AIR MONITORING NETWORK RESULTS FOR 2022

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EXECUTIVE SUMMARY

In February 2011, the California Department of Pesticide Regulation (CDPR) implemented a multi-year statewide Air Monitoring Network (AMN) to measure pesticides in various agricultural communities. The AMN is the first long-term multi-year air monitoring study conducted by CDPR. Its objectives are to collect data that assists in (1) assessing potential health risks, (2) evaluating the effectiveness of existing mitigation measures, (3) developing measures to mitigate risks, and (4) evaluating the effectiveness of regulatory requirements. Representative communities were selected using an exhaustive selection process, which is updated periodically to account for trends or changes that affect California's communities. This annual report is the twelfth volume of this study and contains AMN results from January 1 to December 31, 2022.

CDPR monitored a total of 36 pesticides (31 + 5 breakdown products) from January to April, and 40 pesticides (35 + 5 breakdown products) from May to December in 2022. Monitoring took place across four communities throughout California: Oxnard, Shafter, Santa Maria, and Watsonville. Pesticides monitored in the AMN were selected primarily based on potential risk to human health. Higher-risk pesticides were prioritized and selected for inclusion in the AMN based on higher use, higher volatility, and higher toxicity. At each sampling site, one set of 24-hour air samples was collected on a weekly basis. A sample set is the collective term for all samples recovered from one site in one week and consists of three sorbent tubes and one canister. Sampling start dates were randomly selected each week to produce variation in the sampling day; sampling start times varied from 6:00 AM to 4:00 PM. The air monitors are located in high-use areas and are designed to capture pesticide emissions; however, monitoring data from these areas may not be representative for all of California.

A total of 7,885 analyses (samples multiplied by the number of chemicals analyzed in each sample) were conducted on the air samples collected from all four AMN sites operating in 2022. Of these analyses, 526 (6.7%) were either quantifiable or 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 256 (3.2%) of all analyses conducted. Of the 40 pesticides monitored, 13 were detected at quantifiable levels, 6 were detected at trace levels only, and 21 were not detected. The chemicals with the highest number of quantifiable detections were methyl bromide, 1,3-dichloropropene, and MITC. No chemical exceeded its screening level or regulatory target in 2022.

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

INTRODUCTION

Background

In February 2011, as part of the California Department of Pesticide Regulation's (CDPR) mandate for continuous evaluation of currently registered pesticides, CDPR implemented its first multi-year statewide Air Monitoring Network (AMN) 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, CDPR reevaluated reported California pesticide use data to identify four monitoring sites to continue with AMN monitoring operation in 2021 and beyond. CDPR 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 CDPR's Air Monitoring Network webpage.

Communities Monitored

In 2021, CDPR monitored the air in the vicinities of four communities across California: Oxnard, Santa Maria, Shafter, and Watsonville.

1. Oxnard is in Ventura County. AMN's monitoring station is located at Rio Mesa High School and is operated by the Ventura County Commissioner's (V-CAC) office (Table 1, 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 (SB-CAC) office (Table 1, Appendix B).
3. Shafter is in Kern County. The monitoring station is located adjacent to Sequoia Elementary School and is operated by CDPR (Table 1, 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 CDPR (Table 1, Appendix D).

Table 1. List of communities in the Air Monitoring Network in 2022.

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	CDPR
Watsonville	36.870118, -121.760891	Santa Cruz/ Monterey	11/05/2011	CDPR

Pesticides Monitored

CDPR, with the assistance of staff from the Santa Barbara and Ventura County Agricultural Commissioners' offices, monitored a total of 36 pesticides (31 + 5 breakdown products) from January to April, and 40 pesticides (35 + 5 breakdown products) from May to December in 2022. Starting May 2022, the chemicals captan, fenpyroximate, methomyl, pendimethalin were added to the AMN monitoring list, hence the number of pesticides monitored increased to 40. 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 32 Chemicals: samples taken using Teflon cartridges with XAD-4 resin.

RESULTS

This report is the 12th volume of this study and contains 2022 results from January 1 to December 31, 2022. Tables 2-7 show the analytical results for the pesticides monitored by the AMN, and the results for each individual community are available below in Appendices A-D.

Pesticide Detections

A total of 7,885 analyses (samples multiplied by the number of chemicals analyzed in each sample) were conducted on the air samples collected from the four AMN sites in 2022. Of these, 6.7 % (526) 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 3.2 % (256) of all analyses conducted.

Of the 40 pesticides and breakdown products monitored in 2022:

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

Table 2 lists the number of detections by type for each pesticide and pesticide breakdown product at all sites included in the AMN for 2022. The chemicals with the highest number of quantifiable detections were methyl bromide (n = 99, 48.5%), 1,3-D (n = 61, 34.1%), and MITC (n = 37, 18.2%).

Table 2. Number and percentage of positive samples per chemical in all AMN sites in 2022.

Chemical	Number of valid samples	Quantifiable and Trace detections	Quantifiable detections	Quantifiable and Trace detections %	Quantifiable detections %
1,3-dichloropropene	179	63	61	35.2 %	34.1 %
Acephate	204	0	0	0 %	0 %
Bensulide	204	0	0	0 %	0 %
Captan	150	14	1	9.3 %	0.67 %
Chloropicrin	204	58	24	28.4 %	11.8 %
Chlorothalonil	204	10	0	4.9 %	0 %
Chlorpyrifos	204	1	0	0.49 %	0 %

Chemical	Number of valid samples	Quantifiable and Trace detections	Quantifiable detections	Quantifiable and Trace detections %	Quantifiable detections %
Chlorpyrifos OA	204	0	0	0 %	0 %
Cypermethrin	204	0	0	0 %	0 %
DDVP	204	28	3	13.7 %	1.5 %
DEF	204	0	0	0 %	0 %
Dacthal	204	25	2	12.3 %	0.98 %
Diazinon	204	1	0	0.49 %	0 %
Diazinon OA	168	0	0	0 %	0 %
Dimethoate	204	0	0	0 %	0 %
Dimethoate OA	204	0	0	0 %	0 %
Diuron	204	0	0	0 %	0 %
EPTC	204	1	1	0.49 %	0.49 %
Endosulfan	204	0	0	0 %	0 %
Endosulfan Sulfate	204	0	0	0 %	0 %
Fenpyroximate	151	2	1	1.3 %	0.66 %
Iprodione	204	0	0	0 %	0 %
MITC	203	56	37	27.6 %	18.2 %
Malathion	204	37	8	18.1 %	3.9 %
Malathion OA	204	9	2	4.4 %	0.98 %
Methidathion	204	0	0	0 %	0 %
Methomyl	151	1	1	0.66 %	0.66 %
Methyl Bromide	204	161	99	78.9 %	48.5 %
Metolachlor	204	0	0	0 %	0 %
Norflurazon	204	0	0	0 %	0 %
Oryzalin	204	0	0	0 %	0 %
Oxydemeton Methyl	204	0	0	0 %	0 %
Oxyfluorfen	204	11	0	5.4 %	0 %
Pendimethalin	151	40	16	26.5 %	10.6 %
Permethrin	204	1	0	0.49 %	0 %

Chemical	Number of valid samples	Quantifiable and Trace detections	Quantifiable detections	Quantifiable and Trace detections %	Quantifiable detections %
Phosmet	204	0	0	0 %	0 %
Propargite	204	0	0	0 %	0 %
Simazine	204	0	0	0 %	0 %
Trifluralin	204	7	0	3.4 %	0 %
pp-dicofol	204	0	0	0 %	0 %
Total	7,885	526	256	6.7 %	3.2 %

Table 3 summarizes the total number of detections of the monitored chemicals by community. The percentages of quantifiable and trace, for monitored chemicals ranged from 4.4% to 9.7%. Santa Maria had the highest percentage of samples with detections at 9.7%, followed by Shafter at 6.8%.

Table 3. Number and percentage of positive samples per location in 2022.

Community	Number of valid samples	Quantifiable and Trace detections	Quantifiable detections	Quantifiable and Trace detections %	Quantifiable detections %
Oxnard	1,898	110	48	5.8 %	2.5 %
Santa Maria	1,971	191	87	9.7 %	4.4 %
Shafter	2,009	136	75	6.8 %	3.7 %
Watsonville	2,007	89	46	4.4 %	2.3 %
Total	7,885	526	256	6.7 %	3.2 %

Table 4 summarizes the detections of the monitored chemicals as weekly sample sets by location. 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. Of these samples, 194 (93.7%) sample sets contained at least one quantifiable or trace detection.

Table 4. Detections of monitored chemicals by location, as weekly sample sets in 2022.

Community	Number of sample sets	Sample sets with at least one detection	Sample sets with at least one detection %
Oxnard	51	48	94.1 %
Santa Maria	52	49	94.2 %
Shafter	52	49	94.2 %
Watsonville	52	48	92.3 %
Total	207	194	93.7 %

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 2021. None of the pesticides or breakdown products exceeded their respective acute (24- or 72-hour) screening levels (SL) or regulatory targets (RT) 2022. The pesticides with the highest percentage of 24-hour air concentration compared to its acute screening level were 1,3-dichloropropene (2.1%). All other compounds were less than 1% of their acute screening levels or regulatory targets during monitoring in 2022.

Table 5. Highest 24-hour air concentrations, acute screening levels, and percent of screening level of any pesticide detected at a quantifiable concentration in 2022.

Community	Chemical	Highest 24-hour concentration	24-hour acute screening level	Percent of screening level
Shafter	1,3-dichloropropene	1.2 ppb (5,242 ng/m^3)	55 ppb** (250,000 ng/m^3)	2.1 %
Oxnard	Captan	0.0021 ppb (26 ng/m^3)	0.15 ppb (1,844 ng/m^3)	1.4%
Santa Maria	Chloropicrin	0.67 ppb (4,508 ng/m^3)	73 ppb*† (491,000 ng/m^3)	0.92 %
Santa Maria	Dacthal	0.00074 ppb (10.1 ng/m^3)	1,732 ppb (23,500,000 ng/m^3)	0.00004 %
Santa Maria	DDVP	0.0076 ppb (68.6 ng/m^3)	1.2 ppb (11,000 ng/m^3)	0.62 %
Shafter	EPTC	0.0027 ppb (20.7 ng/m^3)	29.7 ppb (230,000 ng/m^3)	0.009 %
Shafter	Fenpyroximate	0.0019 ppb (32.5 ng/m^3)	0.87 ppb (14,998 ng/m^3)	0.22 %
Oxnard	Malathion	0.018 ppb (246 ng/m^3)	8.3 ppb (112,500 ng/m^3)	0.22 %
Oxnard	Malathion OA	0.0015 ppb (18.8 ng/m^3)	8.8 ppb (112,500 ng/m^3)	0.017 %
Santa Maria	Methomyl	0.0016 ppb (10.5 ng/m^3)	4.8 ppb (32,000 ng/m^3)	0.033 %
Santa Maria	Methyl Bromide	0.34 ppb (1,340 ng/m^3)	210 ppb* (820,000 ng/m^3)	0.16 %
Santa Maria	MITC	0.24 ppb (715 ng/m^3)	220 ppb*† (660,000 ng/m^3)	0.11 %

Community	Chemical	Highest 24-hour concentration	24-hour acute screening level	Percent of screening level
Oxnard	Pendimethalin	0.016 ppb (185 ng/m^3)	150 ppb (1,725,828 ng/m^3)	0.011 %

*This value is a regulatory target rather than a screening level.
†This value is an 8-hour time-weighted-average (TWA) used to compare against the 24-h 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-D and chloropicrin are averaged every 13 weeks (CDPR 2016b), while the sub-chronic concentrations of the remainder 34 active ingredients are averaged every 4 weeks.

Table 6 lists the highest rolling 4-week average concentrations (13-week for 1,3-D and chloropicrin) for all chemicals detected at a quantifiable concentration among all sites in 2022. Chloropicrin was the pesticide with the highest rolling 13-week average concentration with an estimated concentration of 0.11 ppb (33.5%) detected in Oxnard. The pesticide with the highest 4-week average was MITC with an estimated concentration of 0.099 ppb (10%) detected in Shafter.

Table 6. Highest rolling average concentrations, sub-chronic screening levels, and percent of screening levels of any pesticide detected at a quantifiable concentration in 2022.

Community	Chemical	Date‡	Highest rolling average concentration	Sub-chronic screening level	Percent of screening level
Watsonville	1,3-dichloropropene	01/05/2022	0.13 ppb (590 ng/m^3)	3 ppb (14,000 ng/m^3)	4.2 %
Oxnard	Captan	12/19/2022	0.00084 ppb (10.5 ng/m^3)	0.11 ppb (1,352 ng/m^3)	0.78 %
Oxnard	Chloropicrin	09/20/2022	0.11 ppb (771 ng/m^3)	0.35 ppb (2,300 ng/m^3)	33.5 %
Santa Maria	Dacthal	06/06/2022	0.00052 ppb (6.8 ng/m^3)	34.6 ppb (470,000 ng/m^3)	0.0014 %
Santa Maria	DDVP	10/19/2022	0.0037 ppb (33.1 ng/m^3)	0.24 ppb (2,200 ng/m^3)	1.5 %
Shafter	EPTC	05/19/2022	0.00078 ppb (5.9 ng/m^3)	3.1 ppb (24,000 ng/m^3)	0.025 %
Shafter	Fenpyroximate	08/15/2022	0.0008 ppb (10.3 ng/m^3)	0.58 ppb (9,999 ng/m^3)	0.1 %

Community	Chemical	Date‡	Highest rolling average concentration	Sub-chronic screening level	Percent of screening level
Oxnard	Malathion	06/06/2022	0.0062 ppb (84.3 ng/m^3)	6 ppb (80,600 ng/m^3)	0.1 %
Oxnard	Malathion OA	06/14/2022	0.00086 ppb (11.4 ng/m^3)	6.3 ppb (80,600 ng/m^3)	0.014 %
Santa Maria	Methomyl	09/08/2022	0.00047 ppb (3.5 ng/m^3)	4.8 ppb (32,00 ng/m^3)	0.012 %
Santa Maria	Methyl Bromide	08/01/2022	0.11 ppb (408 ng/m^3)	5 ppb* (19,400 ng/m^3)	2.1 %
Shafter	MITC	11/30/2022	0.099 ppb (298 ng/m^3)	1 ppb (3,000 ng/m^3)	9.9 %
Oxnard	Pendimethalin	10/10/2022	0.0063 ppb (72.3 ng/m^3)	49 ppb (563,771 ng/m^3)	0.013 %

* This value is a regulatory target rather than a screening level.
‡This is the week (week 4 or week 13) when the highest cumulative rolling average was detected.

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 2022 at any AMN site alongside its respective chronic SL. The highest annual average concentration relative to its chronic screening level was observed for chloropicrin (18.3%) in Santa Maria, followed by MITC (17.2%) in Shafter.

Table 7. Highest annual average air concentrations, chronic screening levels, and percent of screening level of any pesticide detected at a quantifiable concentration in 2022.

Community	Chemical	Overall average concentration	Chronic screening level	Percent of screening level
Shafter	1,3-dichloropropene	0.056 ppb (253 ng/m^3)	2 ppb (9,000 ng/m^3)	2.8 %
Oxnard	Captan	0.00031 ppb (4 ng/m^3)	0.037 ppb (455 ng/m^3)	0.89 %
Santa Maria	Chloropicrin	0.049 ppb (330 ng/m^3)	0.27 ppb (1,800 ng/m^3)	18.3 %
Santa Maria	Dacthal	0.00026 ppb (3.2 ng/m^3)	3.5 ppb (47,000 ng/m^3)	0.0068 %
Santa Maria	DDVP	0.00076 ppb (6.8 ng/m^3)	0.085 ppb (770 ng/m^3)	0.88 %

Community	Chemical	Overall average concentration	Chronic screening level	Percent of screening level
Shafter	EPTC	0.0002 ppb ($1.4\ ng/m^3$)	1.1 ppb ($8,500\ ng/m^3$)	0.016 %
Shafter	Fenpyroximate	0.00026 ppb ($2.2\ ng/m^3$)	0.058 ppb ($1,000\ ng/m^3$)	0.22 %
Oxnard	Malathion	0.00057 ppb ($7.9\ ng/m^3$)	0.6 ppb ($8,100\ ng/m^3$)	0.098 %
Oxnard	Malathion OA	0.00012 ppb ($1.9\ ng/m^3$)	0.63 ppb ($8,100\ ng/m^3$)	0.023 %
Santa Maria	Methomyl	0.00014 ppb ($1.4\ ng/m^3$)	4.8 ppb ($32,000\ ng/m^3$)	0.003 %
Santa Maria	Methyl Bromide	0.023 ppb ($89.5\ ng/m^3$)	1 ppb ($3,900\ ng/m^3$)	2.3 %
Shafter	MITC	0.017 ppb ($51.6\ ng/m^3$)	0.1 ppb ($300\ ng/m^3$)	17.2 %
Oxnard	Pendimethalin	0.00092 ppb ($11.3\ ng/m^3$)	49 ppb ($563,771\ ng/m^3$)	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 2022, 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 (e.g., 1 in 1,000,000 or 10^{-6}, 1 in 100,000 or 10^{-5}, etc.). Risk in the range of 10^{-5} to 10^{-6} or less is generally considered to be at the limit of what is considered negligible.

Cancer risk is estimated based on the following calculation:

$$\text{Cancer Risk} = \text{nBR} * \text{LAC} * \mathrm{CPF_H}$$

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)
- $\mathrm{CPF_H}$ = estimated cancer potency factor in humans $(\mathrm{mg/kg/day})^{-1}$

CDPR 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. Moreover, CDPR has estimated the following $\mathrm{CPF_H}$ values for three of the six monitored pesticides:

- 1,3-D: $\mathrm{CPF_H}$ = 0.014 $(\mathrm{mg/kg/day})^{-1}$ (CDPR, 2015).
- Chlorothalonil: $\mathrm{CPF_H}$ = 0.016 $(\mathrm{mg/kg/day})^{-1}$ (CDPR, 2018).
- DDVP: $\mathrm{CPF_H}$ = 0.35 $(\mathrm{mg/kg/day})^{-1}$ (CDPR, 1996).

Tables 8 depicts the historic average concentrations and cancer risk estimates for 1,3-D, Chlorothalonil, and DDVP. In 2016, CDPR 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 2022.

Community	1,3-D Concentration	Cancer Risk Estimate	Cancer Risk Target	Percent of Target
Oxnard	0.11 ppb (503 ng/m^3)	2.0e-06	1.0e-05	20 %
Santa Maria	0.12 ppb (538 ng/m^3)	2.1e-06	1.0e-05	21 %
Shafter	0.46 ppb (2072 ng/m^3)	8.1e-06	1.0e-05	81 %
Watsonville	0.092 ppb (419 ng/m^3)	1.6e-06	1.0e-05	16 %

Table 9. Cumulative average concentration, cancer risk (CR) estimate, CR target and percent of CR target for DDVP at each sampling location as of 2022.

Community	DDVP Concentration	Cancer Risk Estimate	Cancer Risk Target	Percent of Target
Oxnard	0.00017 ppb (1.49 ng/m^3)	1.5e-07	1.0e-05	1.5 %
Santa Maria	0.00049 ppb (4.42 ng/m^3)	4.3e-07	1.0e-05	4.3 %
Shafter	0.00013 ppb (1.19 ng/m^3)	1.2e-07	1.0e-05	1.2 %
Watsonville	0.00019 ppb (1.72 ng/m^3)	1.7e-07	1.0e-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 of 1.0 suggests further evaluation.

Table 10 summarizes the highest calculated HI for each community and time period during monitoring in 2022. 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 2022. 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 2022.

Community	Acute HI	Sub-chronic HI	Chronic HI
Oxnard	0.02	0.02	0.03
Santa Maria	0.07	0.05	0.04
Shafter	0.02	0.02	0.03
Watsonville	0.02	0.02	0.03

SUMMARY

Thirteen pesticides were detected at quantifiable concentrations out of 36 chemicals and 5 breakdown products monitored by the AMN in 2022, including all four fumigants 1,3-D, chloropicrin, methyl bromide, and MITC.

Of the 13 pesticides detected at quantifiable concentrations, 1,3-D, methyl bromide, and MITC were detected at quantifiable concentrations across all four AMN locations.

The highest Hazard Index (HI) calculated for any site at any exposure period was 0.07, indicating a low risk from organophosphate cumulative exposure.

1,3-D cancer risk estimates ranged from 16% in Watsonville to 81% in Shafter, and 1,3-D estimates in 2022 were lower than in 2021 in all four communities. The cancer risk estimates for DDVP ranged from 1.2% in Shafter to 4.3% in Santa Maria.

Of the 40 pesticides monitored in 2022, no chemical exceeded its acute, sub-chronic, or chronic exposure level for 2022.

As of August 2023, CDPR proposed regulations to mitigate 1,3-D acute and lifetime exposures to non-occupational bystanders that will go into effect in 2024. CDPR will propose additional regulations in 2024 to mitigate 1,3-D lifetime exposures to occupational bystanders in California.

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 Network site to an Air Monitoring Network (AMN) site. Monitoring is conducted through a CDPR contract with the Ventura County Agricultural Commissioner's (V-CAC) office. V-CAC staff follow strict standard operating procedures established by CDPR's Air Program, ensuring that samples are collected, handled, and transported appropriately to maintain consistency and integrity of the samples. CDPR Air Program staff provides annual training and continuous support to 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 2022. The chemical with the highest number of quantifiable detections was methyl bromide (n = 18, 36%), followed by chloropicrin (n = 8, 18.9%), and Pendimethalin (n = 7, 18.9%).

Table A–1. Number and percentage of positive samples per chemical in Oxnard in 2022.

Chemical	Number of valid samples	Quantifiable and Trace detections	Quantifiable detections	Quantifiable and Trace detections %	Quantifiable detections %
1,3-dichloropropene	43	7	6	16.3 %	14 %
Acephate	49	0	0	0 %	0 %
Bensulide	49	0	0	0 %	0 %
Captan	37	7	1	18.9 %	2.7 %
Chloropicrin	49	17	8	34.7 %	16.3 %
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	3	0	6.1 %	0 %
DEF	49	0	0	0 %	0 %

Chemical	Number of valid samples	Quantifiable and Trace detections	Quantifiable detections	Quantifiable and Trace detections %	Quantifiable detections %
Dacthal	49	0	0	0 %	0 %
Diazinon	49	0	0	0 %	0 %
Diazinon OA	41	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	37	0	0	0 %	0 %
Iprodione	49	0	0	0 %	0 %
MITC	48	6	4	12.5 %	8.3 %
Malathion	49	5	2	10.2 %	4.1 %
Malathion OA	49	5	2	10.2 %	4.1 %
Methidathion	49	0	0	0 %	0 %
Methomyl	37	0	0	0 %	0 %
Methyl Bromide	50	42	18	84 %	36 %
Metolachlor (S-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	4	0	8.2 %	0 %
Pendimethalin	37	14	7	37.8 %	18.9 %
Permethrin	49	0	0	0 %	0 %
Phosmet	49	0	0	0 %	0 %

Chemical	Number of valid samples	Quantifiable and Trace detections	Quantifiable detections	Quantifiable and Trace detections %	Quantifiable detections %
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	1,898	110	48	5.8 %	2.5 %

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 2022. All chemicals for which there were quantifiable detections at Oxnard in 2022 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 2022.

