APPENDICES

Appendix A: Brief History of Carlsbad Environmental Monitoring and Research Program

The Carlsbad Environmental Monitoring & Research Center (CEMRC) was created in 1991 as a division of the Waste-management Education & Research Consortium (WERC), in the College of Engineering at New Mexico State University (NMSU). The CEMRC was conceived as a result of inquiries to WERC by concerned citizens of the Carlsbad region, acting as a grassroots coalition who recognized the need for high quality, independent, health and environmental assessment data. Many individuals and organizations supported the CEMRC's formation including the residents of Carlsbad, NM, and the surrounding region; NMSU; the Carlsbad Department of Development; the New Mexico Congressional Delegation; the New Mexico Radioactive and Hazardous Materials Committee; Westinghouse Electric Corporation; and the U.S. Department of Energy (DOE). The CEMRC was established with a grant entitled "Carlsbad Environmental Monitoring and Research Program" (CEMRP) from DOE to NMSU. The CEMRP initially was funded for $27 million over a seven-year period (1991–1998). Subsequently, the grant was increased to almost $33 million to support operations of the program until 2008.

Dr. Rohinton (Ron) K. Bhada served as Project Director for the CEMRP during 1991-1999. Dr. Donald J. Fingleton served as Director of the CEMRC during 1991-1996. In 1996, Dr. Marsha Conley became Director of Operations and in 1997, Director. Dr. Conley was named CEMRP Project Director in 1999. In July 2001, Dr. Conley retired and Dr. George Hidy acted as an interim director until February 2002, when Mr. Joel Webb was appointed Director of CEMRC. In September 2003, Dr. Deborah Moir became acting interim director during the search for a new permanent director. At the same time, the CEMRP grant ended, the environmental monitoring program stopped, and WTS and LANL provided operating funds to CEMRC for radiochemistry collaborations under contract at CEMRC which included residence of their staff in office and laboratory space at CEMRC. In September 2004, Dr. James Conca was appointed Director of CEMRC. In FY2005 the CEMRP grant was re-instated at about half the annual funding level ($1.2M). The grant funding was increased in 2007 to $1.84M and WTS funding was increased to accommodate new VOC analyses. LES NEF in Eunice began developing a program with CEMRC which was implemented in 2008. Dr. Conca still holds the Director position as of December 2008.

Temporary office accommodations for the CEMRC initially were provided at NMSU-Carlsbad beginning in 1991. In 1992, the CEMRC moved to a leased facility at 800 West Pierce in Carlsbad, which served as a basis for operations through December 1996. Flatow Moore Bryan Shaffer McCabe Architects (Albuquerque, New Mexico) and Research Facilities Design (San Diego, California) were selected in 1991 to design the CEMRC's new facilities. In December of 1993, DOE Secretary Hazel O'Leary made a commitment to provide approximately $7 million in additional funding to support debt service for construction of the new facility. In 1994, the NMSU Board of Regents approved the sale of New Mexico State University Research Corporation Lease Revenue bonds to secure construction money. Construction of the Phase I facility began in August 1995 and was completed in December 1996. The facility is located adjacent to the NMSU-Carlsbad campus, on 22 acres of land donated to NMSU by then New Mexico State Representative Robert S. Light (D-55th District). On March 23, 1997, the Phase I facility was named the Joanna and Robert Light Hall.

In addition to work associated with design and construction of buildings for the CEMRC, a variety of other developmental projects were undertaken to support the CEMRC's scientific activities. In 1993, design began for the Mobile Bioassay Laboratory (MBL) that would complement the facilities planned for the new CEMRC building. Construction of the MBL began in 1994, and the unit was completed and delivered to Carlsbad in 1996. A Radioactive Material License was submitted to the New Mexico Environment Department, and the license was issued in 1996. The MBL was loaned to the DOE Rocky Flats site in Colorado during 2003-2005 to assist in decommissioning of that site which was successfully completed in 2005 and the unit returned to CEMRC. In 2005, funding was obtained by CEMRC from the City of Carlsbad, partially matched by CEMRC, to undertake a major redesign of the radiochemistry laboratory space and build an actinide chemistry laboratory for use by LANL and CEMRC staff to carry out experiments with Pu, U and Np, primarily with the focus of confirming previous WIPP performance assessments with respect to actinide elements in brine under repository conditions. This was completed in 2006. Subsequently, other laboratory improvements occurred in 2006 such as building of a new VOC laboratory and replacement of most of the ventilation system, jointly funded by DOE, WTS and CEMRC. A new sector-field mass spectrometry laboratory for uranium analysis was completed at CEMRC in 2008.

