Department of Pesticide Regulation

Gavin Newsom
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MEMORANDUM

TO: Joy Dias, Supervisor
Groundwater Protection Program
Environmental Monitoring Branch

VIA: Shelley DuTeaux, PhD MPH, Chief *[original signed by S. DuTeaux]*
Human Health Assessment Branch

FROM: Pete Lohstroh, PhD, Senior Toxicologist *[original signed by P. Lohstroh]*
Toxicology and Dose Response Assessment Section
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Risk Assessment Section

DATE: April 13, 2021

SUBJECT: UPDATED RISKS FROM HUMAN EXPOSURE TO IMIDACLOPRID RESIDUES IN WELL WATER

On October 14, 2020, the Department of Pesticide Regulation's (DPR) Human Health Assessment (HHA) Branch was notified by the Environmental Monitoring Branch that imidacloprid was detected in the water of 15 of 309 total wells that were monitored. The detection levels ranged from 0.054 to 5.97 parts per billion (ppb) with an analytical reporting limit (RL) of 0.05 ppb. The Environmental Monitoring Branch requested that HHA determine if there is a health concern for individuals using these wells as a source of drinking water (see request, Appendix 1). This memo is in response to that request and provides an update to an earlier well water analysis issued in 2018 (DPR, 2018).

A drinking water exposure assessment of imidacloprid will be part of a human health risk assessment currently in preparation. The groundwater residue dataset evaluated here is the same as that being incorporated into the full risk assessment. Other sources of data for imidacloprid residues in drinking water are provided for comparison and consistency with the forthcoming risk assessment (see Sources of Drinking Water Residue Data for Imidacloprid).

Conclusions and Recommendations:

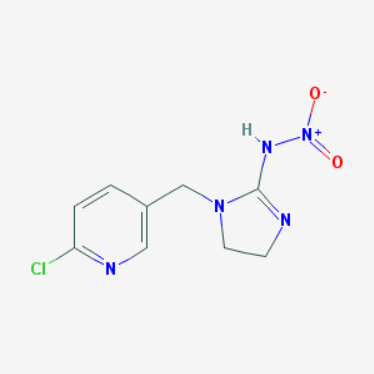
1. The human health risk to the maximum level of imidacloprid measured in well water was evaluated by acute and chronic drinking water exposure analyses using toxicological endpoints established by DPR and consumption rates for drinking water based on the National Health and Nutrition Examination Survey (NHANES) 2005-2010 database. Exposures were evaluated for the US population and for sensitive subpopulations, including infants, children, and women of childbearing age.

2. The results indicate that the detected imidacloprid concentrations in California well water, including the highest residue of 5.97 ppb, do not pose acute or chronic health risks to humans.

3. Based on this assessment, HHA recommends that imidacloprid detections in California wells be compared to the reference level of 283 ppb established previously (DPR, 2018). Residues higher than this level may pose a health concern and should be sent to HHA for further evaluation.

Background

Technical Name: Imidacloprid
Chemical name: N-[1-[(6-chloropyridin-3-yl)methyl]-4,5-dihydroimidazol-2-yl]nitramide; Chemical Abstracts Service Registry Number (CAS) 138261-41-3 (NIH, 2018)
Chemical Structure:



Imidacloprid is a neurotoxic insecticide that belongs to the class of neonicotinoid pesticides. The toxicity of imidacloprid is largely due to interference of neurotransmission via the nicotinic cholinergic nervous system (DPR, 2006). Exposure to imidacloprid may cause loss of coordination, tremors, decreased activity, reduced body temperature, and coma or death at high doses. Imidacloprid is a Category II (moderate) acute oral toxicant[1] based on its median lethal oral dose in mice (LD_{50}; Category II LD_{50} >50 – 500 mg/kg) (DPR, 2006). In acute, subchronic and chronic studies in rats, mice and dogs, the primary target organs of imidacloprid toxicity

[1] Acute Toxicity Categories. US EPA Label Review Manual Chapter 7: Precautionary Statements. US Environmental Protection Agency, Office of Pesticide Programs, Registration Division. Revised March 2018. https://www.epa.gov/sites/production/files/2018-04/documents/chap-07-mar-2018.pdf

were the nervous system, liver, and thyroid gland (DPR, 2006). The United States Environmental Protection Agency (US EPA) does not classify imidacloprid as a carcinogen, designating it as a Group E chemical showing evidence of non-carcinogenicity for humans (US EPA, 2010).

