

# 2002 Report Carlsbad Environmental Monitoring & Research Center

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## Table of Contents

Table of Contents .....	iii
List of Tables .....	iii
List of Figures .....	iv
Acronyms and Abbreviations .....	vi
FOREWORD .....	ix
OVERVIEW .....	1
Current Program Status .....	2
WIPP Environmental Monitoring Project .....	6
Quality Assurance .....	9
WIPP ENVIRONMENTAL MONITORING DATA SUMMARIES .....	17
Aerosol Studies for the WIPP-EM .....	18
Development of Methods for Monitoring Volatile Organic Compounds .....	34
Radionuclides and Inorganics in WIPP Exhaust Air .....	42
Vertical Distribution of <sup>137</sup> Cs in the Vicinity of the Waste Isolation Pilot Plant.....	53
The Identification and Quantification of Gnome-Derived Radionuclides in WIPP Environmental Samples.....	66
Radionuclides in Oil and Gas Formations in the Vicinity of WIPP .....	79
Radionuclides and Inorganics in Selected Drinking Water Sources .....	84
Actinide Chemistry.....	95
Occurrence of Radionuclides in Residents of the Carlsbad, New Mexico Area and Public Awareness of the Center's WIPP Environmental Monitoring Program .....	101
APPENDICES .....	109
REFERENCES .....	119

## List of Tables

Table 1. Listing of CEMRC Staff as of 31 December 2002.....	5
Table 2. Participation in Environmental Measurements Laboratory Quality Assurance Program .....	14
Table 3. Participation in NIST Radiochemistry Intercomparison Program .....	16
Table 4. Aerosol Sampling Status for WIPP EM (March 2002).....	24
Table 5. Minimum Detectable Activities (MDAs) for Actinides in High-Volume Aerosol Samples..	24
Table 6. Summary Statistics for Aerosol Mass Loadings and Actinide Activities in High-Volume Aerosol Samples.....	25
Table 7. Revised Aerosol Sampling Program for the WIPP EM (from March 2002 forward).....	25
Table 8. Volatile Organic Compounds of Concern .....	37
Table 9. Initial Calibration Summary .....	37

Table 10. Summary Statistics for Gross Alpha/Beta Analyses of Daily FAS Filters .....	45
Table 11. Summary Statistics for Elemental Constituents in Weekly FAS Composites .....	46
Table 12. Results of Actinide Analyses for Quarterly FAS Composite Samples .....	47
Table 13. Specific Conductivity and pH data as a function of depth for the four soil profiles.....	58
Table 14. Distribution of clay and <sup>137</sup> Cs as a function of depth in the four soil profiles .....	59
Table 15. Profile inventories for <sup>137</sup> Cs .....	59
Table 16. Column distribution of <sup>134</sup> Cs activity expressed as percent recovery of original spike .....	60
Table 17. Mean concentrations (Bq kg <sup>-1</sup> ) of radionuclides for each of nine Gnome sample locations and across-sample statistics in comparison to the concentrations in surface soils collected from two areas near the WIPP site.....	72
Table 18. Relative percent differences between sieved and unsieved soils paired by sample.....	73
Table 19. Ratio of concentration of metals in sieved Gnome soils to those in WIPP soils. ....	75
Table 20. Relative percent differences between the Gnome and WIPP normalized analyte concentration.....	76
Table 21. Ratios of <sup>137</sup> Cs and <sup>238</sup> Pu to <sup>239,240</sup> Pu in Gnome samples in comparison to mean values for WIPP soils.....	77
Table 22. Gamma Spectrometric Results for Brine Samples from 18 Batteries (Bq/L).....	81
Table 23. Range of Concentrations of Selected Inorganic Analytes in Drinking Water Samples Collected from Carlsbad and Double Eagle during 1998-2002 .....	86
Table 24. Range of Concentrations of Selected Inorganic Analytes in Drinking Water Samples Collected from Hobbs and Loving during 1998-2002 .....	88
Table 25. Range of Concentrations of Selected Inorganic Analytes in Drinking Water Samples Collected from Otis during 1998-2002 .....	90
Table 26. Demographic Characteristics of the "Lie Down and Be Counted" Population Sample through 1 October 2002 .....	104
Table 27. "Lie Down and Be Counted" Results through 1 October 2002 .....	105
Table 28. Summary of Environmental Monitoring Telephone Survey Responses.....	107
Table 29. Responses from 158 Individuals on the Importance of Monitoring Specific Environmental Media .....	108