In 1999, CEMRC was separated from WERC and became a division reporting directly to the Dean of Engineering at NMSU. In July 2006, the College of Engineering at NMSU combined the units CEMRC, WERC and SWTDI under the new Institute for Energy and the Environment (IEE) that is managed by Dr. Abbas Ghassemi, the Associate Dean of Engineering.

Appendix B: Recent Publications

Author	Title	Publisher/Conference
Y. Grof, J. Monk, and M. Akbarzadeh	Real Time Detection, Ultra Low Radiation From Air Filters	Journal of the Health Physics Society 2008 (in press)
W. Weber, R. Marr, D. Kracko, Z. Gao, J. McDonald and **K. Ui Chearnaigh**	Disposition of tungsten in rodents after repeat oral and drinking water exposures	Toxicological and Environmental Chemistry, 90, 445-455, 2008
J. Conca, S. Sage and J. Wright	Nuclear Energy and Waste Disposal in the Age of Recycling	*Journal of the New Mexico Academy of Sciences, 2008 (in press)*
J. Wright and **J. Conca**	*The Geopolitics of Energy: Achieving a Just and Sustainable Energy Distribution by 2040*	Booksurge Publishing, Charleston, SC. ISBN 1-4196-7588-5, 2007
J. L. Conca and M. Apted	Nuclear Energy and Radioactive Waste Disposal in the Age of Recycling	In *GLOBAL '07 - Advanced Nuclear Fuel Cycles and Systems*, American Nuclear Soc, p. 1-8, 2007
W.A. Martin, S. L. Larson, D.R. Felt, J. Wright, C.S. Griggs, M. Thompson, **J.L. Conca**, and C. Nestler	The effect of organics on lead sorption onto Apatite II	*Applied Geochemistry*, 23, 34 - 43, 2007
M. Campbell, H. Wise, J. Evensen, B. Handley, S. Testa, **J. Conca** and H. Moore	Nuclear Power: Winds of Change	Uranum Committee Annual Report, Amer. Assoc. of Petroleum Geologists Energy Minerals Division, Tulsa, OK, 2007 www.mdcampbell.com/EMDUraniumCommitteeReport031907Rev.doc
Kirchner, T. B.	Removal Of Unused Parameters From MATSET File	Produced For PRECCDFGF. Sandia National Laboratories, Carlsbad, NM. 2007
Kirchner, T. B.	Methods and examples of propagating uncertainty and analyzing sensitivity.	In Uncertainties in the Measurement and Dosimetry of External Radiation. NCRP Report No. 158. National Council on Radiation Protection and Measurements, Bethesda, MD. 2008
Kirchner, T. B.	Estimating and applying uncertainty in assessment models.	In Till, J. E. and H. A. Grogan (eds.) Radiological Risk Assessment and Environmental Analysis. Oxford University Press, New York. 2008

Appendix C: Tours, Public Presentations and Other Outreach

Group/Activity
CEMRC worked with State Senate and House to craft and pass bills in 2007 for funding to the MESA schools program for developing energy curricula in public schools: SB0424 & HB0795
November 2007 Sondra Sage *Science in Schools* presentations to Alta Vista Middle School and Craft Elementary School
May 2007 NM State MESA Program Coordinators - tour and presentation
CEMRC worked with local Carlsbad high school science teachers in 2007 to obtain science teaching grants from BP and Idaho National Laboratory for $20k.
October 2007 Sondra Sage, seminar on *Revisiting Recycling* to the CDCA
CEMRC participated in the annual Relay For Life
2007-2008 Conca - nine high school and middle school classes – CEMRC tours and presentations
2007-2008 host of the monthly American Nuclear Society section meeting

Appendix D: Students/Visiting Scientists supported at CEMRC 2007

Student/Scientist	Support Period
Students (12) – Illinois Institute of Tech	Summer 2007
Dr. Jeff Terry, Illinois Institute of Tech	Summer 2007
Dr. Geof Smith, NMSU Las Cruces	Sabbatical 2007
Dr. Sarah Pepper, LANL	Post-doctoral Research Associate 2007

Appendix E: Performance Tests and Audits

Below are summaries of external and internal (Table E-1) audits, and results for three performance tests run in 2007/2008; one for Whole Body Dosimetry (Table E-2, Table E-3, and Figure E-1), one for ICP-MS (Table E-4) and one for radiochemical analyses (Table E-5). Since samples were collected in 2007 but run in 2008, most performance data is for 2008. Table E-6 shows two examples of the daily performance tests for ICP-MS. Table E-4 shows that all analytes run were acceptable within 10% of the assigned value. In addition, daily QA/QC checks using NIST-traceable must show acceptable within 5% before work can begin (Table E-6).

