AIR MONITORING NETWORK RESULTS FOR 2019

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EXECUTIVE SUMMARY

In February 2011, the California Department of Pesticide Regulation (CDPR) implemented a multi-year statewide air monitoring network to measure pesticides in various agricultural communities. The pesticide Air Monitoring Network (AMN) is the first multi-year air monitoring study conducted by CDPR. This AMN annual report is the ninth volume of this study and contains AMN results from January 1, 2019, to December 31, 2019. The goals of the AMN are to provide data that assist CDPR in: assessing potential health risks, developing measures to mitigate risks, and evaluating the effectiveness of regulatory requirements. Based on these goals, the AMN is designed to assess long-term chronic exposures in ambient air. Representative communities were selected using an exhaustive selection process detailed in the Air Monitoring Network Site Selection Report, which can be found at: https://www.cdpr.ca.gov/docs/emon/airinit/air_network.htm. This site selection report is updated periodically to account for changes that impact California's communities and evaluate trends in pesticide use.

The main objective of the AMN is to evaluate chronic exposures in ambient air. The study is specifically designed to address chronic exposures by monitoring ambient air over a period of years to decades. Permanent sites located in high use areas of the state are selected for this purpose. In the course of the study, DPR obtains data on both acute and sub-chronic exposures. While not the focus of the AMN, results in relation to both acute and sub-chronic exposures are still discussed here. However, CDPR and CARB routinely conduct application site and seasonal monitoring studies, which are designed to obtain more information on acute and sub-chronic exposures, respectively. Application site and seasonal monitoring studies for individual pesticides can be found at: https://www.cdpr.ca.gov/docs/emon/airinit/air_monitoring_reports.htm. The air monitors are located in high-use areas and are designed to capture pesticide emissions; however, monitoring data from these areas may not be representative for all of California.

In 2019, CDPR, with the assistance of staff from the California Air Resources Board and the Santa Barbara County Agricultural Commissioner's Office, monitored a total of 31 pesticides and 5 pesticide breakdown products in eight communities. Pesticides monitored in the AMN were selected based primarily on potential risk to human health. Higher-risk pesticides were prioritized and selected for inclusion in the AMN based on higher use, higher volatility, and higher toxicity.

The AMN originally provided monitoring for three communities; however, as part of the Budget Act of 2016, it was temporarily expanded to include five additional sites (for a total of eight sites) for a two-year period. All eight sites were operational throughout 2019.

One 24-h sample was collected each week at each monitoring location. Sampling start dates were randomly selected each week to produce variation in the sampling day while sampling start times were between 5:30 a.m. to 4:00 p.m.

Of the 14,616 analyses[1] conducted, 96.2% (14,061) did not return a detectable concentration. Of the 555 (3.8%) analyses with a detectable (trace or quantifiable) concentration, only 139 (0.95%) had quantifiable concentrations. A quantifiable concentration refers to a concentration above the analytical limit of quantitation.

Of the 36 chemicals monitored, 10 were not detected, 16 were only detected at trace levels, and the remaining 10 compounds (1,3-dichloropropene [1,3-D], chloropicrin, dacthal, DDVP, EPTC, malathion, malathion oxygen analog , MITC, pp-dicofol, and trifluralin) were detected at quantifiable levels. The five chemicals with the highest number of detections from all eight sites were MITC, chloropicrin, malathion, 1,3-D, and Dacthal. The number of detections following the top five were significantly lower.

No state or federal agency has established health standards for pesticides in ambient air. Therefore, CDPR estimates the potential for adverse health effects by comparing the measured air concentration of a pesticide to developed health screening levels or regulatory targets for 1- or 3-day (depending on the pesticide), 4- or 13-week (depending on the pesticide), 1-year, and lifetime exposure periods. CDPR developed health screening levels based on a preliminary assessment of possible health effects, which are used as triggers for CDPR to conduct a more detailed evaluation. Regulatory targets are established based on a complete assessment of possible health risks and supersede the screening levels. CDPR puts measures in place based on the regulatory target to limit exposures, thereby avoiding the adverse effects on human health. Exceeding a regulatory target does not necessarily mean that an adverse health effect occurs; however, it does indicate that the restrictions on the pesticide in use may need to be modified.

None of the AMN sample results exceeded any of established health screening levels or regulatory targets for any of the 36 chemicals that were monitored in 2019.

[1] Number of analyses = Number of samples multiplied by number of chemicals analyzed in each sample.

INTRODUCTION

Background

In February 2011, as part of the California Department of Pesticide Regulation's (CDPR) mandate for continuous evaluation of currently registered pesticides, CDPR implemented its first multi-year statewide Air Monitoring Network (AMN) for measuring pesticides' concentration in the ambient air (hereafter referred to as air) in various California agricultural communities. The AMN was implemented in order to evaluate chronic exposures in ambient air; however, AMN data are used to estimate acute, sub-chronic, and 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 evaluating the effectiveness of current regulatory requirements.

The AMN has the following scientific objectives:

- Identify pesticides in air and determine seasonal, annual, and multi-year concentrations.
- Compare concentrations to acute, sub-chronic, and chronic regulatory targets or health screening levels.
- Track temporal variation in pesticide concentration in the air.
- Estimate cumulative exposure to multiple pesticides with common physiological modes of action in humans (e.g., cholinesterase inhibitors).

As part of the community selection process for the AMN, CDPR evaluated a total of 1,267 communities and ranked them based on pesticide use (both local and regional), demographic data[2], and availability of other exposure and health data. CDPR selected a total of eight communities for the AMN. In 2017, four sampling sites were operational; four others were added to the AMN in 2018. These representative communities were selected using an exhaustive selection process detailed in the AMN Site Selection Report. This report and details on the selection process and rationale of why these communities were selected can be found at: https://www.cdpr.ca.gov/docs/emon/airinit/air_network.htm. This selection report is updated periodically to account for trends or changes that impact California's communities. At each sampling site location, one set of 24-h air samples was collected on a weekly basis. A sample set is the collective term for all samples recovered from one site in one week and consists of three sorbent tubes and one canister (four chemical analytical methods). The air samples were analyzed for 31 pesticides and 5 pesticide breakdown products. This report is the ninth volume of this study and contains AMN results from January 1, 2019, to December 31, 2019.

Changes to the AMN in 2017

The Budget Act of 2016 temporarily increased funding of the AMN, enabling CDPR to expand from three original sampling sites to a total of eight sites for a period of two years (Vidrio et al., 2017). During the temporary expansion of the AMN, CDPR is responsible for the operation of three sites while the

[2] Communities with similar pesticide-use rankings were prioritized based on the number of children, number of persons over 65, and number of persons living in close proximity to farms and agricultural areas with high pesticide use.

California Air Resources Board (CARB) is responsible for operating the remaining five sampling sites. Due to sampling equipment and site procurement delays, the expansion took place in various phases starting on January 1, 2017, and concluding in August 2018 when the last of the eight monitoring sites was added to the AMN. In February 2019, the Shafter sampling site was relocated from Shafter High School to Sequoia Elementary School and in November 2019, the Santa Maria sampling site was relocated within the community of Santa Maria from a CARB monitoring location across from Santa Maria High School to Bonita Elementary School.

Number of Communities Monitored

Four communities were selected based on nearby use of the fumigants 1,3-dichloropropene (1,3-D), chloropicrin, methyl isothiocyanate (MITC), and MITC-generators, while four other communities were selected based upon the use of selected organophosphates (Vidrio et al., 2017). However, all eight sites were monitored for all 36 compounds. Complete details on community selection can be found at:

https://www.cdpr.ca.gov/docs/emon/airinit/community_monitoring.htm. Table 1 lists the eight communities selected for monitoring.

Table 1. List of communities in the 2017 AMN Monitoring Plan.

Community	County	Date of first sample collection	Agency Responsible for Site Operation
Chualar	Monterey	1/1/2017	CDPR
Cuyama	Santa Barbara	5/10/2018	CARB
Lindsay	Tulare	4/26/2018	CARB
Oxnard	Ventura	8/14/2018†	CARB
San Joaquin	Fresno	4/26/2018	CARB
Santa Maria*	Santa Barbara	1/1/2017	CDPR
Shafter**	Kern	1/1/2017 | 4/2/2018‡	CDPR → CARB‡
Watsonville	Monterey	1/1/2017	CDPR

* The sampling site in the community of Santa Maria was moved from a CARB monitoring location to Bonita Elementary School; sampling began at Bonita Elementary School on 11/12/2019.
** The sampling site in the community of Shafter was relocated from Shafter High School to Sequoia Elementary School; sampling began at Sequoia Elementary School on 2/26/2019.
† The Oxnard sampling site transitioned from a Toxic Air Contaminant (TAC) monitoring site to an AMN site in 2018. Additional information on TAC monitoring including annual monitoring reports can be accessed at the following site: https://www.cdpr.ca.gov/docs/emon/airinit/air_monitoring_reports.htm
‡ Monitoring responsibilities of the site was transitioned from CDPR to CARB. Samples collected by CARB staff began to be processed as primary samples on 4/2/18.

CARB began monitoring at their five assigned sites on various dates throughout 2018 (Table 1). Monitoring at Shafter was performed by CDPR staff until CARB was able to take over the monitoring at the site. Additionally, the Oxnard AMN site began the year as a Toxic Air Contaminant (TAC) network site in which 1,3-D and methyl bromide were monitored using 6-day intervals until it was transitioned to a full AMN site in August. After the transition, weekly monitoring for all 36 compounds was conducted at the Oxnard AMN site.

Equipment Upgrades

The increase in temporary funding allowed CDPR and CARB to purchase upgraded sampling equipment custom built for pesticide ambient air monitoring. A key advantage of the new system is greater accuracy and precision in sample collection.

Pesticides Monitored

As part of the AMN, CDPR monitored for 31 pesticides and 5 breakdown products. Chemicals included in the AMN were selected based primarily on potential health risk (Vidrio et al., 2013). Four analytical methods were used to analyze the collected air samples as part of the AMN[3]:

1) Multi-Pesticide Residue;
2) Volatile Organic Compounds (VOC);
3) Methyl Isothiocyanate (MITC); and
4) Chloropicrin.

[3] Greater detail on each of these analytical methods is provided in Appendices I and J.

AIR MONITORING NETWORK RESULTS

Results for all Pesticides and Communities Combined[4]

Pesticide Detections

A total of 14,616 analyses were conducted on the air samples collected from the eight AMN sites operating from January 1, 2019, to December 31, 2019. Of the 14,616 analyses, 3.8% (555) resulted in a detectable concentration, which includes both quantifiable (above the Limit of Quantitation [LOQ]) and trace (above the Method Detection Limit [MDL] but below the LOQ) detections[5]. Samples that resulted in a quantifiable detection accounted for 0.95% (139) of all analyses conducted.

Of the 36 pesticides and breakdown products monitored, 10 were detected at quantifiable levels, 16 were detected at trace levels, and 10 were not detected. Table 2 lists the number of detections by type for each pesticide and pesticide breakdown product at all sites included in the AMN for 2019. The chemicals with the highest number of quantifiable detections were MITC (17.5%), chloropicrin (3.4%), and malathion (3.4%).

Note: "Number of possible detections" is defined as the total number of valid samples collected for Table 2 and 3. Also, "Number is sample set" is defined as all 36 chemicals including 31 pesticides and 5 breakdown products.

Table 2. Number and percentage of positive samples per chemical for all AMN sites during 2019.

Chemical	Number of possible detections	Total number of detections*	Number of quantifiable detections	Percent of detections	Percent of quantifiable detections
1,3-dichloropropene	409	12	12	2.9%	2.9%
Acephate	406	2	0	0.5%	0%
Bensulide	406	1	0	0.2%	0%
Chloropicrin	407	28	14	6.9%	3.4%
Chlorothalonil	403	49	0	12.2%	0%
Chlorpyrifos	406	5	0	1.2%	0%
Chlorpyrifos OA	406	1	0	0.2%	0%
Cypermethrin	406	2	0	0.5%	0%
Dacthal	406	78	12	19.2%	3.0%
DDVP	403	61	3	15.1%	0.7%
DEF	406	0	0	0%	0%
Diazinon	406	1	0	0.2%	0%
Diazinon OA	406	1	0	0.2%	0%

[4] See Appendices A-H for detailed AMN results for each sampling location.

[5] Quantifiable detections refer to concentrations above the LOQ for the respective pesticide. Trace detections are measured concentrations between the LOQ and the MDL. Non-detections refer to all samples with measured concentrations below the MDL.

Chemical	Number of possible detections	Total number of detections*	Number of quantifiable detections	Percent of detections	Percent of quantifiable detections
Dimethoate	406	2	0	0.5%	0%
Dimethoate OA	406	2	0	0.5%	0%
Diuron	406	4	0	1.0%	0%
Endosulfan	406	0	0	0%	0%
Endosulfan Sulfate	406	0	0	0%	0%
EPTC	406	12	5	3.0%	1.2%
Iprodione	406	1	0	0.2%	0%
Malathion	406	55	14	13.5%	3.4%
Malathion OA	406	54	6	13.5%	1.5%
Methidathion	406	1	0	0.2%	0%
Methyl Bromide	409	0	0	0%	0%
Metolachlor	406	0	0	0%	0%
MITC	405	137	71	33.8%	17.5%
Norflurazon	406	0	0	0%	0%
Oryzalin	406	0	0	0%	0%
Oxydemeton Methyl	406	0	0	0%	0%
Oxyfluorfen	406	1	0	0.2%	0%
Permethrin	406	1	0	0.2%	0%
Phosmet	406	0	0	0%	0%
pp-dicofol	406	1	1	0.2%	0.2%
Propargite	406	1	0	0.2%	0%
Simazine	406	0	0	0%	0%
Trifluralin	406	42	1	10.3%	0.2%
Total	**14,616**	**555**	**139**	**3.8%**	**0.95%**

*Includes both quantifiable and trace detections.

Table 3 summarizes the total number of detections of the monitored chemicals by community. The percentages of detections, quantifiable and trace, for monitored chemicals in each community ranged from 1.9% to 6.2% of all collected samples. Santa Maria had the highest percentage of samples with detections (6.2%), and Shafter had the highest percentage of samples with quantifiable detections (1.6%).

A total of 413 sample sets were taken from all eight communities (54 sets from Lindsay; 53 sets from San Joaquin and Santa Maria; 52 sets from Chualar and Watsonville; 51 sets from Oxnard; and 49 sets from Cuyama and Shafter). Three hundred and one (73%) of these samples contained at least one detection (Table 4).

There were a total of 45 lost samples in 2019, detailed in Appendix I. Sample losses were attributed to adverse weather, equipment malfunctions, and samples that did not meet the criteria for being considered valid (e.g., runtime, flow rate, and ending sample pressure and/or volume). Appendix I lists the details of these lost samples.

Table 3. Detections of monitored chemicals by location, as individual samples during 2019.

Community	Number of possible detections*	Total number of detections**	Number of quantifiable detections	Percent of detections	Percent of quantifiable detections
Chualar	1,835	72	18	3.9%	1.0%
Cuyama	1,764	33	5	1.9%	0.3%
Lindsay	1,908	41	11	2.1%	0.6%
Oxnard	1,765	69	23	3.9%	1.3%
San Joaquin	1,908	73	25	3.8%	1.3%
Santa Maria	1,835	113	15	6.2%	0.8%
Shafter	1,764	83	29	4.7%	1.6%
Watsonville	1,837	71	13	3.9%	0.7%
Total	14,616	555	139	3.8%	0.9%

* Sum of total number of possible detections for all AIs monitored at that location

**Includes both quantifiable and trace detections.

Table 4. Detections of monitored chemicals by location, as weekly sample sets during 2019.

Community	Number of sample sets*	Number of sets with at least one detection**	Percent of sample sets with at least one detection
Chualar	52	50	96%
Cuyama	49	22	45%
Lindsay	53	27	50%
Oxnard	51	35	69%
San Joaquin	53	47	89%
Santa Maria	53	41	77%
Shafter	49	41	84%
Watsonville	52	28	54%
Total	413	301	73%

* A sample set is all 36 chemicals (31 pesticides +5 breakdown products).

**Includes both quantifiable and trace detections.

Pesticide Concentrations

Acute Exposure: Highest 24-h Concentrations Among All Sites

While the results of the 24-h samples and acute exposures are discussed in this report, estimating acute exposure is not one of the AMN objectives as the AMN is designed to report on chronic exposures and other long-term trends. CDPR and CARB routinely conduct application-site monitoring studies that are designed to obtain more information on acute exposures to pesticides, where monitoring is conducted in the immediate vicinity (100 feet or less) of a treated field. The air monitors are located in high-use areas and are designed to capture pesticide emissions; however, monitoring data from these areas may not be representative for all of California. Application-site monitoring studies for individual pesticides and all monitoring reports can be found at:https://www.cdpr.ca.gov/docs/emon/airinit/air_monitoring_reports.htm.

Table 5 lists the highest 24-h concentrations at any site for the pesticides detected at a quantifiable concentration in 2019. None of the pesticides or breakdown products exceeded their respective acute (24-h or 72-h) screening levels or regulatory targets during 2019 monitoring. Of all monitored pesticides, the pesticide with the highest percentage of 24-h air concentration compared to its acute screening level was DDVP (5.2%), followed by 1,3-D (2.9%), then chloropicrin (1.4%), and then MITC (0.7%). All other compounds were less than 0.5% of their acute screening levels or regulatory target during monitoring in 2019 (Table 5). The following chemicals were only detected at trace levels at any monitoring location:

- Acephate
- Bensulide
- Chlorothalonil
- Chlorpyrifos
- Chlorpyrifos oxygen analog (OA)
- Cypermethrin
- Diazinon
- Dimethoate
- Dimethoate OA
- Diuron
- Iprodione
- Oxyfluorfen
- Permethrin
- Propargite

The following chemicals were not detected at any monitoring location:

- DEF
- Diazinon OA
- Endosulfan
- Endosulfan Sulfate
- Methyl Bromide
- Methidathion
- Metolachlor
- Norflurazon
- Oryzalin
- Oxydemeton Methyl
- Phosmet
- Simazine

Table 5. Highest 24-h air concentrations, acute screening levels, and percent of screening level of any pesticide detected at a quantifiable concentration in 2019 among all eight sites.

Chemical	Highest 24-concentration	24-h acute screening level	% of screening level
1,3-dichloropropene	3.2 ppb (14,542 ng/m^3)	110 ppb (505,000 ng/m^3)‡	2.9%
Chloropicrin	1.0 ppb (6,939 ng/m^3)	73.0 ppb (491,000 ng/m^3)*†	1.4%
Dacthal	0.002 ppb (34 ng/m^3)	1,730 ppb (23,500,000 ng/m^3)	0.0001%
DDVP	0.06 ppb (572 ng/m^3)	1.22 ppb (11,000 ng/m^3)	5.2%
EPTC	0.009 ppb (73 ng/m^3)	29.7 ppb (230,000 ng/m^3)	0.03%
Malathion	0.008 ppb (113 ng/m^3)	8.33 ppb (113,000 ng/m^3)	0.1%
Malathion OA	0.001 ppb (19 ng/m^3)	8.76 ppb (113,000 ng/m^3)	0.02%
MITC	1.53 ppb (4,580 ng/m^3)	220 ppb (660,000 ng/m^3)*†	0.7%
pp-dicofol	0.001 ppb (19 ng/m^3)	4.49 ppb (68,000 ng/m^3)	0.03%
Trifluralin	0.001 (10 ng/m^3)	87.5 ppb (1,200,000 ng/m^3)	0.0008%

*This value is a regulatory target rather than a screening level.
†This value is an 8-h time-weighted-average (TWA) used to compare against the 24-h measured concentration.
‡This value is a 72-h time-weighted-average (TWA) used to compare against the 24-h measured concentration.

Sub-chronic Exposure: Highest Rolling 4-week or 13-week Average Concentrations Among All Sites

While the results of the 4- or 13- week average concentrations and sub-chronic exposures are discussed in this report, estimating sub-chronic exposures is not one of the AMN objectives as the AMN is designed to report on chronic exposures and other long-term trends. However, results in relation to sub-chronic exposures are discussed here. CDPR and CARB routinely conduct seasonal studies that are designed to obtain information on sub-chronic exposures to pesticides. Seasonal monitoring studies for individual pesticides and all monitoring reports can be found at:

https://www.cdpr.ca.gov/docs/emon/airinit/air_monitoring_reports.htm.

Table 6 lists the highest observed rolling 4-week or 13-week average concentrations for any chemical detected at a quantifiable concentration in 2019 among all sites. Chloropicrin was the pesticide with the highest rolling 13-week average concentration with an estimated concentration of 0.2 ppb (59.1%). This concentration did not exceed the given sub-chronic screening level for chloropicrin exposure. The pesticide with the highest 4-week average was the fumigant MITC, with an estimated concentration of 0.43 ppb (43% of its sub-chronic screening level).

Table 6. Highest rolling 4-week average concentrations, sub-chronic screening levels, and percent of screening levels of any pesticide detected at a quantifiable concentration in 2019 among all eight sites.

Chemical	Highest 4-week average concentration†	Sub-chronic screening level	% of screening level
1,3-dichloropropene*	0.45 ppb (2,056 ng/m^3)	3.0 ppb (14,000 ng/m^3)	14.7%
Chloropicrin*	0.2 ppb (1,359 ng/m^3)	0.35 ppb (2,300 ng/m^3)	59.1%
Dacthal	0.001 ppb (16 ng/m^3)	34.6 ppb (470,000 ng/m^3)	0.003%
DDVP	0.02 ppb (157 ng/m^3)	0.24 ppb (2,200 ng/m^3)	7.1%
EPTC	0.003 ppb (27 ng/m^3)	3.10 ppb (24,000 ng/m^3)	0.10%
Malathion	0.005 ppb (62 ng/m^3)	5.97 ppb (80,600 ng/m^3)	0.08%
Malathion OA	0.0007 ppb (10.3 ng/m^3)	6.27 ppb (80,600 ng/m^3)	0.01%
MITC	0.43 ppb (1,284 ng/m^3)	1.00 ppb (3,000 ng/m^3)	43%
pp-dicofol	0.0004 ppb (6.6 ng/m^3)	3.24 ppb (49,000 ng/m^3)	0.01%
Trifluralin	0.001 ppb (12.2 ng/m^3)	12.4 ppb (170,000 ng/m^3)	0.01%

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

* These concentrations represent the highest 13-week rolling average, rather than the default 4-week rolling average.

Chronic Exposure: Highest One-Year Average Concentrations Among All Sites

Table 7 presents the highest observed annual average concentrations for each chemical detected at a quantifiable concentration in 2019 at any AMN site alongside its respective chronic screening levels. The highest annual average concentration relative to its chronic screening level was observed for MITC (58%), followed by chloropicrin (24%) and then 1,3-D (6.7%).

Table 7. Highest annual average air concentrations, chronic screening levels, and percent of screening level of any pesticide detected at a quantifiable concentration in 2019 among all eight sites.

Chemical	Highest annual average concentration	Chronic Screening Level	% of screening level
MITC	0.06 ppb (174 ng/m^3)	0.10 ppb (300 ng/m^3)	58%
Chloropicrin	0.06 ppb (436 ng/m^3)	0.27 ppb (1,800 ng/m^3)	24%

Chemical	Highest annual average concentration	Chronic Screening Level	% of screening level
1,3-dichloropropene	0.1 ppb (599 ng/m^3)	2.00 ppb (9,000 ng/m^3)	6.7%
DDVP	0.002 ppb (15.3 ng/m^3)	0.09 ppb (770 ng/m^3)	2%
EPTC	0.0004 ppb (4.8 ng/m^3)	1.10 ppb (8,500 ng/m^3)	0.06%
Malathion OA	0.0002 ppb (2.8 ng/m^3)	0.63 ppb (8,100 ng/m^3)	0.03%
Dacthal	0.001 ppb (15.5 ng/m^3)	3.46 ppb (47,000 ng/m^3)	0.003%
Malathion	0.0007 ppb (9.6 ng/m^3)	0.60 ppb (8,100 ng/m^3)	0.01%
pp-dicofol	0.0004 ppb (6.6 ng/m^3)	1.32 ppb (20,000 ng/m^3)	0.01%
Trifluralin	0.0002 ppb (2.2 ng/m^3)	2.99 ppb (41,000 ng/m^3)	0.005%

Lifetime Exposure: Cancer Risk Estimates

The AMN monitors for seven pesticides that have been designated as known or probable carcinogens by Proposition 65 or by U.S. EPA's B2 list: 1,3-D, chlorothalonil, DDVP, diuron, iprodione, oxydemeton methyl, and propargite. Of these, only 1,3-D had any significant quantifiable concentrations during 2019 AMN sampling. Annual average concentrations and cancer risk estimates for 1,3-D are shown in Table 8. These calculations use the average concentration based on all data available from the specified site. It is important to note that these shorter timeframes are less suitable for comparison to a 70-year target and are for illustrative purposes only. These values differ from those presented in the calculated annual concentrations above because those are a simple mean (average) while a TWA is used for the cancer risk estimates.

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.). 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. Cancer risk is estimated based on the following calculation:

$$Cancer\ Risk = CPF_H * LAC * nBR$$

where:
Cancer Risk = probability of an additional case of cancer over a 70-year period.
CPF_H = estimated cancer potency factor in humans $(mg/kg/day)^{-1}$.
LAC = mean lifetime (70-year) air concentration (mg m^{-3}).
nBR = normalized breathing rate of a human adult ($m^3\ kg^{-1}\ day^{-1}$).

CDPR assumes nBR to be 0.28 $m^3\ kg^{-1}\ day^{-1}$ (CDPR, 2015). Based on the available monitoring data, LAC is taken as the mean annual concentration of the pesticide for all available monitoring years. CDPR has

estimated the following CPF_H values for three of the seven AMN-monitored pesticides; two were detected in 2019:

- For 1,3-D: CPF_H= 0.014 $(mg/kg\text{-}day)^{-1}$ (CDPR, 2015).
- For DDVP: CPF_H= 0.35 $(mg/kg\text{-}day)^{-1}$ (CDPR, 1996).

Annual average concentrations and cancer risk estimates for DDVP are shown in Table 9.

Table 8. Average 1,3-D concentrations, regulatory target, cancer risk estimates, cancer risk target, and proportion of cancer risk target for each AMN sampling location during 2019.

Community	Average concentration (ng/m^3)	Lifetime regulatory target (ng/m^3)	Cancer risk estimate	Target	Percent of target (%)
Chualar	188	2,600	7.0E-07	1.00E-05	7
Oxnard	270	2,600	2.30E-06	1.00E-05	23
San Joaquin	278	2,600	1.1E-06	1.00E-05	11
Santa Maria	293	2,600	1.1E-06	1.00E-05	11
Shafter	1,588	2,600	6.1E-06	1.00E-05	61
Watsonville	569	2,600	2.2E-06	1.00E-05	22

Table 9. Average DDVP, regulatory target, cancer risk estimates, cancer risk target, and proportion of cancer risk target for each AMN sampling location during 2019.

Community	Average concentration (ng/m^3)	Cancer risk estimate	Target	Percent of target (%)
San Joaquin	15.3	1.5E-06	1.00E-05	15
Santa Maria	5.5	5.4E-07	1.00E-05	5.4

Cumulative Exposure Estimates for Organophosphates

Cumulative exposures were calculated for organophosphates because these are the only pesticides included in the AMN that have a common mode of action (cholinesterase inhibition) and that were detected at quantifiable concentrations. The 14 organophosphates included in the AMN monitoring are:

- Acephate
- Bensulide
- Chlorpyrifos and its OA
- DDVP
- DEF
- Diazinon and its OA
- Dimethoate and its OA
- Malathion and its OA
- Oxydemeton methyl
- Phosmet

As described in Appendix K, the cumulative exposure was estimated using a hazard quotient (HQ) and hazard index (HI) 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.

Table 10 summarizes the highest calculated HI's for each community and time period during monitoring in 2019. Both the acute and sub-chronic HI values were calculated for each individual sample set, from which the maximum observed HI was reported. None of the HI's exceeded a value of 1.0 at any of the sampling locations during this year. This indicates that even for the combined 14 organophosphate compounds, a summed screening level was not exceeded.

Table 10. Summary of organophosphate cumulative exposure.

Community	Acute Hazard Index	Sub-chronic Hazard Index	Chronic Hazard Index
Chualar	0.029	0.037	0.071
Cuyama	0.091	0.101	0.121
Lindsay	0.022	0.031	0.063
Oxnard	0.024	0.034	0.058
San Joaquin	0.080	0.106	0.073
Santa Maria	0.023	0.030	0.053
Shafter	0.029	0.041	0.071
Watsonville	0.020	0.028	0.048

SUMMARY

The following fumigants accounted for three of the ten pesticides detected at quantifiable concentrations by the AMN in 2019: 1,3-D, chloropicrin, and MITC. Quantifiable detections of 1,3-D were observed at Chualar, Oxnard, San Joaquin, Santa Maria, Shafter, and Watsonville. Quantifiable detections of chloropicrin were observed at Oxnard, Santa Maria, Shafter, and Watsonville. All monitored sites had quantifiable detections of MITC, as also observed in 2018. Organophosphates and their breakdown products accounted for another three of the ten pesticides detected at quantifiable concentrations: DDVP, and malathion and its OA. The remaining four pesticides detected at quantifiable concentrations in 2019 were dacthal, EPTC, pp-dicofol, and trifluralin.

An HI was calculated for the included organophosphates that have a common mode of action (cholinesterase inhibition) and that were detected at quantifiable concentrations. The maximum HI calculated for any site at any exposure period was 0.121, indicating a low risk from cumulative exposure.

No monitored chemical exceeded its respective screening level for any of three types of exposure levels for 2019.

APPENDIX A: DETAILED RESULTS FOR CHUALAR

Chualar

Chualar is a census-designated place (0.6 square miles in area) located approximately 10 miles south-southeast of Salinas in Monterey County. The elevation is 115 feet and it receives on average 16 inches of precipitation annually. Average temperatures range from 53° to 72°F in the summer and 41 to 63°F in the winter. Based on the 2010 census, the population of Chualar was 1,190, of which 36.1% were below 18 years of age and 5.0% were above 65 years of age. The major crops in the immediate area around Chualar are strawberries, lettuce, and tomatoes. The monitoring site is located at a privately-owned water well situated on the eastern side of the community.

Pesticide Detections

Table A-1 lists the number and percentage of analyses resulting in detections at the Chualar sampling site. The active ingredient with the highest percentage of detections was for dacthal (80.4%, n = 41), followed by MITC and DDVP (15.7%, n = 8), and then chloropicrin (9.8%, n = 5). The highest percentage of quantifiable detections was observed for dacthal (21.6%, n = 11), followed by MITC (7.8%, n = 4), and then both chloropicrin and pp-dicofol (2%, n = 1).

Table A-1. Number and percentage of positive samples per chemical in Chualar, California.

Chemical	Number of possible detections	Total number of detections*	Number of quantifiable detections	Percent of detections	Percent of quantifiable detections
1,3-dichloropropene	52	1	1	1.9%	1.9%
Acephate	51	0	0	0%	0%
Bensulide	51	1	0	2.0%	0%
Chloropicrin	51	5	1	9.8%	2.0%
Chlorothalonil	51	0	0	0%	0%
Chlorpyrifos	51	2	0	3.9%	0
Chlorpyrifos OA	51	0	0	0%	0%
Cypermethrin	51	0	0	0%	0%
Dacthal	51	41	11	80.4%	21.6%
DDVP	49	8	0	16.3%	0%
DEF	51	0	0	0%	0%
Diazinon	51	0	0	0%	0%
Diazinon OA	51	0	0	0%	0%

Chemical	Number of possible detections	Total number of detections*	Number of quantifiable detections	Percent of detections	Percent of quantifiable detections
Dimethoate	51	0	0	0%	0%
Dimethoate OA	51	0	0	0%	0%
Diuron	51	0	0	0%	0%
Endosulfan	51	0	0	0%	0%
Endosulfan Sulfate	51	0	0	0%	0%
EPTC	51	0	0	0%	0%
Iprodione	51	0	0	0%	0%
Malathion	51	0	0	0%	0%
Malathion OA	51	4	0	7.8%	0%
Methidathion	51	0	0	0%	0%
Methyl Bromide	52	0	0	0%	0%
Metolachlor (S-Metolachlor)	51	0	0	0%	0%
MITC	51	8	4	15.7%	7.8%
Norflurazon	51	0	0	0%	0%
Oryzalin	51	0	0	0%	0%
Oxydemeton Methyl	51	0	0	0%	0%
Oxyfluorfen	51	0	0	0%	0%
Permethrin	51	0	0	0%	0%
Phosmet	51	0	0	0%	0%
pp-dicofol	51	1	1	2.0%	2.0%
Propargite	51	0	0	0%	0%
Simazine	51	0	0	0%	0%
Trifluralin	51	1	0	2.0%	0%
Total	**1,835**	**72**	**18**	**3.9%**	**1.0%**

*Includes both quantifiable and trace detections.

Pesticide Concentrations

Acute (24-h) Concentrations

Table A-2 shows the highest 24-h concentrations observed for all chemicals monitored at the Chualar Air Monitoring Network (AMN) sampling location in 2019. The highest concentration relative to its screening level was that of chloropicrin at 0.2%, followed by 1,3-dichloropropene at 0.06%. The remaining chemicals for which there were quantifiable detections at Chualar in 2019 were pp-dicofol, MITC, and dacthal.

As noted in Appendix I, the RL for 1,3-dichloropropene and methyl bromide analyzed by the California Air Resources Board's Organic Laboratory Section (CARB OLS) are, respectively, 10-fold and 3-fold higher than that of the samples analyzed by California Department of Food and Agriculture's Center for Analytical Chemistry (CDFA CAC) laboratory. Incorporating these analytical limits into the estimated values for non-detections produced the observed variation between sites for these chemicals, particularly for annual averages where large periods of non-detections have a larger effect on the calculated concentration.

Table A-2. Highest 24-h air concentrations, acute screening levels, and percent of the acute screening level for all chemicals monitored at the Chualar AMN sampling location in 2019.

Chemical	Highest 24-h concentration in ppb (ng/m^3)	24-h acute screening level in ppb (ng/m^3)	% of screening level
Chloropicrin	0.12 ppb (835 ng/m^3)	73.0 ppb (491,000 ng/m^3)*†	0.2%
1,3-dichloropropene	0.063 ppb (286 ng/m^3)	110 ppb (505,000 ng/m^3)‡	0.06%
pp-dicofol	0.001 ppb (19 ng/m^3)	4.49 ppb (68,000 ng/m^3)	0.03%
MITC	0.011 ppb (34 ng/m^3)	220 ppb (660,000 ng/m^3)*†	0.005%
Dacthal	0.002 ppb (34 ng/m^3)	1,730 ppb (23,500,000 ng/m^3)	0.0001%
Acephate	ND	1.60 ppb (12,000 ng/m^3)	
Bensulide	Trace	15.9 ppb (259,000 ng/m^3)	
Chlorothalonil	ND	3.13 ppb (34,000 ng/m^3)	
Chlorpyrifos	Trace	0.08 ppb (1,200 ng/m^3)**	
Chlorpyrifos OA	ND	0.09 ppb (1,200 ng/m^3)**	
Cypermethrin	ND	6.64 ppb (113,000 ng/m^3)	
DDVP	Trace	1.22 ppb (11,000 ng/m^3)	

Chemical	Highest 24-h concentration in ppb (ng/m^3)	24-h acute screening level in ppb (ng/m^3)	% of screening level
DEF	ND	0.68 ppb (8,800 ng/m^3)	
Diazinon	ND	0.01 ppb (130 ng/m^3)	
Diazinon OA	ND	0.01 ppb (130 ng/m^3)	
Dimethoate	ND	0.46 ppb (4,300 ng/m^3)	
Dimethoate OA	ND	0.49 ppb (4,300 ng/m^3)	
Diuron	ND	17.8 ppb (170,000 ng/m^3)	
Endosulfan	ND	0.20 ppb (3,300 ng/m^3)	
Endosulfan Sulfate	ND	0.19 ppb (3,300 ng/m^3)	
EPTC	ND	29.7 ppb (230,000 ng/m^3)	
Iprodione	ND	69.6 ppb (939,000 ng/m^3)	
Malathion	ND	8.33 ppb (113,000 ng/m^3)	
Malathion OA	Trace	8.76 ppb (113,000 ng/m^3)	
Methidathion	ND	0.25 ppb (3,100 ng/m^3)	
Methyl Bromide	ND	210 ppb (820,000 ng/m^3)*	
Metolachlor	ND	7.33 ppb (85,000 ng/m^3)	
Norflurazon	ND	12.6 ppb (170,000 ng/m^3)	
Oryzalin	ND	29.7 ppb (420,000 ng/m^3)	
Oxydemeton Methyl	ND	3.74 ppb (39,200 ng/m^3)	
Oxyfluorfen	ND	34.5 ppb (510,000 ng/m^3)	
Permethrin	ND	10.5 ppb (168,000 ng/m^3)	
Phosmet	ND	5.94 ppb (77,000 ng/m^3)	
Propargite	ND	0.98 ppb (14,000 ng/m^3)	
Simazine	ND	13.3 ppb	

Chemical	Highest 24-h concentration in ppb (ng/m^3)	24-h acute screening level in ppb (ng/m^3)	% of screening level
		(110,000 ng/m^3)	
Trifluralin	Trace	87.5 ppb (1,200,000 ng/m^3)	

*This value is a regulatory target rather than a screening level.
†This value is an 8-h time-weighted-average (TWA) used to compare against the 24-h measured concentration.
‡This value is a 72-h time-weighted-average (TWA) used to compare against the 24-h measured concentration.** CDPR's May 28, 2019, risk management directive for chlorpyrifos established an acute regulatory target of 0.28 ppb (4,050 ng/m3), 1-h time-weighted average (TWA) However, the current sample duration does not allow for a direct comparison between the acute regulatory target concentration and the measured sample values.

Sub-chronic (4- or 13-week) Concentrations

Table A-3 shows the highest observed rolling 4-week or 13-week average concentrations for all chemicals monitored at the Chualar AMN sampling location in 2019. The highest concentration relative to its screening level was that of chloropicrin at 11.4%, then 1,3-dichloropropene at 1.6%, followed by MITC at 0.7%. Quantifiable detections for dacthal and pp-dicofol resulted in calculated sub-chronic concentrations of less than 0.1%.

Table A-3. Highest 4- or 13-wk air concentrations, sub-chronic screening levels, and percent of the sub-chronic screening level for chemicals monitored at the Chualar Air Monitoring Network sampling location.

Chemical	Highest 4-week rolling average concentration in ppb (ng/m^3)	Sub-chronic screening level in ppb (ng/m^3)	% of screening level
Chloropicrin*	0.04 ppb (262 ng/m^3)	0.35 ppb (2,300 ng/m^3)	11.4%
1,3-dichloropropene*	0.06 ppb (227 ng/m^3)	3.0 ppb (14,000 ng/m^3)	1.6%
MITC	0.007 ppb (21.7 ng/m^3)	1.00 ppb (3,000 ng/m^3)	0.7%
pp-dicofol	0.0004 ppb (6.6 ng/m^3)	3.24 ppb (49,000 ng/m^3)	0.01%
Dacthal	0.001 ppb (15.5 ng/m^3)	34.6 ppb (470,000 ng/m^3)	0.003%
Acephate	ND	0.35 ppb (2,300 ng/m^3)	
Bensulide	Trace	1.47 ppb (24,000 ng/m^3)	
Chlorothalonil	ND	3.13 ppb (34,000 ng/m^3)	
Chlorpyrifos	Trace	0.06 ppb (850 ng/m^3)	
Chlorpyrifos OA	ND	0.06 ppb (850 ng/m^3)	

Chemical	Highest 4-week rolling average concentration in ppb (ng/m^3)	Sub-chronic screening level in ppb (ng/m^3)	% of screening level
Cypermethrin	ND	4.76 ppb (81,000 ng/m^3)	
DDVP	Trace	0.24 ppb (2,200 ng/m^3)	
DEF	ND	0.68 ppb (8,800 ng/m^3)	
Diazinon	ND	0.01 ppb (130 ng/m^3)	
Diazinon OA	ND	0.01 ppb (130 ng/m^3)	
Dimethoate	ND	0.32 ppb (3,000 ng/m^3)	
Dimethoate OA	ND	0.34 ppb (3,000 ng/m^3)	
Diuron	ND	1.78 ppb (17,000 ng/m^3)	
Endosulfan	ND	0.20 ppb (3,300 ng/m^3)	
Endosulfan Sulfate	ND	0.19 ppb (3,300 ng/m^3)	
EPTC	ND	3.10 ppb (24,000 ng/m^3)	
Iprodione	ND	21.2 ppb (286,000 ng/m^3)	
Malathion	ND	5.97 ppb (80,600 ng/m^3)	
Malathion OA	Trace	6.27 ppb (80,600 ng/m^3)	
Methidathion	ND	0.25 ppb (3,100 ng/m^3)	
Methyl Bromide	ND	5.0 ppb (19,400 ng/m^3)	
Metolachlor (S-Metolachlor)	ND	1.29 ppb (15,000 ng/m^3)	
Norflurazon	ND	1.92 ppb (26,000 ng/m^3)	
Oryzalin	ND	16.2 ppb (230,000 ng/m^3)	
Oxydemeton Methyl	ND	0.06 ppb (610 ng/m^3)	
Oxyfluorfen	ND	12.2 ppb (18,0000 ng/m^3)	
Permethrin	ND	5.63 ppb (90,000 ng/m^3)	

Chemical	Highest 4-week rolling average concentration in ppb (ng/m^3)	Sub-chronic screening level in ppb (ng/m^3)	% of screening level
Phosmet	ND	2.00 ppb (26,000 ng/m^3)	
Propargite	ND	0.98 ppb (14,000 ng/m^3)	
Simazine	ND	3.76 ppb (31,000 ng/m^3)	
Trifluralin	Trace	12.4 ppb (170,000 ng/m^3)	

* These concentrations represent the highest 13-week rolling average, rather than the default 4-week rolling average.

Chronic (2019) Concentrations

Table A-4 shows the annual average concentration for all chemicals monitored at the Chualar AMN sampling location in 2019. The pesticide with the highest concentration relative to its screening level was chloropicrin at 8.4%, followed by 1,3-dichloropropene at 2.1% and MITC at 1.9%. All other monitored chemicals were less than 1% of their chronic screening level or regulatory target in Chualar during monitoring in 2019.

Table A-4. Annual average air concentrations, chronic screening levels, and percent of the chronic screening levels for chemicals monitored at the Chualar Air Monitoring Network sampling location.

Chemical	Overall average concentration (ng/m^3)	Chronic screening level (ng/m^3)	% of screening level
Chloropicrin	0.02 ppb (152 ng/m^3)	0.27 ppb (1,800 ng/m^3)	8.4%
1,3-dichloropropene	0.04 (193 ng/m^3)	2.00 ppb (9,000 ng/m^3)	2.1%
MITC	0.002 ppb (5.6 ng/m^3)	0.10 ppb (300 ng/m^3)	1.9%
Dacthal	0.0005 (6.6 ng/m^3)	3.46 ppb (47,000 ng/m^3)	0.01%
pp-dicofol	0.0002 ppb (2.6 ng/m^3)	1.32 ppb (20,000 ng/m^3)	0.01%
Acephate	ND	1.13 ppb (8,500 ng/m^3)	
Bensulide	Trace	1.48 ppb (24,000 ng/m^3)	
Chlorothalonil	ND	3.13 ppb (34,000 ng/m^3)	
Chlorpyrifos	Trace	0.04 ppb (510 ng/m^3)	
Chlorpyrifos OA	ND	0.04 ppb (510 ng/m^3)	
Cypermethrin	ND	1.59 ppb	

Chemical	Overall average concentration (ng/m^3)	Chronic screening level (ng/m^3)	% of screening level
		(27,000 ng/m^3)	
DDVP	Trace	0.09 ppb (770 ng/m^3)	
DEF	ND	NA – Seasonal	
Diazinon	ND	0.01 ppb (130 ng/m^3)	
Diazinon OA	ND	0.01 ppb (130 ng/m^3)	
Dimethoate	ND	0.03 ppb (300 ng/m^3)	
Dimethoate OA	ND	0.03 ppb (300 ng/m^3)	
Diuron	ND	0.60 ppb (5,700 ng/m^3)	
Endosulfan	ND	0.02 ppb (330 ng/m^3)	
Endosulfan Sulfate	ND	0.02 ppb (330 ng/m^3)	
EPTC	ND	1.10 ppb (8,500 ng/m^3)	
Iprodione	ND	21.2 ppb (286,000 ng/m^3)	
Malathion	ND	0.60 ppb (8,100 ng/m^3)	
Malathion OA	Trace	0.63 ppb (8,100 ng/m^3)	
Methidathion	ND	0.20 ppb (2,500 ng/m^3)	
Methyl Bromide	ND	1.00 ppb (3,900 ng/m^3)	
Metolachlor (S-Metolachlor)	ND	1.29 ppb (15,000 ng/m^3)	
Norflurazon	ND	1.92 ppb (26,000 ng/m^3)	
Oryzalin	ND	1.64 ppb (232,000 ng/m^3)	
Oxydemeton Methyl	ND	0.06 ppb (610 ng/m^3)	
Oxyfluorfen	ND	3.45 ppb (51,000 ng/m^3)	
Permethrin	ND	5.63 ppb (90,000 ng/m^3)	
Phosmet	ND	1.39 ppb (18,000 ng/m^3)	
Propargite	ND	0.98 ppb	

Chemical	Overall average concentration (ng/m^3)	Chronic screening level (ng/m^3)	% of screening level
		(14,000 ng/m^3)	
Simazine	ND	3.76 ppb (31,000 ng/m^3)	
Trifluralin	Trace	2.99 ppb (41,000 ng/m^3)	

Temporal Trends in Detected Concentrations

Figures A-1 to A-5 present the concentrations over time for monitoring results in 2019 for any chemical detected at a quantifiable concentration in Chualar. Screening levels, as defined in Appendix K, are abbreviated as SL in the following graphs. Regulatory targets, also defined in Appendix K, are abbreviated as RT. For graphs where both a pesticide and its degradate are shown, the detected concentrations of both the parent chemical and its degradate have been summed for each sampling.

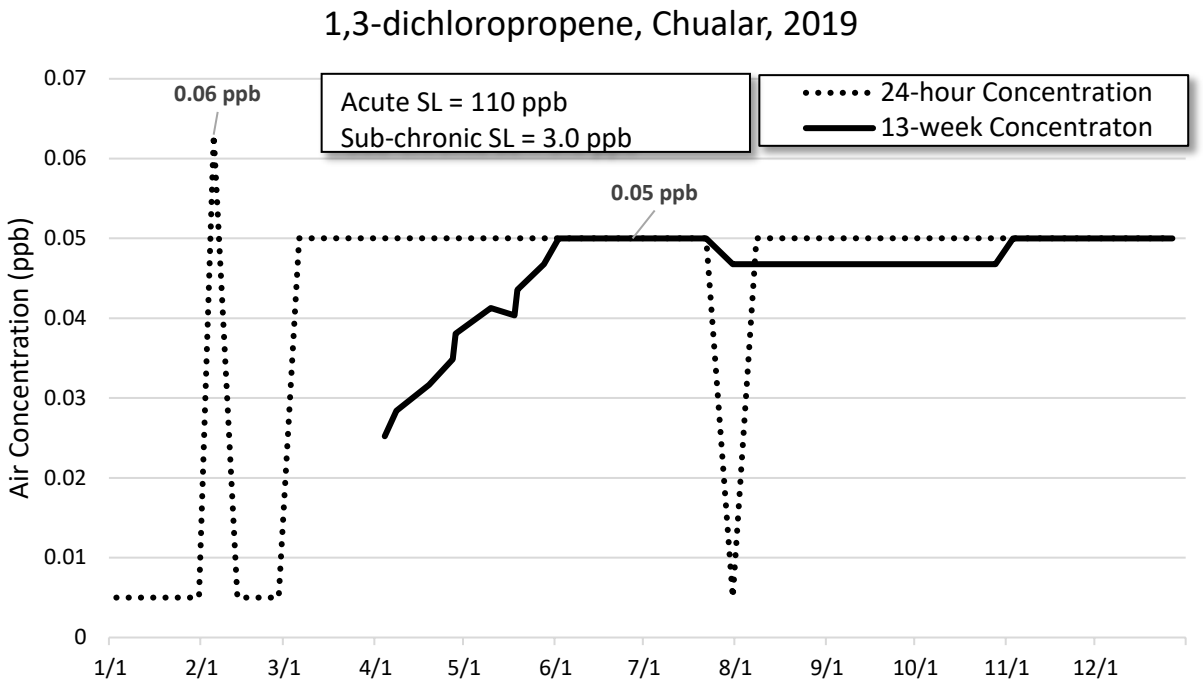

Figure A-1. Temporal trend in 1,3-dichloropropene concentrations in Chualar in 2019.