Imidacloprid is designated as having the potential to pollute groundwater pursuant to Section 13145 of the Food and Agricultural Code, and is listed on the Groundwater Protection List (Title 3, California Code of Regulations, Section 6800).

Summary of Imidacloprid Toxicology

In 2006, DPR completed a risk characterization document (RCD) for imidacloprid in which risk from food and drinking water exposures in the general population was assessed (DPR, 2006). DPR reviewed the available database that consisted of studies submitted by the registrant or published literature covering different routes and durations of exposure. Thyroid toxicity and neurotoxicity in adults and developing organisms were identified as the most sensitive effects.

The critical acute point of departure (POD) was a no-observed-effects-level (NOEL) of 5.5 mg/kg/day from a developmental neurotoxicity study in rats (Sheets, 2001). This POD was based on significant decreases in the dimensions of brain structures in young rats (postnatal day 11 pups) after 32 doses to the dams during gestation and lactation. The acute POD is also applicable for repeated (subchronic or chronic) exposures to imidacloprid because the magnitude is similar to the critical chronic NOEL of 5.7 mg/kg/day based on toxicity to the thyroid gland in chronic studies using adult rats (Eiben, 1991; Eiben and Kaliner, 1991). The acute POD for developmental neurotoxicity in rats (5.5 mg/kg/day) was used to evaluate both acute and chronic risks from exposure to imidacloprid residues in groundwater for women of childbearing age, infants and children for purposes of this memo.

The 2006 RCD established imidacloprid as a neurotoxicant affecting both adult and developing organisms. The RCD also provided detailed evaluations of other endpoints, including those corresponding to reproductive and developmental toxicity, genotoxicity, and oncogenicity. Imidacloprid caused effects on development and reproduction, however these effects occurred at doses higher than those eliciting developmental neurotoxicity or thyroid toxicity. Imidacloprid does not show clear potential to cause gene mutations, chromosome damage, or cancer. In conclusion, the critical PODs established in the DPR's 2006 RCD based on developmental neurotoxicity and thyroid toxicity are considered to be protective of all other effects for corresponding routes and durations.

Risk Evaluation of Imidacloprid Well Water Residues

Groundwater Exposure Analysis

HHA estimated the acute and chronic exposures to imidacloprid in drinking water using the Dietary Exposure Evaluation Model - Food Commodity Intake Database (DEEM-FCID, version 4.02, 5-10c) and the NHANES/"What We Eat in America" (WWEIA). The NHANES/WWEIA is a collection of two-day dietary survey data (including drinking water consumption) from 2005 to 2010 for the US population and select subgroups (US EPA, 2014). The 95th percentile exposures were used for the acute analysis, while 2-day average exposures were used for the chronic analysis (DPR, 2009). The information on 2-day, nonconsecutive food intake is used as a surrogate for chronic consumption patterns in a population. HHA uses the 95th percentile of the exposure levels for each population subgroup as the default upper bound of acute exposures. The maximum detected level of imidacloprid in well water (5.97 ppb) was used for both the acute and chronic analyses because each detection reported in the request was from a discrete well. Averaging exposure from residue levels in samples from multiple wells would not have been appropriate in this case because HHA uses the conservative assumption that the user of the well obtains drinking water exclusively from that source.

The NOEL of 5.5 mg/kg/day based on effects in the developmental neurotoxicity study in rats (Sheets, 2001) was used to calculate the acute or chronic risk in terms of margins of exposure (MOE; ratio of the NOEL over an estimate of human exposure).The target MOE was established at 100 for both acute and chronic risk, assuming that humans are 10 times more sensitive than rats and that there is a 10-fold variation in the sensitivity of humans. A calculated MOE lower than the target (100) indicates a potential health concern.

Acute Exposure: At the 95th exposure percentile, the estimated acute exposures to imidacloprid ranged from 0.272 µg/kg/day for adults 50 to 99 years of age to 1.162 µg/kg/day for non-nursing infants.

Chronic Exposure: Estimates for chronic exposure to imidacloprid residues in drinking water ranged from 0.079 µg/kg/day for males 13 to 19 years of age to 0.594 µg/kg/day for non-nursing infants.

Acute Risk: Acute MOEs at the 95th percentile exposure were greater than 4,700 for the US population and all population subgroups, thus indicating no risk.

Chronic Risk: Chronic MOEs were greater than 9,000 for the total US population and all population subgroups, thus indicating no risk.