Table E-5 shows MAPEP results for three matrices; soil, water, and air filters. Specific selected analytes are tested each year and may be different for each matrix and between years. A value in the Result column means that analyte was tested for. Ref Values are the nominally correct answer and the Acceptance Range gives the range of values that are acceptable. Flag A means the result was acceptable and NR means that analyte was not tested for. Results for an analyte that has no Ref Value or Acceptance Range means the MAPEP sample was not spiked for that analyte but it may exist naturally in that sample matrix. As examples, because of CEMRC's low detection limits, ^{238}Pu was found in the soil sample, $^{239/240}$Pu and ^{241}Am in the water sample, and ^{241}Am in the filter sample in ranges acceptably close to MAPEP's uncontrolled values and were considered acceptable by MAPEP.

The end of Table E-5 shows that there was a false positive for gross alpha, however, CEMRC counts for 5 days, about a hundred times longer than most labs. Therefore, the value was likely not a false positive, but an actual value. Special care has to be taken to provide CEMRC with a sample that has alpha-emissions below our detection limits.

CEMRC Management Assessment Quality Assurance Report

November 1, 2006 – December, 2007

Prepared by: Sharyl McCauley

December 20, 2007

This report serves as a periodic summary of the quality assurance program at the Carlsbad Environmental Monitoring and Research Center (CEMRC). The purpose of this report is to meet the requirement of the CEMRC Quality Assurance Plan (QAP) for an annual management assessment. This report summarizes procedural development, external audits, internal surveillance and nonconformance / non-routine events from November 1, 2006 through December 20, 2007.

Since the implementation of CP-PROC-023 and CP-PROC-024, which enables CEMRC to qualify potential vendors, 23 vendors are currently qualified.

During the year external audits were performed on two of the programmatic areas at CEMRC. The programmatic areas audited were Internal Dosimetry (also referred to as Radiobioassay), for In Vivo Radiobioassay, and Organic Chemistry (formerly under the Environmental Chemistry program) for Volatile Organic Compounds (VOCs). Washington Tru Solutions (WTS) performed these external audits. Summaries and conclusions from the audits are not maintained by the QA Manager but can be found in the records file of these programmatic areas.

Internal audits were performed on all of the programmatic areas, which are as follows: Administration (ADAR-06), Document Control (DCAR-08), Environmental Chemistry (ECAR-07), Field Programs (FPAR-06), Informatics and Modeling (IMAR-06), Organic Chemistry (OCAR-02), and Radiobioassay (RBAR-06). To date, all seven of the audits are closed out. A summary of the programmatic area internal audits can be found in Table E-1. Additionally, due to major staffing changes that occurred in the Radiochemistry Group, a surveillance was conducted (RCAR-06). The surveillance is to be used as a guideline to address areas that need improvement.

There were no non-routine events during this assessment time for a center wide implementation procedure.

The QA system has been consistently and effectively implemented as demonstrated by the decreasing number and diminished severity of the findings in all of the programmatic areas. Overall, the quality assurance program has made huge strides in its development and must maintain this level for continued success.

Table E-1: Internal Audit Summaries 2007 (# of Findings)

Area	AD	DC	OC	EC	FP	IM	RB
Personnel Qualification & Training	1	NF	1	NF	NF	NF	NF
Quality Improvement	NF	NF	NF	NF	NF	NF	NF
Document Control	NF	NF	NF	NF	NF	NF	NF
QA Records	NF	NF	NF	1	NF	1	1
Procurement	NF	NF	NF	NF	NF	NF	NF
Work Processes	NF	NF	1	2	NF	NF	NF
Audits/Assessments	NF	NF	NF	1	1	NF	NF
Sample Control	NF	NF	NF	NF	NF	NF	NF
Scientific Investigations	NF	NF	1	NF	NF	NF	NF
Scientific Notebooks	NF	NF	NF	NF	NF	NF	NF
Procedure Violation	NF	3	NF	1	NF	1	NF

Table Guide

Laboratory Section
AD = Administrative
DC = Document Control
EC = Environmental Chemistry
FP = Field Programs
IM = Informatics & Modeling
OC = Organic Chemistry
QA = Quality Assurance
RB = Radiobioassay (Internally, within CEMRC, it is known as Internal Dosimetry)
RC = Radiochemistry

