DOE-EM/GJTAC3064

Moab UMTRA Project Environmental Air Monitoring Data Quarterly Report for the Moab and Crescent Junction, Utah, Sites Second Quarter 2021 (April - June 2021)

Revision 0

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Moab UMTRA Project
Environmental Air Monitoring Data Quarterly Report for the Moab and Crescent Junction, Utah, Sites Second Quarter 2021 (April – June 2021)

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Review and Approval

10/14/2021

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Revision History

Revision	Date	Description
0	October 2021	Initial issue.

Contents

Figures

Tables

Tables *(continued)*

Acronyms and Abbreviations

DOE	Department of Energy
MEI	maximally exposed individual
mrem	millirems
pCi	picocurie
pCi/L	picocurie per liter
SAP	Sampling Analysis Plan
TED	total effective dose
TLD	thermoluminescent dosimeter
UMTRA	Uranium Mill Tailings Remedial Action

1.0 Introduction

The purpose of this Report is to present the results of environmental air monitoring at the U.S. Department of Energy (DOE) Moab Uranium Mill Tailings Remedial Action (UMTRA) Project sites during the second quarter of 2021. The Project sites consist of the former uranium ore-processing mill located three miles north of Moab, Utah**,** and the disposal site located near Crescent Junction, Utah.

2.0 Regulatory Requirements

This Report demonstrates compliance with DOE Order (O) 458.1, Admin Chg 4, "Radiation Protection of the Public and the Environment," which states DOE radiological activities must be conducted in a manner that does not cause total effective dose (TED) to the public to exceed 100 millirems (mrem) in a year, or an equivalent dose to the lens of the eye exceeding 1,500 mrem in a year, or an equivalent dose to the skin or extremities of 5,000 mrem in a year. This limit excludes doses from background radiation, radon gas and its decay products in air, occupational doses, and medical exposures.

For the Project, the total effective dose is the sum of the direct gamma radiation (minus background) and radioactive particulate material (radioparticulate) exposure. DOE O 458.1 also specifies releases of radioactive material to the atmosphere from DOE activities shall not exceed an annual average concentration of 3 picocuries per liter (pCi/L) of radon or its decay products, excluding background, at the site boundary.

Compliance with DOE O 458.1 is demonstrated by calculating the total effective dose to the maximally exposed individual (MEI) or the representative person or group from the public likely to receive the highest radiation dose based on exposure pathways and parameters. The Project has established an MEI for the Moab and Crescent Junction Project sites.

3.0 Results for April through June 2021

Monitoring data are reported quarterly for radon, direct gamma radiation, and select radioparticulates. Off-site monitoring locations for the Moab site are shown on Figure 1, and on-site and MEI locations are shown on Figure 2. Monitoring locations for the Crescent Junction site are shown on Figure 3.

3.1 Moab Site

There is a total of 27 air monitoring stations equipped with radon and gamma detectors associated with the Moab site. Fifteen of these stations are located within the site boundary, while the additional 12 are located at relevant locations off-site. Of these 27 stations, three on-site and six off-site stations are also equipped with air sampling pumps to measure air radioparticulates.

