

September 4, 2020

Federal Energy Regulatory Commission
888 First Street, N.E.
Washington, D.C. 20426

Attention: Ms. Kimberly D. Bose, Secretary

Re: El Paso Natural Gas Company, L.L.C.;
Docket No. CP18-332-000
South Mainline Expansion Project;
Post-Construction Noise Surveys

Commissioners:

El Paso Natural Gas Company, L.L.C. ("EPNG") is hereby filing with the Federal Energy Regulatory Commission ("Commission") in Docket No. CP18-332-000, its post-construction noise surveys for the South Mainline Expansion Project.

Description of Proceeding

On April 27, 2018, EPNG submitted its application, pursuant to Section 7(c) of the Natural Gas Act ("NGA") requesting a certificate of public convenience and necessity for authorization to construct, own, and operate: (i) an approximately 17-mile, thirty-inch diameter loop line of its existing Line Nos. 1100 and 1103 between Hueco and El Paso, Texas; (ii) the new Red Mountain Compressor Station in Luna County, New Mexico; and (iii) the new Dragoon Compressor Station located in Cochise County, Arizona. This project is referred to as the "South Mainline Expansion Project" or "Project." On November 21, 2019, the Commission issued an Order granting EPNG's requested certificate.¹

Description of Filing

Pursuant to ordering paragraph (B)(3) of the Order Issuing Certificate and in compliance with Environmental Condition No. 15 of the Appendix to the Order, EPNG is herein filing its post-construction noise surveys for the Dragoon Compressor Station and the Red Mountain Compressor Station. EPNG notes that the measured noise levels from both compressor stations running at full operational load conditions were below the Commission requirement of 55 dBA (L_{dn}) at the closest noise sensitive areas as more fully described in the attached reports being provided under Tab 1.

¹ See *El Paso Natural Gas Company, L.L.C.*, 169 FERC ¶ 61,133 (2019).

Filing Information

EPNG respectfully requests that the information being submitted as CEII, under Tab 2, not be released to the public. Such information meets the definition of CEII as found in Section 388.113 of the Commission's regulations. EPNG requests that the Commission accord treatment to the eFiled documents concerning CEII in a manner consistent with Commission's regulations for the life of the assets so as not to place the assets and personnel of EPNG at undue risk. Accordingly, EPNG has marked the documents with "Contains CUI//CEII Information – Do Not Release." Please contact Mr. Francisco Tarin (telephone number 719-667-7517) at 2 North Nevada Avenue, Colorado Springs, Colorado 80903, regarding this request for CEII treatment.

EPNG is e-Filing this letter and attachments with the Commission's Secretary in accordance with the Commission's Order No. 703, *Filing Via the Internet*, guidelines issued on November 15, 2007 in Docket No. RM07-16-000.

Respectfully submitted,

EL PASO NATURAL GAS COMPANY, L.L.C.

By: _____ /s/
Francisco Tarin
Director, Regulatory

Attachments

cc: Mr. Douglas Cotton, OEP



El Paso Natural Gas
Company, L.L.C.
a Kinder Morgan company

SOUTH MAINLINE EXPANSION PROJECT
DOCKET NO. CP18-332-000

TAB 1

NOISE SURVEY REPORT

Subject: **EPNG Dragoon Compressor Station (Cochise County, Arizona): Results of a Sound Survey after Installation of the Facility associated with the EPNG South Mainline Expansion Project**

Prepared for: **El Paso Natural Gas, LLC ("EPNG")**

H&K Report No. 4084

Date of Report: September 3, 2020

H&K Job No. 5419

Submitted by: Paul D. Kiteck, P.E., **Hoover & Keith Inc. (H&K)**

Applicable FERC Docket Number: CP18-332-000

REPORT SUMMARY

This report presents the results of a sound survey performed on Aug. 19, 2020, after installation of the new **Dragoon Compressor Station** (abbreviated as "Station" or "CS" in the report) associated with the **EPNG South Mainline Expansion Project** ("Project"). The purpose of the sound survey was to quantify the sound attributable to the Dragoon CS, which is located on the property of the EPNG Willcox Station, at the nearby noise-sensitive areas (NSAs) and compare the measured sound levels to applicable sound requirements. The following table summarizes the measured daytime L_{eq} (L_d) at the designated closest NSAs along with the resulting L_{dn} (as calculated from the measured L_d) during operation of both the Dragoon CS and the Willcox Station. Note that the measured sound levels at the designated closest NSAs were influenced by noise sources not associated with the operation of the Dragoon CS.

Summary of the Measured Sound Levels at the Designated Closest NSAs during Operation of both the Dragoon CS and Willcox Station, along with the Resulting L_{dn}

Closest NSAs and Type of NSA	Distant and Direction of NSA from Dragoon CS Site Center	Measured Daytime L_{eq} (L_d) during Operation of the Dragoon CS*	Resulting L_{dn} during Operation of Dragoon CS (Calc'd via Meas'd L_d)
NSA #1 (Residence)	2,320 feet (WSW)	47.1 dBA*	53.5 dBA
NSA #2 (Residence)	3,160 feet (SW)	39.4 dBA*	45.8 dBA
NSA #3 (Residences)	2,510 feet (SSW)	38.7 dBA*	45.1 dBA
NSA #4 (Residence)	2,150 feet (S)	33.5 dBA*	39.9 dBA
NSA #5 (Residence)	2,430 feet (E)	31.8 dBA*	38.2 dBA

*Since the measured sound data (L_d) during sound survey was influenced by noise sources not associated with the Dragoon CS, the sound contribution due only to the Dragoon CS is lower than the reported sound levels.

The results of the sound survey and subsequent data calculations indicate that the sound attributable to the **Dragoon Compressor Station** at the designated closest NSAs is lower than **55 dBA** (L_{dn}), which is the FERC sound level requirement. Since the Station was operated at full horsepower load conditions, this sound survey is considered a "full load sound survey".

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1.0 **INTRODUCTION**

In this report, **Hoover & Keith Inc.** (H&K) presents the results of a sound survey performed on Aug. 19, 2020, after installation of the new **Dragoon Compressor Station** (abbreviated as “Station” or “CS” in the report) associated with the **EPNG South Mainline Expansion Project** (“Project”). The purpose of the sound survey was to quantify the sound attributable to the Dragoon CS, which is located on the property of the EPNG Willcox Station, at the nearby noise-sensitive areas (NSAs), consisting primarily of residences, and compare the measured sound levels to applicable sound level requirements.

2.0 **SITE/FACILITY DESCRIPTION**

Figure 1 (Appendix, p. 6) is an area layout–map around the Station showing the surrounding nearby NSA (primarily residences), other areas of interest and the reported sound measurement positions near the identified-designated closest NSAs. The new Dragoon CS is located on the site of another older EPNG natural gas compressor station (i.e., Willcox Station), and the site of both Dragoon CS and Willcox Station are located in Cochise County, Arizona, 12 miles southeast of Willcox, AZ. The designated closest NSAs consist primarily of single-family residences located between 2,150 feet to 3,160 feet from the Dragoon CS site center (i.e., location of the site Compressor Building).

Figure 2 (Appendix, p. 7) is a layout–sketch of the Dragoon CS showing the buildings and auxiliary equipment along with the reported sound measurement positions around the Dragoon CS property. **Figure 3 (Appendix, p. 8)** is a layout–sketch showing equipment–buildings at the Willcox Station and the reported sound measurement positions around the Willcox Station, noting that sound tests were also conducted around the Willcox Station at similar measurement locations chosen for the Dragoon CS “pre-construction sound survey”. For reference, the Willcox Station includes two (2) older General Electric (“GE”) turbine-driven compressor units and a gas aftercooler. The Dragoon CS is equipped with one (1) natural gas turbine-driven compressor unit consisting of a Solar Model Mars 90 turbine (13,000 HP ISO rating) driving a Solar centrifugal compressor. The turbine and compressor are installed inside an insulated metal building (i.e., Compressor Building). For reference, **Figure 4 (Appendix, p. 9)** provides a photo showing the Compressor Building and auxiliary equipment at the Dragoon CS, as viewed from the East Side of the Station.

