

Office of Environmental Management – Grand Junction



Environmental Air Monitoring Data Quarterly Report for the Moab, Utah, Site

Second Quarter 2005 (April through June)

December 2005



U.S. Department
of Energy

Office of Environmental Management

Moab, Utah
Environmental Air Monitoring Results
April - June 2005

Environmental Data Report Contents

This Environmental Air Monitoring Data Report includes the following information:

<u>Item No.</u>	<u>Description of Contents</u>
1.	Summary of Results
2.	Data Assessment , which includes the following: <ul style="list-style-type: none">a. Field activities verification checklistb. Data Assessment Summary
3.	Environmental Air Monitoring Data <ul style="list-style-type: none">a. Atmospheric Radon-222 and Direct Gamma Radiation Data Tableb. Radio-particulate Data Tablec. Time versus Concentration graphs
4.	Sample Location Maps

Summary of Results

Site: Moab, Utah

Sampling Period: April through June 2005

SUMMARY

Radon-222: DOE Order 5400.5, *Radiation Protection of the Public and Environment*, establishes a guideline for atmospheric emissions of radon-222 gas that is applicable to the Moab Site. This guideline is 3.0 picocuries per liter (pCi/L) above background. Background concentrations of radon-222 in the Moab area have been measured to be approximately 0.6 pCi/L; therefore, the guideline for radon-222 emissions at the Moab Site is 3.6 pCi/L. Monitoring data collected from the second quarter of 2005 indicate that this guideline was exceeded at three on-site monitoring locations as shown in Tables 1 and 2. Duplicate detectors were also deployed off-site at the Maximally Exposed Individual (MEI) location, which represents the member of the public residing closest to the tailings pile and is considered to have the greatest potential for exposure. None of the off-site radon monitoring locations, including the MEI location, exceeded DOE's monitoring guideline for radon. This is common for an unremediated tailings pile.

Direct Environmental Gamma Radiation: DOE Order 5400.5, *Radiation Protection of the Public and Environment*, establishes a dose limit of 100 millirem per year (mrem/yr) above naturally occurring radiation levels (background). Background gamma radiation for the Moab area has been measured at approximately 81 mrem/yr; therefore, the gamma dose limit for the Moab Site is 181 mrem/yr. Although radiation doses are summed at the end of a calendar year to determine the actual annual dose, the annual dose may be *estimated* from the quarterly monitoring results. Based on the monitoring data collected from the second quarter of 2005, elevated gamma measurements were observed at six on-site monitoring locations as shown in Tables 1 and 2. None of the off-site monitoring locations, including the MEI location, exceeded DOE's gamma radiation dose limit. This is common for an unremediated tailings pile.

It should be noted that, although the exposure rates may be exceeded at several locations along the DOE site property boundary, this does not reflect expected doses to the public. These data represent the dose that a member of the public could receive *if* that person resided at the point where the data were collected for an entire year. This is not a realistic representation of actual or expected public exposure conditions because no member of the public permanently resides (on an annual basis) at or near these elevated locations. Monitoring data observed at the MEI location represents the only true residential exposure. These data are less than the DOE annual public dose limit (100 mrem/yr), therefore, the dose limit to the public is not being exceeded, even at adjacent lands where the public has access on a transient or short term basis.

Radio-particulates: No standards or radiological exposure limits were exceeded at any of the nine radio-particulate monitoring locations during the current monitoring period. Analytical data for all analytes (Radium-226, Th-230, Polonium-210, and Uranium-total) were below their respective Derived Concentration Guidelines (DCGs), as found in DOE Order 5400.5,

Radiation Protection of the Public and Environment (Table 3). Concentrations of the radio-particulates have been consistently below DCGs since DOE took ownership of the site in 2001.

Table 1. Moab Environmental Air Monitoring Locations with Samples that Exceeded Applicable Regulatory Standards, Limits, or Guidelines during the Second Quarter, 2005

Analyte	Standard / Guideline	Sampling Locations Exceeding Standards/Guidelines
Radon-222	3.6 pCi/L	MPS-0107, MPS-0108, MPS-0109
Direct Gamma Radiation	181 mrem/yr	MPS-0101, MPS-0106, MPS-0108, MPS-0109, MPS-0110, MPS-0111,



Kenneth E. Karp
Acting Moab Project Manager

12-22-05
Date

DATA ASSESSMENT

Environmental Air Monitoring Field Activities Verification Checklist

Project Moab Site
 Date(s) of Verification 07/15/05

Date(s) of Air Monitoring 03/31/05 – 06/29/05
 Name of Verifier Michael J. Gardner

	Response (Yes, No, N/A)	Comments
1. Is the SAP the primary document directing field procedures?	<u>Yes</u>	
2. Were the sampling locations specified in the SAP?	<u>Yes</u>	
3. Were all low-volume air samplers operating at 60 liters/minute?	<u>No</u>	
Did any of the samplers require air flow adjustment?	<u>Yes</u>	
4. Were detectors (radon cups, TLDs) and monitoring equipment found to be in undisturbed and operable condition upon arrival?	<u>Yes</u>	
5. Were the hourly clocks on the low-volume air samplers operational upon arrival?	<u>No</u>	<u>Clocks were not functional at: MPS-0118; and MPS-0123</u>
Were the run times recorded for each radio-particulate monitoring location?	<u>Yes</u>	<u>Run times for the above locations were based on average run times of all other functional monitoring locations. New clocks will be installed on all units.</u>
6. Were duplicates (for radon and gamma radiation) taken at a frequency of one per 20 samples?	<u>Yes</u>	
7. Were equipment blanks (for radio-particulates) taken at a frequency of one per 20 samples?	<u>Yes</u>	
8. Were trip blanks (for radon and gamma radiation) included with each shipment?	<u>Yes</u>	
9. Was the identity of the QC sample locations protected?	<u>Yes</u>	
Were the true locations of the QC samples recorded in the Field Log Book?	<u>Yes</u>	
10. Were all samples collected as specified in the SAP?	<u>Yes</u>	
11. Were chain of custody records completed and was sample custody maintained?	<u>Yes</u>	
12. Are field data sheets signed and dated by sampling personnel?	<u>Yes</u>	
13. Was all other pertinent information documented on the field data sheets?	<u>Yes</u>	

**MOAB, UTAH
MOAB SITE
SECOND QUARTER 2005 SAMPLING
DATA ASSESSMENT SUMMARY**

ATMOSPHERIC RADON-222 ANALYSES

Radon cups were analyzed by Landauer, Inc., in accordance with Landauer's *Quality Assurance Manual for Radon Monitoring Services, Revision Number 9, October 17, 2002*. Second quarter 2005 analytical radon data were received in a report dated July 15, 2005. Unlike radio-particulate analyses, radon-222 data are not reported with qualifiers. The laboratory will make a special note/comment in the event that the detectors are missing, damaged, or the detectors cannot be read. Once the data report is received, sampling personnel review all data to insure that the results are consistent with other data points, and with previous data collected for each monitoring location. Data reports are checked to verify that the reported concentrations/results are correct.