## List of Figures

Figure 1. Sampling Locations in the Vicinity of the WIPP .....	26
Figure 2. Timeseries plots for <sup>239,240</sup> Pu and <sup>241</sup> Am in high-volume aerosol samples from the Carlsbad/WIPP area. ....	27
Figure 3. Timeseries plots for aluminum, an indicator of mineral dust, in the coarse and fine dichotomous aerosol sample fractions. ....	28
Figure 4. Timeseries plots for mass loadings in high-volume total suspended particle (TSP) aerosol samples.....	29
Figure 5. Box and whisker plots for <sup>239,240</sup> Pu activity densities in high-volume aerosol samples.....	30

Figure 6. Timeseries plot of the $^7\text{Be}/^{210}\text{Pb}$ ratio in high-volume aerosol samples from the Carlsbad/WIPP area.....	31
Figure 7a-b. Relationships between U vs. Al (an indicator of mineral dust) in coarse and fine aerosols. ....	32
Figure 8a-b. Relationships between $^{238}\text{Pu}$ vs. $^{239,240}\text{Pu}$ (left) and $^{241}\text{Am}$ vs. $^{239,240}\text{Pu}$ (right).....	32
Figure 9. Relationship between Al (an indicator of mineral dust) vs. $^{239,240}\text{Pu}$ in aerosols. ....	33
Figure 10. Total ion chromatogram of a 50 ppbv calibration standard mixture.....	38
Figure 11. Total ion chromatogram showing unresolved peak .....	39
Figure 12. Single ion chromatograms of the peak from Figure 11.....	40
Figure 13. Variations in response factors for VOCs of interest and internal standards (ISTD).....	41
Figure 14. Alpha Emitting Radioactivity (>MDC) in FAS Samples Collected during December 1998 - September 2002.....	49
Figure 15. Beta Emitting Radioactivity (>MDC) in FAS Samples Collected during December 1998 - September 2002.....	50
Figure 16. Sodium Released as Aerosols in the Exhaust from the WIPP .....	51
Figure 17. Aluminum Released as Aerosols in the Exhaust from the WIPP .....	52
Figure 18. Site location map for profiles excavated at grid nodes A6, A8, C6, and D2 .....	61
Figure 19. Soil Profile 3 before sampling .....	62
Figure 20. Soil Profile 4 after sampling .....	62
Figure 21. Schematic diagram of soil column construction .....	63
Figure 22. Distribution of $^{137}\text{Cs}$ and clay content expressed as a function of depth in Profiles 1, 2 and 3 .....	64
Figure 23. Distribution of $^{137}\text{Cs}$ and clay content expressed as a function of depth in Profile 4.....	65
Figure 24. Distribution of $^{134}\text{Cs}$ activity as a function of depth in the soil columns .....	65
Figure 25. Concentrations of metals in Gnome soils.....	78
Figure 26. Analytical flowchart of radionuclide separation and analysis strategy for brine characterization.....	83
Figure 27. Activity Concentrations of Uranium Isotopes in Drinking Water Samples Collected at Carlsbad and Double Eagle during 1998-2002.....	92
Figure 28. Activity Concentrations of Uranium Isotopes in Drinking Water Samples Collected at Hobbs and Loving during 1998-2002.....	93
Figure 29. Activity Concentrations of Uranium Isotopes in Drinking Water Samples Collected at Otis during 1998-2002 .....	94
Figure 30. Desorption of $^{239}\text{Pu}$ from Pu-loaded MgO-Brine E and Brine G agglomerates under non-agitated conditions.....	98
Figure 31. X-ray Absorption Spectra (XAS) of Pu in MgO--brine reaction products six months after the addition of the $^{239}\text{Pu}(\text{VI})$ , indicating all Pu as Pu(IV).....	99
Figure 32. Phase Constitution of WIPP MgO Backfill after infiltration with 3.7 mole/L $\text{MgCl}_2$ brine and reaction for several weeks.....	100

## Acronyms and Abbreviations

μBq	microBecquerel
μm	micrometer
AA, AAS	atomic absorption, atomic absorption spectrometry
Ag	silver
Al	aluminum
Am	americium
AMS	accelerator mass spectrometry
ANSI	American National Standards Institute
As	arsenic
Ba	barium
Be	beryllium
Bq	Becquerel
C	centigrade
Ca	calcium
CBFO	Carlsbad Field Office
Cd	cadmium
Ce	cerium
CEMRC	Carlsbad Environmental Monitoring & Research Center
CEMRP	Carlsbad Environmental Monitoring and Research Program
CFR	Code of Federal Regulations
Ci	Curie
CIS	cooled injection system
CIO	hypochlorite
cm	centimeter
Cm	curium
Co	cobalt
COC	concentrations of concern
Cr	chromium
CRM	certified reference materials
Cs	cesium
CTC	Chemrad Tennessee Corporation
Cu	copper
DL	detection limit
DOE	U.S. Department of Energy
DOELAP	Department of Energy Laboratory Accreditation Program
DTPA	diethylene-triaminepentaacetic acid
Dy	dysprosium
EEG	Environmental Evaluation Group
EM	Environmental Monitoring
EML	Environmental Monitoring Laboratory
EPA	U.S. Environmental Protection Agency
Er	erbium
ERA	Environmental Research Associates
Eu	europium
Fe	iron
FWHM	Full Width Half Maximum
FY	fiscal year
g	gram
GC/MS	gas-chromatograph/mass spectrometer
Gd	gadolinium