3.0 **SOUND LEVEL REQUIREMENT, TYPICAL METRICS AND TERMINOLOGY**

Applicable acoustical terminology and description of typical metrics used to measure and regulate environmental noise is provided at the end of the report (**Appendix**, pp. 12–13).

FERC Sound Requirement: Conditions set forth by the Office of Energy Projects (OEP) of the FERC, EPNG shall file a noise survey with the Secretary **no later than 60 days** after placing the Dragoon Compressor Station in service. If a full load condition noise survey is not possible,

EPNG shall provide an interim survey at the maximum possible horsepower load and provide the full load survey **within 6 months**. If the noise attributable to the operation of all equipment at the Dragoon CS under interim or full horsepower load conditions exceeds an L_{dn} of 55 dBA at any nearby NSAs, EPNG shall file a report on what changes are needed and shall install the additional noise controls to meet the level **within 1 year** of the in-service date. EPNG shall confirm compliance with the above requirement by filing a second noise survey with the Secretary **no later than 60 days** after it installs the additional noise controls. The L_{dn} is an energy average of the measured daytime equivalent daytime A-wt. sound level (L_d) and measured nighttime L_{eq} (L_n) plus **10 dB**. The **10-dB** adjustment to the L_n is intended to compensate for nighttime sensitivity. For an essentially steady sound source that operates continuously over a 24-hour period and controls the environmental sound level, such as a natural gas compressor station, the L_{dn} is approximately **6.4 dB** above the measured L_{eq} . As a result, an L_{dn} of **55 dBA** corresponds to an L_{eq} (e.g., L_d) of **48.6 dBA**. If both the L_d and L_n are measured and/or estimated, then the L_{dn} is calculated using the following formula:

$$L_{dn} = 10 \log_{10} \left(\frac{15}{24} 10^{L_d/10} + \frac{9}{24} 10^{(L_n+10)/10} \right)$$

State of and County/Local: The State of Arizona does not have any applicable noise regulations for this type of industrial-commercial facility. In addition, no county or local (township) noise regulations have been identified for this facility.

4.0 MEASUREMENT LOCATIONS, CONDITIONS AND MEASUREMENT METHODOLOGY

4.1 Sound Measurement Positions, Closest NSAs and Operating Conditions: Sound measurements were conducted near the designated closest NSAs to the Dragoon CS. In addition, sound measurements were conducted around the Dragoon CS property, and for comparison, sound measurement positions were conducted around the Willcox Station at similar locations as previously performed during the Dragoon CS “pre-construction sound survey”. The following provides a description of the designated NSAs and reported sound measurement positions.

Pos. 1: NSA #1; Residence along Arzberger Road, located 2,320 feet WSW of the Dragoon CS “acoustic site center” (i.e., location of the Compressor Building).

Pos. 2: Sound measurement position conducted during the “pre-construction sound survey”, located near an NSA that was previously the closest to the Willcox Station.

Pos. 3: NSA #2; Residence near the intersection/corner of S. Quicksilver Road and E. Cattle Drive, located approximately 3,160 feet SW of the Dragoon CS site.

Pos. 4: NSA #3; Residences on the North Side of E. Cattle Drive, located approximately 2,510 feet SSW of the Dragoon CS site.

Pos. 5: NSA #4 (considered the closest NSA to Dragoon CS); Residence on the North Side of E. Cattle Drive, located 2,150 feet south of the Dragoon CS site.

Pos. 6: NSA #5; Closest residence on the East Side of Dragoon CS site, located 2,430 feet east of the Dragoon CS site.

- Pos. 7: West fenceline of the Willcox Station, near the site Main Entrance Gate.
- Pos. 8: South fenceline of the Willcox Station, in line with the Willcox Compressor Building.
- Pos. 9: East fenceline of the Willcox Station, in line with the Willcox Compressor Building.
- Pos. 10: North fenceline of the Willcox Station, in line with the Willcox Compressor Building.
- Pos. 11: South fenceline of the Dragoon CS, in line with the Dragoon Compressor Building.
- Pos. 12: East fenceline of the Dragoon CS, in line with the Dragoon Compressor Building.
- Pos. 13: North fenceline of the Dragoon CS, in line with the Dragoon Compressor Building.

The sound survey was performed by Garrett Porter of H&K during the daytime of August 19, 2020. During the sound survey, the temperature was 90°–95° F, the sky was clear and the wind was blowing from the east. During the sound survey, the Solar turbine-driven compressor unit at the Dragoon CS was operated at full load conditions although the Station could only be operated for a limited time frame due to pipeline conditions. In addition, both turbine-driven compressor units at the Willcox Station were operating at approximately full HP load conditions. A summary of the operating conditions of the turbine-driven compressor unit at Dragoon CS during the sound survey are included in **Table A (Appendix, p. 10)**. For a Solar turbine-driven compressor unit, the *Percent of Full Speed of the Gas Producer* (“NGP”) is referred to as the turbine speed and the *Percent of Full Speed of the Power Turbine* (“NPT”) is referred to as the compressor speed, and a Solar turbine-driven compressor unit is typically considered to be operating at full load if the NGP and/or the NPT is approximately 100% of full speed, noting that a Solar Mars turbine can be operated at a maximum NGP of 103.6% of full speed.

- 4.2 Data Acquisition and Sound Measurement Equipment: At each sound measurement location, the L_{eq} and unweighted octave-band (O.B.) sound pressure levels (“SPLs”) were measured at approximately five (5) feet above ground. Sound measurements at the nearby NSAs attempted to exclude “extraneous sound” such as noise of a vehicle passing immediately by the sound measurement location or other intermittent noise sources not related to operating Station equipment, and sound tests were conducted during times that the wind speed was below 8 mph to reduce influence of the wind even though a mic windscreen was employed. The acoustical measurement system consisted of a Norsonic Model Nor140 Sound Level Meter (a Type 1 “SLM” per ANSI S1.4 & S1.11) equipped with a ½-inch microphone with a windscreen. The SLM was calibrated with a microphone calibrator (calibrated within 1 year of the test date).

5.0 **MEASUREMENT RESULTS, OBSERVATIONS AND FINAL COMMENT**

Table A (Appendix, p. 10) shows the measured daytime L_{eq} (L_d) at the NSA sound measurement positions during operation of both the Dragoon CS and Willcox Station along with the average of the measured L_d since more than one test sample was taken during the sound survey tests. **Table A** also includes the resulting L_{dn} at the designated closest NSAs (as calculated from the measured L_d). Meteorological conditions that occurred during the sound survey are summarized in **Table B (Appendix, p. 10)**. The measured A-wt. sound levels (L_d) and associated unweighted O.B. SPLs at all reported measurement positions during operation of both the Dragoon CS and the Willcox Station are provided in **Table C (Appendix, p. 11)**.

The following **Table 1** summarizes the measured L_d at the designated closest NSAs along with the resulting L_{dn} (as calculated from the measured L_d) during operation of both the EPNG Dragoon CS and the EPNG Willcox Station.

Closest NSA(s), Type of NSA and other Meas. Location of Interest	Distant and Direction of NSA from Station Site Center	Measured Daytime Leq (L_d) during Operation of the Dragoon CS*	Resulting L_{dn} during Operation of Dragoon CS (Calc'd via Meas'd L_d)
NSA #1 (Residence)	2,320 feet (WSW)	47.1 dBA*	53.5 dBA
NSA #2 (Residence)	3,160 feet (SW)	39.4 dBA*	45.8 dBA
NSA #3 (Residences)	2,510 feet (SSW)	38.7 dBA*	45.1 dBA
NSA #4 (Residence)	2,150 feet (S)	33.5 dBA*	39.9 dBA
NSA #5 (Residence)	2,430 feet (E)	31.8 dBA*	38.2 dBA

Table 1: Summary of the Measured L_d and Resulting L_{dn} at the Designated Closest NSAs during Full Load Operation of the Dragoon CS and EPNG Willcox Station.