DIRECT ENVIRONMENTAL GAMMA RADIATION ANALYSES

Thermoluminescent dosimeters (TLDs), used for continuous dose measurements at the Moab Site, are analyzed by Environmental, Inc., Midwest Laboratory, in accordance with their analytical procedure *Preparation and Readout of Teledyne Isotopes TLD Card, TIML-TLD-01, Revision 6* (Teledyne Isotopes, 1995). Second quarter 2005 environmental gamma radiation data were received in a report dated July 25, 2005. All data are reported at the 95% confidence level (2 sigma). Once the data report is received, sampling personnel review all data to insure that the results are consistent with other data points, and with previous data collected for each monitoring location. Data reports are checked to verify that the reported concentrations/results are correct.

RADIO-PARTICULATE ANALYSES

All radio-particulate samples were analyzed by Severn Trent Laboratories (STL)-St. Louis, Missouri, a contract laboratory providing analytical services to DOE's Office of Environmental Management located in Grand Junction, Colorado. Radio-particulate samples for the second quarter of 2005 were sent to STL for analysis on July 7, 2005.

STL analyzed the glass fiber (47 mm) air filters for radio-particulates (Ra-226, Th-230, Po-210, and U-total). Analytical results for the second quarter 2005 sampling period are reported by STL in Report Identification Number (RIN) 05070210. Polonium-210 and Thorium-230 were analyzed by alpha spectrometry, STL methods STL-RC-0210 and EML A-01-R MOD respectively. Radium-226 was analyzed by gas proportional counting, STL method EML RA-06-RC MO. Total uranium was analyzed by inductively coupled plasma-mass spectrometry, EPA method SW-846 6020. Radio-particulate analytical data for samples collected during the second quarter of 2005 were reviewed, validated, and summarized in the *Data Review and Validation Report for RIN 05070210* (October 6, 2005), which was prepared and issued by the Grand Junction site laboratory and sample coordinator.

FIELD ACTIVITIES

Duplicate samples are collected for direct gamma environmental radiation at 3 locations:

1) MPS-0117, an off-site, background monitoring site, with consistently low readings; 2) MPS-0107, an on-site location with consistently elevated readings; and 3) MPS-0127, an off-site location that is immediately up-wind of the City of Moab, and is directly south of the Moab Site. Duplicate samples for radon-222 monitoring are collected only at the MEI location. The MEI is located immediately east of the Moab Site property boundary and represents the worst case exposure scenario to a member of the general public.

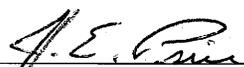
Duplicate samples are not collected for radio-particulate samples. This decision was made on a cost/benefit basis. Because the radio-particulate sample data collected to date indicate that all of the isotopes are several orders of magnitude below their respective DCGs, the costs associated with purchasing a duplicate sampler, providing additional electrical power, and incurring additional analytical expenses were not warranted or justified.

SUSPECTED ANOMALIES

All analytical data are reviewed for anomalous or outlying data points. This review consists of evaluating monitoring data against historical and minimum/maximum values to determine if the reported data are within reasonable expected ranges. Because there are relatively few sample locations (i.e., data points), and the historical data set is relatively short, this review is currently conducted manually. An automated review of reported analytical data against historical and minimum/maximum values may be initiated at some point in the future once it is determined that the data set has become too large or cumbersome for an accurate manual review. Based upon a review of the monitoring data collected during the second quarter of 2005, there were no anomalous data identified.

SUMMARY

Data collected during the second quarter of 2005 met the applicable laboratory control criteria for their respective analyses, and all data were reviewed by qualified personnel and found to be within the acceptable limits of counting error associated with each matrix. Data reported in this Environmental Air Monitoring Report are considered validated and may be treated as final results.



Jeff Price
Environmental Scientist

12/22/05
Date

ENVIRONMENTAL AIR MONITORING DATA

MOAB, UTAH
MOAB SITE
SECOND QUARTER 2005 SAMPLING
ENVIRONMENTAL AIR MONITORING DATA SUMMARY

This section contains data summary tables for each of the environmental air monitoring matrixes. Radon and direct environmental gamma radiation are summarized in Table 2; radio-particulate data are summarized in Table 3. Each data table also displays monitoring data collected during the previous quarters for the calendar year.

Time versus concentration graphs have also been prepared for each matrix. Concentrations over time have been plotted only for selected locations for each matrix. The rationale used for selecting each location is summarized below.

RADON-222

Radon-222 monitoring data have been graphed for the following locations. (1) MPS-MEI is considered to represent the worst-case exposure scenario to a member of the general public and represents actual radon-222 exposure conditions at the MEI location. (2) MPS-0107 is located on the southern property boundary of the Moab Site. This location has historically recorded some of the highest radon exposure readings. (3) MPS-0117 (near the Bar-M Chuck Wagon) is a background monitoring location located approximately five miles north of the Moab Site property and represents ambient or naturally occurring conditions. (4) MPS-0120 (near the Portal RV Park) is located approximately 1 mile downwind of the Moab Site and represents exposure conditions and impacts that would be typical for the Moab community in general.

DIRECT ENVIRONMENTAL GAMMA RADIATION

Environmental gamma radiation data have been graphed for the following locations.

(1) MPS-MEI is considered to represent the worst-case exposure scenario to a member of the general public, and represents actual gamma radiation exposure conditions at the MEI location. (2) MPS-0107 is located on the southern property boundary of the Moab Site. This location has historically recorded some of the highest gamma radiation exposure readings. (3) MPS-0117 (near the Bar-M Chuck Wagon) is a background monitoring location located approximately 5 miles north of the Moab Site property, and represents ambient/naturally occurring conditions. (4) MPS-0120 (near the Portal RV Park) is located approximately 1 mile downwind of the Moab Site, and represents exposure conditions and impacts that would be typical for the Moab community in general.

