

SAMPLING FOR PESTICIDE RESIDUES IN CALIFORNIA WELL WATER

36th Annual Well Sampling Report | 2021 Update



**California Environmental Protection Agency
Department of Pesticide Regulation
Environmental Monitoring Branch
Groundwater Protection Program**

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i



SUMMARY

As required by the Pesticide Contamination Prevention Act (PCPA) under Food and Agricultural Code (FAC) section 13152(e), this report summarizes the results of groundwater sampling in California for pesticide residues by the Department of Pesticide Regulation (DPR) and other agencies that reported their results to DPR. This 2021 annual Well Sampling Report (annual report) includes well sampling data from DPR and the State Water Resources Control Board (SWRCB) for January through December 2020 and the United States Geological Survey (USGS) for January 2019 through December 2020. Previously, DPR delayed collecting USGS data to ensure a more complete and updated dataset but determined that the dataset was not significantly updated after initial posting. Starting with this reporting year, DPR will collect USGS data from the previous year to synchronize the data with other agencies. This change requires the inclusion of two years of USGS data for the 2021 report year. Some of the USGS data are listed as preliminary and could be subject to change.

The report consists of background information, two main tables, multiple appendices, and a glossary. The background information includes numerous steps DPR takes to implement the PCPA. Table 1 summarizes the well sampling data from all three agencies. Table 2 provides additional information about the specific pesticides or pesticide degradates with reported detections and identifies actions taken by DPR to prevent migration of pesticides to groundwater from nonpoint agricultural sources. Appendix A describes how DPR creates Ground Water Protection Areas and implements regulations to mitigate the movement of specific pesticides to groundwater. Appendix B explains the core functions of the three agencies contributing groundwater monitoring data for this report. Appendix C describes DPR's Well Inventory Database. Appendix D summarizes the well sampling results by county.¹

A total of 2,662 wells were sampled for one or more of 221 pesticides or degradates (Table i).² Forty-one pesticides or degradates were detected; nine of the detected pesticides are not registered for use in California (e.g., detections from legacy pesticide use or non-pesticidal use) (Table 2). For all three agencies, sampling data for 2020 was reduced due to various factors associated with the COVID-19 pandemic.

¹ Although DPR is required to provide locations of sampled wells, information in this report is summarized by county to protect well owner privacy. DPR can provide additional location information—including township, range, and section—upon request or at: https://www.cdpr.ca.gov/docs/emon/grndwtr/well_inventory_database/index.htm.

² Some exceptions to the “agricultural use” status of sampled pesticides apply; some industrial use pesticides and pesticides that are no longer—or never were—registered for use in California are included due to the different monitoring goals of reporting agencies.

Table i. Summary of well sampling results for the 2021 annual report.^a

Well Sampling Summary	DPR	SWRCB	USGS	Total^b	Percent Detections
Pesticides/Degradates Sampled^c	70	95	135	221	18.5
Pesticides/Degradates Detected	11	6	32	41	
Wells Sampled^d	72	2,316	286	2,662	11.9
Wells with Detections	50	185	53	318	
Counties Sampled	3	34	27	46	50.0
Counties with Detections	2	8	20	23	

a. Actual sample date ranges for the 2021 annual report are: DPR—February to December 2020. SWRCB—January to December 2020. USGS—January 2019 to October 2020.

b. “Total” reflects total *unique* values, not a summation of values. For example, of the 58 California counties, some counties are sampled by more than one agency, but some are not sampled at all. (For the 2021 data, Plumas, San Benito, San Mateo, Santa Barbara, Santa Clara, Santa Cruz, Sierra, Siskiyou, Trinity, Tuolumne, Ventura, and Yuba counties were not sampled. Sampling data for 2020 was reduced due to various factors associated with the COVID-19 pandemic.)

c. “Pesticides Sampled” and “Pesticides Detected” represents the total number of pesticides sampled for or detected in groundwater regardless of the number of sampling events or detections that occurred during the reporting period.

d. “Wells Sampled” and “Wells with Detections” represent the total number of wells sampled or found to contain pesticide residues regardless of the number of sampling events or detections that occurred during the reporting period.

PREFACE

This report fulfills the requirements of the Pesticide Contamination Prevention Act of 1985 (PCPA), Assembly Bill (AB) 2701 of 2004, and Senate Bill 1117 of 2014. The PCPA originally required DPR to submit groundwater sampling results for pesticide residues in an annual written report; AB 2701 amended the PCPA to require DPR to post the information on DPR's website.

ACKNOWLEDGEMENTS

The authors wish to thank the reviewers whose unique perspectives and experiences helped ensure this report's accuracy and readability. We gratefully acknowledge DPR staff and cooperating federal, state, local, and private agencies for contributing to the database.

DISCLAIMER

As required by the PCPA, this report describes the active ingredients of registered pesticide products that have been detected in groundwater. DPR provides this information to satisfy legal mandates and provide information to the public. Any discussion of commercially available pesticide products does not constitute an actual or implied endorsement of the products by DPR.

GENERAL ABBREVIATIONS

CAC	County Agricultural Commissioner
CALVUL	California Vulnerability Model
3CCR	Title 3, California Code of Regulations
CDPH	California Department of Public Health
DDW	Division of Drinking Water
DPR	Department of Pesticide Regulation
FAC	Food and Agriculture Code
GAMA	Groundwater Ambient Monitoring and Assessment Program
GWPA	Ground Water Protection Area
GWPL	Groundwater Protection List
GWPP	Groundwater Protection Program
LLNL	Lawrence Livermore National Laboratory
LEACHM	Leaching Estimation and Chemistry Model
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
OEHHA	Office of Environmental Health Hazard Assessment
PCPA	Pesticide Contamination Prevention Act
PHG	Public Health Goal
PMZ	Pesticide Management Zone
ppb	Parts per billion
RMPP	Restricted Materials Permit Program
SNV	Specific Numerical Value
SWRCB	State Water Resources Control Board
U.S. EPA	United States Environmental Protection Agency
USGS	United States Geological Survey

PESTICIDE ACRONYMS AND ABBREVIATIONS

Acronym	Pesticide or Degradate
1,2-D	1,2-Dichloropropane
2,4-D	2,4- Dichlorophenoxy acetic acid
2,4-DB	4-(2,4-Dichlorophenoxy) butyric acid
2,4,5-T	2,4,5-Trichloro-phenoxy acetic acid
3-PBA	3-Phenoxybenzoic acid (degradate of cypermethrin, permethrin, gamma-cyhalothrin and lambda-cyhalothrin)
ACET	Deethyl-simazine or Deisopropyl-atrazine (degradate of atrazine and simazine)
BHC	Benzene hexachloride, unspecified isomers
DACT	Diaminochlorotriazine (degradate of simazine)
DBCP	1,2-Dibromo-3-chloropropane
DCPA	Chlorthal-dimethyl
DCPU	Diuron-desmethyl (degradate of diuron)
DDD	Dichloro diphenyl dichloro ethane (degradate of DDT)
DDE	Dichloro diphenyl dichloro ethylene (degradate of DDT)
DDT	Dichloro diphenyl trichloro ethane
DDVP	Dichlorvos
DEA	Deethyl-atrazine (degradate of atrazine)
DSMN	Desmethylnorflurazon (degradate of norflurazon)
EPTC	EPTAM or Ethyl N,N-dipropyl thiocarbamate
ESA	Ethanesulfonic acid (used at the end of pesticide degradate names)
MCPA	2-Methyl-4-chlorophenoxy acetic acid
MCPP	2-(2-Methyl-4-chlorophenoxy) propionic acid
OA or OXA	Oxalamic acid (used at the end of pesticide degradate names)
OIET	2-Hydroxyatrazine (degradate of atrazine)
PCNB	Pentachloronitrobenzene

CONTENTS

SUMMARY..... ii
 Table i. Summary of well sampling results for the 2021 annual report..... iii

PREFACE..... iv

ACKNOWLEDGEMENTS iv

DISCLAIMER iv

GENERAL ABBREVIATIONS v

BACKGROUND 1
 Protecting Groundwater from Pesticide Contamination — The PCPA 1
 Identifying Potential Groundwater Contaminants Under the PCPA..... 3
 Using Environmental Fate Data to Predict Pesticide Behavior in the Environment 3
 Using Computer Modeling Tools to Predict Pesticide Contamination Potential 4
 Monitoring for Pesticides — Prioritizing the Candidates 5
 Responding to Pesticide Detections in Groundwater..... 5
 Areas of Non-Authorization 7
 Assessing the Effectiveness of Mitigation Measures 7

SAMPLING RESULTS 8
 Detections of Pesticides and Related Degradates..... 8
 Table 1. Summary of the well sampling results by pesticide or degradate. 9
 DPR Responses to Pesticide Detections 20
 Table 2. Detailed summary of pesticides or degradates detected in groundwater..... 21

REFERENCES 31

APPENDIX A: GROUND WATER PROTECTION AREAS (GWPA) 34
 History of GWPA Development 34
 Initial Basis for GWPA Designation 34
 New GWPA Designations 35
 Figure A-1. Determination of Detection-based GWPA..... 36
 Figure A-2. Ground Water Protection Areas (GWPA) 37
 Pesticide Use in GWPA 38

APPENDIX B: PRINCIPAL SAMPLING AGENCIES..... 39
 Department of Pesticide Regulation 39
 State Water Resources Control Board 39
 United States Geological Survey 40

APPENDIX C: THE WELL INVENTORY DATABASE 41
 Figure C-1. All Wells in the DPR Well Inventory Database 42
 Figure C-2. All Wells in the DPR Well Inventory Database with Detections 43
 Figure C-3. Well Data Added to the DPR Well Inventory Database in the 2021 Report 44

APPENDIX D: WELL SAMPLING RESULTS SUMMARIZED BY COUNTY 45

Table D-1. Summary of sampling results by county 46
Table D-2. Pesticides or degradates detected by county and DPR evaluation..... 48
GLOSSARY OF TERMS..... 56

BACKGROUND

Protecting Groundwater from Pesticide Contamination — The PCPA

The Department of Pesticide Regulation (DPR) began addressing pesticide contamination of groundwater in the early 1980s after the discovery of 1,2-dibromo-3-chloropropane (DBCP) in well water. Subsequent reports of pesticides in groundwater led to the passage of the Pesticide Contamination Prevention Act (PCPA) of 1985,³ an act designed to prevent pesticide pollution⁴ of groundwater by agricultural use⁵ pesticides, with emphasis on the protection of public drinking water supplies.

The PCPA of 1985 added Article 15 (sections 13141–13152) to the Food and Agricultural Code (FAC). FAC section 13150 allows the continued sale and use of detected pesticides that were determined to pollute or threaten to pollute groundwater provided certain conditions for use have been met. DPR authorizes use modifications of these pesticides under the [Restricted Materials Permit Program](#) (Title 3, California Code of Regulations [3CCR] section 6400 et seq.), implemented by California’s County Agricultural Commissioners (CACs). DPR continues to monitor for pesticides and degradates that were determined not to pollute at the levels detected.

The PCPA authorized the establishment of a program that identifies pesticides that have the potential to pollute groundwater.⁶ Under this program, DPR is required to conduct groundwater sampling, maintain a database of wells sampled for pesticides, and conduct a formal review to determine if the pesticide’s use can continue as currently allowed, with modified use restrictions, or if all uses should be prohibited.

To implement the PCPA, DPR:

- Obtains physical/chemical/environmental fate data from pesticide registrants to support the registration of agricultural use pesticides; maintains the data in DPR’s [Pesticide Chemistry Database](#) (see Pesticide Data Index).

³ The PCPA added sections 13141-13152 to the FAC. 3CCR sections 6416-6487.5 and 6800-6804 implement these FAC sections.

⁴ FAC section 13142 defines “*pollution*” as “the consequence of polluting,” and “*pollute*” as “...to introduce a pesticide product into the groundwaters of the state resulting in an active ingredient, other specified ingredient, or a degradation product of a pesticide above a level that does not cause adverse health effects, accounting for an adequate margin of safety.”

⁵ California’s definition of “agricultural use” is broad and includes not only pesticides used in production agriculture, but also those used on turf (e.g., golf courses, cemeteries) and along rights-of-way.

⁶ See DPR’s [Groundwater Protection Program](#).

- Uses data in the Pesticide Chemistry Database to establish persistence and mobility threshold values called [specific numerical values](#) (SNVs)⁷ and evaluates the groundwater pollution potential of agricultural use pesticides based (in part) on these values. **NOTE:** Senate Bill (SB) 1117 modified the process for determining pollution potential by requiring DPR to develop a peer-reviewed method⁸ (in consultation with a subcommittee of the Director’s Pesticide Registration and Evaluation Committee) to determine the potential of a pesticide to pollute groundwater using SNVs. This revised procedure is currently under scientific peer review.
- Compiles the [Groundwater Protection List](#) (GWPL)⁹ that includes agricultural use pesticide active ingredients, other specified ingredients, and degradation products that have the potential to pollute groundwater. Pesticides whose use has been modified following their detection in groundwater are added to 3CCR section 6800(a) of the GWPL.¹⁰
- Utilizes contaminant transport modeling tools to:
 - Evaluate the contamination potential of pesticides prior to their California registration;
 - Prioritize pesticides for monitoring; and
 - Define [Ground Water Protection Areas](#) (GWPA)s.¹¹
- Monitors for agricultural use pesticides on the GWPL and their degradates to determine if they have migrated to groundwater.
- Evaluates reported pesticide and degradate detections in groundwater, including those reported by other agencies.¹²
- Determines whether the detection of a pesticide in groundwater is the result of legal agricultural use¹³ and, if so, conducts a [formal review process](#) to determine if the pesticide’s

⁷ SNV threshold values for all parameters are listed in 3CCR section 6804.

⁸ Peer review is conducted using the process described in section 57004 of the Health and Safety Code.

⁹ The GWPL (3CCR section 6800) is divided into two parts. Section 6800(a) includes seven chemicals that have been detected in groundwater and are regulated as groundwater contaminants with the potential to pollute: atrazine, bentazon, bromacil, diuron, norflurazon, prometon, and simazine. Section 6800(b) includes 98 chemicals that have the potential to become groundwater contaminants based on their mobility, persistence, and legal uses. SB 1117 requires DPR to “...include on the GWPL each active ingredient, other specified ingredient, and degradation product of a pesticide that, when applied, has the potential to pollute groundwater.”

¹⁰ Previously detected pesticides on the GWPL (3CCR section 6800[a]) with required use modifications include atrazine, bentazon, bromacil, diuron, norflurazon, prometon, and simazine.

¹¹ See Appendix A for more information on GWPA)s.

¹² See Appendix B for a list of reporting agencies and a discussion of their role in the PCPA process.

¹³ Legal agricultural uses include pesticide applications made in accordance with the registered pesticide label.

use can continue as currently allowed, with modified use restrictions, or if all uses should be prohibited.

- Conducts ongoing groundwater monitoring of pesticides whose continued use has been modified to prevent pollution or that were determined not to pollute at the levels initially detected.
- Continuously reviews new science and data that could impact the validity of a finding that a pesticide has not polluted and does not threaten to pollute groundwater.¹⁴
- Resubmits a pesticide to the formal review process or mitigates the threat if new information indicates that continued use of a previously reviewed pesticide threatens to pollute groundwater.

In addition, DPR:

- Maintains a database of pesticide detections in groundwater reported to DPR by local, county, and state, and federal agencies.¹⁵
- Prepares an annual Well Sampling Report that summarizes monitoring results and specifies actions taken by DPR in response to detections from nonpoint agricultural sources. Annual Well Sampling Reports are available at: <http://www.cdpr.ca.gov/docs/emon/grndwtr/wellinv/wirmain.htm>.

Identifying Potential Groundwater Contaminants Under the PCPA

DPR developed several evaluation procedures to estimate a pesticide's potential to pollute groundwater. These procedures are described below.

Using Environmental Fate Data to Predict Pesticide Behavior in the Environment

The PCPA required DPR to establish threshold SNVs for six physical/chemical parameters presumed to be correlated to a pesticide's potential to leach to groundwater: water solubility, soil organic carbon coefficient (Koc), hydrolysis half-life, aerobic soil metabolism half-life, anaerobic soil metabolism half-life, and field dissipation half-life. Water solubility and Koc are indicators of mobility within the soil, while hydrolysis half-life, aerobic and anaerobic soil metabolism, and field dissipation are indicators of the persistence of the pesticide in soil.¹⁶ A pesticide is predicted to have the potential to leach to groundwater if it is both mobile and persistent.

