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Office of Environmental Management – Grand Junction

UMTRA Project

Environmental Air Monitoring Data Quarterly Report for the Moab and Crescent Junction, Utah, Sites Second Quarter 2014 (April through June 2014)

September 2014

U.S. Department of Energy

Office of Environmental Management

Prepared by the Remedial Action Contractor Contractor under contract number DE-DT0002936
for the U.S. Department of Energy Office of Environmental Management, Grand Junction, Colorado.

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Review and Approval

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Acronyms and Abbreviations

DCS	Derived Concentration Standard
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
MEI	maximally exposed individual
mrem	millirems
DOE O	DOE Order
pCi/L	picocuries per liter
qtr	quarter
STD	Standard
TLD	thermoluminescent dosimeter
UMTRA	Uranium Mill Tailings Remedial Action
yr	year

1.0 Introduction

The purpose of this quarterly report is to present the results associated with environmental air monitoring at the U.S. Department of Energy (DOE) Moab Uranium Mill Tailings Remedial Action (UMTRA) Project sites during the first quarter of 2014. The Project sites consist of the former uranium processing mill located 3 miles north of Moab, Utah and the new disposal site located near Crescent Junction, Utah. This report is intended to demonstrate that the public and the environment are protected against undue risk from radiation associated with activities at the Project sites.

Environmental air monitoring reported here is performed for radon, direct gamma radiation, and select radioparticulates. All monitoring locations for the Moab site are shown on Figure 1 and vicinity (off-site) locations including background are shown in Figure 2. Monitoring locations for the Crescent Junction site are shown in Figure 3.

2.0 Summary of Results

2.1 Moab, Utah, Site

Monitoring Period: April through June 2014

Atmospheric Radon-222
U.S. Department of Energy (DOE) Order (O) 458.1, Administrative Change 2, "Radiation Protection of the Public and Environment," establishes a guideline for atmospheric emissions of radon-220 and radon-222 (referred to here as radon-222) that is applicable to the Moab Uranium Mill Tailings Remedial Action (UMTRA) Project. This guideline is 3.0 picocuries per liter (pCi/L) above background. Based on 5 years of data from 2003 through 2008, the average background concentration (established from stations 0117 and 0123) of radon-222 in the Moab area was established as 0.7 pCi/L; therefore, the guideline for radon-222 emissions at the Moab site is 3.7 pCi/L. Monitoring data collected during the second quarter of 2014 indicate that this quarterly guideline was not exceeded at any on- or off-site station. In general, results were similar to previous second quarter data. Remote locations were in line with historical data. Table 1 shows the data for the monitoring locations with no annual guideline exceedance. Table 2 shows summary radon-222 data for the Moab site.

Direct Environmental Gamma Radiation
DOE O 458.1 establishes a public dose limit of 100 millirems per year (mrem/yr) above naturally occurring gamma levels (background). Average background gamma radiation for the Moab area was established as 82 mrem/yr; therefore, the public gamma dose limit for the Moab site is 182 mrem/yr (45.5 mrem/quarter [qtr]). Based on the monitoring data collected during the second quarter of 2014, three on-site monitoring locations exceeded the quarterly gamma dose guideline, and three exceeded the annual guideline. No off-site monitoring locations exceeded these limits. Second quarter analytical results were similar to those of the first quarter of 2014. The results for stations immediately adjacent to the tailings pile have been elevated since the second quarter of 2009, indicating tailings pile influence within the DOE property, as expected. Table 1 shows monitoring locations where the gamma dose guideline was exceeded, and Table 2 shows a summary of gamma data for the Moab site.

Table 1. Moab Environmental Air-monitoring Locations with Samples that Exceeded Applicable Regulatory Standards, Limits, or Guidelines During the Past 12 Months

Analyte	Guideline/Limit	Monitoring Locations Exceeding Quarterly Limit During 2nd Quarter 2014	Monitoring Locations Exceeding Annual Guideline/Limit for the Past 12 Months
Radon-222	3.7 pCi/L	None	None
Direct Gamma Radiation	182 mrem/yr (45.5 mrem/qtr)	0109, 0110, 0112	0109, 0110, 0112

Table 2. Summary of Environmental Radon-222 and Gamma Radiation Monitoring Data for the Moab Site for the Past Year Through Second Quarter 2014

Station Number	1st Quarter 2014		2nd Quarter 2014		3rd Quarter 2013		4th Quarter 2013		Annual	
	Radon (pCi/L)	Gamma (mrem/ 91 d***)	Radon (pCi/L)	Gamma (mrem/ 91 d***)	Radon (pCi/L)	Gamma (mrem/ 91 d***)	Radon (pCi/L)	Gamma (mrem/ 91 d***)	Radon (pCi/L)	Total Gamma (mrem/yr)
On-site Locations										
0101	1.5	40.7	0.9	36.9	0.9	41.2	2.4	45.8	1.4	164.6
0102	0.9	23.6	0.6	22.8	0.5	20.8	1.0	27.8	0.8	95.0
0103	0.7	25.2	0.5	18.4	0.6	19.1	1.3	23.0	0.8	85.7
0104	1.3	28.3	0.8	25.5	1.0	26.2	1.6	32.5	1.2	112.5
0105	1.6	23.8	1.0	22.4	1.0	22.0	1.8	27.9	1.4	96.1
0106	2.4	29.2	1.1	28.2	1.1	30.1	2.9	33.9	1.9	121.4
0107	2.4	28.9	1.5	23.3	1.3	27.4	2.4	29.9	1.9	109.5
0108	2.8	35.6	1.9	43.2	1.7	35.5	2.8	49.4	2.3	163.7
0109	1.8	150.3	1.3	153.7	2.1	162.5	1.8	153.4	1.8	619.9
0110	1.3	80.5	1.4	101.0	1.3	92.8	0.8	104.8	1.2	379.1
0111	0.5	40.7	0.8	39.9	0.8	42.9	0.9	44.6	0.8	168.1
0112	1.3	48.4	1.1	49.4	1.6	50.7	1.8	58.0	1.5	206.5
0113	2.0	37.4	1.3	33.2	1.2	38.1	2.9	37.2	1.9	145.9
0126	2.3	30.3	0.9	23.0	0.9	27.8	2.1	26.2	1.6	107.3
Off-site Locations										
0117[1]	0.4	27.9	0.3	22.1	0.3	26.1	0.4	25.6	0.4	101.7
0118	0.4	24.7	0.3	21.5	0.4	23.6	0.4	25.0	0.4	94.8
0119	0.6	20.1	0.3	20.5	0.3	19.0	0.7	24.1	0.5	83.7
0120	0.4	22.8	0.3	20.9	0.4	20.4	0.4	25.1	0.4	89.2
0121	0.4	25.6	0.3	20.0	0.3	20.4	0.4	23.7	0.4	89.7
0122	0.4	23.0	0.3	21.3	0.3	18.5	0.3	25.2	0.3	88.0
0123*	0.4	24.4	0.3	16.7	0.3	21.3	0.3	19.8	0.3	82.2
0124	0.9	30.8	0.5	23.1	0.5	26.3	1.0	26.8	0.7	107.0
0125	1.2	32.8	0.7	29.0	0.7	29.8	1.6	32.9	1.1	124.5
0127	0.6	27.3	0.3	24.0	0.4	24.1	0.9	27.4	0.6	102.8
0128	1.6	26.5	1.1	26.3	1.1	24.5	2.0	30.5	1.5	107.8
0129	0.8	28.9	1.0	26.8	1.2	29.1	1.7	29.8	1.2	114.6
MEI**	0.7	26.1	0.5	17.4	0.5	22.6	1.1	20.7	0.7	86.8

MEI = maximally exposed individual

*Designated background monitoring locations. Background locations are sufficiently distant from the millsite to be free of any influences from potential site contaminants.

**The MEI is the continually occupied residential property that is closest to the DOE property boundary.

***mrem value is prorated to a 91-day (quarter) exposure period.

Radon-222 and Direct Gamma Conclusion
Radon-222 results were below the annual guideline, with no stations exceeding the quarterly limit. Although direct gamma exposure rates exceeded the quarterly and/or annual guidelines at several locations on the DOE property, these do not reflect elevated doses to the public. These data represent the exposure a member of the public could receive if he or she resided for an entire year at the point where the data were collected; however, no member of the public permanently resides at or near these locations.

Monitoring data observed at the maximally exposed individual (MEI) location, just east of the Moab site, represent the greatest potential exposure to a member of the public. Neither the radon-222 guideline nor the public gamma dose limit established by DOE was exceeded at the MEI location.

Radioparticulates
No radiological exposure limits were exceeded at any of the 10 radioparticulate monitoring locations at or near the Moab site during the second quarter of 2014. Analytical data for all analytes (total uranium, thorium-230, radium-226, and polonium-210) were below their respective derived concentration standards (DCSs), as found in DOE Standard (STD)-1196-2011, "Derived Concentration Technical Standard," (DCS) and as shown in Table 3.

Concentrations of the radioparticulate have been consistently below the DCS values since DOE assumed ownership of the site in 2001. DOE O 458.1 requires the radiological public dose resulting from all airborne emissions to be less than 10 mrem/yr (2.5 mrem/qtr). All on- and off-site sampling results were lower than this dose limit during the second quarter of 2014.

During the second quarter of 2014, the on-site dose resulting from airborne emissions, excluding background, was 0.17 mrem (1.00 mrem/yr) at location 0102 and 0.25 mrem (1.69 mrem/yr) at location 0105. Off-site locations 0117 and 0129 were 0.12 mrem (0.77 mrem/yr) and 0.77 mrem (3.08 mrem/yr), respectively, as shown in Table 3.

Station 0129 is immediately downwind of the site operations. Although results are below the dose limit, stations closer to the site operations (0105 and 0129) indicate higher results than more remote stations (0102 and 0117), as would be expected. The radiological exposure from radioparticulates has been relatively stable during the last year.

2.2 Crescent Junction, Utah, Site

Monitoring Period: April through June 2014
Monitoring locations for the Crescent Junction site are presented in Figure 3. After mill tailings disposal began in 2009, monitoring location 0308 at the Crescent Junction site became the closest to operations, and station 0306 became the MEI location. Location 0307, approximately 5 miles east of the disposal site, represents the second greatest risk to the public after the MEI location, and locations 0301, 0305, and 0309 provide property line data for the disposal site. Stations 0306, 0307, and 0308 were utilized as background locations from the period before tailings disposal.

Atmospheric Radon-222
DOE O 458.1 establishes a guideline of 3.0 pCi/L above background for atmospheric emissions of radon-222 applicable to the Crescent Junction site. Shipment of uranium mill tailings to the Crescent Junction disposal cell commenced in the second quarter of 2009.

Based on 3 years of data from 2006 to 2009, the background concentrations of radon-222 in the Crescent Junction area were established as 0.9 pCi/L; therefore, the guideline for radon-222 emissions at the Crescent Junction site is 3.9 pCi/L. During the second quarter of 2014, none of the on- or off-site stations exceeded the guideline, and these results were generally similar to previous data. Radon-222 data for the Crescent Junction site are summarized in Table 4.