RADIO-PARTICULATES

Radio-particulate monitoring data have been graphed for the following locations. (1) MPS-0102, one of two on-site radio-particulate monitoring locations, is the radio-particulate sampling location closest to the MEI, and provides useful information regarding the MEI's exposure to airborne particulate matter. (2) MPS-0105, the other on-site continuous radio-particulate sampler located on the bank of the Colorado River, is the particulate monitoring location closest to the emissions source (i.e., the mill tailings pile) and is located in the predominantly downwind

vector of the Moab Site. MPS-0105 monitors air particulates at the site boundary adjacent to the Colorado River and the Matheson Wetlands Preserve. (3) MPS-0117 (near the Bar-M Chuck Wagon) is a background monitoring location located approximately 5 miles north of the Moab Site property and represents ambient or naturally occurring conditions. (4) MPS-0120 (near the Portal RV Park) is located approximately 1 mile downwind of the Moab Site and represents exposure conditions and impacts that would be typical for the Moab community in general.

Table 2. Summary of Environmental Radon and Gamma Radiation Monitoring Data for the Moab Site for Calendar Year 2005

Station Number	1st Quarter 2005 (12/29/04 - 03/31/05)		2nd Quarter 2005 (03/31/05 - 06/29/05)		3rd Quarter 2005 (06/29/05 - 10/XX/05)		4th Quarter 2005 (10/XX/05 - 12/XX/05)	
	Radon pCi/L	Gamma mR/91 d (EAA) ⁵	Radon pCi/L	Gamma mR/91 d (EAA)	Radon pCi/L	Gamma MR/91 d (EAA)	Radon pCi/L	Gamma MR/91 d (EAA)
On Site Locations								
MPS- 0101 ¹	2.2	72.5(290.8)	2.1	64.8(260.0)				
MPS-0102 ¹	1.6	23.6(94.7)	1.3	24.2(97.1)				
MPS-0103 ¹	1.4	24.5(98.3)	1.3	24.2(97.1)				
MPS-0104 ¹	1.6	30.6(122.7)	1.6	26.5(106.3)				
MPS-0105 ¹	2.2	46.1(184.9)	2.1	49.1(196.9)				
MPS-0106 ¹	5.8	39.7(159.2)	5.3	41.2(165.3)				
MPS-0107 ¹	2.2	49.2(197.3)	4.3	58.0(232.6)				
MPS-0108 ¹	2.7	117.4(470.9)	4.7	139.4(559.1)				
MPS-0109 ¹	1.7	51.3(205.8)	1.8	59.4(238.3)				
MPS-0110 ¹	1.4	81.2(325.7)	3.4	89.6(359.4)				
MPS-0111 ¹	0.6	63.7(255.5)	1.3	NDA				
MPS-0112 ¹	1.3	37.3(149.6)	1.9	38.1(152.8)				
MPS-0113 ¹	1.7	79.6(319.3)	2.4	74.6(299.2)				
Off-Site Locations								
MPS-0117 ^{2,3}	0.7	21.1(84.6)	0.7	24.4(97.9)				
MPS-0118 ²	0.5	15.1(60.6)	0.8	18.9(75.8)				
MPS-0119 ²	0.6	21.6(86.6)	1.0	26.0(104.3)				
MPS-0120 ²	0.4	16.6(66.6)	0.7	25.1(100.7)				
MPS-0121 ²	0.4	19.2(77.0)	0.6	21.8(87.4)				
MPS-0122 ²	0.4	16.4(65.8)	0.6	19.1(76.6)				
MPS-0123 ^{2,3}	0.4	18.0(72.2)	0.4	18.3(73.4)				
MPS-0124 ²	0.8	18.8(75.4)	NDA	23.9(95.9)				
MPS-0125 ²	0.9	23.1(92.7)	1.5	25.4(101.9)				
MPS-0126 ²	0.9	20.4(81.8)	1.7	24.5(98.3)				
MPS-0127 ²	0.4	17.8(71.4)	0.8	25.8(103.5)				
MEI ⁴	1.2 (1.3) dup	14.2(57.0)	0.8 (1.4) dup	16.3(65.4)				

¹ On-site monitoring location. Located within DOE property boundary.

² Off-site monitoring location.

³ Designated background monitoring location. Background locations are located at sufficient distances away from the millsite to be free from any affects or influences from potential site contaminants.

⁴ The maximally exposed individual (MEI) is the continually occupied residential property that is closest to the DOE property boundary.

⁵ "EAA" is the estimated annual average and is calculated by dividing the actual reading by the number of days of the exposure period, then multiplying by 365. Values for annual averages are in units of mrem/yr. For example, the EAA for MPS-0108 is calculated as follows: 135 mR (observed value) / 91 days (exposure period) × 365 days = 542.

NA = Not Applicable.

NDA = No Data Available.

Table 3. Summary of Radio-particulate Air Monitoring Data for the Moab Site for Calendar Year 2005

Station Number	Isotope	First Quarter 2005 (μCi/mL) ⁵	Second Quarter 2005 (μCi/mL)	Third Quarter 2005 (μCi/mL)	Fourth Quarter 2005 (μCi/mL)	Annual Average (μCi/mL)
On-Site Locations						
MPS-0102 (East Property Line)	Uranium ¹	7.5E-17	1.6E-16			1.2E-16
	Thorium-230 ²	5.6E-17	1.3E-16			9.3E-17
	Radium-226 ³	1.3E-16	9.9E-17			1.1E-16
	Polonium-210 ⁴	1.1E-14	1.6E-15			6.3E-15
MPS-0105 (River Berm)	Uranium ¹	1.6E-16	3.0E-16			2.3E-16
	Thorium-230 ²	6.3E-17	2.8E-16			1.7E-16
	Radium-226 ³	1.3E-16	9.7E-17			1.1E-16
	Polonium-210 ⁴	9.9E-15	2.4E-15			6.2E-15
Off-Site Locations						
MPS-0117 (Bar M Chuck Wagon)	Uranium ¹	1.4E-17	2.5E-17			2.0E-17
	Thorium-230 ²	2.8E-17	7.6E-17			5.2E-17
	Radium-226 ³	1.3E-16	6.4E-17			1.0E-16
	Polonium-210 ⁴	5.0E-15	2.9E-15			4.0E-15
MPS-0118 (Arches National Park Entrance)	Uranium ¹	2.3E-17	3.2E-17			2.8E-17
	Thorium-230 ²	5.2E-17	1.4E-16			1.0E-16
	Radium-226 ³	2.0E-16	2.0E-17			1.1E-16
	Polonium-210 ⁴	6.6E-15	2.5E-15			4.6E-15
MPS-0119 (Scott Matheson Wetlands Preserve)	Uranium ¹	2.3E-17	9.4E-17			5.8E-17
	Thorium-230 ²	4.5E-17	1.6E-16			1.0E-16
	Radium-226 ³	1.4E-16	5.4E-17			1.0E-16
	Polonium-210 ⁴	6.8E-15	3.2E-15			5.0E-15
MPS-0120 (Portal RV Park)	Uranium ¹	1.5E-17	2.1E-17			1.8E-17
	Thorium-230 ²	4.7E-17	1.5E-16			1.0E-16
	Radium-226 ³	1.2E-16	2.8E-17			7.4E-17
	Polonium-210 ⁴	4.3E-15	1.7E-15			3.0E-15
MPS-0121 (Moab Wastewater Treatment Plant)	Uranium ¹	1.8E-17	1.8E-17			1.8E-17
	Thorium-230 ²	1.8E-17	1.2E-16			6.9E-17
	Radium-226 ³	1.4E-16	9.0E-18			7.4E-17
	Polonium-210 ⁴	5.9E-15	1.6E-15			3.7E-15
MPS-0122 (Grand County Recycling Center)	Uranium ¹	1.5E-17	1.9E-17			1.7E-17
	Thorium-230 ²	2.2E-17	2.4E-16			1.3E-16
	Radium-226 ³	1.7E-16	3.0E-17			1.0E-16
	Polonium-210 ⁴	3.4E-15	1.7E-15			2.6E-15
MPS-0123 (Kane Creek Road)	Uranium ¹	1.6E-17	2.4E-17			2.0E-17
	Thorium-230 ²	3.7E-17	7.7E-17			5.7E-17
	Radium-226 ³	1.7E-16	2.8E-17			1.0E-16
	Polonium-210 ⁴	7.5E-15	2.7E-15			5.1E-15

