BASELINE DATA REPORT

Section 2.0

Climatology and Air Quality

OCTOBER 2009

Submitted To:

New Mexico Mining and Minerals Division
&
U.S. Forest Service (Cibola National Forest)

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2.0 Climatology and Air Quality

NMAC §19.10.6.602 D.(13) (a)

Baseline data shall include, as applicable:
(a) A description of the climatological factors representative of the permit area, including precipitation, prevailing winds, and temperature.

2.1 Regional Climate

Climate in the Roca Honda permit area may be classified as arid to semiarid continental, characterized by cool, dry winters, and warm, dry summers. The area is in the north end of climate division 4 (Southwestern Mountains) for New Mexico (Sheppard et al. 1999). Abundant sunshine, low relative humidity, and large annual and diurnal ranges in temperature are characteristics of this climate division, which is a significant distance from any source of oceanic moisture (600 miles from the Pacific Ocean and 800 miles from the Gulf of Mexico).

Winter is the driest season, and what precipitation falls (mostly as snow) is from storms that form in the Pacific Ocean, move inland, and lose most of their moisture in the mountains of California and Arizona. Snow falls from November through March and is light on the valley floors, but increases at higher elevations of the nearby mesas and mountains. The estimated average annual snowfall is 26 inches for the San Juan Basin (U.S. Department of Interior 1980).

The wettest period is in late summer and early fall. Approximately half of the annual precipitation in this region falls in this period from July through September, which averages more than 50 days of brief thunderstorms per year. The storms are sometimes heavy and can be accompanied by hail and strong, gusty winds (Baldwin 1973). These storms may bring several inches of rain to small areas in a short time, and runoff frequently causes local flash floods. In addition, precipitation events lasting several days may occur occasionally in September and October when tropical cyclones move into the area from the Gulf of Mexico or Gulf of California.

Estimates of relative humidity for this region from the soil survey of the McKinley County area show that relative humidity is highest in the early morning near dawn approximately 70 percent in winter and 45 percent in summer and falls to approximately 40 percent in winter and 15 to 20 percent in summer (NRCS 2006). June is usually the driest month, and mid-afternoon relative humidity is typically less than 15 percent. In June, the sun shines approximately 80 to 85 percent of the time, while in the rest of the summer it shines approximately 75 to 80 percent of the time. In winter, sunshine drops to approximately 65 to 70 percent of the time.

The annual rate of evaporation is approximately 75 to 80 inches as measured by standard evaporation pans, shown for the region in the Ground Water Atlas of the United States, Segment 2 (Robson and Banta 1995). Net lake evaporation for the region is 30 to 40 inches per year (New Mexico Interstate Stream Commission and New Mexico Office of the State Engineer 2002). Table 2-1 gives pan evaporation rates for two measuring stations near the permit area (Gallup Mt. Taylor Mill Site and Laguna, New Mexico). Both indicate yearly evaporation rates of about 63 inches per year.

Table 2-1. Monthly Pan Evaporation Rates for Two Sites Near the Permit Area

Location	Period of Record	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Annual
Mt. Taylor[1]	1976-1977	0.00[2]	0.00	3.83	8.09	9.07	12.08	9.70	8.80	6.36	4.65	0.00	0.00	62.58
Laguna[3]	1914-2005	0.00	0.00	0.00	8.47	9.33	11.98	10.76	8.88	6.83	5.00	1.98	0.00	63.23

[1]Located at the Mt. Taylor Uranium Mill Project Monitoring Site #5
[2]Many stations do not sample during winter months. A 0.00 total indicates no measurement is taken
[3]Source: http://www.wrcc.dri.edu/htmlfiles/westevap.final.html

Large-scale (or synoptic) winds in the region are most frequently from the southwest and west and are strongest between March and June, with the highest average speeds in March. Winds up to 60 miles per hour can accompany frontal activity associated with late winter and spring low pressure systems and thunderstorms (Baldwin 1973). The strong spring winds often bring considerable dust into the area.

Maps produced by the Western Regional Climate Center using precipitation data from 1961 to 1990 indicate that the permit area has an average rainfall of less than 12 inches. Average statewide precipitation for that same time period was 13.85 inches (WRCC 2009b).

