented as rolling or moving averages (i.e., average of weeks 1,2,3, and 4; average of weeks 2,3,4, and 5, etc.).

‡ A hazard quotient or hazard index greater than one suggests the need for further evaluation.

Table 25. 1-year average concentration of organophosphates monitored in Salinas, California.

Chemical	1-year average concentration (ng/m^3)	Chronic screening level (ng/m^3)	Chronic Hazard quotient†
Acephate	0.5	8,500	0.000
Bensulide	0.7	24,000	0.000
Chlorpyrifos	2.7	510	0.005
Chlorpyrifos OA	1.5	510	0.003
DDVP	3.0	27,000	0.000
Diazinon	0.6	130	0.004
Diazinon OA	1.0	130	0.008
Dimethoate	1.2	300	0.004
Dimethoate OA	1.0	300	0.003
Malathion	2.4	8,100	0.000
Malathion OA	1.9	8,100	0.000
Oxydemeton methyl	1.2	610	0.002
Phosmet	4.0	18,000	0.000
SSS-tributyl...(DEF)	0.9	NA - Seasonal	NA
Hazard Index			**0.031**

† A hazard quotient or hazard index greater than one suggests the need for further evaluation.

Table 26. Highest 24-hour concentration of organophosphates monitored in Shafter, California.

Chemical	Highest 24-hour adjusted concentration (ng/m^3)†	24-hour acute screening level (ng/m^3)	Acute Hazard quotient‡
Acephate	Not Detected (0.5)	12,000	0.000
Bensulide	Not Detected (0.7)	259,000	0.000
Chlorpyrifos	337.9	1,200	0.282
Chlorpyrifos OA	109.6	1,200	0.091
DDVP	Trace(13.2)	11,000	0.001
Diazinon	Not Detected (0.6)	130	0.004
Diazinon OA	Not Detected (1.1)	130	0.008
Dimethoate	Not Detected (1.2)	4,300	0.000
Dimethoate OA	Not Detected (1.0)	4,300	0.000
Malathion	Trace (12.6)	112,500	0.000
Malathion OA	Trace (5.3)	112,500	0.000
Oxydemeton methyl	Not Detected (1.2)	39,200	0.000
Phosmet	Not Detected (4.0)	77,000	0.000
SSS-tributyl...(DEF)	Not Detected (0.9)	8,800	0.000
Hazard Index			**0.387**

† Number in parentheses is one-half the MDL for samples with no detectable amount, and a value halfway between the MDL and the LOQ for trace samples.

‡ A hazard quotient or hazard index greater than one suggests the need for further evaluation.

Table 27. Highest 4-week rolling concentration of organophosphates monitored in Shafter, California.

Chemical	Highest 4-week rolling concentration (ng/m^3)†	Subchronic screening level (ng/m^3)	Subchronic Hazard quotient‡
Acephate	0.5	8,500	0.000
Bensulide	0.7	24,000	0.000
Chlorpyrifos	92.1	850	0.108
Chlorpyrifos OA	32.0	850	0.038
DDVP	4.5	2,200	0.002
Diazinon	0.6	130	0.004
Diazinon OA	1.0	3,000	0.000
Dimethoate	1.2	3,000	0.000
Dimethoate OA	1.0	300	0.003
Malathion	4.0	80,600	0.000
Malathion OA	3.0	80,600	0.000
Oxydemeton methyl	1.2	610	0.002
Phosmet	4.0	18,000	0.000
SSS-tributyl...(DEF)	0.9	8,800	0.000
Hazard Index			**0.159**

† Concentrations are presented as rolling or moving averages (i.e., average of weeks 1,2,3, and 4; average of weeks 2,3,4, and 5, etc.).

‡ A hazard quotient or hazard index greater than one suggests the need for further evaluation.

Table 28. 1-year average concentration of organophosphates monitored in Shafter, California.

Chemical	1-year average concentration (ng/m^3)	Chronic screening level (ng/m^3)	Chronic Hazard quotient†
Acephate	0.5	8,500	0.000
Bensulide	0.7	24,000	0.000
Chlorpyrifos	16.0	510	0.031
Chlorpyrifos OA	6.8	510	0.013
DDVP	1.8	27,000	0.000
Diazinon	0.6	130	0.004
Diazinon OA	1.0	130	0.008
Dimethoate	1.2	300	0.004
Dimethoate OA	1.0	300	0.003
Malathion	1.3	8,100	0.000
Malathion OA	0.9	8,100	0.000
Oxydemeton methyl	1.2	610	0.002
Phosmet	4.0	18,000	0.000
SSS-tributyl...(DEF)	0.9	NA - Seasonal	NA
Hazard Index			**0.067**

† A hazard quotient or hazard index greater than one suggests the need for further evaluation.

Table 29. Highest 24-hour concentration of organophosphates monitored in Ripon, California.

Chemical	Highest 24-hour adjusted concentration (ng/m^3)†	24-hour acute screening level (ng/m^3)	Acute Hazard quotient‡
Acephate	Not Detected (0.5)	12,000	0.000
Bensulide	Not Detected (0.7)	259,000	0.000
Chlorpyrifos	Trace (14.1)	1,200	0.012
Chlorpyrifos OA	Trace (6.1)	1,200	0.005
DDVP	Trace(13.2)	11,000	0.001
Diazinon	Not Detected (0.6)	130	0.004
Diazinon OA	Trace (5.7)	130	0.044
Dimethoate	Not Detected (1.2)	4,300	0.000
Dimethoate OA	Not Detected (1.0)	4,300	0.000
Malathion	Not Detected (1.1)	112,500	0.000
Malathion OA	Trace (5.3)	112,500	0.000
Oxydemeton methyl	Not Detected (1.2)	39,200	0.000
Phosmet	Not Detected (4.0)	77,000	0.000
SSS-tributyl...(DEF)	Not Detected (0.9)	8,800	0.000
Hazard Index			**0.067**

† Number in parentheses is one-half the MDL for samples with no detectable amount, and a value halfway between the MDL and the LOQ for trace samples.

‡ A hazard quotient or hazard index greater than one suggests the need for further evaluation.

Table 30. Highest 4-week rolling concentration of organophosphates monitored in Ripon, California.