Direct Environmental Gamma Radiation
DOE O 458.1 establishes a dose limit of 100 mrem/yr above naturally occurring gamma levels (background); therefore, the gamma dose limit for the Crescent Junction site is 192.5 mrem/yr (48.1 mrem/qtr), including background. During the second quarter of 2014, no on- or off-site station results exceeded the annual or quarterly gamma radiation dose limit. Refer to Table 5 for a summary of gamma data for the Crescent Junction site.

Radioparticulates
DOE Standard DOE-STD-1196-2011 establishes DCSs for concentrations of radioparticulates in air. Concentrations of the radioparticulates have been consistently below DCSs since DOE began collecting radioparticulate data for the Crescent Junction site in 2006.

The on-site dose resulting from airborne emissions was 1.33 mrem/yr at location 0308 and 1.76 mrem/yr at location 0309, which is downwind of operations. The dose at location 0308 has trended downward since engineering controls were implemented to reduce the level of radioparticulates in this area. Another factor was that disposal activities were completed near this station.

Location 0306, the MEI, had a dose of 0.73 mrem/yr. The two off-site location results were similar to past data and below guidelines or limits. Refer to Table 5 for a summary of radioparticulate air-monitoring data for the Crescent Junction site.

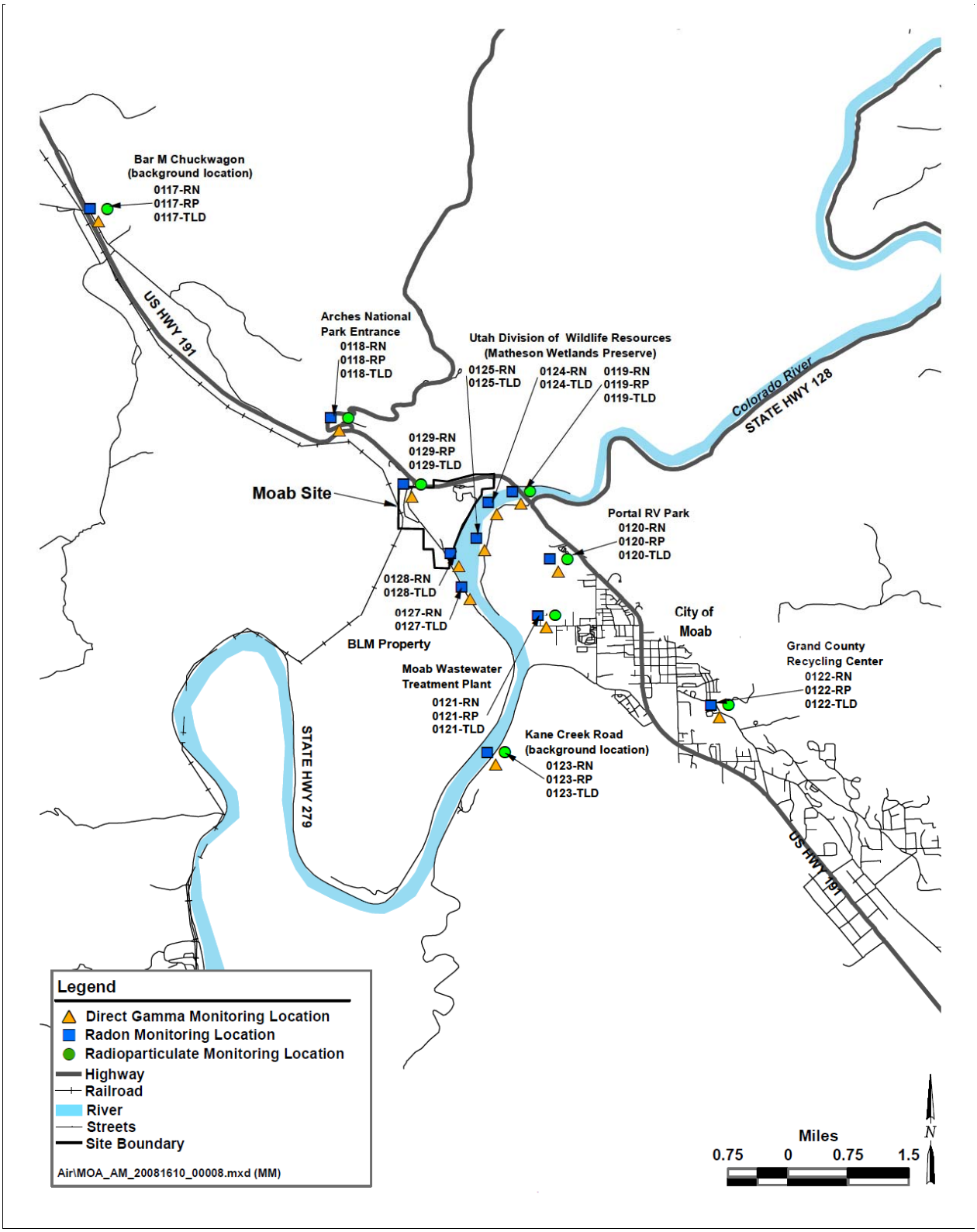

Figure 1. Moab Off-site Environmental Air-monitoring Locations

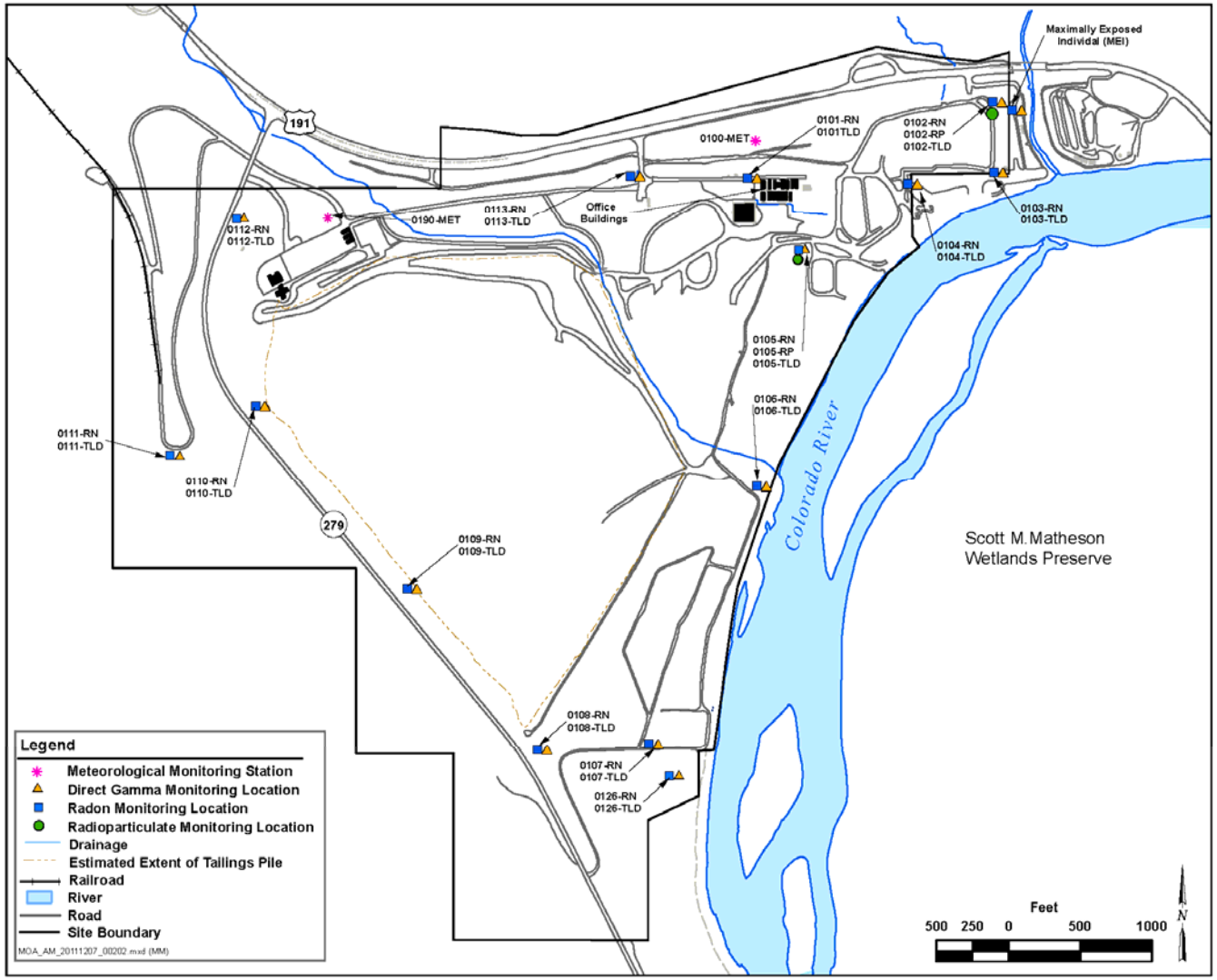

Figure 2. Moab On-site and MEI Environmental Air-monitoring Locations

Table 3. Summary of Radioparticulate Air-monitoring Data for the Moab Site for the Past Year Through Second Quarter 2014