¹⁴ Chlorthal-dimethyl (DCPA), hexazinone, and metolachlor/S-metolachlor and their degradates were determined not to have polluted or threatened to pollute groundwater in the state, but continued monitoring of each was recommended (Leahy, 2017; Leahy, 2018; Reardon, 2011).

¹⁵ See Appendix C for more information on the Well Inventory Database.

¹⁶ Although DPR has not established an SNV for field dissipation data, these data are used in modeling procedures to assess the leaching potential of new products proposed for registration.

DPR developed threshold SNVs by evaluating nationwide groundwater studies and performing a statistical comparison of the physical/chemical attributes of pesticides detected in groundwater as a result of legal agricultural use (called leachers), and pesticides not detected (nonleachers). Analysis showed data for water solubility, hydrolysis half-life, Koc, and anaerobic soil metabolism half-life were significantly different for leachers and nonleachers (Johnson, 1991).¹⁷ However, leacher and nonleacher aerobic soil metabolism data were not significantly different.¹⁸

After establishing threshold SNVs, DPR scientists used the data to characterize a pesticide's behavior in the environment. Pesticides that exceed at least one mobility SNV, one persistence SNV, and are applied under specific conditions are placed on the GWPL and monitored to determine if they have migrated to groundwater as a result of their legal agricultural use.

SB 1117 modified the process for estimating pollution potential by requiring DPR to develop a peer-reviewed SNV-based method in consultation with a subcommittee of the Director's Pesticide Registration and Evaluation Committee. This revised procedure is currently under scientific peer review.

Using Computer Modeling Tools to Predict Pesticide Contamination Potential

In addition to evaluating the contamination potential of agricultural use pesticides by comparing SNV values, DPR scientists use two models to predict pesticide behavior.¹⁹

- **LEACHM**, the *leaching estimation and chemistry model* (Hutson, 2003), is a pesticide fate and transport modeling tool used to evaluate leaching potential. The model enables DPR scientists to predict a pesticide's movement through the root zone of a leaching-vulnerable soil (Spurlock, 2000) and predict the occurrence and magnitude of well water concentrations based upon mobility and persistence data, label information, climate data, and label-recommended irrigation practices (Troiano and Clayton, 2009). If the pesticide is determined to be a potential groundwater contaminant following the evaluation, the registrant is required to take steps (e.g., amending the product label or committing to a stewardship program) to mitigate the potential threat to groundwater before DPR approves the pesticide for use in California. If mitigation is not possible, California registration is denied.
- **CALVUL**, the *California vulnerability model* is used to determine sections in California that are vulnerable to pesticide contamination based on soil type and depth-to-groundwater (Troiano et al., 2000). If pesticide use on a given section of land is deemed likely to result in

¹⁷ An evaluation of SNVs for these properties resulted in the identification of 90 percent of the chemicals detected in groundwater due to legal agricultural use.

¹⁸ The PCPA requires DPR to establish an SNV for each physical/chemical parameter, but because soil metabolism half-life appears to be an ineffective predictor of a pesticide's groundwater contamination potential, the SNV for aerobic soil metabolism half-life is set at a value that minimizes its impact in the discrimination procedure.

¹⁹ The data used in these models are maintained in DPR's Pesticide Chemistry Database. The database includes pesticide mobility and persistence data submitted by pesticide registrants.

groundwater contamination, the section is designated a GWPA.²⁰ Currently, only pesticides listed under 3CCR section 6800(a) are regulated within GWPAs.

Monitoring for Pesticides — Prioritizing the Candidates

DPR ranks pesticides predicted to have the potential to contaminate groundwater to prioritize groundwater monitoring.²¹ This ranking enables DPR to focus limited resources on pesticides that present the greatest contamination risk. DPR assigns the highest priority to California registered agricultural use pesticides that are:

- On the GWPL;²²
- Reported as detections in groundwater by public agencies (see Appendix B for a list of reporting agencies);
- Have a higher likelihood of contaminating groundwater based on computer simulated transport modeling or based on a review of new science and data that indicate the pesticide could potentially pollute groundwater;
- Used intensively, or whose use is increasing; or
- Injected into the soil by ground-based application equipment, applied by chemigation, or followed within 72 hours by flood or furrow irrigation.

DPR also assigns a higher priority to pesticides that:

- Have been detected previously in California (or nationwide); and
- Have no monitoring history in California.

Responding to Pesticide Detections in Groundwater

DPR conducts sampling to confirm detections of agricultural use pesticides, but does not conduct additional sampling if the detected pesticide is:

²⁰ To use a pesticide regulated as a groundwater contaminant in a GWPA, users must obtain a Restricted Materials permit from their County Agricultural Commissioner. These permits specify the enforceable management practices required for use in each type of GWPA. For more information on GWPAs, see Appendix A.

²¹ For more information on pesticide monitoring ranking, see *Selection of Pesticide Active Ingredients for Future Analytical Method Development and Ground Water Monitoring* (Clayton, 2011).

²² DPR samples groundwater for pesticides on the GWPL to 1) determine if pesticides identified as potential contaminants have migrated to groundwater as a result of their legal agricultural use; 2) expand GWPAs if regulated pesticides are detected in new sections; and 3) assess the effectiveness of mitigation measures used in GWPAs.

- Not registered for use as a pesticide in California (e.g., detections from legacy pesticide use or from non-pesticidal use);
- Reported in error or is an invalid detection due to unacceptable analytical quality;
- Not detected in follow-up samples taken by the reporting agency;
- Detected at a concentration below DPR’s analytical screening level (i.e., less than 80 percent of DPR’s analytical reporting limit; the current screening level is 0.04 ppb);²³
- Regulated as a groundwater contaminant under 3CCR section 6800(a) and detected in a GWPA where use of the pesticide is regulated;
- Registered for use as a pesticide but also occurs naturally (such as copper); or
- Detected in a private well that DPR does not have permission to sample.

DPR will defer sampling and place a pesticide on a “watch list” if the pesticide was detected at a concentration below DPR’s analytical screening level (less than 80 percent of DPR’s analytical reporting limit), or if DPR has not yet developed an analytical method that meets the requirements necessary to validate the detection.

If groundwater detections of an active ingredient or its degradates are determined to be from a pesticide’s legal agricultural use, the findings are subject to a formal review process to determine if the pesticide’s use can continue as currently allowed, with modified use restrictions, or if all uses should be prohibited.²⁴ If DPR determines that use can be modified to the extent that there is a high probability it will not pollute, DPR adds the pesticide to 3CCR section 6800(a) of the GWPL and requires applicators to adopt mitigation measures when applying the pesticide in GWPAs. Detections of agricultural use pesticides (or their degradates or other specified ingredients) that do not trigger the formal review process or are determined not to pollute are placed on a “watch list” and tracked by DPR for changes in detection concentration or frequency.

²³ DPR responds only to detections of pesticides over the 0.04 ppb screening level unless the drinking water quality standard (health advisory goal/standard) is lower. DPR’s detection response policy is available upon request.

²⁴ Pesticides that have been subject to the formal review process include aldicarb (1988); atrazine (1986); bentazon (1989); bromacil (1986); chlorthal-dimethyl (2019); diuron (1986); hexazinone (2010); imidacloprid (2021); metolachlor/S-metolachlor (2016); norflurazon (1998); prometon (1986); and simazine (1986). Except for aldicarb, chlorthal-dimethyl, hexazinone, and metolachlor/S-metolachlor, DPR determined that agricultural use of these pesticides could be modified so that there is a high probability their continued use would not pollute groundwater (Leahy, 2017; Leahy, 2018; Reardon, 2011). In 1988, statewide use restrictions were adopted for aldicarb. Chlorthal-dimethyl (2019), hexazinone (2010), and metolachlor/S-metolachlor (2016) were determined not to have polluted or threatened to pollute groundwater in the state but continued monitoring of each was recommended. Another pesticide recently placed in the formal review process was alachlor (2016). The formal review of alachlor was suspended due to the imminent federal cancellation of all alachlor products which was published by U.S. EPA in the Federal Register on 6/30/2016. As of 12/31/2016, all products containing alachlor previously registered for use in California were inactive. The formal review of imidacloprid was initiated September 2021.

If a detected pesticide is added to the GWPL and regulated as a groundwater contaminant under 3CCR section 6800(a)—and the well is located in a GWPA—regulation of use under the Restricted Materials permit program constitutes an adequate DPR response to detections, unless concentrations are high enough to indicate existing mitigation measures are insufficient to prevent pollution. If the well is not located in a GWPA, DPR may establish a GWPA that includes the well site if: 1) the well is in a section of land that is adjacent to an existing GWPA, or 2) the pesticide is detected in two or more wells within a four-section area that is not adjacent to an existing GWPA. (For more information on GWPAs, see Appendix A.)

Areas of Non-Authorization

State law does not authorize DPR to regulate pesticide use when detections in groundwater result from manufacturing processes, accidental spills/releases, or illegal disposal; DPR refers these detections to SWRCB for further investigation.

Assessing the Effectiveness of Mitigation Measures

In 1999, DPR established a well monitoring network to evaluate baseline pesticide concentrations in an effort to measure the effectiveness of groundwater protection regulations. Currently, DPR's well monitoring network includes about 60 shallow, domestic wells located in runoff and/or leaching GWPAs in Fresno and Tulare counties. Previous DPR analysis suggests that DPR's regulatory action has resulted in measurable decreases in both detection frequencies and well water concentrations for many regulated pesticides (Davalos, 2021; Garretson, 1999; Troiano et al., 2013).

SAMPLING RESULTS

Detections of Pesticides and Related Degradates

This 2021 annual report includes well sampling data from DPR and SWRCB for the sampling period of January through December 2020, and USGS for the sampling period of January 2019 through December 2020. Previously, DPR delayed collecting USGS data to ensure a more complete and updated dataset. Despite the delay, some USGS data included in the yearly report were still listed as preliminary by USGS. Therefore, DPR deemed the delay in collecting the data unnecessary. To synchronize USGS data collection with the other reporting agencies, two years of USGS data (samples from 2019 and 2020) will be included in this year's report. Table 1 consists of well sampling data from all three agencies.

The three agencies sampled a total of 2,662 wells for one or more of 221 pesticides or degradates. Of the wells sampled, 318 wells tested positive for one or more pesticides or degradates. Sampling efforts yielded detections of 41 pesticides or degradates, 9 of which are not registered for use in California (e.g., detections from legacy pesticide use or non-pesticidal use).

Sampling data were collected from wells in 46 counties; Plumas, San Benito, San Mateo, Santa Barbara, Santa Clara, Santa Cruz, Sierra, Siskiyou, Trinity, Tuolumne, Ventura, and Yuba counties were not sampled by any agency during the period covered by the 2021 annual report. Twenty-three counties had wells with detections. Overall, sampling data for 2020 was reduced due to various factors associated with the COVID-19 pandemic. (See Appendix D for county sampling results.)

Table 1. Summary of the well sampling results by pesticide or degradate.

Note: Definitions of acronyms and abbreviations are available on page v.

Reporting Limit Range:

- **Zero (0) reporting limit** indicates no value was reported for at least some of the analyses.
- Some detection values listed in this table are below the reporting limit. Each reporting agency determines the value they will report regardless of “accepted” reporting limits. For instance, USGS may report *estimated values*, which can be below reporting limits.

Detected concentrations:

- **Reported detections are listed** for pesticides or degradates (rows are in **bold** for emphasis). Table 2 provides more information about the detections.
- **Dashes (-)** indicate no residues were detected.

Parent Compound Registration Status:

- **REG** indicates the parent pesticide is registered for use in California.
- **nr** indicates it is currently not registered (e.g., detections from legacy pesticide use or non-pesticidal use).

Pesticide or Degradate	Samples Taken/ Positive Samples	Wells Sampled/ Positive Wells	Counties Sampled/ Positive Counties	Reporting Limit Range (ppb)	Detected Concentration Range (ppb)	Sampling Agencies	Parent Compound Registration Status
1,2-D + 1,3-D + C-3 pesticides	2546/0	1220/0	25/0	0 - 0.5	-	SWRCB	nr
1,2-D	4208/23	1985/23	44/7	0 - 250	0.001 - 0.85	SWRCB USGS	nr
1,3-D	4329/0	1204/0	39/0	0 - 0.5	-	SWRCB USGS	REG
1,4-dichlorobenzene (P-DCB)	313/0	275/0	27/0	0 - 250	-	USGS	REG
2,4,5-T	133/0	103/0	9/0	0 - 2	-	SWRCB	nr
2,4,6-trichlorophenol	3/0	3/0	1/0	5	-	SWRCB	nr
2,4-D	711/0	513/0	28/0	0 - 10	-	SWRCB USGS	REG
2,4-DB	94/0	73/0	8/0	0 - 10	-	SWRCB	REG
2,6-Diethylaniline (degradate of alachlor)	243/0	243/0	25/0	0	-	USGS	nr
2-Ethyl-6-methylaniline (degradate of diuron)	243/0	243/0	25/0	0.005	-	USGS	REG
3,4-Dichloroaniline (degradate of diuron, linuron, propanil and iprodione)	729/14	243/14	25/4	0.005	0.002 - 0.012	USGS	REG

Pesticide or Degradate	Samples Taken/ Positive Samples	Wells Sampled/ Positive Wells	Counties Sampled/ Positive Counties	Reporting Limit Range (ppb)	Detected Concentration Range (ppb)	Sampling Agencies	Parent Compound Registration Status
3,5-Dichloroaniline (degradate of dichloran)	486/2	243/2	25/2	0.005	0.002 - 0.003	USGS	REG
3-PBA (degradate of permethrin, cypermethrin and cyhalothrin)	42/0	14/0	4/0	0.2 - 1	-	USGS	REG
4-Chloro-ortho-cresol (degradate of MCPA)	486/0	243/0	25/0	0.006	-	USGS	REG
4-Hydroxy chlorothalonil (degradate of chlorothalonil)	14/0	14/0	4/0	0.05 - 0.25	-	USGS	REG
Abamectin	6/0	5/0	2/0	0.02	-	DPR	REG
Acephate	14/0	14/0	4/0	0 - 0.025	-	USGS	REG
ACET (degradate of atrazine and simazine)	180/43	86/40	7/2	0.025 - 0.05	0.05 - 0.81	DPR USGS	REG
Acetochlor	523/0	288/0	28/0	0 - 0.1	-	SWRCB USGS	nr
Acetochlor ESA (degradate of acetochlor)	14/0	14/0	4/0	0.4 - 2	-	USGS	nr
Acetochlor OA (degradate of acetochlor)	14/0	14/0	4/0	0.1 - 0.25	-	USGS	nr
Acifluorfen	83/0	65/0	3/0	0 - 0.4	-	SWRCB	nr
Acrolein	11/0	11/0	1/0	5	-	SWRCB	REG
Acrylonitrile	1/0	1/0	1/0	0	-	USGS	nr
Alachlor	1535/0	1223/0	43/0	0 - 1	-	SWRCB USGS	nr
Alachlor 2nd Amide (degradate of alachlor)	243/0	243/0	25/0	0.005	-	USGS	nr
Aldicarb	320/0	283/0	18/0	0 - 3	-	SWRCB	nr
Aldicarb sulfone (degradate of aldicarb)	332/0	295/0	20/0	0 - 4	-	SWRCB	nr
Aldicarb sulfoxide (degradate of aldicarb)	329/0	292/0	18/0	0 - 3	-	SWRCB	nr
Aldrin	338/0	219/0	19/0	0 - 0.075	-	SWRCB	nr
Atraton	29/0	22/0	5/0	0.5	-	SWRCB	nr