Table Results
NF = No Findings

Table E-2: Blind Check Study for Internal Dosimetry 2007 by the ORNL Intercomparison Studies In-vivo Program

Oak Ridge National Laboratory

Intercomparison Studies In-vivo Program Report
1st Quarter Calendar Year 2007

Carlsbad Environmental Monitoring & Research Center
Set E

ISOTOPE	SPIKE ACTIVITY AS OF 3-9-07 +/- 2 sigma (nCi)	REPORTED ACTIVITY AS OF 3-9-07 +/- 2 sigma (nCi)	% RELATIVE BIAS
Cs-137	178.8 +/- 8.7	175.71 +/- 8.79	1.1
Co-60	195.3 +/- 9.8	196.59 +/- 9.83	0.7
Co-57	89.71 +/- 4.49	93.55 +/- 4.68	4.3
Y-88	201.0 +/- 10.0	204.7 +/- 10.24	1.8
Ba-133	302.3 +/- 15.1	309.81 +/- 15.49	2.5

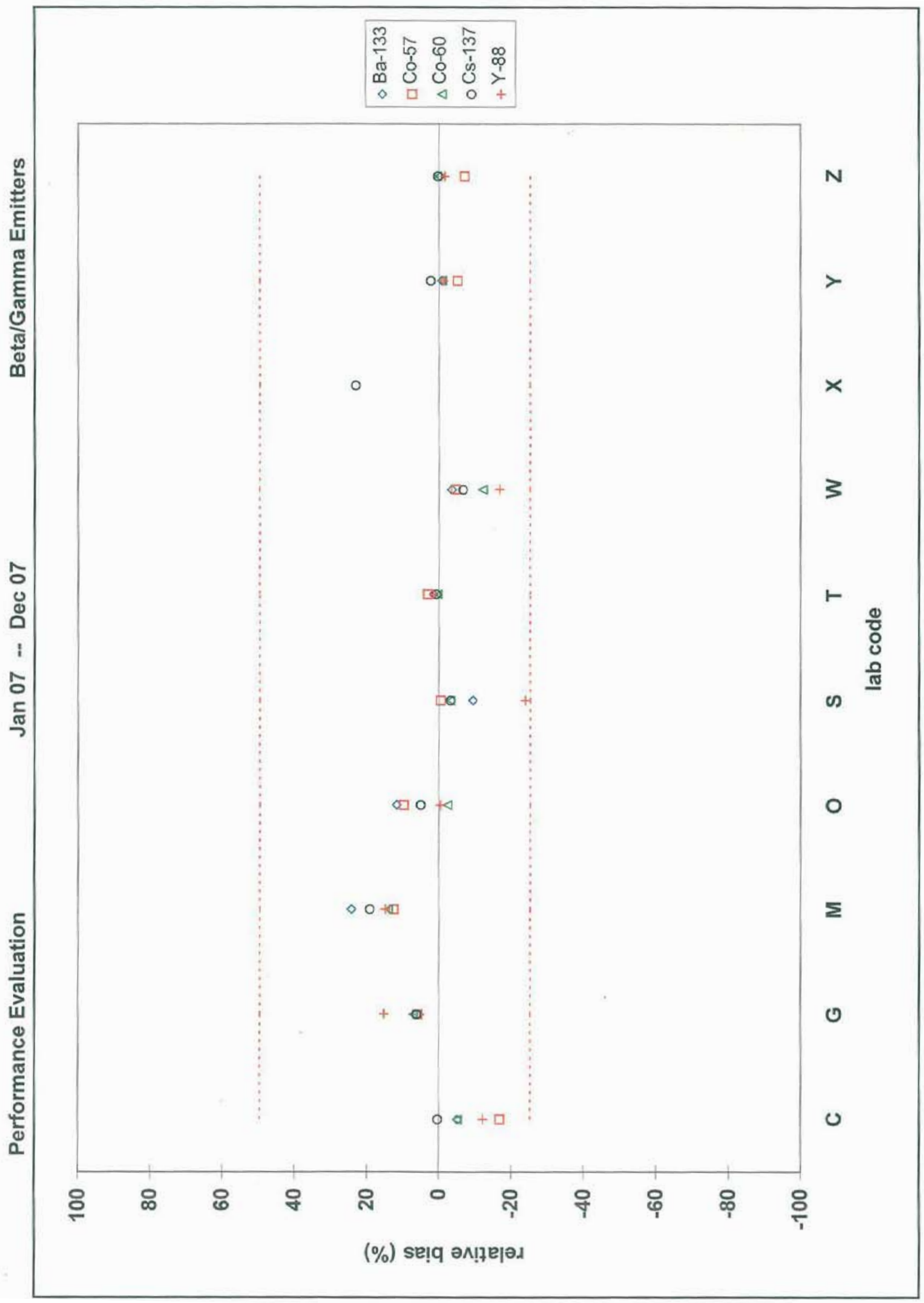

Figure E.1: Comparison of Results for Ten Internal Dosimetry Laboratories in the U.S. During 2007 by the ORNL Intercomparison Studies In-vivo Program

