Quarterly Report

Calendar Year 2025 – First Quarter, January 1 – March 31, 2025

Prepared by:

Carlsbad Environmental Monitoring & Research Center
under a financial assistance grant from
U.S. Department of Energy
Carlsbad Field Office (CBFO)
Award No. DE-EM0005195

Submitted to:

U.S. Department of Energy
Carlsbad Field Office

April 15, 2025

Field Programs - Radiation Safety Group

WIPP Underground Effluent Monitoring (Station B)

From January 1st to March 31st, a total of 114 filters were collected from the primary skid at Station B, (90 sample filters, 12 trip blanks and 12 filter blanks). One hundred and nine filters were collected from Station B backup (85 sample filters, 12 trip blanks and 12 filter blanks), during the same time period.

All 114 filters from the primary skid at Station B have been processed (gravimetrics, sample flow volume, and mass concentration have been calculated in the Field Programs (FP) data package) and transferred to the Radiochemistry group (RC). All 109 of the Station B backup filters were transferred to Environmental Chemistry group (EC).

Ambient Air Sampling

From January 1st to March 31st, 24 ambient air particulate filters were collected from the six perimeter and regional continuous sampling stations (On-Site, Near Field, Cactus Flats, WIPP East, Carlsbad, and Loving) using a high-volume sampler (HiVol). All filters have been processed (gravimetrics, total air flow values, and notes of any irregularities) by FP and transferred to RC.

Subtask - Non-Radiological analyses

From January 1st to March 31st, 8 Whatman-41 filters and 3 trip blank filters were collected, from the 2 sampling sites (Near Field and Cactus Flats) using a high-volume sampler. All filters have been processed (total air flow values and notes of any irregularities) by FP and transferred to EC.

Soils sampling

From January 1st to March 31st, 4 soil samples were processed and transferred to the RC group.

Vegetation sampling

From January 1st to March 31st, 6 vegetation samples (5 samples and 1 duplicate) were processed and transferred to the RC group.

Surface Water Monitoring

No activity to report this quarter.

Drinking Water Monitoring

No activity to report this quarter.

Sediment Monitoring

From January 1st to March 31st , 4 sediment samples were processed and transferred to the RC group.

Groundwater Monitoring

From January 1st to March 31st, 2 groundwater samples were collected. All samples were transferred to RC and EC.

Nuclear Materials Management and Safeguards

From January 1st to March 31st, the Radiation Safety group (RS) has collected and bulked radioactive waste from NMSU, LANL, and the WIPP Labs groups working in the CEMRC facility. Radiation Safety has performed monthly surveys of all laboratories where radioactive materials are present, including smears and dose rate measurements. All fume hoods are face-velocity checked quarterly. The date of the last inspection was March 11, 2025. Two survey instruments were sent to Ludlum Corporation for calibration. One flow meter was received from Omega Engineering after being sent last quarter for calibration.

Radiochemistry Group

WIPP Underground Effluent Monitoring (Station B)

Gross alpha and beta activities on individual filters collected from Station B, taken after the high-efficiency particulate air (HEPA) filtration, were counted using a low-background gas proportional counter (Protean Instruments) for 1200 minutes (20 hours). The analysis of all filters from Station B through the first week of April 2025 has been completed. The complete results for gross alpha and gross beta counts on FAS filters from Station B through March 2025 were submitted to CBFO on April 7, 2025.

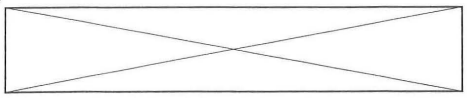
As of March 31st, 2025, the status of environmental sample analysis was as follows:

- Alpha radiation emitting isotopes (^{241}Am, ^{238}Pu, $^{239+240}$Pu, ^{234}U, ^{235}U, and ^{238}U)
    - All 2024 FAS Station A and B samples have been analyzed
    - All 2024 surface water and drinking water samples have been analyzed
    - All 2024 HiVol samples, except for six, have been analyzed
    - Nineteen soil samples from 2024 have been analyzed
- Beta radiation emitting isotope (^{90}Sr)
    - All 2024 FAS Station A and B samples have been analyzed
    - All 2024 surface water and drinking water samples have been analyzed
    - All 2024 HiVol samples, except for six, have been analyzed
    - Nineteen soil samples from 2024 have been analyzed
- Gamma radiation emitting isotopes (^{60}Co, ^{137}Cs, and ^{40}K)
    - All 2024 samples have been analyzed, except for five HiVol samples

Characteristic results are included in the following pages.

U in a HiVol Sample

[PS 0



Sample Description:
Spectrum File: C:\Canberra\ApexAlpha\Root\Data\0000062856.cnf
Batch Identification: HiVolU53532
Sample Identification: U53532
Procedure Description: Uranium

Detector Name: 4-04
Env. Background: System Bkgd 59125

Sample Size: 1.0000E+00 +/- 0.0000E+00 unit
Sample Date/Time: 1/27/2025 4:14:12 PM
Acquisition Date/Time: 1/27/2025 4:14:12 PM
Acquisition Live Time: 7200.0 minutes
Acquisition Real Time: 7200.0 minutes

Tracer Certificate: 1320_U232
Tracer Quantity: 0.047 mL
Counting Efficiency: 0.1848 +/- 0.0037 on 7/17/2024 12:10:47 AM
Chem. Rec. Factor (%): 110.10 +/- 3.5361

PEAK AREA REPORT

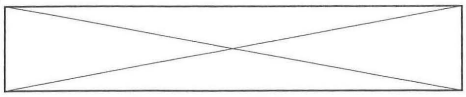
Nuclide		Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	FWHM (keV)
U-232	T	5.271	1677.00	4.91	10.00	41.9
U-234		4.721	1387.00	5.41	10.00	80.8
U-235		4.372	41.00	31.99	1.00	4.3
U-238		4.144	1185.00	5.91	21.00	70.3

T = Tracer Peak used for Effective Efficiency

NUCLIDE ANALYSIS RESULTS

Nuclide	Energy (keV)	Activity (Bq /unit)	MDA (Bq /unit)
U-232	5302.50*	1.912E-02 +/- 9.585E-04	2.680E-04 +/- 1.343E-05
U-234	4761.50*	1.581E-02 +/- 1.166E-03	2.680E-04 +/- 1.343E-05
U-235	4385.50*	5.766E-04 +/- 1.867E-04	1.306E-04 +/- 6.548E-06
U-238	4184.40*	1.345E-02 +/- 1.043E-03	3.728E-04 +/- 1.869E-05

[PS 0



Sample Description:
Spectrum File: C:\Canberra\ApexAlpha\Root\Data\0000062783.cnf
Batch Identification: HiVolU53532
Sample Identification: U53533
Procedure Description: Uranium

Detector Name: 5-03
Env. Background: System Bkgd 59128

Sample Size: 1.0000E+00 +/- 0.0000E+00 unit
Sample Date/Time: 1/23/2025 12:25:39 PM
Acquisition Date/Time: 1/23/2025 12:25:39 PM
Acquisition Live Time: 7200.0 minutes
Acquisition Real Time: 7200.0 minutes

Tracer Certificate: 1320_U232
Tracer Quantity: 0.047 mL
Counting Efficiency: 0.1891 +/- 0.0038 on 7/19/2024 5:18:37 PM
Chem. Rec. Factor (%): 105.96 +/- 3.4093

PEAK AREA REPORT

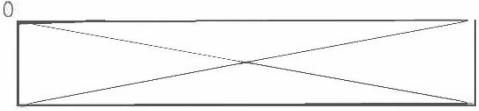
Nuclide		Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	FWHM (keV)
U-232	T	5.270	1667.00	4.93	12.00	81.7
U-234		4.720	1048.00	6.20	4.00	40.4
U-235		4.374	37.00	37.06	5.00	4.0
U-238		4.138	985.00	6.43	9.00	50.3

T = Tracer Peak used for Effective Efficiency

NUCLIDE ANALYSIS RESULTS

Nuclide	Energy (keV)	Activity (Bq /unit)	MDA (Bq /unit)
U-232	5302.50*	1.929E-02 +/- 9.712E-04	2.950E-04 +/- 1.485E-05
U-234	4761.50*	1.213E-02 +/- 9.688E-04	1.836E-04 +/- 9.241E-06
U-235	4385.50*	5.282E-04 +/- 1.976E-04	2.486E-04 +/- 1.252E-05
U-238	4184.40*	1.135E-02 +/- 9.270E-04	2.586E-04 +/- 1.302E-05

[PS 0



Sample Description:
Spectrum File: C:\Canberra\ApexAlpha\Root\Data\0000062790.cnf
Batch Identification: HiVolU53532
Sample Identification: U53534
Procedure Description: Uranium

Detector Name: 5-06
Env. Background: System Bkgd 58599

Sample Size: 1.0000E+00 +/- 0.0000E+00 unit
Sample Date/Time: 1/24/2025 7:22:23 AM
Acquisition Date/Time: 1/24/2025 7:22:23 AM
Acquisition Live Time: 7200.0 minutes
Acquisition Real Time: 7200.0 minutes

Tracer Certificate: 1320_U232
Tracer Quantity: 0.043 mL
Counting Efficiency: 0.1825 +/- 0.0037 on 7/19/2024 9:36:38 PM
Chem. Rec. Factor (%): 114.90 +/- 3.7454

PEAK AREA REPORT

Nuclide		Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	FWHM (keV)
U-232	T	5.263	1596.00	5.03	9.00	82.4
U-234		4.718	1430.00	5.33	10.00	85.0
U-235		4.390	48.00	30.62	3.00	10.8
U-238		4.137	1204.00	5.80	8.00	45.3

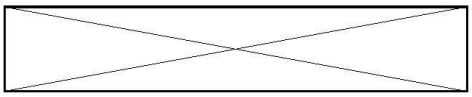
T = Tracer Peak used for Effective Efficiency

NUCLIDE ANALYSIS RESULTS

Nuclide	Energy (keV)	Activity (Bq /unit)	MDA (Bq /unit)
U-232	5302.50*	1.765E-02 +/- 9.060E-04	2.481E-04 +/- 1.274E-05
U-234	4761.50*	1.581E-02 +/- 1.170E-03	2.599E-04 +/- 1.334E-05
U-235	4385.50*	6.548E-04 +/- 2.033E-04	1.924E-04 +/- 9.874E-06
U-238	4184.40*	1.326E-02 +/- 1.027E-03	2.347E-04 +/- 1.204E-05

U and Pu in Soil

[PS 0



Sample Description:
Spectrum File: C:\Canberra\ApexAlpha\Root\Data\0000063419.cnf
Batch Identification: SoilPu54683
Sample Identification: Pu54683
Procedure Description: Pu - 5 days

Detector Name: 4-01
Env. Background: System Bkgd 70964

Sample Size: 1.0040E-03 +/- 0.0000E+00 kg
Sample Date/Time: 3/5/2025 10:36:35 AM
Acquisition Date/Time: 3/5/2025 10:36:35 AM
Acquisition Live Time: 7200.0 minutes
Acquisition Real Time: 7200.0 minutes

Tracer Certificate: 450_Pu-242_T
Tracer Quantity: 0.132 mL
Counting Efficiency: 0.1845 +/- 0.0037 on 7/16/2024 7:14:33 PM
Chem. Rec. Factor (%): 92.76 +/- 2.5964

PEAK AREA REPORT

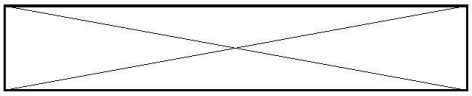
Nuclide		Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	FWHM (keV)
PU-238		5.452	6.00	156.35	8.00	6.0
PU-239		5.138	15.00	54.97	1.00	4.3
PU-242	T	4.870	2735.00	3.83	6.00	38.2

T = Tracer Peak used for Effective Efficiency

NUCLIDE ANALYSIS RESULTS

Nuclide	Energy (keV)	Activity (Bq /kg)	MDA (Bq /kg)
PU-238	5487.10*	8.089E-02 +/- 1.265E-01	2.873E-01 +/- 1.120E-02
PU-239	5147.70*	2.022E-01 +/- 1.115E-01	1.252E-01 +/- 4.882E-03
PU-242	4890.70*	3.669E+01 +/- 1.431E+00	2.524E-01 +/- 9.845E-03

[PS 0



Sample Description:
Spectrum File: C:\Canberra\ApexAlpha\Root\Data\0000063430.cnf
Batch Identification: SoilU54683
Sample Identification: U54683
Procedure Description: Uranium - 5 days

Detector Name: 5-11
Env. Background: System Bkgd 70986

Sample Size: 1.0040E-03 +/- 0.0000E+00 kg
Sample Date/Time: 3/5/2025 10:47:44 AM
Acquisition Date/Time: 3/5/2025 10:47:44 AM
Acquisition Live Time: 7200.0 minutes
Acquisition Real Time: 7200.0 minutes

Tracer Certificate: 1320_U232_T
Tracer Quantity: 0.084 mL
Counting Efficiency: 0.2057 +/- 0.0041 on 7/20/2024 2:59:02 AM
Chem. Rec. Factor (%): 99.65 +/- 5.6703

PEAK AREA REPORT

Nuclide		Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	FWHM (keV)
U-232	T	5.277	2890.00	3.73	6.00	79.6
U-234		4.725	1252.00	5.65	0.00	81.2
U-235		4.352	58.00	27.59	3.00	4.1
U-238		4.146	1325.00	5.52	5.00	52.2

T = Tracer Peak used for Effective Efficiency

NUCLIDE ANALYSIS RESULTS

Nuclide	Energy (keV)	Activity (Bq /kg)	MDA (Bq /kg)
U-232	5302.50*	3.257E+01 +/- 3.476E+00	2.121E-01 +/- 2.263E-02
U-234	4761.50*	1.411E+01 +/- 1.704E+00	8.295E-02 +/- 8.853E-03
U-235	4385.50*	8.064E-01 +/- 2.385E-01	1.960E-01 +/- 2.092E-02
U-238	4184.40*	1.487E+01 +/- 1.786E+00	1.954E-01 +/- 2.086E-02

Sr in Drinking Water

Alpha/Beta Count Results

Air Filter Sample Activity Report

Batch ID DW54707to09 blank lcs

Count Method FAS Gross Alpha Beta

Sample ID 54707 **Addr:** 9

Flow Time		Flow Rate					
On	1/1/1900	0.00 LPM	Bkg Time	1,200.0 minutes	Count Time	1,200.0 minutes	
Off	1/1/1900	0.00 LPM	Total Flow Time	0.0 minutes	Count Began	2/19/2025 5:26:42 PM	
			Total Sampled Volume	1.0000 e+000 Sample	Count Ended	2/20/2025 1:27:53 PM	

	Factor	Bkg cpm	Gross cpm	Net dpm	MDC Bq	DAC Bq	Net Concentration Bq	% of DAC	DAC-Hrs
Alpha	1.000	0.040	0.036	-0.017	1.9786 e-003	0.0000 e+000	-2.8310 e-004 ± 5.6905 e-004	0.000	0.000
sd		0.006	0.005	0.034			5.6905 e-004		
Beta	1.000	0.380	0.413	0.082	3.5761 e-003	0.0000 e+000	1.3665 e-003 ± 1.0810 e-003	0.000	0.000
sd		0.018	0.019	0.065			1.0810 e-003		

Sample ID 54708 **Addr:** 10

Flow Time		Flow Rate					
On	1/1/1900	0.00 LPM	Bkg Time	1,200.0 minutes	Count Time	1,200.0 minutes	
Off	1/1/1900	0.00 LPM	Total Flow Time	0.0 minutes	Count Began	2/19/2025 5:26:48 PM	
			Total Sampled Volume	1.0000 e+000 Sample	Count Ended	2/20/2025 1:28:00 PM	

