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PERSONNEL

DPR personnel assigned to this project include:

Report Author: Yvan Delgado, PhD

Field Coordinator: Kelly Heal

Data Archivists: Sara Mohammadi and Hamed Madaeni

Project Supervisor: Aniela Burant, PhD

This project is under the overall management of Maziar Kandelous, Environmental Program Manager, (916)-445-0981, Maziar.kandelous@cdpr.ca.gov

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EXECUTIVE SUMMARY

The California Department of Pesticide Regulation's (DPR) Air Monitoring Network (AMN) is comprised of four air monitoring stations located in the communities of Oxnard, Shafter, Santa Maria, and Watsonville. AMN monitoring stations provide DPR with data on pesticides in ambient air that allows for the long-term assessment of potential pesticide exposures in agricultural communities with high pesticide use. The AMN monitors for 40 pesticides (35 pesticides and 5 breakdown products) on a weekly basis with higher-risk pesticides prioritized for inclusion into the study based on use, likelihood to enter the air, and toxicity. The AMN data, as part of DPR's continuous evaluation* of pesticide risks, allow DPR to determine if pesticide product label restrictions and California's required mitigation measures are effective in addressing risks to human health and the environment.

Out of the 40 pesticides and breakdown products monitored, eight pesticides were detected (i.e., found at quantifiable concentrations) in ambient air in 2023, including four fumigants: 1,3-dichloropropene (1,3-D), chloropicrin, methyl bromide, and methyl isothiocyanate (MITC), and four non-fumigants: captan, DDVP, malathion, and pendimethalin. MITC and 1,3-D were detected at all four sites. Chloropicrin and methyl bromide were detected at three sites. Captan and DDVP were detected at one, malathion at two, and pendimethalin at three sites. No pesticide concentration exceeded its acute, sub-chronic, or chronic screening or regulatory level (described in the section below) in 2023, meaning that pesticide concentrations found in the air are unlikely to be harmful to human health.

The highest magnitude of pesticide concentrations relative to a screening level was 93% for chloropicrin sub-chronic exposures in Oxnard. Chloropicrin is a soil fumigant that is managed by DPR and County Agricultural Commissioners (CACs) as a restricted material (i.e., chloropicrin use is limited to licensed and trained individuals and then only at times and places approved by CACs). Local permit conditions have been in place statewide since 2015 to mitigate hazards of any offsite movement of chloropicrin to protect bystanders and residents from acute exposures. After chloropicrin air concentrations exceeded the 13-week sub-chronic screening level in 2021, DPR began exploring the factors that contributed to the elevated detections. The 2023 maximum 13-week average concentration of chloropicrin that is below but close to the screening level prompted DPR to conduct a more detailed evaluation of pesticide use data, historical weather patterns, intensive modeling, and more intensive monitoring to better understand potential sources and exposures in the area. DPR's reevaluation of chloropicrin and the California Council on Science and Technology's Fumigant Alternatives Study will be used to supplement DPR's AMN assessment of the fumigant.

About the Air Monitoring Network

DPR evaluates potential pesticide risks by comparing pesticide air concentrations with health thresholds called screening levels and regulatory targets established by DPR scientists. If pesticide concentrations in ambient air exceed these thresholds, DPR takes steps to investigate the causes, and if warranted, develop and implement mitigation measures to reduce exposures to protect human health. In determining screening levels and regulatory targets, DPR evaluates the potential for health impacts related to short-term (acute, 24-hour), medium-term (sub-chronic, 4 or 13 weeks), and long-term (chronic, 1-year) exposures. Examples of symptoms from short-term exposure to high concentrations of pesticides include eye, nose, and throat irritation, nausea, stomach aches, vomiting, skin irritation, blurred vision, headaches, and dizziness. Long-term exposures could potentially lead to birth defects, nervous system problems, and reproductive harm for some pesticides if exposure is persistent over many months or years. Medium-term exposure is tracked to provide an early indication of areas where there may be longer-term (chronic) exposure and the need for additional studies. For some pesticides, DPR also has a threshold to measure against exposure that could lead to lifetime cancer risk.

DPR screening levels incorporate current scientific research, pesticide-specific evaluation, and rigorous monitoring and modeling studies. The levels are based on reference concentrations (i.e., the air concentrations at which no adverse effects are expected to occur in humans with an additional conservative factor included to account for uncertainties). Screening levels are set well below the level at which health effects are expected to occur. Four of the pesticides monitored by the AMN have established regulatory targets that are similar to screening levels but are associated with regulatory actions. Exposures at concentrations below a screening or regulatory level indicate that adverse health effects are unlikely. Concentrations above these levels may lead to adjustments of existing pesticide use restrictions to reduce exposures.

* DPR's Continuous Evaluation (augmented by AB 2113 in 2024) is a process in which DPR considers new information about pesticide risks and impacts on human health and the environment and uses this information to assess the most current potential risks from pesticide use and to inform the effectiveness of existing mitigation measures or the need to develop and implement additional restrictions.

INTRODUCTION

Background

In February 2011, as part of the California Department of Pesticide Regulation's (DPR) mandate for continuous evaluation of currently registered pesticides, DPR implemented its first multi-year statewide Air Monitoring Network (AMN) to measure pesticide concentrations in ambient air, hereafter referred to as air, in various California agricultural communities. The goal is to provide data that assist 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:

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

In 2020, DPR reevaluated reported California pesticide use data to identify four monitoring sites to continue with AMN monitoring operation in 2021 and beyond (CDPR 2020). DPR evaluated 1,228 communities and ranked them based on pesticide use (both local and regional), demographic data, and availability of other exposure and health data. 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. Complete details on community selection can be found in DPR's Air Monitoring Network webpage.

Communities Monitored

In 2023, DPR monitored the air in the vicinities of four communities across California: Oxnard, Santa Maria, Shafter, and Watsonville (Table 1).

1. Oxnard is in Ventura County. The monitoring station is located at Rio Mesa High School and is operated by the Ventura County Commissioner's office (V-CAC) (Appendix A).
2. Santa Maria in Santa Barbara County. The monitoring station is located at Bonita Elementary School and is operated by the Santa Barbara County Commissioner's office (SB-CAC) (Appendix B).
3. Shafter is in Kern County. The monitoring station is located adjacent to Sequoia Elementary School and is operated by DPR (Appendix C).
4. Watsonville is on the southern edge of Santa Cruz County bordering with Monterey County. AMN's monitoring station is located at Ohlone Elementary School and is operated by DPR (Appendix D).

Table 1. List of communities in the Air Monitoring Network in 2023.

Community	Latitude & Longitude	County	Sampling since	Agency responsible
Oxnard	34.255139, -119.144639	Ventura	10/24/2011	V-CAC
Santa Maria	34.957718, -120.509308	Santa Barbara	08/11/2010	SB-CAC
Shafter	35.516472, -119.268785	Kern	02/09/2011	DPR
Watsonville	36.870118, -121.760891	Santa Cruz/ Monterey	11/05/2011	DPR

Pesticides Monitored

DPR, with the assistance of staff from the Santa Barbara and Ventura County Agricultural Commissioners' offices, monitored a total of 40 chemicals, 35 pesticides and 5 breakdown products. Chemicals were selected based primarily on potential health risk (CDPR 2013). Four analytical methods were used to analyze the collected air samples (Appendices E-F):

1. Volatile Organic Compounds (VOC) for 1,3-dichloropropene and methyl bromide: samples taken using SUMMA air-canisters.
2. Methyl Isothiocyanate (MITC): samples taken using coconut-charcoal glass sorbent tubes.
3. Chloropicrin: samples taken using glass sorbent tubes with XAD-4 resin.
4. Multi-Pesticide Residue for 36 Chemicals: samples taken using Teflon cartridges with XAD-4 resin.

RESULTS

This report is the 13th volume of this study and contains the results from January 1 to December 31, 2023. Tables 2-7 show the analytical results for the pesticides monitored in 2023, and the results for each individual community are available below in Appendices A-D.

Pesticide Detections

A total of 8,085 analyses (samples multiplied by the number of chemicals analyzed in each sample) were conducted on the air samples collected from the four AMN sites operating in 2023. Of these, 4.7 % (381) resulted in detectable concentrations, which included both quantifiable and trace detections. Quantifiable detections refer to concentrations above the limit of quantitation (LOQ) for the respective pesticide, while Trace detections are measured concentrations above the method detection limit (MDL) but below the LOQ. Samples that resulted in a quantifiable detection accounted for 2.1 % (169) of all analyses conducted.

Of the 40 pesticides and breakdown products monitored in 2023:

- 8 chemicals were detected at Quantifiable levels: 1,3-dichloropropene, captan, chloropicrin, DDVP, MITC, malathion, methyl bromide, and pendimethalin.
- 11 chemicals were detected only at Trace levels: cypermethrin, dacthal, diazinon, EPTC, malathion oa, norflurazon, oxyfluorfen, permethrin, phosmet, propargite, and trifluralin.
- 21 chemicals were not detected: acephate, bensulide, chlorothalonil, chlorpyrifos, chlorpyrifos oa, DEF, diazinon oa, dimethoate, dimethoate oa, diuron, endosulfan, endosulfan sulfate, fenpyroximate, iprodione, methidathion, methomyl, metolachlor (s-metolachlor), oryzalin, oxydemeton methyl, simazine, and pp-dicofol.

Table 2 lists the number of detections by type for each pesticide and pesticide breakdown product across all sites in 2023. The chemicals with the highest number of quantifiable detections were MITC (22.6%), 1,3-dichloropropene (18.1%), and chloropicrin (18%).

Table 2. Number and percentage of positive samples per chemical in all AMN sites in 2023.

Chemical	Number of valid samples	Quantifiable and Trace detections	Quantifiable detections	Quantifiable and Trace detections %	Quantifiable detections %
1,3-dichloropropene	204	44	37	21.6 %	18.1 %
Acephate	202	0	0	0 %	0 %
Bensulide	202	0	0	0 %	0 %
Captan	202	13	2	6.4 %	1 %
Chloropicrin	206	57	37	27.7 %	18 %
Chlorothalonil	202	0	0	0 %	0 %
Chlorpyrifos	202	0	0	0 %	0 %
Chlorpyrifos oa	202	0	0	0 %	0 %
Cypermethrin	202	1	0	0.5 %	0 %

Chemical	Number of valid samples	Quantifiable and Trace detections	Quantifiable detections	Quantifiable and Trace detections %	Quantifiable detections %
DDVP	202	23	2	11.4 %	1 %
DEF	202	0	0	0 %	0 %
Dacthal	202	1	0	0.5 %	0 %
Diazinon	202	1	0	0.5 %	0 %
Diazinon oa	202	0	0	0 %	0 %
Dimethoate	202	0	0	0 %	0 %
Dimethoate oa	202	0	0	0 %	0 %
Diuron	202	0	0	0 %	0 %
EPTC	202	6	0	3 %	0 %
Endosulfan	202	0	0	0 %	0 %
Endosulfan Sulfate	202	0	0	0 %	0 %
Fenpyroximate	202	0	0	0 %	0 %
Iprodione	202	0	0	0 %	0 %
MITC	199	59	45	29.6 %	22.6 %
Malathion	202	31	8	15.3 %	4 %
Malathion oa	202	8	0	4 %	0 %
Methidathion	202	0	0	0 %	0 %
Methomyl	202	0	0	0 %	0 %
Methyl Bromide	204	63	17	30.9 %	8.3 %
Metolachlor	202	0	0	0 %	0 %
Norflurazon	202	1	0	0.5 %	0 %
Oryzalin	202	0	0	0 %	0 %
Oxydemeton Methyl	202	0	0	0 %	0 %
Oxyfluorfen	202	4	0	2 %	0 %
Pendimethalin	202	63	21	31.2 %	10.4 %
Permethrin	202	1	0	0.5 %	0 %
Phosmet	202	1	0	0.5 %	0 %
Propargite	202	1	0	0.5 %	0 %
Simazine	202	0	0	0 %	0 %

Chemical	Number of valid samples	Quantifiable and Trace detections	Quantifiable detections	Quantifiable and Trace detections %	Quantifiable detections %
Trifluralin	202	3	0	1.5 %	0 %
pp-dicofol	202	0	0	0 %	0 %
Total	8,085	381	169	4.7 %	2.1 %

Table 3 summarizes the total number of detections of the monitored chemicals by community in 2023. The percentage of quantifiable and trace detections for monitored chemicals was 2.2% in Santa Maria and Shafter, and 2% in Oxnard and Watsonville.

Table 3. Number and percentage of positive samples per location in 2023.

Community	Number of valid samples	Quantifiable and Trace detections	Quantifiable detections	Quantifiable and Trace detections %	Quantifiable detections %
Oxnard	1,969	96	39	4.9 %	2 %
Santa Maria	2,040	119	45	5.8 %	2.2 %
Shafter	2,076	98	45	4.7 %	2.2 %
Watsonville	2,000	68	40	3.4 %	2 %
Total	8,085	381	169	4.7 %	2.1 %

Table 4 summarizes the detections of the monitored chemicals as weekly sample sets. 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. A total of 207 sample sets were taken from all four communities and 163 (78.7%) sets contained at least one quantifiable or trace detection.

Table 4. Detections of monitored chemicals by location, as weekly sample sets in 2023.

Community	Number of sample sets	Sample sets with at least one detection	Sample sets with at least one detection %
Oxnard	52	47	90.4 %
Santa Maria	52	42	80.8 %
Shafter	52	44	84.6 %
Watsonville	51	30	58.8 %
Total	207	163	78.7 %

Pesticide Concentrations

Acute Exposure: Highest 24-hour concentrations among all sites

Table 5 lists the highest 24-hour concentrations at any site for the pesticides detected at a quantifiable concentration in 2023. None of the pesticides or breakdown products exceeded their respective acute (24- or 72-hour) screening levels (SL) or regulatory targets (RT) in 2023. The pesticides with the highest percentage of 24-hour air concentration compared to its acute screening level were 1,3-dichloropropene (9.2%), followed by chloropicrin (1.7%), and Captan (1.6%). All other compounds were 1% or less than their acute screening levels or regulatory targets during monitoring in 2023.

Table 5. Highest 24-hour air concentrations, acute screening levels, and percent of screening level of any pesticide detected at a quantifiable concentration in 2023.

Community	Chemical	Date	Highest 24-hour concentration	24-hour acute screening level	Percent of screening level
Shafter	1,3-dichloropropene	06/21/2023	5.1 ppb (22,966 ng/m^3)	55 ppb*‡ (250,000 ng/m^3)	9.2 %
Oxnard	Captan	05/01/2023	0.0025 ppb (30.4 ng/m^3)	0.15 ppb (1,844 ng/m^3)	1.6 %
Santa Maria	Chloropicrin	05/24/2023	1.2 ppb (8,137 ng/m^3)	73 ppb*† (491,000 ng/m^3)	1.7 %
Santa Maria	DDVP	08/10/2023	0.0071 ppb (64 ng/m^3)	1.2 ppb (11,000 ng/m^3)	0.58 %
Santa Maria	Malathion	09/17/2023	0.0023 ppb (31.2 ng/m^3)	8.3 ppb (112,500 ng/m^3)	0.028 %
Shafter	Methyl Bromide	04/17/2023	0.016 ppb (63.7 ng/m^3)	210 ppb* (820,000 ng/m^3)	0.008 %
Shafter	MITC	12/13/2023	2.3 ppb (6,806 ng/m^3)	220 ppb*† (660,000 ng/m^3)	1 %
Oxnard	Pendimethalin	09/21/2023	0.012 ppb (138 ng/m^3)	150 ppb (1,700,000 ng/m^3)	0.008 %

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

Sub-chronic Exposure: Highest rolling 4- or 13-week average concentrations among all sites

Sub-chronic (seasonal) concentrations for 1,3-dichloropropene and chloropicrin are averaged every 13 weeks (CDPR 2016b), while the sub-chronic concentrations of the remaining 38 active ingredients are averaged every 4 weeks. Table 6 lists the highest observed rolling 4- or 13-week average concentrations for any chemical detected at a quantifiable concentration among all sites in 2023. None of the pesticides or breakdown products exceeded their respective sub-chronic (4- or 13-week) screening levels (SL) or regulatory targets (RT) in 2023. Chloropicrin was the pesticide with the highest rolling 13-week average concentration with an estimated concentration of 0.33 ppb (95%). The pesticide with the highest 4-week average was MITC with an estimated concentration of 0.67 ppb (67% of its subchronic SL).

Table 6. Highest rolling average concentrations, sub-chronic screening levels, and percent of screening levels of any pesticide detected at a quantifiable concentration in 2023.

Community	Chemical	Date	Highest rolling average concentration	Sub-chronic screening level	Percent of screening level
Shafter	1,3-dichloropropene	06/27/2023	0.42 ppb (1,895 ng/m^3)	3 ppb (14,000 ng/m^3)	13.5 %
Oxnard	Captan	05/08/2023	0.0012 ppb (14.5 ng/m^3)	0.11 ppb (1,352 ng/m^3)	1.1 %
Oxnard	Chloropicrin	08/15/2023	0.33 ppb (2,195 ng/m^3)	0.35 ppb (2,300 ng/m^3)	95.4 %
Santa Maria	DDVP	08/24/2023	0.0025 ppb (22.9 ng/m^3)	0.24 ppb (2,200 ng/m^3)	1 %
Santa Maria	Malathion	09/28/2023	0.0013 ppb (17.7 ng/m^3)	6 ppb (80,600 ng/m^3)	0.022 %
Shafter	Methyl Bromide	02/23/2023	0.012 ppb (45.1 ng/m^3)	5 ppb* (19,400 ng/m^3)	0.23 %
Shafter	MITC	12/28/2023	0.67 ppb (2,010 ng/m^3)	1 ppb (3,000 ng/m^3)	67 %
Oxnard	Pendimethalin	10/10/2023	0.0087 ppb (99.6 ng/m^3)	49 ppb (560,000 ng/m^3)	0.018 %

* This value is a regulatory target rather than a screening level.

Chronic Exposure: Highest 1-year average concentrations among all sites

Table 7 presents the highest observed annual average concentrations for each chemical detected at a quantifiable concentration in 2023 at any AMN site alongside its respective chronic SL. The highest annual average concentration relative to its chronic screening level was observed for MITC (68.1%), followed by chloropicrin (38.7%), and 1,3-dichloropropene (7.7%).

Table 7. Highest annual average air concentrations, chronic screening levels, and percent of screening level of any pesticide detected at a quantifiable concentration in 2023.

Community	Chemical	Overall average concentration	Chronic screening level	Percent of screening level
Shafter	1,3-dichloropropene	0.15 ppb (690 ng/m^3)	2 ppb (9,000 ng/m^3)	7.7 %
Oxnard	Captan	0.00038 ppb (4.9 ng/m^3)	0.037 ppb (455 ng/m^3)	1.1 %
Oxnard	Chloropicrin	0.1 ppb (696 ng/m^3)	0.27 ppb (1,800 ng/m^3)	38.7 %
Santa Maria	DDVP	0.00065 ppb (5.8 ng/m^3)	0.085 ppb (770 ng/m^3)	0.75 %
Santa Maria	Malathion	0.00036 ppb (5.1 ng/m^3)	0.6 ppb (8,100 ng/m^3)	0.063 %
Watsonville	Methyl Bromide	0.0051 ppb (19.9 ng/m^3)	1 ppb (3,900 ng/m^3)	0.51 %
Shafter	MITC	0.068 ppb (204 ng/m^3)	0.1 ppb (300 ng/m^3)	68.1 %
Oxnard	Pendimethalin	0.0009 ppb (11.1 ng/m^3)	49 ppb (560,000 ng/m^3)	0.002 %

Lifetime exposure: Cancer Risk Estimates

The AMN program monitors six pesticides that are designated as known or probable carcinogens by Proposition 65 or by US EPA's B2 list:

1. 1,3-dichloropropene
2. Chlorothalonil
3. DDVP
4. Diuron
5. Iprodione
6. Propargite

In 2023, 1,3-dichloropropene and DDVP were detected at quantifiable concentrations, hence their annual average concentrations and cancer risk estimates were calculated (Table 8 & 9). 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 time-weighted-average is used for the cancer risk estimates. Cancer risk is expressed as a probability for the occurrence of cancer, such as 1 in 100,000 or 10^{-5}. Risk in the range of 10^{-5} is generally considered to be at the limit of negligible. Cancer risk is estimated based on the following calculation:

$$\text{Cancer Risk} = \text{nBR} * \text{LAC} * \text{CPF}_{\text{H}}$$

where:

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

DPR uses the default respiratory rate (nBR) for an adult of 0.28 m^3kg/day (CDPR 2000), and LAC is the mean annual concentration of the pesticide for all available monitoring years. The CPF_H values for 1,3-dichloropropene (1,3-D) and DDVP which were detected in 2023 are as follows:

- 1,3-D: CPF_{H} = 0.014 $(\text{mg/kg/day})^{-1}$ (CDPR, 2015).
- DDVP: CPF_{H} = 0.350 $(\text{mg/kg/day})^{-1}$ (CDPR, 1996).

Tables 8 and 9 depict the historic average concentrations and cancer risk estimates for 1,3-D and DDVP. In 2016, DPR set the lifetime regulatory target for 1,3-D at 0.56 ppb (2,600 ng/m^3) (CDPR 2016).

Table 8. Cumulative average concentration, cancer risk (CR) estimate, CR target and percent of CR target for 1,3-dichloropropene at each sampling location as of 2023.

Community	1,3-D Concentration	Cancer Risk Estimate	Cancer Risk Target	Percent of Target
Oxnard	0.1 ppb (473 ng/m^3)	1.9e-06	1e-05	19 %
Santa Maria	0.11 ppb (507 ng/m^3)	2.0e-06	1e-05	20 %
Shafter	0.43 ppb (1966 ng/m^3)	7.7e-06	1e-05	77 %
Watsonville	0.087 ppb (395 ng/m^3)	1.5e-06	1e-05	16 %

Table 9. Cumulative average concentration, cancer risk estimate, cancer risk target and percent of cancer risk target for DDVP at each sampling location as of 2023.

Community	DDVP Concentration	Cancer Risk Estimate	Cancer Risk Target	Percent of Target
Oxnard	0.00016 ppb (1.47 ng/m^3)	1.4e-07	1e-05	1.4 %
Santa Maria	0.00052 ppb (4.62 ng/m^3)	4.5e-07	1e-05	4.5 %
Shafter	0.00013 ppb (1.18 ng/m^3)	1.2e-07	1e-05	1.2 %
Watsonville	0.00019 ppb (1.7 ng/m^3)	1.7e-07	1e-05	1.7 %

Organophosphates Cumulative Exposure

Cumulative exposures were calculated for pesticides classified as organophosphates, which are a class of chemical compounds that can cause adverse health effects on humans, such as the inhibition of cholinesterase, an enzyme in the nervous system. The 15 organophosphates included in the AMN monitoring are:

1. Acephate
2. Bensulide
3. Chlorpyrifos
4. Chlorpyrifos OA
5. DDVP
6. DEF
7. Diazinon
8. Diazinon OA
9. Dimethoate
10. Dimethoate OA
11. Malathion
12. Malathion OA
13. Methidathion
14. Oxydemeton methyl
15. Phosmet

The cumulative exposure was estimated using a 2-step procedure. First, we estimated a Hazard Quotient (HQ) for each organophosphate by dividing the detected air concentration by its screening level. Secondly, the organophosphate cumulative exposure is calculated using a Hazard Index (HI) approach where all organophosphates' HQs are added (Appendix G). A HI equal or greater than 1.0 suggests the need for further evaluation.

Table 10 summarizes the highest calculated HI for each community and time period during monitoring in 2023. 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 exceeded a value of 1.0 at any of the sampling locations in 2023. This indicates that even for the combined 15 organophosphate compounds, a summed screening level was not exceeded.

Table 10. Organophosphate cumulative exposure: acute, subchronic, and chronic hazard indices (HI) across all AMN sites in 2023.

Community	Acute HI	Sub-chronic HI	Chronic HI
Oxnard	0.06	0.03	0.03
Santa Maria	0.02	0.03	0.04
Shafter	0.02	0.02	0.03
Watsonville	0.02	0.03	0.03

SUMMARY

Forty chemicals were monitored weekly as part of the Air Monitoring Network in the communities of Oxnard, Shafter, Santa Maria, and Watsonville in 2023. Eight pesticides were detected at quantifiable concentrations, including four fumigants: 1,3-D, chloropicrin, methyl bromide, and MITC, and four non-fumigants: captan, DDVP, malathion, and pendimethalin. Of the eight pesticides detected at quantifiable concentrations, MITC and 1,3-D were detected across all four sampling locations, whereas chloropicrin and methyl bromide were detected at three sampling locations. Captan and DDVP were detected at one site, malathion at two sites, and pendimethalin at three sites. No chemical exceeded its acute, sub-chronic, or chronic screening level or regulatory target in 2023, meaning that pesticide concentrations found in the air are unlikely to be harmful to human health.