Chemical	Highest 24-hour concentration	24-hour acute screening level	Percent of screening level
1,3-dichloropropene	0.46 ppb (2,110 ng/m^3)	55 ppb** (250,000 ng/m^3)	0.84 %
Captan	0.0021 ppb (26 ng/m^3)	0.15 ppb (1,844 ng/m^3)	1.4 %
Chloropicrin	0.52 ppb (3,522 ng/m^3)	73 ppb*† (491,000 ng/m^3)	0.72 %
Malathion	0.018 ppb (246 ng/m^3)	8.3 ppb (112,500 ng/m^3)	0.22 %
Malathion OA	0.0015 ppb (18.8 ng/m^3)	8.8 ppb (112,500 ng/m^3)	0.017 %
Methyl Bromide	0.034 ppb (132 ng/m^3)	210 ppb* (820,000 ng/m^3)	0.016 %
MITC	0.036 ppb (108 ng/m^3)	220 ppb*† (660,000 ng/m^3)	0.016 %
Pendimethalin	0.016 ppb (185 ng/m^3)	150 ppb (1,725,828 ng/m^3)	0.011%

Chemical	Highest 24-hour concentration	24-hour acute screening level	Percent of screening level
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)	
Dacthal	ND	1,732 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	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)	

Chemical	Highest 24-hour concentration	24-hour acute screening level	Percent of screening level
Fenpyroximate	ND	0.87 ppb (14,998 ng/m^3)	
Iprodione	ND	23.2 ppb (313,000 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)	
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 against 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 A–3 shows the highest rolling 4-week average concentrations (13-week for 1,3-D and chloropicrin) for all chemicals monitored at the Oxnard AMN sampling site in 2022. The highest concentration relative to its screening level was that of Chloropicrin at 33.5%, followed by MITC at 1.1%. The remaining chemicals for which there were quantifiable detections 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 2022.

Chemical	Date‡	Highest rolling average concentration	Sub-chronic screening level	Percent of screening level
1,3-dichloropropene	12/14/2022	0.023 ppb (105 ng/m^3)	3 ppb (14,000 ng/m^3)	0.75 %
Captan	12/19/2022	0.00084 ppb (10.5 ng/m^3)	0.11 ppb (1,352 ng/m^3)	0.78 %
Chloropicrin	09/20/2022	0.11 ppb (771 ng/m^3)	0.35 ppb (2,300 ng/m^3)	33.5 %
Malathion	06/06/2022	0.0062 ppb (84.3 ng/m^3)	6 ppb (80,600 ng/m^3)	0.1 %
Malathion OA	06/14/2022	0.00086 ppb (11.4 ng/m^3)	6.3 ppb (80,600 ng/m^3)	0.014 %
Methyl Bromide	03/07/2022	0.028 ppb (111 ng/m^3)	5 ppb* (19,400 ng/m^3)	0.57 %
MITC	04/13/2022	0.011 ppb (33.3 ng/m^3)	1 ppb (3,000 ng/m^3)	1.1 %
Pendimethalin	10/10/2022	0.0063 ppb (72.3 ng/m^3)	49 ppb (563,771 ng/m^3)	0.013 %
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)	

Chemical	Date‡	Highest rolling average concentration	Sub-chronic screening level	Percent of screening level
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)	
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 (9,999 ng/m^3)	
Iprodione		ND	7.1 ppb (95,600 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)	

Chemical	Date‡	Highest rolling average concentration	Sub-chronic screening level	Percent of screening level
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)	
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.
‡ This is the week (week 4 or week 13) when the highest cumulative rolling average was detected.

Chronic (annual) Concentrations

Table A–4 shows the annual average concentration for all chemicals monitored at the Oxnard sampling site in 2022. The pesticide with highest concentration relative to its screening level was that of chloropicrin at 14%, followed by MITC at 3.7%, and 1,3-D 1.3%. All other monitored chemicals were less than 1.3 % of their chronic screening level in Oxnard in 2022.

Table A–4. Annual average air concentrations, chronic screening levels, and percent of the chronic screening levels for chemicals monitored in Oxnard in 2022.

Chemical	Overall average concentration	Chronic screening level	Percent of screening level
1,3-dichloropropene	0.026 ppb (117 ng/m^3)	2 ppb (9,000 ng/m^3)	1.3 %

Chemical	Overall average concentration	Chronic screening level	Percent of screening level
Captan	0.00031 ppb (4 ng/m^3)	0.037 ppb (455 ng/m^3)	0.89 %
Chloropicrin	0.037 ppb (252 ng/m^3)	0.27 ppb (1,800 ng/m^3)	14 %
Malathion	0.00057 ppb (7.9 ng/m^3)	0.6 ppb (8,100 ng/m^3)	0.098 %
Malathion OA	0.00012 ppb (1.9 ng/m^3)	0.63 ppb (8,100 ng/m^3)	0.023 %
Methyl Bromide	0.012 ppb (46.1 ng/m^3)	1 ppb (3,900 ng/m^3)	1.2 %
MITC	0.0037 ppb (11 ng/m^3)	0.1 ppb (300 ng/m^3)	3.7 %
Pendimethalin	0.00092 ppb (11.3 ng/m^3)	49 ppb (563,771 ng/m^3)	0.002 %
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	
Diazinon	ND	0.01 ppb (130 ng/m^3)	

Chemical	Overall average concentration	Chronic screening level	Percent of screening level
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)	
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)	

Chemical	Overall average concentration	Chronic screening level	Percent of screening level
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 2022. Screening levels are abbreviated as SL, whereas regulatory targets are abbreviated as RT.

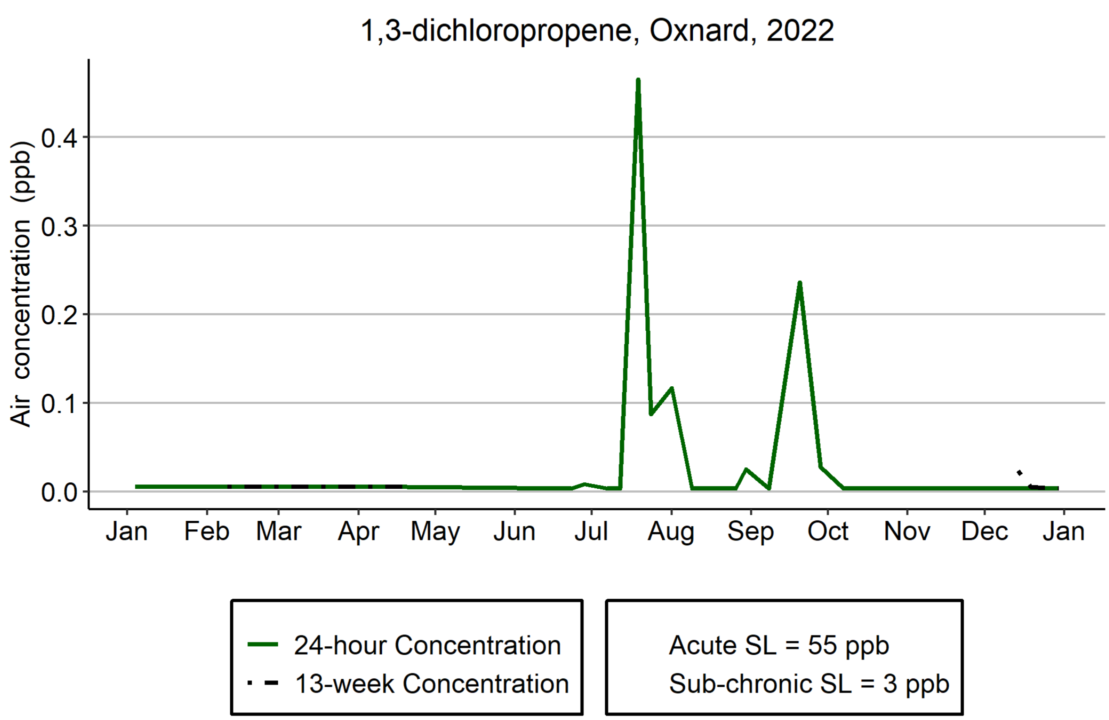

Figure A-1. Temporal trend in 1,3-dichloropropene concentrations in Oxnard in 2022.

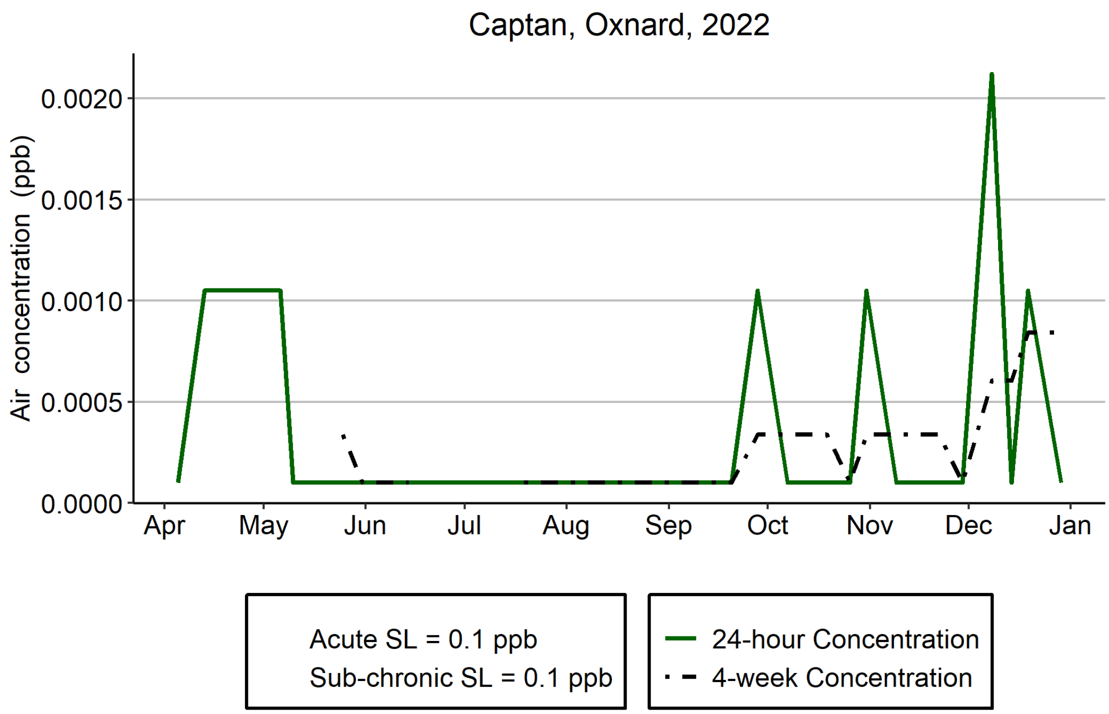

Figure A-2. Temporal trend in Captan concentrations in Oxnard in 2022.

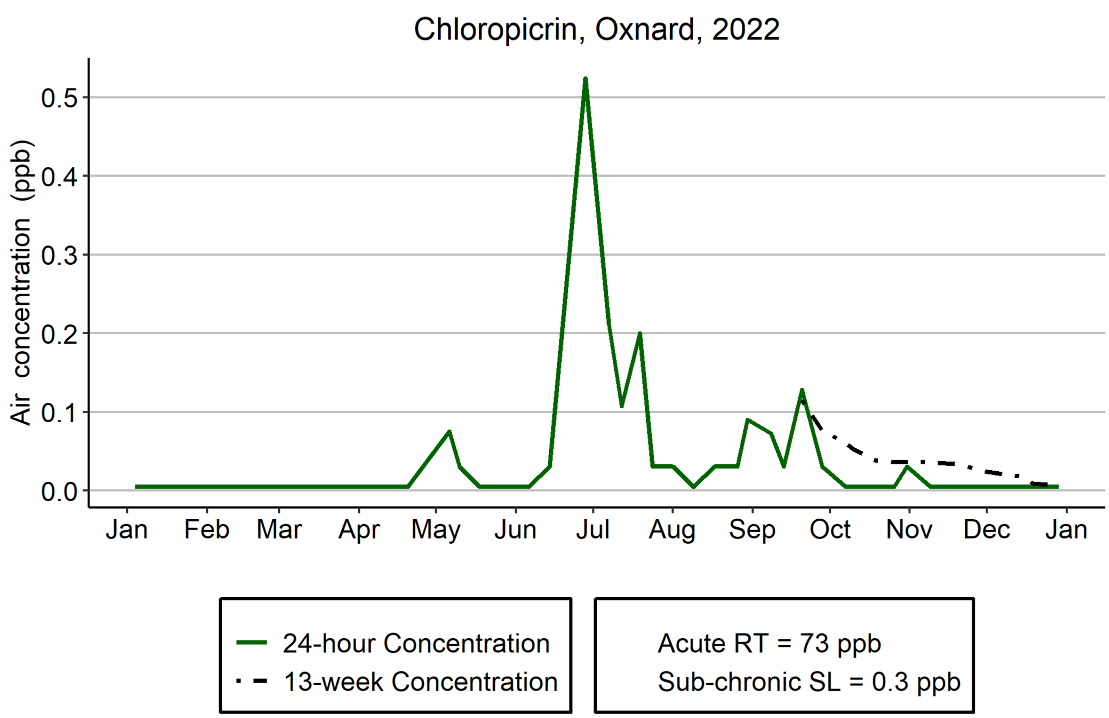

Figure A-3. Temporal trend in Chloropicrin concentrations in Oxnard in 2022.

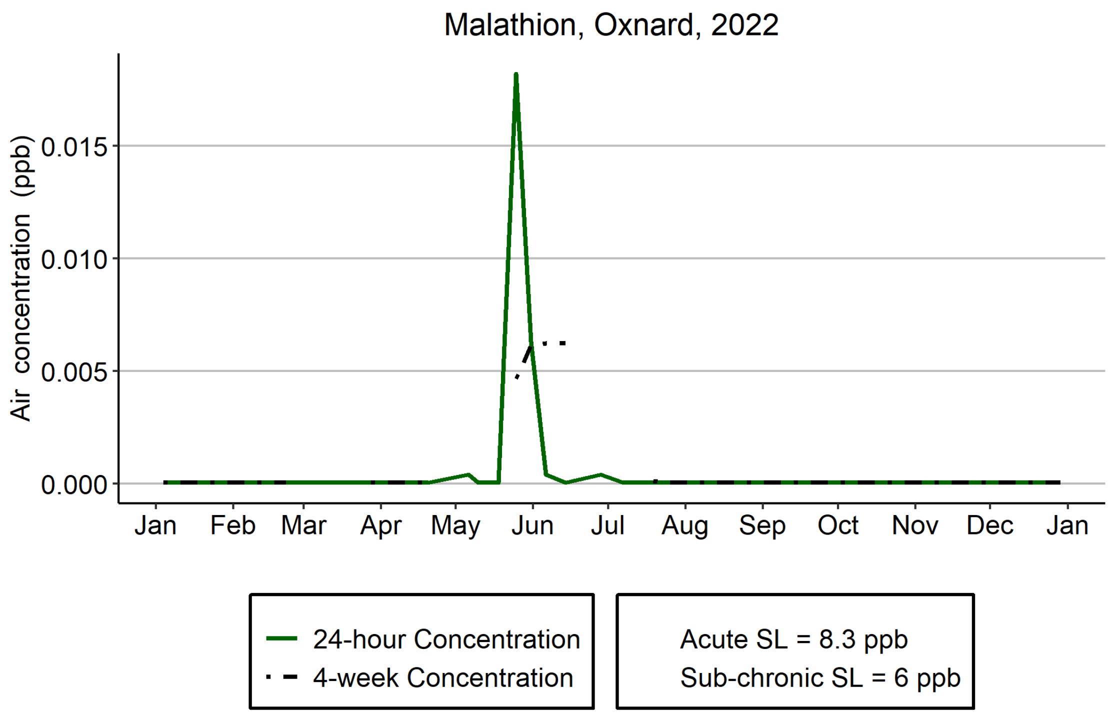

Figure A-3. Temporal trend in Malathion concentrations in Oxnard in 2022.

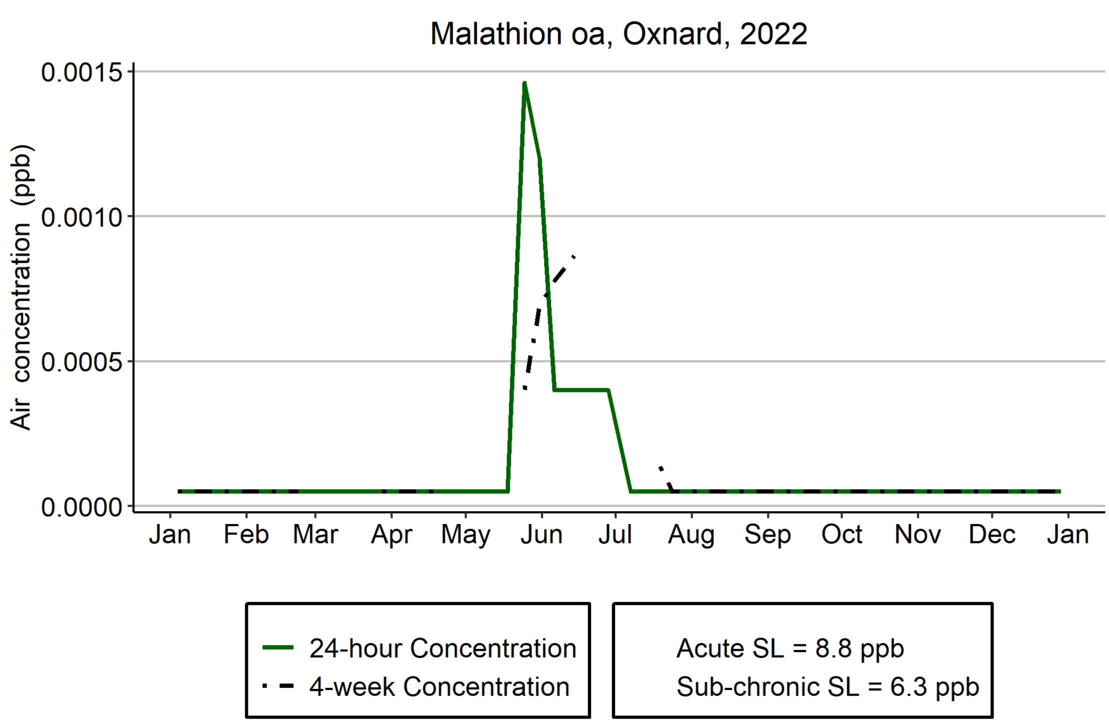

Figure A-5. Temporal trend in Malathion OA concentrations in Oxnard in 2022.

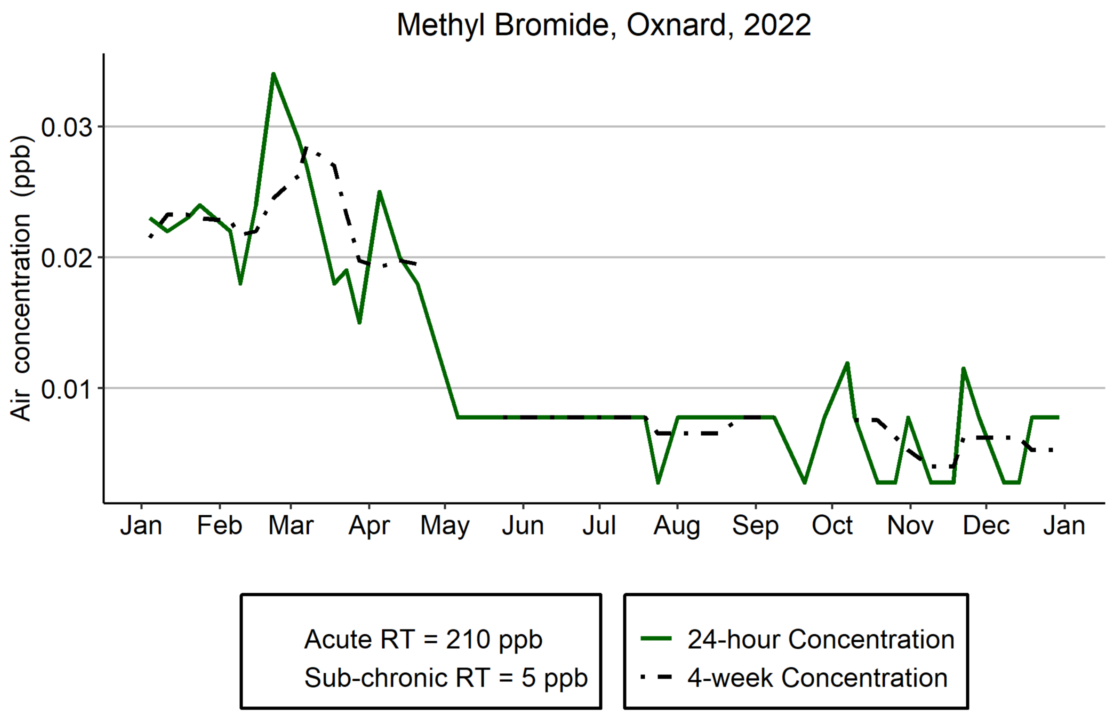

Figure A-6. Temporal trend in Methyl Bromide concentrations in Oxnard in 2022.