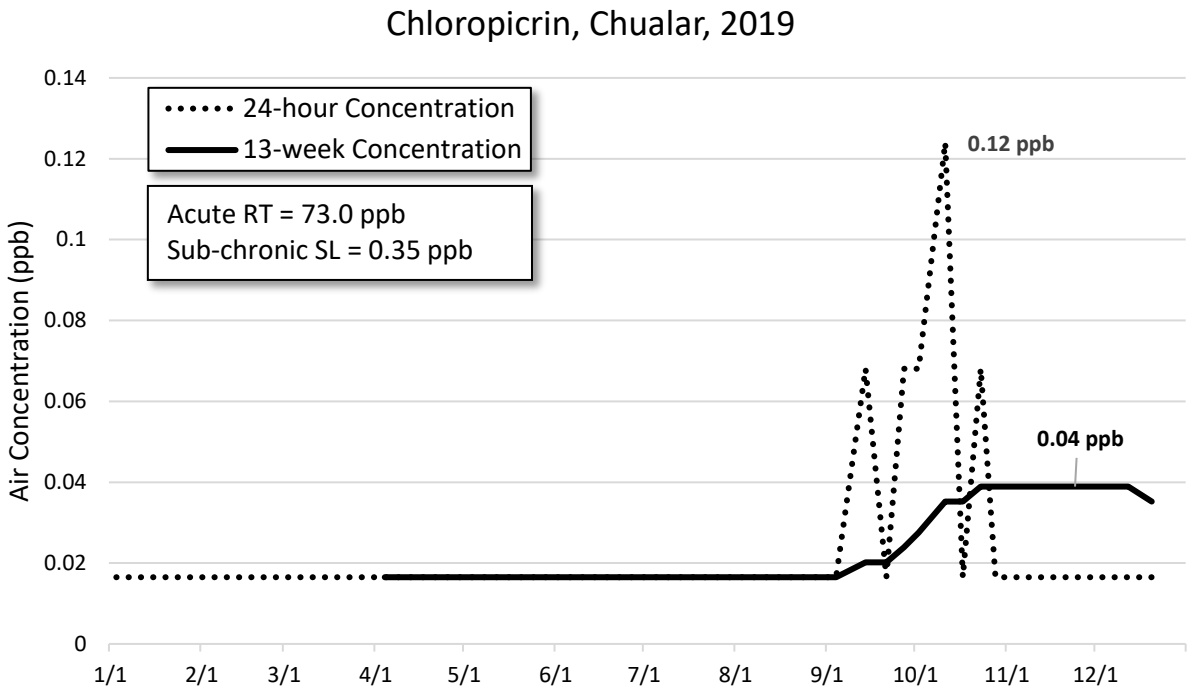

Figure A-2. Temporal trend in chloropicrin concentrations in Chualar in 2019.

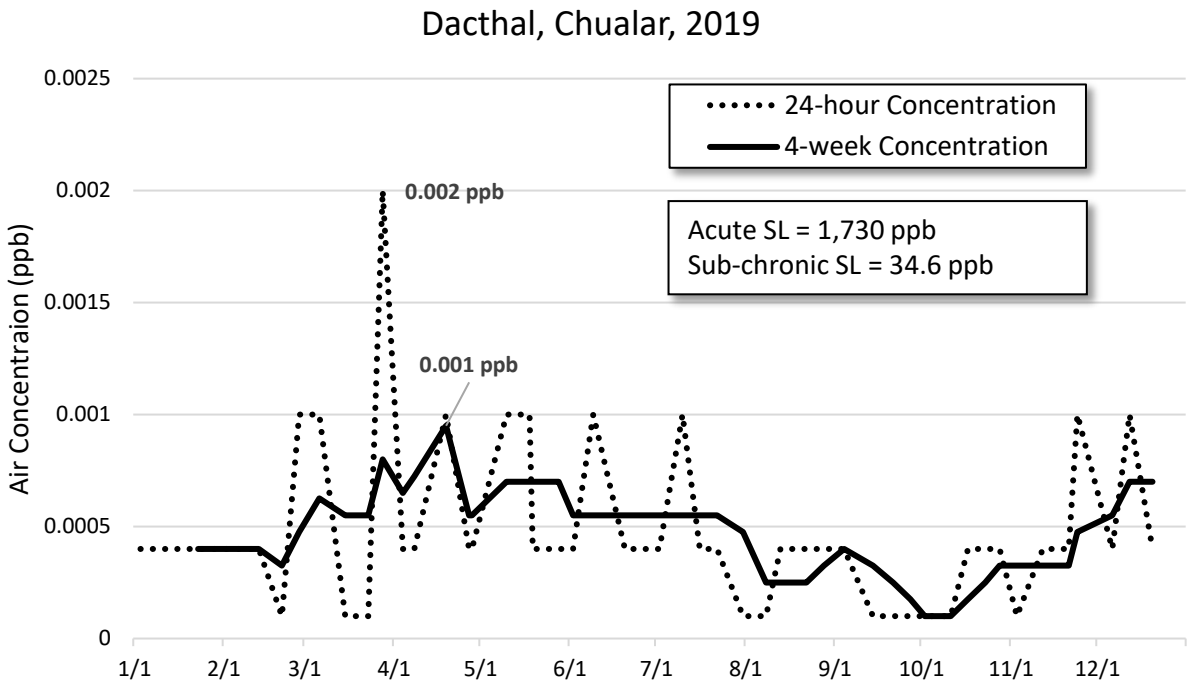

Figure A-3. Temporal trend in dacthal concentrations in Chualar in 2019.

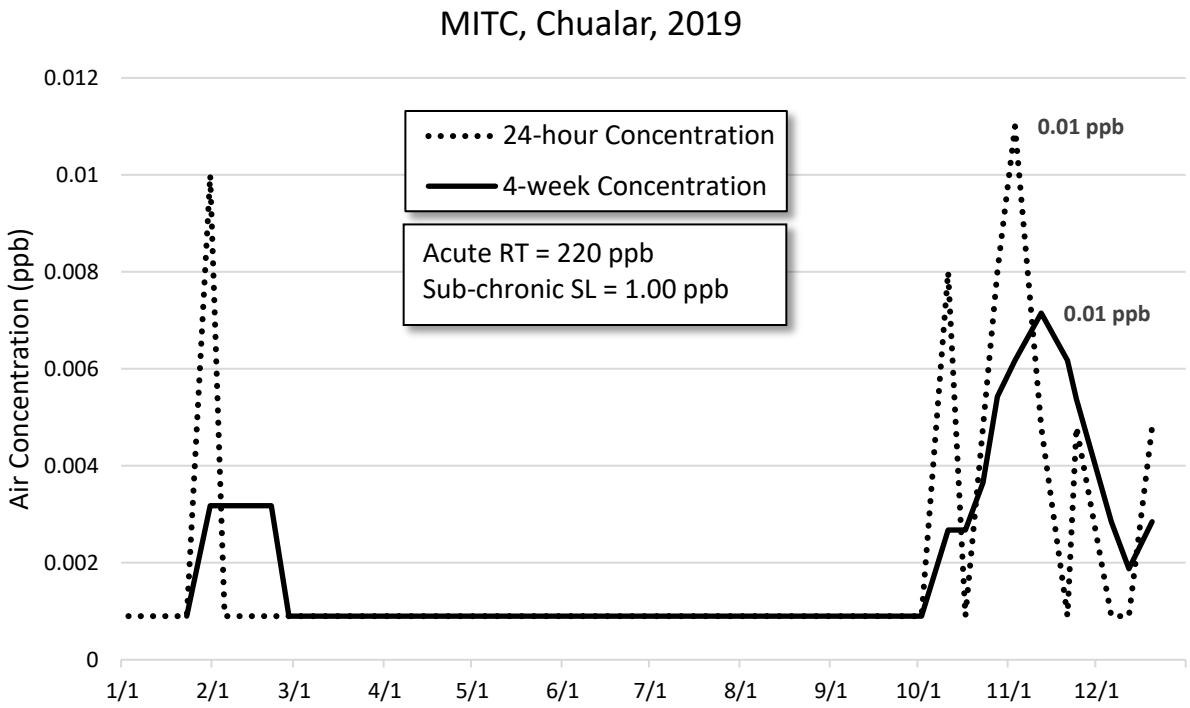

Figure A-4. Temporal trend in MITC concentrations in Chualar in 2019.

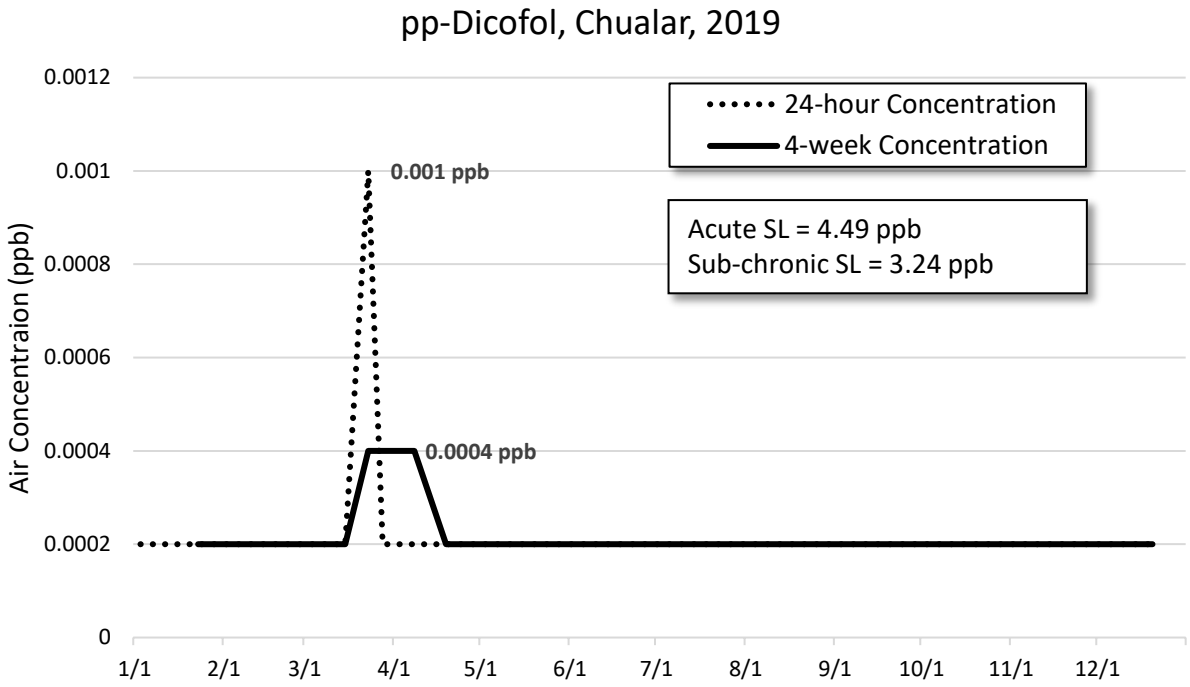

Figure A-5. Temporal trend in pp-Dicofol concentrations in Chualar in 2019.

APPENDIX B: DETAILED RESULTS FOR CUYAMA

Cuyama

Cuyama is a census-designated place located in Santa Barbara County and is 0.46 square miles in area. The average elevation is 2,293 feet; it receives an average of 13.3 inches of precipitation annually. Daily average temperatures range from 59° to 81°F in the summer and 46° to 69°F in the winter. Based on the 2010 census, the population of Cuyama was 57, of which 24.6% were under 18 years of age and 8.8% were over 65 years of age. The major crops in the immediate area around Cuyama are apricots, peaches, and plums. The monitoring site is located at Cuyama Elementary School. Monitoring at this site is conducted by the California Air Resources Board (CARB).

Pesticide Detections

Table B-1 lists the number and percentage of analyses resulting in detections at the Cuyama sampling site. The active ingredient with the highest percentage of detections was MITC (24.5%, n = 12), followed by trifluralin (14.3%, n = 7), and then EPTC (10.2%, n = 5). The highest percentage of quantifiable detections was observed for EPTC, MITC, and trifluralin; all at 4.1% (n = 2).

Table B-1. Number and percentage of positive samples per chemical in Cuyama, California.

Chemical	Number of possible detections	Total number of detections*	Number of quantifiable detections	Percent of possible detections	Percent of quantifiable detections
1,3-dichloropropene	49	0	0	0%	0%
Acephate	49	1	0	2.0%	0%
Bensulide	49	0	0	0%	0%
Chloropicrin	49	0	0	0%	0%
Chlorothalonil	49	2	0	4.1%	0%
Chlorpyrifos	49	0	0	0%	0%
Chlorpyrifos OA	49	0	0	0%	0%
Cypermethrin	49	0	0	0%	0%
Dacthal	49	0	0	0%	0%
DDVP	49	2	0	4.1%	0%
DEF	49	0	0	0%	0%
Diazinon	49	1	0	2.0%	0%
Diazinon OA	49	1	0	2.0%	0%
Dimethoate	49	0	0	0%	0%
Dimethoate OA	49	0	0	0%	0%
Diuron	49	0	0	0%	0%
Endosulfan	49	0	0	0%	0%
Endosulfan Sulfate	49	0	0	0%	0%
EPTC	49	5	2	10.2%	4.1%
Iprodione	49	0	0	0%	0%
Malathion	49	1	0	2.0%	0%

Chemical	Number of possible detections	Total number of detections*	Number of quantifiable detections	Percent of possible detections	Percent of quantifiable detections
Malathion OA	49	1	0	2.0%	0%
Methidathion	49	0	0	0%	0%
Methyl Bromide	49	0	0	0%	0%
Metolachlor (S-Metolachlor)	49	0	0	0%	0%
MITC	49	12	2	24.5%	4.1%
Norflurazon	49	0	0	0%	0%
Oryzalin	49	0	0	0%	0%
Oxydemeton Methyl	49	0	0	0%	0%
Oxyfluorfen	49	0	0	0%	0%
Permethrin	49	0	0	0%	0%
Phosmet	49	0	0	0%	0%
pp-dicofol	49	0	0	0%	0%
Propargite	49	0	0	0%	0%
Simazine	49	0	0	0%	0%
Trifluralin	49	7	1	14.3%	4.1%
Total	**1,764**	**33**	**5**	**1.9%**	**0.3%**

*Includes both quantifiable and trace detections.

Pesticide Concentrations

Acute (24-h) Concentrations

Table B-2 shows the highest 24-h concentrations observed for all chemicals monitored at the Cuyama Air Monitoring Network (AMN) sampling location in 2019. The highest concentration relative to its screening level was MITC at 0.06%, followed by EPTC at 0.03%. The remaining chemical with a quantifiable detection was trifluralin at 0.0008% of its acute screening level.

Table B-2. Highest 24-h air concentrations, acute screening levels, and percent of the acute screening level for all chemicals monitored at the Cuyama AMN sampling location in 2019.

Chemical	Highest 24-h concentration in ppb (ng/m^3)	24-h acute screening level in ppb (ng/m^3)	% of screening level
MITC	0.13 ppb (381 ng/m^3)	220 ppb (660,000 ng/m^3)*†	0.06%
EPTC	0.009 ppb (73 ng/m^3)	29.7 ppb (230,000 ng/m^3)	0.03%
Trifluralin	0.001 ppb (10 ng/m^3)	87.5 ppb (1,200,000 ng/m^3)	0.0008%
1,3-dichloropropene	ND	110 ppb (505,000 ng/m^3)‡	
Acephate	Trace	1.60 ppb (12,000 ng/m^3)	

Chemical	Highest 24-h concentration in ppb (ng/m^3)	24-h acute screening level in ppb (ng/m^3)	% of screening level
Bensulide	ND	15.9 ppb (259,000 ng/m^3)	
Chloropicrin	ND	73.0 ppb (491,000 ng/m^3)*†	
Chlorothalonil	Trace	3.13 ppb (34,000 ng/m^3)	
Chlorpyrifos	ND	0.08 ppb (1,200 ng/m^3)**	
Chlorpyrifos OA	ND	0.09 ppb (1,200 ng/m^3)**	
Cypermethrin	ND	6.64 ppb (113,000 ng/m^3)	
Dacthal	ND	1,730 ppb (23,500,000 ng/m^3)	
DDVP	Trace	1.22 ppb (11,000 ng/m^3)	
DEF	ND	0.68 ppb (8,800 ng/m^3)	
Diazinon	Trace	0.01 ppb (130 ng/m^3)	
Diazinon OA	Trace	0.01 ppb (130 ng/m^3)	
Dimethoate	ND	0.46 ppb (4,300 ng/m^3)	
Dimethoate OA	ND	0.49 ppb (4,300 ng/m^3)	
Diuron	ND	17.8 ppb (170,000 ng/m^3)	
Endosulfan	ND	0.20 ppb (3,300 ng/m^3)	
Endosulfan Sulfate	ND	0.19 ppb (3,300 ng/m^3)	
Iprodione	ND	69.6 ppb (939,000 ng/m^3)	
Malathion	Trace	8.33 ppb (113,000 ng/m^3)	
Malathion OA	Trace	8.76 ppb (113,000 ng/m^3)	
Methidathion	ND	0.25 ppb (3,100 ng/m^3)	
Methyl Bromide	ND	210 ppb (820,000 ng/m^3)*	
Metolachlor	ND	7.33 ppb (85,000 ng/m^3)	

Chemical	Highest 24-h concentration in ppb (ng/m^3)	24-h acute screening level in ppb (ng/m^3)	% of screening level
Norflurazon	ND	12.6 ppb (170,000 ng/m^3)	
Oryzalin	ND	29.7 ppb (420,000 ng/m^3)	
Oxydemeton Methyl	ND	3.74 ppb (39,200 ng/m^3)	
Oxyfluorfen	ND	34.5 ppb (510,000 ng/m^3)	
Permethrin	ND	10.5 ppb (168,000 ng/m^3)	
Phosmet	ND	5.94 ppb (77,000 ng/m^3)	
pp-dicofol	ND	4.49 ppb (68,000 ng/m^3)	
Propargite	ND	0.98 ppb (14,000 ng/m^3)	
Simazine	ND	13.3 ppb (110,000 ng/m^3)	

*This value is a regulatory target rather than a screening level.
†This value is an 8-h time-weighted-average (TWA) used to compare against the 24-h measured concentration.
‡This value is a 72-h time-weighted-average (TWA) used to compare against the 24-h measured concentration.
** CDPR's May 28, 2019, risk management directive for chlorpyrifos established an acute regulatory target of 0.28 ppb (4,050 ng/m^3), 1-h time weighted average (TWA). However, the current sample duration does not allow for a direct comparison between the acute regulatory target concentration and the measured sample values.

Sub-chronic (4-wk or 13-week) Concentrations

Table B-3 shows the highest observed rolling 4-week or 13-week average concentrations for all chemicals monitored at the Cuyama AMN sampling location in 2019. The pesticide with highest concentration relative to its screening level was MITC at 4.2%, followed by EPTC at 0.1%.

Table B-3. Highest 4-week air concentrations, sub-chronic screening levels, and percent of the sub-chronic screening level for chemicals monitored at the Cuyama AMN sampling location.

Chemical	Highest 4-week rolling average concentration in ppb (ng/m^3)	Sub-chronic screening level in ppb (ng/m^3)	% of screening level
MITC	0.04 ppb (125 ng/m^3)	1.00 ppb (3,000 ng/m^3)	4.2%
EPTC	0.003 ppb (26.9 ng/m^3)	3.10 ppb (24,000 ng/m^3)	0.1%
Trifluralin	0.001 ppb (12.2 ng/m^3)	12.4 ppb (170,000 ng/m^3)	0.007%

Chemical	Highest 4-week rolling average concentration in ppb (ng/m^3)	Sub-chronic screening level in ppb (ng/m^3)	% of screening level
1,3-dichloropropene*	ND	3.0 ppb (14,000 ng/m^3)	
Acephate	Trace	0.35 ppb (2,300 ng/m^3)	
Bensulide	ND	1.47 ppb (24,000 ng/m^3)	
Chloropicrin*	ND	0.35 ppb (2,300 ng/m^3)	
Chlorothalonil	Trace	3.13 ppb (34,000 ng/m^3)	
Chlorpyrifos	ND	0.06 ppb (850 ng/m^3)	
Chlorpyrifos OA	ND	0.06 ppb (850 ng/m^3)	
Cypermethrin	ND	4.76 ppb (81,000 ng/m^3)	
Dacthal	ND	34.6 ppb (470,000 ng/m^3)	
DDVP	Trace	0.24 ppb (2,200 ng/m^3)	
DEF	ND	0.68 ppb (8,800 ng/m^3)	
Diazinon	Trace	0.01 ppb (130 ng/m^3)	
Diazinon OA	Trace	0.01 ppb (130 ng/m^3)	
Dimethoate	ND	0.32 ppb (3,000 ng/m^3)	
Dimethoate OA	ND	0.34 ppb (3,000 ng/m^3)	
Diuron	ND	1.78 ppb (17,000 ng/m^3)	
Endosulfan	ND	0.20 ppb (3,300 ng/m^3)	
Endosulfan Sulfate	ND	0.19 ppb (3,300 ng/m^3)	
Iprodione	ND	21.2 ppb (286,000 ng/m^3)	

Chemical	Highest 4-week rolling average concentration in ppb (ng/m^3)	Sub-chronic screening level in ppb (ng/m^3)	% of screening level
Malathion	Trace	5.97 ppb (80,600 ng/m^3)	
Malathion OA	Trace	6.27 ppb (80,600 ng/m^3)	
Methidathion	ND	0.25 ppb (3,100 ng/m^3)	
Methyl Bromide	ND	5.0 ppb (19,400 ng/m^3)	
Metolachlor (S-Metolachlor)	ND	1.29 ppb (15,000 ng/m^3)	
Norflurazon	ND	1.92 ppb (26,000 ng/m^3)	
Oryzalin	ND	16.2 ppb (230,000 ng/m^3)	
Oxydemeton Methyl	ND	0.06 ppb (610 ng/m^3)	
Oxyfluorfen	ND	12.2 ppb (18,0000 ng/m^3)	
Permethrin	ND	5.63 ppb (90,000 ng/m^3)	
Phosmet	ND	2.00 ppb (26,000 ng/m^3)	
pp-dicofol	ND	3.24 ppb (49,000 ng/m^3)	
Propargite	ND	0.98 ppb (14,000 ng/m^3)	
Simazine	ND	3.76 ppb (31,000 ng/m^3)	

* These concentrations represent the highest 13-week rolling average, rather than the default 4-week rolling average.

Chronic (2019) Concentrations

Table B-4 shows the annual average concentration for all chemicals monitored at the Cuyama AMN sampling location in 2019. The highest concentration relative to its screening level was MITC at 4.9%, followed by EPTC at 0.06%, and then trifluralin at 0.005%. All other monitored chemicals were either trace or non-detects; thus, their percent of screening level could not be determined.

Table B-4. Annual average air concentrations, chronic screening levels, and percent of the chronic screening levels for chemicals monitored at the Cuyama AMN sampling location.

Chemical	Overall average concentration (ng/m^3)	Chronic screening level (ng/m^3)	% of screening level
MITC	0.005 ppb (14.6 ng/m^3)	0.10 ppb (300 ng/m^3)	4.9%
EPTC	0.0004 ppb (4.8 ng/m^3)	1.10 ppb (8,500 ng/m^3)	0.06%
Trifluralin	0.0002 ppb (2.2 ng/m^3)	2.99 ppb (41,000 ng/m^3)	0.005%
1,3-dichloropropene	ND	2.00 ppb (9,000 ng/m^3)	
Acephate	Trace	1.13 ppb (8,500 ng/m^3)	
Bensulide	ND	1.48 ppb (24,000 ng/m^3)	
Chloropicrin	ND	0.27 ppb (1,800 ng/m^3)	
Chlorothalonil	Trace	3.13 ppb (34,000 ng/m^3)	
Chlorpyrifos	ND	0.04 ppb (510 ng/m^3)	
Chlorpyrifos OA	ND	0.04 ppb (510 ng/m^3)	
Cypermethrin	ND	1.59 ppb (27,000 ng/m^3)	
Dacthal	ND	3.46 ppb (47,000 ng/m^3)	
DDVP	Trace	0.09 ppb (770 ng/m^3)	
DEF	ND	NA – Seasonal	
Diazinon	Trace	0.01 ppb (130 ng/m^3)	
Diazinon OA	Trace	0.01 ppb (130 ng/m^3)	
Dimethoate	ND	0.03 ppb (300 ng/m^3)	
Dimethoate OA	ND	0.03 ppb (300 ng/m^3)	
Diuron	ND	0.60 ppb (5,700 ng/m^3)	
Endosulfan	ND	0.02 ppb (330 ng/m^3)	
Endosulfan Sulfate	ND	0.02 ppb (330 ng/m^3)	
Iprodione	ND	21.2 ppb	

Chemical	Overall average concentration (ng/m^3)	Chronic screening level (ng/m^3)	% of screening level
		(286,000 ng/m^3)	
Malathion	Trace	0.60 ppb (8,100 ng/m^3)	
Malathion OA	Trace	0.63 ppb (8,100 ng/m^3)	
Methidathion	ND	0.20 ppb (2,500 ng/m^3)	
Methyl Bromide	ND	1.00 ppb (3,900 ng/m^3)	
Metolachlor (S-Metolachlor)	ND	1.29 ppb (15,000 ng/m^3)	
Norflurazon	ND	1.92 ppb (26,000 ng/m^3)	
Oryzalin	ND	1.64 ppb (232,000 ng/m^3)	
Oxydemeton Methyl	ND	0.06 ppb (610 ng/m^3)	
Oxyfluorfen	ND	3.45 ppb (51,000 ng/m^3)	
Permethrin	ND	5.63 ppb (90,000 ng/m^3)	
Phosmet	ND	1.39 ppb (18,000 ng/m^3)	
pp-dicofol	ND	1.32 ppb (20,000 ng/m^3)	
Propargite	ND	0.98 ppb (14,000 ng/m^3)	
Simazine	ND	3.76 ppb (31,000 ng/m^3)	

Temporal trends in detected concentrations

Figures B-1 to B-3 present the concentrations over time for monitoring results in 2019 for any chemical detected at a quantifiable concentration in Cuyama. Screening levels, as defined in Appendix K, are abbreviated SL in the following graphs. Regulatory targets, also defined in Appendix K, are abbreviated at RT.

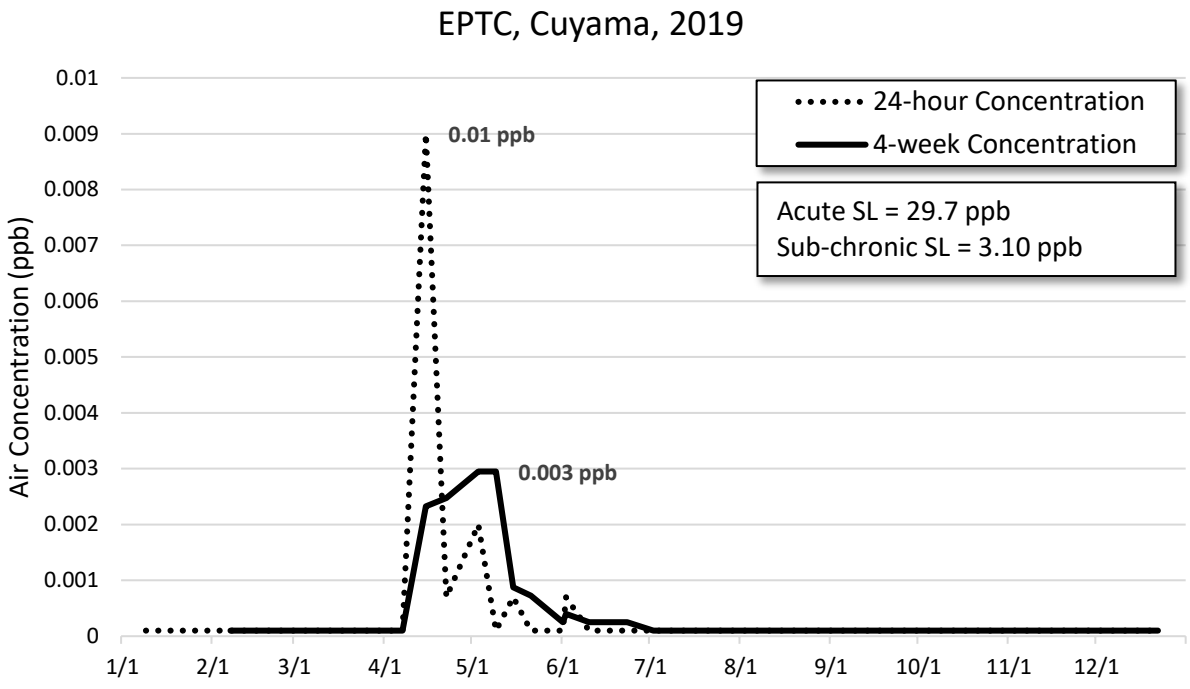

Figure B-1. Temporal trend in EPTC concentrations in Cuyama in 2019.

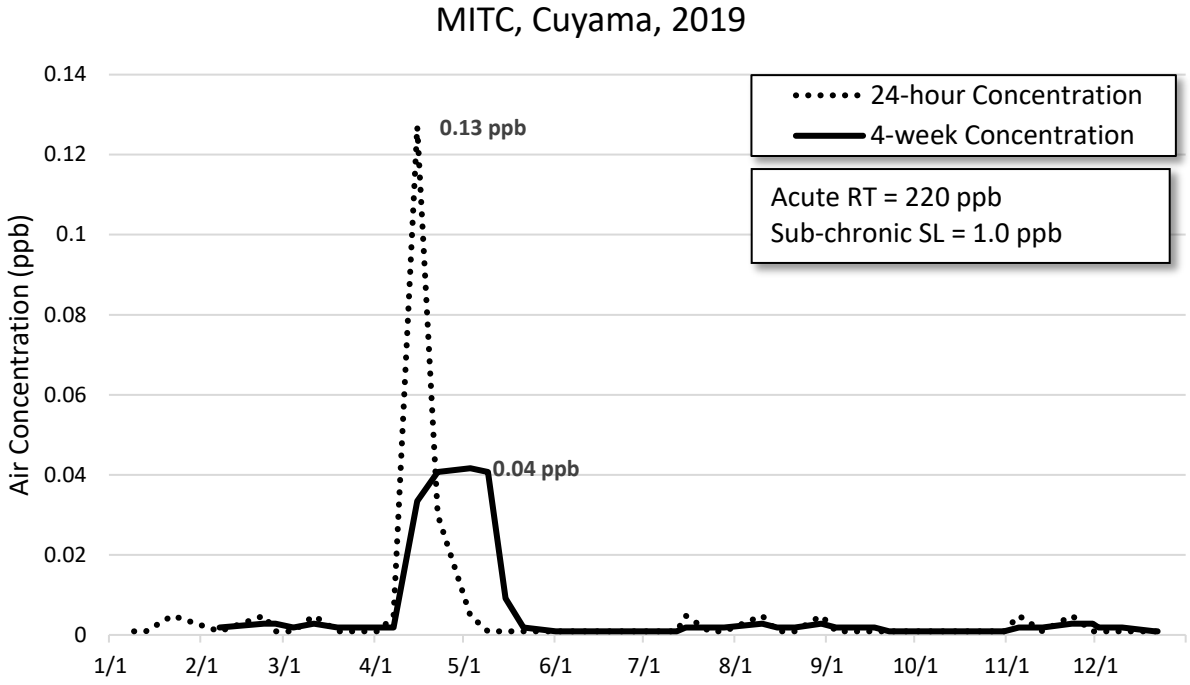

Figure B-2. Temporal trend in MITC concentrations in Cuyama in 2019.

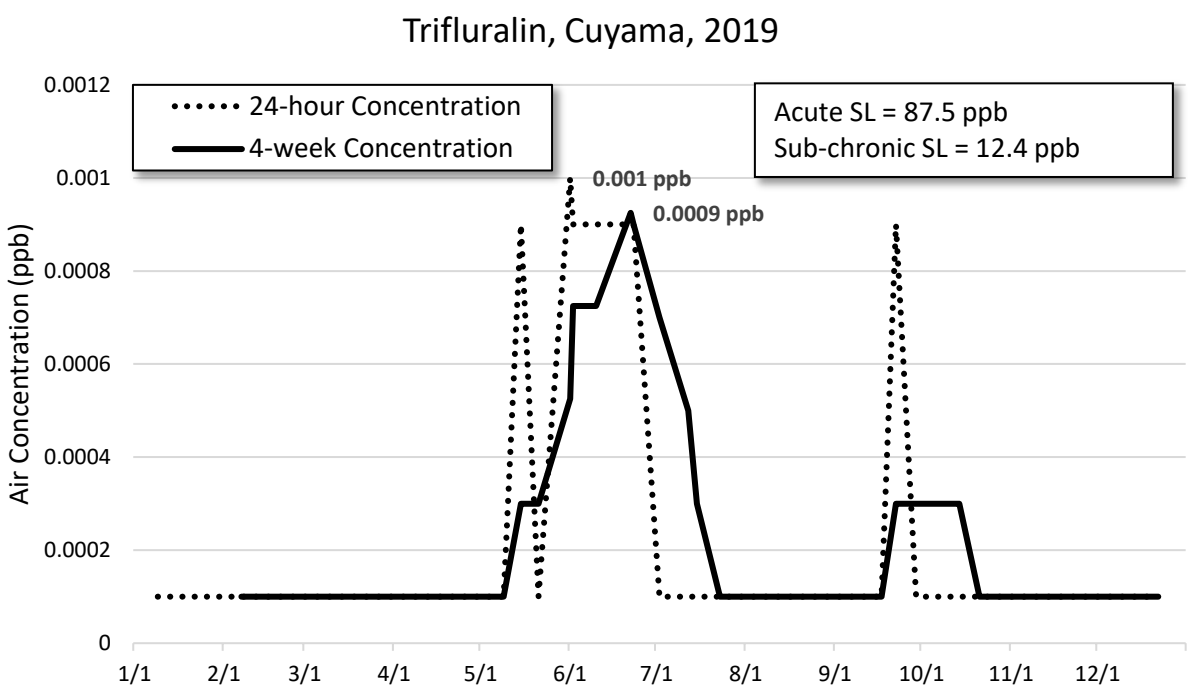

Figure B-3. Temporal trend in trifluralin concentrations in Cuyama in 2019.

APPENDIX C: DETAILED RESULTS FOR LINDSAY

Lindsay

Lindsay is located in Tulare County and is 2.73 square miles in area. The average elevation is 387 feet; it receives about 11.6 inches of precipitation annually. Daily average temperatures range from 56° to 80°F in the summer and 35° to 64°F in the winter. Based on the 2010 census, the population of Lindsay was 11,768, of which 38.4% were under 18 years of and 7.5% were above 65 years of age. The major crops around Lindsay are oranges and grapes. The monitoring site is at Reagan Elementary School. Monitoring at this site is conducted by the California Air Resources Board.

Pesticide Detections

Table C-1 lists the number and percentage of analyses resulting in detections at the Lindsay sampling site. The active ingredient with the highest percentage of detection was MITC (39.6%, n = 21), followed by chlorothalonil (9.4%, n = 5), and then DDVP (7.5%, n = 4). The highest percentage of quantifiable detections was observed for MITC (20.8%, n = 11). All other monitored chemicals did not have a quantifiable detection.

Table C-1. Number and percentage of positive samples per chemical in Lindsay, California.

Chemical	Number of possible detections	Total number of detections*	Number of quantifiable detections	Percent of detections	Percent of quantifiable detections
1,3-dichloropropene	53	0	0	0%	0%
Acephate	53	0	0	0%	0%
Bensulide	53	0	0	0%	0%
Chloropicrin	53	0	0	0%	0%
Chlorothalonil	53	5	0	9.4%	0%
Chlorpyrifos	53	0	0	0%	0%
Chlorpyrifos OA	53	0	0	0%	0%
Cypermethrin	53	0	0	0%	0%
Dacthal	53	2	0	3.7%	0%
DDVP	53	3	0	5.7%	0%
DEF	53	0	0	0%	0%
Diazinon	53	0	0	0%	0%
Diazinon OA	53	0	0	0%	0%
Dimethoate	53	2	0	3.8%	0%
Dimethoate OA	53	1	0	1.9%	0%
Diuron	53	0	0	0%	0%
Endosulfan	53	0	0	0%	0%
Endosulfan Sulfate	53	0	0	0%	0%
EPTC	53	1	0	1.9%	0%
Iprodione	53	0	0	0%	0%
Malathion	53	3	0	5.7%	0%

Chemical	Number of possible detections	Total number of detections*	Number of quantifiable detections	Percent of detections	Percent of quantifiable detections
Malathion OA	53	3	0	5.7%	0%
Methidathion	53	0	0	0%	0%
Methyl Bromide	53	0	0	0%	0%
Metolachlor (S-Metolachlor)	53	0	0	0%	0%
MITC	53	21	11	39.6%	20.8%
Norflurazon	53	0	0	0%	0%
Oryzalin	53	0	0	0%	0%
Oxydemeton Methyl	53	0	0	0%	0%
Oxyfluorfen	53	0	0	0%	0%
Permethrin	53	0	0	0%	0%
Phosmet	53	0	0	0%	0%
pp-dicofol	53	0	0	0%	0%
Propargite	53	0	0	0%	0%
Simazine	53	0	0	0%	0%
Trifluralin	53	0	0	0%	0%
Total	**1,908**	**41**	**11**	**2.1%**	**0.6%**

*Includes both quantifiable and trace detections.

Pesticide Concentrations

Acute (24-h) Concentrations

Table C-2 shows the highest 24-h concentrations observed for all chemicals monitored at the Lindsay Air Monitoring Network (AMN) sampling location in 2019. The pesticide with the highest concentration relative to its screening level was MITC at 0.13%.

Table C-2. Highest 24-h air concentrations, acute screening levels, and percent of the acute screening level for all chemicals monitored at the Lindsay AMN sampling location in 2019.

Chemical	Highest 24-h concentration in ppb (ng/m^3)	24-h acute screening level in ppb (ng/m^3)	% of screening level
MITC	0.29 ppb (880 ng/m^3)	220 ppb (660,000 ng/m^3)*†	0.13%
1,3-dichloropropene	ND	110 ppb (505,000 ng/m^3)‡	
Acephate	ND	1.60 ppb (12,000 ng/m^3)	
Bensulide	ND	15.9 ppb (259,000 ng/m^3)	
Chloropicrin	ND	73.0 ppb (491,000 ng/m^3)*†	

Chemical	Highest 24-h concentration in ppb (ng/m^3)	24-h acute screening level in ppb (ng/m^3)	% of screening level
Chlorothalonil	Trace	3.13 ppb (34,000 ng/m^3)	
Chlorpyrifos	ND	0.08 ppb (1,200 ng/m^3)**	
Chlorpyrifos OA	ND	0.09 ppb (1,200 ng/m^3)**	
Cypermethrin	ND	6.64 ppb (113,000 ng/m^3)	
Dacthal	Trace	1,730 ppb (23,500,000 ng/m^3)	
DDVP	Trace	1.22 ppb (11,000 ng/m^3)	
DEF	ND	0.68 ppb (8,800 ng/m^3)	
Diazinon	ND	0.01 ppb (130 ng/m^3)	
Diazinon OA	ND	0.01 ppb (130 ng/m^3)	
Dimethoate	Trace	0.46 ppb (4,300 ng/m^3)	
Dimethoate OA	Trace	0.49 ppb (4,300 ng/m^3)	
Diuron	ND	17.8 ppb (170,000 ng/m^3)	
Endosulfan	ND	0.20 ppb (3,300 ng/m^3)	
Endosulfan Sulfate	ND	0.19 ppb (3,300 ng/m^3)	
EPTC	Trace	29.7 ppb (230,000 ng/m^3)	
Iprodione	ND	69.6 ppb (939,000 ng/m^3)	
Malathion	Trace	8.33 ppb (113,000 ng/m^3)	
Malathion OA	Trace	8.76 ppb (113,000 ng/m^3)	
Methidathion	ND	0.25 ppb (3,100 ng/m^3)	
Methyl Bromide	ND	210 ppb (820,000 ng/m^3)*	
Metolachlor	ND	7.33 ppb (85,000 ng/m^3)	
Norflurazon	ND	12.6 ppb (170,000 ng/m^3)	

Chemical	Highest 24-h concentration in ppb (ng/m^3)	24-h acute screening level in ppb (ng/m^3)	% of screening level
Oryzalin	ND	29.7 ppb (420,000 ng/m^3)	
Oxydemeton Methyl	ND	3.74 ppb (39,200 ng/m^3)	
Oxyfluorfen	ND	34.5 ppb (510,000 ng/m^3)	
Permethrin	ND	10.5 ppb (168,000 ng/m^3)	
Phosmet	ND	5.94 ppb (77,000 ng/m^3)	
pp-dicofol	ND	4.49 ppb (68,000 ng/m^3)	
Propargite	ND	0.98 ppb (14,000 ng/m^3)	
Simazine	ND	13.3 ppb (110,000 ng/m^3)	
Trifluralin	ND	87.5 ppb (1,200,000 ng/m^3)	

*This value is a regulatory target rather than a screening level.
†This value is an 8-h time-weighted-average (TWA) used to compare against the 24-h measured concentration.
‡This value is a 72-h time-weighted-average (TWA) used to compare against the 24-h measured concentration.
** CDPR's May 28, 2019, risk management directive for chlorpyrifos established an acute regulatory target of 0.28 ppb (4,050 ng/m3), 1-h time weighted average (TWA). However, the current sample duration does not allow for a direct comparison between the acute regulatory target concentration and the measured sample values.

Sub-chronic (4- or 13-week) Concentrations

Table C-3 shows the highest observed rolling 4-week or 13-week average concentrations for all chemicals monitored at the Lindsay AMN sampling location in 2019. The highest concentration relative to its screening level was that of MITC at 8%.

Table C-3. Highest 4- or 13-wk air concentrations, sub-chronic screening levels, and percent of the sub-chronic screening level for chemicals monitored at the Lindsay AMN sampling location.

Chemical	Highest 4-week rolling average concentration in ppb (ng/m^3)	Sub-chronic screening level in ppb (ng/m^3)	% of screening level
MITC	0.08 ppb (239 ng/m^3)	1.00 ppb (3,000 ng/m^3)	8%
1,3-dichloropropene*	ND	3.0 ppb (14,000 ng/m^3)	
Acephate	ND	0.35 ppb (2,300 ng/m^3)	

Chemical	Highest 4-week rolling average concentration in ppb (ng/m^3)	Sub-chronic screening level in ppb (ng/m^3)	% of screening level
Bensulide	ND	1.47 ppb (24,000 ng/m^3)	
Chloropicrin*	ND	0.35 ppb (2,300 ng/m^3)	
Chlorothalonil	Trace	3.13 ppb (34,000 ng/m^3)	
Chlorpyrifos	ND	0.06 ppb (850 ng/m^3)	
Chlorpyrifos OA	ND	0.06 ppb (850 ng/m^3)	
Cypermethrin	ND	4.76 ppb (81,000 ng/m^3)	
Dacthal	Trace	34.6 ppb (470,000 ng/m^3)	
DDVP	Trace	0.24 ppb (2,200 ng/m^3)	
DEF	ND	0.68 ppb (8,800 ng/m^3)	
Diazinon	ND	0.01 ppb (130 ng/m^3)	
Diazinon OA	ND	0.01 ppb (130 ng/m^3)	
Dimethoate	Trace	0.32 ppb (3,000 ng/m^3)	
Dimethoate OA	Trace	0.34 ppb (3,000 ng/m^3)	
Diuron	ND	1.78 ppb (17,000 ng/m^3)	
Endosulfan	ND	0.20 ppb (3,300 ng/m^3)	
Endosulfan Sulfate	ND	0.19 ppb (3,300 ng/m^3)	
EPTC	Trace	3.10 ppb (24,000 ng/m^3)	
Iprodione	ND	21.2 ppb (286,000 ng/m^3)	
Malathion	Trace	5.97 ppb (80,600 ng/m^3)	

Chemical	Highest 4-week rolling average concentration in ppb (ng/m^3)	Sub-chronic screening level in ppb (ng/m^3)	% of screening level
Malathion OA	Trace	6.27 ppb (80,600 ng/m^3)	
Methidathion	ND	0.25 ppb (3,100 ng/m^3)	
Methyl Bromide	ND	5.0 ppb (19,400 ng/m^3)	
Metolachlor (S-Metolachlor)	ND	1.29 ppb (15,000 ng/m^3)	
Norflurazon	ND	1.92 ppb (26,000 ng/m^3)	
Oryzalin	ND	16.2 ppb (230,000 ng/m^3)	
Oxydemeton Methyl	ND	0.06 ppb (610 ng/m^3)	
Oxyfluorfen	ND	12.2 ppb (18,0000 ng/m^3)	
Permethrin	ND	5.63 ppb (90,000 ng/m^3)	
Phosmet	ND	2.00 ppb (26,000 ng/m^3)	
pp-dicofol	ND	3.24 ppb (49,000 ng/m^3)	
Propargite	ND	0.98 ppb (14,000 ng/m^3)	
Simazine	ND	3.76 ppb (31,000 ng/m^3)	
Trifluralin	ND	12.4 ppb (170,000 ng/m^3)	

* These concentrations represent the highest 13-week rolling average, rather than the default 4-week rolling average.

Chronic (2019) Concentrations

Table C-4 shows the annual average concentration for all chemicals monitored at the Lindsay AMN sampling location in 2019. The active ingredient with the highest concentration relative to its screening level was MITC at 9%. No other monitored chemicals had a quantifiable detection.

Table C-4. Annual average air concentrations, chronic screening levels, and percent of the chronic screening levels for chemicals monitored at the Lindsay Air Monitoring Network sampling location.

Chemical	Overall average concentration (ng/m^3)	Chronic screening level (ng/m^3)	% of screening level
MITC	0.009 ppb (27.8 ng/m^3)	0.10 ppb (300 ng/m^3)	9%
1,3-dichloropropene	ND	2.00 ppb (9,000 ng/m^3)	
Acephate	ND	1.13 ppb (8,500 ng/m^3)	
Bensulide	ND	1.48 ppb (24,000 ng/m^3)	
Chloropicrin	ND	0.27 ppb (1,800 ng/m^3)	
Chlorothalonil	Trace	3.13 ppb (34,000 ng/m^3)	
Chlorpyrifos	ND	0.04 ppb (510 ng/m^3)	
Chlorpyrifos OA	ND	0.04 ppb (510 ng/m^3)	
Cypermethrin	ND	1.59 ppb (27,000 ng/m^3)	
Dacthal	Trace	3.46 ppb (47,000 ng/m^3)	
DDVP	Trace	0.09 ppb (770 ng/m^3)	
DEF	ND	NA – Seasonal	
Diazinon	ND	0.01 ppb (130 ng/m^3)	
Diazinon OA	ND	0.01 ppb (130 ng/m^3)	
Dimethoate	Trace	0.03 ppb (300 ng/m^3)	
Dimethoate OA	Trace	0.03 ppb (300 ng/m^3)	
Diuron	ND	0.60 ppb (5,700 ng/m^3)	
Endosulfan	ND	0.02 ppb (330 ng/m^3)	
Endosulfan Sulfate	ND	0.02 ppb (330 ng/m^3)	
EPTC	Trace	1.10 ppb (8,500 ng/m^3)	
Iprodione	ND	21.2 ppb (286,000 ng/m^3)	

Chemical	Overall average concentration (ng/m^3)	Chronic screening level (ng/m^3)	% of screening level
Malathion	Trace	0.60 ppb (8,100 ng/m^3)	
Malathion OA	Trace	0.63 ppb (8,100 ng/m^3)	
Methidathion	ND	0.20 ppb (2,500 ng/m^3)	
Methyl Bromide	ND	1.00 ppb (3,900 ng/m^3)	
Metolachlor (S-Metolachlor)	ND	1.29 ppb (15,000 ng/m^3)	
Norflurazon	ND	1.92 ppb (26,000 ng/m^3)	
Oryzalin	ND	1.64 ppb (232,000 ng/m^3)	
Oxydemeton Methyl	ND	0.06 ppb (610 ng/m^3)	
Oxyfluorfen	ND	3.45 ppb (51,000 ng/m^3)	
Permethrin	ND	5.63 ppb (90,000 ng/m^3)	
Phosmet	ND	1.39 ppb (18,000 ng/m^3)	
pp-dicofol	ND	1.32 ppb (20,000 ng/m^3)	
Propargite	ND	0.98 ppb (14,000 ng/m^3)	
Simazine	ND	3.76 ppb (31,000 ng/m^3)	
Trifluralin	ND	2.99 ppb (41,000 ng/m^3)	

Temporal trends in detected concentrations

Figure C-1 presents the concentrations over time for monitoring results in 2019 for any chemical detected at a quantifiable concentration in Lindsay. Screening levels, as defined in Appendix K, are abbreviated as SL in the following graphs. Regulatory targets, also defined in Appendix K, are abbreviated as RT.