	Factor	Bkg cpm	Gross cpm	Net dpm	MDC Bq	DAC Bq	Net Concentration Bq	% of DAC	DAC-Hrs
Alpha	1.000	0.043	0.065	0.090	2.0880 e-003	0.0000 e+000	1.4971 e-003 ± 6.5719 e-004	0.000	0.000
sd		0.006	0.007	0.039			6.5719 e-004		
Beta	1.000	0.350	0.469	0.295	3.4255 e-003	0.0000 e+000	4.9136 e-003 ± 1.0978 e-003	0.000	0.000
sd		0.017	0.020	0.066			1.0978 e-003		

Sample ID 54709 **Addr:** 11

Flow Time		Flow Rate					
On	1/1/1900	0.00 LPM	Bkg Time	1,200.0 minutes	Count Time	1,200.0 minutes	
Off	1/1/1900	0.00 LPM	Total Flow Time	0.0 minutes	Count Began	2/19/2025 5:26:53 PM	
			Total Sampled Volume	1.0000 e+000 Sample	Count Ended	2/20/2025 1:28:08 PM	

	Factor	Bkg cpm	Gross cpm	Net dpm	MDC Bq	DAC Bq	Net Concentration Bq	% of DAC	DAC-Hrs
Alpha	1.000	0.126	0.143	0.071	3.3769 e-003	0.0000 e+000	1.1842 e-003 ± 1.0137 e-003	0.000	0.000
sd		0.010	0.011	0.061			1.0137 e-003		
Beta	1.000	0.610	0.668	0.141	4.4307 e-003	0.0000 e+000	2.3434 e-003 ± 1.3510 e-003	0.000	0.000
sd		0.023	0.024	0.081			1.3510 e-003		

Alpha/Beta Count Results

Air Filter Sample Activity Report

Batch ID DW54707to09 blank lcs

Count Method FAS Gross Alpha Beta

Sample ID blank **Addr:** 12

Flow Time		Flow Rate
On	1/1/1900	0.00 **LPM**
Off	1/1/1900	0.00 **LPM**

Bkg Time 1,200.0 **minutes** **Count Time** 1,200.0 **minutes**
Total Flow Time 0.0 **minutes** **Count Began** 2/19/2025 5:27:03 PM
Total Sampled Volume 1.0000 e+000 **Sample** **Count Ended** 2/20/2025 1:28:19 PM

	Factor	Bkg cpm	Gross cpm	Net dpm	MDC Bq	DAC Bq	Net Concentration Bq	% of DAC	DAC-Hrs
Alpha	1.000	0.098	0.112	0.060	3.1346 e-003	0.0000 e+000	1.0047 e-003 ± 9.3655 e-004	0.000	0.000
sd		0.009	0.010	0.056			9.3655 e-004		
Beta	1.000	0.689	0.910	0.559	4.8318 e-003	0.0000 e+000	9.3156 e-003 ± 1.5555 e-003	0.000	0.000
sd		0.024	0.028	0.093			1.5555 e-003		

Sample ID lcs **Addr:** 13

Flow Time		Flow Rate
On	1/1/1900	0.00 **LPM**
Off	1/1/1900	0.00 **LPM**

Bkg Time 1,200.0 **minutes** **Count Time** 1,200.0 **minutes**
Total Flow Time 0.0 **minutes** **Count Began** 2/19/2025 5:27:09 PM
Total Sampled Volume 1.0000 e+000 **Sample** **Count Ended** 2/20/2025 1:28:28 PM

	Factor	Bkg cpm	Gross cpm	Net dpm	MDC Bq	DAC Bq	Net Concentration Bq	% of DAC	DAC-Hrs
Alpha	1.000	0.087	0.062	-0.106	2.9569 e-003	0.0000 e+000	-1.7685 e-003 ± 9.1011 e-004	0.000	0.000
sd		0.008	0.007	0.055			9.1011 e-004		
Beta	1.000	0.669	13.403	32.450	4.7626 e-003	0.0000 e+000	5.4083 e-001 ± 7.8329 e-003	0.000	0.000
sd		0.024	0.106	0.470			7.8329 e-003		

CEMRC Gross Alpha-Beta Analysis

Batch ID DW54707to09 blank lcs
Count Method FAS Gross Alpha Beta

Sample ID	Count Began	Addr	Count Time	Alpha counts	Beta counts
54707	2/19/2025 5:26:42 PM	9	1,200.0 **minutes**	43.0	495.0
54708	2/19/2025 5:26:48 PM	10	1,200.0 **minutes**	78.0	563.0
54709	2/19/2025 5:26:53 PM	11	1,200.0 **minutes**	172.0	802.0
blank	2/19/2025 5:27:03 PM	12	1,200.0 **minutes**	134.0	1,092.0
lcs	2/19/2025 5:27:09 PM	13	1,200.0 **minutes**	74.0	16,083.0

Sr in Soil

Alpha/Beta Count Results

Air Filter Sample Activity Report

Batch ID soil54691 92 lcs blank

Count Method FAS Gross Alpha Beta

Sample ID 54691 **Addr:** 5

Flow Time		Flow Rate					
On	1/1/1900	0.00 LPM	Bkg Time	1,200.0 minutes	Count Time	1,200.0 minutes	
Off	1/1/1900	0.00 LPM	Total Flow Time	0.0 minutes	Count Began	3/6/2025 11:18:25 AM	
			Total Sampled Volume	1.0000 e+000 Sample	Count Ended	3/7/2025 7:19:38 AM	

	Factor	Bkg cpm	Gross cpm	Net dpm	MDC Bq	DAC Bq	Net Concentration Bq	% of DAC	DAC-Hrs
Alpha	1.000	0.034	0.057	0.096	1.9169 e-003	0.0000 e+000	1.5924 e-003 ± 6.1651 e-004	0.000	0.000
sd		0.005	0.007	0.037			6.1651 e-004		
Beta	1.000	0.591	0.649	0.143	4.4605 e-003	0.0000 e+000	2.3831 e-003 ± 1.3598 e-003	0.000	0.000
sd		0.022	0.023	0.082			1.3598 e-003		

Sample ID 54692 **Addr:** 6

Flow Time		Flow Rate					
On	1/1/1900	0.00 LPM	Bkg Time	1,200.0 minutes	Count Time	1,200.0 minutes	
Off	1/1/1900	0.00 LPM	Total Flow Time	0.0 minutes	Count Began	3/6/2025 11:18:32 AM	
			Total Sampled Volume	1.0000 e+000 Sample	Count Ended	3/7/2025 7:19:43 AM	

	Factor	Bkg cpm	Gross cpm	Net dpm	MDC Bq	DAC Bq	Net Concentration Bq	% of DAC	DAC-Hrs
Alpha	1.000	0.034	0.048	0.059	1.8927 e-003	0.0000 e+000	9.8998 e-004 ± 5.7974 e-004	0.000	0.000
sd		0.005	0.006	0.035			5.7974 e-004		
Beta	1.000	0.535	0.615	0.200	4.2578 e-003	0.0000 e+000	3.3352 e-003 ± 1.3125 e-003	0.000	0.000
sd		0.021	0.023	0.079			1.3125 e-003		

Sample ID blank for 54691 batch **Addr:** 8

Flow Time		Flow Rate					
On	1/1/1900	0.00 LPM	Bkg Time	1,200.0 minutes	Count Time	1,200.0 minutes	
Off	1/1/1900	0.00 LPM	Total Flow Time	0.0 minutes	Count Began	3/6/2025 11:18:45 AM	
			Total Sampled Volume	1.0000 e+000 Sample	Count Ended	3/7/2025 7:20:02 AM	

	Factor	Bkg cpm	Gross cpm	Net dpm	MDC Bq	DAC Bq	Net Concentration Bq	% of DAC	DAC-Hrs
Alpha	1.000	0.037	0.057	0.084	1.9510 e-003	0.0000 e+000	1.3947 e-003 ± 6.1562 e-004	0.000	0.000
sd		0.006	0.007	0.037			6.1562 e-004		
Beta	1.000	0.367	0.443	0.192	3.5897 e-003	0.0000 e+000	3.1966 e-003 ± 1.1161 e-003	0.000	0.000
sd		0.017	0.019	0.067			1.1161 e-003		

Alpha/Beta Count Results

Air Filter Sample Activity Report

Batch ID soil54691 92 lcs blank

Count Method FAS Gross Alpha Beta

Sample ID LCS for 54691 batch **Addr:** 7

Flow Time		Flow Rate
On	1/1/1900	0.00 **LPM**
Off	1/1/1900	0.00 **LPM**

Bkg Time 1,200.0 **minutes** **Count Time** 1,200.0 **minutes**
Total Flow Time 0.0 **minutes** **Count Began** 3/6/2025 11:18:39 AM
Total Sampled Volume 1.0000 e+000 **Sample** **Count Ended** 3/7/2025 7:19:52 AM

	Factor	Bkg cpm	Gross cpm	Net dpm	MDC Bq	DAC Bq	Net Concentration Bq	% of DAC	DAC-Hrs
Alpha	1.000	0.066	0.073	0.028	2.5988 e-003	0.0000 e+000	4.7181 e-004 ± 7.5991 e-004	0.000	0.000
sd		0.007	0.008	0.046			7.5991 e-004		
Beta	1.000	0.665	10.230	24.399	4.7529 e-003	0.0000 e+000	4.0665 e-001 ± 6.2598 e-003	0.000	0.000
sd		0.024	0.092	0.376			6.2598 e-003		

CEMRC Gross Alpha-Beta Analysis

Batch ID soil54691 92 lcs blank
Count Method FAS Gross Alpha Beta

Sample ID	Count Began	Addr	Count Time	Alpha counts	Beta counts
54691	3/6/2025 11:18:25 AM	5	1,200.0 **minutes**	68.0	779.0
54692	3/6/2025 11:18:32 AM	6	1,200.0 **minutes**	58.0	738.0
blank for 54691 batch	3/6/2025 11:18:45 AM	8	1,200.0 **minutes**	68.0	531.0
LCS for 54691 batch	3/6/2025 11:18:39 AM	7	1,200.0 **minutes**	87.0	12,276.0

Gamma-Radiation-Emitting Isotopes in a FAS Station B Filter

```
**************************************************************************
*                     New Mexico State University                        *
*                      Quality Assurance Report                          *
**************************************************************************


Report Date          : 2/4/25    8:51:22 PM
QA File              : C:\GENIE2K\CAMFILES\Calver3.qaf
Analyst              :
Sample ID            : D3E020425
Sample Quantity      :     1.00 Unit
Sample Date          : 8/1/94   12:00:00 PM
Measurement Date     : 2/4/25    8:41:16 PM
Elapsed Live Time    :      600 seconds
Elapsed Real Time    :      605 seconds
```

Test	Parameter	Low Limit	High Limit	New Value	Flag
LU	015 fwhm-779 ke	1.2800E+00	2.7000E+00	2.2347E+00	< >
LU	015 fwhm-1408 k	1.5800E+00	3.3000E+00	2.5529E+00	< >
SD	015 Act-779 keV	1.0764E+00	6.4499E-02	1.0798E+00	< >
SD	015 Act-1408 ke	1.0899E+00	5.8492E-02	1.1002E+00	< >
LU	015 fwhm-122 ke	1.0200E+00	2.2000E+00	1.7509E+00	< >
SD	015 Act-122 keV	1.1373E+00	1.7061E-02	1.1319E+00	< >
LU	015- 122KeV Pk	1.2078E+02	1.2278E+02	1.2175E+02	< >
LU	015-779 KeV Pk	7.7778E+02	7.7978E+02	7.7876E+02	< >
LU	015-1408 KeV Pk	1.4069E+03	1.4089E+03	1.4083E+03	< >

```
Flags Key:   LU = Boundary Test               (Ab = Above      , Be = Below )
             SD = Sample Driven N-Sigma Test  (In = Investigate, Ac = Action)
             UD = User   Driven N-Sigma Test  (In = Investigate, Ac = Action)
             BS = Measurement Bias Test       (In = Investigate, Ac = Action)
```

Reviewed by: _____

```
*****************************************************************************
* NOTE: DAILY QUALITY CONTROL SAMPLES (QC) ARE GIVEN A USER DRIVEN          *
*  N-SIGMA TEST.  INVESTIGATE MEANS THE MEASUREMENT IS BETWEEN              *
*  10% AND 15% OF THE BASELINE.  ACTION MEANS THAT THE MEASUREMENT          *
*  IS ABOVE 15% OF THE BASELINE.                                            *
*  LABORATORY CONTROL SAMPLES ARE GIVEN A BOUNDARY TEST.  THE RESULT        *
*  IS ACCEPTABLE IF IT LIES BETWEEN +/- 25% OF THE TRUE SOURCE              *
*  ACTIVITY.                                                                *
*****************************************************************************
```

C E M R C G A M M A S P E C T R U M A N A L Y S I S

Sample ID : 24FASB3
Sample Description : 24FASB3
:
Calibration ID :
Background ID :

Sample Collection Date : 3/1/2024 12:00:00 PM
Count Start Date : 2/4/2025 8:52:49 PM

Sample Aliquot : 1.00000E+00
Aliquot Unc. : 0.00000E+00
Aliquot Unit : Unit

Live Time (sec) : 172800
Real Time (sec) : 172814

Energy Calibration Used Done On : 10/1/2024
Efficiency Calibration Used Done On : 11/16/2023
Efficiency ID : DET03_70mlEff_23

%Random Unc. : 0.0
%Systematic Unc. : 0.0

Nuclide	Energy	Eff%	UncEff%	Abun%	UncAbn%	HL(d)	UncHL(d)	Conc(Bq/unit)	Unc2sigma	MDC

K-40	1460.81	0.725	0.009	10.6700	0.1100	4.66412E+11	2.92192E+09	3.05822E-01	1.21125E-01	3.85989E-01
CO-60	1173.22	0.896	0.010	100.0000	0.0000	1.92518E+03	3.65240E-01	4.54089E-03	1.24194E-02	4.23933E-02
CO-60	1332.49	0.794	0.009	100.0000	0.0000	1.92518E+03	3.65240E-01	-8.84433E-03	1.40933E-02	4.94391E-02
CS-137	661.65	1.535	0.021	85.1200	0.2300	1.10193E+04	1.09572E+01	-7.50654E-03	2.35513E-02	7.89442E-02
AM-241	59.54	4.746	0.000	36.3000	0.0000	1.58153E+05	0.00000E+00	3.66500E-02	2.41386E-02	0.00000E+00

5 nuclide lines identified

****
***** P E A K A N A L Y S I S R E P O R T *****
****

Detector Name: DET03
Sample Title: 24FASB3
Peak Analysis Performed on: 2/6/2025 8:53:07 PM
Peak Analysis From Channel: 50
Peak Analysis To Channel: 8190

	Peak No.	ROI start	ROI end	Peak centroid	Energy (keV)	FWHM (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
M	1	66-	86	71.52	17.18	0.41	-2.382E+00	14.37	9.775E+00
m	2	66-	86	81.98	19.73	0.41	-2.523E+00	15.22	3.260E+01
	3	186-	203	191.95	46.54	0.27	6.581E+01	143.41	2.207E+03
	4	234-	253	245.28	59.54	0.31	1.089E+02	143.47	2.069E+03
	5	341-	387	355.79	86.48	0.24	-2.461E+02	275.19	4.399E+03
	6	424-	441	433.04	105.31	0.24	3.684E+01	119.59	1.546E+03
	7	543-	560	548.76	133.52	0.24	-4.357E+01	118.41	1.550E+03
	8	584-	608	597.66	145.44	0.42	-1.725E+02	153.61	2.175E+03
	9	666-	680	671.17	163.36	0.24	-5.172E+01	102.25	1.284E+03
	10	756-	771	764.90	186.21	0.24	2.861E+01	101.76	1.277E+03
	11	828-	850	843.26	205.31	0.24	-8.290E+00	134.94	1.866E+03
	12	973-	993	979.94	238.63	0.43	8.978E+01	118.07	1.464E+03
M	13	1206-	1239	1213.02	295.45	0.49	4.044E+01	4.04	4.076E+02
m	14	1206-	1239	1228.36	299.19	0.49	2.648E+01	3.38	4.011E+02
M	15	1292-	1326	1302.91	317.36	0.50	-3.768E+00	49.77	4.081E+02
m	16	1292-	1326	1312.58	319.72	0.50	-8.290E+00	109.48	3.938E+02

