

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

Annual Update 2017

Document adjusted for accessibility

- **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 2017 (Garretson, 1999). Included here are the results of the 2017 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:** 4/3/17 – 5/22/17

- **Number of Wells Sampled:** 61

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

1. Annual triazine screen – 11 analytes including: atrazine, bromacil, diuron, hexazinone, norflurazon, prometon, simazine, ACET, DACT, DEA, and DMN.
2. Multi Residue screen –
  - (a) 29 analytes by Liquid Chromatography Mass Spectrometry (LC/MS) including: atrazine, azinphos-methyl, azoxystrobin, bensulide, bromacil, carbaryl, carbofuran, diazinon, dimethenamide, dimethoate, diuron, ethofumesate, fenamiphos, fludioxonil, imidacloprid, linuron, mefenoxam/metalaxyl, methiocarb, metolachlor, metribuzin, napropamide, norflurazon, oryzalin, prometon, simazine, tebuthiuron, thiamethoxam, thiobencarb, and uniconazole.
  - (b) 15 analytes by Gas Chromatography Mass Spectrometry (GC/MS) including: alachlor, clomazone, dichloran, dichlorbenil, disulfoton, ethoprophos, ethyl parathion, fonofos, malathion, methyl parathion, phorate, piperonyl butoxide, prometryn, propanil, and triallate.

3. Dacthal and breakdown products – 3 analytes including: dacthal (DCPA), dacthal monoacid (MTP), and dacthal diacid (TPA).
- **Results for Annual Triazine Screen Monitoring, Multi Residue Screen, and Dacthal:**

Results for each well are included in Tables 1-2 and in the California Department of Pesticide Regulation well inventory database (CDPR, 2016). The California Department of Food and Agriculture, Center for Analytical Chemistry analyzed all samples according to Triazine Screen analytical method EM 62.9 (CDFA, 2009), Multi Residue Screen analytical method EMON-SM-05-032 (CDFA, 2013), and/or Dacthal analytical method EMON-SM-05-040 (CDFA, 2016). The reporting limit for each analyte is 0.05 ug/L. A summary of positive results (other than triazine screen analytes) for the Multi Residue Screen from 2014 through 2017 is presented in Table 3. Chemistry results and quality control data are presented in Tables 4-7.

Dacthal and two breakdown products:

Forty nine wells were tested for dacthal and two breakdown products during the 2017 sampling. There were no positive results above the reporting limit. There was one Trace result (a result that is below the reporting limit and is too low to be reliably quantified) in Well #1.

Positive finds (other than triazine screen analytes) from Multi Residue screen:

1. Imidacloprid
 

(a) 0.066 ug/L	Well #15
(b) 0.090 ug/L	Well #22
(c) 0.167 ug/L	Well #26
(d) 0.534 ug/L	Well #23
(e) 5.97 ug/L	Well #29*
(f) Trace	Well #4
(g) Trace	Well #5
(h) Trace	Well #24
(i) Trace	Well #48
  
2. Propanil
 

(a) 0.060 ug/L	Well #4
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3. Fludioxonil
 

(a) 0.066 ug/L	Well 30A
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\* Well 29 services a house that is vacant

## REFERENCES

For references not available email [GWPP@cdpr.ca.gov](mailto:GWPP@cdpr.ca.gov).

CDFA, 2009. EM 62.9 Determination of Atrazine, Bromacil, Cyanazine, Diuron, Hexazinone, Metribuzin, Norflurazon, Prometon, Prometryn, Simazine, Deethyl Atrazine (DEA), Deisopropyl Atrazine ( ACET), Diamino Chlorotrazine (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) Previously available at: [cdpr.ca.gov/docs/emon/pubs/anl\\_methds/emon-sm-62\\_9.pdf](http://cdpr.ca.gov/docs/emon/pubs/anl_methds/emon-sm-62_9.pdf) (verified May 15, 2017).

CDFA, 2013. EMON-SM-05-032 Determination of 44 Pesticides in Well Water by Liquid Chromatography Coupled to Linear Ion Trap Quadrupole and Gas Chromatography Coupled to Triple Quadrupole Mass Spectrometer. Previously available at: [cdpr.ca.gov/docs/emon/pubs/anl\\_methds/emon-sm-05-032.pdf](http://cdpr.ca.gov/docs/emon/pubs/anl_methds/emon-sm-05-032.pdf) (verified October 6, 2017).