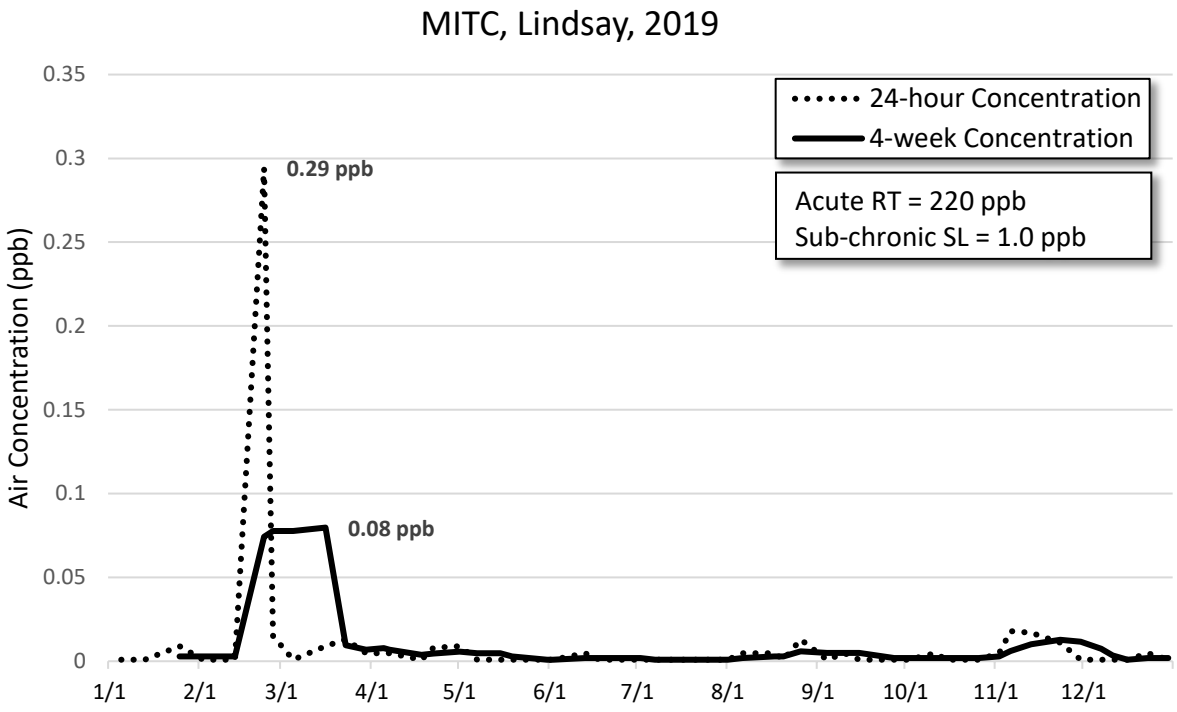

Figure C-1. Temporal trends in MITC concentrations in Lindsay in 2019.

APPENDIX D: DETAILED RESULTS FOR OXNARD

Oxnard

Oxnard is located in Ventura County and is 39.21 square miles in area. The average elevation is 52 feet; it receives an average of 15.62 inches of precipitation annually. Daily average temperatures range from 56° to 76°F in the summer and 42° to 66°F in the winter. Based on the 2010 census, the population of Oxnard was 197,899, of which 29.8% were under 18 years of age and 8.3% were above 65 years of age. The Oxnard Plain is primarily known for strawberry production. The monitoring site is located at Rio Mesa High School and transitioned from a Toxic Air Contaminant (TAC) Network site to an Air Monitoring Network (AMN) site. Monitoring is conducted by the California Air Resources Board (CARB).

Pesticide Detections

Table D-1 lists the number and percentage of analyses resulting in detections at the Oxnard sampling site. The active ingredients with the highest percentages of detections were malathion (28.6%, n = 14) and its oxygen analog breakdown product (32.7%, n = 16), followed by MITC (20.4%, n = 10). The highest percentage of quantifiable detections was observed for malathion (22.4%, n = 11), followed by chloropicrin (10%, n = 5), and then malathion's oxygen analog (6.1%, n = 3).

Table D-1. Number and percentage of positive samples per chemical in Oxnard, California.

Chemical	Number of possible detections	Total number of detections*	Number of quantifiable detections	Percent of detections	Percent of quantifiable detections
1,3-dichloropropene	48	1	1	2%	2%
Acephate	49	0	0	0%	0%
Bensulide	49	0	0	0%	0%
Chloropicrin	49	7	5	14%	10%
Chlorothalonil	49	9	0	18.4%	0%
Chlorpyrifos	49	0	0	0%	0%
Chlorpyrifos OA	49	1	0	2%	0%
Cypermethrin	49	0	0	0%	0%
Dacthal	49	3	1	6.1%	2%
DDVP	49	8	0	16.3%	0%
DEF	49	0	0	0%	0%
Diazinon	49	0	0	0%	0%
Diazinon OA	49	0	0	0%	0%
Dimethoate	49	0	0	0%	0%
Dimethoate OA	49	0	0	0%	0%
Diuron	49	0	0	0%	0%
Endosulfan	49	0	0	0%	0%
Endosulfan Sulfate	49	0	0	0%	0%
EPTC	49	0	0	0%	0%
Iprodione	49	0	0	0%	0%

Chemical	Number of possible detections	Total number of detections*	Number of quantifiable detections	Percent of detections	Percent of quantifiable detections
Malathion	49	14	11	28.6%	22.4%
Malathion OA	49	16	3	32.7%	6.1%
Methidathion	49	0	0	0%	0%
Methyl Bromide	48	0	0	0%	0%
Metolachlor (S-Metolachlor)	49	0	0	0%	0%
MITC	49	10	2	20.4%	4.1%
Norflurazon	49	0	0	0%	0%
Oryzalin	49	0	0	0%	0%
Oxydemeton Methyl	49	0	0	0%	0%
Oxyfluorfen	49	0	0	0%	0%
Permethrin	49	0	0	0%	0%
Phosmet	49	0	0	0%	0%
pp-dicofol	49	0	0	0%	0%
Propargite	49	0	0	0%	0%
Simazine	49	0	0	0%	0%
Trifluralin	49	0	0	0%	0%
Total	1,762	69	23	3.9%	1.3%

*Includes both quantifiable and trace detections.

Pesticide Concentrations

Acute (24-h) Concentrations

Table D-2 shows the highest 24-h concentrations observed for all chemicals monitored at the Oxnard AMN sampling location in 2019. The active ingredient with the highest concentration relative to its screening level was chloropicrin at 1.4%, followed by 1,3-dichloropropene at 0.5% and malathion at 0.1%. All other quantifiable concentrations of chemicals monitored for by the AMN were less than 0.1% of the acute screening level at Oxnard.

Table D-2. Highest 24-h air concentrations, acute screening levels, and percent of the acute screening levels for all chemicals monitored at the Oxnard AMN sampling location in 2019.

Chemical	Highest 24-h concentration in ppb (ng/m^3)	24-h acute screening level in ppb (ng/m^3)	% of screening level
Chloropicrin	1.0 ppb (6,939 ng/m^3)	73.0 ppb (491,000 ng/m^3)*†	1.4%
1,3-dichloropropene	0.51 ppb (2,315 ng/m^3)	110 ppb (505,000 ng/m^3)‡	0.5%
Malathion	0.008 ppb (113 ng/m^3)	8.33 ppb (113,000 ng/m^3)	0.1%

Chemical	Highest 24-h concentration in ppb (ng/m^3)	24-h acute screening level in ppb (ng/m^3)	% of screening level
Malathion OA	0.001 ppb (19 ng/m^3)	8.76 ppb (113,000 ng/m^3)	0.02%
MITC	0.03 ppb (84 ng/m^3)	220 ppb (660,000 ng/m^3)*†	0.01%
Dacthal	0.002 ppb (21 ng/m^3)	1,730 ppb (23,500,000 ng/m^3)	0.00009%
Acephate	ND	1.60 ppb (12,000 ng/m^3)	
Bensulide	ND	15.9 ppb (259,000 ng/m^3)	
Chlorothalonil	Trace	3.13 ppb (34,000 ng/m^3)	
Chlorpyrifos	ND	0.08 ppb (1,200 ng/m^3)**	
Chlorpyrifos OA	Trace	0.09 ppb (1,200 ng/m^3)**	
Cypermethrin	ND	6.64 ppb (113,000 ng/m^3)	
DDVP	Trace	1.22 ppb (11,000 ng/m^3)	
DEF	ND	0.68 ppb (8,800 ng/m^3)	
Diazinon	ND	0.01 ppb (130 ng/m^3)	
Diazinon OA	ND	0.01 ppb (130 ng/m^3)	
Dimethoate	ND	0.46 ppb (4,300 ng/m^3)	
Dimethoate OA	ND	0.49 ppb (4,300 ng/m^3)	
Diuron	ND	17.8 ppb (170,000 ng/m^3)	
Endosulfan	ND	0.20 ppb (3,300 ng/m^3)	
Endosulfan Sulfate	ND	0.19 ppb (3,300 ng/m^3)	
EPTC	ND	29.7 ppb (230,000 ng/m^3)	
Iprodione	ND	69.6 ppb (939,000 ng/m^3)	
Methidathion	ND	0.25 ppb (3,100 ng/m^3)	
Methyl Bromide	ND	210 ppb (820,000 ng/m^3)*	

Chemical	Highest 24-h concentration in ppb (ng/m^3)	24-h acute screening level in ppb (ng/m^3)	% of screening level
Metolachlor	ND	7.33 ppb (85,000 ng/m³)	
Norflurazon	ND	12.6 ppb (170,000 ng/m³)	
Oryzalin	ND	29.7 ppb (420,000 ng/m³)	
Oxydemeton Methyl	ND	3.74 ppb (39,200 ng/m³)	
Oxyfluorfen	ND	34.5 ppb (510,000 ng/m³)	
Permethrin	ND	10.5 ppb (168,000 ng/m³)	
Phosmet	ND	5.94 ppb (77,000 ng/m³)	
pp-dicofol	ND	4.49 ppb (68,000 ng/m^3)	
Propargite	ND	0.98 ppb (14,000 ng/m³)	
Simazine	ND	13.3 ppb (110,000 ng/m³)	
Trifluralin	ND	87.5 ppb (1,200,000 ng/m³)	

*This value is a regulatory target rather than a screening level.
†This value is an 8-h time-weighted-average (TWA) used to compare against the 24-h measured concentration.
‡This value is a 72-h time-weighted-average (TWA) used to compare against the 24-h measured concentration.
** CDPR's May 28, 2019, risk management directive for chlorpyrifos established an acute regulatory target of 0.28 ppb (4,050 ng/m3), 1-h time weighted average (TWA). However, the current sample duration does not allow for a direct comparison between the acute regulatory target concentration and the measured sample values.

Sub-chronic (4- or 13-week) Concentrations

Table D-3 shows the highest observed rolling 4-week or 13-week average concentrations for all chemicals monitored at the Oxnard AMN sampling location in 2019. The active ingredient with the highest concentration relative to its screening level was chloropicrin at 59%. This was followed by 1,3-dichloropropene at 3%, and MITC at 1.3%. The remaining chemicals with quantifiable concentrations were significantly less than 1% of their sub-chronic screening levels.

Table D-3. Highest 4- or 13-wk air concentrations, sub-chronic screening levels, and percent of the sub-chronic screening level for chemicals monitored at the Oxnard Air Monitoring Network sampling location.

Chemical	Highest 4-week rolling average concentration in ppb (ng/m^3)	Sub-chronic screening level in ppb (ng/m^3)	% of screening level
Chloropicrin*	0.2 ppb (1,359 ng/m^3)	0.35 ppb (2,300 ng/m^3)	59.1%
1,3-dichloropropene*	0.09 ppb (417 ng/m^3)	3.0 ppb (14,000 ng/m^3)	3%
MITC	0.01 ppb (40 ng/m^3)	1.00 ppb (3,000 ng/m^3)	1.3%
Malathion	0.005 ppb (62.3 ng/m^3)	6.27 ppb (80,600 ng/m^3)	0.08%
Malathion OA	0.0007 ppb (10.3 ng/m^3)	6.27 ppb (80,600 ng/m^3)	0.01%
Dacthal	0.0007 ppb (8.2 ng/m^3)	34.6 ppb (470,000 ng/m^3)	0.002%
Acephate	ND	0.35 ppb (2,300 ng/m^3)	
Bensulide	ND	1.47 ppb (24,000 ng/m^3)	
Chlorothalonil	Trace	3.13 ppb (34,000 ng/m^3)	
Chlorpyrifos	ND	0.06 ppb (850 ng/m^3)	
Chlorpyrifos OA	Trace	0.06 ppb (850 ng/m^3)	
Cypermethrin	ND	4.76 ppb (81,000 ng/m^3)	
DDVP	Trace	0.24 ppb (2,200 ng/m^3)	
DEF	ND	0.68 ppb (8,800 ng/m^3)	
Diazinon	ND	0.01 ppb (130 ng/m^3)	
Diazinon OA	ND	0.01 ppb (130 ng/m^3)	
Dimethoate	ND	0.32 ppb (3,000 ng/m^3)	
Dimethoate OA	ND	0.34 ppb (3,000 ng/m^3)	
Diuron	ND	1.78 ppb (17,000 ng/m^3)	

Chemical	Highest 4-week rolling average concentration in ppb (ng/m^3)	Sub-chronic screening level in ppb (ng/m^3)	% of screening level
Endosulfan	ND	0.20 ppb (3,300 ng/m^3)	
Endosulfan Sulfate	ND	0.19 ppb (3,300 ng/m^3)	
EPTC	ND	3.10 ppb (24,000 ng/m^3)	
Iprodione	ND	21.2 ppb (286,000 ng/m^3)	
Methidathion	ND	0.25 ppb (3,100 ng/m^3)	
Methyl Bromide	ND	5.0 ppb (19,400 ng/m^3)	
Metolachlor (S-Metolachlor)	ND	1.29 ppb (15,000 ng/m^3)	
Norflurazon	ND	1.92 ppb (26,000 ng/m^3)	
Oryzalin	ND	16.2 ppb (230,000 ng/m^3)	
Oxydemeton Methyl	ND	0.06 ppb (610 ng/m^3)	
Oxyfluorfen	ND	12.2 ppb (18,0000 ng/m^3)	
Permethrin	ND	5.63 ppb (90,000 ng/m^3)	
Phosmet	ND	2.00 ppb (26,000 ng/m^3)	
pp-dicofol	ND	3.24 ppb (49,000 ng/m^3)	
Propargite	ND	0.98 ppb (14,000 ng/m^3)	
Simazine	ND	3.76 ppb (31,000 ng/m^3)	
Trifluralin	ND	12.4 ppb (170,000 ng/m^3)	

* These concentrations represent the highest 13-week rolling average, rather than the default 4-week rolling average.

Chronic (2019) Concentrations

Table D-4 shows the annual average concentration for all chemicals monitored at the Oxnard AMN sampling location in 2019. The active ingredient with the highest concentration relative to its screening level was chloropicrin at 24.2%, followed by MITC at 2.4%. All other monitored chemicals were less than 0.1% of the chronic screening level or regulatory target in Oxnard during monitoring in 2019.

Table D-4. Annual average air concentrations, chronic screening levels, and percent of the chronic screening levels for chemicals monitored at the Oxnard AMN sampling location.

Chemical	Overall average concentration in ppb (ng/m^3)	Chronic screening level in ppb (ng/m^3)	% of screening level
Chloropicrin	0.06 ppb (436 ng/m^3)	0.27 ppb (1,800 ng/m^3)	24.2%
MITC	0.002 ppb (7.1 ng/m^3)	0.10 ppb (300 ng/m^3)	2.4%
1,3-dichloropropene	0.06 ppb (270 ng/m^3)	2.00 ppb (9,000 ng/m^3)	0.03%
Malathion OA	0.0002 ppb (2.8 ng/m^3)	0.63 ppb (8,100 ng/m^3)	0.03%
Malathion	0.0007 ppb (9.6 ng/m^3)	0.60 ppb (8,100 ng/m^3)	0.01%
Dacthal	0.0002 ppb (1.5 ng/m^3)	3.46 ppb (47,000 ng/m^3)	0.003%
Acephate	ND	1.13 ppb (8,500 ng/m^3)	
Bensulide	ND	1.48 ppb (24,000 ng/m^3)	
Chlorothalonil	Trace	3.13 ppb (34,000 ng/m^3)	
Chlorpyrifos	ND	0.04 ppb (510 ng/m^3)	
Chlorpyrifos OA	Trace	0.04 ppb (510 ng/m^3)	
Cypermethrin	ND	1.59 ppb (27,000 ng/m^3)	
DDVP	Trace	0.09 ppb (770 ng/m^3)	
DEF	ND	NA – Seasonal	
Diazinon	ND	0.01 ppb (130 ng/m^3)	
Diazinon OA	ND	0.01 ppb (130 ng/m^3)	
Dimethoate	ND	0.03 ppb (300 ng/m^3)	

Chemical	Overall average concentration in ppb (ng/m^3)	Chronic screening level in ppb (ng/m^3)	% of screening level
Dimethoate OA	ND	0.03 ppb (300 ng/m^3)	
Diuron	ND	0.60 ppb (5,700 ng/m^3)	
Endosulfan	ND	0.02 ppb (330 ng/m^3)	
Endosulfan Sulfate	ND	0.02 ppb (330 ng/m^3)	
EPTC	ND	1.10 ppb (8,500 ng/m^3)	
Iprodione	ND	21.2 ppb (286,000 ng/m^3)	
Methidathion	ND	0.20 ppb (2,500 ng/m^3)	
Methyl Bromide	ND	1.00 ppb (3,900 ng/m^3)	
Metolachlor	ND	1.29 ppb (15,000 ng/m^3)	
Norflurazon	ND	1.92 ppb (26,000 ng/m^3)	
Oryzalin	ND	1.64 ppb (232,000 ng/m^3)	
Oxydemeton Methyl	ND	0.06 ppb (610 ng/m^3)	
Oxyfluorfen	ND	3.45 ppb (51,000 ng/m^3)	
Permethrin	ND	5.63 ppb (90,000 ng/m^3)	
Phosmet	ND	1.39 ppb (18,000 ng/m^3)	
pp-dicofol	ND	1.32 ppb (20,000 ng/m^3)	
Propargite	ND	0.98 ppb (14,000 ng/m^3)	
Simazine	ND	3.76 ppb (31,000 ng/m^3)	
Trifluralin	ND	2.99 ppb (41,000 ng/m^3)	

Temporal trends in detected concentrations

Figures D-1 to D-5 present the present the concentrations over time for monitoring results in 2019 for any chemical detected at a quantifiable concentration in Oxnard. Screening levels, as defined in Appendix K, are abbreviated as SL in the following graphs. Regulatory targets, also defined in Appendix K, are abbreviated as RT. For graphs where both a pesticide and its degradate are shown, the detected concentrations of both the parent chemical and its degradate have been summed for each sampling date.

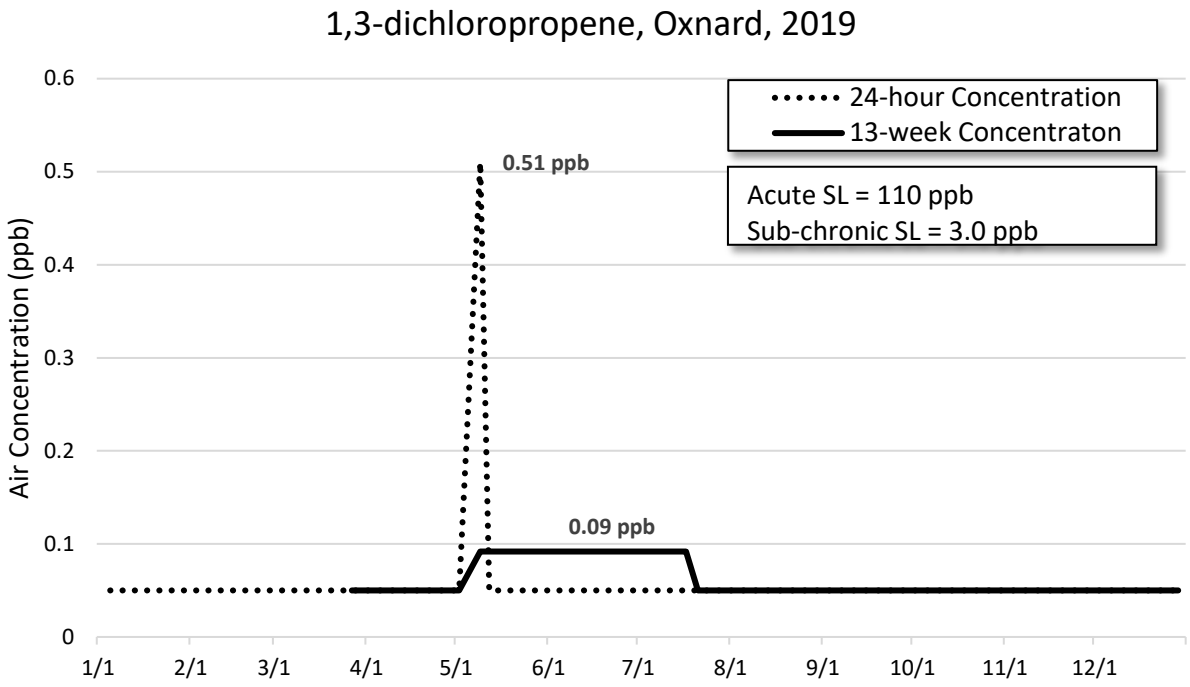

Figure D-1. Temporal trend in 1,3-dichloropropene concentrations in Oxnard in 2019.

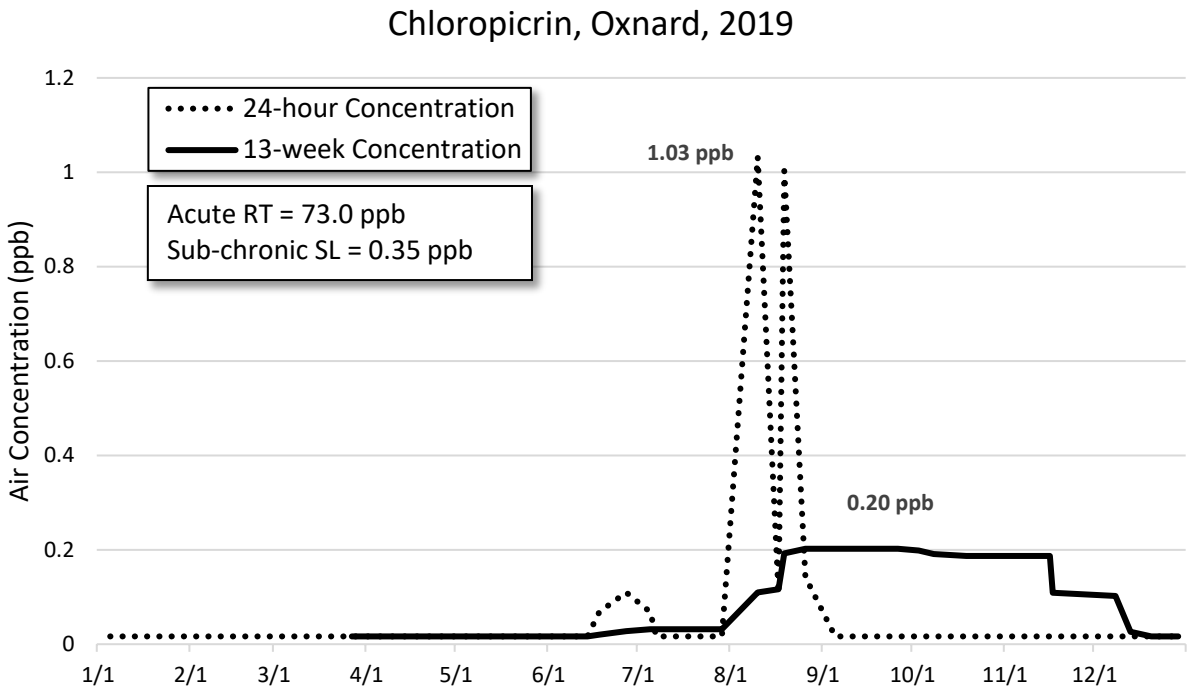

Figure D-2. Temporal trend in chloropicrin concentrations in Oxnard in 2019.

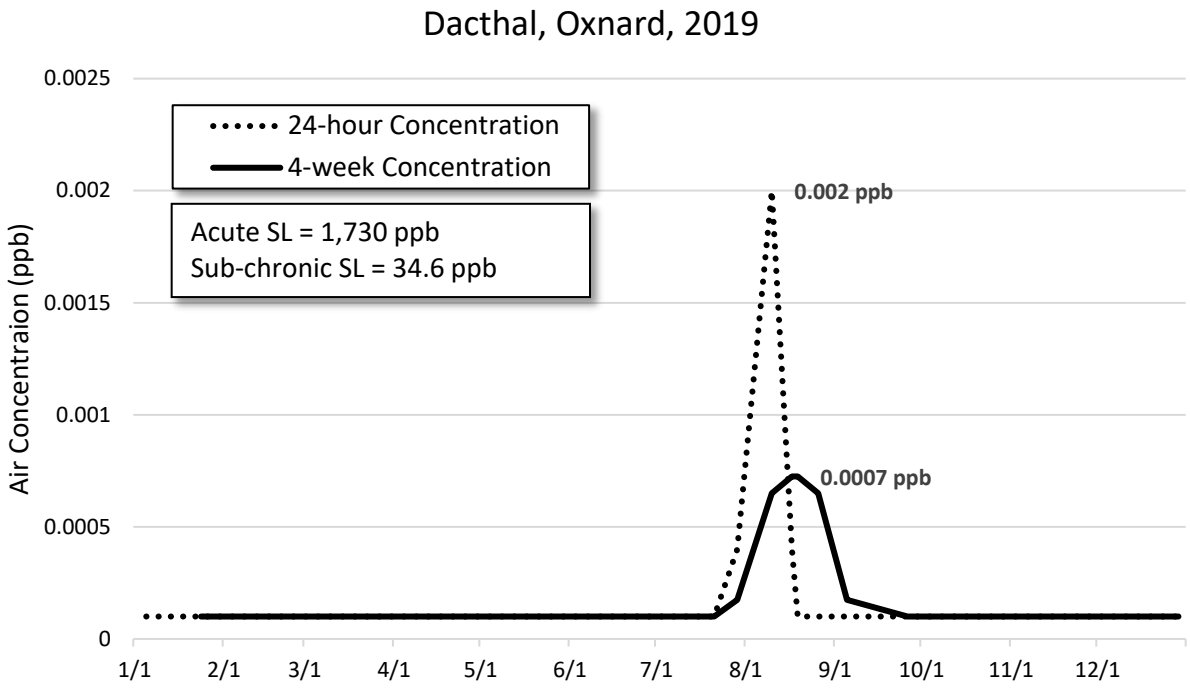

Figure D-3. Temporal trend in dacthal concentrations in Oxnard in 2019.

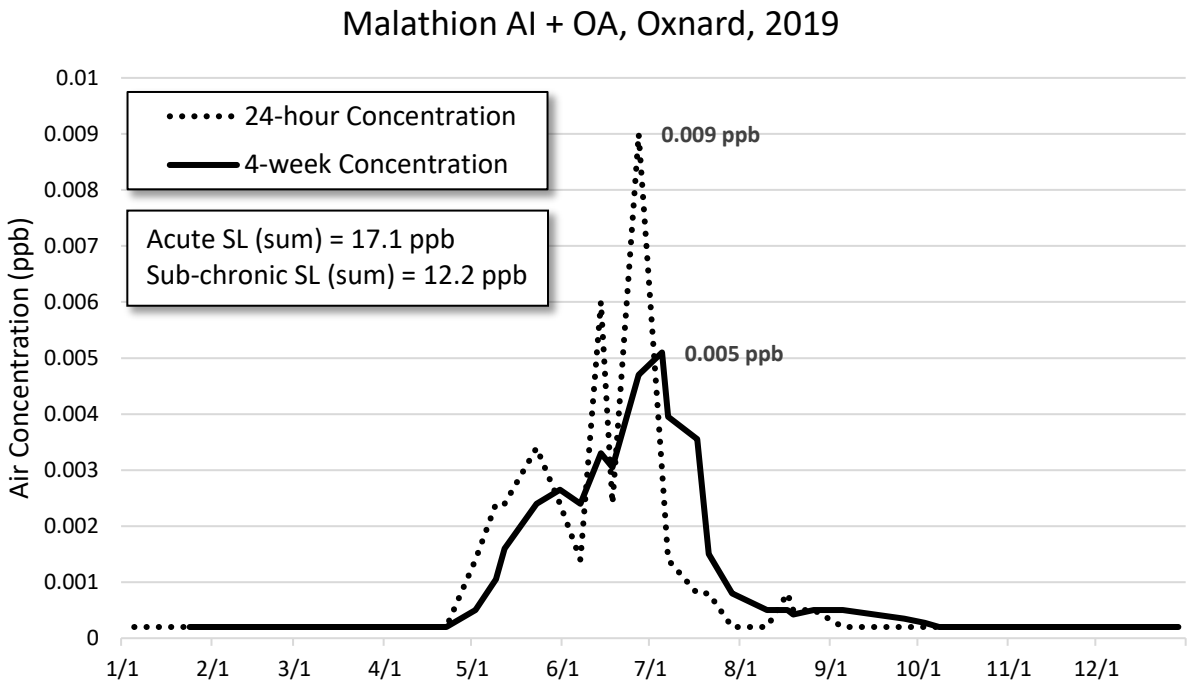

Figure D-4. Temporal trend in malathion AI + OA concentrations in Oxnard in 2019.

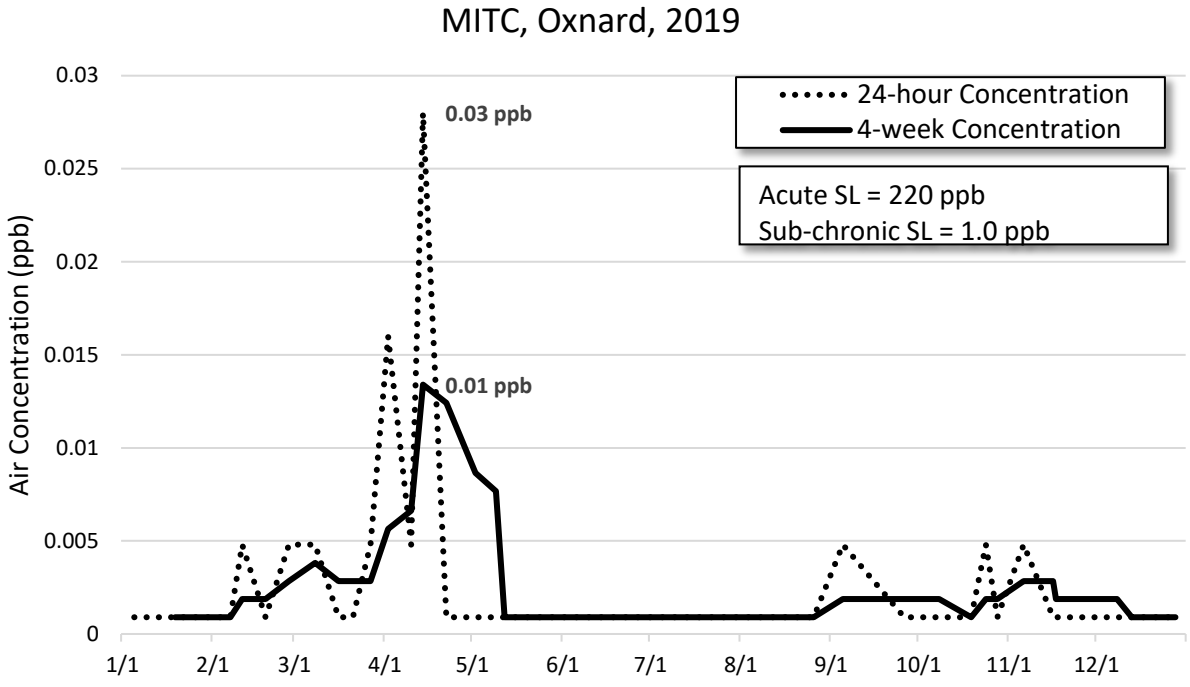

Figure D-5. Temporal trend in MITC concentrations in Oxnard in 2019.

APPENDIX E: DETAILED RESULTS FOR SAN JOAQUIN

San Joaquin

The city of San Joaquin is located in Fresno County and is 1.20 square miles in area. The average elevation is 174 feet; it receives an average of 12.5 inches of precipitation annually. Daily average temperatures range from 56° to 97°F in the summer and 36° to 63°F in the winter. Based on the 2010 census, the population of the city of San Joaquin was 4,001, of which 41.3% were under 18 years of age and 4.4% were above 65 years of age. Agriculture in the area includes grapes, oranges, and nectarines. The monitoring site is located at San Joaquin Elementary School. Monitoring is conducted by the California Air Resources Board.

Pesticide Detections

Table E-1 lists the number and percentage of analyses resulting in detections at the San Joaquin sampling site. The active ingredient with the highest percentage of detections was MITC (54.7%, n = 29), followed by trifluralin (28.3%, n = 15), and then both chlorothalonil and DDVP (15.1%, n = 8). The highest percentage of quantifiable detections was observed for MITC (35.8%, n= 19), followed by 1,3-dichloropropene (3.8%, n = 2)

Table E-1. Number and percentage of positive samples per chemical in San Joaquin, California.

Chemical	Number of possible detections	Total number of detections*	Number of quantifiable detections	Percent of detections	Percent of quantifiable detections
1,3-dichloropropene	53	2	2	3.8%	3.8%
Acephate	53	0	0	0%	0%
Bensulide	53	0	0	0%	0%
Chloropicrin	53	0	0	0%	0%
Chlorothalonil	53	8	0	15.1%	0%
Chlorpyrifos	53	1	0	1.9%	0%
Chlorpyrifos oa	53	0	0	0%	0%
Cypermethrin	53	0	0	0%	0%
Dacthal	53	0	0	0%	0%
DDVP	53	5	2	17%	3.8%
DEF	53	0	0	0%	0%
Diazinon	53	0	0	0%	0%
Diazinon oa	53	0	0	0%	0%
Dimethoate	53	0	0	0%	0%
Dimethoate oa	53	0	0	0%	0%
Diuron	53	1	0	1.9%	0%
Endosulfan	53	0	0	0%	0%
Endosulfan Sulfate	53	0	0	0%	0%
EPTC	53	0	0	0%	0%
Iprodione	53	0	0	0%	0%

Chemical	Number of possible detections	Total number of detections*	Number of quantifiable detections	Percent of detections	Percent of quantifiable detections
Malathion	53	2	0	3.8%	0%
Malathion oa	53	2	0	3.8%	0%
Methidathion	53	0	0	0%	0%
Methyl Bromide	53	0	0	0%	0%
Metolachlor (S-Metolachlor)	53	0	0	0%	0%
MITC	53	31	21	58.4%	39.6%
Norflurazon	53	0	0	0%	0%
Oryzalin	53	0	0	0%	0%
Oxydemeton Methyl	53	0	0	0%	0%
Oxyfluorfen	53	0	0	0%	0%
Permethrin	53	0	0	0%	0%
Phosmet	53	0	0	0%	0%
pp-dicofol	53	0	0	0%	0%
Propargite	53	1	0	1.9%	0%
Simazine	53	0	0	0%	0%
Trifluralin	53	17	0	32.1%	0%
Total	**1,908**	**73**	**25**	**3.8%**	**1.3%**

*Includes both quantifiable and trace detections.

Pesticide Concentrations

Acute (24-h) Concentrations

Table E-2 shows the highest observed 24-h concentrations observed for all chemicals monitored at the San Joaquin Air Monitoring Network (AMN) sampling location in 2019. The highest concentration relative to its screening level was that of DDVP at 5.2%, followed by MITC at 0.7%, and then 1,3-dichloropropene at 0.5%.

Table E-2. Highest 24-h air concentrations, acute screening levels, and percent of the acute screening level for all chemicals monitored at the San Joaquin AMN sampling location in 2019.

Chemical	Highest 24-h concentration in ppb (ng/m^3)	24-h acute screening level in ppb (ng/m^3)	% of screening level
DDVP	0.06 ppb (572 ng/m^3)	1.22 ppb (11,000 ng/m^3)	5.2%
MITC	1.53 ppb (4,580 ng/m^3)	220 ppb (660,000 ng/m^3)*†	0.7%
1,3-dichloropropene	0.56 ppb (2,542 ng/m^3)	110 ppb (505,000 ng/m^3)‡	0.5%
Acephate	ND	1.60 ppb (12,000 ng/m^3)	

Chemical	Highest 24-h concentration in ppb (ng/m^3)	24-h acute screening level in ppb (ng/m^3)	% of screening level
Bensulide	ND	15.9 ppb (259,000 ng/m^3)	
Chloropicrin	ND	73.0 ppb (491,000 ng/m^3)*†	
Chlorothalonil	Trace	3.13 ppb (34,000 ng/m^3)	
Chlorpyrifos	Trace	0.08 ppb (1,200 ng/m^3)**	
Chlorpyrifos OA	ND	0.09 ppb (1,200 ng/m^3)**	
Cypermethrin	ND	6.64 ppb (113,000 ng/m^3)	
Dacthal	ND	1,730 ppb (23,500,000 ng/m^3)	
DEF	ND	0.68 ppb (8,800 ng/m^3)	
Diazinon	ND	0.01 ppb (130 ng/m^3)	
Diazinon OA	ND	0.01 ppb (130 ng/m^3)	
Dimethoate	ND	0.46 ppb (4,300 ng/m^3)	
Dimethoate OA	ND	0.49 ppb (4,300 ng/m^3)	
Diuron	Trace	17.8 ppb (170,000 ng/m^3)	
Endosulfan	ND	0.20 ppb (3,300 ng/m^3)	
Endosulfan Sulfate	ND	0.19 ppb (3,300 ng/m^3)	
EPTC	ND	29.7 ppb (230,000 ng/m^3)	
Iprodione	ND	69.6 ppb (939,000 ng/m^3)	
Malathion	Trace	8.33 ppb (113,000 ng/m^3)	
Malathion OA	Trace	8.76 ppb (113,000 ng/m^3)	
Methidathion	ND	0.25 ppb (3,100 ng/m^3)	
Methyl Bromide	ND	210 ppb (820,000 ng/m^3)*	
Metolachlor	ND	7.33 ppb (85,000 ng/m^3)	

Chemical	Highest 24-h concentration in ppb (ng/m^3)	24-h acute screening level in ppb (ng/m^3)	% of screening level
Norflurazon	ND	12.6 ppb (170,000 ng/m^3)	
Oryzalin	ND	29.7 ppb (420,000 ng/m^3)	
Oxydemeton Methyl	ND	3.74 ppb (39,200 ng/m^3)	
Oxyfluorfen	ND	34.5 ppb (510,000 ng/m^3)	
Permethrin	ND	10.5 ppb (168,000 ng/m^3)	
Phosmet	ND	5.94 ppb (77,000 ng/m^3)	
pp-dicofol	ND	4.49 ppb (68,000 ng/m^3)	
Propargite	Trace	0.98 ppb (14,000 ng/m^3)	
Simazine	ND	13.3 ppb (110,000 ng/m^3)	
Trifluralin	Trace	87.5 ppb (1,200,000 ng/m^3)	

*This value is a regulatory target rather than a screening level.
†This value is an 8-h time-weighted-average (TWA) used to compare against the 24-h measured concentration.
‡This value is a 72-h time-weighted-average (TWA) used to compare against the 24-h measured concentration.
** CDPR's May 28, 2019, risk management directive for chlorpyrifos established an acute regulatory target of 0.28 ppb (4,050 ng/m3), 1-h time weighted average (TWA). However, the current sample duration does not allow for a direct comparison between the acute regulatory target concentration and the measured sample values.

Sub-chronic (4- or 13-wk) Concentrations

Table E-3 shows the highest observed rolling 4-week or 13-week average concentrations for all chemicals monitored at the San Joaquin AMN sampling location in 2019. The highest concentration relative to its sub-chronic screening level was that of MITC at 43%, which was followed by DDVP at 7%, and then 1,3-dichloropropene at 2.9%.

Table E-3. Highest 4- or 13-wk air concentrations, sub-chronic screening levels, and percent of the sub-chronic screening level for chemicals monitored at the San Joaquin AMN sampling location.

Chemical	Highest 4-week rolling average concentration in ppb (ng/m^3)	Sub-chronic screening level in ppb (ng/m^3)	% of screening level
MITC	0.43 ppb (1,284 ng/m^3)	1.00 ppb (3,000 ng/m^3)	43%
DDVP	0.02 ppb (157 ng/m^3)	0.24 ppb (2,200 ng/m^3)	7.1%

Chemical	Highest 4-week rolling average concentration in ppb (ng/m^3)	Sub-chronic screening level in ppb (ng/m^3)	% of screening level
1,3-dichloropropene*	0.09 ppb (405 ng/m^3)	3.0 ppb (14,000 ng/m^3)	2.9%
Acephate	ND	0.35 ppb (2,300 ng/m^3)	
Bensulide	ND	1.47 ppb (24,000 ng/m^3)	
Chloropicrin*	ND	0.35 ppb (2,300 ng/m^3)	
Chlorothalonil	Trace	3.13 ppb (34,000 ng/m^3)	
Chlorpyrifos	Trace	0.06 ppb (850 ng/m^3)	
Chlorpyrifos OA	ND	0.06 ppb (850 ng/m^3)	
Cypermethrin	ND	4.76 ppb (81,000 ng/m^3)	
Dacthal	ND	34.6 ppb (470,000 ng/m^3)	
DEF	ND	0.68 ppb (8,800 ng/m^3)	
Diazinon	ND	0.01 ppb (130 ng/m^3)	
Diazinon OA	ND	0.01 ppb (130 ng/m^3)	
Dimethoate	ND	0.32 ppb (3,000 ng/m^3)	
Dimethoate OA	ND	0.34 ppb (3,000 ng/m^3)	
Diuron	Trace	1.78 ppb (17,000 ng/m^3)	
Endosulfan	ND	0.20 ppb (3,300 ng/m^3)	
Endosulfan Sulfate	ND	0.19 ppb (3,300 ng/m^3)	
EPTC	ND	3.10 ppb (24,000 ng/m^3)	
Iprodione	ND	21.2 ppb (286,000 ng/m^3)	

Chemical	Highest 4-week rolling average concentration in ppb (ng/m^3)	Sub-chronic screening level in ppb (ng/m^3)	% of screening level
Malathion	Trace	5.97 ppb (80,600 ng/m^3)	
Malathion OA	Trace	6.27 ppb (80,600 ng/m^3)	
Methidathion	ND	0.25 ppb (3,100 ng/m^3)	
Methyl Bromide	ND	5.0 ppb (19,400 ng/m^3)	
Metolachlor (S-Metolachlor)	ND	1.29 ppb (15,000 ng/m^3)	
Norflurazon	ND	1.92 ppb (26,000 ng/m^3)	
Oryzalin	ND	16.2 ppb (230,000 ng/m^3)	
Oxydemeton Methyl	ND	0.06 ppb (610 ng/m^3)	
Oxyfluorfen	ND	12.2 ppb (18,0000 ng/m^3)	
Permethrin	ND	5.63 ppb (90,000 ng/m^3)	
Phosmet	ND	2.00 ppb (26,000 ng/m^3)	
pp-dicofol	ND	3.24 ppb (49,000 ng/m^3)	
Propargite	Trace	0.98 ppb (14,000 ng/m^3)	
Simazine	ND	3.76 ppb (31,000 ng/m^3)	
Trifluralin	Trace	12.4 ppb (170,000 ng/m^3)	

* These concentrations represent the highest 13-week rolling average, rather than the default 4-week rolling average.

Chronic (2019) Concentrations

Table E-4 shows the annual average concentration for all chemicals monitored at the San Joaquin AMN sampling location in 2019. The highest concentration relative to its screening level was that of MITC at 58%, followed by 1,3-dichloropropene at 3%, and then DDVP at 2%. All other monitored chemicals were either trace detections or not detected during 2019.

Table E-4. Annual average air concentrations, chronic screening levels, and percent of the chronic screening levels for chemicals monitored at the San Joaquin AMN sampling location.

Chemical	Overall average concentration (ng/m^3)	Chronic screening level (ng/m^3)	% of screening level
1,3-dichloropropene	0.061 ppb (277.52 ng/m^3)	2.00 ppb (9,000 ng/m^3)	3%
MITC	0.058 ppb (174 ng/m^3)	0.10 ppb (300 ng/m^3)	58%
DDVP	0.002 ppb (15.3 ng/m^3)	0.09 ppb (770 ng/m^3)	2%
Acephate	ND	1.13 ppb (8,500 ng/m^3)	
Bensulide	ND	1.48 ppb (24,000 ng/m^3)	
Chloropicrin	ND	0.27 ppb (1,800 ng/m^3)	
Chlorothalonil	Trace	3.13 ppb (34,000 ng/m^3)	
Chlorpyrifos	Trace	0.04 ppb (510 ng/m^3)	
Chlorpyrifos OA	ND	0.04 ppb (510 ng/m^3)	
Cypermethrin	ND	1.59 ppb (27,000 ng/m^3)	
Dacthal	ND	3.46 ppb (47,000 ng/m^3)	
DEF	ND	NA – Seasonal	
Diazinon	ND	0.01 ppb (130 ng/m^3)	
Diazinon OA	ND	0.01 ppb (130 ng/m^3)	
Dimethoate	ND	0.03 ppb (300 ng/m^3)	
Dimethoate OA	ND	0.03 ppb (300 ng/m^3)	
Diuron	Trace	0.60 ppb (5,700 ng/m^3)	
Endosulfan	ND	0.02 ppb (330 ng/m^3)	
Endosulfan Sulfate	ND	0.02 ppb (330 ng/m^3)	
EPTC	ND	1.10 ppb (8,500 ng/m^3)	
Iprodione	ND	21.2 ppb (286,000 ng/m^3)	

Chemical	Overall average concentration (ng/m^3)	Chronic screening level (ng/m^3)	% of screening level
Malathion	Trace	0.60 ppb (8,100 ng/m^3)	
Malathion OA	Trace	0.63 ppb (8,100 ng/m^3)	
Methidathion	ND	0.20 ppb (2,500 ng/m^3)	
Methyl Bromide	ND	1.00 ppb (3,900 ng/m^3)	
Metolachlor (S-Metolachlor)	ND	1.29 ppb (15,000 ng/m^3)	
Norflurazon	ND	1.92 ppb (26,000 ng/m^3)	
Oryzalin	ND	1.64 ppb (232,000 ng/m^3)	
Oxydemeton Methyl	ND	0.06 ppb (610 ng/m^3)	
Oxyfluorfen	ND	3.45 ppb (51,000 ng/m^3)	
Permethrin	ND	5.63 ppb (90,000 ng/m^3)	
Phosmet	ND	1.39 ppb (18,000 ng/m^3)	
pp-dicofol	ND	1.32 ppb (20,000 ng/m^3)	
Propargite	Trace	0.98 ppb (14,000 ng/m^3)	
Simazine	ND	3.76 ppb (31,000 ng/m^3)	
Trifluralin	Trace	2.99 ppb (41,000 ng/m^3)	

Temporal trends in detected concentrations

Figures E-1 to E-3 present the concentrations over time for monitoring results in 2019 for any chemical detected at a quantifiable concentration in San Joaquin. Screening levels, as defined in Appendix K, are abbreviated as SL in the following graphs. Regulatory targets, also defined in Appendix K, are abbreviated as RT.