Calculation of DPR Human Health Reference Levels for Imidacloprid

HHA calculated a DPR Human Health Reference Level (HHRL) for imidacloprid to be used by Environmental Monitoring Branch as a guide when requesting future human health evaluations for imidacloprid residues detected in groundwater and recommend that it be used to screen future groundwater residue detections (DPR, 2018). The reference level is the pesticide concentration (residue level) in drinking water that will result in a 95th percentile MOE at the target MOE (100) for non-nursing infants (the population with the highest exposure to drinking water) when using the NOEL of 5.5 mg/kg/day.

General formula for HHRL calculations:
Acute or Chronic HHRL (ppb) = (DEEM MOE/Target MOE) x (Residue Level at DEEM MOE (ppb)

Acute and chronic imidacloprid HHRL calculations:
Acute HHRL (Table 1): 283 (ppb) = (4735/100) x (5.97 ppb)
Chronic HHRL (Table 1): 552 (ppb) = (9254/100) x (5.97 ppb)

These HHRL values are identical to those used in the 2018 memorandum (DPR, 2018). While both reference levels are based on the subpopulation with the highest estimated risk (non-nursing infants), the acute reference level of 283 ppb was used for screening human health concerns because it was the lowest, and therefore protective of both acute and chronic exposures.

US EPA Human Health Benchmarks for Pesticides

In 2017, the US EPA Office of Ground Water and Drinking Water established acute and chronic human health benchmarks for pesticides (HHBPs) for imidacloprid (US EPA, 2017c). HHBPs are levels of certain food-use pesticides in water at or below which adverse health effects are not anticipated from one-day or lifetime exposures (US EPA, 2017a; pg. 1). The acute HHBP of 930 ppb was based on an acute population adjusted dose (aPAD)[2] of 0.14 mg/kg/day. It was calculated using the lowest-observed-adverse-effects-level (LOAEL) of 42 mg/kg/day from an acute neurotoxicity study using rats and a total uncertainty factor (UF) of 300 (US EPA, 2010; US EPA, 2017b; US EPA, 2017c). A chronic HHBP of 360 ppb was established from a chronic population adjusted dose (cPAD) of 0.057 mg/kg/day based on a no-observed-adverse-effects-level (NOAEL) of 5.7 mg/kg/day from a chronic toxicity study using rats and a total uncertainty

[2] A PAD is a value that reflects an amount of a pesticide to which a person may safely be exposed in one day (acute) or over a lifetime (chronic) (US EPA, 2002).

factor (UF) of 100 (US EPA, 2010; US EPA, 2017b). For comparison, the acute HHRL of 283 ppb that DPR established as a screening level is lower than the acute and chronic US EPA HHBP values (Table 1).

Table 1. Acute and chronic reference levels for imidacloprid in drinking water

Duration	Highest Detected Residue (ppb)	Population[a]	Exposure µg/kg/day	Calculated MOE[b]	Target MOE[c]	DPR HHRL[d] (ppb)	US EPA HHBP[e] (ppb)
Acute	5.97	Non-Nursing Infants	95th Percentile	4735[b]	100	**283**	Children: 930
Chronic	5.97	Non-Nursing Infants	Average	9254[b]	100	552	General Population: 360

a) Subpopulation with highest water intake per body weight

b) MOE (Margin of Exposure) for non-nursing infants.

c) Target MOE is equal to the total uncertainty factors (UF_{TOTAL}) of 100 that accounts for interspecies sensitivity (10x) and intraspecies variability (10x).

d) HHRL, DPR Human Health Reference Level is the Residue Level (pesticide concentration) that will result in a MOE at the Target MOE; HHRL (ppb) = (DEEM MOE/Target MOE) x (Residue Level at DEEM MOE (ppb). The bolded HHRL is used by DPR as a screening residue level.

e) HHBP, US EPA Human Health Benchmark for Pesticides for imidacloprid calculated based on the acute and chronic PADs of 0.14 mg/kg/day and 0.057 mg/kg/day, respectively.

Sources of Drinking Water Residue Data for Imidacloprid

In addition to the groundwater data evaluated above, the following summarizes additional drinking water residue data under consideration in the forthcoming risk assessment for imidacloprid, including DPR's surface water monitoring database and the US Department of Agriculture (USDA) Pesticide Data Program (PDP) drinking water database (USDA, 2019).