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CDPR. 2016. 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](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. Previously available at: [cdpr.ca.gov/docs/emon/pubs/protocol/prot182.pdf](http://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 Previously available at: [cdpr.ca.gov/docs/emon/pubs/ehapref/pesticide\\_well\\_trends.pdf](http://cdpr.ca.gov/docs/emon/pubs/ehapref/pesticide_well_trends.pdf) (verified May 15, 2017)

**Table 1.** Spring 2017 Triazine Screen Sampling Results in ug/L (ppb)

Sample Number	Well Number	Date Sampled	ACET	Atrazine	Bromacil	DACT	DEA	Diuron	DMN	Hexazinone	Norfurazon	Prometon	Simazine	Propazine	RL in ug/l
2767	1	5/22/17	T	ND	ND	0.060	ND	T	ND	ND	ND	ND	ND	66.0	0.05
2740	2	5/16/17	T	ND	ND	T	ND	ND	ND	ND	ND	ND	T	85.0	0.05
2762	3	5/22/17	T	ND	ND	0.094	ND	ND	0.121	ND	T	ND	0.052	74.0	0.05
2763	4	5/22/17	0.246	T	5.480	1.320	T	T	0.205	ND	0.164	T	0.060	68.0	0.05
2744	5	5/15/17	0.313	ND	ND	0.678	T	ND	0.246	ND	T	ND	0.078	87.5	0.05
2745	6	5/15/17	0.542	ND	ND	1.180	ND	T	ND	ND	ND	ND	0.073	85.0	0.05
2749	7	5/15/17	0.086	ND	ND	0.319	T	ND	T	ND	ND	ND	0.053	83.0	0.05
2746	8	5/15/17	0.179	ND	T	0.439	T	T	T	ND	ND	ND	0.070	86.5	0.05
2741	12	5/15/17	0.297	ND	0.346	0.302	ND	T	ND	ND	ND	ND	T	95.0	0.05
2770	13	5/16/17	0.056	ND	0.489	0.247	ND	T	0.118	ND	0.074	ND	T	76.5	0.05
2771	14	5/16/17	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	80.5	0.05
2764	15	5/16/17	0.073	ND	ND	0.267	ND	T	0.190	ND	0.060	ND	0.062	82.5	0.05
2766	16	5/16/17	0.134	ND	0.116	0.392	ND	T	0.244	ND	0.093	ND	0.064	78.5	0.05
2737	19	5/1/17	T	ND	ND	0.113	ND	ND	0.181	ND	T	ND	0.052	73.5	0.05
2734	20	5/1/17	T	ND	ND	T	ND	ND	ND	ND	ND	ND	T	86.0	0.05
2738	21	5/1/17	T	ND	ND	T	ND	ND	T	ND	ND	ND	T	69.5	0.05
2720	22	4/26/17	0.206	ND	ND	0.930	ND	ND	0.074	ND	ND	ND	0.075	72.5	0.05
2721	23	4/26/17	0.128	ND	0.078	0.340	ND	0.058	0.114	ND	T	ND	0.069	65.0	0.05
2722	24	5/10/17	ND	ND	ND	ND	ND	ND	T	ND	ND	ND	ND	84.0	0.05
2747	25	5/10/17	0.053	ND	ND	0.073	ND	ND	0.079	ND	ND	ND	T	92.0	0.05
2743	26	5/10/17	T	ND	ND	0.104	ND	ND	0.102	ND	T	ND	T	85.5	0.05
2742	28	5/10/17	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	T	88.5	0.05
2733	29	5/2/17	T	ND	ND	0.113	ND	T	0.229	ND	T	ND	T	77.5	0.05
2759	30A	5/2/17	0.158	ND	ND	0.309	ND	T	T	ND	T	ND	0.068	69.0	0.05
2753	32	5/3/17	0.138	ND	ND	0.213	ND	ND	0.474	ND	0.301	ND	0.074	80.5	0.05
2757	35	5/3/17	0.073	ND	ND	0.180	ND	0.054	0.084	ND	T	T	0.069	68.5	0.05
2758	36	5/3/17	T	ND	ND	T	ND	ND	T	ND	ND	ND	T	76.0	0.05
2756	37	5/3/17	0.082	ND	ND	0.132	ND	T	0.158	ND	0.113	ND	0.061	82.5	0.05
2732	43	4/26/17	0.151	ND	ND	0.167	ND	T	0.055	ND	0.065	ND	0.082	70.5	0.05
2729	44	4/26/17	0.055	ND	0.217	0.102	ND	T	ND	ND	ND	ND	T	80.0	0.05
2718	45	4/26/17	T	ND	ND	ND	T	T	T	ND	ND	ND	ND	76.0	0.05
2730	47	4/25/17	0.351	ND	ND	0.969	T	T	T	ND	ND	ND	T	78.0	0.05
2701	48	4/24/17	0.519	ND	0.279	1.570	ND	T	0.058	ND	T	ND	T	65.5	0.05
2702	49	4/25/17	0.537	ND	ND	3.240	ND	ND	0.294	ND	0.057	ND	0.056	61.5	0.05
2755	50	5/9/17	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	83.5	0.05
2752	51	5/9/17	T	ND	ND	T	ND	ND	ND	ND	ND	ND	T	82.0	0.05
2754	52	5/9/17	0.110	ND	ND	0.338	ND	ND	T	ND	ND	ND	0.104	85.0	0.05
2751	53	5/9/17	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	77.0	0.05
2739	54	5/9/17	T	ND	ND	T	ND	ND	ND	ND	ND	T	T	88.5	0.05
2769	56	5/22/17	0.300	ND	ND	0.836	ND	ND	ND	ND	ND	ND	0.075	75.5	0.05
2735	57	5/1/17	0.099	ND	ND	0.295	ND	ND	T	ND	ND	ND	T	81.5	0.05
2703	58	4/24/17	T	ND	ND	ND	ND	ND	T	ND	ND	ND	0.056	75.5	0.05
2705	59A	4/24/17	0.101	ND	0.751	0.516	T	T	0.138	ND	0.067	ND	ND	64.0	0.05

