MINISINK COMPRESSOR STATION

AMBIENT SOUND SURVEY AND NOISE IMPACT ANALYSIS

H&K Report No. 2601

H&K Job No. 4388

Date of Report: July 7, 2011

Prepared for: **Hatch Mott MacDonald**
27 Bleeker Street
Milburn, NJ 07041

Applicant: **Millennium Pipeline Company, L.L.C.**

Submitted by: Brian R. Hellebuyck, P.E.
Hoover & Keith Inc.
11391 Meadowglen, Suite D
Houston, TX 77082

REPORT SUMMARY

In this report, Hoover and Keith, Inc. (H&K) present the results of an April 26-27, 2011 ambient sound survey and subsequent noise impact analysis associated with the proposed **Minisink Compressor Station** ("Station"), a new compressor station to be owned and operated by **Millennium Pipeline Company, L.L.C.** (Millennium). The purpose of the ambient sound survey and acoustical analysis is to:

- Document the existing acoustic environment around the proposed site and locate the noise-sensitive areas (NSAs) surrounding the proposed Station.
- Project the sound level contribution that would result from operating the proposed Station installation.
- Determine noise control measures and noise specifications for the Station equipment to insure that the facility meets applicable sound level criteria.

The following table summarizes the measured sound levels and noise quality analysis for the proposed Minisink Compressor Station at the closest NSAs:

NSAs	Distance Center of Proposed Comp. Units	Meas'd L_n (dBA)	Meas'd L_d (dBA)	Calc'd Ambient L_{dn} [(1)] (dBA)	Est'd L_{dn} of Station at Full Load (dBA)	Station L_{dn} + Ambient L_{dn} (dBA)	Potential Increase Above Ambient (dB)
NSA #1 (Houses)	650 ft. E to SE	32.6	41.9	42.2	43.7 46.0		3.8
NSA #2 (House)	1,125 ft. N-NE	32.2	40.4	41.2	38.6 43.1		1.9
NSA #3 (Houses)	1,125 ft. S to SW	31.6	38.5	39.9	38.6 42.3		2.4
NSA #4 (Houses)	1,175 ft. W to NW	31.8	35.9	39.1	38.1 41.6		2.5
[(1)] Via Measured L_d and L_n.							

Noise Quality Analysis for the Proposed Minisink Station at the Closest NSAs

The results of our measurements, observations and analysis indicate that the estimated full load station sound level contribution at the nearby NSAs should be significantly less than an **L_{dn}** of **55 dBA**. Therefore, assuming the recommended noise control measures are followed and successfully implemented, it is our opinion that the sound level attributable to the proposed Station should not exceed the FERC criterion of **55 dBA L_{dn}** at the nearby NSAs and there should be no perceptible increase in vibration.

With respect to more distant NSAs, the Station sound level contribution will decrease with distance as the Station noise control recommendations are designed to control Station noise at the source. With respect to the Station location, elevation and surrounding terrain, the sound level impact at more distant NSAs will be less than the impact at the closest NSAs (i.e., NSA #1 thru NSA #4.)

The potential increase above ambient noise levels ranges from 2 to 4 dB. Regarding the human perception for change in sound level (i.e., potential increase above ambient), a 0-3 dB change in sound level is representative of a minimum impact, a 5-6 dB change is a noticeable impact, and a 10 dB change is perceived as a doubling of sound level or a significant impact.

TABLE OF CONTENTS

Page

Continued on next page

TABLE OF CONTENTS (cont'd.)

FIGURES AND TABLES

1.0 INTRODUCTION

In this report, Hoover and Keith, Inc. (H&K) present the results of an April 26-27, 2011 ambient sound survey and subsequent noise impact analysis associated with the proposed **Minisink Compressor Station** ("Station"), a new compressor station to be owned and operated by **Millennium Pipeline Company, L.L.C.** (Millennium). The purpose of the ambient sound survey and acoustical analysis is to:

- Document the existing acoustic environment around the proposed site and locate the noise-sensitive areas (NSAs) surrounding the proposed Station.
- Project the sound level contribution that would result from operating the proposed Station installation.
- Determine noise control measures and noise specifications for the Station equipment to insure that the facility meets applicable sound level criteria.

2.0 SOUND CRITERIA

Typically, certificate conditions set forth by the Federal Energy Regulatory Commission (FERC) require that the sound level attributable to a new compressor station not exceed an equivalent day-night sound level (L_{dn}) of **55 dBA** at any nearby NSA, such as residences, hospitals or schools. The L_{dn} is an energy average of the daytime L_{eq} (i.e., L_d) and nighttime L_{eq} (i.e., L_n) plus 10 dB. For an essentially steady sound source (e.g., gas compressor station) that operates continuously over a 24-hour period and controls the environmental sound level, the 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**.

There are no applicable State of New York[1], Orange County or Town of Minisink noise regulations for the Station. Contact reports with Orange County and the Town of Minisink are included in **Appendix E** (pp. E-1 to E-4).

For reference, a summary of acoustical terminology and typical metrics used to measure and regulate environmental noise is provided at the end of this report in **Appendix F** (pp. F-1 to F-3).