DPR Surface Water Monitoring Data

Imidacloprid residue data from DPR's Surface Water (SURF) database includes California-specific surface water monitoring data from DPR, the United States Geological Survey (USGS), and the State Water Resources Control Board (SWRCB) (DPR, 2021) (Appendix 2). A total of 1913 samples were tested for imidacloprid, with 612 samples testing above the limit of quantitation (LOQ) and 1301 samples testing at or below the LOQ. The LOQ for the non-detection samples ranged from 0.0038 to 0.2 ppb, depending on the laboratory and analytical method employed. For samples taken from possible potable water sources (n = 612), the

imidacloprid detections ranged from a minimum of 0.0039 ppb to a maximum of 9.14 ppb (Table 2).

USDA PDP Drinking Water Monitoring Data – Groundwater

PDP monitored groundwater for imidacloprid residues between 2009 and 2013 (USDA, 2019). It included potable groundwater at farms and private residences in agricultural areas and wells at public and private schools and daycare centers across the nation. In 2010, PDP started to test municipal water facilities that draw from groundwater sources, collecting samples from 16 facilities in 13 states. The PDP drinking water program ended in 2013. From 2010 to 2013, 1028 municipal groundwater samples were analyzed for imidacloprid, of which 98% had no detected residues. The maximum residue detected was 124 ppt (0.124 ppb) while the mean concentration was 6.1 ppt (0.006 ppb) (n = 1028) using the sample-specific limits of detection (LODs) (1.5 to 6.2 ppt) for samples collected between 2010 and 2013 (Table 2).

USDA PDP Drinking Water Monitoring Data – Surface Water

PDP surface water residue were available from 2001 to 2013 (USDA, 2019). In 2001, PDP initiated a finished drinking water monitoring survey in California and New York and expanded its finished water survey to include Colorado, Kansas, and Texas in 2002. During this survey, samples were collected by water treatment facilities that draw from surface water sources in 29 states plus the District of Columbia. In 2004, the PDP surface water program was retooled to sample paired raw and finished water. The surface water survey ended in April 2013. The maximum residue detected in finished water was 99 ppt (0.099 ppb) while the mean concentration was 11 ppt (0.011 ppb) (n = 3164) using the sample-specific limits of detection (LODs) (1.5 to 42 ppt). The maximum residue detected in unfinished water was 202 ppt (0.202 ppb) while the mean concentration was 12 ppt (0.012 ppb) (n = 2516) using the sample-specific limits of detection (LODs) (1.5 to 42 ppt) for samples collected between 2004 and 2013 (Table 2).

A summary of the drinking water monitoring data evaluated in the forthcoming risk assessment is provided in Table 2.

Table 2. Summary of Drinking Water Monitoring Data

Source	Maximum Residue Concentration (ppb)	DPR Acute HHRL[c] (ppb)
DPR Groundwater Monitoring [a]	5.97	283
DPR Surface Water Monitoring [a]	9.14	
PDP Groundwater Monitoring [b]	0.124	
PDP Surface Water Monitoring [b]	Finished – 0.099 Untreated – 0.202	

a) DPR groundwater database included samples from 309 wells; surface water database included 1913 samples. Data can be accessed through DPR's Groundwater Protection Program Well Inventory Database at https://www.cdpr.ca.gov/docs/emon/grndwtr/well_inventory_database/index.htm or the SURF database at https://www.cdpr.ca.gov/docs/emon/surfwtr/surfdata.htm

b) PDP collected 1028 groundwater samples from municipal water facilities between 2010 and 2013, 3464 finished surface water samples from 2001 to 2013, and 2516 untreated surface water samples from 2004 to 2013. (USDA, 2019).

c) DPR Acute Human Health Risk Level

Conclusions

1. The detected imidacloprid residue levels in CA well water ranging from 0.054 to 5.97 ppb should not be considered an acute or chronic health concern to residents that use the wells for drinking water.

2. We recommend that imidacloprid detections in CA wells be compared to a reference level of 283 ppb. Detected resides higher than this level may pose a health concern and should be sent to HHA for further evaluation.

Cc: Nan Singhasemanon, Assistant Director, Pesticide Programs Division
Karen Morrison, PhD, Assistant Director, Pesticide Programs Division
Kara James, Pesticide Registration Branch

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DPR. 2021. Selection of Potential Imidacloprid Residues in Drinking Water from Surface Water Residue Data: An Analysis for Human Exposure Assessment. Appendix 2.