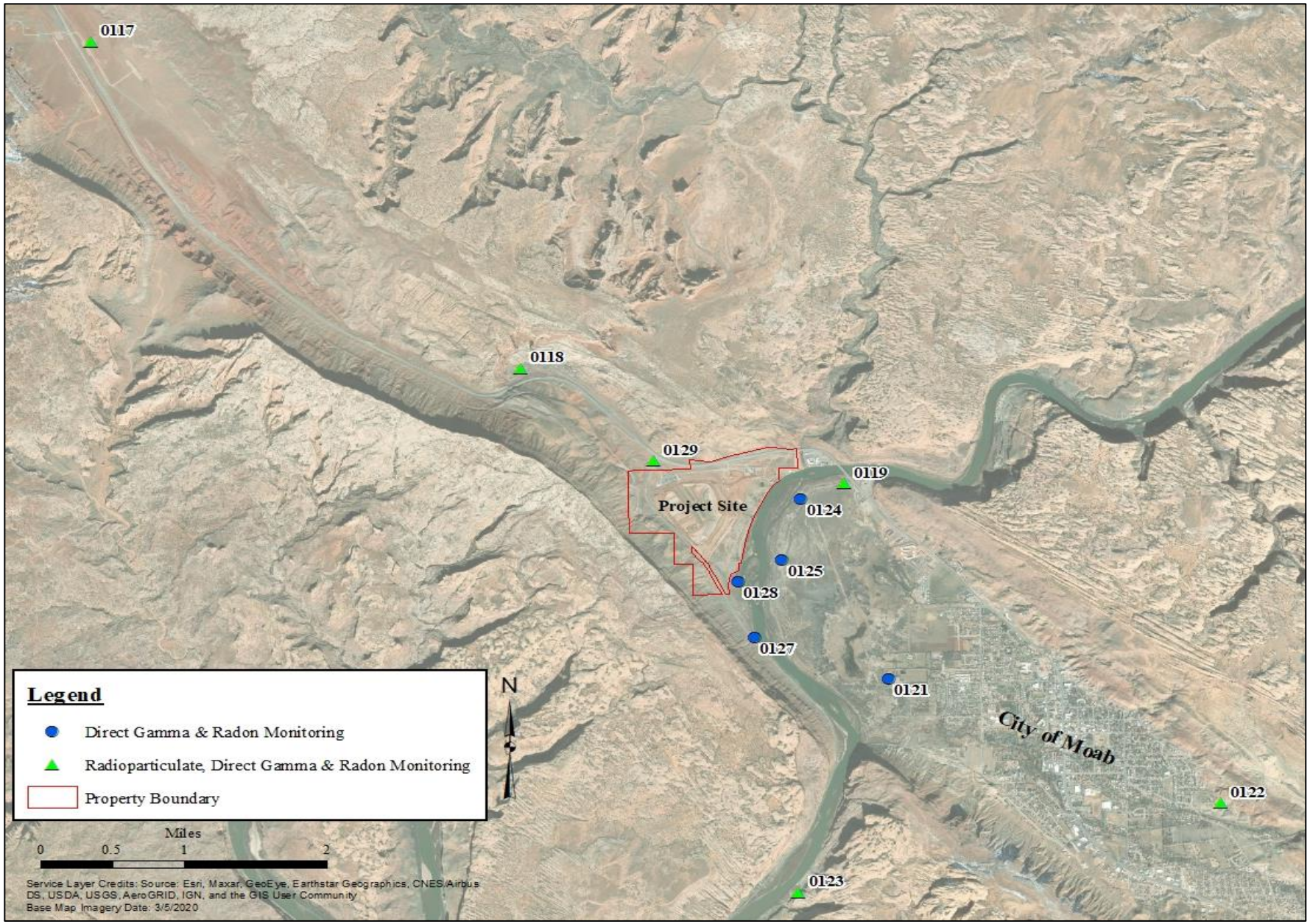

Figure 1. Moab Off-site Environmental Air Monitoring Locations

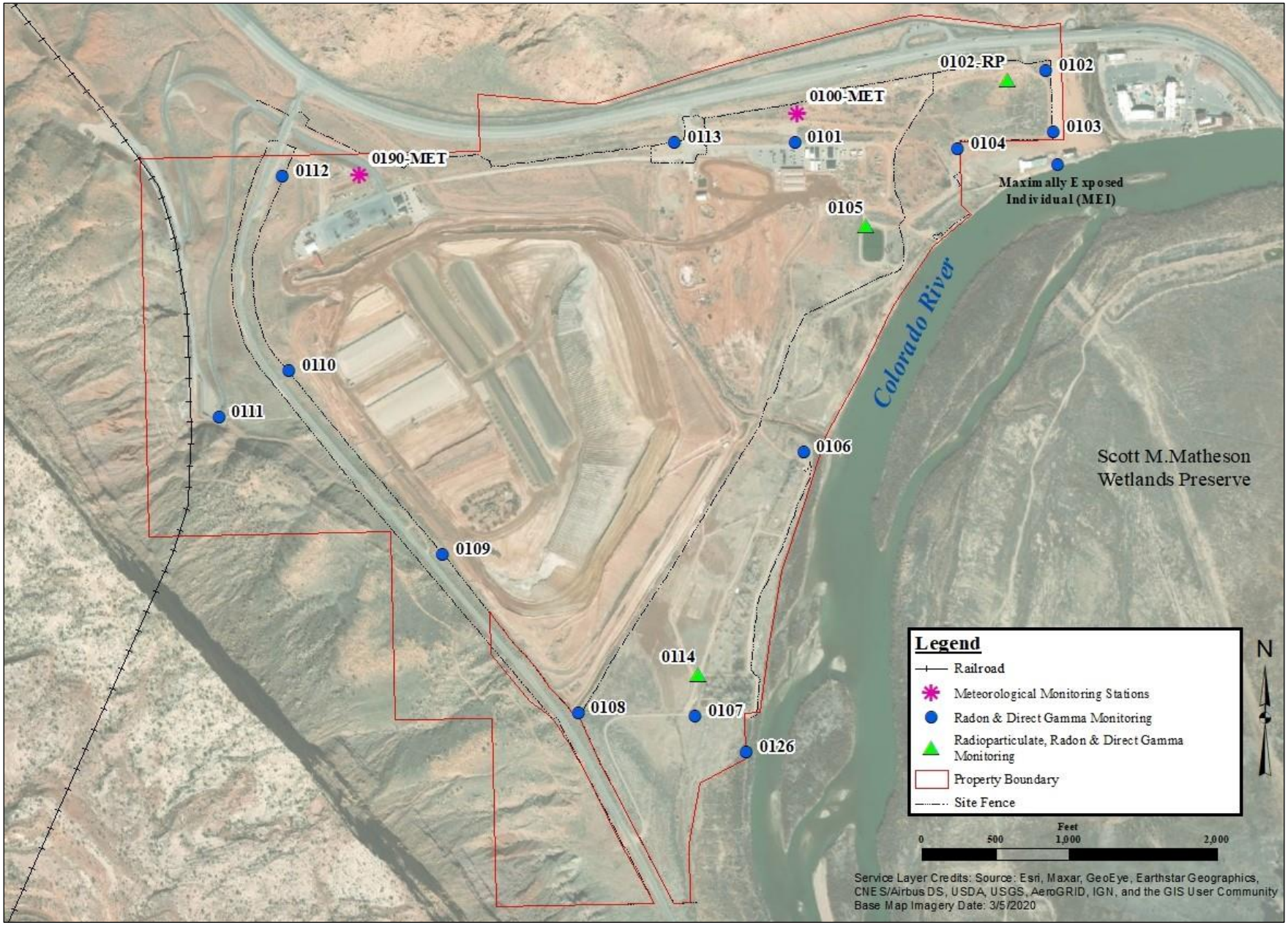

Figure 2. Moab On-site and Maximally Exposed Individual Environmental Air Monitoring Locations

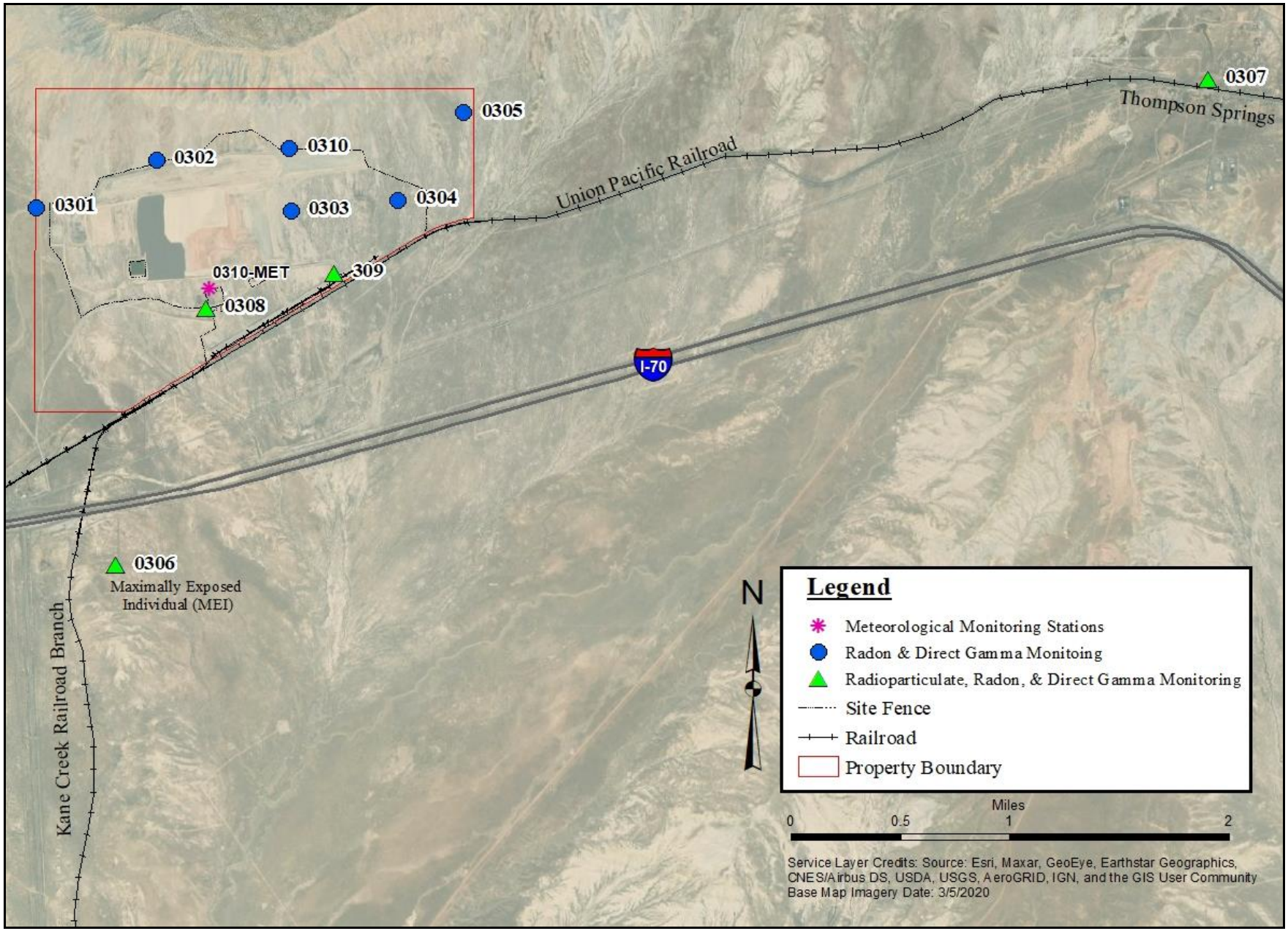

Figure 3. Crescent Junction Site Environmental Air Monitoring Locations

3.1.1 Meteorological Analysis

Meteorological data were collected from the on-site meteorological station (0190-Met) and downloaded from the Vista Data Vision online database, where meteorological data are uploaded from the site. Hourly averages were analyzed. Figure 4 displays the wind rose for this quarter, with the wedges on the wind rose showing which direction the wind is coming from. In second quarter 2021, the winds were primarily out of the northwest with the strongest winds from the southeast. The average temperature for the quarter was 71°F. The lowest recorded temperature for the quarter was 30°F, and the highest was 108°F.