Chloropicrin was detected at 93% of the sub-chronic screening level at the sampling location in Oxnard. Chloropicrin is a soil fumigant that is managed by DPR and County Agricultural Commissioners (CACs) as a restricted material (i.e., chloropicrin use is limited to licensed and trained individuals and then only at times and places approved by CACs). Local permit conditions have been in place statewide since 2015 to mitigate hazards of any offsite movement of chloropicrin to protect bystanders and residents from acute exposures. The 2023 13-week average concentration of chloropicrin that is below but close to the screening level prompted DPR to conduct a more detailed evaluation of pesticide use data, historical weather patterns, intensive modeling, and more intensive monitoring to better understand potential sources and exposures in the area.

The highest Hazard Index (HI) calculated for any site at any exposure period was 0.06, indicating a low risk from organophosphate cumulative exposure. 1,3-D cancer risk estimates ranged from 19% in Oxnard to 77% in Shafter and cancer risk estimates for DDVP ranged from 1.2% in Shafter to 4.5% in Santa Maria. All the cancer risk estimates are based on 13 years of data, well below the 70-year average of data used to evaluate cancer risk exposures. In addition, DPR's new regulations to mitigate 1,3-D acute and lifetime exposures to non-occupational bystanders went into effect on January 1, 2024. DPR is working with OEHHA to mutually develop additional regulations to mitigate 1,3-D lifetime exposures to occupational bystanders.

APPENDIX A: OXNARD RESULTS

Oxnard

Oxnard is located in Ventura County and is 39.2 square miles in area. The average elevation is 52 feet and receives an average of 15.6 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 2020 census, the population of Oxnard was 202,000 of which 27% were under 18 years of age and 10% 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. 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 through a DPR contract with the Ventura County Agricultural Commissioner's (V-CAC) office. V-CAC staff follow strict standard operating procedures established by DPR's Air Program, ensuring that samples are collected, handled, and transported appropriately to maintain consistency and integrity of the samples. DPR Air Program staff provides annual training and continuous support to V-CAC for operation and monitoring at this sampling location.

Pesticide Detections

Table A–1 lists the number and percentage of analyses resulting in detections at the Oxnard AMN sampling site in 2023. The chemical with the highest number of quantifiable detections was chloropicrin (n=15, 28.8%), MITC (n=9, 18.4%), and pendimethalin (n=7, 14.3%).

Table A–1. Number and percentage of positive samples per chemical in Oxnard in 2023.

Chemical	Number of valid samples	Quantifiable and Trace detections	Quantifiable detections	Quantifiable and Trace detections %	Quantifiable detections %
1,3-dichloropropene	52	8	5	15.4 %	9.6 %
Acephate	49	0	0	0 %	0 %
Bensulide	49	0	0	0 %	0 %
Captan	49	12	2	24.5 %	4.1 %
Chloropicrin	52	23	15	44.2 %	28.8 %
Chlorothalonil	49	0	0	0 %	0 %
Chlorpyrifos	49	0	0	0 %	0 %
Chlorpyrifos oa	49	0	0	0 %	0 %
Cypermethrin	49	0	0	0 %	0 %
DDVP	49	2	0	4.1 %	0 %
DEF	49	0	0	0 %	0 %
Dacthal	49	0	0	0 %	0 %
Diazinon	49	1	0	2 %	0 %

Chemical	Number of valid samples	Quantifiable and Trace detections	Quantifiable detections	Quantifiable and Trace detections %	Quantifiable detections %
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 %
EPTC	49	0	0	0 %	0 %
Endosulfan	49	0	0	0 %	0 %
Endosulfan Sulfate	49	0	0	0 %	0 %
Fenpyroximate	49	0	0	0 %	0 %
Iprodione	49	0	0	0 %	0 %
MITC	49	15	9	30.6 %	18.4 %
Malathion	49	2	1	4.1 %	2 %
Malathion oa	49	1	0	2 %	0 %
Methidathion	49	0	0	0 %	0 %
Methomyl	49	0	0	0 %	0 %
Methyl Bromide	52	15	0	28.8 %	0 %
Metolachlor	49	0	0	0 %	0 %
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 %
Pendimethalin	49	16	7	32.7 %	14.3 %
Permethrin	49	0	0	0 %	0 %
Phosmet	49	0	0	0 %	0 %
Propargite	49	0	0	0 %	0 %
Simazine	49	0	0	0 %	0 %
Trifluralin	49	0	0	0 %	0 %
pp-dicofol	49	0	0	0 %	0 %
Total	1,969	96	39	4.9 %	2 %

Pesticide Concentrations

Acute (24-hour) Concentrations

Table A–2 shows the highest 24-hour concentrations observed for all chemicals monitored at the Oxnard AMN sampling site in 2023. The highest concentration relative to its screening level was that of 1,3-dichloropropene at 1.8%, followed by Captan at 1.6% and chloropicrin at 1.5%. The remaining chemicals for which there were quantifiable detections at Oxnard in 2023 were detected at less than 1% of their screening levels.

Table A–2. Highest 24-hour air concentrations, acute screening levels, and percent of the acute screening level for all chemicals monitored in Oxnard in 2023.

Chemical	Date	Highest 24-hour concentration	24-hour acute screening level	Percent of screening level
1,3-dichloropropene	07/31/2023	1 ppb (4,511 ng/m^3)	55 ppb*‡ (250,000 ng/m^3)	1.8 %
Captan	05/01/2023	0.0025 ppb (30.4 ng/m^3)	0.15 ppb (1,844 ng/m^3)	1.6 %
Chloropicrin	07/31/2023	1.1 ppb (7,239 ng/m^3)	73 ppb*† (491,000 ng/m^3)	1.5 %
Malathion	06/06/2023	0.0016 ppb (22.1 ng/m^3)	8.3 ppb (112,500 ng/m^3)	0.02 %
MITC	04/03/2023	0.086 ppb (258 ng/m^3)	220 ppb*† (660,000 ng/m^3)	0.039 %
Pendimethalin	09/21/2023	0.012 ppb (138 ng/m^3)	150 ppb (1,700,000 ng/m^3)	0.008 %
Acephate		ND	1.6 ppb (12,000 ng/m^3)	
Bensulide		ND	15.9 ppb (259,000 ng/m^3)	
Chlorothalonil		ND	3.1 ppb (34,000 ng/m^3)	
Chlorpyrifos		ND	0.084 ppb (1,200 ng/m^3)	
Chlorpyrifos oa		ND	0.088 ppb (1,200 ng/m^3)	
Cypermethrin		ND	6.6 ppb (113,000 ng/m^3)	

Chemical	Date	Highest 24-hour concentration	24-hour acute screening level	Percent of screening level
Dacthal		ND	1732 ppb (23,500,000 ng/m^3)	
DDVP		Trace	1.2 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		ND	0.011 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	0.2 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)	
Fenpyroximate		ND	0.87 ppb (15,000 ng/m^3)	
Iprodione		ND	23.2 ppb (313,000 ng/m^3)	
Malathion oa		Trace	8.8 ppb (112,500 ng/m^3)	
Methidathion		ND	0.25 ppb (3,100 ng/m^3)	
Methomyl		ND	4.8 ppb (32,000 ng/m^3)	

Chemical	Date	Highest 24-hour concentration	24-hour acute screening level	Percent of screening level
Methyl Bromide		Trace	210 ppb (820,000 ng/m^3)	
Metolachlor (S-Metolachlor)		ND	7.3 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	3.7 ppb (39,200 ng/m^3)	
Oxyfluorfen		Trace	34.5 ppb (510,000 ng/m^3)	
Permethrin		ND	10.5 ppb (168,000 ng/m^3)	
Phosmet		ND	5.9 ppb (77,000 ng/m^3)	
pp-dicofol		ND	4.5 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-hour time-weighted-average (TWA) used to compare the 24-h measured concentration.
‡ This value is a 72-hour TWA used to compare against the 24-hour measured concentration.

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

Sub-chronic (seasonal) concentrations for 1,3-dichloropropene and chloropicrin are averaged every 13 weeks (CDPR 2016b), while the sub-chronic concentrations of the remaining 38 active ingredients are averaged every 4 weeks (Table A-3). The highest concentration relative to its screening level was that of chloropicrin at 95.4%, 1,3-dichloropropene at 3.4%, and MITC 3%. The remaining chemicals for which there were quantifiable detections at Oxnard in 2023 were detected at less than 1% of their screening levels.

Table A–3. Highest rolling average air concentrations, sub-chronic screening levels, and percent of the sub- chronic screening level for chemicals monitored in Oxnard in 2023.

Chemical	Date	Highest rolling average concentration	Sub-chronic screening level	Percent of screening level
1,3-dichloropropene	10/05/2023	0.11 ppb (479 ng/m^3)	3 ppb (14,000 ng/m^3)	3.4 %
Captan	05/08/2023	0.0012 ppb (14.5 ng/m^3)	0.11 ppb (1,352 ng/m^3)	1.1 %
Chloropicrin	08/15/2023	0.33 ppb (2,195 ng/m^3)	0.35 ppb (2,300 ng/m^3)	95.4 %
Malathion	06/21/2023	0.00053 ppb (7.4 ng/m^3)	6 ppb (80,600 ng/m^3)	0.009 %
MITC	04/03/2023	0.03 ppb (91.2 ng/m^3)	1 ppb (3,000 ng/m^3)	3 %
Pendimethalin	10/10/2023	0.0087 ppb (99.6 ng/m^3)	49 ppb (560,000 ng/m^3)	0.018 %
Acephate		ND	1.1 ppb (8,500 ng/m^3)	
Bensulide		ND	1.5 ppb (24,000 ng/m^3)	
Chlorothalonil		ND	3.1 ppb (34,000 ng/m^3)	
Chlorpyrifos		ND	0.059 ppb (850 ng/m^3)	
Chlorpyrifos oa		ND	0.062 ppb (850 ng/m^3)	
Cypermethrin		ND	4.8 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)	

Chemical	Date	Highest rolling average concentration	Sub-chronic screening level	Percent of screening level
Diazinon oa		ND	0.011 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	1.8 ppb (17,000 ng/m^3)	
Endosulfan		ND	0.2 ppb (3,300 ng/m^3)	
Endosulfan Sulfate		ND	0.19 ppb (3,300 ng/m^3)	
EPTC		ND	3.1 ppb (24,000 ng/m^3)	
Fenpyroximate		ND	0.58 ppb (10,000 ng/m^3)	
Iprodione		ND	7.1 ppb (95,600 ng/m^3)	
Malathion oa		Trace	6.3 ppb (80,600 ng/m^3)	
Methidathion		ND	0.25 ppb (3,100 ng/m^3)	
Methomyl		ND	4.8 ppb (32,000 ng/m^3)	
Methyl Bromide		Trace	5 ppb* (19,400 ng/m^3)	
Metolachlor (S-Metolachlor)		ND	1.3 ppb (15,000 ng/m^3)	
Norflurazon		ND	1.9 ppb (26,000 ng/m^3)	
Oryzalin		ND	16.2 ppb (230,000 ng/m^3)	
Oxydemeton Methyl		ND	0.058 ppb (610 ng/m^3)	
Oxyfluorfen		Trace	12.2 ppb (180,000 ng/m^3)	

Chemical	Date	Highest rolling average concentration	Sub-chronic screening level	Percent of screening level
Permethrin		ND	5.6 ppb (90,000 ng/m^3)	
Phosmet		ND	2 ppb (26,000 ng/m^3)	
pp-dicofol		ND	3.2 ppb (49,000 ng/m^3)	
Propargite		ND	0.98 ppb (14,000 ng/m^3)	
Simazine		ND	3.8 ppb (31,000 ng/m^3)	
Trifluralin		ND	12.4 ppb (170,000 ng/m^3)	

* This value is a regulatory target rather than a screening level.

Chronic (annual) Concentrations

Table A–4 shows the annual average concentration for all chemicals monitored at the Oxnard sampling site in 2023. The pesticide with highest concentration relative to its screening level was that of chloropicrin at 38.7%, followed by MITC at 9.5%, and 1,3-dichloropropene at 1.5%. All other monitored chemicals were less than 1% of their chronic screening level in 2023.

Table A–4. Annual average air concentrations, chronic screening levels, and percent of the chronic screening levels for chemicals monitored in Oxnard in 2023.

Chemical	Overall average concentration	Chronic screening level	Percent of screening level
1,3-dichloropropene	0.029 ppb (132 ng/m^3)	2 ppb (9,000 ng/m^3)	1.5 %
Captan	0.00038 ppb (4.9 ng/m^3)	0.037 ppb (455 ng/m^3)	1.1 %
Chloropicrin	0.1 ppb (696 ng/m^3)	0.27 ppb (1,800 ng/m^3)	38.7 %
Malathion	0.000089 ppb (1.4 ng/m^3)	0.6 ppb (8,100 ng/m^3)	0.018 %
MITC	0.0096 ppb (28.6 ng/m^3)	0.1 ppb (300 ng/m^3)	9.5 %
Pendimethalin	0.0009 ppb (11.1 ng/m^3)	49 ppb (560,000 ng/m^3)	0.002 %

Chemical	Overall average concentration	Chronic screening level	Percent of screening level
Acephate	ND	1.1 ppb (8,500 ng/m^3)	
Bensulide	ND	1.5 ppb (24,000 ng/m^3)	
Chlorothalonil	ND	3.1 ppb (34,000 ng/m^3)	
Chlorpyrifos	ND	0.036 ppb (510 ng/m^3)	
Chlorpyrifos oa	ND	0.037 ppb (510 ng/m^3)	
Cypermethrin	ND	1.6 ppb (27,000 ng/m^3)	
Dacthal	ND	3.5 ppb (47,000 ng/m^3)	
DDVP	Trace	0.085 ppb (770 ng/m^3)	
DEF	ND	NA ppb (NA ng/m^3)	
Diazinon	Trace	0.01 ppb (130 ng/m^3)	
Diazinon oa	ND	0.011 ppb (130 ng/m^3)	
Dimethoate	ND	0.032 ppb (300 ng/m^3)	
Dimethoate oa	ND	0.034 ppb (300 ng/m^3)	
Diuron	ND	0.6 ppb (5,700 ng/m^3)	
Endosulfan	ND	0.02 ppb (330 ng/m^3)	
Endosulfan Sulfate	ND	0.019 ppb (330 ng/m^3)	
EPTC	ND	1.1 ppb (8,500 ng/m^3)	
Fenpyroximate	ND	0.058 ppb (1,000 ng/m^3)	

Chemical	Overall average concentration	Chronic screening level	Percent of screening level
Iprodione	ND	7.1 ppb (95,600 ng/m^3)	
Malathion oa	Trace	0.63 ppb (8,100 ng/m^3)	
Methidathion	ND	0.2 ppb (2,500 ng/m^3)	
Methomyl	ND	4.8 ppb (32,000 ng/m^3)	
Methyl Bromide	Trace	1 ppb (3,900 ng/m^3)	
Metolachlor (S-Metolachlor)	ND	1.3 ppb (15,000 ng/m^3)	
Norflurazon	ND	1.9 ppb (26,000 ng/m^3)	
Oryzalin	ND	16.2 ppb (230,000 ng/m^3)	
Oxydemeton Methyl	ND	0.058 ppb (610 ng/m^3)	
Oxyfluorfen	Trace	3.4 ppb (51,000 ng/m^3)	
Permethrin	ND	5.6 ppb (90,000 ng/m^3)	
Phosmet	ND	1.4 ppb (18,000 ng/m^3)	
pp-dicofol	ND	1.3 ppb (20,000 ng/m^3)	
Propargite	ND	0.98 ppb (14,000 ng/m^3)	
Simazine	ND	3.8 ppb (31,000 ng/m^3)	
Trifluralin	ND	3 ppb (41,000 ng/m^3)	

Temporal Trends in Detected Concentrations

The following figures depict the concentrations over time for any chemical detected at a quantifiable concentration in Oxnard in 2023. Screening levels are abbreviated as SL, whereas regulatory targets are abbreviated as RT.

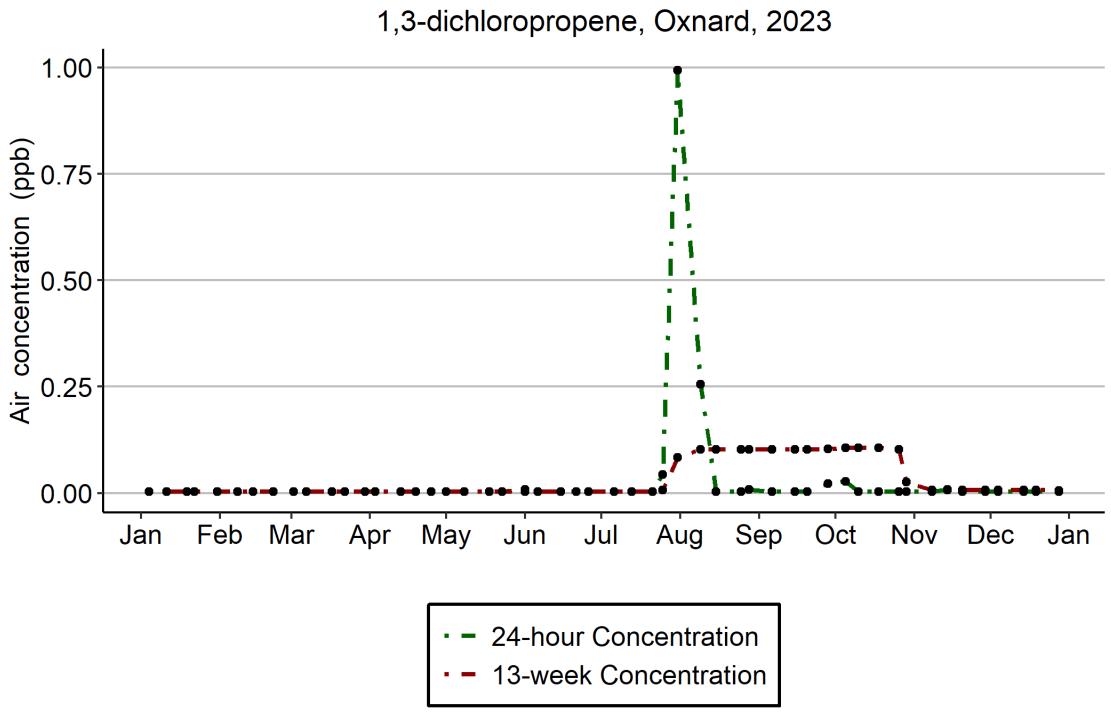

Figure A-1. Temporal trend in 1,3-dichloropropene concentrations in Oxnard in 2023 (Acute RT = 55 ppb ; Sub-chronic SL = 3 ppb).

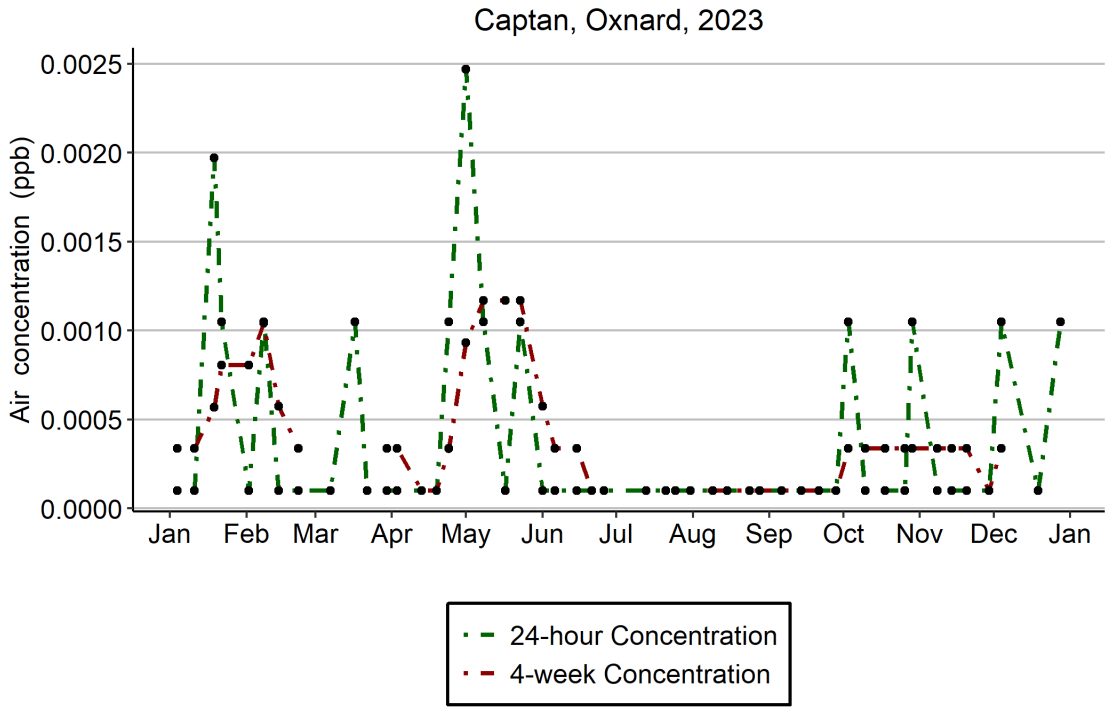

Figure A-2. Temporal trend in Captan concentrations in Oxnard in 2023 (Acute SL = 0.15 ppb ; Sub-chronic SL = 0.11 ppb).

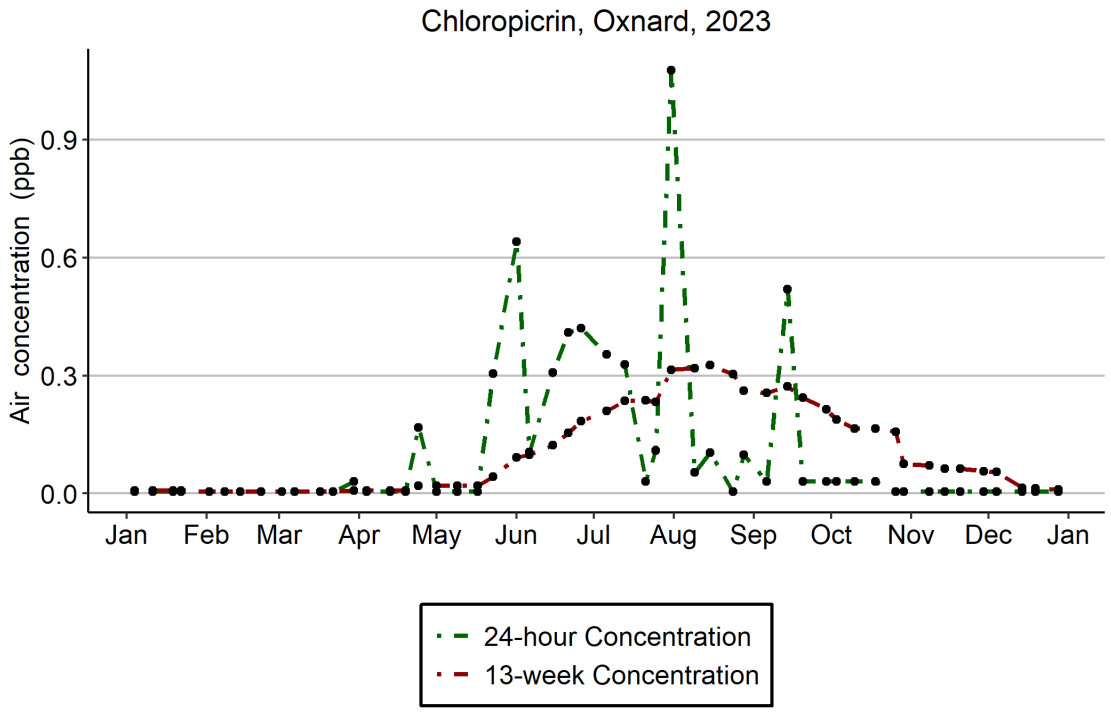

Figure A-3. Temporal trend in Chloropicrin concentrations in Oxnard in 2023 (Acute RT = 73 ppb ; Sub-chronic SL = 0.35 ppb).