*Since measured sound levels during sound survey influenced by the noise sources not related to Dragoon CS, the sound level contribution due only to Dragoon CS is actually lower than the reported sound levels.

Observations: During the sound tests near the designated closest NSAs to the EPNG Willcox Station (i.e., NSA #1 and NSA #2), the noise associated with the Willcox Station was considered the most notable noise contributor to the measured A-wt. sound levels, and the noise of the Dragoon CS did not significantly contribute to the measured A-wt. sound levels (L_d) at NSA #1 and NSA #2. At the other designated nearby NSAs (i.e., NSA #3, NSA #4 and NSA #5), the noise associated with the Willcox Station and Dragoon CS was faintly audible, and other environmental noise sources contributed primarily to the measured A-wt. sound levels (e.g., sound of birds-insects, wind-related sounds and noise of residential AC units).

Final Comment: The results of the sound survey and subsequent data calculations indicate that the sound level attributable to the **Dragoon Compressor Station** at the nearby NSAs is lower than **55 dBA** (L_{dn}), which is the FERC sound level requirement. Since the Station was operated at full horsepower load conditions, this sound survey is considered a "full load sound survey".

APPENDIX

- **FIGURE 1:** AREA LAYOUT–MAP AROUND THE DRAGOON CS AND WILLCOX STATION SHOWING ANY SURROUNDING NSAs, OTHER AREAS OF INTEREST AND CHOSEN SOUND MEASUREMENT POSITIONS NEAR THE DESIGNATED CLOSEST NSAs
- **FIGURE 2:** LAYOUT–SKETCH OF THE DRAGOON CS SHOWING THE BUILDINGS-EQUIPMENT AND REPORTED SOUND MEASUREMENT POSITIONS AROUND THE STATION PROPERTY-FENCELINE
- **FIGURE 3:** LAYOUT–SKETCH OF THE WILLCOX STATION SHOWING THE BUILDINGS-EQUIPMENT AND REPORTED SOUND MEASUREMENT POSITIONS AROUND THE STATION PROPERTY-FENCELINE
- **FIGURE 4:** PHOTO SHOWING THE COMPRESSOR BUILDING AND AUXILIARY EQUIPMENT AT THE DRAGOON CS, AS VIEWED FROM THE “EAST SIDE” OF THE STATION
- **SUMMARY OF THE MEASURED SITE SOUND DATA DURING THE SOUND SURVEY AND ANY SUBSEQUENT SOUND CALCULATIONS**
- **SUMMARY OF ACOUSTICAL TERMINOLOGY AND TYPICAL METRICS**



Figure 4: EPNG Dragoon Compressor Station: Photo showing the Compressor Building and Auxiliary Equipment, as Viewed from East Side of the Dragoon CS (area of Meas. Pos. 12).

Measurement Set		Meas'd/Calc'd A-Wt. Levels (dBA)				Notes/Observations during the Sound Survey
		Day-time Leq(Ld)	Avg. of Ld	Night-time Leq(Ln)	Calc'd Ldn Note (1)	
Pos. 1 (near NSA #1): Residence 2,320 ft. WSW from Dragoon CS Site Acoustic Center	11/15/17 9:41 AM 11/15/17 9:48 AM 11/15/17 9:49 AM	46.3 47.3 47.7	47.1	Not Meas'd	53.5 Note (1)	Primary observed noise during sound survey tests: Noise of Willcox CS dominant; also, sound of birds, insects and at times, wind-related sounds.
Pos. 3 (near NSA #2): Residence 3,160 ft. SW from Dragoon CS Site Acoustic Center	11/15/17 9:51 AM 11/15/17 9:52 AM 11/15/17 9:53 AM	38.2 41.5 38.6	39.4	Not Meas'd	45.8 Note (1)	Primary observed noise during sound survey tests: Noise of Willcox CS dominant; also, sound of insects, distant roosters and noise of home AC units.
Pos. 4 (near NSA #3): 2 residences 2,510 ft. SSW from Dragoon CS Site Acoustic Center	11/15/17 9:56 AM 11/15/17 9:57 AM 11/15/17 9:58 AM	39.2 38.4 38.4	38.7	Not Meas'd	45.1 Note (1)	Primary observed noise during sound survey tests: Noise of Willcox CS audible; also, sound of birds, and at times, wind-related sounds.
Pos. 5 (near NSA #4): Residence 2,150 ft. South of Dragoon CS Site Acoustic Center	11/15/17 10:03 AM 11/15/17 10:04 AM 11/15/17 10:05 AM	33.1 33.8 33.6	33.5	Not Meas'd	39.9 Note (1)	Primary observed noise during sound survey tests: Sound of birds and noise of home AC units significant; Noise of both Willcox CS & Dragoon CS faintly audible.
Pos. 6 (near NSA #5): Residence 2,430 ft. East of Dragoon CS Site Acoustic Center	11/15/17 10:03 AM 11/15/17 10:04 AM 11/15/17 10:05 AM	27.1 33.5 34.9	31.8	Not Meas'd	38.2 Note (1)	Primary observed noise during sound survey tests: Sound of birds and noise of distant aircraft; noise of Dragoon CS only faintly audible.

Table A: EPNG Dragoon Compressor Station ("CS"): Summary of the Measured Daytime Sound Levels (i.e., Ld) at the Designated Closest NSAs, as Measured on August 19, 2020, during Operation of the Solar Mars Turbine-Driven Unit at the Dragoon CS and Operation of both Turbine-Driven Compressor Units at the Willcox CS, along with the Resulting Ldn (as calculated via the Measured Ld).

Operating Conditions during Sound Survey:

- > Solar Mars 90 Unit (Dragoon CS): NGP @ 102.3% and NPT @ 97%
- > Solar Mars 90 Unit (Dragoon CS): suction pressure @ 628 psig; discharge pressure @ 780 psig.
- > Fans of gas aftercooler operating; Dragoon CS gas recycling required (CS recycle valve 100% open).
- > Both turbine-driven compressor units at Willcox CS also operating at approx. full load conditions.

Note (1): Ldn calculated by adding 6.4 dB to the measured Ld since nighttime sound levels should be similar to the daytime sound levels.

Measurement Set		Temp. (°F)	R.H. (%)	Wind Direction	Wind Speed	Peak Wind	Sky Conditions
Meas. Positions/Period	Time Frame/Date of Tests						
Pos. 1 - 13 (Daytime)	10:00 AM to 12:00 PM (8/19/20)	90 - 95	20	From the east	0-3 mph	5 mph	Mostly clear skies

Table B: EPNG Dragoon Compressor Station: Summary of the Meteorological Conditions during the Sound Survey on August 19, 2020.

EPNG South Mainline Expansion Project and new Dragoon Compressor Station
Results of Sound Survey after Installation of the Station

Hoover & Keith Inc.

