Analytical Results for the Community Environmental Monitoring Program (CEMP) Air Sampling Network–First Quarter CY2011

The CEMP air-sampling network is designed to monitor and collect radioactive airborne particles from NTS and non-NTS 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 29 continuously operating environmental sampling stations. A total of 27 stations are equipped with a low volume air sampler/totalizer configuration to collect particulate radionuclides on glass fiber filter paper. Ideally, the samples are collected on a bi-weekly basis with a target collection time of 336 hours (two weeks). The samplers are calibrated on a monthly 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. The filters are composited on a quarterly basis for gamma spectroscopy analysis only after the gross alpha/beta analyses have been completed.

In the U.S., the principle 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 microcuries per filter. DRI converts the laboratory data unit of measurement to pCi/m^3 for the ease in comparison of data. The data for the environmental thermoluminescent dosimeter (TLD) is reported in milliroentgens (mR).

A summary of the first quarter CY2011 analytical results for gross alpha and beta analyses are found in Tables 1 and 2. These tables document the minimum, maximum, and average values for each of the 27 air-sampling network stations. The last column shows the average annual value from the previous year (CY2010) for comparison purposes. Overall the gross alpha results for the first quarter of CY2011 reflect similar values to previous quarters. These data remain consistent with the average CY2010 analyses used for comparison, especially when analytical error is considered. The first quarter CY2011 gross beta results were affected by the Fukushima Nuclear Power Plant accident in Japan. While only a small increase is evident in the average values for the quarter, the maximum values are noticeably elevated. This reflects the two to three week sample collection interval in which beta emitting radionuclides were detectable from the event. The maximum values are approximately 2.5 times higher than normally observed averaging 0.066 pCi/m^3 for this quarter as opposed to an average of 0.025 pCi/m^3 for the fourth quarter of CY2010.

The first quarter gamma results for CY2011 are shown in Tables 3 and 4. Table 3 presents the data as a composite of the entire quarter as in previous reports. The Cs-137, Cs-134 and I-131 results reflect detectable levels of these radionuclides due to the Japan event. The stations which show detectable levels of I-131 are those which were chosen to

represent the CEMP network on a geographical basis for expedited analysis. They were analyzed immediately upon receipt by the University of Nevada Radioanalytical Services Laboratory on the Las Vegas campus. The remaining samples were analyzed using the standard procedures of the CEMP. Due to the short half-life of I-131 (8 days), these samples had decayed to non-detectable levels during the lag time between collection and analysis by the routine laboratory used by the CEMP. It is also important to note that the I-131 values for the Las Vegas and Henderson stations are significantly higher than the other stations. This is due to the addition of charcoal canisters at these locations to optimize the collection of radioiodine.

Table 4 presents the gamma data specific to the nuclear accident in Japan. These results are from samples collected during the time period of approximately 3/13 to 3/30/11. Again Cs-137 and Cs-134 were detected at all CEMP stations while I-131 and Te-132 were detected at the stations chosen to represent the CEMP network for expedited analysis. As expected, these results are significantly higher than those of Table 3 since they represent a specifically defined time period. These results more accurately represent the concentrations of these radioisotopes in the air samples as they became detectable following the accident.

The TLD results for the first quarter of CY2011 are shown in Table 4. Overall, the results display similar values to the previous quarters of the last calendar year. The 2010 pressurized ion chamber, or 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 first quarter shows consistent agreement with CY2010.

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 Analytical Results for the First Quarter of Calendar Year 2011
(Average analytical error, +/− 0.0007)