Chemical	Highest 4-week rolling concentration (ng/m^3)†	Subchronic screening level (ng/m^3)	Subchronic Hazard quotient‡
Acephate	0.5	8,500	0.000
Bensulide	0.7	24,000	0.000
Chlorpyrifos	14.1	850	0.017
Chlorpyrifos OA	6.1	850	0.007
DDVP	4.5	2,200	0.002
Diazinon	0.6	130	0.004
Diazinon OA	2.2	130	0.017
Dimethoate	1.2	3,000	0.000
Dimethoate OA	1.0	3,000	0.000
Malathion	1.1	80,600	0.000
Malathion OA	4.1	80,600	0.000
Oxydemeton methyl	1.2	610	0.002
Phosmet	4.0	18,000	0.000
SSS-tributyl...(DEF)	0.9	8,800	0.000
Hazard Index			**0.050**

† Concentrations are presented as rolling or moving averages (i.e., average of weeks 1,2,3, and 4; average of weeks 2,3,4, and 5, etc.).

‡ A hazard quotient or hazard index greater than one suggests the need for further evaluation.

Table 31. 1-year average concentration of organophosphates monitored in Ripon, California.

Chemical	1-year average concentration (ng/m^3)	Chronic screening level (ng/m^3)	Chronic Hazard quotient†
Acephate	0.5	8,500	0.000
Bensulide	0.7	24,000	0.000
Chlorpyrifos	4.3	510	0.008
Chlorpyrifos OA	2.2	510	0.004
DDVP	1.8	27,000	0.000
Diazinon	0.6	130	0.004
Diazinon OA	1.1	130	0.009
Dimethoate	1.2	300	0.004
Dimethoate OA	1.0	300	0.003
Malathion	1.1	8,100	0.000
Malathion OA	1.0	8,100	0.000
Oxydemeton methyl	1.2	610	0.002
Phosmet	4.0	18,000	0.000
SSS-tributyl...(DEF)	0.9	NA - Seasonal	NA
Hazard Index			**0.036**

† A hazard quotient or hazard index greater than one suggests the need for further evaluation.

Cancer Risk Estimates

Two of the chemicals (1,3-Dichloropropene and chlorothalonil) that were measured at quantifiable concentrations, but below their screening levels, are classified as human carcinogens by both U.S. EPA and Proposition 65. The risk of cancer from exposure to a chemical is determined from the cancer potency of the chemical and the human exposure to the chemical. Cancer potency is expressed in the units of $(mg/kg\text{-}day)^{-1}$. Cancer risk is expressed as a probability for the occurrence of cancer (e.g., 1 in 1,000,000 or 10^{-6}, 1 in 100,000 or 10^{-5}, etc). It is a standard default assumption that exposure to a carcinogen takes place over a lifetime, so the default respiratory rate for an adult is used (0.28 $m^3/kg/day$) over 70 years. For 1,3-dichloropropene, DPR has calculated a cancer potency of 0.055 $(mg/kg\text{-}day)^{-1}$. The risk is then calculated as (cancer potency) X (chronic air concentration) X (respiratory rate). Alternatively, the 1,3-dichloropropene cancer risk can be expressed relative to DPR's regulatory target concentration of 650 ng/m^3 (cancer potency X respiratory rate, and converting units).

The concentration is calculated as an average of the monthly averages of the measured concentrations over the year of sampling. Since most of the samples resulted in non-detectable concentrations, the method of handling the non-detectable concentrations can have a large effect on the estimated cancer risk. Because the detection limit for 1,3-dichloropropene has such a significant effect on the cancer risk estimates, three different estimates were calculated using 2011–2014 averages (Table 32). In addition to uncertainty in the data, the estimate assumes that the chronic exposure occurs every single day for a lifetime (70 years). However, this assumption is consistent with standard risk assessment procedures.

As described in the next section, the cancer risk estimates for 1,3-dichloropropene were calculated by treating samples with no detectable concentrations as having concentrations of 0 (Minimum), 1/2*MDL (Standard), or MDL (Maximum):

Table 32. Four-year average minimum, standard, and maximum cancer risk estimates for 1,3-dichloropropene for each AMN sampling location (2011-2014).

Sampling location	Minimum (ND = 0*MDL)*	Standard (ND=1/2 MDL)**	Maximum (ND = MDL)***	Target
Salinas	2.71E-06	4.96E-06	7.20E-06	1.00E-05
Shafter	1.69E-05	1.92E-05	2.14E-05	1.00E-05
Ripon	5.54E-06	7.89E-06	1.02E-05	1.00E-05

* Cancer risk estimates were calculated using a concentration of 0 ng/m^3 for samples with no detectable concentrations.
** Cancer risk estimates were calculated using ½*MDL for samples with no detectable concentrations (standard method).
*** Cancer risk estimates were calculated using MDL for samples with no detectable concentrations.

The method of calculation determines whether the risk is considered negligible or above that. Risk in the range of 10^{-5} to 10^{-6} or less is generally considered to be at the limit of what is considered to be negligible. DPR has set a cancer risk regulatory target of 10^{-5} for 1,3-dichloropropene. Using DPR's standard assumption for no detectable samples, the air concentrations at the Shafter site showed that for the four years, 1,3-D was detected at an average concentration that, if continued for 70 years, would exceed DPR's cancer risk goal by 192%.However, there are several factors that create uncertainty about their use as an indicator of cancer risk.

- The air concentrations discussed in this report are four-year averages, while the regulatory goal is an average for a 70-year lifetime.
- Monitoring did not occur continuously, so the air concentrations during the unmonitored periods are unknown. DPR's yearly concentrations are based on one day of sampling each week.

Using DPR's standard method (½*MDL) to estimate average air concentrations, Table 33 shows the year-by-year trend of the AMN, as well as the 4-year average concentration. Shafter's data showed that for four years, 1,3-D was detected at an average level that, if continued for 70 years, would exceed DPR's regulatory target (Table 33). Table 33 suggests a decreasing trend in 1,3-dichloropropene concentrations for all sites from sampling years 2011 through 2014.

Table 33. Year-by-year and 4-year average air concentration (standard method) for 1,3-dichloropropene for each sampling location.

