

Study 228: Monitoring the Concentrations of Detected Pesticides in Wells Located in Highly Sensitive Areas (Well Network Sampling)

Annual Update 2013

- **Introduction:**

This report summarizes the annual results of a monitoring project that documents pesticide concentrations in domestic wells located in the San Joaquin Valley of California. This study was initiated to monitor levels of herbicides in wells located in areas that are highly vulnerable to pesticide movement to ground water in order to determine efficacy of ground water protection regulations implemented in those areas. The wells were sampled annually from 1999 through 2013 (Garretson, 1999). Included here are the results of the 2013 sampling. A statistical analysis of data collected from 1999-2012 is reported in Troiano et al., 2013. This study is ongoing and updates of results are posted annually.

- **Study Area:** Fresno and Tulare Counties

- **Most Recent Sampling Period:** 4/8/13 – 5/18/13

- **Number of Wells Sampled:** 67

- **Pesticides, Pesticide Degradates, and Chemicals Monitored:**

Annual triazine screen – 11 analytes including: atrazine, bromacil, diuron, hexazinone, norflurazon, prometon, simazine, ACET, DACT, DEA, and DMN.

- **Results for Annual Triazine Screen Monitoring:**

Results for each well are included in Table 1 and in the California Department of Pesticide Regulation well inventory database (CDPR, 2013). The California Department of Food and Agriculture, Center for Analytical Chemistry analyzed all samples according to analytical method EM 62.9 (CDFA, 2009). The reporting limit for each analyte is 0.05 ug/L. Chemistry results and quality control data are presented in Tables 2-3.

REFERENCES

CDFA, 2009. EM 62.9 Determination of Atrazine, Bromacil, Cyanazine, Diuron, Hexazinone, Metribuzin, Norflurazon, Prometon, Prometryn, Simazine, Deethyl Atrazine (DEA), Deisopropyl Atrazine (ACET), Diamino Chlorotraizine (DACT), Tebuthiuron and the metabolites Tebuthiuron-104, Tebuthiuron-106, Tebuthiuron-107 and Tebuthiuron-108 in Well Water and River Water By Liquid Chromatography- Atmospheric Pressure Chemical Ionization Mass Spectrometry (Revised 2009) <http://www.cdpr.ca.gov/docs/emon/pubs/anl_methds/emon-sm-62_9.pdf> (Verified May 15, 2017).

CDPR. 2013. Well inventory data base. California Department of Pesticide Regulation, Sacramento, California. Available at: <http://www.cdpr.ca.gov/docs/emon/grndwtr/well_inventory_database/index.htm>(verified July 12, 2017).

Garretson, C. 1999. Protocol for Monitoring the Concentration of Detected Pesticides in Wells Located in Highly Sensitive Areas. Study 182. Environmental Monitoring Branch, Department of Pesticide Regulation, California Environmental Protection Agency, Sacramento, California. Available at: <<http://www.cdpr.ca.gov/docs/emon/pubs/protocol/prot182.pdf>> (verified May 15, 2017).

Troiano, J., C. Garretson, A. Dasilva, J. Marade, and T. Barry. 2013. Pesticide and Nitrate Trends in Domestic Wells where Pesticide Use Is Regulated in Fresno and Tulare Counties, California. J. Environ. Qual. doi:10.2134/jeq2013.06.0219 Available at: <http://www.cdpr.ca.gov/docs/emon/pubs/ehapref/pesticide_well_trends.pdf> (verified May 15, 2017).

Table 1. Spring 2013 Sampling Results in ug/L (ppb)