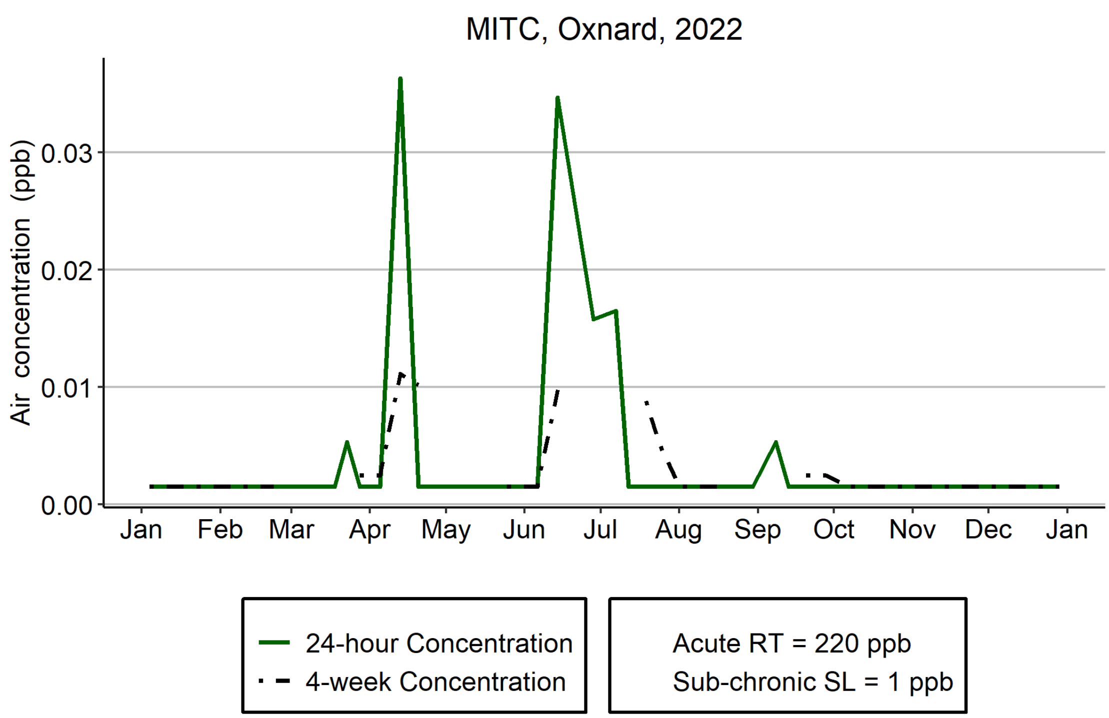

Figure A-7. Temporal trend in MITC concentrations in Oxnard in 2022.

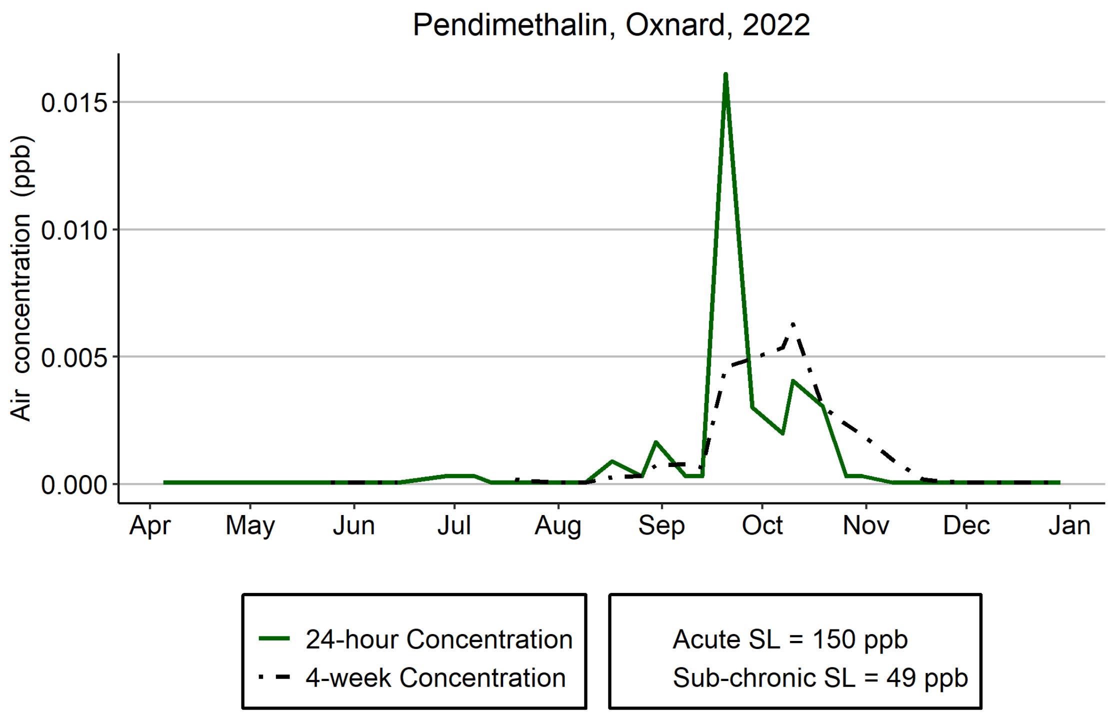

Figure A-8. Temporal trend in Pendimethalin concentrations in Oxnard in 2022.

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

Pesticide Detections

Table B-1 lists the number and percentage of analyses resulting in detections at the Santa Maria AMN sampling site in 2022. The chemical with the highest number of quantifiable detections was methyl bromide (n = 33, 65%), followed by 1,3-D (n = 16, 36%), and MITC (n = 14, 28%).

Table B–1. Number and percentage of positive samples per chemical in Santa Maria in 2022.

Chemical	Number of valid samples	Quantifiable and Trace detections	Quantifiable detections	Quantifiable and Trace detections %	Quantifiable detections %
1,3-dichloropropene	45	16	16	35.6 %	35.6 %
Acephate	51	0	0	0 %	0 %
Bensulide	51	0	0	0 %	0 %
Captan	37	6	0	16.2 %	0 %
Chloropicrin	51	24	11	47.1 %	21.6 %
Chlorothalonil	51	2	0	3.9 %	0 %
Chlorpyrifos	51	1	0	2 %	0 %
Chlorpyrifos OA	51	0	0	0 %	0 %
Cypermethrin	51	0	0	0 %	0 %
DDVP	51	18	3	35.3 %	5.9 %
DEF	51	0	0	0 %	0 %
Dacthal	51	22	2	43.1 %	3.9 %

Chemical	Number of valid samples	Quantifiable and Trace detections	Quantifiable detections	Quantifiable and Trace detections %	Quantifiable detections %
Diazinon	51	1	0	2 %	0 %
Diazinon OA	41	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	38	0	0	0 %	0 %
Iprodione	51	0	0	0 %	0 %
MITC	51	16	14	31.4 %	27.5 %
Malathion	51	26	6	51 %	11.8 %
Malathion OA	51	3	0	5.9 %	0 %
Methidathion	51	0	0	0 %	0 %
Methomyl	38	1	1	2.6 %	2.6 %
Methyl Bromide	51	41	33	80.4 %	64.7 %
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	3	0	5.9 %	0 %
Pendimethalin	38	4	1	10.5 %	2.6 %
Permethrin	51	1	0	2 %	0 %
Phosmet	51	0	0	0 %	0 %
Propargite	51	0	0	0 %	0 %
Simazine	51	0	0	0 %	0 %
Trifluralin	51	6	0	11.8 %	0 %
pp-dicofol	51	0	0	0 %	0 %
Total	1,971	191	87	9.7 %	4.4 %

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 2022. All chemicals for which there were quantifiable detections at Santa Maria in 2022 were detected at less than 1% 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 2022.

Chemical	Highest 24-hour concentration	24-hour acute screening level	Percent of screening level
1,3-dichloropropene	0.21 ppb (940 ng/m^3)	55 ppb** (250,000 ng/m^3)	0.38 %
Chloropicrin	0.67 ppb (4,508 ng/m^3)	73 ppb*† (491,000 ng/m^3)	0.92 %
Dacthal	0.00074 ppb (10.1 ng/m^3)	1,732 ppb (23,500,000 ng/m^3)	0.00004 %
DDVP	0.0076 ppb (68.6 ng/m^3)	1.2 ppb (11,000 ng/m^3)	0.62 %
Malathion	0.0031 ppb (42.2 ng/m^3)	8.3 ppb (112,500 ng/m^3)	0.037 %
Methomyl	0.0016 ppb (10.5 ng/m^3)	4.8 ppb (32,000 ng/m^3)	0.033 %
Methyl Bromide	0.34 ppb (1,340 ng/m^3)	210 ppb* (820,000 ng/m^3)	0.16 %
MITC	0.24 ppb (715 ng/m^3)	220 ppb*† (660,000 ng/m^3)	0.11 %
Pendimethalin	0.00089 ppb (10.2 ng/m^3)	150 ppb (1,725,828 ng/m^3)	0.0006 %
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	Trace	3.1 ppb (34,000 ng/m^3)	

Chemical	Highest 24-hour concentration	24-hour acute screening level	Percent of screening level
Chlorpyrifos	Trace	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)	
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 (14,998 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)	
Metolachlor (S-Metolachlor)	ND	7.3 ppb (85,000 ng/m^3)	

Chemical	Highest 24-hour concentration	24-hour acute screening level	Percent of screening level
Norflurazon	ND	12.6 ppb (170,000 ng/m^3)	
Oryzalin	ND	29.7 ppb (420,000 ng/m^3)	
Oxydemeton Methyl	ND	3.7 ppb (39,200 ng/m^3)	
Oxyfluorfen	Trace	34.5 ppb (510,000 ng/m^3)	
Permethrin	Trace	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 against 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 average concentrations (13-week for 1,3-D and chloropicrin) for all chemicals monitored at the Santa Maria AMN sampling site in 2022. The highest concentration relative to its screening level was that of Chloropicrin at 33.3%, followed by MITC at 6.7%. The remaining chemicals for which there were quantifiable detections were detected at 2.1% or less than 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 2022.

Chemical	Date‡	Highest rolling average concentration	Sub-chronic screening level	Percent of screening level
1,3-dichloropropene	04/13/2022	0.062 ppb (282 ng/m^3)	3 ppb (14,000 ng/m^3)	2 %
Chloropicrin	11/07/2022	0.11 ppb (767 ng/m^3)	0.35 ppb (2,300 ng/m^3)	33.3 %
Dacthal	06/06/2022	0.00052 ppb (6.8 ng/m^3)	34.6 ppb (470,000 ng/m^3)	0.0014 %
DDVP	10/19/2022	0.0037 ppb (33.1 ng/m^3)	0.24 ppb (2,200 ng/m^3)	1.5 %
Malathion	11/07/2022	0.001 ppb (14.2 ng/m^3)	6 ppb (80,600 ng/m^3)	0.018 %
Methomyl	09/08/2022	0.00047 ppb (3.5 ng/m^3)	4.8 ppb (32,000 ng/m^3)	0.01 %
Methyl Bromide	08/01/2022	0.11 ppb (408 ng/m^3)	5 ppb* (19,400 ng/m^3)	2.1 %
MITC	03/28/2022	0.068 ppb (202 ng/m^3)	1 ppb (3,000 ng/m^3)	6.7 %
Pendimethalin	11/07/2022	0.00038 ppb (5.7 ng/m^3)	49 ppb (563,771 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		Trace	0.11 ppb (1,352 ng/m^3)	
Chlorothalonil		Trace	3.1 ppb (34,000 ng/m^3)	
Chlorpyrifos		Trace	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)	

Chemical	Date‡	Highest rolling average concentration	Sub-chronic screening level	Percent of screening level
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	0.32 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 (9,999 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)	
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)	

Chemical	Date‡	Highest rolling average concentration	Sub-chronic screening level	Percent of screening level
Oxyfluorfen		Trace	12.2 ppb (180,000 ng/m^3)	
Permethrin		Trace	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		Trace	12.4 ppb (170,000 ng/m^3)	

* This value is a regulatory target rather than a screening level.
‡ This is the week (week 4 or week 13) when the highest cumulative rolling average was detected.

Chronic (annual) Concentrations

Table B–4 shows the annual average concentration for all chemicals monitored at the Santa Maria sampling site in 2022. The pesticide with highest concentration relative to its screening level was that of chloropicrin at 18.3%, followed by MITC at 12.1%. All other monitored chemicals were less than 3% of their chronic screening level in Santa Maria in 2022.

Table B–4. Annual average air concentrations, chronic screening levels, and percent of the chronic screening levels for chemicals monitored in Santa Maria in 2022.

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 %
Chloropicrin	0.049 ppb (330 ng/m^3)	0.27 ppb (1,800 ng/m^3)	18.3 %
Dacthal	0.00026 ppb (3.2 ng/m^3)	3.5 ppb (47,000 ng/m^3)	0.0068 %

Chemical	Overall average concentration	Chronic screening level	Percent of screening level
DDVP	0.00076 ppb (6.8 ng/m^3)	0.085 ppb (770 ng/m^3)	0.88 %
Malathion	0.00035 ppb (4.9 ng/m^3)	0.6 ppb (8,100 ng/m^3)	0.06 %
Methomyl	0.00014 ppb (1.4 ng/m^3)	4.8 ppb (32,000 ng/m^3)	0.003 %
Methyl Bromide	0.023 ppb (89.5 ng/m^3)	1 ppb (3,900 ng/m^3)	2.3 %
MITC	0.012 ppb (36.4 ng/m^3)	0.1 ppb (300 ng/m^3)	12.1 %
Pendimethalin	0.000092 ppb (1.7 ng/m^3)	49 ppb (563,771 ng/m^3)	0.0003 %
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)	
Chlorothalonil	Trace	3.1 ppb (34,000 ng/m^3)	
Chlorpyrifos	Trace	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)	
DEF	ND	NA	
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)	

Chemical	Overall average concentration	Chronic screening level	Percent of screening level
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 OA	Trace	0.63 ppb (8,100 ng/m^3)	
Methidathion	ND	0.2 ppb (2,500 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	Trace	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)	

Chemical	Overall average concentration	Chronic screening level	Percent of screening level
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 2022. Screening levels are abbreviated as SL, whereas regulatory targets are abbreviated as RT.

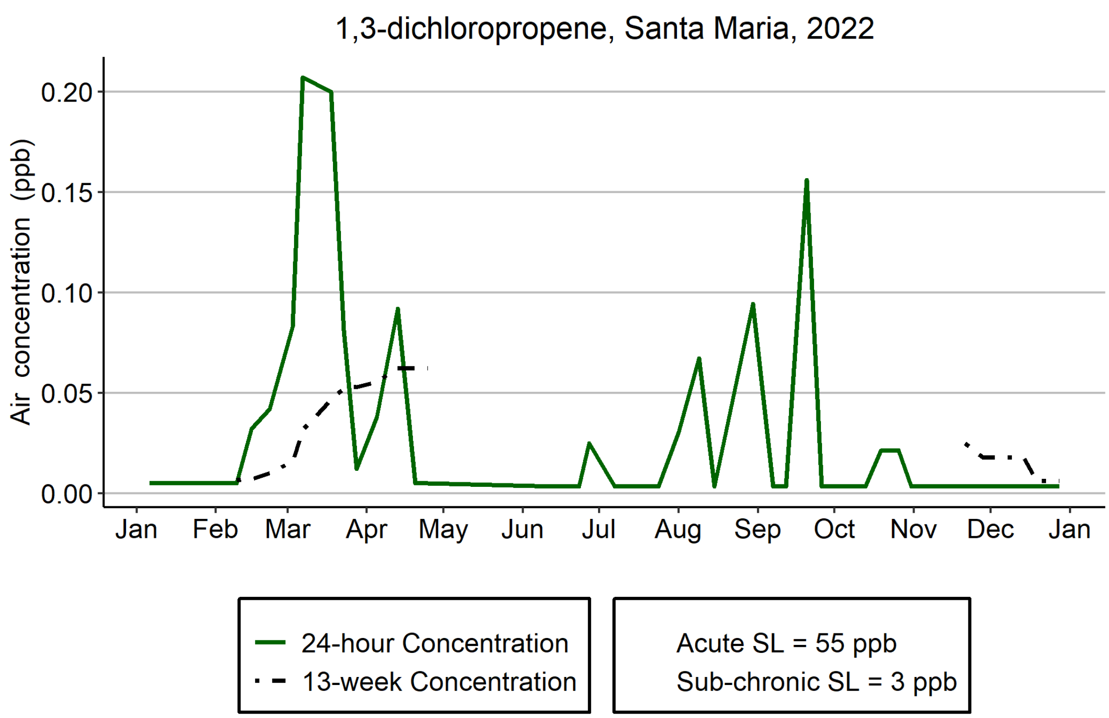

Figure B-1. Temporal trend in 1,3-dichloropropene concentrations in Santa Maria in 2022.

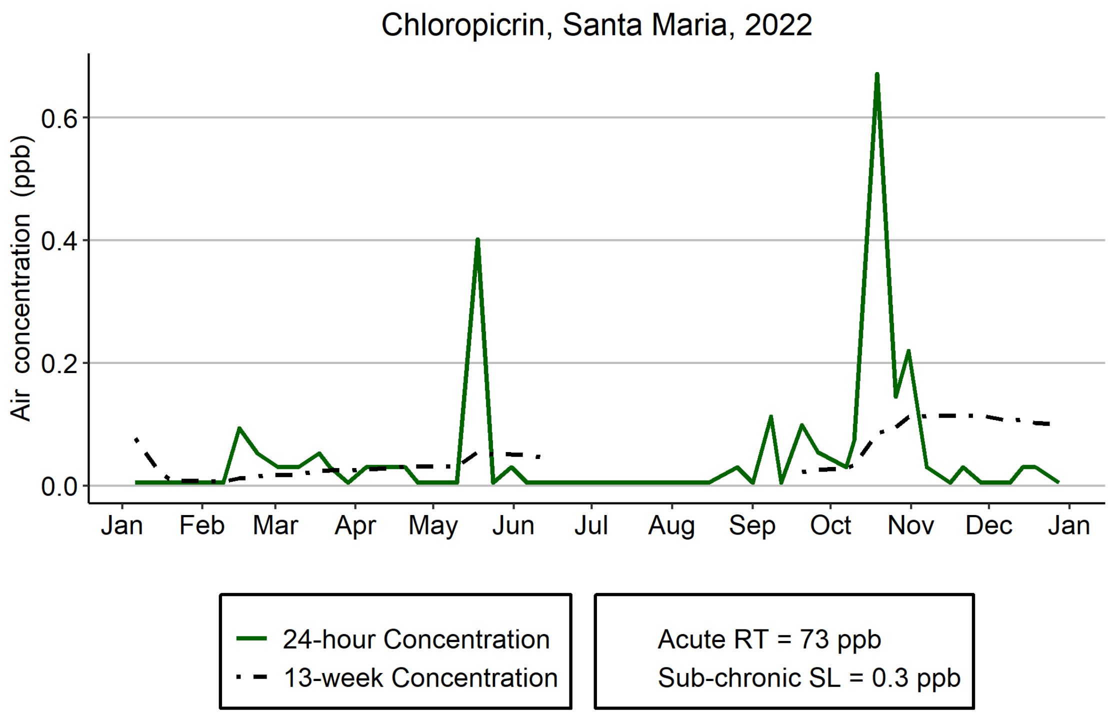

Figure B-2. Temporal trend in Chloropicrin concentrations in Santa Maria in 2022.

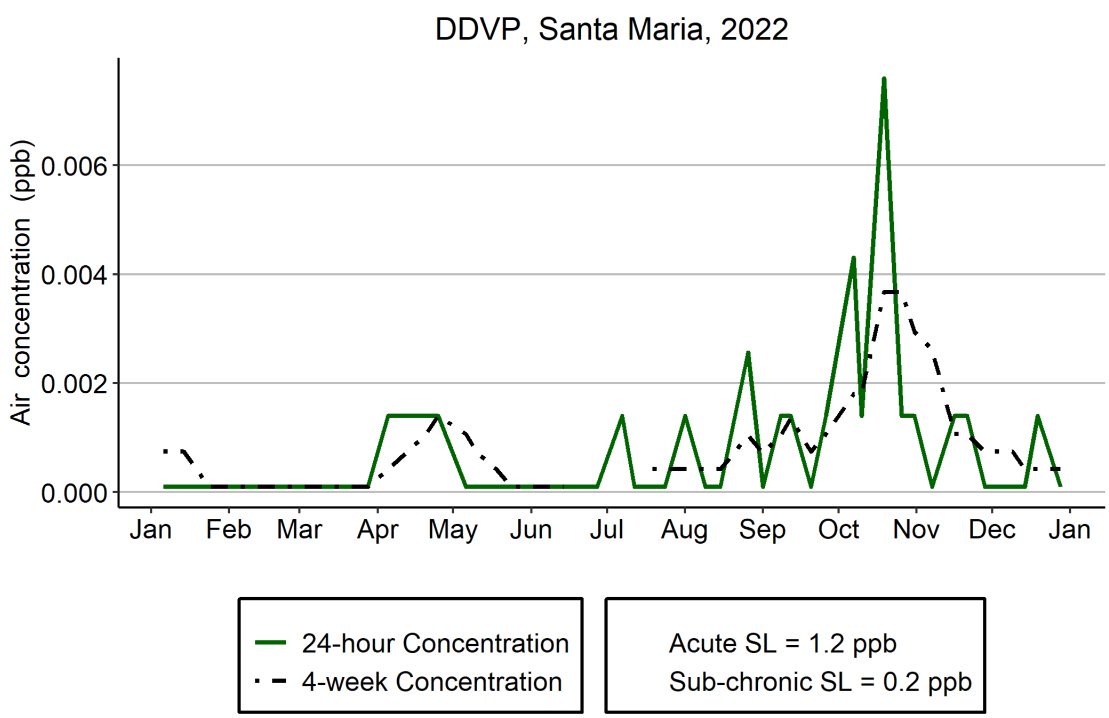

Figure B-3. Temporal trend in DDVP concentrations in Santa Maria in 2022.

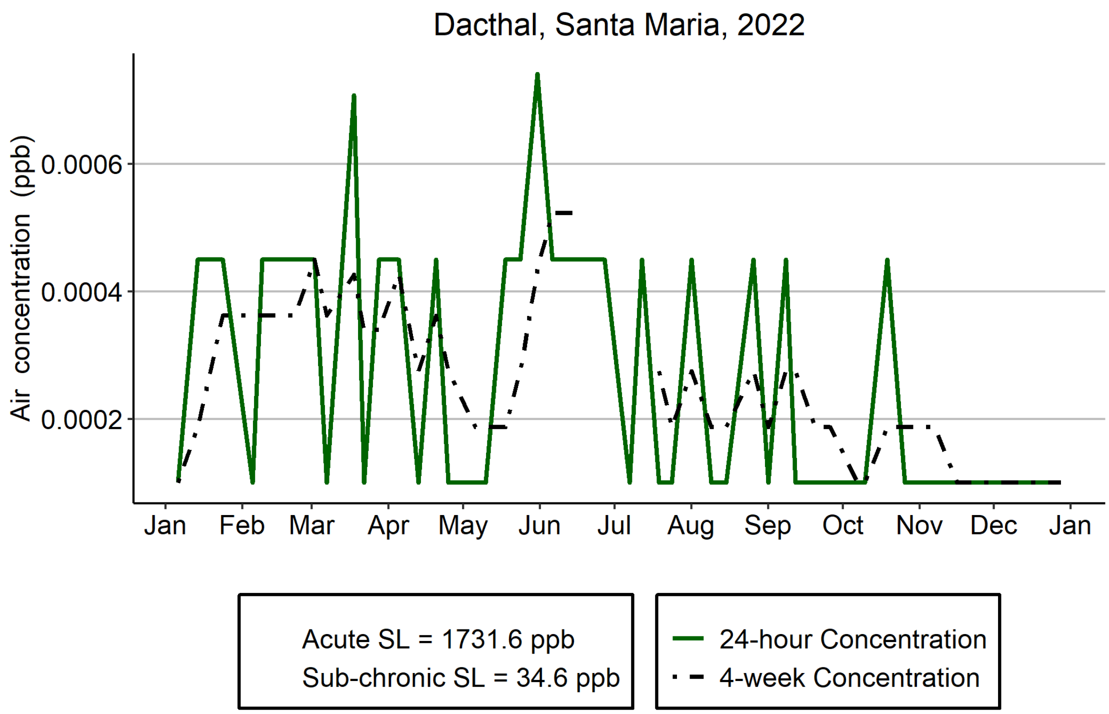

Figure B-4. Temporal trend in Dacthal concentrations in Santa Maria in 2022.