Pesticide or Degradate	Samples Taken/ Positive Samples	Wells Sampled/ Positive Wells	Counties Sampled/ Positive Counties	Reporting Limit Range (ppb)	Detected Concentration Range (ppb)	Sampling Agencies	Parent Compound Registration Status
Atrazine	1809/22	1443/22	44/8	0 - 0.5	0.002 - 0.09	DPR SWRCB USGS	REG
Azinphos-methyl	243/0	243/0	25/0	0	-	USGS	nr
Azoxystrobin	34/0	29/0	5/0	0 - 0.05	-	DPR USGS	REG
Benefin	243/2	243/2	25/2	0	0.006	USGS	REG
Bensulide	22/0	16/0	1/0	0.05	-	DPR	REG
Bentazon	620/0	442/0	23/0	0 - 2	-	SWRCB	REG
BHC (other than gamma isomer)	194/0	53/0	2/0	0 - 0.05	-	SWRCB	nr
Bromacil	812/15	617/14	25/3	0 - 10	0.008 - 10.3	DPR SWRCB USGS	REG
Bromoxynil octanoate	14/0	14/0	4/0	0 - 0.25	-	USGS	REG
Butachlor	670/0	502/0	18/0	0 - 0.38	-	SWRCB	nr
Camphor	13/0	13/0	1/0	0.044 - 0.08	-	USGS	REG
Captan	51/0	41/0	1/0	0.1	-	SWRCB	REG
Carbaryl	615/0	566/0	38/0	0 - 5	-	DPR SWRCB USGS	REG
Carbendazim	14/0	14/0	4/0	0 - 0.025	-	USGS	REG
Carbofuran	749/0	672/0	40/0	0 - 5	-	DPR SWRCB USGS	nr
Carbon disulfide	1277/12	526/12	33/9	0 - 0.5	0.1 - 1	SWRCB USGS	nr
Carbophenothion	51/2	41/2	1/1	0	0.11 - 0.12	SWRCB	nr
Chlorantraniliprole	6/0	5/0	2/0	0.02	-	DPR	REG
Chlordane	472/0	310/0	19/0	0 - 0.1	-	SWRCB	nr
Chloropicrin	260/0	257/0	26/0	0 - 1	-	USGS	REG
Chlorothalonil	77/0	65/0	7/0	0 - 5	-	SWRCB	REG

Pesticide or Degradate	Samples Taken/ Positive Samples	Wells Sampled/ Positive Wells	Counties Sampled/ Positive Counties	Reporting Limit Range (ppb)	Detected Concentration Range (ppb)	Sampling Agencies	Parent Compound Registration Status
Chlorpropham	52/0	42/0	1/0	0	-	SWRCB	REG
Chlorpyrifos	292/0	288/0	26/0	0 - 0.16	-	DPR SWRCB USGS	REG
Chlorpyrifos oxon (degradate of chlorpyrifos)	238/0	238/0	25/0	0.056	-	USGS	REG
Chorimuron ethyl	14/0	14/0	4/0	0 - 0.025	-	USGS	nr
Clomazone	17/0	16/0	1/0	0.05	-	DPR	REG
Cyanazine	294/0	284/0	25/0	0	-	SWRCB USGS	nr
Cyfluthrin	243/2	243/2	25/2	0.008	0.002 - 0.006	USGS	REG
Cyhalothric acid (degradate of bifenthrin)	7/0	7/0	3/0	0.5 - 2	-	USGS	REG
Cyprodinil	6/0	5/0	2/0	0.02	-	DPR	REG
DACT (degradate of simazine)	76/49	72/45	3/2	0.05	0.05 - 4.91	DPR	REG
Dalapon	608/0	431/0	23/0	0 - 10	-	SWRCB	nr
DBCP	1909/545	1205/182	41/7	0 - 0.5	0.002 - 0.98	SWRCB USGS	nr
DCPA	244/4	244/4	26/3	0	0.002 - 0.003	SWRCB USGS	REG
DCPA degradates (non specific)	289/8	162/7	12/4	0 - 0.1	0.15 - 1.5	SWRCB	REG
DDD (degradate of DDT)	64/0	52/0	2/0	0 - 0.02	-	SWRCB	nr
DDE (degradate of DDE)	64/0	52/0	2/0	0 - 0.01	-	SWRCB	nr
DDT	64/0	52/0	2/0	0 - 0.02	-	SWRCB	nr
DDVP	266/0	263/0	26/0	0 - 0.64	-	USGS	REG
DEA (degradate of atrazine)	76/2	72/2	3/1	0.05	0.06 - 0.14	DPR	REG
Dechlorometolachlor (degradate of metolachlor)	14/2	14/2	4/1	0 - 0.003	0.003 - 0.004	USGS	REG
Desisopropyl desethyl atrazine (degradate of atrazine)	14/0	14/0	4/0	0.005	-	USGS	REG
Desulfinyl fipronil (degradate of fipronil)	6/0	5/0	2/0	0.01	-	DPR	REG

Pesticide or Degradate	Samples Taken/ Positive Samples	Wells Sampled/ Positive Wells	Counties Sampled/ Positive Counties	Reporting Limit Range (ppb)	Detected Concentration Range (ppb)	Sampling Agencies	Parent Compound Registration Status
Desulfinyl fipronil amide (degradate of fipronil)	6/0	5/0	2/0	0.01	-	DPR	REG
Diazinon	914/0	739/0	38/0	0 - 2	-	DPR SWRCB USGS	REG
Dicamba	476/0	325/0	21/0	0 - 1.5	-	SWRCB USGS	REG
Dichloran	17/0	16/0	1/0	0.05	-	DPR	REG
Dichlobenil	17/0	16/0	1/0	0.05	-	DPR	REG
Dichlorprop	83/0	62/0	5/0	0 - 0.5	-	SWRCB	REG
Dicrotophos	257/0	254/0	26/0	0 - 0.084	-	USGS	nr
Dieldrin	555/7	437/7	36/5	0 - 0.02	0.002 - 0.01	SWRCB USGS	nr
Diflubenzuron	20/0	19/0	6/0	0 - 0.025	-	DPR USGS	REG
Dimethenamid	36/0	30/0	5/0	0 - 0.05	-	DPR USGS	REG
Dimethoate	957/0	779/0	38/0	0 - 10	-	DPR SWRCB USGS	REG
Dinoseb	623/0	445/0	23/0	0 - 2	-	SWRCB	nr
Diphenamid	52/0	42/0	1/0	100	-	SWRCB	nr
Diquat dibromide	601/0	491/0	25/0	0 - 4	-	SWRCB	REG
Disulfoton	305/0	294/0	25/0	0 - 0.05	-	DPR SWRCB USGS	nr
Disulfoton sulfone (degradate of disulfoton)	243/0	243/0	25/0	0.016	-	USGS	nr
Diuron	123/15	97/9	9/3	0 - 0.25	0.012 - 0.14	DPR SWRCB USGS	REG
DCPU (degradate of diuron)	14/2	14/2	4/1	0.025 - 0.25	0.021 - 0.079	USGS	REG

Pesticide or Degradate	Samples Taken/ Positive Samples	Wells Sampled/ Positive Wells	Counties Sampled/ Positive Counties	Reporting Limit Range (ppb)	Detected Concentration Range (ppb)	Sampling Agencies	Parent Compound Registration Status
DSMN (degradate of norflurazon)	76/27	72/25	3/2	0.05	0.035 - 0.97	DPR	REG
Endosulfan	64/0	52/0	2/0	0 - 0.01	-	SWRCB	nr
Endosulfan II	64/0	52/0	2/0	0 - 0.01	-	SWRCB	nr
Endosulfan sulfate (degradate of endosulfan)	308/0	296/0	26/0	0 - 0.05	-	SWRCB USGS	nr
Endothall	442/0	353/0	21/0	0 - 45	-	SWRCB	REG
Endrin	492/0	325/0	20/0	0 - 0.1	-	SWRCB	nr
Endrin aldehyde (degradate of endrin)	65/0	53/0	2/0	0 - 0.05	-	SWRCB	nr
EPTC	295/0	285/0	25/0	0 - 0.1	-	SWRCB USGS	REG
Ethion	248/0	248/0	25/0	0 - 0.004	-	SWRCB USGS	nr
Ethofumesate	22/0	16/0	1/0	0.05	-	DPR	REG
Ethoprop (prophos)	280/0	274/0	26/0	0 - 0.05	-	DPR USGS	REG
Ethylene dibromide	1705/5	1166/5	39/4	0 - 0.02	0.004 - 0.39	SWRCB USGS	nr
Ethylene dichloride	300/2	262/2	27/1	0 - 500	0.03 - 0.08	USGS	nr
Etofenprox	6/0	5/0	2/0	0.02	-	DPR	REG
Etoxazole	14/0	14/0	4/0	0	-	USGS	REG
Fenamiphos	258/0	252/0	25/0	0.029 - 0.05	-	DPR USGS	nr
Fenamiphos sulfone (degradate of fenamiphos)	243/0	243/0	25/0	0.06	-	USGS	nr
Fenamiphos sulfoxide (degradate of fenamiphos)	223/0	223/0	25/0	0.031	-	USGS	nr
Fipronil	263/1	259/1	26/1	0 - 0.25	0.002	DPR USGS	REG
Fipronil sulfide (degradate of fipronil)	6/0	5/0	2/0	0.01	-	DPR	REG
Fipronil sulfone (degradates of fipronil)	263/2	259/2	26/2	0 - 0.25	0.005	DPR USGS	REG

Pesticide or Degradate	Samples Taken/ Positive Samples	Wells Sampled/ Positive Wells	Counties Sampled/ Positive Counties	Reporting Limit Range (ppb)	Detected Concentration Range (ppb)	Sampling Agencies	Parent Compound Registration Status
Fipronil-carboxamide (degradate of fipronil)	263/2	259/2	26/1	0 - 0.05	0.004	DPR USGS	REG
Fludioxonil	22/1	16/1	1/1	0.05	0.33	DPR	REG
Fluometuron	14/0	14/0	4/0	0 - 0.25	-	USGS	nr
Fonofos	243/0	243/0	25/0	0	-	USGS	nr
Formaldehyde	1/0	1/0	1/0	0	-	SWRCB	REG
Glyphosate	415/0	336/0	18/0	0 - 25	-	SWRCB	REG
Halosulfuron-methyl	14/0	14/0	4/0	0.025 - 0.25	-	USGS	REG
Heptachlor	488/0	323/0	20/0	0 - 0.01	-	SWRCB	nr
Heptachlor epoxide (degradate of heptachlor)	488/0	323/0	20/0	0 - 0.01	-	SWRCB	nr
Hexachlorobenzene	581/0	372/0	22/0	0 - 0.5	-	SWRCB	nr
Hexazinone	339/7	326/7	26/6	0 - 0.05	0.003 - 0.023	DPR USGS	REG
Hydroxycarbofuran (degradate of carbofuran)	323/0	286/0	20/0	0 - 3	-	SWRCB	nr
Hydroxymetolachlor (degradate of metolachlor)	14/0	14/0	4/0	0 - 0.01	-	USGS	REG
Hydroxysimazine (degradate of simazine)	14/0	14/0	4/0	0	-	USGS	REG
Imazethapyr	14/0	14/0	4/0	0 - 0.01	-	USGS	REG
Imidacloprid	36/6	30/5	5/1	0 - 0.05	0.05 - 0.11	DPR	REG
Indoxacarb	6/0	5/0	2/0	0.02	-	DPR	REG
Iprodione	243/0	243/0	25/0	1.422	-	USGS	REG
Isofenphos	243/0	243/0	25/0	0.003	-	USGS	nr
Isoxaben	6/0	5/0	2/0	0.02	-	DPR	REG
Kresoxim-methyl	6/0	5/0	2/0	0.02	-	DPR	REG
Lambda-cyhalothrin	243/0	243/0	25/0	0.009	-	USGS	REG
Lindane (gamma-BHC)	544/0	362/0	22/0	0 - 0.2	-	SWRCB	nr
Linuron	36/0	30/0	5/0	0 - 0.05	-	DPR USGS	REG

Pesticide or Degradate	Samples Taken/ Positive Samples	Wells Sampled/ Positive Wells	Counties Sampled/ Positive Counties	Reporting Limit Range (ppb)	Detected Concentration Range (ppb)	Sampling Agencies	Parent Compound Registration Status
Malaoxon (degradate of malathion)	243/0	243/0	25/0	0.008	-	USGS	REG
Malathion	302/0	284/0	26/0	0 - 0.05	-	DPR SWRCB USGS	REG
MCPA	24/0	12/0	1/0	10	-	SWRCB	REG
MCPP	24/0	12/0	1/0	10	-	SWRCB	REG
Metalaxyl	303/1	283/1	26/1	0 - 0.16	0.001	DPR USGS	REG
Metconazole	14/0	14/0	4/0	0.01	-	USGS	REG
Methamidophos	14/0	14/0	4/0	0 - 0.05	-	USGS	nr
Methidathion	245/0	244/0	25/0	0.006 - 0.02	-	DPR USGS	nr
Methiocarb	218/0	183/0	16/0	0 - 5	-	DPR SWRCB	REG
Methomyl	343/0	305/0	24/0	0 - 2	-	DPR SWRCB USGS	REG
Methoxychlor	534/0	352/0	22/0	0 - 10	-	SWRCB	nr
Methoxyfenozide	20/1	19/1	6/1	0 - 0.02	0.002	DPR USGS	REG
Methyl bromide	2691/0	1382/0	41/0	0 - 0.5	-	SWRCB USGS	REG
Methyl iodide	1/0	1/0	1/0	0	-	USGS	nr
Methyl paraoxon (degradate of methyl parathion)	243/0	243/0	25/0	0.03	-	USGS	nr
Methyl parathion	271/0	258/0	26/0	0	-	SWRCB USGS	nr
Metolachlor	976/4	795/4	38/2	0 - 10	0.006 - 0.008	DPR SWRCB USGS	REG
Metolachlor OXA (degradate of metolachlor)	14/0	14/0	4/0	0.2 - 0.5	-	USGS	REG

Pesticide or Degradate	Samples Taken/ Positive Samples	Wells Sampled/ Positive Wells	Counties Sampled/ Positive Counties	Reporting Limit Range (ppb)	Detected Concentration Range (ppb)	Sampling Agencies	Parent Compound Registration Status
Metribuzin	957/0	778/0	38/0	0 - 1	-	DPR SWRCB USGS	REG
Molinate	1233/1	991/1	43/1	0 - 2	0.013	SWRCB USGS	nr
Myclobutanil	257/0	254/0	26/0	0 - 0.01	-	USGS	REG
Napropamide	22/0	16/0	1/0	0.05	-	DPR	REG
Norflurazon	98/23	72/14	3/2	0.05	0.05 - 0.34	DPR	REG
OIET (degradate of atrazine)	14/2	14/2	4/1	0.01 - 0.025	0.011 - 0.034	USGS	REG
Ortho-dichlorobenzene	3906/0	1731/0	32/0	0 - 0.5	-	SWRCB	nr
Oryzalin	36/0	30/0	5/0	0 - 0.25	-	DPR USGS	REG
Oxadiazon	6/0	5/0	2/0	0.02	-	DPR	REG
Oxamyl	476/0	408/0	23/0	0 - 20	-	SWRCB	REG
Oxyfluorfen	243/0	243/0	25/0	0.007	-	USGS	REG
Paraquat dichloride	65/0	45/0	4/0	0 - 20	-	SWRCB	REG
Parathion or ethyl parathion	28/0	15/0	1/0	0	-	SWRCB	nr
PCNB	5/0	5/0	1/0	0.1	-	SWRCB	REG
Pendimethalin	243/0	243/0	25/0	0	-	USGS	REG
Pentachlorophenol (PCP)	9/0	9/0	1/0	2.6	-	USGS	nr
Permethrin	257/0	254/0	26/0	0 - 0.25	-	USGS	REG
Permethrin, other related compounds	14/0	14/0	4/0	0 - 0.25	-	USGS	REG
Phorate	260/0	259/0	25/0	0 - 0.05	-	DPR USGS	REG
Phoratoxon (degradate of phorate)	243/0	243/0	25/0	0.097	-	USGS	REG
Phosmet	243/0	243/0	25/0	0.008	-	USGS	REG
Phosmet oxon (degradate of phosmet)	232/0	232/0	24/0	0.055	-	USGS	REG
Phostebupirim	14/0	14/0	4/0	0.003 - 0.005	-	USGS	nr
Picloram	608/0	431/0	23/0	0 - 1	-	SWRCB	nr
Piperonyl butoxide	51/0	36/0	5/0	0 - 0.2	-	DPR USGS	REG