Sample Number	Well Number	Date Sampled	ACET	Atrazine	Bromacil	DACT	DEA	Diuron	DMN	Hexazinone	Norflurazon	Prometon	Simazine	Propazine	RL in ug/l
2466	1	5/8/13	0.556	ND	ND	0.342	ND	0.225	ND	ND	ND	ND	0.080	69.5	0.05
2316	2	5/8/13	0.124	ND	ND	0.074	ND	T	T	ND	ND	ND	0.078	80.5	0.05
2340	3	4/22/13	0.131	ND	ND	0.135	ND	ND	0.204	ND	T	ND	0.088	76.5	0.05
2394	4	4/22/13	0.467	T	3.740	0.658	T	0.057	0.188	ND	0.289	T	0.110	73.5	0.05
2492	5	4/24/13	0.588	ND	ND	0.902	ND	ND	0.298	ND	ND	ND	0.115	78.0	0.05
2538	6	4/19/13	0.774	ND	ND	1.100	ND	ND	T	ND	ND	ND	0.099	71.0	0.05
2536	7	4/19/13	0.057	ND	ND	0.137	ND	ND	ND	ND	ND	ND	T	75.5	0.05
2522	8	4/18/13	0.272	ND	0.113	0.319	0.053	0.061	ND	ND	ND	ND	0.110	78.0	0.05
2400	12	4/25/13	0.373	ND	0.351	0.258	ND	T	ND	ND	ND	ND	T	83.0	0.05
2384	13	4/22/13	0.185	ND	0.292	0.308	ND	T	0.079	ND	0.065	ND	0.056	77.0	0.05
2410	14	4/22/13	T	ND	ND	ND	ND	ND	ND	ND	ND	ND	T	70.0	0.05
2396	15	5/8/13	0.133	ND	ND	0.206	ND	T	0.333	ND	0.232	ND	0.084	75.5	0.05
2510	16	4/22/13	0.260	ND	T	0.632	ND	0.118	0.621	ND	0.336	ND	0.091	78.0	0.05
2424	18	4/12/13	0.103	ND	ND	0.257	ND	ND	T	ND	ND	ND	T	72.5	0.05
2408	19	4/11/13	0.152	ND	ND	0.190	ND	ND	0.092	ND	ND	ND	0.066	86.0	0.05
2474	20	4/15/13	0.131	ND	ND	0.072	ND	ND	ND	ND	ND	ND	0.058	85.0	0.05
2528	21	4/15/13	T	ND	ND	0.116	ND	ND	0.134	ND	ND	ND	ND	80.0	0.05
2388	22	4/11/13	0.206	ND	ND	0.802	ND	ND	T	ND	ND	ND	0.080	82.5	0.05
2416	23	4/23/13	0.208	ND	0.056	0.336	ND	T	0.231	ND	T	ND	0.051	85.5	0.05
2468	24	4/18/13	ND	ND	ND	T	ND	ND	0.064	ND	ND	ND	T	83.5	0.05
2406	25	4/12/13	0.091	ND	ND	0.072	ND	T	ND	ND	ND	ND	0.072	86.0	0.05
2428	26	4/18/13	0.093	ND	ND	0.095	ND	ND	0.096	ND	ND	ND	T	86.5	0.05
2508	27	4/18/13	0.151	ND	ND	0.090	ND	ND	ND	ND	ND	ND	0.069	69.5	0.05
2442	28	4/24/13	T	ND	ND	0.053	ND	ND	ND	ND	ND	ND	T	78.5	0.05
2514	29	4/17/13	0.058	ND	ND	0.094	ND	ND	0.250	ND	T	ND	T	81.0	0.05
2422	30	4/25/13	0.230	ND	ND	0.457	T	ND	0.495	ND	0.058	ND	0.073	82.5	0.05
2520	32	4/17/13	0.288	ND	ND	0.285	ND	ND	0.476	ND	0.289	ND	0.093	81.5	0.05
2488	34	4/17/13	T	ND	ND	0.052	ND	ND	0.056	ND	ND	ND	T	88.5	0.05
2430	35	4/16/13	0.164	ND	ND	0.127	ND	T	T	ND	ND	T	0.115	85.0	0.05
2390	36	4/16/13	T	ND	ND	T	ND	ND	ND	ND	ND	T	T	83.5	0.05
2502	37	4/16/13	0.204	ND	ND	0.227	ND	0.096	0.460	ND	0.303	ND	0.106	84.5	0.05
2486	43	4/15/13	0.287	ND	ND	0.178	ND	0.100	0.076	ND	0.097	ND	0.113	83.5	0.05
2484	44	4/15/13	0.108	ND	0.095	0.151	ND	T	ND	ND	ND	ND	T	88.5	0.05
2418	45	4/11/13	T	ND	ND	T	ND	T	ND	ND	ND	ND	ND	84.0	0.05
2318	47	4/11/13	0.681	ND	ND	1.090	0.069	T	ND	ND	ND	ND	T	83.5	0.05
2476	48	4/10/13	0.890	ND	1.070	1.570	ND	T	T	ND	ND	ND	0.054	76.0	0.05
2380	49	4/11/13	0.929	ND	ND	3.040	T	ND	0.168	ND	T	ND	0.076	87.5	0.05
2426	50	4/12/13	T	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.073	78.5	0.05
2458	51	4/24/13	0.075	ND	ND	0.131	ND	ND	T	ND	ND	ND	T	77.0	0.05
2480	52	4/17/13	0.235	ND	ND	0.201	ND	ND	ND	ND	ND	ND	0.139	86.0	0.05
2534	53	4/16/13	T	ND	ND	0.115	ND	ND	ND	ND	ND	ND	T	76.0	0.05
2494	54	4/16/13	T	ND	ND	0.052	ND	ND	ND	ND	ND	T	0.068	91.0	0.05
2526	56	4/18/13	0.473	ND	ND	1.030	ND	ND	ND	ND	ND	ND	0.130	77.0	0.05
2460	57	4/23/13	0.146	ND	ND	0.291	ND	ND	T	ND	ND	ND	T	73.5	0.05
2500	58	4/10/13	T	ND	ND	T	ND	ND	ND	ND	ND	ND	T	72.5	0.05
2386	59	4/10/13	0.366	0.082	ND	0.309	0.095	T	0.444	ND	0.091	ND	T	89.5	0.05