¹DOE DCG for Total Uranium = 2.E-12

²DOE DCG for Thorium-230 = 4.E-14

⁵μCi/mL = microCuries per milliliter

³DOE DCG for Radium-226 = 1.E-12

⁴DOE DCG for Polonium-210 = 1.E-12

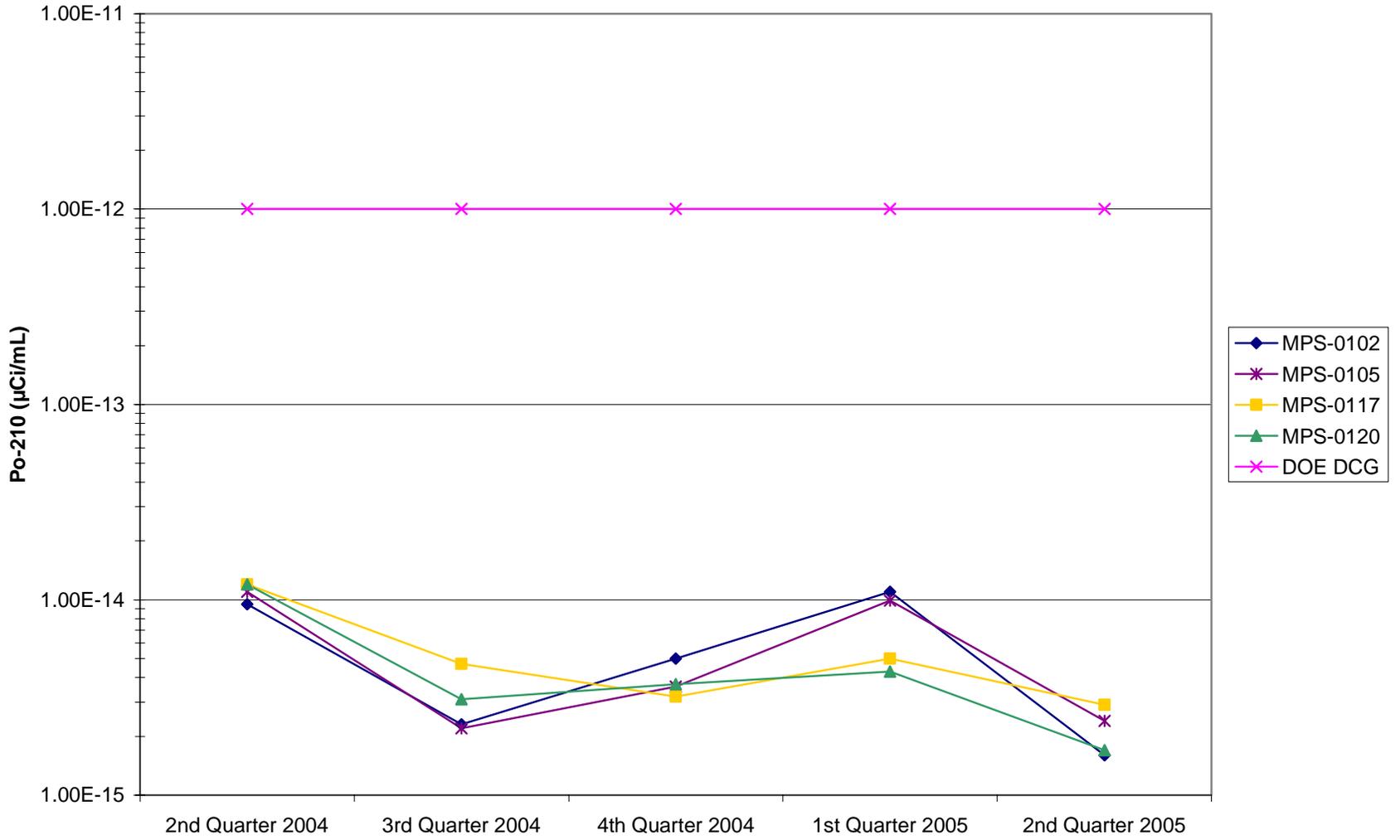


Figure 1. Moab Radio-particulate Concentration (Po-210)