Pesticide or Degradate	Samples Taken/ Positive Samples	Wells Sampled/ Positive Wells	Counties Sampled/ Positive Counties	Reporting Limit Range (ppb)	Detected Concentration Range (ppb)	Sampling Agencies	Parent Compound Registration Status
Prometon	449/5	403/5	28/4	0 - 0.5	0.004 - 0.022	DPR SWRCB USGS	REG
Prometryn	385/0	354/0	32/0	0 - 2	-	DPR SWRCB USGS	REG
Propachlor	684/0	517/0	19/0	0 - 0.5	-	SWRCB	nr
Propanil	260/0	259/0	25/0	0 - 0.05	-	DPR USGS	REG
Propargite	249/0	248/0	25/0	0 - 0.02	-	DPR USGS	REG
Propazine	14/0	14/0	4/0	0 - 0.005	-	USGS	nr
Propiconazole (trans)	263/1	259/1	26/1	0 - 0.025	0.003	DPR USGS	REG
Propiconazole (cis or total)	243/0	243/0	25/0	0.013	-	USGS	REG
Propoxur	210/0	181/0	19/0	0 - 5	-	SWRCB USGS	REG
Pyraclostrobin	20/0	19/0	6/0	0.003 - 0.02	-	DPR USGS	REG
Pyriproxyfen	6/0	5/0	2/0	0.015 - 0.02	-	DPR	REG
Quinoxifen	6/0	5/0	2/0	0.02	-	DPR	REG
Secbumeton	29/0	22/0	5/0	0.5	-	SWRCB	nr
Silvex	610/0	432/0	23/0	0 - 1	-	SWRCB	nr
Simazine	1788/88	1426/73	44/14	0 - 1	0.003 - 0.171	DPR SWRCB USGS	REG
Sulfentrazone	14/0	14/0	4/0	0.05	-	USGS	REG
Sulfometuron methyl	14/1	14/1	4/1	0 - 0.01	0.007	USGS	REG
Tebuconazole	14/0	14/0	4/0	0.05	-	USGS	REG
Tebufenozide	6/0	5/0	2/0	0.02	-	DPR	REG

Pesticide or Degradate	Samples Taken/ Positive Samples	Wells Sampled/ Positive Wells	Counties Sampled/ Positive Counties	Reporting Limit Range (ppb)	Detected Concentration Range (ppb)	Sampling Agencies	Parent Compound Registration Status
Tebuthiuron	294/8	274/8	26/6	0 - 0.05	0.004 - 0.086	DPR USGS	REG
Tefluthrin	243/7	243/7	25/4	0.008	0.003 - 0.005	USGS	nr
Terbacil	52/0	42/0	1/0	0.1	-	SWRCB	nr
Terbufos	257/0	254/0	26/0	0	-	USGS	nr
Terbufos oxon sulfone (degradate of terbufos)	257/0	254/0	26/0	0 - 0.068	-	USGS	nr
Terbufos sulfoxide (degradate of terbufos)	14/0	14/0	4/0	0 - 0.005	-	USGS	nr
Terbuthylazine	243/0	243/0	25/0	0.01	-	USGS	REG
Terbutryn	29/0	22/0	5/0	0.5	-	SWRCB	REG
Tetrachloroethane	3907/0	1729/0	32/0	0 - 0.5	-	SWRCB	nr
Tetraconazole	14/0	14/0	4/0	0.04 - 0.1	-	USGS	REG
Thiabendazole	27/0	27/0	4/0	0	-	USGS	REG
Thiamethoxam	22/0	16/0	1/0	0.05	-	DPR	REG
Thiobencarb	1408/0	1118/0	43/0	0 - 1	-	DPR SWRCB USGS	REG
Toxaphene	478/0	314/0	19/0	0 - 1	-	SWRCB	nr
Triallate	17/0	16/0	1/0	0.05	-	DPR	REG
Tribufos	243/0	243/0	25/0	0.004 - 0.02	-	USGS	REG
Triclopyr	3/0	3/0	3/0	0	-	USGS	REG
Triclosan	22/0	13/0	1/0	0.02 - 0.32	-	USGS	REG
Trifloxystrobin	20/0	19/0	6/0	0 - 0.02	-	DPR USGS	REG
Trifluralin	306/1	297/1	26/1	0	0.004	SWRCB USGS	REG
Uniconazole	14/0	9/0	1/0	0.05	-	DPR	REG
Vernolate	5/0	5/0	1/0	1	-	SWRCB	nr

DPR RESPONSES TO PESTICIDE DETECTIONS

As required under the PCPA (FAC section 13152[e][4]), this section of the annual report describes DPR's responses to the pesticide and degradate detections in groundwater by DPR, SWRCB, and USGS (Table 2). Of the 41 pesticide or degradate detections reported:

- Thirteen are pesticides (or degradates of a parent compound) listed under 3CCR section 6800(a) and already regulated as groundwater contaminants within GWPAs (see Appendix A for more information on GWPAs). Eight of the 13 compounds were also detected outside of GWPAs. Seven of those eight compounds were reported at levels below DPR's screening level (0.04 ppb). One simazine detection was detected outside of GWPAs in one well at a level over DPR's screening level. DPR is evaluating this detection.
- Ten are pesticides (or degradates of a parent compound) listed as potential groundwater contaminants under 3CCR section 6800(b).
 - Three were detected above DPR's screening level: fludioxonil, imidacloprid, and tebuthiuron.
 - The one fludioxonil detection is part of an ongoing DPR study to determine a source (Kocis, 2020).
 - In September 2021, DPR submitted imidacloprid for evaluation under the [formal review process](#). Five imidacloprid detections listed in this report are included in the review process.
 - DPR is evaluating the tebuthiuron detection.
 - The other seven—3,5-dichloroaniline, benfenin, hexazinone, metalaxyl, metolachlor, propiconazole, and sulfometuron methyl—were reported at levels far below DPR's screening level (0.04 ppb).
- Nine are registered pesticides (or degradates of a parent compound) not listed under 3CCR sections 6800(a) or (b).
 - Two are degradates of chlorthal-dimethyl that were found not to pollute at the levels detected (Leahy, 2018).
 - The other seven—benfenin, cyfluthrin, fipronil, fipronil sulfone, fipronil-carboxamide, methoxyfenozide, and trifluralin—were reported at levels far below DPR's screening level (0.04 ppb).
- Nine are not registered for use as a pesticide in California (e.g., detections from legacy pesticide use or non-pesticidal use).

Table 2. Detailed summary of pesticides or degradates detected in groundwater.

Detection concentration ranges and drinking water quality standards are reported in parts per billion (ppb). The last column includes the compound's registration status and DPR's initial evaluation and response to agricultural use pesticide detections.

Pesticide or Degradate	Wells with Detections	Wells with Detections over 0.04 ppb	Concentration Range (ppb)	† CA MCL	† OEHHA PHG	† U.S. EPA MCL	† U.S. EPA MCLG	†† Cancer Group	* Groundwater Protection List (GWPL) Status: 3CCR section 6800(a) or (b)
									‡ DPR Response to Detections (0.04 ppb screening level)
1,2-D	23	7	0.001 - 0.85	5	0.5	5	0	B2	Not registered for use in California since 1990.
3,4-Dichloroaniline (degradate of diuron, linuron and propanil)	14	0	0.002 - 0.012	-	-	-	-	-	Parent pesticide is on the GWPL, 3CCR section 6800(a). -- No wells with detections exceeded the DPR screening level.
3,5-Dichloroaniline (degradate of dichloran and iprodione)	2	0	0.002 - 0.003	-	-	-	-	-	Parent pesticide is on the GWPL, 3CCR section 6800(b). -- No wells with detections exceeded the DPR screening level.
ACET (degradate of atrazine or simazine)	40	40	0.05 - 0.81	-	-	-	-	-	Parent pesticides are on the GWPL, 3CCR section 6800(a). -- Forty (40) wells with detections exceeded the DPR screening level and are in GWPAs. Applications of this pesticide in GWPAs are regulated under the RMPP. No further investigation is required. **

Pesticide or Degradate	Wells with Detections	Wells with Detections over 0.04 ppb	Concentration Range (ppb)	† CA MCL	† OEHHA PHG	† U.S. EPA MCL	† U.S. EPA MCLG	†† Cancer Group	* Groundwater Protection List (GWPL) Status: 3CCR section 6800(a) or (b)
									‡ DPR Response to Detections (0.04 ppb screening level)
Atrazine	22	1	0.002 - 0.09	1	0.15	3	3	N	This pesticide is on the GWPL, 3CCR section 6800(a). -- One (1) well with a detection exceeded the DPR screening level and is in a GWPA. Applications of this pesticide in GWPAs are regulated under the RMPP. No further investigation is required.
Benefin	2	0	0.006	-	-	-	-	-	This pesticide is on the GWPL, 3CCR section 6800(b). -- No wells with detections exceeded the DPR screening level.
Bromacil	14	13	0.008 - 10.3	-	-	-	-	C	This pesticide is on the GWPL, 3CCR section 6800(a). -- Thirteen (13) wells with detections exceeded the DPR screening level and are in GWPAs. Applications of this pesticide in GWPAs are regulated under the RMPP. No further investigation is required.
Carbon disulfide	12	12	0.1 - 1	-	-	-	-	-	Not registered for use in California since 1987.
Carbophenothion	2	2	0.11 - 0.12	-	-	-	-	-	Not registered for use in California since 1987.
Cyfluthrin	2	0	0.002 - 0.006	-	-	-	-	-	This pesticide is not on the GWPL. -- No wells with detections exceeded the DPR screening level.

Pesticide or Degradate	Wells with Detections	Wells with Detections over 0.04 ppb	Concentration Range (ppb)	† CA MCL	† OEHHA PHG	† U.S. EPA MCL	† U.S. EPA MCLG	†† Cancer Group	* Groundwater Protection List (GWPL) Status: 3CCR section 6800(a) or (b)
									‡ DPR Response to Detections (0.04 ppb screening level)
DACT (degradate of simazine)	45	45	0.05 - 4.91	-	-	-	-	-	Parent pesticide is on the GWPL, 3CCR section 6800(a). -- Forty-five (45) wells with detections exceeded the DPR screening level and are in GWPAs. Applications of this pesticide in GWPAs are regulated under the RMPP. No further investigation is required.
DBCP	182	94	0.002 - 0.98	0.2	0.003	0.2	0	B2	Not registered for use in California since 1979.
DCPA	4	0	0.002 - 0.003	-	-	-	-	C	This pesticide is not on the GWPL. -- No wells with detections exceeded the DPR screening level.
DCPA degradate	7	7	0.15 - 1.5	-	-	-	-	-	Parent pesticide is not on the GWPL. -- Seven (7) wells with detections exceeded the DPR screening level. DPR completed the formal review process for chlorthal-dimethyl in 2019. These degradates were found not to pollute at the levels detected (Leahy, 2018).

Pesticide or Degradate	Wells with Detections	Wells with Detections over 0.04 ppb	Concentration Range (ppb)	† CA MCL	† OEHHA PHG	† U.S. EPA MCL	† U.S. EPA MCLG	†† Cancer Group	* Groundwater Protection List (GWPL) Status: 3CCR section 6800(a) or (b)
									‡ DPR Response to Detections (0.04 ppb screening level)
DCPU (degradate of diuron)	2	1	0.021 - 0.079	-	-	-	-	-	Parent pesticide is on the GWPL, 3CCR section 6800(a). -- One (1) well with a detection exceeded the DPR screening level and is in a GWPA. Applications of this pesticide in GWPAs are regulated under the RMPP. No further investigation is required.
DEA (degradate of atrazine)	2	2	0.06 - 0.14	-	-	-	-	-	Parent pesticide is on the GWPL, 3CCR section 6800(a). -- Two (2) wells with detections exceeded the DPR screening level and are in GWPAs. Applications of this pesticide in GWPAs are regulated under the RMPP. No further investigation is required.
Dechlorometolachlor (degradate of metolachlor)	2	0	0.003 - 0.004	-	-	-	-	-	Parent pesticide is not on the GWPL. -- No wells with detections exceeded the DPR screening level. DPR completed the formal review process for metolachlor in 2016. The degradates were found not to pollute at the levels detected (Leahy, 2017).
Dieldrin	7	0	0.002 - 0.01	-	-	-	-	B2	Not registered for use in California since 1986.

Pesticide or Degradate	Wells with Detections	Wells with Detections over 0.04 ppb	Concentration Range (ppb)	† CA MCL	† OEHHA PHG	† U.S. EPA MCL	† U.S. EPA MCLG	†† Cancer Group	* Groundwater Protection List (GWPL) Status: 3CCR section 6800(a) or (b)
									‡ DPR Response to Detections (0.04 ppb screening level)
Diuron	9	5	0.012 - 0.14	-	-	-	-	L	This pesticide is on the GWPL, 3CCR section 6800(a). -- Five (5) wells with detections exceeded the DPR screening level and are in GWPAs. Applications of this pesticide in GWPAs are regulated under the RMPP. No further investigation is required.
DSMN (degradate of norflurazon)	25	24	0.035 - 0.97	-	-	-	-	-	Parent pesticide is on the GWPL, 3CCR section 6800(a). -- Twenty-four (24) wells with detections exceeded the DPR screening level and are in GWPAs. Applications of this pesticide in GWPAs are regulated under the RMPP. No further investigation is required.
Ethylene dibromide	5	1	0.004 - 0.39	0.05	0.01	0.05	0	L	Not registered for use in California since 1987.
Ethylene dichloride	2	1	0.03 - 0.08	0.5	0.4	5	0	-	Not registered for use in California since 1987.
Fipronil	1	0	0.002	-	-	-	-	-	This pesticide is not on the GWPL. -- No wells with detections exceeded the DPR screening level.
Fipronil sulfone (degradate of fipronil)	2	0	0.005	-	-	-	-	-	Parent pesticide is not on the GWPL. -- No wells with detections exceeded the DPR screening level.

Pesticide or Degradate	Wells with Detections	Wells with Detections over 0.04 ppb	Concentration Range (ppb)	† CA MCL	† OEHHA PHG	† U.S. EPA MCL	† U.S. EPA MCLG	†† Cancer Group	* Groundwater Protection List (GWPL) Status: 3CCR section 6800(a) or (b)
									‡ DPR Response to Detections (0.04 ppb screening level)
Fipronil-carboxamide	2	0	0.004	-	-	-	-	-	Parent pesticide is not on the GWPL. -- No wells with detections exceeded the DPR screening level.
Fludioxonil	1	1	0.33	-	-	-	-	-	This pesticide is on the GWPL, 3CCR section 6800(b). -- One (1) well with a detection exceeded the DPR screening level. Fludioxonil has been detected by DPR in this well previously (Davalos, 2021). DPR is currently reviewing these results and conducting further investigation (Kocis, 2020).
Hexazinone	7	0	0.003 - 0.023	-	-	-	-	D	This pesticide is on the GWPL, 3CCR section 6800(b). -- No wells with detections exceeded the DPR screening level. DPR completed the formal review process for hexazinone in 2010. These detections were found not to pollute at the levels detected (Reardon, 2011).

Pesticide or Degradate	Wells with Detections	Wells with Detections over 0.04 ppb	Concentration Range (ppb)	† CA MCL	† OEHHA PHG	† U.S. EPA MCL	† U.S. EPA MCLG	†† Cancer Group	* Groundwater Protection List (GWPL) Status: 3CCR section 6800(a) or (b)
									† DPR Response to Detections (0.04 ppb screening level)
Imidacloprid	5	5	0.05 - 0.11	-	-	-	-	-	This pesticide is on the GWPL, 3CCR section 6800(b). -- Five (5) wells with detections exceeded the DPR screening level and are included in DPR's Legal Agricultural Use determination for imidacloprid (Aggarwal, 2021b). DPR submitted imidacloprid for evaluation under the formal review process in September 2021. DPR issued two reports in conjunction with this evaluation (Aggarwal 2021a; Aggarwal 2021b).
Metalaxyl	1	0	0.001	-	-	-	-	-	This pesticide is on the GWPL, 3CCR section 6800(b). -- No wells with detections exceeded the DPR screening level.
Methoxyfenozide	1	0	0.002	-	-	-	-	-	Parent pesticide is not on the GWPL. -- No wells with detections exceeded the DPR screening level.
Metolachlor	4	0	0.006 - 0.008	-	-	-	-	C	This pesticide is on the GWPL, 3CCR section 6800(b). -- No wells with detections exceeded the DPR screening level.
Molinate	1	0	0.013	20	1	-	-	-	Not registered for use in California since 2009.