ND = None Detected (<0.05ug/L)

T = Trace (found below detection limit at a level too low to be reliably quantified)

Table 1. cont'd. Spring 2013 Sampling Results in ug/L (ppb)

Sample Number	Well Number	Date Sampled	ACET	Altrazine	Bromacil	DACT	DEA	Diuron	DMN	Hexazinone	Norflurazon	Prometon	Simazine	Propazine	RL in Ug/l
2432	61	4/10/13	0.299	ND	0.625	0.768	T	T	T	ND	ND	ND	0.064	74.0	0.05
2448	63	5/13/13	0.125	ND	ND	0.141	ND	T	0.091	ND	T	ND	0.060	74.5	0.05
2478	65	4/10/13	T	ND	ND	T	ND	ND	ND	ND	ND	ND	T	72.5	0.05
2402	68	4/9/13	ND	ND	ND	T	ND	ND	ND	ND	ND	ND	T	88.0	0.05
2456	69	4/10/13	0.860	ND	1.580	2.220	ND	T	ND	ND	ND	ND	T	81.0	0.05
2440	70	4/25/13	0.229	ND	ND	0.439	T	ND	0.491	ND	0.054	ND	0.074	80.0	0.05
2464	71	4/10/13	0.696	ND	1.340	1.340	ND	T	0.645	ND	0.296	ND	T	77.5	0.05
2398	72	5/6/13	0.831	ND	ND	1.410	T	T	T	ND	ND	ND	0.072	72.5	0.05
2376	73	4/9/13	0.237	ND	ND	1.500	T	ND	0.118	ND	ND	ND	T	87.0	0.05
2378	74	4/10/13	0.782	ND	0.486	1.020	T	T	T	ND	0.078	ND	0.105	83.5	0.05
2392	75	5/6/13	1.160	ND	0.511	0.807	ND	T	ND	ND	ND	ND	0.098	80.5	0.05
2490	79	5/6/13	0.112	ND	0.051	0.054	ND	0.367	ND	ND	T	ND	0.327	86.0	0.05
2420	80	4/8/13	0.779	ND	2.130	3.190	ND	T	0.055	ND	T	ND	T	74.0	0.05
2530	84	5/6/13	ND	ND	T	T	ND	ND	ND	ND	ND	ND	ND	71.0	0.05
2438	85	4/8/13	1.100	ND	1.830	0.972	T	T	0.298	ND	0.407	ND	0.144	75.5	0.05
2436	86	5/6/13	1.250	ND	0.062	8.150	T	ND	0.090	ND	T	ND	0.072	80.0	0.05
2498	89	5/8/13	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	76.0	0.05
2412	90	4/24/13	0.126	T	0.065	0.147	0.107	0.055	ND	T	ND	ND	0.075	74.5	0.05
2404	92	4/11/13	0.324	ND	ND	0.332	ND	0.119	0.156	ND	0.072	ND	0.072	83.0	0.05
2414	94	4/11/13	0.884	ND	0.278	3.130	ND	T	0.186	ND	T	ND	0.054	84.0	0.05
2462	95	4/25/13	T	ND	ND	T	ND	ND	ND	ND	ND	ND	T	75.0	0.05

ND = None Detected (<0.05ug/L)

T = Trace (found below detection limit at a level too low to be reliably quantified)