2.2 Climatological Factors Representative of the Permit Area

Weather stations near the Roca Honda permit area with available weather statistics include San Mateo and Grants. The San Mateo weather station ceased operation in 1988 and had two separate reporting locations during its history. From 4/4/1918 to 11/19/1958 and again from 2/17/1966 to 2/29/1988, it was located in the community of San Mateo at an elevation of approximately 7,230 feet (ft). From 11/20/1958 to 2/16/1966, the station was located at the Floyd Lee Ranch approximately 1.5 miles southeast of the current Roca Honda weather station, at an elevation of approximately 7,075 ft. Figure 2-1 shows these locations relative to the permit area. These two locations are 1.5 miles apart and at similar elevations (+/- 50 ft) and are considered to be a single reporting location or station. This station has a Cooperative Observer Program (COOP) ID of 297918. Records can be accessed from the Western Regional Climate Center website, www.wrcc.dri.edu. The Grants location is at the Grants-Milan Airport approximately 20 miles southwest of the Roca Honda permit area at an elevation of 6,520 ft. This location recorded conditions from 1953 to the present and has a COOP ID of 293682. Records can be accessed from the National Climatic Data Center website, www.ncdc.noaa.gov.

Weather at San Mateo should be very similar to conditions at the Roca Honda permit area because of proximity and similar elevations. The RHR meteorological station was installed in Section 16, as shown on, Figure 2-1 in November 2007 and is at an elevation of 7,257 ft. Temperature and precipitation are similar at the two locations. The largest difference is in temperature. Mean annual temperatures were approximately 45° F and 51° F at San Mateo and Grants, respectively. This difference is consistent with the 600-ft elevation gain from Grants to San Mateo and the expected temperature decrease of approximately 5° F for each 1,000 ft of elevation (Tuan et al. 1973).

