Groundwater Protection Program

2014 Monitoring Activity & Results

Sampling Details

The Agricultural Chemicals & Groundwater Protection Program (Program) sampled the following networks in 2014: Weld County monitoring (MW), domestic (DW), and irrigation (IW) wells, and the Lower South Platte. These are all dedicated networks that have been routinely sampled since 1995. Results for 2014 are briefly compared to historical results in *General Findings* along with any noteworthy discoveries. Table 1 summarizes the sampling logistics.

TABLE 1 SUMMARY OF MONITORING ACTIVITIES CONDUCTED IN 2014

Network	# Wells In Network	# Samples Collected	Sampling Period	Lab Analyses Conducted
Weld County MWs	22	63	06/16/2014 - 09/24/2014	CDA (Pesticide & Anion)
Weld County DWs	13	8	08/05/2014 - 08/06/2014	CDA (Pesticide & Anion)*
Weld County IWs	33	16	08/04/2014 - 08/06/2014	CDA (Anion)
Lower South Platte MWs	23	20	08/25/2014 - 09/16/2014	CDA (Pesticide & Anion)
TOTAL	91	107		

MWs stands for monitoring wells; **DWs** stands for domestic wells; **IWs** stands for irrigation wells.
* Only three DWs were analyzed for pesticide compounds at the request of the well owners.

In 2013, the Program conducted multiple sampling events on the Weld County MWs to analyze for stable isotopes and that protocol was followed again in 2014. Additionally, these multiple sampling events were used to determine if significant variability in nitrate concentration was occurring within season when compared to the historic normal June sampling period for the Weld County MWs. The two additional sampling events took place in August and September. Results on the isotope signature and within season nitrate variability are briefly discussed in *General Findings*.

The normal analysis suite for groundwater samples includes seven anions and 102 pesticide compounds (Table 7). Nearly all samples undergo this complete analysis except the Weld County DWs and IWs which are typically only analyzed for anions unless a well owner requests pesticide analysis. In 2014 only three of eight sampled Weld County DWs were run for pesticides and the 16 Weld County IWs that were sampled were analyzed for anions only. The split samples collected from Weld County MWs for isotope analysis were sent to the University of California at Davis for $^{15}N/^{18}O$ determination and to Tetratech in Fort Collins, CO for elemental boron and isotope ^{11}B determination. Furthermore, the Center for Environmental Mass Spectrometry at the University of Colorado – Boulder, received split samples from the first round of Weld County MW sampling for

qualitative analysis of 600+ pesticide compounds and quantitative analysis of what is being termed sewage tracers. These consist of a handful of pharmaceutical and food-type products that have potential to serve as indicators of water from a waste water treatment plant or septic system discharge. These results will be used by the Program to assist with the nitrate sourcing interpretation in the Weld County nitrate trend assessment that is currently ongoing. The analytes screened for at the CDA laboratory and their corresponding reporting limits are presented in **Table 7** at the end of this summary. As of February 2015, all the isotope results for 2014 sampling events have not been received and reviewed, so they are only briefly discussed.

General Findings

Nitrate

Nitrate-nitrogen (NO_3-N) values discovered in all well networks (Table 2) continue to fall in line with historical sampling data. In Weld County, NO_3-N median values for the DWs and IWs were near the lower end of the long-term median range and the MWs reached the lowest ever median which was actually below the all-time median range. The NO_3-N median for Lower South Platte MWs was within the all-time median range for data that has been collected five times since 2001.

2014 NO_3-N Findings by Network

Well Network	# Years Sampled	All Time Median Range	Median	Range	% BDL	% ≥MCL
Weld County MWs	21	16.5 - 21.4	13.9	2.0 - 64.4	0	71.4
Weld County DWs	13	8.0 - 12.4	8.2	1.0 - 15.1	0	37.5
Weld County IWs	23	16.1 - 18.0	16.0	1.9 - 38.3	0	93.8
Lower South Platte MWs	5	5.79 - 8.83	8.4	0.1 - 28.5	0	35.0

All data in this table are only results from the primary sampling event of each network. **All Time Median Range** is the 95% confidence interval of the median for all years of data collection in the network; **Median** is the 2014 median for the network; **Range** is the range of values discovered in 2014 in the network; % **BDL** is the percentage of samples that were below thd detection limit in 2014; % **≥ MCL** is the percentage of samples with NO_3-N at or above the U.S. EPA Drinking Water Maximum Contaminant Level of 10.0 in 2014; All values

TABLE 2 NO_3-N RESULTS FOR SAMPLES COLLECTED FROM EACH NETWORK'S PRIMARY SAMPLING EVENT IN 2014 WITH COMPARISON TO ALL TIME MEDIAN VALUES.

