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

Annual Update 2016

- **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 2016 (Garretson, 1999). Included here are the results of the 2016 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:** 3/28/16 – 5/26/16

- **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 uniconizole.

     (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.

- **Results for Annual Triazine Screen Monitoring and for Multi Residue Screen:**

  Results for each well are included in Tables 1-2 and in the California Department of Pesticide Regulation well inventory database (CDPR, 2015). The California Department of Food and Agriculture, Center for Analytical Chemistry analyzed all samples according to analytical method EM 62.9 (CDFA, 2009) and Multi Residue screen analytical method EMON-SM-05-032 (CDFA, 2013). The reporting limit for each analyte is 0.05 ug/L. Chemistry results and quality control data are presented in Tables 3-6.

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

  1. Imidacloprid
     (a) 0.072ug/L Well #26
     (b) 0.080ug/L Well #22
     (c) 0.209ug/L Well #23
     (d) 0.644ug/L Well #47
     (e) Trace Well #48

  2. Fludioxonil
     (a) Trace Well #30A

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) Available at: http://www.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. Available at: http://www.cdpr.ca.gov/docs/emon/pubs/anl_methds/emon-sm-05-032.pdf (verified October 6, 2017).

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 (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 2016 Triazine Screen 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
2374	1	3/28/16	0.053	ND	ND	0.065	ND	T	ND	ND	ND	ND	ND	98.0	0.05
2555	2	3/28/16	0.129	ND	ND	0.125	ND	T	T	ND	ND	ND	0.063	76.5	0.05
2603	3	3/28/16	0.050	ND	ND	T	ND	ND	0.092	ND	ND	ND	T	83.0	0.05
2575	4	3/29/16	0.488	T	3.540	1.060	T	0.055	0.327	ND	0.372	T	0.097	102.0	0.05
2648	5	5/3/16	0.561	ND	ND	0.817	T	ND	0.285	ND	ND	ND	0.109	90.5	0.05
2657	6	5/3/16	0.733	ND	ND	1.070	ND	T	T	ND	ND	ND	0.082	90.5	0.05
2685	7	5/3/16	0.270	ND	ND	0.291	ND	ND	0.638	ND	0.403	ND	0.101	101.0	0.05
2357	8	5/2/16	0.262	ND	0.064	0.319	T	0.055	ND	ND	ND	ND	0.105	84.5	0.05
2548	12	3/28/16	0.303	ND	0.255	0.298	ND	T	ND	ND	ND	ND	T	77.5	0.05