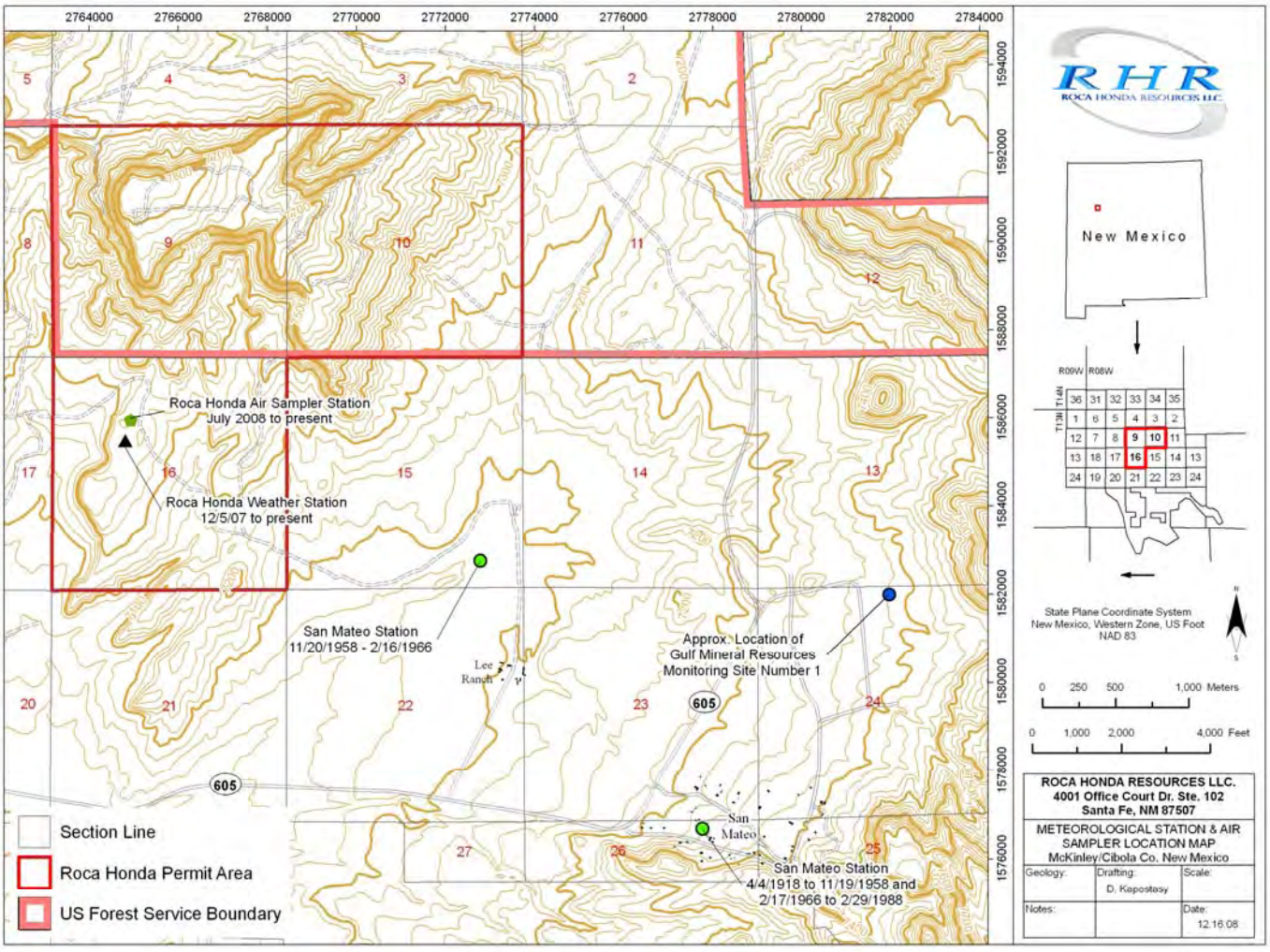

Figure 2-1. Meteorological Station Locations and Air Sampler Location

2.2.1 Precipitation

Annual average precipitation at the San Mateo weather station over the period of record, (i.e., 4/4/1918 - 2/29/1988) was 8.7 inches (See Table 2-2). This is less than expected given the elevation of the ranch and probably results from its location on a valley floor with topographic features that rise more than 1,000 ft to the southwest (La Jara Mesa) and east (Mesa Chivato and Mt. Taylor). The topographic features may block precipitation and create a rain shadow.

The months of July, August, and September average monthly precipitation amounts for San Mateo are 1.68, 2.11, and 1.12 inches, respectively (Table 2-2). The highest monthly precipitation during any month at San Mateo was 4.38 inches in August 1948 (Gulf Mineral Resources Company [GMRC] 1979). The highest single-day precipitation records at the Grants, Thoreau, McGaffey, and Zuni weather stations range from 1.9 to 2.6 inches produced by thunderstorms (NRCS 2006). Point Precipitation Frequency Estimates for San Mateo show that high rainfall events can occur (Bonnin et al. 2006).

The San Mateo weather station is near the valley floor and receives an annual average snowfall of approximately 10 inches, which is much less than the average snowfall for some other parts of the San Juan basin. Snowfall increases dramatically above the valley floors. Thoreau, approximately 40 miles west of San Mateo, has a similar elevation but is located on a slope above the valley floor and receives approximately 32 inches of snow annually (NRCS 2006).

Table 2-2. Monthly and Annual Climate Summary of Temperature and Precipitation for the San Mateo, NM,COOP Weather Station

Period of Record: April 4, 1918 to February 29, 1988													
	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Annual
Average Max. Temperature (° F)	40.6	44.4	51.6	61.0	70.6	81.1	83.0	79.6	73.2	62.9	50.9	41.4	61.7
Average Min. Temperature (° F)	15.4	18.9	25.2	30.7	40.4	50.0	55.1	53.2	46.3	35.9	25.3	17.0	34.4
Average Total Precipitation (inches)	0.38	0.29	0.37	0.30	0.49	0.52	1.68	2.16	1.11	0.74	0.45	0.35	8.83
Average Total Snowfall (inches)	3.0	2.3	1.5	0.1	0.1	0.0	0.0	0.0	0.0	0.3	1.3	3.1	11.8

2.2.2 Prevailing Winds

Local wind conditions at the Roca Honda permit area are affected by topographic features that modify general synoptic wind patterns. Wind measurements were not made at the San Mateo weather station, but several short-term meteorological monitoring stations were established in the middle to late 1970s in the vicinity of the proposed GMRC Mt. Taylor Uranium Mill Project. One of these stations, Monitoring Site No. 1, located 1.5 to 2 miles east-southeast of the Roca Honda permit area and approximately 1 mile north of the community of San Mateo, as shown in Figure 2-1, measured wind direction and speed for 1 year. Figure 2-2 is a wind rose diagram of that data. These measurements are expected to be representative for conditions in the San Mateo valley (GMRC 1979).