Historically, more than 60% of all samples collected in Weld County, during their normally scheduled sampling times, have been above the U.S. EPA Maximum Contaminant Level (MCL) for NO_3-N of 10.0 mg L^{-1} or parts-per-million (ppm), and this result was seen again for the Weld County data in 2014. Table 2 shows each network's NO_3-N median value and percentage of wells over the EPA MCL.

The multiple sampling events conducted on Weld County MWs in 2014 showed similar results to those seen in 2012 and 2013. The initial purpose behind the multiple sampling events was to discern if a significant difference or variability in nitrate concentration was occurring throughout the growing season. As can be seen in **Table 3**, there is no evidence of the concentrations detected in July/August or September/October in the years 2012 through 2014 being significantly different than those detected in June. Furthermore, no wells exhibited a consistent increase in nitrate from the first sampling in June through the last sampling event in September/October across all three years of sampling. Samples collected in June did have the lowest standard deviation but the lowest median was seen in September/October. The maximum NO_3-N values detected in each of the three sampling events came from different wells. Ultimately, the multiple sampling events conducted over the last three years in Weld County have shown the highly variable nature of the nitrate concentrations in the South Platte alluvial aquifer, but show no evidence suggesting that the Program sampling only in June has missed any significant change in the nitrate contamination that impacts the portion of the South Platte alluvial aquifer that the Program monitors.

TABLE 3 INDIVIDUAL WELL NO_3-N RESULTS FOR SAMPLES COLLECTED FROM 2012-2014 WITH COMPARISON TO LONG-TERM MEDIAN VALUES. ALL VALUES ARE IN PARTS-PER-MILLION OR MG L^{-1}.

Weld County Monitoring Well NO_3-N 2012-2014			
Statistic	**June**	**July/Aug**	**Sept/Oct**
Mean	20.3	23.0	22.0
Std Dev	16.5	17.6	20.5
Variance	272	309	422
Minimum	1.4	0.8	0.7
1st Quartile	9.1	8.4	5.6
Median	15.7	21.5	14.6
3rd Quartile	27.7	32.7	30.9
Maximum	64.4	71.8	103.0
95% CI Median	11.7 - 21.6	13.7 - 25.2	10.2 - 23.7

The program is continuing to receive and analyze isotope data on samples collected from the three sampling events of Weld County MWs in 2014. Preliminary results show that the $^{15}N/^{18}O$ signature on nitrate in the alluvial groundwater is predominantly organic in nature. No sites had an isotopic signature that suggests that synthetic nitrate fertilizer was the source of nitrate contamination in groundwater. A small percentage of samples have signatures that may suggest nitrified ammonia fertilizer as the nitrate source. Given the natural abundance of ^{11}B in the environment its analysis results by themselves are not very useful in determining nitrate source; however in some instances it can help differentiate organic $^{15}N/^{18}O$ signatures between manure and domestic waste sources.