Station	Minimum (pCi/m^3)	Maximum (pCi/m^3)	Average (pCi/m^3)	2009 Average (pCi/m^3)
Alamo	0.0006	0.0016	0.0009	0.0016
Amargosa	0.0004	0.0009	0.0007	0.0012
Beatty	0.0005	0.0019	0.0011	0.0012
Boulder City	0.0005	0.0012	0.0009	0.0015
Caliente	0.0007	0.0022	0.0014	0.0018
Cedar City	0.0004	0.0011	0.0006	0.0008
Delta	0.0006	0.0023	0.0009	0.0011
Duckwater	0.0006	0.0010	0.0008	0.0011
Ely	0.0005	0.0008	0.0006	0.0009
Garden Valley	0.0004	0.0010	0.0007	0.0011
Goldfield	0.0005	0.0012	0.0009	0.0011
Henderson	0.0008	0.0014	0.0010	0.0013
Indian Springs	0.0004	0.0011	0.0006	0.0012
Las Vegas	0.0008	0.0015	0.0010	0.0011
Mesquite	0.0005	0.0014	0.0009	0.0015
Milford	0.0006	0.0011	0.0009	0.0012
Nyala	0.0006	0.0017	0.0009	0.0012
Overton	0.0005	0.0014	0.0009	0.0011
Pahrump	0.0006	0.0019	0.0011	0.0013

Pioche	0.0006	0.0012	0.0009	0.0010
Rachel	0.0006	0.0010	0.0008	0.0012
Sarcobatus	0.0006	0.0022	0.0013	0.0019
St. George	0.0003	0.0014	0.0009	0.0011
Stone Cabin	0.0005	0.0010	0.0007	0.0010
Tecopa	0.0006	0.0011	0.0009	0.0013
Tonopah	0.0004	0.0011	0.0007	0.0010
Twin Springs	0.0006	0.0009	0.0008	0.0013

Table 2. Gross Beta Analytical Results for the First Quarter of Calendar Year 2011.
(Average analytical error, +/– 0.003)

Station	Minimum (pCi/m^3)	Maximum (pCi/m^3)	Average (pCi/m^3)	2010 Average (pCi/m^3)
Alamo	0.010	0.083	0.025	0.017
Amargosa	0.010	0.068	0.023	0.018
Beatty	0.010	0.064	0.022	0.017
Boulder City	0.013	0.059	0.027	0.022
Caliente	0.014	0.074	0.026	0.019
Cedar City	0.012	0.070	0.022	0.015
Delta	0.013	0.056	0.026	0.018
Duckwater	0.011	0.062	0.021	0.017
Ely	0.012	0.061	0.020	0.015
Garden Valley	0.009	0.078	0.023	0.017
Goldfield	0.011	0.060	0.023	0.016
Henderson	0.013	0.054	0.022	0.019
Indian Springs	0.012	0.084	0.025	0.018
Las Vegas	0.014	0.055	0.027	0.018
Mesquite	0.013	0.070	0.026	0.020
Milford	0.014	0.060	0.026	0.020
Nyala	0.014	0.044	0.020	0.018
Overton	0.014	0.072	0.026	0.019
Pahrump	0.011	0.086	0.025	0.017

Pioche	0.012	0.068	0.021	0.014
Rachel	0.012	0.077	0.025	0.018
Sarcobatus	0.013	0.064	0.024	0.019
St. George	0.015	0.064	0.026	0.019
Stone Cabin	0.013	0.064	0.022	0.015
Tecopa	0.011	0.074	0.025	0.019
Tonopah	0.012	0.067	0.023	0.015
Twin Springs	0.012	0.052	0.021	0.019

Table 3. Gamma Spectroscopy Results for the First Quarter of Calendar Year 2011.

Station	Cs-137 (pCi/m^3)	Cs-134 (pCi/m^3)	I-131 (pCi/m^3)	Be-7 (pCi/m^3)
Alamo	0.004	0.004	N.D.	0.128
Amargosa	0.004	0.004	0.006	0.056
Beatty	0.003	0.003	N.D.	0.085
Boulder City	0.008	0.002	0.014	0.230
Caliente	0.004	0.007	N.D.	0.117
Cedar City	0.004	0.005	N.D.	0.144
Delta	0.004	0.005	N.D.	0.199
Duckwater	0.003	0.002	0.010	0.111
Ely	0.002	0.002	N.D.	0.076
Garden Valley	0.007	0.005	0.013	0.158
Goldfield	0.004	0.005	N.D.	0.126
Henderson	0.006	0.005	0.070	0.112
Indian Springs	0.006	0.005	N.D.	0.137
Las Vegas	0.011	0.005	0.078	0.115
Mesquite	0.005	0.006	N.D.	0.284
Milford	0.004	0.005	N.D.	0.139
Nyala	0.004	0.004	N.D.	0.174
Overton	0.005	0.006	N.D.	0.074
Pahrump	0.005	0.005	0.013	0.119