Sampling location	Air concentration (ng/m^3)†				2011-2014 Average concentration (ng/m^3)‡	Lifetime (70 year) Regulatory Target concentration (ng/m^3)
	2011	2012	2013	2014		
Salinas	760	360	407	33	311	650
Shafter	ND*	453	2,589	909	1,135	650
Ripon	851	ND*	914	302	516	650

† Air concentrations were calculated using 1/2*MDL for samples with no detectable concentrations (standard method).
‡ 4-year average concentration.
*ND = Not Detected.

Uncertainty of Air Concentrations - Treatment of ND and Trace Samples

To determine the impact of DPR's practice of substituting a value of ½MDL for samples with no detectable amount and substituting the midpoint between the MDL and the LOQ for trace samples, various highest rolling 4-week average concentrations and 1-year average concentrations were calculated for pesticides with at least one detectable concentration using two alternative methods of treating samples with no detectable and trace concentrations. Table 34 shows various highest rolling 4-week average concentrations and 1-year average concentrations determined by using a "minimum", a "standard", and a "maximum" method. Minimum average concentrations are calculated using a value of 0 ng/m^3 for samples with no detectable amount and by using the MDL for trace samples. Standard average

concentrations are calculated by using a value of one-half of the MDL for samples with no detectable amount and substituting the midpoint between the MDL and the LOQ for trace samples. Maximum average concentrations were calculated using the MDL for samples with no detectable amount and substituting the LOQ for all trace detections.

The difference between maximum and minimum values for rolling 4-week averages varied from 0% to 85% depending on the pesticide in question, while the difference in the 1-year average concentrations contained more variance for some pesticides ranging from 0% to 185%. Overall compared to the screening level, employing the DPR's standard method versus a minimum or maximum alternative method does not change the fact that the concentrations observed are greatly below the screening levels for all pesticides monitored, with chloropicrin's subchronic screening level and 1,3-dichloropropene's cancer risk being exceptions, and thus the standard method provides more of an accurate midpoint representation of the actual environmental concentrations for the target pesticides.

Table 34. Minimum, standard, and maximum highest rolling 4-week average concentrations and 1-year average concentrations for pesticides or breakdown products with at least one quantifiable detection.

Pesticide	Minimum Highest 4-wk rolling concentration (ng/m^3)	Standard Highest 4-wk rolling concentration (ng/m^3)	Maximum Highest 4-wk rolling concentration (ng/m^3)	Percent Difference between maximum and minimum	Minimum overall average concentration (ng/m^3)	Standard overall average concentration (ng/m^3)	Maximum overall average (ng/m^3)	Percent Difference between maximum and minimum
1,3-Dichloropropene	4,077	4,077	4,077	0%	396	414	432	9%
Carbon Disulfide	319	319	319	0%	74	82	90	20%
Chloropicrin	2,161	2,161	2,161	0%	77	183	289	116%
Chlorothalonil	77	77	77	0%	9	15	20	75%
Chlorpyrifos	87	92	97	11%	4	8	12	101%
Chlorpyrifos OA	30	32	34	15%	2	3	5	106%
Chlorthal-dimethyl	4	7	10	85%	0.4	2	3	156%
Diuron	5	8	10	66%	0.4	3	10	185%
EPTC	83	86	88	6%	2	3	4	67%
Methyl Bromide	1257	1262	1267	1%	128	143	158	21%
MITC	98	98	98	0%	11	14	17	38%

AIR MONITORING NETWORK TREND ANALYSIS

This report covers results from the fourth year of monitoring by the AMN, which has been collecting samples since 2011 (Vidrio et al., 2013a Vidrio et al., 2013b, Vidrio et al., 2014). Of the 34 pesticides and 5 pesticide breakdown products monitored by DPR in 2011, 29 were detected in at least one sample. All concentrations were low relative to the screening levels. Overall, 92.5 % of the 5,676 analyses (number of samples times the number of chemicals analyzed) resulted in no detectable concentrations. Only 7.5% of the analyses had detectable (trace or quantifiable) concentrations, and 3% of the analyses had quantifiable concentrations. None of the pesticides exceeded their screening levels for exposure periods of one year or less, indicating low health risk to the people in these communities. Seven of the nine pesticides (plus two breakdown products) detected at quantifiable concentrations in the AMN were either fumigants (1,3-dichloropropene, chloropicrin, methyl bromide, MITC) or organophosphate insecticides (chlorpyrifos, diazinon, malathion).

Of the 33 pesticides and 5 pesticide breakdown products monitored by DPR in 2012, 24 were detected in at least one sample. All concentrations were low relative to the screening levels. A total of 6,002 analyses were conducted on the air samples collected from all three sampling locations from January 1, 2012 to December 31, 2012. Of the 6,002 analyses, 331 (5.5%) showed detectable concentrations, which included quantifiable and trace detections. Samples with quantifiable concentrations accounted for 1.3% (81) of all analyses conducted. Quantifiable detections refer to concentrations above the LOQ for their respective

pesticide. Fourteen of the 33 pesticides and 5 pesticide breakdown products monitored by DPR were not detected.

Of the 32 pesticides and 5 pesticide breakdown products monitored by DPR in 2013, 24 were detected in at least one sample. Chloropicrin exceeded its subchronic screening level, and 1,3-dichloropropene was detected at a level, that if continued for 70 years, would exceed DPR's regulatory goal for cancer risk. All other concentrations were low relative to the screening levels. A total of 6,033 analyses were conducted on the air samples collected from all three sampling locations from January 1, 2013 to December 31, 2013. Of the 6,033 analyses, 426 (7.1%) showed detectable concentrations, which included quantifiable and trace detections. Samples with quantifiable concentrations accounted for 2.6% (159) of all analyses conducted. Quantifiable detections refer to concentrations above the LOQ for their respective pesticide. Thirteen of the 33 pesticides and 5 pesticide breakdown products monitored by DPR were not detected.

Of the 32 pesticides and 5 pesticide breakdown products monitored by DPR in 2014, 23 were detected in at least one sample. None of the pesticides exceeded their screening level, but 1,3-dichloropropene was detected at a level, that if continued for 70 years, would exceed DPR's regulatory goal for cancer risk exceeded DPR's regulatory goal for cancer risk. All concentrations were low relative to the screening levels. A total of 5,966 analyses were conducted on the air samples collected from all three sampling locations from January 1, 2014 to December 31, 2014. Of the 5,966 analyses, 498 (8.3%) showed detectable concentrations, which included quantifiable and trace detections. Samples with quantifiable concentrations accounted for 3.8% (225) of all analyses conducted. Quantifiable detections refer to concentrations above the LOQ for their respective pesticide. Fourteen of the 32 pesticides and 5 pesticide breakdown products monitored by DPR were not detected.