CEMRC is Lab T. For all years that CEMRC has participated in the ORNL program, CEMRC has consistently performed better than all other labs in this area.

Table E-3: Quality Assurance/Quality Control for Internal Dosimetry 2007 Audits

Agency	Date	Conclusion	Reason
CEMRC Self Assessment	3/14-15/07	1 finding and 1 observation. Pass	Quality System
CEMRC Self Assessment	10/18-20/07	Three findings. Pass	Quality System
Oak Ridge National Lab, Intercomparison Studies Program	Quarterly	Pass	External QC
WTS	6/26-27/07	No findings, 1 observation, 2 conditions corrected during audit, and 1 noteworthy practice. Pass	Annual

Table E-4: Blind Check 2008 Environmental Chemistry Inorganic Analyses

WS-144 Final Complete Report

Kim UiChearnaigh
Environmental Scientist
New Mexico State University
1400 University Dr
CEMRC
Carlsbad, NM 88220-3575
(505) 234-5506

EPA ID:	Not Reported
ERA Customer Number:	N215603
Report Issued:	09/10/08
Study Dates:	07/07/08 - 08/21/08

Anal. No.	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description
WS Metals							
1000	Aluminum	µg/L	450.	420	354 - 484	Acceptable	EPA 200.8
0140	Antimony	µg/L	25.2	24.0	16.8 - 31.2	Acceptable	EPA 200.8
0001	Arsenic	µg/L	40.6	36.7	25.7 - 47.7	Acceptable	EPA 200.8
0002	Barium	µg/L	1270	1190	1010 - 1370	Acceptable	EPA 200.8
0141	Beryllium	µg/L	8.05	8.19	6.96 - 9.42	Acceptable	EPA 200.8
0226	Boron	µg/L	1420	1500	1310 - 1660	Acceptable	EPA 200.8
0003	Cadmium	µg/L	31.3	31.2	25.0 - 37.4	Acceptable	EPA 200.8
0004	Chromium	µg/L	65.4	63.0	53.6 - 72.4	Acceptable	EPA 200.8
0091	Copper	µg/L	412	393	354 - 432	Acceptable	EPA 200.8
1070	Iron	µg/L	1190	1130	1010 - 1240	Acceptable	EPA 200.8
0005	Lead	µg/L	17.0	16.1	11.3 - 20.9	Acceptable	EPA 200.8
0236	Manganese	µg/L	127	118	105 - 130	Acceptable	EPA 200.8
0237	Molybdenum	µg/L	32.2	31.1	26.1 - 35.4	Acceptable	EPA 200.8
0142	Nickel	µg/L	51.1	48.5	41.2 - 55.8	Acceptable	EPA 200.8
0007	Selenium	µg/L	45.6	40.9	32.7 - 49.1	Acceptable	EPA 200.8
1150	Silver	µg/L	32.4	30.7	25.7 - 35.6	Acceptable	EPA 200.8
0143	Thallium	µg/L	9.47	8.86	6.20 - 11.5	Acceptable	EPA 200.8
1185	Vanadium	µg/L	1210	1160	1040 - 1280	Acceptable	EPA 200.8
0239	Zinc	µg/L	2090	2020	1820 - 2220	Acceptable	EPA 200.8
WS Inorganics							
0027	Alkalinity as CaCO3	mg/L		87.9	79.1 - 96.7	Not Reported	
1575	Chloride	mg/L	17.5	16.4	14.1 - 18.9	Acceptable	EPA 300.1
1610	Conductivity at 25°C	µmhos/cm		334	301 - 367	Not Reported	
0010	Fluoride	mg/L	4.13	4.32	3.89 - 4.75	Acceptable	EPA 300.1
1820	Nitrate + Nitrite as N	mg/L		8.62	7.76 - 9.48	Not Reported	
0009	Nitrate as N	mg/L	9.55	8.62	7.76 - 9.48	Not Acceptable	EPA 300.1
1125	Potassium	mg/L		32.9	28.4 - 37.2	Not Reported	
0145	Sulfate	mg/L	13.7	13.0	10.2 - 15.3	Acceptable	EPA 300.1
0024	Total Dissolved Solids at 180°C	mg/L		294	192 - 396	Not Reported	