Pesticide or Degradate	Wells with Detections	Wells with Detections over 0.04 ppb	Concentration Range (ppb)	† CA MCL	† OEHHA PHG	† U.S. EPA MCL	† U.S. EPA MCLG	†† Cancer Group	* Groundwater Protection List (GWPL) Status: 3CCR section 6800(a) or (b)
									‡ DPR Response to Detections (0.04 ppb screening level)
Norflurazon	14	14	0.05 - 0.34	-	-	-	-	-	This pesticide is on the GWPL, 3CCR section 6800(a). -- Fourteen (14) wells with detections exceeded the DPR screening level and are in GWPAs. Applications of this pesticide in GWPAs are regulated under the RMPP. No further investigation is required.
OIET (degradate of atrazine)	2	0	0.011 - 0.034	-	-	-	-	-	The parent pesticide is on the GWPL, 3CCR section 6800(a). -- No wells with detections exceeded the DPR screening level.
Prometon	5	0	0.004 - 0.022	-	-	-	-	N	This pesticide is on the GWPL, 3CCR section 6800(a). -- No wells with detections exceeded the DPR screening level.
Propiconazole	1	0	0.003	-	-	-	-	-	This pesticide is on the GWPL, 3CCR section 6800(b). -- No wells with detections exceeded the DPR screening level.

Pesticide or Degradate	Wells with Detections	Wells with Detections over 0.04 ppb	Concentration Range (ppb)	† CA MCL	† OEHHA PHG	† U.S. EPA MCL	† U.S. EPA MCLG	†† Cancer Group	* Groundwater Protection List (GWPL) Status: 3CCR section 6800(a) or (b)
									‡ DPR Response to Detections (0.04 ppb screening level)
Simazine	73	32	0.003 - 0.171	4	4	4	4	N	This pesticide is on the GWPL, 3CCR section 6800(a). -- Thirty-two (32) wells with detections exceeded the DPR screening level. Thirty-one (31) of these wells are in GWPAs. Applications of this pesticide in GWPAs are regulated under the RMPP. No further investigation is required. DPR will evaluate the one (1) remaining detection.
Sulfometuron methyl	1	0	0.007	-	-	-	-	-	This pesticide is on the GWPL, 3CCR section 6800(b). -- No wells with detections exceeded the DPR screening level.
Tebuthiuron	8	1	0.004 - 0.086	-	-	-	-	D	This pesticide is on the GWPL, 3CCR section 6800(b). -- One (1) well with a detection exceeded the DPR screening level. DPR will evaluate this detection.
Tefluthrin	7	0	0.003 - 0.005	-	-	-	-	-	Never registered for use in California.
Trifluralin	1	0	0.004	-	-	-	-	C	Parent pesticide is not on the GWPL. -- No wells with detections exceeded the DPR screening level.

† Drinking water quality standards: MCL—maximum contaminant level; MCLG—maximum contaminant level goal; PHG—public health goal. Other acronyms used include: OEHHA—California Office of Environmental Health Hazard Assessment; U.S. EPA—United States Environmental Protection Agency.

- California (State Water Resources Control Board) MCL values and the PHG for ethylene dibromide are available at: https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/mclreview/mcls_dlr_phgs.pdf.
- Office of Environmental Health Hazard Assessment PHGs are available at: <https://oehha.ca.gov/water/public-health-goals-phgs>.
- U.S. EPA MCL, MCLG, and cancer risk (descriptor) designations derived from the publication *2018 Edition of the Drinking Water Standards and Health Advisories Tables* available at: <https://www.epa.gov/ground-water-and-drinking-water/national-primary-drinking-water-regulations#Organic>
 - All health standards not found at sources listed above were derived from *SWRCB water quality goal search app* available at: <https://public3.waterboards.ca.gov/wqgapps/>.

^{††} Cancer Group (descriptor) acronyms (U.S. EPA): (A) human carcinogen; (B1) probable human carcinogen—indicates limited human evidence; (B2) probable human carcinogen—sufficient evidence in animals and inadequate or no evidence in humans; (C) possible human carcinogen; (D) not classifiable as to human carcinogenicity; (E) evidence of noncarcinogenicity for humans; (L) likely to be carcinogenic to humans; (N) not likely to be carcinogenic in humans; (S) suggestive evidence of carcinogenic potential.

* Pesticides on the GWPL 3CCR section 6800(a) or (b) are those labeled for agricultural, outdoor institutional, or outdoor industrial use that have the potential to pollute groundwater. Section 6800(a) includes seven agricultural herbicides that are regulated as groundwater contaminants: atrazine, bentazon, bromacil, diuron, norflurazon, prometon, and simazine. Section 6800(b) includes 98 pesticides that have the potential to become groundwater contaminants based on their mobility, persistence, and legal uses. The GWPL is available at: <http://www.cdpr.ca.gov/docs/legbills/calcode/040101.htm>.

If the detected pesticide is regulated as a groundwater contaminant under 3CCR section 6800(a)—and the well is located in a GWPA where use of the pesticide is regulated—current regulation of use constitutes an adequate response to new detections *unless* concentrations are high enough to indicate existing mitigation measures are not adequate to prevent *pollution*. (“Pollution” is defined in FAC section 13142 as “...the consequence of polluting,” and “pollute” means “to introduce a pesticide product into the groundwaters of the state resulting in an active ingredient, other specified ingredient, or a degradation product of a pesticide above a level that does not cause adverse health effects, accounting for an adequate margin of safety.”)

[‡] DPR only responds to detections of pesticides over the 0.04 ppb screening level unless the drinking water quality standard (health advisory goal/standard) is low. DPR’s policy relative to its response to reported detections is available upon request.

^{††} DPR does not investigate detections within GWPAs for pesticides (or their degradates) that are on the 6800(a) list of known groundwater contaminants (Schuette, 2004). Applications of these pesticides in GWPAs are managed by County Agricultural Commissioners via the Restricted Materials permit program. This program requires applicators to modify their pesticide use practices based on soil properties of the GWPA.

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APPENDIX A: GROUND WATER PROTECTION AREAS (GWPA'S)

Ground Water Protection Areas (GWPA's) are defined as one-square-mile sections of land that DPR has determined to be sensitive to the movement of pesticides to groundwater. GWPA's are established based on either detections in groundwater of pesticides (or their degradates) listed in 3CCR section 6800(a)²⁵, or by using the CALVUL computer model. Pesticides listed in 3CCR section 6800(a) are regulated as groundwater contaminants in GWPA's and their use is prohibited unless specific management practices are implemented. There are currently 3,840 GWPA's in California encompassing over 2.45 million acres.

History of GWPA Development

Early research conducted by DPR scientists enabled DPR to identify two important soil conditions that contribute to groundwater contamination: 1) coarse-textured soils where *leaching* is the predominant contamination pathway (Troiano et al., 1993); and 2) hardpan soil layers where *runoff* from the application site into dry wells or areas with high infiltration rates is the predominant contamination pathway (Braun and Hawkins, 1991). DPR identified depth-to-groundwater as another factor contributing to contamination when DPR scientists discovered that pesticide detections were more frequent in areas of shallow groundwater (Troiano et al., 1999).

In 2004, DPR implemented regulations that replaced Pesticide Management Zones (PMZs) with GWPA's²⁶. PMZs were one-square-mile sections of land that required mitigation only after specific pesticides were detected in groundwater. In contrast, GWPA's identify sections vulnerable to pesticide contamination and require specific management practices of pesticides listed in 3CCR section 6800(a) regardless of whether they were detected in groundwater within that section. The empirical model CALVUL was used to identify the vulnerable areas by analyzing soil type and depth-to-groundwater data. DPR based designations of GWPA's primarily on this CALVUL modeling effort and then also included all the former (and draft) PMZs from 1989 to 1999 in the designations. DPR's use of the CALVUL model increased the area under regulation from 313,000 acres (the acreage identified as PMZs) to about 2.4 million acres (PMZs plus GWPA's). The science and regulatory aspects are explained in more detail in the following sections.

Initial Basis for GWPA Designation

In 2004, DPR implemented regulations that established GWPA's for *leaching* or *runoff* pathways based on the following factors (Troiano et al., 2000; Marade and Troiano, 2000):

- If a section of land had an estimated depth-to-groundwater of 70 feet or less and the predominant soil type was characterized as coarse-textured, it was identified as a *leaching* GWPA. If the section had an estimated depth-to-groundwater of 70 feet or less and the soil contained a hardpan layer, it was identified as a *runoff* GWPA.

²⁵ Pesticides listed in 3CCR section 6800(a): atrazine, bentazon, bromacil, norflurazon, prometon, simazine, and diuron (except for diuron products with less than 7% diuron that are applied to foliage).

²⁶ GWPA's are classified in regulation as sections of land characterized by either coarse-textured or hardpan soils with a ten-year spring-averaged annual estimated depth-to-groundwater of 70 feet or less.

- If a section had both leaching and runoff characteristics (coarse-textured soil with a hardpan layer), it was identified as a leaching GWPA if the mean hardpan depth was greater than 48 inches, or as a runoff GWPA if the mean hardpan depth was less than 48 inches.
- If a section did not meet the above criteria but was previously identified as a PMZ, it was classified as a leaching or runoff GWPA as follows:
 - If the predominant soil in the section was coarse-textured, it was classified as a leaching GWPA; otherwise, the section was classified as a runoff GWPA.
 - If the PMZ lacked soil survey data, it was assigned a GWPA pathway based on soil condition information provided by local agencies. DPR also assessed agronomic practices in the section to determine whether leaching or runoff was the apparent pathway for recharge of water to groundwater.

New GWPA Designations

DPR establishes new GWPAs based on the following factors:

- CALVUL modeling identifies the section as vulnerable; or
- Active ingredients listed in 3CCR section 6800(a), or their degradation products, are detected in:
 - One well in a section that is adjacent to a GWPA; or
 - Two or more wells within a four-section area that is not adjacent to an existing GWPA. (See **Figure A-1** to understand how new GWPAs are added based on detections.)

In 2020, DPR designated 122 additional sections (approximately 78,000 acres) in 15 counties as GWPAs based on the detections of active ingredients listed in 3CCR section 6800(a) or their degradation products. The document previously incorporated by reference in the definitions of 3CCR section 6000 was amended to include the new GWPAs and was retitled “*Ground Water Protection Areas 2018 (Rev. 10/18)*.” The document identifies each GWPA as either a leaching or runoff GWPA. Currently, there are 3,840 GWPAs in California (**Figure A-2**).

Figure A-1. Determination of Detection-based GWPA

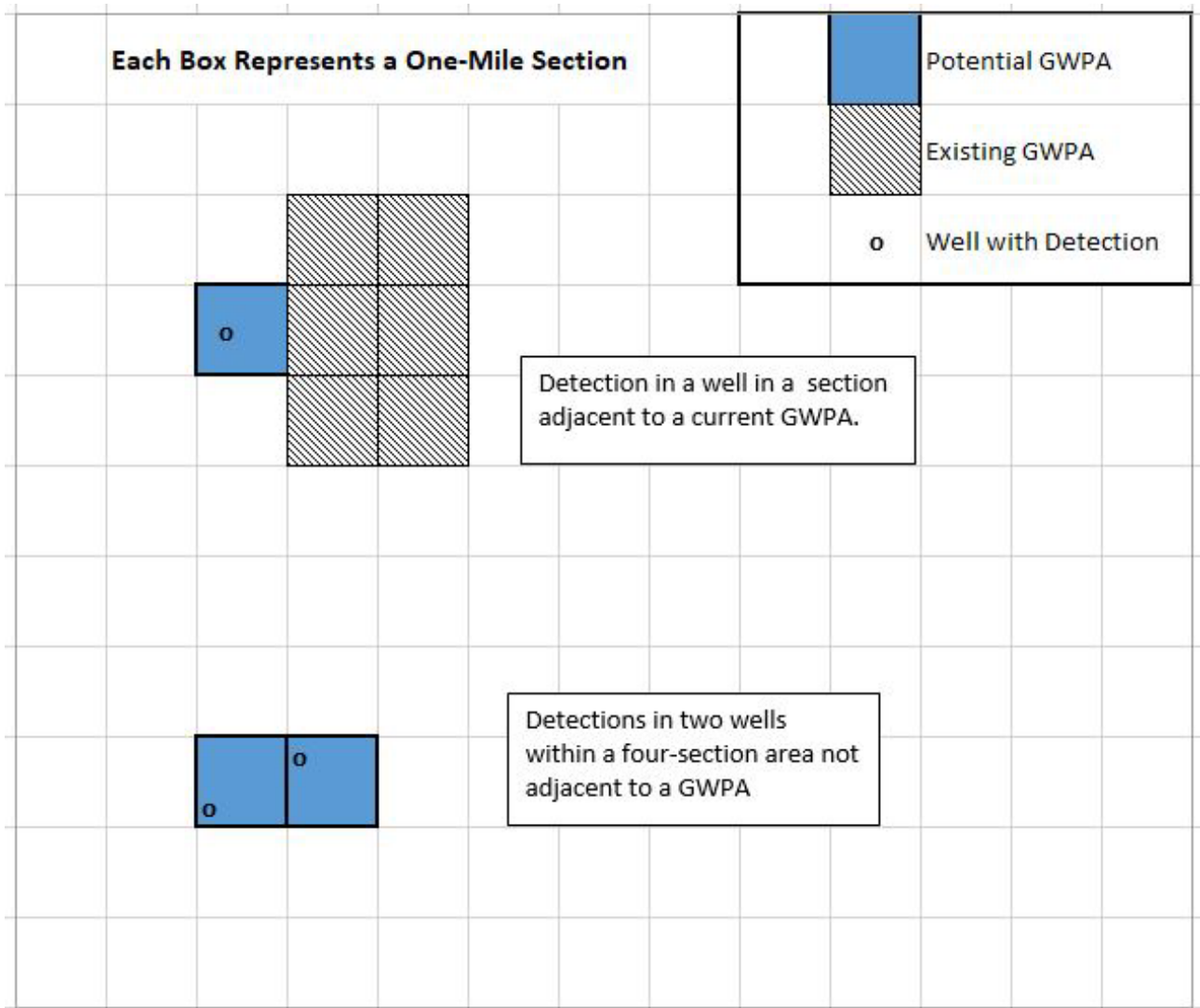
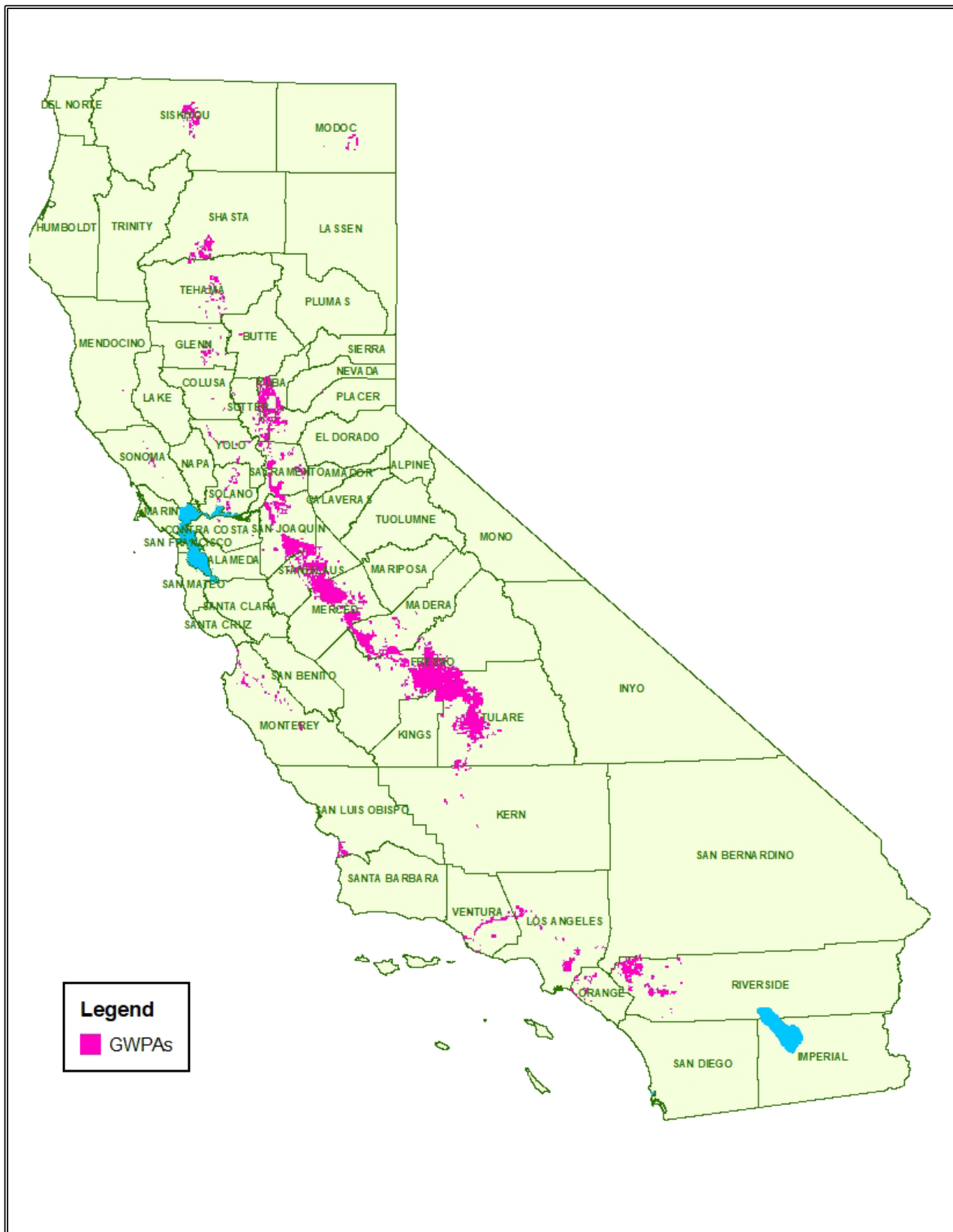