2372	13	3/29/16	0.125	ND	0.483	0.257	ND	T	0.091	ND	0.065	ND	T	80.5	0.05
2370	14	3/29/16	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	73.0	0.05
2371	15	3/29/16	0.151	ND	ND	0.530	ND	T	0.272	ND	0.129	ND	0.074	84.5	0.05
2672	16	5/3/16	0.901	ND	0.645	1.700	ND	T	T	ND	ND	ND	0.051	76.0	0.05
2655	19	4/14/16	0.267	ND	ND	0.315	ND	T	0.382	ND	0.165	ND	0.083	92.0	0.05
2656	20	4/14/16	0.066	ND	ND	T	ND	ND	ND	ND	ND	ND	T	97.5	0.05
2359	21	4/14/16	ND	ND	ND	T	ND	ND	T	ND	ND	ND	ND	96.0	0.05
2666	22	4/25/16	0.324	ND	ND	1.160	ND	ND	0.099	ND	ND	ND	0.074	90.5	0.05
2664	23	4/25/16	0.306	ND	0.115	0.436	ND	0.078	0.175	ND	T	ND	0.093	89.5	0.05
2646	24	4/18/16	T	ND	ND	T	ND	ND	0.337	ND	0.059	ND	ND	106.0	0.05
2643	25	4/18/16	0.058	ND	ND	0.057	ND	T	T	ND	ND	ND	T	104.0	0.05
2644	26	4/18/16	0.086	ND	ND	0.114	ND	ND	0.117	ND	ND	ND	T	104.0	0.05
2645	28	4/18/16	T	ND	ND	0.066	ND	ND	ND	ND	ND	ND	T	97.5	0.05
2660	29	4/27/16	0.062	ND	ND	0.157	ND	ND	0.163	ND	ND	ND	T	93.0	0.05
2659	30A	4/27/16	0.343	ND	ND	0.461	T	0.056	0.064	ND	T	ND	0.087	80.5	0.05
2671	32	4/27/16	T	ND	ND	T	ND	ND	T	ND	ND	ND	0.074	82.0	0.05
2642	35	4/19/16	0.124	ND	ND	0.131	ND	T	T	ND	T	T	0.089	95.5	0.05
2641	36	4/19/16	0.050	ND	ND	0.089	ND	ND	T	ND	ND	T	T	110.0	0.05
2640	37	4/19/16	0.109	ND	ND	0.087	ND	T	0.092	ND	T	ND	0.077	106.0	0.05
2668	43	4/25/16	0.271	ND	ND	0.180	ND	T	0.120	ND	0.162	ND	0.109	90.5	0.05
2669	44	4/25/16	0.136	ND	0.139	0.208	ND	T	T	ND	ND	ND	T	89.5	0.05
2665	45	4/25/16	T	ND	ND	0.057	T	0.072	0.066	ND	ND	ND	ND	97.5	0.05
2663	47	4/26/16	0.698	ND	ND	1.360	0.083	T	0.065	ND	ND	ND	T	115.0	0.05
2674	48	4/28/16	0.184	0.081	0.059	0.233	0.201	0.065	T	T	ND	ND	0.102	110.0	0.05
2662	49	4/26/16	1.140	ND	ND	3.100	T	ND	0.346	ND	0.062	ND	0.106	93.0	0.05
2681	50	4/13/16	T	ND	ND	ND	ND	ND	ND	ND	ND	ND	T	96.5	0.05
2356	51	4/13/16	0.100	ND	ND	0.216	ND	ND	0.066	ND	ND	ND	0.062	106.0	0.05
2694	52	4/13/16	0.229	ND	ND	0.306	ND	ND	0.060	ND	ND	ND	0.158	114.0	0.05
2683	53	4/13/16	T	ND	ND	0.091	ND	ND	ND	ND	ND	ND	T	110.0	0.05
2682	54	4/13/16	0.056	ND	ND	0.070	ND	ND	ND	ND	ND	0.090	0.065	103.0	0.05
2637	56	4/19/16	0.500	ND	ND	1.190	ND	ND	ND	ND	ND	ND	0.129	109.0	0.05
2639	57	4/19/16	0.173	ND	ND	0.389	ND	ND	T	ND	ND	ND	T	109.0	0.05
2673	58	4/28/16	0.215	ND	ND	0.399	T	ND	ND	ND	ND	ND	0.068	97.0	0.05
2689	59A	4/11/16	0.144	ND	0.941	0.601	T	T	0.077	ND	T	ND	ND	117.0	0.05

ND = None Detected (<0.05 ug/L)