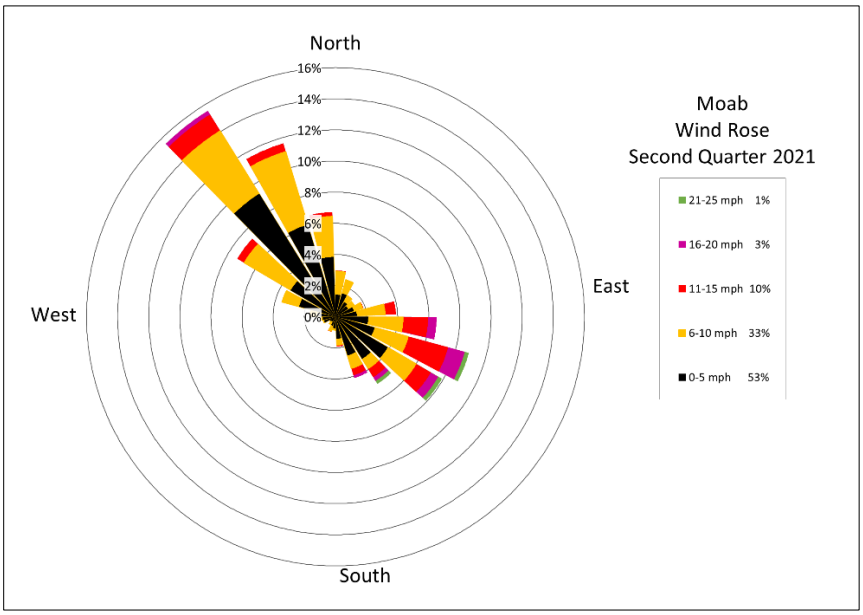

Figure 4. Moab Wind Rose for Second Quarter 2021

The site received 1.23 inches of precipitation during second quarter 2021. Figure 5 presents the Moab ten-year average (based on data collected from 2010 through 2020) along with 2020 and 2021 cumulative precipitation. As this graph displays, second quarter 2021 precipitation is less than the site's ten-year average.

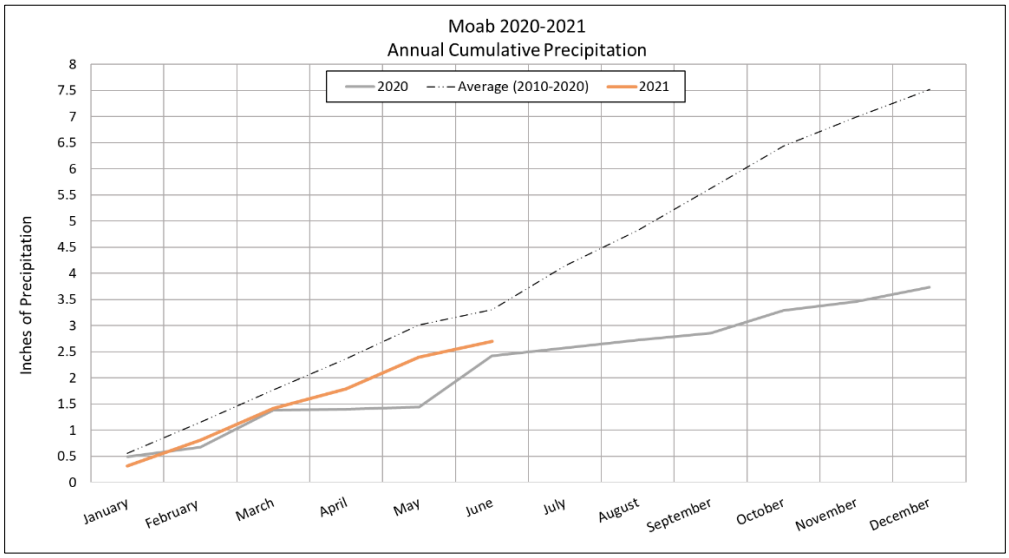

Figure 5. Moab Average, 2020, and Second Quarter 2021 Cumulative Precipitation

3.1.2 Radon

Based on five years of data collected between 2003 and 2008 from stations 0117 and 0123, the average background concentration of radon in the Moab area was established as 0.7 pCi/L. Therefore, the Project's annual average radon emission limit at the Moab site boundary is 3.7 pCi/L. On-site monitoring locations close to the site boundary or publicly accessible areas are used to demonstrate compliance at the boundary. Table 1 shows quarterly and annual radon results for the past year (including background) for on- and off-site locations.

Table 1. Radon Concentrations for the Moab Site for the Past Year

Station Number	Third Quarter 2020 (pCi/L)	Fourth Quarter 2020 (pCi/L)	First Quarter 2021 (pCi/L)	Second Quarter 2021 (pCi/L)	Annual Average Concentration Based on Four Quarters (pCi/L)
On-site Locations					
0101	2.8	5.1	2.3	1.4	**2.9**
0102	1.5	2.8	2.0	0.9	**1.8**
0103	1.4	3.0	1.6	0.8	**1.7**
0104	2.3	4.5	2.1	1.2	**2.5**
0105	2.5	5.2	2.4	1.4	**2.9**
0106	3.1	6.6	3.5	1.9	**3.8**
0107	2.6	5.0	3.1	1.5	**3.1**
0108	3.6	5.5	2.9	2.1	**3.5**
0109	1.9	2.2	1.4	1.5	**1.8**
0110	2.1	2.1	1.2	0.9	**1.6**
0111	0.9	1.0	0.7	0.4	**0.7**
0112	2.5	2.8	1.4	1.0	**1.9**
0113	3.3	5.1	2.1	1.7	**3.1**
0114	2.9	5.6	3.5	1.8	**3.5**
0126	2.1	4.2	2.5	1.2	**2.5**
Off-site Locations					
0117	0.4	0.7	0.5	0.2	**0.4**
0118	0.8	0.9	0.7	0.3	**0.7**
0119	0.9	1.5	1.2	0.5	**1.0**
0121	0.7	0.9	0.6	0.3	**0.6**
0122	0.4	0.5	0.5	0.2	**0.4**
0123	0.4	0.7	0.5	0.2	**0.5**
0124	1.1	2.2	1.4	0.6	**1.3**
0125	1.2	2.3	1.6	0.8	**1.5**
0127	0.9	1.7	1.1	0.4	**1.0**
0128	1.9	4.1	2.3	1.3	**2.4**
0129	2.1	2.6	1.2	0.9	**1.7**
MEI	1.4	2.8	1.5	0.7	**1.6**

Background has not been subtracted from annual values

The Moab locations with the highest annual average radon concentrations as of second quarter 2021 are displayed in Figure 6. Locations 0101, 0106, 0107, 0108, 0113, and 0114 continue to have the highest annual average from the last quarter. Location 0106 was the only station that exceeded the 3.7 pCI/L annual average limit. However, this station is located on-site and no member of the public has access to or occupies that location to receive a dose in excess of the annual limit. When compared to the previous quarter, the data indicate second quarter 2021 concentrations at all locations decreased as much as 1.7 pCi/L, except for one location, which increased 0.1 pCi/L.