Figure A-2. Ground Water Protection Areas (GWPsAs)



Pesticide Use in GWPAs

Individuals using 3CCR section 6800(a) pesticides registered for agricultural, outdoor industrial, and outdoor institutional use in GWPAs are required to modify their use practices. Users must obtain a [Restricted Materials](#) permit from their CACs. The permit or Notice of Intent identifies the management practices required for each type of GWPA.²⁷ At least one of the following management practices (or an alternative management practice approved by the DPR Director) must be met for the following type of GWPA:

- **3CCR section 6487.3 Engineered Rights-of-Way** within a GWPA:
 - 1) Runoff is directed to a vegetated area or a fallow field;
 - 2) Compliance with a permit issued pursuant to the storm water provisions of the federal Clean Water Act; or
 - 3) The property owner complies with the requirements of 3CCR section 6487.4 (see below).

- **3CCR section 6487.4 Runoff GWPAs:**
 - 1) Application timing is limited to the period April 1 – July 31;
 - 2) The soil is disturbed prior to pesticide application;
 - 3) The pesticide is incorporated into the soil;
 - 4) The pesticide is applied as a band treatment; or
 - 5) Runoff is retained on- or off-site, or directed to a fallow field.

- **3CCR section 6487.5 Leaching GWPAs:**
 - 1) The permittee shall not apply any irrigation water for six months following application of the pesticide;
 - 2) The pesticide shall be applied to the planting bed or the berm above the level of irrigation water; or
 - 3) Irrigation shall be managed according to a specified formula.

The permittee must notify the CAC within 24 to 48 hours prior to application to give the CAC an opportunity to inspect the site. Pre-application site inspections allow CACs to determine whether the use modifications are protective and, if they are not, to revise the permit accordingly.

²⁷ More information on how DPR and CACs regulate the use of groundwater contaminants in vulnerable areas is available at: http://www.cdpr.ca.gov/docs/emon/grndwtr/gwp_id_gwpa.htm.

APPENDIX B: PRINCIPAL SAMPLING AGENCIES

The principal agencies contributing groundwater monitoring data for this annual Well Sampling Report are DPR, SWRCB, and USGS. Each agency's unique regulatory responsibilities define the pesticides selected for monitoring, type and sensitivity of laboratory analyses, well types sampled, sampling locations, and sampling frequency. For instance, DPR primarily samples shallow, domestic wells in areas where agricultural pesticides are used, while SWRCB assesses the overall quality of groundwater used for consumption (regardless of the frequency or intensity of pesticide use near sampled wells).

Department of Pesticide Regulation

DPR's Groundwater Protection Program samples groundwater as a function of its responsibilities under the PCPA. (See the **Background** section of this report for a detailed description.)

State Water Resources Control Board

SWRCB is responsible for enforcement of the federal and California Safe Drinking Water Acts. To meet the goal of ensuring delivery of safe drinking water, SWRCB's Division of Drinking Water (DDW) oversees approximately 7,500 [public water systems](#) and establishes health-protective drinking water standards. These standards, known as [maximum contaminant levels](#) (MCLs), are developed by evaluating the health risks presented by a chemical, and by assessing the technical and economic factors related to its use (such as treatment efficacy and cost). SWRCB establishes a contaminant's MCL at a level as close to the [public health goal](#)²⁸ (PHG) set by the Office of Environmental Health Hazard Assessment (OEHHA) as is technically and economically feasible, placing primary emphasis on the protection of public health (see [the MCL process](#)).

- The [Division of Drinking Water](#) (DDW) regulates public water systems to ensure the delivery of safe drinking water; oversees water recycling projects; issues permits for water treatment devices; supports and promotes water system security; and performs many other functions. DDW consists of two field operations branches and a Program Management Branch. The Northern and Southern California field operations branches are responsible for enforcing the federal and California Safe Drinking Water Acts and regulatory oversight of public water systems. The Program Management Branch includes the Data/Toxicology Office, which compiles, evaluates, and reports drinking water quality data for public water systems.
- DDW performs a role that was previously performed by the California Department of Public Health (CDPH); this role includes reporting pesticide detections in drinking water wells to DPR.

²⁸ Public Health Goals are concentrations of drinking water contaminants that pose no significant health risk if consumed for a lifetime, based on current risk assessment principles, practices, and methods.

SWRCB also monitors groundwater as a function of its Groundwater Ambient Monitoring and Assessment Program (GAMA).²⁹ This program is designed to improve groundwater quality and increase public availability of information about groundwater quality. SWRCB expanded the GAMA Program following implementation of the [Groundwater Quality Monitoring Act of 2001](#) (Part 2.76 [commencing with section 10780], Division 6 of the Water Code). This law resulted in a [publicly-accepted plan](#) to monitor and assess “priority basins”— basins that account for over 90 percent of the groundwater used in California. The GAMA Program includes four projects:

- The [GAMA Priority Basin Project](#) monitors dozens of chemicals at very low detection limits. Monitoring and assessment of priority basins are completed every ten years; trend monitoring is performed every three years. SWRCB collaborates with USGS and the Lawrence Livermore National Laboratory (LLNL) to implement the GAMA Priority Basin Project.
- The [GAMA Domestic Well Project](#) samples multiple areas in coordination with county environmental health departments. It also provides water quality information to domestic well users.
- The [GAMA Special Studies Project](#) partners with LLNL to conduct groundwater studies that evaluate nitrate, wastewater, and groundwater recharge. LLNL scientists use tools that include Tritium-Helium age dating and computer modeling. The University of California, Davis, also contributes to the GAMA Special Studies Project.
- The [GeoTracker GAMA](#) information management system enables users (scientists, regulators, water managers, educators, and the public) to access millions of data records from SWRCB and Regional Water Quality Control Boards, Department of Water Resources, DPR, and USGS. GeoTracker GAMA provides access to a Google map-based database that provides the results of groundwater quality testing, groundwater level evaluations, environmental monitoring well logs, and links to published reports.

United States Geological Survey

USGS compiles surface water, groundwater, and water quality data from local databases to develop a national information system. USGS groundwater database contains records collected from about 850,000 wells studied over the past 100 years. This well information is available via the Internet through [NWISWeb](#), the National Water Information System Web Interface.

- The USGS [Office of Groundwater](#) maintains the **Groundwater Watch** program. This program compiles data from active well networks.

²⁹ For more information about SWRCB’s GAMA Program, go to <http://www.waterboards.ca.gov/gama/>.

APPENDIX C: THE WELL INVENTORY DATABASE

In the early 1980s, DPR established the Well Inventory Database under the authority granted in FAC section 13152(c) and began collecting groundwater sampling data from public agencies. The database currently contains over 2.9 million records, including monitoring data from 30,527 public and private wells sampled for 485 different pesticides and degradates (**Figure C-1**). Over 6,600 of the wells in the database have reported detections of at least one pesticide or degradate (**Figure C-2**). The 2021 report added data for 2,662 wells sampled for pesticides or degradates; 318 of those wells had at least one reported detection (**Figure C-3**). Although approximately 45 agencies submitted data for inclusion in the database in the past, most data now added comes from DPR, SWRCB, and USGS.

The Well Inventory Database includes the following information:

- Well location by county
- Well type (domestic, agricultural, industrial, large water system)
- Well sampling agency and study number(s)
- Sample date, analysis date, analyzing laboratory
- Chemical analyzed, concentration detected, method detection limit or reporting limit
- Unusual or important notes about the detection or the analytical method
- Legal agricultural use determination/point or nonpoint source determination
- Year the analysis/detection was added to the Database

The Well Inventory Database is available for download at:

https://www.cdpr.ca.gov/docs/emon/grndwtr/well_inventory_database/index.htm.

Due to privacy concerns, DPR does not release well owner information. See DPR's policy on the release of well sampling data at:

http://www.cdpr.ca.gov/docs/emon/grndwtr/wellinv/data_policy.htm.

Figure C-2. All Wells in the DPR Well Inventory Database with Detections of Pesticides or Degradates

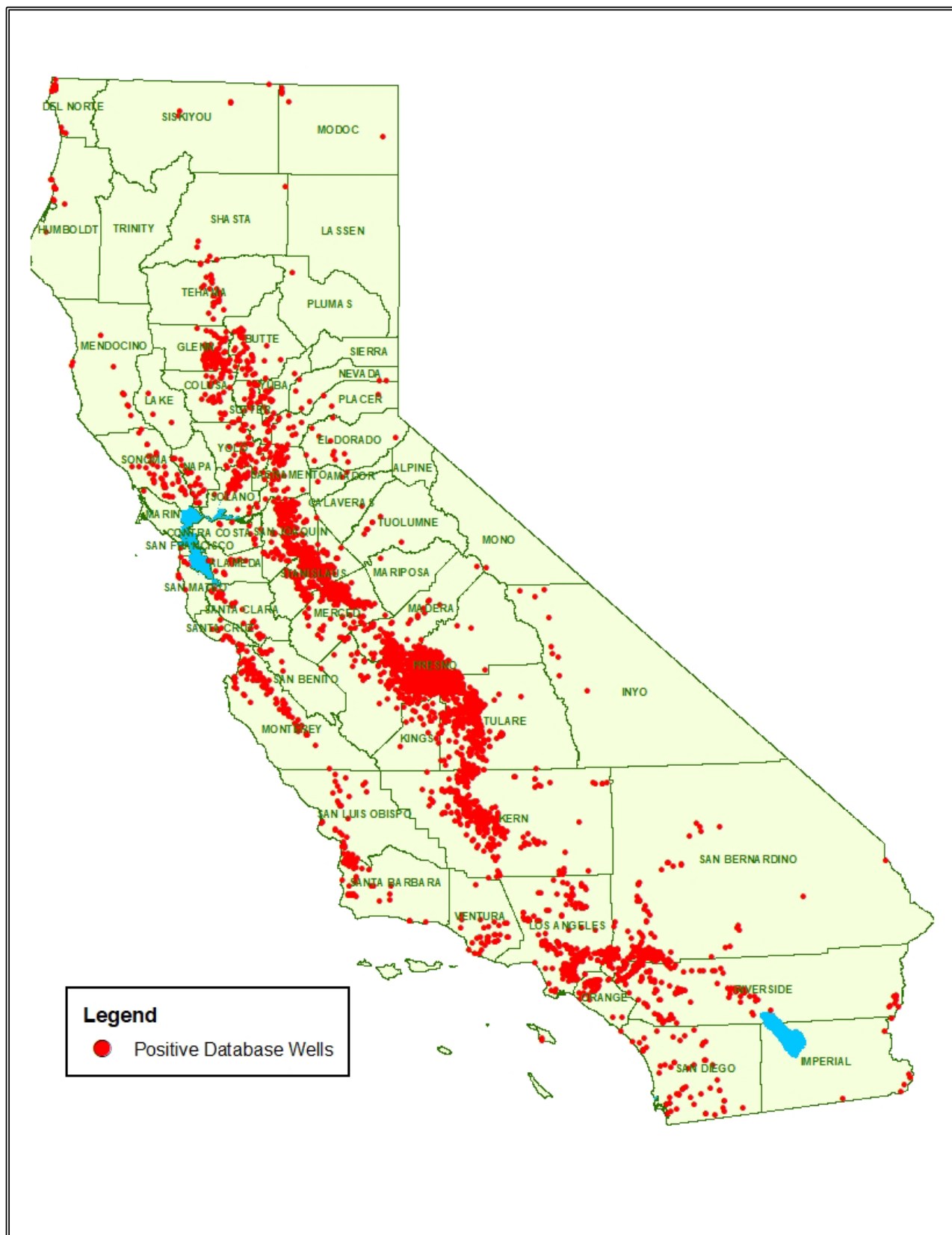
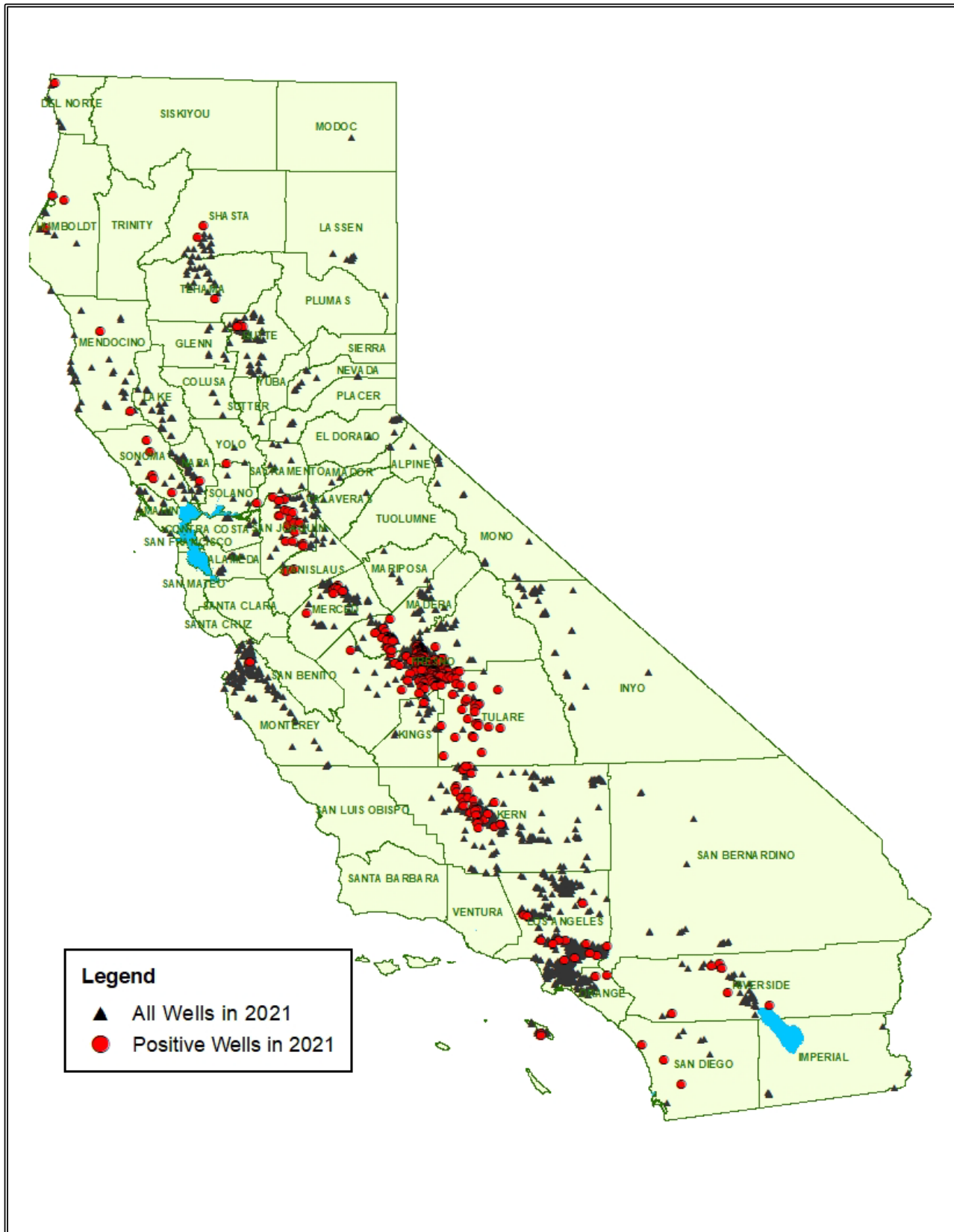


Figure C-3. Well Data Added to the DPR Well Inventory Database in the 2021 Report



APPENDIX D: WELL SAMPLING RESULTS SUMMARIZED BY COUNTY

Appendix D, Table 1, summarizes the following information for each county:

- Total number of wells sampled and tested for pesticides or degradates
- Total number of wells with reported detections
 - Any wells tested multiple times during the year were only counted once
- Total number of specific pesticides or degradates tested
- Total number of specific pesticides or degradates detected
 - A well may be tested for a single chemical or a screen of multiple chemicals, and have various chemicals reported as detected. Also, an individual chemical can be detected in several wells. Each of these scenarios is accounted for in the appropriate column as described in the header row.