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

Table 1. cont'd. Spring 2016 Triazine Screen 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
2686	61	4/11/16	0.456	ND	1.940	1.510	T	0.057	ND	ND	ND	ND	0.071	118.0	0.05
2367	63A	4/11/16	ND	ND	ND	T	T	ND		ND	ND	ND	ND	104.0	0.05
2368	65	4/4/16	T	ND	ND	0.058	ND	ND	ND	ND	ND	ND	T	79.5	0.05
2687	68	4/4/16	ND	ND	ND	T	ND	ND	ND	ND	ND	ND	ND	80.0	0.05
2366	69	4/11/16	0.809	ND	0.605	3.340	ND	0.054	ND	ND	ND	ND	0.055	109.0	0.05
2690	71	4/4/16	0.686	ND	1.070	1.420	ND	T	0.838	ND	0.411	ND	T	81.0	0.05
2679	72	4/4/16	0.699	ND	T	1.510	T	T	T	ND	T	ND	0.058	79.5	0.05
2693	73	4/4/16	0.138	ND	ND	1.370	T	ND	T	ND	ND	ND	ND	80.0	0.05
2688	74	4/4/16	0.753	ND	0.361	1.090	T	T	T	ND	0.078	ND	0.103	96.5	0.05
2676	75A	3/30/16	0.931	ND	0.398	0.860	ND	T	ND	ND	ND	ND	0.087	77.5	0.05
2680	80	3/30/16	0.372	ND	0.678	1.860	ND	T	ND	ND	ND	ND	T	97.0	0.05
2677	84	3/30/16	T	ND	T	T	ND	ND	ND	ND	ND	ND	ND	76.5	0.05
2684	86	3/30/16	1.130	ND	ND	8.890	T	ND	ND	ND	ND	ND	0.053	82.0	0.05
2543	89	3/28/16	0.074	ND	T	0.112	ND	ND	T	ND	ND	ND	T	87.5	0.05
2692	90	5/2/16	0.274	ND	0.055	0.674	ND	0.066	0.632	ND	0.285	ND	0.075	79.0	0.05
2358	92	4/14/16	0.417	ND	ND	0.389	ND	0.175	0.155	ND	0.095	ND	0.071	99.5	0.05
2658	94	4/26/16	0.742	ND	ND	4.040	ND	T	0.336	ND	0.098	ND	T	84.0	0.05
2638	95	5/2/16	ND	ND	ND	T	ND	ND	ND	ND	ND	ND	T	102.0	0.05

ND = None Detected (<0.05 ug/L)

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

Table 2. Results for 2016 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 Sample Number	Well Number	Date Sampled	Atrazine	Bromacil	Diuron	Norflurazon	Prometon	Simazine	Imidacloprid	Fludioxonil
M	1	3/28/16			T					
Tr	1	3/28/16			T					
M	2	3/28/16			T			0.063		
Tr	2	3/28/16			T			0.063		
M	3	3/28/16						T		
Tr	3	3/28/16						T		
M	4	3/29/16	T	3.770	T	0.305	T	0.067		
Tr	4	3/29/16	T	3.540	0.055	0.372	T	0.097		
M	5	5/3/16						0.091		
Tr	5	5/3/16						0.109		
M	6	5/3/16			T			0.074		
Tr	6	5/3/16			T			0.082		
M	7	5/3/16						0.057		
Tr	7	5/3/16				0.403		0.101		
M	8	5/2/16		0.067	0.059			0.105		
Tr	8	5/2/16		0.064	0.055			0.105		
M	12	3/28/16		0.480	T			T		
Tr	12	3/28/16		0.255	T			T		
M	13	3/30/16		0.567	T	0.072		T		
Tr	13	3/29/16		0.483	T	0.065		T		
M	14	3/29/16								
Tr	14	3/29/16								
M	15	3/29/16			T	0.129		0.065		
Tr	15	3/29/16			T	0.129		0.074		
M	16	5/3/16		T	0.060	0.258		0.073		
Tr	16	5/3/16		0.645	T			0.051		
M	19	4/14/16			T	0.151		0.069		
Tr	19	4/14/16			T	0.165		0.083		
M	20	4/14/16						T		
Tr	20	4/14/16						T		
M	21	4/14/16								
Tr	21	4/14/16								
M	22	4/25/16						0.064	0.080	
Tr	22	4/25/16						0.074		