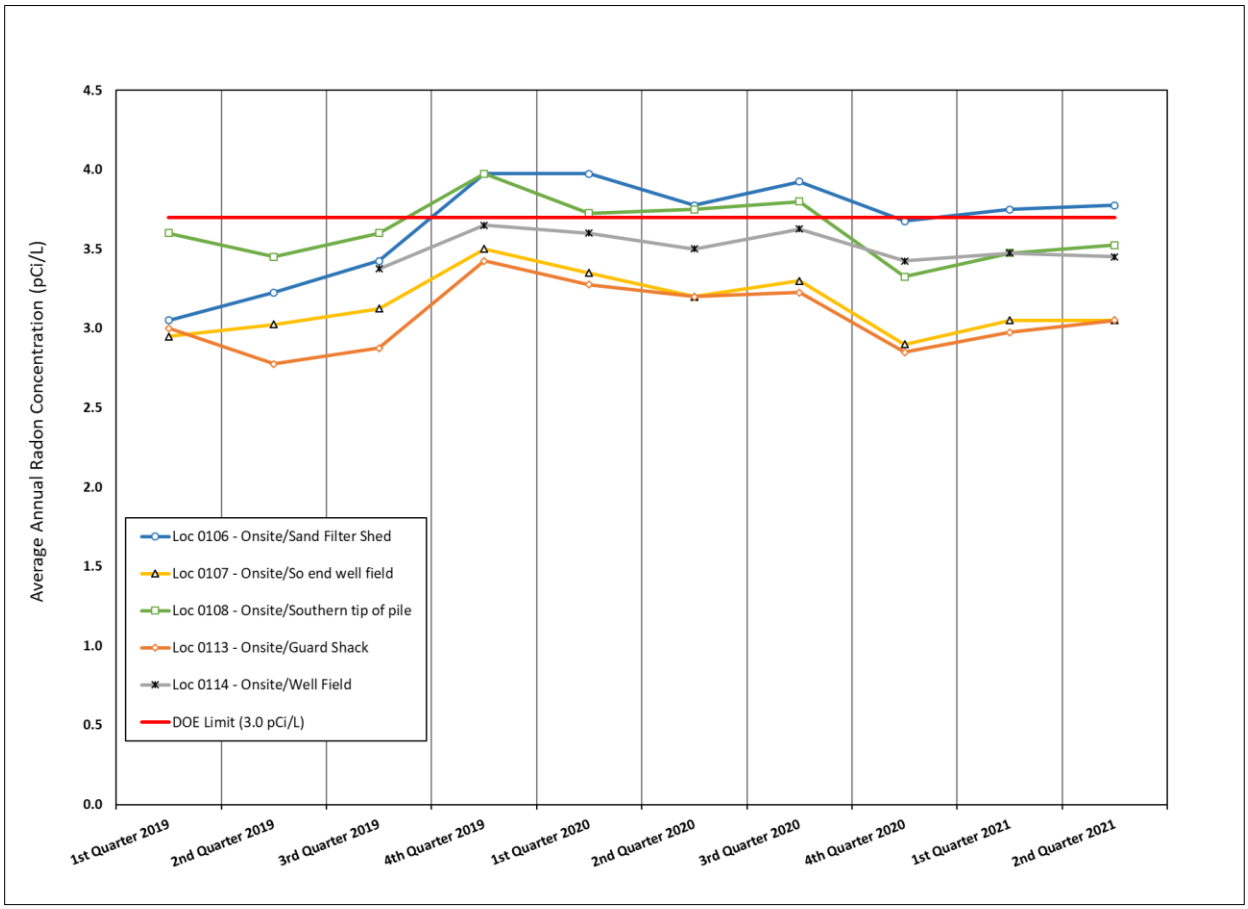

Figure 6. Moab Locations with Highest Second Quarter 2021 Average Annual Radon Concentrations

3.1.3 Direct Gamma Radiation

The average annual background (based on five years of data collected between 2003 and 2008) of direct gamma radiation effective dose for the Moab area was established as 82 mrem/year. Table 2 provides quarterly and annual gamma results for the past year, including background, at on- and off-site locations. The annual gamma dose represents the dose an individual would receive from occupying a location for an entire year.

Compared to the previous quarter, this quarter's results indicate the dose decreased at six on-site locations as much as 4 mrem, while five on-site locations increased as much as 13 mrem (location 0109). Three on-site location results indicated no change from the previous quarter. The off-site results indicate eight stations decreased as much as 2 mrem, while four locations increased as much as 3 mrem.

Table 2. Gamma Radiation Effective Doses for the Moab Site for the Past Year

Station Number	Third Quarter 2020 (mrem)	Fourth Quarter 2020 (mrem)	First Quarter 2021 (mrem)	Second Quarter 2021 (mrem)	Annual Dose Based on Four Quarters (mrem)
On-site Locations					
0101	43	44	40	43	**170**
0102	26	27	29	25	**107**
0103	25	28	28	27	**108**
0104	27	30	31	31	**119**
0105	28	31	30	29	**118**
0106	37	38	41	37	**153**
0107	30	32	34	33	**129**
0108	46	46	48	50	**190**
0109	119	112	109	122	**462**
0110	108	96	97	98	**399**
0111	39	40	NS	41	**NA**
0112	53	52	51	51	**207**
0113	43	44	37	38	**162**
0114	34	36	37	34	**141**
0126	28	31	34	34	**127**
Off-site Locations					
0117	26	28	30	29	**113**
0118	24	25	28	29	**106**
0119	25	25	32	30	**112**
0121	22	24	26	25	**97**
0122	20	22	25	23	**90**
0123	20	23	26	25	**94**
0124	27	29	28	29	**113**
0125	29	32	33	31	**125**
0127	27	26	29	28	**110**
0128	28	29	31	29	**117**
0129	33	33	34	37	**137**
MEI	27	28	26	28	**109**

Background has not been subtracted from annual values

NS = No Sample collected from this location, TLD missing upon collection (unknown cause)

NA = Not Applicable, insufficient data to calculate a representative annual dose

3.1.4 Radioparticulates

The effective background dose from inhalation of radioparticulates was not determined, so all effective dose from radioparticulates measured at the Project's monitoring stations are assumed to be from the Project. Table 3 provides the calculated quarterly and annual effective dose from inhalation of radioparticulates for the past year for the Moab site. Filters were analyzed for concentrations of total uranium, actinium-227, thorium-230, radium-226, and polonium-210. Since actinium-227 and protactinium-231 are assumed to be in equilibrium, the concentration of protactinium-231 is estimated by dividing the analyzed actinium-227 concentration by a correction factor of 0.614, which is consistent with the Moab UMTRA Project Health Physics Plan (DOE-EM/GJ3003).