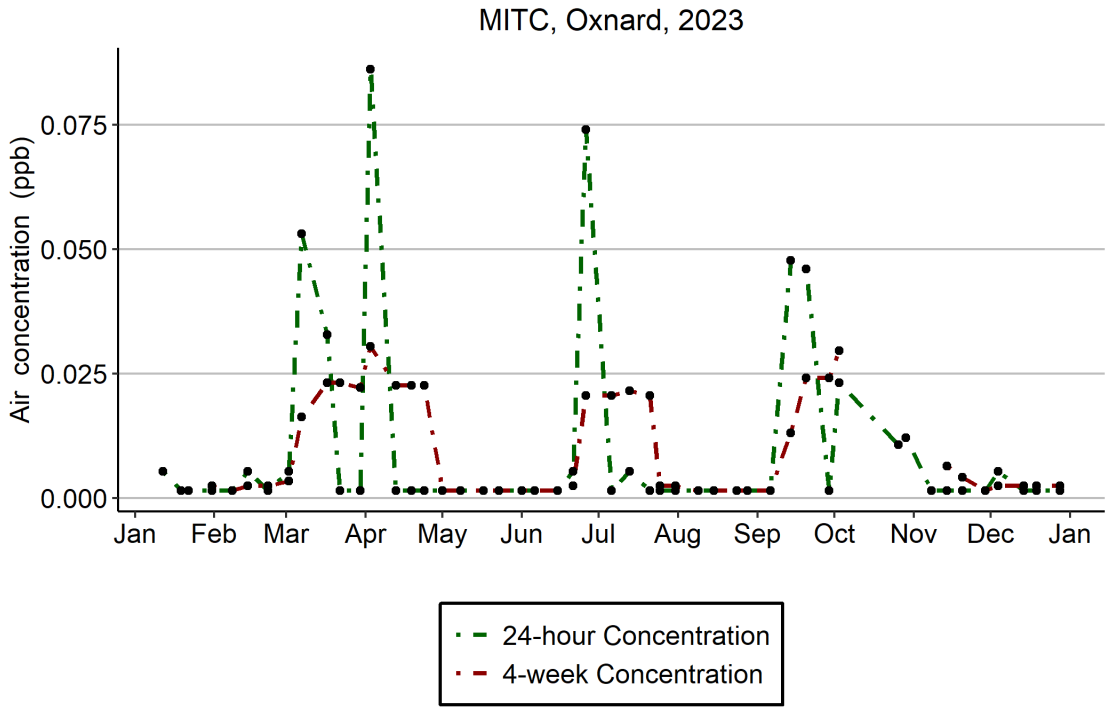

Figure A-4. Temporal trend in MITC concentrations in Oxnard in 2023 (Acute RT = 220 ppb ; Sub-chronic SL = 1 ppb).

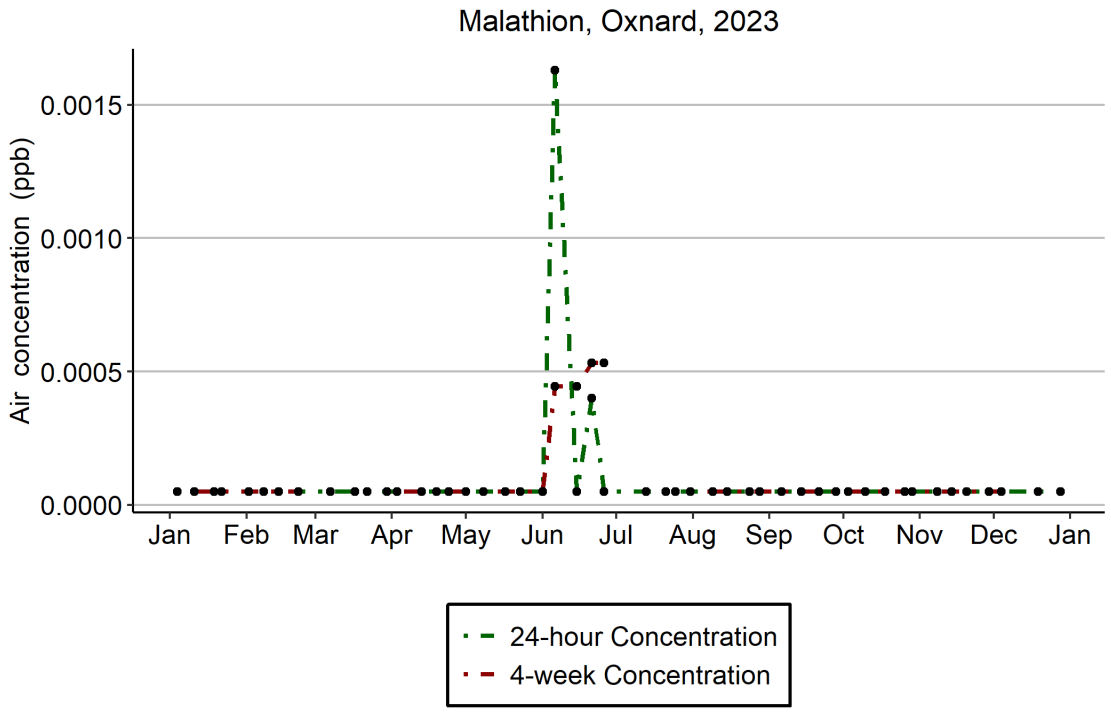

Figure A-5. Temporal trend in Malathion concentrations in Oxnard in 2023 (Acute SL = 8.3 ppb ; Sub-chronic SL = 6 ppb).

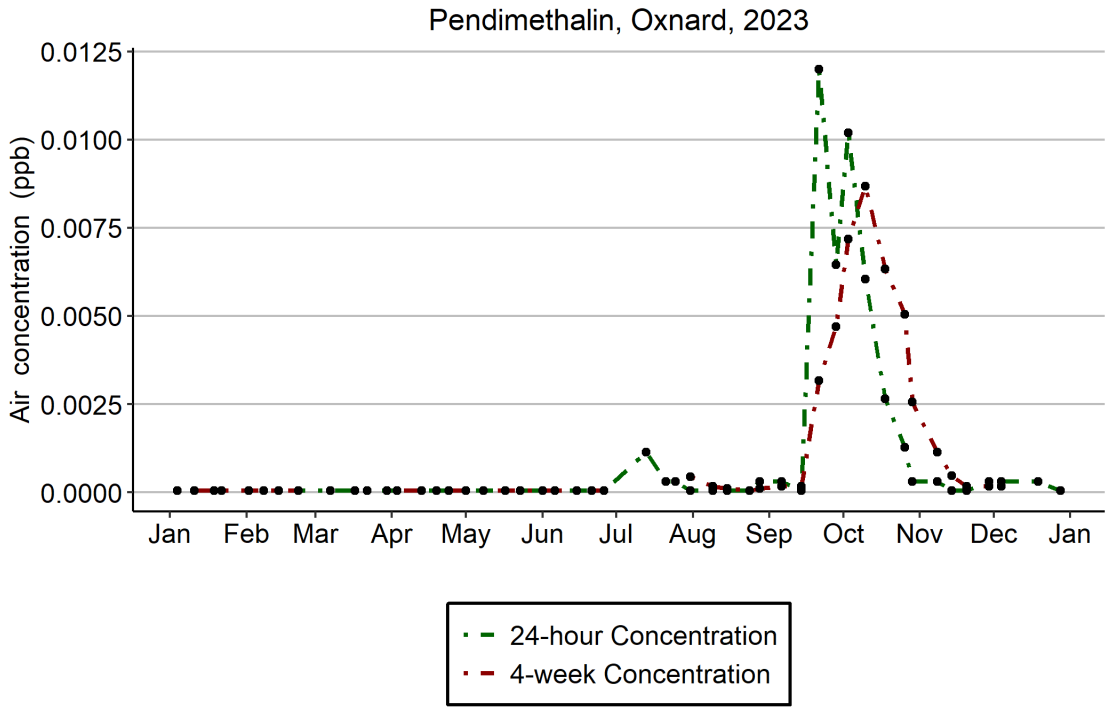

Figure A-6. Temporal trend in Pendimethalin concentrations in Oxnard in 2023 (Acute SL = 150 ppb ; Sub-chronic SL = 49 ppb).

APPENDIX B: SANTA MARIA RESULTS

Santa Maria

Santa Maria is located in Santa Barbara County and is 23.4 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 110,000 based on the 2020 census. Of this population, 31% were below 18 years of age and 10% were above 65 years of age. The major crops in the immediate area are strawberries, wine grapes, and broccoli. The monitoring site was relocated from a CARB monitoring location to the southwest corner of Bonita Elementary School where sampling began on November 12, 2019. Monitoring is conducted through a DPR contract with the Santa Barbara County Agricultural Commissioner's (SB-CAC) office. SB-CAC staff follow strict standard operating procedures established by DPR's Air Program, ensuring that samples are collected, handled, and transported appropriately to maintain consistency and integrity of the samples. DPR Air Program staff provides annual training and continuous support to SB-CAC for operation and monitoring at this location.

Pesticide Detections

Table B–1 lists the number and percentage of analyses resulting in detections at the Santa Maria AMN sampling site in 2023. The chemical with the highest number of quantifiable detections was MITC (n=14, 27.5%), followed by chloropicrin (n=11, 21.6%), and 1,3-dichloropropene (n=9, 17.6%).

Table B–1. Number and percentage of positive samples per chemical in Santa Maria in 2023.

Chemical	Number of valid samples	Quantifiable and Trace detections	Quantifiable detections	Quantifiable and Trace detections %	Quantifiable detections %
1,3-dichloropropene	51	11	9	21.6 %	17.6 %
Acephate	51	0	0	0 %	0 %
Bensulide	51	0	0	0 %	0 %
Captan	51	0	0	0 %	0 %
Chloropicrin	51	18	11	35.3 %	21.6 %
Chlorothalonil	51	0	0	0 %	0 %
Chlorpyrifos	51	0	0	0 %	0 %
Chlorpyrifos oa	51	0	0	0 %	0 %
Cypermethrin	51	0	0	0 %	0 %
DDVP	51	17	2	33.3 %	3.9 %
DEF	51	0	0	0 %	0 %
Dacthal	51	1	0	2 %	0 %

Chemical	Number of valid samples	Quantifiable and Trace detections	Quantifiable detections	Quantifiable and Trace detections %	Quantifiable detections %
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	0	0	0 %	0 %
EPTC	51	0	0	0 %	0 %
Endosulfan	51	0	0	0 %	0 %
Endosulfan Sulfate	51	0	0	0 %	0 %
Fenpyroximate	51	0	0	0 %	0 %
Iprodione	51	0	0	0 %	0 %
MITC	51	15	14	29.4 %	27.5 %
Malathion	51	24	7	47.1 %	13.7 %
Malathion oa	51	4	0	7.8 %	0 %
Methidathion	51	0	0	0 %	0 %
Methomyl	51	0	0	0 %	0 %
Methyl Bromide	51	15	1	29.4 %	2 %
Metolachlor	51	0	0	0 %	0 %
Norflurazon	51	0	0	0 %	0 %
Oryzalin	51	0	0	0 %	0 %
Oxydemeton Methyl	51	0	0	0 %	0 %
Oxyfluorfen	51	2	0	3.9 %	0 %
Pendimethalin	51	9	1	17.6 %	2 %
Permethrin	51	0	0	0 %	0 %
Phosmet	51	0	0	0 %	0 %
Propargite	51	0	0	0 %	0 %
Simazine	51	0	0	0 %	0 %
Trifluralin	51	3	0	5.9 %	0 %
pp-dicofol	51	0	0	0 %	0 %
Total	2,040	119	45	5.8 %	2.2 %

Pesticide Concentrations

Acute (24-hour) Concentrations

Table B–2 shows the highest 24-hour concentrations observed for all chemicals monitored at the Santa Maria AMN sampling site in 2023. All chemicals for which there were quantifiable detections were detected at less than 2% of their screening levels.

Table B–2. Highest 24-hour air concentrations, acute screening levels, and percent of the acute screening level for all chemicals monitored in Santa Maria in 2023.

Chemical	Date	Highest 24-hour concentration	24-hour acute screening level	Percent of screening level
1,3-dichloropropene	09/17/2023	0.35 ppb (1,589 ng/m^3)	55 ppb*‡ (250,000 ng/m^3)	0.64 %
Chloropicrin	05/24/2023	1.2 ppb (8,137 ng/m^3)	73 ppb*† (491,000 ng/m^3)	1.7 %
DDVP	08/10/2023	0.0071 ppb (64 ng/m^3)	1.2 ppb (11,000 ng/m^3)	0.58 %
Malathion	09/17/2023	0.0023 ppb (31.2 ng/m^3)	8.3 ppb (112,500 ng/m^3)	0.028 %
Methyl Bromide	10/24/2023	0.015 ppb (56.7 ng/m^3)	210 ppb (820,000 ng/m^3)	0.007 %
MITC	10/09/2023	1.2 ppb (3,588 ng/m^3)	220 ppb*† (660,000 ng/m^3)	0.54 %
Pendimethalin	10/18/2023	0.001 ppb (12 ng/m^3)	150 ppb (1,700,000 ng/m^3)	0.001 %
Acephate		ND	1.6 ppb (12,000 ng/m^3)	
Bensulide		ND	15.9 ppb (259,000 ng/m^3)	
Captan		ND	0.15 ppb (1,844 ng/m^3)	
Chlorothalonil		ND	3.1 ppb (34,000 ng/m^3)	
Chlorpyrifos		ND	0.084 ppb (1,200 ng/m^3)	
Chlorpyrifos oa		ND	0.088 ppb (1,200 ng/m^3)	
Cypermethrin		ND	6.6 ppb (113,000 ng/m^3)	

Chemical	Date	Highest 24-hour concentration	24-hour acute screening level	Percent of screening level
Dacthal		Trace	1732 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	0.011 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	0.2 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)	
Fenpyroximate		ND	0.87 ppb (15,000 ng/m^3)	
Iprodione		ND	23.2 ppb (313,000 ng/m^3)	
Malathion oa		Trace	8.8 ppb (112,500 ng/m^3)	
Methidathion		ND	0.25 ppb (3,100 ng/m^3)	
Methomyl		ND	4.8 ppb (32,000 ng/m^3)	
Metolachlor (S-Metolachlor)		ND	7.3 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)	

Chemical	Date	Highest 24-hour concentration	24-hour acute screening level	Percent of screening level
Oxydemeton Methyl		ND	3.7 ppb (39,200 ng/m^3)	
Oxyfluorfen		Trace	34.5 ppb (510,000 ng/m^3)	
Permethrin		ND	10.5 ppb (168,000 ng/m^3)	
Phosmet		ND	5.9 ppb (77,000 ng/m^3)	
pp-dicofol		ND	4.5 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-hour time-weighted-average (TWA) used to compare the 24-h measured concentration.

‡ This value is a 72-hour TWA used to compare against the 24-hour measured concentration.

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

Table B–3 shows the highest rolling 4-week or 13-week average concentrations for all chemicals monitored in Santa Maria in 2023. The highest concentration relative to its screening level was that of chloropicrin at 58.9% and MITC at 44.8%. The remaining chemicals for which there were quantifiable detections were detected at less than 2% of their screening levels

Table B–3. Highest rolling average air concentrations, sub-chronic screening levels, and percent of the sub- chronic screening level for chemicals monitored in Santa Maria in 2023.

Chemical	Date	Highest rolling average concentration	Sub-chronic screening level	Percent of screening level
1,3-dichloropropene	11/08/2023	0.049 ppb (224 ng/m^3)	3 ppb (14,000 ng/m^3)	1.6 %
Chloropicrin	11/15/2023	0.2 ppb (1,355 ng/m^3)	0.35 ppb (2,300 ng/m^3)	58.9 %

Chemical	Date	Highest rolling average concentration	Sub-chronic screening level	Percent of screening level
DDVP	08/24/2023	0.0025 ppb (22.9 ng/m^3)	0.24 ppb (2,200 ng/m^3)	1 %
Malathion	09/28/2023	0.0013 ppb (17.7 ng/m^3)	6 ppb (80,600 ng/m^3)	0.022 %
Methyl Bromide	01/04/2023	0.011 ppb (41.4 ng/m^3)	5 ppb* (19,400 ng/m^3)	0.21%
MITC	10/09/2023	0.45 ppb (1,345 ng/m^3)	1 ppb (3,000 ng/m^3)	44.8 %
Pendimethalin	10/24/2023	0.00048 ppb (7.3 ng/m^3)	49 ppb (560,000 ng/m^3)	0.001 %
Acephate		ND	1.1 ppb (8,500 ng/m^3)	
Bensulide		ND	1.5 ppb (24,000 ng/m^3)	
Captan		ND	0.11 ppb (1,352 ng/m^3)	
Chlorothalonil		ND	3.1 ppb (34,000 ng/m^3)	
Chlorpyrifos		ND	0.059 ppb (850 ng/m^3)	
Chlorpyrifos oa		ND	0.062 ppb (850 ng/m^3)	
Cypermethrin		ND	4.8 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	0.011 ppb (130 ng/m^3)	
Dimethoate		ND	0.32 ppb (3,000 ng/m^3)	

Chemical	Date	Highest rolling average concentration	Sub-chronic screening level	Percent of screening level
Dimethoate oa		ND	0.34 ppb (3,000 ng/m^3)	
Diuron		ND	1.8 ppb (17,000 ng/m^3)	
Endosulfan		ND	0.2 ppb (3,300 ng/m^3)	
Endosulfan Sulfate		ND	0.19 ppb (3,300 ng/m^3)	
EPTC		ND	3.1 ppb (24,000 ng/m^3)	
Fenpyroximate		ND	0.58 ppb (10,000 ng/m^3)	
Iprodione		ND	7.1 ppb (95,600 ng/m^3)	
Malathion oa		Trace	6.3 ppb (80,600 ng/m^3)	
Methidathion		ND	0.25 ppb (3,100 ng/m^3)	
Methomyl		ND	4.8 ppb (32,000 ng/m^3)	
Metolachlor (S-Metolachlor)		ND	1.3 ppb (15,000 ng/m^3)	
Norflurazon		ND	1.9 ppb (26,000 ng/m^3)	
Oryzalin		ND	16.2 ppb (230,000 ng/m^3)	
Oxydemeton Methyl		ND	0.058 ppb (610 ng/m^3)	
Oxyfluorfen		Trace	12.2 ppb (180,000 ng/m^3)	
Permethrin		ND	5.6 ppb (90,000 ng/m^3)	
Phosmet		ND	2 ppb (26,000 ng/m^3)	

Chemical	Date	Highest rolling average concentration	Sub-chronic screening level	Percent of screening level
pp-dicofol		ND	3.2 ppb (49,000 ng/m^3)	
Propargite		ND	0.98 ppb (14,000 ng/m^3)	
Simazine		ND	3.8 ppb (31,000 ng/m^3)	
Trifluralin		Trace	12.4 ppb (170,000 ng/m^3)	

* This value is a regulatory target rather than a screening level.

Chronic (annual) Concentrations

Table B–4 shows the annual average concentration for all chemicals monitored at the Santa Maria sampling site in 2023. The pesticide with highest concentration relative to its screening level was that of MITC at 44.3%, followed by chloropicrin at 31.2%. All other monitored chemicals were less than 1% of their chronic screening level in Santa Maria in 2023.

Table B–4. Annual average air concentrations, chronic screening levels, and percent of the chronic screening levels for chemicals monitored in Santa Maria in 2023.

Chemical	Overall average concentration	Chronic screening level	Percent of screening level
1,3-dichloropropene	0.017 ppb (79.3 ng/m^3)	2 ppb (9,000 ng/m^3)	0.88 %
Chloropicrin	0.083 ppb (561 ng/m^3)	0.27 ppb (1,800 ng/m^3)	31.2 %
DDVP	0.00065 ppb (5.8 ng/m^3)	0.085 ppb (770 ng/m^3)	0.75 %
Malathion	0.00036 ppb (5.1 ng/m^3)	0.6 ppb (8,100 ng/m^3)	0.063 %
Methyl Bromide	0.0044 ppb (17 ng/m^3)	1 ppb (3,900 ng/m^3)	0.44 %
MITC	0.044 ppb (133 ng/m^3)	0.1 ppb (300 ng/m^3)	44.3 %
Pendimethalin	0.00011 ppb (2 ng/m^3)	49 ppb (560,000 ng/m^3)	0.001 %

Chemical	Overall average concentration	Chronic screening level	Percent of screening level
Acephate	ND	1.1 ppb (8,500 ng/m^3)	
Bensulide	ND	1.5 ppb (24,000 ng/m^3)	
Captan	ND	0.037 ppb (455 ng/m^3)	
Chlorothalonil	ND	3.1 ppb (34,000 ng/m^3)	
Chlorpyrifos	ND	0.036 ppb (510 ng/m^3)	
Chlorpyrifos oa	ND	0.037 ppb (510 ng/m^3)	
Cypermethrin	ND	1.6 ppb (27,000 ng/m^3)	
Dacthal	Trace	3.5 ppb (47,000 ng/m^3)	
DEF	ND	NA ppb (NA ng/m^3)	
Diazinon	ND	0.01 ppb (130 ng/m^3)	
Diazinon oa	ND	0.011 ppb (130 ng/m^3)	
Dimethoate	ND	0.032 ppb (300 ng/m^3)	
Dimethoate oa	ND	0.034 ppb (300 ng/m^3)	
Diuron	ND	0.6 ppb (5,700 ng/m^3)	
Endosulfan	ND	0.02 ppb (330 ng/m^3)	
Endosulfan Sulfate	ND	0.019 ppb (330 ng/m^3)	
EPTC	ND	1.1 ppb (8,500 ng/m^3)	
Fenpyroximate	ND	0.058 ppb (1,000 ng/m^3)	

Chemical	Overall average concentration	Chronic screening level	Percent of screening level
Iprodione	ND	7.1 ppb (95,600 ng/m^3)	
Malathion oa	Trace	0.63 ppb (8,100 ng/m^3)	
Methidathion	ND	0.2 ppb (2,500 ng/m^3)	
Methomyl	ND	4.8 ppb (32,000 ng/m^3)	
Metolachlor (S-Metolachlor)	ND	1.3 ppb (15,000 ng/m^3)	
Norflurazon	ND	1.9 ppb (26,000 ng/m^3)	
Oryzalin	ND	16.2 ppb (230,000 ng/m^3)	
Oxydemeton Methyl	ND	0.058 ppb (610 ng/m^3)	
Oxyfluorfen	Trace	3.4 ppb (51,000 ng/m^3)	
Permethrin	ND	5.6 ppb (90,000 ng/m^3)	
Phosmet	ND	1.4 ppb (18,000 ng/m^3)	
pp-dicofol	ND	1.3 ppb (20,000 ng/m^3)	
Propargite	ND	0.98 ppb (14,000 ng/m^3)	
Simazine	ND	3.8 ppb (31,000 ng/m^3)	
Trifluralin	Trace	3 ppb (41,000 ng/m^3)	

Temporal Trends in Detected Concentrations

The following figures depict the concentrations over time for any chemical detected at a quantifiable concentration in Santa Maria in 2023. Screening levels are abbreviated as SL, whereas regulatory targets are abbreviated as RT.

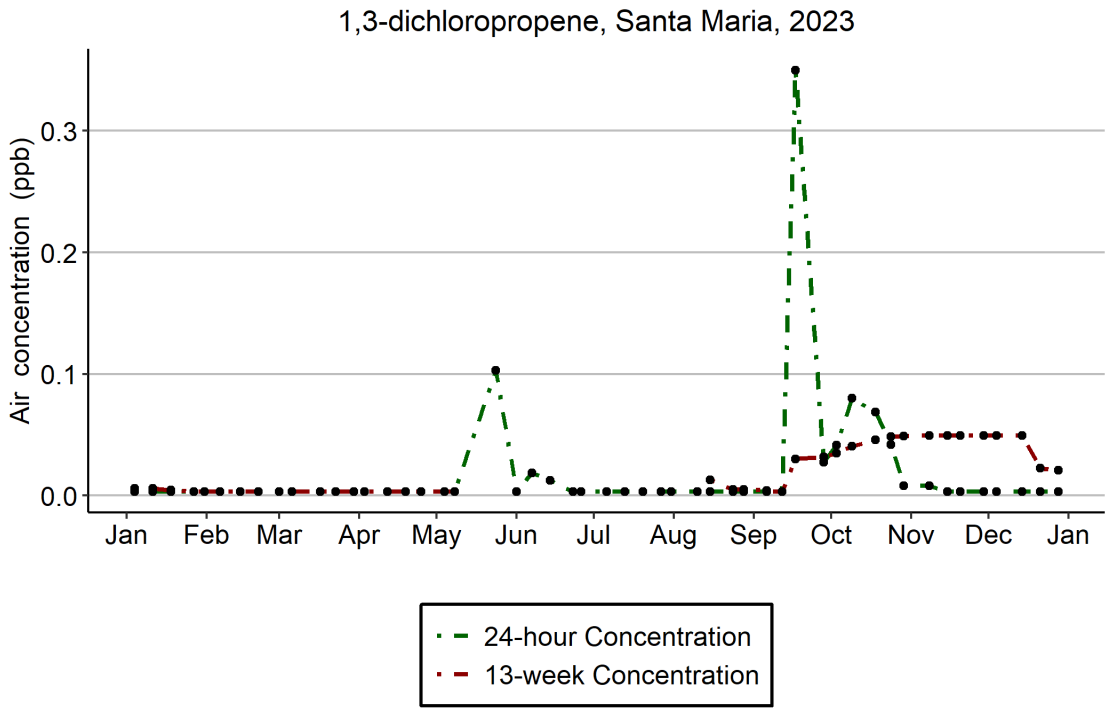

Figure B-1. Temporal trend in 1,3-dichloropropene concentrations in Santa Maria in 2023 (Acute RT = 55 ppb ; Sub-chronic SL = 3 ppb).