[1] The NYSDEC has a Policy Document (i.e., Program Policy DEP-00-1; Revised Feb. 2, 2001, "Assessing and Mitigating Noise Impacts") to provide guidance and clarify program issues for NYSDEC staff to ensure compliance with statutory and regulatory requirements for facility operations regulated under New York State Environmental Quality Reviews or "SEQR".

3.0 DESCRIPTION OF SITE AND PROPOSED COMPRESSOR STATION

3.1 Description of the Site

Figure 1 (p. A-1) depicts the proposed Station and surrounding area. **Figure 2** (p. A-2) depicts the Station and immediate surrounding area. The Station is located in the Town of Minisink in Orange County, New York and the Station is approximately 9 miles E-SE of Port Jervis, New York. The surrounding area consists of forested lands, agricultural lands and residences upon gently to moderately sloped terrain. The closest NSAs are residences along Jacobs Road approximately 650 ft. east to southeast of the center of the proposed compressor units. Other NSAs include residences 1,125 ft. north-northeast, 1,125 ft. south to southwest, and 1,175 ft. west to northwest of the center of the proposed compressor units.

3.2 Description of the Station Equipment

Figure 3 (p. A-3) depicts the proposed Station Plot Plan. The noise impact analysis assumes that the Station will include two (2) Solar Centaur 50 Turbine Compressor Units that are ISO rated at 6,130 HP each. The following describes auxiliary equipment and other notable items associated with the new station:

- Acoustically designed compressor building.
- High performance turbine exhaust systems.
- High performance turbine air inlet systems.
- Low noise turbine lube oil coolers.
- Aboveground gas piping.
- Control / MCC building and station air compressors.
- Standby generator.

4.0 MEASUREMENT METHODOLOGY

4.1 Sound Measurement Locations

Four (4) locations were chosen to measure the sound levels near the closest NSAs located around the proposed Station and the measurement locations are depicted on **Figure 2** (p. A-2). The following is a description of the NSAs and the selected sound measurement positions:

Pos. 1: Adjacent to NSA #1: Houses located on Jacobs Road. The closest houses are approximately 650 ft. east to southeast of the proposed compressor units.

Pos. 2: Adjacent to NSA #2: House located off of Jacobs Road approximately 1,125 ft. north-northeast of the proposed compressor units.

Pos. 3: Adjacent to NSA #3: Houses located on Jacobs Road. The closest houses are approximately 1,125 ft. south to southwest of the proposed compressor units.

Pos. 4: Adjacent to NSA #4: Houses located on Chestnut Ridge, Bender and Oak Hill Roads. The closest house is approximately 1,175 ft. west of the proposed compressor units.

4.2 Data Acquisition and Sound Measurement Equipment

Ambient sound measurements were performed by Orlando Fernandez of H&K during the nighttime and morning periods on April 26 and April 27, 2011, respectively. At the reported sound measurement locations, the A-wt. equivalent sound levels (Leq) and unweighted octave-band sound pressure levels (SPLs) were performed at approximately 5 ft. above ground. Typically, 3 representative samples of the ambient noise were performed at each sound measurement position.

The acoustical measurement system consisted of a Rion Model NA-27 Sound Level Meter (a Type 1 SLM per ANSI S1.4 & S1.11) equipped with a 1/2-inch microphone with a windscreen, and SLM was calibrated within 1 year of the sound test date.

5.0 MEASUREMENT RESULTS

5.1 Measured Sound Level Data

Table A (p. B-1) shows the measured daytime L_{eq} (i.e., L_d) and the measured nighttime L_{eq} (i.e., L_n) along with the average of the measured L_d and L_n since more than one (1) sample of the sound level was measured. In addition, **Table A** includes an estimated day-night average sound level (i.e., L_{dn}), as calculated from the measured L_d and L_n and observations during the measurements. Meteorological conditions during the tests are summarized in **Table B** (p. B-1). The measured nighttime and daytime unweighted octave-band SPLs at the reported sound measurement positions and the average of the octave-band SPLs are provided in **Tables C & D** (p. B-2).

The following **Table 1** summarizes the measured nighttime ambient L_n and measured daytime ambient L_d at the NSAs along with the calculated L_{dn} (as calculated from the measured L_d and L_n).

NSAs	Distance to Center of Proposed Comp. Units	Meas'd L_n (dBA)	Meas'd L_d (dBA)	Calc'd Ambient L_{dn} [(1)] (dBA)
Pos. 1, Houses (NSA #1)	650 ft. E to SE	32.6	41.9	**42.2**
Pos. 2, House (NSA #2)	1,125 ft. N-NE	32.2	40.4	**41.2**
Pos. 3, Houses (NSA #3)	1,125 ft. S to SW	31.6	38.5	**39.9**
Pos. 4, Houses (NSA #4)	1,175 ft. W to NW	31.8	35.9	**39.1**
[(1)] Via Measured L_d and L_n.				

Table 1: Measured Sound Levels and the Calculated L_{dn} at the Closest NSAs

The goal of the ambient sound survey is to document the lower range of ambient sound levels for the meteorological conditions that existed during the sound survey. During the sound survey, the wind speeds were relatively low (0-4 mph), which resulted in generally still conditions. The sound measurements were performed at or near the shoulder of public roads and the measurements were paused to obtain periods of minimum audible traffic noise, no passby traffic, periods with no direct aircraft flyovers, and other short term sounds to exclude "extraneous sound" from the sound survey.