Table 3. Radioparticulate Effective Doses for the Moab Site for the Past Year

Station Number	Isotope	Third Quarter 2020 (mrem)	Fourth Quarter 2020 (mrem)	First Quarter 2021 (mrem)	Second Quarter 2021 (mrem)	Annual Total Dose Based on Four Quarters (mrem)
On-site Locations						
0102-RP (MEI)	Total Uranium	0.003	0.003	0.002	0.003	**4.37**
	Thorium-230	0.045	0.043	0.021	0.025	
	Radium-226	0.057	0.088	0.013	0.035	
	Polonium-210	0.383	0.773	0.716	0.407	
	Actinium-227	0.303	0.536	0.072	0.513	
	Protactinium-231	0.070	0.123	0.017	0.118	
0105-RP	Total Uranium	0.005	0.005	0.003	0.004	**5.60**
	Thorium-230	0.141	0.160	0.080	0.083	
	Radium-226	0.114	0.101	0.101	0.101	
	Polonium-210	0.627	0.895	0.790	0.554	
	Actinium-227	0.490	0.629	ND	0.373	
	Protactinium-231	0.113	0.145	ND	0.086	
0114-RP	Total Uranium	0.006	0.004	0.003	0.005	**7.87**
	Thorium-230	0.208	0.115	0.131	0.165	
	Radium-226	0.154	0.141	0.185	0.211	
	Polonium-210	0.635	0.895	0.895	0.505	
	Actinium-227	0.629	0.839	0.816	0.653	
	Protactinium-231	0.145	0.193	0.188	0.150	
Off-site Locations						
0117-RP	Total Uranium	0.003	0.003	0.002	0.003	**3.42**
	Thorium-230	0.017	0.021	0.014	0.011	
	Radium-226	0.007	0.044	0.020	0.029	
	Polonium-210	0.358	0.602	0.700	0.301	
	Actinium-227	ND	0.839	0.149	0.051	
	Protactinium-231	ND	0.193	0.034	0.012	
0118-RP	Total Uranium	0.002	0.003	0.002	0.003	**2.87**
	Thorium-230	0.067	0.048	0.012	0.064	
	Radium-226	0.037	0.075	0.003	0.092	
	Polonium-210	0.326	0.562	0.513	0.350	
	Actinium-227	0.126	0.233	ND	0.217	
	Protactinium-231	0.029	0.054	ND	0.050	
0119-RP	Total Uranium	0.003	0.004	0.002	0.003	**3.78**
	Thorium-230	0.032	0.035	0.025	0.016	
	Radium-226	0.019	0.023	0.053	0.025	
	Polonium-210	0.350	0.692	0.724	0.334	
	Actinium-227	0.326	0.443	0.373	0.028	
	Protactinium-231	0.075	0.102	0.086	0.006	
0122-RP	Total Uranium	0.003	0.003	0.002	0.003	**3.33**
	Thorium-230	0.020	0.024	0.019	0.019	
	Radium-226	0.023	0.048	0.012	0.040	
	Polonium-210	0.423	0.651	0.659	0.317	
	Actinium-227	0.072	0.326	0.233	0.231	
	Protactinium-231	0.017	0.075	0.054	0.053	

Table 3. Radioparticulate Effective Doses for the Moab Site for the Past Year (continued)

Station Number	Isotope	Third Quarter 2020 (mrem)	Fourth Quarter 2020 (mrem)	First Quarter 2021 (mrem)	Second Quarter 2021 (mrem)	Annual Total Dose Based on Four Quarters (mrem)
Off-site Locations (*continued*)						
0123-RP	Total Uranium	0.002	0.003	0.002	0.003	**3.12**
	Thorium-230	0.023	0.021	0.020	0.023	
	Radium-226	0.019	0.016	0.027	0.032	
	Polonium-210	0.342	0.602	0.651	0.317	
	Actinium-227	0.280	0.280	0.168	0.103	
	Protactinium-231	0.064	0.064	0.039	0.024	
0129-RP	Total Uranium	0.004	0.005	0.003	0.005	**7.33**
	Thorium-230	0.293	0.184	0.104	0.264	
	Radium-226	0.136	0.158	0.132	0.128	
	Polonium-210	0.358	0.635	0.684	0.366	
	Actinium-227	0.979	0.536	0.396	1.235	
	Protactinium-231	0.225	0.123	0.091	0.284	

ND = not detected; analyte concentration below detection limit

These analytical results are used to calculate the effective dose from the inhalation of radioparticulates. The annual dose associated with the stations closest to the site operations (0102, 0105, 0114, and 0129) is higher compared to the remaining stations. Two on-site stations and two off-site stations saw an increase in annual dose (up to 0.167 mrem) compared to the previous quarter's annual dose. One on-site and four off-site stations saw a decrease in annual dose (up to 0.201 mrem).

3.1.5 Total Effective Dose

The Project must ensure the annual total effective dose from gamma radiation and radioparticulates from Project activities does not exceed 100 mrem above background. The MEI annual total effective dose for this quarter was 31.37 mrem, which is well below the DOE limit. This value was calculated by subtracting the background dose of 82 mrem from the MEI annual gamma radiation dose of 109 mrem and then adding the radioparticulate total dose of 4.37 mrem from location 0102, the closest radioparticulate station to the MEI. Nearly all of the dose to the MEI is due to direct gamma radiation. The dose to the lens of the eye, skin, and extremities is the same as a full body dose and is below the regulatory limit of 1500 mrem in a year to the lens of the eye and 5000 mrem in a year to the skin or extremities. Figure 7 shows total effective dose measured at the Moab site since 2019.

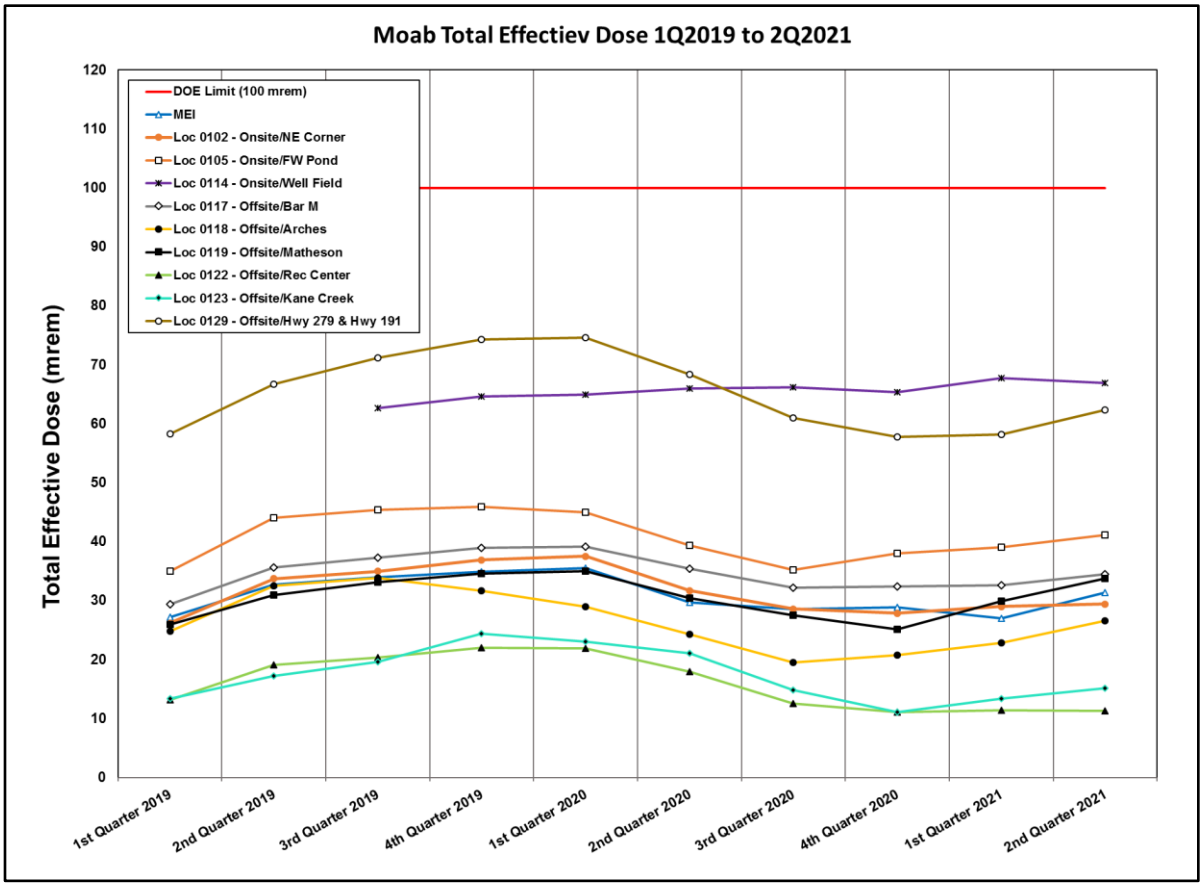

Figure 7. Total Effective Dose Measured at Moab Locations Since 2019

3.2 Crescent Junction Site

There are nine air monitoring stations associated with the Crescent Junction site, two located off-site and seven on-site. All nine are equipped with radon and gamma detectors. Two on-site and two off-site stations are also equipped with air sampling pumps to measure air radioparticulates. After mill tailings disposal began in the second quarter of 2009, the Crescent Junction monitoring location 0306 became the MEI. Due to disposal cell excavation activities in third quarter 2020, station 0303 was removed. One radon and direct gamma station was added to the northern site boundary fence and labeled as 0310.