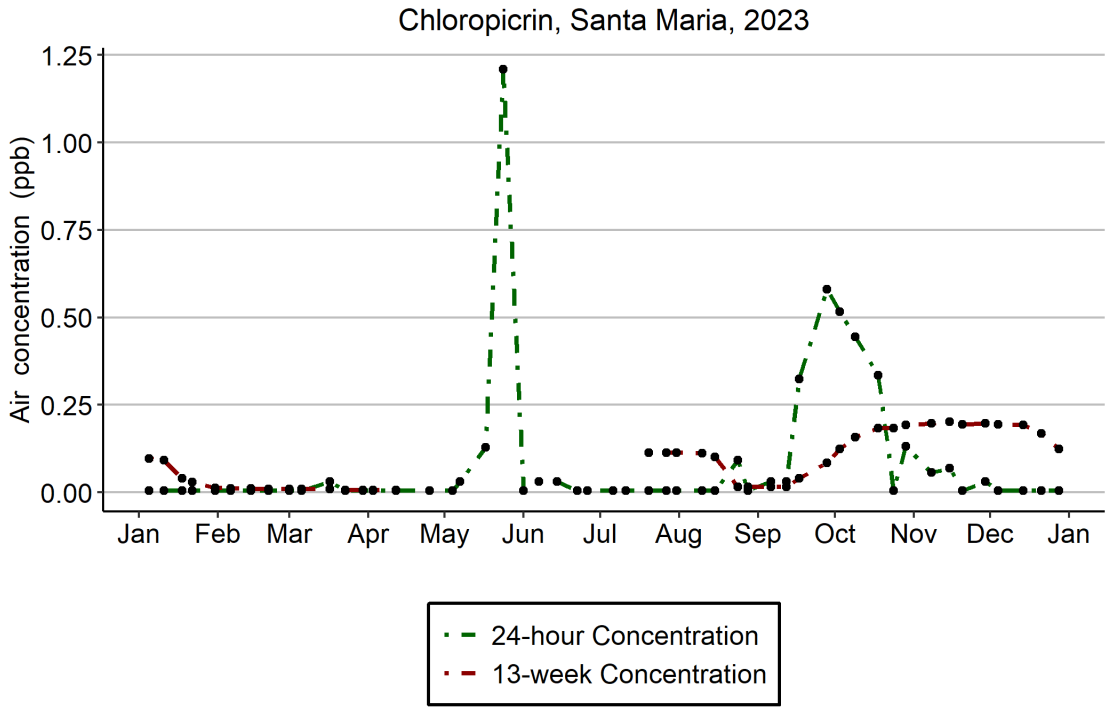

Figure B-2. Temporal trend in Chloropicrin concentrations in Santa Maria in 2023 (Acute RT = 73 ppb ; Sub-chronic SL = 0.35 ppb).

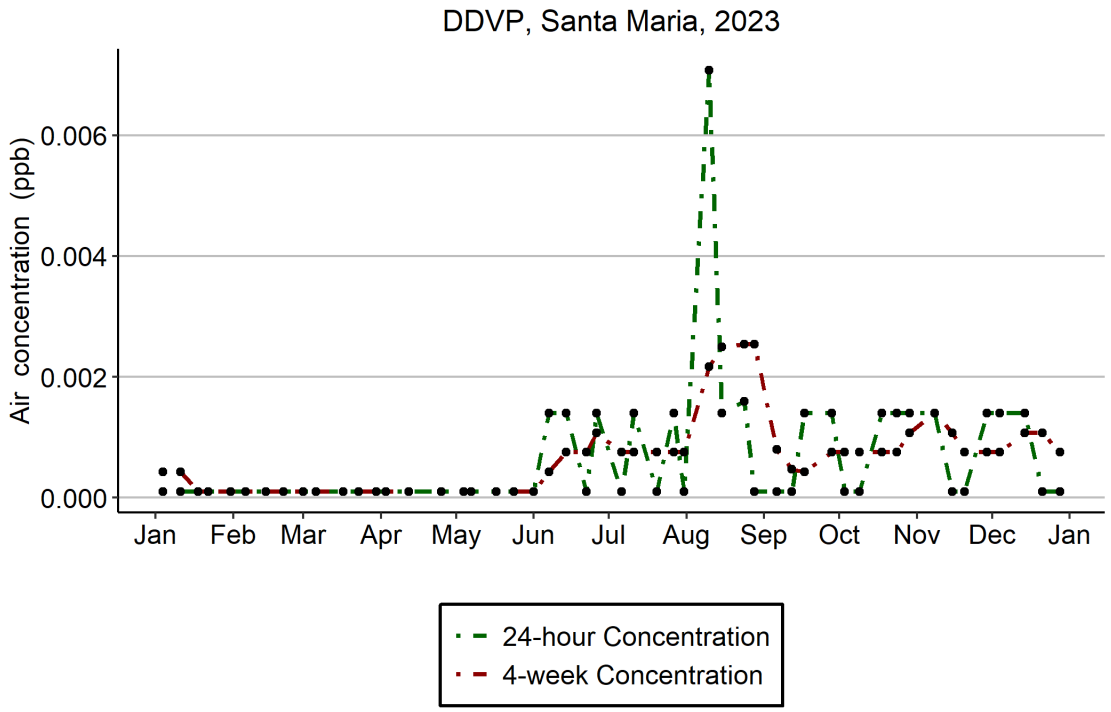

Figure B-3. Temporal trend in DDVP concentrations in Santa Maria in 2023 (Acute SL = 1.2 ppb ; Sub-chronic SL = 0.2 ppb).

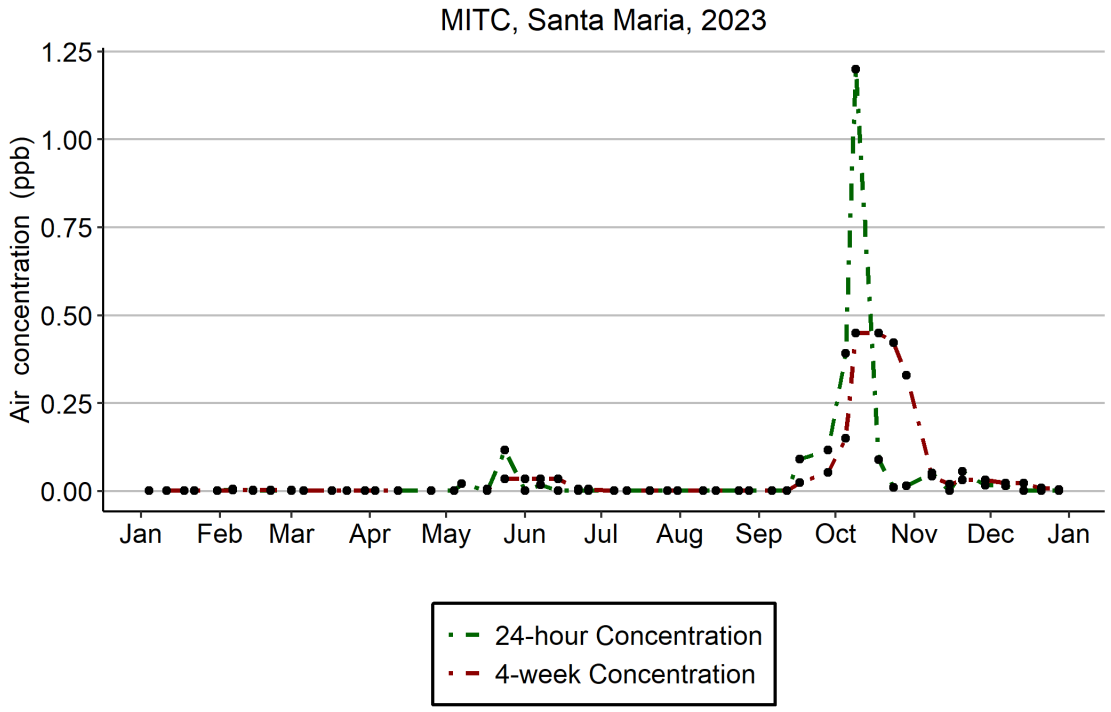

Figure B-4. Temporal trend in MITC concentrations in Santa Maria in 2023 (Acute RT = 220 ppb ; Sub-chronic SL = 1 ppb).

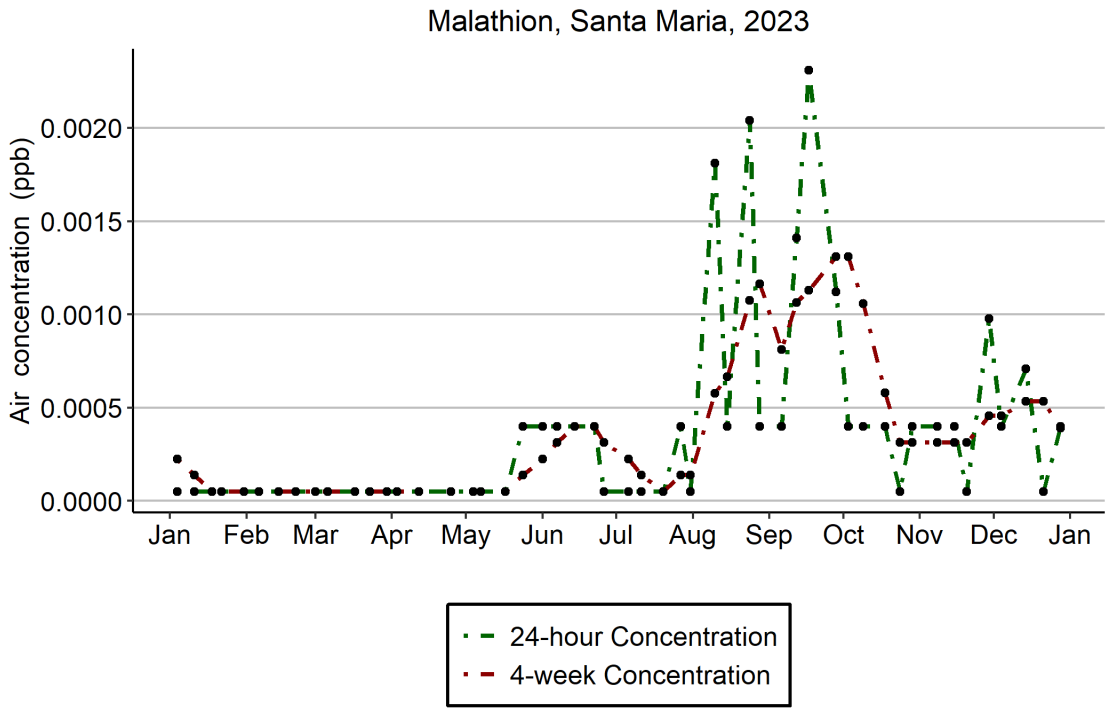

Figure B-5. Temporal trend in Malathion concentrations in Santa Maria in 2023 (Acute SL = 8.3 ppb ; Sub-chronic SL = 6 ppb).

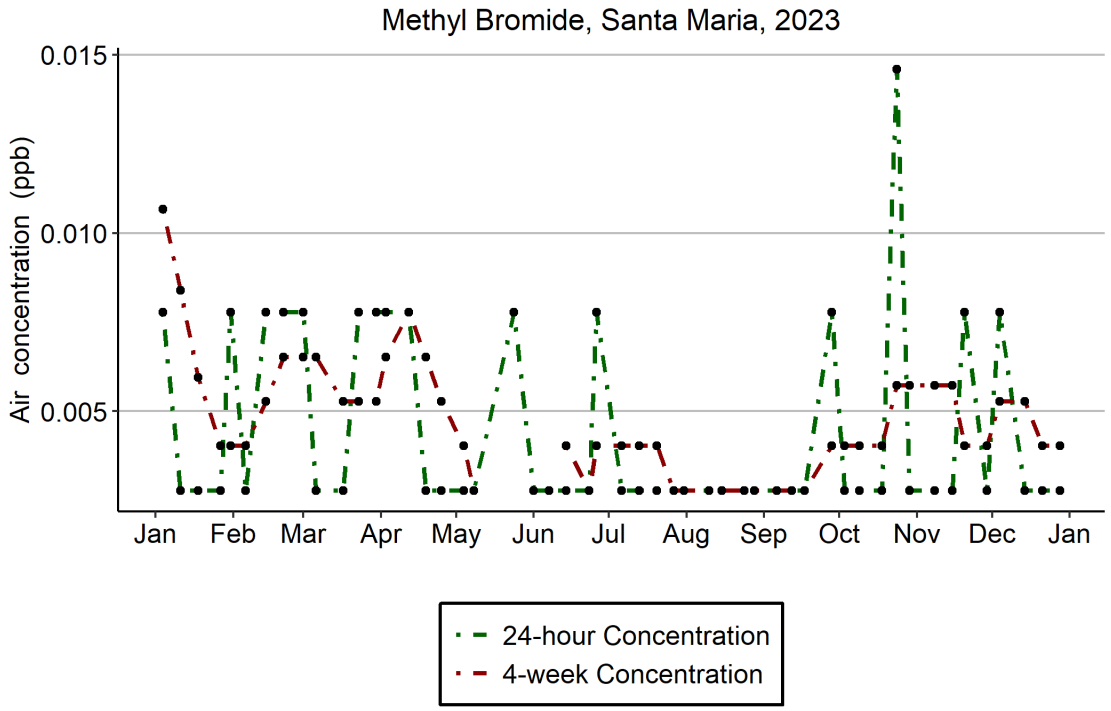

Figure B-6. Temporal trend in Methyl Bromide concentrations in Santa Maria in 2023 (Acute RT = 210 ppb ; Sub-chronic RT = 5 ppb).

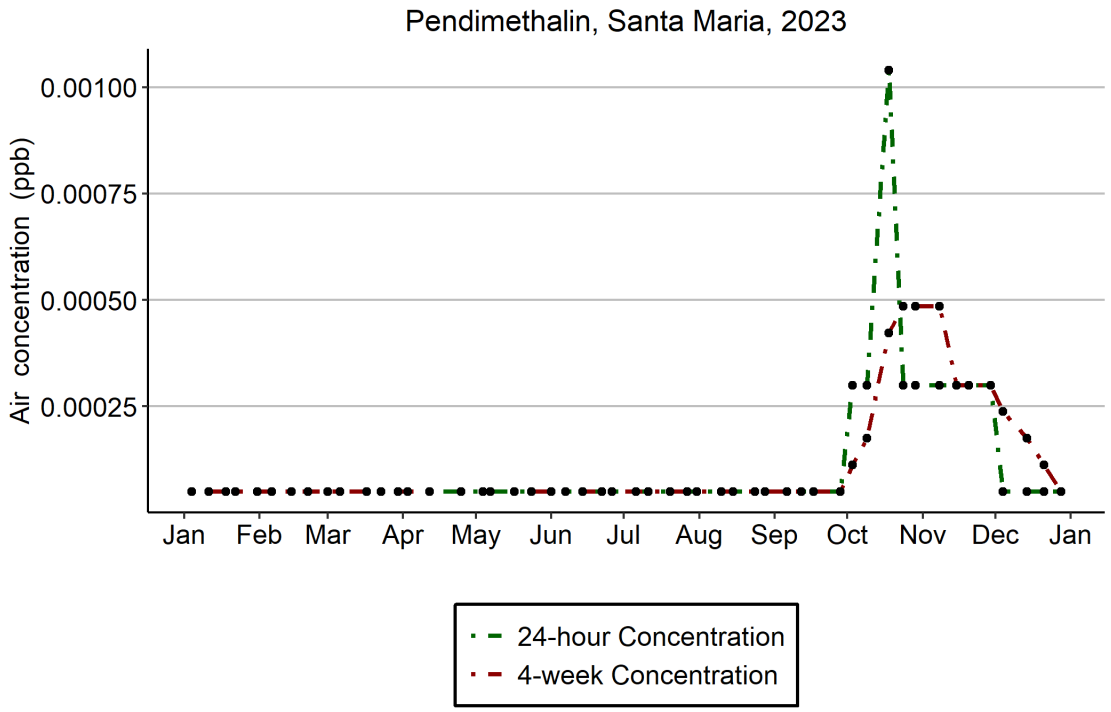

Figure B-7. Temporal trend in Pendimethalin concentrations in Santa Maria in 2023 (Acute SL = 150 ppb ; Sub-chronic SL = 49 ppb).

APPENDIX C: SHAFTER RESULTS

Shafter

The Shafter sampling site has continued as a monitoring site since 2011. Shafter is 18 square miles in area located 18 miles west-northwest of Bakersfield in Kern County. The elevation is 351 feet and 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 2020 census, the population of Shafter was 16,988, of which 35% were below 18 years of age and 8% 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 was initially operated by DPR until April 2018 when the California Air Resources Board (CARB) assumed operation of this monitoring location. 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. On January 1, 2021, DPR re-assumed operation of this monitoring location.

Pesticide Detections

Table C–1 lists the number and percentage of analyses resulting in detections at the Shafter AMN sampling site in 2023. The chemicals with the highest number of quantifiable detections were MITC (n=15, 30%), pendimethalin (n=13, 25%), and 1,3-dichloropropene (n=10, 19.6%).

Table C–1 Number and percentage of positive samples per chemical in Shafter in 2023.

Chemical	Number of valid samples	Quantifiable and Trace detections	Quantifiable detections	Quantifiable and Trace detections %	Quantifiable detections %
1,3-dichloropropene	51	11	10	21.6 %	19.6 %
Acephate	52	0	0	0 %	0 %
Bensulide	52	0	0	0 %	0 %
Captan	52	0	0	0 %	0 %
Chloropicrin	52	2	0	3.8 %	0 %
Chlorothalonil	52	0	0	0 %	0 %
Chlorpyrifos	52	0	0	0 %	0 %
Chlorpyrifos oa	52	0	0	0 %	0 %
Cypermethrin	52	0	0	0 %	0 %
DDVP	52	1	0	1.9 %	0 %
DEF	52	0	0	0 %	0 %
Dacthal	52	0	0	0 %	0 %
Diazinon	52	0	0	0 %	0 %

Chemical	Number of valid samples	Quantifiable and Trace detections	Quantifiable detections	Quantifiable and Trace detections %	Quantifiable detections %
Diazinon oa	52	0	0	0 %	0 %
Dimethoate	52	0	0	0 %	0 %
Dimethoate oa	52	0	0	0 %	0 %
Diuron	52	0	0	0 %	0 %
EPTC	52	6	0	11.5 %	0 %
Endosulfan	52	0	0	0 %	0 %
Endosulfan Sulfate	52	0	0	0 %	0 %
Fenpyroximate	52	0	0	0 %	0 %
Iprodione	52	0	0	0 %	0 %
MITC	50	21	15	42 %	30 %
Malathion	52	1	0	1.9 %	0 %
Malathion oa	52	1	0	1.9 %	0 %
Methidathion	52	0	0	0 %	0 %
Methomyl	52	0	0	0 %	0 %
Methyl Bromide	51	17	7	33.3 %	13.7 %
Metolachlor (S-Metolachlor)	52	0	0	0 %	0 %
Norflurazon	52	0	0	0 %	0 %
Oryzalin	52	0	0	0 %	0 %
Oxydemeton Methyl	52	0	0	0 %	0 %
Oxyfluorfen	52	0	0	0 %	0 %
Pendimethalin	52	38	13	73.1 %	25 %
Permethrin	52	0	0	0 %	0 %
Phosmet	52	0	0	0 %	0 %
Propargite	52	0	0	0 %	0 %
Simazine	52	0	0	0 %	0 %
Trifluralin	52	0	0	0 %	0 %
pp-dicofol	52	0	0	0 %	0 %
Total	2,076	98	45	4.7 %	2.2 %

Pesticide Concentrations

Acute (24-hour) Concentrations

Table C–2 shows the highest 24-hour concentrations observed for all chemicals monitored at the Shafter AMN sampling site in 2023. The highest concentration relative to its screening level was that of 1,3-dichloropropene at 9.2%. The remaining chemicals for which there were quantifiable detections were detected at 1% (or less) of their screening levels.

Table C–2. Highest 24-hour air concentrations, acute screening levels, and percent of the acute screening level for all chemicals monitored in Shafter in 2023.

Chemical	Date	Highest 24-hour concentration	24-hour acute screening level	Percent of screening level
1,3-dichloropropene	06/21/2023	5.1 ppb (22,966 ng/m^3)	55 ppb*‡ (250,000 ng/m^3)	9.2 %
Methyl Bromide	04/17/2023	0.016 ppb (63.7 ng/m^3)	210 ppb* (820,000 ng/m^3)	0.008 %
MITC	12/13/2023	2.3 ppb (6,806 ng/m^3)	220 ppb*† (660,000 ng/m^3)	1 %
Pendimethalin	02/08/2023	0.0025 ppb (28.3 ng/m^3)	150 ppb (1,700,000 ng/m^3)	0.002 %
Acephate		ND	1.6 ppb (12,000 ng/m^3)	
Bensulide		ND	15.9 ppb (259,000 ng/m^3)	
Captan		ND	0.15 ppb (1,844 ng/m^3)	
Chloropicrin		Trace	73 ppb (491,000 ng/m^3)	
Chlorothalonil		ND	3.1 ppb (34,000 ng/m^3)	
Chlorpyrifos		ND	0.084 ppb (1,200 ng/m^3)	
Chlorpyrifos oa		ND	0.088 ppb (1,200 ng/m^3)	
Cypermethrin		ND	6.6 ppb (113,000 ng/m^3)	
Dacthal		ND	1732 ppb (23,500,000 ng/m^3)	

Chemical	Date	Highest 24-hour concentration	24-hour acute screening level	Percent of screening level
DDVP		Trace	1.2 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	0.011 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	0.2 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)	
Fenpyroximate		ND	0.87 ppb (15,000 ng/m^3)	
Iprodione		ND	23.2 ppb (313,000 ng/m^3)	
Malathion		Trace	8.3 ppb (112,500 ng/m^3)	
Malathion oa		Trace	8.8 ppb (112,500 ng/m^3)	
Methidathion		ND	0.25 ppb (3,100 ng/m^3)	
Methomyl		ND	4.8 ppb (32,000 ng/m^3)	
Metolachlor (S-Metolachlor)		ND	7.3 ppb (85,000 ng/m^3)	
Norflurazon		ND	12.6 ppb (170,000 ng/m^3)	

Chemical	Date	Highest 24-hour concentration	24-hour acute screening level	Percent of screening level
Oryzalin		ND	29.7 ppb (420,000 ng/m^3)	
Oxydemeton Methyl		ND	3.7 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	5.9 ppb (77,000 ng/m^3)	
pp-dicofol		ND	4.5 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-hour time-weighted-average (TWA) used to compare the 24-h measured concentration.
‡ This value is a 72-hour TWA used to compare against the 24-hour measured concentration.

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

Table C–3 shows the highest rolling 4-week or 13-week average concentrations for all chemicals monitored at the Shafter AMN sampling site in 2023. The highest concentration relative to its screening level was that of MITC at 67%, followed by 1,3-dichloropropene at 13.5%. The remaining chemicals were less than 1% of their screening levels.

Table C–3. Highest rolling average air concentrations, sub-chronic screening levels, and percent of the sub- chronic screening level for chemicals monitored in Shafter in 2023.

Chemical	Date	Highest rolling average concentration	Sub-chronic screening level	Percent of screening level
1,3-dichloropropene	06/27/2023	0.42 ppb (1,895 ng/m^3)	3 ppb (14,000 ng/m^3)	13.5 %
Methyl Bromide	02/23/2023	0.012 ppb (45.1 ng/m^3)	5 ppb* (19,400 ng/m^3)	0.23 %

Chemical	Date	Highest rolling average concentration	Sub-chronic screening level	Percent of screening level
MITC	12/28/2023	0.67 ppb (2,010 ng/m^3)	1 ppb (3,000 ng/m^3)	67 %
Pendimethalin	02/15/2023	0.0016 ppb (18.2 ng/m^3)	49 ppb (560,000 ng/m^3)	0.003 %
Acephate		ND	1.1 ppb (8,500 ng/m^3)	
Bensulide		ND	1.5 ppb (24,000 ng/m^3)	
Captan		ND	0.11 ppb (1,352 ng/m^3)	
Chloropicrin		Trace	0.35 ppb (2,300 ng/m^3)	
Chlorothalonil		ND	3.1 ppb (34,000 ng/m^3)	
Chlorpyrifos		ND	0.059 ppb (850 ng/m^3)	
Chlorpyrifos oa		ND	0.062 ppb (850 ng/m^3)	
Cypermethrin		ND	4.8 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		ND	0.01 ppb (130 ng/m^3)	
Diazinon oa		ND	0.011 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	1.8 ppb (17,000 ng/m^3)	

Chemical	Date	Highest rolling average concentration	Sub-chronic screening level	Percent of screening level
Endosulfan		ND	0.2 ppb (3,300 ng/m^3)	
Endosulfan Sulfate		ND	0.19 ppb (3,300 ng/m^3)	
EPTC		Trace	3.1 ppb (24,000 ng/m^3)	
Fenpyroximate		ND	0.58 ppb (10,000 ng/m^3)	
Iprodione		ND	7.1 ppb (95,600 ng/m^3)	
Malathion		Trace	6 ppb (80,600 ng/m^3)	
Malathion oa		Trace	6.3 ppb (80,600 ng/m^3)	
Methidathion		ND	0.25 ppb (3,100 ng/m^3)	
Methomyl		ND	4.8 ppb (32,000 ng/m^3)	
Metolachlor (S-Metolachlor)		ND	1.3 ppb (15,000 ng/m^3)	
Norflurazon		ND	1.9 ppb (26,000 ng/m^3)	
Oryzalin		ND	16.2 ppb (230,000 ng/m^3)	
Oxydemeton Methyl		ND	0.058 ppb (610 ng/m^3)	
Oxyfluorfen		ND	12.2 ppb (180,000 ng/m^3)	
Permethrin		ND	5.6 ppb (90,000 ng/m^3)	
Phosmet		ND	2 ppb (26,000 ng/m^3)	
pp-dicofol		ND	3.2 ppb (49,000 ng/m^3)	
Propargite		ND	0.98 ppb (14,000 ng/m^3)	

Chemical	Date	Highest rolling average concentration	Sub-chronic screening level	Percent of screening level
Simazine		ND	3.8 ppb (31,000 ng/m^3)	
Trifluralin		ND	12.4 ppb (170,000 ng/m^3)	

* This value is a regulatory target rather than a screening level.