H&K Job No. 5419

H&K Report No. 4084 (Date: 09/03/2020)

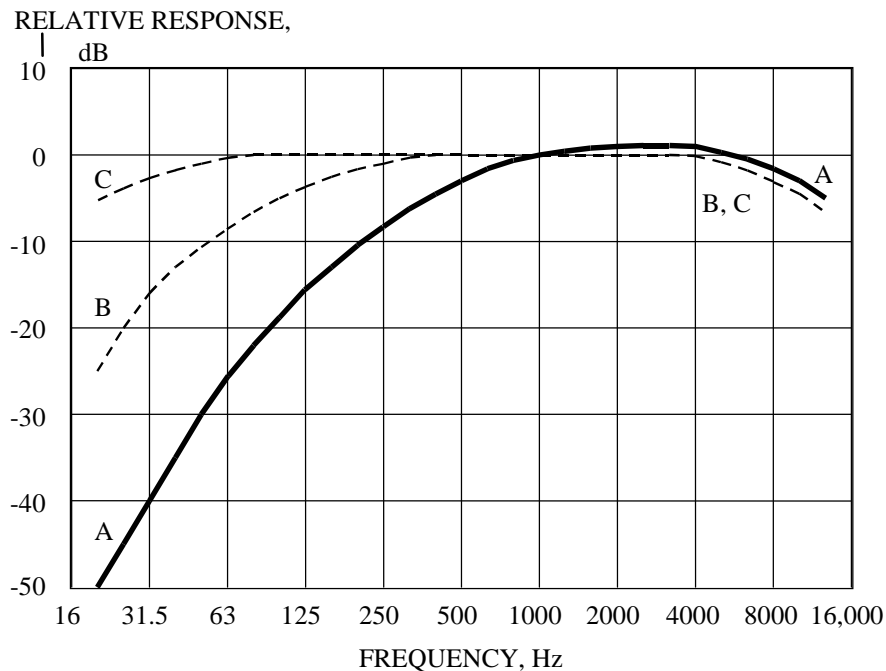
Measurement Set		Unweighted Sound Pressure Level (SPL) in dB per O.B. Freq. (in Hz)										A-Wt.
Meas. Pos. & NSA	Time/Date of Test	31.5	63	125	250	500	1000	2000	4000	8000	Level	
Pos. 1 (near NSA #1): Residence 2,320 ft. WSW from Dragoon CS Site Acoustic Center	10:44 AM (8/19/20)	63.0	63.9	56.5	46.1	40.6	39.3	35.7	30.2	12.7	46.3	
	10:44 AM (8/19/20)	61.2	64.4	56.2	45.7	42.1	41.7	37.9	29.8	13.6	47.3	
	10:45 AM (8/19/20)	66.8	63.3	55.2	45.2	42.5	43.0	38.8	31.4	14.1	47.7	
	Avg. A-Wt. & SPL	63.7	63.9	56.0	45.7	41.7	41.3	37.5	30.5	13.5	47.1	
Pos. 2: Near a residence that was previously the closest NSA on the W. Side of Willcox CS	10:48 AM (8/19/20)	58.4	61.0	53.8	40.2	36.6	41.8	37.6	24.1	13.6	45.5	
	10:49 AM (8/19/20)	58.0	61.6	53.9	40.5	36.6	39.0	35.7	26.6	13.3	44.3	
	10:50 AM (8/19/20)	59.5	61.9	53.7	40.9	35.7	38.8	35.0	26.3	14.1	44.1	
	Avg. A-Wt. & SPL	58.6	61.5	53.8	40.5	36.3	39.9	36.1	25.7	13.7	44.6	
Pos. 3 (near NSA #2): Residence 3,160 ft. SW from Dragoon CS Site Acoustic Center	10:53 AM (8/19/20)	55.9	57.3	48.0	37.2	33.3	29.3	25.4	26.2	15.5	38.2	
	10:54 AM (8/19/20)	57.2	58.5	49.7	39.6	36.7	35.1	33.1	25.1	23.7	41.5	
	10:55 AM (8/19/20)	61.2	58.7	48.6	37.1	33.5	29.9	25.8	20.1	13.1	38.6	
	Avg. A-Wt. & SPL	58.1	58.2	48.8	38.0	34.5	31.4	28.1	23.8	17.4	39.4	
Pos. 4 (near NSA #3): 2 residences 2,510 ft. SSW from Dragoon CS Site Acoustic Center	10:59 AM (8/19/20)	56.2	54.9	50.0	38.1	35.2	30.5	28.5	26.5	13.7	39.2	
	11:00 AM (8/19/20)	62.4	56.1	50.4	37.1	32.4	27.7	25.2	24.2	12.7	38.4	
	11:01 AM (8/19/20)	62.6	55.8	50.2	37.9	32.9	27.3	25.4	24.4	12.8	38.4	
	Avg. A-Wt. & SPL	60.4	55.6	50.2	37.7	33.5	28.5	26.4	25.0	13.1	38.7	
Pos. 5 (near NSA #4): Residence 2,150 ft. South of Dragoon CS Site Acoustic Center	11:04 AM (8/19/20)	62.1	52.4	43.6	32.0	25.6	19.1	18.2	22.9	14.5	33.1	
	11:05 AM (8/19/20)	62.3	53.0	44.6	33.4	26.5	21.7	20.1	17.8	20.5	33.8	
	11:06 AM (8/19/20)	63.0	52.5	42.1	33.1	27.1	25.2	21.8	18.6	18.7	33.6	
	Avg. A-Wt. & SPL	62.5	52.6	43.4	32.8	26.4	22.0	20.0	19.8	17.9	33.5	
Pos. 6 (near NSA #5): Residence 2,430 ft. East of Dragoon CS Site Acoustic Center	11:12 AM (8/19/20)	55.3	42.9	38.2	24.7	20.8	17.7	16.4	13.9	12.5	27.1	
	11:14 AM (8/19/20)	65.3	53.9	43.7	31.6	24.6	21.1	17.8	14.5	13.0	33.5	
	11:15 AM (8/19/20)	66.8	54.5	41.8	33.9	29.0	24.7	23.3	17.2	15.7	34.9	
	Avg. A-Wt. & SPL	62.5	50.4	41.2	30.1	24.8	21.2	19.2	15.2	13.7	31.8	
Pos. 7: West fenceline of the Willcox CS	8/19/20 10:24 AM	76.7	82.4	76.5	68.1	62.3	62.2	57.5	57.6	41.6	68.0	
	8/19/20 10:25 AM	76.8	82.3	76.7	68.6	61.9	62.0	57.4	57.1	42.0	67.9	
	Avg. A-Wt. & SPL	76.8	82.4	76.6	68.4	62.1	62.1	57.5	57.4	41.8	68.0	
Pos. 8: South fenceline of the Willcox CS, in line with the Compr. Bldg.	8/19/20 10:28 AM	74.7	75.1	70.9	64.5	58.1	52.2	58.9	67.6	53.7	69.8	
	8/19/20 10:29 AM	75.3	75.1	71.0	64.8	58.2	53.1	59.4	68.5	53.4	70.6	
	Avg. A-Wt. & SPL	75.0	75.1	71.0	64.7	58.2	52.7	59.2	68.1	53.6	70.2	
Pos. 9: East fenceline of the Willcox CS, in line with the Compr. Bldg.	8/19/20 10:32 AM	74.1	74.3	72.3	65.8	61.1	57.4	63.6	70.7	50.3	73.0	
	8/19/20 10:33 AM	74.2	74.2	72.5	66.3	60.5	57.4	63.2	69.1	50.7	71.8	
	Avg. A-Wt. & SPL	74.2	74.3	72.4	66.1	60.8	57.4	63.4	69.9	50.5	72.4	
Pos. 10: North fenceline of the Willcox CS	8/19/20 10:36 AM	69.1	71.6	67.4	59.3	53.6	53.6	55.4	51.3	33.2	60.9	
	8/19/20 10:37 AM	69.1	71.5	67.5	59.4	53.8	52.4	54.7	51.5	33.6	60.5	
	Avg. A-Wt. & SPL	69.1	71.6	67.5	59.4	53.7	53.0	55.1	51.4	33.4	60.7	
Pos. 11: South fenceline of the Dragoon CS	8/19/20 10:05 AM	69.3	70.0	64.7	61.5	54.8	64.6	63.2	57.0	44.0	68.2	
	8/19/20 10:06 AM	69.8	69.5	64.9	61.3	54.4	64.7	63.0	56.3	42.6	68.1	
	Avg. A-Wt. & SPL	69.6	69.8	64.8	61.4	54.6	64.7	63.1	56.7	43.3	68.1	
Pos. 12: East fenceline of the Dragoon CS, in line with the Compr. Bldg.	8/19/20 10:11 AM	73.0	79.7	70.4	59.0	52.2	57.3	55.3	51.3	36.0	62.6	
	8/19/20 10:12 AM	70.3	79.6	70.8	59.0	51.7	56.4	54.3	50.5	35.0	62.1	
	Avg. A-Wt. & SPL	71.7	79.7	70.6	59.0	52.0	56.9	54.8	50.9	35.5	62.4	
Pos. 13: North fenceline of the Dragoon CS, in line with the Compr. Bldg.	8/19/20 10:16 AM	70.6	72.0	68.7	62.3	52.8	61.6	61.6	53.8	38.3	66.1	
	8/19/20 10:17 AM	70.2	71.8	68.8	62.3	53.6	64.8	62.3	54.3	39.0	67.8	
	Avg. A-Wt. & SPL	70.4	71.9	68.8	62.3	53.2	63.2	62.0	54.1	38.7	67.0	

Table C: EPNG Dragoon Compressor Station: Measured Daytime Leq (Ld) and associated Unweighted Octave-Band (O.B.) SPLs at the Designated Closest NSAs and around the Property of the Dragoon CS and Willcox CS, as measured on Aug. 19, 2020.