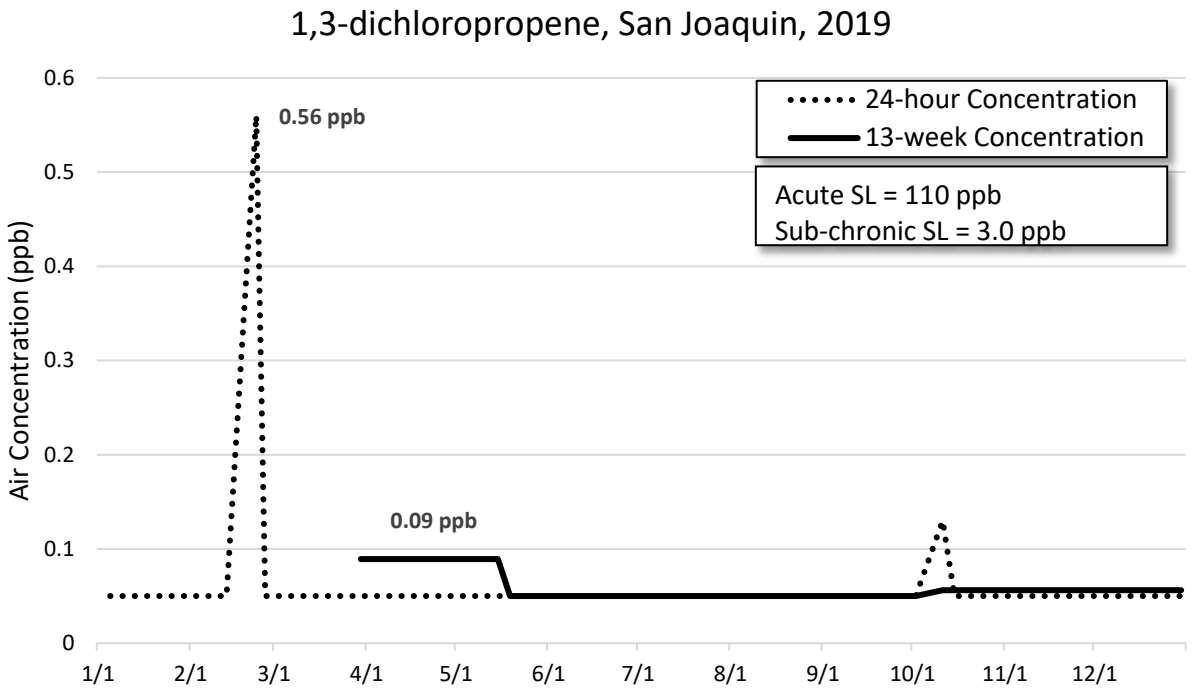

Figure E-1. Temporal trend in 1,3-dichloropropene concentrations in San Joaquin in 2019.

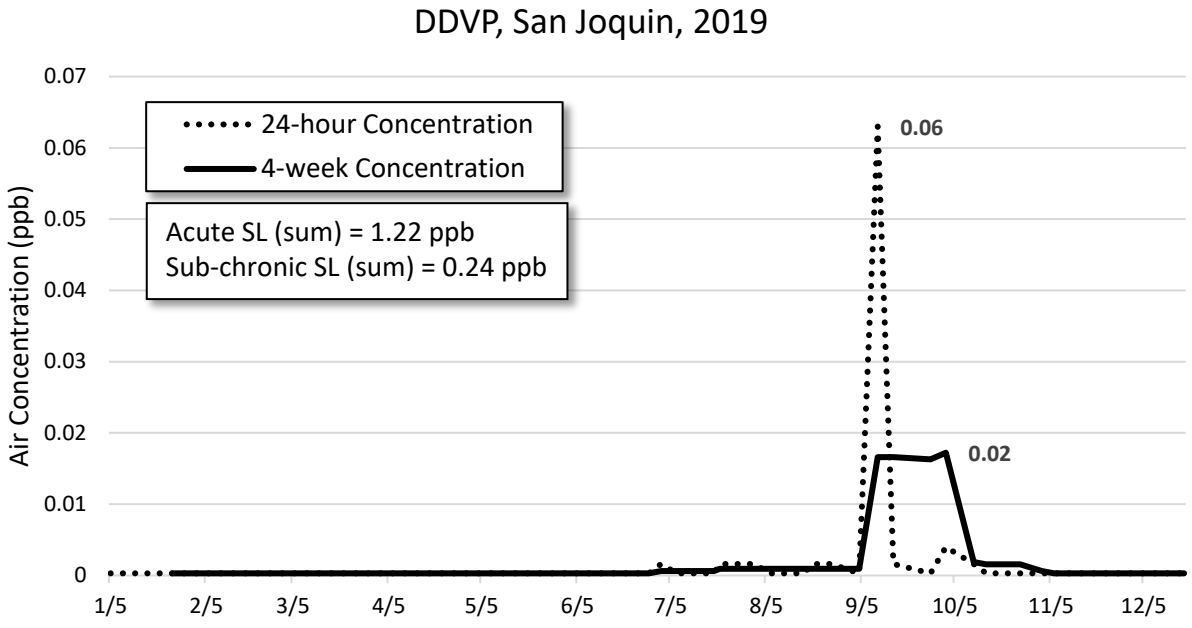

Figure E-2. Temporal trend in DDVP concentrations in San Joaquin in 2019.

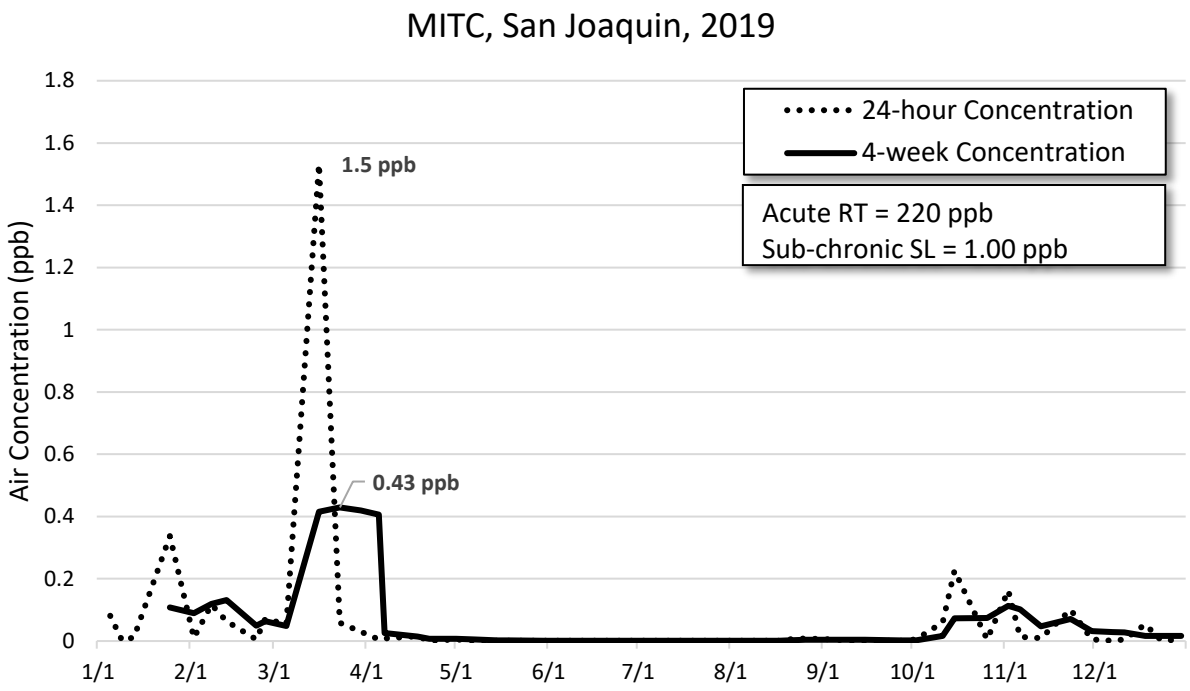

Figure E-3. Temporal trend in MITC concentrations in San Joaquin in 2019.

APPENDIX F: DETAILED RESULTS FOR SANTA MARIA

Santa Maria

Santa Maria is located in Santa Barbara County and is 23.42 square miles in area. The average elevation is 217 feet; it receives an average of 14 inches of precipitation annually. Daily average temperatures range from 47° to 73°F in the summer and 39° to 64°F in winter. Santa Maria is the most populous city in Santa Barbara County, with a population of 99,553 based on the 2010 census. Of this population, 31.45% were below 18 years of age and 9.43% were above 65 years of age. The major crops in the immediate area around Santa Maria are strawberries, wine grapes, and broccoli. The monitoring site was located at a California Air Resources Board (CARB) monitoring location adjacent to Santa Maria High School for most of 2019. On November 12, 2019, the monitoring site was relocated to the southwest corner of Bonita Elementary.

Monitoring at this site is conducted through a California Department of Pesticide Regulation (CDPR) contract with the Santa Barbara County Agricultural Commissioner's (SB CAC) office. SB CAC staff follow strict standard operating procedures established by CDPR's Air Program for this study, ensuring that samples are collected, handled, and transported appropriately to maintain consistency and integrity of the samples. CDPR Air Program staff provides annual training and continuous support to SB CAC for operation and monitoring at this sampling location.

Pesticide Detections

Table F-1 lists the number and percentage of analyses resulting in detections at the Santa Maria sampling site. The active ingredient with the highest percentage of detections was malathion (49%, n = 25), followed by dacthal (43.1%, n = 22), and then malathion's oxygen analog (OA) break-down product (37.2%, n = 19). The highest percentage of quantifiable detections was observed for MITC (11.5%, n = 6), followed by malathion OA (5.9%, n = 3), and then both chloropicrin and malathion (3.9%, n = 2).

Table F-1. Number and percentage of positive samples per chemical in Santa Maria, California.

Chemical	Number of possible detections	Total number of detections*	Number of quantifiable detections	Percent of possible detections	Percent of quantifiable detections
1,3-dichloropropene	52	1	1	1.9%	1.9%
Acephate	51	1	0	2.0%	0%
Bensulide	51	0	0	0%	0%
Chloropicrin	51	3	2	5.9%	3.9%
Chlorothalonil	51	3	0	5.9%	0%
Chlorpyrifos	51	0	0	0%	0%
Chlorpyrifos OA	51	0	0	0%	0%
Cypermethrin	51	1	0	2.0%	0%
Dacthal	51	22	0	43.1%	0%
DDVP	51	13	1	25.4%	2.0%
DEF	51	0	0	0%	0%

Chemical	Number of possible detections	Total number of detections*	Number of quantifiable detections	Percent of possible detections	Percent of quantifiable detections
Diazinon	51	0	0	0%	0%
Diazinon OA	51	0	0	0%	0%
Dimethoate	51	0	0	0%	0%
Dimethoate OA	51	1	0	2.0%	0%
Diuron	51	0	0	0%	0%
Endosulfan	51	0	0	0%	0%
Endosulfan Sulfate	51	0	0	0%	0%
EPTC	51	0	0	0%	0%
Iprodione	51	0	0	0%	0%
Malathion	51	25	2	49%	3.9%
Malathion OA	51	20	3	39.2%	5.9%
Methidathion	51	0	0	0%	0%
Methyl Bromide	52	0	0	0%	0%
Metolachlor (S-Metolachlor)	51	0	0	0%	0%
MITC	52	11	6	21.2%	11.5%
Norflurazon	51	0	0	0%	0%
Oryzalin	51	0	0	0%	0%
Oxydemeton Methyl	51	0	0	0%	0%
Oxyfluorfen	51	0	0	0%	0%
Permethrin	51	0	0	0%	0%
Phosmet	51	0	0	0%	0%
pp-dicofol	51	0	0	0%	0%
Propargite	51	0	0	0%	0%
Simazine	51	0	0	0%	0%
Trifluralin	51	12	0	23.5%	0%
Total	**1,835**	**113**	**15**	**6.2%**	**0.8%**

*Includes both quantifiable and trace detections.

Pesticide Concentrations

Acute (24-h) Concentrations

Table F-2 shows the highest 24-h concentrations observed for all chemicals monitored at the Santa Maria Air Monitoring Network (AMN) sampling location in 2019. The active ingredient with the highest concentration relative to its screening level was chloropicrin at 0.6%, followed by DDVP at 0.2%. All other quantifiable concentrations were below 0.1% of their respective chemicals' screening level.

Table F-2. Highest 24-h air concentrations, acute screening levels, and percent of the acute screening level for all chemicals monitored at the Santa Maria AMN sampling location in 2019.

Chemical	Highest 24-h concentration in ppb (ng/m^3)	24-h acute screening level in ppb (ng/m^3)	% of screening level
Chloropicrin	0.45 ppb (2,992 ng/m^3)	73.0 ppb (491,000 ng/m^3)*†	0.6%
DDVP	0.003 ppb (24 ng/m^3)	1.22 ppb (11,000 ng/m^3)	0.2%
Malathion	0.007 ppb (97 ng/m^3)	8.33 ppb (113,000 ng/m^3)	0.09%
MITC	0.125 ppb (375 ng/m^3)	220 ppb (660,000 ng/m^3)*†	0.06%
Malathion OA	0.001 ppb (13 ng/m^3)	8.76 ppb (113,000 ng/m^3)	0.01%
1,3-dichloropropene	0.13 ppb (590 ng/m^3)	110 ppb (505,000 ng/m^3)‡	0.001%
Acephate	Trace	1.60 ppb (12,000 ng/m^3)	
Bensulide	ND	15.9 ppb (259,000 ng/m^3)	
Chlorothalonil	Trace	3.13 ppb (34,000 ng/m^3)	
Chlorpyrifos	ND	0.08 ppb (1,200 ng/m^3)**	
Chlorpyrifos OA	ND	0.09 ppb (1,200 ng/m^3)**	
Cypermethrin	Trace	6.64 ppb (113,000 ng/m^3)	
Dacthal	Trace	1,730 ppb (23,500,000 ng/m^3)	
DEF	ND	0.68 ppb (8,800 ng/m^3)	
Diazinon	ND	0.01 ppb (130 ng/m^3)	
Diazinon OA	ND	0.01 ppb (130 ng/m^3)	
Dimethoate	ND	0.46 ppb (4,300 ng/m^3)	
Dimethoate OA	Trace	0.49 ppb (4,300 ng/m^3)	
Diuron	ND	17.8 ppb (170,000 ng/m^3)	
Endosulfan	ND	0.20 ppb (3,300 ng/m^3)	
Endosulfan Sulfate	ND	0.19 ppb	

Chemical	Highest 24-h concentration in ppb (ng/m^3)	24-h acute screening level in ppb (ng/m^3)	% of screening level
		(3,300 ng/m³)	
EPTC	ND	29.7 ppb (230,000 ng/m³)	
Iprodione	ND	69.6 ppb (939,000 ng/m³)	
Methidathion	Trace	0.25 ppb (3,100 ng/m³)	
Methyl Bromide	ND	210 ppb (820,000 ng/m³)*	
Metolachlor	ND	7.33 ppb (85,000 ng/m³)	
Norflurazon	ND	12.6 ppb (170,000 ng/m³)	
Oryzalin	ND	29.7 ppb (420,000 ng/m³)	
Oxydemeton Methyl	ND	3.74 ppb (39,200 ng/m³)	
Oxyfluorfen	ND	34.5 ppb (510,000 ng/m³)	
Permethrin	ND	10.5 ppb (168,000 ng/m³)	
Phosmet	ND	5.94 ppb (77,000 ng/m³)	
pp-dicofol	ND	4.49 ppb (68,000 ng/m^3)	
Propargite	ND	0.98 ppb (14,000 ng/m³)	
Simazine	ND	13.3 ppb (110,000 ng/m³)	
Trifluralin	Trace	87.5 ppb (1,200,000 ng/m³)	

*This value is a regulatory target rather than a screening level.
†This value is an 8-h time-weighted-average (TWA) used to compare against the 24-h measured concentration.
‡This value is a 72-h time-weighted-average (TWA) used to compare against the 24-h measured concentration.
** CDPR's May 28, 2019, risk management directive for chlorpyrifos established an acute regulatory target of 0.28 ppb (4,050 ng/m3), 1-h time weighted average (TWA). However, the current sample duration does not allow for a direct comparison between the acute regulatory target concentration and the measured sample values.

Sub-chronic (4- or 13-wk) Concentrations

Table F-3 shows the highest observed rolling 4-week or 13-week average concentrations for all chemicals monitored at the Santa Maria AMN sampling location in 2019. The active ingredient with the highest concentration relative to its screening level was chloropicrin at 23%. This was followed by MITC at 4.3% and then 1,3-dichloropropene at 1.8%. Rolling 4-week averages for DDVP, malathion and its OA breakdown product were 0.5%, 0.03%, and 0.008% of the sub-chronic screening levels, respectively.

Table F-3. Highest 4- or 13-wk air concentrations, sub-chronic screening levels, and percent of the sub-chronic screening level for chemicals monitored at the Santa Maria AMN sampling location.

Chemical	Highest 4-week rolling average concentration in ppb (ng/m^3)	Sub-chronic screening level in ppb (ng/m^3)	% of screening level
Chloropicrin*	0.08 ppb (523 ng/m^3)	0.35 ppb (2,300 ng/m^3)	23%
MITC	0.04 ppb (129 ng/m^3)	1.00 ppb (3,000 ng/m^3)	4.3%
1,3-dichloropropene*	0.06 ppb (255 ng/m^3)	3.0 ppb (14,000 ng/m^3)	1.8%
DDVP	0.001 ppb (11 ng/m^3)	0.24 ppb (2,200 ng/m^3)	0.5%
Malathion	0.002 ppb (28 ng/m^3)	5.97 ppb (80,600 ng/m^3)	0.03%
Malathion OA	0.0005 ppb (6.2 ng/m^3)	6.27 ppb (80,600 ng/m^3)	0.008%
Acephate	Trace	0.35 ppb (2,300 ng/m^3)	
Bensulide	ND	1.47 ppb (24,000 ng/m^3)	
Chlorothalonil	Trace	3.13 ppb (34,000 ng/m^3)	
Chlorpyrifos	ND	0.06 ppb (850 ng/m^3)	
Chlorpyrifos oa	ND	0.06 ppb (850 ng/m^3)	
Cypermethrin	Trace	4.76 ppb (81,000 ng/m^3)	
Dacthal	Trace	34.6 ppb (470,000 ng/m^3)	
DEF	ND	0.68 ppb (8,800 ng/m^3)	
Diazinon	ND	0.01 ppb (130 ng/m^3)	
Diazinon oa	ND	0.01 ppb (130 ng/m^3)	
Dimethoate	ND	0.32 ppb (3,000 ng/m^3)	
Dimethoate oa	Trace	0.34 ppb	

		(3,000 ng/m^3)	
Diuron	ND	1.78 ppb (17,000 ng/m^3)	
Endosulfan	ND	0.20 ppb (3,300 ng/m^3)	
Endosulfan Sulfate	ND	0.19 ppb (3,300 ng/m^3)	
EPTC	ND	3.10 ppb (24,000 ng/m^3)	
Iprodione	ND	21.2 ppb (286,000 ng/m^3)	
Methidathion	Trace	0.25 ppb (3,100 ng/m^3)	
Methyl Bromide	ND	5.0 ppb (19,400 ng/m^3)	
Metolachlor (S-Metolachlor)	ND	1.29 ppb (15,000 ng/m^3)	
Norflurazon	ND	1.92 ppb (26,000 ng/m^3)	
Oryzalin	ND	16.2 ppb (230,000 ng/m^3)	
Oxydemeton Methyl	ND	0.06 ppb (610 ng/m^3)	
Oxyfluorfen	ND	12.2 ppb (18,0000 ng/m^3)	
Permethrin	ND	5.63 ppb (90,000 ng/m^3)	
Phosmet	ND	2.00 ppb (26,000 ng/m^3)	
pp-dicofol	ND	3.24 ppb (49,000 ng/m^3)	
Propargite	ND	0.98 ppb (14,000 ng/m^3)	
Simazine	ND	3.76 ppb (31,000 ng/m^3)	
Trifluralin	Trace	12.4 ppb (170,000 ng/m^3)	

* These concentrations represent the highest 13-week rolling average, rather than the default 4-week rolling average.

Chronic (2019) Concentrations

Table F-4 shows the annual average concentration for all chemicals monitored at the Santa Maria AMN sampling location in 2019. The active ingredient with the highest concentration relative to its screening level was chloropicrin at 12%, followed by MITC at 5.7% and 1,3-dichloropropene at 2.6%.

Table F-4. Annual average air concentrations, chronic screening levels, and percent of the chronic screening levels for chemicals monitored at the Santa Maria AMN sampling location.

Chemical	Overall average concentration in ppb (ng/m^3)	Chronic screening level in ppb (ng/m^3)	% of screening level
Chloropicrin	0.03 ppb (216 ng/m^3)	0.27 ppb (1,800 ng/m^3)	12%
MITC	0.006 ppb (17 ng/m^3)	0.10 ppb (300 ng/m^3)	5.7%
1,3-dichloropropene	0.05 ppb (234 ng/m^3)	2.00 ppb (9,000 ng/m^3)	2.6%
DDVP	0.0007 ppb (5.5 ng/m^3)	0.09 ppb (770 ng/m^3)	0.7%
Malathion	0.0004 ppb (5.3 ng/m^3)	0.60 ppb (8,100 ng/m^3)	0.07%
Malathion OA	0.0002 ppb (2.7 ng/m^3)	0.63 ppb (8,100 ng/m^3)	0.03%
Acephate	Trace	1.13 ppb (8,500 ng/m^3)	
Bensulide	ND	1.48 ppb (24,000 ng/m^3)	
Chlorothalonil	Trace	3.13 ppb (34,000 ng/m^3)	
Chlorpyrifos	ND	0.04 ppb (510 ng/m^3)	
Chlorpyrifos OA	ND	0.04 ppb (510 ng/m^3)	
Cypermethrin	Trace	1.59 ppb (27,000 ng/m^3)	
Dacthal	Trace	3.46 ppb (47,000 ng/m^3)	
DEF	ND	NA – Seasonal	
Diazinon	ND	0.01 ppb (130 ng/m^3)	
Diazinon OA	ND	0.01 ppb (130 ng/m^3)	
Dimethoate	ND	0.03 ppb (300 ng/m^3)	
Dimethoate OA	Trace	0.03 ppb (300 ng/m^3)	

Chemical	Overall average concentration in ppb (ng/m^3)	Chronic screening level in ppb (ng/m^3)	% of screening level
Diuron	ND	0.60 ppb (5,700 ng/m^3)	
Endosulfan	ND	0.02 ppb (330 ng/m^3)	
Endosulfan Sulfate	ND	0.02 ppb (330 ng/m^3)	
EPTC	ND	1.10 ppb (8,500 ng/m^3)	
Iprodione	ND	21.2 ppb (286,000 ng/m^3)	
Methidathion	Trace	0.20 ppb (2,500 ng/m^3)	
Methyl Bromide	ND	1.00 ppb (3,900 ng/m^3)	
Metolachlor	ND	1.29 ppb (15,000 ng/m^3)	
Norflurazon	ND	1.92 ppb (26,000 ng/m^3)	
Oryzalin	ND	1.64 ppb (232,000 ng/m^3)	
Oxydemeton Methyl	ND	0.06 ppb (610 ng/m^3)	
Oxyfluorfen	ND	3.45 ppb (51,000 ng/m^3)	
Permethrin	ND	5.63 ppb (90,000 ng/m^3)	
Phosmet	ND	1.39 ppb (18,000 ng/m^3)	
pp-dicofol	ND	1.32 ppb (20,000 ng/m^3)	
Propargite	ND	0.98 ppb (14,000 ng/m^3)	
Simazine	ND	3.76 ppb (31,000 ng/m^3)	
Trifluralin	Trace	2.99 ppb (41,000 ng/m^3)	

Temporal trends in detected concentrations

Figures F-1 to F-5 present the concentrations over time for monitoring results in 2019 for any chemical detected at a quantifiable concentration in Santa Maria. Screening levels, as defined in Appendix K, are abbreviated as SL in the following graphs. Regulatory targets, also defined in Appendix K, are abbreviated as RT. For graphs where both a pesticide and its degradate are shown, the detected concentrations of both the parent chemical and its degradate have been summed for each sampling date.

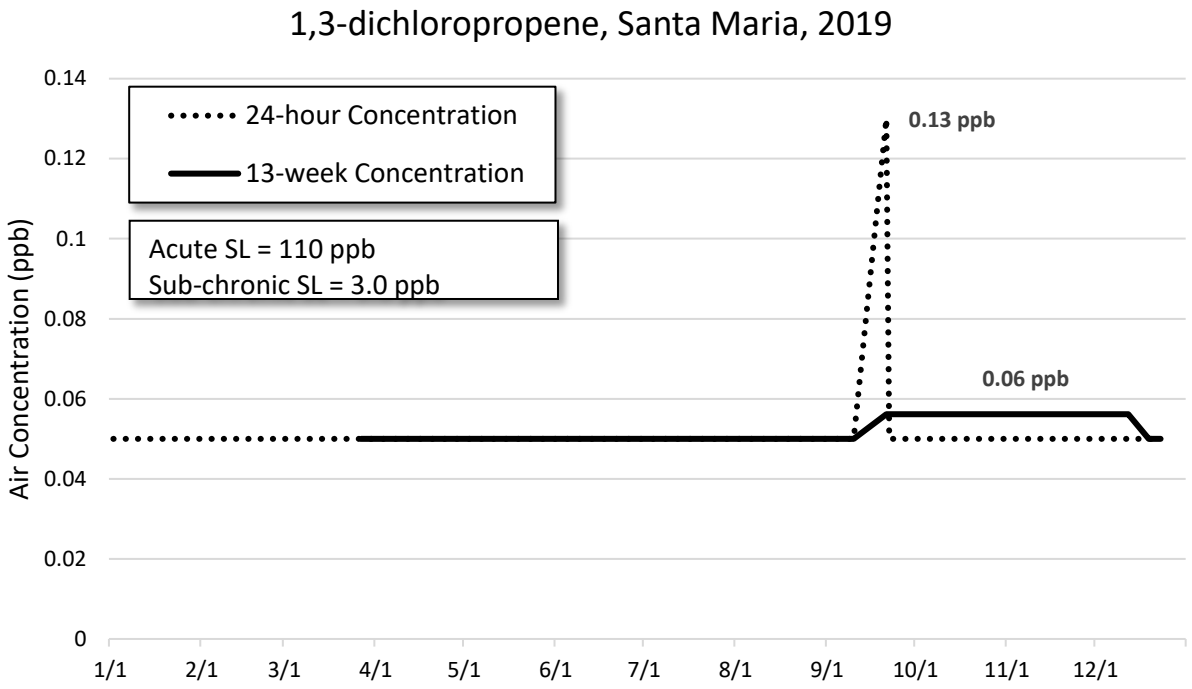

Figure F-1. Temporal trend in 1,3-dichloropropene concentrations in Santa Maria in 2019.

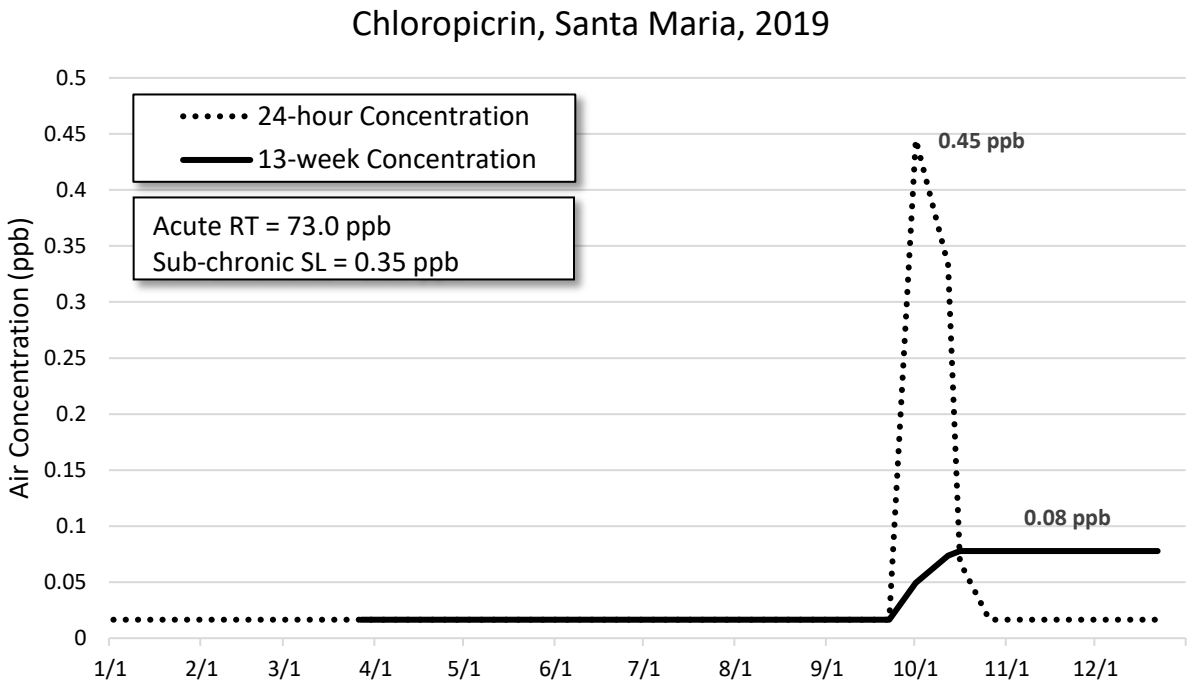

Figure F-2. Temporal trend in chloropicrin concentrations in Santa Maria in 2019.

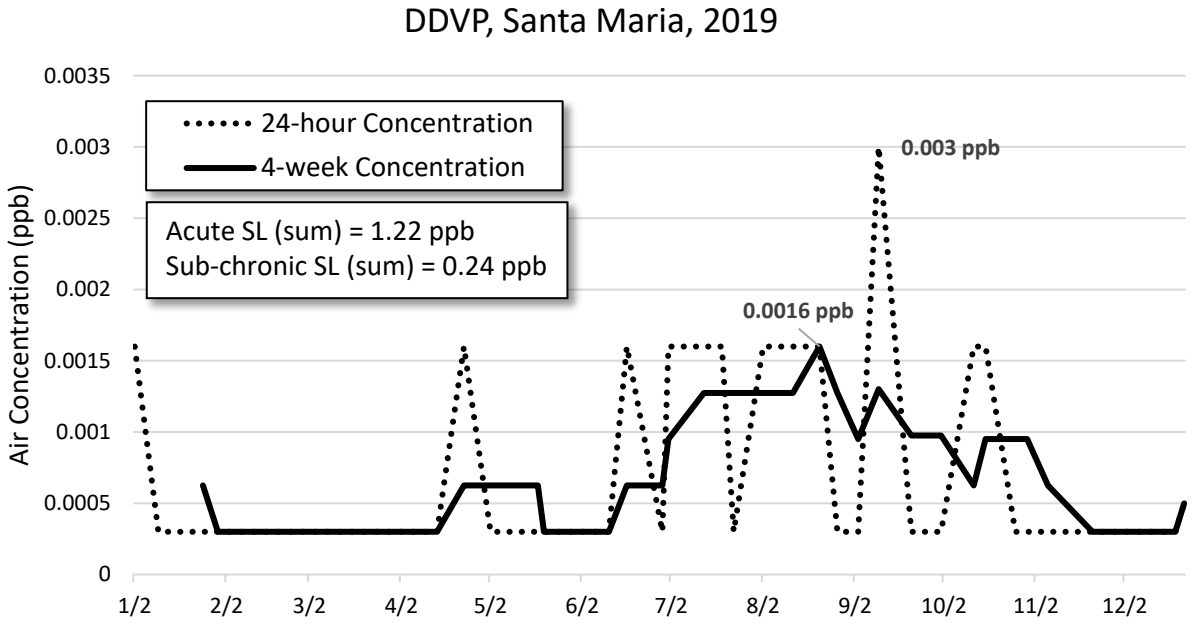

Figure F-3. Temporal trend in DDVP concentrations in Santa Maria in 2019.

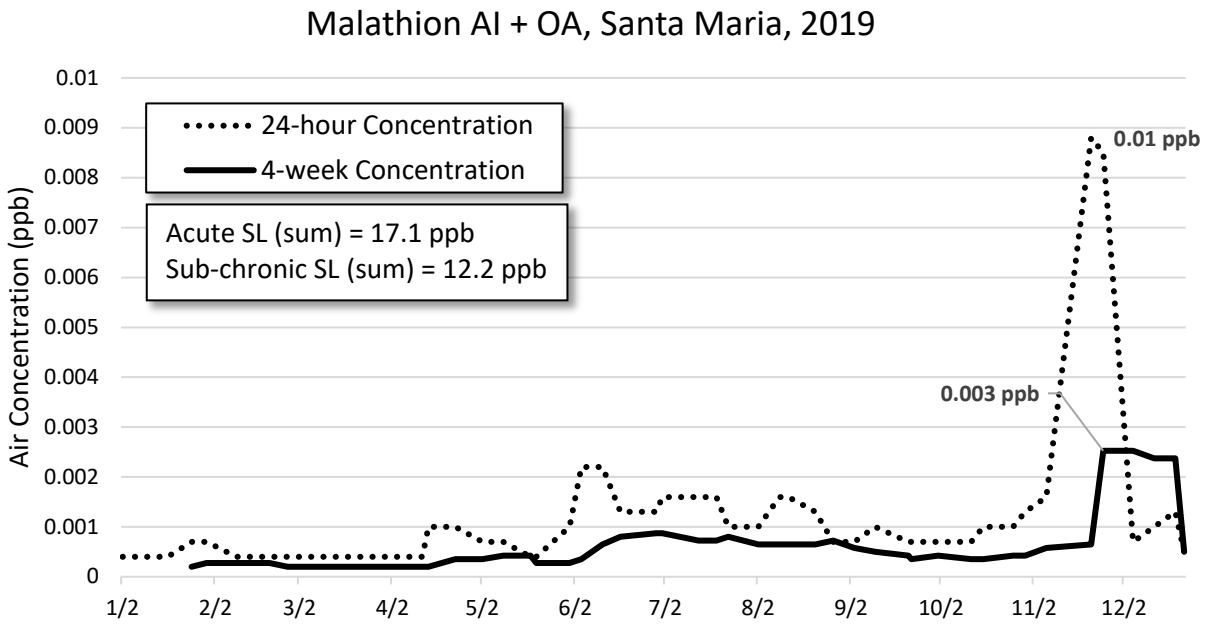

Figure F-4. Temporal trend in summed malathion AI + OA concentrations in Santa Maria in 2019.

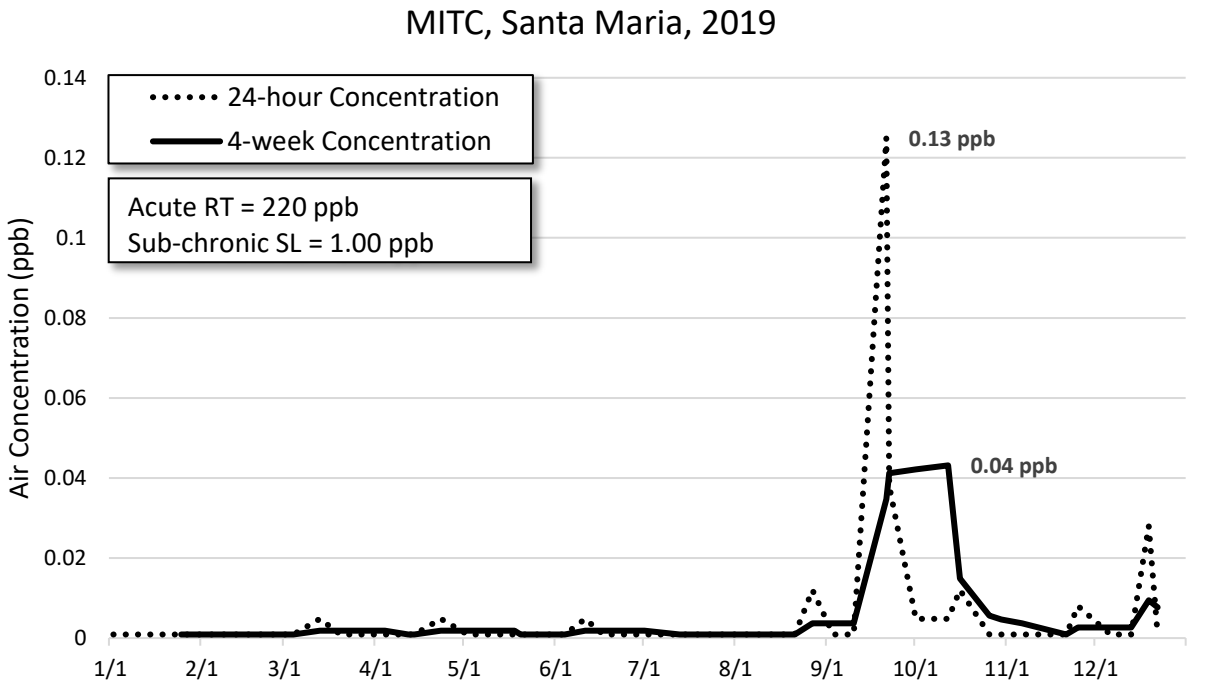

Figure F-5. Temporal trend in MITC concentrations in Santa Maria in 2019.

APPENDIX G: DETAILED RESULTS FOR SHAFTER

Shafter

The Shafter sampling site has continued as a monitoring site from the original three communities in the 2011-2016 Air Monitoring Network (AMN) monitoring period. Shafter is a small city (18 square miles in area) located approximately 18 miles west-northwest of Bakersfield in Kern County. The elevation is 351 feet; it receives an average of 7 inches of precipitation annually. Average temperatures range from 59° to 99°F in the summer and 35° to 64°F in winter. Based on the 2010 census, the population of Shafter was 16,988, of which 36.0% were below 18 years of age and 6.6% were above 65 years of age. The major crops in the immediate area around Shafter are almonds, grapes, carrots, and alfalfa.

The monitoring site was originally situated at a city well located adjacent to Shafter High School at the northeastern edge of the city. Monitoring at this sampling location has continued uninterrupted since February 1, 2011, during which time, it was operated by the California Department of Pesticide Regulation (CDPR). The California Air Resources Board (CARB) assumed operation of this monitoring location on April 2, 2018. On February 22, 2019, the monitoring site was relocated to the north- west corner of Sequoia Elementary School, a half mile north-northwest from the original sampling location.

Pesticide Detections

Table G-1 lists the number and percentage of analyses resulting in detections at the Shafter sampling site. The active ingredient with the highest percentage of detections was MITC (59.2%, n = 29), followed by chlorothalonil (40%, n = 20), and then DDVP, EPTC, and 1,3-dichloropropene (10%, n = 5). The highest percentage of quantifiable detections was observed for MITC (40.8%, n = 20), followed by 1,3-dichloropropene (10%, n = 5), and then EPTC (6%, n = 3).

Table G-1. Number and percentage of positive samples per chemical in Shafter, California.

Chemical	Number of possible detections	Total number of detections*	Number of quantifiable detections	Percent of detections	Percent of quantifiable detections
1,3-dichloropropene	49	5	5	10%	10%
Acephate	49	0	0	0%	0%
Bensulide	49	0	0	0%	0%
Chloropicrin	49	1	1	2.1%	2.1%
Chlorothalonil	49	20	0	40.0%	0%
Chlorpyrifos	49	2	0	4.0%	0%
Chlorpyrifos OA	49	0	0	0%	0%
Cypermethrin	49	1	0	2.0%	0%
Dacthal	49	1	0	2.0%	0%
DDVP	49	5	0	10.0%	0%
DEF	49	0	0	0%	0%
Diazinon	49	0	0	0%	0%
Diazinon OA	49	0	0	0%	0%

Chemical	Number of possible detections	Total number of detections*	Number of quantifiable detections	Percent of detections	Percent of quantifiable detections
Dimethoate	49	0	0	0%	0%
Dimethoate OA	49	0	0	0%	0%
Diuron	49	2	0	4.0%	0%
Endosulfan	49	0	0	0%	0%
Endosulfan Sulfate	49	0	0	0%	0%
EPTC	49	5	3	10.0%	6.0%
Iprodione	49	1	0	2.0%	0%
Malathion	49	4	0	8.0%	0%
Malathion OA	49	2	0	4.1%	0%
Methidathion	49	0	0	0%	0%
Methyl Bromide	49	0	0	0%	0%
Metolachlor (S-Metolachlor)	49	0	0	0%	0%
MITC	49	29	20	59.2%	40.8%
Norflurazon	49	0	0	0%	0%
Oryzalin	49	0	0	0%	0%
Oxydemeton Methyl	49	0	0	0%	0%
Oxyfluorfen	49	1	0	2.0%	0%
Permethrin	49	1	0	2.0%	0%
Phosmet	49	0	0	0%	0%
pp-dicofol	49	0	0	0%	0%
Propargite	49	0	0	0%	0%
Simazine	49	0	0	0%	0%
Trifluralin	49	3	0	6.0%	0%
Total	**1,795**	**83**	**29**	**4.6%**	**1.6%**

*Includes both quantifiable and trace detections.

Pesticide Concentrations

Acute (24-h) Concentrations

Table G-2 shows the highest 24-h concentrations observed for all chemicals monitored at the Shafter AMN sampling location in 2019. The active ingredient with the highest concentration relative to its screening level was 1,3-dichloropropene at 2.9%, followed by chloropicrin at 0.1%. The remaining chemicals for which there were quantifiable detections at Shafter in 2019 were EPTC and MITC.

Table G-2. Highest 24-h air concentrations, acute screening levels, and percent of the acute screening levels for all chemicals monitored at the Shafter AMN sampling location in 2019.

Chemical	Highest 24-h concentration in ppb (ng/m^3)	24-h acute screening level in ppb (ng/m^3)	% of screening level
1,3-dichloropropene	3.2 ppb (14,524 ng/m^3)	110 ppb (505,000 ng/m^3)‡	2.9%
Chloropicrin	0.1 ppb (694 ng/m^3)	73.0 ppb (491,000 ng/m^3)*†	0.1%
EPTC	0.005 ppb (36 ng/m^3)	29.7 ppb (230,000 ng/m^3)	0.02%
MITC	0.106 ppb (316 ng/m^3)	220 ppb (660,000 ng/m^3)*†	0.05%
Acephate	ND	1.60 ppb (12,000 ng/m^3)	
Bensulide	ND	15.9 ppb (259,000 ng/m^3)	
Chlorothalonil	Trace	3.13 ppb (34,000 ng/m^3)	
Chlorpyrifos	Trace	0.08 ppb (1,200 ng/m^3)**	
Chlorpyrifos OA	ND	0.09 ppb (1,200 ng/m^3)**	
Cypermethrin	Trace	6.64 ppb (113,000 ng/m^3)	
Dacthal	Trace	1,730 ppb (23,500,000 ng/m^3)	
DDVP	Trace	1.22 ppb (11,000 ng/m^3)	
DEF	ND	0.68 ppb (8,800 ng/m^3)	
Diazinon	ND	0.01 ppb (130 ng/m^3)	
Diazinon OA	ND	0.01 ppb (130 ng/m^3)	
Dimethoate	ND	0.46 ppb (4,300 ng/m^3)	
Dimethoate OA	ND	0.49 ppb (4,300 ng/m^3)	
Diuron	Trace	17.8 ppb (170,000 ng/m^3)	
Endosulfan	ND	0.20 ppb (3,300 ng/m^3)	
Endosulfan Sulfate	ND	0.19 ppb (3,300 ng/m^3)	
Iprodione	Trace	69.6 ppb	

Chemical	Highest 24-h concentration in ppb (ng/m^3)	24-h acute screening level in ppb (ng/m^3)	% of screening level
		(939,000 ng/m³)	
Malathion	Trace	8.33 ppb (113,000 ng/m³)	
Malathion OA	ND	8.76 ppb (113,000 ng/m³)	
Methidathion	ND	0.25 ppb (3,100 ng/m³)	
Methyl Bromide	ND	210 ppb (820,000 ng/m³)*	
Metolachlor	ND	7.33 ppb (85,000 ng/m³)	
Norflurazon	ND	12.6 ppb (170,000 ng/m³)	
Oryzalin	ND	29.7 ppb (420,000 ng/m³)	
Oxydemeton Methyl	ND	3.74 ppb (39,200 ng/m³)	
Oxyfluorfen	Trace	34.5 ppb (510,000 ng/m³)	
Permethrin	Trace	10.5 ppb (168,000 ng/m³)	
Phosmet	ND	5.94 ppb (77,000 ng/m³)	
pp-dicofol	ND	4.49 ppb (68,000 ng/m^3)	
Propargite	ND	0.98 ppb (14,000 ng/m³)	
Simazine	ND	13.3 ppb (110,000 ng/m³)	
Trifluralin	Trace	87.5 ppb (1,200,000 ng/m³)	

*This value is a regulatory target rather than a screening level.
†This value is an 8-h time-weighted-average (TWA) used to compare against the 24-h measured concentration.
‡This value is a 72-h time-weighted-average (TWA) used to compare against the 24-h measured concentration.
** CDPR's May 28, 2019, risk management directive for chlorpyrifos established an acute regulatory target of 0.28 ppb (4,050 ng/m3), 1-h time weighted average (TWA). However, the current sample duration does not allow for a direct comparison between the acute regulatory target concentration and the measured sample values.

Sub-chronic (4- or 13-wk) Concentrations

Table G-3 shows the highest observed rolling 4-week or 13-week average concentrations for all chemicals monitored at the Shafter AMN sampling location in 2019. The active ingredient with the highest concentration relative to its screening level was 1,3-dichloropropene at 12.7%. This was followed by chloropicrin at 7.1% and MITC at 6.5%.

Table G-3. Highest 4- or 13-wk air concentrations, sub-chronic screening levels, and percent of the sub-chronic screening level for chemicals monitored at the Shafter AMN sampling location.

Chemical	Highest 4-week rolling average concentration in ppb (ng/m^3)	Sub-chronic screening level in ppb (ng/m^3)	% of screening level
1,3-dichloropropene*	0.45 ppb (2,056 ng/m^3)	3.0 ppb (14,000 ng/m^3)	14.7%
Chloropicrin*	0.02 ppb (164 ng/m^3)	0.35 ppb (2,300 ng/m^3)	7.1%
MITC	0.07 ppb (194 ng/m^3)	1.00 ppb (3,000 ng/m^3)	6.5%
EPTC	0.002 ppb (13 ng/m^3)	3.10 ppb (24,000 ng/m^3)	0.05%
Acephate	ND	0.35 ppb (2,300 ng/m^3)	
Bensulide	ND	1.47 ppb (24,000 ng/m^3)	
Chlorothalonil	Trace	3.13 ppb (34,000 ng/m^3)	
Chlorpyrifos	Trace	0.06 ppb (850 ng/m^3)	
Chlorpyrifos OA	ND	0.06 ppb (850 ng/m^3)	
Cypermethrin	Trace	4.76 ppb (81,000 ng/m^3)	
Dacthal	Trace	34.6 ppb (470,000 ng/m^3)	
DDVP	Trace	0.24 ppb (2,200 ng/m^3)	
DEF	ND	0.68 ppb (8,800 ng/m^3)	
Diazinon	ND	0.01 ppb (130 ng/m^3)	
Diazinon OA	ND	0.01 ppb (130 ng/m^3)	
Dimethoate	ND	0.32 ppb (3,000 ng/m^3)	
Dimethoate OA	ND	0.34 ppb (3,000 ng/m^3)	
Diuron	Trace	1.78 ppb	

Chemical	Highest 4-week rolling average concentration in ppb (ng/m^3)	Sub-chronic screening level in ppb (ng/m^3)	% of screening level
		(17,000 ng/m^3)	
Endosulfan	ND	0.20 ppb (3,300 ng/m^3)	
Endosulfan Sulfate	ND	0.19 ppb (3,300 ng/m^3)	
Iprodione	Trace	21.2 ppb (286,000 ng/m^3)	
Malathion	Trace	0.60 ppb (8100 ng/m^3)	
Malathion OA	ND	6.27 ppb (80,600 ng/m^3)	
Methidathion	ND	0.25 ppb (3,100 ng/m^3)	
Methyl Bromide	ND	5.0 ppb (19,400 ng/m^3)	
Metolachlor (S-Metolachlor)	ND	1.29 ppb (15,000 ng/m^3)	
Norflurazon	ND	1.92 ppb (26,000 ng/m^3)	
Oryzalin	ND	16.2 ppb (230,000 ng/m^3)	
Oxydemeton Methyl	ND	0.06 ppb (610 ng/m^3)	
Oxyfluorfen	ND	12.2 ppb (18,0000 ng/m^3)	
Permethrin	Trace	5.63 ppb (90,000 ng/m^3)	
Phosmet	Trace	2.00 ppb (26,000 ng/m^3)	
pp-dicofol	ND	3.24 ppb (49,000 ng/m^3)	
Propargite	ND	0.98 ppb (14,000 ng/m^3)	
Simazine	ND	3.76 ppb (31,000 ng/m^3)	
Trifluralin	ND	12.4 ppb (170,000 ng/m^3)	

* These concentrations represent the highest 13-week rolling average, rather than the default 4-week rolling average.