All analytes are included in ERA's A2LA accreditation. Lab Code: 1539-01

Table E-5: Radiochemistry MAPEP 2008 Intercomparison Results

MAPEP Mixed Analyte Performance Evaluation Program

Department of Energy RESL - 1955 Fremont Ave, MS4149 - Idaho Falls, ID 83415

Laboratory Results For MAPEP Series 19

(CMRC01) Carlsbad Environmental Monitoring and Research Center
1400 University Dr.
Carlsbad, NM 88220

MAPEP-08-MaS19: Radiological, inorganic and semi-volatile organics combined soil standard

Inorganic — Units: (mg/kg)

Analyte	Result	Ref Value	Flag	Notes	Bias	Acceptance Range	Unc Value	Unc Flag
Antimony	NR	69.49				48.64 - 90.34		
Arsenic	NR	79.93				55.95 - 103.91		
Barium	NR	248				174 - 322		
Beryllium	NR	36.61				25.63 - 47.59		
Cadmium	NR	12.02				8.41 - 15.63		
Chromium	NR	81.23				56.86 - 105.60		
Cobalt	NR	88.57				62.00 - 115.14		
Copper	NR	79.02				55.31 - 102.73		
Lead	NR	60.15				42.11 - 78.20		
Mercury	NR	0.0167				0.0117 - 0.0217		
Nickel	NR	124.49				87.14 - 161.84		
Selenium	NR	12.99				9.09 - 16.89		
Silver	NR	61.6				43.1 - 80.1		
Thallium	NR	89.71				62.80 - 116.62		
Vanadium	NR	35.8				25.1 - 46.5		
Zinc	NR	242.35				169.65 - 315.06		
Technetium-99	NR	0.0005341				0.0003739 - 0.0006943		
Uranium-Total	NR	24.5				17.2 - 31.9		
Uranium-235	NR	0.171				0.120 - 0.222		
Uranium-238	NR	24.4				17.1 - 31.7		

Organic — Units: (ug/kg)

Analyte	Result	Ref Value	Flag	Notes	Z-	Acceptance Range	Unc Value	Unc Flag
Aldrin	NR	127				45 - 210		
gamma-BHC (Lindane)	NR	78				14 - 142		
Dieldrin	NR	215				88 - 342		
Endosulfan sulfate	NR	270				71 - 468		
Heptachlor epoxide	NR	96				37 - 154		
1,2,4-Trichlorobenzene	NR	1401				236 - 2567		
Anthracene	NR	1456				369 - 2543		
Benzo(b)fluoranthene	NR	1002				222 - 1782		
Butylbenzylphthalate	NR	2684				739 - 4628		
4-Chloro-3-methylphenol	NR	4064				1359 - 6770		
2-Chloronaphthalene	NR	1993				538 - 3449		

Organic								Units: (ug/kg)
Analyte	Result	Ref Value	Flag	Notes	Z-	Acceptance Range	Unc Value	Unc Flag
2-Chlorophenol	NR	1229				123 - 2411		
Chrysene	NR	1284				455 - 2113		
Di-n-butylphthalate	NR	2009				364 - 3654		
2,4-Dichlorophenol	NR	1747				183 - 3310		
Diethylphthalate	NR	1659				308 - 3010		
Dimethylphthalate	NR	1459				292 - 2625		
2,4-Dinitrotoluene	NR	1238				124 - 2514		
2,6-Dinitrotoluene	NR	1311				280 - 2342		
Bis(2-ethylhexyl)phthalate	NR	2570				642 - 4498		
Fluoranthene	NR	1130				400 - 1860		
Fluorene	NR	2259				780 - 3738		
Hexachlorobenzene	NR	1610				595 - 2625		
2-Methylnaphthalene	NR	3532				1705 - 5360		
2-Nitrophenol	NR	3344				445 - 6243		
2,4,6-Trichlorophenol	NR	2322				441 - 4203		