Table 35 shows the highest 24-hour concentrations from all three AMN sampling locations from 2011, 2012, 2013, and 2014. Concentrations measured in 2012 were relatively lower than the concentrations measured in 2011 for most pesticides monitored with the exception of chlorpyrifos, chlorpyrifos OA, and carbon disulfide both of which were not detected in 2011 but had quantifiable concentrations in 2012. Similarly, concentrations measured in 2013 were both lower and higher than concentrations measured in 2011 or 2012, depending on the pesticide monitored. Each of the previously detected pesticides (either in 2011 or 2012) were also detected in 2013 at quantifiable or at trace concentrations in at least one sampling location. Generally, the quantifiable concentrations in 2014 are lower than the ones in 2013 except methyl bromide and chlorothalonil in Shafter and carbon disulfide in Salinas.

Table 36 shows the highest rolling 4-week average concentrations from all three AMN sampling locations from 2011 through 2014. Concentrations are presented as rolling or moving averages (i.e., average of weeks 1, 2, 3, and 4; average of weeks 2, 3, 4, and 5, etc.). Although, most concentrations measured in 2012 were relatively lower than the concentrations measured in 2011 for most pesticides monitored, the highest rolling 4-week average concentrations for chlorpyrifos, chlorpyrifos OA, DDVP, and diuron all were higher in 2012 compared to the highest rolling 4-week average concentrations from 2011. Compared to highest rolling 4-week average concentrations from 2011 and 2012, 2013 concentrations provided mixed results: seven pesticides were generally higher than previously measured concentrations in 2011 or 2012 (1,3-Dichlorpropene (1,3-D), carbon disulfide, chloropicrin, chlorpyrifos, chlorpyrifos OA, DDVP, and EPTC), seven pesticides were generally lower than previously measured concentrations in 2011 or 2012 (diazinon, diazinon OA, diuron, malathion, malathion OA, methyl bromide, and MITC), and two pesticides were detected in 2013 that were previously never been measured above trace levels in either 2011 or 2012 as part of the AMN monitoring (chlorothalonil and oxyfluorfen). In the case of 2014 results, the rolling 4-week average concentrations showed decreasing trend relative to 2013 results except for carbon disulfide in all sites, chlorthal-dimethyl and diuron in Salinas, and methyl bromide in Ripon. Diazinon, and

dimethoate OA were two pesticides that were not detected in 2014 but had been detected in previous sampling years.

As listed in Table 37, the 1-year average concentrations from the pesticides with at least one detectable concentration in 2012 were generally lower than the average concentrations from 2011. With the exception of diuron, malathion, and malathion OA; pesticides detected in 2013 had a higher 1-year average concentration than the same pesticides in 2011 and 2012. In 2014 the 1-year average concentrations for most pesticides decreased relative to the average concentrations of the same pesticides in 2013 with exception of chlorothalonil (22 ng/m^3 in 2014 vs 16 ng/m^3 in 2013).

Table 35. Highest 24-hour concentrations for pesticides with at least one detectable concentration by year (2011 – 2014) for each AMN sampling location.