Station Number	Isotope	1st Quarter 2014 (µCi/mL)	2nd Quarter 2014 (µCi/mL)	3rd Quarter 2013 (µCi/mL)	4th Quarter 2013 (µCi/mL)	Annual Average (µCi/mL)	Annual Dose Based on Four Quarters (mrem/yr)
On-site Locations							
0102-RP	Uranium[1]	1.47E-16	1.52E-16	1.6E-16	1.5E-16	1.52E-16	**1.00**
	Thorium-230[2]	1.48E-16	1.21E-16	1.6E-16	1.3E-16	1.40E-16	
	Radium-226[3]	4.84E-17	1.57E-17	8.2E-17	3.5E-17	4.53E-17	
	Polonium-210[4]	6.46E-15	3.67E-15	3.9E-15	1.2E-14	6.41E-15	
0105-RP	Uranium[1]	2.21E-16	2.40E-16	2.4E-16	2.3E-16	2.33E-16	**1.69**
	Thorium-230[2]	4.31E-16	2.34E-16	4.4E-16	4.0E-16	3.77E-16	
	Radium-226[3]	2.15E-16	9.48E-17	2.0E-16	1.2E-16	1.57E-16	
	Polonium-210[4]	7.41E-15	4.03E-15	4.7E-15	1.3E-14	7.16E-15	
Off-site Locations							
0117-RP	Uranium[1]	1.57E-16	1.86E-16	1.4E-16	2.3E-16	1.79E-16	**0.77**
	Thorium-230[2]	6.07E-17	5.85E-17	9.1E-17	1.0E-16	7.87E-17	
	Radium-226[3]	5.40E-17	1.03E-16	5.5E-17	3.7E-17	6.21E-17	
	Polonium-210[4]	5.53E-15	3.12E-15	3.5E-15	1.0E-14	5.54E-15	
0118-RP	Uranium[1]	1.48E-16	2.25E-16	1.4E-16	1.9E-16	1.76E-16	**1.29**
	Thorium-230[2]	1.62E-16	2.77E-16	3.7E-16	1.7E-16	2.44E-16	
	Radium-226[3]	1.07E-16	1.71E-16	1.3E-16	3.6E-17	1.11E-16	
	Polonium-210[4]	6.62E-15	3.69E-15	4.4E-15	1.2E-14	6.57E-15	
0119-RP	Uranium[1]	1.29E-16	1.91E-16	1.7E-16	1.4E-16	1.58E-16	**1.20**
	Thorium-230[2]	1.62E-16	2.77E-16	3.7E-16	1.7E-16	2.44E-16	
	Radium-226[3]	9.30E-17	6.74E-17	6.0E-17	7.2E-17	7.32E-17	
	Polonium-210[4]	7.01E-15	3.05E-15	4.0E-15	8.9E-15	5.75E-15	
0120-RP	Uranium[1]	1.29E-16	2.00E-16	1.3E-16	1.8E-16	1.60E-16	**0.79**
	Thorium-230[2]	8.48E-17	8.78E-17	1.3E-16	8.8E-17	9.78E-17	
	Radium-226[3]	9.56E-17	7.38E-17	6.5E-17	9.7E-17	8.29E-17	
	Polonium-210[4]	5.66E-15	3.05E-15	3.6E-15	8.8E-15	5.29E-15	
0121-RP	Uranium[1]	1.56E-16	1.65E-16	1.7E-16	1.6E-16	1.62E-16	**0.92**
	Thorium-230[2]	8.08E-17	1.53E-16	1.7E-16	1.3E-16	1.34E-16	
	Radium-226[3]	1.12E-16	8.92E-17	9.7E-17	2.5E-17	8.08E-17	
	Polonium-210[4]	6.47E-15	3.44E-15	4.5E-15	8.4E-15	5.71E-15	
0122-RP	Uranium[1]	1.38E-16	1.74E-16	1.1E-16	1.6E-16	1.47E-16	**0.77**
	Thorium-230[2]	7.79E-17	6.62E-17	1.2E-16	5.9E-17	8.08E-17	
	Radium-226[3]	9.94E-17	4.58E-17	9.0E-17	4.8E-17	7.09E-17	
	Polonium-210[4]	5.51E-15	2.93E-15	2.9E-15	1.1E-14	5.55E-15	
0123-RP	Uranium[1]	1.20E-16	1.91E-16	2.7E-16	1.6E-16	1.86E-16	**0.76**
	Thorium-230[2]	6.74E-17	9.29E-17	1.4E-16	6.2E-17	9.05E-17	
	Radium-226[3]	7.01E-17	6.36E-17	9.5E-17	4.9E-17	6.95E-17	
	Polonium-210[4]	6.07E-15	3.82E-15	3.9E-15	7.0E-15	5.19E-15	

Table 3. Summary of Radioparticulate Air-monitoring Data for the Moab Site for the Past Year Through Second Quarter 2014 (continued)

Station Number	Isotope	1st Quarter 2014 (µCi/mL)	2nd Quarter 2014 (µCi/mL)	3rd Quarter 2013 (µCi/mL)	4th Quarter 2013 (µCi/mL)	Annual Average (µCi/mL)	Annual Dose Based on Four Quarters (mrem/yr)
Off-site Locations (*continued*)							
0129-RP	Uranium[1]	2.76E-16	3.71E-16	2.8E-16	3.2E-16	3.12E-16	3.08
	Thorium-230[2]	7.67E-16	1.01E-15	1.0E-15	9.5E-16	9.31E-16	
	Radium-226[3]	3.50E-16	6.12E-16	2.1E-16	3.7E-16	3.85E-16	
	Polonium-210[4]	6.86E-15	5.03E-15	4.7E-15	1.1E-14	7.00E-15	

µCi/mL = microcuries per milliliter
[1]DOE DCS for Total Uranium = 4.7E-13
[2]DOE DCS for Thorium-230 = 9.4E-14
[3]DOE DCS for Radium-226 = 4.0E-13
[4]DOE DCS for Polonium-210 = 8.7E-13

3.0 Data Assessment

3.1 Data Assessment Summary

Atmospheric Radon-222 Analyses

Radon detectors were analyzed by Landauer, Inc., in accordance with their "Quality Assurance Manual for Radon Monitoring Services." Second quarter 2014 analytical radon-222 data were received in a report dated July 15, 2014. When detectors were missing, damaged, or could not be read, the laboratory noted an explanation. After the data report was received, Project personnel evaluated the data for consistency with other data points and sample duplicates.

Direct Environmental Gamma Radiation Analyses

Thermoluminescent dosimeters (TLDs) are used for continuous dose measurements and are analyzed by ATI Environmental, Inc., Midwest Laboratory in accordance with its analytical procedures, "Preparation and Readout of Teledyne Isotopes TLD Card, TIML-TLD-01." Second quarter 2014 environmental gamma radiation data were received in a report dated July 24, 2014. After the laboratory results were received, the Project evaluated the data for consistency and compared it to historical data and sample duplicates.

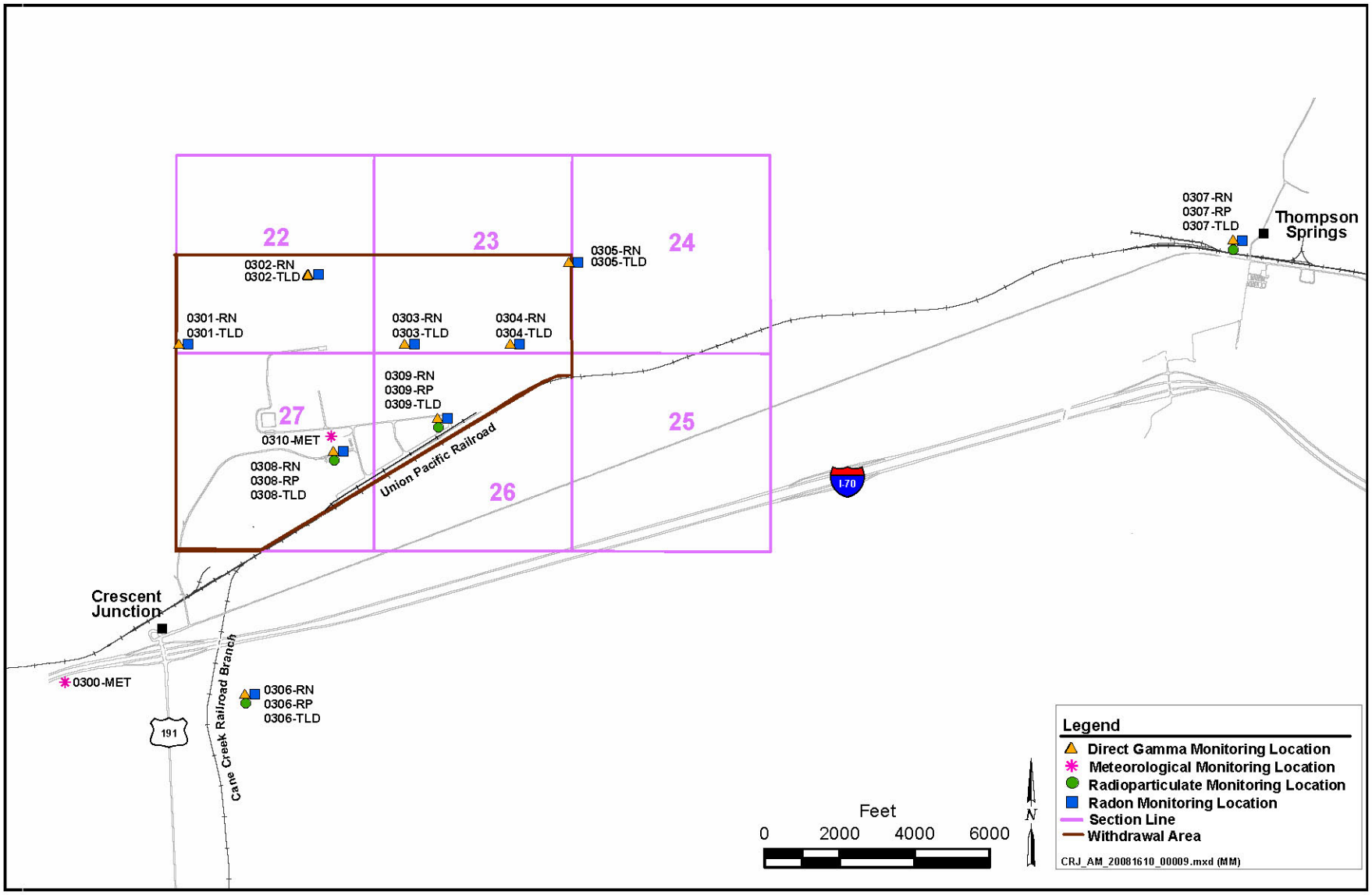

Figure 3. Crescent Junction Site Environmental Air-monitoring Locations

Table 4. Summary of Environmental Radon-222 and Gamma Radiation-monitoring Data for the Crescent Junction Site for the Past Year Through Second Quarter 2014

Station Number	1st Quarter 2014		2nd Quarter 2014		3rd Quarter 2013		4th Quarter 2013		Annual	
	Radon (pCi/L)	Gamma (mrem/ 91 d[1])	Radon (pCi/L)	Gamma (mrem/ 91 d[1])	Radon (pCi/L)	Gamma (mrem/ 91 d[1])	Radon (pCi/L)	Gamma (mrem/ 91 d[1])	Average Radon (pCi/L)	Total Gamma (mrem/ yr)
0301	0.6	26.2	0.5	22.0	0.6	23.1	0.8	23.2	0.6	94.5
0302	0.6	22.7	0.8	21.8	0.9	22.6	0.8	24.7	0.8	91.8
0303	1.0	30.9	0.4	21.4	0.5	27.7	1.3	23.6	0.8	103.6
0304	0.5	28.9	0.4	20.5	0.7	23.9	0.5	22.8	0.5	96.1
0305	0.4	30.0	0.3	26.6	0.5	22.8	0.5	28.7	0.4	108.1
0306[2]	0.4	28.7	0.3	22.9	0.4	25.3	0.5	25.5	0.4	102.4
0307	0.4	28.6	0.3	22.0	0.3	23.2	0.4	24.8	0.4	98.6
0308	1.7	28.0	0.9	23.5	1.1	24.0	1.9	26.2	1.4	101.7
0309	0.5	23.3	0.6	22.1	0.6	23.1	0.7	25.6	0.6	94.1

[1]mrem/91 d = value is prorated to a 91-day (quarter) exposure period.
[2]MEI location.