Pioche	0.004	0.005	N.D.	0.084
Rachel	0.004	0.004	N.D.	0.110
Sarcobatus	0.004	0.004	N.D.	0.103
St. George	0.006	0.005	0.018	0.127
Stone Cabin	0.006	0.005	N.D.	0.202
Tecopa	0.006	0.005	N.D.	0.183
Tonopah	0.005	0.005	N.D.	0.151
Twin Springs	0.003	0.004	N.D.	0.138

N.D. = not detected

Table 4. Gamma Spectroscopy Results Specific to the Japan Nuclear Accident.

Station	Cs-137 (pCi/m^3)	Cs-134 (pCi/m^3)	I-131 (pCi/m^3)	Te-132 (pCi/m^3)
Alamo	0.023	0.021	N.D.	N.D.
Amargosa	0.029	0.022	0.038	0.011
Beatty	0.019	0.020	N.D.	N.D.
Boulder City	0.018	0.016	0.030	0.003
Caliente	0.019	0.030	N.D.	N.D.
Cedar City	0.017	0.024	N.D.	N.D.
Delta	0.019	0.022	N.D.	N.D.
Duckwater	0.022	0.018	0.061	N.D.
Ely	0.023	0.017	N.D.	N.D.
Garden Valley	0.031	0.025	0.061	0.007
Goldfield	0.026	0.024	N.D.	N.D.
Henderson	0.015	0.012	0.163	0.008
Indian Springs	0.037	0.030	N.D.	N.D.
Las Vegas	0.036	0.016	0.235	0.011
Mesquite	0.021	0.027	N.D.	N.D.
Milford	0.020	0.022	N.D.	N.D.
Nyala	0.020	0.018	N.D.	N.D.
Overton	0.021	0.027	N.D.	N.D.
Pahrump	0.030	0.030	0.070	0.015

Pioche	0.021	0.026	N.D.	N.D.
Rachel	0.031	0.035	N.D.	N.D.
Sarcobatus	0.024	0.029	N.D.	N.D.
St. George	0.022	0.018	0.070	0.006
Stone Cabin	0.030	0.025	N.D.	N.D.
Tecopa	0.036	0.031	N.D.	N.D.
Tonopah	0.033	0.035	N.D.	N.D.
Twin Springs	0.025	0.018	N.D.	N.D.

N.D. = not detected

Table 5. TLD Analytical Results for the First Quarter of Calendar Year 2011

Station	First Quarter Exposure (mR)	Est. Annual Exposure (mR/yr)	2010 TLD Exposure (mR/yr)	2010 PIC Exposure (mR/yr)
Alamo	27	108	106	120
Amargosa	24	104	94	106
Beatty	35	141	129	149
Boulder City	25	91	94	134
Caliente	28	112	104	139
Cedar City	23	92	81	100
Delta	23	92	86	106
Duckwater	27	101	103	129
Ely	24	89	91	107
Garden Valley	35	130	139	153
Goldfield	28	112	110	132
Henderson	27	99	102	121
Indian Springs	24	104	90	99
Las Vegas	22	81	87	97
Medlins Ranch	32	119	132	148
Mesquite	24	88	95	106
Milford	34	137	130	153
Nyala	27	101	100	120
Overton	22	80	87	98
Pahrump	19	71	73	73

Pioche	26	112	102	124
Rachel	32	128	118	132
Sarcobatus	36	145	140	148
St. George	21	84	70	92
Stone Cabin	33	119	131	148
Tecopa	26	113	97	129
Tonopah	33	134	122	141
Twin Springs	37	139	146	170