Our observations during the sound survey indicate that the area surrounding the proposed Station is a generally quiet area (i.e., sparse suburban or rural residential) that would be controlled by normal environmental sounds (i.e., birds, insects, wind noise, distant traffic, passby traffic, aircraft, etc.).

In conclusion, the measured sound level data adequately quantifies the existing ambient sound levels around the site for the meteorological conditions that occurred during the sound survey. Throughout a typical year, there may be periods with lower ambient sound levels than reported in this report, but is our opinion that the long term ambient sound levels would be similar to the reported sound levels factoring in the total noise produced by all sources associated with a given environment.

5.2 Observations during the Site Sound Tests

At NSA #1: Primary Daytime noise included birds & insects, the sound of wind, several aircrafts, and distant traffic noise. Primary Nighttime noise included insects, birds, the sound of wind, several aircrafts, and distant traffic noise.

At NSA #2: Primary Daytime noise included birds & insects, the sound of wind, several aircrafts, and distant traffic noise. Primary Nighttime noise included insects, birds, the sound wind, several aircrafts, and distant traffic noise.

At NSA #3: Primary Daytime noise included birds & insects, the sound of wind, several aircrafts, and distant traffic noise. Primary Nighttime noise included insects, birds, the sound of wind, several aircrafts, and distant traffic noise.

At NSA #4: Primary Daytime noise included birds & insects, the sound of wind, and distant traffic noise. Primary Nighttime noise included insects, birds, the sound of wind, and distant traffic noise.

6.0 NOISE IMPACT EVALUATION

6.1 Significant Sound Sources

The noise impact evaluation considers the noise produced by all significant sound sources associated with the proposed Station that could impact the sound contribution at the nearby NSAs. A description of the analysis methodology and source of sound data is provided in **Appendix D** (p. D-5). The following sound sources are considered significant:

- Turbine-compressor casing noise that penetrates the compressor building.
- Noise of the turbine unit exhaust systems.
- Noise of the turbine air intake systems.
- Noise of the electric motor driven lube oil coolers.
- Noise radiated by above ground compressor station piping.

6.2 Estimated Sound Contribution

Tables E - H (pp. C-1 to C-4) show the calculation (i.e., spreadsheet analysis) of the estimated octave-band SPLs and the A-wt. sound level, at NSAs #1 - #4, contributed by the significant noise sources associated with the proposed facilities for standard day propagating conditions (i.e., no wind, 60 deg. F., 70% R.H.) and any shielding from buildings, terrain or foliage has been conservatively ignored. This spreadsheet analysis includes the potential noise reduction due to the anticipated and/or recommended noise control measures for equipment.

6.3 Noise Quality Analysis

Table 2 below summarizes the Noise Quality Analysis for the closest NSAs for the proposed Station:

NSAs	Distance Center of Proposed Comp. Units	Meas'd L_n (dBA)	Meas'd L_d (dBA)	Calc'd Ambient L_{dn} [(1)] (dBA)	Est'd L_{dn} of Station at Full Load (dBA)	Station L_{dn} + Ambient L_{dn} (dBA)	Potential Increase Above Ambient (dB)
NSA #1 (Houses)	650 ft. E to SE	32.6	41.9	42.2	43.7 46.0		3.8
NSA #2 (House)	1,125 ft. N-NE	32.2	40.4	41.2	38.6 43.1		1.9
NSA #3 (Houses)	1,125 ft. S to SW	31.6	38.5	39.9	38.6 42.3		2.4
NSA #4 (Houses)	1,175 ft. W to NW	31.8	35.9	39.1	38.1 41.6		2.5
[(1)] Via Measured L_d and L_n.							

Table 2: Proposed Minisink Compressor Station - Noise Quality Analysis

As noted above in **Table 2**, the sound contribution of the proposed Station is estimated to be significantly less than the 55 dBA L_{dn} FERC Criteria at the nearby NSAs.

6.4 Estimated Sound Levels for Normal Unit Blowdowns

The sound levels associated with high pressure gas venting are a function of initial blowdown pressure, the diameter and type of blowdown valve, and the diameter and arrangement of the downstream vent piping. As expected, blowdown sound levels are loudest at the beginning of the blowdown event and they decrease as the blowdown pressure decreases. The following **Table 3** summarizes the expected sound levels for normal blowdown events (i.e., unit start up and shut down) at the closest NSA:

"Normal" Blowdown Sound Source	Closest NSA	Distance / Direction to Blowdown Silencer	Est'd Initial Sound Level for Blowdown (dBA)
Unit Blowdown	Houses (NSA #1)	650 ft. E to SE	**53**

Table 3: Estimated Initial Sound Levels for "Normal" Blowdown Event

6.5 Construction Noise Impact

Table I (p. E-1) shows the calculation (i.e., spreadsheet analysis) of the estimated construction noise during Station construction activities. The acoustical analysis of the construction related activities considers the noise produced by any significant sound sources associated with the primary construction equipment that could impact the sound contribution at the nearby NSAs. The predicted sound contribution of construction activities was performed only for the closest NSA (i.e., NSA #1).