Summary of Typical Metrics and Acoustical Terminology

- (1) Decibel (dB): A unit for expressing the relative power level difference between acoustical or electrical signals. It is ten times the common logarithm of the ratio of two related quantities that are proportional to power. When adding dB or dBA values, the values must be added logarithmically. For example, the logarithmic addition of **35 dB** plus **35 dB** is **38 dB**.
- (2) A-Weighted Sound Level (dBA): The A-wt. sound level is a single-figure sound rating, expressed in decibels (Re 20 μ Pa), which correlates to the human perception of the loudness of sound. The dBA level is commonly used to measure industrial and environmental noise since it is easy to measure and provides a reasonable indication of the human annoyance value of the noise. The dBA measurement is not a good descriptor of a noise consisting of strong low-frequency components or for a noise with tonal components. The A-weighted curve approximates the response of the average ear at sound levels of 20 to 50 decibels. The following are the relative response of A-weighted filter per octave band frequency, and a graph/curve is provided that shows a graphical representation of the A-wt. filter response per frequency (in Hz).

31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1,000 Hz	2,000 Hz	4,000 Hz	8,000 Hz	16,000 Hz
-39.4 dB	-26.2 dB	-16.1 dB	-8.6 dB	-3.2 dB	0 dB	+1.2 dB	+1.0 dB	-1.1 dB	-6.6 dB



- (3) Equivalent Sound Level (L_{eq}): The equivalent sound level (L_{eq}) can be considered an average sound level measured during a period of time, including any fluctuating sound levels during that period. In this report, the L_{eq} is equal to the level of a steady (in time) A-weighted sound level that would be equivalent to the sampled A-weighted sound level on an energy basis for a specified measurement interval. The concept of the measuring L_{eq} has been used broadly to relate individual and community reaction to aircraft and other environmental noises.

- (4) Daytime Sound Level (L_d) & Nighttime Sound Level (L_n): L_d is the equivalent A-weighted sound level, in decibels, for a 15 hour time period, between 07:00 to 22:00 Hours (7:00 a.m. to 10:00 p.m.). L_n is the equivalent A-weighted sound level, in decibels, for a 9 hour time period, between 22:00 to 07:00 Hours (10:00 p.m. to 7:00 a.m.).
- (5) Day-Night Average Sound Level (L_{dn}): The L_{dn} is an energy average of the measured daytime L_{eq} (L_d) and the measured nighttime L_{eq} (L_n) plus **10 dB**. The **10-dB** adjustment to the L_n is intended to compensate for nighttime sensitivity. As such, the L_{dn} is not a true measure of the sound level but represents a skewed average that correlates generally with past sound surveys which attempted to relate environmental sound levels with physiological reaction and physiological effects. For a steady sound source that operates continuously over a 24-hour period and controls the environmental sound level, an L_{dn} is approximately **6.4 dB** above the measured L_{eq} . Consequently, an L_{dn} of **55 dBA** corresponds to a L_{eq} of **48.6 dBA**. If both the L_d and L_n are measured, then the L_{dn} is calculated using the following formula:
- $$L_{dn} = 10 \log_{10} \left(\frac{15}{24} 10^{L_d/10} + \frac{9}{24} 10^{(L_n+10)/10} \right)$$
- (6) Octave Band (O.B.) Sound Pressure Level (SPL): Sound is typically measured in frequency ranges (e.g., high-pitched sound, low-pitched sound, etc.) that provides more meaningful sound data regarding the sound character of the noise. When measuring two noise sources for comparison, it is better to measure the spectrum of each noise, such as in O.B. SPL frequency ranges. Then, the relative loudness of two sounds can be compared frequency range by frequency range.
- (7) L-Percent Sound Levels: L percent levels (e.g., L_{50} , L_{90} & L_{10}) refer to the A-wt. sound levels that are exceeded for 90, 50 and 10 percent of the time, respectively, during a sound measurement period. For example, the 50-percentile exceeded sound level is designated to as L_{50} and is sometimes described as the median sound level. The range between L_{10} and L_{90} usually provides a good indication of the variability of the sound levels during the measurement period, and the L_{90} can be to represent the “lowest” background/ambient sound level.
- (8) Relevant Standards, associated Standards Institute(s) and References
American National Standards Institute (ANSI) S1.4: Specification for SLM:
Type I Sound Level Meter: SLM having a tolerance of +/- 0.5 dB from 22.4 to 11,200 Hz.
ANSI S1.11-1971 (R-1976): Specifications for Octave, Half-Octave and Third-Octave Filter Sets.
ASTM Standard E1014-84: Standard Guide for the Measurement of Outdoor A-Weighted Sound Level. This guide covers the measurement of A-weighted sound levels outdoors at specified locations or along particular site boundaries, using a general-purpose sound level meter.

End of Report

Subject: **EPNG Red Mountain Compressor Station (Luna County, New Mexico): Results of a Sound Survey after Installation of the Facility associated with the EPNG South Mainline Expansion Project**

Prepared for: **El Paso Natural Gas, LLC ("EPNG")**

H&K Report No. 4083

Date of Report: September 3, 2020

H&K Job No. 5418

Submitted by: Paul D. Kiteck, P.E., **Hoover & Keith Inc. (H&K)**

Applicable FERC Docket Number: CP18-332-000

REPORT SUMMARY

This report presents the results of a sound survey performed on August 17, 2020, after installation of the new **Red Mountain Compressor Station** (abbreviated as "Station" or "CS" in the report) associated with the **EPNG South Mainline Expansion Project** ("Project"). The purpose of the sound survey was to quantify the sound level attributable to the Station at the nearby noise-sensitive areas (NSAs) and compare the measured sound level during Station operation to applicable sound requirements.

The following table summarizes the measured daytime L_{eq} (L_d) at the identified-designated closest NSA (i.e., residence more than 2 miles from the Station) and approximately 1 mile from the Station along with the resulting L_{dn} (as calculated from the measured L_d) during full load operation of the Station. Note that the measured sound level at the designated closest NSA and 1-mile measurement location was influenced by noise sources not associated with the Station operation.

Summary of the Measured Sound Levels and Resulting L_{dn} at the Designated Closest NSA and approximately 1 Mile from the Station during Full Load Operation of the Station

Closest NSA(s), Type of NSA and other Meas. Location of Interest	Distant and Direction of NSA from Station Site Center	Measured Daytime L_{eq} (L_d) during Operation of the Station*	Resulting L_{dn} during Operation of the Station (Calc'd via Meas'd L_d)
NSA #1 (Residence)	12,200 feet (E)	41.8 dBA*	48.2 dBA
1 Mile Location	5,280 feet (W)	34.5 dBA*	40.9 dBA

*Since the measured sound data (L_d) during sound survey was influenced by noise sources not associated with the Station, the sound contribution due only to the Station is lower than the reported sound levels.

The results of the sound survey and subsequent data calculations indicate that the sound attributable to the **Red Mountain Compressor Station** during full load operation at any nearby NSA is notably lower than **55 dBA** (L_{dn}), which is the FERC sound level requirement. Since the Station was operated at full horsepower load conditions, this sound survey is considered a "full load sound survey".