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Appendices

Appendix 1. DPR Memo: Potential Health Effects of Imidacloprid in Well Water 13 Oct 20 2020 (2 pages

Department of Pesticide Regulation

Gavin Newsom
Governor

Val Dolcini
Director

Jared Blumenfeld
Secretary for Environmental Protection

MEMORANDUM

TO: Shelley DuTeaux
Branch Chief
Human Health Assessment Branch

FROM: Edgar Vidrio *Original Signed by E. Vidrio*
Branch Chief
Environmental Monitoring Branch
916-323-2778

DATE: October 13, 2020

SUBJECT: POTENTIAL HEALTH EFFECTS OF IMIDACLOPRID IN WELL WATER

The Environmental Monitoring Branch's Groundwater Protection Program (GWPP) monitored groundwater for imidacloprid in 309 discrete wells. From 2014 to 2020, imidacloprid was detected above the reporting limit of 0.05 ppb in fifteen wells, with concentrations ranging from 0.054 to 5.97 ppb (Table 1). Fourteen wells had trace detections below the reporting limit of 0.05 ppb but above the method detection limit of 0.01 ppb. Thirteen of the wells with detections were sampled multiple times and the ranges of concentrations are included in Table 1. Imidacloprid was not detected in 280 wells. Imidacloprid's major degradation products were analyzed for but not detected in 122 well samples.

We request the Human Health Assessment Branch to determine whether these detections pose a significant risk to human health.

If you have any questions, please feel free to contact me.

Attachment

cc: Joy Dias

Attachment 1

Table 1. Results for all wells with detections of imidacloprid above the method detection limit.

Well Location (County-Meridian-Township/Range-Section)	Imidacloprid Concentration (ppb)
10M15S22E03	Trace[a] – 5.97*
10M14S22E31	0.059 – 0.665
10M15S24E14	ND[b] - 0.644
10M14S23E35	0.073 – 0.536
10M15S21E09	Trace – 0.167
10M14S23E34	Trace – 0.12
10M15S21E03	Trace – 0.112
10M14S22E14	0.066 – 0.106
10M15S22E06	0.072
10M14S23E33	ND - 0.065
10M15S22E03	0.055
10M14S22E02	0.054
42S10N34W17	0.103
54M16S24E12	0.124
54M17S25E11	0.074
10M13S22E33	ND - Trace
10M13S23E32	ND - Trace
10M14S21E13	ND - Trace
10M14S22E01	Trace
10M14S22E01	Trace
10M14S22E18	Trace
10M15S21E09	Trace
10M15S23E03	Trace
10M15S24E36	ND - Trace
27M15S03E09	Trace
42S08N33W25	Trace
42S10N33W20	Trace
42S10N34W14	Trace
54M18S26E24	Trace

a. Trace concentrations = between the method detection limit (0.01 ppb) and the reporting limit (0.05 ppb)
b. ND = non-detect = below the method detection limit (0.01 ppb)
* Well services a vacant house

Appendix 2. DPR Memo: Selection of Potential Imidacloprid Residues in Drinking Water from Surface Water Residue Data: An Analysis for Human Exposure Assessment, 05 March 2021 (5 pages

Department of Pesticide Regulation

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FROM: Christopher DeMars, B.Sc.
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DATE: March 5, 2021

SUBJECT: SELECTION OF POTENTIAL IMIDACLOPRID RESIDUES IN DRINKING WATER FROM SURFACE WATER RESIDUE DATA: AN ANALYSIS FOR HUMAN EXPOSURE ASSESSMENT

BACKGROUND

The Exposure Assessment Section of the Human Health Assessment (HHA) Branch was requested to assist in the analysis of imidacloprid concentrations in surface water and to provide imidacloprid residue levels for calculating acute and chronic exposures from drinking water. This analysis uses imidacloprid residue data from a variety of agencies including the California Department of Pesticide Regulation (DPR), the US Geological Survey (USGS), and the State Water Resources Control Board (SWRCB) in order to provide a reasonable worst case scenario for drinking water sourced from surface water.

Imidacloprid use has increased in California since 1994, with a dramatic increase starting in 2007, largely due to agricultural applications (Figure 1). Approximately half a million pounds of active ingredient (AI) was applied to crops in 2019. Peak use for commercial, non-agricultural purposes occurred in 2002, with 150,000 pounds used (Figure 1). Imidacloprid is heavily used in all of California's agricultural regions, with applications ranging from less than 1 lb AI to more than 18,800 lbs AI per square mile (Figure 2).