Construction of the Station will consist of earth work (e.g., site grading, clearing & grubbing) and construction of the site foundations and equipment, and it is assumed that

the highest level of construction noise would occur during site earth work (i.e., time frame when the largest amount of construction equipment would operate). The analysis indicates that the maximum A-wt. noise level of construction activities at the closest NSA would be equal to or less than 64 dBA (i.e., L_{dn} of approximately 64 dBA, since construction would only occur during daytime hours.

7.0 NOISE CONTROL REQUIREMENTS

The following section provides recommended noise control measures and equipment noise specifications along with other assumptions that may affect the noise generated by the facility.

7.1 Compressor Building

Building Structure

- As a minimum, walls/roof should be constructed with exterior steel of 18 gauge and interior layer of 6-inch thick unfaced mineral wool (e.g., 6.0-8.0 pcf uniform density) covered with a 24 gauge perforated liner. Thermal insulation, such as "R-19", should not be used as a substitute for the 6.0-8.0 pcf material.

- Personnel entry doors should have a minimum STC-38 sound rating and could include door glazing if a 2' x 2' maximum view port is employed (e.g., 1/2 inch thick laminated glazing or double pane safety glass). Doors should seal well with the doorframe and be self-closing.

- No windows, skylights or "open" louvers should be installed.

- All voids and openings in the building walls resulting from penetrations should be patched and well sealed. Building construction details shall be consistent with a high performance acoustical compressor building.

- A double roll up door system shall be utilized for the equipment access opening. Each overhead sectional roll-up door, as a minimum, should be a 20 gauge insulated type design (e.g., 20 gauge exterior with a 22 gauge backskin with insulation core) and should be completely weather-stripped.

Building Ventilation

- The building ventilation system should be designed to properly ventilate (and cool) the building and equipment during maximum outside ambient temperatures with all

personnel and equipment doors closed. Personnel and/or equipment doors will only be opened during maintenance activities.

- The A-wt. sound level for each ventilation inlet should not exceed **40 dBA** at **50 feet** from the building penetration (i.e., inlet louver, acoustic inlet hood, etc.). The A-wt. sound level for each ventilation exhaust outlet should not exceed **40 dBA** at **50 feet** from the building penetration (i.e., exhaust louver, exhaust hood, etc.), noting that this sound source is at or near the compressor building roof. A ridge vent shall not be utilized. Each ventilation inlet and exhaust outlet shall assume that the following sound pressure levels exist inside the compressor building at and adjacent to the ventilation equipment:

SPLs per Octave-Band Center Freq. & A-Wt. Level

31.5	63	125	250	500		1000	2000	4000	8000	dBA
85	90	90	95	95	95			95	95	90		**101**

  - As a minimum, air-supply fans used for ventilation should include a metal boot enclosing the fan; a minimum 36-inch length exterior silencer and a weather hood lined with acoustical insulation. Assuming separate roof exhaust vents will be utilized, each roof exhaust vent, as a minimum, should include a 36-inch length silencer (i.e., baffle-type design) mounted between the building surface and vent/hood (i.e., in the ventilator throat).

7.2 Turbine Exhaust Systems

The exhaust system should include a two stage silencer system that provides the following total dynamic insertion loss (DIL) values at the rated turbine operating conditions:

DIL Values in dB per Octave-Band Center Freq. for Exh. Muffler System

31.5	63	125	250	500		1000	2000	4000	8000
10	20	32	43	55		55	55	45	35

The recommended method to achieve the above DIL values is to install one rectangular muffler (parallel baffle design) horizontally inside the building (to the greatest extent possible) and to install another rectangular muffler (parallel baffle design) vertically outside the building (i.e., integrated into the vertical exhaust stack). It is also required that the horizontal section of ducting (and support structure) is acoustically isolated from the vertical exhaust stack and silencer with a suitable vibration break.

In addition, the exterior exhaust ductwork and exterior exhaust silencers should be completely covered with an additional layer of acoustical lagging such as a 4-in. thick

inner layer of 8.0-pcf insulation (e.g., mineral wool) covered with a heavy-gauge galvanized steel jacketing (minimum 18 gauge).

If an oxidation catalyst is required, it is recommended that the catalyst housing is installed inside the compressor building to control breakout noise.

7.3 Turbine Air Inlet Systems

The intake system should include two silencers in series (i.e., two stage silencing system) between the air intake filter and turbine unit. It is recommended that the first silencer is located inside the building, while the second stage silencer can be located outside the building, if required. It is also required that the first stage silencer (and support system) is acoustically isolated from the second stage silencer (and support structure) with an acoustical vibration break (i.e., 3" flexible fabric joint). The Solar supplied support structure for the 1st stage and 2nd stage silencers should be separated (i.e., not span across the flexible joint).

The first stage silencer can either be a "tubular" design or parallel baffle construction. The second stage silencer should be a parallel baffle construction. The "tubular" first stage silencer should meet the following dynamic insertion loss (DIL) values at the rated turbine operating conditions:

DIL Values in dB per Octave-Band Center Freq. for 1st Stage Muffler

31.5	63	125	250	500		1000	2000	4000	8000
1	2	3	4	18	38	46	54		50

The second stage parallel baffle silencer should meet the following static insertion loss (DIL values) at the rated turbine operating conditions:

DIL Values in dB per Octave-Band Center Freq. for 2nd Stage Muffler

31.5	63	125	250	500		1000	2000	4000	8000
8	15	28	35	40	40	40	40		25

It is assumed that an updraft style air inlet filter is utilized, noting that this style of filter provides additional attenuation that is required.