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1.0 **INTRODUCTION**

In this report, **Hoover & Keith Inc.** (H&K) presents the results of a sound survey performed on August 17, 2020, after installation of the new **Red Mountain Compressor Station** (abbreviated as “Station” or “CS” in the report) associated with the **El Paso Natural Gas (EPNG) South Mainline Expansion Project** (“Project”). The purpose of the sound survey was to quantify the sound level attributable to the Station at the identified nearby noise-sensitive areas (NSAs), consisting of a residence located more than 2 miles from the Station, and compare the measured sound level during Station operation to applicable sound requirements.

2.0 **SITE/FACILITY DESCRIPTION**

Figure 1 (Appendix, p. 6) is an area layout/map around the Station showing the surrounding closest NSA, other areas of interest and the reported sound measurement positions near the identified-designated closest NSA and location 1 mile from the Station site. The Station is located Luna County, New Mexico, approximately 10 miles west of Deming, NM. The Red Mountain Station equipment is located at the site of the previous EPNG Deming Compressor Station, which no longer operates. The area around the site is mostly undeveloped land, and the closest NSA (i.e., residence) is located more than 2 miles from the Station.

Figure 2 (Appendix, p. 7) is a layout of the Station showing the buildings-equipment and the reported sound measurement positions around the Station property. The Station is equipped with one (1) natural gas turbine-driven compressor unit consisting of a Solar Model Mars 90 turbine (13,000 HP ISO rating) driving a Solar centrifugal compressor. The turbine and compressor are installed in an insulated metal building (i.e., Compressor Building). For reference, **Figure 3 (Appendix, p. 8)** provides a photo showing the Compressor Building and auxiliary equipment at the Station, as viewed from the South Side of the Station.

3.0 **SOUND LEVEL REQUIREMENT, TYPICAL METRICS AND TERMINOLOGY**

A summary of applicable acoustical terminology in this report and description of typical metrics used to measure and regulate environmental noise is provided at the end of the report (**Appendix, pp. 11–12**).

FERC Sound Requirement: Conditions set forth by the Office of Energy Projects (OEP) of the FERC, EPNG shall file a noise survey with the Secretary **no later than 60 days** after placing the Red Mountain Compressor Station in service. If a full load condition noise survey is not possible, EPNG shall provide an interim survey at the maximum possible horsepower load and provide the full load survey **within 6 months**. If the noise attributable to the operation of all equipment at the Red Mountain Compressor Station under interim or full horsepower load conditions exceeds an L_{dn} of 55 dBA at any nearby NSAs, EPNG shall file a report on what changes are needed and shall install the additional noise controls to meet the level **within 1 year** of the in-service date.

EPNG shall confirm compliance with the above requirement by filing a second noise survey with the Secretary **no later than 60 days** after it installs the additional noise controls.

The L_{dn} is an energy average of the measured daytime equivalent daytime A-wt. sound level (L_d) and measured nighttime L_{eq} (L_n) plus **10 dB**. The **10-dB** adjustment to the L_n is intended to compensate for nighttime sensitivity. For an essentially steady sound source that operates continuously over a 24-hour period and controls the environmental sound level, such as a natural gas compressor station, the L_{dn} is approximately **6.4 dB** above the measured L_{eq} . As a result, an L_{dn} of **55 dBA** corresponds to an L_{eq} (e.g., L_d) of **48.6 dBA**. If both the L_d and L_n are measured and/or estimated, then the L_{dn} is calculated using the following formula:

$$L_{dn} = 10 \log_{10} \left(\frac{15}{24} 10^{L_d/10} + \frac{9}{24} 10^{(L_n+10)/10} \right)$$

State of and County/Local: The State of New Mexico does not have any applicable noise regulations for this type of industrial-commercial facility. In addition, no county or local (township) noise regulations have been identified for this facility.

4.0 MEASUREMENT LOCATIONS, CONDITIONS AND MEASUREMENT METHODOLOGY

4.1 Sound Measurement Positions, Closest NSAs and Operating Conditions: Sound measurements were conducted near the designated closest NSA to the Station, noting that the Station sound level contribution at more distant NSAs should be lower than the Station sound level at the identified nearby NSAs. In addition, sound measurement at 1 mile from the Station and around the property of the Station are reported. The following provides a description of the identified-designated closest NSA and the reported sound measurement positions.

Pos. 1: Near NSA #1 ("closest NSA"); Residence located approximately 12,200 feet (2.2 miles) east of the Station site "acoustic" center (i.e., location of the Compressor Building).

Pos. 2: Measurement position approximately 1 mile west of the Station site center.

Pos. 3: South fenceline of the Station, in line with the Compressor Building.

Pos. 4: West fenceline of the Station, in line with the Compressor Building.

Pos. 5: North fenceline of the Station, in line with the Compressor Building.

Pos. 6: East fenceline of the Station, in line with the Compressor Building.

The sound survey was performed by Garrett Porter of H&K during the daytime of August 17, 2020. During the sound survey, the temperature was 93° F, the sky was clear and the wind was blowing from the east.

During the sound survey, the Station turbine-driven compressor unit was operated at full load conditions although the Station could only be operated for a limited time frame due to pipeline conditions. A summary of the Station-unit operating conditions during the sound survey are included in **Table A (Appendix, p. 9)**. Note that the *Percent of Full Speed of the Gas Producer* ("NGP") is referred to as the turbine speed and the *Percent of Full Speed of the Power Turbine*

("NPT") is referred to as the compressor speed, and a Solar turbine-driven compressor unit is typically considered to be operating at full load if the NGP and/or the NPT is approximately 100% of full speed, noting that a Solar Mars turbine can be operated at a maximum NGP of 103.6% of full speed.

- 4.2 Data Acquisition and Sound Measurement Equipment: At each sound measurement location, the L_{eq} and unweighted octave-band (O.B.) sound pressure levels ("SPLs") were measured at approximately five (5) feet above ground. Sound measurements at the nearby NSAs attempted to exclude "extraneous sound" such as the noise of a vehicle passing immediately by the sound measurement location or other intermittent noise sources not related to Station operating equipment, and sound tests were conducted during times that the wind speed was below 8 mph to reduce influence of the wind even though a mic windscreen was employed. The acoustical measurement system consisted of a Norsonic Model Nor140 Sound Level Meter (a Type 1 "SLM" per ANSI S1.4 & S1.11) equipped with a ½-inch microphone with a windscreen. The SLM was calibrated with a microphone calibrator (calibrated within 1 year of the test date).

5.0 MEASUREMENT RESULTS, OBSERVATIONS AND FINAL COMMENT

Table A (Appendix, p. 9) shows the measured daytime L_{eq} (L_d) during operation of the Station at the NSA sound measurement position(s) along with the average of the measured L_d since more than one test sample was taken during the sound survey tests. **Table A** also includes the resulting L_{dn} at the designated closest NSA, as calculated from the measured L_d . Meteorological conditions that occurred during the sound survey are summarized in **Table B** (Appendix, p. 9). The measured A-wt. sound levels (L_d) and associated unweighted O.B. SPLs at all reported measurement positions during Station operation are provided in **Table C** (Appendix, p. 10).

The following **Table 1** summarizes the measured L_d at the designated closest NSA (i.e., residence more than 2 miles from the Station) and approximately 1 mile from the Station along with the resulting L_{dn} (as calculated from the measured L_d) during operation of the Station compressor unit.

Closest NSA(s), Type of NSA and other Meas. Location of Interest	Distant and Direction of NSA from Station Site Center	Measured Daytime L_{eq} (L_d) during Operation of the Station*	Resulting L_{dn} during Operation of the Station (Calc'd via Meas'd L_d)
NSA #1 (Residence)	12,200 feet (E)	41.8 dBA*	48.2 dBA
1 Mile Location	5,280 feet (W)	34.5 dBA*	40.9 dBA

Table 1: Summary of the Measured L_d and Resulting L_{dn} at the Designated Closest NSA and at approximately 1 Mile from the Station during Full Load Operation of the Station

*Since measured sound levels during sound survey influenced by the noise sources not related to Station, the sound level contribution due only to Station is actually lower than the reported sound levels.