3.2.1 Meteorological Analysis

Meteorological data were collected from the on-site meteorological station and downloaded from the Vista Data Vision online database, where meteorological data are uploaded from the site. Hourly averages were analyzed. Due to complications with the on-site station, the off-site meteorological station was used for precipitation data. Figure 8 displays the wind rose for this quarter, with the wedges on the wind rose showing which direction the wind is coming from. In second quarter 2021, the prevailing winds were out of the west/southwest. The site received 1.03 inches of precipitation during the second quarter 2021. Figure 9 presents the Crescent Junction average (based on data collected from 2010 through 2020) in addition to the 2020 and 2021 cumulative precipitation. The average temperature for the quarter was 74°F. The lowest recorded temperature for the quarter was 38°F, and the highest was 103°F.

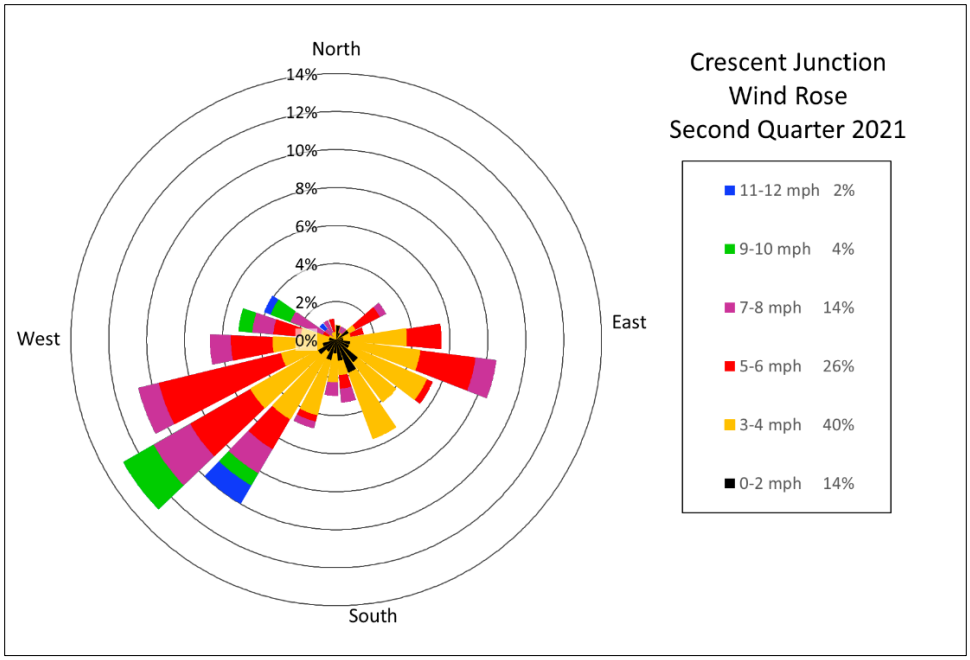

Figure 8. Crescent Junction Wind Rose for Second Quarter 2021

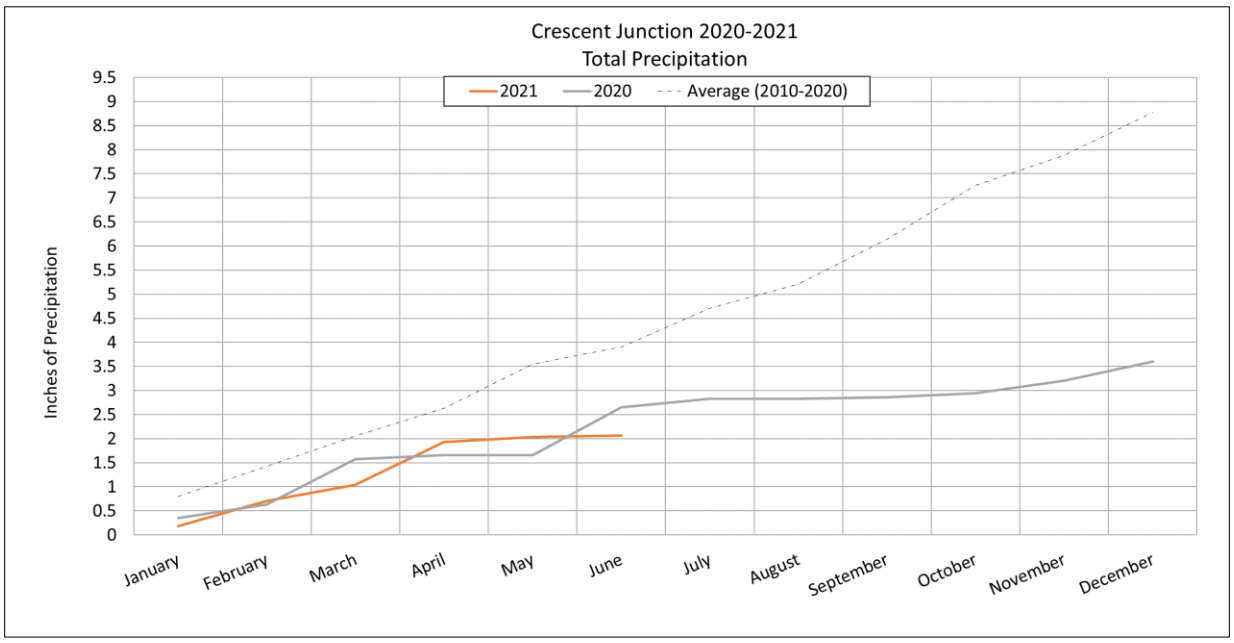

Figure 9. Crescent Junction Average, 2020, and Second Quarter 2021 Cumulative Precipitation

3.2.2 Radon

Based on three years of data from 2006 to 2009, the background concentration of radon in the Crescent Junction area was established as 0.9 pCi/L. Therefore, the Project must limit radon emissions at the Crescent Junction site boundary (withdrawal area) to 3.9 pCi/L. None of the on- or off-site stations exceeded the limit of 3.9 pCi/L in second quarter 2021. Locations 0301 and 0305 are used to demonstrate compliance with the public dose limit in DOE O 458.1 at the site boundary. Table 4 shows quarterly and annual radon results for the past year, including background for on- and off-site locations.