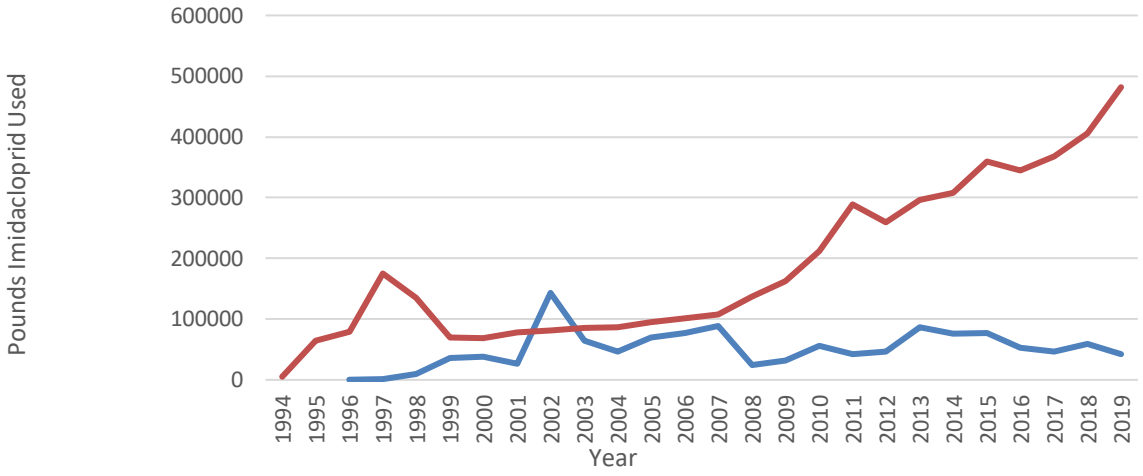

Figure 1. Statewide imidacloprid use in pounds of active ingredient by year for production agricultural use (red) and non-agricultural commercial use (blue). Private residential use of products bought from the retail supply chain is not included in either category.