Chronic (annual) Concentrations

Table C–4 shows the annual average concentration for all chemicals monitored at the Shafter sampling site in 2023. The pesticide with highest concentration relative to its screening level was that of MITC at 68%, followed by 1,3-dichloropropene at 7.7%. All other monitored chemicals were less than 1% of their chronic screening level.

Table C–4. Annual average air concentrations, chronic screening levels, and percent of the chronic screening levels for chemicals monitored in Shafter in 2023.

Chemical	Overall average concentration	Chronic screening level	Percent of screening level
1,3-dichloropropene	0.15 ppb (690 ng/m^3)	2 ppb (9,000 ng/m^3)	7.7 %
Methyl Bromide	0.0051 ppb (19.9 ng/m^3)	1 ppb (3,900 ng/m^3)	0.51 %
MITC	0.068 ppb (204 ng/m^3)	0.1 ppb (300 ng/m^3)	68.1 %
Pendimethalin	0.00049 ppb (6.9 ng/m^3)	49 ppb (560,000 ng/m^3)	0.001 %
Acephate	ND	1.1 ppb (8,500 ng/m^3)	
Bensulide	ND	1.5 ppb (24,000 ng/m^3)	
Captan	ND	0.037 ppb (455 ng/m^3)	
Chloropicrin	Trace	0.27 ppb (1,800 ng/m^3)	
Chlorothalonil	ND	3.1 ppb (34,000 ng/m^3)	

Chemical	Overall average concentration	Chronic screening level	Percent of screening level
Chlorpyrifos	ND	0.036 ppb (510 ng/m^3)	
Chlorpyrifos oa	ND	0.037 ppb (510 ng/m^3)	
Cypermethrin	ND	1.6 ppb (27,000 ng/m^3)	
Dacthal	ND	3.5 ppb (47,000 ng/m^3)	
DDVP	Trace	0.085 ppb (770 ng/m^3)	
DEF	ND	NA ppb (NA ng/m^3)	
Diazinon	ND	0.01 ppb (130 ng/m^3)	
Diazinon oa	ND	0.011 ppb (130 ng/m^3)	
Dimethoate	ND	0.032 ppb (300 ng/m^3)	
Dimethoate oa	ND	0.034 ppb (300 ng/m^3)	
Diuron	ND	0.6 ppb (5,700 ng/m^3)	
Endosulfan	ND	0.02 ppb (330 ng/m^3)	
Endosulfan Sulfate	ND	0.019 ppb (330 ng/m^3)	
EPTC	Trace	1.1 ppb (8,500 ng/m^3)	
Fenpyroximate	ND	0.058 ppb (1,000 ng/m^3)	
Iprodione	ND	7.1 ppb (95,600 ng/m^3)	
Malathion	Trace	0.6 ppb (8,100 ng/m^3)	

Chemical	Overall average concentration	Chronic screening level	Percent of screening level
Malathion oa	Trace	0.63 ppb (8,100 ng/m^3)	
Methidathion	ND	0.2 ppb (2,500 ng/m^3)	
Methomyl	ND	4.8 ppb (32,000 ng/m^3)	
Metolachlor (S-Metolachlor)	ND	1.3 ppb (15,000 ng/m^3)	
Norflurazon	ND	1.9 ppb (26,000 ng/m^3)	
Oryzalin	ND	16.2 ppb (230,000 ng/m^3)	
Oxydemeton Methyl	ND	0.058 ppb (610 ng/m^3)	
Oxyfluorfen	ND	3.4 ppb (51,000 ng/m^3)	
Permethrin	ND	5.6 ppb (90,000 ng/m^3)	
Phosmet	ND	1.4 ppb (18,000 ng/m^3)	
pp-dicofol	ND	1.3 ppb (20,000 ng/m^3)	
Propargite	ND	0.98 ppb (14,000 ng/m^3)	
Simazine	ND	3.8 ppb (31,000 ng/m^3)	
Trifluralin	ND	3 ppb (41,000 ng/m^3)	

Temporal Trends in Detected Concentrations

The following figures depict the concentrations over time for any chemical detected at a quantifiable concentration in Shafter in 2023. Screening levels are abbreviated as SL, whereas regulatory targets are abbreviated as RT.

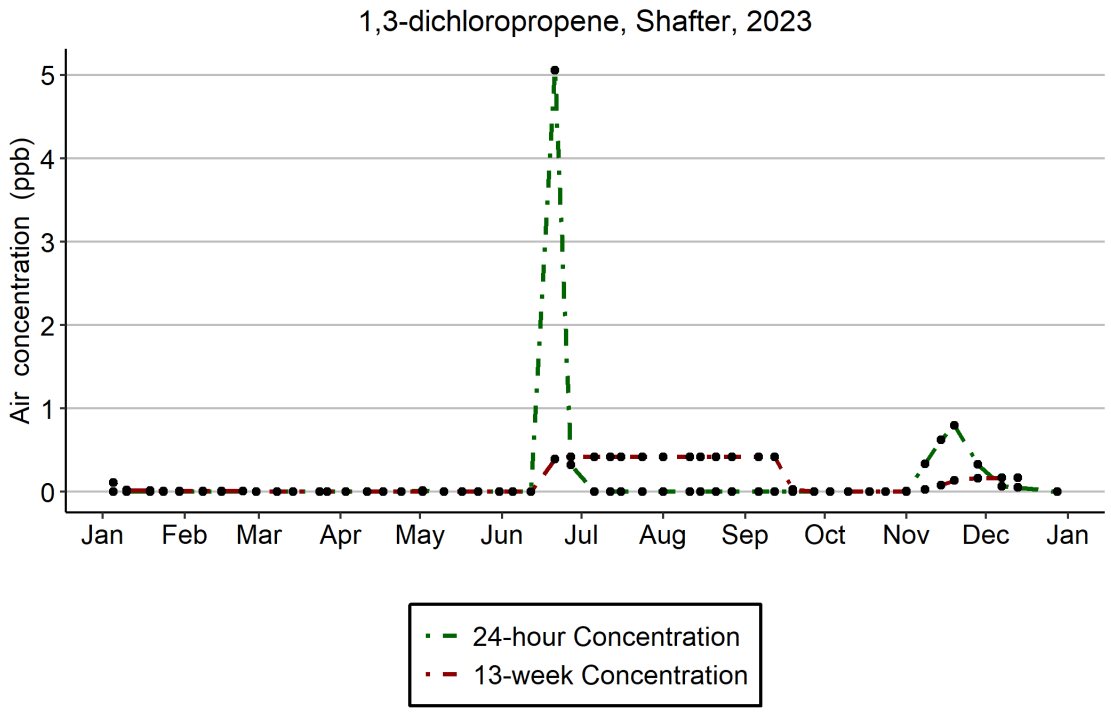

Figure C-1. Temporal trend in 1,3-dichloropropene concentrations in Shafter in 2023 (Acute RT = 55 ppb ; Sub-chronic SL = 3 ppb).

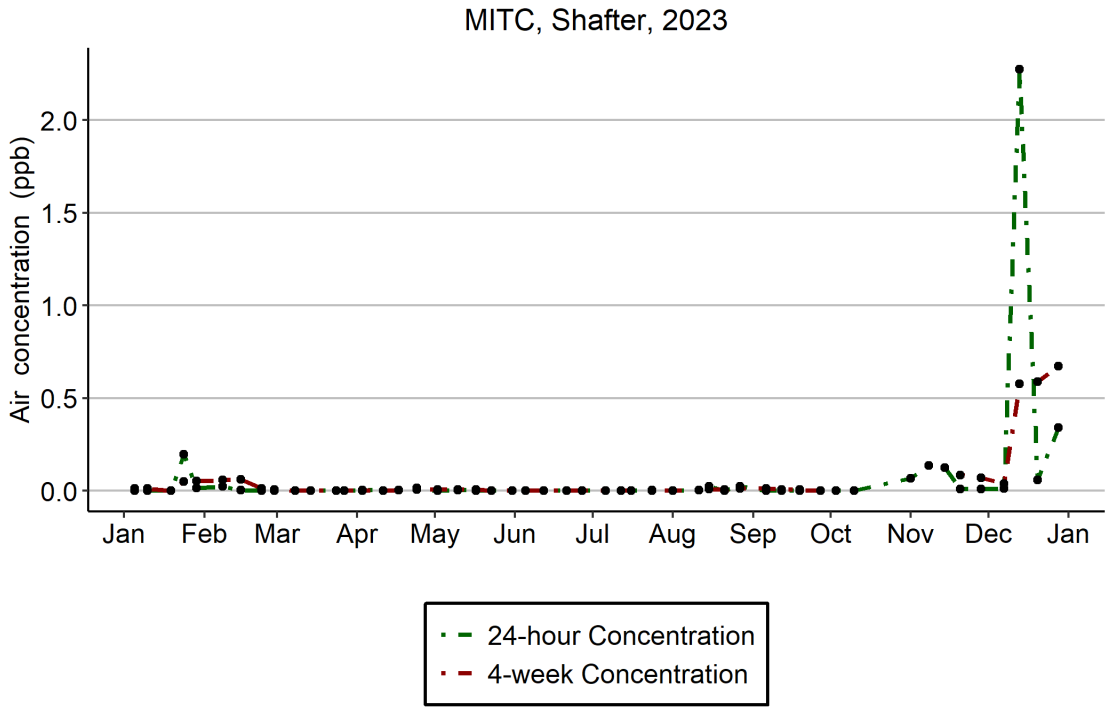

Figure C-2. Temporal trend in MITC concentrations in Shafter in 2023 (Acute RT = 220 ppb ; Sub-chronic SL = 1 ppb).

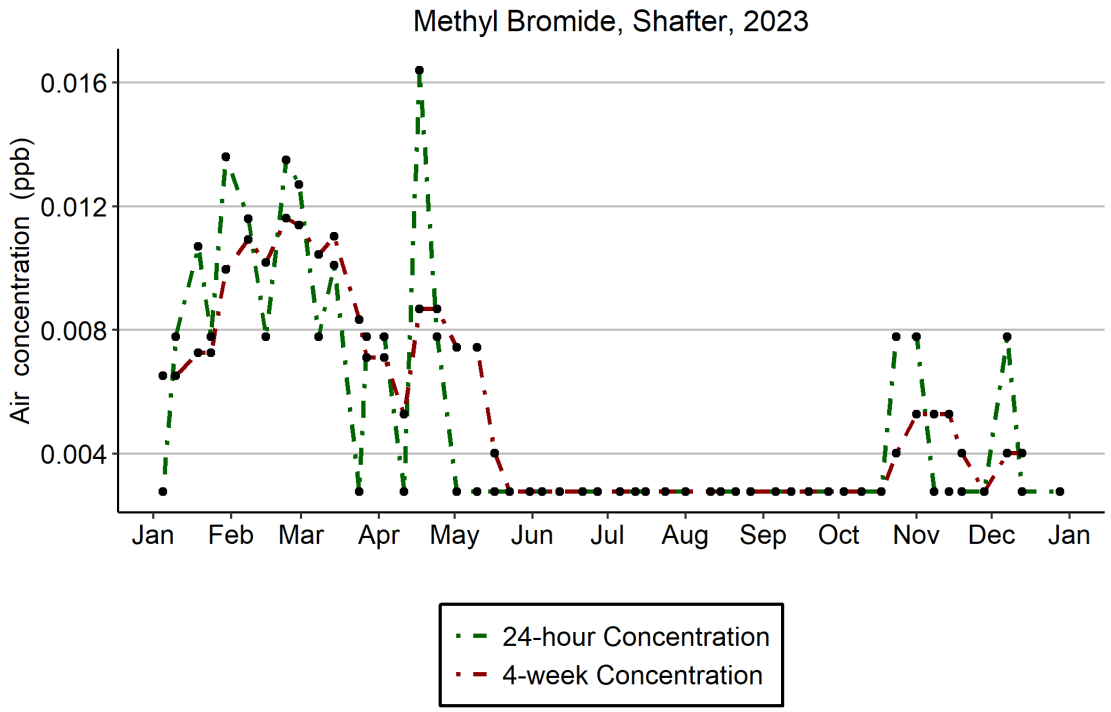

Figure C-3. Temporal trend in Methyl Bromide concentrations in Shafter in 2023 (Acute RT = 210 ppb ; Sub-chronic RT = 5 ppb).

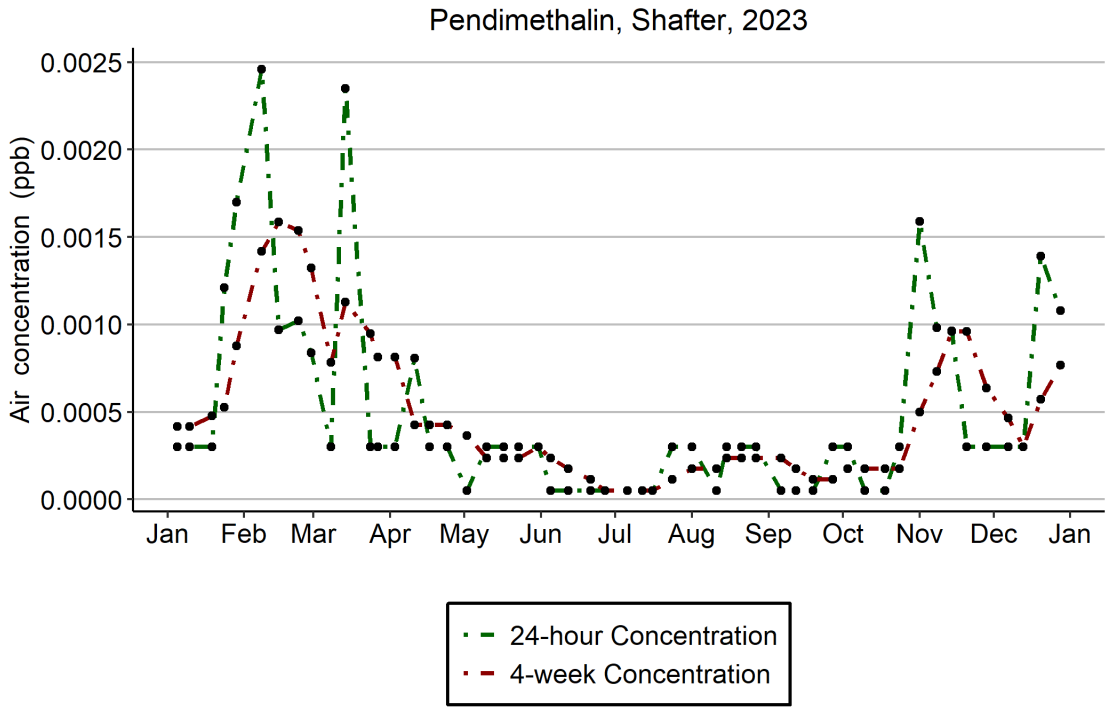

Figure C-4. Temporal trend in Pendimethalin concentrations in Shafter in 2023 (Acute SL = 150 ppb ; Sub-chronic SL = 49 ppb).

APPENDIX D: WATSONVILLE RESULTS

Watsonville

Watsonville is a small city of 7 square miles in area located on the southern edge of Santa Cruz County. The elevation is 29 feet, and 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 2020 census, the population of Watsonville was 53,000 of which 31% were below 18 years of age and 11% 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. DPR is responsible for operating this monitoring location.

Pesticide Detections

Table D–1 lists the number and percentage of analyses resulting in detections at the Watsonville AMN sampling site in 2023. The chemical with the highest number of quantifiable detections was 1,3-dichloropropene (n=13, 26%), followed by chloropicrin (n=11, 21.6%).

Table D–1 Number and percentage of positive samples per chemical in Watsonville in 2023.

Chemical	Number of valid samples	Quantifiable and Trace detections	Quantifiable detections	Quantifiable and Trace detections %	Quantifiable detections %
1,3-dichloropropene	50	14	13	28 %	26 %
Acephate	50	0	0	0 %	0 %
Bensulide	50	0	0	0 %	0 %
Captan	50	1	0	2 %	0 %
Chloropicrin	51	14	11	27.5 %	21.6 %
Chlorothalonil	50	0	0	0 %	0 %
Chlorpyrifos	50	0	0	0 %	0 %
Chlorpyrifos oa	50	0	0	0 %	0 %
Cypermethrin	50	1	0	2 %	0 %
DDVP	50	3	0	6 %	0 %
DEF	50	0	0	0 %	0 %
Dacthal	50	0	0	0 %	0 %
Diazinon	50	0	0	0 %	0 %
Diazinon oa	50	0	0	0 %	0 %
Dimethoate	50	0	0	0 %	0 %

Chemical	Number of valid samples	Quantifiable and Trace detections	Quantifiable detections	Quantifiable and Trace detections %	Quantifiable detections %
Dimethoate oa	50	0	0	0 %	0 %
Diuron	50	0	0	0 %	0 %
EPTC	50	0	0	0 %	0 %
Endosulfan	50	0	0	0 %	0 %
Endosulfan Sulfate	50	0	0	0 %	0 %
Fenpyroximate	50	0	0	0 %	0 %
Iprodione	50	0	0	0 %	0 %
MITC	49	8	7	16.3 %	14.3 %
Malathion	50	4	0	8 %	0 %
Malathion oa	50	2	0	4 %	0 %
Methidathion	50	0	0	0 %	0 %
Methomyl	50	0	0	0 %	0 %
Methyl Bromide	50	16	9	32 %	18 %
Metolachlor (S-Metolachlor)	50	0	0	0 %	0 %
Norflurazon	50	1	0	2 %	0 %
Oryzalin	50	0	0	0 %	0 %
Oxydemeton Methyl	50	0	0	0 %	0 %
Oxyfluorfen	50	1	0	2 %	0 %
Pendimethalin	50	0	0	0 %	0 %
Permethrin	50	1	0	2 %	0 %
Phosmet	50	1	0	2 %	0 %
Propargite	50	1	0	2 %	0 %
Simazine	50	0	0	0 %	0 %
Trifluralin	50	0	0	0 %	0 %
pp-dicofol	50	0	0	0 %	0 %
Total	2,000	68	40	3.4 %	2 %

Pesticide Concentrations

Acute (24-hour) Concentrations

Table D–2 shows the highest 24-hour concentrations observed for all chemicals monitored at the Watsonville AMN sampling site in 2023. All chemicals for which there were quantifiable detections were detected at less than 2% of their screening levels in 2023.

Table D–2. Highest 24-hour air concentrations, acute screening levels, and percent of the acute screening level for all chemicals monitored in Watsonville in 2023.

Chemical	Date	Highest 24-hour concentration	24-hour acute screening level	Percent of screening level
1,3-dichloropropene	09/08/2023	0.22 ppb (1,003 ng/m^3)	55 ppb*‡ (250,000 ng/m^3)	0.4 %
Chloropicrin	09/08/2023	0.97 ppb (6,511 ng/m^3)	73 ppb*† (491,000 ng/m^3)	1.3 %
Methyl Bromide	11/03/2023	0.016 ppb (60.6 ng/m^3)	210 ppb* (820,000 ng/m^3)	0.007 %
MITC	10/10/2023	0.052 ppb (154 ng/m^3)	220 ppb*† (660,000 ng/m^3)	0.023 %
Acephate		ND	1.6 ppb (12,000 ng/m^3)	
Bensulide		ND	15.9 ppb (259,000 ng/m^3)	
Captan		Trace	0.15 ppb (1,844 ng/m^3)	
Chlorothalonil		ND	3.1 ppb (34,000 ng/m^3)	
Chlorpyrifos		ND	0.084 ppb (1,200 ng/m^3)	
Chlorpyrifos oa		ND	0.088 ppb (1,200 ng/m^3)	
Cypermethrin		Trace	6.6 ppb (113,000 ng/m^3)	
Dacthal		ND	1732 ppb (23,500,000 ng/m^3)	
DDVP		Trace	1.2 ppb (11,000 ng/m^3)	

Chemical	Date	Highest 24-hour concentration	24-hour acute screening level	Percent 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	0.011 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	0.2 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)	
Fenpyroximate		ND	0.87 ppb (15,000 ng/m^3)	
Iprodione		ND	23.2 ppb (313,000 ng/m^3)	
Malathion		Trace	8.3 ppb (112,500 ng/m^3)	
Malathion oa		Trace	8.8 ppb (112,500 ng/m^3)	
Methidathion		ND	0.25 ppb (3,100 ng/m^3)	
Methomyl		ND	4.8 ppb (32,000 ng/m^3)	
Metolachlor (S-Metolachlor)		ND	7.3 ppb (85,000 ng/m^3)	
Norflurazon		Trace	12.6 ppb (170,000 ng/m^3)	
Oryzalin		ND	29.7 ppb (420,000 ng/m^3)	

Chemical	Date	Highest 24-hour concentration	24-hour acute screening level	Percent of screening level
Oxydemeton Methyl		ND	3.7 ppb (39,200 ng/m^3)	
Oxyfluorfen		Trace	34.5 ppb (510,000 ng/m^3)	
Pendimethalin		ND	150 ppb (1,700,000 ng/m^3)	
Permethrin		Trace	10.5 ppb (168,000 ng/m^3)	
Phosmet		Trace	5.9 ppb (77,000 ng/m^3)	
pp-dicofol		ND	4.5 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		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-hour time-weighted-average (TWA) used to compare the 24-h measured concentration.
‡ This value is a 72-hour TWA used to compare against the 24-hour measured concentration.

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

Table D–3 shows the highest rolling 4-week or 13-week average concentrations for all chemicals monitored at the Watsonville AMN sampling site in 2023. The highest concentration relative to its screening level was that of chloropicrin at 65%. The other three chemicals for which there were quantifiable detections were less than 3% of their sub-chronic screening levels.

Table D–3. Highest rolling average air concentrations, sub-chronic screening levels, and percent of the sub- chronic screening level for chemicals monitored in Watsonville in 2023.

Chemical	Date	Highest rolling average concentration	Sub-chronic screening level	Percent of screening level
1,3-dichloropropene	11/06/2023	0.058 ppb (265 ng/m^3)	3 ppb (14,000 ng/m^3)	1.9 %
Chloropicrin	11/02/2023	0.22 ppb (1,505 ng/m^3)	0.35 ppb (2,300 ng/m^3)	65.4 %

Chemical	Date	Highest rolling average concentration	Sub-chronic screening level	Percent of screening level
Methyl Bromide	03/09/2023	0.011 ppb (43 ng/m^3)	5 ppb* (19,400 ng/m^3)	0.22 %
MITC	10/10/2023	0.029 ppb (87.3 ng/m^3)	1 ppb (3,000 ng/m^3)	2.9 %
Acephate		ND	1.1 ppb (8,500 ng/m^3)	
Bensulide		ND	1.5 ppb (24,000 ng/m^3)	
Captan		Trace	0.11 ppb (1,352 ng/m^3)	
Chlorothalonil		ND	3.1 ppb (34,000 ng/m^3)	
Chlorpyrifos		ND	0.059 ppb (850 ng/m^3)	
Chlorpyrifos oa		ND	0.062 ppb (850 ng/m^3)	
Cypermethrin		Trace	4.8 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		ND	0.01 ppb (130 ng/m^3)	
Diazinon oa		ND	0.011 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	1.8 ppb (17,000 ng/m^3)	

Chemical	Date	Highest rolling average concentration	Sub-chronic screening level	Percent of screening level
Endosulfan		ND	0.2 ppb (3,300 ng/m^3)	
Endosulfan Sulfate		ND	0.19 ppb (3,300 ng/m^3)	
EPTC		ND	3.1 ppb (24,000 ng/m^3)	
Fenpyroximate		ND	0.58 ppb (10,000 ng/m^3)	
Iprodione		ND	7.1 ppb (95,600 ng/m^3)	
Malathion		Trace	6 ppb (80,600 ng/m^3)	
Malathion oa		Trace	6.3 ppb (80,600 ng/m^3)	
Methidathion		ND	0.25 ppb (3,100 ng/m^3)	
Methomyl		ND	4.8 ppb (32,000 ng/m^3)	
Metolachlor (S-Metolachlor)		ND	1.3 ppb (15,000 ng/m^3)	
Norflurazon		Trace	1.9 ppb (26,000 ng/m^3)	
Oryzalin		ND	16.2 ppb (230,000 ng/m^3)	
Oxydemeton Methyl		ND	0.058 ppb (610 ng/m^3)	
Oxyfluorfen		Trace	12.2 ppb (180,000 ng/m^3)	
Pendimethalin		ND	49 ppb (560,000 ng/m^3)	
Permethrin		Trace	5.6 ppb (90,000 ng/m^3)	
Phosmet		Trace	2 ppb (26,000 ng/m^3)	

Chemical	Date	Highest rolling average concentration	Sub-chronic screening level	Percent of screening level
pp-dicofol		ND	3.2 ppb (49,000 ng/m^3)	
Propargite		Trace	0.98 ppb (14,000 ng/m^3)	
Simazine		ND	3.8 ppb (31,000 ng/m^3)	
Trifluralin		ND	12.4 ppb (170,000 ng/m^3)	

* This value is a regulatory target rather than a screening level.