ND = None Detected (<0.05 ug/L)

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

Propazine added as a surrogate for QA/QC purposes

**Table 1. cont'd. Spring 2017 Triazine Screen 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
2700	61	4/24/17	0.228	ND	1.240	1.340	T	T	ND	ND	ND	ND	T	66.5	0.05
2707	63A	4/4/17	ND	ND	ND	T	ND	ND	ND	ND	ND	ND	ND	66.5	0.05
2710	65	4/4/17	T	ND	ND	T	ND	ND	ND	ND	ND	ND	T	61.5	0.05
2711	68	4/4/17	ND	ND	ND	T	ND	T	ND	ND	ND	ND	ND	61.5	0.05
2719	69	4/4/17	0.287	ND	0.297	2.110	ND	T	ND	ND	ND	ND	T	62.5	0.05
2709	71	4/4/17	0.425	ND	0.480	1.440	ND	T	0.615	ND	0.282	ND	T	60.0	0.05
2708	72	4/3/17	0.473	ND	T	1.760	T	ND	ND	ND	T	ND	T	66.5	0.05
2706	73	4/3/17	0.079	ND	ND	1.580	T	ND	T	ND	ND	ND	ND	64.0	0.05
2727	74	4/3/17	0.390	ND	0.316	0.917	ND	T	T	ND	0.060	ND	0.064	61.0	0.05
2725	75A	4/3/17	0.566	ND	0.321	0.757	ND	T	ND	ND	ND	ND	0.063	65.5	0.05
2728	80	4/3/17	0.298	ND	1.220	2.180	ND	T	ND	ND	ND	ND	T	66.5	0.05
2724	84	4/3/17	T	ND	T	T	ND	ND	ND	ND	ND	ND	ND	70.5	0.05
2726	86	4/3/17	0.537	ND	ND	5.050	T	ND	ND	ND	ND	ND	T	59.5	0.05
2768	89	5/22/17	T	ND	T	0.067	ND	T	T	ND	ND	ND	T	87.0	0.05
2760	90	5/2/17	0.091	0.068	T	0.189	0.116	0.059	T	T	T	ND	0.070	74.0	0.05
2736	92	5/1/17	0.239	ND	ND	0.356	ND	0.068	0.103	ND	0.060	ND	0.055	80.5	0.05
2731	94	4/25/17	0.456	ND	ND	2.890	ND	T	0.199	ND	0.059	ND	T	65.5	0.05
2761	95	5/2/17	T	ND	ND	T	ND	ND	ND	ND	ND	ND	T	74.5	0.05

ND = None Detected (<0.05 ug/L)

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

Propazine added as a surrogate for QA/QC purposes

**Table 2.** Results for 2017 Triazine Screen vs Multi Residue Screen in ug/L (ppb). The table includes the six analytes that are duplicated in the two screens plus any positive or trace finds for analytes that are only included in the Multi Residue screen.