Table 5. Summary of Radioparticulate Air-monitoring Data for the Crescent Junction Site for the Past Year Through Second Quarter 2014

Station Number	Isotope	1st Quarter 2014 (µCi/mL)	2nd Quarter 2014 (µCi/mL)	3rd Quarter 2013 (µCi/mL)	4th Quarter 2013 (µCi/mL)	Annual Average (µCi/mL)	Annual Dose Based on Four Quarters (mrem/yr)
Off-site Locations							
MEI or 0306-RP	Uranium[1]	1.8E-16	1.6E-16	1.2E-16	1.4E-16	1.5E-16	0.73
	Thorium-230[2]	7.2E-17	7.3E-17	1.1E-16	8.3E-17	8.4E-17	
	Radium-226[3]	3.2E-17	1.0E-17	1.9E-17	3.4E-17	2.4E-17	
	Polonium-210[4]	5.4E-15	3.3E-15	3.6E-15	8.3E-15	5.1E-15	
0307-RP	Uranium[1]	1.2E-16	1.6E-16	1.2E-16	1.6E-16	1.4E-16	0.69
	Thorium-230[2]	6.6E-17	6.2E-17	5.9E-17	6.3E-17	6.3E-17	
	Radium-226[3]	5.3E-17	4.6E-17	5.1E-17	7.0E-17	5.5E-17	
	Polonium-210[4]	5.0E-15	3.2E-15	4.4E-15	8.2E-15	5.2E-15	
On-site Locations							
0308-RP	Uranium[1]	1.5E-16	1.5E-16	1.7E-16	1.7E-16	1.6E-16	1.33
	Thorium-230[2]	2.3E-16	2.9E-16	3.8E-16	2.4E-16	2.8E-16	
	Radium-226[3]	1.4E-16	1.6E-16	1.6E-16	8.1E-17	1.4E-16	
	Polonium-210[4]	5.9E-15	4.5E-15	4.5E-15	9.1E-15	6.0E-15	
0309-RP	Uranium[1]	1.7E-16	1.7E-16	1.5E-16	1.8E-16	1.7E-16	1.76
	Thorium-230[2]	4.4E-16	4.2E-16	3.4E-16	3.9E-16	4.0E-16	
	Radium-226[3]	2.0E-16	1.4E-16	2.0E-16	9.0E-17	1.6E-16	
	Polonium-210[4]	5.8E-15	3.8E-15	1.1E-14	9.1E-15	7.4E-15	

µCi/mL = microcuries per milliliter
[1]DOE DCS for Total Uranium = 4.7E-13
[2]DOE DCS for Thorium-230 = 9.4E-14
[3]DOE DCS for Radium-226 = 4.0E-13
[4]DOE DCS for polonium-210 = 8.7E-13

Radioparticulate Analyses
ALS Environmental, Inc., laboratory analyzed the radioparticulate samples. Total uranium was analyzed by inductively coupled plasma-mass spectrometry, U.S. Environmental Protection Agency (EPA) method SW-846 6020A, procedure PA SOP827, Revision 5. Isotopic thorium (includes thorium-230) and polonium-210 were analyzed by alpha spectroscopy, method PA-SOP714R10. Radium-226 was analyzed by the radon emanation method, EPA method 903.1(m). Second quarter 2014 radioparticulate analytical data were received in report identification number 1407096, dated July 30, 2014. The Project reviewed and validated the data for consistency and compared results to historical data.

Duplicate Sampling
Duplicate samples for radon-222 were collected at three Moab locations: (1) 0108, an on-site location near the southern toe of the tailings pile; (2) 0111, an on-site location at the western property line near the rail load-out area; and (3) 0121, a location approximately 2 miles southeast of the Moab site. Duplicate measurements of direct gamma were taken at two Moab locations: (1) 0108, an on-site location with elevated readings; and (2) 0129, an off-site location near the northern property boundary. Duplicate radon-222 measurements were collected at Crescent Junction locations 0303 and 0308. Duplicate direct gamma measurements were taken at Crescent Junction locations 0301 and 0305, which were random locations with potentially high readings.

Duplicates are not being collected for radioparticulate samples per the *Moab UMTRA Project Environmental Air Monitoring Sampling and Analysis Plan* (DOE-EM/GJRAC1434). Results of isotopic analysis for all of the radioparticulate samples collected to date have been below their respective DCSs. Consequently, the additional costs associated with purchasing a duplicate sampler, providing electrical power, and procuring analytical analyses are not justified.

Suspected Anomalies
All analytical data are reviewed for anomalous or outlying data points. No anomalous data were noted for the second quarter of 2014. Direct gamma data was similar to historic data, with continued elevated gamma readings for stations 0109, 0110, and 0112, which are close to the excavation activity. The quarterly review consists of evaluating monitoring data against historical and minimum/maximum values to determine if the reported data are within reasonable expected ranges.

Summary
Data collected during the second quarter of 2014 met the applicable laboratory control criteria for their respective analyses, and all data were reviewed by qualified personnel. The results were within the acceptable limits associated with each matrix. Data reported in this environmental air-monitoring report are considered validated and may be treated as final results. The checklist protocol summary of field observations for the second quarter of 2014 is shown in Section 5.0.

4.0 Environmental Air-monitoring Data

4.1 Environmental Air-monitoring Data Summary

Tables 2 through 5 summarize radon-222, direct gamma radiation, and radioparticulate data for the Moab and Crescent Junction sites. Time/concentration graphs have been plotted for selected locations for each component of the monitoring program. The rationale used for selecting each location is summarized below.

Radon-222 and Direct Gamma Radiation
Radon-222 data were plotted on a graph (Figure 8) for the following Moab site monitoring locations: (1) 0108, which had elevated radon levels in the past; (2) location 0120, which is near the Portal RV Park, approximately 1 mile southeast of the Moab site, and represents potential exposure to the public; (3) 0129, which is directly downwind of operations; and (4) the MEI.

Gamma radiation data were plotted on a graph (Figure 9) for the following Moab site monitoring locations: (1) 0106, which is along the eastern property boundary and has previously recorded elevated direct gamma radiation; (2) 0109, 0110, and 0112, which were plotted as on-site locations directly adjacent to the tailings pile with high readings; (3) 0117, which is approximately 5 miles northwest of the Moab site property and is a background monitoring location; (4) 0120, an off-site location between the site and Moab; (5) 0129, which is downwind and near the northern property boundary; and (6) the MEI.

Radon-222 and gamma radiation data were plotted on graphs (Figures 14 and 15, respectively) for the following Crescent Junction monitoring locations: (1) 0302, which is close to the northern side of operations; (2) 0306 and 0307, which are off-site stations closest to members of the public; (3) 0308, which is close to the southern side of operations; and (4) 0309, which is downwind of operations.

Radioparticulates
Radioparticulate-monitoring data were plotted on graphs (Figures 4 through 7) for the following Moab site locations: (1) 0102, which is the station closest to the MEI; (2) 0105, which is closest to the emissions source (i.e., the mill tailings pile); (3) 0117, which is a background monitoring location approximately 5 miles northwest of the Moab site property and represents ambient or naturally occurring conditions; (4) 0120, which is approximately 1 mile southeast of the Moab site and represents an off-site location between the site and Moab; and (5) 0129, which is directly downwind of operations with the greatest potential impact from operations.

Radioparticulate-monitoring data were plotted on graphs (Figures 10 through 13) for the following Crescent Junction site locations: 0306, 0307, 0308, and 0309. These locations were selected for the same reasons as stated for radon-222 and gamma radiation.

5.0 Environmental Air-monitoring Field Activities Verification Checklist

Project	Moab/Crescent Junction, Utah	**Date(s) of Air Sampling**	April – June 2014
Date(s) of Verification	August 15, 2014	**Name of Verifier**	Ed Baker

	Response (Yes, No, NA)	**Comments**
1. Is the *Air Monitoring Sampling and Analysis Plan* the primary document directing field procedures?	Yes	
2. Were the sampling locations specified in the *Air Monitoring Sampling and Analysis Plan* ?	Yes	
3. Were low-volume air samplers on and operating at or near 60 liters/minute ±10%?	No	Power outage/GFI reset caused loss of data at stations 308, 102, 117, 118, and 129; and the pump was replaced at 105.
4. Did any of the samplers require airflow adjustment?	No	
5. Were detectors (radon cups, TLDs) and monitoring equipment found to be undisturbed and in operable condition upon arrival?	Yes	
6. Were the hourly clocks on the low-volume air samplers operational upon arrival?	No	Hour meter at 120 and 122 were replaced, and hours were estimated for the week.
7. Were the run times recorded for each radioparticulate-monitoring location?	Yes	
8. Were duplicates (for radon-222 and gamma radiation) taken at a frequency of one per 20 samples?	Yes	
9. Were filter blanks (for radioparticulates) taken at a frequency of one per 20 samples?	No	Not required per the *Air Monitoring Sampling and Analysis Plan* .
10. Were trip blanks (for radon-222 and gamma radiation) included with each shipment?	No	A trip blank is not used for the radon-222 monitoring because units are sealed; however, a trip blank was used for the direct gamma radiation monitoring.
11. Was the identity of the quality-control sample locations protected?	Yes	
12. Were the true locations of the quality-control samples recorded in the Field Log Book?	Yes	
13. Were all samples collected as specified in the *Air Monitoring Sampling and Analysis Plan* ?	Yes	
14. Were chain-of-custody records completed, and was sample custody maintained?	Yes	
15. Are field data sheets signed and dated by sampling personnel?	Yes	
16. Was all other pertinent information documented on the field data sheets?	Yes	

6.0 References

DOE (U.S. Department of Energy), *Moab UMTRA Project Environmental Air Monitoring Sampling and Analysis Plan* (DOE-EM/GJRAC1434).

DOE (U.S. Department of Energy) Order 458.1, Administrative Change 2, "Radiation Protection of the Public and the Environment."

DOE (U.S. Department of Energy) Standard-1196-2011 "Derived Concentration Technical Standard."

ATI Environmental, Inc., Midwest Laboratory, "Preparation and Readout of Teledyne Isotopes TLD Card," TIML-TLD-01, Revision 7 Teledyne Isotopes.

Landauer, Inc., "Quality Assurance Manual for Radon Monitoring Services."