Table 2. Quality Control – Matrix Spike Percent Recoveries

Analytes: Triazine Screen
 Reporting Limit: 0.05ug/L
 Lab: CDFA

QC Matrix: CDPR Ground water
 Method: EM62.9
 Spike Level: 0.200ug/L

Extraction Date	ACET	Atrazine	Bromacil	DACT	DEA	Diuron	DMN	Hexazinone	Norflurazon	Prometon	Simazine	Propazin
4/16/13	93.0	86.0	97.0	79.0	88.0	91.5	87.0	83.5	88.5	88.8	86.5	84.0
	89.5	84.5	89.0	89.5	86.0	83.5	85.5	79.5	82.0	86.5	83.5	85.5
4/16/13	84.5	88.5	72.0	86.5	91.0	90.5	63.5	95.5	98.5	96.5	73.0	87.5
	81.5	89.0	71.5	85.0	88.5	91.5	68.5	91.5	94.5	91.0	75.5	79.5
4/23/13	96.0	89.0	93.5	96.0	101	77.5	81.0	92.5	72.5	84.5	89.5	87.0
	104	82.0	89.5	92.5	95.0	70.5	74.0	89.5	64.0	77.0	96.0	77.5
4/24/13	91.0	79.0	90.5	86.5	77.5	72.0	73.0	88.5	68.0	83.0	86.5	76.0
	92.5	83.0	92.5	92.5	80.5	73.0	72.0	90.0	69.5	85.5	84.5	79.0
4/30/13	96.5	83.5	94.0	96.0	85.0	91.0	85.5	89.0	87.5	86.0	91.5	83.5
	96.5	82.0	93.5	99.5	93.5	83.5	80.5	93.0	83.5	84.5	89.0	79.0
5/1/13	95.5	83.5	88.0	92.5	89.5	70.5	77.0	88.5	74.0	83.5	88.5	76.5
	96.5	83.0	94.5	94.0	90.0	81.0	85.0	91.5	84.5	85.5	91.0	81.5
5/13/13	95.0	86.0	95.0	88.5	94.0	80.5	88.0	99.5	85.0	91.0	87.0	83.5
	105	90.5	101	90.5	88.5	81.5	86.0	100	84.0	95.5	96.5	85.5
5/29/13	93	86.5	90	96.0	91.5	84.0	81.0	93	79.0	86.5	90.0	79.5
	91	82.0	97	104.0	99.5	82.0	86.0	98	80.5	85.0	84.5	77.5
Mean	93.8	84.9	90.5	91.8	89.9	81.5	79.6	91.4	81.0	86.9	87.1	81.4
SD	6.0	3.2	8.1	6.1	6.1	7.3	7.5	5.4	9.5	4.8	6.2	3.8
Observed Minimum	81.5	79.0	71.5	79.0	77.5	70.5	63.5	79.5	64.0	77.0	73.0	76.0
LCL	74.5	68.7	68.6	70.3	74.7	51.9	53.2	68.5	52.6	73.5	69.6	46.3
UCL	109	103	117	116	105	146	139	111	151	106	108	142
Observed Maximum	105	90.5	101	100	101	91.5	88.0	100	98.5	96.5	96.5	87.5

LCL = Lower Control Limit : Method Validation Mean minus 3 X SD

UCL = Upper Control Limit : Method Validation Mean plus 3 X SD

One matrix blank was run with each extraction set, no detections were found.

Table 3. Quality Control – Blind Spike Recoveries

Analytes: Triazine Screen		QC Matrix: CDPR Ground water											
Reporting Limit: 0.05ug/L		Method: EM62.9											
Lab: CDFA		Spike Level: various ug/L											
Date Extracted	CDFA#		ACET	Atrazine	Bromacil	DACT	DEA	Diuron	DMN	Hexazinone	Norflurazon	Prometon	Simazine
4/16/13	3401	ug/L	0.10						0.20				
		result	0.083						0.16				
		% recovery	83.0						79.0				
4/24/13	3446	ug/L				0.25							0.15
		result				0.235							0.141
		% recovery				94.0							94.0
5/1/13	3533	ug/L	0.10					0.30					
		result	0.083					0.170					
		% recovery	83.0					56.7					
5/13/13	3656	ug/L		0.20					0.10				
		result		0.175					0.08				
		% recovery		87.5					77.0				
5/29/13	3840	ug/L								0.10	0.25	0.15	
		result								0.086	0.178	0.126	
		% recovery								86.0	71.2	84.0	
5/29/13	3841	ug/L	0.10				0.25						
		result	0.083				0.240						
		% recovery	83.0				96.0						