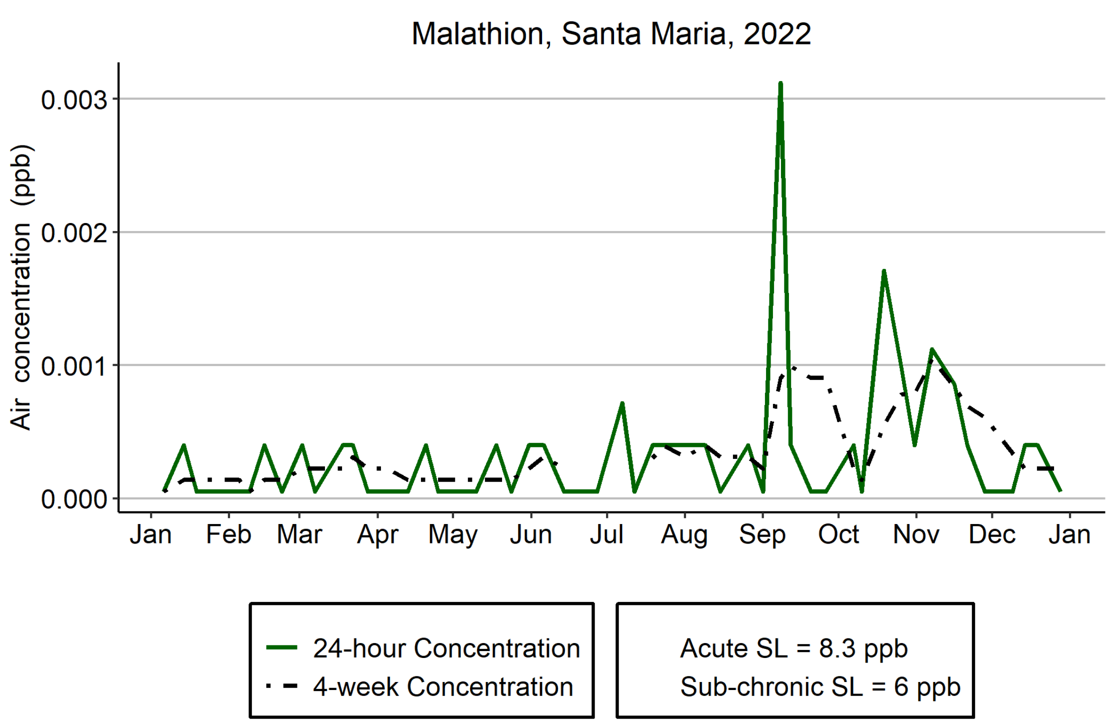

Figure B-5. Temporal trend in Malathion concentrations in Santa Maria in 2022.

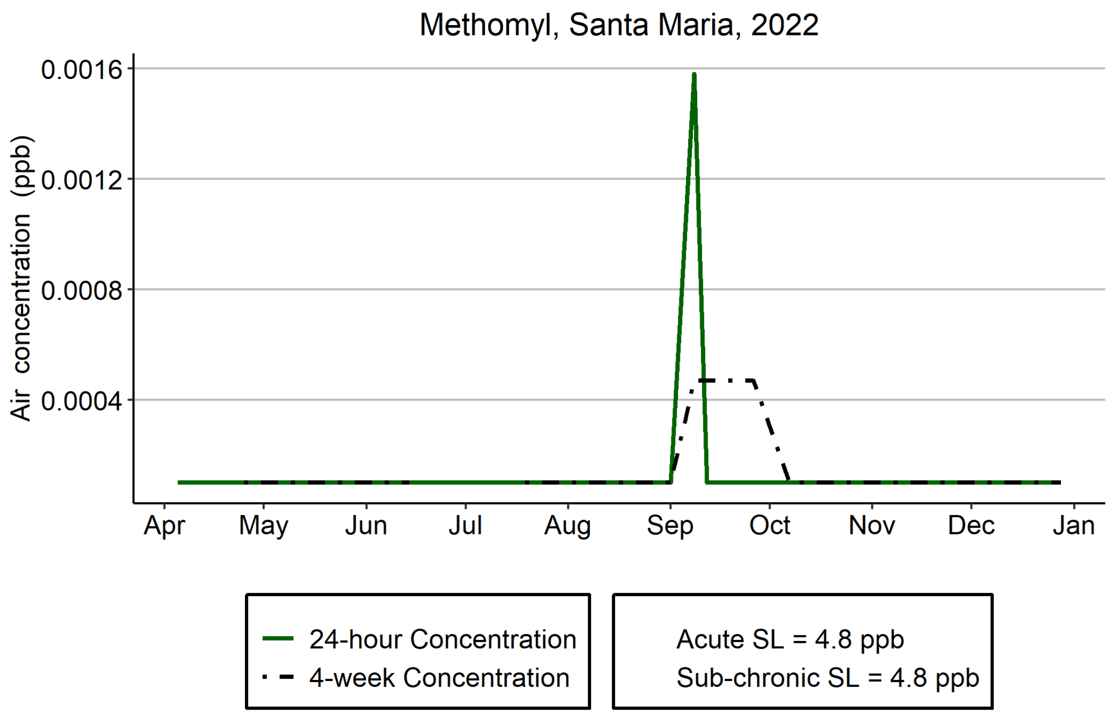

Figure B-6. Temporal trend in Methomyl concentrations in Santa Maria in 2022.

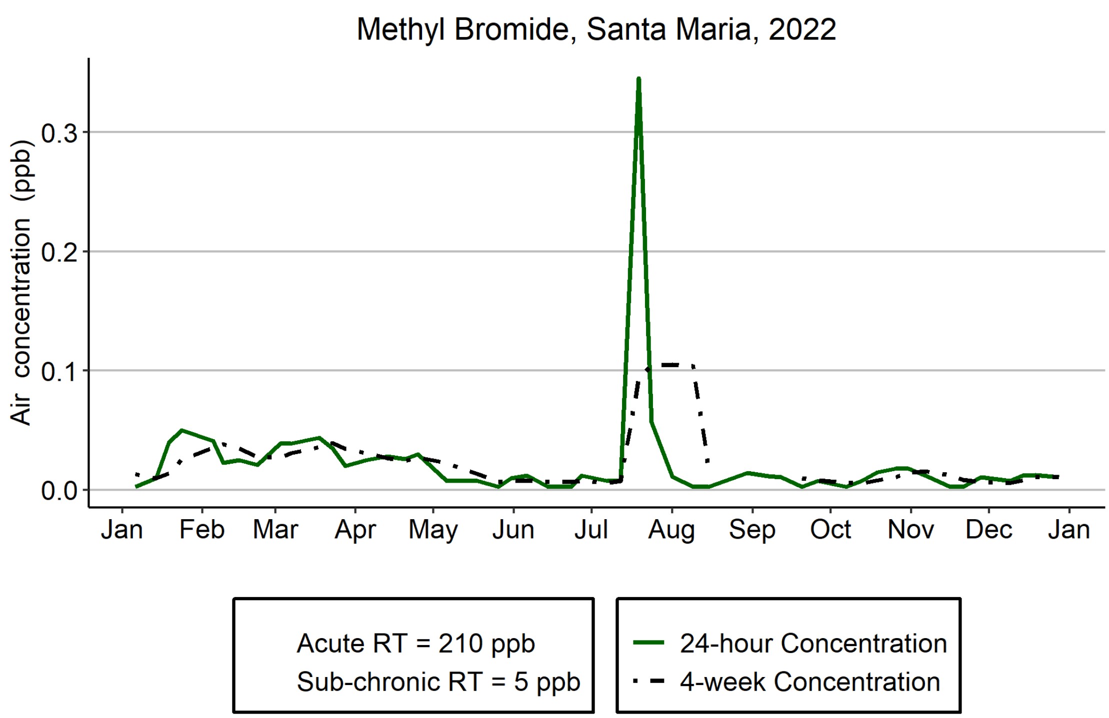

Figure B-7. Temporal trend in Methyl Bromide concentrations in Santa Maria in 2022.

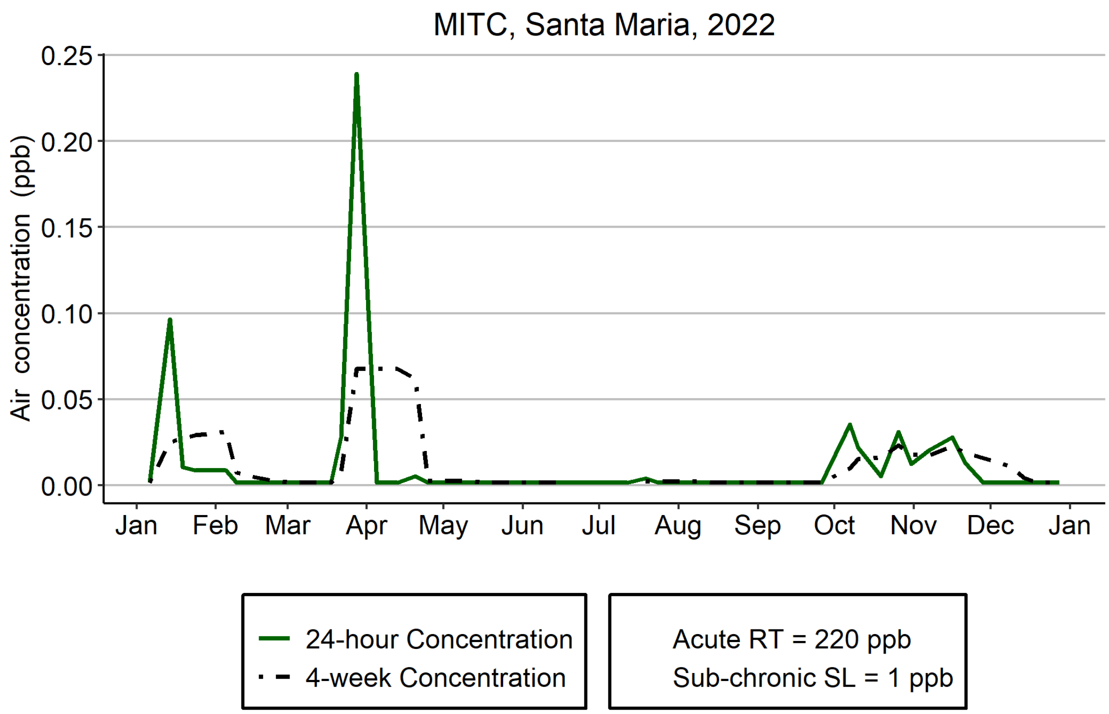

Figure B-8. Temporal trend in MITC concentrations in Santa Maria in 2022.

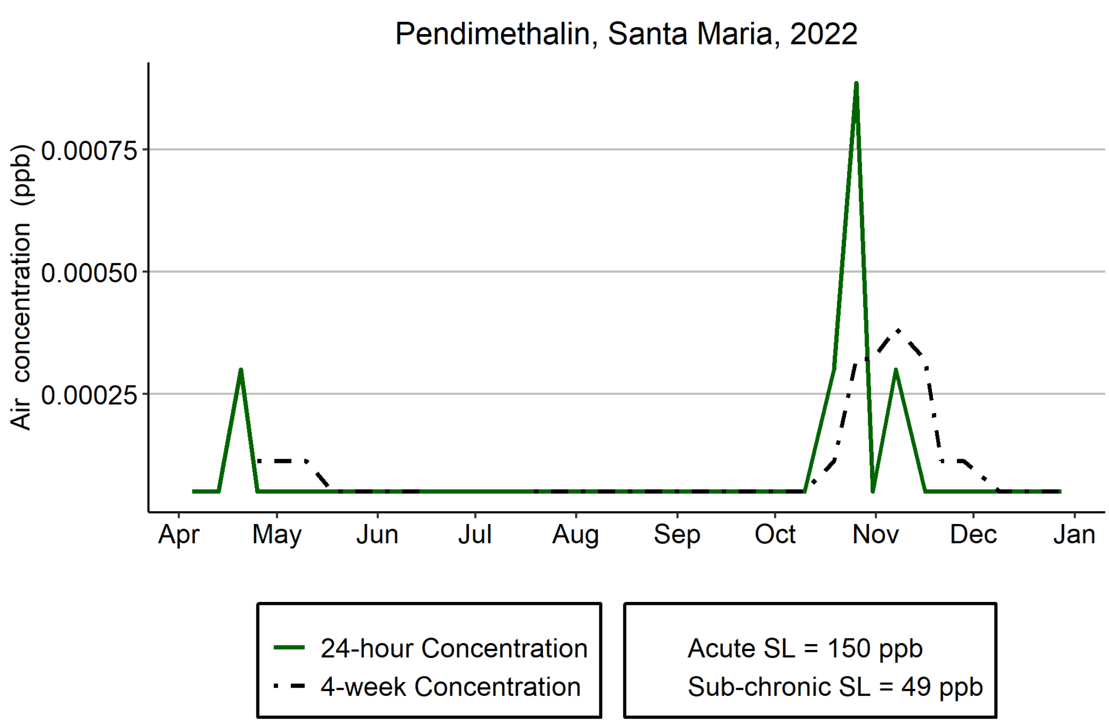

Figure B-9. Temporal trend in Pendimethalin concentrations in Santa Maria in 2022.

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 CDPR until April 2018 when the California Air Resources Board (CARB) assumed operation of this monitoring location. In February 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. In January 2021, CDPR 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 2022. The chemical with the highest number of quantifiable detections was 1,3-D (n = 27, 59%), followed by methyl bromide (n = 26, 50%), and MITC (n = 12, 23%).

Table C–1 Number and percentage of positive samples per chemical in Shafter in 2022.

Chemical	Number of valid samples	Quantifiable and Trace detections	Quantifiable detections	Quantifiable and Trace detections %	Quantifiable detections %
1,3-dichloropropene	46	28	27	60.9 %	58.7 %
Acephate	52	0	0	0 %	0 %
Bensulide	52	0	0	0 %	0 %
Captan	38	1	0	2.6 %	0 %
Chloropicrin	52	2	0	3.8 %	0 %
Chlorothalonil	52	8	0	15.4 %	0 %
Chlorpyrifos	52	0	0	0 %	0 %
Chlorpyrifos OA	52	0	0	0 %	0 %
Cypermethrin	52	0	0	0 %	0 %
DDVP	52	5	0	9.6 %	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	43	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	1	1	1.9 %	1.9 %
Endosulfan	52	0	0	0 %	0 %
Endosulfan Sulfate	52	0	0	0 %	0 %
Fenpyroximate	38	2	1	5.3 %	2.6 %
Iprodione	52	0	0	0 %	0 %
MITC	52	23	12	44.2 %	23.1 %
Malathion	52	0	0	0 %	0 %
Malathion OA	52	0	0	0 %	0 %
Methidathion	52	0	0	0 %	0 %
Methomyl	38	0	0	0 %	0 %
Methyl Bromide	52	41	26	78.8 %	50 %
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	2	0	3.8 %	0 %
Pendimethalin	38	22	8	57.9 %	21.1 %
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	1	0	1.9 %	0 %
pp-dicofol	52	0	0	0 %	0 %
Total	2,009	136	75	6.8 %	3.7 %

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 2022. All chemicals for which there were quantifiable detections at Santa Maria in 2022 were detected at 2.1% or less than 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 2022.

Chemical	Highest 24-hour concentration	24-hour acute screening level	Percent of screening level
1,3-dichloropropene	1.2 ppb (5,242 ng/m^3)	55 ppb** (250,000 ng/m^3)	2.1 %
EPTC	0.0027 ppb (20.7 ng/m^3)	29.7 ppb (230,000 ng/m^3)	0.009 %
Fenpyroximate	0.0019 ppb (32.5 ng/m^3)	0.87 ppb (14,998 ng/m^3)	0.22 %
Methyl Bromide	0.068 ppb (264 ng/m^3)	210 ppb* (820,000 ng/m^3)	0.032 %
MITC	0.18 ppb (551 ng/m^3)	220 ppb*† (660,000 ng/m^3)	0.083 %
Pendimethalin	0.0027 ppb (30.8 ng/m^3)	150 ppb (1,725,828 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	Trace	0.15 ppb (1,844 ng/m^3)	
Chloropicrin	Trace	73 ppb*† (491,000 ng/m^3)	
Chlorothalonil	Trace	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)	

Chemical	Highest 24-hour concentration	24-hour acute screening level	Percent of screening level
Cypermethrin	ND	6.6 ppb (113,000 ng/m^3)	
Dacthal	ND	1,732 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	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)	
Iprodione	ND	23.2 ppb (313,000 ng/m^3)	
Malathion	ND	8.3 ppb (112,500 ng/m^3)	
Malathion OA	ND	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)	

Chemical	Highest 24-hour concentration	24-hour acute screening level	Percent of screening level
Norflurazon	ND	12.6 ppb (170,000 ng/m^3)	
Oryzalin	ND	29.7 ppb (420,000 ng/m^3)	
Oxydemeton Methyl	ND	3.7 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 against 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 average concentrations (13-week for 1,3-D and chloropicrin) for all chemicals monitored at the Shafter AMN sampling site in 2022. The highest concentration relative to its screening level was that of MITC at 10%, followed by 1,3-D at 4%. The remaining chemicals for which there were quantifiable detections were detected at less than 1% 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 2022.

Chemical	Date‡	Highest rolling average concentration	Sub-chronic screening level	Percent of screening level
1,3-dichloropropene	10/27/2022	0.11 ppb (518 ng/m^3)	3 ppb (14,000 ng/m^3)	3.7 %
EPTC	05/19/2022	0.00078 ppb (5.9 ng/m^3)	3.1 ppb (24,000 ng/m^3)	0.025 %
Fenpyroximate	08/15/2022	0.0008 ppb (10.3 ng/m^3)	0.58 ppb (9,999 ng/m^3)	0.1 %
Methyl Bromide	03/30/2022	0.049 ppb (191 ng/m^3)	5 ppb* (19,400 ng/m^3)	0.99 %
MITC	11/30/2022	0.099 ppb (298 ng/m^3)	1 ppb (3,000 ng/m^3)	9.9 %
Pendimethalin	11/30/2022	0.0015 ppb (18.2 ng/m^3)	49 ppb (563,771 ng/m^3)	0.0032 %
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)	
Chloropicrin		Trace	0.35 ppb (2,300 ng/m^3)	
Chlorothalonil		Trace	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)	

Chemical	Date‡	Highest rolling average concentration	Sub-chronic 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	0.32 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)	
Iprodione		ND	7.1 ppb (95,600 ng/m^3)	
Malathion		ND	6 ppb (80,600 ng/m^3)	
Malathion OA		ND	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)	

Chemical	Date‡	Highest rolling average concentration	Sub-chronic screening level	Percent of screening level
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)	
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.
‡ This is the week (week 4 or week 13) when the highest cumulative rolling average was detected.

Chronic (annual) Concentrations

Table C–4 shows the annual average concentration for all chemicals monitored at the Shafter sampling site in 2022. The pesticide with highest concentration relative to its screening level was that of MITC at 17.2%, followed by 1,3-D at 2.8%. All other monitored chemicals were less than 2% of their chronic screening level in Shafter in 2022.

Table C–4. Annual average air concentrations, chronic screening levels, and percent of the chronic screening levels for chemicals monitored in Shafter in 2022.

Chemical	Overall average concentration	Chronic screening level	Percent of screening level
1,3-dichloropropene	0.056 ppb (253 ng/m^3)	2 ppb (9,000 ng/m^3)	2.8 %
EPTC	0.0002 ppb (1.4 ng/m^3)	1.1 ppb (8,500 ng/m^3)	0.016 %
Fenpyroximate	0.00026 ppb (2.2 ng/m^3)	0.058 ppb (1,000 ng/m^3)	0.22 %

Chemical	Overall average concentration	Chronic screening level	Percent of screening level
Methyl Bromide	0.014 ppb (53.4 ng/m^3)	1 ppb (3,900 ng/m^3)	1.4 %
MITC	0.017 ppb (51.6 ng/m^3)	0.1 ppb (300 ng/m^3)	17.2 %
Pendimethalin	0.00041 ppb (5.8 ng/m^3)	49 ppb (563,771 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	Trace	0.037 ppb (455 ng/m^3)	
Chloropicrin	Trace	0.27 ppb (1,800 ng/m^3)	
Chlorothalonil	Trace	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	
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)	

Chemical	Overall average concentration	Chronic screening level	Percent of screening level
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)	
Iprodione	ND	7.1 ppb (95,600 ng/m^3)	
Malathion	ND	0.6 ppb (8,100 ng/m^3)	
Malathion OA	ND	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)	

Chemical	Overall average concentration	Chronic screening level	Percent of screening level
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 Shafter in 2022. Screening levels are abbreviated as SL, whereas regulatory targets are abbreviated as RT.

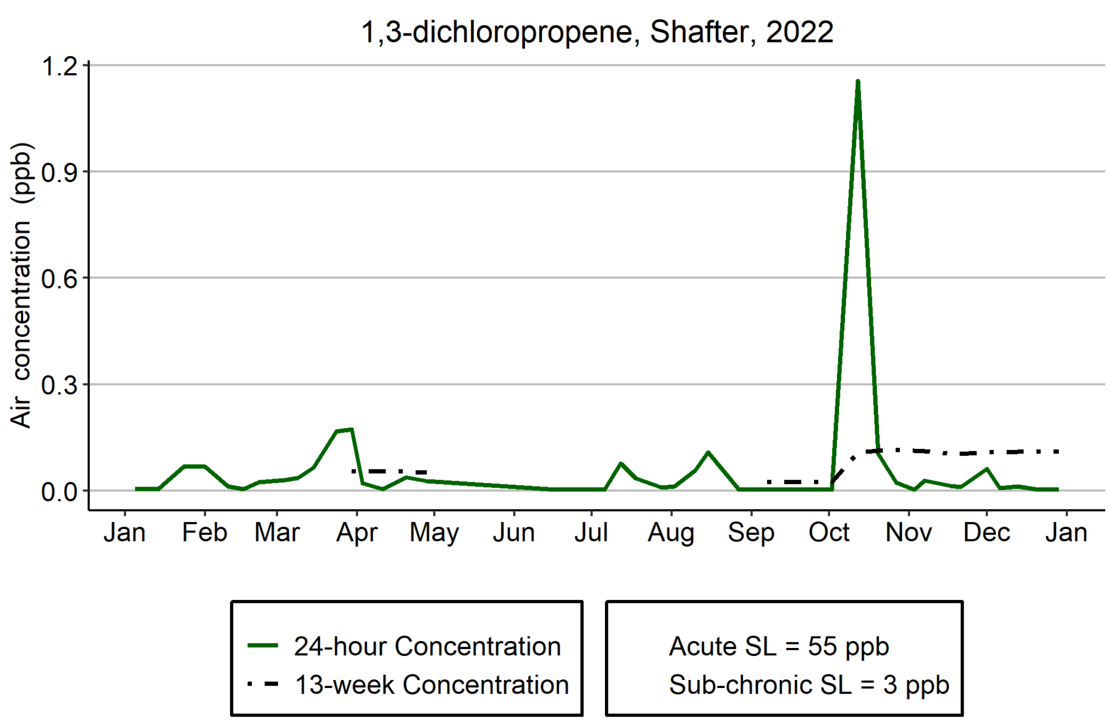

Figure C-1. Temporal trend in 1,3-dichloropropene concentrations in Shafter in 2022.