Gamma-Radiation-Emitting Isotopes in a HiVol Filter

C E M R C G A M M A S P E C T R U M A N A L Y S I S

Sample ID : HiVol53472
Sample Description : HiVol53472
:
Calibration ID :
Background ID :

Sample Collection Date : 3/27/2024 12:00:00 PM
Count Start Date : 1/8/2025 6:51:29 PM

Sample Aliquot : 1.00000E+00
Aliquot Unc. : 0.00000E+00
Aliquot Unit : Unit

Live Time (sec) : 172800
Real Time (sec) : 172809

Energy Calibration Used Done On : 10/1/2024
Efficiency Calibration Used Done On : 11/15/2023
Efficiency ID : DET4A_70mlEff_23

%Random Unc. : 0.0
%Systematic Unc. : 0.0

Nuclide	Energy	Eff%	UncEff%	Abun%	UncAbn%	HL(d)	UncHL(d)	Conc(Bq/unit)	Unc2sigma	MDC
K-40	1460.81	1.839	0.026	10.6700	0.1100	4.66412E+11	2.92192E+09	-1.73431E-01	9.93424E-02	3.43031E-01
CO-60	1173.22	2.233	0.024	100.0000	0.0000	1.92518E+03	3.65240E-01	1.65625E-03	2.55597E-03	8.87444E-03
CO-60	1332.49	1.991	0.026	100.0000	0.0000	1.92518E+03	3.65240E-01	2.25779E-03	2.69374E-03	9.27787E-03
CS-137	661.65	3.657	0.046	85.1200	0.2300	1.10193E+04	1.09572E+01	-3.55013E-02	8.50283E-03	2.97194E-02
AM-241	59.54	5.804	0.000	36.3000	0.0000	1.58153E+05	0.00000E+00	-2.42188E-02	1.75666E-02	0.00000E+00

5 nuclide lines identified

****
***** P E A K A N A L Y S I S R E P O R T *****
****

Detector Name: DET04A
Sample Title: HiVol53472
Peak Analysis Performed on: 1/10/2025 6:51:42 PM
Peak Analysis From Channel: 50
Peak Analysis To Channel: 8190

Peak No.	ROI start	ROI end	Peak centroid	Energy (keV)	FWHM (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	189-	194	191.06	46.43	0.00	0.000E+00	0.00	0.000E+00
2	242-	247	244.38	59.45	0.00	0.000E+00	0.00	0.000E+00
3	967-	985	977.64	238.51	0.95	4.656E+00	160.40	2.201E+03
4	1430-	1445	1440.92	351.65	0.39	2.711E+00	124.66	1.660E+03
5	1950-	1967	1955.86	477.40	0.28	1.454E+01	92.75	8.525E+02
6	2382-	2402	2389.14	583.21	0.68	2.661E+01	77.18	5.844E+02
7	2470-	2481	2475.79	604.37	0.25	-5.648E+00	47.30	3.036E+02
8	2704-	2715	2709.09	661.35	0.24	-1.032E+01	39.24	2.123E+02
9	2974-	2985	2979.05	727.28	0.37	2.219E+01	36.93	1.698E+02
10	3249-	3266	3259.01	795.64	0.24	-2.488E+01	40.52	2.029E+02
11	3726-	3739	3732.27	911.22	0.24	-2.506E+01	26.31	1.051E+02
12	4797-	4810	4803.76	1172.90	0.27	5.764E+00	17.79	4.124E+01
13	5211-	5226	5218.68	1274.23	0.24	-7.494E+00	18.92	5.049E+01
14	5449-	5464	5456.97	1332.43	0.75	7.006E+00	16.72	3.299E+01
15	5974-	5989	5981.86	1460.62	0.24	-3.559E+00	15.00	3.256E+01

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet

****
***** N U C L I D E I D E N T I F I C A T I O N R E P O R T *****
****

Sample Title: HiVol53472
Nuclide Library Used: C:\Genie2k\CAMFILES\Rpt.NLB
ISOCS Geom. ...atory\GENERAL_PURPOSE_BEAKER\250ml Nalgene bottle.geo

..... IDENTIFIED NUCLIDES .....

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (Bq /Unit)	Activity Uncertainty	Coinc Corr
K-40	0.994	1460.81*	10.67	-1.734309E-01	9.934236E-02	err
CO-60	0.992	1173.22*	100.00	1.656253E-03	2.555970E-03	err
		1332.49*	100.00	2.257788E-03	2.693744E-03	err
CS-137	0.985	661.65*	85.12	-3.550130E-02	8.502826E-03	err
AM-241	0.999	59.54*	36.30	-2.421881E-02	1.756658E-02	err

* = Energy line found in the spectrum.
@ = Energy line not used for Weighted Mean Activity
Energy Tolerance : 1.000 keV
Nuclide confidence index threshold = 0.10
Errors quoted at 1.000 sigma
Coincidence correction performed.
free = No coincidence correction required.
miss = Nuclide energy was not found in the coincidence library.
err = Error in coincidence correction calculation.
ISOCS/LabSOCS/Coinc. Corr. Warning/error code = 537199805
COIERR_CAMPTCCLOAD Error loading Peak-to-Total Calibration

****
***** INTERFERENCE CORRECTED REPORT *****
****

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (Bq /Unit)	Wt mean Activity Uncertainty
K-40	0.994	-1.7343086E-01	9.9342359E-02
CO-60	0.992	1.9412445E-03	1.8541374E-03
CS-137	0.985	-3.5501301E-02	8.5028264E-03
AM-241	0.999	-2.4218810E-02	1.7566583E-02

? = Nuclide is part of an undetermined solution
X = Nuclide rejected by the interference analysis
@ = Nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 1.000 sigma

********** U N I D E N T I F I E D P E A K S **********

Peak Locate Performed on: 1/10/2025 6:51:42 PM
Peak Locate From Channel: 50
Peak Locate To Channel: 8190

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty	Peak Type	Tol. Nuclide
1	46.43	0.00000E+00	0.00		
3	238.51	2.69459E-05	1722.43		
4	351.65	-9.58280E-04	-50.30		
5	477.40	8.41558E-05	318.90		
6	583.21	1.53997E-04	145.02		
7	604.37	-3.26860E-05	-418.69		
9	727.28	1.28426E-04	83.21		
10	795.64	-1.43977E-04	-81.43		
11	911.22	-1.45038E-04	-52.50		
13	1274.23	-4.33654E-05	-126.22		

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet

Errors quoted at 1.000 sigma

Gamma-Radiation-Emitting Isotopes in Soil

```
**************************************************************************
*                      New Mexico State University                       *
*                       Quality Assurance Report                         *
**************************************************************************


Report Date          : 3/7/25   11:13:48 AM
QA File              : C:\Genie2k\CAMFILES\Calver1_2019.QAF
Analyst              :
Sample ID            : D1E030725
Sample Quantity      :     1.00 Unit
Sample Date          : 8/1/94   10:00:00 AM
Measurement Date     : 3/7/25   11:01:33 AM
Elapsed Live Time    :      720 seconds
Elapsed Real Time    :      733 seconds
```

Test	Parameter	Low Limit	High Limit	New Value	Flag
LU	121 Pk Energy	1.2078E+02	1.2278E+02	1.2186E+02	< >
LU	779 Pk Energy	7.7789E+02	7.8089E+02	7.7895E+02	< >
LU	1408 Pk Energy	1.4069E+03	1.4089E+03	1.4087E+03	< >
LU	121 FWHM	7.0000E-01	2.3000E+00	1.4744E+00	< >
LU	779 FWHM	1.4000E+00	3.1000E+00	2.5689E+00	< >
LU	1408 FWHM	1.9000E+00	4.2000E+00	4.0349E+00	< >
LU	121 DCA	9.0000E-01	1.2000E+00	1.1000E+00	< >
LU	779 DCA	9.5000E-01	1.2850E+00	1.1258E+00	< >
LU	1408 DCA	1.0000E+00	1.3000E+00	1.1903E+00	< >

```
Flags Key:   LU = Boundary Test               (Ab = Above      , Be = Below )
             SD = Sample Driven N-Sigma Test  (In = Investigate, Ac = Action)
             UD = User   Driven N-Sigma Test  (In = Investigate, Ac = Action)
             BS = Measurement Bias Test       (In = Investigate, Ac = Action)
```

Reviewed by: _____

```
**************************************************************************
* NOTE: DAILY QUALITY CONTROL SAMPLES (QC) ARE GIVEN A USER DRIVEN       *
*  N-SIGMA TEST.  INVESTIGATE MEANS THE MEASUREMENT IS BETWEEN           *
*  10% AND 15% OF THE BASELINE.  ACTION MEANS THAT THE MEASUREMENT       *
*  IS ABOVE 15% OF THE BASELINE.                                         *
*  LABORATORY CONTROL SAMPLES ARE GIVEN A BOUNDARY TEST.  THE RESULT     *
*  IS ACCEPTABLE IF IT LIES BETWEEN +/- 25% OF THE TRUE SOURCE           *
*  ACTIVITY.                                                             *
**************************************************************************
```

C E M R C G A M M A S P E C T R U M A N A L Y S I S

Sample ID : Soil54687
Sample Description : Soil54687
:
Calibration ID :
Background ID :

Sample Collection Date : 9/24/2024 10:00:00 AM
Count Start Date : 3/7/2025 11:24:21 AM

Sample Aliquot : 1.00000E+00
Aliquot Unc. : 0.00000E+00
Aliquot Unit : Unit

Live Time (sec) : 172800
Real Time (sec) : 172971

Energy Calibration Used Done On : 7/16/2024
Efficiency Calibration Used Done On : 7/16/2024
Efficiency ID : DET01_SoilEff_24

%Random Unc. : 0.0
%Systematic Unc. : 0.0

Nuclide	Energy	Eff%	UncEff%	Abun%	UncAbn%	HL(d)	UncHL(d)	Conc(Bq/unit)	Unc2sigma	MDC

K-40	1460.81	0.993	0.037	10.6700	0.1100	4.66412E+11	2.92192E+09	6.38189E+01	2.56795E+00	1.23034E+00
CO-60	1173.22	1.181	0.024	100.0000	0.0000	1.92518E+03	3.65240E-01	8.59454E-03	1.80837E-02	6.04918E-02
CO-60	1332.49	1.069	0.031	100.0000	0.0000	1.92518E+03	3.65240E-01	8.89952E-03	1.69132E-02	5.66923E-02
CS-137	661.65	1.807	0.030	85.1200	0.2300	1.10193E+04	1.09572E+01	9.54218E-01	3.88389E-02	9.93016E-02
AM-241	59.54	1.132	0.000	36.3000	0.0000	1.58153E+05	0.00000E+00	1.10919E-01	1.27566E-01	0.00000E+00

5 nuclide lines identified

****
***** P E A K A N A L Y S I S R E P O R T *****
****

Detector Name: DET01
Sample Title: Soil54687
Peak Analysis Performed on: 3/9/2025 12:27:18 PM
Peak Analysis From Channel: 50
Peak Analysis To Channel: 8190

Peak No.	ROI start	ROI end	Peak centroid	Energy (keV)	FWHM (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	182-	196	189.76	46.50	1.18	3.521E+02	227.31	4.364E+03
2	237-	247	243.03	59.50	0.76	7.873E+01	180.96	3.395E+03
3	966-	984	977.07	238.63	1.63	7.434E+03	313.74	6.595E+03
4	1427-	1453	1441.35	351.93	2.17	6.613E+03	262.45	3.616E+03
5	1949-	1964	1956.32	477.60	0.40	1.245E+01	109.92	1.498E+03
6	2372-	2401	2389.00	583.19	2.90	3.302E+03	196.06	2.194E+03
7	2469-	2493	2477.14	604.70	4.11	-2.803E+02	232.05	5.102E+03
8	2693-	2726	2710.55	661.66	2.62	2.509E+03	186.34	2.123E+03
9	2961-	2990	2979.66	727.33	2.32	6.719E+02	144.71	1.711E+03
10	3242-	3269	3260.64	795.90	1.69	4.119E+02	121.28	1.274E+03
11	3713-	3752	3733.11	911.20	3.34	2.298E+03	170.32	1.649E+03
12	4798-	4815	4806.90	1173.24	0.33	1.653E+01	69.56	6.545E+02
13	5213-	5234	5221.96	1274.53	0.31	-6.218E+01	72.30	6.792E+02
14	5450-	5469	5459.51	1332.50	0.24	1.550E+01	58.92	4.445E+02
15	5961-	6008	5985.38	1460.83	5.41	1.172E+04	250.90	1.370E+03

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet

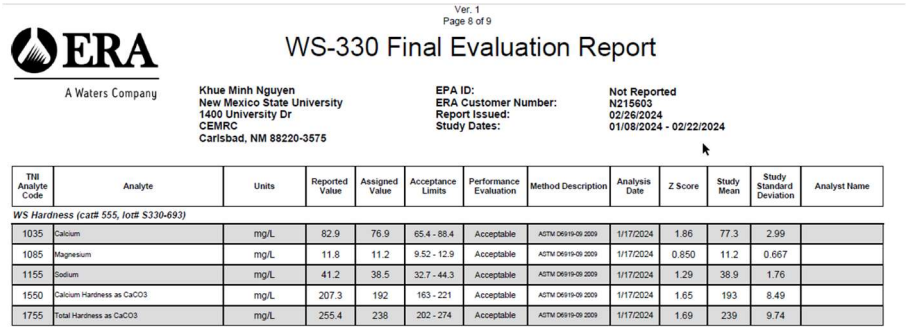
Environmental Chemistry Group

From January 1st to March 31st, 2025, the Environmental Chemistry (EC) group conducted the analyses for 2025 proficiency tests (hardness, inorganics, metals, and mercury), processed the anions and cations analyses for the Fixed Air Sampler (FAS) filters station A, and the metal analysis for FAS station B collected in 2024, and analyzed two groundwater samples (including anions, cations, pH, conductivity, specific gravity, and TDS/TSS) collected in March 2025.

The following tables and figures represent characteristics results.