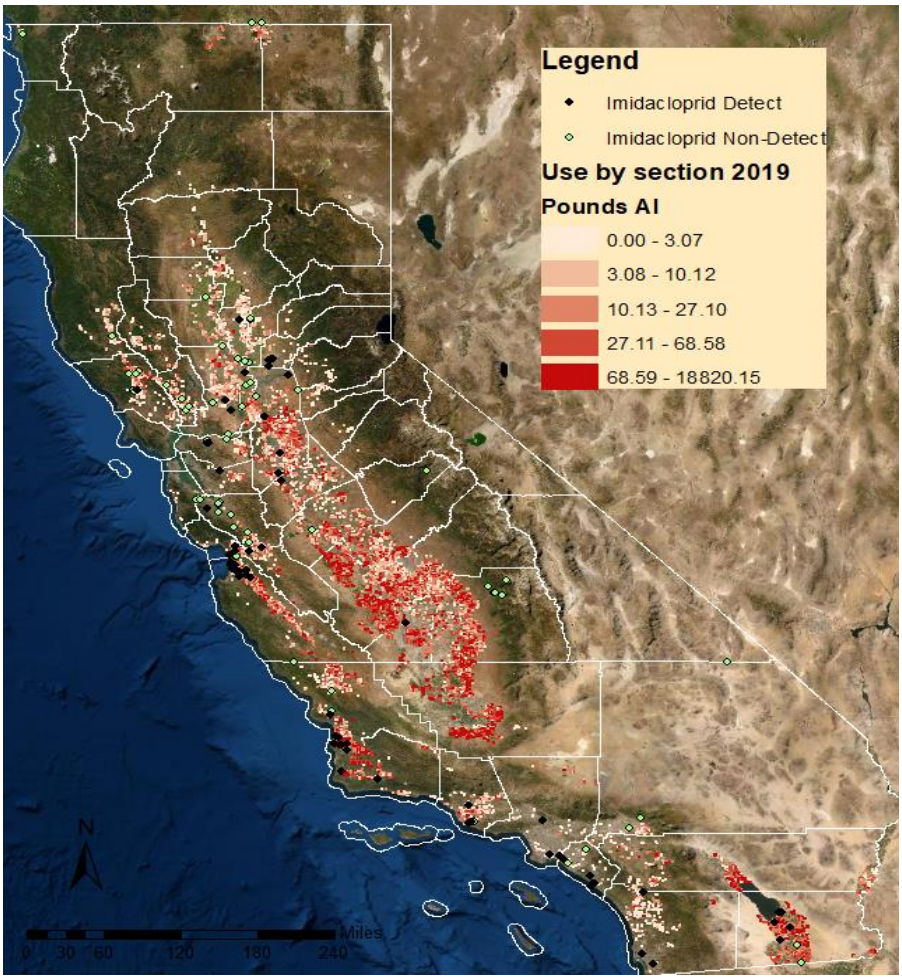

Figure 2. Public Land Survey System (PLSS) section map of 2019 imidacloprid production agricultural use overlaid with SURF testing sites that were positive for imidacloprid (black dots) and testing sites measured below the Limit of Quantitation (LOQ) (light green dots).

Due to the extensive spatial use of imidacloprid throughout California, and the large mass of AI applied, this memorandum provides a first-tier analysis of the current surface water testing database, including identification of samples from waterways that could be used for drinking water extraction and the range of sample concentrations and non-detects.

DRINKING WATER RESIDUE ANALYSIS METHODOLOGY

DPR's Environmental Monitoring Branch (EM) curates a database of analytical results of surface water sampling conducted in California by DPR, USGS, and other state, local, and federal agencies (SURF[1]). All SURF samples that were tested for imidacloprid were extracted for further data analysis. There was far less testing for degradates than for the parent compound, and most of those resulted in non-detects. At the 68 sites that tested for degradates, there were no detection of imidacloprid olefinic-guanidine or imidacloprid urea in 57 samples. Imidacloprid guanidine had a maximum concentration of 0.291 ppb. In comparison, the maximum concentration of imidacloprid at those same sites was 6.39 ppb. Due to the limited number of sites and sampling for degradates, and to allow for a direct comparison with parent residue data in groundwater and surface water, only analytical testing results for imidacloprid (the parent compound), and not the guanidine, olefin, and urea degradates were included in this analysis. The data were further refined to include only surface water that may feed or contribute to a drinking water source. To do so, SURF sites flagged as 'Ocean' or 'Estuary' in the SURF 'waterbody_type' field, or any site_type listed as 'Ag Ditch', or any 'site' name containing 'Bay', 'Sfbay', 'ditch', 'drain', 'lagoon', and 'slough' were removed as these are presumably non-potable sources of water. The remaining sites may or may not be co-located near a drinking water extraction site, but still likely to be a free-flowing fresh water source that may contribute to potable water.

RESULTS

There were a total of 233 sites with a range of 1 to 193 samples per site, averaging approximately 8 samples per site. Of these, 85 sites had at least one imidacloprid detection, ranging from one to 98 detections per site and an average of approximately 7 detections per site. Samples that tested for imidacloprid range in time from 2/12/2000 to 6/26/2019. The first detection was at 10/1/2004 (0.09ppb) followed by a few equally small detections in 2004 and 2005, followed by no detections until 2010 when detections became fairly consistent with regular spikes over 1ppb. Basic statistics of the samples in the SURF dataset are found in Table 1. The arithmetic mean of concentrations across all samples is 0.106 ppb, but it cannot be guaranteed that non-detect samples actually had no imidacloprid present or, alternatively, if there was even a possibility of that sampling location having imidacloprid. Therefore, a second mean was calculated using just the samples that had a detection (0.332 ppb).

[1] The Department of Pesticide Regulation's (DPR) Surface Water Database (SURF) is available through online query/export or as downloadable comma delimited (.csv) files. As of this writing, data is available at https://www.cdpr.ca.gov/docs/emon/surfwtr/surfcont.htm

Table 1. Basic SURF Statistics for Imidacloprid Surface Water Residue Detections

Minimum concentration (non-zero samples) (ppb)	0.004
Maximum concentration (ppb)	9.14
Mean concentration (all samples) (ppb)	0.106
Mean concentration (non-zero samples) (ppb)	0.332
Total number of surface water samples with imidacloprid residue (n)	1913
Number of detect samples (n)	612
Number of non-detect samples (n)	1301

Sites that had at least one positive imidacloprid test are depicted as black dots in Figure 2 while sites that tested for imidacloprid but had no result over the analytical limit of quantitation (LOQ) are in light green. The histogram of positive imidacloprid detections can be found in Figure 3, below. A total of 1913 samples were tested for imidacloprid, with 612 samples testing above the LOQ and 1301 samples testing at or below the LOQ. The LOQ for the non-detection samples ranged from 0.0038 to 0.2 ppb, depending on the laboratory and analytical method employed. For samples taken from possible potable water sources (n = 612), the imidacloprid detections ranged from a minimum of 0.0039 ppb to a maximum of 9.14 ppb. The vast majority of surface water samples with detections (79%) contained less than 0.4 ppb imidacloprid.