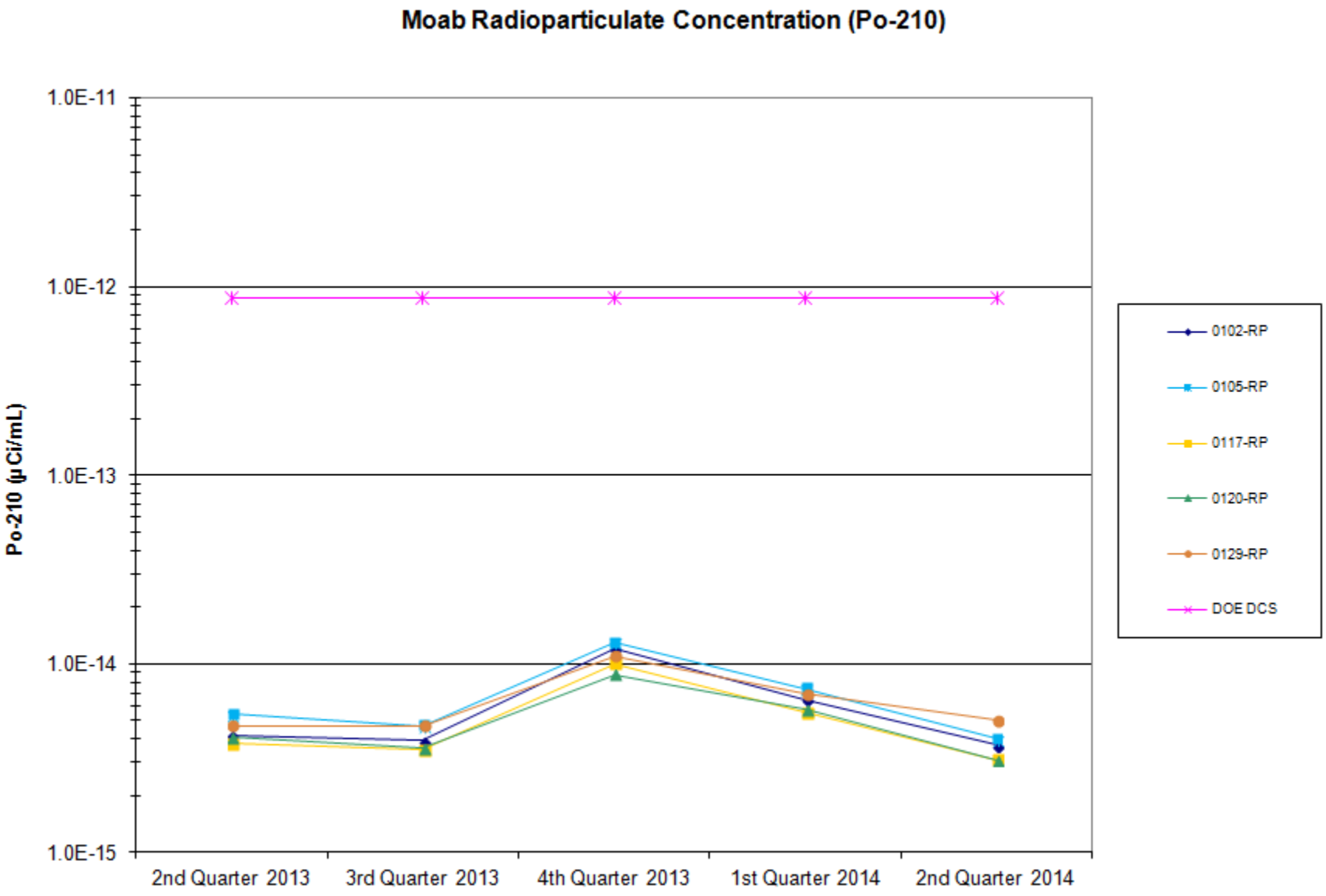

Figure 4. Polonium-210 Concentrations at Select Moab Monitoring Locations

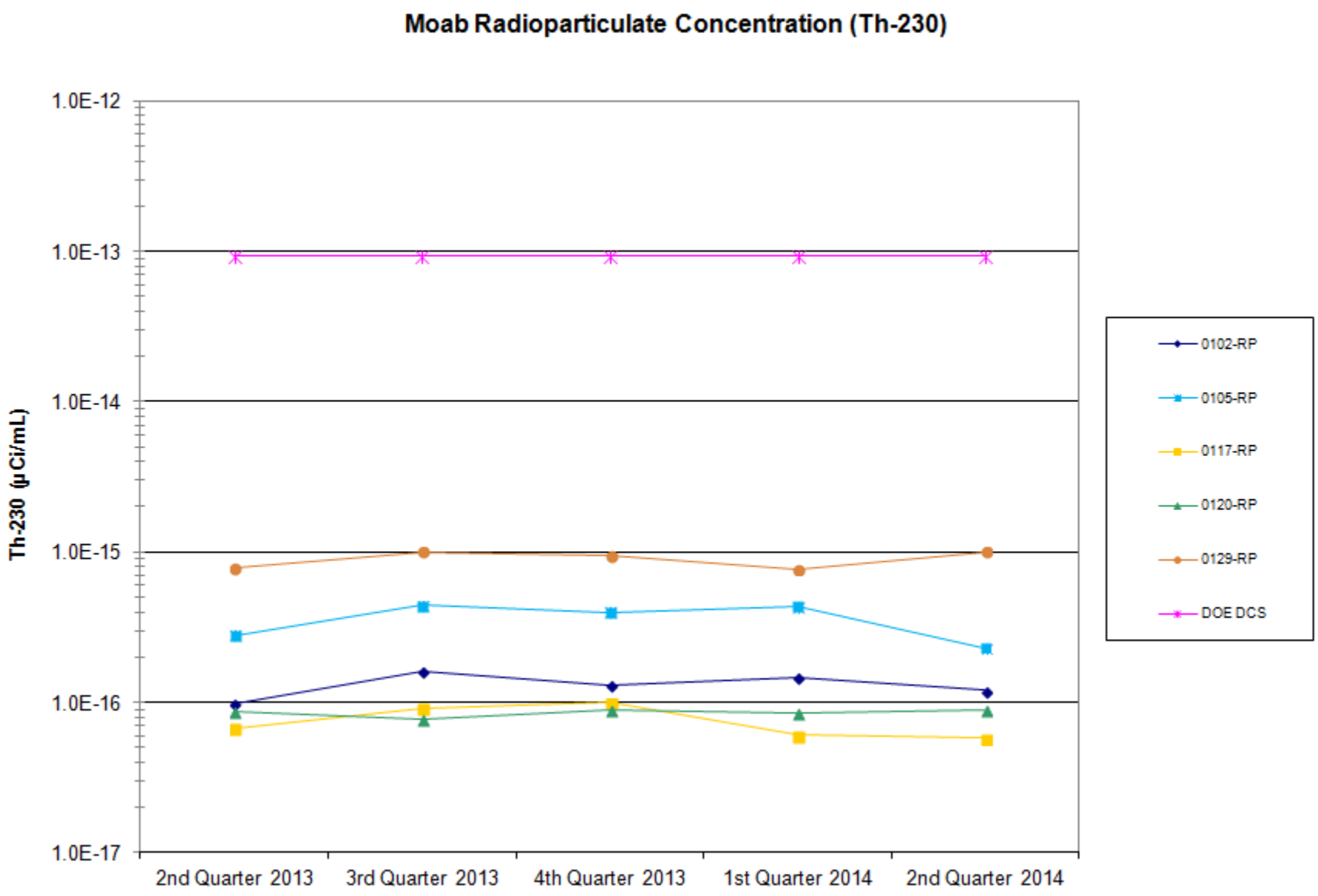

Figure 5. Thorium-230 Concentrations at Select Moab Monitoring Locations

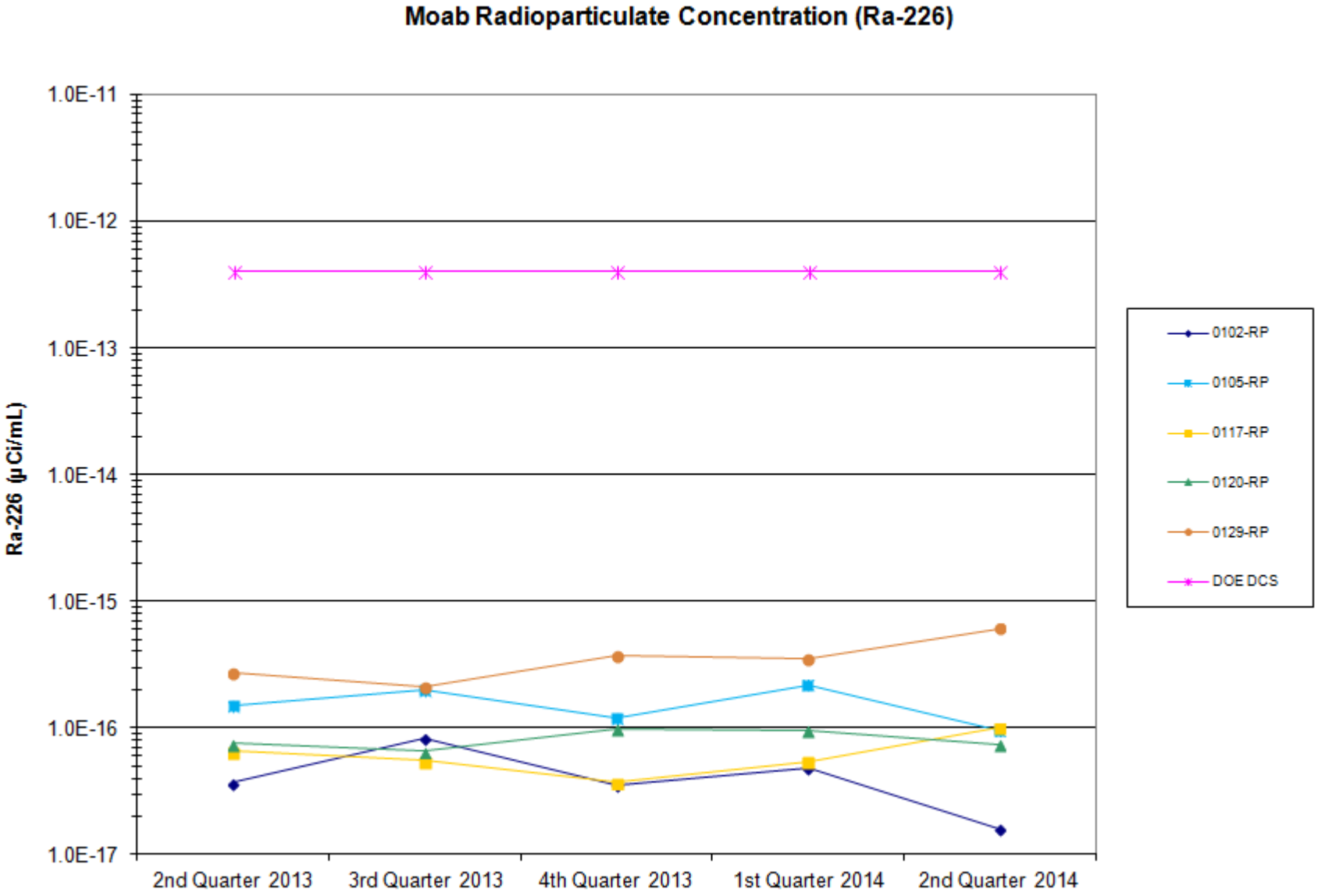

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Figure 6. Radium-226 Concentrations at Select Moab Monitoring Locations