Proficiency Test Results

Sample Type: Proficiency Test
Year: 2024
Analysis Performed: Cations (Hardness)



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ERA
A Waters Company

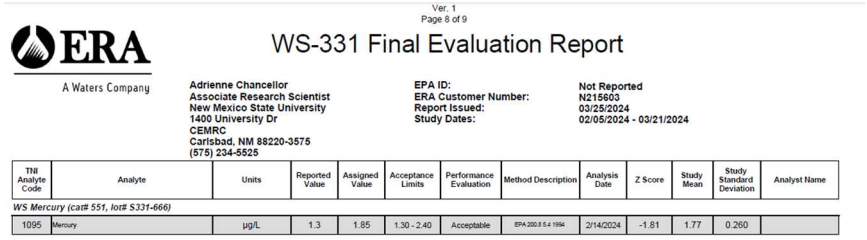
WS-330 Final Evaluation Report

Khue Minh Nguyen
New Mexico State University
1400 University Dr
CEMRC
Carlsbad, NM 88220-3575

EPA ID: Not Reported
ERA Customer Number: N215603
Report Issued: 02/26/2024
Study Dates: 01/08/2024 - 02/22/2024

TNI Analyte Code	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description	Analysis Date	Z Score	Study Mean	Study Standard Deviation	Analyst Name
WS Hardness (cat# 555, lot# S330-693)												
1035	Calcium	mg/L	82.9	76.9	65.4 - 88.4	Acceptable	ASTM D6919-09 2009	1/17/2024	1.86	77.3	2.99	
1085	Magnesium	mg/L	11.8	11.2	9.52 - 12.9	Acceptable	ASTM D6919-09 2009	1/17/2024	0.850	11.2	0.667	
1155	Sodium	mg/L	41.2	38.5	32.7 - 44.3	Acceptable	ASTM D6919-09 2009	1/17/2024	1.29	38.9	1.76	
1550	Calcium Hardness as CaCO3	mg/L	207.3	192	163 - 221	Acceptable	ASTM D6919-09 2009	1/17/2024	1.65	193	8.49	
1755	Total Hardness as CaCO3	mg/L	255.4	238	202 - 274	Acceptable	ASTM D6919-09 2009	1/17/2024	1.69	239	9.74	

Sample Type: Proficiency Test
Year: 2024
Analysis Performed: Mercury



Ver. 1
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ERA
A Waters Company

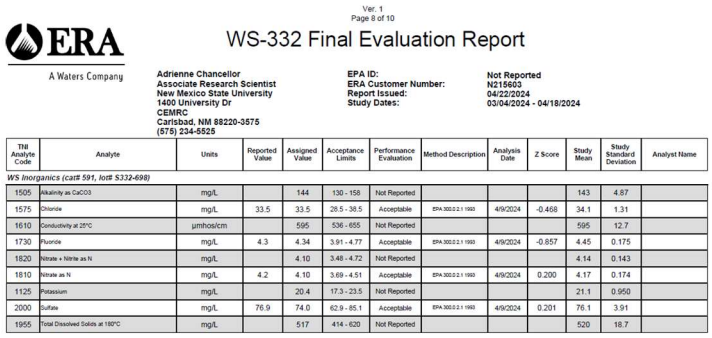
WS-331 Final Evaluation Report

Adrienne Chancellor
Associate Research Scientist
New Mexico State University
1400 University Dr
CEMRC
Carlsbad, NM 88220-3575
(575) 234-5525

EPA ID: Not Reported
ERA Customer Number: N215603
Report Issued: 03/25/2024
Study Dates: 02/05/2024 - 03/21/2024

TNI Analyte Code	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description	Analysis Date	Z Score	Study Mean	Study Standard Deviation	Analyst Name
WS Mercury (cat# 551, lot# S331-666)												
1095	Mercury	µg/L	1.3	1.85	1.30 - 2.40	Acceptable	EPA 200.8 5.4 1994	2/14/2024	-1.81	1.77	0.260	

Sample Type: Proficiency Test
Year: 2024
Analysis Performed: Anions (Inorganic)



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WS-332 Final Evaluation Report

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EPA ID: Not Reported
ERA Customer Number: N215603
Report Issued: 04/22/2024
Study Dates: 03/04/2024 - 04/18/2024

TNI Analyte Code	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description	Analysis Date	Z Score	Study Mean	Study Standard Deviation	Analyst Name
WS Inorganics (cat# 591, lot# S332-698)												
1505	Alkalinity as CaCO3	mg/L		144	130 - 158	Not Reported				143	4.87	
1575	Chloride	mg/L	33.5	33.5	28.5 - 38.5	Acceptable	EPA 300.0 2.1 1993	4/9/2024	-0.468	34.1	1.31	
1610	Conductivity at 25°C	µmhos/cm		595	536 - 655	Not Reported				595	12.7	
1730	Fluoride	mg/L	4.3	4.34	3.91 - 4.77	Acceptable	EPA 300.0 2.1 1993	4/9/2024	-0.857	4.45	0.175	
1820	Nitrate + Nitrite as N	mg/L		4.10	3.48 - 4.72	Not Reported				4.14	0.143	
1810	Nitrate as N	mg/L	4.2	4.10	3.69 - 4.51	Acceptable	EPA 300.0 2.1 1993	4/9/2024	0.200	4.17	0.174	
1125	Potassium	mg/L		20.4	17.3 - 23.5	Not Reported				21.1	0.950	
2000	Sulfate	mg/L	76.9	74.0	62.9 - 85.1	Acceptable	EPA 300.0 2.1 1993	4/9/2024	0.201	76.1	3.91	
1955	Total Dissolved Solids at 180°C	mg/L		517	414 - 620	Not Reported				520	18.7	

Sample Type: Proficiency Test
Year: 2024
Analysis Performed: Metals

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A Waters Company

WS-332 Final Evaluation Report

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EPA ID: Not Reported
ERA Customer Number: N215603
Report Issued: 04/22/2024
Study Dates: 03/04/2024 - 04/18/2024

TNI Analyte Code	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description	Analysis Date	Z Score	Study Mean	Study Standard Deviation	Analyst Name
WS Metals (cat# 590, lot# S332-697)												
1000	Aluminum	µg/L	334.6	306	245 - 367	Acceptable	EPA 200.8 5.4 1994	3/26/2024	1.00	315	19.3	
1005	Antimony	µg/L	27.1	28.0	19.6 - 36.4	Acceptable	EPA 200.8 5.4 1994	3/26/2024	-0.655	28.0	1.39	
1010	Arsenic	µg/L	31.1	32.7	22.9 - 42.5	Acceptable	EPA 200.8 5.4 1994	3/26/2024	-0.764	33.2	2.69	
1015	Barium	µg/L	624.8	623	530 - 716	Acceptable	EPA 200.8 5.4 1994	3/26/2024	0.0454	624	26.9	
1020	Beryllium	µg/L	11.2	10.8	9.18 - 12.4	Acceptable	EPA 200.8 5.4 1994	3/26/2024	0.817	10.7	0.626	
1025	Boron	µg/L		1430	1220 - 1640	Not Reported				1420	58.3	
1030	Cadmium	µg/L	44.5	48.1	38.5 - 57.7	Acceptable	EPA 200.8 5.4 1994	3/26/2024	-0.953	46.4	1.99	
1040	Chromium	µg/L	67.9	72.5	61.6 - 83.4	Acceptable	EPA 200.8 5.4 1994	3/26/2024	-1.53	72.4	2.98	
1055	Copper	µg/L	1457.9	1490	1340 - 1640	Acceptable	EPA 200.8 5.4 1994	3/26/2024	-0.614	1500	62.9	
1070	Iron	µg/L	984.6	1040	884 - 1200	Acceptable	EPA 200.8 5.4 1994	3/26/2024	-1.21	1050	54.0	
1075	Lead	µg/L	31.6	32.3	22.6 - 42.0	Acceptable	EPA 200.8 5.4 1994	3/26/2024	-0.414	32.2	1.53	
1090	Manganese	µg/L	595.8	628	534 - 722	Acceptable	EPA 200.8 5.4 1994	3/26/2024	-1.69	633	21.9	
1100	Molybdenum	µg/L	106.6	117	99.4 - 135	Acceptable	EPA 200.8 5.4 1994	3/26/2024	-0.981	114	7.54	
1105	Nickel	µg/L	349.9	354	301 - 407	Acceptable	EPA 200.8 5.4 1994	3/26/2024	-0.687	359	13.9	
1140	Selenium	µg/L	80.6	88.5	70.8 - 106	Acceptable	EPA 200.8 5.4 1994	3/26/2024	-1.39	88.7	5.78	
1150	Silver	µg/L	20.68	22.5	15.8 - 29.2	Acceptable	EPA 200.8 5.4 1994	3/26/2024	-1.23	22.8	1.71	
1165	Thallium	µg/L	3.3	3.46	2.42 - 4.50	Acceptable	EPA 200.8 5.4 1994	3/26/2024	-0.547	3.40	0.187	
1185	Vanadium	µg/L	183.2	190	162 - 218	Acceptable	EPA 200.8 5.4 1994	3/26/2024	-0.685	189	8.16	
1190	Zinc	µg/L	910.9	929	790 - 1070	Acceptable	EPA 200.8 5.4 1994	3/26/2024	-0.778	940	37.9	

Sample Type: Proficiency Test
Year: 2025
Analysis Performed: Cations (Hardness)

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WS-342 Final Evaluation Report

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EPA ID: Not Reported
ERA Customer Number: N215603
Report Issued: 03/03/2025
Study Dates: 01/13/2025 - 02/27/2025

TNI Analyte Code	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description	Analysis Date	Z Score	Study Mean	Study Standard Deviation	Analyst Name
WS Hardness (cat# 555, lot# S342-693)												
1035	Calcium	mg/L	63.5	59.9	50.9 - 68.9	Acceptable	ASTM D6919-09 2009	1/18/2025	0.944	60.8	2.82	
1085	Magnesium	mg/L	13.2	12.8	10.9 - 14.7	Acceptable	ASTM D6919-09 2009	1/18/2025	0.432	12.9	0.645	
1155	Sodium	mg/L	21.2	19.6	16.7 - 22.5	Acceptable	ASTM D6919-09 2009	1/18/2025	1.39	19.9	0.902	
1550	Calcium Hardness as CaCO3	mg/L	158.8	150	128 - 172	Acceptable	ASTM D6919-09 2009	1/18/2025	1.07	152	6.08	
1755	Total Hardness as CaCO3	mg/L	213.1	202	172 - 232	Acceptable	ASTM D6919-09 2009	1/18/2025	1.12	205	7.36	

Sample Type: Proficiency Test
Year: 2025
Analysis Performed: Mercury

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A Waters Company

WS-343 Final Evaluation Report

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EPA ID: Not Reported
ERA Customer Number: N215603
Report Issued: 03/31/2025
Study Dates: 02/10/2025 - 03/27/2025

TNI Analyte Code	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description	Analysis Date	Z Score	Study Mean	Study Standard Deviation	Analyst Name
WS Mercury (cat# 551, lot# S343-666)												
1095	Mercury	µg/L	4.3	5.77	4.04 - 7.50	Acceptable	EPA 200.8 5.4 1994	2/18/2025	-2.33	5.64	0.577	

Sample Type: Proficiency Test
Year: 2025
Analysis Performed: Anions (Inorganic)

ERA
A Waters Company

WS-343 Final Evaluation Report

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EPA ID: Not Reported
ERA Customer Number: N215603
Report Issued: 03/31/2025
Study Dates: 02/10/2025 - 03/27/2025

TNI Analyte Code	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description	Analysis Date	Z Score	Study Mean	Study Standard Deviation	Analyst Name
WS Inorganics (cat# 591, lot# S343-698)												
1505	Alkalinity as CaCO3	mg/L		48.0	43.2 - 52.8	Not Reported				47.8	1.65	
1575	Chloride	mg/L	76.1	73.9	62.8 - 85.0	Acceptable	EPA 300.0 2.1 1993	2/13/2025	0.264	75.2	3.34	
1610	Conductivity at 25°C	µmhos/cm		958	862 - 1050	Not Reported				947	20.4	
1730	Fluoride	mg/L	2.2	2.26	2.03 - 2.49	Acceptable	EPA 300.0 2.1 1993	2/13/2025	-0.758	2.32	0.154	
1820	Nitrate + Nitrite as N	mg/L		7.93	6.74 - 9.12	Not Reported				8.01	0.318	
1810	Nitrate as N	mg/L	8.0	7.93	7.14 - 8.72	Acceptable	EPA 300.0 2.1 1993	2/13/2025	0.111	7.96	0.379	
1125	Potassium	mg/L		26.8	22.8 - 30.8	Not Reported				27.3	1.45	
2000	Sulfate	mg/L	226.4	222	189 - 255	Acceptable	EPA 300.0 2.1 1993	2/13/2025	0.242	224	9.79	
1955	Total Dissolved Solids at 180°C	mg/L		622	498 - 746	Not Reported				614	28.4	

Sample Type: Proficiency Test
Year: 2025
Analysis Performed: Metals

FAS Filters – Station A

Sample Type: FAS, Station A
Year: 2024
Analysis Performed: Anions in weekly composites

Week	Chloride ng/m³	Nitrate ng/m³	Phosphate ng/m³	Sulfate ng/m³
01/01/24	1.83E+05	4.44E+02	<MDL	2.53E+04
01/08/24	2.60E+05	3.47E+02	<MDL	2.56E+04
01/15/24	2.78E+05	4.75E+02	<MDL	2.01E+04
01/22/24	3.74E+05	3.01E+02	<MDL	5.18E+04
02/01/24	2.13E+05	<MDL	<MDL	3.62E+04
02/08/24	3.43E+05	4.03E+01	<MDL	3.06E+04
02/15/24	#VALUE!	8.64E+01	<MDL	1.00E+05
02/22/24	1.16E+06	1.90E+02	<MDL	5.62E+04
03/01/24	2.63E+05	2.47E+02	<MDL	3.15E+04
03/08/24	4.15E+05	3.29E+02	<MDL	2.61E+04
03/15/24	2.27E+05	2.08E+02	<MDL	3.75E+04
03/22/24	1.86E+05	3.80E+02	<MDL	3.98E+04
04/01/24	5.13E+05	2.30E+02	<MDL	5.93E+04
04/08/24	5.03E+05	2.47E+02	<MDL	7.11E+04
04/15/24	4.48E+05	2.33E+02	<MDL	4.07E+04
04/22/24	4.54E+05	2.64E+02	<MDL	2.63E+04
05/01/24	4.59E+05	3.24E+02	<MDL	2.85E+04
05/08/24	4.12E+05	3.90E+02	<MDL	2.37E+04
05/15/24	3.93E+05	2.13E+02	<MDL	2.40E+04
05/22/24	1.45E+06	2.64E+02	<MDL	2.76E+04
06/01/24	1.62E+05	3.39E+02	<MDL	1.53E+04
06/08/24	3.01E+05	<MDL	<MDL	2.20E+04
06/15/24	1.42E+05	2.27E+02	<MDL	1.58E+04
06/22/24	1.48E+05	2.88E+02	<MDL	1.95E+04
07/01/24	1.50E+05	1.22E+02	1.10E+02	1.84E+04
07/08/24	2.46E+05	5.65E+01	<MDL	2.00E+04
07/15/24	5.62E+04	5.11E+01	7.07E+01	1.18E+04
07/22/24	4.32E+04	<MDL	<MDL	1.05E+04
08/01/24	8.87E+04	2.47E+02	<MDL	1.94E+04
08/08/24	7.28E+04	<MDL	<MDL	1.80E+04
08/15/24	7.85E+04	2.00E+02	<MDL	2.31E+04
08/22/24	6.16E+04	2.21E+02	<MDL	1.43E+04
09/01/24	4.20E+04	<MDL	<MDL	1.01E+04
09/08/24	9.16E+04	<MDL	<MDL	2.49E+04
09/15/24	4.56E+04	<MDL	<MDL	1.24E+04
09/22/24	7.15E+04	<MDL	<MDL	1.72E+04
10/01/24	4.64E+04	3.11E+02	<MDL	1.06E+04
10/21/24	4.46E+04	<MDL	<MDL	1.56E+04
10/22/24	1.03E+05	2.66E+02	<MDL	3.07E+04
11/01/24	2.36E+05	1.77E+02	<MDL	2.66E+04
11/08/24	1.30E+05	2.28E+02	<MDL	8.06E+04
11/15/24				
11/22/24				
12/01/24				
12/08/24				
12/15/24				
12/22/24				

