Analytical Results for the Community Environmental Monitoring Program (CEMP) Air Sampling and TLD Network Second Quarter CY2021

The CEMP air-sampling network is designed to monitor and collect radioactive airborne particles from NNSS and non-NNSS related activities, as well as background environmental sources. This report is compiled by the Desert Research Institute (DRI) and summarizes the results from the analysis of the air samples collected by CEMP station managers as part of the community environmental monitoring program.

In general, the CEMP air-sampling network is comprised of 24 continuously operating environmental sampling stations. A total of 23 stations are equipped with a low volume air sampler/totalizer configuration to collect particulate radionuclides on glass fiber filter paper. Prior to October 1, 2013 all air samples were collected on a bi-weekly basis with a target collection time of 336 hours (two weeks). After October 1, 2013, approximately half of the stations were converted to 'stand by' status in which only one two-week sample was collected and analyzed every quarter year. Beginning October 1, 2017 all CEMP stations are again operating full time with samples being collected every two weeks. Now the procedure is to submit one sample set per quarter year for analysis. The remaining samples are archived to be accessed if needed. This protocol will be followed unless an important event were to occur on or off the NNSS (major fires, transportation incident or an unusual result are a few examples). Archived samples would be used to assess conditions before and after an event. The samplers are calibrated on a quarterly basis by DRI to maintain a collection rate of 1.75 cfm (@ STP). All relevant information such as collection times, variations in flow rate, actual flow volumes, power outages, and other information documenting the integrity of the sample are recorded by the station managers. This allows for the proper interpretation of the analytical results. The air filters are analyzed by a commercial laboratory for gross alpha/beta activity as well as by high-resolution gamma spectrometry.

In the U.S., the principal reporting unit for the measurement of radioactivity in the atmospheric environment is pCi/m^3 (picocuries per cubic meter). DRI receives its data from the lab as picocuries per filter. DRI converts the laboratory data unit of measurement to pCi/m^3 for the ease in comparison of data for this report.

A summary of the second quarter CY2021 analytical results for gross alpha and beta analyses are found in Table 1. This table documents the results of the quarterly analyses for each of the 23 air-sampling network stations. The average annual value from the previous year (CY2020) is provided for comparison purposes. Overall, the gross alpha results for the second quarter of CY2021 reflect similar values to previous quarters. These data remain consistent with the average CY2020 analyses used for comparison, especially when analytical error is considered. The second quarter CY2021 beta results are also consistent with previous results.

The second quarter gamma results for CY2021 are shown in Table 2. All of the samples were gamma spectrum negligible with the exception of beryllium (Be-7) a

naturally occurring element of atmospheric origin. Overall, these data are consistent with previous analytical results.

The TLD results for the second quarter of CY2021 are shown in Table 3. Data for the environmental thermoluminescent dosimeter (TLD) is reported in milliroentgens (mR). Overall, the results display similar values to the previous quarters of the last calendar year. The 2020 pressurized ion chamber (PIC) exposure rate and TLD data are also provided for comparison. As with historical data, TLD values are commonly lower than the PIC results. The overall estimated annual exposure based on the second quarter shows consistency with CY2020.

DRI welcomes and encourages input from the station managers regarding the content of the CEMP quarterly reports. If there is anything you feel we could provide to help you interpret the data or enable you to explain the information to someone in your community not familiar with the program, please let us know.

Table 1. Gross Alpha/Beta Analytical Results for the Second Quarter of Calendar Year 2021. (Data represents one analysis per quarter)