Chemical	Highest 24-hour concentration (ng/m^3)											
	Salinas				Shafter				Ripon			
	2011	2012	2013	2,014	2011	2012	2013	2,014	2011	2012	2013	2,014
1,3-Dichloropropene	10,072 (6%)†	3,430 (2%)	4,319 (16%)	440 (4 %)	ND‡	3,643 (6%)	39,969 (26%)	9251 (37%)	12,250 (4%)	ND	14,745 (17%)	3511 (19 %)
Acephate	Trace (2%)	ND	ND	ND	ND	Trace (2%)	ND	ND	ND	ND	ND	ND
Acrolein*	3,117 (58%)	----	----	----	2,796 (60%)	----	----	----	5,959 (57%)	----	----	----
Bensulide	Trace (9%)	ND	ND	ND	Trace (2%)	ND	ND	ND	ND	ND	ND	ND
Carbon Disulfide	ND	616 (2%)	153 (14%)	691 (44%)	ND	ND	897 (15%)	548 (50%)	ND	ND	464 (11%)	370 (49%)
Chloropicrin	3,926 (6%)	ND	6,384 (13%)	4,809 (2%)	ND	ND	ND	ND	ND	ND	1,279 (6%)	1,150 (4%)
Chlorothalonil	ND	ND	Trace (4%)	Trace (12%)	Trace (13%)	Trace (23%)	80 (60%)	118 (13%)	Trace (38%)	Trace (21%)	Trace (42%)	Trace (66%)
Chlorpyrifos	Trace (23%)	Trace (23%)	Trace (2%)	Trace (2%)	27 (53%)	131 (48%)	423 (75%)	338 (56%)	Trace (19%)	Trace (13%)	Trace (21%)	Trace (15%)
Chlorpyrifos OA	Trace (11%)	Trace (8%)	ND	ND	9 (45%)	17 (48%)	143 (55%)	110 (62%)	Trace (25%)	13 (19%)	Trace (23%)	Trace (17%)
Chlorthal-dimethyl	Trace (40%)	Trace (52%)	Trace (49%)	10 (63 %)	Trace (15%)	ND	Trace (8%)	ND	Trace (6%)	ND	ND	ND
DDVP	Trace (6%)	Trace (10%)	52 (13%)	Trace (12%)	Trace (2%)	ND	Trace (6%)	Trace (2%)	ND	69 (2%)	Trace (8%)	Trace (2%)
Diazinon	Trace (23%)	Trace (2%)	39 (2%)	ND	60 (11%)	Trace (4%)	29 (6%)	ND	Trace (4%)	Trace (4%)	49 (4%)	ND
Diazinon OA	Trace (17%)	ND	26 (2%)	ND	36 (4%)	10 (8%)	Trace (8%)	ND	Trace (2%)	Trace (2%)	Trace (2%)	Trace (2%)
Dimethoate OA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Trace (2%)	ND
Diuron	Trace (4%)	32 (40%)	Trace (19%)	14.4 (8%)	Trace (6%)	Trace (12%)	Trace (2%)	Trace (10%)	ND	Trace (10%)	Trace (2%)	Trace (4%)
Endosulfan	ND	ND	ND	Trace (2%)	ND	ND	ND	ND	ND	Trace (2%)	Trace (2%)	Trace (4%)
EPTC	ND	ND	ND	Trace (2%)	187 (17%)	18 (4%)	250 (9%)	216 (12%)	ND	ND	ND	ND
Iprodione	ND	ND	ND	ND	Trace (2%)	Trace (4%)	Trace (4%)	Trace (6%)	Trace (2%)	Trace (2%)	Trace (9%)	Trace (2%)
Malathion	13 (9%)	Trace (13%)	Trace (15%)	Trace (12%)	ND	Trace (2%)	Trace (4%)	Trace (2%)	Trace (2%)	ND	Trace (2%)	ND
Malathion OA	Trace (30%)	Trace (31%)	Trace (13%)	Trace (27%)	Trace (6%)	11 (10%)	Trace (9%)	Trace (6%)	Trace (13%)	Trace (10%)	Trace (13%)	Trace (8%)
Methidathion	Trace (9%)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methyl bromide	6,055 (19%)	2,527 (10%)	4,425 (10%)	3,063 (27%)	2,934 (9%)	2,135 (4%)	209 (4%)	963 (15%)	2,934 (20%)	2,667 (4%)	1,153 (9%)	2,329 (30%)
Metolachlor	Trace (11%)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MITC	51 (10%)	182 (6%)	234 (15%)	72 (12%)	930 (40%)	347 (56%)	762 (57%)	113 (42%)	308 (42%)	90 (23%)	852 (19%)	203 (23%)
Norflurazon	Trace (4%)	ND	ND	ND	Trace (2%)	ND	ND	ND	ND	ND	ND	ND
Oryzalin	Trace (2%)	ND	ND	ND	Trace (2%)	Trace (2%)	Trace (2%)	Trace (2%)	ND	Trace (6%)	ND	ND
Oxyfluorfen	ND	ND	53 (2%)	ND	ND	ND	ND	ND	Trace (4%)	Trace (6%)	ND	Trace (2%)
Permethrin	ND	ND	ND	ND	Trace (2%)	ND	Trace (2%)	ND	Trace (4%)	ND	Trace (2%)	Trace (2%)
Phosmet	Trace (2%)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Propargite	ND	ND	ND	ND	Trace (2%)	ND	Trace (11%)	ND	Trace (4%)	Trace (13%)	Trace (4%)	Trace (11%)
Simazine	Trace (6%)	Trace (4%)	ND	Trace (2%)	Trace (4%)	Trace (12%)	ND	Trace (4%)	Trace (2%)	Trace (10%)	ND	Trace (2%)
Trifluralin	Trace (2%)	Trace (2%)	ND	ND	Trace (9%)	Trace (6%)	Trace (4%)	Trace (4%)	Trace (25%)	Trace (23%)	Trace (11%)	Trace (15%)

†Values in parentheses refer to the percentage of samples with detections.

‡ND = Not Detected.

*Acrolein, which was previously included on the AMN as a monitored pesticide was dropped from AMN monitoring starting on January 1, 2012.

Table 36. Highest rolling 4-week average concentrations for pesticides with at least one detectable concentration by year (2011 – 2014) for each AMN sampling location.

Chemical	Highest 4-week rolling concentration (ng/m^3)											
	Salinas				Shafter				Ripon			
	2011	2012	2013	2,014	2011	2012	2013	2,014	2011	2012	2013	2,014
1,3-Dichloropropene	2743‡	1,082	2,611	158	ND†	1,135	18,022	4,077	4,022	ND	7,993	1,740
Acephate	Trace	ND	ND	ND	ND	Trace	ND	ND	ND	ND	ND	ND
Acrolein*	1,706	----	----	----	1,901	----	----	----	2,773	----	----	----
Bensulide	Trace	ND	ND	ND	Trace	ND	ND	ND	ND	ND	ND	ND
Carbon Disulfide	ND	271	156	319	ND	ND	341	303	ND	ND	170	226
Chloropicrin	1,809	ND	3,224	2,161	ND	ND	ND	ND	ND	ND	987	578
Chlorothalonil	ND	ND	Trace	Trace	Trace	Trace	38	Trace	Trace	Trace	Trace	Trace
Chlorpyrifos	Trace	Trace	Trace	Trace	15	46	113	92	Trace	Trace	Trace	Trace
Chlorpyrifos OA	Trace	Trace	ND	ND	7	13	44	32	Trace	8	Trace	Trace
Chlorthal-dimethyl	Trace	Trace	Trace	7	Trace	ND	Trace	ND	Trace	ND	ND	ND
DDVP	Trace	Trace	28	Trace	Trace	ND	Trace	Trace	ND	18	Trace	Trace
Diazinon	Trace	Trace	10	ND	18	Trace	10	ND	Trace	Trace	14	ND
Diazinon OA	Trace	ND	7	ND	11	Trace	ND	ND	Trace	Trace	ND	Trace
Dimethoate OA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Trace	ND
Diuron	Trace	20	Trace	8	Trace	Trace	Trace	Trace	ND	Trace	Trace	Trace
Endosulfan	ND	ND	ND	Trace	ND	ND	ND	ND	ND	Trace	Trace	Trace
EPTC	ND	ND	ND	Trace	76	Trace	139	86	ND	ND	ND	ND
Iprodione	ND	ND	ND	ND	Ttrace	Trace	Trace	Trace	Trace	Trace	Trace	Trace
Malathion	Trace	Trace	Trace	Trace	ND	Trace	Trace	Trace	Trace	ND	Trace	ND
Malathion OA	Trace	Trace	Trace	Trace	Trace	Trace	Trace	Trace	Trace	Trace	Trace	Trace
Methidathion	Trace	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methyl bromide	4,124	1,098	1,871	1,262	1,403	683	198	389	1,659	1,119	437	867
Metolachlor	Trace	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MITC	15	71	89	36	564	177	319	74	144	50	272	98
Norflurazon	Trace	ND	ND	ND	Trace	ND	ND	ND	ND	ND	ND	ND
Oryzalin	Trace	ND	ND	ND	Trace	Trace	Trace	Trace	ND	Trace	ND	ND
Oxyfluorfen	ND	ND	16	ND	ND	ND	ND	ND	Trace	Trace	ND	Trace
Permethrin	ND	ND	ND	ND	Trace	ND	Trace	ND	Trace	ND	Trace	Trace
Trifluralin	Trace	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Propargite	ND	ND	ND	ND	Trace	ND	Trace	ND	Trace	Trace	Trace	Trace
Simazine	Trace	Trace	ND	Trace	Trace	Trace	ND	Trace	Trace	Trace	ND	Trace
Trifluralin	Trace	Trace	ND	ND	Trace	Trace	Trace	Trace	Trace	Trace	Trace	Trace