NOTE: Filters were not received for the following time frames: 11/15/2024-12/22/2024

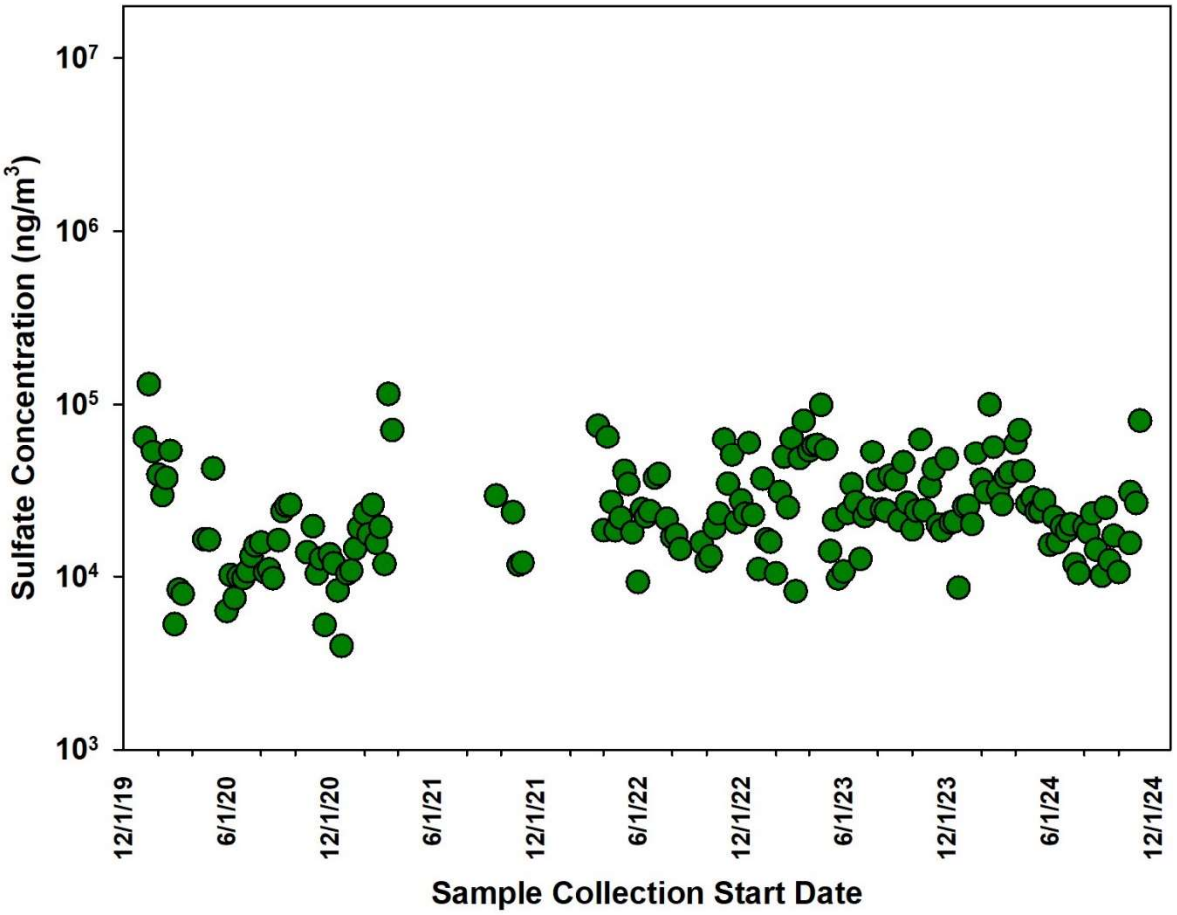

Figure 1: Historical Concentrations of Sulfate at Station A

Sample Type: FAS, Station A
Year: 2024
Analysis Performed: Cations in weekly composites

Week	Sodium ng/m³	Ammonium ng/m³	Magnesium ng/m³	Potassium ng/m³	Calcium ng/m³
01/01/24	1.26E+06	<MDL	2.44E+03	2.42E+03	1.14E+04
01/08/24	1.71E+06	<MDL	5.94E+02	2.21E+03	1.07E+04
01/15/24	1.85E+06	<MDL	1.82E+03	1.88E+03	8.75E+03
01/22/24	2.49E+06	<MDL	5.36E+02	2.40E+03	2.20E+04
02/01/24	1.38E+06	<MDL	9.01E+02	3.12E+03	1.49E+04
02/08/24	2.27E+06	<MDL	7.21E+02	3.63E+03	1.14E+04
02/15/24	#VALUE!	<MDL	5.85E+03	1.01E+04	3.64E+04
02/22/24	3.12E+06	<MDL	4.12E+03	6.45E+03	2.14E+04
03/01/24	1.75E+06	<MDL	5.51E+02	2.38E+03	1.24E+04
03/08/24	2.81E+06	<MDL	9.99E+02	2.80E+03	1.08E+04
03/15/24	1.49E+06	<MDL	3.52E+03	4.07E+03	1.68E+04
03/22/24	1.21E+06	<MDL	4.96E+02	2.13E+03	1.80E+04
04/01/24	3.40E+06	<MDL	9.82E+02	3.99E+03	2.33E+04
04/08/24	3.35E+06	<MDL	1.02E+03	4.07E+03	2.63E+04
04/15/24	3.04E+06	<MDL	8.30E+02	2.99E+03	1.52E+04
04/22/24	3.09E+06	<MDL	7.87E+02	2.87E+03	8.45E+03
05/01/24	3.11E+06	<MDL	1.87E+03	3.17E+03	8.98E+03
05/08/24	2.76E+06	<MDL	1.75E+03	3.07E+03	7.73E+03
05/15/24	2.62E+06	<MDL	4.01E+03	<MDL	8.32E+03
05/22/24	3.82E+06	<MDL	1.99E+03	3.42E+03	8.50E+03

06/01/24	1.11E+06	<MDL	5.38E+02	2.10E+03	4.96E+03
06/08/24	2.01E+06	<MDL	2.66E+02	2.49E+03	6.58E+03
06/15/24	9.45E+05	<MDL	1.46E+03	<MDL	6.26E+03
06/22/24	9.94E+05	<MDL	4.71E+02	<MDL	7.79E+03
07/01/24	9.91E+05	<MDL	1.37E+03	1.74E+03	7.83E+03
07/08/24	1.65E+06	<MDL	1.72E+03	3.10E+03	6.61E+03
07/15/24	3.61E+04	<MDL	9.82E+02	1.68E+03	4.93E+03
07/22/24	2.78E+04	<MDL	8.22E+02	1.75E+03	4.02E+03
08/01/24	5.88E+05	<MDL	6.25E+02	6.33E+02	8.17E+03
08/08/24	5.03E+04	<MDL	3.46E+02	6.81E+02	7.10E+03
08/15/24	5.16E+05	<MDL	6.19E+02	8.31E+02	1.04E+04
08/22/24	4.21E+04	<MDL	6.66E+02	1.04E+03	6.15E+03
09/01/24	2.85E+04	<MDL	5.93E+02	5.11E+02	4.37E+03
09/08/24	6.17E+05	<MDL	9.12E+02	1.86E+03	9.88E+03
09/15/24	3.22E+04	<MDL	2.99E+02	2.10E+02	5.01E+03
09/22/24	4.71E+05	<MDL	5.51E+02	9.39E+02	7.99E+03
10/01/24	3.09E+04	<MDL	1.28E+03	1.36E+03	5.76E+03
10/21/24	2.88E+04	<MDL	<MDL	1.73E+03	5.99E+03
10/22/24	6.83E+05	<MDL	1.18E+03	2.47E+03	1.31E+04
11/01/24	1.59E+06	<MDL	1.83E+03	3.18E+03	8.95E+03
11/08/24	8.40E+05	<MDL	3.98E+03	7.72E+03	2.93E+04
11/15/24					
11/22/24					
12/01/24					
12/08/24					
12/15/24					
12/22/24					

NOTE: Filters were not received for the following time frames: 11/15/2024-12/22/2024

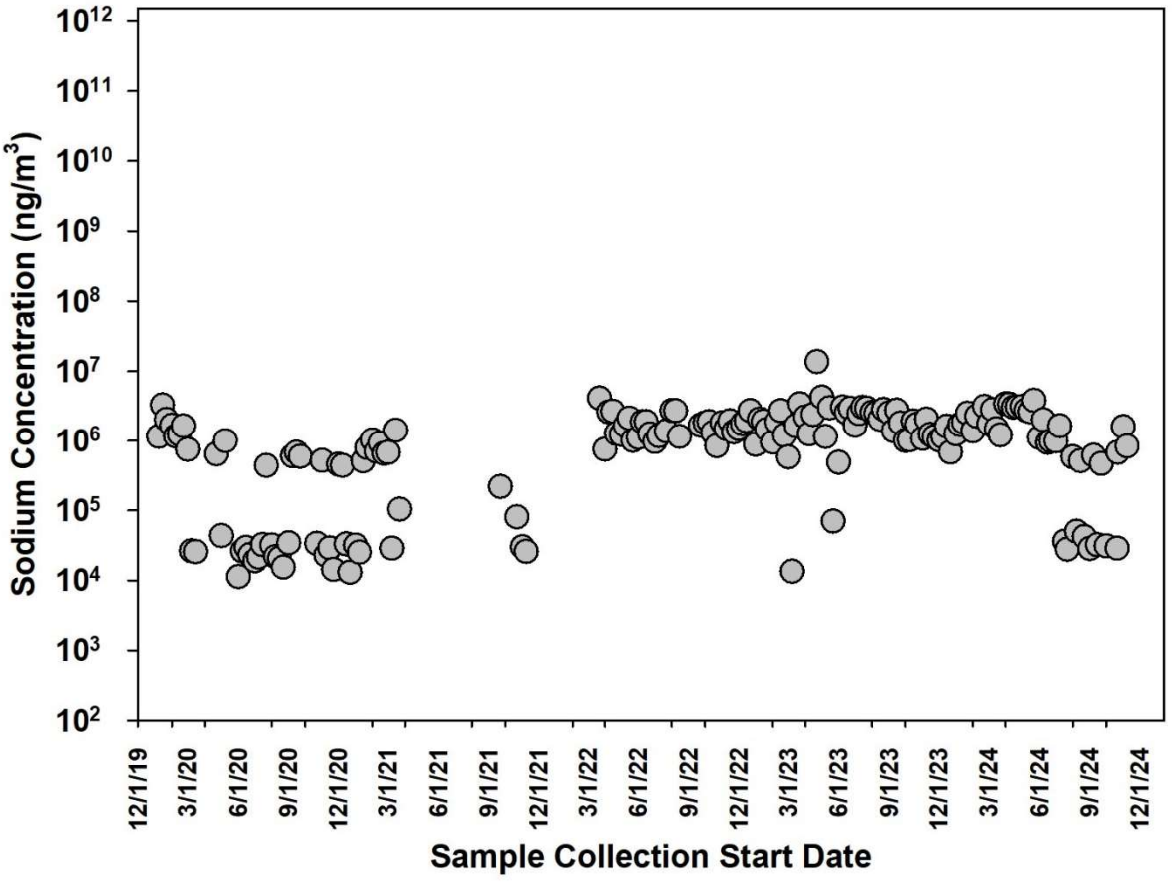

Figure 2: Historical Concentrations of Sodium at Station A

FAS Filters – Station B

Sample Type: FAS, Station B
Year: 2024
Analysis Performed: Metals in monthly composites

Month	Aluminum ng/m³	Cadmium ng/m³	Lead ng/m³	Magnesium ng/m³	Silicon ng/m³	Thorium ng/m³	Uranium ng/m³
January	63.97	0.40	0.11	46.32	532.7	<MDC	<MDC
February	<MDC	0.38	0.15	45.55	434.2	<MDC	<MDC
March	<MDC	0.39	0.12	<MDC	376.5	<MDC	<MDC
April	69.80	0.42	0.14	44.81	420.4	0.01	0.005
May	73.60	0.43	0.12	48.93	490.5	<MDC	<MDC
June	63.89	0.44	0.14	45.94	388.1	<MDC	<MDC
July	<MDC	0.41	0.23	41.98	348.2	<MDC	<MDC
August	<MDC	0.40	0.15	48.33	360.2	<MDC	<MDC
September	<MDC	0.44	0.18	42.32	334.5	<MDC	<MDC
October	<MDC	0.38	0.16	46.71	386.8	<MDC	0.005
November	<MDC	0.38	0.12	<MDC	304.3	<MDC	<MDC
December	<MDC	0.38	0.11	<MDC	315.4	<MDC	<MDC

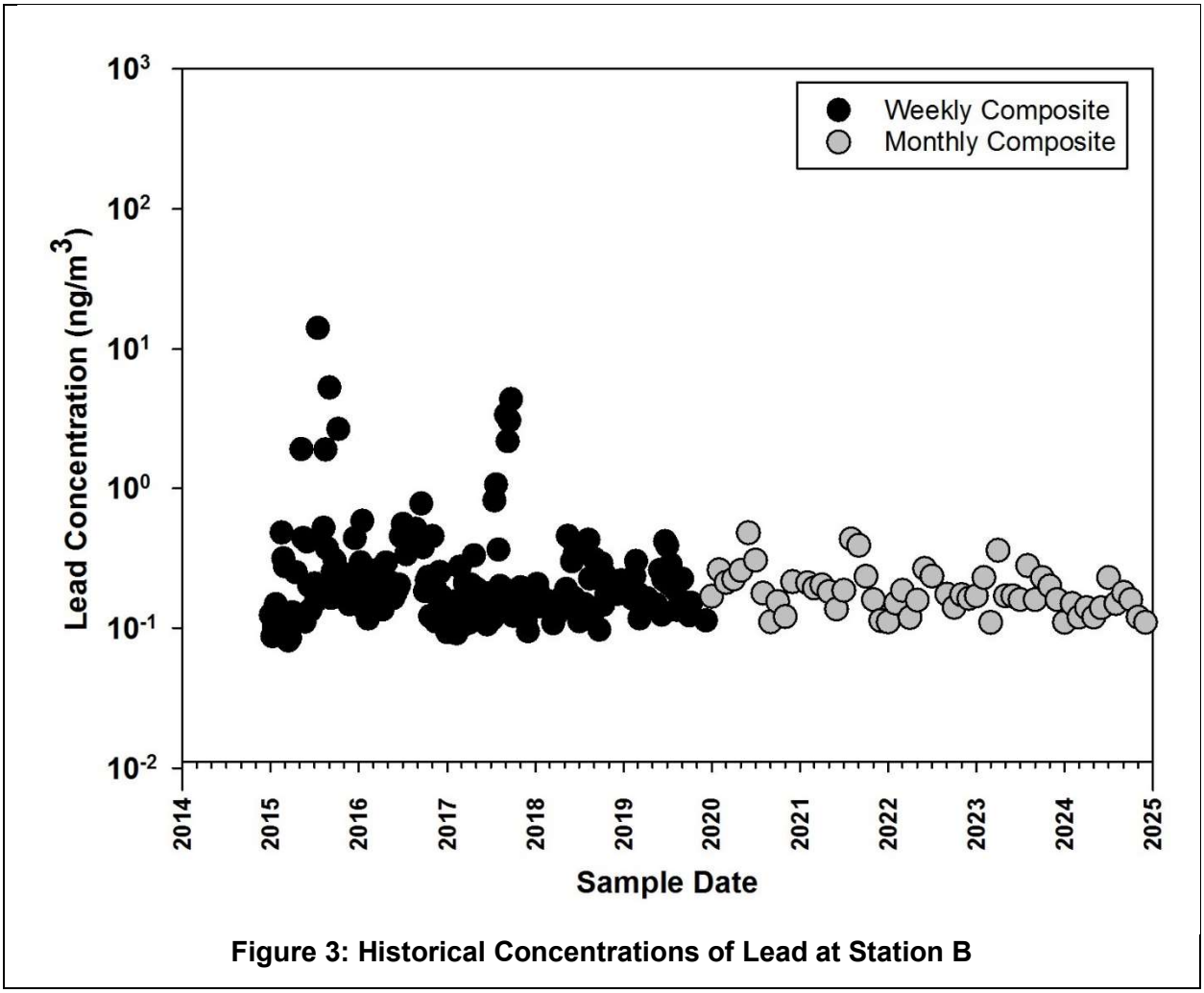

Figure 3: Historical Concentrations of Lead at Station B

Whatman Filters

Sample Type: Near Field (107), ambient air
Year: 2024
Analysis Performed: Anions

Start Date	Chloride µg/m³	Nitrate µg/m³	Phosphate µg/m³	Sulfate µg/m³
01/19/24	4.17E-01	1.45E+00	9.63E-04	1.02E+00
03/01/24	3.01E-01	1.78E+00	2.77E-03	1.31E+00
03/27/24	3.12E-01	1.90E+00	2.72E-03	1.78E+00
04/26/24	3.14E-01	1.98E+00	3.94E-03	1.92E+00
05/24/24	1.54E-01	1.76E+00	3.22E-03	2.59E+00
06/19/24	1.27E-01	1.92E+00	<MDL	1.87E+00
07/17/24				