Appendix D, Table 2, provides details on the detections listed in Table 1. The table only shows the counties with detections and the respective pesticides or degradates detected.

- ‘Wells Tested’ shows the number of wells in the county tested for the detected chemical
- ‘Wells With Detections’ shows the number of wells that had detections
- ‘Concentration Range’ is the concentration levels of the chemical reported in parts per billion (ppb) from the lowest to the highest detection
- ‘DPR Evaluation’ lists whether the detected pesticide or degradate is currently registered for use in California, and if the detection(s) require follow-up investigation. Detections of pesticides at levels below DPR’s screening level, pesticides previously determined not to pollute at the levels detected, and pesticides on the 6800(a) list detected in GWPA’s will not require additional follow-up. Detections of unregistered pesticides may be from historical use (i.e., DBCP), and DPR will generally not conduct follow-up investigations unless illegal use is suspected.

A list of all pesticides and degradates monitored in each county, whether detected or not, is available on request from DPR’s [Groundwater Protection Program](#).

Full Well Inventory Database downloads are available at https://www.cdpr.ca.gov/docs/emon/grndwtr/well_inventory_database/index.htm.

Table D-1. Summary of sampling results by county.

Total number of wells sampled, pesticides and degradates tested, wells with detections, and the number of specific pesticides and degradates detected for each California county in the 2021 report.

Dashes (-) = no residues were detected

County	Wells Tested	Wells With Detections	Pesticides and Degradates Tested	Individual Chemicals Detected
Alameda	30	-	52	-
Alpine	4	-	48	-
Amador	7	-	8	-
Butte	87	3	46	1
Calaveras	7	-	83	-
Colusa	4	-	22	-
Contra Costa	14	-	51	-
Del Norte	6	1	132	2
El Dorado	15	-	60	-
Fresno	437	157	161	18
Glenn	9	-	45	-
Humboldt	14	3	133	5
Imperial	8	-	33	-
Inyo	65	-	57	-
Kern	319	39	53	4
Kings	21	1	121	1
Lake	27	-	105	-
Lassen	10	-	9	-
Los Angeles	760	15	140	13
Madera	91	19	122	4
Marin	28	-	40	-
Mariposa	6	-	18	-
Mendocino	52	2	154	2
Merced	82	9	113	2
Modoc	1	-	6	-
Mono	24	-	51	-
Monterey	195	1	57	1
Napa	49	1	117	1

County	Wells Tested	Wells With Detections	Pesticides and Degradates Tested	Individual Chemicals Detected
Nevada	13	-	32	-
Orange	43	2	110	16
Placer	5	-	107	-
Riverside	41	6	81	6
Sacramento	9	1	81	3
San Bernardino	22	-	88	-
San Diego	9	3	81	5
San Francisco	1	-	33	-
San Joaquin	45	17	81	9
San Luis Obispo	1	-	4	-
Shasta	18	2	81	4
Solano	4	-	81	-
Sonoma	13	5	81	3
Stanislaus	7	2	81	2
Sutter	1	-	81	-
Tehama	20	1	81	1
Tulare	36	27	91	21
Yolo	2	1	81	1

Table D-2. Pesticides or degradates as detected by county and DPR evaluation.

County	Pesticide or Degradate Detected	Wells Tested	Wells With Detections	Concentration Range (ppb)	DPR Evaluation
Butte	DCPA degradates (non specific)	13	3	0.15 - 0.36	Degradate of a registered pesticide. DPR completed the formal review process for chlorthal-dimethyl in 2019. These degradates were found not to pollute at the levels detected (Leahy, 2018).
Del Norte	Simazine	3	1	0.005	Registered 6800(a) pesticide. The detection is below the DPR screening level.
Del Norte	Tebuthiuron	3	1	0.019	Registered pesticide. The detection is below the DPR screening level.
Fresno	1,2-D	274	4	0.005 - 0.056	Not registered for use in California since 1990.
Fresno	3,4-Dichloroaniline (degradate of diuron, linuron, propanil and iprodione)	10	4	0.004 - 0.012	Degradate of a registered 6800(a) pesticide. All four (4) detections are below the DPR screening level.
Fresno	ACET (degradate of atrazine and simazine)	52	28	0.05 - 0.45	Degradate of a registered 6800(a) pesticide. All twenty-eight (28) detections are in GWPAs.
Fresno	Atrazine	342	3	0.003 - 0.09	Registered 6800(a) pesticide. The one (1) detection above the DPR screening level is in a GWPA.
Fresno	Bromacil	266	5	0.05 - 10.3	Registered 6800(a) pesticide. All five (5) detections are in GWPAs.
Fresno	DACT (degradate of simazine)	52	33	0.05 - 3.28	Degradate of a 6800(a) registered pesticide. All thirty-three (33) detections are in GWPAs.
Fresno	DBCP	339	112	0.01 - 0.48	Not registered for use in California since 1979.
Fresno	DEA (degradate of atrazine)	52	2	0.06 - 0.14	Degradate of a registered 6800(a) pesticide. Both (2) detections are in GWPAs.
Fresno	Dieldrin	15	1	0.01	Not registered for use in California since 1986.
Fresno	Diuron	52	7	0.012 - 0.14	Registered 6800(a) pesticide. All seven (7) detections are in GWPAs.
Fresno	DSMN (degradate of norflurazon)	52	21	0.035 - 0.38	Degradate of a registered 6800(a) pesticide. All twenty-one (21) detections are in GWPAs.

County	Pesticide or Degradate Detected	Wells Tested	Wells With Detections	Concentration Range (ppb)	DPR Evaluation
Fresno	Ethylene dibromide	324	1	0.004	Not registered for use in California since 1987.
Fresno	Fipronil sulfone (degradate)	11	1	0.005	Degradate of a registered pesticide. The detection is below the DPR screening level.
Fresno	Fludioxonil	16	1	0.33	Registered Pesticide. This detection is part of an ongoing DPR study to determine the source (Kocis, 2020).
Fresno	Hexazinone	62	1	0.013	Registered pesticide. The detection is below the DPR screening level.
Fresno	Imidacloprid	16	5	0.05 - 0.11	Registered pesticide. The five (5) wells are included in DPR's Legal Agricultural Use determination for imidacloprid (Aggarwal, 2021b).
Fresno	Norflurazon	52	12	0.05 - 0.267	Registered 6800(a) pesticide. All twelve (12) wells are in GWPAs.
Fresno	Simazine	342	30	0.003 - 0.12	Registered 6800(a) pesticide. Twenty-six (26) wells with detections above the DPR screening level are in GWPAs. The other four (4) wells have detections below the DPR screening level.
Humboldt	Carbon disulfide	7	1	0.1	Not registered for use in California since 1987.
Humboldt	Dieldrin	4	1	0.002	Not registered for use in California since 1986.
Humboldt	DCPA	4	1	0.003	Registered pesticide. The detection is below the DPR screening level.
Humboldt	Tebuthiuron	5	1	0.015	Registered pesticide. The detection is below the DPR screening level.
Humboldt	Tefluthrin	4	1	0.004	Never registered for use in California.
Kern	1,2-D	175	4	0.5 - 0.85	Not registered for use in California since 1990.
Kern	Carbon disulfide	2	1	1	Not registered for use in California since 1987.
Kern	DBCP	159	33	0.01 - 0.98	Not registered for use in California since 1979.
Kern	Ethylene dibromide	148	2	0.021 - 0.39	Not registered for use in California since 1987.
Kings	3,4-Dichloroaniline (degradate of diuron, linuron, propanil and iprodione)	5	1	0.004	Degradate of a registered 6800(a) pesticide. The detection is below the DPR screening level.

County	Pesticide or Degradate Detected	Wells Tested	Wells With Detections	Concentration Range (ppb)	DPR Evaluation
Los Angeles	1,2-D	752	2	0.005 - 0.006	Not registered for use in California since 1990.
Los Angeles	3,4-Dichloroaniline (degradate of diuron, linuron, propanil and iprodione)	8	1	0.006	Degradate of a registered 6800(a) pesticide. The detection is below the DPR screening level.
Los Angeles	Atrazine	177	6	0.005 - 0.016	Registered 6800(a) pesticide. All six (6) wells with detections are below the DPR screening level.
Los Angeles	Carbon disulfide	234	1	0.54	Not registered for use in California since 1987.
Los Angeles	Carbophenothion	41	2	0.11 - 0.12	Not registered for use in California since 1987.
Los Angeles	DBCP	175	2	0.026 - 0.05	Not registered for use in California since 1979.
Los Angeles	DCPA degradates (non specific)	98	2	0.17 - 0.67	Degradate of a registered pesticide. DPR completed the formal review process for chlorthal-dimethyl in 2019. The degradates were found not to pollute at the levels detected (Leahy, 2018).
Los Angeles	Ethylene dichloride	8	2	0.03 - 0.08	Not registered for use in California since 1987.
Los Angeles	Hexazinone	8	1	0.023	Registered pesticide. The detection is below the DPR screening level.
Los Angeles	Prometon	50	1	0.007	Registered 6800(a) pesticide. The detection is below the DPR screening level.
Los Angeles	Simazine	177	6	0.006 - 0.051	Registered 6800(a) pesticide. Two (2) wells have detections are above the DPR screening level. One (1) well is in a GWPA. DPR will evaluate the other detection.
Los Angeles	Tebuthiuron	8	2	0.015 - 0.017	Registered pesticide. Both (2) detections are below the DPR screening level.
Los Angeles	Tefluthrin	8	1	0.005	Never registered for use in California.
Madera	1,2-D	57	1	0.038	Not registered for use in California since 1990.
Madera	Atrazine	59	1	0.005	Registered 6800(a) pesticide. The detection is below the DPR screening level.
Madera	Carbon disulfide	5	1	0.2	Not registered for use in California since 1987.
Madera	DBCP	61	18	0.012 - 0.71	Not registered for use in California since 1979.

Mendocino	Carbon disulfide	5	1	0.1	Not registered for use in California since 1987.
Mendocino	Simazine	38	1	0.005	Registered 6800(a) pesticide. The detection is below the DPR screening level.
Merced	DBCP	56	8	0.01 - 0.088	Not registered for use in California since 1979.
Merced	Simazine	43	1	0.009	Registered 6800(a) pesticide. The detection is below the DPR screening level.
Monterey	DCPA degradates (non specific)	6	1	0.25	Degradate of a registered pesticide. DPR completed the formal review process for chlorthal-dimethyl in 2019. The degradates were found not to pollute at the levels detected (Leahy, 2018).
Napa	DCPA degradates (non specific)	11	1	1.5	Degradate of a registered pesticide. DPR completed the formal review process for chlorthal-dimethyl in 2019. The degradates were found not to pollute at the levels detected (Leahy, 2018).
Orange	Atrazine	33	1	0.019	Registered 6800(a) pesticide. The detection is below the DPR screening level.
Orange	Bromacil	26	1	0.008	Registered 6800(a) pesticide. The detection is below the DPR screening level.
Orange	DCEU (degradate of diuron)	8	2	0.021 - 0.079	Degradate of a registered 6800(a) pesticide. The one (1) detection above the DPR screening level is in a GWPA.
Orange	Dechlorometolachlor (degradate of metolachlor)	8	2	0.003 - 0.004	Degradate of a registered pesticide. Both (2) detections are below the DPR screening level.
Orange	Diuron	8	1	0.036	Registered 6800(a) pesticide. The detection is below the DPR screening level.
Orange	Fipronil	8	1	0.002	Registered Pesticide. The detection is below the DPR screening level.
Orange	Fipronil-carboxamide (degradate of fipronil)	8	2	0.004	Degradate of a registered pesticide. Both (2) detections are below the DPR screening level.
Orange	Hexazinone	8	2	0.003 - 0.013	Registered pesticide. Both (2) detections are below the DPR screening level.

Orange	Metalaxyl	8	1	0.001	Registered pesticide. The detection is below the DPR screening level.
Orange	Methoxyfenozide	8	1	0.002	Registered pesticide. The detection is below the DPR screening level.
Orange	OIET (degradate of atrazine)	8	2	0.011 - 0.034	Degradate of a registered pesticide. Both (2) detections are below the DPR screening level.
Orange	Prometon	8	2	0.006 - 0.009	Registered 6800(a) pesticide. Both (2) detections are below the DPR screening level.
Orange	Propiconazole	8	1	0.003	Registered pesticide. The detection is below the DPR screening level.
Orange	Simazine	26	2	0.016 - 0.171	Registered 6800(a) pesticide. One (1) detection above the DPR screening level is in a GWPA. The other detection is below the DPR screening level.
Orange	Sulfometuron methyl	8	1	0.007	Registered pesticide. The detection is below the DPR screening level.
Orange	Tebuthiuron	8	2	0.004 - 0.022	Registered pesticide. Both (2) detections are below the DPR screening level.
Riverside	Carbon disulfide	41	3	0.1 - 0.4	Not registered for use in California since 1987.
Riverside	Dieldrin	41	2	0.002	Not registered for use in California since 1986.
Riverside	Hexazinone	41	1	0.004	Registered pesticide. The detection is below the DPR screening level.
Riverside	Metolachlor	41	1	0.007	Registered pesticide. The detection is below the DPR screening level.
Riverside	Simazine	41	1	0.007	Registered 6800(a) pesticide. The detection is below the DPR screening level.
Riverside	Tefluthrin	41	1	0.005	Never registered for use in California.
Sacramento	Carbon disulfide	9	1	0.1	Not registered for use in California since 1987.
Sacramento	Hexazinone	9	1	0.01	Registered pesticide. The detection is below the DPR screening level.
Sacramento	Molinate	9	1	0.013	Registered pesticide. The detection is below the DPR screening level.
San Diego	1,2-D	9	1	0.243	Not registered for use in California since 1990.
San Diego	Fipronil sulfone (degradate)	9	1	0.005	Degradate of a registered pesticide. The detection is below the DPR screening level.