DPR Screen	Well Number	Date Sampled	Atrazine	Bromacil	Diuron	Norflurazon	Prometon	Simazine	Fludioxonil	Imidacloprid	Propanil
M	1	5/22/17			T						
Tr	1	5/22/17			T						
M	2	5/16/17						T			
Tr	2	5/16/17						T			
M	3	5/22/17				T		0.081			
Tr	3	5/22/17				T		0.052			
M	4	5/22/17	T	5.210	0.074	0.191	T	0.081		T	0.06
Tr	4	5/22/17	T	5.480	T	0.164	T	0.060			
M	5	5/15/17				T		0.094		T	
Tr	5	5/15/17				T		0.078			
M	6	5/15/17			T			0.081			
Tr	6	5/15/17			T			0.073			
M	7	5/15/17						0.057			
Tr	7	5/15/17						0.053			
M	8	5/15/17		T	T			0.076			
Tr	8	5/15/17		T	T			0.070			
M	12	5/15/17		0.495	T			T			
Tr	12	5/15/17		0.346	T			T			
M	13	5/16/17		0.863	T	0.087		T			
Tr	13	5/16/17		0.489	T	0.074		T			
M	14	5/16/17									
Tr	14	5/16/17									
M	15	5/16/17			T	0.069		0.076		0.066	
Tr	15	5/16/17			T	0.060		0.062			
M	16	5/16/17		0.128	T	0.100		0.070			
Tr	16	5/16/17		0.116	T	0.093		0.064			
M	19	5/1/17					0.151	0.095			
Tr	19	5/1/17				T		0.052			
M	20	5/1/17						T			
Tr	20	5/1/17						T			
M	21	5/1/17						T			
Tr	21	5/1/17						T			
M	22	4/26/17						0.087		0.09	
Tr	22	4/26/17						0.075			

Blank spaces = None Detected

Detection Limit = 0.05 ug/L

T = Trace (positive results below the detection limit, too low to reliably quantify)

M = Multi Residue screen

Tr = Triazine screen

**Table 2. cont'd.** Results for 2017 Triazine Screen vs Multi Residue Screen in ug/L (ppb). The table includes the six analytes that are duplicated in the two screens plus any positive or trace finds for analytes that are only included in the Multi Residue screen.

DPR Screen	Well Number	Date Sampled	Atrazine	Bromacil	Diuron	Norflurazon	Prometon	Simazine	Fludioxonil	Imidacloprid	Propanil
M	23	4/26/17		0.084	0.070	T		0.086		0.534	
Tr	23	4/26/17		0.078	0.058	T		0.069			
M	24	5/10/17								T	
Tr	24	5/10/17									
M	25	5/10/17						T			
Tr	25	5/10/17						T			
M	26	5/10/17				T		T		0.167	
Tr	26	5/10/17				T		T			
M	28	5/10/17									
Tr	28	5/10/17						T			
M	29	5/2/17			T	T		T		5.97	
Tr	29	5/2/17			T	T		T			
M	30A	5/2/17			T	T		0.091	0.066		
Tr	30A	5/2/17			T	T		0.068			
M	32	5/3/17				0.340		0.083			
Tr	32	5/3/17				0.301		0.074			
M	35	5/3/17			0.070	T	T	0.097			
Tr	35	5/3/17			0.054	T	T	0.069			
M	36	5/3/17						T			
Tr	36	5/3/17						T			
M	37	5/3/17			T	0.137		0.076			
Tr	37	5/3/17			T	0.113		0.061			
M	43	4/26/17			T	0.076		0.104			
Tr	43	4/26/17			T	0.065		0.082			
M	44	4/26/17		0.260	0.078			T			
Tr	44	4/26/17		0.217	T			T			
M	45	4/26/17			T						
Tr	45	4/26/17			T						
M	47	4/25/17			T			T			
Tr	47	4/25/17			T			T			
M	48	4/24/17		0.438	T	T		0.057		T	
Tr	48	4/24/17		0.279	T	T		T			

Blank spaces = None Detected

Detection Limit = 0.05 ug/L

T = Trace (positive results below the detection limit, too low to reliably quantify)

M = Multi Residue screen

Tr = Triazine screen

**Table 2. cont'd.** Results for 2017 Triazine Screen vs Multi Residue Screen in ug/L (ppb). The table includes the six analytes that are duplicated in the two screens plus any positive or trace finds for analytes that are only included in the Multi Residue screen.