Chronic (annual) Concentrations

Table D–4 shows the annual average concentration for all chemicals monitored at the Watsonville sampling site in 2023. The pesticide with highest concentration relative to its screening level was that of chloropicrin at 22.8%. All other monitored chemicals were less than 5% of their chronic screening level.

Table D–4. Annual average air concentrations, chronic screening levels, and percent of the chronic screening levels for chemicals monitored in Watsonville in 2023.

Chemical	Overall average concentration	Chronic screening level	Percent of screening level
1,3-dichloropropene	0.02 ppb (91.6 ng/m^3)	2 ppb (9,000 ng/m^3)	1 %
Chloropicrin	0.061 ppb (411 ng/m^3)	0.27 ppb (1,800 ng/m^3)	22.8 %
Methyl Bromide	0.0051 ppb (19.9 ng/m^3)	1 ppb (3,900 ng/m^3)	0.51 %
MITC	0.0045 ppb (13.4 ng/m^3)	0.1 ppb (300 ng/m^3)	4.5 %
Acephate	ND	1.1 ppb (8,500 ng/m^3)	
Bensulide	ND	1.5 ppb (24,000 ng/m^3)	
Captan	Trace	0.037 ppb (455 ng/m^3)	

Chemical	Overall average concentration	Chronic screening level	Percent of screening level
Chlorothalonil	ND	3.1 ppb (34,000 ng/m^3)	
Chlorpyrifos	ND	0.036 ppb (510 ng/m^3)	
Chlorpyrifos oa	ND	0.037 ppb (510 ng/m^3)	
Cypermethrin	Trace	1.6 ppb (27,000 ng/m^3)	
Dacthal	ND	3.5 ppb (47,000 ng/m^3)	
DDVP	Trace	0.085 ppb (770 ng/m^3)	
DEF	ND	NA ppb (NA ng/m^3)	
Diazinon	ND	0.01 ppb (130 ng/m^3)	
Diazinon oa	ND	0.011 ppb (130 ng/m^3)	
Dimethoate	ND	0.032 ppb (300 ng/m^3)	
Dimethoate oa	ND	0.034 ppb (300 ng/m^3)	
Diuron	ND	0.6 ppb (5,700 ng/m^3)	
Endosulfan	ND	0.02 ppb (330 ng/m^3)	
Endosulfan Sulfate	ND	0.019 ppb (330 ng/m^3)	
EPTC	ND	1.1 ppb (8,500 ng/m^3)	
Fenpyroximate	ND	0.058 ppb (1,000 ng/m^3)	
Iprodione	ND	7.1 ppb (95,600 ng/m^3)	
Malathion	Trace	0.6 ppb (8,100 ng/m^3)	

Chemical	Overall average concentration	Chronic screening level	Percent of screening level
Malathion oa	Trace	0.63 ppb (8,100 ng/m^3)	
Methidathion	ND	0.2 ppb (2,500 ng/m^3)	
Methomyl	ND	4.8 ppb (32,000 ng/m^3)	
Metolachlor (S-Metolachlor)	ND	1.3 ppb (15,000 ng/m^3)	
Norflurazon	Trace	1.9 ppb (26,000 ng/m^3)	
Oryzalin	ND	16.2 ppb (230,000 ng/m^3)	
Oxydemeton Methyl	ND	0.058 ppb (610 ng/m^3)	
Oxyfluorfen	Trace	3.4 ppb (51,000 ng/m^3)	
Pendimethalin	ND	49 ppb (560,000 ng/m^3)	
Permethrin	Trace	5.6 ppb (90,000 ng/m^3)	
Phosmet	Trace	1.4 ppb (18,000 ng/m^3)	
pp-dicofol	ND	1.3 ppb (20,000 ng/m^3)	
Propargite	Trace	0.98 ppb (14,000 ng/m^3)	
Simazine	ND	3.8 ppb (31,000 ng/m^3)	
Trifluralin	ND	3 ppb (41,000 ng/m^3)	

Temporal Trends in Detected Concentrations

The following figures depict the concentrations over time for any chemical detected at a quantifiable concentration in Watsonville in 2023. Screening levels are abbreviated as SL, whereas regulatory targets are abbreviated as RT.

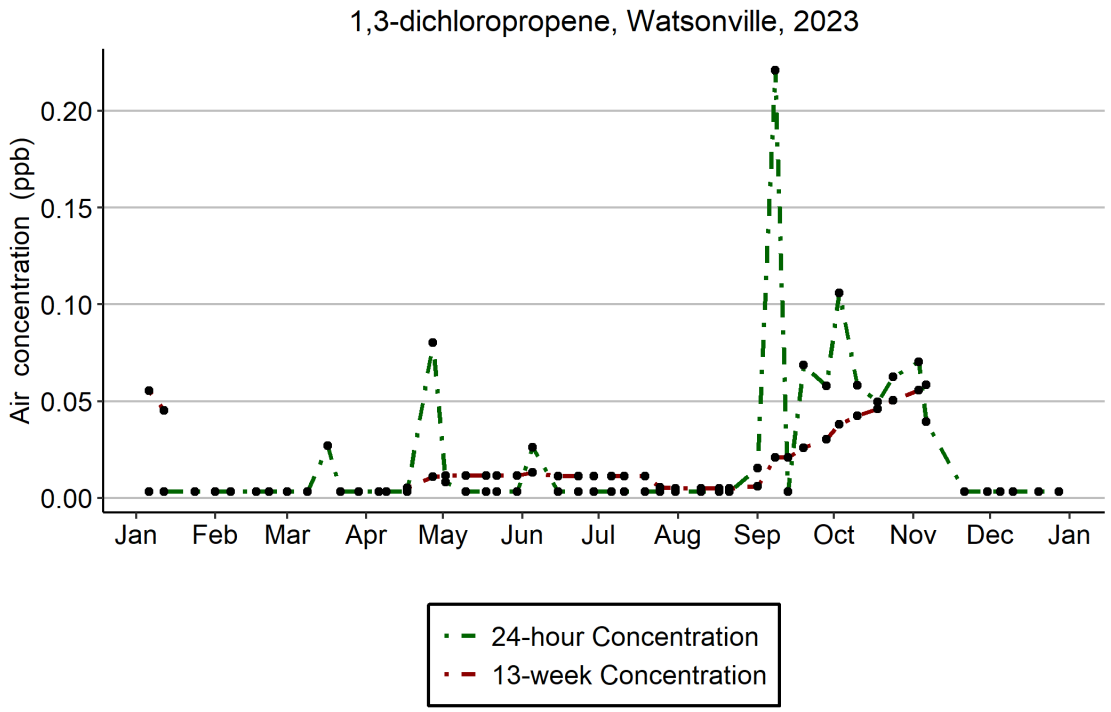

Figure -D1. Temporal trend in 1,3-dichloropropene concentrations in Watsonville in 2023 (Acute RT = 55 ppb ; Sub-chronic SL = 3 ppb).

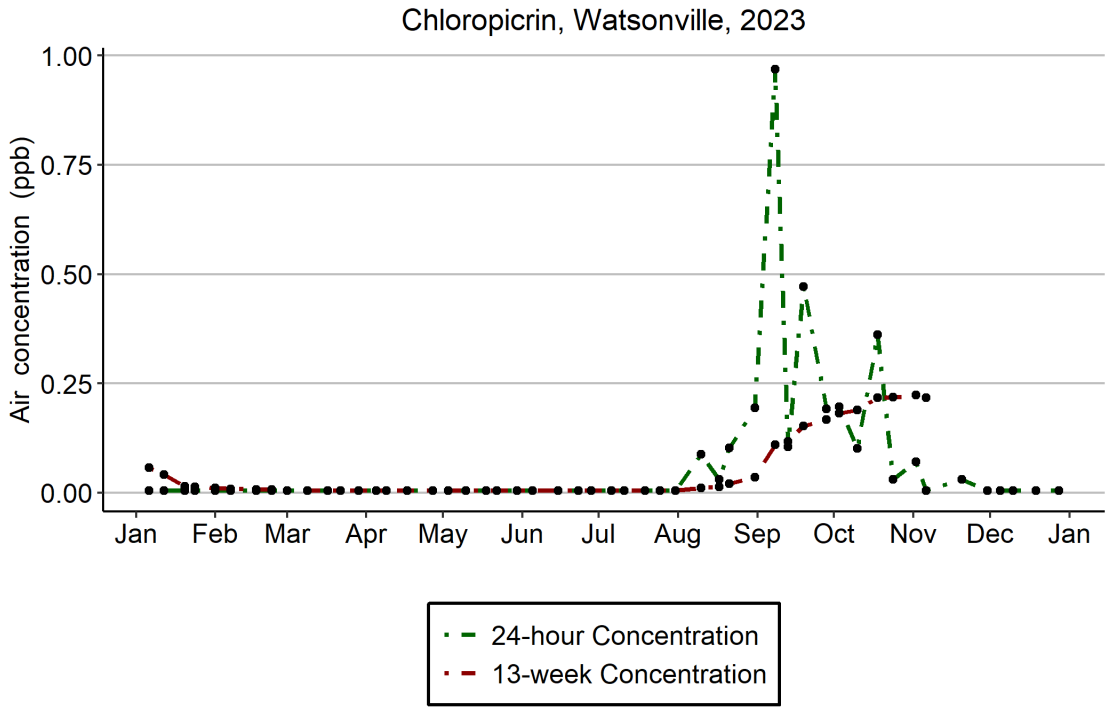

Figure D-2. Temporal trend in Chloropicrin concentrations in Watsonville in 2023 (Acute RT = 73 ppb ; Sub-chronic SL = 0.35 ppb).

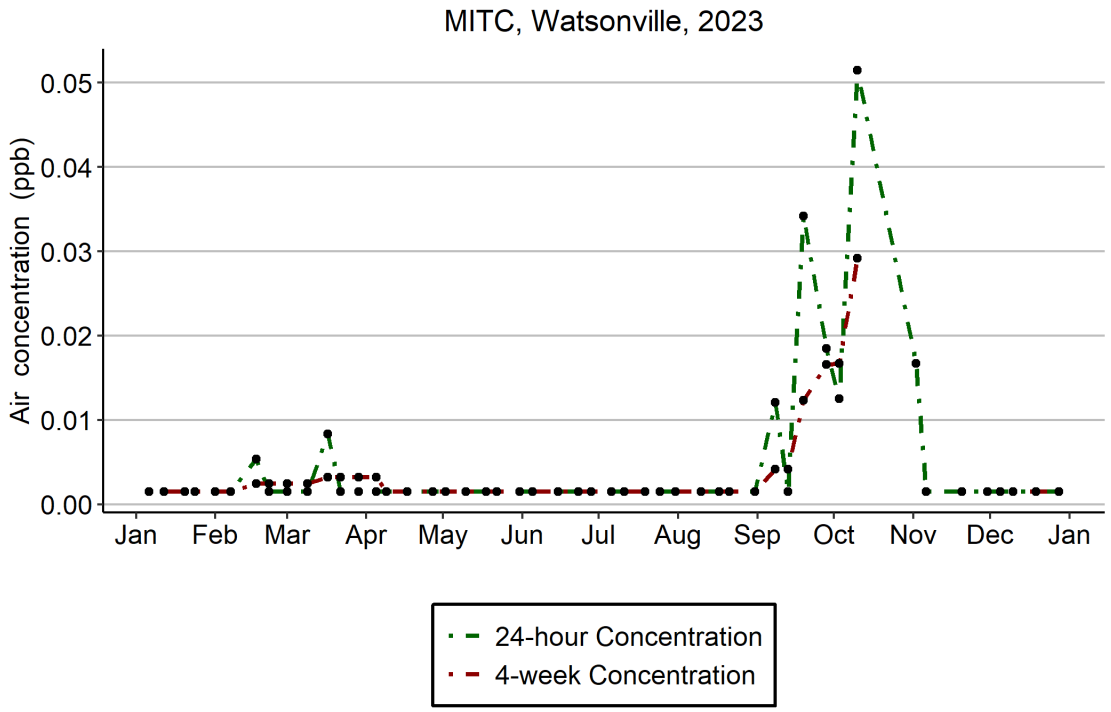

Figure D-3. Temporal trend in MITC concentrations in Watsonville in 2023 (Acute RT = 220 ppb ; Sub-chronic SL = 1 ppb).

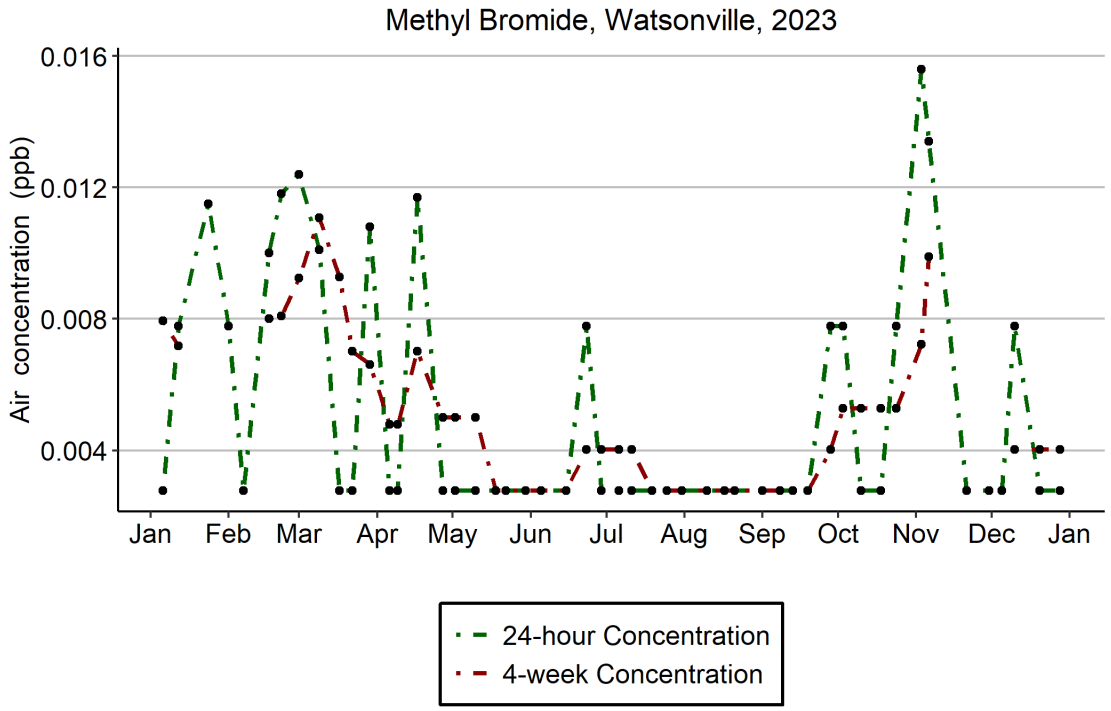

Figure D-4. Temporal trend in Methyl Bromide concentrations in Watsonville in 2023 (Acute RT = 210 ppb ; Sub-chronic RT = 5 ppb).

APPENDIX E: FIELD METHODS

Materials and Methods

Current Air Sampling Methods

As part of the Air Monitoring Network (AMN), the California Department of Pesticide Regulation (DPR) monitors for 31 pesticides and 5 breakdown products. Chemicals included in the AMN were selected based primarily on potential health risk (CDPR 2013). Four sampling methods were used for the collection of air samples.

Volatile Organic Compounds (VOC)

Ambient air was drawn through 1/16" internal diameter PTFE (Teflon) tubing into a 6-liter SUMMA canister for a 24-hour period. Air samplers included an automatically initiated 60-second purge period to clear the sampling lines immediately prior to sample collection. Two sampling instruments were used: Nutech (model 2703) was used in Santa Barbara, Shafter, and Watsonville, and the flow rate for this sampler was 3.5 mL/min (± 10%). Likewise, Xonteck (model 901) was used in Oxnard, and the flow rate for this sampler was 7.5 mL/min (± 10%).

Multi-Pesticide Residue

Ambient air was drawn through a customized XAD-4 media using channel 1 of a custom-built 3-channel pesticide sampling version of a Speciation Air Sampling System manufactured by Met One Instruments, hereafter referred to as Met One pesticide sampler. Channel 1 provided a sustained flow of 15.0 L/min ± 10%. 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.

Methyl Isothiocyanate (MITC)

Ambient air was drawn through Anasorb CSC coconut charcoal sorbent tubes (SKC # 226-16-02) using channel 2 of the Met One pesticide sampler. Channel 2 provided a sustained flow of 1.5 L/min ± 10%. 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.

Chloropicrin

Ambient air was drawn through XAD-4 sorbent tubes (SKC # 226-175) using channel 3 of the Met One pesticide sampler. Channel 3 provided a sustained flow of 50 mL/min ± 10%. 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)

In the event of unforeseen complications with current equipment, DPR has the option to use legacy methodologies and equipment, allowing staff to collect samples during the scheduled timeframe without compromising the sample's integrity.

Should the Xonteck equipment fail or become unavailable, ambient air was drawn into a 6-L air sample canister (cat. # 24142) pre-evacuated to a pressure of -30" Hg for VOC analysis as a backup method. 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.

Should the Met One equipment fail or become unavailable, ambient air was drawn through the XAD-4 media using an SKC® AirChek HV30 air pump as a backup method. The pump was calibrated at a flow rate of 15 L/min (± 10%) for a continuous 24-h period. The cartridges were 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.

Field Sampling Procedure

One 24-h sample was collected each week at each of the four sites. 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 10%, the equipment was recalibrated. 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, DPR collected quality control (QC) samples including trip blanks and duplicates (co-located) samples at a rate of at least 10% of primary samples. Table F-

5 and Table F-6 summarize the results of these QC procedures and are 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 stations in Shafter and Watsonville 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, a duplicate sample is a sample that is co-located with a regular field sample to evaluate the overall precision in sample measurement and analysis. The sampling stations at Shafter and Watsonville were designated as quality control sites, hence a second set of sampling equipment were installed at these locations.

APPENDIX F: LABORATORY ANALYSIS

Analytical Methods

A total of four analytical methods were used and analyzed by California Department of Food and Agriculture's Center for Analytical Chemistry (CDFA-CAC):

VOC

Air samples collected in summa canisters were analyzed for the presence of the fumigants 1,3-dichloropropene and methyl bromide (Table F-1) using a gas chromatography-mass spectrometry (GC-MS) methodology similar to US EPA's Method TO-15 established by CDFA-CAC (CDFA 2013). Analysis of 1,3-D includes results for both cis- and trans- isomers, which were then consolidated and reported as a total 1,3-D concentration for use in this report.

Table F-1. 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 were collected on Anasorb CSC coconut charcoal sorbent tubes (SKC # 226-16-02) and analyzed by CDFA-CAC staff. MITC residues adsorbed onto the activated charcoal were extracted from the charcoal with 1% carbon disulfide in ethyl acetate and analyzed via GC-MS (Table F-2). Full method validation data was obtained and verified by CDFA-CAC (CDFA 2018).

Chloropicrin

Samples were collected on XAD-4 sorbent tubes (SKC # 226-175) and analyzed by CDFA-CAC staff. Chloropicrin residues adsorbed onto the XAD-4 resin were extracted from the resin with methylene chloride and analyzed via GC-MS (Table F-2, CDFA 2020). Full method validation data was obtained and verified by CDFA-CAC (CDFA 2020).

Table F-2. Target analytes in individual analyte residue analysis.

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

Multi-Pesticide Residue

Prior to sampling, CDFA-CAC staff washed, rinsed, and packed 30 mL of XAD-4 sorbent material into a custom-built Teflon cartridge to collect 36 analytes via multi-pesticide residue analysis. Multi-pesticide residue analysis using XAD-4 resin was performed via GC-MS and liquid chromatography mass spectrometry (LC-MS) using ethyl acetate (CDFA 2021). This analysis can detect a variety of fungicides, insecticides, herbicides, and defoliants. The breakdown products (oxygen analogs) of chlorpyrifos, diazinon, dimethoate, endosulfan, and malathion were also included in the multi-pesticide residue analysis method (Table F-3).

Table F-3. Target analytes in multi-pesticide residue analysis.

Chemical	**Chemical Class**	**Pesticide Group**
Acephate	Organophosphate	Insecticide
Bensulide	Organophosphate	Herbicide
Chlorothalonil	Chloronitrile	Fungicide
Captan	Phthalimide	Fungicide
Chlorpyrifos	Organophosphate	Insecticide
Chlorpyrifos oxygen analog (OA)	Organophosphate	Degradate
Chlorthal-dimethyl (Dacthal, DCPA)	Phthalate	Herbicide
Cypermethrin	Pyrethroid	Insecticide
DDVP	Organophosphate	Insecticide
DEF (SSS-tributyl phosphorotrithioate)	Organophosphate	Defoliant
Diazinon	Organophosphate	Insecticide
Diazinon OA	Organophosphate	Degradate
Dicofol	Organochlorine	Insecticide
Dimethoate	Organophosphate	Insecticide
Dimethoate OA	Organophosphate	Degradate
Diuron	Urea	Herbicide
Endosulfan	Organochlorine	Insecticide
Endosulfan Sulfate	Organochlorine	Degradate
EPTC	Carbamate	Herbicide
Fenpyroximate	Pyrazole	Insecticide
Iprodione	Dicarboximide	Fungicide
Malathion	Organophosphate	Insecticide
Malathion OA	Organophosphate	Degradate
Methidathion	Organophosphate	Insecticide
Methomyl	Carbamate	Insecticide

Chemical	Chemical Class	Pesticide Group
Metolachlor	Chloracetanilide	Herbicide
Norflurazon	Pyridazinone	Herbicide
Oryzalin	Dinitroaniline	Herbicide
Oxydemeton methyl	Organophosphate	Insecticide
Oxyfluorfen	Diphenyl ether	Herbicide
Pendimethalin	Dinitroaniline	Herbicide
Permethrin	Pyrethroid	Insecticide
Phosmet	Organophosphate	Insecticide
Propargite	Organosulfite	Insecticide
Simazine	Triazine	Herbicide
Trifluralin	Dinitroaniline	Herbicide

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 (CDFA 2018, CDFA 2020). 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, CDFA-CAC uses 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 (CDFA 2013).

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 (Table F-4). CDFA-CAC 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 was analyzed at least 7 times, and the MDL is determined by calculating the standard deviation and multiplying it by the t-value at 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 (Table F-4). The level of interference determines the magnitude of this factor, the more interference, the higher the factor.

Table F-4. Method detection limit (MDL) and limit of quantitation (LOQ) established by CDFA's Center for Analytical Chemistry.

Chemical	MDL (ppb)	LOQ (ppb)	MDL (ng/m^3)	LOQ (ng/m^3)
1,3-dichloropropene	0.00655	0.0100	29.7	45.4
Acephate	0.00040	0.0012	2.9	9.3
Bensulide	0.00020	0.0006	3.3	9.3
Captan	0.00020	0.0019	3.0	23.1
Chloropicrin	0.00950	0.0517	63.6	347.2
Chlorothalonil	0.00020	0.0021	2.2	23.1
Chlorpyrifos	0.00010	0.0016	2.0	23.1
Chlorpyrifos oa	0.00010	0.0007	2.0	9.3
Cypermethrin	0.00020	0.0014	3.4	23.1
DDVP	0.00020	0.0026	1.8	23.1
DEF	0.00020	0.0007	2.0	9.3
Dacthal	0.00020	0.0007	2.1	9.3
Diazinon	0.00020	0.0007	2.1	9.3
Diazinon oa	0.00020	0.0008	1.9	9.3
Dimethoate	0.00020	0.0010	2.3	9.3
Dimethoate oa	0.00030	0.0011	2.9	9.3
Diuron	0.00020	0.0010	2.2	9.3
EPTC	0.00030	0.0012	2.0	9.3
Endosulfan	0.00010	0.0014	2.0	23.1
Endosulfan Sulfate	0.00010	0.0013	2.1	23.1
Fenpyroximate	0.00040	0.0014	2.6	9.3
Iprodione	0.00020	0.0007	2.7	9.3
MITC	0.00300	0.0077	8.9	23.1
Malathion	0.00010	0.0007	1.8	9.3
Malathion oa	0.00010	0.0007	1.9	9.3
Methidathion	0.00020	0.0007	2.8	9.3
Methomyl	0.00020	0.0008	2.3	9.3

Chemical	MDL (ppb)	LOQ (ppb)	MDL (ng/m^3)	LOQ (ng/m^3)
Methyl Bromide	0.00555	0.0100	21.6	38.8
Metolachlor (S-Metolachlor)	0.00020	0.0008	2.1	9.3
Norflurazon	0.00010	0.0007	2.0	9.3
Oryzalin	0.00020	0.0007	2.5	9.3
Oxydemeton Methyl	0.00020	0.0009	2.5	9.3
Oxyfluorfen	0.00010	0.0016	1.7	23.1
Pendimethalin	0.00010	0.0005	2.2	9.3
Permethrin	0.00020	0.0014	2.5	23.1
Phosmet	0.00010	0.0007	1.8	9.3
Propargite	0.00020	0.0016	2.6	23.1
Simazine	0.00020	0.0011	1.9	9.3
Trifluralin	0.00010	0.0017	1.7	23.1
pp-dicofol	0.00010	0.0015	1.6	23.1

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:

$$ng/m^3 = \frac{\text{Results } (\mu g) \text{ x } 1000 \text{ } (ng/\mu g) \text{ x } 1000 \text{ } (L/m^3)}{\text{Run time } (min) \text{ x Flow rate } (L/min)}$$

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

$$ng/m^3 = \frac{\text{Results } (ppb) \text{ x } (ng)/(ppb \text{ x } g) \text{ x Molecular weight } (g/mole)}{0.02445 \text{ } (m^3/mole)}$$

In the equation above, 0.02445 m^3 (24.45 L) is the volume of a mole of a gas when the pressure is at 1 atmosphere and the temperature is at 25°C. Additionally, given that 1 ppb = 1 ng/g, we add the unit ng/(g.ppb) for conversion purposes.