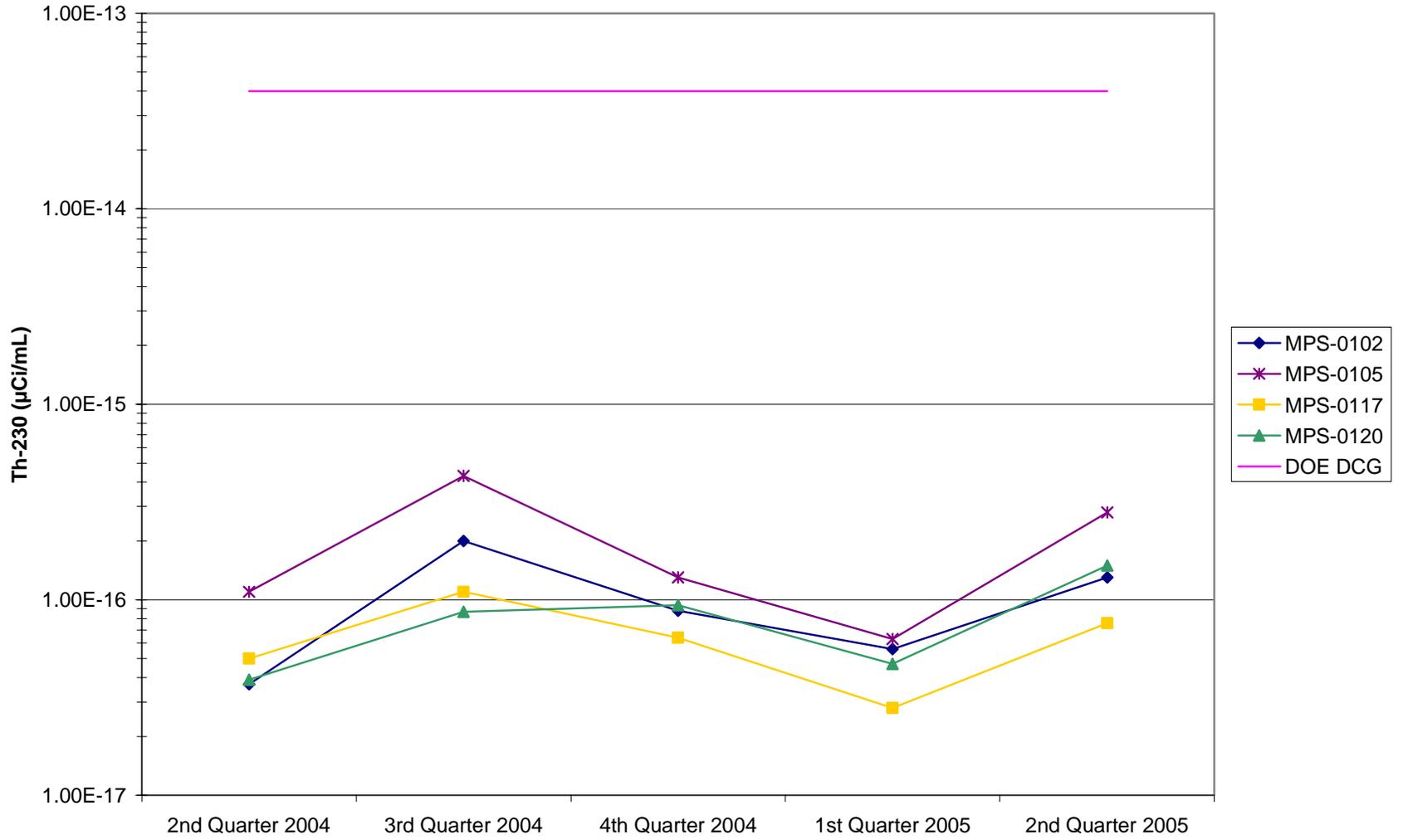


Figure 2. Moab Radio-particulate Concentration (Th-230)

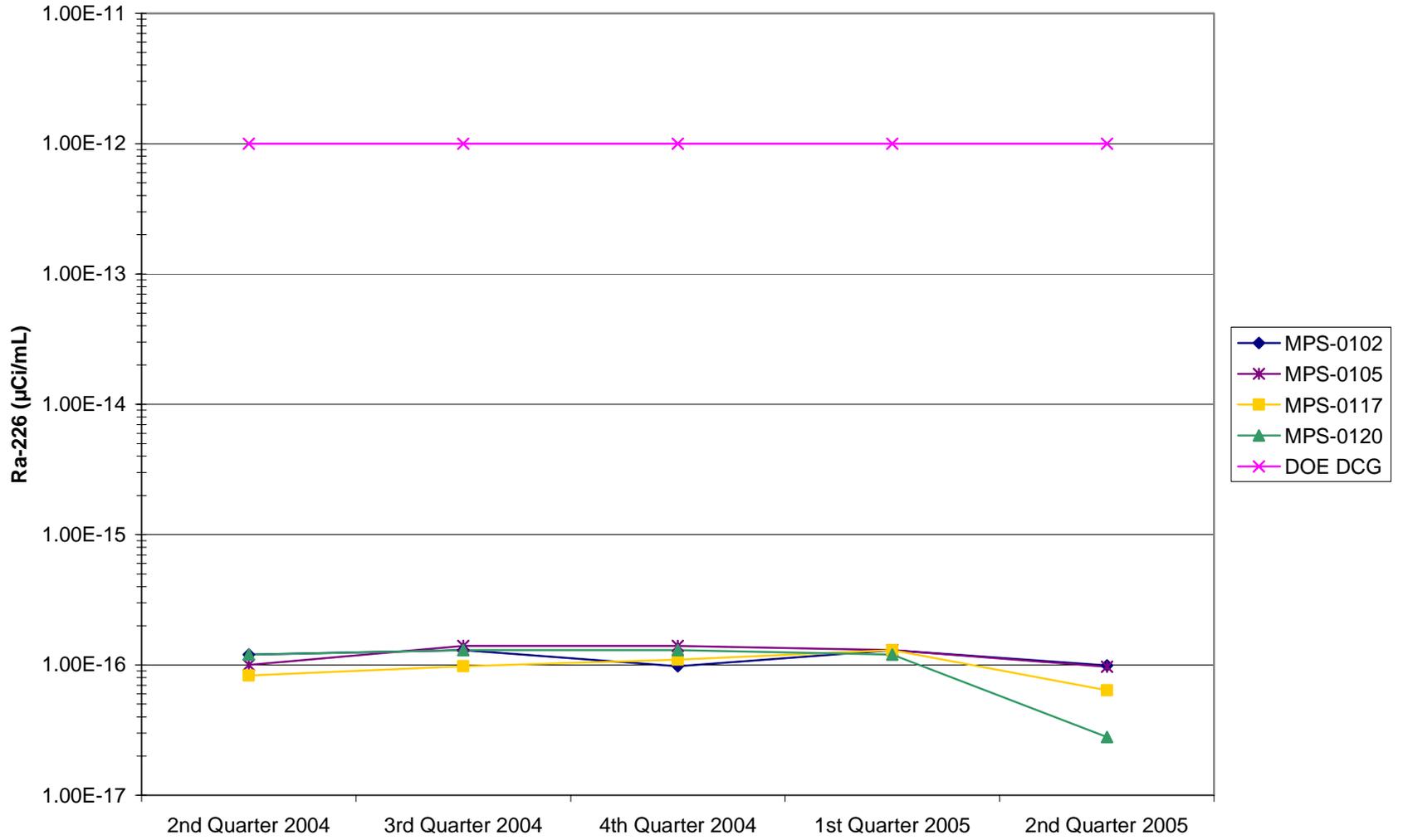


Figure 3. Moab Radio-particulate Concentration (Ra-226)