DPR Screen	Well Number	Date Sampled	Atrazine	Bromacil	Diuron	Norflurazon	Prometon	Simazine	Fludioxonil	Imidacloprid	Propanil
M	49	4/25/17				0.064		0.075			
Tr	49	4/25/17				0.057		0.056			
M	50	5/9/17									
Tr	50	5/9/17									
M	51	5/9/17						T			
Tr	51	5/9/17						T			
M	52	5/9/17						0.118			
Tr	52	5/9/17						0.104			
M	53	5/9/17									
Tr	53	5/9/17									
M	54	5/9/17					0.050	T			
Tr	54	5/9/17					T	T			
M	56	5/22/17						0.127			
Tr	56	5/22/17						0.075			
M	57	5/1/17						T			
Tr	57	5/1/17						T			
M	58	4/24/17						0.057			
Tr	58	4/24/17						0.056			
M	59A	4/24/17		T							
Tr	59A	4/24/17	0.751	T		0.067					
M	61	4/24/17	1.540	T				T			
Tr	61	4/24/17	1.240	T				T			
M	63A	4/4/17									
Tr	63A	4/4/17									
M	65	4/4/17						T			
Tr	65	4/4/17						T			
M	68	4/4/17			T						
Tr	68	4/4/17			T						
M	69	4/4/17	0.446	T				T			
Tr	69	4/4/17	0.297	T				T			
M	71	4/4/17	0.578	T		0.374		0.052			
Tr	71	4/4/17	0.480	T		0.282		T			
M	72	4/3/17		T	T	T		0.066			
Tr	72	4/3/17		T		T		T			

Blank spaces = None Detected

Detection Limit = 0.05 ug/L

T = Trace (positive results below the detection limit, too low to reliably quantify)

M = Multi Residue screen

Tr = Triazine screen

**Table 2. cont'd.** Results for 2017 Triazine Screen vs Multi Residue Screen in ug/L (ppb). The table includes the six analytes that are duplicated in the two screens plus any positive or trace finds for analytes that are only included in the Multi Residue screen.

DPR Screen	Well Number	Date Sampled	Atrazine	Bromacil	Diuron	Norflurazon	Prometon	Simazine	Fludioxonil	Imidacloprid	Propanil
M	73	4/3/17									
Tr	73	4/3/17									
M	74	4/3/17		0.450	T	0.071		0.091			
Tr	74	4/3/17		0.316	T	0.060		0.064			
M	75A	4/3/17		0.460	T			0.090			
Tr	75A	4/3/17		0.321	T			0.063			
M	80	4/3/17		1.410	0.051			T			
Tr	80	4/3/17		1.220	T			T			
M	84	4/3/17						T			
Tr	84	4/3/17		T							
M	86	4/3/17		T							
Tr	86	4/3/17						T			
M	89	5/22/17		T	T			T			
Tr	89	5/22/17		T	T			T			
M	90	5/2/17	0.079	0.054	0.072	T		0.082			
Tr	90	5/2/17	0.068	T	0.059	T		0.070			
M	92	5/1/17			0.069	0.070		0.057			
Tr	92	5/1/17			0.068	0.060		0.055			
M	94	4/25/17			T	0.078		T			
Tr	94	4/25/17			T	0.059		T			
M	95	5/2/17									
Tr	95	5/2/17						T			

Blank spaces = None Detected

Detection Limit = 0.05 ug/L

T = Trace (positive results below the detection limit, too low to reliably quantify)

M = Multi Residue screen

Tr = Triazine screen

**Table 3.** Summary of Positive Results (other than triazine screen analytes) for Multi Residue Screen from 2014 through 2017 in ug/L (ppb).

Well #	Township/Range-Section	Analyte	Sample Year			
			2014	2015	2016	2017
4	13S/23E-32	Imidacloprid				T
5	14S/21E-13	Imidacloprid				T
15	14S/22E-14	Imidacloprid				0.066
18	14S/22E-31	Imidacloprid	0.059	0.665	Dry	Dry
21	14S/23E-33	Imidacloprid	NS	0.065		
22	14S/23E-34	Imidacloprid	NS	0.120	0.080	0.090
23	14S/23E-35	Imidacloprid	NS	0.218	0.209	0.534
24	15S/21E-03	Imidacloprid				T
26	15S/21E-09	Imidacloprid	T	0.051	0.072	0.167
29	15S/22E-03	Imidacloprid		T		5.970*
47	15S/24E-14	Imidacloprid	NS		0.644	
48	15S/24E-36	Imidacloprid	NS		T	T
37	15S/22E-21	Oryzalin	T			
44	15S/23E-02	Oryzalin	NS	T		
29	15S/22E-03	Mefenoxam/Metalaxyl		T		
74	19S/26E-01	Metalachlor	NS	T		
30A	15S/22E-05	Fludioxonil	NS		T	0.066
4	13S/23E-32	Propanil				0.060