Observations: During the sound tests near the designated closest NSA (NSA #1), the Station noise was not audible. Therefore, the Station noise did not contribute to the measured A-wt. sound levels (L_d). The most notable non-Station ("environmental") sound sources that

contributed to the measured A-wt. sound levels at NSA #1 was the noise associated with distant vehicle traffic (along I-10), and at times, the sound of birds. At a distance of 1 mile from the Station (i.e., Meas. Pos. 2), the Station noise was faintly audible, and as a result, the noise associated with the Station operation was not a significant contributor to the measured A-wt. sound levels at Meas. Pos. 2.

Final Comment: The results of the sound survey and subsequent data calculations indicate that the sound level attributable to the **Red Mountain Compressor Station** during full load operation at any nearby NSA is notably lower than **55 dBA** (L_{dn}), which is the FERC sound level requirement. Since the Station was operated at full horsepower load conditions, this sound survey is considered a "full load sound survey".

APPENDIX

- **FIGURE 1: AREA LAYOUT–MAP AROUND THE STATION SHOWING ANY SURROUNDING NSAs, OTHER AREAS OF INTEREST AND CHOSEN SOUND MEASUREMENT POSITION NEAR THE DESIGNATED CLOSEST NSA AND AT 1 MILE SOUND MEASUREMENT LOCATION**
- **FIGURE 2: LAYOUT–SKETCH OF THE STATION SHOWING THE BUILDINGS-EQUIPMENT AND REPORTED SOUND MEASUREMENT POSITIONS AROUND THE STATION PROPERTY-FENCELINE**
- **FIGURE 3: PHOTO SHOWING THE COMPRESSOR BUILDING AND AUXILIARY EQUIPMENT, AS VIEWED FROM THE “SOUTH SIDE” OF THE STATION**
- **SUMMARY OF THE MEASURED SITE SOUND DATA DURING THE SOUND SURVEY AND ANY SUBSEQUENT SOUND CALCULATIONS**
- **SUMMARY OF ACOUSTICAL TERMINOLOGY AND TYPICAL METRICS**



Figure 3: EPNG Red Mountain Compressor Station: Photo showing the Compressor Building and Auxiliary Equipment, as Viewed from South Side of the Station (area of Meas. Pos. 3).

Measurement Set		Meas'd/Calc'd A-Wt. Levels (dBA)				Notes/Observations
		Day-time Leq(Ld)	Avg'd of Ld	Night-time Leq(Ln)	Calc'd Ldn	
Meas. Pos. & NSA	Time of Test					
Pos. 1 (NSA #1) Residence approximately 12,200 feet east of the CS site	5:01 PM	41.2	41.8	Not Meas'd	48.2 Note (1)	Primary noise during tests: Noise of distant traffic along Interstate 10 (I-10); sound of insects, and at times, sound of wind blowing in local foliage-brush. Noise of the CS not audible at this location.
	5:02 PM	41.2				
	5:04 PM	43.0				
Pos. 2: Measurement Location approximately 1 Mile west of the CS site	4:49 PM	35.3	34.5	Not Meas'd	40.9 Note (1)	Primary noise during tests: Noise of distant traffic along I-10; sound of insects, and at times, wind-related sounds. Noise of the CS faintly audible at this location.
	4:50 PM	33.8				
	4:51 PM	34.5				

Table A: EPNG Red Mountain Compressor Station ("CS"): Summary of Measured Daytime Leq (i.e., Ld) at the Designed Closest NSA and 1 Mile from CS during Full Load Operation of the Station Solar Mars Turbine-Driven Compressor Unit, as Measured on August 17, 2020, along with the Resulting Ldn, as calculated from the Measured Ld.

Station/Unit Operating Conditions during Sound Survey:

- > Solar Mars 90 Unit: NGP @ 103% and NPT @ 96%
- > Solar Mars 90 Unit: Compressor suction pressure @ 626 psig; discharge pressure @ 700 psig.
- > Most fans of gas aftercooler operating, and there was CS gas recycling (CS recycle valve 95% open).

Note (1): Ldn calc'd by adding 6.4 dB to meas'd Ld since nighttime sound levels (Ln) not measured.

Measurement Set		Temp. (°F)	R.H. (%)	Wind Direction	Wind Speed	Peak Wind	Sky Conditions
Meas. Positions	Time Frame/Date of Tests						
Pos. 1 - 6	4:00 PM to 5:30 PM Aug. 17 (2020)	93	18	Wind from the east	3 - 5 mph	7 mph	Mostly clear

Table B: EPNG Red Mountain CS: Summary of Meteorological Conditions during the Sound Survey Measurements around the Facility on August 17, 2020.

EPNG South Mainline Expansion Project and Red Mountain Compressor Station
Results of Sound Survey after Installation of the Station

Hoover & Keith Inc.

H&K Job No. 5418

H&K Report No. 4083 (Date: 09/03/2020)

Measurement Set		Unweighted Sound Pressure Level (SPL) in dB per O.B. Frequency (in Hz)									A-Wt. Level
Meas. Pos. & NSA	Time of Test	31.5	63	125	250	500	1000	2000	4000	8000	
Pos. 1 (NSA #1) Residence approximately 12,200 feet east of the CS site	5:01 PM	53.7	49.9	45.0	40.3	40.1	37.1	24.6	11.9	12.1	41.2
	5:02 PM	62.7	53.2	46.2	41.4	38.8	37.2	26.5	13.7	12.8	41.2
	5:04 PM	74.2	64.2	50.6	42.0	36.9	33.6	25.1	17.9	16.3	43.0
	Avg. A-Wt. & SPL	63.5	55.8	47.3	41.2	38.6	36.0	25.4	14.5	13.7	41.8
Pos. 2: Measurement Location approximately 1 Mile west of the CS site	4:49 PM	55.4	49.4	38.5	35.6	34.6	29.4	20.1	14.0	13.1	35.3
	4:50 PM	53.1	47.9	40.1	34.2	31.3	27.8	21.9	20.0	13.1	33.8
	4:51 PM	47.3	45.9	38.7	37.6	33.4	27.1	21.5	11.8	12.2	34.5
	Avg. A-Wt. & SPL	51.9	47.7	39.1	35.8	33.1	28.1	21.2	15.3	12.8	34.5
Pos. 3: South fenceline of the Station, in line with Compressor Bldg.	4:27 PM	68.4	74.1	68.4	58.7	48.6	49.8	54.0	50.5	33.7	59.7
	4:28 PM	68.5	74.6	69.3	58.8	48.6	50.0	54.6	50.4	33.8	60.1
	4:29 PM	69.5	74.6	68.9	58.9	48.8	50.2	54.8	50.8	33.7	60.2
	Avg. A-Wt. & SPL	68.8	74.4	68.9	58.8	48.7	50.0	54.5	50.6	33.7	60.0
Pos. 4: West fenceline of the Station, in line with Compressor Bldg.	4:31 PM	64.1	67.3	65.5	60.5	53.1	58.5	66.0	62.5	44.0	69.2
	4:32 PM	64.1	67.6	66.0	59.6	52.1	58.4	65.8	63.3	44.4	69.3
	4:33 PM	62.7	67.0	66.3	59.9	51.5	57.8	64.8	63.7	44.4	68.9
	Avg. A-Wt. & SPL	63.6	67.3	65.9	60.0	52.2	58.2	65.5	63.2	44.3	69.1
Pos. 5: North fenceline of the Station, in line with Compressor Bldg.	4:35 PM	66.4	66.0	65.6	61.5	53.8	55.9	61.5	56.6	41.0	65.0
	4:36 PM	67.1	65.7	65.7	60.8	53.4	55.1	61.6	56.3	40.7	64.8
	4:37 PM	65.9	66.0	65.9	61.0	53.8	55.5	61.4	56.4	40.8	64.8
	Avg. A-Wt. & SPL	66.5	65.9	65.7	61.1	53.7	55.5	61.5	56.4	40.8	64.9
Pos. 6: East fenceline of the Station, in line with Compressor Bldg.	4:39 PM	65.5	65.2	65.0	60.0	54.8	52.0	59.9	55.4	37.9	63.4
	4:40 PM	64.6	64.6	63.9	61.3	56.5	51.5	58.9	54.7	35.6	62.9
	4:41 PM	64.4	64.7	63.5	61.7	57.2	51.6	58.2	54.3	35.2	62.6
	Avg. A-Wt. & SPL	64.8	64.8	64.1	61.0	56.2	51.7	59.0	54.8	36.2	63.0