Chronic (2019) Concentrations

Table G-4 shows the annual average concentration for all chemicals monitored at the Shafter AMN sampling location in 2019. The active ingredient with the highest concentration relative to its screening level was MITC at 14.3%, followed by chloropicrin at 6.8%, and then 1,3-dichloropropene at 6.7%.

Table G-4. Annual average air concentrations, chronic screening levels, and percent of the chronic screening levels for chemicals monitored at the Shafter AMN sampling location.

Chemical	Overall average concentration (ng/m^3)	Chronic screening level (ng/m^3)	% of screening level
MITC	0.01 ppb (43 ng/m^3)	0.10 ppb (300 ng/m^3)	14.3%
Chloropicrin	0.02 ppb (123 ng/m^3)	0.27 ppb (1,800 ng/m^3)	6.8%
1,3-dichloropropene	0.1 ppb (599 ng/m^3)	2.00 ppb (9,000 ng/m^3)	6.7%
EPTC	0.0003 ppb (3.9 ng/m^3)	1.10 ppb (8,500 ng/m^3)	0.05%
Acephate	ND	1.13 ppb (8,500 ng/m^3)	
Bensulide	ND	1.48 ppb (24,000 ng/m^3)	
Chlorothalonil	Trace	3.13 ppb (34,000 ng/m^3)	
Chlorpyrifos	Trace	0.04 ppb (510 ng/m^3)	
Chlorpyrifos OA	ND	0.04 ppb (510 ng/m^3)	
Cypermethrin	Trace	1.59 ppb (27,000 ng/m^3)	
Dacthal	Trace	3.46 ppb (47,000 ng/m^3)	
DDVP	Trace	0.09 ppb (770 ng/m^3)	
DEF	ND	NA – Seasonal	
Diazinon	ND	0.01 ppb (130 ng/m^3)	
Diazinon OA	ND	0.01 ppb (130 ng/m^3)	
Dimethoate	ND	0.03 ppb (300 ng/m^3)	
Dimethoate OA	ND	0.03 ppb (300 ng/m^3)	
Diuron	Trace	0.60 ppb (5,700 ng/m^3)	
Endosulfan	ND	0.02 ppb	

Chemical	Overall average concentration (ng/m^3)	Chronic screening level (ng/m^3)	% of screening level
		(330 ng/m^3)	
Endosulfan Sulfate	ND	0.02 ppb (330 ng/m^3)	
Iprodione	Trace	21.2 ppb (286,000 ng/m^3)	
Malathion	Trace	0.60 ppb (8,100 ng/m^3)	
Malathion OA	ND	0.63 ppb (8,100 ng/m^3)	
Methidathion	ND	0.20 ppb (2,500 ng/m^3)	
Methyl Bromide	ND	1.00 ppb (3,900 ng/m^3)	
Metolachlor (S-Metolachlor)	ND	1.29 ppb (15,000 ng/m^3)	
Norflurazon	ND	1.92 ppb (26,000 ng/m^3)	
Oryzalin	ND	1.64 ppb (232,000 ng/m^3)	
Oxydemeton Methyl	ND	0.06 ppb (610 ng/m^3)	
Oxyfluorfen	ND	3.45 ppb (51,000 ng/m^3)	
Permethrin	Trace	5.63 ppb (90,000 ng/m^3)	
Phosmet	Trace	1.39 ppb (18,000 ng/m^3)	
pp-dicofol	ND	1.32 ppb (20,000 ng/m^3)	
Propargite	ND	0.98 ppb (14,000 ng/m^3)	
Simazine	ND	3.76 ppb (31,000 ng/m^3)	
Trifluralin	ND	2.99 ppb (41,000 ng/m^3)	

Temporal trends in detected concentrations

Figures G-1 to G-4 present the concentrations over time for monitoring results in 2019 for any chemical detected at a quantifiable concentration in Shafter. Screening levels, as defined in Appendix K, are abbreviated as SL in the following graphs. Regulatory targets, also defined in Appendix K, are abbreviated as RT.

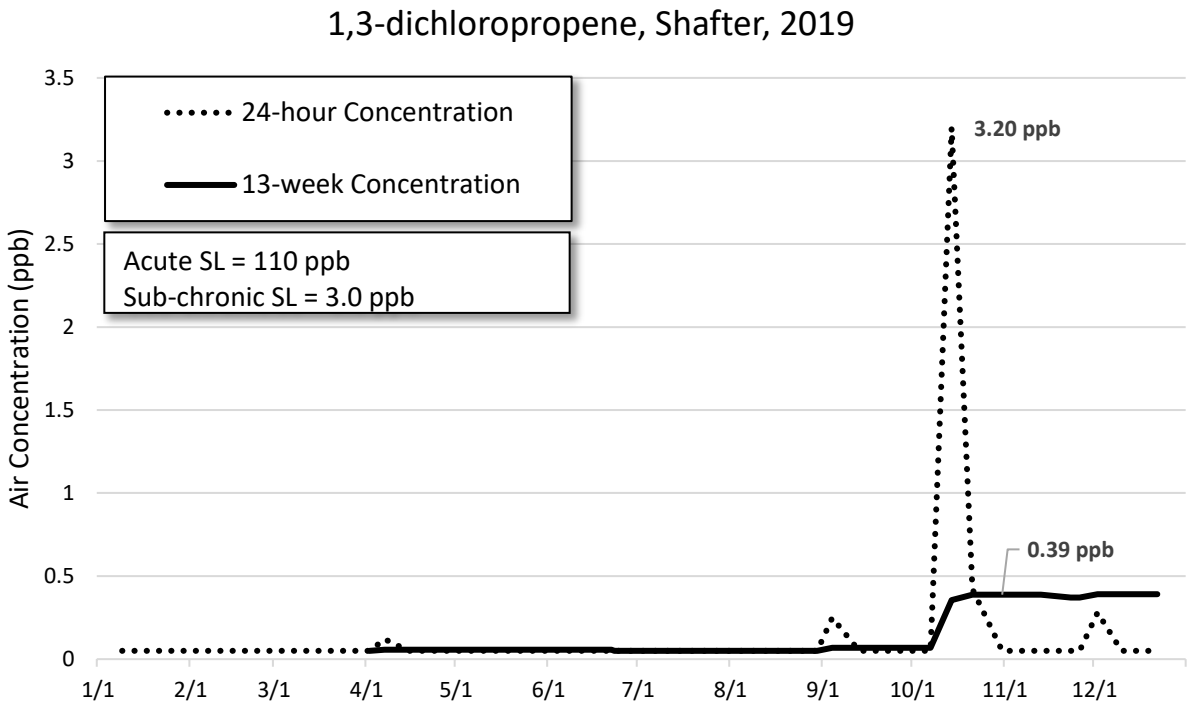

Figure G-1. Temporal trend in 1,3-dichloropropene concentrations in Shafter in 2019.

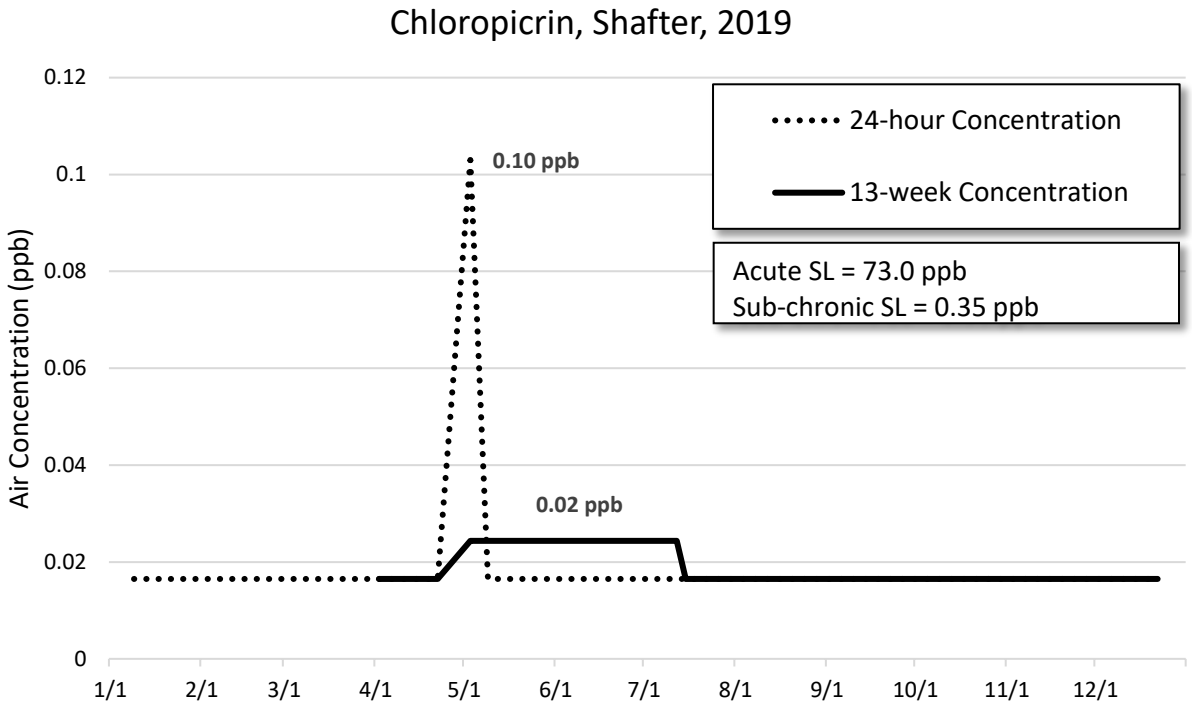

Figure G-2. Temporal trend in chloropicrin concentrations in Shafter in 2019.

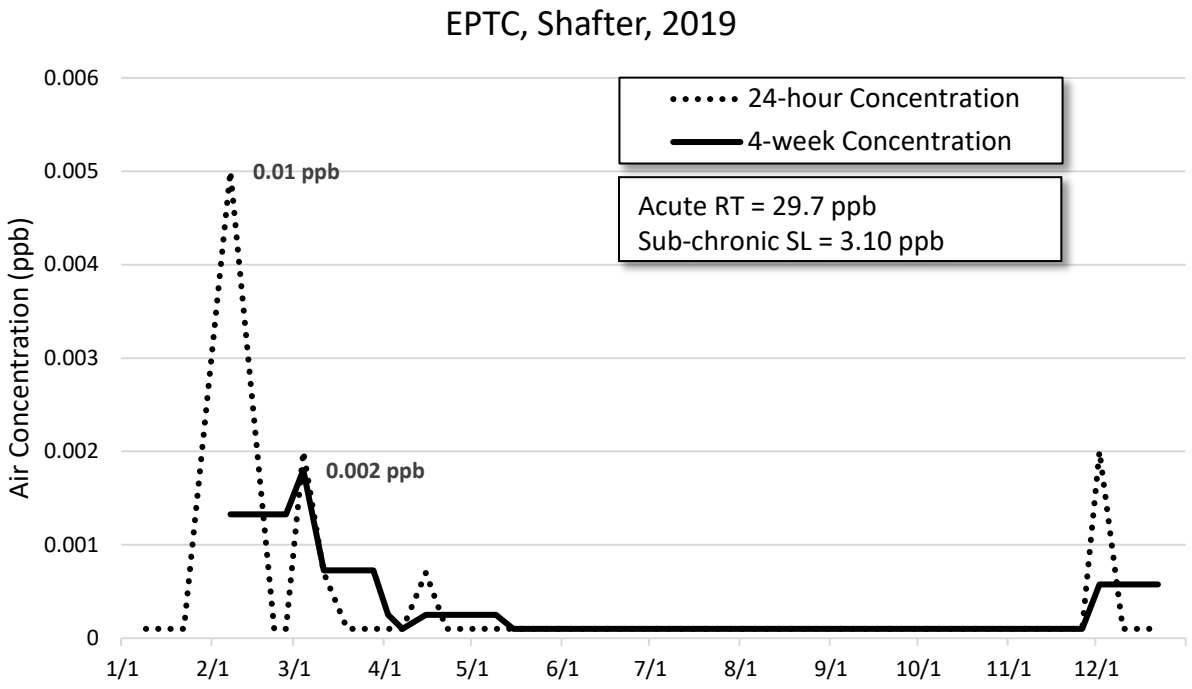

Figure G-3. Temporal trend in EPTC concentrations in Shafter in 2019.

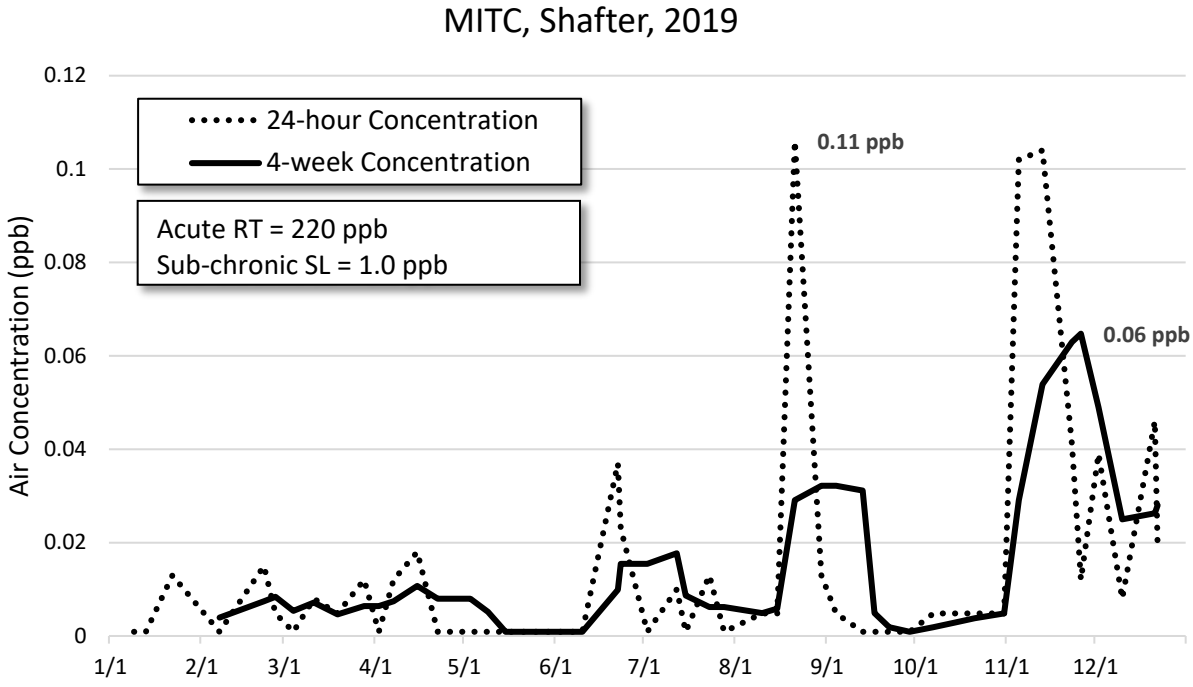

Figure G-4. Temporal trend in MITC concentrations in Shafter in 2019.

APPENDIX H: DETAILED RESULTS FOR WATSONVILLE

Watsonville

Watsonville is a small city (7 square miles in area) located on the southern edge of Santa Cruz County. The elevation is 29 feet; it receives on average 22 inches of precipitation annually. Daily average temperatures range from 50° to 72°F in the summer to 38° to 63°F in winter. Based on the 2010 census, the population of Watsonville was 51,199, of which 31.5% were below 18 years of age and 8.3% were above 65 years of age. The major crops in the immediate area around Watsonville are strawberries, apples, and lettuce. The monitoring site is located approximately 2 miles south of Watsonville at Ohlone Elementary School.

Pesticide Detections

Table H-1 lists the number and percentage of analyses resulting in detections at the Watsonville sampling site. The active ingredients with the highest percentage of detections were MITC (30%, n = 15), followed by DDVP (25.5%, n = 13), and then chloropicrin (23.5%, n = 12). The highest percentage of quantifiable detections was observed for MITC (10%, n = 5), followed by chloropicrin (9.8% n = 5), and then 1,3-dichloropropene (3.8%, n = 2).

Table H-1. Number and percentage of positive samples per chemical in Watsonville, California.

Chemical	Number of possible detections	Total number of detections*	Number of quantifiable detections	Percent of detections	Percent of quantifiable detections
1,3-dichloropropene	52	2	2	3.8%	3.8%
Acephate	51	0	0	0%	0%
Bensulide	51	0	0	0%	0%
Chloropicrin	51	12	5	23.5%	9.8%
Chlorothalonil	51	1	0	2.0%	0%
Chlorpyrifos	51	0	0	0%	0%
Chlorpyrifos OA	51	0	0	0%	0%
Cypermethrin	51	0	0	0%	0%
Dacthal	51	9	0	17.6%	0%
DDVP	51	13	0	25.5%	0%
DEF	51	0	0	0%	0%
Diazinon	51	0	0	0%	0%
Diazinon OA	51	0	0	0%	0%
Dimethoate	51	0	0	0%	0%
Dimethoate OA	51	0	0	0%	0%
Diuron	51	1	0	2.0%	0%
Endosulfan	51	0	0	0%	0%
Endosulfan Sulfate	51	0	0	0%	0%
EPTC	51	1	0	2.0%	0%
Iprodione	51	0	0	0%	0%

Chemical	Number of possible detections	Total number of detections*	Number of quantifiable detections	Percent of detections	Percent of quantifiable detections
Malathion	51	7	1	13.7%	2.0%
Malathion OA	51	8	0	15.7%	0%
Methidathion	51	0	0	0%	0%
Methyl Bromide	52	0	0	0%	0%
Metolachlor (S-Metolachlor)	51	0	0	0%	0%
MITC	50	15	5	30.0%	10.0%
Norflurazon	51	0	0	0%	0%
Oryzalin	51	0	0	0%	0%
Oxydemeton Methyl	51	0	0	0%	0%
Oxyfluorfen	51	0	0	0%	0%
Permethrin	51	0	0	0%	0%
Phosmet	51	0	0	0%	0%
pp-dicofol	51	0	0	0%	0%
Propargite	51	0	0	0%	0%
Simazine	51	0	0	0%	0%
Trifluralin	51	2	0	3.9%	0%
Total	**1,837**	**71**	**13**	**3.9%**	**0.7%**

*Includes both quantifiable and trace detections.

Pesticide Concentrations

Acute (24-h) Concentrations

Table H-2 shows the highest observed 24-h concentrations for all chemicals monitored at the Watsonville Air Monitoring Network (AMN) sampling location in 2019. The active ingredient with the highest concentration relative to its screening level was chloropicrin at 1.2%, followed by 1,3-dichloropropene (0.3%), malathion (0.05%), and then MITC (0.02%).

Table H-2. Highest 24-h air concentrations, acute screening levels, and percent of the acute screening level for all chemicals monitored at the Watsonville AMN sampling location in 2019.

Chemical	Highest 24-h concentration in ppb (ng/m^3)	24-h acute screening level in ppb (ng/m^3)	% of screening level
Chloropicrin	0.9 ppb (5,741 ng/m^3)	73.0 ppb (491,000 ng/m^3)*†	1.2%
1,3-dichloropropene	0.29 ppb (1,316 ng/m^3)	110 ppb (505,000 ng/m^3)‡	0.3%
Malathion	0.004 ppb (56 ng/m^3)	8.33 ppb (113,000 ng/m^3)	0.05%
MITC	0.06 ppb (164 ng/m^3)	220 ppb (660,000 ng/m^3)*†	0.02%

Chemical	Highest 24-h concentration in ppb (ng/m^3)	24-h acute screening level in ppb (ng/m^3)	% of screening level
Acephate	ND	1.60 ppb (12,000 ng/m^3)	
Bensulide	ND	15.9 ppb (259,000 ng/m^3)	
Chlorothalonil	Trace	3.13 ppb (34,000 ng/m^3)	
Chlorpyrifos	ND	0.08 ppb (1,200 ng/m^3)**	
Chlorpyrifos OA	ND	0.09 ppb (1,200 ng/m^3)**	
Cypermethrin	ND	6.64 ppb (113,000 ng/m^3)	
Dacthal	Trace	1,730 ppb (23,500,000 ng/m^3)	
DDVP	Trace	1.22 ppb (11,000 ng/m^3)	
DEF	ND	0.68 ppb (8,800 ng/m^3)	
Diazinon	ND	0.01 ppb (130 ng/m^3)	
Diazinon OA	ND	0.01 ppb (130 ng/m^3)	
Dimethoate	ND	0.46 ppb (4,300 ng/m^3)	
Dimethoate OA	ND	0.49 ppb (4,300 ng/m^3)	
Diuron	Trace	17.8 ppb (170,000 ng/m^3)	
Endosulfan	ND	0.20 ppb (3,300 ng/m^3)	
Endosulfan Sulfate	ND	0.19 ppb (3,300 ng/m^3)	
EPTC	Trace	29.7 ppb (230,000 ng/m^3)	
Iprodione	ND	69.6 ppb (939,000 ng/m^3)	
Malathion OA	Trace	8.76 ppb (113,000 ng/m^3)	
Methidathion	ND	0.25 ppb (3,100 ng/m^3)	
Methyl Bromide	ND	210 ppb (820,000 ng/m^3)*	
Metolachlor	ND	7.33 ppb (85,000 ng/m^3)	

Chemical	Highest 24-h concentration in ppb (ng/m^3)	24-h acute screening level in ppb (ng/m^3)	% of screening level
Norflurazon	ND	12.6 ppb (170,000 ng/m^3)	
Oryzalin	ND	29.7 ppb (420,000 ng/m^3)	
Oxydemeton Methyl	ND	3.74 ppb (39,200 ng/m^3)	
Oxyfluorfen	ND	34.5 ppb (510,000 ng/m^3)	
Permethrin	ND	10.5 ppb (168,000 ng/m^3)	
Phosmet	ND	5.94 ppb (77,000 ng/m^3)	
pp-dicofol	ND	4.49 ppb (68,000 ng/m^3)	
Propargite	ND	0.98 ppb (14,000 ng/m^3)	
Simazine	ND	13.3 ppb (110,000 ng/m^3)	
Trifluralin	Trace	87.5 ppb (1,200,000 ng/m^3)	

*This value is a regulatory target rather than a screening level.
†This value is an 8-h time-weighted-average (TWA) used to compare against the 24-h measured concentration.
‡This value is a 72-h time-weighted-average (TWA) used to compare against the 24-h measured concentration.
** CDPR's May 28, 2019, risk management directive for chlorpyrifos established an acute regulatory target of 0.28 ppb (4,050 ng/m3), 1-h time weighted average (TWA). However, the current sample duration does not allow for a direct comparison between the acute regulatory target concentration and the measured sample values.

Sub-chronic (4- or 13-wk) Concentrations

Table H-3 shows the highest observed rolling 4-week or 13-week average concentrations for all chemicals monitored at the Watsonville AMN sampling location in 2019. The active ingredient with the highest concentration relative to its screening level was chloropicrin at 45%, followed by 1,3-dichloropropene at 2.7%, MITC at 2.4%, and finally malathion at 0.02%.

Table H-3. Highest 4- or 13-wk air concentrations, sub-chronic screening levels, and percent of the sub-chronic screening level for chemicals monitored at the Watsonville AMN sampling location.

Chemical	Highest 4-week rolling average concentration in ppb (ng/m^3)	Sub-chronic screening level in ppb (ng/m^3)	% of screening level
Chloropicrin*	0.15 ppb (1,042 ng/m^3)	0.35 ppb (2,300 ng/m^3)	45%
1,3-dichloropropene*	0.08 ppb (374 ng/m^3)	3.0 ppb (14,000 ng/m^3)	2.7%

Chemical	Highest 4-week rolling average concentration in ppb (ng/m^3)	Sub-chronic screening level in ppb (ng/m^3)	% of screening level
MITC	0.024 ppb (71 ng/m^3)	1.00 ppb (3,000 ng/m^3)	2.4%
Malathion	0.0012 ppb (16 ng/m^3)	5.97 ppb (80,600 ng/m^3)	0.02%
Acephate	ND	0.35 ppb (2,300 ng/m^3)	
Bensulide	ND	1.47 ppb (24,000 ng/m^3)	
Chlorothalonil	Trace	3.13 ppb (34,000 ng/m^3)	
Chlorpyrifos	ND	0.06 ppb (850 ng/m^3)	
Chlorpyrifos OA	ND	0.06 ppb (850 ng/m^3)	
Cypermethrin	ND	4.76 ppb (81,000 ng/m^3)	
Dacthal	Trace	34.6 ppb (470,000 ng/m^3)	
DDVP	Trace	0.24 ppb (2,200 ng/m^3)	
DEF	ND	0.68 ppb (8,800 ng/m^3)	
Diazinon	ND	0.01 ppb (130 ng/m^3)	
Diazinon OA	ND	0.01 ppb (130 ng/m^3)	
Dimethoate	ND	0.32 ppb (3,000 ng/m^3)	
Dimethoate OA	ND	0.34 ppb (3,000 ng/m^3)	
Diuron	Trace	1.78 ppb (17,000 ng/m^3)	
Endosulfan	ND	0.20 ppb (3,300 ng/m^3)	
Endosulfan Sulfate	ND	0.19 ppb (3,300 ng/m^3)	
EPTC	Trace	3.10 ppb (24,000 ng/m^3)	

Chemical	Highest 4-week rolling average concentration in ppb (ng/m^3)	Sub-chronic screening level in ppb (ng/m^3)	% of screening level
Iprodione	ND	21.2 ppb (286,000 ng/m^3)	
Malathion OA	Trace	6.27 ppb (80,600 ng/m^3)	
Methidathion	ND	0.25 ppb (3,100 ng/m^3)	
Methyl Bromide	ND	5.0 ppb (19,400 ng/m^3)	
Metolachlor (S-Metolachlor)	ND	1.29 ppb (15,000 ng/m^3)	
Norflurazon	ND	1.92 ppb (26,000 ng/m^3)	
Oryzalin	ND	16.2 ppb (230,000 ng/m^3)	
Oxydemeton Methyl	ND	0.06 ppb (610 ng/m^3)	
Oxyfluorfen	ND	12.2 ppb (18,0000 ng/m^3)	
Permethrin	ND	5.63 ppb (90,000 ng/m^3)	
Phosmet	ND	2.00 ppb (26,000 ng/m^3)	
pp-dicofol	ND	3.24 ppb (49,000 ng/m^3)	
Propargite	ND	0.98 ppb (14,000 ng/m^3)	
Simazine	ND	3.76 ppb (31,000 ng/m^3)	
Trifluralin	Trace	12.4 ppb (170,000 ng/m^3)	

* These concentrations represent the highest 13-week rolling average, rather than the default 4-week rolling average.

Chronic (2019) Concentrations

Table H-4 shows the annual average concentration for all chemicals monitored at the Watsonville AMN sampling location in 2019. The highest concentration relative to its screening level was that of chloropicrin at 19.3%. This was followed by MITC at 4%, 1,3-dichloropropene at 2.9%, and then malathion at 0.03%.

Table H-4. Annual average air concentrations, chronic screening levels, and percent of the chronic screening levels for chemicals monitored at the AMN sampling location.

Chemical	Overall average concentration in ppb (ng/m^3)	Chronic screening level in ppb (ng/m^3)	% of screening level
Chloropicrin	0.05 ppb (348 ng/m^3)	0.27 ppb (1,800 ng/m^3)	19.3%
MITC	0.004 ppb (12 ng/m^3)	0.10 ppb (300 ng/m^3)	4%
1,3-dichloropropene	0.06 ppb (260 ng/m^3)	2.00 ppb (9,000 ng/m^3)	2.9%
Malathion	0.0002 ppb (2.6 ng/m^3)	0.60 ppb (8,100 ng/m^3)	0.03%
Acephate	ND	1.13 ppb (8,500 ng/m^3)	
Bensulide	ND	1.48 ppb (24,000 ng/m^3)	
Chlorothalonil	Trace	3.13 ppb (34,000 ng/m^3)	
Chlorpyrifos	ND	0.04 ppb (510 ng/m^3)	
Chlorpyrifos OA	ND	0.04 ppb (510 ng/m^3)	
Cypermethrin	ND	1.59 ppb (27,000 ng/m^3)	
Dacthal	Trace	3.46 ppb (47,000 ng/m^3)	
DDVP	Trace	0.09 ppb (770 ng/m^3)	
DEF	ND	NA – Seasonal	
Diazinon	ND	0.01 ppb (130 ng/m^3)	
Diazinon OA	ND	0.01 ppb (130 ng/m^3)	
Dimethoate	ND	0.03 ppb (300 ng/m^3)	
Dimethoate OA	ND	0.03 ppb (300 ng/m^3)	
Diuron	Trace	0.60 ppb (5,700 ng/m^3)	
Endosulfan	ND	0.02 ppb (330 ng/m^3)	
Endosulfan Sulfate	ND	0.02 ppb (330 ng/m^3)	
EPTC	Trace	1.10 ppb (8,500 ng/m^3)	

Chemical	Overall average concentration in ppb (ng/m^3)	Chronic screening level in ppb (ng/m^3)	% of screening level
Iprodione	ND	21.2 ppb (286,000 ng/m^3)	
Malathion OA	Trace	0.63 ppb (8,100 ng/m^3)	
Methidathion	ND	0.20 ppb (2,500 ng/m^3)	
Methyl Bromide	ND	1.00 ppb (3,900 ng/m^3)	
Metolachlor	ND	1.29 ppb (15,000 ng/m^3)	
Norflurazon	ND	1.92 ppb (26,000 ng/m^3)	
Oryzalin	ND	1.64 ppb (232,000 ng/m^3)	
Oxydemeton Methyl	ND	0.06 ppb (610 ng/m^3)	
Oxyfluorfen	ND	3.45 ppb (51,000 ng/m^3)	
Permethrin	ND	5.63 ppb (90,000 ng/m^3)	
Phosmet	ND	1.39 ppb (18,000 ng/m^3)	
pp-dicofol	ND	1.32 ppb (20,000 ng/m^3)	
Propargite	ND	0.98 ppb (14,000 ng/m^3)	
Simazine	ND	3.76 ppb (31,000 ng/m^3)	
Trifluralin	Trace	2.99 ppb (41,000 ng/m^3)	

Temporal trends in detected concentrations

Figures H-1 to H-4 present the concentrations over time for monitoring results in 2019 for any chemical detected at a quantifiable concentration in Watsonville. Screening levels, as defined in Appendix K, are abbreviated as SL in the following graphs. Regulatory targets, also defined in Appendix K, are abbreviated as RT.

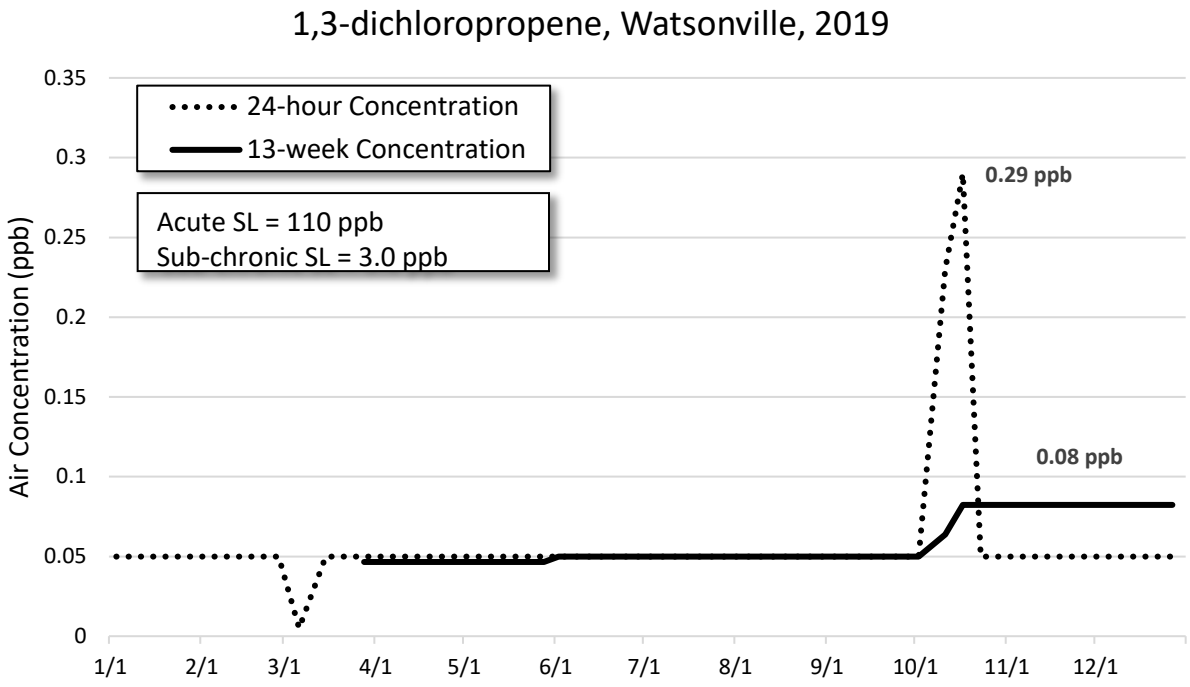

Figure H-1. Temporal trend in 1,3-dichloropropene concentrations in Watsonville in 2019.

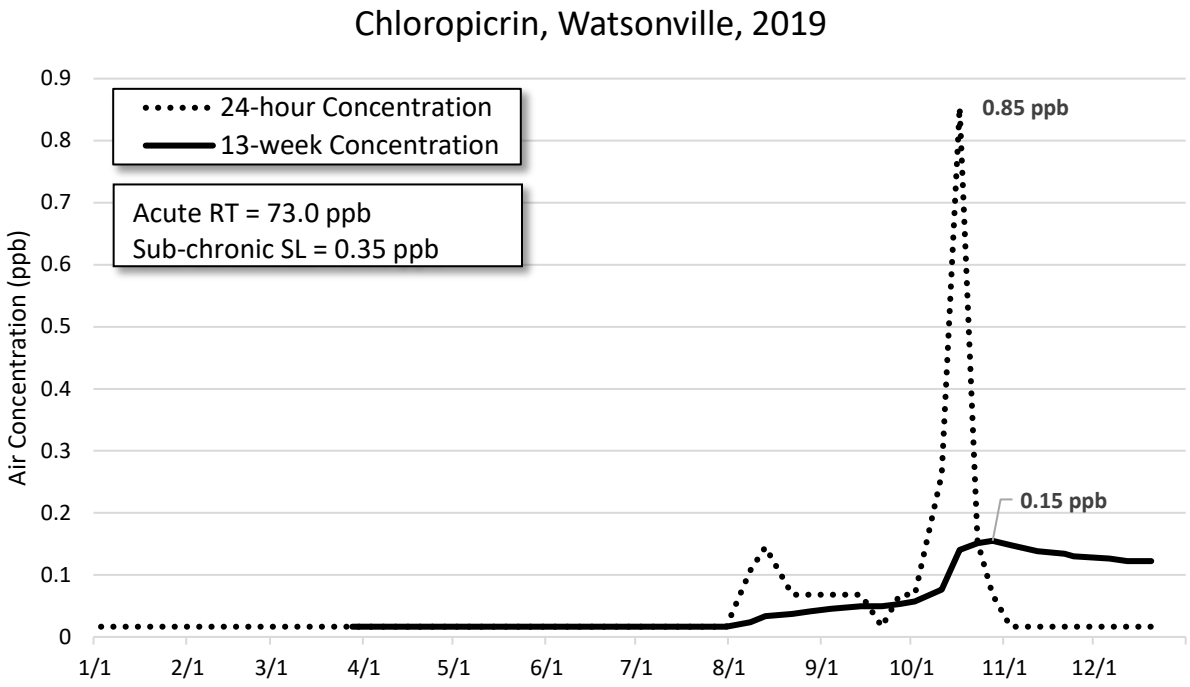

Figure H-2. Temporal trend in chloropicrin concentrations in Watsonville in 2019.

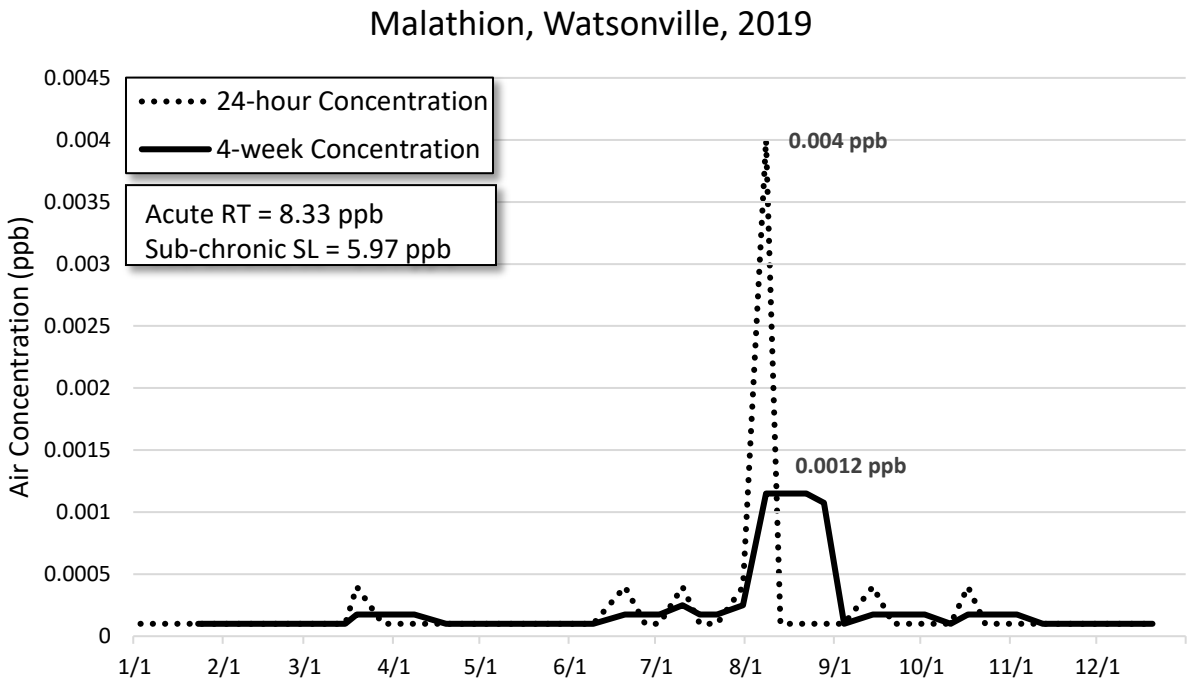

Figure H-3. Temporal trend in malathion concentrations in Watsonville in 2019.

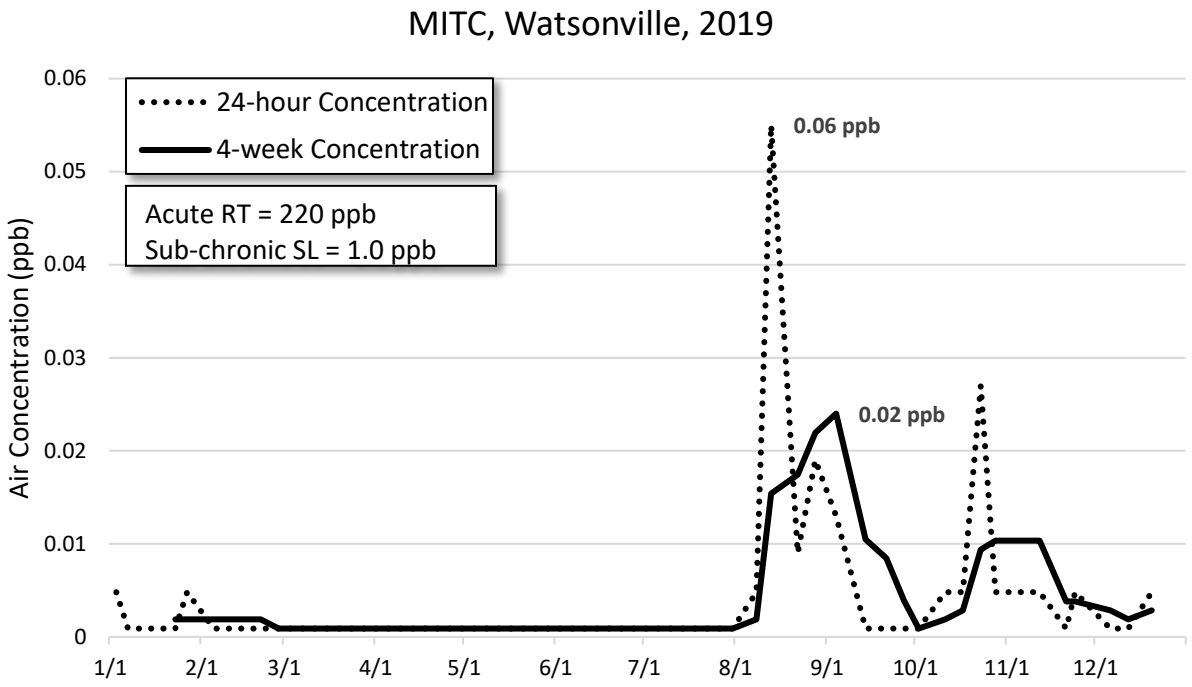

Figure H-4. Temporal trend in MITC concentrations in Watsonville in 2019.

APPENDIX I: LABORATORY ANALYSIS

Pesticides Monitored

As part of the Air Monitoring Network (AMN), the California Department of Pesticide Regulation (CDPR) monitors for 31 pesticides and 5 breakdown products. Chemicals included in the AMN were selected based primarily on potential health risk (Vidrio et al., 2013). A total of four analytical methods were used to analyze the collected air samples as part of the AMN:

1. Multi-pesticide residue analysis
2. Volatile organic compounds (VOC) analysis
3. MITC analysis
4. Chloropicrin analysis

Multi-Pesticide Residue Analysis

Prior to sampling, personnel from the California Department of Food and Agriculture Center for Analytical Chemistry (CDFA CAC) laboratory washed, rinsed, and packed 30 mL of XAD-4 sorbent material into a custom-built Teflon® cartridge used to collect 32 analytes via multi-pesticide residue analysis.

Multi-pesticide residue analysis using XAD-4 resin was performed by laboratory staff using gas chromatography – mass spectrometry (GC-MS) and liquid chromatography – mass spectrometry (LC-MS) methods as described elsewhere (CDFA, 2018a). 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-pesticide residue analysis method. Table I-1 lists the 32 analytes included in the multi-pesticide residue analysis.

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

Chemical	Chemical Class	Pesticide Group
Acephate	Organophosphate	Insecticide
Bensulide	Organophosphate	Herbicide
Chlorothalonil	Chloronitrile	Fungicide
Chlorpyrifos	Organophosphate	Insecticide
Chlorpyrifos Oxygen Analog	Organophosphate	Degradate
Chlorthal-dimethyl (DCPA, Dacthal)	Phthalate	Herbicide
Cypermethrin	Pyrethroid	Insecticide
DDVP	Organophosphate	Insecticide
DEF (SSS-tributyl phosphorotrithioate)	Organophosphate	Defoliant
Diazinon	Organophosphate	Insecticide
Diazinon Oxygen Analog	Organophosphate	Degradate
Dicofol	Organochlorine	Insecticide
Dimethoate	Organophosphate	Insecticide
Dimethoate Oxygen Analog	Organophosphate	Degradate
Diuron	Urea	Herbicide
Endosulfan	Organochlorine	Insecticide
Endosulfan Sulfate	Organochlorine	Degradate

Chemical	Chemical Class	Pesticide Group
EPTC	Carbamate	Herbicide
Iprodione	Dicarboximide	Fungicide
Malathion	Organophosphate	Insecticide
Malathion Oxygen Analog	Organophosphate	Degradate
Methidathion	Organophosphate	Insecticide
Metolachlor	Chloracetanilide	Herbicide
Norflurazon	Pyridazinone	Herbicide
Oryzalin	Dinitroaniline	Herbicide
Oxydemeton-methyl	Organophosphate	Insecticide
Oxyfluorfen	Diphenyl ether	Herbicide
Permethrin	Pyrethroid	Insecticide
Phosmet	Organophosphate	Insecticide
Propargite	Organosulfite	Insecticide
Simazine	Triazine	Herbicide
Trifluralin	Dinitroaniline	Herbicide

Volatile Organic Compound Analysis

Collected air canisters were analyzed for the presence of two analytes (Table I-2) using a volatile organic compound (VOC) GC-MS method similar to the United States Environmental Protection Agency's (US EPA) Method TO-15. The standard operating procedure for this analysis is described in detail elsewhere (CDFA, 2010). Analysis of 1,3-D, includes results for both *cis*- and *trans*- isomers, which are then consolidated and reported as a total 1,3-D concentration for use in this report. VOC compounds analyzed by ARB OLS laboratory utilized method MLD 058 (CARB 2002).

Table I-2. Target analytes in volatile organic compound analysis.

Pesticide	Pesticide Group	Chemical Class
1,3-dichloropropene	Fumigant	Halogenated organic
Methyl bromide	Fumigant	Halogenated organic

MITC

Samples collected on Anasorb coconut charcoal sorbent tubes were analyzed by CDFA CAC laboratory for the presence of MITC by GC-MS as described by CDFA (2018b). MITC extraction from the sorbent medium involves using carbon disulfide in ethyl acetate. The proportion of carbon disulfide used was recently increased to 1.0% (CDFA, 2018b). This is followed by analysis using a gas chromatography-nitrogen phosphorous detector (GC-NPD) (Table I-3).

Chloropicrin

Samples collected on XAD-4 sorbent tubes were analyzed by CDFA CAC laboratory for the presence of chloropicrin by gas chromatography-electron capture detector (GC-ECD) as described by CDFA (1999). Each tube was desorbed in hexane and analyzed by a GC equipped with an ECD (Table I-3).

Table I-3. Target analytes in individual analyte residue analysis.

Pesticide	Pesticide Group	Chemical Class
MITC	Fumigant	-
Chloropicrin	Fumigant	Halogenated organic

Laboratory Methods

Method Calibration

The laboratory established method 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 conducting a regression analysis of standard concentrations measured by the instrument (peak height or peak area of the chromatogram) using at least five concentrations. The minimum acceptable correlation coefficient of the calibration was given in the standard operating procedure for each method, but in general was at least 0.95. For gaseous VOC sample analysis, CARB MLD-OLS utilizes a certified National Institute of Standards (NIST) standard calibration mixture, or mixtures, containing all analytes of interest. The standards are slightly higher in concentration than the typical sample and must be within the dynamic range of the GC/MS system. This CARB MLD-OLS established method calibration is described in detail in MLD 058 (CARB, 2002).

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 % 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 I-4 and I-5 lists all the quantitation and detection limits for AMN analytes.

Table I-4. Quantitation and detection limits for Air Monitoring Network samples collected on sorbent media analyzed by the CDFA CAC laboratory.

Chemical	MDL (ppb)	LOQ (ppb)	MDL (ng/m^3)	LOQ (ng/m^3)
Acephate	0.000087	0.0012	0.65	9.3
Bensulide	0.000054	0.00057	0.88	9.3
Chloropicrin	0.033	0.10	222	694
Chlorothalonil	0.000081	0.0021	0.88	23.1
Chlorpyrifos	0.000061	0.0016	0.88	23.1
Chlorpyrifos OA	0.000058	0.00068	0.79	9.3
Cypermethrin	0.00014	0.0014	2.31	23.1
Chlorthal-dimethyl	0.000065	0.00068	0.88	9.3
DDVP	0.000082	0.0026	0.74	23.1

Chemical	MDL (ppb)	LOQ (ppb)	MDL (ng/m^3)	LOQ (ng/m^3)
DEF	0.000022	0.00072	0.28	9.3
Diazinon	0.000030	0.00075	0.37	9.3
Diazinon OA	0.000031	0.00079	0.37	9.3
Dimethoate	0.000079	0.00099	0.74	9.3
Dimethoate OA	0.000069	0.0011	0.6	9.3
Diuron	0.000039	0.00098	0.37	9.3
Endosulfan	0.00011	0.0014	1.76	23.1
Endosulfan Sulfate	0.000051	0.0013	0.88	23.1
EPTC	0.00019	0.0030	1.44	23.1
Iprodione	0.000076	0.0017	1.02	23.1
Malathion	0.000096	0.00069	1.3	9.3
Malathion OA	0.000029	0.00072	0.37	9.3
Methidathion	0.000071	0.00075	0.88	9.3
Metolachlor	0.000091	0.00080	1.06	9.3
MITC	0.0019	0.0077	5.44	23.1
Norflurazon	0.000044	0.00069	0.6	9.3
Oryzalin	0.00012	0.0016	1.67	23.1
Oxydemeton methyl	0.00014	0.00089	1.44	9.3
Oxyfluorfen	0.000088	0.0016	1.3	23.1
Permethrin	0.00010	0.0014	1.62	23.1
Phosmet	0.00029	0.00072	3.7	9.3
pp-Dicofol	0.00030	0.0015	4.49	23.1
Propargite	0.000071	0.0016	1.02	23.1
Simazine	0.000039	0.0011	0.32	9.3
Trifluralin	0.000085	0.0017	1.16	23.1

Table I-5. Method detection limits for Air Monitoring Network volatile organic compound (VOC) samples, by laboratory.