Sample Type: Cactus Flats (108), ambient air
Year: 2024
Analysis Performed: Anions

Start Date	Chloride µg/m³	Nitrate µg/m³	Phosphate µg/m³	Sulfate µg/m³
01/19/24	2.97E-01	1.58E+00	<MDL	1.20E+00
03/01/24	2.16E-01	1.45E+00	1.49E-03	1.31E+00
03/27/24	3.11E-01	1.77E+00	1.33E-03	1.75E+00
04/26/24	2.74E-01	2.09E-03	2.07E+00	2.63E-03
05/24/24	1.52E-01	1.87E+00	2.40E-03	2.76E+00
06/19/24	1.01E-01	1.58E+00	<MDL	1.46E+00
07/17/24				

Sample Type: Near Field (107), ambient air
Year: 2024
Analysis Performed: Cations

Start Date	Calcium µg/m³	Magnesium µg/m³	Potassium µg/m³	Sodium µg/m³
01/19/24	7.24E-01	6.65E-02	9.17E-02	2.84E-01
03/01/24	9.90E-01	6.54E-02	8.23E-02	2.43E-01
03/27/24	1.12E+00	9.49E-02	1.10E-01	3.08E-01
04/26/24	3.04E-01	2.48E-01	2.33E-02	5.45E-02
05/24/24	1.71E+00	1.96E-02	5.31E-02	4.12E-01
06/19/24	1.24E+00	2.33E-02	5.46E-02	3.04E-01
07/17/24	1.52E+00	5.90E-02	8.83E-02	2.79E-01
08/08/24	1.42E+00	6.51E-02	7.71E-02	3.64E-01
08/30/24	1.40E+00	5.07E-02	8.61E-02	2.24E-01
10/04/24				
10/25/24				
11/20/24				

Sample Type: Cactus Flats (108), ambient air
Year: 2024
Analysis Performed: Cations

Start Date	Calcium µg/m³	Magnesium µg/m³	Potassium µg/m³	Sodium µg/m³
01/19/24	8.96E-01	4.57E-02	5.38E-02	2.24E-01
03/01/24	1.01E+00	9.52E-03	2.55E-02	1.90E-01
03/27/24	1.24E+00	7.87E-02	8.55E-02	2.83E-01
04/26/24	2.78E-01	1.93E-01	2.11E-02	4.18E-02
05/24/24	1.84E+00	9.65E-02	1.05E-01	3.79E-01
06/19/24	1.89E+00	2.61E-02	5.16E-02	3.43E-01
07/17/24	1.84E+00	5.41E-02	8.34E-02	2.15E-01
08/08/24	1.12E+00	4.40E-02	5.75E-02	1.89E-01
08/30/24	1.38E+00	4.19E-02	6.69E-02	1.16E-01
10/04/24				
10/25/24				
11/20/24				

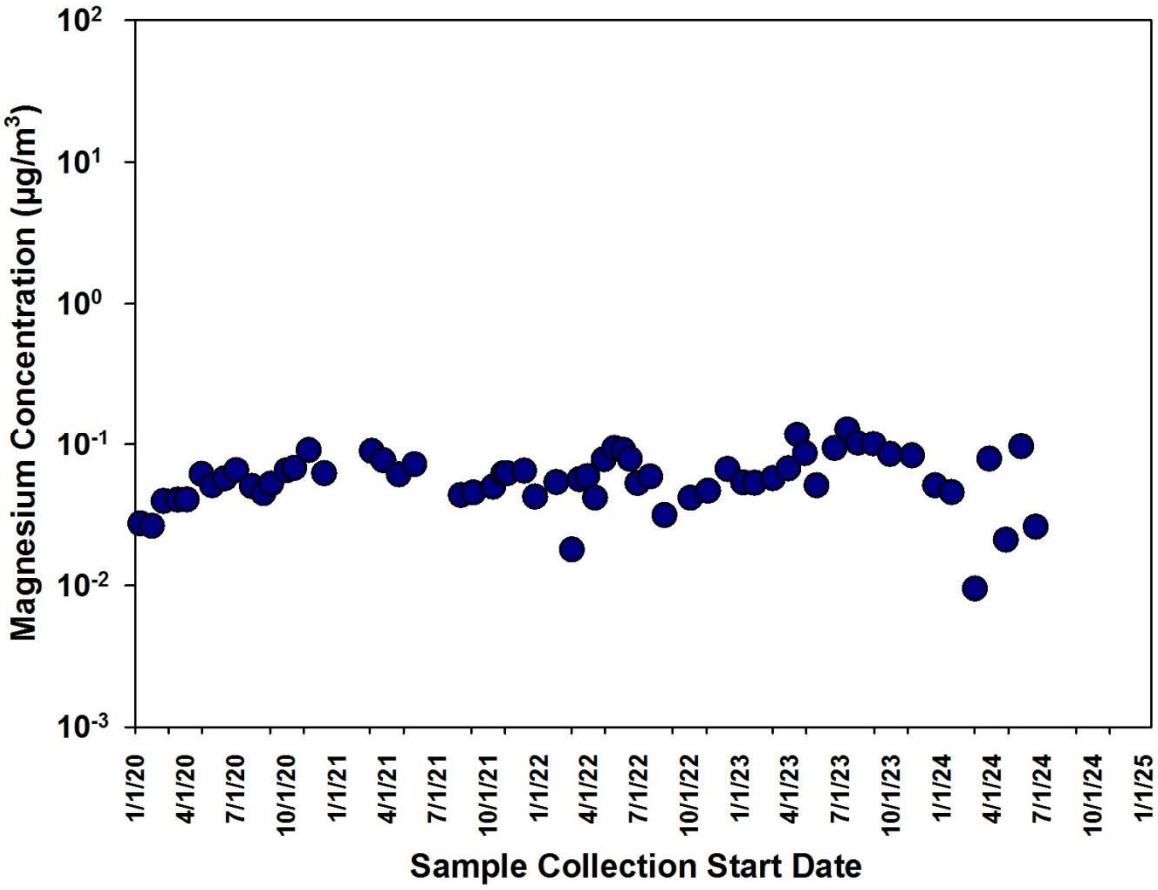

Figure 4: Historical Concentrations of Magnesium at Cactus Flats

Drinking Water

Sample Type: Drinking Water
Year: 2024
Analysis Performed: Anions

Sample Location	Chloride µg/L	Nitrate µg/L	Phosphate µg/L	Sulfate µg/L
Carlsbad (Sheep draw)	3.73E+04	4.60E+03	<MDL	9.26E+04
Hobbs	1.19E+05	2.17E+04	<MDL	1.47E+05
Double Eagle PRV4	3.39E+04	1.35E+04	<MDL	3.94E+04
Loving	4.02E+04	2.03E+04	<MDL	1.25E+05
Otis	2.31E+05	1.80E+04	<MDL	5.55E+05
Malaga	6.46E+05	1.57E+04	<MDL	9.92E+05

Sample Type: Drinking Water
Year: 2024
Analysis Performed: Cations

Sample Location	Calcium µg/L	Magnesium µg/L	Potassium µg/L	Sodium µg/L
Carlsbad (Sheep draw)	7.42E+04	3.00E+04	<MDL	2.64E+04
Hobbs	1.11E+05	2.13E+04	<MDL	5.73E+04
Double Eagle PRV4	5.22E+04	9.85E+03	3.65E+03	3.51E+04
Loving	9.01E+04	3.43E+04	<MDL	2.62E+04
Otis	2.40E+05	6.22E+04	<MDL	8.79E+04
Malaga	4.58E+05	1.16E+05	<MDL	2.06E+05

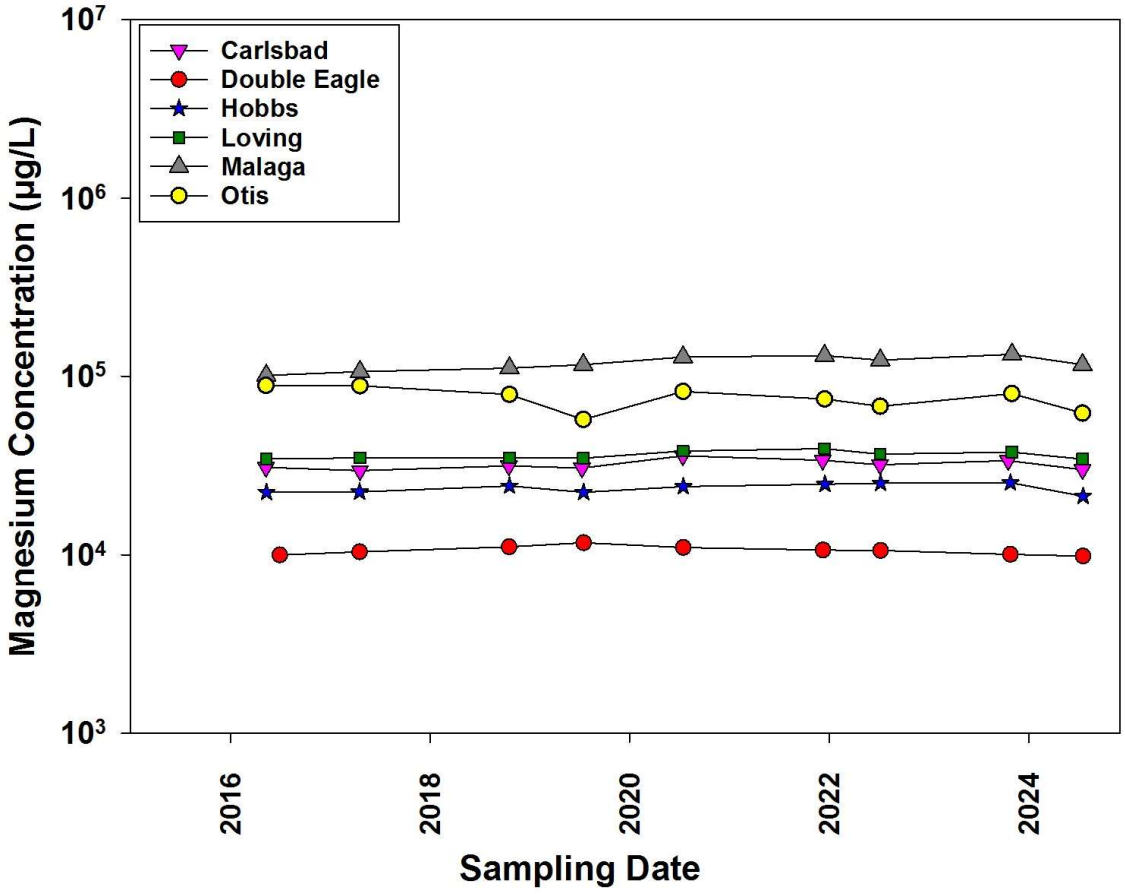

Figure 5: Historical Concentrations of Magnesium in Drinking Water

Sample Type: Drinking Water
Year: 2024
Analysis Performed: pH

Sample Location	pH @ 20.6°C
Carlsbad (Sheep draw)	7.99
Hobbs	7.95
Double Eagle PRV4	8.47
Loving	8.19
Otis	8.26
Malaga	8.01

Sample Type: Drinking Water
Year: 2024
Analysis Performed: Total Organic Carbon

Sample Location	TOC mg/L
Sheep Draw	1.231
Hobbs	1.114
Double Eagle PRV-4	0.5095
Loving	0.7142
Otis	0.5344
Malaga	0.7121

Sample Type: Drinking Water
Year: 2024
Analysis Performed: Conductivity

Sample Location	Conductivity mS/cm	Temperature °C
Sheep Draw (Carlsbad)	0.697	21.0
Loving	0.807	21.0
Otis	1.93	21.0
Malaga	3.81	21.0
Hobbs	0.995	21.0
PRV4 (Double Eagle)	0.496	21.0

Sample Type: Drinking Water
Year: 2024
Analysis Performed: Specific gravity

Sample Location	Specific Gravity
Sheep Draw (Carlsbad)	0.995
Loving	0.996
Otis	0.997
Malaga	0.997
Hobbs	0.996
PRV4 (Double Eagle)	0.996

Sample Type: Drinking Water
Year: 2024
Analysis Performed: TDS/TSS

Sample Location	TDS mg/L	TSS mg/L
Sheep Draw (Carlsbad)	220.0	N.D.
Loving	400.0	N.D.
Otis	1440.0	N.D.
Malaga	3020.0	N.D.
Hobbs	620.0	N.D.
PRV4 (Double Eagle)	120.0	N.D.
N.D. = non-detect.		