7.4 Turbine Unit Lube Oil Coolers

The Solar low noise lube oil cooler (i.e., maximum 80 dBA PWL) with a Howden SX fan and V-Belt drive is required for this Station.

7.5 Aboveground Gas Piping

The Station high pressure gas piping shall be buried to the greatest extent possible and it is assumed the Unit suction, discharge, bypass valves will be buried and actuated with high head extensions and electric valve actuators (i.e., no pneumatic valve operators). It is also assumed that the Unit surge control valves are located inside the Compressor Building. It is assumed that the Station suction and discharge headers will be buried.

Any remaining aboveground piping can be acoustically lagged with a minimum 3" thick fiberglass or mineral wool (e.g., 8.0 pcf uniform density) that is covered with a mass-filled vinyl jacket (e.g., composite of 1.0 psf mass-filled vinyl laminated to 0.020" thick aluminum) if necessary.

Aboveground valves can be covered with removable and/or reusable acoustic material and/or blankets, if necessary. The blanket material typically consists of a core of 2-inch thick needled fiber mat (6.0-8.0 pcf density) and a liner material of mass-loaded vinyl (1.0-1.25 psf surface weight) that is covered with a coated fiberglass cloth. The inner layer of insulation should be covered with a stainless steel mesh instead of coated fiberglass cloth.

It is also recommended that any aboveground gas piping should be separated from other metal structures such as metal gratings, walkways and stairs around the piping, to the greatest extent possible to facility acoustical lagging.

Please note that thermal insulation (i.e., calcium silicate and banded metal jacketing) is not suitable for attenuating piping noise. If thermal insulation for any piping systems is required for personnel protection, etc, then consideration to utilize the acoustical system described above should be given.

7.6 Unit and Station Control Valves

Any unit or Station control / recycle valves shall be low noise style valves (i.e., Globe Style) with Whisperflo or Whisper III noise trim.

7.7 Miscellaneous Equipment

Gas Blowdown Silencer (i.e., unit piping purge/unit blowdown): It is recommended that this sound source is silenced to **50 dBA** at **300 ft**. (as measured 5 ft. above the ground).

Fuel Gas Skids: It is recommended that any fuel gas skids be designed with regulators that can achieve **85 dBA** at **3 ft**. for the worst case design conditions (i.e., anticipated maximum pressure drop and flow across the regulator valve).

Station Standby Generator and Acoustical Enclosure: It is recommended that the generator not exceed **55 dBA** at **100 ft**. from the package in all directions.

8.0 FINAL COMMENT

The results of our measurements, observations and analysis indicate that the estimated full load station sound level contribution at the nearby NSAs should be significantly less than an **L_{dn}** of **55 dBA**. Therefore, assuming the recommended noise control measures are followed and successfully implemented, it is our opinion that the sound level attributable to the proposed station should not exceed the FERC criterion of **55 dBA L_{dn}** at the nearby NSAs and there should be no perceptible increase in vibration.