Radiological								Units: (Bq/kg)
Analyte	Result	Ref Value	Flag	Notes	Bias	Acceptance Range	Unc Value	Unc Flag
Americium-241	62.67	69.1	A		-9.3	48.4 - 89.8	3.33	
Antimony-125	NR	22.8				16.0 - 29.6		
Cesium-134	NR	581				407 - 755		
Cesium-137	NR	2.8						
Cobalt-57	NR	333				233 - 433		
Cobalt-60	NR	145				102 - 189		
Iron-55	NR	676				473 - 879		
Manganese-54	NR	415				291 - 540		
Nickel-63	NR	760				532 - 988		
Plutonium-238	.34		A				.12	
Plutonium-239/240	53.67	55.6	A		-3.5	38.9 - 72.3	2.44	
Potassium-40	NR	570				399 - 741		
Strontium-90	NR							
Technetium-99	NR	335				235 - 436		
Uranium-234/233	293.65	292	A		0.6	204 - 380	11.74	
Uranium-238	298.85	303	A		-1.4	212 - 394	12.88	
Zinc-65	NR							

Radiological Reference Date: August 1, 2008

MAPEP-08-MaW19: Radiological, inorganic combined water standard

Inorganic								Units: (mg/L)
Analyte	Result	Ref Value	Flag	Notes	Bias	Acceptance Range	Unc Value	Unc Flag
Antimony	NR	1.044				0.731 - 1.357		
Arsenic	NR	3.692				2.584 - 4.800		

Inorganic Units: (mg/L)

Analyte	Result	Ref Value	Flag	Notes	Bias	Acceptance Range	Unc Value	Unc Flag
Barium	NR	1.79				1.25 - 2.33		
Beryllium	NR	<0.005						
Cadmium	NR	.78				0.55 - 1.01		
Chromium	NR	1.277				0.894 - 1.660		
Cobalt	NR	2.672				1.870 - 3.474		
Copper	NR	3.671				2.570 - 4.772		
Lead	NR	<0.01						
Mercury	NR	.01885				0.01320 - 0.02451		
Nickel	NR	2.499				1.749 - 3.249		
Selenium	NR	.646				0.452 - 0.840		
Thallium	NR	2.637				1.846 - 3.428		
Vanadium	NR	2.254				1.578 - 2.930		
Zinc	NR	2.549				1.784 - 3.314		
Technetium-99	NR	0.0000060				0.00000420 - 0.00000780		
Uranium-Total	NR	0.287				0.201 - 0.373		
Uranium-238	NR	0.285				0.200 - 0.371		
Uranium-235	NR	0.00201				0.00141 - 0.00261		

Radiological Units: (Bq/L)

Analyte	Result	Ref Value	Flag	Notes	Bias	Acceptance Range	Unc Value	Unc Flag
Americium-241	-.001025		A				.	
Cesium-134	NR	19.5				13.7 - 25.4		
Cesium-137	NR	23.6				16.5 - 30.7		
Cobalt-57	NR							
Cobalt-60	NR	11.6				8.1 - 15.1		
Hydrogen-3	NR	341				239 - 443		
Iron-55	NR	46.2				32.3 - 60.1		
Manganese-54	NR	13.7				9.6 - 17.8		
Nickel-63	NR							
Plutonium-238	.43	0.5	A		-14.0	0.4 - 0.7	.02	
Plutonium-239/240	.006		A				.002	
Strontium-90	NR	6.45				4.52 - 8.39		
Technetium-99	NR	3.76				2.63 - 4.89		
Uranium-234/233	3.28	3.44	A		-4.7	2.41 - 4.47	0.15	
Uranium-238	3.48	3.55	A		-2.0	2.49 - 4.62	.51	
Zinc-65	NR	17.1				12.0 - 22.2		

Radiological Reference Date: August 1, 2008

MAPEP-08-RdF19: Radiological air filter

Inorganic Units: (ug/sample)

Analyte	Result	Ref Value	Flag	Notes	Bias	Acceptance Range	Unc Value	Unc Flag
Uranium-Total	NR	22.0				15.4 - 28.6		

Inorganic								Units: (ug/sample)
Analyte	Result	Ref Value	Flag	Notes	Bias	Acceptance Range	Unc Value	Unc Flag
Uranium-235	NR	0.157				0.110 - 0.204		
Uranium-238	NR	21.9				15.3 - 28.5		