Table 4. Radon Concentrations for the Crescent Junction Site for the Past Year

Station Number	Third Quarter 2020 (pCi/L)	Fourth Quarter 2020 (pCi/L)	First Quarter 2021 (pCi/L)	Second Quarter 2021 (pCi/L)	Annual Average Concentration Based on Four Quarters (pCi/L)
On-site Locations					
0301	0.5	0.7	0.6	0.2	**0.5**
0302	0.7	1.1	0.7	0.5	**0.7**
0303	NS	NS	NS	NS	**NA**
0304	0.8	1.0	0.8	0.5	**0.8**
0305	0.6	0.8	0.5	0.3	**0.6**
0308	2.2	4.4	2.1	1.3	**2.5**
0309	1.4	2.8	1.8	1.2	**1.8**
0310	0.7	1.0	0.7	0.5	**0.7**
Off-site Locations					
0306 (MEI)	0.6	0.8	0.5	0.3	**0.6**
0307	0.4	0.7	0.5	0.2	**0.5**

Background has not been subtracted from annual values.

NS = No Sample collected from this location

NA = Not Applicable, insufficient data to calculate a representative annual average

Compared to the previous quarter, the quarterly radon concentrations at all stations decreased as much as 0.8 pCi/L. The Crescent Junction locations with the highest annual average radon concentrations during the second quarter are shown on Figure 10, which displays the annual average concentrations results for these locations since the first quarter of 2019.

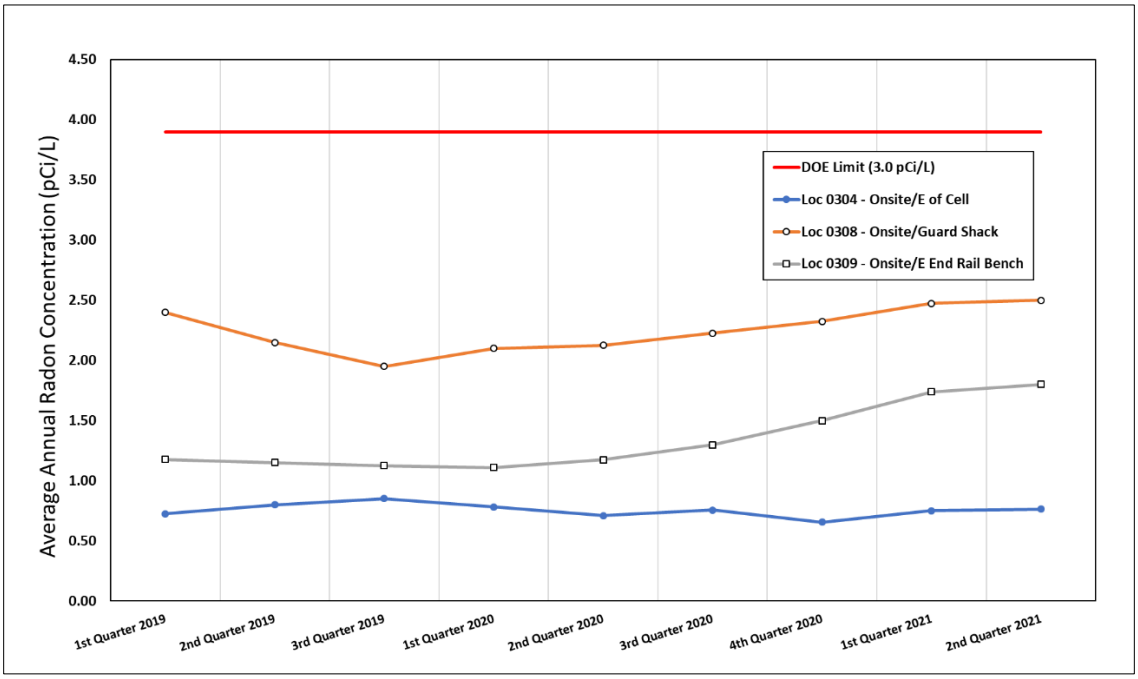

Figure 10. Crescent Junction Locations with Highest Second Quarter 2021 Average Annual Radon Concentrations

3.2.3 Direct Gamma Radiation

The average annual background direct gamma radiation exposure dose for the Crescent Junction area was established as 92.5 mrem based on three years of data collected from 2006 to 2009. Table 5 shows quarterly and annual results for the past year, including background for on- and off-site locations. The annual gamma dose represents the dose an individual would receive from occupying a location for an entire year.

This quarter's analytical results compared to the previous quarter's indicated that the gamma radiation dose decreased at four onsite locations (as much as 4 mrem) and increased at the three remaining locations (up to 1 mrem). The dose increased at one off-site locations (1 mrem), and decreased at the other off-site location (3 mrem). 0301 TLD was unable to be retrieved during the first quarter 2021 sample collection. Therefore, the 0301 duplicate was used to report results for that location.

Table 5. Gamma Radiation Effective Doses for the Crescent Junction Site for the Past Year

Station Number	Third Quarter 2020 (mrem)	Fourth Quarter 2020 (mrem)	First Quarter 2021 (mrem)	Second Quarter 2021 (mrem)	Annual Total Dose Based on Four Quarters (mrem)
On-site Locations					
0301	27	27	30	29	**113**
0302	26	28	31	27	**112**
0303	NS	NS	NS	NS	**NA**
0304	27	29	32	31	**119**
0305	26	28	32	31	**117**
0308	29	30	31	32	**122**
0309	28	27	33	34	**122**
0310	27	29	29	30	**115**
Off-site Locations					
0306 (MEI)	26	25	30	27	**108**
0307	27	30	31	33	**121**

Background has not been subtracted from annual values

NS = No Sample collected from this location

NA = Not Applicable, insufficient data to calculate a representative annual average

3.2.4 Radioparticulates

The effective background dose from inhalation of radioparticulates at the Crescent Junction site was not determined. Therefore, all effective dose measured at the Project's monitoring stations is assumed to be from the Project. Samples were collected at the four monitoring locations at or near the Crescent Junction site to determine the air particulate concentrations of total uranium, thorium-230, radium-226, polonium-210, actinium-227, and protactinium-231 (based on the actinium-227 concentration, as described in Section 3.1.4). The two Crescent Junction onsite locations saw an increase in annual dose, as much as 0.217 mrem, while the two off-site locations saw a decrease in annual dose, as much as 0.225 mrem. Table 6 shows radioparticulate effective doses for the Crescent Junction site for the past year.

Table 6. Radioparticulate Effective Doses for the Crescent Junction Site for the Past Year

Station Number	Isotope	Third Quarter 2020 (mrem)	Fourth Quarter 2020 (mrem)	First Quarter 2021 (mrem)	Second Quarter 2021 (mrem)	Annual Total Dose Based on Four Quarters (mrem)
On-site Locations						
0308-RP	Total Uranium	0.003	0.003	0.003	0.003	**4.36**
	Thorium-230	0.120	0.077	0.069	0.077	
	Radium-226	0.097	0.092	0.092	0.123	
	Polonium-210	0.366	0.562	0.684	0.326	
	Actinium-227	0.559	0.373	0.049	0.373	
	Protactinium-231	0.129	0.086	0.011	0.086	
0309-RP	Total Uranium	0.005	0.005	0.003	0.003	**5.53**
	Thorium-230	0.115	0.104	0.141	0.101	
	Radium-226	0.128	0.172	0.216	0.114	
	Polonium-210	0.456	0.586	0.651	0.317	
	Actinium-227	0.396	0.536	0.536	0.490	
	Protactinium-231	0.091	0.123	0.123	0.113	
Off-site Locations						
306-RP MEI	Total Uranium	0.002	0.002	0.002	0.002	**2.67**
	Thorium-230	0.015	0.013	0.015	0.017	
	Radium-226	0.037	0.039	0.030	0.002	
	Polonium-210	0.358	0.505	0.627	0.285	
	Actinium-227	0.280	0.131	0.154	0.023	
	Protactinium-231	0.064	0.030	0.035	0.005	
0307-RP	Total Uranium	0.002	0.002	0.002	0.003	**2.37**
	Thorium-230	0.013	0.008	0.013	0.021	
	Radium-226	0.019	0.017	0.009	0.015	
	Polonium-210	0.334	0.488	0.521	0.269	
	Actinium-227	0.350	0.168	ND	ND	
	Protactinium-231	0.080	0.039	ND	ND	