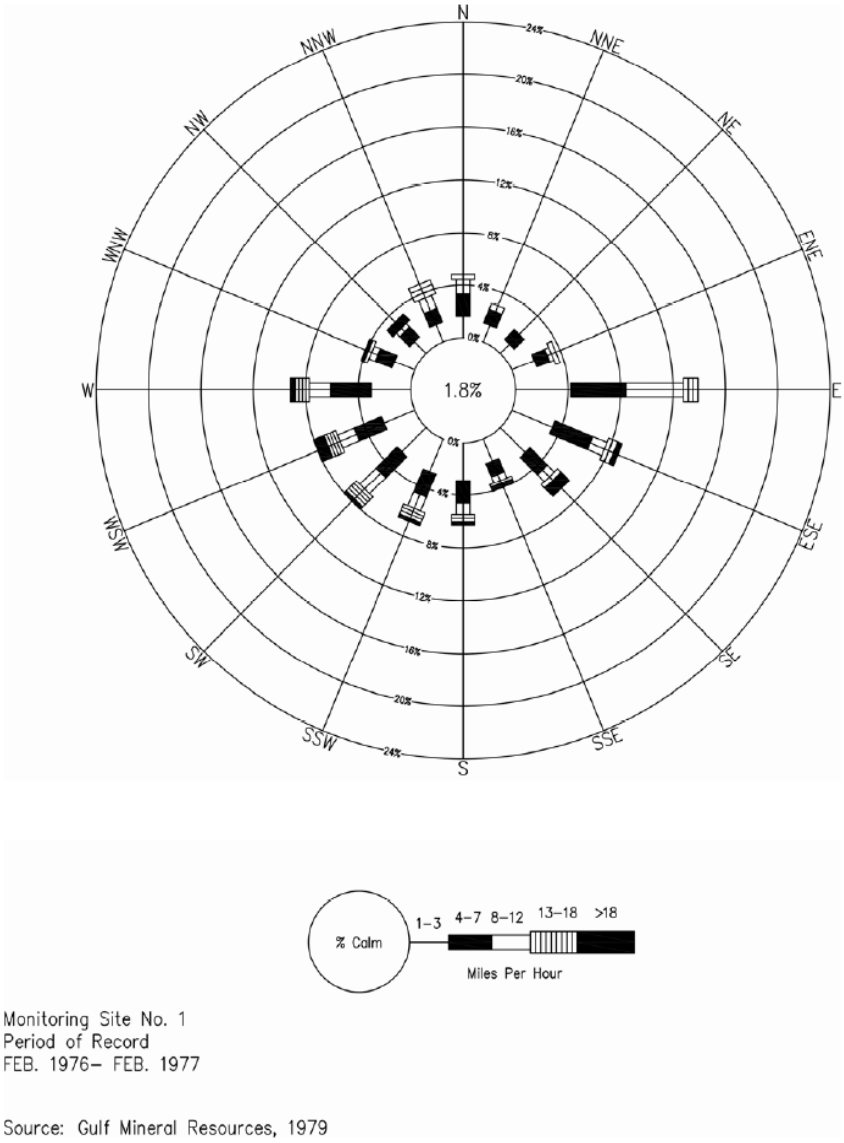

Figure 2-2. Wind Rose Diagram for GMRC Monitoring Site Number 1

2.2.3 Temperature

The monthly and annual climate summary of average temperature and precipitation for the San Mateo weather station (Table 2-2) shows that temperature extremes have ranged from a low of -35° F in January 1971 to a high of 103° F in June 1962 (GMRC 1979). Average high and low temperatures are 41° F and 16° F for the coldest month (January) and are 83° F and 55° F for the warmest month (July), respectively. Diurnal temperature range at San Mateo is generally 25° F to 30° F.

2.3 Site Climatology

The Roca Honda permit area is at an elevation between 7,075 ft and 7,857 ft, which is 0 to 750 ft above the San Mateo Creek valley floor. The highest elevation in the permit area is atop Jesus Mesa in Sec. 9 at 7,857 ft. As discussed earlier, characteristics of temperature, precipitation, evaporation rates, and wind conditions for the Roca Honda permit area can be estimated from the San Mateo and Grants weather stations and from short-term meteorological monitoring stations established in the mid to late 1970s for the proposed Mt. Taylor Uranium Mill Project.

An RHR meteorological station was installed in Section 16 of the permit area in November 2007 and began recording data at 15:00 on December 5, 2007 (See Figure 2-1). This station will provide site-specific data for the proposed mine. The station is currently recording on hourly intervals and reports temperature, relative humidity, precipitation, wind speed and direction, barometric pressure and will be further modified in accordance with the approved SAP. The Roca Honda weather station will be operated on an ongoing basis throughout the life of the project.