Blank Spaces = ND (below detection limit of 0.05ug/L)

NS = Well not sampled in 2014 (27 wells were sampled in 2014)

Dry = Well went dry and was unable to be sampled

\* = Well 29 services a house which is vacant

**Table 4. Quality Control – Triazine Screen Matrix Spike Percent Recoveries**

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

QC Matrix: CDPR Ground water  
 Method: EM 62.9  
 Spike Level: 0.200ug/L

Extraction Date	Percent Recovery											
	ACET	Atrazine	Bromacil	DACT	DEA	Diuron	DMN	Hexazinone	Norflurazon	Prometon	Sinazine	Propazine
4/10/2017	78.5	75.0	89.0	91.5	79.5	84.0	86.0	88.0	84.5	76.5	78.5	73.5
	72.0	73.5	81.0	86.5	66.5	87.5	81.0	83.0	84.5	72.0	71.5	66.0
5/2/2017	71.0	80.0	76.5	98.0	73.5	79.0	78.5	84.0	80.0	79.0	73.0	70.0
	70.5	80.0	81.5	101.0	75.5	79.5	84.0	81.0	85.5	79.0	76.5	74.5
5/3/2017	66.0	69.5	84.0	103.0	68.0	83.0	83.0	83.0	82.5	77.5	77.0	70.5
	74.5	74.5	87.5	94.5	83.0	85.5	74.0	77.0	81.5	86.0	76.5	74.5
5/15/2017	59.5	72.5	81.0	88.5	66.5	71.5	78.0	73.0	70.0	71.0	69.5	72.5
	65.5	87.0	83.0	91.0	65.5	83.0	88.0	77.0	86.5	86.5	79.5	85.5
5/17/2017	73.5	82.0	86.5	88.0	85.0	89.0	89.5	83.5	85.5	88.5	83.5	77.0
	73.5	77.5	80.5	95.5	80.0	97.0	82.5	86.5	86.0	81.5	73.5	78.5
6/6/2017	75.0	94.5	88.5	118	82.5	93.5	98.5	96.0	90.5	96.0	87.5	94.0
	77.0	84.0	86.5	104	79.5	97.0	88.0	95.0	81.0	106.0	84.5	95.5
6/7/2017	66.0	79.5	91.5	104	79.0	87.0	85.0	86.5	86.5	83.0	89.0	94.0
	69.0	85.0	85.5	98.0	77.0	80.5	85.5	89.0	77.0	81.0	80.0	82.5
7/7/2017	68.0	79.5	80.5	91.0	75.5	84.0	86.0	85.5	86.5	85.5	79.5	77.5
	72.5	82.5	84.0	99.5	80.0	103	90.0	93.5	94.5	92.0	91.0	78.0
Mean	70.8	79.8	84.2	97.0	76.0	86.5	84.8	85.1	83.9	83.5	79.4	79.0
SD	4.9	6.2	3.9	8.1	6.3	8.0	5.7	6.4	5.5	9.2	6.3	9.0
Observed Minimum	59.5	69.5	76.5	86.5	65.5	71.5	74.0	73.0	70.0	71.0	69.5	66.0
LCL	74.4	68.8	68.5	70.2	74.7	52.0	53.2	68.6	52.7	73.6	69.6	46.4
UCL	109	103	117	116	105	146	139	110	151	106	108	142
Observed Maximum	78.5	94.5	91.5	118	85.0	103	98.5	96.0	94.5	106	91.0	95.5

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.