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 2016 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	Imidacloprid	Fludioxonil
M	23	4/25/16		0.115	0.069	T		0.072	0.209	
Tr	23	4/25/16		0.115	0.078	T		0.093		
M	24	4/18/16				0.052				
Tr	24	4/18/16				0.059				
M	25	4/18/16			T			T		
Tr	25	4/18/16			T			T		
M	26	4/18/16						T	0.072	
Tr	26	4/18/16						T		
M	28	4/18/16						T		
Tr	28	4/18/16						T		
M	29	4/27/16			T			T		
Tr	29	4/27/16						T		
M	30A	4/27/16			0.051	T		0.085		T
Tr	30A	4/27/16			0.056	T		0.087		
M	32	4/27/16				0.337		0.084		
Tr	32	4/27/16						0.074		
M	35	4/19/16			T	T	T	0.082		
Tr	35	4/19/16			T	T	T	0.089		
M	36	4/19/16						T		
Tr	36	4/19/16					T	T		
M	37	4/19/16			T	T		0.061		
Tr	37	4/19/16			T	T		0.077		
M	43	4/25/16			T	0.145		0.100		
Tr	43	4/25/16			T	0.162		0.109		
M	44	4/25/16		0.216	T			T		
Tr	44	4/25/16		0.139	T			T		
M	45	4/25/16			0.066					
Tr	45	4/25/16			0.072					
M	47	4/26/16				T			0.644	
Tr	47	4/26/16			T			T		
M	48	4/28/16		0.707	T	T		T	T	
Tr	48	4/28/16	0.081	0.059	0.065			0.102		

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 2016 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 Sample Number	Well Number	Date Sampled	Atrazine	Bromacil	Diuron	Norflurazon	Prometon	Simazine	Imidacloprid	Fludioxonil
M	49	4/26/16				0.055		0.085		
Tr	49	4/26/16				0.062		0.106		
M	50	4/13/16						T		
Tr	50	4/13/16						T		
M	51	4/13/16						0.053		
Tr	51	4/13/16						0.062		
M	52	4/13/16						0.118		
Tr	52	4/13/16						0.158		
M	53	4/13/16						T		
Tr	53	4/13/16						T		
M	54	4/13/16					0.070	T		
Tr	54	4/13/16					0.090	0.065		
M	56	4/19/16						0.101		
Tr	56	4/19/16						0.129		
M	57	4/19/16						T		
Tr	57	4/19/16						T		
M	58	4/28/16						0.076		
Tr	58	4/28/16						0.068		
M	59A	4/11/16		0.875	T	T				
Tr	59A	4/11/16		0.941	T	T				
M	61	4/11/16		1.660	T			T		
Tr	61	4/11/16		1.940	0.057			0.071		
M	63A	4/11/16								
Tr	63A	4/11/16								
M	65	4/4/16						T		
Tr	65	4/4/16						T		
M	68	4/4/16								
Tr	68	4/4/16								
M	69	4/11/16		0.589	T			T		
Tr	69	4/11/16		0.605	0.054			0.055		
M	71	4/4/16		1.510	T	0.446		T		
Tr	71	4/4/16		1.070	T	0.411		T		
M	72	4/4/16		T	T	T		0.059		
Tr	72	4/4/16		T	T	T		0.058		