Current results from the period December 5, 2007 to September 16, 2009 are given in Table 2-3 and Figure 2-3. These data will supplement historical local meteorological data described above.

Table 2-3. Monthly and Annual Average Climate Summary for the Roca Honda Weather Station

Period of Record: December 5, 2007 to September 16, 2009													
	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Annual
Average Temp. (°C)	-1.06	2.04	4.90	8.25	14.0	18.4	20.9	20.4	16.6	10.9	5.09	-0.96	9.96
Average Total Precipitation[1] (mm)	2.29	0.76	8.13	11.4	13.7	45.5	47.8	40.1	45.8	15.7	2.03	7.87	241.1
Average Relative Humidity (%)	56.8	47.7	38.1	28.3	33.3	29.5	44.8	38.0	44.8	35.6	44.8	61.2	41.9
Average Wind Speed (m/s)	1.96	2.31	2.83	3.12	2.65	2.47	1.95	1.95	1.71	2.00	1.99	2.21	2.26
Average Wind Direction (deg)	195.0	203.0	224.3	227.3	213.5	206.4	204.9	202.8	187.1	188.3	201.8	214.6	205.8
Average Barometric Pressure (mbar)	1007.5	1016.1	1022.9	1029.3	1038.0	1041.9	1042.2	1035.4	1026.6	1015.7	1005.6	1005.1	1023.9

[1]*Precipitation data begins in September 2008 due to a malfunction with the rain gauge*

The data given above represents a small overall sample size (21 months) as compared to the Grants and San Mateo weather stations, but does represent actual site data that will continued to be gathered during the duration of the project. Precipitation data was gathered for a period of 12 months starting in September 2008 after a malfunction of the rain gauge was corrected. This data will be updated as more data is gathered. Wind speed and direction are shown in Figure 2-3. Prevailing wind direction at the permit area during the sampling period is from the west, west-southwest, west-northwest, northwest, and southwest.