Chemical	MDL (ARB-OLS) (ppb)	MDL (ARB-OLS) (ng/m^3)	MDL (CDFA CAC) (ppb)	MDL (CDFA CAC) (ng/m^3)
1,3-dichloropropene	0.1	454	0.01	45.4
Methyl bromide	0.03	116.4	0.0051	19.8

Air Concentration Calculations

For the sorbent tube and cartridge samples, air concentrations are 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 calculation:

$$\frac{Sample\ results\ (ug) x\ 1000\ L/m^3}{Flow\ rate\left(\frac{L}{\min}\right) x\ run\ time\ (\min)} \text{ x 1000 } ng/\mu g = ng/m^3$$

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

$$\frac{Sample\ results\ (ppb) x\ Molecular\ weight\ (g/mol)}{24.45} \text{ x 1000 } = ng/m^3$$

The calculation above assumes 1 atmosphere of pressure at 25°C and 24.45 is obtained from multiplication of the Universal Gas Constant (R) (82.06 atm.cm^3/(mol·K)) and temperature in Kelvin (298 K) with appropriate unit conversions based on the ideal gas law[6].

Per standard CDPR practice, when calculating average concentrations from multiple samples, samples with no detectable amounts 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)).

Data Validation/Quality Assurance

Method Validation

For multi-residue, MITC, and chloropicrin analyses, an acceptable range of spike recoveries was established by analyzing laboratory spike samples in five replicate analyses at five different spike levels. The mean percent recovery and standard deviation were determined based on these 25 data points. The control limits were established as the mean percent recovery ± 3 SDs. In addition, a method trapping efficiency was determined by collecting 2-stage air samples that were analyzed to determine the proportion of the spike trapped in the bottom stage to assess for possible sample breakthrough. For VOC analysis, ARB-OLS utilized method MLD 058 where extensive method validation had been performed (CARB 2002).

General Continuing Quality Control

Samples were stored at the CDPR facility in West Sacramento under the care of the laboratory liaison until scheduled delivery to the CDFA CAC laboratory or the Air Resources Board – Organic Laboratory Section (ARB-OLS) laboratory. Storage stability was evaluated for the longest anticipated holding period with at least four sampling intervals and two replicate samples at each sampling interval. All analytes analyzed by CDFA CAC laboratory have storage stability data for a minimum of 28 days, analytes analyzed by ARB-OLS have storage stability data for 30 days. Each extraction set consisted of 1 to 20 actual samples and quality control (QC) samples which include a reagent blank, a matrix blank, and a matrix spiked sample. Any subsequent matrix spiked samples outside the control limits required the set of samples associated with that spike to be reanalyzed.

[6] Ideal gas law: pV = nRT
where p = pressure, V = volume, n = number of moles, R = universal gas constant, and T = temperature

Quality Control Results

Laboratory matrix spikes and matrix blanks were included with every set of samples extracted and analyzed at the CDFA CAC laboratory and are part of the laboratory's QC program. The matrix spikes are conducted to assess accuracy and precision; the blanks are used to check for contamination at the laboratory or contamination of the media packed in the sorption tubes or cartridges. The blank matrix materials were not fortified but were extracted and analyzed along with the matrix spikes and field samples. Table I-6 lists the average for the QC samples that were extracted and analyzed with the air samples for the entire monitoring period. Average laboratory matrix spike recoveries ranged from 81% to 99% for all chemicals analyzed. ARB-OLS lab does not perform matrix spikes or field blanks, however.

Field blanks and duplicate samples are part of CDPR's field and laboratory QC program.

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. All field blanks resulted in non-detections. These results are shown in Table I-6.

Table I-7 summarizes the results of duplicate samples. A duplicate sample is a sample that is co-located with another sample in the field. These samples serve to evaluate the overall precision in sample measurement and analysis. Consistent with previous reports, there were a large number of non-detection pairs among co-located samples. For sample pairs in which both samples produced a quantifiable detection these concentrations were compared to find the relative difference, expressed as a percentage. This was possible for a total of eight sample pairs; values d range from 4% to 9%.

Table I-4. Average results for quality control/quality assurance samples from the 2019 AMN analyzed by CDFA's CAC lab.

Chemical	Lab spikes (% recovery)	Lab blanks (ng/m^3)	Field blanks (ng/m^3)
1,3-dichloropropene	94%	ND	None Taken
Acephate	93%	ND	ND
Bensulide	85%	ND	ND
Chloropicrin	95%	ND	ND
Chlorothalonil	92%	ND	ND
Chlorpyrifos	94%	ND	ND
Chlorpyrifos OA	87%	ND	ND
Cypermethrin	93%	ND	ND
Dacthal	90%	ND	ND
DDVP	82%	ND	ND
DEF	88%	ND	ND
Diazinon	93%	ND	ND
Diazinon OA	94%	ND	ND
Dimethoate	93%	ND	ND
Dimethoate OA	92%	ND	ND
Diuron	93%	ND	ND
Endosulfan	92%	ND	ND
Endosulfan Sulfate	95%	ND	ND
EPTC	89%	ND	ND

Chemical	Lab spikes (% recovery)	Lab blanks (ng/m^3)	Field blanks (ng/m^3)
Iprodione	95%	ND	ND
Malathion	96%	ND	ND
Malathion OA	95%	ND	ND
Methidathion	88%	ND	ND
Methyl bromide	97%	ND	None Taken
Metolachlor	88%	ND	ND
MITC	81%	ND	ND
Norflurazon	93%	ND	ND
Oryzalin	89%	ND	ND
Oxydemeton methyl	93%	ND	ND
Oxyfluorfen	97%	ND	ND
Permethrin	94%	ND	ND
Phosmet	87%	ND	ND
pp-Dicofol	96%	ND	ND
Propargite	95%	ND	ND
Simazine	94%	ND	Trace
Trifluralin	94%	ND	ND

Table I-5. Results for duplicate (collocated) sample pairs in 2019.

Primary/duplicate paired results category	Chloropicrin	MITC	Multi-residue	VOC
ND †/ND	17	11	567	34
Trace ‡/Trace	0	2	6	0
Trace/ND	0	0	2	0
ND/Trace	0	0	1	0
LOQ/ND	0	0	0	1
ND/ > LOQ	0	0	0	0
Trace/ > LOQ	0	0	0	0
> LOQ/ > LOQ	1	4	0	3
Relative Difference *	9%	5%	N/A	4%

† ND = Not Detected.

‡ Trace = Pesticide detection confirmed, but less than the quantitation limit.

* For pairs with both concentrations >LOQ.

Lost and Invalid Samples

A valid sample is a sample that meets all the sampling criteria for its corresponding sampling method. For example, A VOC sample collected by Xonteck ambient air sampler (model 901) should run for 24±1 hours and the ending pressure must be between 6 and 16 PSI. These criteria for each sampling method and each sampling media is explained in detail in Appendix J.

As previously stated on page 14 of the report, 45 samples were lost or invalidated during the year of sampling. Table I-8 lists the location, date, and type of samples.

Table I-8. Lost or invalid samples in 2019.

Location	Operator	Date	Sample Type(s)
Chualar	DPR	12/27/2019	Chloropicrin, MITC, Multi-Residue
Cuyama	CARB	2/2/2019	Chloropicrin, MITC, Multi-Residue, VOC
Cuyama	CARB	2/14/2019	Chloropicrin, MITC, Multi-Residue, VOC
Oxnard	CARB	2/2/2019	Chloropicrin, MITC, Multi-Residue, VOC
Oxnard	CARB	3/8/2019	VOC
Oxnard	CARB	9/14/2019	Chloropicrin, MITC, Multi-Residue, VOC
Oxnard	CARB	9/17/2019	Chloropicrin, MITC, Multi-Residue, VOC
Oxnard	CARB	11/26/2019	Chloropicrin, MITC, Multi-Residue
Oxnard	CARB	12/2/2019	Chloropicrin, MITC, Multi-Residue
Santa Maria	SBCAC	11/12/2019	Chloropicrin, MITC, Multi-Residue
Shafter	CARB	2/2/2019	Chloropicrin, MITC, Multi-Residue, VOC
Shafter	CARB	2/14/2019	Chloropicrin, MITC, Multi-Residue, VOC
Watsonville	DPR	4/27/2019	MITC
Watsonville	DPR	12/27/2019	Chloropicrin, MITC, Multi-Residue

APPENDIX J – FIELD METHODS

Materials and Methods

Air Sampling Equipment and Methods

A total of four methods were used for the collection of air samples as part of the AMN. Each of these methods required specific equipment as described below.

In situations where current equipment is not accessible and backup equipment cannot be used, the California Department of Pesticide Regulation has the option to use legacy methodologies and equipment, allowing staff to collect samples during the scheduled timeframe without compromising the sample's integrity in the event of unforeseen complications with current equipment.

Multi-Pesticide Residue Sampling

Current Equipment:

As part of sample collection, ambient air was drawn through the XAD-4 media using channel 1 of a custom-built 3-channel pesticide sampling version of a Speciation Air Sampling System (SASS) manufactured by Met One Instruments, hereafter referred to as Met One® pesticide sampler. Channel 1 provided a sustained flow of 15.0 L/min ± 5%. The average of flow measurements collected at 5-minute intervals was used to directly calculate the volume sampled which was reported by the instrument. This allowed for more certainty than that of the previous method of calculation which used the mean from only two data points (measurements at the start and finish of sample collection). The Met One® pesticide sampler includes a solar shield of a sufficient size to shield the multi-pesticide cartridges from direct sunlight exposure during the sampling period.

Legacy Air Monitoring Network Equipment (2011-2018):

As part of sample collection, ambient air was drawn through the XAD-4 media with an SKC® AirChek HV30 air pump, calibrated at a flow rate of 15 L/min (± 10%) for a continuous 24-h period. The cartridge was connected to the pump using a combination of threaded ABS plastic fittings, nitrile o-rings, and approximately 8 feet of Tygon® tubing which were all downstream of the sample media. The Teflon® tube containing the sample media was kept sealed prior to sampling at which time the inlet of the cartridge itself was opened to the ambient air. Bios Defender 530® or DC-Lite® flow meters were used to obtain flow rates at the start and finish of the sampling period. This method is used as a backup method should the current equipment fail or become unavailable.

Volatile Organic Compounds

Current Equipment:

As part of sample collection, ambient air was drawn through 1/16” internal diameter PTFE (Teflon®) tubing into a Xonteck model 901 ambient air sampler into a 6-L air sample canister. The flow rate using this method was 7.5 mL/min (± 10%) and was sustained for a 24-h period. The sampler itself included an automatically initiated 60-second purge period to clear the sampling lines immediately prior to sample collection.

Legacy AMN Equipment (2011-2018):
As part of sample collection, ambient air was drawn into a 6-L air sample canister (cat. # 24142) pre-evacuated to a pressure of -30" Hg for VOC analysis. A Restek flow controller (cat. # 24160) was attached to the canister inlet to achieve a flow rate of 3.0 mL/min (± 10%) for a continuous 24-h sampling period. The air sampling inlet of the flow controller was placed at a sampling height of 3-10 meters, depending on the sampling site location, with a sufficient amount of 1/16" internal diameter PTFE (Teflon®) tubing to reach the canister. Bios Defender 530® or DC-Lite® flow meters were used to check the flow rate at the start and finish of the sampling period. This method is used as a backup method should the current equipment fail or become unavailable.

MITC

Current Equipment:
As part of sample collection, ambient air was drawn through the SKC® Anasorb® CSC sorbent sample tubes containing activated coconut charcoal media using channel 2 of the Met One pesticide sampler. Channel 2 provided a sustained flow of 1.5 L/min ± 5%. The average of flow measurements collected at 5-minute intervals was used to directly calculate the volume sampled which was reported by the sampler. This feature allowed for more certainty than the previous method of calculation, which used the mean from only two data points (measurements at the start and end of sample collection). The glass sorption tubes containing the sampling media and any collected analyte were shielded from sunlight by the sampler's radiation shield.

Legacy AMN Equipment (2011-2018):
As part of sample collection, ambient air was drawn through the XAD-4 media with an SKC® AirChek HV30 air pump, calibrated at a flow rate of 15 L/min (± 10%) for a continuous 24-h period. The cartridge was connected to the pump using a combination of threaded ABS plastic fittings, nitrile o-rings, and approximately 8 feet of Tygon® tubing which were all downstream of the sample media. The Teflon® tube containing the sample media was kept sealed prior to sampling at which time the inlet of the cartridge itself was open to the ambient air. Bios Defender 530® or DC-Lite® flow meters were used to obtain flow rates at the start and finish of the sampling period. This method is used as a backup method should the current equipment fail or become unavailable.

Chloropicrin

Current Equipment:
As part of sample collection, ambient air was drawn through the SKC® XAD-4 sorbent sample tubes using channel 3 of the Met One pesticide sampler. Channel 3 provided a sustained flow of 50 mL/min ± 5%. The average of flow measurements collected at 5-minute intervals was used to directly calculate the volume sampled which was reported by the machine. This feature allowed for more certainty than the previous method of calculation which used the mean from only two data points (measurements at the start and finish of sample collection). The glass sorption tubes containing the sampling media and any collected analyte were shielded from sunlight by the sampler's radiation shield.

Legacy AMN Equipment (2011-2018):
As part of sample collection, ambient air was drawn through the XAD-4 media with an SKC® AirChek HV30 air pump, calibrated at a flow rate of 15 L/min (± 10%) for a continuous 24-h period. The cartridge

was connected to the pump using a combination of threaded ABS plastic fittings, nitrile o-rings, and approximately 8 feet of Tygon® tubing which were all downstream of the sample media. The Teflon® tube containing the sample media was kept sealed prior to sampling at which time the inlet of the cartridge itself was open to the ambient air. Bios Defender 530® or DC-Lite® flow meters were used to obtain flow rates at the start and finish of the sampling period. This method is used as a backup method should the current equipment fail or become unavailable.

Field Sampling Procedure

One 24-h sample was collected each week at each of the eight sites, once they were active. The starting day varied each week with the actual dates being randomly selected as much as possible. Actual sampling start times were left to the discretion of the field sampling personnel.

Chain of custody (COC) forms, sample analysis request forms, and sample labels including the study number and unique sample identification numbers were supplied to field sampling personnel to be attached to sample tubes, cartridges, and canister tags prior to sampling.

Each of the four sample types detailed above were set up and started as closely as possible to the same time, except for the occasional make-up sample needed to replace an invalid sample. These make-up samples were typically run on the day following an invalidation event. Reasons why samples might be deemed invalid include, but are not limited to, the following: sampling period out of range, ending flow or pressure out of acceptable range, power interruptions, glass tube breakage during removal (i.e., damaged sampling media), and inoperative sampling equipment. The starting flow rates were measured prior to air sample collection and if any were determined to be out of the acceptable range (± 5% for the new equipment, ± 10% for the old equipment) that sampling equipment was recalibrated to within an acceptable tolerance. 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 a COC form.

Quality Control Methods

In addition to the primary samples, CDPR collected quality control (QC) samples including trip blanks, and co-located duplicate samples at a rate of at least 10% of primary samples. The QC results section located at the end of this report summarizes the results of these QC procedures. These QC procedures where specific to samples analyzed by CDFA's CAC lab only.

A trip blank sample provides information on possible contamination of field collected samples. For the manufactured pre-packed XAD-4 and charcoal sample tubes, trip blank sample 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 collected. Trip blanks were collected from the monitoring station in Watsonville (designated CDPR's QC sampling site) at least once every month of sampling. Trip blank samples containing detectable amounts of any of the pesticides would indicate a problem with contamination during transport or during laboratory extraction.

Additionally, to determine if sample analyte breakthrough occurred in the sampling media, a method trapping efficiency was conducted for AMN sample collection media with the exception of air canisters (CDPR, 1995). Two-stage air samples were collected and analyzed to determine the proportion of the spike trapped in the bottom stage to assess for possible sample breakthrough.

A duplicate sample is a sample that is co-located with a regular field sample. These samples evaluate overall precision in sample measurement and analysis.

The site at Watsonville was designated as CDPR's QC site for the CDPR-operated portion of the AMN. A second set of sampling equipment dedicated to the collection of QC samples was installed at this location.

APPENDIX K: HEALTH EVALUATION AND CALCULATIONS

Calculation of Sub-chronic Rolling Averages

13-week Rolling Averages

In 2016, CDPR eliminated the practice of using a 4-week rolling average concentration to represent a sub-chronic time period for 1,3-dichloropropene (1,3-D) and chloropicrin to compare to sub-chronic screening levels and regulatory targets. This determination was based on an evaluation conducted by CDPR's Human Health Assessment Branch that looked at seasonal reference concentrations for these two chemicals. Greater details are provided elsewhere (CDPR, 2016)

Health Evaluation Methods

Pesticides can cause a variety of health effects when present at concentrations above health-protective levels. The pesticides included in the Air Monitoring Network (AMN) were selected in part because (1) risk assessments indicate the high potential for 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 adverse effects such as respiratory illnesses, damage to the nervous system, cancer, and birth defects. Vidrio et al. (2013) summarize the potential health effects of each pesticide. No state or federal agency has established health standards for pesticides in air. Therefore, CDPR in consultation with the Office of Environmental Health Hazard Assessment developed health screening levels or regulatory targets 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 CDPR to conduct a more detailed evaluation. An air concentration that measures less than 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. (2013) summarize more information on CDPR-determined screening levels including information on deriving screening levels for each pesticide.

CDPR puts measures in place based on the regulatory target to limit exposures so that adverse effects can be avoided. Exceeding a regulatory target 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. CDPR normally establishes a regulatory target after completing a formal risk assessment of a chemical's toxicity and potential exposures. CDPR management determines a regulatory target using its 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). Four of the pesticides monitored in the AMN (chloropicrin, MeBr, MITC, and 1,3-D) have regulatory targets for one or more exposure periods.

Cumulative Exposures

Cumulative exposure and risk were estimated using a hazard quotient and hazard index approach for pesticides that have a common mode of action (such as cholinesterase inhibitors). 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, sub-chronic, 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. Such a results would indicate the need for a further, more refined evaluation. Similarly, the risk from multiple pesticides (cumulative risk) is evaluated using the hazard index (HI) approach, which sums of the HQs for the pesticides monitored.

HI = HQ1 (pesticide 1) + HQ2 (pesticide 2) + HQ3 (pesticide 3) + … (and so forth)

An HI greater than 1 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.

APPENDIX L: COMPARISON TO PREVIOUS YEARS OF AIR MONITORING NETWORK DATA

All Air Monitoring Network Sites

This report covers results from the ninth year of monitoring by the Air Monitoring Network (AMN), which has been collecting samples since 2011. While there were significant changes to the AMN in 2017, as detailed in last year's report (CDPR, 2019), a few comparisons to the overall results from previous years are possible. Among individual sites, Shafter has remained in operation since 2011 and comparisons of the historic data for that site are shown below. Additionally, comparisons of annual averages between 2019 and 2018 datasets have been made for all remaining sites which became operational in 2017 (Chualar, Santa Maria, and Watsonville).

Table L-1 shows the number of individual pesticides and breakdown products monitored by the AMN each year, as well as whether that pesticide was detected in a given year. This data are further broken down into whether that pesticide was detected at a quantifiable level during monitoring in that year. The initial number of pesticides monitored by the AMN was 39 in 2011 (34 pesticides and 5 breakdown products). On January 1, 2012, acrolein was removed from AMN monitoring because acrolein is mainly produced as a byproduct of automobile emissions and other combustion sources not related to pesticidal uses (ATSDR, 2007), and uncertainties related to the laboratory methodology. On March 21, 2012, CDPR cancelled the registration of all products containing methyl iodide at the request of the registrant. Therefore, monitoring for methyl iodide as part of the AMN stopped on June 20, 2012. In December 2016, carbon disulfide was removed from the list of monitored chemicals due to detections originating from non-pesticidal sources and the voluntary withdrawal of registration of pesticide products that produce carbon disulfide.

Table L-2 shows the results presented in terms of individual analyses are shown as raw counts; Table L-3 summarizes this information into the percentages of possible detections. Inspection of these results reveals that the highest number of detections as a percentage of analyses occurred in 2015 (10.3%), and that the highest percentage of quantifiable detections occurred in both 2015 and 2016 (5.2%, each). The lowest percentage of detections occurred in 2019 (3.8%); 2019 also had the lowest percentage of quantifiable detections (0.95%).

Table L-1. Summary of pesticide detection trends in the Air Monitoring Network, aggregated by chemical (2011 – 2019).

Year	Total monitored chemicals*	Total non-detected chemicals	Total detected chemicals †	Total quantifiable chemicals
2011	39	10	29	9
2012	38	14	24	11
2013	37	13	24	14

Year	Total monitored chemicals*	Total non-detected chemicals	Total detected chemicals †	Total quantifiable chemicals
2014	37	14	23	11
2015	37	11	26	14
2016	37	12	25	11
2017	36	9	27	10
2018	36	8	28	11
2019	36	11	25	10

* Includes all pesticides that were monitored as part of the AMN for that year.

† Includes both quantified and trace detections.

Table L-2. Summary of pesticide detection trends in the Air Monitoring Network, as individual analyses (2011 – 2019).

Year	Total analyses	Total non-detected analyses	Total detected analyses †	Total quantifiable analyses
2011	5,676	5,251	425	173
2012	6,002	5,671	331	81
2013	6,033	5,607	426	159
2014	5,966	5,468	498	225
2015	5,892	5,286	606	306
2016	5,928	5,393	535	307
2017	7,396	6,868	528	122
2018	12,058	11,316	742	152
2019	14,616	14,061	555	139

† Includes both quantified and trace detections.

Table L-3. Summary of pesticide detection trends in the Air Monitoring Network, as a percentage of possible detections (2011 – 2019).

Year	Percent of non-detected analyses	Percent of detected analyses †	Percent of quantifiable analyses
2011	92.5%	7.5%	3.0%
2012	94.5%	5.5%	1.3%
2013	92.9%	7.1%	2.6%
2014	91.7%	8.3%	3.8%
2015	89.7%	10.3%	5.2%
2016	91.0%	9.0%	5.2%
2017	92.9%	7.1%	1.6%
2018	93.8%	6.2%	1.3%
2019	96.2%	3.8%	0.95%

† Includes both quantified and trace detections.

Historic Air Concentrations in Chualar

Monitoring began in Chualar on January 1, 2017. Tables L-4 to L-7 summarize results for three years of monitoring.

Table L-4 shows the percentage of analyses during that year which resulted in either a trace or quantifiable detection. Detections were variable between the three years of monitoring: the number of detections for the fumigants 1,3-dichloropropene (1,3-D) and methyl isothiocyanate (MITC) increased in year two, but subsequently decreased in year three.

Table L-5 shows the highest observed 24-h concentration for any chemical with a positive detection during any year of monitoring at Chualar. The highest observed 24-h concentration of 1,3-D decreased from 1,996 ng/m³ (0.4 ppb) in 2017 to 460 ng/m³ (0.1 ppb) in 2018 to 286 ng/m³ (0.06 ppb) in 2019. The highest observed 24-h concentration of MITC increased from 92 ng/m³ (0.03 ppb) in 2017 to 340 ng/m³ (0.11 ppb) in 2018 and then decreased to 34 ng/m³ (0.01 ppb) in 2019.

Table L-6 shows the highest observed rolling 4- or 13- week average concentrations for any chemical with a positive detection during any year of monitoring at Chualar. The highest observed rolling 13-week average of chloropicrin in 2019 decreased compared to the previous two years. The highest observed rolling 4-week average concentration of MITC also decreased from 101 ng/m³ (0.034 ppb) in 2018 to 21.7 ng/m³ (0.007 ppb) in 2019.

Table L-7 shows the annual average concentrations for any chemical with a positive detection during any year of monitoring at Chualar. The annual average concentration of 1,3-D in Chualar decreased from 252 ng/m³ (0.1 ppb) in 2017 to 120 ng/m³ (0.027 ppb) in 2018 and then increased to 193 ng/m³ (0.04 ppb). The annual average concentration of chloropicrin showed a very slight increase from 164 ng/m³ (0.02 ppb) in 2017 to 180 ng/m³ (0.026 ppb) in 2018 and then a slight decrease to 152 ng/m³ (0.02 ppb) in 2019. The annual average concentration of MITC increased from 7 ng/m³ (0.002 ppb) in 2017 to 15 ng/m³ (0.005 ppb) in 2018 and decreased to 5.6 ng/m³ (0.002 ppb) in 2019.

Table L-4. Percentage of analyses performed resulting in a detection at Chualar, by year.*

Chemical	2017	2018	2019
1,3-dichloropropene	4%	18%	2%
Acephate	0%	2%	0%
Bensulide	4%	2%	2%
Chloropicrin	12%	15%	10%
Chlorothalonil	25%	8%	0%
Chlorpyrifos	0%	0%	4%
Chlorthal-dimethyl	100%	98%	80%
DDVP	6%	12%	16%
Diuron	4%	0%	0%
Endosulfan	0%	2%	0%
Malathion	18%	10%	0%
Malathion OA	16%	8%	8%
MITC	25%	42%	16%
Norflurazon	4%	0%	0%
Oryzalin	4%	0%	0%
Permethrin	2%	4%	0%
pp-dicofol	0%	0%	2%
Simazine	2%	0%	0%
Trifluralin	0%	0%	2%

* These values include both trace and quantifiable detections.

Table L-5. Highest 24-h concentrations for pesticides with at least one detectable concentration by year (2017 – 2019) in Chualar, California.

Chemical	2017	2018	2019
1,3-dichloropropene	0.4 ppb (1,996 ng/m³)	0.1 ppb (460 ng/m³)	0.06 ppb (286 ng/m³)
Acephate	ND	Trace	ND
Bensulide	Trace	Trace	Trace
Chloropicrin	0.1 ppb (805 ng/m³)	0.1 ppb (780 ng/m³)	0.1 ppb (835 ng/m³)
Chlorothalonil	Trace	Trace	ND
Chlorpyrifos	ND	ND	Trace
Chlorthal-dimethyl	0.002 ppb (22 ng/m³)	0.003 ppb (39 ng/m³)	0.002 ppb (34 ng/m³)
DDVP	Trace	Trace	Trace
Diuron	Trace	ND	ND
Endosulfan	ND	Trace	ND
Malathion	Trace	0.0007 ppb (9.5 ng/m³)	ND
Malathion OA	Trace	Trace	Trace
MITC	0.03 ppb (92 ng/m³)	0.11 ppb (340 ng/m³)	0.011 ppb (34 ng/m³)
Norflurazon	Trace	ND	ND
Oryzalin	Trace	ND	ND
pp-dicofol	ND	ND	0.001 ppb (19 ng/m³)
Permethrin	Trace	Trace	ND

Chemical	2017	2018	2019
Simazine	Trace	ND	ND
Trifluralin	ND	ND	Trace

Table L-6. Highest rolling 4-week average concentrations for pesticides with at least one detectable concentration by year (2017 – 2019) in Chualar, California.

Chemical	2017	2018	2019
1,3-dichloropropene (13-wk)	0.1 ppb (398 ng/m³)	0.081 ppb (370 ng/m³)	0.06 ppb (227 ng/m³)cdfa/arb
Acephate	ND	Trace	ND
Bensulide	Trace	Trace	Trace
Chloropicrin (13-wk)	0.05 ppb (322 ng/m³)	0.055 ppb (370 ng/m³)	0.04 ppb (273 ng/m³)
Chlorothalonil	Trace	Trace	ND
Chlorpyrifos	ND	ND	Trace
Chlorthal-dimethyl	0.001 ppb (16 ng/m³)	0.002 ppb (25 ng/m³)	0.001 ppb (15.5 ng/m³)
DDVP	Trace	Trace	Trace
Diuron	Trace	ND	ND
Endosulfan	ND	Trace	ND
Malathion	Trace	0.0004 ppb (5.2 ng/m³)	ND
Malathion OA	Trace	Trace	Trace
MITC	0.01 ppb (31 ng/m³)	0.034 ppb (101 ng/m³)	0.007 ppb (21.7 ng/m³)

Norflurazon	Trace	ND	ND
Oryzalin	Trace	ND	ND
Permethrin	Trace	Trace	ND
Simazine	Trace	ND	ND
Trifluralin	ND	ND	Trace

Table L-7. Comparison of the 1-year average concentration for pesticides with at least one detectable concentration by year (2017 – 2019) in Chualar, California.

Chemical	2017	2018	2019
1,3-dichloropropene	0.1 ppb (252 ng/m³)	0.027 ppb (120 ng/m³)	0.04 (193 ng/m³)
Acephate	ND	Trace	ND
Bensulide	Trace	Trace	Trace
Chloropicrin	0.02 ppb (164 ng/m³)	0.026 ppb (180 ng/m³)	0.02 ppb (152 ng/m³)
Chlorothalonil	Trace	Trace	ND
Chlorpyrifos	ND	ND	Trace
Chlorthal-dimethyl	0.0006 ppb (8 ng/m³)	0.0005 ppb (7.1 ng/m³)	0.0005 (6.6 ng/m³)
DDVP	Trace	Trace	Trace
Diuron	Trace	ND	ND
Endosulfan	ND	Trace	ND
Malathion	Trace	0.00009 ppb (1.2 ng/m³)	ND
Malathion OA	Trace	Trace	Trace

Chemical	2017	2018	2019
MITC	0.002 ppb (7 ng/m³)	0.005 ppb (15 ng/m³)	0.002 ppb (5.6 ng/m^3)
Norflurazon	Trace	ND	ND
Oryzalin	Trace	ND	ND
Permethrin	Trace	Trace	ND
pp-dicofol	ND	ND	0.0002 ppb (2.6 ng/m^3)
Simazine	Trace	ND	ND
Trifluralin	ND	ND	Trace

Historic Air Concentrations in Cuyama

Monitoring began in Cuyama on May 10, 2018. Tables L-8 to L-10 summarized results for two years of monitoring. Since monitoring at Chualar began in May of 2018, it is not possible to compare annual concentrations of monitored chemicals.

Table L-8 shows the percentage of analyses during that year which resulted in either a trace or quantifiable detection. Changes between these two years include a significant decrease in the detection of both MITC and trifluralin. However, since monitoring for 2018 was only conducted for approximately six months and not a full year, the overall percentage of detected chemicals in 2018 versus 2019 is not directly comparable.

Table L-9 shows the highest observed 24-h concentration for any chemical with a positive detection during any year of monitoring at Cuyama. The highest observed 24-h concentration for MITC significantly increased from 60 ng/m^3 (0.02 ppb) in 2018 to 381 ng/m^3 (0.13 ppb) in 2019. Conversely, the highest observed 24-h concentration for trifluralin significantly increased from 410 ng/m^3 (0.03 ppb) in 2018 to 10 ng/m^3 (0.001 ppb) in 2019.

Table L-10 shows the highest observed rolling 4-week average concentrations for any chemical with a positive detection during either year of monitoring at Cuyama. The highest observed rolling 4-week average concentration of MITC increased from 32 ng/m³ (0.011 ppb) in 2018 to 125 ng/m³ (0.04 ppb) in 2019. The highest observed rolling 4-week average concentration of trifluralin decreased from 170 ng/m³ (0.012 ppb) in 2018 to 12.2 ng/m³ (0.001 ppb) in 2019.

Table L-8. Percentage of analyses performed resulting in a detection at Cuyama, by year.*

Chemical	2018	2019
Acephate	0%	2%
Chlorothalonil	9%	4%
DDVP	3%	4%
Diazinon	0%	2%
Diazinon OA	0%	2%
EPTC	0%	10%
Iprodione	3%	0%
Malathion	0%	2%
Malathion OA	3%	2%
MITC	89%	25%
Trifluralin	31%	14%

* These values include both trace and quantifiable detections.

Table L-9. Highest 24-h concentrations for pesticides with at least one detectable concentration by year (2018 – 2019) in Cuyama, California.

Chemical	2018	2019
Acephate	ND	Trace
Chlorothalonil	Trace	Trace
DDVP	Trace	Trace
Diazinon	ND	Trace
Diazinon OA	ND	Trace
EPTC	ND	0.009 ppb (73 ng/m^3)
Iprodione	Trace	ND

Chemical	2018	2019
Malathion	ND	Trace
Malathion OA	Trace	Trace
MITC	0.02 ppb (60 ng/m³)	0.13 ppb (381 ng/m³)
Trifluralin	0.03 ppb (410 ng/m³)	0.001 ppb (10 ng/m³)

Table L-10. Highest rolling 4-week average concentrations for pesticides with at least one detectable concentration by year (2018 – 2019) in Cuyama, California.

Chemical	2018	2019
Acephate	ND	Trace
Chlorothalonil	Trace	Trace
DDVP	Trace	Trace
Diazinon	ND	Trace
Diazinon OA	ND	Trace
EPTC	ND	0.003 ppb (26.9 ng/m³)
Iprodione	Trace	ND
Malathion	ND	Trace
Malathion OA	Trace	Trace
MITC	0.011 ppb (32 ng/m³)	0.04 ppb (125 ng/m³)
Trifluralin	0.012 ppb (170 ng/m³)	0.001 ppb (12.2 ng/m³)

Historic Air Concentrations in Lindsay

Monitoring began in Lindsay on April 26, 2018. Tables L-11 to L-13 summarize results for two years of monitoring. Since monitoring at Chualar began in April of 2018, it is not possible to compare annual concentrations of monitored chemicals.

Table L-11 shows the percentage of analyses during that year which resulted in either a trace or quantifiable detection. Changes between these two years include a general decrease in detections of organophosphates and also a decrease in detections for the fumigant MITC. However, since monitoring for 2018 was only conducted for seven months and not a full year, the overall percentage of detected chemicals in 2018 versus 2019 is not directly comparable.

Table L-12 shows the highest observed 24-h concentration for any chemical with a positive detection during any year of monitoring at Lindsay. There were no quantifiable detections of organophosphates in 2019 to compare to 2018. However, the highest observed 24-h concentration for MITC increased approximately 10-fold in 2019 at 880 ng/m^3 (0.29 ppb) compared to 2018 at 84 ng/m^3 (0.028 ppb).

Table L-13 shows the highest observed rolling 4-week average concentrations for any chemical with a positive detection during either year of monitoring at Lindsay. The only chemical with a quantifiable concentration in 2019 was MITC; its 4-week rolling average increased from in 2018 51 ng/m^3 (0.02 ppb) to 239 ng/m^3 (0.08 ppb) in 2019.

Table L-11. Percentage of analyses performed resulting in a detection at Lindsay, by year.*

Chemical	2018	2019
Acephate	3%	0%
Chlorothalonil	50%	9%
Chlorpyrifos	17%	0%
Chlorpyrifos OA	22%	0%
Dacthal	0%	4%
DDVP	3%	6%
Dimethoate	3%	4%
Dimethoate OA	8%	2%
Diuron	6%	0%
EPTC	0%	2%
Malathion	3%	6%

Chemical	2018	2019
Malathion OA	8%	6%
MITC	61%	40%
Propargite	3%	0%
Simazine	3%	0%

* These values include both trace and quantifiable detections.

Table L-12. Highest 24-h concentrations for pesticides with at least one detectable concentration by year (2018 – 2019) in Lindsay, California.

Chemical	2018	2019
Acephate	Trace	ND
Chlorothalonil	Trace	Trace
Chlorpyrifos	Trace	ND
Chlorpyrifos OA	0.001 ppb (14 ng/m^3)	ND
Dacthal	ND	Trace
DDVP	Trace	Trace
Dimethoate	Trace	Trace
Dimethoate OA	0.002 ppb (17 ng/m^3)	Trace
Diuron	Trace	ND
EPTC	ND	Trace
Malathion	Trace	Trace
Malathion OA	Trace	Trace
MITC	0.028 ppb (84 ng/m^3)	0.29 ppb (880 ng/m^3)

Propargite	Trace	ND
Simazine	Trace	ND

Table L-13. Highest rolling 4-week average concentrations for pesticides with at least one detectable concentration by year (2018 – 2019) in Lindsay, California.

Chemical	2018	2019
Acephate	Trace	ND
Chlorothalonil	Trace	Trace
Chlorpyrifos	Trace	ND
Chlorpyrifos OA	0.0005 ppb (7.3 ng/m^3)	ND
Dacthal	ND	Trace
DDVP	Trace	Trace
Dimethoate	Trace	Trace
Dimethoate OA	0.0008 ppb (6.9 ng/m^3)	Trace
Diuron	Trace	ND
EPTC	ND	Trace
Malathion	Trace	Trace
Malathion OA	Trace	Trace
MITC	0.02 ppb (51 ng/m^3)	0.08 ppb (239 ng/m^3)
Propargite	Trace	ND
Simazine	Trace	ND

Historic Air Concentrations in Oxnard

Monitoring began in Oxnard on August 14, 2018. Table L-14 to L-16 summarize results for two years of monitoring. Since monitoring at Oxnard began in August of 2018, it is not possible to compare annual concentrations of monitored chemicals.

Table L-14 shows the percentage of analyses during that year which resulted in either a trace or quantifiable detection at Oxnard. Changes between these two years include a general decrease in detections of organophosphates (DDVP and malathion being exceptions) and also a decrease in detections for the fumigants chloropicrin and MITC. However, since monitoring for 2018 was only conducted for seven months and not a full year, the overall percentage of detected chemicals in 2018 versus 2019 is not directly comparable.

Table L-15 shows the highest observed 24-h concentration for any chemical with a positive detection during any year of monitoring at Oxnard. The highest observed 24-h concentration for the fumigants 1,3-D, chloropicrin, and MITC all increased in 2019 relative to 2018. The observed 24-h concentration for 1,3-D increased from 0.1 ppb (450 ng/m^3) in 2018 to 0.51 ppb (2,315 ng/m^3) 2019; for chloropicrin, the highest observed 24-h concentration increased from 0.8 ppb (5,400 ng/m^3) in 2018 to 1.0 ppb (6,939 ng/m^3) in 2019; for MITC, the highest observed 24-h concentration increased from 0.016 ppb (48 ng/m^3) in 2018 to 0.03 ppb (84 ng/m^3) in 2019.

Table L-16 shows the highest observed rolling 4- or 13- week average concentrations for any chemical with a positive detection during either year of monitoring at Oxnard. The highest rolling averages for all chemicals detected at a quantifiable level in 2018 increased in 2019. The 13-week rolling for 1,3-D increased from 0.054 ppb (240 ng/m^3) to 0.09 ppb (417 ng/m^3); the 13-week rolling average for chloropicrin increased from 0.035 ppb (240 ng/m^3) to 0.2 ppb (1,359 ng/m^3). The 4-week rolling average for MITC slightly increased from 0.01 ppb (32 ng/m^3) to 0.01 ppb (40 ng/m^3).

Table L-14. Percentage of analyses performed resulting in a detection at Oxnard, by year.*

Chemical	2018	2019
1,3-dichloropropene	5%	2%
Chloropicrin	20%	14%
Chlorothalonil	65%	18%
Chlorpyrifos OA	5%	2%
Dacthal	40%	6%
DDVP	0%	16%
Malathion	5%	29%

Malathion OA	15%	33%
MITC	55%	20%

* These values include both trace and quantifiable detections.

Table L-15. Highest 24-h concentrations for pesticides with at least one detectable concentration by year (2018 – 2019) in Oxnard, California.

Chemical	2018	2019
1,3-dichloropropene	0.1 ppb (450 ng/m^3)	0.51 ppb (2,315 ng/m^3)
Chloropicrin	0.8 ppb (5,400 ng/m^3)	1.0 ppb (6,939 ng/m^3)
Dacthal	Trace	0.002 ppb (21 ng/m^3)
Malathion	Trace	0.008 ppb (113 ng/m^3)
Malathion OA	Trace	0.001 ppb (19 ng/m^3)
MITC	0.016 ppb (48 ng/m^3)	0.03 ppb (84 ng/m^3)

Table L-16. Highest rolling 4-week average concentrations for pesticides with at least one detectable concentration by year (2018 – 2019) in Oxnard, California.

Chemical	2018	2019
1,3-dichloropropene (13-wk)	0.054 ppb (240 ng/m^3)	0.09 ppb (417 ng/m^3)
Chloropicrin (13-wk)	0.035 ppb (240 ng/m^3)	0.2 ppb (1,359 ng/m^3)
Dacthal	Trace	0.0007 ppb (8.2 ng/m^3)

Malathion	Trace	0.005 ppb (62 ng/m^3)
Malathion OA	Trace	0.0007 ppb (10 ng/m^3)
MITC	0.011 ppb (32 ng/m^3)	0.01 ppb (40 ng/m^3)

Historic Air Concentrations in San Joaquin

Monitoring began in San Joaquin on April 26, 2018. Table L-17 to L-19 summarize results for two years of monitoring. Since monitoring at San Joaquin began in April of 2018, it is not possible to compare annual concentrations of monitored chemicals.

Table L-17 shows the percentage of analyses during that year which resulted in either a trace or quantifiable detection at San Joaquin. Changes between these two years include an overall decrease in the detection of organophosphates while detections of the fumigants MITC and methyl bromide also decreased, and 1,3-D remained stable. However, since monitoring for 2018 was only conducted for eight months and not a full year, the overall percentage of detected chemicals in 2018 versus 2019 is not directly comparable.

Table L-18 shows the highest observed 24-h concentration for any chemical with a positive detection during any year of monitoring at San Joaquin. The highest observed 24-h concentration for the fumigant 1,3-D decreased from 0.74 ppb (3,359 ng/m^3) in 2018 to 2,542 ng/m^3 (0.56 ppb) in 2019; for the fumigant MITC, the highest observed 24-h concentration increased from 0.32 ppb (949 ng/m^3) to 4,580 ng/m^3 (1.53 ppb) in 2019.

Table L-19 shows the highest observed rolling 4- or 13- week average concentrations for any chemical with a positive detection during either year of monitoring at San Joaquin. The 13-week rolling average for 1,3-D was approximately the same for both 2018 and 2019. The 4-week rolling average for MITC increased significantly from in 0.14 (949 ng/m^3) 2018 to in 0.43 ppb (1,284 ng/m^3) in 2019.

Table L-17. Percentage of analyses performed resulting in a detection at San Joaquin, by year.*

Chemical	2018	2019
1,3-dichloropropene	3%	4%
Acephate	8%	0%
Chlorothalonil	56%	15%
Chlorpyrifos	19%	2%

Chemical	2018	2019
Chlorpyrifos OA	36%	0%
Dacthal	6%	0%
DDVP	19%	17%
Dimethoate OA	6%	0%
Diuron	3%	2%
Malathion	0%	4%
Malathion OA	3%	2%
Methyl Bromide	8%	0%
Metolachlor	3%	0%
MITC	72%	58%
Oxyfluorfen	3%	0%
Propargite	11%	2%
Trifluralin	33%	32%

* These values include both trace and quantifiable detections.

Table L-18. Highest 24-h concentrations for pesticides with at least one detectable concentration by year (2018 – 2019) in San Joaquin, California.

Chemical	2018	2019
1,3-dichloropropene	0.74 ppb (3,359 ng/m^3)	0.56 ppb (2,542 ng/m^3)
Chlorpyrifos OA	0.001 ppb (14 ng/m^3)	ND
Methyl Bromide	0.038 ppb (147 ng/m^3)	ND
MITC	0.32 ppb (949 ng/m^3)	1.53 ppb (4,580 ng/m^3)

Table L-19. Highest rolling 4-week average concentrations for pesticides with at least one detectable concentration by year (2018 – 2019) in San Joaquin, California.

Chemical	2018	2019
1,3-dichloropropene (13-wk)	0.10 ppb (468 ng/m^3)	0.09 ppb (405 ng/m^3)
Chlorpyrifos OA	0.0005 ppb (7.2 ng/m^3)	ND
Methyl Bromide	0.024 ppb (93 ng/m^3)	ND
MITC	0.14 ppb (422 ng/m^3)	0.43 ppb (1,284 ng/m^3)

Historic Air Concentrations in Santa Maria

Monitoring began in Santa Maria on January 1, 2017. Tables L-20 to L-23 summarize results for the three years of AMN monitoring.

Table L-20 shows the percentage of analyses during that year which resulted in either a trace or quantifiable detection. Changes between these three years show an overall decrease for most analytes. Exceptions include dacthal, DDVP, and trifluralin where detections were mostly steady between 2017 and 2019.

Table L-21 shows the highest observed 24-h concentration for any chemical with a positive detection during any year of monitoring at Santa Maria. The highest observed 24-h concentration of MITC increased from 457 ng/m³ (0.2 ppb) in 2017 to 1,300 ng/m³ (0.42 ppb) in 2018 and then decreased to 375 ng/m³ (0.13 ppb) in 2019. Other 24-h concentrations at Santa Maria were relatively consistent or slightly declined between 2017 and 2019.

Table L-22 shows the highest observed rolling 4- or 13- week average concentrations for any chemical with a positive detection at Santa Maria. The highest observed rolling 13-week average concentration of 1,3-D decreased from 1,152 ng/m³ (0.3 ppb) in 2017 to 440 ng/m³ (0.097 ppb) in 2018 and decreased again to 405 ng/m^3 (0.09 ppb). The highest observed rolling 4-week average concentration of MITC increased from 140 ng/m³ (0.05 ppb) in 2017 to 320 ng/m³ (0.11 ppb) in 2018, and then increased significantly to 1,284 ng/m^3 (0.43 ppb) in 2019.

Table L-23 shows the annual average concentrations for any chemical with a positive detection during any year of monitoring at Santa Maria. The annual average concentration of 1,3-D decreased from 366 ng/m³ (0.1 ppb) in 2017 to 280 ng/m³ (0.062 ppb) in 2018 and further decreased to 234 ng/m³ (0.05 ppb) in 2019. The annual average concentration of MITC increased from 23 ng/m³ (0.008 ppb) in 2017 to

37 ng/m³ (0.012 ppb) in 2018 then decreased to 17 ng/m³ (0.006 ppb) in 2019. The annual average concentration of chloropicrin steadily decreased from 317 ng/m³ (0.05 ppb) in 2017 to 280 ng/m³ (0.04 ppb) in 2018 and down to 216 ng/m³ (0.04 ppb) in 2019.

Table L-20. Percentage of analyses performed resulting in a detection at Santa Maria, by year.

Chemical	2017	2018	2019
1,3-dichloropropene	13%	6%	2%
Acephate	0%	0%	2%
Chloropicrin	21%	17%	6%
Chlorothalonil	10%	8%	6%
Chlorpyrifos	0%	4%	0%
Chlorthal-dimethyl	40%	39%	43%
Cypermethrin	0%	0%	2%
DDVP	23%	16%	26%
Diazinon OA	0%	2%	0%
Dimethoate OA	0%	0%	2%
Diuron	0%	2%	0%
Endosulfan	0%	4%	0%
EPTC	0%	0%	0%
Iprodione	0%	2%	0%
Malathion	60%	59%	49%
Malathion OA	69%	63%	39%
Methidathion	0%	0%	0%
MITC	33%	50%	21%
Simazine	0%	2%	0%
Trifluralin	33%	22%	24%

* These values include both trace and quantifiable detections.

Table L-21. Highest 24-h concentrations for pesticides with at least one detectable concentration by year (2017 – 2019) in Santa Maria, California.

Chemical	2017	2018	2019
1,3-dichloropropene	0.5 ppb (2,450 ng/m³)	0.48 ppb (2,200 ng/m³)	0.13 ppb (590 ng/m³)
Chloropicrin	0.5 ppb (3,095 ng/m³)	0.46 ppb (3,100 ng/m³)	0.45 ppb (2,992 ng/m³)
Acephate	ND	ND	Trace
Chlorothalonil	Trace	Trace	Trace
Chlorpyrifos	ND	Trace	ND
Chlorthal-dimethyl	Trace	Trace	Trace
Cypermethrin	ND	ND	Trace
DDVP	Trace	Trace	0.003 ppb (24 ng/m³)
Diazinon OA	ND	Trace	ND
Diuron	ND	Trace	ND
Endosulfan	ND	Trace	ND
Dimethoate OA	ND	ND	Trace
Malathion	0.001 ppb (15 ng/m³)	0.0007 ppb (9.8 ng/m³)	0.007 ppb (97 ng/m³)
Malathion OA	Trace	Trace	0.001 ppb (13 ng/m³)
MITC	0.2 ppb (457 ng/m³)	0.42 ppb (1,300 ng/m³)	0.125 ppb (375 ng/m³)
Simazine	ND	Trace	ND
Trifluralin	Trace	Trace	Trace

Table L-22. Highest rolling 4-week average concentrations for pesticides with at least one detectable concentration by year (2017-2018) in Santa Maria, California.