† ND = Not Detected.

‡Concentrations are presented as rolling or moving averages (i.e., average of weeks 1,2,3, and 4; average of weeks 2,3,4, and 5, etc.).

*Acrolein, which was previously included on the AMN as a monitored pesticide was dropped from AMN monitoring starting on January 1, 2012.

Table 37. Comparison of the 1-year average concentrations for pesticides with at least one detectable concentration by year (2011 – 2014) for each AMN sampling location.

Chemical	Overall average concentration (ng/m^3)												
	Salinas				Shafter				Ripon				
	2011	2012	2013	2014	2011	2012	2013	2014	2011	2012	2013	2014	
1,3-Dichloropropene	760	360	407	33	ND†	453	2,589	909	851	ND	914	302	
Acephate	Trace	ND	ND	ND	ND	Trace	ND	ND	ND	ND	ND	ND	
Acrolein*	1,706	----	----	----	1,901	----	----	----	2,773	----	----	----	
Bensulide	Trace	ND	ND	ND	Trace	ND	ND	ND	ND	ND	ND	ND	
Carbon Disulfide	ND	270	136	84	ND	ND	149	86	ND	ND	140	76	
Chloropicrin	325	ND	413	291	ND	ND	ND	ND	ND	ND	177	146	
Chlorothalonil	ND	ND	Trace	Trace	Trace	Trace	16	22	Trace	Trace	Trace	Trace	
Chlorpyrifos	Trace	Trace	Trace	Trace	Trace	Trace	20	16	Trace	Trace	Trace	Trace	
Chlorpyrifos OA	Trace	Trace	ND	ND	Trace	Trace	8	7	Trace	Trace	Trace	Trace	
Chlorthal-dimethyl	Trace	Trace	Trace	Trace	Trace	ND	Trace	ND	Trace	ND	ND	ND	
DDVP	Trace	Trace	Trace	Trace	Trace	ND	Trace	Trace	ND	Trace	Trace	Trace	
Diazinon	Trace	Trace	Trace	ND	Trace	Trace	Trace	ND	Trace	Trace	Trace	ND	
Diazinon OA	Trace	ND	Trace	ND	Trace	Trace	ND	ND	Trace	Trace	ND	Trace	
Dimethoate OA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Trace	ND	
Diuron	Trace	Trace	Trace	Trace	Trace	Trace	Trace	Trace	ND	Trace	Trace	Trace	
Endosulfan	ND	ND	ND	Trace	ND	ND	ND	ND	ND	Trace	Trace	Trace	
EPTC	ND	ND	ND	ND	Trace	Trace	Trace	Trace	ND	ND	ND	ND	
Iprodione	ND	ND	ND	ND	Ttrace	Trace	Trace	Trace	Trace	Trace	Trace	Trace	
Malathion	Trace	Trace	Trace	Trace	ND	Trace	Trace	Trace	Trace	ND	Trace	Trace	
Malathion OA	Trace	Trace	Trace	Trace	Trace	Trace	Trace	Trace	Trace	Trace	Trace	Trace	
Methidathion	Trace	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Methyl bromide	1,020	355	301	187	425	247	163	70	656	315	194	172	
Metolachlor	Trace	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
MITC	6	Trace	Trace	Trace	73	51	66	21	34	14	37	15	
Norflurazon	Trace	ND	ND	ND	Trace	ND	ND	ND	ND	ND	ND	ND	
Oryzalin	Trace	ND	ND	ND	Trace	Trace	Trace	Trace	ND	Trace	ND	ND	
Oxyfluorfen	ND	ND	Trace	ND	ND	ND	ND	ND	Trace	Trace	ND	Trace	
Permethrin	ND	ND	ND	ND	Trace	ND	Trace	ND	Trace	ND	Trace	Trace	
Trifluralin	Trace	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Propargite	ND	ND	ND	ND	Trace	ND	Trace	ND	Trace	Trace	Trace	Trace	
Simazine	Trace	Trace	ND	Trace	Trace	Trace	ND	Trace	Trace	Trace	ND	Trace	
Trifluralin	Trace	Trace	ND	ND	Trace	Trace	Trace	Trace	Trace	Trace	Trace	Trace	

† ND = Not Detected.

*Acrolein, which was previously included on the AMN as a monitored pesticide was dropped from AMN monitoring starting on January 1, 2012.

Comparison to Other Monitoring

ARB, in support of DPR's Toxic Air Contaminant monitoring program, monitors ambient air for a variety of pesticides. ARB monitors air concentrations of a pesticide in counties with the highest reported use for that particular pesticide and during the season of its highest reported use. The ambient air sampling conducted under this program includes results for 15 of the pesticides monitored in the AMN: 1,3-dichloropropene, chlorpyrifos, chlorpyrifos OA, chlorothalonil, diazinon, endosulfan, EPTC, malathion, malathion OA, MITC, methyl bromide, permethrin, propargite, simazine and S,S,S-tributylphosphorotrithioate (DEF) (Table 38).

Pesticide Action Network North America (PANNA) monitored for chlorpyrifos and its oxygen analog in Lindsay (Tulare County) as part of its Drift Catcher program (Mills and Kegley, 2006) in locations near or next to applications. The program collected 104 24-hour samples between July 13 and August 2, 2004, and 108 samples between June 13 and July 22, 2005. In 2004, 76 percent of the samples were above the quantitation limit of 30 ng/sample (equivalent to 6 ng/m^3 for a 24-hour sample). Chlorpyrifos had the highest measured concentration, 1,340 ng/m^3 for a 24-hour period (Table 38).