ND = not detected; analyte concentration below detection limit

3.2.5 Total Effective Dose

The annual total effective dose to the Crescent Junction MEI was 18.17 mrem, which is well below the annual limit of 100 mrem. This is calculated by subtracting the background dose of 92.5 mrem from the MEI (location 0306) gamma radiation dose of 108 mrem, and then adding the radioparticulate dose of 2.67 mrem for the MEI. Figure 11 is a plot of the total effective dose from the four Crescent Junction locations since 2019. In Figure 11, the background was subtracted from the total effective dose calculations, therefore, the DOE limit is shown as 100 mrem. Nearly all of the dose to the MEI is due to direct gamma radiation. The dose to the lens of the eye, skin, and extremities is the same as a full body dose and is below the regulatory limit of 1500 mrem in a year to the lens of the eye and 5000 mrem in a year to the skin or extremities.

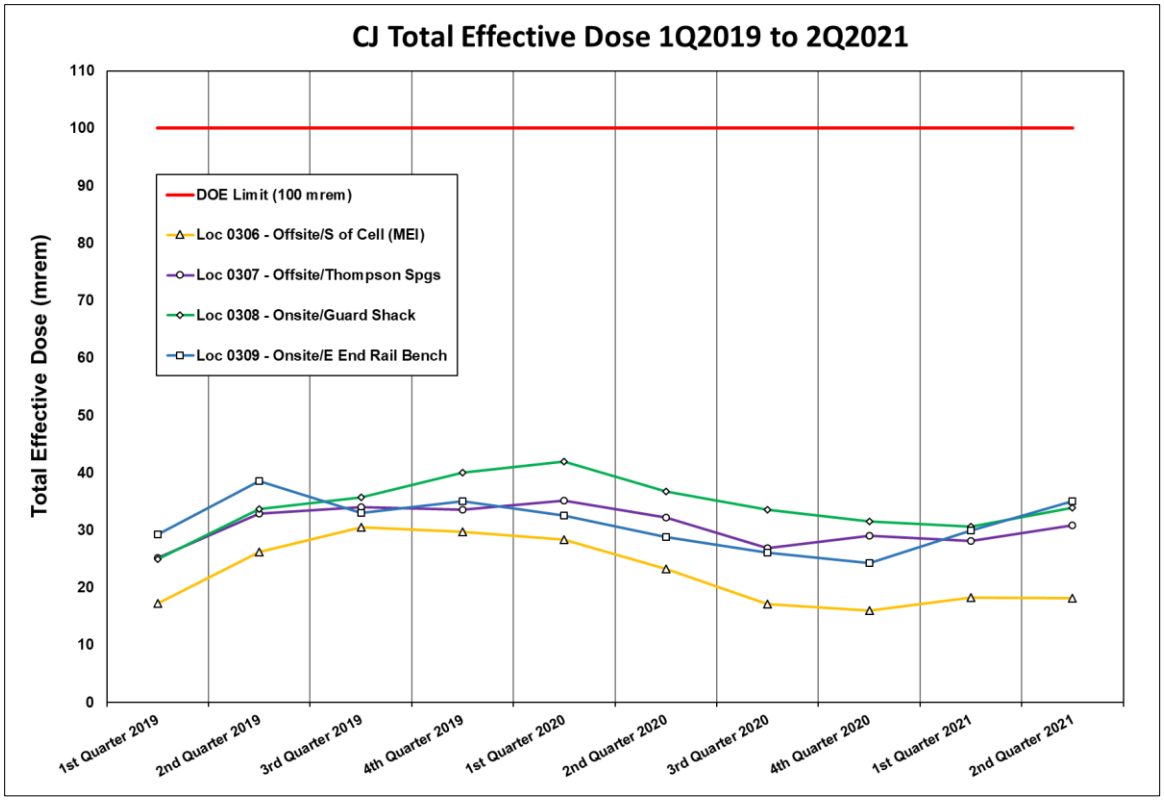

Figure 11. Total Effective Dose Measured at Crescent Junction Locations Since 2019

4.0 Data Assessment

Radon detectors, thermoluminescent dosimeters used for continuous dose measurements, and radioparticulate sample filters were sent to qualified off-site laboratories for analyses in accordance with the *Moab UMTRA Project Environmental Air Monitoring Sampling and Analysis Plan* (SAP) (DOE-EM/GJTAC2219). Qualified Project personnel evaluated the analytical data received for consistency with other data points and Quality Assurance/Quality Control samples.

4.1 Quality Assurance/Quality Control Sampling

Duplicate samples for radon were collected at Moab locations 0102, 0108, and 0111, and at Crescent Junction locations 0303 and 0308. In addition, duplicate direct gamma samples were collected at Moab locations 0102, 0108, and 0129 and Crescent Junction locations 0301 and 0305. All results associated with the duplicate sampling are provided in Table 7. No duplicate samples were collected for radioparticulate samples, per the SAP.

As Table 7 displays, the five locations that included duplicate radon samples were within 0.2 pCi/L of each other. The five locations equipped with duplicate gamma detectors were all within 5 mrem of each other. These radon and gamma duplicate results are within the acceptable ranges, and the data are considered valid based on these results.

Table 7. Duplicate Results for Second Quarter 2021

Location	Result	Duplicate Result
Moab		
Radon:	pCi/L	pCi/L
0102	0.9	0.7
0108	2.1	1.9
0111	0.4	0.5
Gamma:	mrem	Mrem
0102	25	26
0108	50	49
0129	37	32
Crescent Junction		
Radon:	pCi/L	pCi/L
0308	1.3	1.3
0310	0.5	0.4
Gamma:	mrem	mrem
0301	29	30
0305	31	31

Control samples measured the dose for gamma and radon while being shipped from the site to the respective analytical laboratories. Transit values for direct gamma was at or below background levels and was not subtracted from quarterly values. The Radonova lab subtracts the average transit exposure from the reported radon concentrations. The radon transit values are shown in Table 8.

Table 8. Shipment Control Sample Results for Second Quarter 2021

Sample	Result
Radon:	pCi/L
In-transit 1	9 +/- 9
In-transit 2	8 +/- 9
In-transit 3	2 +/- 9

4.2 Suspected Anomalies

All analytical data are reviewed for anomalous or outlying data points. Monitoring data are evaluated against historical and minimum/maximum values to determine if the reported data are within reasonable expected ranges. One location showed an anomalous value, location 0127. This value was still well below regulatory limits, and no member of the public has access to or occupies that location. The lab was contacted to reevaluate the results for that location. A revised report was issued with the corrected value used in this report.

4.3 Summary

Data collected during the second quarter of 2021 met the applicable laboratory control criteria for their respective analyses. The results were within the acceptable limits associated with each matrix. Data in this report are considered validated and may be treated as final results.

5.0 References

DOE (U.S. Department of Energy), *Moab UMTRA Project Environmental Air Monitoring Sampling and Analysis Plan* (DOE-EM/GJTAC2219).

DOE (U.S. Department of Energy), *Moab UMTRA Project Health Physics Plan* (DOE-EM/GJ3003).

DOE (U.S. Department of Energy) Order 458.1, Admin Chg. 4, "Radiation Protection of the Public and the Environment.