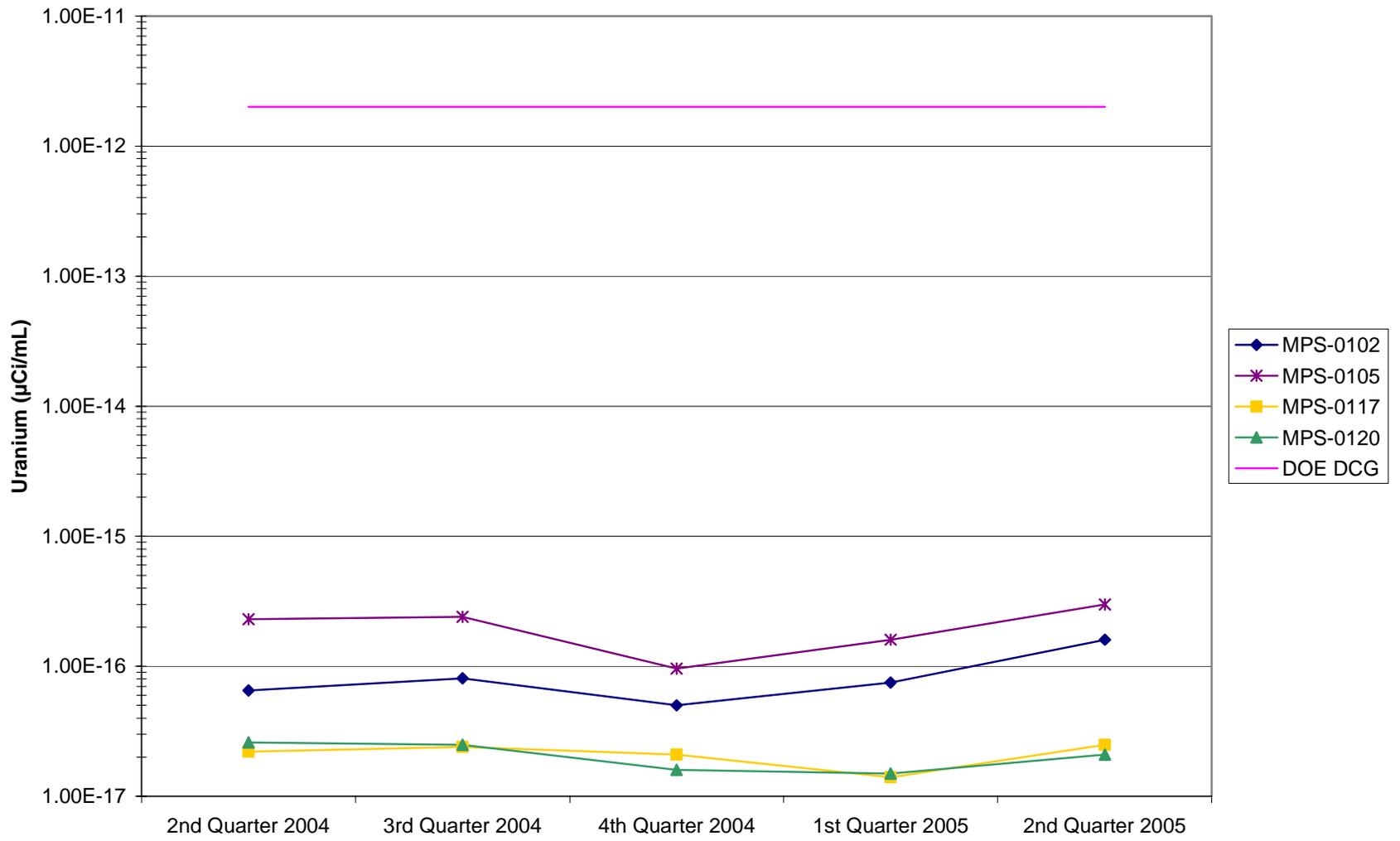


Figure 4. Moab Radio-particulate Concentration (Uranium)