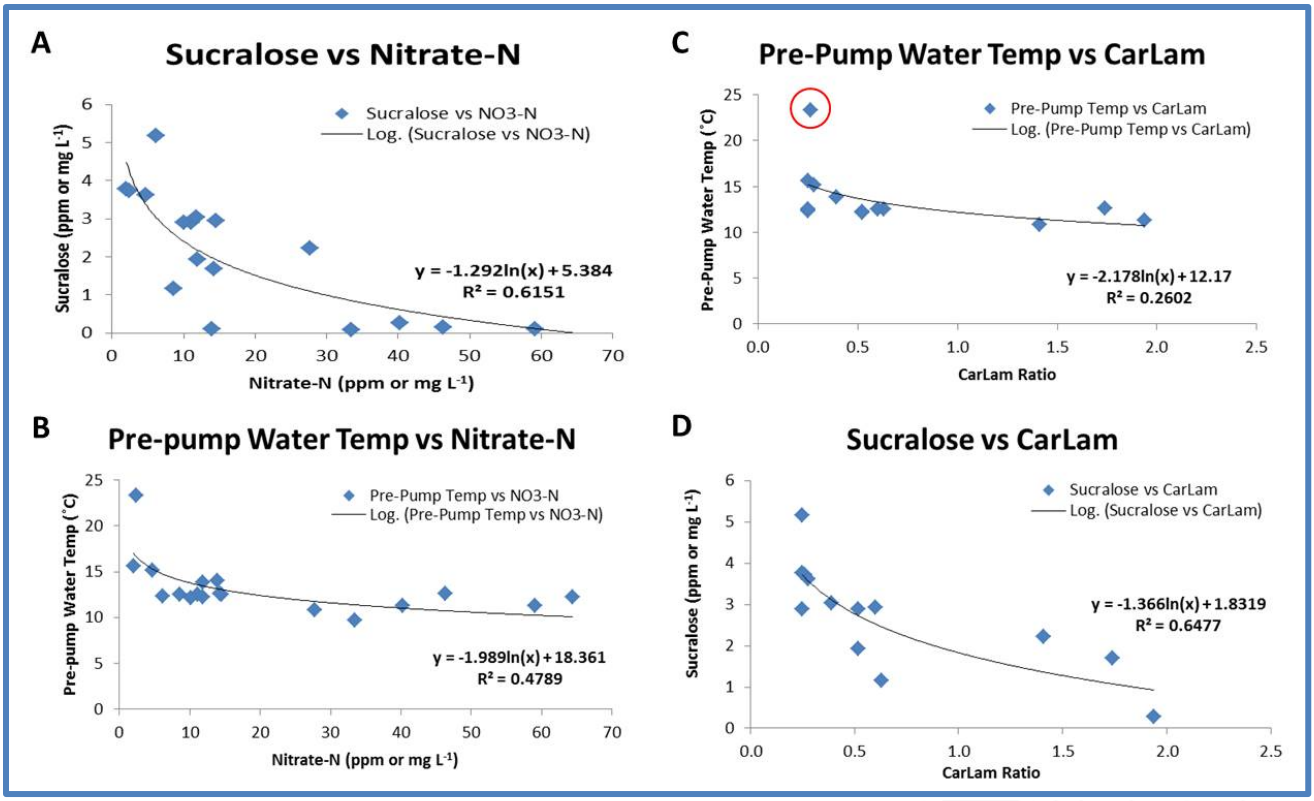
Select pharmaceuticals and artificial sweeteners quantitatively determined by the Center for Mass Spectrometry, from the first round of Weld County MW samples collected in June, show evidence of waste water influence on alluvial groundwater quality in Weld County. Carbamazepine and lamotrigine, both anti-epileptic drugs, were detected in 19 and 16 of the 21 sampled wells

respectively. Sucralose, the artificial sweetener more commonly known as Splenda®, was detected in all but one well while sulfamethoxazole, a drug commonly used for urinary tract infections and other inner-body infections, was detected in 19 wells. Gabapentin was found in only five wells and is a medication used to treat seizures or post-shingles nerve pain.

The ratio between carbamazepine and lamotrigine (CarLam) is being considered as a potential tool for age-dating groundwater because of differences in how the two chemicals withstand the waste water treatment process. In the 15 instances in which both compounds were detected in the same well and a ratio could be calculated, six had a ratio less than 0.30 (being proposed to indicate groundwater containing more 'newer' water); five had a ratio between 0.30 and 0.60 (being proposed to indicate a mixture in which a qualitative age cannot be discerned); and four had a ratio greater than 1.0 (being proposed to indicate groundwater containing more 'older' water).

In three of the five wells with gabapentin detection the CarLam is indicative of more 'newer' water while the other two gabapentin detects were in wells with CarLam of 0.39 and 0.52. Sucralose detected in wells with dissolved oxygen greater than 2.0 mg L^{-1} was found to be inversely proportional to nitrate with an R^2 of 0.62 using a logarithmic model (**Fig 1A**). An R^2 of 1.0 indicates a perfect correlation between variables. Similarly, the pre-pump water temperature measured in

FIGURE 1 GRAPHS USING LOGARITHMIC CORRELATION MODELS SHOWING RELATIONSHIPS BETWEEN NITRATE-N AND SUCRALOSE **(A)** AND PRE-PUMP WATER TEMP **(B)** AND RELATIONSHIPS BETWEEN CARLAM RATIO AND PRE-PUMP WATER TEMP **(C)** AND SUCRALOSE **(D)**. RED CIRCLE SHOWS OUTLIER POINT THAT KEEPS THE R^2 VALUE FROM REACHING 0.41