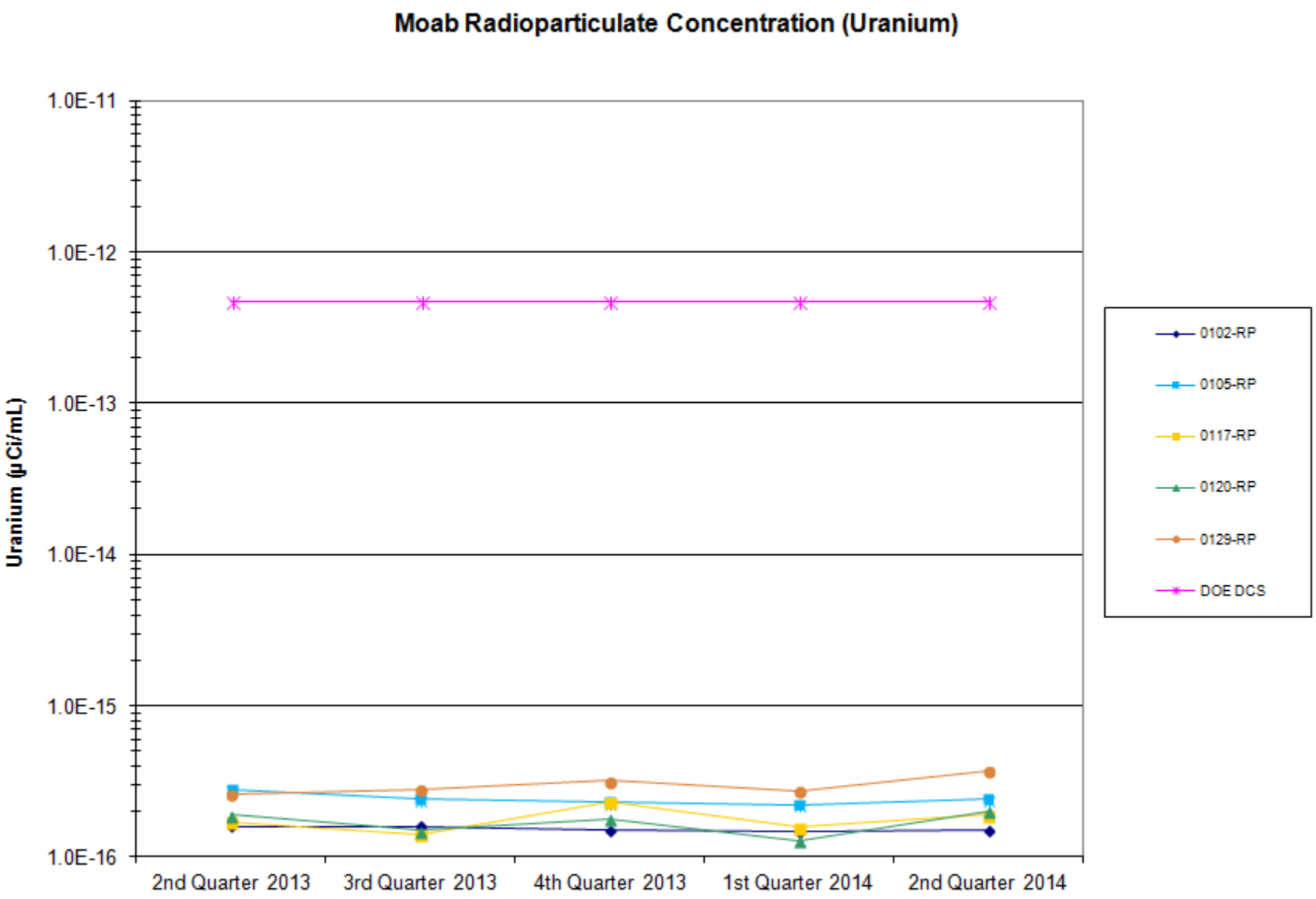

Figure 7. Total Uranium Concentrations at Select Moab Monitoring Locations

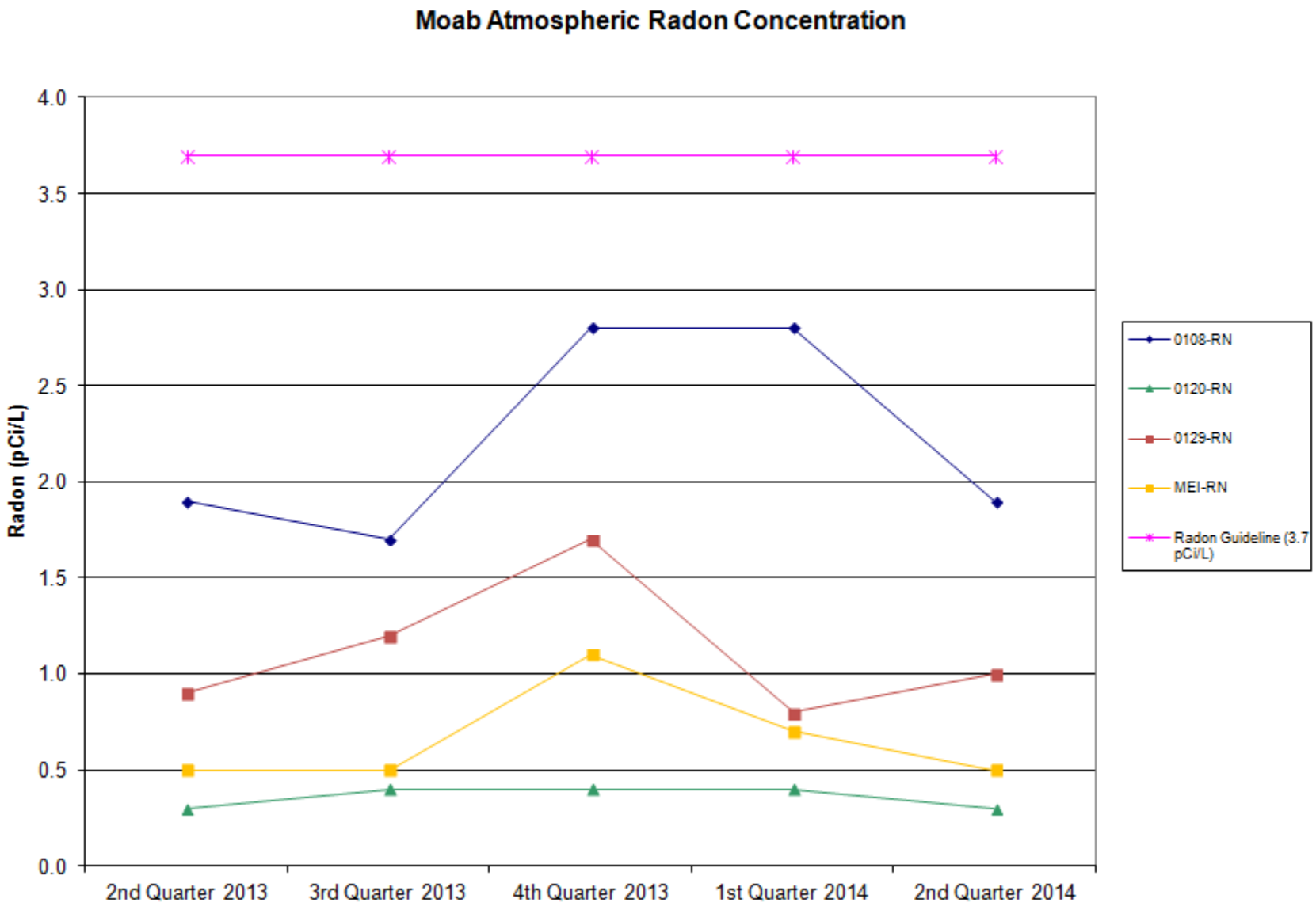

Figure 8. Atmospheric Radon-222 Concentrations at Select Moab Monitoring Locations