Chemical	2017	2018	2019
1,3-dichloropropene (13-wk)	0.3 ppb (1,152 ng/m³)	0.097 ppb (440 ng/m³)	0.09 ppb (405 ng/m3)
Chloropicrin (13-wk)	0.1 ppb (849 ng/m³)	0.11 ppb (750 ng/m³)	0.08 ppb (523 ng/m³)
Chlorothalonil	Trace	Trace	Trace
Chlorpyrifos	ND	Trace	Trace
Chlorthal-dimethyl	Trace	Trace	ND
DDVP	Trace	Trace	0.001 ppb (11 ng/m³)
Diazinon OA	ND	Trace	ND
Diuron	ND	Trace	Trace
Endosulfan	ND	Trace	ND
Malathion	0.0009 ppb (12 ng/m³)	0.0005 ppb (6.4 ng/m³)	0.002 ppb (28 ng/m³)
Malathion OA	Trace	Trace	0.0005 ppb (6.2 ng/m³)
MITC	0.05 ppb (140 ng/m³)	0.11 ppb (320 ng/m³)	0.43 ppb (1,284 ng/m³)
Propargite	ND	ND	Trace
Simazine	ND	Trace	ND
Trifluralin	Trace	Trace	Trace

Table L-23. Comparison of the 1-year average concentration for pesticides with at least one detectable concentration by year (2017 – 2019) in Santa Maria, California.

Chemical	2017	2018	2019
1,3-dichloropropene	0.1 ppb (366 ng/m³)	0.062 ppb (280 ng/m³)	0.05 ppb (234 ng/m³)
Acephate	ND	ND	Trace
Chloropicrin	0.05 ppb (317 ng/m³)	0.041 ppb (280 ng/m³)	0.03 ppb (216 ng/m³)
Chlorothalonil	Trace	Trace	Trace
Chlorpyrifos	ND	Trace	ND
Chlorthal-dimethyl	Trace	Trace	Trace
Cypermethrin	ND	ND	Trace
DDVP	Trace	Trace	0.0007 ppb (5.5 ng/m³)
Dimethoate OA	ND	ND	Trace
Diazinon OA	ND	Trace	ND
Diuron	ND	Trace	ND
Endosulfan	ND	Trace	ND
EPTC	ND	ND	Trace
Malathion	0.0004 ppb (5 ng/m³)	0.0003 ppb (3.5 ng/m³)	0.0004 ppb (5.3 ng/m³)
Malathion OA	Trace	Trace	0.0002 ppb (2.7 ng/m³)
Methidathion	ND	ND	Trace

Chemical	2017	2018	2019
MITC	0.008 ppb (23 ng/m³)	0.012 ppb (37 ng/m³)	0.006 ppb (17 ng/m^3)
Simazine	ND	Trace	ND
Trifluralin	Trace	Trace	Trace

Historic Air Concentrations in Shafter

Shafter is the only remaining site of the original AMN monitoring locations with available pesticide concentration air monitoring data dating back to February of 2011. Tables L-24 to L-27 summarize results for monitoring data from Shafter.

Table L-24 shows the percentage of analyses during that year which resulted in either a trace or quantifiable detection. Patterns in the percentage of positive detections generally held for all organophosphates monitored for the duration of monitoring at Shafter. Detections for the fumigant 1,3-D in 2019 greatly decreased compared to the previous six years of monitoring. Chlorpyrifos was also detected at a greatly reduced frequency compared to previous years and its oxygen analog was not detected at all in 2019. Chloropicrin was detected for the first time at Shafter in 2019.

Table L-25 shows the highest observed 24-h concentration for any chemical with a positive detection during any year of monitoring at Shafter. The amounts of detected chemicals generally decreased relative to previous years. The highest observed 24-h concentration of 1,3-D in 2019 was 3.2 ppb (14,524 ng/m³), significantly less than 2018. Chloropicrin was detected for the first time at Shafter with its highest observed 24-h concentration measured to be 0.1 ppb (694 ng/m³).

Table L-26 shows the highest observed rolling 4- or 13-week average concentrations for any chemical with a positive detection during any year of monitoring at Shafter. The highest observed rolling 13-week average concentration of 1,3-D in 2019 (0.4 ppb 1,774 ng/m³) was one of the lowest observed since the beginning of the study. The observed rolling 13-week average concentration of chloropicrin in 2019 (0.02 ppb 164 ng/m³) was the first time a sub-chronic rolling average could be determined for that chemical.

Table L-27 shows the annual average concentrations for any chemical with a positive detection during any year of monitoring at Shafter. The annual average concentration of 1,3-D in 2019 (0.1 ppb 599 ng/m³) was one of the lowest observed since the beginning of the study. The annual average concentration of chloropicrin in 2019 was determined to be 0.02 ppb (123 ng/m^3).

Table L-24. Percentage of analyses performed resulting in a detection at Shafter, by year.

Chemical	2011	2012	2013	2014	2015	2016	2017	2018	2019
1,3-dichloropropene	ND	6%	26%	37%	42%	50%	48%	38%	10%
Acephate	ND	2%	ND	ND	ND	ND	2%	ND	ND
Acrolein †	60%	--	--	--	--	--	--	--	--
Bensulide	2%	ND	ND	ND	ND	ND	ND	4%	ND
Carbon Disulfide †	ND	ND	15%	50%	90%	92%	--	--	--
Chloropicrin	ND	ND	ND	ND	ND	ND	ND	ND	2%
Chlorothalonil	13%	23%	60%	13%	75%	62%	69%	64%	43%
Chlorpyrifos	53%	48%	75%	56%	61%	29%	48%	30%	4%
Chlorpyrifos OA	45%	48%	55%	62%	53%	50%	58%	25%	ND
Cypermethrin	ND	ND	ND	ND	ND	ND	ND	ND	2%
Dacthal	15%	ND	8%	ND	2%	15%	10%	4%	2%
DDVP	2%	ND	6%	2%	8%	2%	2%	8%	10%
Diazinon	11%	4%	6%	ND	ND	ND	4%	ND	ND
Diazinon OA	4%	8%	8%	ND	ND	2%	2%	2%	ND
Diuron	6%	12%	2%	10%	10%	ND	4%	4%	4%
EPTC	17%	4%	9%	12%	10%	6%	10%	6%	10%
Iprodione	2%	4%	4%	6%	8%	8%	6%	2%	2%
Malathion	ND	2%	4%	2%	ND	ND	6%	ND	6%
Malathion OA	6%	10%	9%	6%	6%	ND	4%	2%	4%
Methyl bromide	9%	4%	4%	15%	13%	8%	ND	13%	ND
Metolachlor	ND	ND	ND	ND	ND	ND	10%	ND	ND
MITC	40%	56%	57%	42%	35%	42%	62%	83%	59%
Norflurazon	2%	ND	ND	ND	2%	ND	2%	ND	ND

Chemical	2011	2012	2013	2014	2015	2016	2017	2018	2019
Oryzalin	2%	2%	2%	2%	6%	ND	8%	2%	ND
Oxyfluorfen	ND	ND	ND	ND	ND	ND	6%	9%	2%
Permethrin	2%	ND	2%	ND	ND	ND	ND	ND	2%
Propargite	2%	ND	11%	ND	ND	ND	2%	ND	ND
Simazine	4%	12%	ND	4%	4%	6%	6%	6%	ND
Trifluralin	9%	6%	4%	4%	8%	ND	2%	2%	6%

* These values include both trace and quantifiable detections.
† Monitoring for acrolein was discontinued on January 1, 2012. Monitoring for carbon disulfide was discontinued on January 1, 2017.

Table L-25. Highest 24-h concentrations for pesticides with at least one detectable concentration by year (2011 – 2019) in Shafter, California.

Chemical	2011	2012	2013	2014	2015	2016	2017	2018	2019
1,3-dichloropropene	ND	0.8 ppb (3,643 ng/m³)	8.8 ppb (39,969 ng/m³)	2 ppb (9,251 ng/m³)	2.1 ppb (9,713 ng/m³)	10.0 ppb (45,323 ng/m³)	0.7 ppb (3,394 ng/m³)	50 ppb (230,000 ng/m³)	3.2 ppb (14,524 ng/m³)
Acephate	ND	Trace	ND	ND	ND	ND	Trace	ND	ND
Acrolein†	1.2 ppb (2,796 ng/m³)	-	-	-	-	-	-	-	-
Bensulide	Trace	ND	ND	ND	ND	ND	ND	Trace	ND
Carbon Disulfide†	ND	ND	0.3 ppb (897 ng/m³)	0.2 ppb (548 ng/m³)	0.3 ppb (812 ng/m³)	0.3 ppb (946 ng/m³)	-	-	-
Chloropicrin	ND	ND	ND	ND	ND	ND	ND	ND	0.1 ppb (694 ng/m³)
Chlorothalonil	Trace	Trace	0.007 ppb (80 ng/m³)	0.01 ppb (118 ng/m³)	0.004 ppb (39 ng/m³)	0.005 ppb (58 ng/m³)	0.005 ppb (55 ng/m³)	0.005 ppb (50 ng/m³)	Trace
Chlorpyrifos	0.002 ppb (27 ng/m³)	0.009 ppb (131 ng/m³)	0.03 ppb (423 ng/m³)	0.02 ppb (338 ng/m³)	0.005 ppb	0.004 ppb (52 ng/m³)	0.01 ppb (138 ng/m³)	0.004 ppb (50 ng/m³)	Trace

Chemical	2011	2012	2013	2014	2015	2016	2017	2018	2019
					(78 ng/m³)				
Chlorpyrifos OA	0.0007 ppb (9 ng/m³)	0.002 ppb (17 ng/m³)	0.01 ppb (143 ng/m³)	0.008 ppb (110 ng/m³)	0.001 ppb (13 ng/m³)	Trace	0.004 ppb (59 ng/m³)	Trace	ND
Dacthal	Trace	ND	Trace	ND	Trace	Trace	Trace	Trace	Trace
DDVP	Trace	ND	Trace	Trace	Trace	0.0 ppb (49 ng/m³)	0.0 ppb (65 ng/m³)	Trace	Trace
Diazinon	0.005 ppb (60 ng/m³)	Trace	0.002 ppb (29 ng/m³)	ND	ND	ND	Trace	ND	ND
Diazinon OA	0.003 ppb (36 ng/m³)	0.0008 ppb (10 ng/m³)	Trace	ND	ND	Trace	Trace	Trace	ND
Diuron	Trace	Trace	Trace	Trace	Trace	ND	Trace	Trace	Trace
EPTC	0.02 ppb (187 ng/m³)	0.002 ppb (18 ng/m³)	0.03 ppb (250 ng/m³)	0.03 ppb (216 ng/m³)	0.004 ppb (29 ng/m³)	0.003 ppb (27 ng/m³)	0.002 ppb (12 ng/m³)	Trace	0.005 ppb (36 ng/m³)
Iprodione	Trace	Trace	Trace	Trace	Trace	0.001 ppb (17 ng/m³)	Trace	Trace	Trace
Malathion	ND	Trace	Trace	Trace	ND	ND	0.001 ppb (15 ng/m³)	ND	Trace
Malathion OA	Trace	0.0009 ppb (11 ng/m³)	Trace	Trace	Trace	ND	Trace	Trace	ND
Methyl bromide	0.8 ppb (2,934 ng/m³)	0.6 ppb (2,135 ng/m³)	0.1 ppb (209 ng/m³)	0.2 ppb (963 ng/m³)	0.1 ppb (283 ng/m³)	0.03 ppb (113 ng/m³)	ND	0.097 ppb (380 ng/m³)	ND
Metolachlor	ND	ND	ND	ND	ND	ND	Trace	ND	ND

Chemical	2011	2012	2013	2014	2015	2016	2017	2018	2019
MITC	0.3 ppb (930 ng/m³)	0.1 ppb (347 ng/m³)	0.3 ppb (762 ng/m³)	0.04 ppb (113 ng/m³)	0.1 ppb (232 ng/m³)	0.004 ppb (109 ng/m³)	0.1 ppb (382 ng/m³)	1.2 ppb (3,700 ng/m³)	0.11 ppb (316 ng/m³)
Norflurazon	Trace	ND	ND	ND	Trace	ND	Trace	ND	ND
Oryzalin	Trace	Trace	Trace	Trace	0.004 ppb (62 ng/m³)	ND	Trace	Trace	ND
Oxyfluorfen	ND	ND	ND	ND	ND	ND	Trace	Trace	Trace
Permethrin	Trace	ND	Trace	ND	ND	ND	ND	ND	Trace
Propargite	Trace	ND	Trace	ND	ND	ND	Trace	ND	ND
Simazine	Trace	Trace	ND	Trace	Trace	Trace	Trace	Trace	ND
Trifluralin	Trace	Trace	Trace	Trace	Trace	ND	Trace	Trace	Trace

† Monitoring for acrolein was discontinued on January 1, 2012. Monitoring for carbon disulfide was discontinued on January 1, 2017.

Table L-26. Highest rolling 4- and 13-week average concentrations for pesticides with at least one detectable concentration by year (2011 – 2019) in Shafter, California.

Chemical	2011	2012	2013	2014	2015	2016	2017	2018	2019
1,3-dichloropropene (13-wk)	ND	0.1 ppb (594 ng/m³)	2 ppb (9,190 ng/m³)	2.2 ppb (10,119 ng/m³)	0.5 ppb (2,176 ng/m³)	1 ppb (4,678 ng/m³)	1.1 ppb (4,812 ng/m³)	5.6 ppb (25,000 ng/m³)	0.4 ppb (1,774 ng/m³)
Acephate	ND	Trace	ND	ND	ND	ND	Trace	Trace	ND
Bensulide	Trace	ND	ND	ND	ND	ND	ND	ND	ND
Chloropicrin (13-wk)	ND	ND	ND	ND	ND	ND	ND	ND	0.02 ppb (164 ng/m³)
Chlorothalonil	Trace	Trace	0.003 ppb (38 ng/m³)	Trace	0.002 ppb (25 ng/m³)	0.002 ppb (24 ng/m³)	0.003 ppb (38 ng/m³)	0.003 ppb (35 ng/m³)	Trace
Chlorpyrifos	0.001 ppb	0.003 ppb	0.008 ppb	0.006 ppb	0.004 ppb	0.003 ppb	0.004 ppb	0.002 ppb	Trace

Chemical	2011	2012	2013	2014	2015	2016	2017	2018	2019
	(15 ng/m³)	(46 ng/m³)	(113 ng/m³)	(92 ng/m³)	(60 ng/m³)	(39 ng/m³)	(51 ng/m³)	(22 ng/m³)	
Chlorpyrifos OA	0.0005 ppb (7 ng/m³)	0.001 ppb (13 ng/m³)	0.003 ppb (44 ng/m³)	0.002 ppb (32 ng/m³)	0.0007 ppb (9 ng/m³)	Trace	0.001 ppb (19 ng/m³)	Trace	ND
Cypermethrin	ND	ND	ND	ND	ND	ND	ND	ND	Trace
Dacthal	Trace	ND	Trace	ND	Trace	Trace	Trace	Trace	Trace
DDVP	Trace	ND	Trace	Trace	Trace	0.001 ppb (13 ng/m³)	0.002 ppb (17 ng/m³)	Trace	Trace
Diazinon	0.001 ppb (18 ng/m³)	Trace	0.0008 ppb (10 ng/m³)	ND	ND	ND	Trace	ND	ND
Diazinon OA	0.0009 ppb (11 ng/m³)	Trace	ND	ND	ND	Trace	Trace	Trace	ND
Diuron	Trace	Trace	Trace	Trace	Trace	ND	Trace	Trace	Trace
EPTC	0.01 ppb (76 ng/m³)	Trace	0.02 ppb (139 ng/m³)	0.01 ppb (86 ng/m³)	0.002 ppb (19 ng/m³)	0.001 ppb (10 ng/m³)	0.001 ppb (9 ng/m³)	Trace	0.0018 ppb (13.3 ng/m³)
Iprodione	Trace	Trace	Trace	Trace	Trace	0.0007 ppb (10 ng/m³)	Trace	Trace	Trace
Malathion	ND	Trace	Trace	Trace	ND	ND	0.0004 ppb (5 ng/m³)	ND	Trace
Malathion OA	Trace	Trace	Trace	Trace	Trace	ND	Trace	Trace	ND
Methyl bromide	0.4 ppb (1,403 ng/m³)	0.2 ppb (683 ng/m³)	0.1 ppb (198 ng/m³)	0.1 ppb (389 ng/m³)	0.05 ppb (186 ng/m³)	0.02 ppb (81 ng/m³)	ND	0.004 ppb (160 ng/m³)	ND

Chemical	2011	2012	2013	2014	2015	2016	2017	2018	2019
Metolachlor	ND	ND	ND	ND	ND	ND	Trace	ND	ND
MITC	0.2 ppb (564 ng/m³)	0.1 ppb (177 ng/m³)	0.1 ppb (319 ng/m³)	0.02 ppb (74 ng/m³)	0.1 ppb (156 ng/m³)	0.02 ppb (51 ng/m³)	0.1 ppb (236 ng/m³)	0.5 ppb (1,500 ng/m³)	0.07 ppb (194 ng/m³)
Norflurazon	Trace	ND	ND	ND	Trace	ND	Trace	ND	ND
Oryzalin	Trace	Trace	Trace	Trace	0.001 ppb (16 ng/m³)	ND	Trace	Trace	ND
Oxyfluorfen	ND	ND	ND	ND	ND	ND	Trace	Trace	ND
Permethrin	Trace	ND	Trace	ND	ND	ND	ND	ND	Trace
Propargite	Trace	ND	Trace	ND	ND	ND	Trace	ND	ND
Simazine	Trace	Trace	ND	Trace	Trace	Trace	Trace	Trace	ND
Trifluralin	ND	ND	ND	ND	ND	ND	Trace	Trace	ND

Table L-27. Comparison of the 1-year average concentration for pesticides with at least one detectable concentration by year (2011 – 2019) in Shafter, California.

Chemical	2011	2012	2013	2014	2015	2016	2017	2018	2019
1,3-dichloropropene	ND	0.1 ppb (453 ng/m³)	0.6 ppb (2,589 ng/m³)	0.2 ppb (909 ng/m³)	0.2 ppb (800 ng/m³)	0.3 ppb (1,559 ng/m³)	0.1 ppb (486 ng/m³)	1.5 ppb (6,900 ng/m³)	0.1 ppb (599 ng/m³)
Acephate	ND	Trace	ND	ND	ND	ND	Trace	Trace	ND
Bensulide	Trace	ND	ND	ND	ND	ND	ND	ND	ND
Chloropicrin	ND	ND	ND	ND	ND	ND	ND	ND	0.02 ppb (123 ng/m³)
Chlorothalonil	Trace	Trace	0.001 ppb (16 ng/m³)	0.002 ppb (22 ng/m³)	Trace	0.001 ppb (15 ng/m³)	0.001 ppb (16 ng/m³)	0.0009 ppb (10 ng/m³)	Trace

Chlorpyrifos	Trace	Trace	0.001 ppb (20 ng/m³)	0.001 ppb (16 ng/m³)	Trace	0.0006 ppb (8 ng/m³)	0.0008 ppb (11 ng/m³)	0.0004 ppb (5.3 ng/m³)	Trace
Chlorpyrifos OA	Trace	Trace	0.0006 ppb (8 ng/m³)	0.0005 ppb (7 ng/m³)	Trace	Trace	0.0004 ppb (6 ng/m³)	Trace	ND
Cypermethrin	ND	ND	ND	ND	ND	ND	ND	ND	Trace
Dacthal	Trace	ND	Trace	ND	Trace	Trace	Trace	Trace	Trace
DDVP	Trace	ND	Trace	Trace	Trace	0.0003 ppb (3 ng/m³)	0.0003 ppb (3 ng/m³)	Trace	Trace
Diazinon	Trace	Trace	Trace	ND	ND	ND	Trace	ND	ND
Diazinon OA	Trace	Trace	ND	ND	ND	Trace	Trace	Trace	ND
Diuron	Trace	Trace	Trace	Trace	Trace	ND	Trace	Trace	Trace
EPTC	Trace	Trace	Trace	Trace	Trace	0.003 ppb (2 ng/m³)	0.0003 ppb (2 ng/m³)	Trace	0.0003 ppb (3.9 ng/m³)
Iprodione	Trace	Trace	Trace	Trace	Trace	0.0001 ppb (2 ng/m³)	Trace	Trace	Trace
Malathion	ND	Trace	Trace	Trace	ND	ND	0.0001 ppb (2 ng/m³)	ND	Trace
Malathion OA	Trace	Trace	Trace	Trace	Trace	ND	Trace	Trace	ND
Methyl bromide	0.1 ppb (425 ng/m³)	0.1 ppb (247 ng/m³)	0.04 ppb (163 ng/m³)	0.02 ppb (70 ng/m³)	0.01 ppb (40 ng/m³)	0.007 ppb (26 ng/m³)	ND	0.018 ppb (71 ng/m³)	ND
Metolachlor	ND	ND	ND	ND	ND	ND	Trace	ND	ND
MITC	0.02 ppb (73 ng/m³)	0.02 ppb (51 ng/m³)	0.02 ppb (66 ng/m³)	0.007 ppb (21 ng/m³)	0.009 ppb (27 ng/m³)	0.006 ppb (17 ng/m³)	0.02 ppb (51 ng/m³)	0.058 ppb (170 ng/m³)	0.01 ppb (43 ng/m³)

Norflurazon	Trace	ND	ND	ND	Trace	ND	Trace	ND	ND
Oryzalin	Trace	Trace	Trace	Trace	Trace	ND	Trace	Trace	ND
Oxyfluorfen	ND	ND	ND	ND	ND	ND	Trace	Trace	ND
Permethrin	Trace	ND	Trace	ND	ND	ND	ND	ND	Trace
Propargite	Trace	ND	Trace	ND	ND	ND	Trace	ND	ND
Simazine	Trace	Trace	ND	Trace	Trace	Trace	Trace	Trace	ND
Trifluralin	ND	ND	ND	ND	ND	ND	Trace	Trace	ND

Historic Air Concentrations in Watsonville

Monitoring began at Watsonville on January 1, 2017. Tables L-28 to L-31 summarize results for AMN monitoring at Watsonville.

Table L-28 shows the percentage of analyses during that year which resulted in either a trace or quantifiable detection. Patterns between these three years include steady detections of chloropicrin and a consistent increase in detections of DDVP.

Table L-29 shows the highest observed 24-h concentration for any chemical with a positive detection during any year of monitoring at Watsonville. The highest observed 24-h concentration of 1,3-D decreased from 1,860 ng/m³ (0.4 ppb) in 2017 to 1,200 ng/m³ (0.27 ppb) in 2018 and then slightly increased to 1,316 ng/m³ (0.29 ppb) in 2019. The highest observed 24-h concentration of chloropicrin decreased from 3,221 ng/m³ (0.5 ppb) in 2017 to 780 ng/m³ (0.12 ppb) in 2018 and then greatly increased to 5,741 ng/m³ (0.9 ppb) in 2019. The highest observed 24-h concentration of MITC increased from 56 ng/m³ (0.02 ppb) in 2017 to 120 ng/m³ (0.042 ppb) in 2018 and increased again in 2019 to 164 ng/m³ (0.06 ppb).

Table L-30 shows the highest observed rolling 4- or 13-week average concentration for any chemical with a positive detection during any year of monitoring at Watsonville. The highest observed rolling 13-week average concentration of 1,3-D decreased from 904 ng/m³ (0.2 ppb) in 2017 to 430 ng/m³ (0.094 ppb) in 2018 and decreased again in 2019 down to 374 ng/m3 (0.08 ppb). The highest observed rolling 13-week average concentration of chloropicrin decreased from 974 ng/m³ (0.1 ppb) in 2017 to 480 ng/m³ (0.071 ppb) in 2018 then increased to 1,042 ng/m^3 in 2019. The highest observed rolling 4-week average concentration of MITC increased from 19 ng/m³ (0.0 ppb) in 2017 to 44 ng/m³ (0.015 ppb) in 2018 and increased again in 2019 to 71 ng/m^3 (0.024 ppb).

Table L-31 shows the annual average concentrations for any chemical with a positive detection during any year of monitoring at Watsonville. The annual average concentration of 1,3-D decreased from 397 ng/m³ (0.1 ppb) in 2017 to 210 ng/m³ (0.046 ppb) in 2018 and increased to 260 ng/m³ (0.06 ppb). The

annual average concentration of chloropicrin decreased from 347 ng/m³ (0.1 ppb) in 2017 to 200 ng/m³ (0.03 ppb) in 2018 and increased to 348 ng/m³ (0.05 ppb) in 2019. The annual average concentration of MITC increased from 6 ng/m³ (0.002 ppb) in 2017 to 15 ng/m³ (0.005 ppb) in 2018 and then decreased to 12 ng/m³ (0.004 ppb) in 2019.

Table L-28. Percentage of analyses performed resulting in a detection at Watsonville, by year.

Chemical	2017	2018	2019
1,3-dichloropropene	20%	6%	4%
Chloropicrin	25%	25%	24%
Chlorothalonil	4%	0%	2%
Chlorpyrifos	2%	0%	0%
Chlorthal-dimethyl	8%	2%	18%
DDVP	2%	10%	26%
Diuron	2%	0%	2%
Endosulfan	2%	0%	0%
Malathion	14%	6%	14%
Malathion OA	10%	6%	16%
Metolachlor	2%	0%	0%
MITC	18%	48%	30%
Norflurazon	2%	0%	0%
Oryzalin	2%	0%	0%
pp-Dicofol	2%	0%	0%
Simazine	2%	0%	0%
Trifluralin	14%	2%	4%

* These values include both trace and quantifiable detections.

Table L-29. Highest 24-h concentrations for pesticides with at least one detectable concentration by year (2017 – 2019) in Watsonville, California.

Chemical	2017	2018	2019
1,3-dichloropropene	0.4 ppb (1,860 ng/m³)	0.27 ppb (1,200 ng/m³)	0.29 ppb (1,316 ng/m³)
Chloropicrin	0.5 ppb (3,221 ng/m³)	0.12 ppb (780 ng/m³)	0.9 ppb (5,741 ng/m³)
Chlorothalonil	Trace	ND	Trace
Chlorpyrifos	Trace	ND	ND
Chlorthal-dimethyl	Trace	Trace	Trace
DDVP	Trace	Trace	Trace
Diuron	Trace	ND	Trace
Endosulfan	Trace	ND	ND
EPTC	ND	ND	Trace
Malathion	Trace	Trace	0.004 ppb (56 ng/m³)
Malathion OA	Trace	Trace	Trace
Metolachlor	Trace	ND	ND
MITC	0.02 ppb (56 ng/m³)	0.042 ppb (120 ng/m³)	0.06 ppb (164 ng/m³)
Norflurazon	Trace	ND	ND
Oryzalin	Trace	ND	ND
pp-Dicofol	Trace	ND	ND
Simazine	Trace	ND	ND
Trifluralin	Trace	Trace	Trace

Table L-30. Highest rolling 4-week average concentrations for pesticides with at least one detectable concentration by year (2017 – 2019) in Watsonville, California.

Chemical	2017	2018	2019
1,3-dichloropropene (13-wk)	0.2 ppb (904 ng/m³)	0.094 ppb (430 ng/m³)	0.08 ppb (374 ng/m³)
Chloropicrin (13-wk)	0.1 ppb (974 ng/m³)	0.071 ppb (480 ng/m³)	0.15 ppb (1,042 ng/m³)
Chlorothalonil	Trace	ND	Trace
Chlorpyrifos	Trace	ND	ND
Chlorthal-dimethyl	Trace	Trace	Trace
DDVP	Trace	Trace	Trace
Diuron	Trace	ND	Trace
Endosulfan	Trace	ND	ND
Malathion	Trace	Trace	0.0012 ppb (16 ng/m³)
Malathion OA	Trace	Trace	Trace
Metolachlor	Trace	ND	ND
MITC	0.006 ppb (19 ng/m³)	0.015 ppb (44 ng/m³)	0.024 ppb (71 ng/m³)
Norflurazon	Trace	ND	ND
Oryzalin	Trace	ND	ND
pp-Dicofol	Trace	ND	ND
Simazine	Trace	ND	ND
Trifluralin	Trace	Trace	Trace

Table L-31. Comparison of the 1-year average concentration for pesticides with at least one detectable concentration by year (2017 – 2019) in Watsonville, California.

Chemical	2017	2018	2019
1,3-dichloropropene	0.1 ppb (397 ng/m³)	0.046 ppb (210 ng/m³)	0.06 ppb (260 ng/m³)
Chloropicrin	0.1 ppb (347 ng/m³)	0.03 ppb (200 ng/m³)	0.05 ppb (348 ng/m³)
Chlorothalonil	Trace	ND	Trace
Chlorpyrifos	Trace	ND	ND
Chlorthal-dimethyl	Trace	Trace	Trace
DDVP	Trace	Trace	Trace
Diuron	Trace	ND	Trace
Endosulfan	Trace	ND	ND
Malathion	Trace	Trace	0.0002 ppb (2.6 ng/m³)
Malathion OA	Trace	Trace	Trace
Metolachlor	Trace	ND	ND
MITC	0.002 ppb (6 ng/m³)	0.005 ppb (15 ng/m³)	0.004 ppb (12 ng/m³)
Norflurazon	Trace	ND	ND
Oryzalin	Trace	ND	ND
pp-Dicofol	Trace	ND	ND
Simazine	Trace	ND	ND
Trifluralin	Trace	Trace	Trace

APPENDIX M:
AMBIENT AIR MONITORING ASSOCIATED WITH ACUTE, SUB-CHRONIC, AND CHRONIC EXPOSURES

The goals of CDPR's ambient air monitoring are to provide data that assists in assessing potential inhalation exposures, developing measures to mitigate exposures, and evaluating the effectiveness of regulatory requirements. CDPR conducts different types of ambient air monitoring and uses modeling efforts to fill in the monitoring gaps to evaluate potential acute, sub-chronic, and chronic exposures.

Acute

Acute risk assesses a short-term exposure to a pesticide concentration determined through a human risk assessment process based on toxicological data. The exposure time period varies from hours to days, depending on the toxicity and the mechanism or mode of action of the active ingredient. CDPR's established procedure for evaluating acute inhalation exposure is to conduct a field application study, coupled with soil flux and air dispersion modeling. Ambient air is monitored in the immediate vicinity of the application site. This type of study involves placement of 8 to 16 sampling stations a set distance from the field and includes sampling intervals varying from 2 to 12 hours over a period of days. CDPR uses these data to document air concentrations and estimate emissions from the application site. The emissions data enables CDPR to estimate air concentrations for a variety of applications and weather conditions using computer modeling. The air monitoring and computer modeling data are used to assess exposures, and if necessary, develop mitigation measures to minimize the potential for exposure and possible adverse health effects. Mitigation measures to address acute risks include, but are not limited to, the implementation of buffer zones, the limitation of application rates or acreage, prohibition of high emission application methods, and the use of low emission application methods.

Sub-Chronic

Sub-chronic risk assesses the seasonal exposure to a pesticide concentration determined through a human risk assessment process based on toxicological data. The exposure time period varies from weeks to months, depending on the toxicity of the active ingredient. CDPR's established procedure for evaluating sub-chronic risk is to study the seasonal use variation of a single pesticide and to monitor the ambient air in the region of highest use, during the pesticide's peak use time period. This type of study involves placement of sampling stations at sensitive sites such as schools, with sampling intervals varying from 2 to 5 times per week for the entire peak-use time period. This allows CDPR to assess the seasonal exposure and need for developing mitigation measures required to minimize the potential risk for exposure and possible adverse health effects. Mitigation measures to address sub-chronic risks include, but are not limited to, the limitation of application rates, the prohibition of high emission application methods, the use of low emission application methods, and regional limits on the amount of use.

Chronic

Chronic risk assesses the annual exposure to a pesticide concentration determined through a human risk assessment process based on toxicological data. CDPR's established procedure for evaluating chronic

risk is to study the use of pesticides with potential chronic risk across the state and monitor the ambient air in selected, representative communities. Representative communities were selected using an exhaustive selection process detailed in the Air Monitoring Network Site Selection Report, which can be found at: https://www.cdpr.ca.gov/docs/emon/airinit/air_network.htm. This includes weekly monitoring at a representative sensitive site, such as a school, within the selected communities over the course of a year. This allows CDPR to continuously evaluate the temporal trends of pesticides in air, assess the chronic exposure to individual pesticides and cumulative exposure to multiple pesticides, and evaluate the need for developing and implementing additional mitigation measures. Mitigation measures to address chronic risk include, but are not limited to, the limitation of application rates, prohibition of high emission application methods, prohibition of use during certain months or climate conditions, the introduction of low emission application methods, and regional limits on the amount of use.

The AMN study was designed to monitor ambient air over a period of years to decades and record spatial and temporal trends in pesticide concentrations. Therefore, the scope of the AMN study is focused on long-term ambient air monitoring and evaluating chronic risks.

Due to its design and framework, the AMN is not intended for use as an investigatory tool for monitoring pesticides in air from singular pesticide applications. However, DPR uses AMN monitoring data as a reliable source to investigate the efficacy of existing mitigations. CDPR uses these acute and sub-chronic values in conjunction with other results from CDPR's various projects, including modeling efforts, to accurately evaluate pesticide concentrations in the ambient air and the efficacy of existing mitigation measures.

APPENDIX N – REFERENCES

Electronic versions of the following reports are available at https://www.cdpr.ca.gov/docs/emon/airinit/air_monitoring_reports.htm.

ATSDR, 2007. Toxicological profile for Acrolein. Agency for Toxic Substances and Disease Registry (ATSDR). Atlanta, GA.

CARB, 2002. Final Report for the 2001 MeBr and 1,3-Dichloropropene Air Monitoring in Monterey and Santa Cruz Counties. Memorandum to John Sanders, dated March 29, 2002. California Air Resources Board. Sacramento, CA.

CDFA, 1999. Determination of chloropicrin desorbed from XAD-4 resin tubes. California Department of Food and Agriculture. Sacramento, CA.

CDFA, 2010. Determination of Acrolein, Iodomethane, Carbon Disulfide, cis-1,3-Dichloropropene, trans-1,3-Dichloropropene, MIBK and Bromomethane in air samples collected in summa canisters. EMON-SM-019. California Department of Food and Agriculture. Sacramento, CA.

CDFA, 2018a. Determination of Selected Pesticides Collected on XAD-4 Resin by High Performance Liquid Chromatography Ion Trap Mass Spectrometry and Gas Chromatography Mass Spectrometry. California Department of Food and Agriculture. Sacramento, CA.

CDFA, 2018b. Determination of MITC in Air by GC-MS. California Department of Food and Agriculture. Sacramento, CA.

CDPR, 1995. Standard Operating Procedure: Chemistry Laboratory Quality Control. Department of Pesticide Regulation. Sacramento, CA.

CDPR, 1996. Risk Characterization Document: Dichlorvos (DDV). Department of Pesticide Regulation. Sacramento, CA.

CDPR, 2015. 1,3-Dichloropropene, Risk characterization document-Inhalation exposure to workers, occupational and residential bystanders and the general public. Human Health Assessment Branch. Department of Pesticide Regulation. Sacramento, CA.

CDPR, 2016. Calculation of Intermediate-Term Residential Exposures Using Measured Air Concentrations from the Ambient Air Monitoring Network. Memorandum to Shelley DuTeaux dated August 9, 2016. Department of Pesticide Regulation. Sacramento, CA.

CDPR, 2019. Air Monitoring Network Results for 2018: Volume 8. Report Air 19-02. Department of Pesticide Regulation. Sacramento, CA.

Vidrio, E., P. Wofford, R. Segawa and J. Shreider. 2013. Air Monitoring Network Results for 2011: Volume 1. Department of Pesticide Regulation. Sacramento, CA.

Vidrio, E., R. Neal, R. Segawa, P. Wofford. 2017. Department of Pesticide Regulation Air Monitoring Network Plan. Department of Pesticide Regulation. Sacramento, CA.

APPENDIX O – COMMENTS

Number	Comment	Response	Action
1.	**From California Air Resource Board, CARB:** **Acknowledgements** Suggest report include CARB staff which installed equipment at monitoring sites, operated network sites and handled the samples. There is a missing acknowledgement for the Lindsay site.	Comment acknowledged by CDPR. The 2019 AMN report was amended to include CARB staff in the Acknowledgements section.	Changes to report were made.
2.	**From CARB:** **Page 10** "Due to sampling equipment and site procurement delays, the expansion took place in various phases starting on January 1, 2017, and concluding in August 2018 when the last of the eight monitoring sites was added to the AMN." It should be noted that some sites were existing and received additional equipment, while some sites were completely new. Thus, explaining the lengthy 1.5 year period.	Comment acknowledged by CDPR.	No changes to report are needed.
3.	**From CARB:** **Page 11** (redundancies) "In February 2019, the Shafter sampling site was relocated ~~within the community~~ of Shafter from Shafter High School to Sequoia Elementary (School). The February 2019 relocation date is incorrect. The actual date is available in sampling records. In November 2019, the Santa Maria site was relocated ~~within the community of Santa Maria~~ from a CARB monitoring location near Santa Maria High School to Bonita Elementary School.	The information contained in the Draft 2019 AMN report is correct. The starting date of monitoring activities at Sequoia Elementary commenced on February 26, 2019.	No changes to report are needed.
4.	**From CARB:** **Page 18** "Annual average concentrations and cancer risk estimates for 1,3-D are shown in Table ?" Doesn't have a number.	Comment acknowledged by CDPR. Text in the report has been updated to read as follows: "Annual average concentrations and cancer risk estimates for 1,3-D are provided in Table 8."	Changes to report were made.

Number	Comment	Response	Action
5.	**From CARB:** **Page 19** There appears to be no reference to Table 9 in the text of the document.	Comment acknowledged by CDPR. A reference to Table 9 has been added.	Changes to report were made.
6.	**From CARB:** **Page 106** "Error! Reference Source not found." Need to update table reference.	Comment acknowledged by CDPR.	
7.	**From CARB:** **Page 111** Legacy AMN equipment (for multi-pesticide, VOC, MITC and chloropicrin) "This method is used as a backup method should the current equipment fail or become unavailable." Were the backup methods used in the 2019 sample collection? If so, do we know which samples? Are the results comparable between the samples from each type of equipment? If not, it should be noted that the backup method was not needed/used. Spare units of the current equipment were purchased to address this issue.	Comment acknowledged by CDPR. Language has been added to Appendix J to clarify equipment usage.	Changes to report were made.
8.	**From CARB:** **Page 113** "A field spike is 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." It should be noted that a field spike is sampled on a duplicate instrument. This is alluded to at the bottom of page 114, but suggest you move the sentence to paragraph 3 under "Quality Control Methods"	The description of field spikes in the 2019 AMN report is consistent with past AMN reports. No changes were deemed necessary.	No changes to the report were made.
9.	**From CARB:** **Tables and Calculations** "Number of Possible Detections" Suggest explaining this in the text or renaming to "Number of Valid Samples".	CDPR acknowledges this comment. Additional language was added to clarify the text.	Changes to report were made.

Number	Comment	Response	Action
10.	**From CARB:** The report notes in the Executive Summary and body of the report that ten of the 36 monitored pesticides were not detected. Suggest the report point out that lack of detection does not necessarily mean that those pesticides do not become airborne. Some of those ten undetected pesticides may not have been used in the vicinity of the monitoring sites. In prior years DPR checked the pesticide use data near the monitoring sites and reached this conclusion. Periodic high measurements of some pesticides (e.g., 1,3-D), highlights the need for ongoing air monitoring of pesticides so that DPR can continue to assess public exposure and potential health concerns, along with the potential need for mitigation.	CDPR acknowledges this comment. CDPR staff makes every attempt to present the results in a clear and unbiased manner. While it is possible that the lack of detections may be due to some of the monitored pesticides being less volatile than others, the actual reason(s) for the presence or lack of detections are not always clear and reflects the limitation in the analysis for cause and effect. As such, it would be inappropriate for CDPR to make causal statements without the supporting data to corroborate them. Therefore, CDPR believes that the sampling results are clearly and effectively presented throughout the report and thus no changes are required at this time.	No changes to report are needed.
11.	**From CARB:** Suggest report includes comments that provide more clarity for addressing the cancer effects, cumulative effects, and what has been done to reduce these impacts within the communities affected. Understand that these are the monitoring results, but it should send a clear message as to what this monitoring effort will result in mitigation actions.	CDPR acknowledges this comment and may take this into consideration for future reports. CDPR creates AMN yearly results reports as a way to summarize the results from the collected air samples across all AMN monitoring sites. CDPR uses results from the AMN, along with other monitoring, modeling, and other sources, when assessing risks and determining appropriate risk management decisions. The cancer risk estimate and interpretations included in this report are consistent with previous CDPR study publications and are used for comparison purposes only. The AMN is one of many resources used by the department as part of risk management decisions.	No changes to report are needed.
12.	**From CARB:** Parlier, for which 1,3-D exceeded acute, subchronic, chronic, and lifetime screening levels in 2018 is not included in the report. The data for 2019 indicates no screening level is exceeded for Parlier. Parlier isn't a full network site but it might be useful for Parlier to be mentioned in this document considering the levels in 2018, and especially if no Merced-Fresno 1,3-D report is being released this year. (That report was dated July for the past two years, maybe it's just delayed this year.)	This report includes all 2019 results associated with CDPR's pesticide AMN. The results alluded to in CARB's comment relate to monitoring results obtained in a separate air monitoring study conducted by CDPR, which is not directly associated with the AMN. Complete 1,3-dichloropropene monitoring results from air samples collected in Merced and Fresno Counties (CDPR Study #309) are included in a separate report which is available at https://www.cdpr.ca.gov/docs/emon/airinit/air_monitoring_reports.htm.	No changes to the report are needed.

Number	Comment	Response	Action
13.	**From CARB:** It could be useful to include a more graphical way of representing the data. For example, Figures 2 and 3 of the 2016 DPR "Study #309: Monitoring of 1,3-dichloropropene in Merced and Fresno Counties" show application weight per day in calendar form (See Below). Similar figures for air monitoring could be valuable for presenting the data.	Comment acknowledged by CDPR. CDPR will take this suggestion into consideration for future yearly reports.	No changes to the report are needed.

Number	Comment	Response	Action
14.	**From California Rural Legal Assistance Foundation (CRLAF), Natural Resources Defense Council (NRDC), Center for Environmental Health (CEH), Californians for Pesticide Reform (CPR), Pesticide Action Network (PAN):** **Executive Summary** The conclusion in the Executive Summary that none of the pesticides or breakdown products monitored exceeded screening levels should be supplemented with these clarifying statements: 1) The 8-year average 1,3-D air concentration of 0.38 ppb at the Shafter site exceeds DPR's previous regulatory target of 0.14 ppb which OEHHA continues to support. 2) The highest chloropicrin 4 week rolling average air level at the Oxnard site was 0.571 ppb. This exceeds DPR's previous 4 week average sub-chronic screening level of 0.35 ppb by 63%.	CDPR disagrees with this comment. Every attempt is made by staff to convey the obtained results in a clear and unbiased manner. As a standard practice, we default to comparing calculated 4-week rolling average air concentrations against a 28-day time period as a Tier-I comparison for sub-chronic exposures for most pesticides included in the AMN. However, there is a specified sub-chronic time period (13-weeks) for Chloropicrin established after an evaluation of available toxicological data by CDPR's Human Health Assessment Branch. Therefore, using the default 4-week time period for chloropicrin is inappropriate. Therefore, CDPR will continue to use a 13-week time frame to estimate sub-chronic exposures to chloropicrin as stated in this report and consistent with previous DPR study publications. All monitoring results are compared to established CDPR screening levels or regulatory target concentrations for each pesticide. The lifetime exposure Regulatory Target value for 1,3-D is 0.56 ppb. The sub-chronic exposure time for Chloropicrin 13 weeks and the associated Screening Level is 0.35 ppb.	No changes to report are needed.

Number	Comment	Response	Action
15.	**From CRLAF, NRDC, CEH, CPR, PAN:** **Combined results for all pesticides and communities** We remain concerned that beginning the report by quoting statistics that aggregate all the data conveys a false sense of security that does not reflect the air levels documented in the actual monitoring data. The statements in the report that 96.2% of analyses did not return a detectable concentration that 3.8% of analyses had at least one detectable pesticide concentration and that only 0.95% of analyses had quantifiable detections are highly misleading because they ignore the realities of pesticide use patterns. In order to reach 100% detections (a total of 14,616 positive analyses), every pesticide tested for would have to be found on each of the days monitored at each of the air monitoring sites. In reality, use of most pesticides is concentrated in certain months. As pesticide use varies between crops and regions, not all of the pesticides monitored are used near all of the monitoring sites. Therefore, using the total number of analyses for all pesticides at all locations as the denominator does not provide a meaningful context. Detection frequency should either be calculated based on what pesticides were used in the vicinity of a specific site, shortly prior to the sampling date, or should not be highlighted. When these concerns were raised three years ago at the August 18, 2017 PREC meeting, then Branch Chief Pam Wofford stated that DPR was conducting an uncertainty analysis of frequency of detections. Is this analysis still in process and if so when will it be completed?	CDPR disagrees with this comment. The main objective of the AMN is to evaluate chronic exposures in ambient air. CDPR frames AMN results at a higher level to give a more comprehensive view of the results in relation to chronic exposures. Therefore, the results are presented as yearly detection frequencies and yearly average concentrations. CDPR, however, conducts seasonal studies that are specifically designed to monitor for certain pesticides during high use periods in a region. Those types of studies are more appropriate to evaluate detections in the context of seasonal use. In 2018, CDPR published a Comprehensive Air Monitoring Network Report for 2011 – 2016. This report had a section on a linear regression analysis of selected pesticide detected concentrations and use. While this was not an uncertainty analysis, the results did show a weak positive relationship between pesticide use and measured concentrations for sub-chronic time periods for several of the pesticides of interest. There were mixed results for the chronic time-period, with only a few pesticides of interest measured in Shafter showing a statistically significant relationship with use.	No changes to report are needed.
16.	**From CRLAF, NRDC, CEH, CPR, PAN:** **Combined results for all pesticides and communities**	CDPR makes every attempt to convey all data and results obtained as part of the AMN in a clear and unbiased manner. This specific	No changes to report are needed.

Number	Comment	Response	Action
	From We note that Table 4 shows that there was an average of at least one pesticide detection in 73% of weekly sample sets collected at each monitoring site. This statistic should also be included in any discussion of aggregate findings in the report narrative.	statistic is included in Table 4 and in the text on page 14.	
17.	**From CRLAF, NRDC, CEH, CPR, PAN:** **Combined results for all pesticides and communities** The report states that there were 45 lost samples in 2019 including 3 summa canisters. This is a 10-fold increase over 2018 when only 4 samples were lost. The date and location of lost or otherwise invalidated samples should be provided in the report.	Comment acknowledged by CDPR. 2019 AMN report was amended to include a detailed description of invalidated air samples.	Changes to report were made
18.	**From CRLAF, NRDC, CEH, CPR, PAN:** **Combined results for all pesticides and communities** The tables in the Air Monitoring Study Results and 1,3-D Ambient Air Monitoring Results Presentations at the July 17th Pesticide Registration and Evaluation Committee (slides 13-15 and slide 26) that compile highest air concentrations and compare highest 1 day, 4 week, 13 week and annual average concentrations between sites for all pesticides with quantifiable detections are very helpful and informative. We once again strongly recommend including them in the report with 1,3-D results combined with other pesticide results. However, in Table 8 and slide 26, annual 1,3 D air concentrations for Oxnard should be included for 2012-2018 when this was a TAC monitoring site. We note that these years of data are included for Watsonville which was also a TAC monitoring site in earlier years.	Comment acknowledged by CDPR. CDPR will consider this suggestion for future AMN reports.	No changes to report are needed.
19.	**From CRLAF, NRDC, CEH, CPR, PAN:** **Combined results for all pesticides and communities** Please note also that there is an error in the slide 15 table of highest annual air concentrations for the Shafter chloropicrin	This comment is not directed to this report. As such, no response is needed.	No changes to report are needed.