each well is inversely proportional to nitrate concentration (R^2 = 0.48) and the CarLam ratio (R^2 = 0.26) using a logarithmic model (**Figs 1b, 1c**). The CarLam R^2 is low because of one outlier (circled in red in Figure 1c) which has unusually high groundwater temperature (23.3 ˚C). Without this data point the R^2 for the trend in Figure 1c would be 0.41. Additionally, sucralose was found to be inversely proportional to CarLam with an R^2 of 0.65 using the same model (**Fig 1d**). These correlations show that wells with groundwater that is more recently recharged (higher water temperature) tend to have higher concentrations of sucralose and lower nitrate concentrations. This suggests that the water chemistry in these wells is affected more by surface water or waste water treatment effluent than irrigated agriculture. This scenario is feasible given the abundance of irrigation canal/ditch diversions from the South Platte River, downstream of waste water treatment discharge points, which provide ample opportunity for seepage into groundwater throughout the Weld County monitoring well network area. A more in depth presentation and discussion on this information will take place as part of the Program's ongoing reassessment of Weld County groundwater nitrate trends and how they relate to monitoring and outreach in the area.

2014 Pesticide Results

	# Samples	# Detects	# Types	Main 8 # Det	Main 8 % Det	Metolachlor # Det	Metolachlor % Det
Weld County MWs	63	225	24	167	74.2%	119	52.9%
Round 1	21	84	20	61	72.6%	41	48.8%
Round 2	21	67	15	52	77.6%	38	56.7%
Round 3	21	73	19	54	74.0%	40	54.8%
Weld County DWs	3	11	6	7	63.6%	6	54.5%
Lower South Platte	20	48	9	32	66.7%	22	45.8%
All Samples	149	284	25	207	72.9%	147	51.8%

TABLE 4 PESTICIDE DETECTION SUMMARY FOR SAMPLES COLLECTED IN 2014 FROM THREE ROUNDS OF SAMPLING OF WELD COUNTY MW NETWORK, FROM SELECT WELLS IN WELD COUNTY DW NETWORK, AND FROM MONITORING WELLS IN THE LOWER SOUTH PLATTE. **MAIN 8** IS COMBINED DETECT RESULTS FOR ATRAZINE AND ITS DESETHYL-, DESISOPROPYL-, HYDROXY DEGRADATE COMPOUNDS, METOLACHLOR AND ITS –ESA AND –OA DEGRADATE COMPOUNDS, AND PROMETON. **METOLACHLOR** IS COMBINED DETECT RESULTS FOR METOLACHLOR AND ITS –ESA AND –OA DEGRADATE COMPOUNDS.

Pesticides

A total of 284 detects of 25 different pesticide compounds were discovered in 2014 (**Table 6**). The majority (79.2%) of detects were found in Weld County MWs. However, the 21 Weld County MWs were sampled three times and this explains why so many detects came from that network. However, over the three sampling events there were 84, 67, and 73 pesticide detects which shows these wells consistently have detectable quantities of multiple pesticide compounds as seen in **Table 4**.

Since sampling began in Weld County MWs in 1995, a group of eight pesticide compounds (herein termed 'Main 8') have accrued the highest number of detects – atrazine (Tradename[1] AAtrex) and its degradates desethyl atrazine (DEA), desisopropyl atrazine, and hydroxy atrazine (HA); metolachlor (Tradename Bicep) and its degradates metolachlor ESA (MESA) and metolachlor OA (MOA); and prometon (Tradename Pramitol). **Table 5** shows the number of detects these compounds have accrued across two different time periods: 1995-2008 and 2009-2014. The reason for the two periods is that the Program only began analyzing for HA, MESA, and MOA in 2009, so their accrual of detects has occurred only in the last six years. As detections of atrazine and DEA have decreased since 2008, MESA and MOA have now become the most frequently detected compounds. In Weld County MWs particularly, MESA and MOA together have accumulated 420 detects since 2009 which is nearly equal to the sum of atrazine, DEA, prometon, and metolachlor detects discovered since 1995 (432). Of the 21 Weld County MWs consistently sampled from 2009 to 2014, the vast majority of them have seen MESA detected in every sample at a median concentration of two parts-per-billion (ppb). MESA does not have a drinking water standard.

TABLE 5 SUMMARY OF TOP EIGHT PESTICIDE COMPOUNDS DETECTED IN WELD COUNTY MWS OVER TWO DIFFERENT TIME PERIODS.