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 2016 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 Sample Number	Well Number	Date Sampled	Atrazine	Bromacil	Diuron	Norflurazon	Prometon	Simazine	Imidacloprid	Fludioxonil
M	73	4/4/16								
Tr	73	4/4/16								
M	74	4/4/16		0.629	T	0.072		0.087		
Tr	74	4/4/16		0.361	T	0.078		0.103		
M	75A	3/30/16		0.897	T			0.090		
Tr	75A	3/30/16		0.398	T			0.087		
M	80	3/30/16		0.944	T			T		
Tr	80	3/30/16		0.678	T			T		
M	84	3/30/16		T						
Tr	84	3/30/16		T						
M	86	3/30/16		T				0.051		
Tr	86	3/30/16						0.053		
M	89	3/28/16		T	T			T		
Tr	89	3/28/16		T				T		
M	90	5/2/16	0.064	T	0.05	T		0.073		
Tr	90	5/2/16		0.055	0.066	0.285		0.075		
M	92	4/14/16		0.128		0.077		0.058		
Tr	92	4/14/16			0.175	0.095		0.071		
M	94	4/26/16		T	T	0.099		T		
Tr	94	4/26/16			T	0.098		T		
M	95	5/2/16						T		
Tr	95	5/2/16						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. 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	ACET	Atrazine	Bromacil	DACT	DEA	Diuron	DMN	Hexazinone	Norflurazon	Prometon	Simazine	Propazine
	115	102	115	121	112	108	112	115	115	113	109	90.0
4/19/16	105	94.5	102	109	102	101	98.0	102	96.5	102	104	84.0
	109	95.5	105	108	107	101	101	101	103	105	99.0	96.0
4/26/2016	108	95.0	105	103	107	96.5	99.0	101	101	102	102	92.0
	115	108	116	122	116	108	113	116	115	112	109	109
4/27/2016	114	104	109	118	114	107	111	116	114	112	107	110
	105	87.5	108	110	100	105	109	113	112	94.5	88.0	83.0
5/12/2016	98.5	84.0	102	102	96.0	96.0	101	105	101	93.0	88.0	82.0
	109	101	110	113	109	105	106	111	106	109	103	98.0
5/13/2016	106	92.5	106	110	106	103	106	106	106	104	98.5	94.0
	113	104	113	120	113	100	103	110	97.5	109	103	100
6/3/2016	113	103	109	115	114	98.0	105	110	100	109	107	98.5
Mean	109	98	108	113	108	102	105	109	106	105	101	95
SD	5.1	7.3	4.6	6.7	6.2	4.3	5.1	5.7	6.9	6.6	7.2	9.2
Observed Minimum	98.5	84.0	102	102	96.0	96.0	98.0	101	96.5	93.0	88.0	82.0
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	115	108	116	122	116	108	113	116	115	113	109	110

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 4. 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

	Percent Recovery (%)																												
Extraction Date	Atrazine	Azinphos-methyl	Azoxystrobin	Bensulide	Bromacil	Carbaryl	Carbofuran	Diazinon	Dimethenamide	Dimethoate	Diuron	Ethofumesate	Fenamiphos	Fludioxonil	Imidacloprid	Linuron	Mefenoxam/Metalaxy	Methiocarb	Metolachlor	Metribuzin	Napropamide	Norflurazon	Oryzalin	Prometon	Simazine	Tebuthiuron	Thiamethoxam	Thiobencarb	Uniconazole
4/11/2016	90.0	90.0	102	97.5	87.0	89.5	93.0	90.0	86.0	93.5	90.5	92.0	84.0	95.0	91.0	95.0	97.0	87.0	95.0	87.5	92.0	98.0	95.5	95.5	93.0	97.0	86.5	95.0	94.5
4/11/2016	88.5	86.5	98.0	96.0	87.0	89.0	89.0	82.5	89.0	92.5	91.5	92.5	82.0	92.5	95.0	91.5	90.5	84.5	91.0	89.5	89.5	92.0	103	94.5	92.0	94.0	84.5	91.0	92.5
4/25/2016	91.0	96.0	97.5	99.5	97.0	88.5	95.5	93.5	100	101	96.5	95.0	89.5	95.5	96.5	96.5	101	87.5	96.0	90.5	96.5	94.0	97.5	98.5	93.5	98.5	99.5	93.5	96.0
4/26/2016	89.5	90.5	94.5	95.0	89.5	96.5	96.0	87.0	95.0	90.5	92.0	86.0	85.0	95.5	93.0	92.0	97.0	94.0	94.0	92.5	93.5	96.0	98.5	98.5	94.0	97.5	84.5	92.0	88.0
5/9/2016	95.5	96.0	102	102	90.5	98.5	98.0	83.0	101	96.0	97.0	95.0	80.5	89.0	96.0	98.5	102	97.0	95.0	95.0	94.0	102	102	103	99.5	99.0	86.0	100	92.0
5/10/2016	92.5	90.0	94.0	104	92.0	101	94.5	83.5	93.5	107	95.0	89.5	91.0	98.5	102	94.0	98.0	101	92.5	90.5	96.0	99.5	102	100	101	101	95.5	94.5	89.5
Mean	91.2	91.5	98.0	99.0	90.5	93.8	94.3	86.6	94.1	96.8	93.8	91.7	85.3	94.3	95.6	94.6	97.6	91.8	93.9	90.9	93.6	96.9	99.8	98.3	95.5	97.8	89.4	94.3	92.1
SD	2.5	3.8	3.5	3.5	3.7	5.5	3.1	4.4	5.9	6.2	2.8	3.5	4.1	3.2	3.7	2.7	4.1	6.5	1.9	2.6	2.6	3.7	3.0	3.1	3.8	2.3	6.4	3.2	3.0
Observed Minimum	88.5	86.5	94.0	95.0	87.0	88.5	89.0	82.5	86.0	90.5	90.5	86.0	80.5	89.0	91.0	91.5	90.5	84.5	91.0	87.5	89.5	92.0	95.5	94.5	92.0	94.0	84.5	91.0	88.0
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	95.5	96.0	102	104	97.0	101	98.0	93.5	101	107	97.0	95.0	91.0	98.5	102	98.5	102	101	96.0	95.0	96.5	102	103	103	101	101	99.5	100	96.0