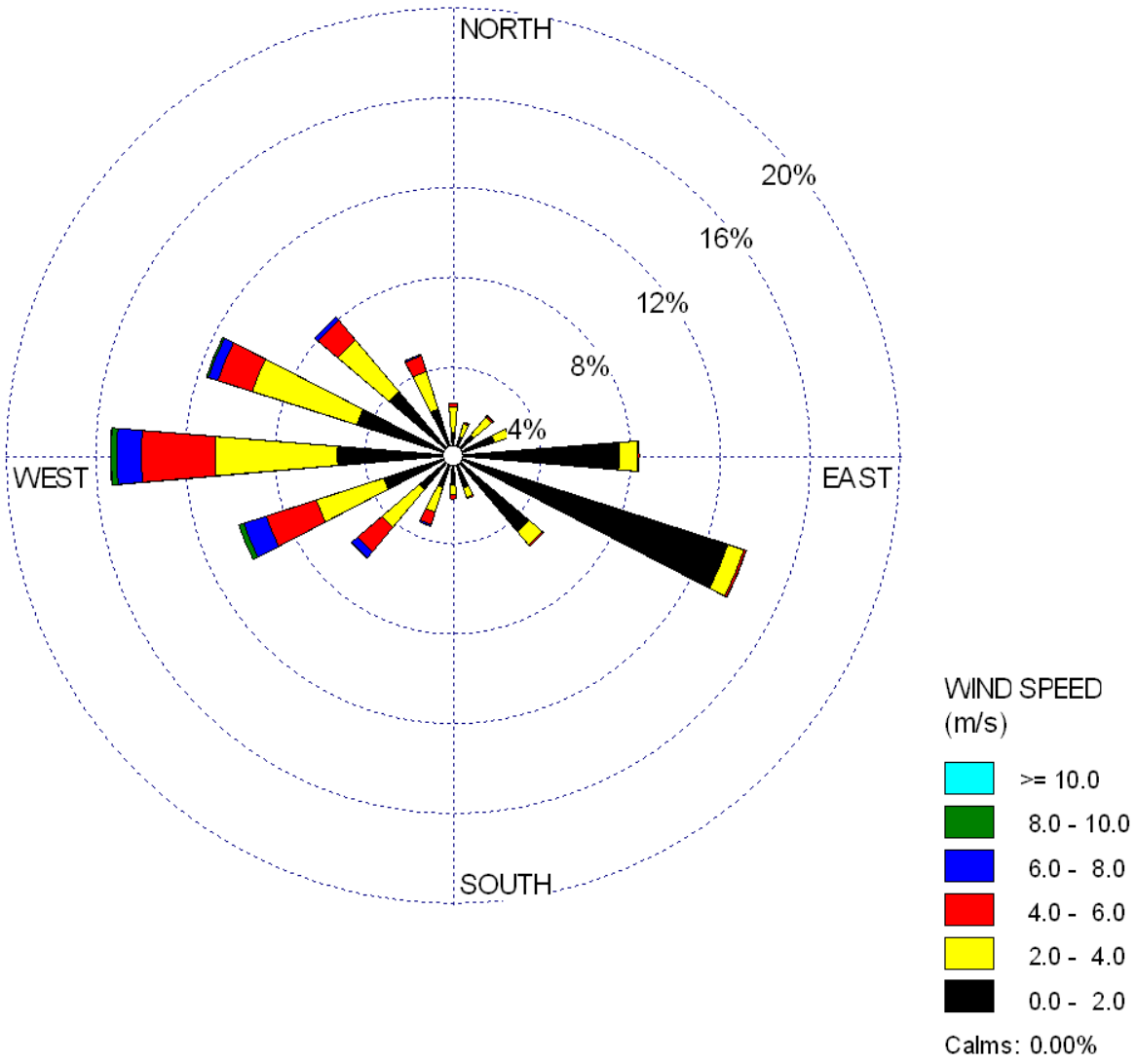

Figure 2-3. Wind Rose Diagram for Roca Honda Weather Station (Sec. 16, T13N, R8W)

The data provided in Table 2-3 are for the lower elevation areas at the Roca Honda permit area. Projected temperature values for the top of Jesus Mesa and the high mesa in Section 10 will be approximately be 3.5° F colder than at the Roca Honda weather station. This is because temperature decreases approximately 5° F for every 1,000 ft of elevation gain. The higher elevations of these mesa tops will also cause a localized orographic effect increasing both rain and snowfall totals on the mesas compared to values recorded at the Roca Honda weather station. Monthly pan evaporation rate measurements at one monitoring site for the Mt. Taylor Uranium Mill Project were highest in June (about 12 inches) and lower (8 to 10 inches) in April, May, July, and August (GMRC 1979). Total evaporation for the year was approximately 63 inches. Pan evaporation rates in the Roca Honda permit area are expected to be similar. The SAP will be revised to incorporate monitoring for this parameter.

2.4 Site Air Quality

The Roca Honda permit area is located in the Southwestern Mountains – Augustine Plains Intrastate Air Quality Control Region in northwestern NM. The entire area has been classified by the U.S. Environmental Protection Agency (EPA) as National Ambient Air Quality Standards attainment area (EPA 2007a). The Clean Air Act of 1990 required EPA to set NAAQS for six criteria pollutants considered harmful to public health and the environment. An "attainment area," for any of the air pollutants, is an area which is shown by monitored data or air quality modeling not to exceed the ambient air quality standard for such pollutant. Further, there are no Prevention of Significant Deterioration Class I areas in Northwestern NM (EPA 2007b). Total suspended particulate matter (TSP) is an additional regulated air constituent of air quality concern in New Mexico. Natural sources of TSP in the area typically include wind-blown dust and vehicle traffic on unpaved roads.

An air quality monitoring station was installed at the Roca Honda permit area in Section 16, as shown on Figure 2-1, for the purpose of monitoring background levels of radioparticulates, radon, and gamma activity. The station was installed in July, 2008 and has been in continuous operation to date. Tables 2-4 to 2-8 show the results of the first four quarters of sampling.

Individual air filter samples collected on a bi-weekly basis (and sent to the lab quarterly) were analyzed for levels of gross-alpha and gross-beta (Table 2-4). A compilation of all the bi-weekly samples for one quarter is analyzed for radium-226 and thorium isotopes (Table 2-5), and uranium isotopes and total uranium (Table 2-6). Radon concentrations are measured using alpha-track detectors which are collected on a quarterly basis (Table 2-7). Gamma is measured using thermoluminescent dosimeters which are also collected on a quarterly basis (Table 2-8).

Table 2-4. Gross Alpha/Gross Beta (results to-date).