Time Period	1995-2008	2009-2014
# Samples Collected	264	246
Pesticide	**# Detects**	**# Detects**
Atrazine	69	35
Desethyl atrazine	85	69
Deisoproyl atrazine	6	27
Hydroxy atrazine	NA	55
Metolachlor	54	48
Metolachlor ESA	NA	233
Metolachlor OA	NA	187
Prometon	37	35

The Main 8 compounds comprised more than 70% of all detects in any round of sampling in the Weld County MWs, and 67% of detects in the 20 wells sampled as part of the Lower South Platte. As evidenced in Tables 4 and 5, these compounds constitute the majority of total pesticide detects discovered by the Program. All metolachlor compounds accounted for about 46% of detects in the Lower South Platte and nearly 53% of all Weld County detects.

The Program also detected two new pesticides in 2014, both in Weld County MWs. Chlorantraniliprole (Tradename Coragen), an insecticide with a long soil half-life, was found in the same well in all three sampling rounds, and an additional well in the 3rd round of sampling. The highest concentration of 1.53 ppb is a minute fraction of the EPA's chronic Human Health Benchmark for Pesticides (HHBP) of 11,060 ppb for the compound. The insecticide Cyromazine (Tradename Larvadex) was detected in the 1st and 3rd rounds in the same well but was also well below its HHBP of 1,050 ppb with a max concentration of 0.19 ppb. It is used to protect against leafminer beetles and other insects on various vegetable crops. Glyphosate (Tradename Roundup)

[1] **Tradenames** are used as example for a product that contains a particular active ingredient or pesticide compound and do not indicate that the specific product has been studied and/or detected by the Program.

and its main degradate AMPA were part of the pesticide analysis suite in 2014, but no detects of either compound were found in any of the 149 samples analyzed. This marked the first time the Program has screened groundwater samples for the presence of glyphosate, and although its detection is unlikely, analysis will continue due to the magnitude of use both in quantity and areal extent in Colorado.

Conclusion

The Program found nothing substantially different with regard to nitrate or pesticide contamination in 2014. The multiple sampling events in Weld County MWs replicated the within season variability seen in 2013, but did not provide any evidence of significant differences. The nitrate concentrations found in Weld County are in line with the 20+ years of data which shows some tendency towards a decreasing trend but not a statistically significant one. Preliminary results on nitrate isotopic signatures in Weld County alluvial groundwater suggest that the predominant source of nitrate may be organic in nature. Inclusion of pharmaceutical and artificial sweetener analysis may lend further help in discerning where domestic waste influences may be greater than animal manure influences. The number of pesticide detects/types is similar to past years. Metolachlor degradates continue to be the most frequently detected pesticides, especially in Weld County MWs. The Weld County MW network saw two new pesticides discovered with detections of chlorantraniliprole and cyromazine, both insecticides, and both at detected levels well below any level of concern. No detects of glyphosate or its main degradate, AMPA, were discovered in 2014.

All of the data seen and/or discussed in this monitoring summary can be queried and downloaded from the Program's online water quality database and map viewer which can be accessed at: http://www.erams.com/co_groundwater. Program personnel contact information and other information can be found on the Program's main website http://www.co.gov/ag/gw.