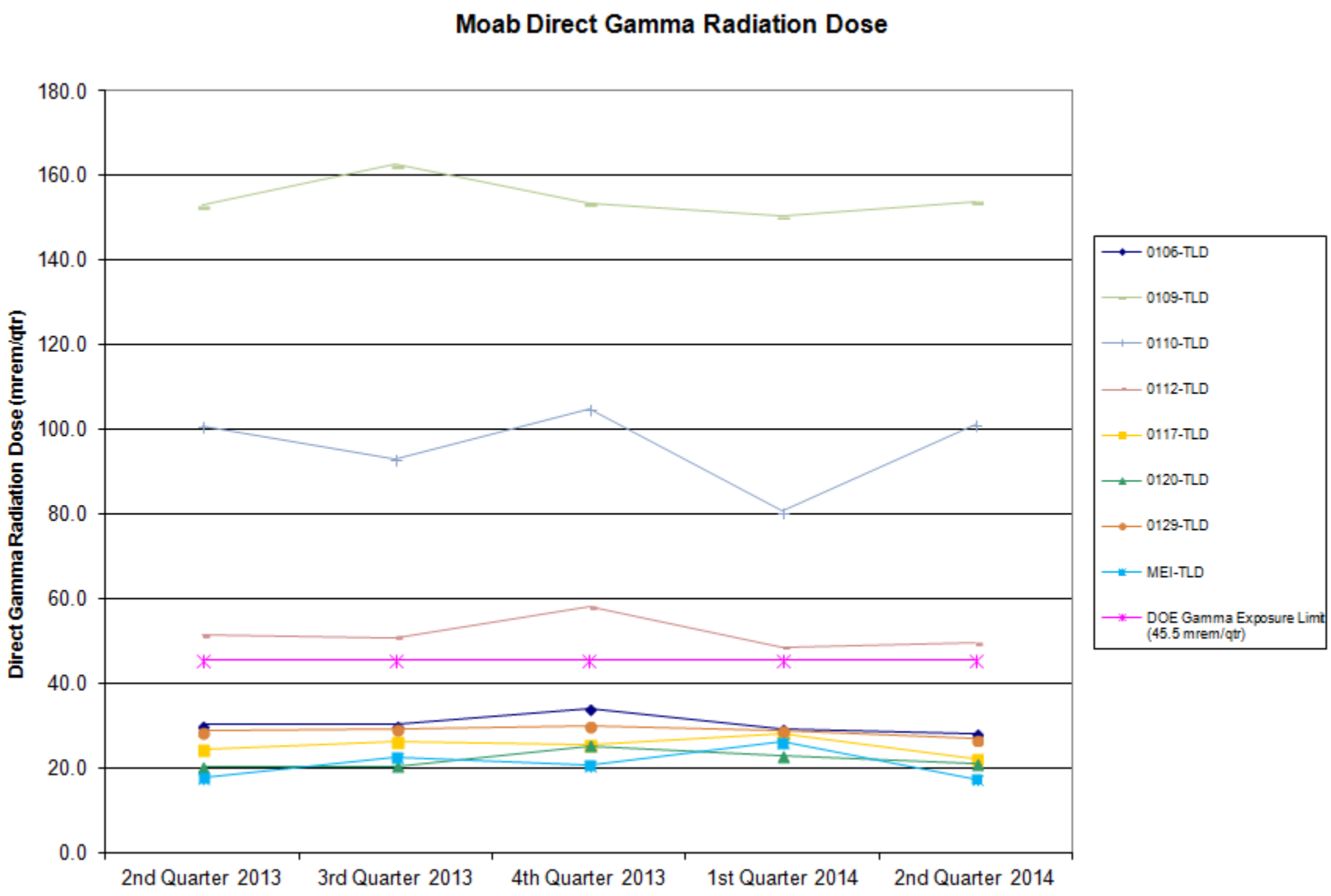

Figure 9. Direct Gamma Radiation Dose at Select Moab Monitoring Locations

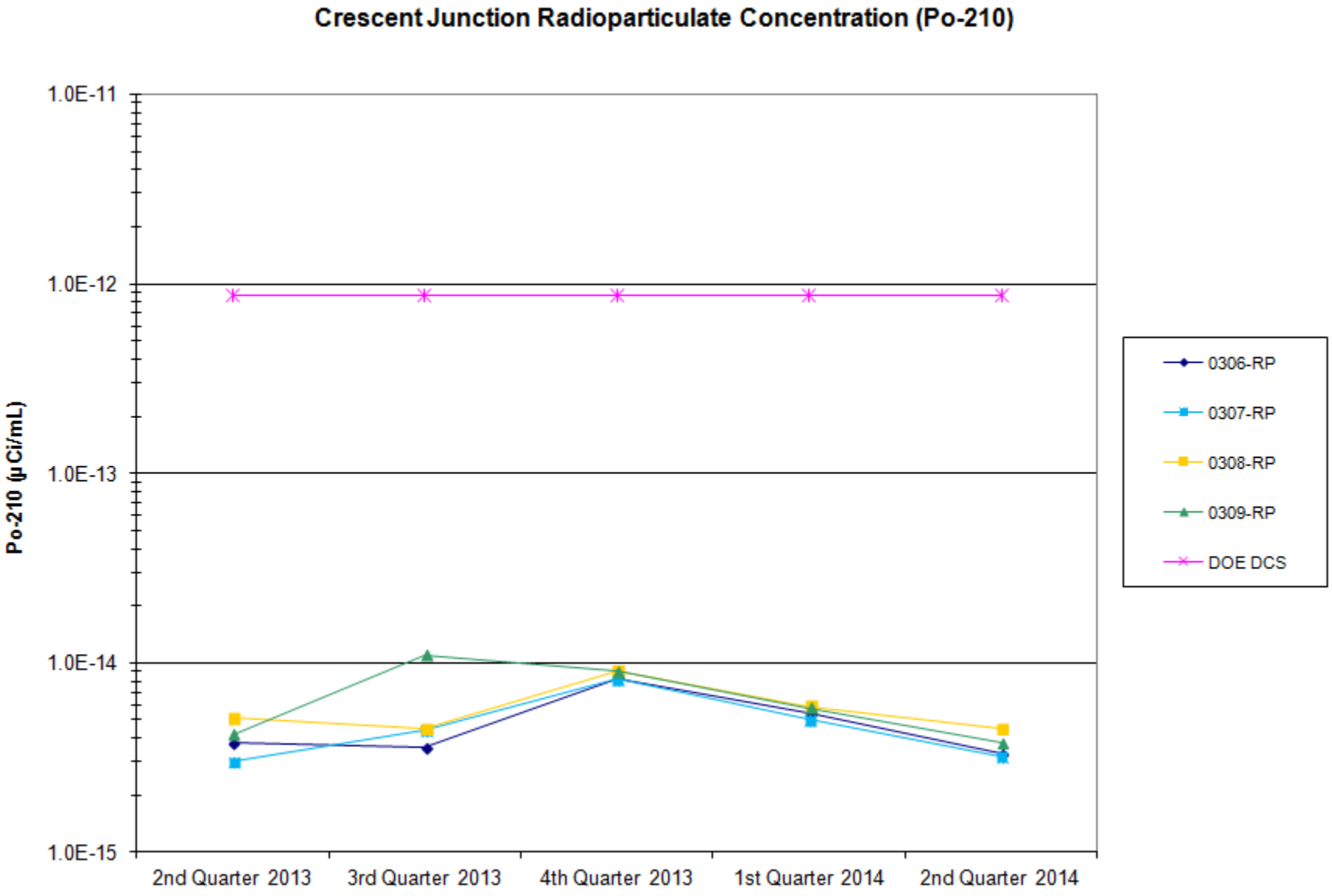

Figure 10. Polonium-210 Concentrations at Select Crescent Junction Monitoring Locations

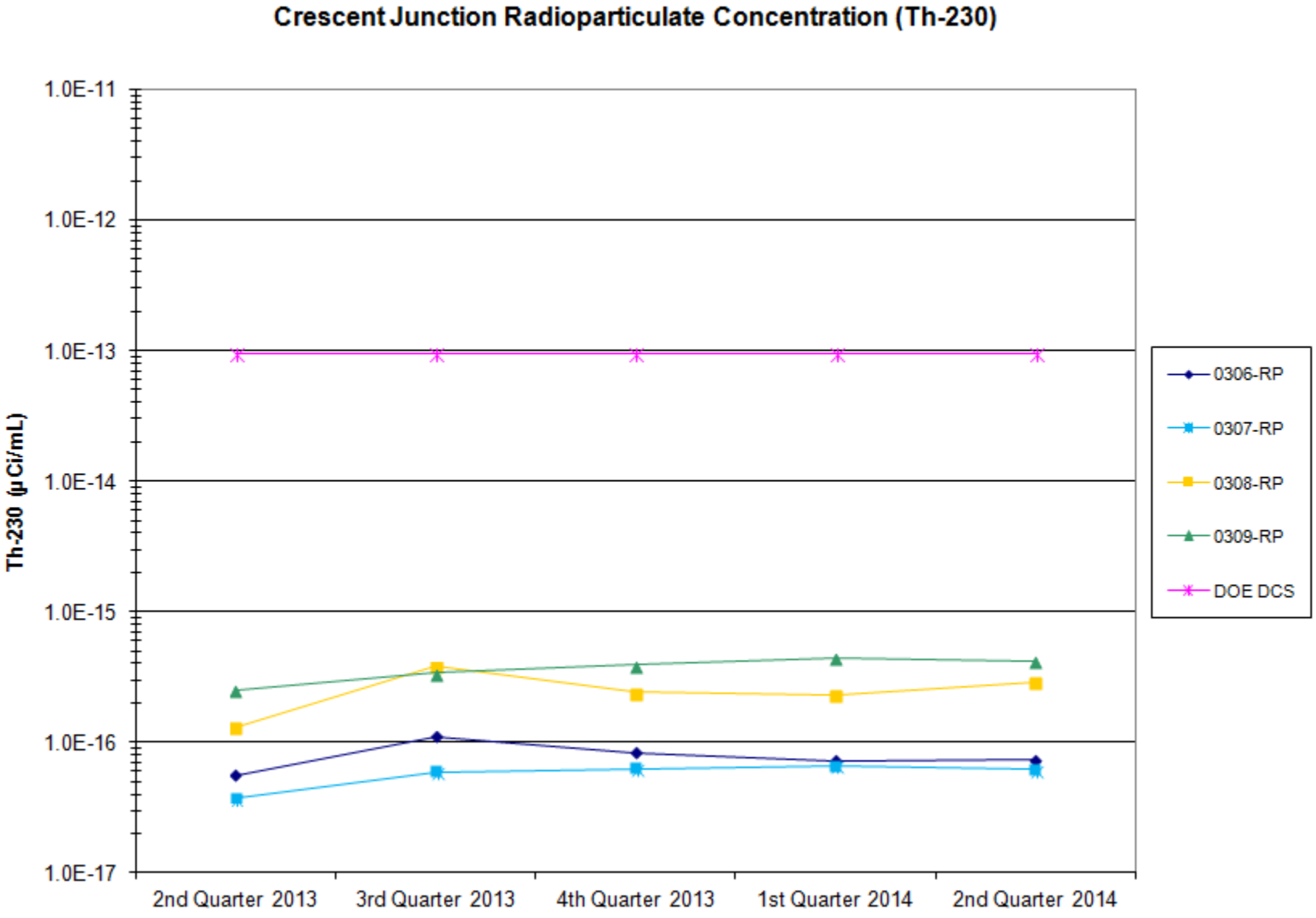

Figure 11. Thorium-230 Concentrations at Select Crescent Junction Monitoring Locations

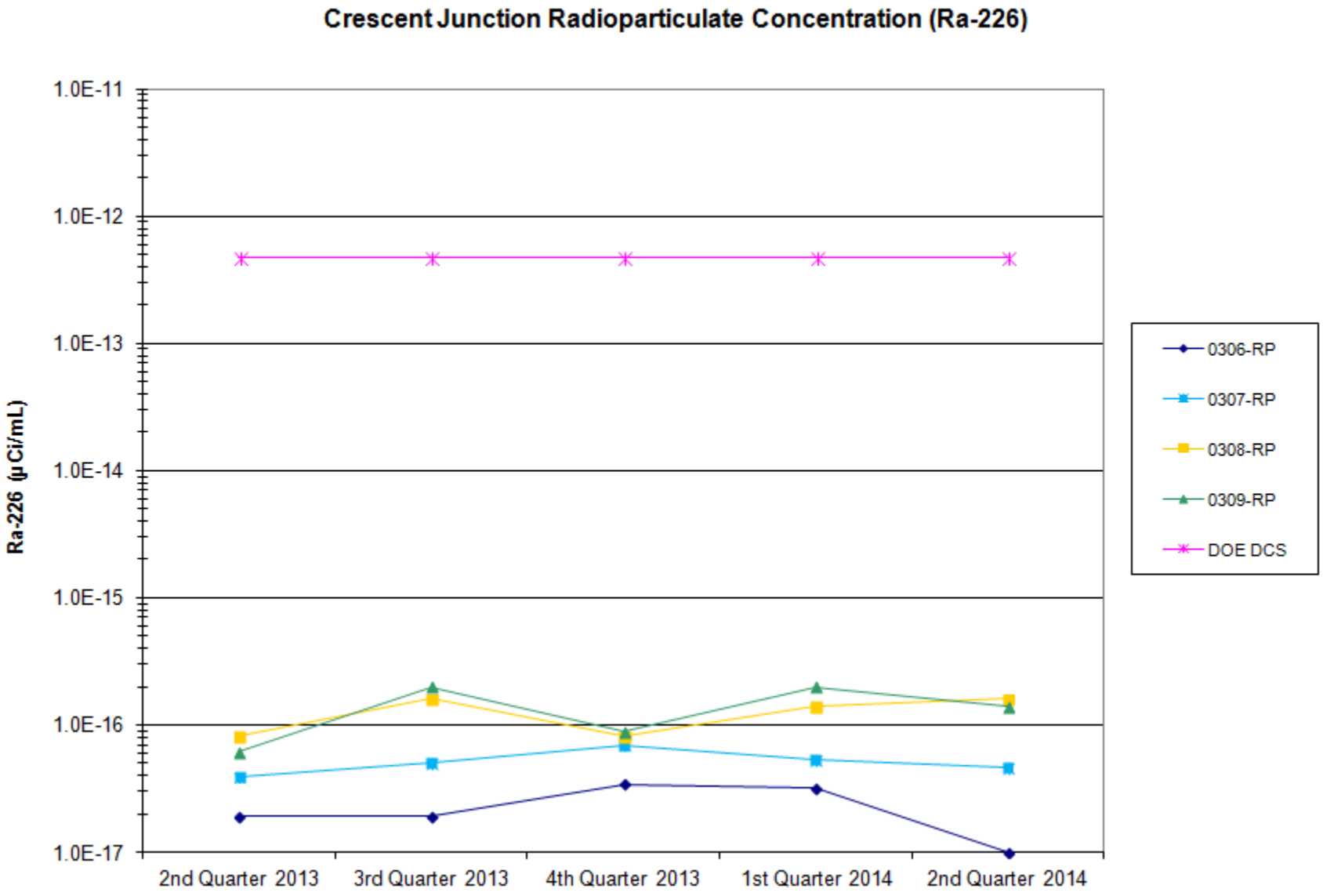

Figure 12. Radium-226 Concentrations at Select Crescent Junction Monitoring Locations