Maximum 24-hour concentrations measured at Salinas and Ripon in 2014 were much lower than concentrations measured in other parts of the state by ARB, PANNA, or those measured by DPR in Parlier. Concentrations measured in 2014 for endosulfan, chlorothalonil, chlorpyrifos, chlorpyrifos OA, EPTC, and methyl bromide were higher than the 24-hour maximum concentrations measured in Parlier, but lower than concentrations measured in other parts of the state by ARB or PANNA (Table 38).

Table 38. Highest 24-hour concentrations of the pesticides monitored in Salinas, Shafter, and Ripon from 2011 to 2014 compared to previous DPR/ARB and PANNA monitoring studies in California.

Chemical	Year	County	Other Studies	Parlier	2011			2012			2013			2014		
					Salinas	Shafter	Ripon	Salinas	Shafter	Ripon	Salinas	Shafter	Ripon	Salinas	Shafter	Ripon
			Maximum 24-hr concentration (ng/m^3)													
1,3-D	2000	Kern	135,000	23,080	10,072	ND†	12,249	3,430	3,643	ND	4,319	39,969	14,745	440	9,251	3,511
Chlorothalonil	2002	Fresno	14	Trace	ND	Trace	Trace	ND	18	Trace	Trace	80	Trace	Trace	118	Trace
Chlorpyrifos	2004	Tulare	1,340	150	Trace	27	Trace	Trace	131	Trace	Trace	423	Trace	Trace	338	Trace
Chlorpyrifos OA	1996	Tulare	230	28	Trace	9.2	Trace	Trace	17	13	ND	143	Trace	ND	110	Trace
Diazinon	1997	Fresno	290	172	Trace	60	Trace	Trace	Trace	Trace	39	29	49	ND	ND	ND
Endosulfan	1996	Fresno	166	ND	ND	ND	ND	ND	ND	Trace	ND	ND	Trace	Trace	ND	Trace
EPTC	1996	Imperial	240	ND	ND	187	ND	ND	18	ND	ND	250	ND	Trace	216	ND
Malathion	1998	Imperial	90	21	13	ND	Trace	Trace	Trace	ND	Trace	Trace	Trace	Trace	Trace	ND
Malathion OA	1998	Imperial	28	16	Trace	Trace	Trace	Trace	11	Trace	Trace	Trace	Trace	Trace	Trace	Trace
Methyl bromide	2001	Santa Cruz	142,000	2,468	6,055	2,934	2,934	2,527	2,135	2,667	4,425	209	1,153	3,063	963	2,329
MITC	1993	Kern	18,000	5,010	51	930	308	182	347	90	234	762	852	72	113	203
Permethrin	1997	Monterey	Trace	Trace	ND	Trace	Trace	ND	ND	ND	ND	Trace	Trace	ND	ND	Trace
Propargite	1999	Fresno	1300	Trace	ND	Trace	Trace	ND	ND	Trace	ND	Trace	Trace	ND	ND	Trace
Simazine	1998	Fresno	18	Trace	Trace	Trace	Trace	Trace	Trace	Trace	ND	ND	ND	Trace	Trace	Trace
DEF	1987	Fresno	330	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

† ND = Not Detected.

DATA VALIDATION/QUALITY ASSURANCE

Data Review

Before evaluating any data, the entire set of sample chains of custody (COC) and laboratory quality assurance data were reviewed to determine the strength of the data for final assessment. The sample COCs were checked for any notations of flow faults or stoppage in sample collection, or any changes greater than 20 percent in the flow over the sampling interval. There were no invalid air samples in 2014.

Quality Control Results

Laboratory matrix spikes and matrix blanks were included with every set of samples extracted and analyzed at the laboratory and are part of the laboratory quality control (QC) program. The matrix spikes are conducted to assess accuracy and precision; the blanks are to check for contamination at the laboratory or contamination of the resin packed in the sorption tubes. The blank matrix materials were not fortified, but were extracted and analyzed along with the matrix spikes and field samples. Table 39 lists the averages for the quality control samples that were extracted and analyzed with the air samples for the entire monitoring period. Laboratory matrix spike recovery averages ranged from 73% to 99% for all chemicals analyzed. None of the laboratory matrix spike samples were outside the control limits established from the validation data.

The matrix blind spikes were fortified by a CDFA chemist not associated with the analysis. The blind spikes were given to DPR staff, relabeled, and then intermingled and delivered with field samples. Table 39 lists the average percent recovery results and they ranged from 29% to 115%. The trip blanks were blank matrix samples that were transported to and from the field locations, but were not placed on air pumps. These samples were a control to check for contamination during transportation.

Field blanks, blind spikes and duplicate samples are part of DPR's field and laboratory QC program. A duplicate sample is a sample that is co-located with another sample in the field. These samples serve to evaluate overall precision in sample measurement and analysis. Table 40 lists duplicate samples with quantifiable concentrations which had a maximum relative difference of 7.5%for the XAD multiple pesticide samples, 12.8% for the MITC samples, 0% for chloropicrin samples, and 29.1% for VOC samples.

Table 39. Average results for quality control/quality assurance in samples from the 2014 AMN.