Pesticide Compounds Detected in Various Networks Sampled in 2014				
Pesticide Active Ingredient	**Network**	**# Detects**	**Conc. Range (Median)**	**Note**
Acetochlor ESA	Lower South Platte	1	0.32	No Drinking Water Standard
	Weld County Monitoring #1	1	0.97	
Alachlor ESA	Lower South Platte	13	0.12 - 1.77 (0.26)	No Drinking Water Standard
	Weld County Domestic	2	0.13 - 0.25	
	Weld County Monitoring #1	5	0.15 - 0.18 (0.16)	
	Weld County Monitoring #2	7	0.10 - 1.17 (0.19)	
	Weld County Monitoring #3	5	0.12 - 1.14 (0.19)	
Atrazine	Weld County Monitoring #2	1	0.1	U.S. EPA Drinking Water MCL 3.0 ppb
Azoxystrobin	Weld County Monitoring #1	2	0.12 - 0.13	U.S. EPA HHBP Chronic 1,260 ppb
Bromacil	Weld County Monitoring #1	1	0.04	U.S. EPA Drinking Water HAL 70 ppb
	Weld County Monitoring #2	1	0.45	
	Weld County Monitoring #3	2	0.19 - 4.31	
Chlorantraniliprole	Weld County Monitoring #1	1	0.175	U.S. EPA HHBP Chronic 11,060 ppb
	Weld County Monitoring #2	1	0.17	
	Weld County Monitoring #3	2	0.10 - 1.53	
Chlorsulfuron	Weld County Monitoring #3	1	0.17	U.S. EPA HHBP Chronic 140 ppb
Cyromazine	Weld County Monitoring #1	1	0.19	U.S. EPA HHBP Chronic 1,050 ppb
	Weld County Monitoring #3	1	0.13	
Desethyl Atrazine	Lower South Platte	3	0.12 - 0.55 (0.16)	No Drinking Water Standard
	Weld County Domestic	1	0.11	
	Weld County Monitoring #1	8	0.10 - 0.19 (0.11)	
	Weld County Monitoring #2	3	0.10 - 0.18 (0.16)	
	Weld County Monitoring #3	3	0.11 -0.16 (0.11)	
Deisopropyl Atrazine	Weld County Monitoring #1	1	0.11	No Drinking Water Standard
	Weld County Monitoring #2	1	0.28	
	Weld County Monitoring #3	2	0.10 - 0.23	
Diflufenzopyr	Weld County Monitoring #2	1	0.12	U.S. EPA HHBP Chronic 1,082 ppb
	Weld County Monitoring #3	1	1.50	
Dimethenamid ESA	Lower South Platte	1	0.42	No Drinking Water Standard
	Weld County Monitoring #1	3	0.10 - 0.36 (0.12)	
	Weld County Monitoring #2	1	0.15	
	Weld County Monitoring #3	1	0.23	
Dimethenamid OA	Weld County Monitoring #1	1	0.11	No Drinking Water Standard
	Weld County Monitoring #3	1	0.40	
Hydroxy Atrazine	Lower South Platte	7	0.06 - 0.12 (0.09)	U.S. EPA HHBP Chronic 70 ppb
	Weld County Domestic	1	0.04	
	Weld County Monitoring #1	10	0.05 - 0.31 (0.07)	
	Weld County Monitoring #2	9	0.04 - 0.09 (0.06)	
	Weld County Monitoring #3	9	0.04 - 0.12 (0.08)	
Imazapic	Weld County Monitoring #3	1	0.13	U.S. EPA HHBP Chronic 3,500 ppb
Imazapyr	Weld County Domestic	1	0.32	U.S. EPA HHBP Chronic 17,500 ppb
	Weld County Monitoring #1	2	0.10 - 0.14	
	Weld County Monitoring #2	2	0.10 - 0.12	
Imidocloprid	Weld County Monitoring #1	1	0.10	U.S. EPA HHBP Chronic 339 ppb
	Weld County Monitoring #3	1	0.67	
Metalaxyl	Weld County Monitoring #3	1	0.66	No Drinking Water Standard
Metolachlor	Lower South Platte	1	0.91	U.S. EPA Drinking Water HAL 700 ppb
	Weld County Monitoring #1	4	0.15 - 0.67 (0.28)	
	Weld County Monitoring #2	2	0.10 - 0.155	
	Weld County Monitoring #3	2	0.16 - 0.18	
Metolachlor ESA	Lower South Platte	16	0.17 - 6.84 (0.52)	No Drinking Water Standard
	Weld County Domestic	3	0.95 - 3.42 (1.41)	
	Weld County Monitoring #1	20	0.21 - 6.19 (2.18)	
	Weld County Monitoring #2	19	0.15 - 7.78 (2.10)	
	Weld County Monitoring #3	21	0.10 - 8.23 (1.71)	
Metolachlor OA	Lower South Platte	5	0.26 - 4.27 (0.41)	No Drinking Water Standard
	Weld County Domestic	3	0.31 - 1.26 (0.44)	
	Weld County Monitoring #1	17	0.10 - 2.41 (1.02)	
	Weld County Monitoring #2	17	0.10 - 5.96 (1.26)	
	Weld County Monitoring #3	17	0.10 - 5.57 (0.91)	
Nicosulfuron	Weld County Monitoring #1	3	0.10 - 0.12 (0.10)	U.S. EPA HHBP Chronic 8,750 ppb
Picloram	Weld County Monitoring #1	1	0.80	U.S. EPA Drinking Water MCL 500 ppb
	Weld County Monitoring #2	1	0.30	
	Weld County Monitoring #3	1	0.11	
Prometon	Weld County Monitoring #1	1	0.10	U.S. EPA Drinking Water HAL 40 ppb
Thiamethoxam	Lower South Platte	1	0.38	U.S. EPA HHBP Chronic 84 ppb
	Weld County Monitoring #1	1	0.77	
	Weld County Monitoring #2	1	0.23	
	Weld County Monitoring #3	2	0.15 - 0.18	

Conc. Range/Median is the range of concentration the detected pesticide active ingredient was discovered at, and for instances with more than three detections the median is shown in parentheses; all concentrations are in parts-per-billion (ppb); **HAL** is Health Advisory Level; **MCL** is Maximum Contaminant Level; **HHBP** is Human Health Benchmark for Pesticides; Weld County #1, #2, and #3 correspond to the first, second, and third sampling events which occured in June, August, and September, respectively.