San Diego	Prometon	9	1	0.022	Registered 6800(a) pesticide. The detection is below the DPR screening level.
San Diego	Simazine	9	2	0.004 - 0.006	Registered 6800(a) pesticide. Both (2) detections are below the DPR screening level.
San Diego	Tebuthiuron	9	1	0.086	Registered pesticide. DPR will evaluate the detection.
San Joaquin	1,2-D	45	8	0.001 - 0.023	Not registered for use in California since 1990.
San Joaquin	3,5-Dichloro aniline (degradate of dichloran)	45	1	0.003	Degradate of a registered pesticide. The detection is below the DPR screening level.
San Joaquin	Atrazine	45	5	0.002 - 0.018	Registered 6800(a) pesticide. All five (5) detections are below the DPR screening level.
San Joaquin	Carbon disulfide	45	2	0.1-0.4	Not registered for use in California since 1987.
San Joaquin	DBCP	45	8	0.002 - 0.203	Not registered for use in California since 1979.
San Joaquin	Dieldrin	45	2	0.002	Not registered for use in California since 1986.
San Joaquin	Ethylene dibromide	45	1	0.007	Not registered for use in California since 1987.
San Joaquin	Metolachlor	45	3	0.006 - 0.008	Registered pesticide. All three (3) detections are below the DPR screening level.
San Joaquin	Simazine	45	6	0.003 - 0.035	Registered 6800(a) pesticide. All six (6) detections are below the DPR screening level.
Shasta	Atrazine	18	1	0.005	Registered 6800(a) pesticide. The detection is below the DPR screening level.
Shasta	Cyfluthrin	18	1	0.002	Registered pesticide. The detection is below the DPR screening level.
Shasta	Prometon	18	1	0.004	Registered 6800(a) pesticide. The detection is below the DPR screening level.
Shasta	Simazine	18	1	0.007	Registered 6800(a) pesticide. The detection is below the DPR screening level.
Sonoma	Atrazine	13	2	0.005	Registered 6800(a) pesticide. Both (2) detections are below the DPR screening level.
Sonoma	Benefin (benfluralin)	13	1	0.006	Registered pesticide. The detection is below the DPR screening level.
Sonoma	Simazine	13	3	0.006 - 0.007	Registered 6800(a) pesticide. All three (3) detections are below the DPR screening level.

Stanislaus	DBCP	7	1	0.013	Not registered for use in California since 1979.
Stanislaus	Simazine	7	1	0.007	Registered 6800(a) pesticide. The detection is below the DPR screening level.
Tehama	DCCA	20	1	0.002	Registered pesticide. The detection is below the DPR screening level.
Tulare	1,2-D	20	3	0.003 - 0.138	Not registered for use in California since 1990.
Tulare	3,4-Dichloroaniline (degradate of diuron, linuron, propanil and iprodione)	18	8	0.002 - 0.006	Degradate of a registered 6800(a) pesticide. All eight (8) detections are below the DPR screening level.
Tulare	3,5-Dichloro aniline (degradate of dichloran)	18	1	0.002	Degradate of a registered pesticide. The detection is below the DPR screening level.
Tulare	ACET (degradate of atrazine and simazine)	16	12	0.05 - 0.81	Degradate of a registered 6800(a) pesticide. All twelve (12) wells are in GWPAs.
Tulare	Atrazine	36	3	0.005 - 0.009	Registered 6800(a) pesticide. All three (3) detections are below the DPR screening level.
Tulare	Benefin (benfluralin)	18	1	0.006	Registered pesticide. The detection is below the DPR screening level.
Tulare	Bromacil	16	8	0.3 - 1.05	Registered 6800(a) pesticide. All eight (8) wells are in GWPAs.
Tulare	Carbon disulfide	18	1	0.4	Not registered for use in California since 1987.
Tulare	Cyfluthrin	18	1	0.006	Registered pesticide. The detection is below the DPR screening level.
Tulare	DACT (degradate of simazine)	16	12	0.17 - 4.91	Degradate of a 6800(a) registered pesticide. All twelve (12) detections are in GWPAs.
Tulare	Dieldrin	18	1	0.002	Not registered for use in California since 1986.
Tulare	Diuron	16	1	0.06	Registered 6800(a) pesticide. The well is in a GWPA.
Tulare	DCCA	18	2	0.002	Registered pesticide. Both (2) detections are below the DPR screening level.
Tulare	DSMN (degradate of norflurazon)	16	4	0.08 - 0.97	Degradate of a registered 6800(a) pesticide. All four (4) wells are in GWPAs.
Tulare	Ethylene dibromide	20	1	0.004	Not registered for use in California since 1987.
Tulare	Hexazinone	34	1	0.006	Registered pesticide. The detection is below the DPR screening level.

Tulare	Norflurazon	16	2	0.25 - 0.34	Registered 6800(a) pesticide. Both (2) wells are in GWPAs.
Tulare	Simazine	36	17	0.005 - 0.08	Registered 6800(a) pesticide. The six (6) wells with detections above the DPR screening level are in GWPAs. The other eleven (11) wells with detections are below the DPR screening level.
Tulare	Tebuthiuron	18	1	0.02	Registered pesticide. The detection is below the DPR screening level.
Tulare	Tefluthrin	18	4	0.003 - 0.004	Never registered for use in California.
Tulare	Trifluralin	18	1	0.004	Registered pesticide. The detection is below the DPR screening level.
Yolo	Simazine	2	1	0.003	Registered 6800(a) pesticide. The detection is below the DPR screening level.

GLOSSARY OF TERMS

TERM	DEFINITION
AB 2021	See “Pesticide Contamination Prevention Act.”
AB 2701	AB 2701 (Chapter 644, Statutes of 2004) amended the Pesticide Contamination Prevention Act (PCPA) to require DPR to post specified information on sampling for pesticide residues in California groundwater to its website. This law replaced the previous requirement that DPR submit the sampling information in a written report to the Legislature.
Active ingredient	The chemical or chemicals in a pesticide formulation that are biologically active and are capable, in themselves, of preventing, destroying, repelling, or mitigating insects, fungi, rodents, weeds, or other pests. The remainder of the product consists of one or more <i>inert ingredients</i> (such as water, solvents, emulsifiers, surfactants, clay, and propellants), for reasons other than pesticidal activity.
Agricultural Commissioner	Local officials whose duties include pesticide use enforcement in their counties.
Agricultural use	<p>The use of any pesticide, method, or device for the control of plant or animal pests, or any other pests, or the use of any pesticide to regulate plant growth or defoliation of plants. Agricultural use includes but is not limited to commercial production of animals or plants (including forest), parks, golf courses, cemeteries, roadsides, rights-of-way, and nurseries. It excludes pesticides intended for:</p> <ul style="list-style-type: none"> a) Home use b) Structural pest control c) Industrial or institutional use d) The control of an animal pest under the written prescription of a veterinarian e) Uses by certain local districts or agencies that operate under a cooperative agreement with the California Department of Public Health, such as many mosquito abatement districts. <p>See also “legal agricultural use.”</p>

GLOSSARY

TERM	DEFINITION
Analysis	For well water sampling data in the Well Inventory Database, it is the act of determining whether a substance is present in a water sample using laboratory methodology.
CalEPA	California Environmental Protection Agency. Comprised of the Department of Pesticide Regulation, the Department of Toxic Substances Control, the State Water Resources Control Board, the California Air Resources Board, the Department of Resources Recycling and Recovery (CalRecycle), and the Office of Environmental Health Hazard Assessment.
California Code of Regulations (CCR)	Regulations formally adopted by state agencies. Regulations about pesticides and pest control operations are mainly in Title 3, Division 6 and Title 16, Division 19.
Chemigation	Applying pesticide through an irrigation system or mixing with irrigation water before the water is applied to the soil or crop.
Degradation	<p>With respect to pesticides, degradation is the breakdown of the parent chemical by the action of microbes, water, air, sunlight, or other agents into daughter products (degradates) that may undergo further degradation by similar processes.</p> <p>With respect to groundwater quality, degradation refers to a reduction of water quality.</p>
Detection	A well water sample in which the presence of a pesticide is detected at or above the minimum detection limit of the analytical instruments used for analysis of the pesticide under investigation. A detection may be designated as confirmed or unconfirmed.
Director	In the context of this report, “Director” means Director of the Department of Pesticide Regulation.
Environmental fate	Describes the processes by which pesticides move and are transformed in the environment, including persistence in air, water, and soil; reactivity and degradation; migration in groundwater; and bioaccumulation in aquatic or terrestrial organisms.
FAC	Food and Agricultural Code. Divisions 6 and 7 of the FAC pertain to the registration, sale, and use of pesticides.
Formulation	Pesticide product as sold, usually a mixture of active and inert ingredients.

GLOSSARY

TERM	DEFINITION
Groundwater	Water found below the surface of the land, usually in porous rock formations.
Ground Water Protection Area (GWPA)	A geographic area defined in state regulations as vulnerable to pesticide contamination through the mechanism of either leaching or runoff.
Groundwater Protection List (GWPL)	A list of pesticides having the potential to pollute groundwater included in 3CCR section 6800.
Inert ingredient	Any substance other than an active ingredient which is intentionally included in a pesticide product. Also known as “other” ingredients, they do not attack a particular pest but may be chemically or biologically active.
Leaching	A pathway by which agricultural pesticides may reach groundwater; the process by which residues are dissolved in soil water and follow the movement of water through the soil matrix as it recharges a groundwater aquifer.
Legal agricultural use	The application of a pesticide, according to its labeled directions and in accordance with federal and state laws and regulations, for agricultural use as defined in FAC section 11408. See also “agricultural use.”
Maximum contaminant level (MCL)	MCLs are health protective drinking water standards to be met by public water systems. MCLs consider not only chemicals' health risks but also factors such as their detectability, treatability, and the cost of treatment.
Maximum contaminant level goal (MCLG)	The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety and are non-enforceable public health goals.
Mitigation measure	A use practice designed to reduce the risk of harm to people or the environment.
Model	Mathematical equations that represent certain processes. These equations can be implemented in a computer program to facilitate calculations and to test model predictions against measured data.

GLOSSARY

TERM	DEFINITION
Monitoring well	A well principally used for any of the follow purposes: (1) observing groundwater levels and flow conditions, (2) obtaining samples for determining groundwater quality, or (3) evaluating hydraulic properties of water-bearing strata.
Non-agricultural use	<i>See "agricultural use."</i>
Nonpoint source	Pollution sources that are diffuse and do not have a distinct discharge point (compare with <i>point source</i>), for example, applications of agricultural pesticides to crops.
Permit	Time- and site-specific permits are issued by County Agricultural Commissioners to use pesticides designated as restricted materials.
Pest	Any undesired insect, rodent, nematode, fungus, bird, vertebrate, invertebrate, weed, virus, bacteria, or other microorganisms (except microorganisms on or in humans or animals) declared to be injurious to human health or the environment.
Pest control	The use or application of any pesticide. It also means using any substance, method, or device to control pests; prevent, destroy, repel, mitigate, or correct any pest infestation or disorder of plants; or inhibit, regulate, stimulate, or otherwise alter plant growth by direct application to plants.
Pesticide	A substance, or mixture of substances, intended to defoliate plants, regulate plant growth, or prevent, destroy, repel, or mitigate any insects, fungi, bacteria, weeds, rodents, predatory animal, or any other form of plant or animal life declared to be a pest detrimental to vegetation, man, animal, or households, or any environment. Also, in California only, a spray adjuvant.
Pesticide Contamination Prevention Act (PCPA, AB 2021)	A law, effective January 1, 1986, added agricultural use sections 13141 through 13152 to Division 7 of the FAC. The PCPA requires the following: 1) each registrant of an agricultural use pesticide to submit environmental fate data to DPR; 2) the Director to use those data to establish a list of pesticides with the potential to pollute groundwater (GWPL); 3) the Director to monitor groundwater for these pesticides; 4) all local, county, and state agencies to report to DPR the results of pesticides sampled in groundwater; 5) the Director to maintain a specified well sampling database and to post certain information annually on DPR's website about pesticides in groundwater; and 6) a specified subcommittee and the Director to conduct a formal review to determine if continued use of a pesticide can be allowed if it is detected and verified in groundwater due to legal agricultural use.

GLOSSARY

TERM	DEFINITION
Pesticide Management Zone (PMZ)	A geographic surveying unit of approximately one-square-mile, considered vulnerable to groundwater contamination based on detections of pesticides or pesticide degradates in groundwater due to agricultural use. PMZs were formally listed in 3CCR section 6802 and were pesticide specific. The use of a pesticide inside its PMZs was subject to certain groundwater protection restrictions and requirements. All PMZs were reclassified as GWPAs in May 2004.
Point source	A source of contamination, such as a spill or at a waste site that is initially deposited and concentrated in a small, well-defined area.
Pollution	Food and Agriculture Code section 13142 defines “ <i>pollution</i> ” as “the consequence of polluting,” and “ <i>pollute</i> ” as “...to introduce a product into the groundwaters of the state resulting in an active ingredient, other specified ingredient, or a degradation product of a pesticide above a level that does not cause adverse health effects, accounting for an adequate margin of safety.”
Public health goal (PHG)	OEHHA establishes PHGs. Based on current risk assessment principles, practices, and methods, PHGs are concentrations of drinking water contaminants that pose no significant health risk if consumed for a lifetime. OEHHA establishes PHGs pursuant to Health and Safety Code section 116365(c) for contaminants with MCLs.
Range	When used in the context of mapping locations, a range is a single series or row of townships, each six miles square, extending parallel to, and numbered east and west from, a survey base meridian line. A range is a vertical column of townships.
Registered pesticide	A pesticide product approved by the U.S. EPA and DPR for use in California.
Regulations	State agencies adopt regulations to implement or clarify statutes enacted by the California Legislature. They can also be adopted in response to federal legislation, court decisions, changing technologies, and concerns for the health and well-being of the residents of California.

GLOSSARY

TERM	DEFINITION
Reporting limit	<p>The minimum value for an analysis method and chemical that a reporting laboratory/agency lists they will accept as a valid detection of that chemical. Values below that level may not be reported or may be reported as a trace. The Reporting Limit value should be greater than zero. In this document, a “Reporting Limit” of zero (0) indicates an agency did not specify a Reporting Limit in their data.</p> <p>DPR defines the reporting limit as the lowest amount detected following the analytical method set at a level high enough to account for matrix effects (1 to 5 times the method detection limit). Whereas trace concentrations are the concentrations between the method detection limit and the reporting limit and may not be as reliably quantified. Other agencies use different terminology and standards for their limits.</p>
Restricted material	<p>Restricted materials are pesticides deemed to have a higher potential to cause harm to public health, farm workers, domestic animals, honeybees, the environment, wildlife, or other crops compared to other pesticides. With certain exceptions, restricted materials may be purchased and used only by or under the supervision of a certified commercial or private applicator under a permit issued by the County Agricultural Commissioner (CAC).</p>
Senate Bill (SB) 1117	<p>SB 1117 of 2014 amended the Pesticide Contamination Prevention Act (PCPA) to require DPR to regulate each active ingredient, other specified ingredient, or degradation product of a pesticide on the GWPL that is detected as a result of legal agricultural use. It also revises the information that DPR is required to post on its website to include pesticide degradation products and other specified ingredients.</p> <p>SB 1117 also revises the information included in the GWPL to include not only each active ingredient, but other specified ingredients or degradation product(s) of a pesticide that, when applied, have the potential to pollute groundwater. It also requires DPR’s Director—in consultation with a specified subcommittee of the Director’s Pesticide Registration and Evaluation Committee—to develop a peer-reviewed method to determine pollution potential using specific numerical values.</p>
Section	<p>Section/Township/Range: Public Land Survey System units. A section is a one-square-mile block of land containing 640 acres. A township typically has 36 sections. A range is a vertical column of townships.</p>

GLOSSARY

TERM	DEFINITION
Specific numerical values (SNV)	<p>The PCPA requires certain numeric threshold values to be established for the following physical and chemical properties of pesticide active ingredients: water solubility, soil adsorption coefficient, hydrolysis, aerobic and anaerobic soil metabolism, and field dissipation (the field dissipation SNV has not been established). The PCPA associates these properties with the longevity and mobility of a pesticide in the soil and requires the establishment of SNVs in regulation as a means of predicting which pesticides are likely to pollute groundwater.</p>
Township	<p>When used in the context of mapping locations, a township is a public land surveying unit that is a square parcel of land, six miles on each side. The location of a township is established as being x number of six-mile units east or west of a north-south line running through an initial point (called the “principal meridian”) and x number of six-mile units north or south of an east-west line running through another point (called the “baseline”).</p> <p>A township typically has 36 sections.</p>
Well Inventory Database	<p>A statewide database, required by the PCPA and maintained by DPR, of wells sampled for pesticides and pesticide degradates.</p>