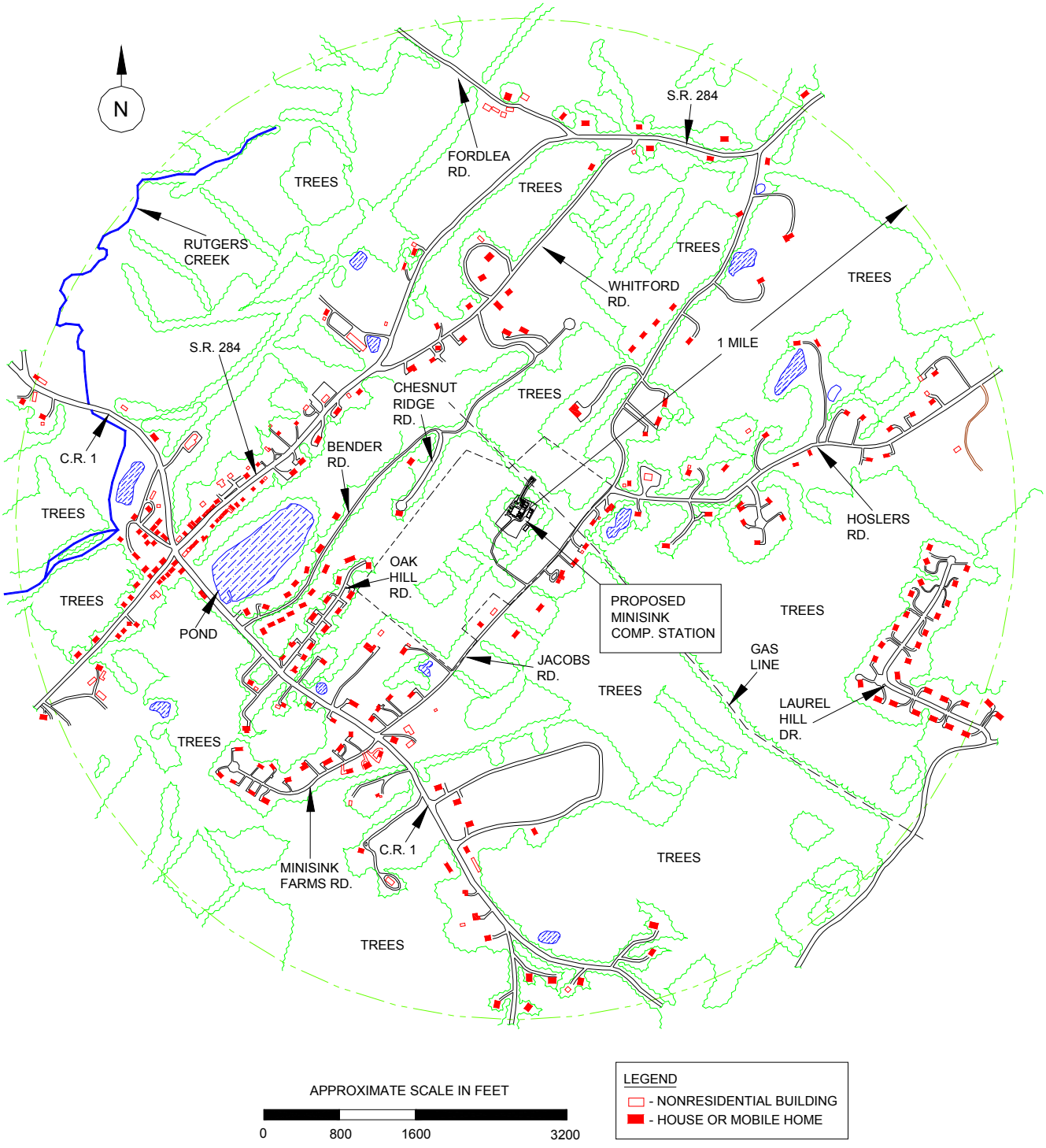

Figure 1: **Proposed Minisink Compressor Station and Surrounding Area**

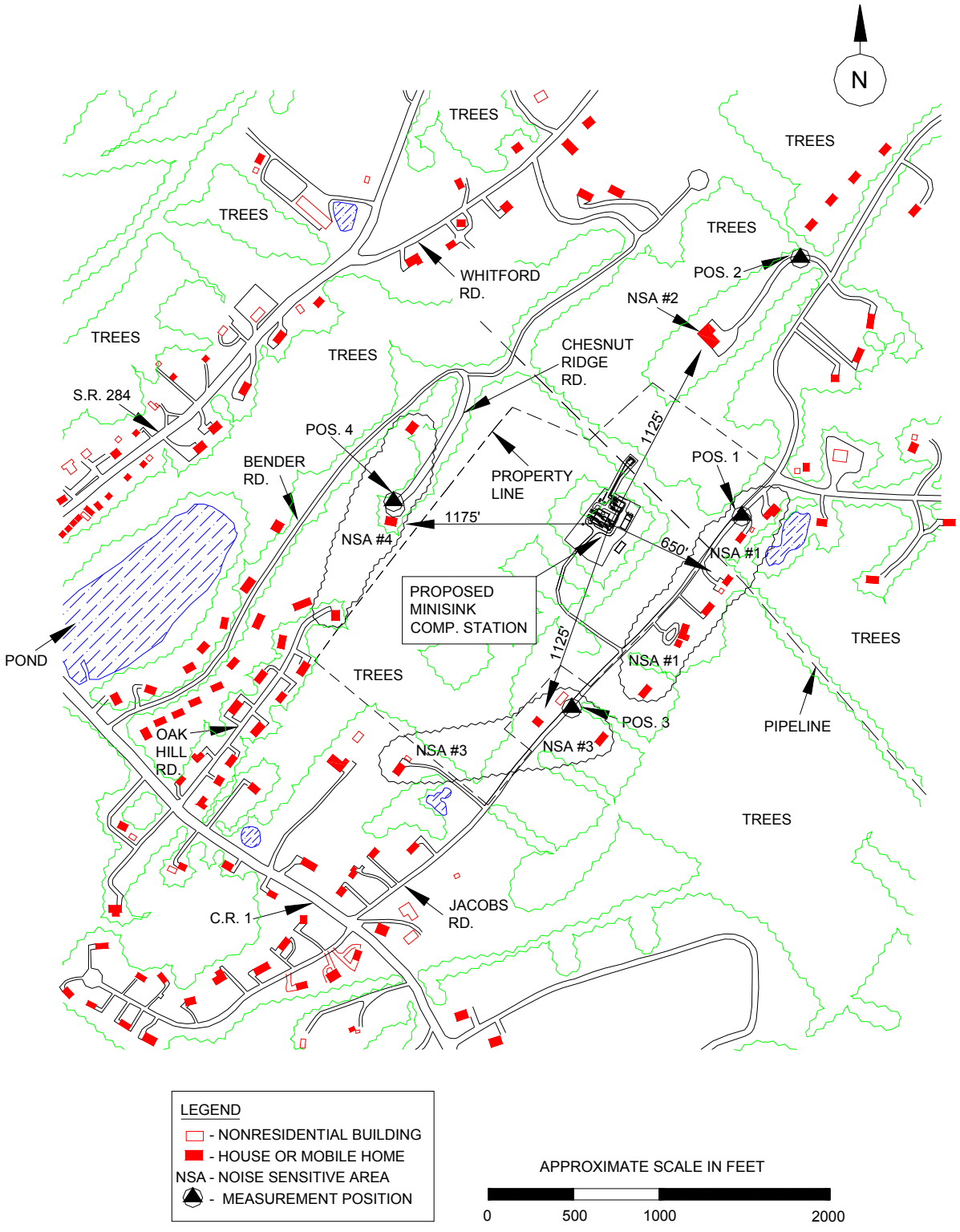

Figure 2: **Proposed Minisink Compressor Station and Immediate Area**

CRITICAL ENERGY INFRASTRUCTURE INFORMATION

HAS BEEN REMOVED

Figure 3: **Proposed Minisink Compressor Station Plot Plan**

Measurement Set		Meas'd A-Wt. Sound Levels (dBA)					
		Day-time	Avg'd of	Night-time	Avg'd of	Calc'd	
Meas. Pos. & NSA	Date of Test	Leq(Ld)	Ld	Leq(Ln)	Ln	Ldn	Notes/Observations
Pos. 1 (NSA #1)	04/26-27/2011	39.5		30.8			Primary Daytime noise: Birds & insects, the
Houses on Jacobs Rd.	04/26-27/2011	42.5	**41.9**	33.6	**32.6**	**42.2**	wind, several aircrafts, distant traffic noise.
approx. 650 ft. E to SE	04/26-27/2011	43.8		33.6		Note (1)	Primary Nighttime noise: Insects. Birds, the wind,
of Proposed Comp. Units							several aircrafts, distant traffic noise.
Pos. 2 (NSA #2)	04/26-27/2011	42.3		31.6			Primary Daytime noise: Birds & insects, the
House on Jacobs Rd.	04/26-27/2011	39.9	**40.4**	32.7	**32.2**	**41.2**	wind, several aircrafts, distant traffic noise.
approx. 1,125 ft. N-NE	04/26-27/2011	39.1		32.2		Note (1)	Primary Nighttime noise: Insects. Birds, the wind,
of Proposed Comp. Units							several aircrafts, distant traffic noise.
Pos. 3 (NSA #3)	04/26-27/2011	38.3		31.4			Primary Daytime noise: Birds & insects, the
Houses on Jacobs Rd.	04/26-27/2011	38.7	**38.5**	31.1	**31.6**	**39.9**	wind, several aircrafts, distant traffic noise.