Per standard DPR practice, when an active ingredient is detected but the concentration is lower than its quantitation limit, this pesticide is considered to have a "Trace" amount and is presumed to contain a concentration halfway between the MDL and the LOQ (Trace = (MDL+LOQ)/2). Likewise, non-detected (ND) pesticides are presumed to contain one-half their MDL value (ND = MDL/2).

Data Validation/Quality Assurance

Method Validation

The method validation consisted of five sample sets and five fortification (spike) levels for chloropicrin and multi-residue analyses, and three sample sets and seven fortification levels for MITC (CDFA 2008, 2018, 2020). An acceptable range of spike recoveries was established by analyzing laboratory spike sample, and the mean percent recovery and standard deviation were determined based on these data points. The control limits were established as the mean percent recovery ± 3 standard deviations.

General Continuing Quality Control

Samples were stored at DPR's Bradshaw Regional Office under the care of the laboratory liaison until scheduled delivery to the CDFA-CAC 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. Each extraction set consisted of 1 to 24 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.

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 F-5 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 79% to 98% for all chemicals analyzed. Field blanks and duplicate samples are part of DPR'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. Table F-5 shows that all field blanks resulted in non-detections.

Table F-5. Quality control/quality assurance results from 2023 analyzed by CDFA-CAC.

Chemical	Lab Spikes Number	Lab Spikes Recovery	Lab Blanks Number	Lab Blanks Detection	Field Blanks Number	Field Blanks Detection
1,3-dichloropropene	52	98 %	52	ND	33	ND
Acephate	27	92 %	27	ND	17	ND
Bensulide	27	90 %	27	ND	17	ND
Captan	27	85 %	27	ND	17	ND
Chloropicrin	31	94 %	31	ND	17	ND
Chlorothalonil	27	85 %	26	ND	17	ND
Chlorpyrifos	27	89 %	27	ND	17	ND
Chlorpyrifos OA	27	90 %	27	ND	17	ND
Cypermethrin	27	89 %	27	ND	17	ND
Dacthal	27	88 %	26	ND	17	ND
DDVP	27	83 %	26	ND	17	ND
DEF	27	92 %	27	ND	17	ND
Diazinon	27	90 %	27	ND	17	ND
Diazinon OA	27	92 %	27	ND	17	ND
Dimethoate	27	90 %	27	ND	17	ND
Dimethoate OA	27	92 %	27	ND	17	ND
Diuron	27	92 %	27	ND	17	ND
Endosulfan I	27	87 %	27	ND	17	ND
Endosulfan Sulfate	27	88 %	27	ND	17	ND
EPTC	27	79 %	26	ND	17	ND
Fenpyroximate	27	93 %	27	ND	17	ND
Iprodione	27	86 %	27	ND	17	ND
Malathion	27	91 %	27	ND	17	ND
Malathion OA	27	92 %	27	ND	17	ND
Methidathion	27	91 %	27	ND	17	ND
Methomyl	27	89 %	27	ND	17	ND
Methyl Bromide	52	98 %	52	ND	33	ND
Metolachlor	27	90 %	27	ND	17	ND
MITC	44	85 %	44	ND	17	ND
Norflurazon	27	91 %	27	ND	17	ND

Chemical	Lab Spikes Number	Lab Spikes Recovery	Lab Blanks Number	Lab Blanks Detection	Field Blanks Number	Field Blanks Detection
Oryzalin	27	89 %	27	ND	17	ND
Oxydemeton methyl	27	83 %	27	ND	17	ND
Oxyfluorfen	27	91 %	27	ND	17	ND
Pendimethalin	27	93 %	27	ND	17	ND
Permethrin	27	90 %	27	ND	17	ND
Phosmet	27	91 %	27	ND	17	ND
pp-Dicofol	27	89 %	27	ND	17	ND
Propargite	27	88 %	27	ND	17	ND
Simazine	27	90 %	27	ND	17	ND
Trifluralin	27	88 %	26	ND	17	ND

Table F-6 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 many 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.

Table F-6. Results for the co-located sample pairs in 2023. Values indicate the total number of events where the Primary sample and its Duplicate sample fell in the specific paired category.

Paired category: Primary / Duplicate	1,3-D	Methyl bromide	Chloropicrin	MITC	Multi-residue
ND / ND	16	16	20	17	884
ND / Trace	0	0	0	0	2
ND / >LOQ	1	0	0	1	0
Trace / ND	0	2	0	1	1
Trace / Trace	0	0	1	0	9
Trace / >LOQ	0	0	0	0	2
>LOQ / ND	0	0	0	0	0
>LOQ / Trace	0	1	0	0	1
>LOQ / >LOQ	7	1	3	4	2

ND = Not detected ; Trace = Detection below the quantitation limit ; LOQ = Limit of quantification.

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 Nutech2703 ambient air sampler should run for 24 hours and the ending pressure must be between -4 and -10 inHg. These criteria for each sampling method and each sampling media are explained in detail in Appendix E.

In 2023, 17 samples were lost or invalidated during the year. Table F-7 lists the location, operator, date, and type of samples.

Table F-7. Invalid samples in 2023.

Community	Operator	Date	Sample type
Oxnard	V-CAC	1/5/2023	MITC sorbent tube was damaged.
Oxnard	V-CAC	3/3/2023	Multi-residue sampling instrument was off.
Oxnard	V-CAC	7/7/2023	Multi-residue sampling instrument was off.
Oxnard	V-CAC	10/11/2023	MITC. CDFA lab mistake during sample extraction.
Oxnard	V-CAC	10/19/2023	MITC. CDFA lab mistake during sample extraction.
Oxnard	V-CAC	12/15/2023	Multi-residue sampling instrument was off.
Santa Maria	SB-CAC	4/20/2023	Chloropicrin, MITC, & Multi-residue. Power outage.
Santa Maria	SB-CAC	5/18/2023	1,3-D/MeBr sampling instrument was off.
Shafter	DPR	10/20/2023	MITC. CDFA lab mistake during sample extraction.
Shafter	DPR	10/25/2023	MITC. CDFA lab mistake during sample extraction.
Shafter	DPR	12/21/2023	1,3-D/MeBr sampling instrument was off.
Ohlone	DPR	1/21/2023	1,3-D/MeBr & Multi-residue. Power outage.
Ohlone	DPR	10/19/2023	MITC. CDFA lab mistake during sample extraction.
Ohlone	DPR	10/25/2023	MITC. CDFA lab mistake during sample extraction.

Appendix G: HEALTH EVALUATION AND CALCULATIONS

Calculation of Sub-chronic Rolling Averages

In 2016, DPR updated the calculation of sub-chronic concentrations for 1,3-dichloropropene and chloropicrin from 4-week rolling average concentrations to 13-week rolling average concentrations to be compared with their sub-chronic screening levels and regulatory targets (CDPR 2016b). This determination was based on evaluations conducted by DPR's Human Health Assessment Branch that investigated seasonal reference concentrations for 1,3-D and chloropicrin in 2012 and 2015, respectively (CDPR 2012, CDPR 2015).

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 (CDPR 2013). No state or federal agency has established health standards for pesticides in air. Therefore, DPR in consultation with the Office of Environmental Health Hazard Assessment 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 DPR 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. DPR (2013) summarizes more information on DPR-determined screening levels including information on deriving screening levels for each pesticide.

DPR 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. DPR normally establishes a regulatory target after completing a formal risk assessment of a chemical's toxicity and potential exposures. DPR 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). Out of the 40 pesticides monitored in the AMN, 1,3-dichloropropene, chloropicrin, methyl bromide, and MITC 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 classified as organophosphates, which are a class of chemical

compounds that can cause adverse health effects on humans, such as inhibiting cholinesterase, an enzyme in the nervous system. 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,

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

If HQ is greater than 1, then the air concentration exceeds the screening level. Such a result 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 H: COMPARISON TO PREVIOUS YEARS OF AMN DATA

All AMN Sites

This report covers results from the twelfth year of monitoring by the Air Monitoring Network (AMN), which has been collecting samples since 2011. Annual AMN reports from 2011 to 2022 can be found in Air Monitoring Reports page at DPR's website and are available upon request.

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 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, DPR canceled 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. In April 2022, the active ingredients captan, fenpyroximate, methomyl, pendimethalin were added to the AMN list of monitored chemicals.

Table H-1 shows the number of individual pesticides and breakdown products monitored each year. This data is further broken down into whether pesticides were detected at quantifiable levels during monitoring in that year. Table H-2 shows the results presented in terms of individual analyses as raw counts.

Table H-1. Summary of pesticide detection trends aggregated by chemical from 2011 to 2023.

Year	Total monitored chemicals	Non-detected chemicals	Quantifiable and Trace detections	Quantifiable detections
2011	39	10	29	9
2012	38	14	24	11
2013	37	13	24	14
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
2020	36	7	29	10
2021	36	14	22	10
2022	40	21	19	13
2023	40	21	19	8

Table H-2. Summary of pesticide detection trends as individual analyses from 2011 to 2023.

Year	Total analyses	Non-detected analyses	Quantifiable and Trace analyses	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	14,621	14,066	555	139
2020	4,692	4,315	377	152
2021	7,161	6,687	474	251
2022	7,885	7,359	526	256
2023	8,085	7,704	381	169

Table H-3 summarizes this information into the percentages of possible detections. Further inspection reveals that the highest percentage of detections occurred in 2015 with 10% of quantifiable and trace detections and 5.2% of quantifiable detections. On the other hand, The lowest percentage of detections occurred in 2019 with 3.8% of possible detections and 0.95% of quantifiable detections.

Table H-3. Summary of pesticide detection trends as percentage of possible detections from 2011 to 2023.

Year	Non-detected analyses %	Quantifiable and Trace analyses %	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%

Year	Non-detected analyses %	Quantifiable and Trace analyses %	Quantifiable analyses %
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 %
2020	92 %	8 %	3.2 %
2021	93.4 %	6.6 %	3.5 %
2022	93.3 %	6.7 %	3.2 %
2023	95.3 %	4.7 %	2.1 %

Historic Air Concentrations in Oxnard

The following tables summarize results for five years of air monitoring in Oxnard.

Table H-4. Percentage of analyses performed resulting in a quantifiable or trace detection in Oxnard in 2019-2023.

Chemical	2019	2020	2021	2022	2023
1,3-dichloropropene	2 %	0 %	18 %	16 %	15 %
Bensulide	0 %	10 %	0 %	0 %	0 %
Captan	0 %	0 %	0 %	19 %	24 %
Chloropicrin	14 %	0 %	45 %	35 %	44 %
Chlorothalonil	18 %	20 %	0 %	0 %	0 %
Chlorpyrifos oa	2 %	0 %	0 %	0 %	0 %
DDVP	16 %	0 %	4 %	6 %	4 %
Dacthal	6 %	0 %	31 %	0 %	0 %
Diazinon	0 %	0 %	0 %	0 %	2 %
MITC	20 %	40 %	30 %	12 %	31 %
Malathion	29 %	0 %	17 %	10 %	4 %
Malathion oa	33 %	0 %	10 %	10 %	2 %
Methyl Bromide	0 %	0 %	35 %	84 %	29 %
Oxyfluorfen	0 %	0 %	2 %	8 %	2 %

Chemical	2019	2020	2021	2022	2023
Pendimethalin	0 %	0 %	0 %	38 %	33 %
Simazine	0 %	0 %	2 %	0 %	0 %

Table H-5. Highest 24-hour concentrations for pesticides with at least one detectable concentration in Oxnard in 2019-2023.

Chemical	2019	2020	2021	2022	2023
1,3-dichloropropene	0.51 ppb (2,315 ng/m^3)	ND	0.57 ppb (2,587 ng/m^3)	0.46 ppb (2,110 ng/m^3)	1 ppb (4,511 ng/m^3)
Bensulide	ND	Trace	ND	ND	ND
Captan	ND	ND	ND	0.0021 ppb (26 ng/m^3)	0.0025 ppb (30.4 ng/m^3)
Chloropicrin	1 ppb (6,939 ng/m^3)	ND	2.6 ppb (17,771 ng/m^3)	0.52 ppb (3,522 ng/m^3)	1.1 ppb (7,239 ng/m^3)
Chlorothalonil	Trace	Trace	ND	ND	ND
Chlorpyrifos oa	Trace	ND	ND	ND	ND
DDVP	Trace	ND	Trace	Trace	Trace
Dacthal	0.0015 ppb (20.6 ng/m^3)	ND	0.00013 ppb (1.8 ng/m^3)	ND	ND
Diazinon	ND	ND	ND	ND	Trace
MITC	0.028 ppb (84 ng/m^3)	0.0078 ppb (23.4 ng/m^3)	0.18 ppb (527 ng/m^3)	0.036 ppb (108 ng/m^3)	0.086 ppb (258 ng/m^3)
Malathion	0.0084 ppb (113 ng/m^3)	ND	0.009 ppb (121 ng/m^3)	0.018 ppb (246 ng/m^3)	0.0016 ppb (22.1 ng/m^3)
Malathion oa	0.0015 ppb (19.1 ng/m^3)	ND	0.0015 ppb (18.9 ng/m^3)	0.0015 ppb (18.8 ng/m^3)	Trace
Methyl Bromide	ND	ND	0.029 ppb (113 ng/m^3)	0.034 ppb (132 ng/m^3)	Trace
Oxyfluorfen	ND	ND	Trace	Trace	Trace
Pendimethalin	ND	ND	ND	0.016 ppb (185 ng/m^3)	0.012 ppb (138 ng/m^3)
Simazine	ND	ND	Trace	ND	ND

Table H-6. Highest rolling 4- or 13-week average concentrations for pesticides with at least one detectable concentration in Oxnard in 2019-2023.

Chemical	2019	2020	2021	2022	2023
1,3-dichloropropene	0.085 ppb (388 ng/m^3)	ND	0.073 ppb (330 ng/m^3)	0.023 ppb (105 ng/m^3)	0.11 ppb (479 ng/m^3)
Bensulide	ND	Trace	ND	ND	ND
Captan	ND	ND	ND	0.00084 ppb (10.5 ng/m^3)	0.0012 ppb (14.5 ng/m^3)
Chloropicrin	0.2 ppb (1,359 ng/m^3)	ND	0.42 ppb (2,845 ng/m^3)	0.11 ppb (771 ng/m^3)	0.33 ppb (2,195 ng/m^3)
Chlorothalonil	Trace	Trace	ND	ND	ND
Chlorpyrifos oa	Trace	ND	ND	ND	ND
DDVP	Trace	ND	Trace	Trace	Trace
Dacthal	0.00058 ppb (8.2 ng/m^3)	ND	0.00045 ppb (5.7 ng/m^3)	ND	ND
Diazinon	ND	ND	ND	ND	Trace
MITC	0.014 ppb (40.7 ng/m^3)	0.005 ppb (15 ng/m^3)	0.046 ppb (139 ng/m^3)	0.011 ppb (33.3 ng/m^3)	0.03 ppb (91.2 ng/m^3)
Malathion	0.0046 ppb (62.3 ng/m^3)	ND	0.0025 ppb (34.4 ng/m^3)	0.0062 ppb (84.3 ng/m^3)	0.00053 ppb (7.4 ng/m^3)
Malathion oa	0.00077 ppb (9.9 ng/m^3)	ND	0.00067 ppb (8.9 ng/m^3)	0.00086 ppb (11.4 ng/m^3)	Trace
Methyl Bromide	ND	ND	0.024 ppb (95.1 ng/m^3)	0.028 ppb (111 ng/m^3)	Trace
Oxyfluorfen	ND	ND	Trace	Trace	Trace
Pendimethalin	ND	ND	ND	0.0063 ppb (72.3 ng/m^3)	0.0087 ppb (99.6 ng/m^3)
Simazine	ND	ND	Trace	ND	ND

Table H-7. Comparison of the 1-year average concentration for pesticides with at least one detectable concentration in Oxnard in 2019-2023.

Chemical	2019	2020	2021	2022	2023
1,3-dichloropropene	0.059 ppb (270 ng/m^3)	ND	0.026 ppb (119 ng/m^3)	0.026 ppb (117 ng/m^3)	0.029 ppb (132 ng/m^3)
Bensulide	ND	Trace	ND	ND	ND
Captan	ND	ND	ND	0.00031 ppb (4 ng/m^3)	0.00038 ppb (4.9 ng/m^3)
Chloropicrin	0.066 ppb (442 ng/m^3)	ND	0.13 ppb (843 ng/m^3)	0.037 ppb (252 ng/m^3)	0.1 ppb (696 ng/m^3)
Chlorothalonil	Trace	Trace	ND	ND	ND
Chlorpyrifos oa	Trace	ND	ND	ND	ND
DDVP	Trace	ND	Trace	Trace	Trace
Dacthal	0.000075 ppb (1.5 ng/m^3)	ND	0.00019 ppb (2.4 ng/m^3)	ND	ND
Diazinon	ND	ND	ND	ND	Trace
MITC	0.003 ppb (8.8 ng/m^3)	0.0033 ppb (9.8 ng/m^3)	0.0068 ppb (20.3 ng/m^3)	0.0037 ppb (11 ng/m^3)	0.0096 ppb (28.6 ng/m^3)
Malathion	0.00069 ppb (9.4 ng/m^3)	ND	0.00029 ppb (4 ng/m^3)	0.00057 ppb (7.9 ng/m^3)	0.00009 ppb (1.4 ng/m^3)
Malathion oa	0.00016 ppb (2 ng/m^3)	ND	0.0001 ppb (1.6 ng/m^3)	0.00012 ppb (1.9 ng/m^3)	Trace
Methyl Bromide	ND	ND	0.0077 ppb (30 ng/m^3)	0.012 ppb (46.1 ng/m^3)	Trace
Oxyfluorfen	ND	ND	Trace	Trace	Trace
Pendimethalin	ND	ND	ND	0.00092 ppb (11.3 ng/m^3)	0.0009 ppb (11.1 ng/m^3)
Simazine	ND	ND	Trace	ND	ND

Historic Air Concentrations in Santa Maria

The following tables summarize results for five years of air monitoring in Santa Maria.

Table H-8. Percentage of analyses performed resulting in a quantifiable or trace detection in Santa Maria in 2019-2023.

Chemical	2019	2020	2021	2022	2023
1,3-dichloropropene	2 %	49 %	53 %	36 %	22 %
Acephate	2 %	2 %	0 %	0 %	0 %
Captan	0 %	0 %	0 %	16 %	0 %
Chloropicrin	6 %	29 %	30 %	47 %	35 %
Chlorothalonil	6 %	29 %	2 %	4 %	0 %
Chlorpyrifos	0 %	0 %	0 %	2 %	0 %
Cypermethrin	2 %	2 %	0 %	0 %	0 %
DDVP	25 %	37 %	31 %	35 %	33 %
Dacthal	43 %	53 %	63 %	43 %	2 %
Diazinon	0 %	2 %	0 %	2 %	0 %
Diazinon oa	0 %	2 %	2 %	0 %	0 %
Dimethoate	0 %	2 %	0 %	0 %	0 %
Dimethoate oa	2 %	2 %	0 %	0 %	0 %
Diuron	0 %	2 %	0 %	0 %	0 %
Iprodione	0 %	2 %	0 %	0 %	0 %
MITC	22 %	37 %	35 %	31 %	29 %
Malathion	49 %	61 %	59 %	51 %	47 %
Malathion oa	39 %	57 %	8 %	6 %	8 %
Methidathion	0 %	2 %	2 %	0 %	0 %
Methomyl	0 %	0 %	0 %	3 %	0 %
Methyl Bromide	0 %	4 %	63 %	80 %	29 %
Metolachlor (S-Metolachlor)	0 %	2 %	2 %	0 %	0 %
Norflurazon	0 %	2 %	2 %	0 %	0 %
Oryzalin	0 %	2 %	2 %	0 %	0 %
Oxydemeton Methyl	0 %	2 %	2 %	0 %	0 %

Chemical	2019	2020	2021	2022	2023
Oxyfluorfen	0 %	0 %	10 %	6 %	4 %
Pendimethalin	0 %	0 %	0 %	11 %	18 %
Permethrin	0 %	4 %	2 %	2 %	0 %
Phosmet	0 %	2 %	2 %	0 %	0 %
Simazine	0 %	4 %	2 %	0 %	0 %
Trifluralin	24 %	24 %	31 %	12 %	6 %

Table H-9. Highest 24-hour concentrations for pesticides with at least one detectable concentration in Santa Maria in 2019-2023.

Chemical	2019	2020	2021	2022	2023
1,3-dichloropropene	0.13 ppb (590 ng/m^3)	1.1 ppb (5,097 ng/m^3)	0.8 ppb (3,617 ng/m^3)	0.21 ppb (940 ng/m^3)	0.35 ppb (1,589 ng/m^3)
Acephate	Trace	0.0017 ppb (12.5 ng/m^3)	ND	ND	ND
Captan	ND	ND	ND	Trace	ND
Chloropicrin	0.44 ppb (2,992 ng/m^3)	0.59 ppb (3,966 ng/m^3)	0.62 ppb (4,191 ng/m^3)	0.67 ppb (4,508 ng/m^3)	1.2 ppb (8,137 ng/m^3)
Chlorothalonil	Trace	Trace	Trace	Trace	ND
Chlorpyrifos	ND	ND	ND	Trace	ND
Cypermethrin	Trace	Trace	ND	ND	ND
DDVP	0.0026 ppb (23.6 ng/m^3)	0.0098 ppb (88.9 ng/m^3)	Trace	0.0076 ppb (68.6 ng/m^3)	0.0071 ppb (64 ng/m^3)
Dacthal	Trace	Trace	Trace	0.00074 ppb (10.1 ng/m^3)	Trace
Diazinon	ND	Trace	ND	Trace	ND
Diazinon oa	ND	Trace	Trace	ND	ND
Dimethoate	ND	Trace	ND	ND	ND
Dimethoate oa	Trace	Trace	ND	ND	ND
Diuron	ND	Trace	ND	ND	ND
Iprodione	ND	Trace	ND	ND	ND

Chemical	2019	2020	2021	2022	2023
MITC	0.12 ppb (375 ng/m^3)	0.042 ppb (124 ng/m^3)	0.13 ppb (400 ng/m^3)	0.24 ppb (715 ng/m^3)	1.2 ppb (3,588 ng/m^3)
Malathion	0.0071 ppb (96.5 ng/m^3)	0.0026 ppb (35.6 ng/m^3)	0.0014 ppb (19.4 ng/m^3)	0.0031 ppb (42.2 ng/m^3)	0.0023 ppb (31.2 ng/m^3)
Malathion oa	0.00098 ppb (12.5 ng/m^3)	Trace	Trace	Trace	Trace
Methidathion	ND	Trace	Trace	ND	ND
Methomyl	ND	ND	ND	0.0016 ppb (10.5 ng/m^3)	ND
Methyl Bromide	ND	0.024 ppb (93.2 ng/m^3)	0.079 ppb (307 ng/m^3)	0.34 ppb (1,340 ng/m^3)	0.015 ppb (56.7 ng/m^3)
Metolachlor (S-Metolachlor)	ND	Trace	Trace	ND	ND
Norflurazon	ND	Trace	Trace	ND	ND
Oryzalin	ND	Trace	Trace	ND	ND
Oxydemeton Methyl	ND	Trace	Trace	ND	ND
Oxyfluorfen	ND	ND	Trace	Trace	Trace
Pendimethalin	ND	ND	ND	0.00089 ppb (10.2 ng/m^3)	0.001 ppb (12 ng/m^3)
Permethrin	ND	Trace	Trace	Trace	ND
Phosmet	ND	Trace	Trace	ND	ND
Simazine	ND	Trace	Trace	ND	ND
Trifluralin	Trace	0.0019 ppb (25.5 ng/m^3)	0.0082 ppb (112 ng/m^3)	Trace	Trace

Table H-10. Highest rolling 4- or 13-week average concentrations for pesticides with at least one detectable concentration in Santa Maria in 2019-2023.