Sample Type: Drinking Water
Year: 2024
Analysis Performed: Metals

Metal	Carlsbad Conc µg/L	Loving Conc µg/L	Otis Conc µg/L	Malaga Conc µg/L	Hobbs Conc µg/L	Double Eagle (PRV4) Conc µg/L
Ag	7.19E-02	<MDC	<MDC	<MDC	<MDC	2.00E-01
Al	3.43E+00	2.04E+00	4.18E+00	6.74E+00	2.11E+00	3.55E+00
As	7.69E-01	1.72E+00	1.87E+00	2.62E+00	8.42E+00	7.82E+00
Ba	7.25E+01	3.39E+01	1.66E+01	1.34E+01	5.64E+01	1.02E+02
Be	<MDC	<MDC	<MDC	<MDC	<MDC	<MDC
Ca	7.44E+04	8.80E+04	2.34E+05	4.43E+05	1.13E+05	5.44E+04
Cd	5.42E-03	<MDC	<MDC	<MDC	1.31E-02	<MDC
Ce	3.10E-03	<MDC	<MDC	<MDC	<MDC	<MDC
Co	1.35E-01	1.64E-01	4.03E-01	7.01E-01	2.01E-01	9.89E-02
Cr	1.41E+00	2.40E+00	2.12E+00	1.81E+00	1.79E+00	1.31E+00
Cu	2.63E+00	3.10E+00	5.03E+00	3.57E+00	4.72E+00	1.64E+00
Dy	<MDC	<MDC	<MDC	<MDC	<MDC	<MDC
Er	<MDC	<MDC	<MDC	<MDC	<MDC	<MDC
Eu	1.86E-02	8.17E-03	<MDC	<MDC	<MDC	2.51E-02
Fe	2.80E+02	3.32E+02	1.02E+03	1.73E+03	1.05E+03	2.34E+02
Gd	<MDC	<MDC	<MDC	<MDC	<MDC	<MDC
Hg	<MDL	<MDL	<MDL	<MDL	<MDL	<MDL
K	1.30E+03	1.90E+03	2.86E+03	3.99E+03	2.74E+03	2.96E+03
La	4.46E-03	<MDC	<MDC	<MDC	<MDC	<MDC
Li	7.43E+00	2.13E+01	4.32E+01	6.44E+01	3.72E+01	2.06E+01
Mg	3.47E+04	3.91E+04	7.69E+04	1.32E+05	2.71E+04	1.13E+04
Mn	4.99E-01	3.01E-02	6.79E-02	4.45E-01	1.24E+00	1.08E+00
Mo	1.36E+00	1.67E+00	3.47E+00	4.00E+00	2.72E+00	1.93E+00
Na	2.60E+04	2.58E+04	8.73E+04	1.94E+05	5.59E+04	3.48E+04
Nd	3.23E-03	<MDC	<MDC	<MDC	<MDC	<MDC
Ni	3.38E+00	3.88E+00	1.12E+01	1.85E+01	5.45E+00	2.43E+00
P	<MDC	<MDC	<MDC	<MDC	<MDC	<MDC
Pb	3.14E-01	2.26E-01	<MDC	2.36E-01	1.24E+00	4.70E-01
Pr	<MDC	<MDC	<MDC	<MDC	<MDC	<MDC
Sb	3.22E-02	3.41E-02	4.56E-02	4.34E-02	6.71E-02	3.43E-02
Sc	1.84E+00	2.92E+00	3.26E+00	3.17E+00	7.42E+00	4.82E+00
Se	<MDC	<MDC	<MDC	<MDC	<MDC	<MDC
Si	6.29E+03	9.89E+03	1.04E+04	1.05E+04	2.60E+04	1.65E+04
Sr	3.49E+02	8.33E+02	2.91E+03	5.80E+03	1.28E+03	5.93E+02
Th	<MDC	<MDC	<MDC	<MDC	<MDC	<MDC
Tl	1.09E-01	<MDC	<MDC	<MDC	2.13E-02	1.23E-02
U	8.22E-01	1.94E+00	3.83E+00	5.67E+00	3.77E+00	1.71E+00
V	3.79E+00	1.16E+01	1.04E+01	7.93E+00	3.16E+01	3.17E+01
Zn	8.28E+00	4.95E+00	2.66E+01	8.69E+00	3.81E+01	6.81E+00

Surface Water

Sample Type: Surface Water
Year: 2024
Analysis Performed: Anions

Sample Location	Chloride µg/L	Nitrate µg/L	Phosphate µg/L	Sulfate µg/L
Hill Tank	4.54E+03	5.60E+02	5.09E+02	1.38E+04
Noya Tank	4.46E+04	<MDL	<MDL	6.44E+03
Pierce Canyon	1.69E+06	4.06E+03	<MDL	1.77E+06
Lake Carlsbad (Shallow)	6.13E+05	4.11E+03	<MDL	1.04E+06
Lake Carlsbad (Deep)	6.39E+05	4.11E+03	<MDL	1.08E+06
Brantley Lake (Shallow)	5.33E+05	1.39E+03	<MDL	8.83E+05
Brantley (Deep)	7.15E+05	1.61E+03	<MDL	9.96E+05
Red Bluff (Shallow)	3.71E+06	<MDL	<MDL	3.70E+06
Red Bluff (Deep)	3.69E+06	<MDL	<MDL	3.68E+06

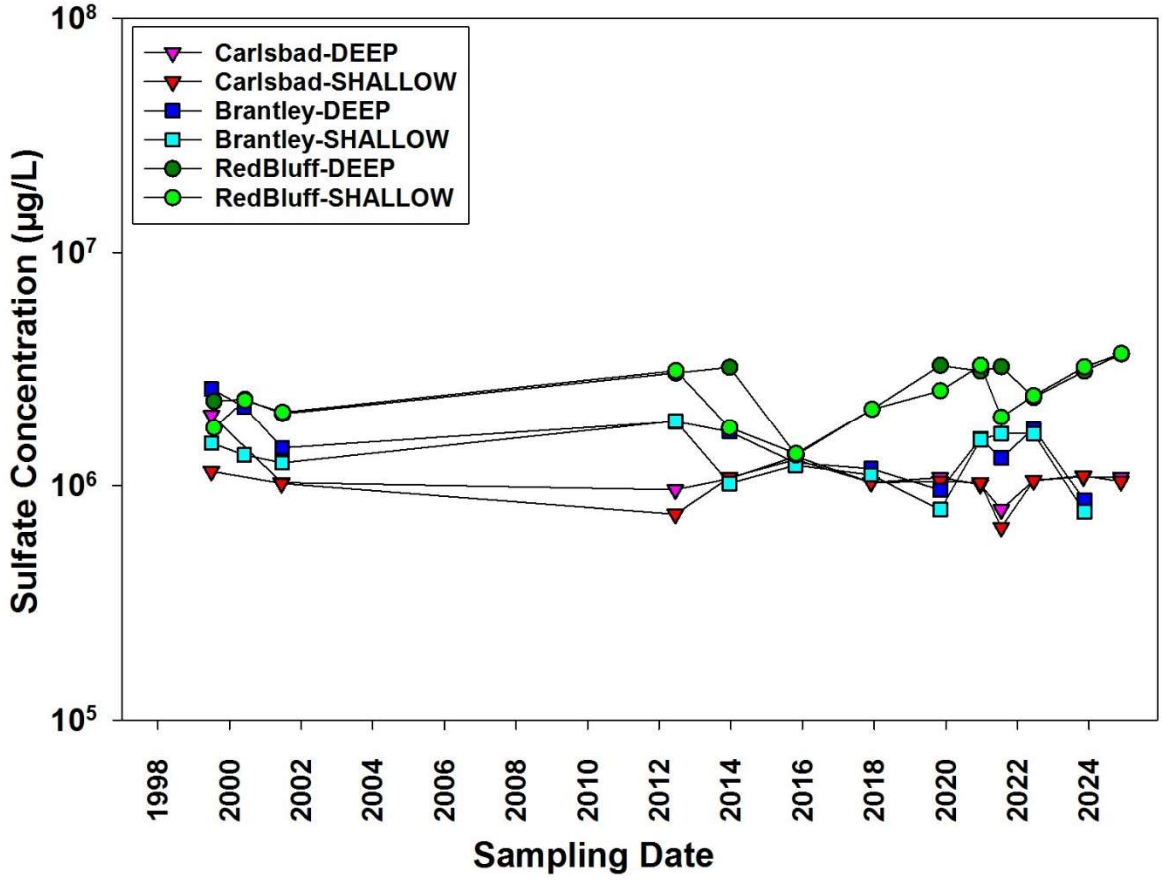

Figure 6: Historical Concentrations of Sulfate in Surface Water

Sample Type: Surface Water
Year: 2024
Analysis Performed: Cations

Sample Location	Calcium µg/L	Magnesium µg/L	Potassium µg/L	Sodium µg/L
Hill Tank	6.75E+04	8.91E+03	2.44E+04	2.41E+03
Noya Tank	2.13E+05	1.55E+04	4.25E+04	1.28E+04
Pierce Canyon	5.68E+05	2.12E+05	4.16E+04	9.76E+05
Lake Carlsbad (Shallow)	3.53E+05	1.18E+05	2.19E+04	3.94E+05
Lake Carlsbad (Deep)	3.54E+05	1.19E+05	2.14E+04	3.99E+05
Brantley Lake (Shallow)	3.26E+05	7.75E+04	2.26E+04	3.23E+05
Brantley Lake (Deep)	3.65E+05	9.44E+04	2.40E+04	4.35E+05
Red Bluff (Shallow)	9.56E+05	5.65E+05	1.71E+05	2.18E+06
Red Bluff (Deep)	9.95E+05	5.62E+05	1.85E+05	2.20E+06

Sample Type: Surface Water
Year: 2024
Analysis Performed: pH

Sample Location	pH @ 24°C
Hill Tank	8.782
Noya Tank	8.180
Pierce Canyon	8.338
Lake Carlsbad (Shallow)	8.22
Lake Carlsbad (Deep)	8.32
Brantley Lake (Shallow)	8.43
Brantley Lake (Deep)	8.36
Red Bluff (Shallow)	8.25
Red Bluff (Deep)	8.24

Sample Type: Surface Water
Year: 2024
Analysis Performed: Conductivity

Sample Location	Conductivity mS/cm	Temperature °C
Hill Tank	0.456	20.0
Noya Tank	0.533	20.3
Pierce Canyon	9.83	19.9
Lake Carlsbad (Shallow)	3.88	21.5
Lake Carlsbad (Deep)	3.94	21.5
Brantley Lake (Shallow)	3.15	19.3
Brantley Lake (Deep)	3.90	19.4
Red Bluff (Shallow)	14.55	20.3
Red Bluff (Deep)	14.70	19.9

Sample Type: Surface Water
Year: 2024
Analysis Performed: Specific gravity

Sample Location	SG $_{T/4^{o}C}$
Hill Tank	0.987
Noya Tank	0.980
Pierce Canyon	0.983
Lake Carlsbad (Shallow)	1.001
Lake Carlsbad (Deep)	0.999
Brantley Lake (Shallow)	1.001
Brantley (Deep)	0.998
Red Bluff (Shallow)	1.004
Red Bluff (Deep)	1.005

Sample Type: Surface Water
Year: 2024
Analysis Performed: TOC

Sample Location	TOC mg/L
Hill Tank	14.66
Noya Tank	115.0
Pierce Canyon	5.665
Lake Carlsbad (Shallow)	1.875
Lake Carlsbad (Deep)	1.527
Brantley Lake (Shallow)	4.741
Brantley (Deep)	4.711
Red Bluff (Shallow)	10.43
Red Bluff (Deep)	10.33

Sample Type: Surface Water
Year: 2024
Analysis Performed: TDS/TSS

Sample Location	TDS mg/L	TSS mg/L
Hill Tank	160.00	140.00
Noya Tank	460.00	520.00
Pierce Canyon	5620.00	220.00
Lake Carlsbad (Shallow)	3040.00	80.00
Lake Carlsbad (Deep)	2240.00	N.D.
Brantley Lake (Shallow)	2080.00	320.00
Brantley (Deep)	2280.00	40.00
Red Bluff (Shallow)	11840.00	N.D.
Red Bluff (Deep)	10680.00	40.00

Sample Type: Surface Water
Year: 2024
Analysis Performed: Metals

Metal	Hill Tank Conc µg/L	Noya Tank Conc µg/L	Pierce Canyon Conc µg/L
Ag	<MDC	4.32E-01	<MDC
Al	4.56E+02	1.68E+04	1.14E+02
As	7.34E+00	2.86E+01	<MDC
Ba	2.11E+02	3.04E+03	4.09E+01
Be	<MDC	3.21E+00	<MDC
Ca	6.39E+04	4.46E+05	5.39E+05
Cd	<MDC	1.45E+00	<MDC
Ce	1.93E+00	1.13E+02	5.51E-01
Co	1.17E+00	3.08E+01	1.54E+00
Cr	1.58E+00	1.35E+01	<MDC
Cu	1.18E+01	4.30E+01	3.05E+00
Dy	1.67E-01	1.04E+01	<MDC
Er	7.77E-02	4.72E+00	3.78E-02
Eu	<MDC	4.26E+00	<MDC
Fe	4.32E+02	1.19E+04	1.78E+03
Gd	2.47E-01	1.63E+01	<MDC
Hg	<MDL	<MDL	<MDL
K	2.15E+04	4.58E+04	1.66E+04
La	8.98E-01	4.98E+01	<MDC
Li	4.43E+00	2.40E+01	8.34E+01
Mg	9.69E+03	3.77E+04	2.15E+05
Mn	9.24E+01	4.88E+03	2.14E+01
Mo	9.23E-01	1.43E+00	4.02E+00
Na	2.26E+03	1.24E+04	9.31E+05
Nd	1.03E+00	6.30E+01	<MDC
Ni	4.79E+00	5.48E+01	2.44E+01
P	2.76E+02	5.85E+03	<MDC
Pb	<MDC	7.41E+01	<MDC
Pr	2.39E-01	1.38E+01	<MDC
Sb	6.35E-01	8.23E-01	<MDC
Sc	1.73E+00	9.05E+00	1.08E+00
Se	<MDC	<MDC	<MDC
Si	6.56E+03	2.91E+04	4.67E+03
Sr	3.13E+02	9.98E+02	8.50E+03
~~Th~~			
Tl	<MDC	<MDC	<MDC
U	7.27E-01	1.49E+00	8.19E+00
V	1.77E+01	1.16E+02	5.13E+00
Zn	<MDC	<MDC	<MDC

	Brantley Lake		Lake Carlsbad		Red Bluff	
Metal	Shallow Conc µg/L	Deep Conc µg/L	Shallow Conc µg/L	Deep Conc µg/L	Shallow Conc µg/L	Deep Conc µg/L
Ag	<MDC	<MDC	<MDC	<MDC	<MDC	<MDC
Al	1.35E+02	1.62E+02	2.48E+01	2.94E+01	<MDC	<MDC
As	<MDC	<MDC	<MDC	<MDC	<MDC	<MDC
Ba	1.20E+02	1.17E+02	1.62E+01	1.63E+01	8.18E+01	8.62E+01
Be	<MDC	<MDC	<MDC	<MDC	<MDC	<MDC
Ca	3.03E+05	3.38E+05	3.42E+05	3.39E+05	9.81E+05	9.98E+05
Cd	<MDC	<MDC	<MDC	<MDC	<MDC	<MDC
Ce	4.96E-01	2.17E-01	<MDC	<MDC	<MDC	<MDC
Co	<MDC	6.32E-01	<MDC	<MDC	<MDC	<MDC
Cr	6.90E+00	6.57E+00	7.72E+00	7.92E+00	3.31E+01	3.98E+01
Cu	<MDC	<MDC	<MDC	<MDC	<MDC	<MDC
Dy	3.33E-01	<MDC	<MDC	<MDC	<MDC	<MDC
Er	3.13E-01	<MDC	3.30E-02	<MDC	<MDC	<MDC
Eu	<MDC	<MDC	<MDC	<MDC	<MDC	<MDC
Fe	1.06E+03	1.24E+03	1.17E+03	1.34E+03	4.73E+03	4.11E+03
Gd	3.40E-01	<MDC	<MDC	<MDC	<MDC	<MDC
Hg	<MDL	<MDL	<MDL	<MDL	<MDL	<MDL
K	8.48E+03	8.31E+03	4.92E+03	4.92E+03	4.15E+04	4.11E+04
La	<MDC	<MDC	<MDC	<MDC	<MDC	<MDC
Li	2.50E+01	3.09E+01	3.88E+01	3.90E+01	1.71E+02	1.67E+02
Mg	6.75E+04	8.44E+04	1.08E+05	1.10E+05	4.40E+05	4.45E+05
Mn	8.31E+00	1.26E+01	<MDC	<MDC	4.24E+01	4.27E+01
Mo	3.33E+00	<MDC	3.18E+00	<MDC	<MDC	<MDC
Na	2.97E+05	4.05E+05	3.72E+05	3.73E+05	2.09E+06	2.17E+06
Nd	<MDC	<MDC	<MDC	<MDC	<MDC	<MDC
Ni	1.28E+01	1.43E+01	1.36E+01	1.41E+01	<MDC	<MDC
P	<MDC	<MDC	<MDC	<MDC	<MDC	<MDC
Pb	<MDC	<MDC	<MDC	<MDC	<MDC	<MDC
Pr	3.51E-01	<MDC	<MDC	<MDC	<MDC	<MDC
Sb	<MDC	<MDC	<MDC	<MDC	<MDC	<MDC
Sc	1.36E+00	1.34E+00	1.28E+00	1.67E+00	2.10E+00	2.18E+00
Se	<MDC	<MDC	<MDC	<MDC	<MDC	<MDC
Si	5.33E+03	5.71E+03	6.60E+03	6.79E+03	5.98E+03	6.40E+03
Sr	3.78E+03	4.14E+03	4.65E+03	4.08E+03	1.36E+04	1.33E+04
Th	<MDC	<MDC	<MDC	<MDC	<MDC	<MDC
Tl	<MDC	<MDC	<MDC	<MDC	<MDC	<MDC
U	2.92E+00	3.26E+00	3.22E+00	3.18E+00	9.39E+00	9.61E+00
V	6.17E+00	5.78E+00	6.10E+00	6.24E+00	9.95E+00	1.26E+01
Zn	<MDC	<MDC	<MDC	<MDC	<MDC	<MDC