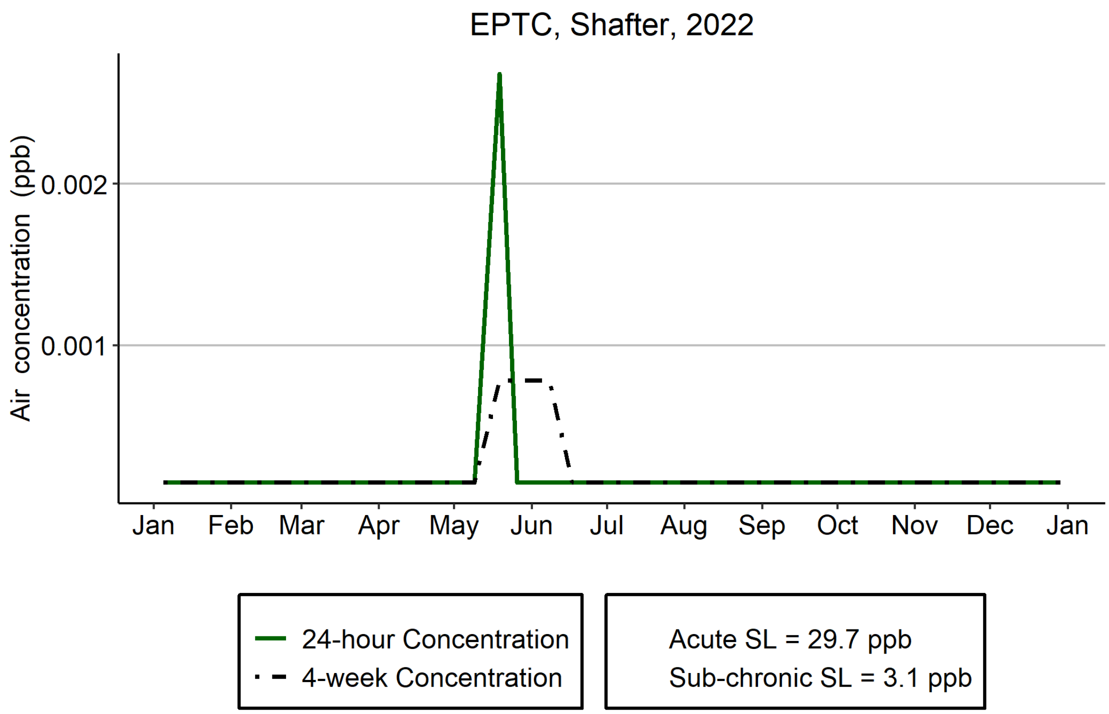

Figure C-2. Temporal trend in EPTC concentrations in Shafter in 2022.

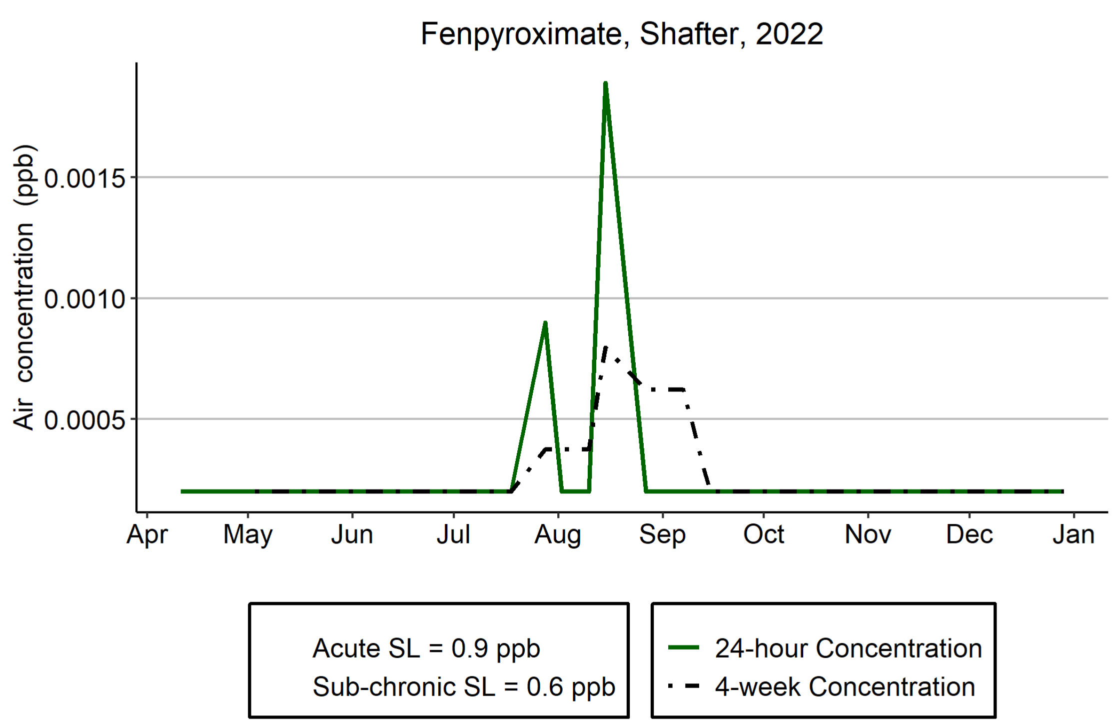

Figure C-3. Temporal trend in Fenpyroximate concentrations in Shafter in 2022.

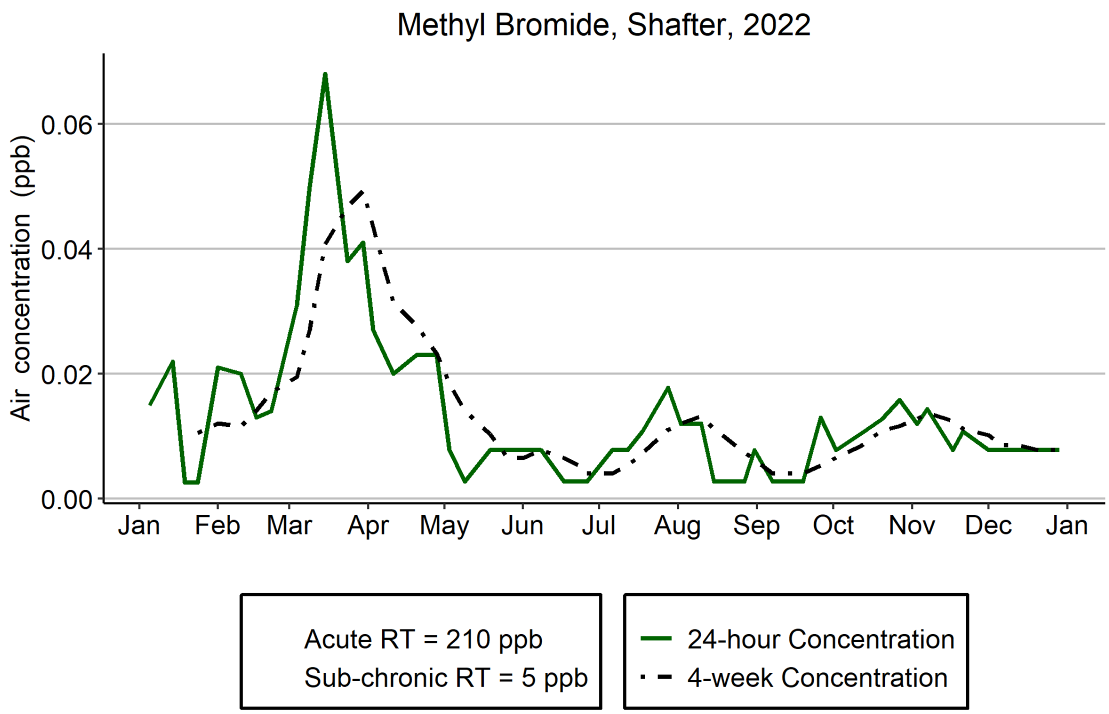

Figure C-4. Temporal trend in Methyl Bromide concentrations in Shafter in 2022.

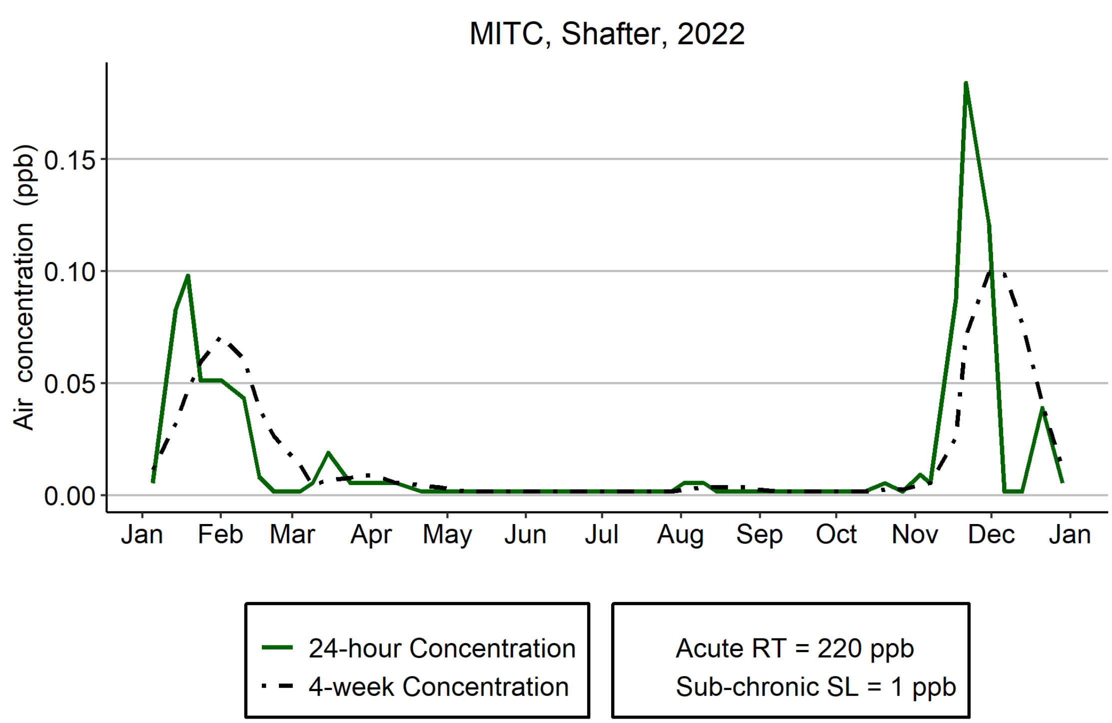

Figure C-5. Temporal trend in MITC concentrations in Shafter in 2022.

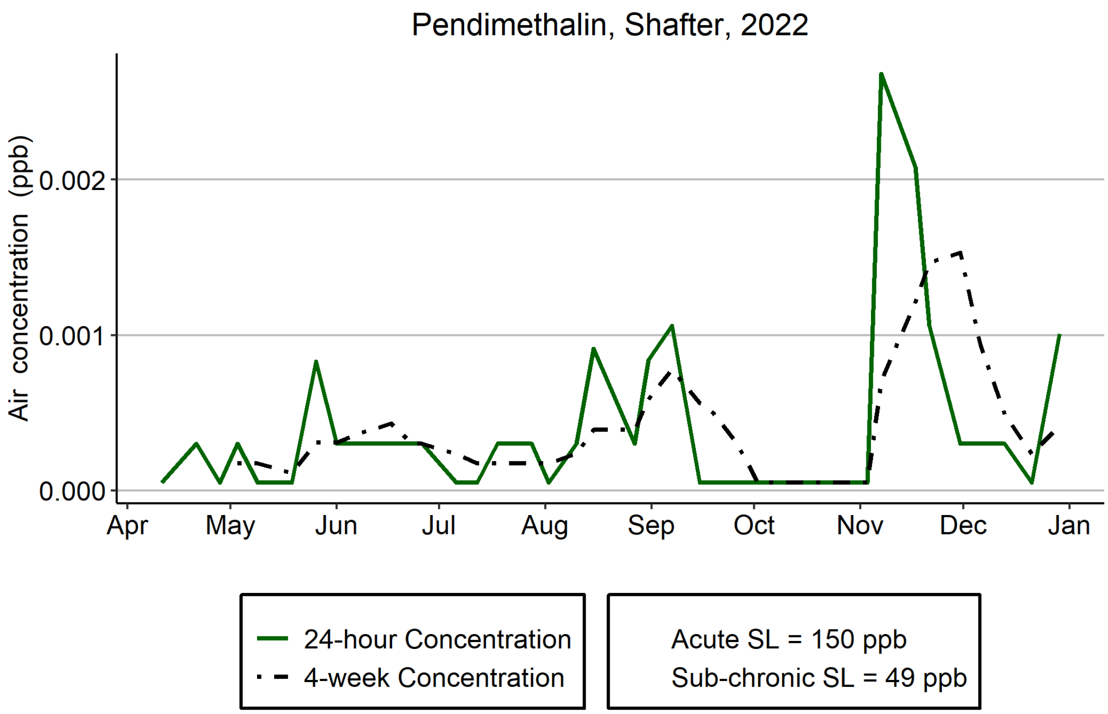

Figure C-6. Temporal trend in Pendimethalin concentrations in Shafter in 2022.

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. CDPR 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 2022. The chemical with the highest number of quantifiable detections was methyl bromide (n = 22, 43.1%), followed by 1,3-D (n = 12, 26.7%), MITC (n = 7, 13.5%) and chloropicrin (n = 5, 9.6%).

Table D–1 Number and percentage of positive samples per chemical in Watsonville in 2022.

Chemical	Number of valid samples	Quantifiable and Trace detections	Quantifiable detections	Quantifiable and Trace detections %	Quantifiable detections %
1,3-dichloropropene	45	12	12	26.7 %	26.7 %
Acephate	52	0	0	0 %	0 %
Bensulide	52	0	0	0 %	0 %
Captan	38	0	0	0 %	0 %
Chloropicrin	52	15	5	28.8 %	9.6 %
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	2	0	3.8 %	0 %
DEF	52	0	0	0 %	0 %
Dacthal	52	3	0	5.8 %	0 %
Diazinon	52	0	0	0 %	0 %
Diazinon OA	43	0	0	0 %	0 %

Chemical	Number of valid samples	Quantifiable and Trace detections	Quantifiable detections	Quantifiable and Trace detections %	Quantifiable detections %
Dimethoate	52	0	0	0 %	0 %
Dimethoate OA	52	0	0	0 %	0 %
Diuron	52	0	0	0 %	0 %
EPTC	52	0	0	0 %	0 %
Endosulfan	52	0	0	0 %	0 %
Endosulfan Sulfate	52	0	0	0 %	0 %
Fenpyroximate	38	0	0	0 %	0 %
Iprodione	52	0	0	0 %	0 %
MITC	52	11	7	21.2 %	13.5 %
Malathion	52	6	0	11.5 %	0 %
Malathion OA	52	1	0	1.9 %	0 %
Methidathion	52	0	0	0 %	0 %
Methomyl	38	0	0	0 %	0 %
Methyl Bromide	51	37	22	72.5 %	43.1 %
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	2	0	3.8 %	0 %
Pendimethalin	38	0	0	0 %	0 %
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	2,007	89	46	4.4 %	2.3 %

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 2022. All chemicals for which there were quantifiable detections at Watsonville in 2022 were detected at less than 1% of their screening levels.

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 2022.

Chemical	Highest 24-hour concentration	24-hour acute screening level	Percent of screening level
1,3-dichloropropene	0.36 ppb (1,629 ng/m^3)	55 ppb** (250,000 ng/m^3)	0.65 %
Chloropicrin	0.34 ppb (2,310 ng/m^3)	73 ppb*† (491,000 ng/m^3)	0.47 %
Methyl Bromide	0.035 ppb (136 ng/m^3)	210 ppb* (820,000 ng/m^3)	0.017 %
MITC	0.12 ppb (347 ng/m^3)	220 ppb*† (660,000 ng/m^3)	0.053 %
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)	
Dacthal	Trace	1,732 ppb (23,500,000 ng/m^3)	
DDVP	Trace	1.2 ppb (11,000 ng/m^3)	

Chemical	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 (14,998 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	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	Trace	34.5 ppb (510,000 ng/m^3)	
Pendimethalin	ND	150 ppb (1,725,828 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 against 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 average concentrations (13-week for 1,3-D and chloropicrin) for all chemicals monitored at the Watsonville AMN sampling site in 2022. The highest concentration relative to its screening level was that of Chloropicrin at 27%, followed by 1,3-D at 4.2%, MITC at 3.8%, and methyl bromide at 0.6%.

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 2022.

Chemical	Date‡	Highest rolling average concentration	Sub-chronic screening level	Percent of screening level
1,3-dichloropropene	01/05/2022	0.13 ppb (590 ng/m^3)	3 ppb (14,000 ng/m^3)	4.2 %
Chloropicrin	11/08/2022	0.092 ppb (620 ng/m^3)	0.35 ppb (2,300 ng/m^3)	27 %
Methyl Bromide	03/22/2022	0.029 ppb (113 ng/m^3)	5 ppb* (19,400 ng/m^3)	0.58 %
MITC	10/27/2022	0.039 ppb (115 ng/m^3)	1 ppb (3,000 ng/m^3)	3.8 %
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)	
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)	

Chemical	Date‡	Highest rolling average concentration	Sub-chronic screening level	Percent of screening level
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 (9,999 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		Trace	12.2 ppb (180,000 ng/m^3)	

Chemical	Date‡	Highest rolling average concentration	Sub-chronic screening level	Percent of screening level
Pendimethalin		ND	49 ppb (5 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)	
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.
‡ This is the week (week 4 or week 13) when the highest cumulative rolling average was detected.

Chronic (annual) Concentrations

Table D–4 shows the annual average concentration for all chemicals monitored at the Watsonville sampling site in 2022. The pesticide with highest concentration relative to its screening level was that of chloropicrin at 10.3%, followed by MITC at 7.6 %, 1,3- dichloropropene at 1.5%, and methyl bromide at 1.1%.

Table D–4. Annual average air concentrations, chronic screening levels, and percent of the chronic screening levels for chemicals monitored in Watsonville in 2022.

Chemical	Overall average concentration	Chronic screening level	Percent of screening level
1,3-dichloropropene	0.03 ppb (137 ng/m^3)	2 ppb (9,000 ng/m^3)	1.5 %
Chloropicrin	0.028 ppb (186 ng/m^3)	0.27 ppb (1,800 ng/m^3)	10.3 %
Methyl Bromide	0.011 ppb (43.4 ng/m^3)	1 ppb (3,900 ng/m^3)	1.1 %

Chemical	Overall average concentration	Chronic screening level	Percent of screening level
MITC	0.0077 ppb (22.9 ng/m^3)	0.1 ppb (300 ng/m^3)	7.6 %
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)	
DDVP	Trace	0.085 ppb (770 ng/m^3)	
DEF	ND	NA	
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)	

Chemical	Overall average concentration	Chronic screening level	Percent of screening level
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)	
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)	
Pendimethalin	ND	49 ppb (563,771 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)	

Chemical	Overall average concentration	Chronic screening level	Percent of screening level
Propargite	ND	0.98 ppb (14,000 ng/m³)	
Simazine	ND	3.8 ppb (31,000 ng/m³)	
Trifluralin	ND	3 ppb (41,000 ng/m³)	

Temporal Trends in Detected Concentrations

The following figures depict the concentrations over time for any chemical detected at a quantifiable concentration in Watsonville in 2022. Screening levels are abbreviated as SL, whereas regulatory targets are abbreviated as RT.

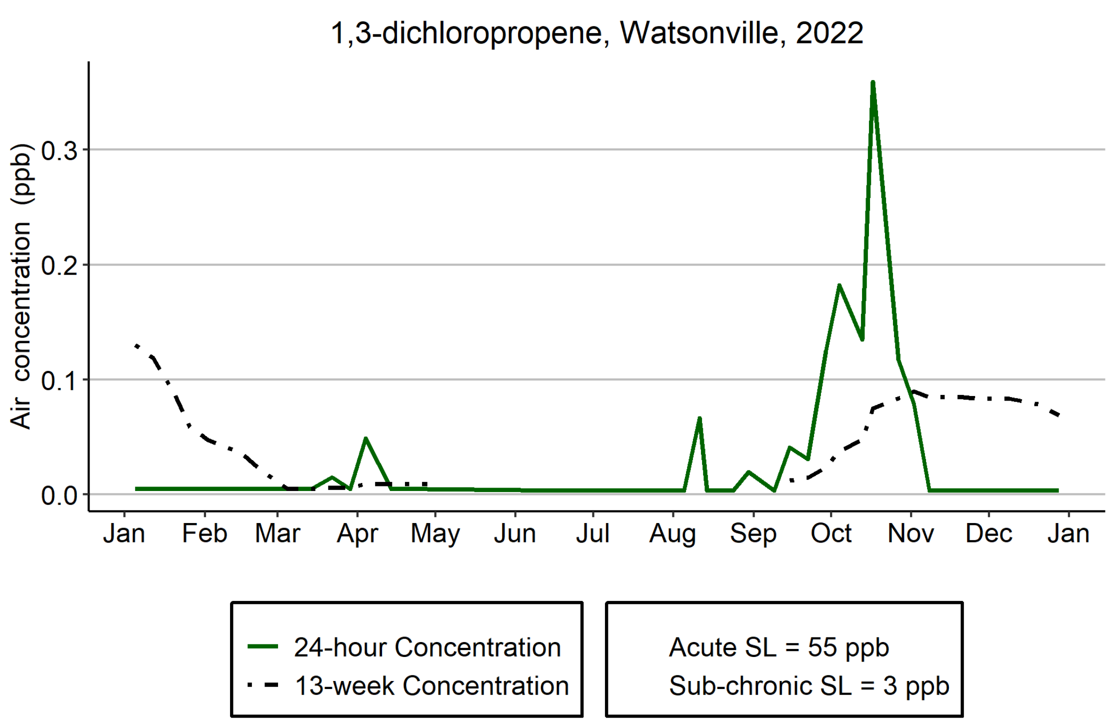

Figure D-1. Temporal trend in 1,3-dichloropropene concentrations in Watsonville in 2022.