	Sample ID	Collection Time	Gross-Alpha 900 DC	Gross-Alpha +/-	Gross-Beta 900 DC	Gross-Beta +/-	Units
2008 QTR3 July - Sept	RH-01-2008-08-22-F	10:20:00	1.38	0.6	14.2	2.7	pCi/Sample
	RH-01-2008-09-08-F	10:20:00	1.36	0.6	13.4	2.6	pCi/Sample
	RH-01-2008-09-24-F	11:30:00	0.89	0.56	16.6	2.9	pCi/Sample
	RH-01-2008-09-24-F	11:30:00	1.11	0.48	15	3.1	pCi/Sample
	RH-01-2008-10-08-F	10:55:00	1.09	0.56	14.9	2.8	pCi/Sample
2008 QTR4 Oct – Dec	RH-01-2008-10-27-F	10:36:00	2.82	0.92	17.8	3.3	pCi/Sample
	RH-01-2008-11-06-F	13:54:00	1.14	0.57	9.3	2	pCi/Sample
	RH-01-2008-11-19-F	10:43:00	0.87	0.48	7.8	1.7	pCi/Sample
	RH-01-2008-12-04-F	14:00:00	2.16	0.79	15.3	2.9	pCi/Sample
	RH-01-2008-12-18-F	13:12:00	0.72	0.45	7.4	1.7	pCi/Sample
	RH-01-2008-12-31-F	10:10:00	0.09	0.23	6.2	1.5	pCi/Sample
2009 QTR1 Jan - Mar	RH-01-2009-01-14-F	11:47:00	1.91	0.74	9.2	2	pCi/Sample
	RH-01-2009-01-29-F	13:17:00	1.57	0.66	12.7	2.5	pCi/Sample
	RH-01-2009-02-12-F	9:35:00	1.35	0.62	9	1.9	pCi/Sample
	RH-01-2009-03-05-F	11:18:00	0.95	0.54	14.4	2.8	pCi/Sample
	RH-01-2009-03-19-F	10:00:00	0.68	0.43	11.5	2.3	pCi/Sample
	RH-01-2009-03-31-F	9:48:00	0.38	0.36	10.2	2.1	pCi/Sample
2009 QTR2 Apr - June	RH-01-2009-04-14-F	9:45:00	1.43	0.57	7.8	1.4	pCi/Sample
	RH-01-2009-04-29-F	11:35:00	1.76	0.58	11.4	1.4	pCi/Sample
	RH-01-2009-05-26-F	9:10:00	3.4	0.6	19.8	1.4	pCi/Sample
	RH-01-2009-06-03-F	14:30:00	0.79	0.53	9	1.3	pCi/Sample
	RH-01-2009-06-16-F	16:30:00	0.81	0.6	9.5	1.4	pCi/Sample
	RH-01-2009-07-06-F	10:00:00	0.73	0.55	14.5	1.3	pCi/Sample

Table 2-5. Radium, Thorium Isotopes (results to-date)

Sample ID	Ra-226	Ra-226	Th-228	Th-228	Th-229	Th-230	Th-230	Th-232	Th-232	Units
Method	**E903.1**	**+/-**	**D3972-90M**	**+/-**	**D3972-90M**	**D3972-90M**	**+/-**	**D3972-90M**	**+/-**	
RH-01-2008-QTR-3	0.17	0.4	0.34	0.21	13	0.37	0.23	0.11	0.1	pCi/Sample
RH-01-2008-QTR-4	0	0.31	0.19	0.27	29.3	0.54	0.27	0.28	0.14	pCi/Sample
RH-01-2009-QTR-1	-0.13	0.5	0.22	0.17	11.7	0.57	0.26	0.36	0.13	pCi/Sample
RH-01-2009-QTR-2	0.24	0.51	0.37	0.55	13	0.41	0.5	0.13	0.11	pCi/Sample

Table 2-6. Uranium Isotopes (results to-date)

Sample ID	U-234	U-234	U-235	U-235	U-238	U-238	Total U	Total U	Units
Method	D3972-90M	+/-	D3972-90M	+/-	D3972-90M	+/-	D3972-90M	+/-	
RH-01-2008-QTR-3	0.33	0.25	0.02	0.16	0.17	0.18	0.52	0.35	pCi/Sample
RH-01-2008-QTR-4	0.74	0.37	0	0.17	0.19	0.18	0.93	0.44	pCi/Sample
RH-01-2009-QTR-1	0.52	0.3	0.13	0.16	0.09	0.14	0.74	0.37	pCi/Sample
RH-01-2009-QTR-2	0.53	0.16	0.024	0.116	0.31	0.22	0.86	0.25	pCi/Sample