Chemical	Lab spikes (% recovery)	Field spikes (% recovery)	Lab blanks (ng/m^3)	Trip blanks (ng/m^3)
Acephate	94	72	ND	ND
Bensulide	94	70	ND	ND
Carbon Disulfide	95	NS	ND	ND
Chloropicrin	94	86	ND	ND
Chlorothalonil	96	93	ND	ND
Chlorpyrifos	95	NS	ND	ND
Chlorpyrifos OA	93	88	ND	ND
Cypermethrin	95	60	ND	ND
Chlorthal-dimethyl (DCPA)	95	83	ND	ND
DDVP	91	83	ND	ND
Diazinon	90	91	ND	ND
Diazinon OA	95	92	ND	ND
cis-1,3-Dichloropropene	98	96	ND	ND
trans-1,3-Dichloropropene	98	121	ND	ND
Dicofol	98	NS	ND	ND
Dimethoate	96	84	ND	ND
Dimethoate OA	96	96	ND	ND
Diuron	96	77	ND	ND
Endosulfan	95	90	ND	ND
Endosulfan Sulfate	97	96	ND	ND
EPTC	85	76	ND	ND
Iprodione	95	83	ND	ND
Malathion	96	NS	ND	ND
Malathion OA	97	NS	ND	ND
Methidathion	89	NS	ND	ND
Methyl Bromide	97	65	ND	ND
Metolachlor	93	115	ND	ND
MITC	73	63	ND	ND
Norflurazon	96	63	ND	ND
Oryzalin	94	44	ND	ND
Oxydemeton methyl	87	29	ND	ND
Oxyfluorfen	99	75	ND	ND
Permethrin	94	NS	ND	ND
Phosmet	96	97	ND	ND
Propargite	97	76	ND	ND
Simazine	95	92	ND	ND
SSS-tributyl… (DEF)	91	87	ND	ND
Trifluralin	95	53	ND	ND

†ND = Not detected.

‡NS = Field sample not spiked with the chemical.

Table 40. Results for duplicate sample pairs in 2014.

Primary/duplicate results	Number of pairs			
	Multi-pesticide residue analysis samples	MITC samples	Chloropicrin samples	VOC samples
ND†/ND	443	10	16	31
Trace‡/Trace	28	0	0	0
ND/Trace	6	1	0	0
ND/>LOQ	1	2	0	3
Trace/>LOQ	0	0	0	0
>LOQ/>LOQ	2	3	0	10
Relative Difference*	7.5%	12.8%	0%	29.1%

†ND = Not detected.
‡Trace = Pesticide detection confirmed, but less than the quantitation limit.
*For pairs with both concentrations >LOQ.

Validation and Control Limits

The MITC and the multi-pesticide pesticide analysis method were validated according to the DPR standard operating procedures (DPR, 1995). The laboratory conducted validations by spiking three to five matrix blanks at three to five different spike levels, and then analyzing them. This procedure was repeated three to five times. From the validation data, DPR created control limits by multiplying the standard deviation of the data by $\pm$ 3 times and adding it to the mean.

DISCUSSION

For 1,3-dichloropropene, DPR's goal is not to exceed the regulatory target of 650 ng/m^3 (0.14 ppb) as an average for a 70-year lifetime exposure. The data from the Shafter site showed that for the 4 years of monitoring, 1,3-dichloropropene was detected at an average level that, if continued for 70 years, would exceed DPR's regulatory target. Since 1,3-dichloropropene exceeded the regulatory goal for cancer risk over these four years, DPR is in the process of conducting a detailed evaluation for this pesticide. It should be noted, however, that the monitored level for the Shafter site in 2014 is considerably lower than the 2013 results. The 1,3-dichloropropene evaluation includes analysis of pesticide use data, such as amount, date, and location of applications, as well analysis of wind speed, wind direction and other weather conditions during the time high concentrations were detected. DPR is also updating its risk assessment for 1,3-dichloropropene. DPR implemented a township cap for 1,3-dichloropropene in 1999 to control cancer risk. However, DPR approved waivers to the cap for several townships each year. The high concentrations detected at the AMN sites, as well as sites from other monitoring, occurred in townships or adjacent to townships where DPR granted waivers to the township cap. Based on previous air monitoring network results, DPR suspended approval of the township cap waivers in February 2014. This is likely the primary reason for the decrease in the 1,3-dichloropropene air concentrations between 2013 and 2014.

Seven of the eleven detected at quantifiable concentrations in the AMN were either fumigants (1,3-dichloropropene, carbon disulfide, methyl bromide, chloropicrin, and MITC) or organophosphate insecticides (chlorpyrifos + OA). Chlorothalonil, chlorthal-dimethyl (DCPA), diuron, and EPTC were also detected at quantifiable concentrations.

The AMN results supplement data from the Toxic Air Contaminant program, and allow DPR to provide more robust estimates of subchronic and chronic exposures to individuals as well as assess cumulative exposure to

multiple pesticides. Organophosphates were the only pesticides that were detected at quantifiable concentrations and have a common mode of action (cholinesterase inhibition). The hazard index (combined screening level) for organophosphates was less than one for all exposure periods, indicating a low risk from cumulative exposure.

Relative to the screening levels, air concentrations representing chronic exposure were less than the acute or subchronic exposures for most pesticides. While the subchronic exposure was greater than the acute exposure for several pesticides, the AMN and other community ambient air monitoring usually underestimates acute exposure. While acute exposure is discussed in this report, the AMN best measures subchronic and chronic exposures. Estimation of acute exposures is not one of the AMN objectives. The AMN's ambient air monitoring in communities is the standard method DPR uses to estimate subchronic and chronic exposures. Application-site monitoring in the immediate vicinity of a treated field is normally used to estimate acute exposure, and these air concentrations are typically several times higher than acute exposures measured from ambient air monitoring since they are collected 100 feet or less from the application, whereas ambient samples may be collected a mile or more away. It's likely that the maximum acute exposure is higher than indicated by these data.

DPR has established regional use limits (township caps) for methyl bromide to control subchronic exposure. Townships are 6 x 6 mile areas designated by the Public Lands Survey System. The township cap for methyl bromide is a monthly cap, with the goal of limiting the subchronic exposure to no more than the screening level of 19,400 ng/m^3 (5 ppb). All measured air concentrations were less than ten percent of DPR's regulatory target, indicating that the methyl bromide township caps are effectively keeping air concentrations below the health protective targets set by DPR.

Higher pesticide air concentrations have been detected in other studies. This is likely due to greater amounts of pesticides applied near the monitoring sites for the other studies, as well as mitigation measures implemented since some of the studies were conducted. Ambient air monitoring for the toxic air contaminant program focuses on the highest use areas and highest use periods for individual pesticides.

Additionally, to reduce exposure to chloropicrin, DPR implemented new control measures in April 2015. The mitigation measures will reduce overall air concentrations and include such conditions as smaller maximum application size and larger buffer zones for many applications.

DPR plans to continue monitoring at the same AMN sites through at least 2015, in part to determine the effectiveness of the actions to reduce exposure to chloropicrin and 1,3-dichloropropene.

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