Radiological								Units: (Bq/sample)
Analyte	Result	Ref Value	Flag	Notes	Bias	Acceptance Range	Unc Value	Unc Flag
Americium-241	.00015		A				.0003	
Cesium-134	NR	2.63				1.84 - 3.42		
Cesium-137	NR							
Cobalt-57	NR	1.50				1.05 - 1.95		
Cobalt-60	NR							
Manganese-54	NR	2.64				1.85 - 3.43		
Plutonium-238	.12	0.118	A		1.7	0.083 - 0.153	.01	
Plutonium-239/240	.15	0.152	A		-1.3	0.106 - 0.198	.02	
Strontium-90	NR	1.12				0.78 - 1.46		
Uranium-234/233	.27	0.262	A		3.1	0.183 - 0.341	.02	
Uranium-238	.28	0.272	A		2.9	0.190 - 0.354	.02	
Zinc-65	NR	0.94				0.66 - 1.22		

Radiological Reference Date: August 1, 2008

MAPEP-08-GrF19: Gross alpha/beta air filter

Radiological								Units: (Bq/sample)
Analyte	Result	Ref Value	Flag	Notes	Bias	Acceptance Range	Unc Value	Unc Flag
Gross beta	.520	0.525	A		-1.0	0.263 - 0.788	.004	L
Gross alpha	.00013		N	(1)			.00001	

Radiological Reference Date: August 1, 2008

Notes:

(1) = False Positive
A = Acceptable
N = Not Acceptable
Unc = Uncontrolled
NR = Not Run

Table E-6: An Example of the Daily Performance Tests for ICP-MS

Sample Daily Performance Data of the Elan 6100 ICP-MS for July-August 2008
(Proficiency Test WS-144 was measured on July 22, 2008)

	Acceptable Ranges		7/17/08			7/22/08		
	Recommended Net Intensity Mean of 5 replicate readings*	*Required* Relative Standard Deviation (%)	Measured Mean Intensity	Relative Standard Deviation	Performance Evaluation	Measured Mean Intensity	Relative Standard Deviation	Performance Evaluation
Be	1,000-3,000	0.0 - 5.0%	1450.9	2.2	Acceptable	2102.8	1.0	Acceptable
Mg	20,000-80,000	0.0 - 5.0%	16419.8	2.1	Check for low counts	21670.6	1.6	Acceptable
In	120,000-250,000	0.0 - 5.0%	224993.3	1.0	Acceptable	268839.1	2.5	Acceptable
Pb	70,000-180,000	0.0 - 5.0%	151956.6	1.2	Acceptable	167021.3	0.8	Acceptable
Ba	900,000-2,300,000	0.0 - 5.0%	2032880.9	2.6	Acceptable	2440974.7	2.3	Acceptable
Ba++	≤ 5.0% Ba value	N/A	1.40%	3.9	Acceptable	1.50%	2.5	Acceptable
Ce	900,000-3,300,000	0.0 - 5.0%	2603869.4	1.9	Acceptable	3137983.4	0.9	Acceptable
CeO	≤ 5.0% Ce value	N/A	1.30%	3.5	Acceptable	1.50%	1.6	Acceptable
Bkgd	≤ 25.0	N/A	17.0	N/A	Acceptable	17.4	N/A	Acceptable

	Acceptable Ranges		8/19/2008			8/25/2008		
	Recommended Net Intensity Mean of 5 replicate readings*	*Required* Relative Standard Deviation (%)	Measured Mean Intensity	Relative Standard Deviation	Performance Evaluation	Measured Mean Intensity	Relative Standard Deviation	Performance Evaluation
Be	1,000-3,000	0.0 - 5.0%	1388.1	1.2	Acceptable	1706.9	1.9	Acceptable
Mg	20,000-80,000	0.0 - 5.0%	17418.4	2.3	Check for low counts	20088.1	1.6	Acceptable
In	120,000-250,000	0.0 - 5.0%	185525.8	0.8	Acceptable	236953.6	2.1	Acceptable
Pb	70,000-180,000	0.0 - 5.0%	110303.9	1.3	Acceptable	145631.6	1.3	Acceptable
Ba	900,000-2,300,000	0.0 - 5.0%	1628944.3	1.7	Acceptable	2121194.9	1.4	Acceptable
Ba++	≤ 5.0% Ba value	N/A	1.40%	1.8	Acceptable	1.50%	3.1	Acceptable
Ce	900,000-3,300,000	0.0 - 5.0%	2083317.8	1.3	Acceptable	2737480.7	0.7	Acceptable
CeO	≤ 5.0% Ce value	N/A	1.40%	2.1	Acceptable	1.30%	2.6	Acceptable
Bkgd	≤ 25.0	N/A	22.0	N/A	Acceptable	16.4	N/A	Acceptable

*Recommended ranges show typical instrument performance--higher values are acceptable but possible interferences should be explored

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