Table 2-7. Radon alpha-track (results to-date)

Year	2008	2008	2008	2008	2009	2009	2009	2009	Units
Quarter	3	3	4	4	1	1	2	2	
Detector #	4728810	4728811	4735440	4735454	4735519	4735520	4761326	4761325	
Install Date	7/28/2008	7/28/2008	10/10/2008	10/10/2008	12/31/2008	12/31/2008	3/31/2009	3/31/2009	
Ending Date	10/10/2008	10/10/2008	12/31/2008	12/31/2008	3/31/2009	3/31/2009	7/6/2009	7/6/2009	
Sample ID	RH-1-2008-10-10-A	RH-1-2008-10-10-B	RH-1-2008-12-31-B	RH-1-2008-12-31-A	RH-1-2009-3-31-A	RH-1-2009-3-31-B	RH-1-2009-7-06-A	RH-1-2009-7-06-B	
Exposure	30.0	30.0	141.9	132.5	88.6	58.3	53.4	56.4	pCi/l-days
Avg. Radon Conc.	0.4	0.4	1.7	1.6	1	0.6	0.6	0.6	pCi/l

Table 2-8. Gamma Thermoluminescent Dosimeters (results to-date)

Year	2008	2008	2009	2009	Units
Quarter	3	4	1	2	
Control - Daily	24	32	30	25	mR
Environmental	27	35	39	33	mR

2.5 References

Baldwin, J.L., 1973. *Climates of the States*, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Washington, D.C.

Bonnin, G.M., D. Martin, B. Lin, T. Parzybok, M. Yekta, and D. Riley, 2006. *Precipitation-Frequency Atlas of the United States*, NOAA Atlas 14, Volume 1, Version 4, National Weather Service.

EPA, 2007a. *Counties Designate Nonattainment or Maintenance for Clean Air Act's National Ambient Air Quality Standards, 2007a. www.nmenv.state.nm.us/abq/modeling/documents/nm_class1areas_map.pdf.*

EPA, 2007b. *Prevention of Significant Deterioration Permit Program Status*, 2007b.

Gulf (Gulf Mineral Resources Company), 1979. Uranium Mill License Application, Mount Taylor Uranium Mill, San Mateo, New Mexico, Environmental Report, Volumes 2 and 3, Amendment 1, March.

New Mexico Interstate Stream Commission and New Mexico Office of the State Engineer, 2002. "Net Lake Evaporation," Plate 7, in *New Mexico Water Resource Atlas*, prepared by New Mexico Interstate Stream Commission and New Mexico Office of the State Engineer.

NRCS (Natural Resources Conservation Service), 2006. *Soil Survey of McKinley County Area, New Mexico, McKinley County and Parts of Cibola and San Juan Counties*, U.S. Department of Agriculture, Natural Resources Conservation Service, in cooperation with U.S. Department of Interior, Bureau of Land Management and Bureau of Indian Affairs, and the New Mexico Agricultural Experiment Station.

Robson, S.G., and E.R. Banta, 1995. *Ground Water Atlas of the United States, Segment 2 – Arizona, Colorado, New Mexico, and Utah*, U.S. Geological Survey Hydrologic Investigations Atlas 730-C.

Sheppard, P.R., A.C. Comrie, G.D. Packin, K. Angersbach, and M.K. Hughes, 1999. *The Climate of the Southwest*, Institute for the Study of Planet Earth, CLIMAS Report Series CL1-99.

Tuan, Y.F., C.E. Everard, J.G. Widdison, and I. Bennett, 1973. *The Climate of New Mexico*, New Mexico State Planning Office, Santa Fe.

U.S. Department of Interior, 1980. *Uranium Development in the San Juan Basin Region – A Report on Environmental Issues, final edition*, San Juan Basin Regional Uranium Study, Office of Trust Responsibilities, Bureau of Indian Affairs, Albuquerque, New Mexico.

WRCC (Western Regional Climate Center) 2009a. Average Pan Evaporation Data for New Mexico (1914-2005). Historical Climate Information. Western Regional Climate Center and Desert Research Institute. n.d. Web. 30 September 2009. <http://www.wrcc.dri.edu/htmlfiles/westevap.fianl.html>

WRCC 2009b. Annual Average Precipitation for New Mexico (1961-1990). Precipitation Maps for the Western U.S. Historical Climate Information. Western Regional Climate Center and Desert Research Institute. n.d. Web. 30 September 2009. <http://www.wrcc.dri.edu>