Ge	germanium
GPS	global positioning satellite
HCl	hydrochloric acid
HClO <sub>4</sub>	perchloric acid
HF	hydrofluoric acid
Hg	mercury
HNO <sub>3</sub>	nitric acid
H <sub>2</sub> O <sub>2</sub>	hydrogen peroxide
HP	high purity
HPGe	high purity germanium
IC	ion chromatography
ICP-MS	inductively coupled plasma-mass spectrometry
ISTC	International Science and Technology Center
K	potassium
keV	kiloelectron volts
km	kilometer
L	liter
La	lanthanum
LaF <sub>3</sub>	lanthanum fluoride
LANL	Los Alamos National Laboratory
LDBC	"Lie Down and Be Counted"
LFB	Laboratory Fortified Blank
LFM	Laboratory Fortified Matrix
Li	lithium
LLNL	Lawrence Livermore National Laboratory
LRB	Laboratory Reagent Blanks
m	meter
MBL	mobile bioassay laboratory
mBq	milliBecquerel
MDC	minimum detectable concentration
MDL	minimum detection level
MeV	mega electron volts
Mg	magnesium
MgCl <sub>2</sub>	magnesium chloride
MgO	magnesium oxide
min	minute
mL	milliliter
mm	millimeter
Mn	manganese
Mo	molybdenum
Na	sodium
NaCl	halite
NaOH	sodium hydroxide
Nd	neodymium
Ni	nickel
NIST	National Institute of Standards and Technology
NMSU	New Mexico State University
NORM	naturally occurring radioactive material
Np	neptunium
NRC	National Research Council
NRIP	NIST Radiochemistry Intercomparison Program
NTS	Nevada Test Site

ORNL	Oak Ridge National Laboratory
p	probability
Pb	lead
pH	scale indicating acidity or alkalinity of a substance
PM <sub>10</sub>	particulate matter smaller than 10 micrometers in aerodynamic diameter
PM <sub>2.5</sub>	particulate matter smaller than 2.5 micrometers in \ aerodynamic diameter
ppbv	parts per billion by volume
Pr	praseodymium
PRB	Program Review Board
Pu	plutonium
QA/QAP	quality assurance/quality assurance program
QAPD	quality assurance program document
QC	quality control
RPD	relative percent difference
SAB	Science Advisory Board
Sb	antimony
Sc	scandium
SD	standard deviation
Se	selenium
SE	standard error
Si	silicon
Sm	samarium
Sn	tin
Sr	strontium
T <sub>1/2</sub>	half-life
Th	thorium
Ti	titanium
Tl	thallium
TRU	transuranic
TSP	total suspended particulates
U	uranium
UT/LS	upper troposphere and lower stratosphere
UV Vis	ultraviolet visible
V	vanadium
VOC	Volatile Organic Compound
WERC	Waste-management Education & Research Consortium
WIPP	Waste Isolation Pilot Plant
WTS	Washington TRU Solutions
XANES	X-Ray Absorption Near Edge Spectroscopy
XAS	X-Ray Absorption Spectroscopy

## FOREWORD

This report was written, edited and produced collaboratively by the staff of the Carlsbad Environmental Monitoring & Research Center (CEMRC), who are hereby acknowledged for their contributions to the report and the project activities described herein. The first section is an overview of the current program activities, structure, resources and quality assurance. The second section consists of data summaries containing methods and descriptions of results of studies in the WIPP Environmental Monitoring project. Tables presenting data from the WIPP Environmental Monitoring project, and the contents of this report are available for electronic access at <http://www.cemrc.org>.

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This year's cover photograph features a CEMRC radiochemist performing a step in the separation of radionuclides from environmental samples. Such radiochemical manipulations may include coprecipitation, ion exchange or extraction chromatography. Prior to the start of the separation procedure each sample is spiked with appropriate carriers and yield tracers to assist in the quantification of the radionuclides of interest. Following separation each radionuclide fraction is converted to an appropriate form for counting by gamma spectrometry, gas proportional counting, liquid scintillation counting or alpha spectrometry. The Foreword shows various equipment used by scientists at CEMRC.