approx. 1,125 ft. S to SW	04/26-27/2011	38.5		32.1		Note (1)	Primary Nighttime noise: Insects. Birds, the wind,
of Proposed Comp. Units							several aircrafts, distant traffic noise.
Pos. 4 (NSA #4)	04/26-27/2011	36.5		32.6			Primary Daytime noise: Birds & insects, the
Houses on Chestnut R., Bender	04/26-27/2011	35.3	**35.9**	30.7	**31.8**	**39.1**	wind, distant traffic noise.
& Oak Hill Rds, 1,175 ft. W to	04/26-27/2011	35.7		32.1		Note (1)	Primary Nighttime noise: Insects. Birds, the wind,
NW of Proposed Comp. Units							distant traffic noise.

Table A: **Millennium Minisink CS Pre-Construction Noise Survey: Summary of Meas'd Daytime/Nighttime A-Wt. Sound Levels (i.e., Ld & Ln) at the Closest NSA(s) within 1.0 Mile of the Minisink CS Site, as Measured on April 26-27, 2011.**

Note (1): If both Ld and Ln are measured and/or estimated, Ldn is calculated using the following formula:

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

Measurement Set		Temp.	R.H.	Wind	Wind	Peak	
Meas. Pos.	Time Frame/Date of Tests	(°F)	(%)	Direction	Speed	Wind	Sky Conditions
Pos. 1 to Pos. 4	10:30 PM to 11:50 PM (04/26/11)	72 - 74	55 - 59	Wind from the NW	1 - 2 mph	2 - 4 mph	Overcast sky
Pos. 1 to Pos. 4	8:30 AM to 10:30 AM (04/27/11)	63 - 67	71 - 78	Wind from the NW	0 - 1 mph	1 - 2 mph	Overcast sky

Table B: **Millennium Minisink CS Pre-Construction Noise Survey: Summary of Meteorological Conditions during the Ambient Sound Survey on April 26-27, 2011.**