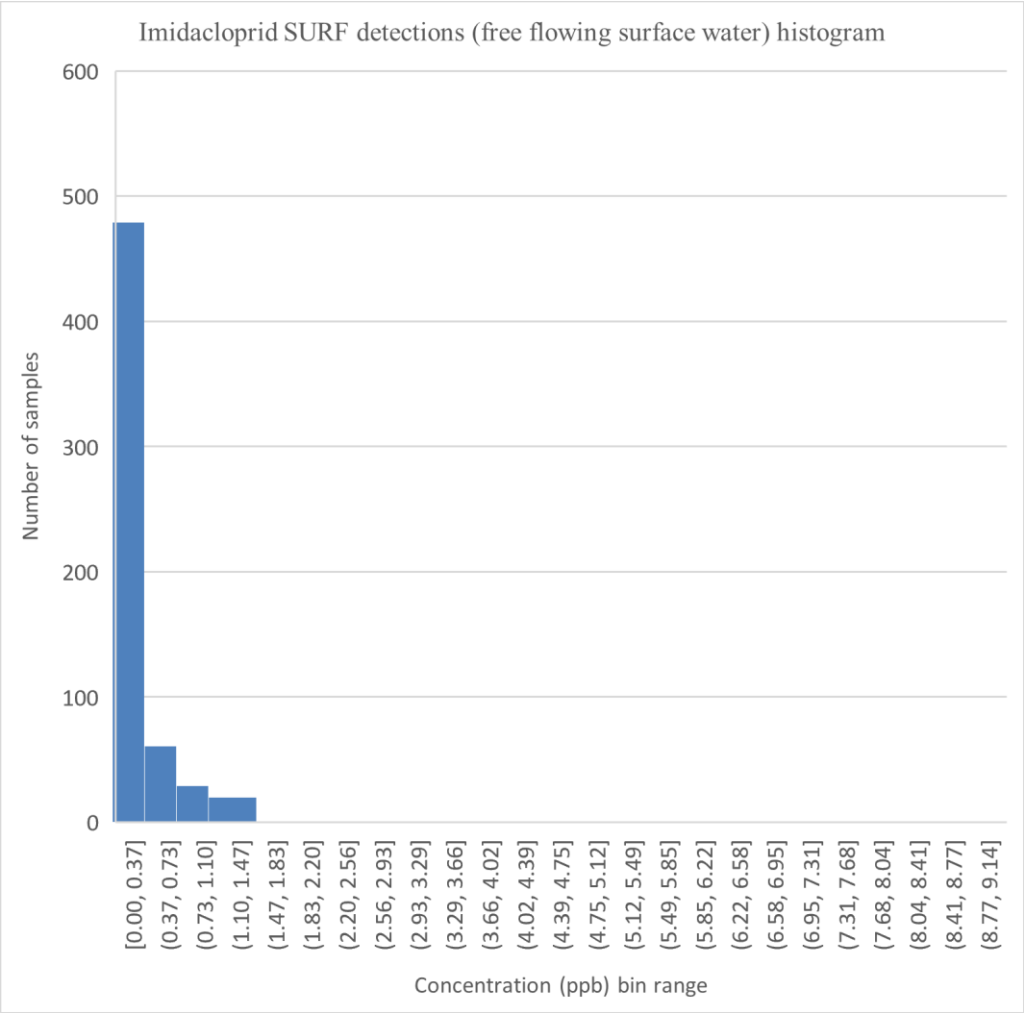

Figure 3. Surface water samples from the SURF database with imidacloprid detection by concentration (ppb)

CONCLUSION

This memorandum describes a first-tier analysis of the current surface water testing database and provides residue values of imidacloprid in potential potable water sources. It is recommended that the maximum concentration (9.14 ppb) be used to calculate acute exposure and the mean concentration of the non-zero values (0.332 ppb) be used to calculate chronic exposure. If the risk from exposures based on the recommended drinking water residues exceeds the target risk, additional refinement of the surface water data analysis can be provided as needed.