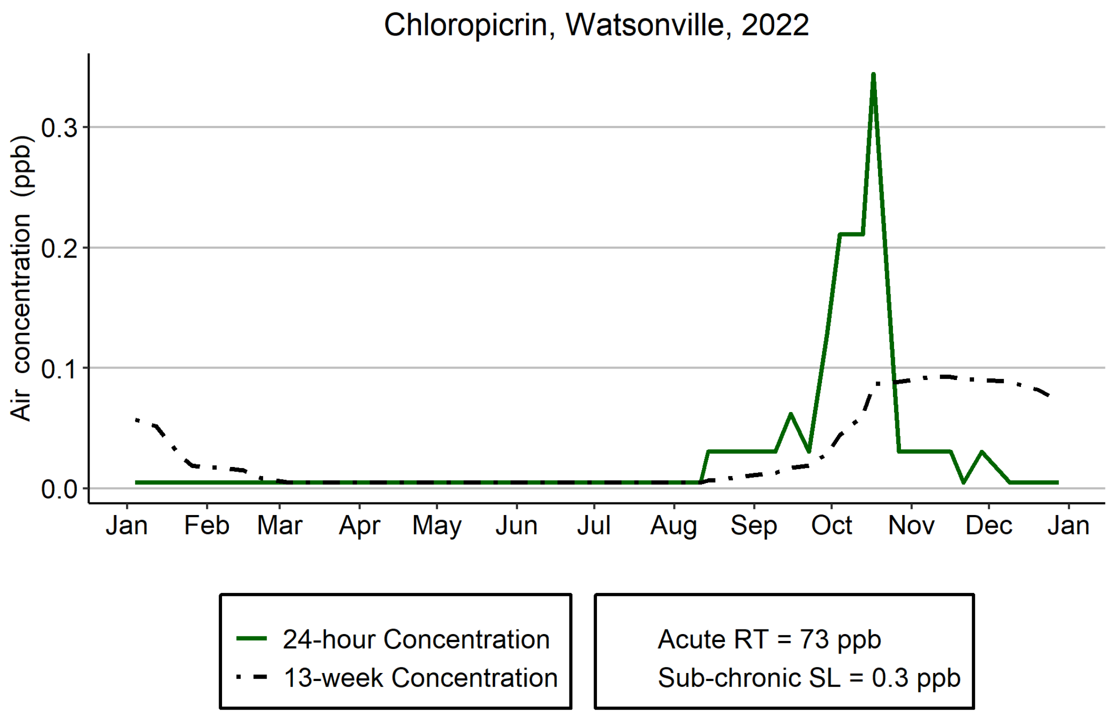

Figure D-2. Temporal trend in Chloropicrin concentrations in Watsonville in 2022.

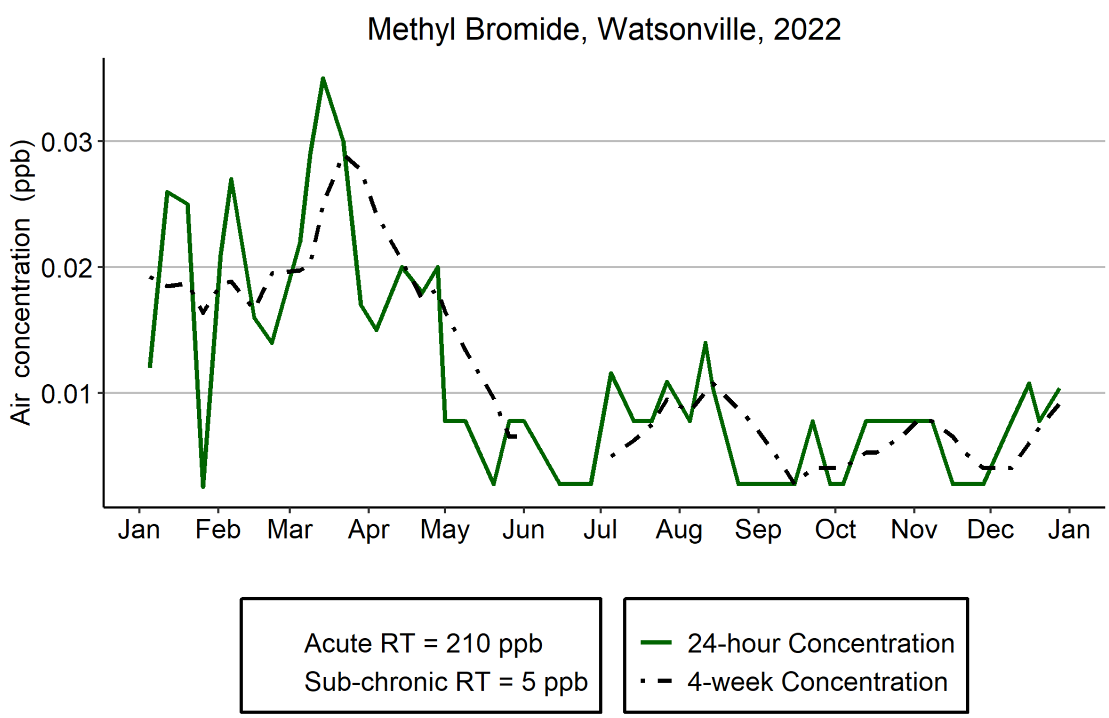

Figure D-3. Temporal trend in Methyl Bromide concentrations in Watsonville in 2022.

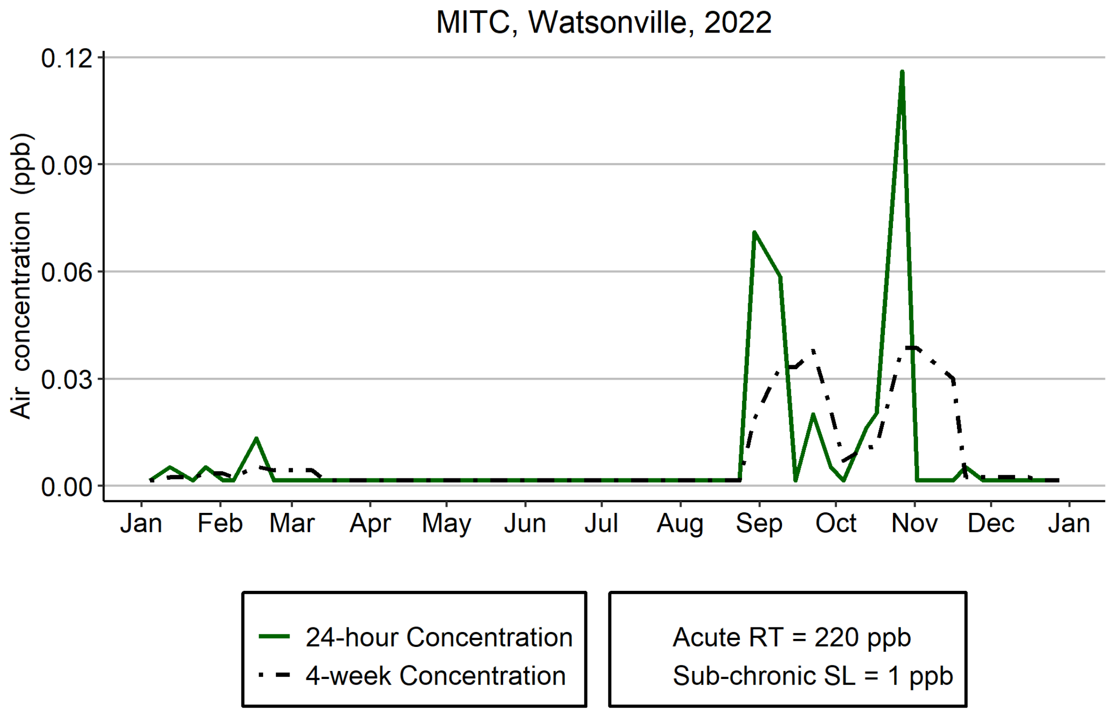

Figure D-4. Temporal trend in MITC concentrations in Watsonville in 2022.

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 (CDPR) 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 Xonteck model 901 ambient air sampler into a 6-L air steel canister. The flow rate using this method was 7.5 mL/min (± 10%) and was sustained for a 24-h period. The sampler itself included an automatically initiated 60-second purge period to clear the sampling lines immediately prior to sample collection.

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, CDPR 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, CDPR 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, CDFA 2018). 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 32 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

Chemical	Chemical Class	Pesticide Group
Iprodione	Dicarboximide	Fungicide
Malathion	Organophosphate	Insecticide
Malathion OA	Organophosphate	Degradate
Methidathion	Organophosphate	Insecticide
Methomyl	Carbamate	Insecticide
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. 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 (Table F-4). 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. 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-CAC.

Chemical	MDL (ppb)	LOQ (ppb)	MDL (ng/m^3)	LOQ (ng/m^3)
1,3-dichloropropene	0.0100	0.0100	45.4	45.4
Acephate	0.0004	0.0012	2.9	9.3
Bensulide	0.0002	0.0006	3.3	9.3
Captan	0.0002	0.0019	3.0	23.1
Chloropicrin	0.0095	0.0517	63.6	347.2
Chlorothalonil	0.0002	0.0021	2.2	23.1
Chlorpyrifos	0.0001	0.0016	2.0	23.1
Chlorpyrifos OA	0.0001	0.0007	2.0	9.3
Cypermethrin	0.0002	0.0014	3.4	23.1
DDVP	0.0002	0.0026	1.8	23.1
DEF	0.0002	0.0007	2.0	9.3
Dacthal	0.0002	0.0007	2.1	9.3
Diazinon	0.0002	0.0007	2.1	9.3
Diazinon OA	0.0002	0.0008	1.9	9.3
Dimethoate	0.0002	0.0010	2.3	9.3
Dimethoate OA	0.0003	0.0011	2.9	9.3
Diuron	0.0002	0.0010	2.2	9.3
EPTC	0.0003	0.0012	2.0	9.3
Endosulfan	0.0001	0.0014	2.0	23.1

Chemical	MDL (ppb)	LOQ (ppb)	MDL (ng/m^3)	LOQ (ng/m^3)
Endosulfan Sulfate	0.0001	0.0013	2.1	23.1
Fenpyroximate	0.0004	0.0014	2.6	9.3
Iprodione	0.0002	0.0007	2.7	9.3
MITC	0.0030	0.0077	8.9	23.1
Malathion	0.0001	0.0007	1.8	9.3
Malathion OA	0.0001	0.0007	1.9	9.3
Methidathion	0.0002	0.0007	2.8	9.3
Methomyl	0.0002	0.0008	2.3	9.3
Methyl Bromide	0.0051	0.0100	19.8	38.8
Metolachlor (S-Metolachlor)	0.0002	0.0008	2.1	9.3
Norflurazon	0.0001	0.0007	2.0	9.3
Oryzalin	0.0002	0.0007	2.5	9.3
Oxydemeton Methyl	0.0002	0.0009	2.5	9.3
Oxyfluorfen	0.0001	0.0016	1.7	23.1
Pendimethalin	0.0001	0.0005	2.2	9.3
Permethrin	0.0002	0.0014	2.5	23.1
Phosmet	0.0001	0.0007	1.8	9.3
Propargite	0.0002	0.0016	2.6	23.1
Simazine	0.0002	0.0011	1.9	9.3
Trifluralin	0.0001	0.0017	1.7	23.1
pp-dicofol	0.0001	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:

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

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

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

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 *x* ppb) for conversion purposes.

Per standard CDPR 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 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 CDPR'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 81% to 97% for all chemicals analyzed. Field blanks and duplicate samples are part of CDPR's field and laboratory QC program. The trip blanks were blank matrix samples that were transported to and from the field locations but were not placed on air pumps. These samples were a control to check for contamination during transportation. Table F-5 shows that with the exception of one Trace detection for methyl bromide and one Trace detection for oxyfluorfen, all field blanks resulted in non-detections.

Table F-5. Quality control/quality assurance results from 2022 analyzed by CDFA-CAC. Unless explicitly stated, "ND" means that all samples were non-detected.

Chemical	Lab Spikes Number	Lab Spikes Recovery	Lab Blanks Number	Lab Blanks Detection	Field Blanks Number	Field Blanks Detection
1,3-dichloropropene	42	97 %	29	ND	0	--
Acephate	23	89 %	21	ND	7	ND
Bensulide	23	90 %	21	ND	7	ND
Captan	17	89 %	20	ND	7	ND
Chloropicrin	28	95 %	25	ND	7	ND
Chlorothalonil	24	83 %	21	ND	7	ND
Chlorpyrifos	24	89 %	21	ND	7	ND
Chlorpyrifos OA	23	91 %	21	ND	7	ND
Cypermethrin	24	95 %	21	ND	7	ND
Dacthal	24	87 %	21	ND	7	ND
DDVP	24	81 %	21	ND	7	ND
DEF	23	92 %	21	ND	7	ND
Diazinon	23	89 %	21	ND	7	ND
Diazinon OA	18	91 %	16	ND	4	ND
Dimethoate	23	91 %	21	ND	7	ND
Dimethoate OA	23	92 %	21	ND	7	ND
Diuron	23	90 %	21	ND	7	ND
Endosulfan I	24	87 %	21	ND	7	ND

Chemical	Lab Spikes Number	Lab Spikes Recovery	Lab Blanks Number	Lab Blanks Detection	Field Blanks Number	Field Blanks Detection
Endosulfan Sulfate	24	89 %	21	ND	7	ND
EPTC	24	78 %	21	ND	7	ND
Fenpyroximate	16	93 %	20	ND	7	ND
Iprodione	24	91 %	21	ND	7	ND
Malathion	24	92 %	21	ND	7	ND
Malathion OA	23	91 %	21	ND	7	ND
Methidathion	23	90 %	21	ND	7	ND
Methomyl	16	90 %	20	ND	7	ND
Methyl Bromide	42	96 %	35	ND	1	Trace
Metolachlor	23	90 %	21	ND	7	ND
MITC	31	84 %	31	ND	7	ND
Norflurazon	23	91 %	21	ND	7	ND
Oryzalin	23	90 %	21	ND	7	ND
Oxydemeton methyl	23	84 %	21	ND	7	ND
Oxyfluorfen	24	94 %	21	ND	6	1 Trace 5 ND
Pendimethalin	15	94 %	20	ND	7	ND
Permethrin	24	91 %	21	ND	7	ND
Phosmet	23	90 %	21	ND	7	ND
pp-Dicofol	24	89 %	21	ND	7	ND
Propargite	24	91 %	21	ND	7	ND
Simazine	23	90 %	21	ND	7	ND
Trifluralin	24	89 %	21	ND	7	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 nondetection 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 2022. 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	12	5	7	6	316
ND / Trace	1	0	0	0	4
ND / >LOQ	2	0	0	0	0
Trace / ND	0	0	0	1	0
Trace / Trace	0	5	0	0	4
Trace / >LOQ	0	0	0	0	0
>LOQ / ND	0	0	0	0	0
>LOQ / Trace	0	1	0	0	0
>LOQ / >LOQ	7	3	2	2	2
>LOQ/>LOQ RD %	12 %	5 %	46 %	8 %	16 %

ND = Not detected; Trace = Detection confirmed but less than the quantitation limit; LOQ = Limit of quantification; RD = Relative difference for pairs with both concentrations >LOQ.

Lost and Invalid Samples

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

In 2022, 117 samples were lost or invalidated during field sampling. Additionally, between May and November, CDPR delivered all samples to the CDFA laboratory for extraction and analysis. CDFA had a software error and was unable to analyze 63 samples (Table F-7).

Table F-7. Lost or invalid samples in 2022.

Community	Operator	Date	Sample type
Oxnard	V-CAC	4/25/2022	VOC, chloropicrin, MITC, Multi. Power outage.
Oxnard	V-CAC	6/20/2022	Chloropicrin, MITC, Multi. School was closed.
Oxnard	V-CAC	8/26/2022	MITC feel out of sampler instrument.
Oxnard	V-CAC	9/12/2022	1,3-D & methyl bromide (VOC). Faulty canister.
Santa Maria	SB-CAC	6/20/2022	Chloropicrin, MITC, Multi. Power outage.
Santa Maria	SB-CAC	8/22/2022	VOC. Faulty canister.
Shafter	CDPR	6/13/2022	MITC flow rate out of range.
Shafter	CDPR	8/22/2022	Chloropicrin flow rate out of range.
Ohlone	CDPR	6/6/2022	VOC. Final canister pressure was out of range.
All four communities	CDFA	5/1/2022 to 6/15/2022	CDFA-CAC laboratory lost 27 1,3-D samples.
All four communities	CDFA	9/8/2022 to 11/8/2022	CDFA-CAC laboratory lost 36 diazinon OA samples.

Appendix G: HEALTH EVALUATION AND CALCULATIONS

Calculation of Sub-chronic Rolling Averages

In 2016, CDPR 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 CDPR'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, CDPR in consultation with the Office of Environmental Health Hazard Assessment developed health screening levels or regulatory targets to place the results in a health-based context.

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

CDPR puts measures in place based on the regulatory target to limit exposures so that adverse effects can be avoided. Exceeding a regulatory target does not necessarily mean an adverse health effect occurs, but it does indicate that the restrictions on the pesticide use may need to be modified. CDPR normally establishes a regulatory target after completing a formal risk assessment of a chemical's toxicity and potential exposures. CDPR management determines a regulatory target using its risk assessment, as well as risk assessments from other agencies, pesticide use patterns, potential effects on use of alternative pesticides, and other factors. A regulatory target is based on a more comprehensive evaluation than a health screening level. Therefore, a regulatory target supersedes a health screening level (i.e., a specific pesticide and exposure duration will have either a regulatory target or a health screening level, but not both). Out of the 36 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,

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

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 2021 can be found in Air Monitoring Reports page at CDPR'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, CDPR 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 chemicals captan, fenpyroximate, methomyl, pendimethalin were added to the AMN, hence the number of pesticides monitored by the AMN increased to 40.

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. Pesticide detection trends aggregated by chemical from 2011 to 2022.

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

Table H-2. Pesticide detection trends as individual analyses from 2011 to 2022.

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

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 10.3% of possible detections and 5.2% of quantifiable detections. The lowest percentage of detections occurred in 2019 with 3.8% of possible detections and 0.95% of quantifiable detections.

Table H-3. Pesticide detection trends as percentage of possible detections from 2011 to 2022.

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%
2016	91.0%	9.0%	5.2%
2017	92.9%	7.1%	1.6%
2018	93.8%	6.2%	1.3%

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

Historic Air Concentrations in Oxnard

The following tables summarize results for five years of air monitoring in Oxnard. Monitoring in 2020 was only conducted for 11 weeks due to COVID-19; therefore, direct comparisons should be performed with caution.

Table H-4. Percentage of analyses performed resulting in a quantifiable or trace detection in Oxnard in 2018-2022.

Chemical	2018	2019	2020	2021	2022
1,3-dichloropropene	6 %	2 %	0 %	18 %	16 %
Bensulide	0 %	0 %	10 %	0 %	0 %
Captan	--	--	--	--	19 %
Chloropicrin	20 %	14 %	0 %	45 %	35 %
Chlorothalonil	65 %	18 %	20 %	0 %	0 %
Chlorpyrifos OA	5 %	2 %	0 %	0 %	0 %
DDVP	0 %	16 %	0 %	4 %	6 %
Dacthal	40 %	6 %	0 %	31 %	0 %
MITC	55 %	20 %	40 %	30 %	12 %
Malathion	5 %	29 %	0 %	17 %	10 %
Malathion OA	15 %	33 %	0 %	10 %	10 %
Methyl Bromide	0 %	0 %	0 %	35 %	84 %
Oxyfluorfen	0 %	0 %	0 %	2 %	8 %
Pendimethalin	--	--	--	--	38 %
Simazine	0 %	0 %	0 %	2 %	0 %

Table H-5. Highest 24-hour concentrations for pesticides with at least one detectable concentration in Oxnard in 2018-2022.

Chemical	2018	2019	2020	2021	2022
1,3-dichloropropene	0.35 ppb (1,589 ng/m^3)	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)
Bensulide	ND	ND	Trace	ND	ND
Captan	--	--	--	--	0.0021 ppb (26 ng/m^3)
Chloropicrin	0.8 ppb (5,365 ng/m^3)	1 ppb (6,939 ng/m^3)	ND	2.6 ppb (17,771 ng/m^3)	0.52 ppb (3,522 ng/m^3)
Chlorothalonil	Trace	Trace	Trace	ND	ND
Chlorpyrifos OA	Trace	Trace	ND	ND	ND
DDVP	ND	Trace	ND	Trace	Trace
Dacthal	Trace	0.0015 ppb (20.6 ng/m^3)	ND	0.00013 ppb (1.8 ng/m^3)	ND
MITC	0.016 ppb (48.2 ng/m^3)	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)
Malathion	Trace	0.0084 ppb (113 ng/m^3)	ND	0.009 ppb (121 ng/m^3)	0.018 ppb (246 ng/m^3)
Malathion OA	Trace	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)
Methyl Bromide	ND	ND	ND	0.029 ppb (113 ng/m^3)	0.034 ppb (132 ng/m^3)
Oxyfluorfen	ND	ND	ND	Trace	Trace
Pendimethalin	--	--	--	--	0.016 ppb (185 ng/m^3)
Simazine	ND	ND	ND	Trace	ND

Table H-6. Highest rolling 4-week average concentrations (13-week for 1,3-D and chloropicrin) for pesticides with at least one detectable concentration in Oxnard in 2018-2022.