Number	Comment	Response	Action
	value. From comparison with the draft report, the correct value appears to be 0.02 ppb, not 0.2 ppb.		
20.	**From CRLAF, NRDC, CEH, CPR, PAN:** **Acute Screening Levels - Chloropicrin** The acute regulatory target for chloropicrin of 73 ppb used in this report as a 24 hour average exposure target level was set in a Risk Management Directive (RMD) as an 8 hour average so at the very least it should be adjusted to 24.3 ppb as a 24 hour level. Furthermore, this 73 ppb target level was set over the objection of OEHHA. The chloropicrin TAC report and risk assessment, which are also supported by OEHHA, include a 24 hour reference level of 0.92 ppb for protection of children. The highest 24 hour level measured in Oxnard (1.032 ppb) exceeded this reference level by 12% and the highest levels measured in Watsonville (0.854 ppb) Santa Maria (0.455 ppb) reached 93% and 50% of this level respectively.	CDPR developed regulatory targets based on complete assessments of possible health risks. As mentioned in the report, exceeding a regulatory target does not necessarily mean an adverse health effect occurs, but it does trigger a detailed evaluation and it may indicate that the restrictions on the pesticide use may need to be modified. CDPR, as part of the AMN procedures, collects 24-h air samples, which are compared with established acute screening levels or regulatory targets for individual pesticides. If any 24-h air concentration exceeds its acute target, CDPR conducts a detailed evaluation to determine if any unacceptable exposure may have occurred and if any additional restrictions on the use of the pesticide are needed. Comparing a measured 24-hr air concentration to the established acute regulatory target (8-hr, 24-h, or 72-h) as a trigger for further evaluation in the case of any exceedances is consistent with previous CDPR protocols and studies. No changes to the report are deemed necessary.	No changes to report are needed.
21.	**From CRLAF, NRDC, CEH, CPR, PAN:** **Acute Screening Levels - MITC** The acute regulatory target for MITC of 220 ppb used in this report as a 24 hour average exposure target level was set in a Risk Management Directive as an 8 hour exposure level so at the very least it should be adjusted to 73 ppb as a 24 hour exposure target level. Furthermore, this level was set over OEHHA's objections because 220 ppb was the "no effects" level in a toxicology study, leaving no margin of error. The DPR TAC report and risk assessment established an 8 hour reference level of 22 ppb for protection against irritation to the eyes and respiratory system which should be	See response for Comment #20 above.	No changes to report are needed.

Number	Comment	Response	Action
	adjusted to 7.3 ppb as a 24 hour target exposure level. The highest 24 hour air level measured in San Joaquin (1.532 ppb) reached 21% of 7.3 ppb, the 8 hour reference level of 22 ppb, adjusted for 24 hour exposure. As you know, in the seasonal monitoring study conducted in Arvin in the summer of 2017 a peak 24 hour level of 4 ppb was measured with a month-long average air level of 1.03 ppb, exceeding the sub-chronic screening level of 1 ppb, set to prevent damage to the nasal cavity.		
22.	**From CRLAF, NRDC, CEH, CPR, PAN:** **Sub-Chronic Screening Levels Chloropicrin and 1,3-D** In 2017 DPR discontinued the practice of using a 4-week rolling average concentration to compare to chloropicrin and 1,3-D sub-chronic screening levels and began comparing to 90 day or 13 week rolling averages. This change was made after peak 4 week rolling averages were found to exceed the 4 week chloropicrin screening level at the Santa Maria air monitoring site in 2014 and 2015 and the peak 4-week 1,3-D air concentration for 2016 in Shafter reached 97.6% the 1,3-D sub-chronic screening level. DPR toxicologists claim these changes were justified because the toxicology studies used to set the sub-chronic screening levels were 90 days long for chloropicrin and 13 weeks long for 1,3-D. However, the revised averaging times have still not been reviewed by OEHHA and should be. We think it is more scientifically valid and health protective to continue to compare air levels of these fumigants to the peak 4-week rolling average concentration rather than a season-long average concentration. While rhinitis was found in rats at the end of a 90-day chloropicrin inhalation study it may have developed earlier and humans may be more sensitive than rats. In addition, in reality people are exposed to varying levels of chloropicrin and 1,3-D	CDPR disagrees with this comment. As a standard practice, we default to comparing calculated 4-week rolling average air concentrations against a 28-day time period as a Tier-I comparison for sub-chronic exposures for most pesticides included in the AMN. However, there is a specified sub-chronic time period (13-weeks) for 1,3-D and Chloropicrin established after a evaluation of available toxicological data by CDPR's Human Health Assessment Branch. Therefore, using the default 4-week time period for 1,3-D and chloropicrin is inappropriate. Therefore, CDPR will continue to use a 13-week time frame to estimate sub-chronic exposures to chloropicrin and 1,3-D as stated in this report and consistent with previous DPR study publications.	No changes to report are needed.

Number	Comment	Response	Action
	over time and higher level short term exposures may cause more respiratory and nasal problems. If calculated as a 4 week rolling average, the highest sub-chronic chloropicrin air concentration in 2019 was 0.571 ppb at the Oxnard site. This exceeds the sub-chronic screening level of 0.35 ppb by 63%. If calculated as a 4 week rolling average, the highest sub-chronic 1,3-D air concentration in 2019 was 0.93 ppb at the Shafter site. This reached 31% of the subchronic screening level.		
23.	**From CRLAF, NRDC, CEH, CPR, PAN:** **Lifetime exposure: Cancer risk estimates** The phrase "potential carcinogens" is not appropriate. The pesticides 1,3-D, chlorothalonil, DDVP, diuron, iprodione and propargite are classified as known carcinogens under Proposition 65 and as probable carcinogens by USEPA. In addition, studies are in process evaluating potential carcinogenicity of MITC and chloropicrin.	Comment acknowledged by CDPR. Sentence was edited to read as follows: "The AMN monitors for seven pesticides that have been designated as known or probable carcinogens by Proposition 65 or by U.S. EPA's B2 list: 1,3-D, chlorothalonil, DDVP, diuron, iprodione, oxydemeton methyl, and propargite."	Changes to report were made.
24.	**From CRLAF, NRDC, CEH, CPR, PAN:** **Lifetime exposure: Cancer risk estimates** DPR has selected a cancer risk level of 1 in 100,000 as the regulatory target for 1,3-D but this level is not generally considered negligible. A cancer risk of 1 in 1 million is used as the level of negligible risk by DPR in risk assessments and considered by OEHHA and most public health entities as the limit for adequate health protection.	CDPR disagrees with this comment. CDPR's language for the selected cancer risk level is consistent with language previously published by the department. The statement is included in the report to provide the necessary context to the risk estimate calculations. Additionally, the provided range is in line with the range considered by other agencies, including US EPA and World Health Organization, to be "negligible" or "low-risk" (i.e., 10^{-5} to 10^{-6}).	No changes to report are needed.
25.	**From CRLAF, NRDC, CEH, CPR, PAN:** **Lifetime exposure: Cancer risk estimates** The report should also note that DPR's 1,3-D risk assessment includes both the portal of entry and systemic cancer potency risk factors and that OEHHA maintains that the systemic cancer potency risk factor should continue to be used for adequate health protection. We note, as shown in slide 29 of the Air Monitoring Network results July	CDPR disagrees with this comment. The cancer risk estimate and interpretations included in this report are consistent with previous DPR study publications and follow the latest 2016 1,3-D Risk Management Directive. No changes to the report are deemed necessary.	No changes to report are needed.

Number	Comment	Response	Action
	17, 2019 PREC meeting presentation, that when utilizing the systemic cancer potency risk factor, risk exceeds 10^{-5} at the Shafter site and also the Parlier and Delhi sites where weekly 1,3-D monitoring is being conducted in a separate study. Further, at the Santa Maria site, the average air concentration reached 0.13 ppb, exceeding the 0.1 ppb threshold level OEHHA supports to protect children from cancer. We also note that 1,3-D cancer risk levels exceed 10-6 at the Shafter, Santa Maria and Watsonville sites using the portal of entry cancer potency factor.		
26.	**From CRLAF, NRDC, CEH, CPR, PAN:** **Lifetime exposure: Cancer risk estimates** Both slide 29 of the AMN PREC presentation and Table 8 of the draft report are misleading for the Oxnard site where 1,3-D was also monitored from October 2011 through December 2018 by CARB. Much higher air levels recorded in earlier years elevate the overall average concentration and thus the cancer risk level substantially.	Table 8 was revised to include monitoring data from October 2011 through December 2018 from CARB	Changes were made to the report.
27.	**From CRLAF, NRDC, CEH, CPR, PAN:** **Chloropicrin carcinogenicity** The average annual concentration of chloropicrin in Oxnard was 0.06 ppb (60 ppt), in Watsonville 0.05 ppb (50 ppt), in Santa Maria was 0.03 ppb (30 ppt) and in Chualar and Shafter 0.02 ppb (20 ppt). If sustained over time, these concentrations all greatly exceed the reference concentration of 0.24 ppt for controlling cancer risk to the 1 in a million level that was established in the DPR Chloropicrin TAC and Risk Characterization documents as the negligible risk level and supported in review by OEHHA and the TAC Scientific Review Panel. DPR subsequently made a unilateral decision that chloropicrin cancer data was equivocal and that an additional study was needed to assess cancer risk. That study is not due to be submitted until	Comment acknowledged by CDPR.	No changes to report are needed.

Number	Comment	Response	Action
	December 31, 2021 so in the meantime we are left with great uncertainty about cancer risk from chloropicrin exposure due to this huge data gap.		
28.	**From CRLAF, NRDC, CEH, CPR, PAN:** **Cumulative exposures** The results described in Table 10 clearly illustrate that exposures occur to multiple organophosphates at monitoring sites in California. However, the comparison to screening levels based on cholinesterase inhibition likely underestimates the risk associated with these exposures. Both DPR and OEHHA have concluded that the most sensitive health endpoint for chlorpyrifos is developmental neurotoxicity and these harms have been documented in animals and human studies at levels below that which results in cholinesterase inhibition. In 2015, USEPA concluded that there was substantial evidence linking exposure to the class of organophosphates to developmental neurotoxicity and that this harm could occur at levels below that which caused cholinesterase inhibition. To more accurately describe the health risk associated with the cumulative exposure to the organophosphate levels detected at monitoring sites, DPR should work with OEHHA to develop a screening level that protects against neurodevelopmental harm and, in the meantime, include an explanation in any reports that the cumulative exposure analysis does not fully capture the risks associated with these exposures.	This is a complex subject and is rapidly evolving in the scientific community. DPR doesn't have sufficient information and evidence to be able to change the analysis in this report. However, CDPR makes all completed air monitoring reports including raw monitoring data available to the public. This information can be accessed at the following site: http://www.cdpr.ca.gov/docs/emon/airinit/air_network_data_analysis.htm	No changes to report are needed.
29.	**From CRLAF, NRDC, CEH, CPR, PAN:** **Cumulative exposures** In addition, DPR's focus on evaluating cumulative exposures only for those pesticides with a known common mode of action is too narrow and doesn't capture the risks associated with the combined exposures to multiple chemicals with the same health effect. This broader approach is needed to more accurately describe the	Comment acknowledged by CDPR.	No changes to report are needed.

Number	Comment	Response	Action
	risks posed by pesticides detected at air monitoring sites in California.		
30.	**From CRLAF, NRDC, CEH, CPR, PAN:** **Results for individual communities** We appreciate inclusion of a description of each community. An aerial view map of each monitoring site would be helpful along with an assessment of proximity to agricultural fields. The figures showing temporal trends in levels of individual pesticides detected at each monitoring site are very useful.	Comment acknowledged by CDPR. Comment will be taken into consideration for future AMN reports.	No changes to report are needed.
31.	**From CRLAF, NRDC, CEH, CPR, PAN:** **Field spike recoveries** Lab spike recoveries for MITC (81%) and DDVP (82%) seem a little low and suggest that reported values for these pesticides may be underestimates.	CDPR disagrees with this comment. As was detailed in Appendix I, section "Data Validation/Quality Assurance", all lab spike (QC) recoveries were within the established control limits determined by the analytical laboratory.	No changes to report are needed.
32.	**From CRLAF, NRDC, CEH, CPR, PAN:** **Field spike recoveries** We also strongly disagree with the Department's decision to discontinue use of field spikes at the end of 2018. It seemed appropriate to devote more resources to figuring out why multiple field spikes were low (less than 80% for chlorothalonil, chlorpyrifos, malathion and MITC) instead of discontinuing field spike measurements. Field spikes provide reliable data about how field conditions may be affecting sample recovery. While the field spikes have their challenges and the data from them have their limitations (as cited by DPR in the 2018 AMN update), discontinuing the practice of collecting field spikes would mean that no information would be collected about how field samples might have been affected by important environmental conditions (e.g., humidity, temperature, other environmental factors affecting samples). For example, a 2018 memo from CDFA regarding MITC stated "The low recovery for the blind spikes would indicate that the sampling,	Comment acknowledged by CDPR. CDPR performed an assessment on the need and value of fortified field spikes detailed in a memorandum released on November 9, 2018. Although fortified field spike samples provide some additional information on recovery from the sampling matrix, the value of these samples, as currently prepared and handled, in assessing any quality control aspect of the air monitoring studies conducted by CDPR's Air Program is debatable. CDPR will continue to use results from trapping efficiency studies, storage stability studies, laboratory field blanks, laboratory fortified matrix spikes, field blanks, and co-located samples to provide greater verifiable information. These quality control measures provide DPR confidence in the analytical method and resulting air concentrations.	No changes to report are needed.

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	extraction and analysis of the samples the lab analyzed during 2017 are reporting findings that are lower than what is actually in the air during the sampling." MITC air monitoring studies conducted by academics have included fortified field spikes, in order to collect data about field conditions while conducting air sampling. DPR could potentially use information from field spikes to help determine whether losses in the field are the result of laboratory methods (as CARB determined for 2017 methyl bromide samples), or for other reasons. In the 1990s, low field spike recovery rates for methyl bromide contributed to a study being conducted that showed that recoveries were greatly improved if steel canisters were used, rather than charcoal air tubes. As a result, sampling methodologies were improved for DPR field sampling. Therefore, field spikes can be useful and indeed may play an important role in helping DPR assess whether screening thresholds are potentially being exceeded.		
33.	**From CRLAF, NRDC, CEH, CPR, PAN:** **Historical air concentration analyses** It would be better to place the historical air concentration analyses, which provide very useful background, in the "Results from individual communities" section after 2018 data for each community site. In the historic analyses, we appreciate that non-zereo [sic] values are provided in both ppb and ng/m3 this year. The historical air concentration analysis shows that the Shafter had the first ever detection of chloropicrin in 2019. This should be mentioned earlier in the report. For Oxnard, Santa Maria and Watsonville more than 2 years of data are available for 1,3-D, methyl bromide and chloropicrin because these were previously TAC sites. That additional data should be included in historical analyses.	The intent of this report is to focus on the observed ambient air concentrations during the 2019 calendar year. Historical data for all air monitoring studies are available through the Pesticide Air Monitoring Results Database where all monitored results can be accessed and/or reviewed. This information can be accessed at the following site: https://www.cdpr.ca.gov/docs/emon/airinit/pesticide_air_monitoring_database.htm.	No changes to report are needed.

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34.	**From CRLAF, NRDC, CEH, CPR, PAN:** **Air Monitoring Database** The Air Monitoring database previously available in google sheets was very well designed, user friendly and versatile. We greatly appreciated the inclusion of preliminary monitoring data and the ability to filter data by chemical, site and specific time periods and download filtered data into spreadsheets. It is unfortunate that Google discontinued Google fusion tabless [sic] at the end of 2019. We urge DPR to develop an alternative database that continues to be searchable and if possible is expanded to include mapping and graphing functions but we appreciate that preliminary monitoring data is still being posted for download into a spreadsheet.	CDPR agrees with this comment. Unfortunately, due to Google closing Fusion Tables, CDPR is currently working to provide a suitable alternative with similar functionality as the Google Fusion Tables interface. During this time, result from the Pesticide Air Monitoring Results Database will continue to be available for download as a .CSV file until a suitable Google Fusion Table replacement is determined.	No changes to report are needed.
35.	**From CRLAF, NRDC, CEH, CPR, PAN:** **Suggestions for further analyses** Many of these monitoring sites are located at schools. We would recommend conducting an analysis to evaluate how the school buffer zone requirements may have impacted air levels measured at these sites. It also appears that 1,3- D and chloropicrin air levels have decreased at coastal sites in recent years. We recommend conducting an analysis that looks at whether there is any correlation between these fumigant air levels and the extent of use of TIF tarps surrounding the air monitoring sites.	This comment is beyond the scope of the "Air Monitoring Network Results for 2019 – Volume 9" draft document. Comment acknowledged by the Department. No response required.	No changes to report are needed.

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36.	**From Dow AgroScience, DAS:** **AMN Reports: Comments on Monitoring Results for 1,3-D** As discussed previously, the "Acute" screening level of 110 ppb should be	CDPR disagrees with this comment. Development of the new screening levels for 1,3-D, including information and justification of all data used to determine these levels, was	No changes to report are needed.

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	compared to a 3-day time weighted average air concentration, rather that the 24-hour concentration shown below. This would result in a lower concentration and a lower "% of screening level."	clearly detailed in the 2015 1,3-D Risk Assessment document. The use of human equivalent concentrations and uncertainty factors in establishing CDPR screening levels is consistent with previous CDPR study publications. No changes to the report are deemed necessary.	
37.	**From DAS:** **AMN Reports: Comments on Monitoring Results for 1,3-D** DOW disagrees with the comparison of the 24h measured 1,3-D concentration to the 72-h 'acute' endpoint since that will result in an arbitrarily higher % of the acute screening level since a 24-h concentration is more 'acute' than a 72-h concentration. The comparison of the 24h concentrations to the 24-h acute endpoint for all molecules except for 1,3-D which has a 72-h acute endpoint, does not give an accurate reflection of the "% of screening level" reached for 1,3-D. If CDPR elects to maintain this comparison for 1,3-D, DOW requests that it should be qualified via a footnote, i.e., the "acute" screening level is a short-term, 72-h toxicological endpoint based on the time to effect for significant changes in laboratory animal body weight, and is more directly relevant for comparisons to estimates of 72-h TWA ambient air concentrations of 1,3-D.	CDPR disagrees with this comment. Development of the new screening levels for 1,3-D, including information and justification of all data used to determine these levels, was clearly detailed in the 2015 1,3-D Risk Assessment document. The use of human equivalent concentrations and uncertainty factors in establishing CDPR screening levels is consistent with previous CDPR study publications. No changes to the report are deemed necessary.	No changes to report are needed.
38.	**From DAS:** **AMN Reports: Comments on Monitoring Results for 1,3-D** CDPR also estimated theoretical lifetime excess cancer risk using a cancer potency factor, which is based on the presumption that 1,3-D acts as a no threshold carcinogen. However, as discussed previously, and as recently determined by the U.S. EPA after reviewing new studies, 1,3-D acts via a threshold-based mechanism. Further, EPA (2019b) has reclassified the potential carcinogenicity of	CDPR disagrees with this comment. Development of the new screening levels for 1,3-D, including information and justification of all data used to determine these levels, was clearly detailed in the 2015 1,3-D Risk Assessment document. The use of human equivalent concentrations and uncertainty factors in establishing CDPR screening levels is consistent with previous CDPR study publications. No changes to the report are deemed necessary.	No changes to report are needed.

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	1,3-D and adopted a threshold-based chronic risk assessment methodology (chronic point of departure / Margin of Exposure). Even with the use of the erroneous and conservative cancer potency-based approach, the theoretical cancer risk estimates were below the target risk level of 1E-5 (see below). <table>		
39.	**From DAS:** **AMN Reports: Comments on Monitoring Results for 1,3-D** CDPR also reported on the monitoring of 1,3-Dicloropropene in Merced and Fresno Counties for 2019. In 2019, a total of 103 valid primary samples were collected from the two sites (Appendices I and II of CPDR's report). During this period, 1,3-D was detected in 80% of air samples collected from Delhi and Parlier. It is important to note that current 1,3-D permit conditions do not allow the application of 1,3-D during the month of December. Detections of 1,3-D were present in most of the samples collected from Delhi and Parlier during the month of December (7 out of 8 samples). Delhi experienced low-level detections for the first three weeks followed by a non-detection during the last sampling event in December. In Parlier, four low 1,3-D detections were present in the month of December. For untarped applications of 1,3-D, studies have demonstrated that the fumigant's cumulative emission tends to stabilize roughly two weeks after application. As discussed by CDPR, this may be one of the contributing factors to the low levels of detections observed during December even in the absence of 1,3-D applications during that month. DPR's hypothesis is confirmed by examination of the ratio of the cis/trans-1,3-D isomers for the December AMN samples from Parlier and Merced shows that the ratio is decreasing and is	Comment acknowledged by CDPR. No response is required.	No changes to report are needed.

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	approaching, or slightly below "1", suggesting that the source of 1,3-D is likely from an application made weeks earlier (i.e.. at the very end of November). Evaluation of the cis/trans ratio from a number of field volatility studies with 1,3-D all show a pattern similar to that shown in Figure 1, with the ratio being significantly greater than "1" shortly after an application is made, then decreasing exponentially over time. Figure 1 is based on data from a field volatility study with replicated measurements conducted by Ashworth et al., 2018. The reason for that characteristic behavior is because the cis-1,3-D has a higher vapor pressure (~34mm Hg) than the trans1,3-D (~24 mm Hg), causing it to evaporate from the soil faster than the trans-1,3-D as has been observed in many 1,3-D field volatility studies. <Figure 1> Although the ratio of cis/trans-1,3-D isomers in formulated 1,3-D fumigants is nominally "1:1", the ratio of cis/trans-1,3-D isomers in edge of field air samples collected from field volatility studies typically show an initially high ratio of cis/trans-1,3-D (ranging from 2-10 or higher) that gradually declines over time as the cis-1,3-D dissipates more rapidly than the trans-1,3-D. This behavior is illustrated in Figure 1 which shows that the ratio of cis/trans-1,3-D is initially much greater than "1" (in this case 3.7) due to the greater volatility of the cis-1,3-D, then gradually tails off as the cis-1,3-D levels decrease and become similar to the trans-1,3-D concentrations by about one week after application. This behavior is shown here for duplicate monitoring masts at the 1.5m height, however the same trend occurs at all measured heights (not shown) and occurs in all field volatility studies conducted by the author since 1995. This trend has useful implications, in that it can be used to determine whether a 'parcel' of 1,3-D in ambient air is the result of an application that was made within 24-48		

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	hours, or one that was made a week or more earlier. Indeed, this behavior is also evident in the AMN monitoring data from Parlier and Delhi, where cis- and trans-1,3-D concentrations were reported. Examination of the cis-trans ratio of the AMN results for Delhi and Parlier in December 2019 (shown in the Table below) show that the ratio is <1 for samples taken in December, with the exception of a ratio of 1.1 for the sample taken on December 4, 2019 in Delhi. That sample was likely influenced by an application made near the AMN receptor at the end of November, less than a week before the sample was taken. <Table> A similar pattern is observed in DPR's 2018 and 2017 AMN monitoring results at these two sites (data not shown), and suggests that although there are no 1,3-D applications allowed in December, applications made at the end of November will continue to emit 1,3-D for several weeks and will contribute to lower levels of 1,3-D in ambient air. The fact that the ratio of cis/trans-1,3-D is consistently <1 for samples collected in mid- to late-December at these sites for 2017, 2018, and 2019 supports that conclusion. The maximum cis/trans ratios observed during high use seasons in 2019 were 1.9 and 1.6 in Delhi and Parlier, respectively, and have been observed to be as high as 2.4 in the 2017 monitoring data. This unique characteristic of 1,3-D emissions can be used as a 'marker' for the approximate age of the observed 1,3-D in ambient air and can be used to inform the question "was the 1,3-D applied a few days ago, or a few weeks ago?". Comparisons to 2018, Delhi's maximum sub-chronic exposure decreased 13% while the annual average showed a 21% reduction. Over a one-year period, the maximum acute exposure increased slightly from 1.80 to 2.04 ppb (13%). In		

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	Parlier, maximum concentrations of acute decreased 98%, sub-chronic decreased 92%, and chronic concentration were reduced 90% over the last year. None of the 2019 measured values exceeded their time-domain-specific health screening levels or regulatory targets.		
40.	**From DAS:** **AMN Reports: Comments on Monitoring Results for 1,3-D** We note that CDPRs summary tables (reproduced below) do not present the units of measure for air concentration, but they are obviously ppb values as indicated in the text. <Table 5> <Table 6>	Comment acknowledged by CDPR.	Changes to report were made.
41.	**From DAS:** **General Discussion of AMN data utility** The collection and analysis of air samples is very resource intensive and taking continuous measurements for an extended time period is typically not feasible. For this reason, only a single 24-h sample is collected from each AMN site each week. The weekly 24-hour 1,3-D concentrations are very useful for characterizing potential acute exposure to 1,3-D, however the utility of the AMN data for quantifying short-term, sub-chronic, and chronic (annual or lifetime) exposure and risk is not as straightforward for two reasons. First, only a single 24-h sample is collected each week and therefore 6 out of 7 days (>85%) have no data. This results in the need to assume a 1,3-D concentration on the non-sampled days. DPR assumes that the measured concentration persists for the entire week which they acknowledge could result in either an over- or under-prediction of the weekly average concentration. Secondly, the AMN dataset is typically highly censored due to many samples where the concentration is less than the analytical Limit of Detection (LOD)	Comment acknowledged by CDPR. No response is required.	No changes to report are needed.

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	or Minimum Detection Limit (MDL). DPR assumes that samples that show no detection (ND) are equal to one-half of the MDL or LOD, which could also result in an over- or under-prediction of the weekly concentration. Both issues add uncertainty when monitoring data is used to assess potential sub-chronic, chronic and lifetime exposure and risk, and point to the value of air dispersion modeling to fill in gaps in the monitoring data.		
42.	**From DAS:** **Use of Air Dispersion Modeling to Supplement AMN Data** A cost-effective and scientifically sound approach to supplementing monitoring data is to use a validated air dispersion model such as the SOil Fumigant Exposure Assessment (SOFEA) model. SOFEA can be parameterized with pesticide use data (volume applied; date applied etc.) obtained from DPR's Pesticide Use Reporting (PUR) database and when combined with local meteorological data, has been shown to accurately simulate the timing and magnitude of 1,3-D concentrations in ambient air (van Wesenbeeck et al., 2016) as well as the overall PDF of 1,3-D concentrations in air. SOFEA also simulates air concentrations on an hourly time step and can therefore be used to characterize acute, subchronic and chronic exposures ranging from 1 hour to several years, or a human lifetime. The use of a modeling tool such as SOFEA is a logical complement to monitoring datasets and can be used to fill in data gaps with reasonable certainty, especially when local product use information and weather data are available. Ultimately the use of a model significantly reduces the need for arbitrary conservative assumptions to deal with missing and censored data, and decreases the uncertainty associated with many monitoring datasets.	Comment acknowledged by CDPR. No response is required.	No changes to report are needed.

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43.	**From DAS:** **Evaluation of 1,3-D Screening-Levels and Regulatory Targets** As noted above, alternative, refined derivations of 1,3-D acute, subchronic and chronic Human Equivalent Concentrations (HECs) and associated screening levels, and the "regulatory target" concentration (for lifetime exposure and risk evaluation) used for comparison too AMN measurements and modeled air concentrations, have been presented to DPR by DOW. Table 1 presents a comparison of screening level values currently recommended by DPR, versus those recommended by DOW. Detailed comments have been submitted to DPR. Further, an important consideration is the selection of an appropriate exposure metric (i.e., matching duration and time required for manifestation of the toxicological effect of interest), for comparison to alternative HECs and the resulting risk estimates (Margins of Exposure). In the case of the acute HEC recommended by DPR, while the values have been time-weighted to a 24 hour period based on Haber's Law (or Rule) (i.e., adjustment for concentration x time), the time to effect in the repeat dose study selected by DPR is 3 days (time and repeat dosing period required for statistically significant body weight decrement to be observed). Thus, the DPR acute screening level, should be compared to 72-hour time weighted average exposure values (air concentrations assumed to be inhaled by bystanders). Further, an alternative to the repeat dose study used by DPR for the acute screening level derivation, is reliance on a 4-hour inhalation toxicology study and related benchmark response (BMR) of 10% body weight gain decrement, which reflects EPA and other guidance for selection of a biologically significant response. Differences in subchronic and chronic screening levels recommended by DOW in comparison to DPR (see Table 1), relate to DOW's reliance on EPA's most	CDPR disagrees with this comment. Development of the new screening levels for 1,3-D, including information and justification of all data used to determine these levels, was clearly detailed in the 2015 1,3-D Risk Assessment document. The use of human equivalent concentrations and uncertainty factors in establishing CDPR screening levels is consistent with previous CDPR study publications. CDPR developed health screening levels based on a preliminary assessment of possible health effects, which are used as triggers for CDPR to conduct a more detailed evaluation. CDPR, as part of the AMN procedures, collects 24-h air samples, which are compared with established acute screening levels or regulatory targets for individual pesticides. If any 24-h air concentration exceeds its acute target, CDPR conducts a detailed evaluation to determine if any unacceptable exposure may have occurred and if any additional restrictions on the use of the pesticide are needed. Comparing a measured 24-hr air concentration to the established acute regulatory target (8-hr, 24-h, or 72-h) as a trigger for further evaluation in the case of any exceedances is consistent with previous CDPR protocols and studies. No changes to the report are deemed necessary.	No changes to report are needed.

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	recent guidance for derivation of inhalation reference concentrations (screening levels), and the use of a refined uncertainty factor that is consistent with that derived by the U.S. Environmental Protection Agency (EPA). <Table>		
44.	**From DAS:** **Evaluation of 1,3-D Screening-Levels and Regulatory Targets** In the case of the acute screening level for 1,3-D, it is important to provide context to the point of departure, i.e., decrements in body weight gain. Body weight gain decrements have been used by multiple entities (DPR, USEPA) as a point of departure and the basis for establishing permissible exposure limits to humans. However, upon closer examination of 1,3-D inhalation toxicology studies and the decrements in body weight observed in all of these studies, coupled with consideration of some key physiological and toxicokinetic measurements/indicators, it is clear that body weight, particularly after repeat dosing, e.g., 3 days, is not an optimal point of departure for use in acute (24 hrs or less) Human Equivalent Concentration (HEC) derivation. In fact, it appears body weight decrements resulting from inhalation exposure to 1,3-D are a secondary effect, resulting from primary effects on respiration rate, GSH depletion, and systemic over-exposure to the test material. A recent toxicokinetic study4 supports this reasoned conclusion and raises significant questions about inhalation studies that are conducted above the KMD and their use in risk assessment. As CA DPR considers risk mitigation measures for acute exposures to 1,3-D, it is imperative that a balanced discussion and reasoned conclusion, supported by the available science, be conducted. If a repeat dose study is used	CDPR disagrees with this comment. Development of the new screening levels for 1,3-D, including information and justification of all data used to determine these levels, was clearly detailed in the 2015 1,3-D Risk Assessment document. The use of human equivalent concentrations and uncertainty factors in establishing CDPR screening levels is consistent with previous CDPR study publications. No changes to the report are deemed necessary.	No changes to report are needed.

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	for the acute HEC (normalized to 24 hr exposure duration, i.e., per day exposure basis), as stated previously, it is imperative that it is compared to an appropriate exposure metric that matches the time to effects (3 days, or three 24 hr periods).		
45.	**From DAS:** **1,3-D and Effects on Portal of Entry Tissues** Dichloropropene compounds, in general, have sensory irritation properties and this translates into portal of entry (in this case inhalation) effects involving the respiratory tract, which are considered a primary toxicological/irritancy response in animals and humans. Body weight decrement is typically a secondary effect from oral and inhalation exposures often resulting from an apical injury, stress, or other treatment-related factors that may directly affect food consumption or respirability (e.g., breathing rate). In fact, for 1,3-D, EPA IRIS program/office used nasal histopathology for derivation of the BMD and while this was derived from a repeated-dose and longer-term study, it shows the focus on portal of entry effects, which are a primary effect of exposure to 1,3-D. Consideration of body weight as the sentinel and appropriate endpoint of concern for establishing permissible exposure levels to humans, particularly from body weight decrements after 3 days of exposure (as used by CA DPR from Stott et al., 1984) is a toxicologically "blunt" and potentially irrelevant (relative to the toxicological profile and characteristics of 1,3-D) endpoint. If body weight is going to be used as a point of departure, particularly for acute exposures, available data for 4-hr exposures should be used, notably when body weight changes were reported. Finally, use of an acute exposure scenario such as 4-hours is far more appropriate when extrapolating to the human situation for protection of human health following acute exposures of this time duration. Humans are not continuously exposed to acute levels of 1,3-D for 72 hours and	CDPR disagrees with this comment. Development of the new screening levels for 1,3-D, including information and justification of all data used to determine these levels, was clearly detailed in the 2015 1,3-D Risk Assessment document. The use of human equivalent concentrations and uncertainty factors in establishing CDPR screening levels is consistent with previous CDPR study publications. No changes to the report are deemed necessary	No changes to report are needed.

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	therefore, there is no scientific basis or rationale to use body weight decrements at 3 days for extrapolating to the acute (24 hrs or less) exposure scenario for humans.		
46.	**From DAS:** **Review of Selected Inhalation Studies and Effects on Body Weight** Stott et al (1984) conducted a 13-week inhalation study in rats and mice and at the two highest concentrations (90 and 150 ppm) for both species, statistical decrements in body weight were recorded. In rats, the decrements for both sexes began on day 3 (first measurement) and continued for the duration of the study, while in male and female mice, statistically significant differences were not recorded at 90 ppm until day 59 and 45, respectively, and at day 15 (males) and day 3 and 17 (females) for animals exposed to 150 ppm. In interpreting these effects for rats, Stott et al (1984) concluded that "As no histologically observable changes were noted in these tissues, the organ weight differences were not interpreted as being indicative of a specific target organ effect; but rather, represented an indirect, nonspecific result of TELONE II vapor exposure in these rats." For mice, Stott et al (2014 concluded that "The absence of any observable histological alterations in any of these organs indicated that the organ weight differences were a nonspecific result of exposure to TELONE II vapors (e.g.t stress-induced atrophy of lymphoid elements)." For both species, there is a clear threshold for concentration-dependent effects on body weight gain and for both, high concentrations of 1,3-D were required to elicit/manifest a decrement in weight gain. Additionally, it would appear that the absence of any histologically relevant changes in those organs/tissues evaluated support the interpretation that decrements in body weight gain are a result of non-specific secondary consequences to experimental stress or reduction in respiratory minute volume (discussed	CDPR disagrees with this comment. Development of the new screening levels for 1,3-D, including information and justification of all data used to determine these levels, was clearly detailed in the 2015 1,3-D Risk Assessment document. The use of human equivalent concentrations and uncertainty factors in establishing CDPR screening levels is consistent with previous CDPR study publications. No changes to the report are deemed necessary.	No changes to report are needed.

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	below), both of which could result in reduction in food consumption and hence declines in body weight gain. In the end, these results are consistent with exposure to excessive concentrations of 1,3-D and not the result of treatment-related target organ specificity and toxicity. A review of six different study types, as noted by CA DPR in their 2015 RCD for 1,3-D (Table IV), reveals a generally similar pattern in that body weight decrements, while recorded at various days (and again, multiple study types were involved), are concentration-dependent, but clearly threshold-related. The studies ranged from a genotoxicity study to subchronic inhalation studies to 2-yr bioassays, and while we have not reviewed these studies for determination of the critical point of departure, it is likely that body weight decrements were not found to be the most sensitive driver in all cases for establishment of references values for permissible exposures to humans. In summary, a review of multiple studies shows body weight decrements to be a common occurrence resulting from repeated exposure to 1,3-D, a phenomenon which is concentration-dependent and for which a clear threshold exists. Table 2 presents Benchmark Concentrations (BMC10 for body weight decrement associated with a 10% response rate) and BMCL10 (lower confidence limit) based on body weight decrement for various 1,3-D repeat dose studies. In comparison, the BMCL10 derived by Dow Agrosciences for the Cracknell et al. (1987) 4-hour inhalation exposure study (1,3-D at concentrations 0, 351, 572, 585, or 665 ppm) is 42 ppm. Moreover, the effects consistently resulted from exposure to high concentrations of 1,3-D, and certainly for animals from the repeat dose study conducted by Stott et al (1984), appear to be secondary effects owing to other experimental factors (e.g., stress, reduction in respiratory minute volume). If as we believe, these effects are		

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	secondary to other experimental factors, then it is important to probe further for biological/physiological evidence as to why exposure to high concentrations of 1,3-D results in overall body weight declines, which is discussed next. <Table 2>		
47.	**From DAS:** **Drivers Behind Body Weight Decrements** Several biological changes occur in animals upon repeated inhalation exposure to 1,3-D. These effects are physiological (respiration) as well as metabolic (glutathione depletion). Either or both effects could result in stress to rats or mice exposed to 1,3-D via inhalation. Changes in the respiratory patterns of rats or mice have been observed following 1,3-D exposures. Stott et al. report 26-47% decreases in respiratory minute volume (RMV) in rats acutely exposed for 3 hr to 1,3D concentrations of 300 and 900 ppm (Stott and Kastl, 1986). Hotchkiss et al. also found a decrease in respiration of rats acutely exposed to 1,3-D for 6 hr, with 21 and 52% reductions in RMV at 60 and 150 ppm vs. 2.5 ppm (Hotchkiss et al., 2015). These up to two-fold decreases in total inhalation would impact normal physiology and as a result, food consumption and body weight. The metabolic fate of 1,3-D involves conjugation with glutathione (GSH) for all of the reported pathways observed in the rat and mouse (Bartels et al., 2004). These observations are consistent with the measured depletion of lung GSH levels upon repeated exposures, with decreases of ~40-50% at 1,3-D concentrations of 60 and 150 ppm (Stott et al., 2001). Depletion of GSH in the portal-of-entry lung tissue is known to result in oxidative stress (Deneke et al., 1985; Rahman and MacNee, 2000) which could impact body weight gains (i.e., resulting in body weight decrements).	CDPR disagrees with this comment. Development of the new screening levels for 1,3-D, including information and justification of all data used to determine these levels, was clearly detailed in the 2015 1,3-D Risk Assessment document. The use of human equivalent concentrations and uncertainty factors in establishing CDPR screening levels is consistent with previous CDPR study publications. No changes to the report are deemed necessary.	No changes to report are needed.

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48.	**From DAS:** **Toxicokinetic KMD** The metabolic clearance of inhaled 1,3-D has been shown be a saturable process in the rat and mouse. Stott and Kastl (1986) found that 1,3-D blood levels became supralinear at or above 300 ppm (3 hr acute exposure). Similarly, blood levels of 1,3-D were shown to be supralinear in mice at or above 30 ppm (6 hr acute exposure) (Hackett, 2018). This nonlinearity in systemic exposure is consistent with test materialbased GSH depletion (discussed above), and correlates with increases in 1,3-D blood levels following lung GSH depletion via diethylmaleate pretreatment in rats (Yang, 1989). Beyond saturation of metabolic clearance, the ratio of cis/trans 1,3-D isomers in mouse blood also changes substantially from ~0.13 to ~0.20 between the exposure concentrations of 40 and 60 ppm. These data indicate a substantial shift in one or more processes involved in metabolism of these two isomers at higher 1,3-D exposure levels. Several regulatory guidance documents describe a KMD as a dose level or exposure concentration at which systemic exposures become non-dose proportional, due to saturation of one or more pharmacokinetic or metabolic processes (i.e., absorption, metabolism) (OECD, 2014; NRC, 2007). For example, as per OECD Guidance document 116: "Although top dose selection based on identification of inflection points in toxicokinetic nonlinearity may result in study designs that fail to identify target organ or body weight effects, it must be appreciated that metabolic saturation in fact represents an equivalent indicator of biological stress. In this case, the stress is evidenced by appearance of non-linear toxicokinetics rather than appearance of histological damage, adverse changes in	CDPR disagrees with this comment. Development of the new screening levels for 1,3-D, including information and justification of all data used to determine these levels, was clearly detailed in the 2015 1,3-D Risk Assessment document. The use of human equivalent concentrations and uncertainty factors in establishing CDPR screening levels is consistent with previous CDPR study publications. No changes to the report are deemed necessary.	No changes to report are needed.

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	clinical chemistry, haematology parameters or decrease in body weight gain." Based on this rationale, biological effects such as body weight gain decrements, seen only at or above the KMD, would be considered irrelevant for human health risk assessments.		
49.	**From DAS:** **Discussion and Recommendations** Analysis of the scientific data presented above indicates that there is strong evidence that the body weight decrements that are often seen in toxicity studies in animals exposed to 1,3-D are not a direct result of treatment-related exposure (i.e., primary or apical effect), but rather an indirect effect resulting from key physiological and metabolic processes. This is supported by evidence that 1,3-D's primary effect following inhalation is on portal-of-entry effects (used by EPA's IRIS program for BMD calculations) and consistent evidence from numerous studies indicating that body weight decrements are a threshold-related phenomenon with decrements only occurring at higher doses/concentrations, ones at which systemic exposures become non-dose proportional owing to saturation of pharmacokinetic or metabolic processes. In fact, as discussed above, there is solid evidence that the higher concentrations associated with body weight decrements were associated with (a) reduced respiration which directly has relevance for reduced food consumption and body weight gain; (b) GSH depletion which in turn can be associated with oxidative stress and body weight decrements; and (c) test concentrations which exceeded the KMD for 1,3-D and therefore which are not relevant for human risk assessment. Body weight decrements resulting from high exposures to 1,3-D should not be used as the primary basis for HEC derivation and subsequent risk mitigation as it has clearly been shown that this effect is secondary to	CDPR disagrees with this comment. Development of the new screening levels for 1,3-D, including information and justification of all data used to determine these levels, was clearly detailed in the 2015 1,3-D Risk Assessment document. The use of human equivalent concentrations and uncertainty factors in establishing CDPR screening levels is consistent with previous CDPR study publications. No changes to the report are deemed necessary.	No changes to report are needed.

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	overexposure which has direct effects on physiological parameters such as respiration rate and resultant reduced body weight gain. If CDPR decides to continue to use body weight decrease from the repeated exposure studies to derive an acute endpoint, several considerations should be recognized: 1) Body weight was evaluated following acute exposure in the Cracknell et al (1987) study, and the use of repeated exposure on the same endpoint and disregarding the existing acute exposure studies results in a more conservative acute screening level value. 2) DPR used the benchmark dose approach to generate BMCLs and used the 1 standard deviation (SD) as benchmark response (BMR). This is a default assumption / selection according to the Benchmark Dose Technical Guidance Document (External Review Draft): "for continuous data if no known biological significance, a change of 1SD may be applied as a default BMR." However, with respect to body weight change and to what degree or magnitude it is considered adverse, two guidance documents specifically point out that 10% decrease in body weight is generally recognized as biologically significant (USEPA 2003, and USEPA 2000). Consistent with this guidance, EPA's tier I risk assessment, Integrated Risk Information System (IRIS), and tier II risk assessment, Provisional Peer-viewed Toxicity Values (PPRTV) both utilize 10% body weight decrease as BMR. 3) Body weight decrease used to derive an acute RfC is of minimal adversity when such effect is not accompanied with other toxicological correlates or toxicity indications from other endpoints including clinical chemistry, hematology, neurotoxicity, and histopathology in adult animals, or fetal and offspring effects in pre-, post-neonatal, or young animals. Thus, based on these considerations, the reduced uncertainty factors may be		

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	warranted. Solecki et al (2005) in their publication on the establishment of acute reference doses for pesticides, specifically noted that "A reduced factor [safety] might be appropriate if the endpoint used to derive an ARfD is of minimal adversity and the critical NOAEL is from a repeat dose study (e.g., reduced food consumption and body weight gain (i.e., observed in the first days) or increased organ weight with minimal pathological change. When considering body weight changes considerations need to be given to potential problems of palatability of the feed." This perspective is directly relevant to the case here in which inhalation of high concentrations of 1,3-D are affecting respiration and hence reduced food consumption. In conclusion, there is little support for the utilization of body weight decrement as an endpoint for establishing an acute HEC. If DPR chooses to continue this practice, then DOW strongly recommends comparing the selected time domain of the acute HEC to a corresponding exposure period (i.e., 4 hr HEC compared to a 4 hr TWA inhalation exposure, or a 3-day HEC compared to a 3-day TWA inhalation exposure). For purposes of "acute" exposure, a more defensible and appropriate exposure period is 4hours (or 24-hours), and not 3 days. The latter is clearly not acute and would be better described as short-term. Finally, there is sound scientific evidence that body weight decrements are secondary effects owing to a variety of 1,3-D-specific portal of entry effects, and related effects on physiology, pharmacokinetics and metabolism, at sufficient doses (i.e. at and above the KMD).		

Number	Comment	Response	Action
50.	**From CARB's Northern Laboratory Branch, CARB-NLB:** **Page 24** The section states that CARB's MDL for 1,3-Dichloropropene is 10-fold higher than CDFA. The value referenced as CARB's Method Detection Limit (MDL) is actually a static reporting limit (RL), which has been used as the reporting convention for VOCs reported by CARB throughout the program. An MDL verification study is performed annually to verify that the reporting limit can be supported, and is generally much lower than the RL.	The text was revised to address this comment.	Changes to report were made.
51.	**From CARB-NLB:** **Page 97** Last paragraph has a typo stating "1,3-Dichloropicrin", not "1,3-Dichloropropene".	Comment acknowledged by CDPR. The typo has been corrected.	Changes to report were made.
52.	**From CARB-NLB:** **Page 105, VOC Analysis** This paragraph is a general description and only provides limited detail on MLD 058. It states that CARB is using a method similar to TO-15, which is true, but MLD058 does incorporate modifications to TO-15. Possibly the procedure should be summarized more fully, or even attached, rather than reference a 2010 CDFA report.	Comment acknowledged by the Department. No response required.	No changes to report are needed.
53.	**From CARB-NLB:** **Page 106, Method Calibration** This section appears to focus on calibration procedures for the solid sorbent methods, "samples containing know amounts of analyte dissolved in a solvent", and does not describe MLD 058 use gas/air standards for calibration.	Comment acknowledged by the Department. Report was edited to point out this fact.	Changes to report were made.
54.	**From CARB-NLB:** **Page 106, MDL**	Comment acknowledged by the Department. Report was edited to address this comment.	Changes to report were made.

Number	Comment	Response	Action
	This section notes MDL value of 0.1 ppb for both 1,3-D and Methyl Bromide. This value reflects the RL for 1,3-D only, and does not reflect the MDL or RL for Methyl Bromide, which has an RL of 0.03 ppb. The MDL values are verified annually (See comment #1).		
55.	**From CARB-NLB:** **Page 107, Table of VOC Analytes** Incorrectly defines the CARB Reporting Limit (RL) as an MDL (see comment #1).	Comment acknowledged by CDPR. Report was edited to address this comment.	Changes to report were made.
56.	**From CARB-NLB:** **Page 108, Method Validation** This section provides limited detail and does not accurately describe validation for MLD 058. Multi-level spike validation was not performed for MLD 058, but extensive method validation was performed. This section should include further clarification on which analyses it is describing.	Comment acknowledged by CDPR. Report was edited to point out this fact.	Changes to report were made.
57.	**From CARB-NLB:** **Page 108, General Continuing QC** This section states a hold time (HT) of 28 days, but for MLD 058 includes a 30 days HT. Additionally, the section only discussed extraction methods and associated extraction QC and does not incorporate QC utilized for MLD 058.	Comment acknowledged by CDPR. The description of the hold time (HT) has been corrected.	Changes to report were made.
58.	**From CARB-NLB:** **Page 108, QC Results** The section should clarify which analyses it describes, or be expanded to describe MLD058. MLD 058 does not do matrix spikes or field/trip blanks. CARB assumes "lab spikes" are referring to lab control standards, but there are also more QC that are performed for MLD058 and could be documented in this section.	Comment acknowledged by CDPR. Report was edited to point out this fact.	Changes to report were made.

Number	Comment	Response	Action
59.	**From CARB-NLB:** **Page 109, Table1-6** No spikes were performed for 1,3-DCP or other VOCs in 2019, and CARB is not sure where the value of 94% listed in the table is derived from.	Comment acknowledged by CDPR.	No changes to report are needed.
60.	**From CARB-NLB:** **Page 111, "Volatile Organic Compounds"** It is mentioned that the canisters used are SilcoCans. CARB has provided CDPR with three different types of canisters throughout the study: Aerosphere, Entech Silonite, and Restek SilcoCans. It should be clarified if the SilcoCans are used exclusively for CDFA analyses?	Comment acknowledged by CDPR. The description of air canisters has changed from the brand name "SilcoCans" to "air sample canisters."	Changes to report were made.
61.	**From CARB-NLB:** **Page 113, QC Methods** This section should specify that it describes the processes for sorbent media processes only, not VOC analyses.	Comment acknowledged by CDPR. Report was updated to reflect suggestion.	No changes to report are needed.
62.	**From CARB-NLB:** **114, First paragraph** Indicates canister spikes were scheduled monthly at Watsonville, however, no VOC spikes were performed in 2019 for CARB analyses. It should be clarified if these spikes were prepared and analyzed by CDFA?	Comment acknowledged by CDPR. The reference to VOC spikes has been removed.	Changes to report were made.