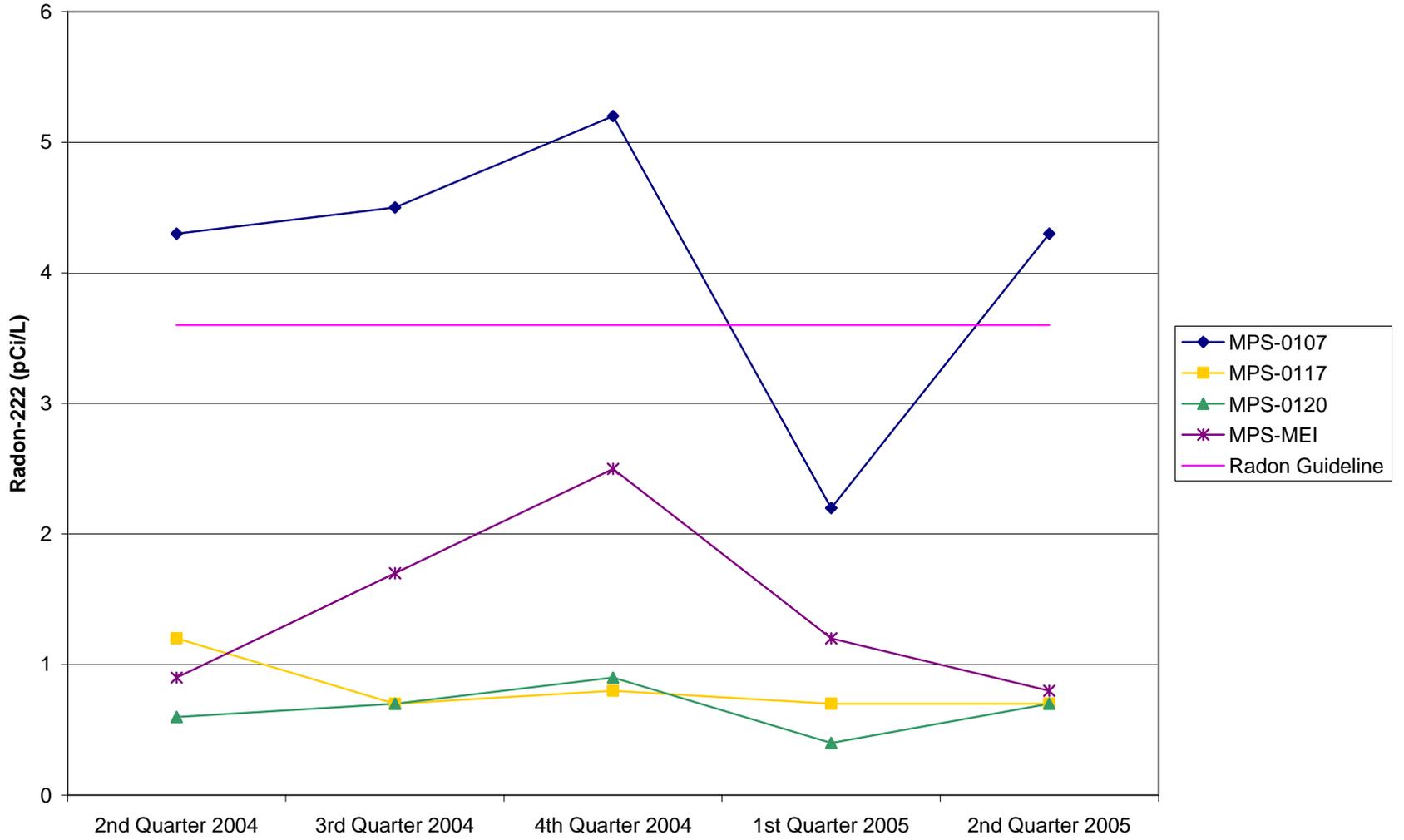


Figure 5. Moab Atmospheric Radon-222 Concentration

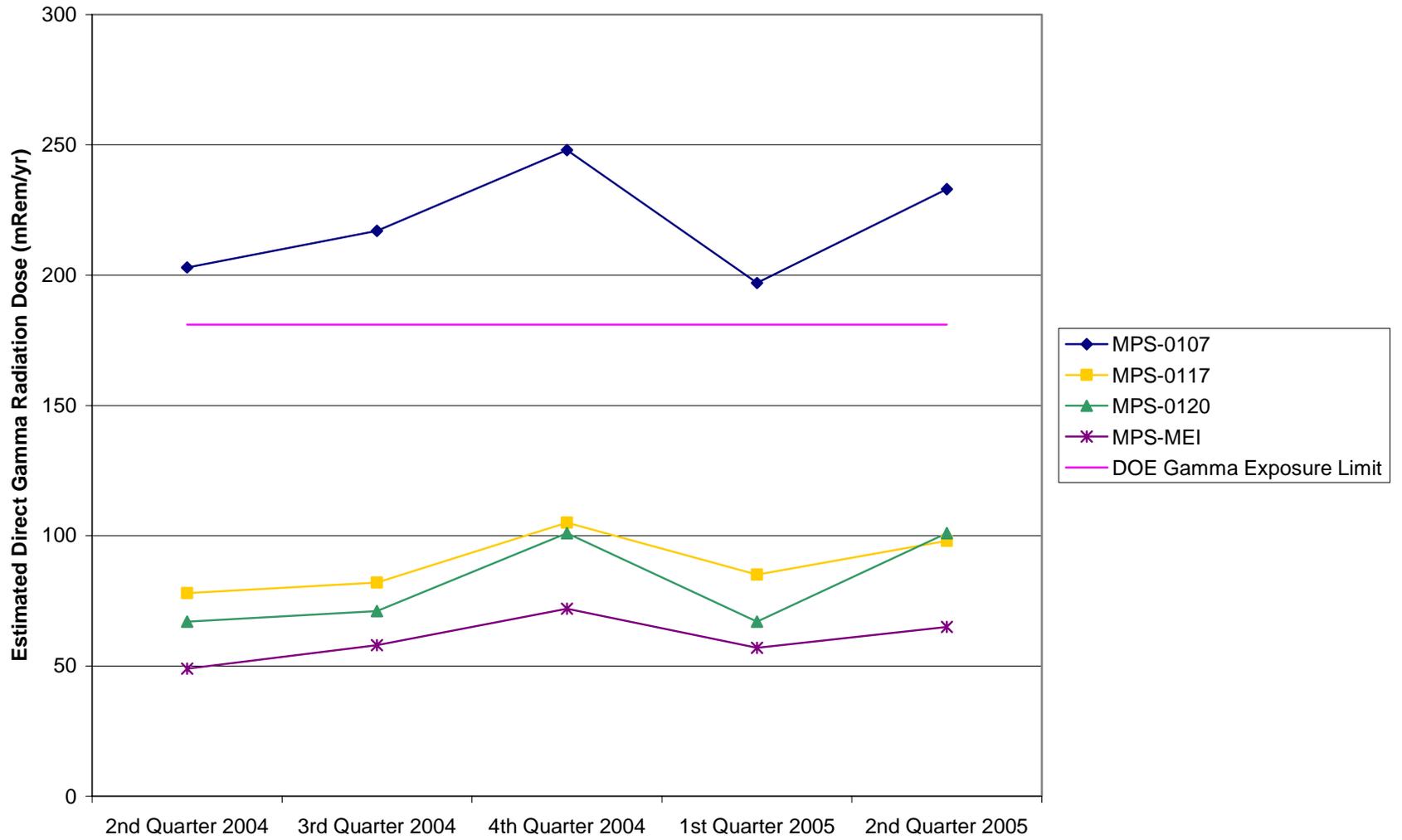
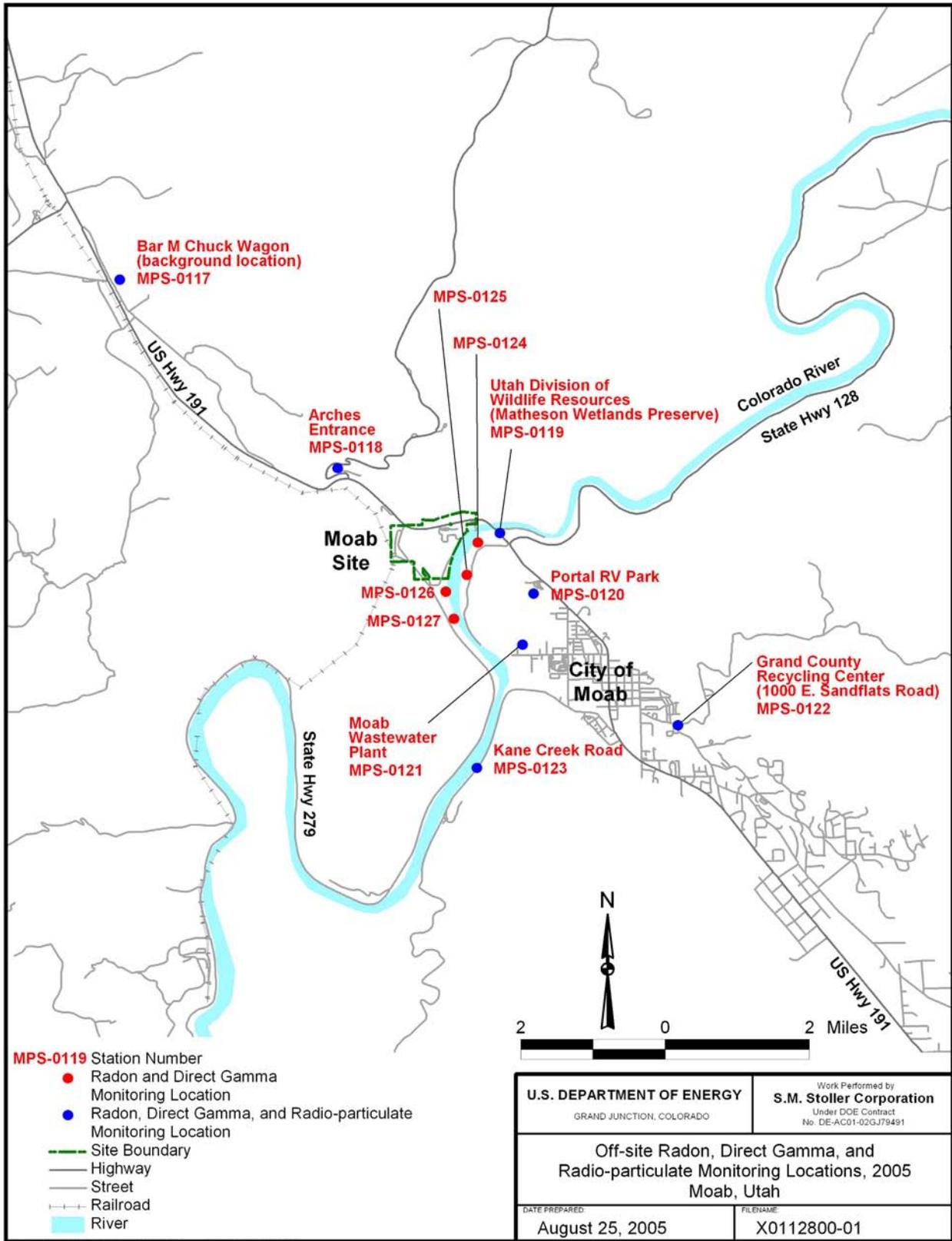