Chemical	2018	2019	2020	2021	2022
1,3-dichloropropene	0.073 ppb (332 ng/m^3)	0.085 ppb (388 ng/m^3)	ND	0.073 ppb (330 ng/m^3)	0.023 ppb (105 ng/m^3)
Bensulide	ND	ND	Trace	ND	ND

Chemical	2018	2019	2020	2021	2022
Captan	--	--	--	--	0.00084 ppb (10.5 ng/m^3)
Chloropicrin	0.095 ppb (639 ng/m^3)	0.2 ppb (1,359 ng/m^3)	ND	0.42 ppb (2,845 ng/m^3)	0.11 ppb (771 ng/m^3)
Chlorothalonil	Trace	Trace	Trace	ND	ND
Chlorpyrifos OA	Trace	Trace	ND	ND	ND
DDVP	ND	Trace	ND	Trace	Trace
Dacthal	Trace	0.00058 ppb (8.2 ng/m^3)	ND	0.00045 ppb (5.7 ng/m^3)	ND
MITC	0.011 ppb (32.7 ng/m^3)	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)
Malathion	Trace	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)
Malathion oa	Trace	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)
Methyl Bromide	ND	ND	ND	0.024 ppb (95.1 ng/m^3)	0.028 ppb (111 ng/m^3)
Oxyfluorfen	ND	ND	ND	Trace	Trace
Pendimethalin	--	--	--	--	0.0063 ppb (72.3 ng/m^3)
Simazine	ND	ND	ND	Trace	ND

Table H-7. Comparison of the 1-year average concentration for pesticides with at least one detectable concentration in Oxnard in 2018-2022.

Chemical	2018	2019	2020	2021	2022
1,3-dichloropropene	0.061 ppb (279 ng/m^3)	0.059 ppb (270 ng/m^3)	ND	0.026 ppb (119 ng/m^3)	0.026 ppb (117 ng/m^3)
Bensulide	ND	ND	Trace	ND	ND
Captan	ND	ND	ND	ND	0.00031 ppb (4 ng/m^3)
Chloropicrin	0.068 ppb (454 ng/m^3)	0.066 ppb (442 ng/m^3)	ND	0.13 ppb (843 ng/m^3)	0.037 ppb (252 ng/m^3)
Chlorothalonil	Trace	Trace	Trace	ND	ND
Chlorpyrifos OA	Trace	Trace	ND	ND	ND

Chemical	2018	2019	2020	2021	2022
DDVP	ND	Trace	ND	Trace	Trace
Dacthal	Trace	0.000075 ppb (1.5 ng/m^3)	ND	0.00019 ppb (2.4 ng/m^3)	ND
MITC	0.0047 ppb (14.1 ng/m^3)	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)
Malathion	Trace	0.00069 ppb (9.4 ng/m^3)	ND	0.00029 ppb (4 ng/m^3)	0.00057 ppb (7.9 ng/m^3)
Malathion OA	Trace	0.00016 ppb (2 ng/m^3)	ND	0.0001 ppb (1.6 ng/m^3)	0.00012 ppb (1.9 ng/m^3)
Methyl Bromide	ND	ND	ND	0.0077 ppb (30 ng/m^3)	0.012 ppb (46.1 ng/m^3)
Oxyfluorfen	ND	ND	ND	Trace	Trace
Pendimethalin	--	--	--	--	0.00092 ppb (11.3 ng/m^3)
Simazine	ND	ND	ND	Trace	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 2018-2022.

Chemical	2018	2019	2020	2021	2022
1,3-dichloropropene	6 %	2 %	49 %	53 %	36 %
Acephate	0 %	2 %	2 %	0 %	0 %
Captan	--	--	--	--	16 %
Chloropicrin	17 %	6 %	29 %	30 %	47 %
Chlorothalonil	8 %	6 %	29 %	2 %	4 %
Chlorpyrifos	4 %	0 %	0 %	0 %	2 %
Cypermethrin	0 %	2 %	2 %	0 %	0 %
DDVP	16 %	25 %	37 %	31 %	35 %
Dacthal	39 %	43 %	53 %	63 %	43 %

Chemical	2018	2019	2020	2021	2022
Diazinon	0 %	0 %	2 %	0 %	2 %
Diazinon OA	2 %	0 %	2 %	2 %	0 %
Dimethoate	0 %	0 %	2 %	0 %	0 %
Dimethoate OA	0 %	2 %	2 %	0 %	0 %
Diuron	2 %	0 %	2 %	0 %	0 %
Endosulfan	4 %	0 %	0 %	0 %	0 %
Iprodione	2 %	0 %	2 %	0 %	0 %
MITC	58 %	22 %	37 %	35 %	31 %
Malathion	59 %	49 %	61 %	59 %	51 %
Malathion OA	63 %	39 %	57 %	8 %	6 %
Methidathion	0 %	0 %	2 %	2 %	0 %
Methomyl	--	--	--	--	3 %
Methyl Bromide	0 %	0 %	4 %	63 %	80 %
Metolachlor (S-Metolachlor)	0 %	0 %	2 %	2 %	0 %
Norflurazon	0 %	0 %	2 %	2 %	0 %
Oryzalin	0 %	0 %	2 %	2 %	0 %
Oxydemeton Methyl	0 %	0 %	2 %	2 %	0 %
Oxyfluorfen	0 %	0 %	0 %	10 %	6 %
Pendimethalin	--	--	--	--	11 %
Permethrin	0 %	0 %	4 %	2 %	2 %
Phosmet	0 %	0 %	2 %	2 %	0 %
Simazine	2 %	0 %	4 %	2 %	0 %
Trifluralin	22 %	24 %	24 %	31 %	12 %

Table H-9. Highest 24-hour concentrations for pesticides with at least one detectable concentration in Santa Maria in 2018-2022.

Chemical	2018	2019	2020	2021	2022
1,3-dichloropropene	0.48 ppb (2,179 ng/m^3)	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)
Acephate	ND	Trace	0.0017 ppb (12.5 ng/m^3)	ND	ND
Captan	--	--	--	--	Trace
Chloropicrin	0.46 ppb (3,100 ng/m^3)	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)
Chlorothalonil	Trace	Trace	Trace	Trace	Trace
Chlorpyrifos	Trace	ND	ND	ND	Trace
Cypermethrin	ND	Trace	Trace	ND	ND
DDVP	Trace	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)
Dacthal	Trace	Trace	Trace	Trace	0.00074 ppb (10.1 ng/m^3)
Diazinon	ND	ND	Trace	ND	Trace
Diazinon OA	Trace	ND	Trace	Trace	ND
Dimethoate	ND	ND	Trace	ND	ND
Dimethoate OA	ND	Trace	Trace	ND	ND
Diuron	Trace	ND	Trace	ND	ND
Endosulfan	Trace	ND	ND	ND	ND
Iprodione	Trace	ND	Trace	ND	ND
MITC	0.42 ppb (1,269 ng/m^3)	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)
Malathion	0.00072 ppb (9.8 ng/m^3)	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)
Malathion OA	Trace	0.00098 ppb (12.5 ng/m^3)	Trace	Trace	Trace
Methidathion	ND	ND	Trace	Trace	ND
Methomyl	--	--	--	--	0.0016 ppb (10.5 ng/m^3)
Methyl Bromide	ND	ND	0.024 ppb (93.2 ng/m^3)	0.079 ppb (307 ng/m^3)	0.34 ppb (1,340 ng/m^3)

Chemical	2018	2019	2020	2021	2022
Metolachlor (S-Metolachlor)	ND	ND	Trace	Trace	ND
Norflurazon	ND	ND	Trace	Trace	ND
Oryzalin	ND	ND	Trace	Trace	ND
Oxydemeton Methyl	ND	ND	Trace	Trace	ND
Oxyfluorfen	ND	ND	ND	Trace	Trace
Pendimethalin	--	--	--	--	0.00089 ppb (10.2 ng/m^3)
Permethrin	ND	ND	Trace	Trace	Trace
Phosmet	ND	ND	Trace	Trace	ND
Simazine	Trace	ND	Trace	Trace	ND
Trifluralin	Trace	Trace	0.0019 ppb (25.5 ng/m^3)	0.0082 ppb (112 ng/m^3)	Trace

Table H-10. Highest rolling 4-week average concentrations (13-week for 1,3-D and chloropicrin) for pesticides with at least one detectable concentration in Santa Maria in 2018-2022.

Chemical	2018	2019	2020	2021	2022
1,3-dichloropropene	0.093 ppb (422 ng/m^3)	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)
Acephate	ND	Trace	0.00045 ppb (3.4 ng/m^3)	ND	ND
Captan	--	--	--	--	Trace
Chloropicrin	0.11 ppb (748 ng/m^3)	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)
Chlorothalonil	Trace	Trace	Trace	Trace	Trace
Chlorpyrifos	Trace	ND	ND	ND	Trace
Cypermethrin	ND	Trace	Trace	ND	ND
DDVP	Trace	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)
Dacthal	Trace	Trace	Trace	Trace	0.00052 ppb (6.8 ng/m^3)
Diazinon	ND	ND	Trace	ND	Trace

Chemical	2018	2019	2020	2021	2022
Diazinon oa	Trace	ND	Trace	Trace	ND
Dimethoate	ND	ND	Trace	ND	ND
Dimethoate oa	ND	Trace	Trace	ND	ND
Diuron	Trace	ND	Trace	ND	ND
Endosulfan	Trace	ND	ND	ND	ND
Iprodione	Trace	ND	Trace	ND	ND
MITC	0.11 ppb (323 ng/m^3)	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)
Malathion	0.00048 ppb (6.4 ng/m^3)	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)
Malathion oa	Trace	0.00036 ppb (4.8 ng/m^3)	Trace	Trace	Trace
Methidathion	ND	ND	Trace	Trace	ND
Methomyl	--	--	--	--	0.00047 ppb (3.5 ng/m^3)
Methyl Bromide	ND	ND	0.015 ppb (58.2 ng/m^3)	0.048 ppb (184 ng/m^3)	0.11 ppb (408 ng/m^3)
Metolachlor (S-Metolachlor)	ND	ND	Trace	Trace	ND
Norflurazon	ND	ND	Trace	Trace	ND
Oryzalin	ND	ND	Trace	Trace	ND
Oxydemeton Methyl	ND	ND	Trace	Trace	ND
Oxyfluorfen	ND	ND	ND	Trace	Trace
Pendimethalin	--	--	--	--	0.00038 ppb (5.7 ng/m^3)
Permethrin	ND	ND	Trace	Trace	Trace
Phosmet	ND	ND	Trace	Trace	ND
Simazine	Trace	ND	Trace	Trace	ND
Trifluralin	Trace	Trace	0.00088 ppb (12.1 ng/m^3)	0.003 ppb (40.6 ng/m^3)	Trace

Table H-11. Comparison of the 1-year average concentration for pesticides with at least one detectable concentration in Santa Maria in 2018-2022.

Chemical	2018	2019	2020	2021	2022
1,3-dichloropropene	0.061 ppb (276 ng/m^3)	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)
Acephate	ND	Trace	0.00008 ppb (0.57 ng/m^3)	ND	ND
Captan	--	--	--	--	Trace
Chloropicrin	0.041 ppb (277 ng/m^3)	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)
Chlorothalonil	Trace	Trace	Trace	Trace	Trace
Chlorpyrifos	Trace	ND	ND	ND	Trace
Cypermethrin	ND	Trace	Trace	ND	ND
DDVP	Trace	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)
Dacthal	Trace	Trace	Trace	Trace	0.00026 ppb (3.2 ng/m^3)
Diazinon	ND	ND	Trace	ND	Trace
Diazinon OA	Trace	ND	Trace	Trace	ND
Dimethoate	ND	ND	Trace	ND	ND
Dimethoate OA	ND	Trace	Trace	ND	ND
Diuron	Trace	ND	Trace	ND	ND
Endosulfan	Trace	ND	ND	ND	ND
Iprodione	Trace	ND	Trace	ND	ND
MITC	0.015 ppb (43.7 ng/m^3)	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)
Malathion	0.00026 ppb (3.5 ng/m^3)	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)
Malathion OA	Trace	0.00016 ppb (2.1 ng/m^3)	Trace	Trace	Trace
Methidathion	ND	ND	Trace	Trace	ND
Methomyl	--	--	--	--	0.00014 ppb (1.4 ng/m^3)
Methyl Bromide	ND	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)

Chemical	2018	2019	2020	2021	2022
Metolachlor (S-Metolachlor)	ND	ND	Trace	Trace	ND
Norflurazon	ND	ND	Trace	Trace	ND
Oryzalin	ND	ND	Trace	Trace	ND
Oxydemeton Methyl	ND	ND	Trace	Trace	ND
Oxyfluorfen	ND	ND	ND	Trace	Trace
Pendimethalin	--	--	--	--	0.00009 ppb (1.7 ng/m^3)
Permethrin	ND	ND	Trace	Trace	Trace
Phosmet	ND	ND	Trace	Trace	ND
Simazine	Trace	ND	Trace	Trace	ND
Trifluralin	Trace	Trace	0.00027 ppb (3.7 ng/m^3)	0.00049 ppb (6.9 ng/m^3)	Trace

Historic Air Concentrations in Shafter

The following tables summarize results for five years of air monitoring in Shafter. In 2020, only 1,3-D and methyl bromide were sampled all year, hence direct comparisons should be performed with caution.

Table H-12. Percentage of analyses performed resulting in a quantifiable or trace detection in Shafter in 2018-2022.

Chemical	2018	2019	2020	2021	2022
1,3-dichloropropene	38 %	10 %	71 %	69 %	61 %
Bensulide	4 %	0 %	0 %	0 %	0 %
Captan	--	--	--	--	3 %
Chloropicrin	0 %	2 %	0 %	4 %	4 %
Chlorothalonil	64 %	43 %	91 %	24 %	15 %
Chlorpyrifos	30 %	4 %	0 %	0 %	0 %
Chlorpyrifos OA	25 %	0 %	0 %	0 %	0 %
Cypermethrin	2 %	2 %	0 %	0 %	0 %
DDVP	8 %	10 %	0 %	4 %	10 %

Chemical	2018	2019	2020	2021	2022
Dacthal	4 %	2 %	9 %	0 %	0 %
Diazinon	0 %	0 %	9 %	0 %	0 %
Diazinon OA	2 %	0 %	9 %	2 %	0 %
Dimethoate	0 %	0 %	9 %	0 %	0 %
Diuron	4 %	4 %	9 %	2 %	0 %
EPTC	6 %	10 %	0 %	6 %	2 %
Endosulfan Sulfate	0 %	0 %	9 %	0 %	0 %
Fenpyroximate	--	--	--	--	5 %
Iprodione	2 %	2 %	0 %	0 %	0 %
MITC	83 %	59 %	82 %	40 %	44 %
Malathion	0 %	6 %	0 %	0 %	0 %
Malathion OA	2 %	4 %	9 %	2 %	0 %
Methyl Bromide	13 %	0 %	12 %	55 %	79 %
Metolachlor (S-Metolachlor)	0 %	0 %	9 %	0 %	0 %
Norflurazon	0 %	0 %	9 %	0 %	0 %
Oryzalin	2 %	0 %	0 %	0 %	0 %
Oxyfluorfen	9 %	2 %	9 %	6 %	4 %
Pendimethalin	--	--	--	--	58 %
Permethrin	0 %	2 %	0 %	0 %	0 %
Simazine	6 %	0 %	9 %	0 %	0 %
Trifluralin	2 %	6 %	18 %	4 %	2 %

Table H-13. Highest 24-hour concentrations for pesticides with at least one detectable concentration in Shafter in 2018-2022.

Chemical	2018	2019	2020	2021	2022
1,3-dichloropropene	50.5 ppb (229,166 ng/m^3)	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)
Bensulide	Trace	ND	ND	ND	ND

Chemical	2018	2019	2020	2021	2022
Captan	--	--	--	--	Trace
Chloropicrin	ND	0.1 ppb (694 ng/m^3)	ND	Trace	Trace
Chlorothalonil	0.0046 ppb (49.9 ng/m^3)	Trace	0.0033 ppb (36.3 ng/m^3)	Trace	Trace
Chlorpyrifos	0.0031 ppb (44.9 ng/m^3)	Trace	ND	ND	ND
Chlorpyrifos OA	Trace	ND	ND	ND	ND
Cypermethrin	Trace	Trace	ND	ND	ND
DDVP	Trace	Trace	ND	0.0033 ppb (30.2 ng/m^3)	Trace
Dacthal	Trace	Trace	Trace	ND	ND
Diazinon	ND	ND	Trace	ND	ND
Diazinon OA	Trace	ND	Trace	Trace	ND
Dimethoate	ND	ND	Trace	ND	ND
Diuron	Trace	Trace	Trace	Trace	ND
EPTC	Trace	0.0046 ppb (35.6 ng/m^3)	ND	0.016 ppb (128 ng/m^3)	0.0027 ppb (20.7 ng/m^3)
Endosulfan Sulfate	ND	ND	Trace	ND	ND
Fenpyroximate	--	--	--	--	0.0019 ppb (32.5 ng/m^3)
Iprodione	Trace	Trace	ND	ND	ND
MITC	1.3 ppb (3,747 ng/m^3)	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)
Malathion	ND	Trace	ND	ND	ND
Malathion OA	Trace	Trace	Trace	Trace	ND
Methyl Bromide	0.097 ppb (377 ng/m^3)	ND	0.048 ppb (186 ng/m^3)	0.047 ppb (182 ng/m^3)	0.068 ppb (264 ng/m^3)
Metolachlor (S-Metolachlor)	ND	ND	Trace	ND	ND
Norflurazon	ND	ND	Trace	ND	ND
Oryzalin	Trace	ND	ND	ND	ND
Oxyfluorfen	Trace	Trace	Trace	Trace	Trace

Chemical	2018	2019	2020	2021	2022
Pendimethalin	--	--	--	--	0.0027 ppb (30.8 ng/m^3)
Permethrin	ND	Trace	ND	ND	ND
Simazine	Trace	ND	Trace	ND	ND
Trifluralin	Trace	Trace	Trace	0.00027 ppb (3.8 ng/m^3)	Trace

Table H-14. Highest rolling 4-week average concentrations (13-week for 1,3-D and chloropicrin) for pesticides with at least one detectable concentration in Shafter in 2018-2022.

Chemical	2018	2019	2020	2021	2022
1,3-dichloropropene	5.6 ppb (25,443 ng/m^3)	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)
Bensulide	Trace	ND	ND	ND	ND
Captan	--	--	--	--	Trace
Chloropicrin	ND	0.023 ppb (156 ng/m^3)	ND	Trace	Trace
Chlorothalonil	0.0028 ppb (30.6 ng/m^3)	Trace	0.0021 ppb (22.6 ng/m^3)	Trace	Trace
Chlorpyrifos	0.0014 ppb (20.2 ng/m^3)	Trace	ND	ND	ND
Chlorpyrifos oa	Trace	ND	ND	ND	ND
Cypermethrin	Trace	Trace	ND	ND	ND
DDVP	Trace	Trace	ND	0.00091 ppb (8.2 ng/m^3)	Trace
Dacthal	Trace	Trace	Trace	ND	ND
Diazinon	ND	ND	Trace	ND	ND
Diazinon oa	Trace	ND	Trace	Trace	ND
Dimethoate	ND	ND	Trace	ND	ND
Diuron	Trace	Trace	Trace	Trace	ND
EPTC	Trace	0.00064 ppb (5 ng/m^3)	ND	0.0042 ppb (32.7 ng/m^3)	0.00078 ppb (5.9 ng/m^3)

Chemical	2018	2019	2020	2021	2022
Endosulfan Sulfate	ND	ND	Trace	ND	ND
Fenpyroximate	--	--	--	--	0.0008 ppb (10.3 ng/m^3)
Iprodione	Trace	Trace	ND	ND	ND
MITC	0.5 ppb (1,509 ng/m^3)	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)
Malathion	ND	Trace	ND	ND	ND
Malathion oa	Trace	Trace	Trace	Trace	ND
Methyl Bromide	0.04 ppb (155 ng/m^3)	ND	0.023 ppb (90.2 ng/m^3)	0.033 ppb (128 ng/m^3)	0.049 ppb (191 ng/m^3)
Metolachlor (S-Metolachlor)	ND	ND	Trace	ND	ND
Norflurazon	ND	ND	Trace	ND	ND
Oryzalin	Trace	ND	ND	ND	ND
Oxyfluorfen	Trace	Trace	Trace	Trace	Trace
Pendimethalin	--	--	--	--	0.0015 ppb (18.2 ng/m^3)
Permethrin	ND	Trace	ND	ND	ND
Simazine	Trace	ND	Trace	ND	ND
Trifluralin	Trace	Trace	Trace	0.00026 ppb (3.7 ng/m^3)	Trace

Table H-15. Comparison of the 1-year average concentration for pesticides with at least one detectable concentration in Shafter in 2018-2022.

Chemical	2018	2019	2020	2021	2022
1,3-dichloropropene	1.5 ppb (6,921 ng/m^3)	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)
Bensulide	Trace	ND	ND	ND	ND
Captan	--	--	--	--	Trace
Chloropicrin	ND	0.018 ppb (123 ng/m^3)	ND	Trace	Trace

Chemical	2018	2019	2020	2021	2022
Chlorothalonil	0.00091 ppb (10 ng/m^3)	Trace	0.0014 ppb (14.8 ng/m^3)	Trace	Trace
Chlorpyrifos	0.00034 ppb (4.8 ng/m^3)	Trace	ND	ND	ND
Chlorpyrifos OA	Trace	ND	ND	ND	ND
Cypermethrin	Trace	Trace	ND	ND	ND
DDVP	Trace	Trace	ND	0.00018 ppb (1.6 ng/m^3)	Trace
Dacthal	Trace	Trace	Trace	ND	ND
Diazinon	ND	ND	Trace	ND	ND
Diazinon OA	Trace	ND	Trace	Trace	ND
Dimethoate	ND	ND	Trace	ND	ND
Diuron	Trace	Trace	Trace	Trace	ND
EPTC	Trace	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)
Endosulfan Sulfate	ND	ND	Trace	ND	ND
Fenpyroximate	--	--	--	--	0.00026 ppb (2.2 ng/m^3)
Iprodione	Trace	Trace	ND	ND	ND
MITC	0.059 ppb (176 ng/m^3)	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)
Malathion	ND	Trace	ND	ND	ND
Malathion OA	Trace	Trace	Trace	Trace	ND
Methyl Bromide	0.018 ppb (69.1 ng/m^3)	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)
Metolachlor (S-Metolachlor)	ND	ND	Trace	ND	ND
Norflurazon	ND	ND	Trace	ND	ND
Oryzalin	Trace	ND	ND	ND	ND
Oxyfluorfen	Trace	Trace	Trace	Trace	Trace
Pendimethalin	--	--	--	--	0.00041 ppb (5.8 ng/m^3)
Permethrin	ND	Trace	ND	ND	ND

Chemical	2018	2019	2020	2021	2022
Simazine	Trace	ND	Trace	ND	ND
Trifluralin	Trace	Trace	Trace	0.00007 ppb (1.1 ng/m^3)	Trace

Historic Air Concentrations in Watsonville

The following tables summarize results for five years of air monitoring in Watsonville. In 2020, only 1,3-D and methyl bromide were sampled all year, hence direct comparisons should be performed with caution.

Table H-16. Percentage of analyses performed resulting in a quantifiable or trace detection in Watsonville in 2018-2022.