TABLE 6 CONCENTRATION RANGE AND MEDIAN FOR THE DIFFERENT PESTICIDE ACTIVE INGREDIENTS DISCOVERED IN THE NETWORKS SAMPLED IN 2014.

COLORADO
Department of Agriculture
Conservation Services Division

Analytes Measured of Groundwater Samples† Collected in 2014							
Analyte Name	**Reporting Limit**	**Units**	**Laboratory**	**Analyte Name**	**Reporting Limit**	**Units**	**Laboratory**
2,4-D	0.1	ug/L	CDA Groundwater Lab	Imazamox	0.1	ug/L	CDA Groundwater Lab
2,4-DB	0.1	ug/L	CDA Groundwater Lab	Imazapic	0.1	ug/L	CDA Groundwater Lab
2,4-DP	0.1	ug/L	CDA Groundwater Lab	Imazapyr	0.1	ug/L	CDA Groundwater Lab
3-Hydroxycarbofuran	0.1	ug/L	CDA Groundwater Lab	Imazethapyr	0.1	ug/L	CDA Groundwater Lab
Acetochlor	0.1	ug/L	CDA Groundwater Lab	Imidacloprid	0.1	ug/L	CDA Groundwater Lab
Acetochlor ESA	0.1	ug/L	CDA Groundwater Lab	Isoxaflutole	0.1	ug/L	CDA Groundwater Lab
Acetochlor OA	0.1	ug/L	CDA Groundwater Lab	Kresoxim methyl	0.1	ug/L	CDA Groundwater Lab
Acifluorfen	0.1	ug/L	CDA Groundwater Lab	Linuron	0.5	ug/L	CDA Groundwater Lab
Alachlor	0.1	ug/L	CDA Groundwater Lab	MCPA	0.1	ug/L	CDA Groundwater Lab
Alachlor ESA	0.1	ug/L	CDA Groundwater Lab	MCPP	0.1	ug/L	CDA Groundwater Lab
Alachlor OA	0.1	ug/L	CDA Groundwater Lab	Metalaxyl	0.1	ug/L	CDA Groundwater Lab
Aldicarb	0.1	ug/L	CDA Groundwater Lab	Metconazole	0.1	ug/L	CDA Groundwater Lab
Aldicarb sulfone	0.2	ug/L	CDA Groundwater Lab	Methomyl	0.1	ug/L	CDA Groundwater Lab
Aldicarb sulfoxide	0.1	ug/L	CDA Groundwater Lab	Metolachlor	0.1	ug/L	CDA Groundwater Lab
Aminopyralid	0.1	ug/L	CDA Groundwater Lab	Metolachlor ESA	0.1	ug/L	CDA Groundwater Lab
AMPA	2.0	ug/L	CDA Groundwater Lab	Metolachlor OA	0.1	ug/L	CDA Groundwater Lab
Atrazine	0.1	ug/L	CDA Groundwater Lab	Metribuzin	0.1	ug/L	CDA Groundwater Lab
Azoxystrobin	0.1	ug/L	CDA Groundwater Lab	Metsulfuron methyl	0.1	ug/L	CDA Groundwater Lab
Bentazon	0.2	ug/L	CDA Groundwater Lab	Nicosulfuron	0.1	ug/L	CDA Groundwater Lab
Bromacil	0.2	ug/L	CDA Groundwater Lab	Norflurazon	0.2	ug/L	CDA Groundwater Lab
Carbaryl	0.2	ug/L	CDA Groundwater Lab	Norflurazon desmethyl	0.5	ug/L	CDA Groundwater Lab
Carbofuran	0.1	ug/L	CDA Groundwater Lab	Oxamyl	0.2	ug/L	CDA Groundwater Lab
Chlorantraniliprole	0.1	ug/L	CDA Groundwater Lab	Oxydemeton methyl	0.1	ug/L	CDA Groundwater Lab
Chlorimuron ethyl	0.1	ug/L	CDA Groundwater Lab	Picloram	0.5	ug/L	CDA Groundwater Lab
Chlorsulfuron	0.1	ug/L	CDA Groundwater Lab	Prometon	0.1	ug/L	CDA Groundwater Lab
Clopyralid	1.0	ug/L	CDA Groundwater Lab	Propazine	0.1	ug/L	CDA Groundwater Lab