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 5. Quality Control – Multi Residue GC/MS Screen Matrix Spike Percent Recoveries

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

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

	Percent Recovery (%)														
Extraction Date	Alachlor	Clomazone	Dichloran	Dichlorbenil	Disulfoton	Ethoprophos	Ethyl Parathion	Fonofos	Malathion	Methyl Parathion	Phorate	Piperonyl Butoxide	Prometryn	Propanil	Triallate
4/11/2016	100	107	94.0	116	61.0	114	102	101	91.0	101	102	97.0	98.0	100	97.5
4/11/2016	86.5	87.5	79.5	82.5	110	85.5	90.0	86.5	87.5	83.0	82.0	86.5	92.0	85.5	81.0
4/25/2016	80.5	87.0	84.5	87.0	86.0	85.5	80.0	84.0	77.5	74.5	76.5	74.5	76.0	77.5	87.5
4/26/2016	94.5	93.5	81.5	91.0	69.5	96.5	90.0	90.5	90.5	91.5	89.0	82.5	92.5	93.0	88.5
5/9/2016	85.0	105	100	107	77.0	101	98.5	101	97.0	98.0	88.0	78.5	104	104	101
5/10/2016	77.0	79.0	69.5	83.5	71.0	82.5	74.0	75.5	72.5	70.5	70.5	70.5	77.0	77.5	77.5
Mean	87.3	93.2	84.8	94.5	79.1	94.2	89.1	89.8	86.0	86.4	84.7	81.6	89.9	89.6	88.8
SD	8.6	11.0	10.9	13.8	17.3	12.1	10.7	10.0	9.2	12.5	11.0	9.4	11.3	11.3	9.1
Observed Minimum	77.0	79.0	69.5	82.5	61.0	82.5	74.0	75.5	72.5	70.5	70.5	70.5	76.0	77.5	77.5
LCL	54.9	42.4	51.3	34.7	34.7	52.0	55.1	48.4	51.0	54.8	61.5	32.3	46.3	58.2	52.0
UCL	140	156	148	149	144	144	151	147	163	150	141	186	156	149	144
Observed Maximum	100	107	100	116	110	114	102	101	97.0	101	102	97.0	104	104	101

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 6. Quality Control – Triazine and Multi Residue Screen Blind Spike Percent Recoveries

Sample #	Extraction Date	Analysis	Analyte	Spike Level (ppb)	Result (ppb)	% Recovery	Control limit exceeded
2360	4/11/2016	Multi-Residue	Azoxystrobin	0.15	0.14	93.3%	No
			Triallate	0.2	0.171	85.5%	No
			Unicoizole	0.3	0.315	105%	No
9159	5/6/2016	Multi-Residue	Bensulide	0.15	0.138	92.0%	No
			Prometryn	0.2	0.148	74.0%	No
			Propanil	0.3	0.232	77.3%	No
2362	5/12/2016	Triazine	ACET	0.15	0.182	121%	Yes
			Bromacil	0.15	0.113	75.3%	No