Chemical	2018	2019	2020	2021	2022
1,3-dichloropropene	6 %	4 %	49 %	46 %	27 %
Chloropicrin	25 %	24 %	0 %	29 %	29 %
Chlorothalonil	0 %	2 %	0 %	0 %	0 %
DDVP	10 %	25 %	0 %	12 %	4 %
Dacthal	2 %	18 %	0 %	6 %	6 %
Diuron	0 %	2 %	0 %	0 %	0 %
EPTC	0 %	2 %	0 %	0 %	0 %
MITC	48 %	30 %	9 %	19 %	21 %
Malathion	6 %	14 %	0 %	0 %	12 %
Malathion OA	6 %	16 %	0 %	0 %	2 %
Methyl Bromide	0 %	0 %	2 %	29 %	73 %
Oxyfluorfen	0 %	0 %	0 %	2 %	4 %
Trifluralin	2 %	4 %	0 %	0 %	0 %

Table H-17. Highest 24-hour concentrations for pesticides with at least one detectable concentration in Watsonville in 2018-2022.

Chemical	2018	2019	2020	2021	2022
1,3-dichloropropene	0.27 ppb (1,225 ng/m^3)	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)

Chemical	2018	2019	2020	2021	2022
Chloropicrin	0.12 ppb (778 ng/m^3)	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)
Chlorothalonil	ND	Trace	ND	ND	ND
DDVP	Trace	Trace	ND	Trace	Trace
Dacthal	Trace	Trace	ND	Trace	Trace
Diuron	ND	Trace	ND	ND	ND
EPTC	ND	Trace	ND	ND	ND
MITC	0.042 ppb (125 ng/m^3)	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)
Malathion	Trace	0.0042 ppb (56 ng/m^3)	ND	ND	Trace
Malathion OA	Trace	Trace	ND	ND	Trace
Methyl Bromide	ND	ND	0.023 ppb (89.3 ng/m^3)	0.95 ppb (3,693 ng/m^3)	0.035 ppb (136 ng/m^3)
Oxyfluorfen	ND	ND	ND	Trace	Trace
Trifluralin	Trace	Trace	ND	ND	ND

Table H-18. Highest rolling 4-week average concentrations (13-week for 1,3-D and chloropicrin) for pesticides with at least one detectable concentration in Watsonville in 2018-2022.

Chemical	2018	2019	2020	2021	2022
1,3-dichloropropene	0.07 ppb (316 ng/m^3)	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)
Chloropicrin	0.063 ppb (426 ng/m^3)	0.15 ppb (1,042 ng/m^3)	ND	0.097 ppb (652 ng/m^3)	0.092 ppb (620 ng/m^3)
Chlorothalonil	ND	Trace	ND	ND	ND
DDVP	Trace	Trace	ND	Trace	Trace
Dacthal	Trace	Trace	ND	Trace	Trace
Diuron	ND	Trace	ND	ND	ND
EPTC	ND	Trace	ND	ND	ND
MITC	0.015 ppb (44.6 ng/m^3)	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)
Malathion	Trace	0.0012 ppb (15.7 ng/m^3)	ND	ND	Trace

Chemical	2018	2019	2020	2021	2022
Malathion oa	Trace	Trace	ND	ND	Trace
Methyl Bromide	ND	ND	0.015 ppb (58.2 ng/m^3)	0.24 ppb (931 ng/m^3)	0.029 ppb (113 ng/m^3)
Oxyfluorfen	ND	ND	ND	Trace	Trace
Trifluralin	Trace	Trace	ND	ND	ND

Table H-19. Comparison of the 1-year average concentration for pesticides with at least one detectable concentration in Watsonville in 2018-2022.

Chemical	2018	2019	2020	2021	2022
1,3-dichloropropene	0.046 ppb (210 ng/m^3)	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)
Chloropicrin	0.03 ppb (203 ng/m^3)	0.052 ppb (348 ng/m^3)	ND	0.029 ppb (197 ng/m^3)	0.028 ppb (186 ng/m^3)
Chlorothalonil	ND	Trace	ND	ND	ND
DDVP	Trace	Trace	ND	Trace	Trace
Dacthal	Trace	Trace	ND	Trace	Trace
Diuron	ND	Trace	ND	ND	ND
EPTC	ND	Trace	ND	ND	ND
MITC	0.0055 ppb (16.6 ng/m^3)	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)
Malathion	Trace	0.00017 ppb (2.3 ng/m^3)	ND	ND	Trace
Malathion OA	Trace	Trace	ND	ND	Trace
Methyl Bromide	ND	ND	0.0055 ppb (21.4 ng/m^3)	0.026 ppb (101 ng/m^3)	0.011 ppb (43.4 ng/m^3)
Oxyfluorfen	ND	ND	ND	Trace	Trace
Trifluralin	Trace	Trace	ND	ND	ND

APPENDIX I: REFERENCES

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APPENDIX J: COMMENTS

Number	Comment	Response	Action
1	**From California Rural Legal Assistance Foundation (CRLAF) & Californians for Pesticide Reform (CPR)** Thank you for the opportunity to provide comment on the 2020, 2021 and 2022 Air Monitoring Network Reports. We are concerned that the presentation of air monitoring results in the annual report continues to be misleading and incomplete and have inaccuracies. We offer the following specific comments for your consideration. We urge you to revise the draft report to address these concerns, many of which were previously flagged in our comment letter dated August 28, 2020, but which remain unaddressed.	DPR's Air Program is dedicated to establishing monitoring programs that address the concerns of all Californians. Our goal is to provide transparent results that contribute to protecting human health and the environment, aligning with DPR's missions. The AMN and 1,3-D reports strive to consistently deliver representative, comprehensive, and accurate monitoring data. DPR and our scientists then provide clear and concise analysis based on that data along with existing research information currently available. DPR remains committed to utilizing feedback from stakeholders to rectify any mistakes or typos in the report and to offer clarifications that prevent misinterpretation of monitoring data. Appendix O of the "2019 Pesticide Air Monitoring Network Report" addresses such comments and feedback.	We welcome and appreciate your comments. No changes are required at this time.
2	**From CRLAF & CPR** The report does not tabulate or discuss analyses and detections of unregistered pesticides appropriately. Tabulation of percentages of air samples with trace or quantifiable detections should not include those pesticides no longer registered in California in the total	The scientific objectives of the AMN, as outlined in the Introduction, emphasize DPR's focus on monitoring pesticides in the ambient air and comparing measured concentrations to screening levels or regulatory targets. It is important to note that the count and percentage of detections serve only to provide an overview of the patterns identified in the report. Therefore, they	Comment acknowledged; no changes are required at this time.

Number	Comment	Response	Action
	because these pesticides should not be in use and therefore should not be detected in the air. Four of the pesticides monitored (chlorpyrifos, endosulfan, oxydemeton-methyl and methidathion) and three breakdown products (chlorpyrifos OA, endosulfan sulfate and pp-dicofol) are no longer registered for use in California. This comprises 19.4% of the analyses between January and April and 17.5% of the analyses for the remainder of 2022. The report states that 21 of the chemicals monitored weren't detected but doesn't disclose that 6 of these compounds (28.6%) are not currently registered.	should be interpreted solely in that context.	
3	**From CRLAF & CPR** The report should include discussion of possible sources of the trace level detection of chlorpyrifos at the Santa Maria site since it was illegal to possess or use existing stocks of chlorpyrifos in 2022.	DPR has collaborated with the Santa Barbara County Agricultural Commissioner's office to assess all pesticide uses in their county. The results of our inquiry indicate that chlorpyrifos has not been reported to be legally used in Santa Barbara county in 2022.	Comment acknowledged; no changes are required at this time.
4	**From CRLAF & CPR** If detection frequency is used it should be based on pesticide use near the sampling site shortly prior to sampling date. Use of most pesticides is concentrated in certain months in specific geographic areas. As pesticide use varies between crops and regions, not all of the pesticides monitored for are used near all of the monitoring sites.	As mentioned in Comment # 2, it is crucial to understand that the number, percentage, or frequency of detections merely offer an overview of the patterns identified in the report. Therefore, they should only be interpreted in that context. As part of DPR's ongoing evaluation efforts, we remain dedicated to year-round monitoring of ambient air. DPR	We appreciate your comment; no changes are required at this time.

Number	Comment	Response	Action
	Therefore, using the total number of analyses for all pesticides at all locations as the denominator does not provide a meaningful context. Despite repeated feedback from our coalition over many years, DPR continues to prominently highlight the percentage of detections, including as the first item in the results section of the Executive Summary. The value of air monitoring is the ability to detect traces of pesticides that have been used, to determine whether such use results in potential exposure mitigations. It is not relevant, or even possible, to detect a chemical that was not used.	does not base its monitoring and data reporting on assumptions about whether a pesticide was applied or the proximity of the application(s) to monitoring locations. Relying on the assumption that a chemical was not applied could potentially lead to undetected concentrations. Consequently, it is not recommended to limit our long-term monitoring of ambient air to historical levels of pesticide use. This practice is just one example of measures in place to prevent biased monitoring or interpretation of data. Moreover, the value of air monitoring lies in its ability to assess pesticide concentrations relative to established screening levels and regulatory targets. This evaluation helps determine the effectiveness of existing mitigations and whether additional measures are necessary.	
5	**From CRLAF & CPR** DPR's continued use of this inflated denominator, and prominent highlighting of the resulting diluted detection rate, gives the appearance of bias. It has been six years since these concerns were raised at the August 18, 2017 PREC meeting. Then Branch Chief Pam Wofford stated that DPR was conducting an uncertainty analysis of frequency of detections. Is this analysis still in process and if so when will it be completed? Detection frequency should either	The scientific objectives of the AMN are focused on determining concentrations and comparing them to screening levels (SL) or regulatory targets (RT). It is crucial to note that detection frequency, as a count analysis, provides a summary of patterns in the report and should be interpreted accordingly. More meaningful context can be obtained when concentrations are compared to SLs/RTs. Detailed results for each monitoring location over the last	We appreciate your comment; no changes are required at this time.

Number	Comment	Response	Action
	be calculated based on what pesticides were used in the vicinity of a specific site, shortly prior to the sampling date, or should not be highlighted. A separate line plotted for pesticide use within several miles (or even within the county) of the AMN site within a week of the pesticide detection should be added to the temporal trend graphs in the appendices.	five years are available in the Appendices. As part of our commitment to addressing comments and providing clarifications, DPR presentations on the monitoring data have consistently included a slide discussing the AMN's scientific objectives and their relation to SLs and regulatory RTs. Screening levels are based on a preliminary assessment of potential health effects. A measured concentration exceeding the SL doesn't necessarily indicate a health concern but does warrant a refined evaluation, including the assessment of preliminary developed threshold concentrations such as SL. Regulatory targets, established after a formal risk assessment of a chemical's toxicity and potential exposures, supersede SLs. A concentration surpassing the RT doesn't necessarily indicate an adverse health effect but suggests the need to consider modifications to pesticide use restrictions. Pam Wofford, as indicated on page 19 of the minutes of the 2017 PREC meeting, mentioned that the AMN comprehensive report (in progress at that time) would include analyses considering weather, pesticide use reporting data, and more. The AMN comprehensive report, published in June 2018, is accessible by clicking here.	

Number	Comment	Response	Action
6	**From CRLAF & CPR** Why is methyl bromide being detected so frequently? This report should discuss the plausible sources of the high number of methyl bromide detections at each monitoring site and whether local pesticide use data indicate that these could be authorized commodity, nursery or experimentally permitted fumigations or illegal use.	The AMN scientific objectives focus on determining concentrations and comparing them to screening levels (SL) and regulatory targets (RT). It is not within the scope of this report to propose hypotheses regarding potential sources of any detections, including methyl bromide. Despite the marginal concentration of methyl bromide detected, DPR conducted a comprehensive investigation into the detection frequency of methyl bromide in 2022. Our findings will be published on DPR's website soon.	Comment acknowledged; no changes are required at this time.
7	**From CRLAF & CPR** List pesticides added in May earlier in the report. The body of the report should explain that the 4 additional pesticides added in May of 2022 are captan, fenproximate, methomyl, and pendimethalin so readers don't have to wait to find this information in the Appendices on page 99.	Thank you for pointing this out. We added a statement about the new active ingredients on page 8.	A statement was added on page 8.
8	**From CRLAF & CPR** *Pages 12-15* High level methomyl detection. Tables 5-7 show that the one methomyl detection in Santa Maria was at 32.7% of the acute target level, comprising 69.6% of the sub-chronic target level and 28% of chronic target level. This detection	In July 2023, DPR's Human Health Assessment Branch (HHA) provided preliminary Screening Levels (SL) for residential bystanders concerning captan, fenpyroximate, methomyl, and pendimethalin. A final review of the data in September 2023 revealed a unit conversion error for methomyl, leading to a reduction of the SLs by a factor of 1,000. The narrative for	Comment acknowledged; no changes are required at this time.

Number	Comment	Response	Action
	was not recognized as the highest percentage of an acute, sub-chronic and chronic levels in the narrative for each table.	methomyl will be incorporated into the relevant tables of the 2022 report, reflecting the correction of its SL value.	
9	**From CRLAF & CPR** DPR's current screening or regulatory levels should be compared to other recommended levels and previous DPR recommended levels.	DPR's Human Health Assessment Branch (HHA) develops air screening levels for pesticides based on well established, scientifically vetted methodologies. These include the selection of toxicity endpoints, consideration of the uncertainties inherent to modern inhalation dosimetry, and the specific approaches used for detection. Furthermore, the DPR-AMN program is unique since other agencies generally do not establish comparable screening levels. While we agree that there may be a value in presenting DPR's previously established SLs for comparison, we would only do so with the explicit recognition that the updated values reflect the current state of science, both with respect to dosimetry and to detection. Finally, in light of the comment it is worth noting that HHA's screening levels are based on toxicity values developed in risk assessments done both by DPR and by other regulatory agencies and authoritative bodies. Please note that the new AMN reports will include not only the updated SLs but also a detailed documentation and justification for each value.	Comment acknowledged; no changes are required at this time.

Number	Comment	Response	Action
10	**From CRLAF & CPR** 1,3 D and chloropicrin sub-chronic levels: In 2017 DPR discontinued the practice of using a 4- week rolling average concentration to compare to chloropicrin and 1,3 D sub-chronic screening levels and began comparing to 90 day or 13 week rolling averages. This change was made after peak 4 week rolling averages were found to exceed the 4 week chloropicrin screening level at the Santa Maria air monitoring site in 2014 and 2015, and the peak 4-week 1,3-D air concentration for 2016 in Shafter reached 97.6% the 1,3-D sub-chronic screening level. DPR toxicologists claim these changes were justified because the toxicology studies used to set the sub-chronic screening levels were 90 days long for chloropicrin and 13 weeks long for 1,3-D. However, the revised averaging times have still not been reviewed by OEHHA and should be. We raised this issue in our last comment letter on the 2019 Air Monitoring Report, but no change has been made.	In 2017, DPR's HHA branch published the outcomes of their dedicated efforts, utilizing available data and evolving science to update Screening Levels for 1,3-D and Chloropicrin. Their analysis revealed that the appropriate sub-chronic Screening Level for 1,3-D is 3 ppb over a 13-week period. Similarly, for chloropicrin, the data indicated that the appropriate sub-chronic Screening Level is 0.35 ppb over a 13-week period. The comprehensive analysis results can be accessed by clicking here.	We appreciate your comment; no changes are required at this time.
11	**From CRLAF & CPR** The acute regulatory target for chloropicrin of 73 ppb used in this report as a 24 hour average exposure target level was set in a Risk Management Directive (RMD) as an 8 hour average, so at the very least it should be adjusted to 24.3 ppb as a 24 hour level. Furthermore, this 73 ppb target	This report does not encompass a discussion of toxicological studies or the factors considered in Risk Characterization Documents or Risk Management Directives, nor does it involve adjustments to the established 8-hour (e.g., 73 ppb as an 8-hour average for Chloropicrin) or 72-hour (e.g., 55 ppb as a 72-hour average for 1,3-D) levels.	No changes are required at this time.

Number	Comment	Response	Action
	level was set over the objection of OEHHA: [click for link] . The chloropicrin TAC report and risk assessment, which are also supported by OEHHA, include a 24 hour reference level of 0.92 ppb for protection of children. We raised this issue in our last comment letter on the 2019 Air Monitoring Report, but no change has been made.	As part of the AMN procedures, we collect 24-h air samples, which are compared with established screening levels or regulatory targets for individual pesticides. A measured concentration that is above the RT does not necessarily indicate an adverse health effect has occurred; however, it does indicate that restrictions on pesticide use may need to be modified.	
12	**From CRLAF & CPR** The chloropicrin reference concentration of 0.24 ppt for controlling cancer risk to the 1 in a million level that was established in the DPR Chloropicrin TAC and Risk Characterization documents as the negligible risk level and supported in review by OEHHA and the TAC Scientific Review Panel. DPR subsequently made a unilateral decision that chloropicrin cancer data was equivocal and that an additional study was needed to assess cancer risk. The results of the first phase of this study are currently being reviewed by DPR and OEHHA. In the meantime, we are left with great uncertainty about the cancer risk from exposure to chloropicrin.	DPR’s language for the selected cancer risk level is consistent with language previously published by the department. The statement is included in the report to provide the necessary context to the risk estimate calculations. Additionally, the provided range is in line with the range considered by other agencies, including US EPA and World Health Organization, to be "negligible" or “low-risk” (i.e. 10^{-5} to 10^{-6}).	Thank you for your comment, no changes are required at this time.
13	**From CRLAF & CPR** The acute regulatory target for MITC of 220 ppb used in this report as a 24 hour average exposure target level was set in a Risk Management Directive5 as an 8	This report does not encompass a discussion of toxicological studies or the factors considered in Risk Characterization Documents or Risk Management Directives, nor does it involve adjustments to the established 8-hour (e.g., 220 ppb	Comment acknowledged; no changes are required at this time.

Number	Comment	Response	Action
	hour exposure level so at the very least it should be adjusted to 73 ppb as a 24 hour exposure target level. Furthermore, this level was set over OEHHA's objections because 220 ppb was the "no effects" level in a toxicology study, leaving no margin of error. The DPR TAC report6 and risk assessment7 established an 8 hour reference level of 22 ppb for protection against irritation to the eyes and respiratory system which should be adjusted to 7.3 ppb as a 24 hour target exposure level. We raised this issue in our last comment letter on the 2019 Air Monitoring Report, but no change has been made.	as an 8-hour average for MITC) or 72-hour (e.g., 55 ppb as a 72-hour average for 1,3-D) levels. DPR's Regulatory Targets are established following a formal risk assessment of the chemical's toxicity and potential exposures, superseding Screening Levels. As part of the AMN procedures, we collect 24-h air samples, which are compared with established screening levels or regulatory targets for individual pesticides. A measured concentration that is above the RT does not necessarily indicate an adverse health effect has occurred; however, it does indicate that restrictions on pesticide use may need to be modified.	
14	**From CRLAF & CPR** USEPA recently released a Dacthal risk assessment with a recommended exposure limit of 0.001 mg/kg/day to prevent severe developmental effects. (0.001 mg/kg/day)(69 kg/adult)/20 mg/day inhaled = 0.00325 mg/m3 or 0.24 ppb.	DPR is currently examining the documentation that US EPA recently published regarding Dacthal (DCPA).	Comment acknowledged; no changes are required at this time.
15	**From CRLAF & CPR** Highest sub-chronic MITC level was 9.9% (not 1%) of screening level In the narrative for Table 6, the highest sub-chronic level of MITC (0.099 ppb) was incorrectly described as 1% of the screening level but correctly shown as 9.9% of the screening level in Table 6.	Thank you for pointing this out; this was a typo and was meant to be rounded up to 10%. Edit was made on page 13.	Value was fixed on page 13.

Number	Comment	Response	Action
16	**From CRLAF & CPR** Captan and malathion are Proposition 65 listed carcinogens On page 17, captan and malathion should be added to the list of carcinogenic pesticides being monitored. Both are listed as carcinogens under Proposition 65 and Safe Harbor NSRLs have been set: [link here]	The Human Health Assessment branch is currently updating the AMN carcinogen list. These changes will be reflected in the coming AMN reports.	Thank you for your comment; no changes are required at this time.
17	**From CRLAF & CPR** Tables of historic air concentrations. The tables of historic air concentrations at each site are useful but the tables should list captan, fenproxymate, methomyl and pendimethalin as “not measured” rather than not detected (ND) prior to 2022.	Thank you for pointing this out. NDs were removed from Captan, fenpyroximate, methomyl and pendimethalin prior to 2021 on pages 99-116.	Changes were made on pages 99-116.
18	**From CRLAF & CPR** High percentage of trace detections of dacthal needs further analysis. The high percentage of trace detections of dacthal at the Santa Maria and Watsonville sites is concerning in light of EPA’s new risk assessment findings. An updated analysis of dacthal use in proximity to these sites should be conducted.	As part of DPR’s ongoing evaluation efforts, we remain dedicated to year-round monitoring of the ambient air. To prevent biased monitoring, DPR does not base its monitoring and data reporting on assumptions about whether a pesticide was applied or the proximity of the application(s) to monitoring locations. Relying on the assumption that a chemical was not applied could potentially lead to undetected concentrations. As part of the AMN procedures, we collect 24-h air samples, which are compared with established screening levels or regulatory targets for individual pesticides.	Thank you for your comment; no changes are required at this time.

Number	Comment	Response	Action
		Dacthal detections are all below its current Screening Levels. DPR is currently examining the documentation that US EPA recently published on DCPA (Dacthal).	
19	**From CRLAF & CPR** Operation of Oxnard and Santa Maria sites by county CAC staff. We appreciate the time and effort that Ventura and Santa Barbara CAC offices are devoting to operation of AMN stations but have some concerns that growers could inadvertently get information about monitoring dates when they visit to the CAC offices or have other contact with CAC staff. Are safeguards in place to prevent this from happening?	DPR has fostered professional relationships with other government agencies that are based on trust, over the last decades. DPR's Air Program staff are fully responsible for setting the sampling dates at the Oxnard (Ventura) and Santa Maria (Santa Barbara) monitoring stations. We continuously review the procedure, protocol, training, quality assurance, and equipment at these sites to ensure that everything is running well and to our standards.	Comment acknowledged; no changes are required at this time.
20	**From CRLAF & CPR** We urge you to carefully review these comments and correct the errors and omissions we have pointed out. It is unacceptable that the issues we have raised repeatedly in our previous public comment letters continue to go unaddressed. Please contact Anne Katten if you need clarification on any of these points.	We have carefully reviewed your comments and made all pertinent changes. DPR will continue to use comments from our stakeholders to address any mistakes or typos and to provide clarifications to avoid misinterpretation of the monitoring data. Appendix O of the "2019 Pesticide Air Monitoring Network Report" includes DPR's responses to the comments and feedback provided in your comment letter dated August 28, 2020. As always, we welcome and appreciate your feedback and comments.	Comment acknowledged; no changes are required at this time.