Figure 6. Moab Direct Gamma Radiation Dose

SAMPLING LOCATION MAPS



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Figure 7. Off-site Radon, Direct Gamma, and Radio-particulate Monitoring Locations, 2005

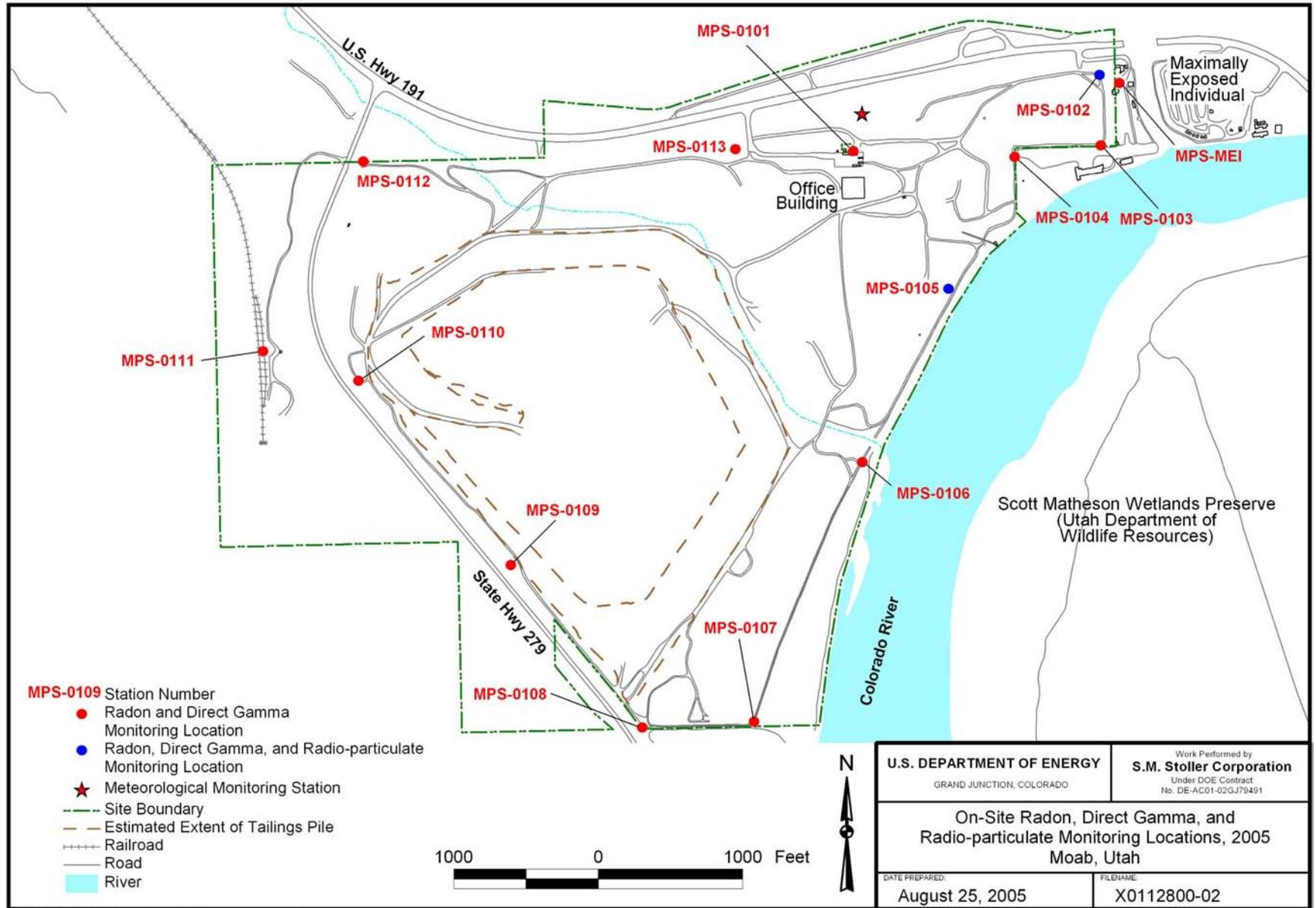


Figure 8. On-site Radon, Direct Gamma, and Radio-particulate Monitoring Locations, 2005