Cyanazine	0.1	ug/L	CDA Groundwater Lab	Propoxur	0.1	ug/L	CDA Groundwater Lab
Cyproconazole	0.1	ug/L	CDA Groundwater Lab	Prosulfuron	0.1	ug/L	CDA Groundwater Lab
Cyromazine	0.1	ug/L	CDA Groundwater Lab	Pyrimethanil	0.1	ug/L	CDA Groundwater Lab
Desethyl Atrazine	0.1	ug/L	CDA Groundwater Lab	Quinclorac	0.1	ug/L	CDA Groundwater Lab
Desisopropyl Atrazine	0.1	ug/L	CDA Groundwater Lab	Simazine	0.1	ug/L	CDA Groundwater Lab
Dicamba	0.1	ug/L	CDA Groundwater Lab	Sulfentrazone	0.2	ug/L	CDA Groundwater Lab
Diflufenzopyr	0.1	ug/L	CDA Groundwater Lab	Sulfometuron methyl	0.1	ug/L	CDA Groundwater Lab
Dimethenamid	0.1	ug/L	CDA Groundwater Lab	Sulfosulfuron	0.1	ug/L	CDA Groundwater Lab
Dimethenamid ESA	0.1	ug/L	CDA Groundwater Lab	Tebuconazole	0.1	ug/L	CDA Groundwater Lab
Dimethenamid OA	0.1	ug/L	CDA Groundwater Lab	Tebufenozide	0.1	ug/L	CDA Groundwater Lab
Dimethoate	0.1	ug/L	CDA Groundwater Lab	Tebuthiuron	0.1	ug/L	CDA Groundwater Lab
Dinotefuran	0.1	ug/L	CDA Groundwater Lab	Terbacil	0.1	ug/L	CDA Groundwater Lab
Disulfoton sulfone	0.1	ug/L	CDA Groundwater Lab	Thiamethoxam	0.1	ug/L	CDA Groundwater Lab
Disulfoton sulfoxide	0.1	ug/L	CDA Groundwater Lab	Triadimefon	0.1	ug/L	CDA Groundwater Lab
Diuron	0.1	ug/L	CDA Groundwater Lab	Triallate	0.1	ug/L	CDA Groundwater Lab
Ethofumesate	0.2	ug/L	CDA Groundwater Lab	Triasulfuron	0.1	ug/L	CDA Groundwater Lab
Ethoprop	0.1	ug/L	CDA Groundwater Lab	Trichlorfon	0.1	ug/L	CDA Groundwater Lab
Fenamiphos	0.1	ug/L	CDA Groundwater Lab	Triclopyr	0.2	ug/L	CDA Groundwater Lab
Fenamiphos sulfone	0.1	ug/L	CDA Groundwater Lab	Triticonazole	0.1	ug/L	CDA Groundwater Lab
Florasulam	0.1	ug/L	CDA Groundwater Lab	Br	0.05	mg/L	CDA Groundwater Lab
Flufenacet	0.1	ug/L	CDA Groundwater Lab	Cl	0.05	mg/L	CDA Groundwater Lab
Flumetsulam	0.1	ug/L	CDA Groundwater Lab	F	0.05	mg/L	CDA Groundwater Lab
Glyphosate	1.0	ug/L	CDA Groundwater Lab	Nitrate-nitrogen	0.05	mg/L	CDA Groundwater Lab
Halofenozide	0.1	ug/L	CDA Groundwater Lab	Nitrite-nitrogen	0.05	mg/L	CDA Groundwater Lab
Halosulfuron methyl	0.1	ug/L	CDA Groundwater Lab	Ortho-P (Dissolved)	0.05	mg/L	CDA Groundwater Lab
Hydroxy Atrazine	0.04	ug/L	CDA Groundwater Lab	SO4	0.05	mg/L	CDA Groundwater Lab
Imazamethabenz ester	0.1	ug/L	CDA Groundwater Lab				

†, not all groundwater samples underwent analysis for all analytes listed in this table; **CDA** is Colorado Department of Agriculture

TABLE 7 REPORTING LIMITS FOR ALL LABORATORY ANALYTES MEASURED IN 2014.

COLORADO
Department of Agriculture
Conservation Services Division