Propazine added as a surrogate for QA/QC purposes

**Table 5. Quality Control – Multi Residue LC/MS Screen Matrix Spike Percent Recoveries**

Analytes: Multi Residue LC/MS Screen  
 Reporting Limit: 0.05ug/L  
 Lab: CDFA

QC Matrix: CDPR Ground water  
 Method: EMON-SM-05-032  
 Spike Level: 0.200ug/L

Extraction Date	Percent Recovery (%)																												
	Atrazine	Azinphos-methyl	Azoxystrobin	Bensulfide	Bromacil	Carbaryl	Carbofuran	Diazinon	Dimethenamide	Dimethoate	Diuron	Ethofumesate	Fenamiphos	Fludioxonil	Imidacloprid	Linuron	Metenoxam/Mezalex	Methiocarb	Metolachlor	Metrifluzin	Napropamide	Norfurazon	Oryzalin	Prometon	Simazine	Tebuthiuron	Thiamethoxam	Thiobencarb	Uniconazole
4/7/2017	84.0	94.0	90.0	91.0	84.5	91.5	87.0	89.0	91.5	86.5	91.0	85.0	81.5	89.0	87.5	88.0	88.0	86.5	86.5	84.5	90.0	91.5	85.5	89.5	86.5	89.5	84.5	84.5	88.5
5/4/2017	81.5	94.0	88.0	90.5	87.0	87.0	84.0	83.0	86.0	83.5	90.0	89.5	86.0	90.5	86.0	88.5	90.5	86.5	87.5	82.5	90.5	91.0	91.5	88.0	85.0	88.0	85.0	85.0	94.5
5/10/2017	78.5	87.0	72.0	81.0	82.5	72.5	78.0	67.0	73.0	81.0	89.0	76.5	66.5	83.5	88.5	80.0	86.5	68.0	79.0	78.5	81.0	91.5	80.5	91.5	85.0	88.5	81.1	73.5	80.0
5/26/2017	84.5	91.0	73.0	80.5	86.5	92.0	92.0	75.5	91.0	91.0	93.5	82.0	65.0	90.0	92.0	85.0	95.5	87.0	88.0	90.0	86.5	94.0	77.5	94.5	91.0	94.0	84.5	80.0	77.0
5/26/2017	78.5	84.5	78.5	77.5	81.5	84.5	79.5	57.5	75.0	82.0	88.0	77.0	63.0	81.0	87.0	85.0	83.0	81.0	74.5	79.5	82.0	86.5	68.0	86.0	85.0	86.0	80.5	70.5	74.5
6/5/2017	89.5	94.5	87.0	74.5	90.0	97.5	96.5	71.5	89.5	94.0	95.5	85.5	69.5	88.5	95.5	94.5	96.0	94.5	89.0	91.0	92.0	94.5	79.5	98.5	98.0	96.5	87.5	79.5	80.5
Mean	82.8	90.8	81.4	82.5	85.3	87.5	86.2	73.9	84.3	86.3	91.2	82.6	71.9	87.1	89.4	86.8	89.9	83.9	84.1	84.3	87.0	91.5	80.4	91.3	88.4	90.4	83.9	78.8	82.5
SD	4.2	4.2	8.0	6.8	3.1	8.6	7.2	11.3	8.3	5.2	2.8	5.1	9.5	3.9	3.6	4.8	5.1	8.9	5.9	5.2	4.6	2.8	7.9	4.6	5.2	4.0	2.6	5.8	7.5
Observed Minimum	78.5	84.5	72.0	74.5	81.5	72.5	78.0	57.5	73.0	81.0	88.0	76.5	63.0	81.0	86.0	80.0	83.0	68.0	74.5	78.5	81.0	86.5	68.0	86.0	85.0	86.0	80.5	70.5	74.5
LCL	73.1	50.9	74.3	62.3	75.2	64.1	75.7	61.7	71.0	72.5	76.9	45.9	73.5	62.1	70.7	76.1	74.7	67.7	68.0	75.7	76.7	79.3	79.6	79.7	75.3	69.7	65.5	75.0	79.4
UCL	115	151	126	130	109	144	115	116	118	116	115	133	118	123	118	113	120	140	134	111	116	114	113	118	111	130	107	114	117
Observed Maximum	89.5	94.5	90.0	91.0	90.0	97.5	96.5	89.0	91.5	94.0	95.5	89.5	86.0	90.5	95.5	94.5	96.0	94.5	89.0	91.0	92.0	94.5	91.5	98.5	98.0	96.5	87.5	85.0	94.5