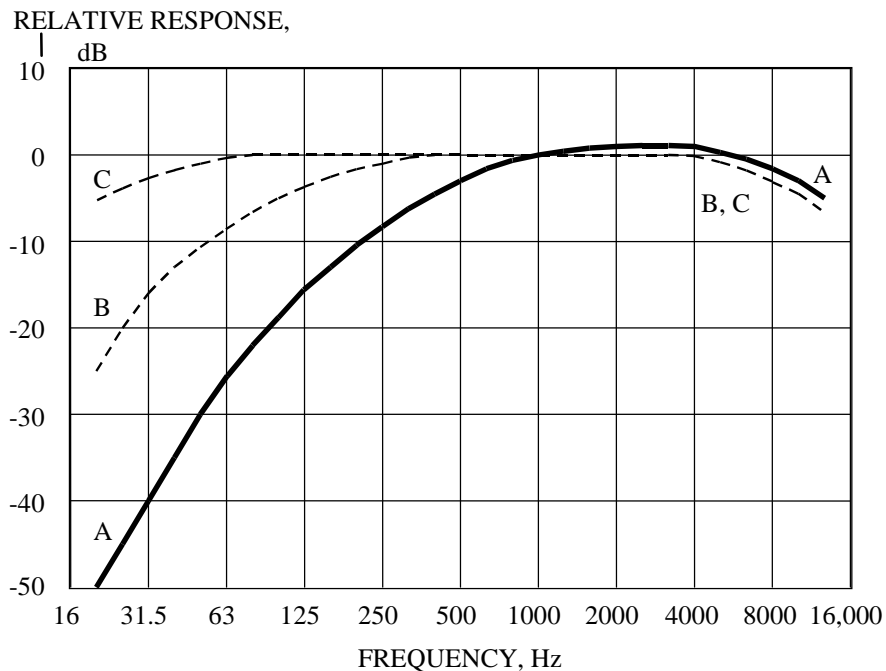
Table C:

EPNG Red Mountain CS: Measured A-Wt. Levels (Ld) and Unweighted O.B. SPLs at the Designated Closest NSA, at approximately 1 Mile from the CS Site and around the Station Property, as measured on Aug. 17, 2020, during Full Load Operation of the Station Mars Turbine-Driven Compressor Unit.

Summary of Typical Metrics and Acoustical Terminology

- (1) Decibel (dB): A unit for expressing the relative power level difference between acoustical or electrical signals. It is ten times the common logarithm of the ratio of two related quantities that are proportional to power. When adding dB or dBA values, the values must be added logarithmically. For example, the logarithmic addition of **35 dB** plus **35 dB** is **38 dB**.
- (2) A-Weighted Sound Level (dBA): The A-wt. sound level is a single-figure sound rating, expressed in decibels (Re 20 μ Pa), which correlates to the human perception of the loudness of sound. The dBA level is commonly used to measure industrial and environmental noise since it is easy to measure and provides a reasonable indication of the human annoyance value of the noise. The dBA measurement is not a good descriptor of a noise consisting of strong low-frequency components or for a noise with tonal components. The A-weighted curve approximates the response of the average ear at sound levels of 20 to 50 decibels. The following are the relative response of A-weighted filter per octave band frequency, and a graph/curve is provided that shows a graphical representation of the A-wt. filter response per frequency (in Hz).

31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1,000 Hz	2,000 Hz	4,000 Hz	8,000 Hz	16,000 Hz
-39.4 dB	-26.2 dB	-16.1 dB	-8.6 dB	-3.2 dB	0 dB	+1.2 dB	+1.0 dB	-1.1 dB	-6.6 dB



- (3) Equivalent Sound Level (L_{eq}): The equivalent sound level (L_{eq}) can be considered an average sound level measured during a period of time, including any fluctuating sound levels during that period. In this report, the L_{eq} is equal to the level of a steady (in time) A-weighted sound level that would be equivalent to the sampled A-weighted sound level on an energy basis for a specified measurement interval. The concept of the measuring L_{eq} has been used broadly to relate individual and community reaction to aircraft and other environmental noises.

- (4) Daytime Sound Level (L_d) & Nighttime Sound Level (L_n): L_d is the equivalent A-weighted sound level, in decibels, for a 15 hour time period, between 07:00 to 22:00 Hours (7:00 a.m. to 10:00 p.m.). L_n is the equivalent A-weighted sound level, in decibels, for a 9 hour time period, between 22:00 to 07:00 Hours (10:00 p.m. to 7:00 a.m.).
- (5) Day-Night Average Sound Level (L_{dn}): The L_{dn} is an energy average of the measured daytime L_{eq} (L_d) and the measured nighttime L_{eq} (L_n) plus **10 dB**. The **10-dB** adjustment to the L_n is intended to compensate for nighttime sensitivity. As such, the L_{dn} is not a true measure of the sound level but represents a skewed average that correlates generally with past sound surveys which attempted to relate environmental sound levels with physiological reaction and physiological effects. For a steady sound source that operates continuously over a 24-hour period and controls the environmental sound level, an L_{dn} is approximately **6.4 dB** above the measured L_{eq} . Consequently, an L_{dn} of **55 dBA** corresponds to a L_{eq} of **48.6 dBA**. If both the L_d and L_n are measured, then the L_{dn} is calculated using the following formula:
- $$L_{dn} = 10 \log_{10} \left(\frac{15}{24} 10^{L_d/10} + \frac{9}{24} 10^{(L_n+10)/10} \right)$$
- (6) Octave Band (O.B.) Sound Pressure Level (SPL): Sound is typically measured in frequency ranges (e.g., high-pitched sound, low-pitched sound, etc.) that provides more meaningful sound data regarding the sound character of the noise. When measuring two noise sources for comparison, it is better to measure the spectrum of each noise, such as in O.B. SPL frequency ranges. Then, the relative loudness of two sounds can be compared frequency range by frequency range.
- (7) L-Percent Sound Levels: L percent levels (e.g., L_{50} , L_{90} & L_{10}) refer to the A-wt. sound levels that are exceeded for 90, 50 and 10 percent of the time, respectively, during a sound measurement period. For example, the 50-percentile exceeded sound level is designated to as L_{50} and is sometimes described as the median sound level. The range between L_{10} and L_{90} usually provides a good indication of the variability of the sound levels during the measurement period, and the L_{90} can be to represent the “lowest” background/ambient sound level.
- (8) Relevant Standards, associated Standards Institute(s) and References
American National Standards Institute (ANSI) S1.4: Specification for SLM:
Type I Sound Level Meter: SLM having a tolerance of +/- 0.5 dB from 22.4 to 11,200 Hz.
ANSI S1.11-1971 (R-1976): Specifications for Octave, Half-Octave and Third-Octave Filter Sets.
ASTM Standard E1014-84: Standard Guide for the Measurement of Outdoor A-Weighted Sound Level. This guide covers the measurement of A-weighted sound levels outdoors at specified locations or along particular site boundaries, using a general-purpose sound level meter.

End of Report

Certificate of Service

I hereby certify that I have this day caused a copy of the foregoing document to be served upon each person designated on the official service list compiled by the Commission's Secretary in this proceeding in accordance with the requirements of Section 385.2010 of the Federal Energy Regulatory Commission's Rules of Practice and Procedure.

Dated at Colorado Springs, Colorado as of this 4th day of September, 2020.

/s/

Francisco Tarin

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