Station	Gross Alpha (pCi/m^3)	2020 Average	Gross Beta (pCi/m^3)	2020 Average
Alamo	0.0014	0.0029	0.0207	0.0219
Amargosa	0.0023	0.0027	0.0207	0.0246
Beatty	0.0016	0.0022	0.0221	0.0213
Boulder City	0.0015	0.0026	0.0203	0.0256
Caliente	0.0023	0.0029	0.0185	0.0262
Cedar City	0.0020	0.0023	0.0176	0.0205
Delta	0.0015	0.0019	0.0175	0.0202
Duckwater	0.0018	0.0025	0.0187	0.0196
Ely	0.0014	0.0019	0.0186	0.0173
Goldfield	0.0018	0.0022	0.0174	0.0192
Henderson	0.0027	0.0030	0.0210	0.0253
Indian Springs	0.0019	0.0027	0.0259	0.0252
Las Vegas	0.0020	0.0023	0.0207	0.0229
Mesquite	0.0019	0.0033	0.0211	0.0262
Milford	0.0018	0.0020	0.0179	0.0223
Overton	0.0023	0.0031	0.0210	0.0273
Pahrump	0.0015	0.0028	0.0199	0.0221
Pioche	0.0017	0.0021	0.028	0.0207
Rachel	0.0013	0.0019	0.0206	0.0211
Sarcobatus	0.0017	0.0021	0.0223	0.0244
St. George	0.0010	0.0023	0.0204	0.0280
Tecopa	0.0017	0.0023	0.0264	0.0281
Tonopah	0.0009	0.0018	0.0190	0.0209

Average analytical error gross alpha +/- 0.00070 (pCi/m^3)
Average analytical error gross beta +/- 0.00235 (pCi/m^3)

Table 2. Gamma Spectroscopy Results for the Second Quarter of Calendar Year 2021.

Station	Cs-137 (pCi/m^3)	Cs-137 MDC, (pCi/m^3)	Be-7 (pCi/m^3)	Be-7 MDC, (pCi/m^3)	Pb-210 (pCi/m^3)
Alamo	<MDC	0.016	0.225	0.042	N.D.
Amargosa	<MDC	0.014	0.186	0.040	N.D.
Beatty	<MDC	0.012	0.174	0.017	N.D.
Boulder City	<MDC	0.005	0.173	0.017	N.D.
Caliente	<MDC	0.014	N.D.	N/A	N.D.
Cedar City	<MDC	0.015	0.147	0.034	N.D.
Delta	<MDC	0.012	0.164	0.036	N.D.
Duckwater	<MDC	0.014	0.152	0.042	N.D.
Ely	<MDC	0.007	0.183	0.025	N.D.
Goldfield	<MDC	0.009	0.159	0.020	N.D.
Henderson	<MDC	0.009	0.148	0.039	N.D.
Indian Springs	<MDC	0.022	0.262	0.049	N.D.
Las Vegas	<MDC	0.013	0.199	0.032	N.D.
Mesquite	<MDC	0.014	N.D.	N/A	N.D.
Milford	<MDC	0.011	0.161	0.025	N.D.
Overton	<MDC	0.015	0.157	0.018	N.D.
Pahrump	<MDC	0.015	0.222	0.049	N.D.
Pioche	<MDC	0.010	0.149	0.031	N.D.
Rachel	<MDC	0.013	0.206	0.029	N.D.
Sarcobatus	<MDC	0.011	0.172	0.033	N.D.
St. George	<MDC	0.015	0.123	0.027	N.D.
Tecopa	<MDC	0.016	0.201	0.044	N.D.
Tonopah	<MDC	0.008	0.170	0.038	N.D.

MDC = Minimum detectable concentration
N.D. = Not detected

Table 3. TLD Analytical Results for the Second Quarter of Calendar Year 2021

Station	Second Quarter Exposure (mR)	Est. Annual Exposure (mR/yr)	2020 TLD Exposure (mR/yr)	2020 PIC Exposure (mR/yr)
Alamo	28	112	121	117
Amargosa	27	107	117	102
Beatty	37	149	146	149
Boulder City	28	108	112	133
Caliente	30	114	118	144
Cedar City	27	110	101	116
Delta	27	110	107	114
Duckwater	29	109	132	137
Ely	26	107	114	109
Goldfield	34	136	122	141
Henderson	31	119	122	118
Indian Springs	27	107	99	102
Las Vegas	26	100	101	92
Mesquite	27	110	108	104
Milford	37	135	145	162
Overton	20	77	86	97
Pahrump	21	83	85	75
Pioche	31	118	131	144
Rachel	35	141	130	137
Sarcobatus	35	141	140	148
St. George	30	122	120	125
Tecopa	27	107	105	117
Tonopah	37	147	141	146