LCL = Lower Control Limit : Method Validation Mean minus 3 XSD

UCL = Upper Control Limit : Method Validation Mean plus 3 XSD

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

**Table 6. Quality Control – Multi Residue GC/MS Screen Matrix Spike Percent Recoveries**

Analytes: Multi Residue GC/MS Screen		QC Matrix: CDPR Ground water													
Reporting Limit: 0.05ug/L		Method: EMON-SM-05-032													
Lab: CDFA		Spike Level: 0.200ug/L													
Extraction Date	Percent Recovery (%)														
	Alachlor	Clomazone	Dichloran	Dichlorbenil	Disulfoton	Ethoprophos	Ethyl Parathion	Fonofos	Malathion	Methyl Parathion	Phorate	Piperonyl Butoxide	Prometryn	Propanil	Triallate
4/7/2017	71.5	75.5	73.0	73.0	77.5	86.0	81.5	83.5	74.0	77.0	71.0	81.5	74.5	79.5	85.5
5/4/2017	107	106	107	103	97.0	83.0	101	105	108	97.5	100	100	102	108	106
5/10/2017	85.0	81.5	69.5	102.0	63.0	82.5	66.5	72.5	91.0	64.0	68.5	99.0	101	102	71.5
5/26/2017	104	111	94.5	65.0	86.0	94.0	93.5	78.5	96.0	83.5	80.5	105	89.5	111	91.0
5/26/2017	97.5	90.0	77.0	51.0	79.5	76.0	80.5	78.5	114	80.0	65.0	98.0	107	139	80.5
6/5/2017	79.0	90.0	75.5	72.5	66.0	83.5	77.0	80.5	86.0	80.0	76.5	81.0	85.5	85.0	81.0
Mean	90.7	92.3	82.8	77.8	78.2	84.2	83.3	83.1	94.8	80.3	76.9	94.1	93.3	104.1	85.9
SD	14.3	13.8	14.7	20.8	12.6	5.9	12.3	11.3	14.6	10.8	12.6	10.2	12.3	21.2	11.8
Observed Minimum	71.5	75.5	69.5	51.0	63.0	76.0	66.5	72.5	74.0	64.0	65.0	81.0	74.5	79.5	71.5
LCL	73.1	50.9	74.3	62.3	75.2	64.1	75.7	61.7	71.0	72.5	76.9	45.9	73.5	62.1	70.7
UCL	115	151	126	130	109	144	115	116	118	116	115	133	118	123	118
Observed Maximum	107	111	107	103	97	94	101	105	114	98	100	105	107	139	106

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 7. Quality Control – Triazine, Multi Residue, and Dacthal Blind Spike Percent Recoveries**

DPR Sample #	CDFA Sample #	Extraction Date	Analysis Date	Analyte	Spike Level (ppb)	Result (ppb)	% Recovery	Control limit exceeded
				Multi Residue Screen				
9172	2666	4/7/2017	4/10/2017	bromacil	0.25	0.319	128%	No
				diuron	0.2	0.216	108%	No
				fludioxinil	0.15	0.15	100%	No
				alachlor	0.1	0.116	116%	No
				prometryn	0.2	0.199	99.5%	No
9173	2967	5/4/2017	5/4/2017	imidacloprid	0.2	0.176	88.0%	No
				norflurazon	0.25	0.231	92.4%	No
				oryzalin	0.2	0.179	89.5%	No
				ethoprophos	0.15	0.121	80.7%	No
9174	3031	5/10/2017	5/22/2017	prometon	0.15	0.151	101%	No
				simazine	0.1	0.095	95.0%	No
				dichlorbenil	0.2	0.196	98.0%	No
9175	3412	6/5/2017	6/5/2017	atrazine	0.1	0.117	117%	No
				imidacloprid	0.15	0.156	104%	No
				Triazine Screen				
2712	2651	4/10/2017	6/26/2017	Hexazinone	0.3	0.212	70.7%	No
				Norflurazon	0.25	0.215	86.0%	No
				Prometon	0.2	0.13	65.0%	No
				Simazine	0.15	0.116	77.3%	No
2713	2952	5/3/2017	7/6/2017	Atrazine	0.15	0.106	70.7%	No
				DEA	0.3	0.238	79.3%	No
				Diuron	0.2	0.163	81.5%	No
				DMN	0.1	0.088	88.0%	No
2714	3058	5/15/2017	7/11/2017	ACET	0.15	0.109	72.7%	No
				Bromacil	0.2	0.185	92.5%	No
				DACT	0.25	0	0.0%	Yes
				Dacthal				
7077	3288	6/2/2017	6/5/2017	DCPA	0.1	0.073	73.0%	No
				MTP	0.2	0.205	103%	No
				TPA	0.2	0.156	78.0%	No