Chemical	2019	2020	2021	2022	2023
1,3-dichloropropene	0.056 ppb (255 ng/m^3)	0.28 ppb (1,285 ng/m^3)	0.23 ppb (1,022 ng/m^3)	0.062 ppb (282 ng/m^3)	0.049 ppb (224 ng/m^3)
Acephate	Trace	0.00045 ppb (3.4 ng/m^3)	ND	ND	ND

Chemical	2019	2020	2021	2022	2023
Captan	ND	ND	ND	Trace	ND
Chloropicrin	0.078 ppb (523 ng/m^3)	0.11 ppb (728 ng/m^3)	0.094 ppb (631 ng/m^3)	0.11 ppb (767 ng/m^3)	0.2 ppb (1,355 ng/m^3)
Chlorothalonil	Trace	Trace	Trace	Trace	ND
Chlorpyrifos	ND	ND	ND	Trace	ND
Cypermethrin	Trace	Trace	ND	ND	ND
DDVP	0.0013 ppb (11.9 ng/m^3)	0.0035 ppb (31.2 ng/m^3)	Trace	0.0037 ppb (33.1 ng/m^3)	0.0025 ppb (22.9 ng/m^3)
Dacthal	Trace	Trace	Trace	0.00052 ppb (6.8 ng/m^3)	Trace
Diazinon	ND	Trace	ND	Trace	ND
Diazinon oa	ND	Trace	Trace	ND	ND
Dimethoate	ND	Trace	ND	ND	ND
Dimethoate oa	Trace	Trace	ND	ND	ND
Diuron	ND	Trace	ND	ND	ND
Iprodione	ND	Trace	ND	ND	ND
MITC	0.043 ppb (130 ng/m^3)	0.012 ppb (34.4 ng/m^3)	0.025 ppb (73.8 ng/m^3)	0.068 ppb (202 ng/m^3)	0.45 ppb (1,345 ng/m^3)
Malathion	0.002 ppb (26.9 ng/m^3)	0.0013 ppb (17.2 ng/m^3)	0.00077 ppb (10.5 ng/m^3)	0.001 ppb (14.2 ng/m^3)	0.0013 ppb (17.7 ng/m^3)
Malathion oa	0.00036 ppb (4.8 ng/m^3)	Trace	Trace	Trace	Trace
Methidathion	ND	Trace	Trace	ND	ND
Methomyl	ND	ND	ND	0.00047 ppb (3.5 ng/m^3)	ND
Methyl Bromide	ND	0.015 ppb (58.2 ng/m^3)	0.048 ppb (184 ng/m^3)	0.11 ppb (408 ng/m^3)	0.011 ppb (41.4 ng/m^3)
Metolachlor (S-Metolachlor)	ND	Trace	Trace	ND	ND
Norflurazon	ND	Trace	Trace	ND	ND
Oryzalin	ND	Trace	Trace	ND	ND
Oxydemeton Methyl	ND	Trace	Trace	ND	ND

Chemical	2019	2020	2021	2022	2023
Oxyfluorfen	ND	ND	Trace	Trace	Trace
Pendimethalin	ND	ND	ND	0.00038 ppb (5.7 ng/m^3)	0.00048 ppb (7.3 ng/m^3)
Permethrin	ND	Trace	Trace	Trace	ND
Phosmet	ND	Trace	Trace	ND	ND
Simazine	ND	Trace	Trace	ND	ND
Trifluralin	Trace	0.00088 ppb (12.1 ng/m^3)	0.003 ppb (40.6 ng/m^3)	Trace	Trace

Table H-11. Comparison of the 1-year average concentration for pesticides with at least one detectable concentration in Santa Maria in 2019-2023.

Chemical	2019	2020	2021	2022	2023
1,3-dichloropropene	0.052 ppb (234 ng/m^3)	0.11 ppb (519 ng/m^3)	0.077 ppb (348 ng/m^3)	0.029 ppb (132 ng/m^3)	0.017 ppb (79.3 ng/m^3)
Acephate	Trace	0.00008 ppb (0.57 ng/m^3)	ND	ND	ND
Captan	ND	ND	ND	Trace	ND
Chloropicrin	0.032 ppb (216 ng/m^3)	0.046 ppb (306 ng/m^3)	0.039 ppb (263 ng/m^3)	0.049 ppb (330 ng/m^3)	0.083 ppb (561 ng/m^3)
Chlorothalonil	Trace	Trace	Trace	Trace	ND
Chlorpyrifos	ND	ND	ND	Trace	ND
Cypermethrin	Trace	Trace	ND	ND	ND
DDVP	0.0004 ppb (3.5 ng/m^3)	0.00074 ppb (6.7 ng/m^3)	Trace	0.00076 ppb (6.8 ng/m^3)	0.00065 ppb (5.8 ng/m^3)
Dacthal	Trace	Trace	Trace	0.00026 ppb (3.2 ng/m^3)	Trace
Diazinon	ND	Trace	ND	Trace	ND
Diazinon oa	ND	Trace	Trace	ND	ND
Dimethoate	ND	Trace	ND	ND	ND
Dimethoate oa	Trace	Trace	ND	ND	ND
Diuron	ND	Trace	ND	ND	ND
Iprodione	ND	Trace	ND	ND	ND

Chemical	2019	2020	2021	2022	2023
MITC	0.0061 ppb (18.1 ng/m^3)	0.0059 ppb (17.7 ng/m^3)	0.011 ppb (34 ng/m^3)	0.012 ppb (36.4 ng/m^3)	0.044 ppb (133 ng/m^3)
Malathion	0.00037 ppb (5 ng/m^3)	0.00039 ppb (5.2 ng/m^3)	0.00032 ppb (4.4 ng/m^3)	0.00035 ppb (4.9 ng/m^3)	0.00036 ppb (5.1 ng/m^3)
Malathion oa	0.00016 ppb (2.1 ng/m^3)	Trace	Trace	Trace	Trace
Methidathion	ND	Trace	Trace	ND	ND
Methomyl	ND	ND	ND	0.00014 ppb (1.4 ng/m^3)	ND
Methyl Bromide	ND	0.006 ppb (23.4 ng/m^3)	0.017 ppb (66.7 ng/m^3)	0.023 ppb (89.5 ng/m^3)	0.0044 ppb (17 ng/m^3)
Metolachlor (S-Metolachlor)	ND	Trace	Trace	ND	ND
Norflurazon	ND	Trace	Trace	ND	ND
Oryzalin	ND	Trace	Trace	ND	ND
Oxydemeton Methyl	ND	Trace	Trace	ND	ND
Oxyfluorfen	ND	ND	Trace	Trace	Trace
Pendimethalin	ND	ND	ND	0.000092 ppb (1.7 ng/m^3)	0.00011 ppb (2 ng/m^3)
Permethrin	ND	Trace	Trace	Trace	ND
Phosmet	ND	Trace	Trace	ND	ND
Simazine	ND	Trace	Trace	ND	ND
Trifluralin	Trace	0.00027 ppb (3.7 ng/m^3)	0.00049 ppb (6.9 ng/m^3)	Trace	Trace

Historic Air Concentrations in Shafter

The following tables summarize results for five years of air monitoring in Shafter.

Table H-12. Percentage of analyses performed resulting in a quantifiable or trace detection in Shafter in 2019-2023.

Chemical	2019	2020	2021	2022	2023
1,3-dichloropropene	10 %	71 %	69 %	61 %	22 %
Captan	0 %	0 %	0 %	3 %	0 %
Chloropicrin	2 %	0 %	4 %	4 %	4 %
Chlorothalonil	43 %	91 %	24 %	15 %	0 %
Chlorpyrifos	4 %	0 %	0 %	0 %	0 %
Cypermethrin	2 %	0 %	0 %	0 %	0 %
DDVP	10 %	0 %	4 %	10 %	2 %
Dacthal	2 %	9 %	0 %	0 %	0 %
Diazinon	0 %	9 %	0 %	0 %	0 %
Diazinon oa	0 %	9 %	2 %	0 %	0 %
Dimethoate	0 %	9 %	0 %	0 %	0 %
Diuron	4 %	9 %	2 %	0 %	0 %
EPTC	10 %	0 %	6 %	2 %	12 %
Endosulfan Sulfate	0 %	9 %	0 %	0 %	0 %
Fenpyroximate	0 %	0 %	0 %	5 %	0 %
Iprodione	2 %	0 %	0 %	0 %	0 %
MITC	59 %	82 %	40 %	44 %	42 %
Malathion	6 %	0 %	0 %	0 %	2 %
Malathion oa	4 %	9 %	2 %	0 %	2 %
Methyl Bromide	0 %	12 %	55 %	79 %	33 %
Metolachlor (S-Metolachlor)	0 %	9 %	0 %	0 %	0 %
Norflurazon	0 %	9 %	0 %	0 %	0 %
Oxyfluorfen	2 %	9 %	6 %	4 %	0 %
Pendimethalin	0 %	0 %	0 %	58 %	73 %
Permethrin	2 %	0 %	0 %	0 %	0 %

Chemical	2019	2020	2021	2022	2023
Simazine	0 %	9 %	0 %	0 %	0 %
Trifluralin	6 %	18 %	4 %	2 %	0 %

Table H-13. Highest 24-hour concentrations for pesticides with at least one detectable concentration in Shafter in 2019-2023.

Chemical	2019	2020	2021	2022	2023
1,3-dichloropropene	3.2 ppb (14,524 ng/m^3)	37.5 ppb (170,199 ng/m^3)	2.3 ppb (10,421 ng/m^3)	1.2 ppb (5,242 ng/m^3)	5.1 ppb (22,966 ng/m^3)
Captan	ND	ND	ND	Trace	ND
Chloropicrin	0.1 ppb (694 ng/m^3)	ND	Trace	Trace	Trace
Chlorothalonil	Trace	0.0033 ppb (36.3 ng/m^3)	Trace	Trace	ND
Chlorpyrifos	Trace	ND	ND	ND	ND
Cypermethrin	Trace	ND	ND	ND	ND
DDVP	Trace	ND	0.0033 ppb (30.2 ng/m^3)	Trace	Trace
Dacthal	Trace	Trace	ND	ND	ND
Diazinon	ND	Trace	ND	ND	ND
Diazinon oa	ND	Trace	Trace	ND	ND
Dimethoate	ND	Trace	ND	ND	ND
Diuron	Trace	Trace	Trace	ND	ND
EPTC	0.0046 ppb (35.6 ng/m^3)	ND	0.016 ppb (128 ng/m^3)	0.0027 ppb (20.7 ng/m^3)	Trace
Endosulfan Sulfate	ND	Trace	ND	ND	ND
Fenpyroximate	ND	ND	ND	0.0019 ppb (32.5 ng/m^3)	ND
Iprodione	Trace	ND	ND	ND	ND
MITC	0.11 ppb (316 ng/m^3)	0.054 ppb (162 ng/m^3)	0.13 ppb (388 ng/m^3)	0.18 ppb (551 ng/m^3)	2.3 ppb (6,806 ng/m^3)

Chemical	2019	2020	2021	2022	2023
Malathion	Trace	ND	ND	ND	Trace
Malathion oa	Trace	Trace	Trace	ND	Trace
Methyl Bromide	ND	0.048 ppb (186 ng/m^3)	0.047 ppb (182 ng/m^3)	0.068 ppb (264 ng/m^3)	0.016 ppb (63.7 ng/m^3)
Metolachlor (S-Metolachlor)	ND	Trace	ND	ND	ND
Norflurazon	ND	Trace	ND	ND	ND
Oxyfluorfen	Trace	Trace	Trace	Trace	ND
Pendimethalin	ND	ND	ND	0.0027 ppb (30.8 ng/m^3)	0.0025 ppb (28.3 ng/m^3)
Permethrin	Trace	ND	ND	ND	ND
Simazine	ND	Trace	ND	ND	ND
Trifluralin	Trace	Trace	0.00027 ppb (3.8 ng/m^3)	Trace	ND

Table H-14. Highest rolling 4- or 13-week average concentrations for pesticides with at least one detectable concentration in Shafter in 2019-2023.

Chemical	2019	2020	2021	2022	2023
1,3-dichloropropene	0.45 ppb (2,056 ng/m^3)	4.5 ppb (20,620 ng/m^3)	4.5 ppb (20,493 ng/m^3)	0.11 ppb (518 ng/m^3)	0.42 ppb (1,895 ng/m^3)
Captan	ND	ND	ND	Trace	ND
Chloropicrin	0.023 ppb (156 ng/m^3)	ND	Trace	Trace	Trace
Chlorothalonil	Trace	0.0021 ppb (22.6 ng/m^3)	Trace	Trace	ND
Chlorpyrifos	Trace	ND	ND	ND	ND
Cypermethrin	Trace	ND	ND	ND	ND
DDVP	Trace	ND	0.00091 ppb (8.2 ng/m^3)	Trace	Trace
Dacthal	Trace	Trace	ND	ND	ND
Diazinon	ND	Trace	ND	ND	ND

Chemical	2019	2020	2021	2022	2023
Diazinon oa	ND	Trace	Trace	ND	ND
Dimethoate	ND	Trace	ND	ND	ND
Diuron	Trace	Trace	Trace	ND	ND
EPTC	0.00064 ppb (5 ng/m^3)	ND	0.0042 ppb (32.7 ng/m^3)	0.00078 ppb (5.9 ng/m^3)	Trace
Endosulfan Sulfate	ND	Trace	ND	ND	ND
Fenpyroximate	ND	ND	ND	0.0008 ppb (10.3 ng/m^3)	ND
Iprodione	Trace	ND	ND	ND	ND
MITC	0.14 ppb (424 ng/m^3)	0.031 ppb (92.2 ng/m^3)	0.034 ppb (100 ng/m^3)	0.099 ppb (298 ng/m^3)	0.67 ppb (2,010 ng/m^3)
Malathion	Trace	ND	ND	ND	Trace
Malathion oa	Trace	Trace	Trace	ND	Trace
Methyl Bromide	ND	0.023 ppb (90.2 ng/m^3)	0.033 ppb (128 ng/m^3)	0.049 ppb (191 ng/m^3)	0.012 ppb (45.1 ng/m^3)
Metolachlor (S-Metolachlor)	ND	Trace	ND	ND	ND
Norflurazon	ND	Trace	ND	ND	ND
Oxyfluorfen	Trace	Trace	Trace	Trace	ND
Pendimethalin	ND	ND	ND	0.0015 ppb (18.2 ng/m^3)	0.0016 ppb (18.2 ng/m^3)
Permethrin	Trace	ND	ND	ND	ND
Simazine	ND	Trace	ND	ND	ND
Trifluralin	Trace	Trace	0.00026 ppb (3.7 ng/m^3)	Trace	ND

Table H-15. Comparison of the 1-year average concentration for pesticides with at least one detectable concentration in Shafter in 2019-2023.

Chemical	2019	2020	2021	2022	2023
1,3-dichloropropene	0.13 ppb (599 ng/m^3)	1.8 ppb (8,163 ng/m^3)	0.16 ppb (745 ng/m^3)	0.056 ppb (253 ng/m^3)	0.15 ppb (690 ng/m^3)
Captan	ND	ND	ND	Trace	ND
Chloropicrin	0.018 ppb (123 ng/m^3)	ND	Trace	Trace	Trace
Chlorothalonil	Trace	0.0014 ppb (14.8 ng/m^3)	Trace	Trace	ND
Chlorpyrifos	Trace	ND	ND	ND	ND
Cypermethrin	Trace	ND	ND	ND	ND
DDVP	Trace	ND	0.00018 ppb (1.6 ng/m^3)	Trace	Trace
Dacthal	Trace	Trace	ND	ND	ND
Diazinon	ND	Trace	ND	ND	ND
Diazinon oa	ND	Trace	Trace	ND	ND
Dimethoate	ND	Trace	ND	ND	ND
Diuron	Trace	Trace	Trace	ND	ND
EPTC	0.00028 ppb (2.1 ng/m^3)	ND	0.00048 ppb (3.6 ng/m^3)	0.0002 ppb (1.4 ng/m^3)	Trace
Endosulfan Sulfate	ND	Trace	ND	ND	ND
Fenpyroximate	ND	ND	ND	0.00026 ppb (2.2 ng/m^3)	ND
Iprodione	Trace	ND	ND	ND	ND
MITC	0.015 ppb (44.5 ng/m^3)	0.02 ppb (59.7 ng/m^3)	0.012 ppb (35.6 ng/m^3)	0.017 ppb (51.6 ng/m^3)	0.068 ppb (204 ng/m^3)
Malathion	Trace	ND	ND	ND	Trace
Malathion oa	Trace	Trace	Trace	ND	Trace
Methyl Bromide	ND	0.0068 ppb (26.4 ng/m^3)	0.012 ppb (46.6 ng/m^3)	0.014 ppb (53.4 ng/m^3)	0.0051 ppb (19.9 ng/m^3)
Metolachlor	ND	Trace	ND	ND	ND
Norflurazon	ND	Trace	ND	ND	ND

Chemical	2019	2020	2021	2022	2023
Oxyfluorfen	Trace	Trace	Trace	Trace	ND
Pendimethalin	ND	ND	ND	0.00041 ppb (5.8 ng/m^3)	0.00049 ppb (6.9 ng/m^3)
Permethrin	Trace	ND	ND	ND	ND
Simazine	ND	Trace	ND	ND	ND
Trifluralin	Trace	Trace	0.000069 ppb (1.1 ng/m^3)	Trace	ND

Historic Air Concentrations in Watsonville

The following tables summarize results for five years of air monitoring in Watsonville.

Table H-16. Percentage of analyses performed resulting in a quantifiable or trace detection in Watsonville in 2019-2023.

Chemical	2019	2020	2021	2022	2023
1,3-dichloropropene	4 %	49 %	46 %	27 %	28 %
Captan	0 %	0 %	0 %	0 %	2 %
Chloropicrin	24 %	0 %	29 %	29 %	27 %
Chlorothalonil	2 %	0 %	0 %	0 %	0 %
Cypermethrin	0 %	0 %	0 %	0 %	2 %
DDVP	25 %	0 %	12 %	4 %	6 %
Dacthal	18 %	0 %	6 %	6 %	0 %
Diuron	2 %	0 %	0 %	0 %	0 %
EPTC	2 %	0 %	0 %	0 %	0 %
MITC	30 %	9 %	19 %	21 %	16 %
Malathion	14 %	0 %	0 %	12 %	8 %
Malathion oa	16 %	0 %	0 %	2 %	4 %
Methyl Bromide	0 %	2 %	29 %	73 %	32 %
Norflurazon	0 %	0 %	0 %	0 %	2 %
Oxyfluorfen	0 %	0 %	2 %	4 %	2 %
Permethrin	0 %	0 %	0 %	0 %	2 %

Chemical	2019	2020	2021	2022	2023
Phosmet	0 %	0 %	0 %	0 %	2 %
Propargite	0 %	0 %	0 %	0 %	2 %
Trifluralin	4 %	0 %	0 %	0 %	0 %

Table H-17. Highest 24-hour concentrations for pesticides with at least one detectable concentration in Watsonville in 2019-2023.

Chemical	2019	2020	2021	2022	2023
1,3-dichloropropene	0.29 ppb (1,316 ng/m^3)	0.83 ppb (3,753 ng/m^3)	0.4 ppb (1,811 ng/m^3)	0.36 ppb (1,629 ng/m^3)	0.22 ppb (1,003 ng/m^3)
Captan	ND	ND	ND	ND	Trace
Chloropicrin	0.85 ppb (5,741 ng/m^3)	ND	0.31 ppb (2,074 ng/m^3)	0.34 ppb (2,310 ng/m^3)	0.97 ppb (6,511 ng/m^3)
Chlorothalonil	Trace	ND	ND	ND	ND
Cypermethrin	ND	ND	ND	ND	Trace
DDVP	Trace	ND	Trace	Trace	Trace
Dacthal	Trace	ND	Trace	Trace	ND
Diuron	Trace	ND	ND	ND	ND
EPTC	Trace	ND	ND	ND	ND
MITC	0.055 ppb (164 ng/m^3)	0.0096 ppb (28.7 ng/m^3)	0.063 ppb (188 ng/m^3)	0.12 ppb (347 ng/m^3)	0.052 ppb (154 ng/m^3)
Malathion	0.0042 ppb (56 ng/m^3)	ND	ND	Trace	Trace
Malathion oa	Trace	ND	ND	Trace	Trace
Methyl Bromide	ND	0.023 ppb (89.3 ng/m^3)	0.95 ppb (3,693 ng/m^3)	0.035 ppb (136 ng/m^3)	0.016 ppb (60.6 ng/m^3)
Norflurazon	ND	ND	ND	ND	Trace
Oxyfluorfen	ND	ND	Trace	Trace	Trace
Permethrin	ND	ND	ND	ND	Trace
Phosmet	ND	ND	ND	ND	Trace
Propargite	ND	ND	ND	ND	Trace
Trifluralin	Trace	ND	ND	ND	ND

Table H-18. Highest rolling 4- or 13-week average concentrations for pesticides with at least one detectable concentration in Watsonville in 2019-2023.

Chemical	2019	2020	2021	2022	2023
1,3-dichloropropene	0.082 ppb (374 ng/m^3)	0.36 ppb (1,612 ng/m^3)	0.19 ppb (875 ng/m^3)	0.13 ppb (590 ng/m^3)	0.058 ppb (265 ng/m^3)
Captan	ND	ND	ND	ND	Trace
Chloropicrin	0.15 ppb (1,042 ng/m^3)	ND	0.097 ppb (652 ng/m^3)	0.092 ppb (620 ng/m^3)	0.22 ppb (1,505 ng/m^3)
Chlorothalonil	Trace	ND	ND	ND	ND
Cypermethrin	ND	ND	ND	ND	Trace
DDVP	Trace	ND	Trace	Trace	Trace
Dacthal	Trace	ND	Trace	Trace	ND
Diuron	Trace	ND	ND	ND	ND
EPTC	Trace	ND	ND	ND	ND
MITC	0.024 ppb (71 ng/m^3)	0.0035 ppb (10.5 ng/m^3)	0.02 ppb (58.6 ng/m^3)	0.039 ppb (115 ng/m^3)	0.029 ppb (87.3 ng/m^3)
Malathion	0.0012 ppb (15.7 ng/m^3)	ND	ND	Trace	Trace
Malathion oa	Trace	ND	ND	Trace	Trace
Methyl Bromide	ND	0.015 ppb (58.2 ng/m^3)	0.24 ppb (931 ng/m^3)	0.029 ppb (113 ng/m^3)	0.011 ppb (43 ng/m^3)
Norflurazon	ND	ND	ND	ND	Trace
Oxyfluorfen	ND	ND	Trace	Trace	Trace
Permethrin	ND	ND	ND	ND	Trace
Phosmet	ND	ND	ND	ND	Trace
Propargite	ND	ND	ND	ND	Trace
Trifluralin	Trace	ND	ND	ND	ND

Table H-19. Comparison of the 1-year average concentration for pesticides with at least one detectable concentration in Watsonville in 2019-2023.

Chemical	2019	2020	2021	2022	2023
1,3-dichloropropene	0.057 ppb (260 ng/m^3)	0.12 ppb (543 ng/m^3)	0.06 ppb (272 ng/m^3)	0.03 ppb (137 ng/m^3)	0.02 ppb (91.6 ng/m^3)
Captan	ND	ND	ND	ND	Trace
Chloropicrin	0.052 ppb (348 ng/m^3)	ND	0.029 ppb (197 ng/m^3)	0.028 ppb (186 ng/m^3)	0.061 ppb (411 ng/m^3)
Chlorothalonil	Trace	ND	ND	ND	ND
Cypermethrin	ND	ND	ND	ND	Trace
DDVP	Trace	ND	Trace	Trace	Trace
Dacthal	Trace	ND	Trace	Trace	ND
Diuron	Trace	ND	ND	ND	ND
EPTC	Trace	ND	ND	ND	ND
MITC	0.0046 ppb (13.6 ng/m^3)	0.0022 ppb (6.7 ng/m^3)	0.0038 ppb (11.4 ng/m^3)	0.0077 ppb (22.9 ng/m^3)	0.0045 ppb (13.4 ng/m^3)
Malathion	0.00017 ppb (2.3 ng/m^3)	ND	ND	Trace	Trace
Malathion oa	Trace	ND	ND	Trace	Trace
Methyl Bromide	ND	0.0055 ppb (21.4 ng/m^3)	0.026 ppb (101 ng/m^3)	0.011 ppb (43.4 ng/m^3)	0.0051 ppb (19.9 ng/m^3)
Norflurazon	ND	ND	ND	ND	Trace
Oxyfluorfen	ND	ND	Trace	Trace	Trace
Permethrin	ND	ND	ND	ND	Trace
Phosmet	ND	ND	ND	ND	Trace
Propargite	ND	ND	ND	ND	Trace
Trifluralin	Trace	ND	ND	ND	ND

APPENDIX I: REFERENCES

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