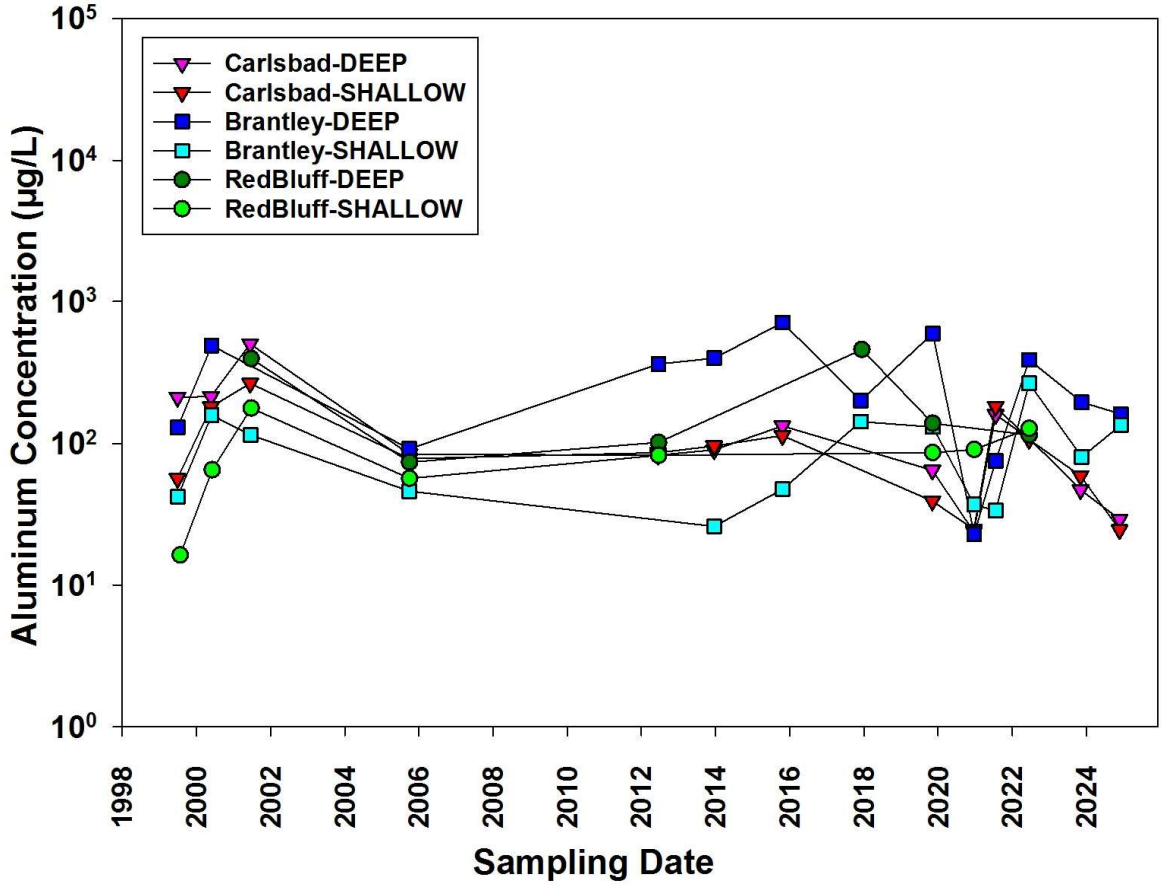

Figure 7: Historical Concentrations of Aluminum in Surface Water

Groundwater

Sample Type: Groundwater
Year: 2025
Analysis Performed: Anions

Sample Location	Chloride µg/L	Nitrate µg/L	Phosphate µg/L	Sulfate µg/L
WQSP-1	3.56E+07	<MDL	<MDL	4.85E+06
WQSP-2	3.59E+07	<MDL	<MDL	5.28E+06
WQSP-3				
WQSP-4				
WQSP-5				
WQSP-6				

Sample Type: Groundwater
Year: 2025
Analysis Performed: Cations

Sample Location	Calcium µg/L	Magnesium µg/L	Potassium µg/L	Sodium µg/L
WQSP-1	1.79E+06	1.01E+06	4.12E+05	2.31E+07
WQSP-2	1.58E+06	9.74E+05	4.36E+05	2.16E+07
WQSP-3				
WQSP-4				
WQSP-5				
WQSP-6				

Sample Type: Groundwater
Year: 2025
Analysis Performed: pH

Sample Location	pH @ 23°C
WQSP-1	6.86
WQSP-2	7.05
WQSP-3	
WQSP-4	
WQSP-5	
WQSP-6	

Sample Type: Groundwater
Year: 2025
Analysis Performed: Conductivity

Sample Location	Conductivity mS/cm	Temperature °C
WQSP-1	85.4	21.7
WQSP-2	83.6	21.7
WQSP-3		
WQSP-4		
WQSP-5		
WQSP-6		

Sample Type: Groundwater
Year: 2025
Analysis Performed: Specific gravity

Sample Location	SG $_{T/4°C}$
WQSP-1	1.041
WQSP-2	1.044
WQSP-3	
WQSP-4	
WQSP-5	
WQSP-6	

Sample Type: Groundwater
Year: 2025
Analysis Performed: TOC

Sample Location	TOC mg/L
WQSP-1	
WQSP-2	
WQSP-3	
WQSP-4	
WQSP-5	
WQSP-6	

Sample Type: Groundwater
Year: 2025
Analysis Performed: TDS/TSS

Sample Location	TDS mg/L	TSS mg/L
WQSP-1	66480	N.D.
WQSP-2	66440	N.D.
WQSP-3		
WQSP-4		
WQSP-5		
WQSP-6		

Internal Dosimetry Group and Public Outreach

***In vivo* radiobioassay measurements performed during the reporting period**:

None for WIPP (no current contract), 38 for the contract radiological personnel and those working in the laboratories located at CEMRC, 6 for the public participants.

CEMRC Lung and Whole-Body APEX In-Vivo radiobioassay measurement system annual energy and efficiency calibrations for the 2025-2026 period:

Performed successfully the annual energy and efficiency calibrations of CEMRC Lung and Whole Body APEX *In-vivo* radiobioassay measurement system during January-March 2025.

Department of Energy Laboratory Accreditation Program (DOELAP) for Radiobioassay (DOE-STD-1112 compliance) 2025 Performance Testing of unknown BOMAB and Lung set phantoms:

Participated in the DOELAP 2025 performance testing of unknown BOMAB and Lung set phantoms. For Whole-Body, activities of fission/activation products Co-60, Cs-134 and Cs-137 were tested in BOMAB phantom; for lungs, Pu-238, Am-241, U-238, U-235, Mn-54, Co-57, Co-60, were tested in lung sets phantoms. All results were acceptable.

Outreach activities:

CEMRC and the Internal Dosimetry group continue to interact with the public to explain CEMRC's function and to encourage the Lie Down and Be Counted (LDBC) project's lung and whole body in-vivo radiobioassay measurements at CEMRC. CEMRC also promotes awareness of environmental monitoring and research, to the public. The following are outreach activities during the reporting period:

3/1/2025: SCIENCE BOWL 2025: SENMC, Carlsbad, NM 88220 (all-day event). CEMRC staff members interacted with students and the public, demonstrated science experiments, and explained CEMRC's mission.

3/20/2025: STEAM EXPO (Science Technology, Engineering, Arts Mathematics) SENMC gym, Carlsbad, NM 88220 4:00 - 6:00 pm. Explained and handed out the flyers about Lie down and Be Counted program to around 200 community members and students of all ages. Interacted with community members to encourage participating in the LDBC program. About 9 members showed interest in visiting LDBC facility and provided contact information.

3/25/2025: SENMC Workforce Development group members visited the Lung and Whole-Body counting facility. Explained and handed out flyers about Lie down and Be Counted program. Explained and demonstrated the lung and whole-body radiobioassay measurement to the visitors.

Low Background Radiation Experiment (LBRE)

The LBRE group carried out sub-background radiation experiments using, for the first time at WIPP, the fruit fly *Drosophila melanogaster*. Results with the important biological model were consistent with work previously carried out by the group, that is the fruit flies were stressed in the WIPP underground without normal levels of radiation compared to when grown at the surface. Specifically, development of the flies underground was delayed, particularly between egg-laying and the adult stages. In both experiments, after a 14-day incubation, pupae development was significantly inhibited underground compared to the surface (Figure 1).

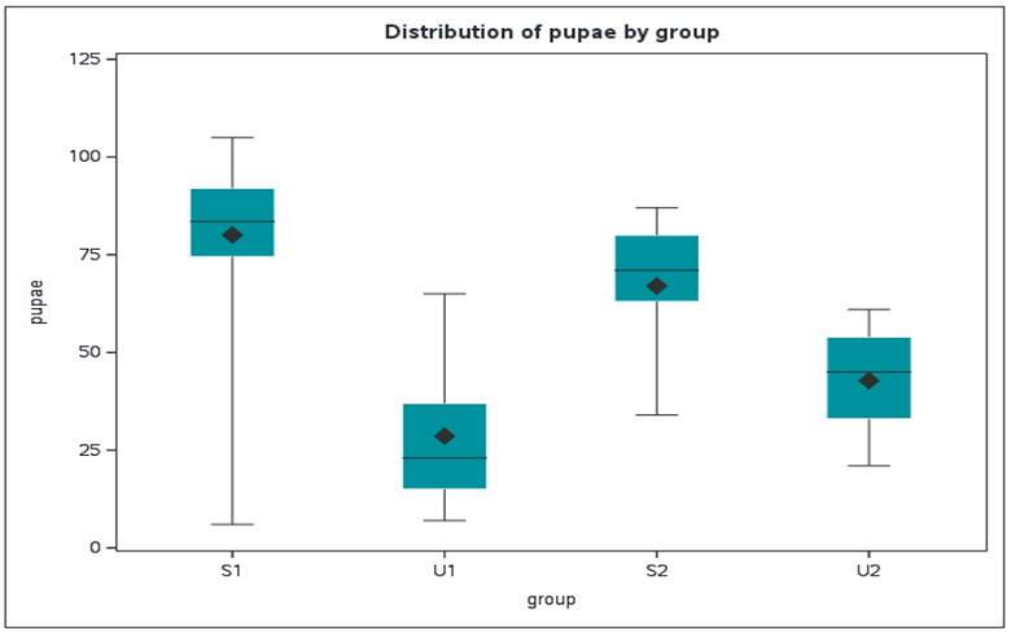

Figure 1. Boxplot of Fruit Fly Pupal Counts for Experiments at WIPP.
Two experiments were run (S1, U1; S2, U2), with S=Surface and U = Underground. Significantly more pupae hatched on the Surface in both experiments: S1-U1 p-value < 0.0001, and S2-U2 p-value = 0.0015.

The experiment was later expanded to include a technique that we previously used at WIPP called a Reciprocal Control (Castillo et a. 2015). The idea is that during incubation with the biological inhibition in play, one moves the underground inhibited cells up to the Surface Control and document if the cells are rescued. We first carried out this experiment at WIPP in 2014 and it became a key part of a landmark paper confirming that it was the lack of radiation that had inhibited cells (Castillo et al. 2015).

Results of the Reciprocal Control experiment are shown in Figure 2. Three mating pairs were allowed to mate and lay eggs on day 0 at the WIPP surface or the underground in 50 replicate tubes. At day 2 after eggs were laid, 25 replicates were “rescued” from the underground to the surface, and 25 tubes from the surface were reciprocally moved from the surface to the underground (Figure 2A). At day 16, pupae and adults were counted and, consistent with the earlier experiments, there were significantly fewer pupae hatched per egg laid in the underground (Figure 2B). Just as observed earlier (Castillo et al. 2015), the underground stress was relieved

when we rescued the flies from the underground, with the rescued treatment now statistically the same # of pupae hatched as the control (Figure 2B). The reciprocal treatment moved from the surface to the underground resulted in a pupae hatch rate intermediate between the surface and underground (data not shown). This experiment confirms that was observed in bacteria is true in the complex, multi-cellular Drosophila, and once again demonstrates a significant cost in fitness when organisms are deprived of natural levels of radiation.

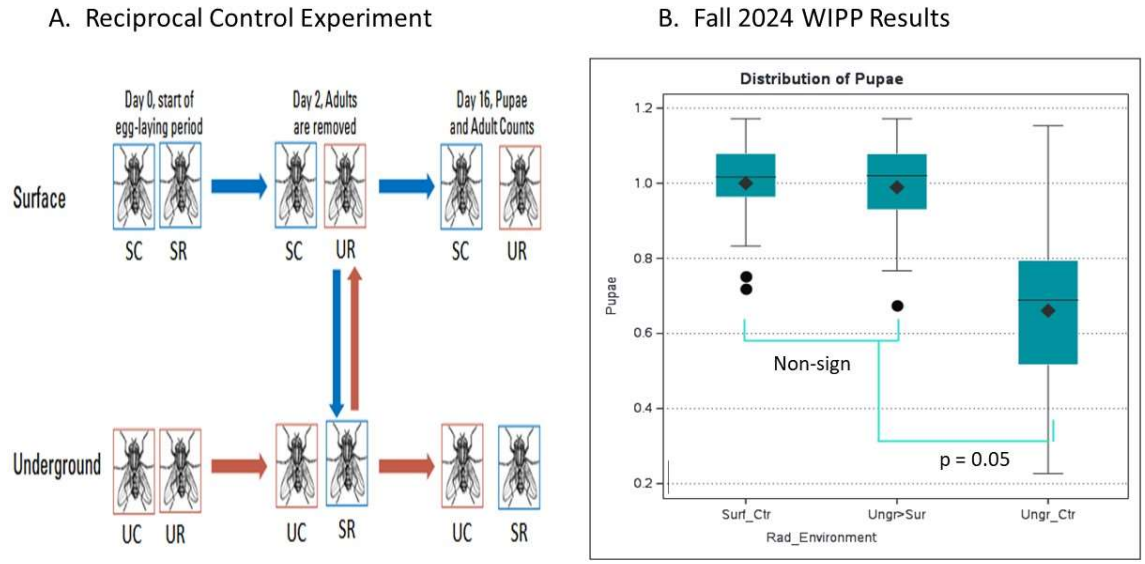

Figure 2. Boxplot of Standardized Pupal Ratios (n = 25)
A. Experimental Design of Reciprocal Control Experiment. **B.** Pupal ratios were obtained by dividing the pupal counts by the corresponding egg count per tube, then standardized by dividing by the mean ratio for the surface control group. Surf_Ctrl = surface control; Ungr>Surf = underground flies rescued to the surface; Ungr Ctrl = underground control. The error bar whiskers represent the minima and maxima except where dots are shown as min/max.