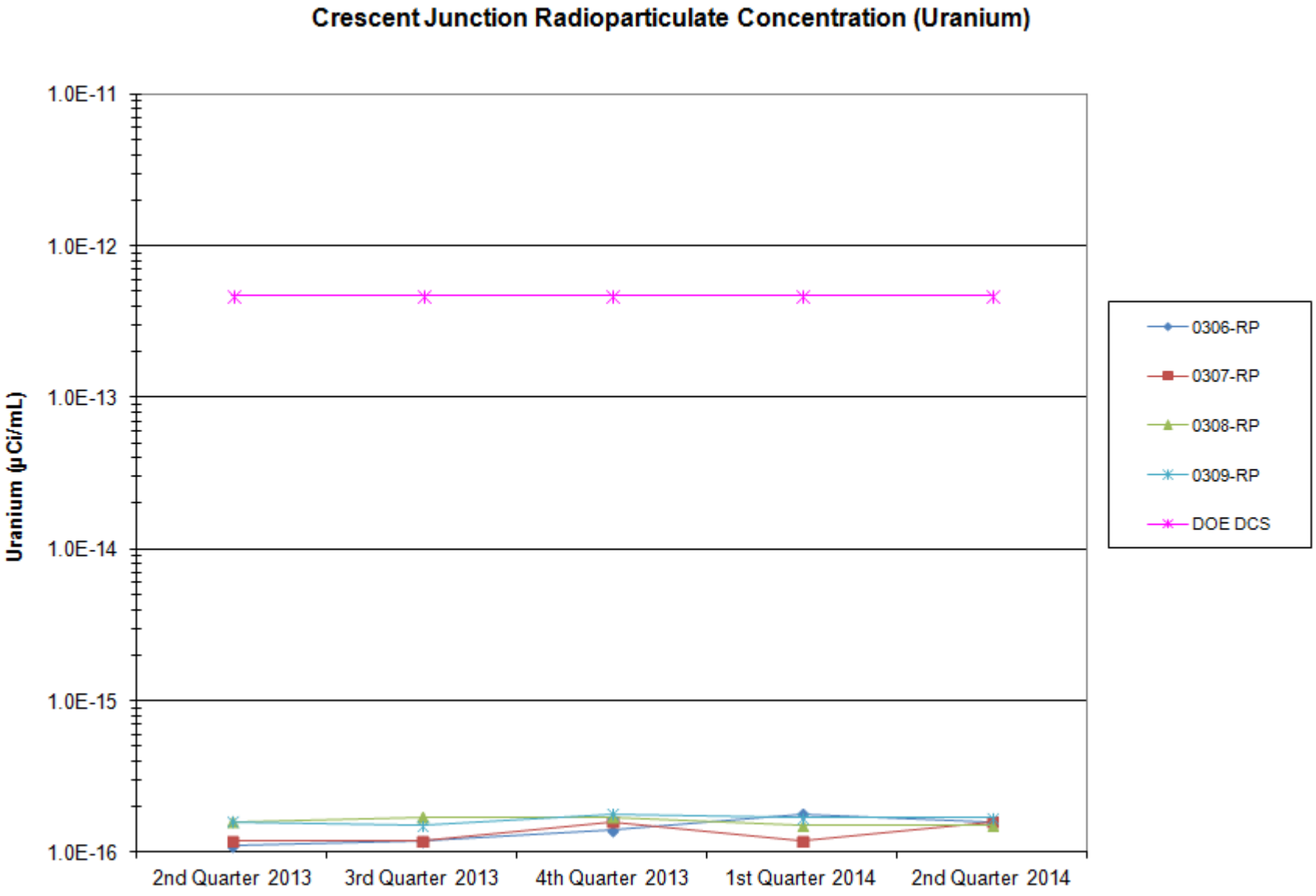

Figure 13. Total Uranium Concentrations at Select Crescent Junction Monitoring Locations

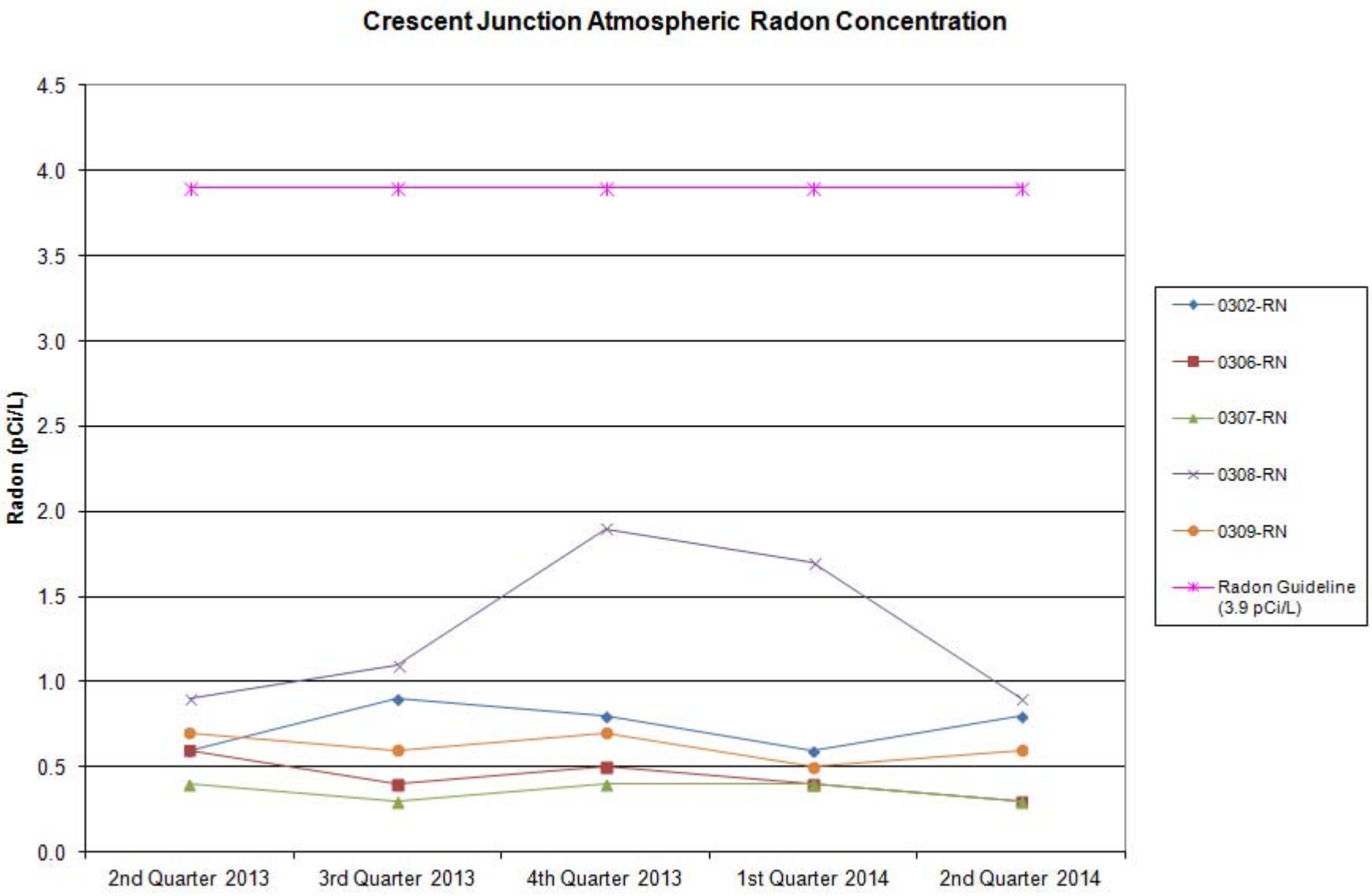

Figure 14. Atmospheric Radon-222 Concentrations at Select Crescent Junction Monitoring Locations

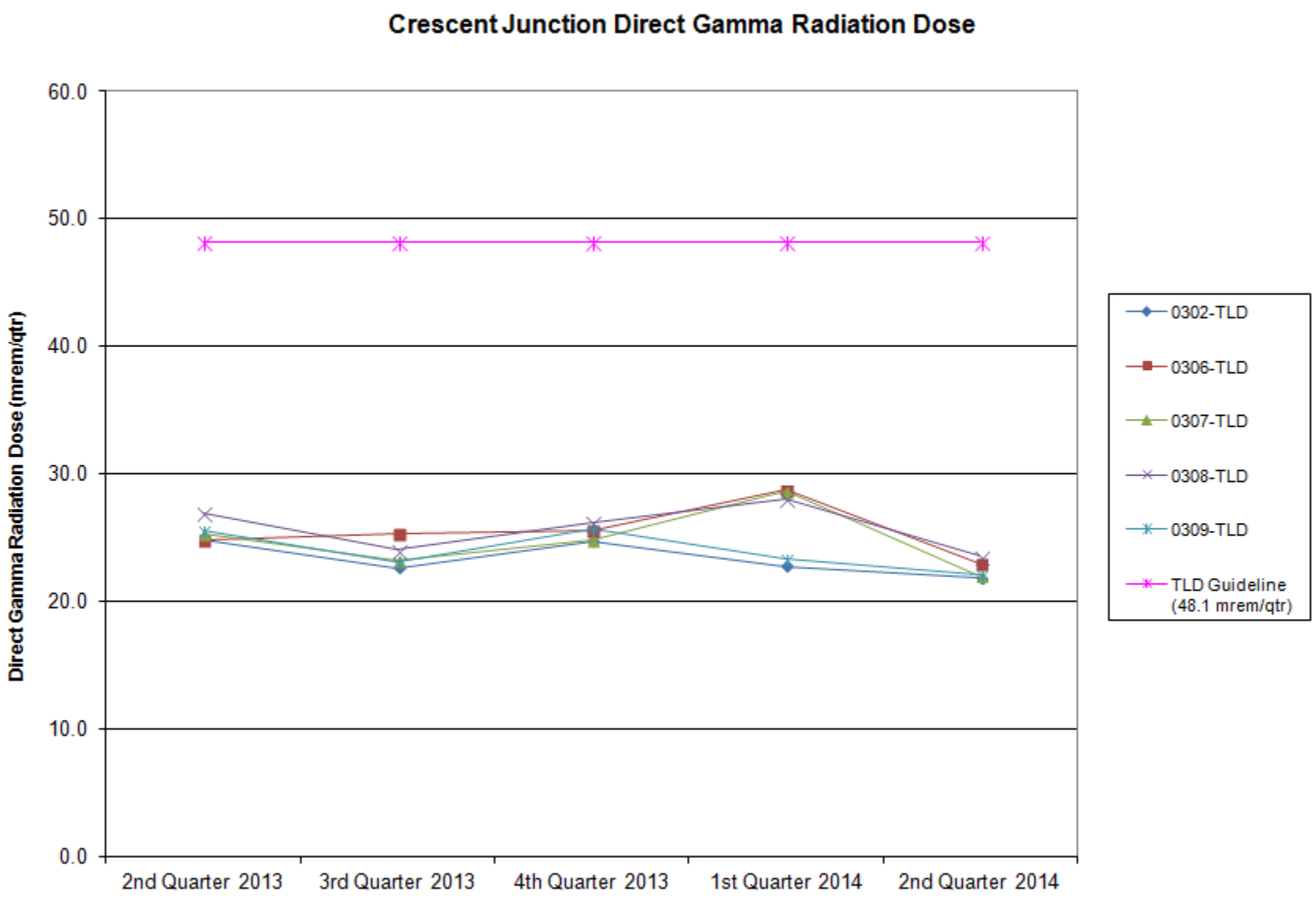

Figure 15. Direct Gamma Radiation Dose at Select Crescent Junction Monitoring Locations