Measurement Set		Sound Pressure Level (SPL) in dB per Octave-Band Frequency (in Hz)									A-Wt.
Meas. Pos. & NSA	Time/Date of Test	31.5	63	125	250	500	1000	2000	4000	8000	Level
Pos. 1 (NSA #1)	8:53 AM (04/27/11)	44.2	50.2	41.3	27.4	27.9	29.1	31.7	36.1	21.7	39.5
Houses on Jacobs Rd.	8:56 AM (04/27/11)	44.8	50.4	40.4	27.7	27.6	32.5	37.0	38.5	18.7	42.5
approx. 650 ft. E to SE	9:12 AM (04/27/11)	44.5	46.0	43.6	36.6	31.2	27.6	38.7	39.7	23.9	43.8
of Proposed Comp. Units	**Average SPL**	**44.5**	**48.9**	**41.8**	**30.6**	**28.9**	**29.7**	**35.8**	**38.1**	**21.4**	**41.9**
Pos. 2 (NSA #2)	8:38 AM (04/27/11)	47.0	50.1	44.6	32.0	29.6	29.9	38.6	36.0	25.0	42.3
House on Jacobs Rd.	8:41 AM (04/27/11)	45.5	49.5	52.0	32.2	28.1	27.7	32.8	31.8	23.6	39.9
approx. 1,125 ft. N-NE	8:45 AM (04/27/11)	50.3	51.5	44.1	30.4	27.9	28.3	32.1	34.3	28.4	39.1
of Proposed Comp. Units	**Average SPL**	**47.6**	**50.4**	**46.9**	**31.5**	**28.5**	**28.6**	**34.5**	**34.0**	**25.7**	**40.4**
Pos. 3 (NSA #3)	9:26 AM (04/27/11)	45.7	46.3	39.0	28.9	26.6	28.6	31.1	33.7	29.9	38.3
Houses on Jacobs Rd.	9:30 AM (04/27/11)	44.5	46.9	40.2	28.9	26.1	28.0	32.3	34.3	28.0	38.7
approx. 1,125 ft. S to SW	9:38 AM (04/27/11)	42.5	46.6	40.4	28.8	25.9	26.4	31.3	34.2	30.5	38.5
of Proposed Comp. Units	**Average SPL**	**44.2**	**46.6**	**39.9**	**28.9**	**26.2**	**27.7**	**31.6**	**34.1**	**29.5**	**38.5**
Pos. 4 (NSA #4)	9:48 AM (04/27/11)	50.5	54.7	45.3	38.0	29.5	28.5	25.6	25.0	21.1	36.5
Houses on Chestnut R., Bender	9:52 PM (04/27/11)	46.7	47.4	41.0	32.4	27.7	29.3	28.8	26.2	20.5	35.3
& Oak Hill Rds, 1,175 ft. W to	9:57 PM (04/27/11)	46.9	49.0	44.6	32.1	26.0	27.2	26.1	28.1	28.3	35.7
NW of Proposed Comp. Units	**Average SPL**	**48.0**	**50.4**	**43.6**	**34.2**	**27.7**	**28.3**	**26.8**	**26.4**	**23.3**	**35.9**

Table C: **Millennium Minisink CS Pre-Construction Noise Survey: Meas'd Ambient Ld and the Associated Unweighted Octave-Band (O.B.) SPLs at the Closest NSA(s) within 1.0 Mile of the Minisink CS site, as Measured on April 27, 2011.**

Measurement Set		Sound Pressure Level (SPL) in dB per Octave-Band Frequency (in Hz)									A-Wt.
Meas. Pos. & NSA	Time/Date of Test	31.5	63	125	250	500	1000	2000	4000	8000	Level
Pos. 1 (NSA #1)	10:47 PM (04/26/11)	46.3	42.6	37.7	27.6	24.9	23.0	24.3	21.0	19.2	30.8
Houses on Jacobs Rd.	10:53 PM (04/26/11)	43.7	42.3	39.1	29.0	25.6	23.2	23.9	26.3	29.4	33.6
approx. 650 ft. E to SE	10:59 PM (04/26/11)	44.2	43.5	38.7	30.1	28.4	29.6	25.7	21.0	14.8	33.6
of Proposed Comp. Units	**Average SPL**	**44.7**	**42.8**	**38.5**	**28.9**	**26.3**	**25.3**	**24.6**	**22.8**	**21.1**	**32.6**
Pos. 2 (NSA #2)	10:28 PM (04/26/11)	44.3	41.9	37.1	29.3	27.0	25.4	25.4	19.7	14.0	31.6
House on Jacobs Rd.	10:33 PM (04/26/11)	44.2	43.3	37.2	29.4	26.4	28.5	25.9	20.6	14.1	32.7
approx. 1,125 ft. N-NE	10:40 PM (04/26/11)	43.7	42.9	37.6	30.3	26.2	27.4	24.3	21.5	16.8	32.2
of Proposed Comp. Units	**Average SPL**	**44.1**	**42.7**	**37.3**	**29.7**	**26.5**	**27.1**	**25.2**	**20.6**	**15.0**	**32.2**
Pos. 3 (NSA #3)	11:07 PM (04/26/11)	43.2	42.7	39.8	30.0	24.5	24.6	24.8	20.4	14.5	31.4
Houses on Jacobs Rd.	11:14 PM (04/26/11)	42.8	42.9	38.4	28.5	23.9	24.3	25.1	21.1	14.6	31.1
approx. 1,125 ft. S to SW	11:19 PM (04/26/11)	45.2	42.1	39.7	28.1	22.7	21.1	26.3	26.0	13.7	32.1
of Proposed Comp. Units	**Average SPL**	**43.7**	**42.6**	**39.3**	**28.9**	**23.7**	**23.3**	**25.4**	**22.5**	**14.3**	**31.6**
Pos. 4 (NSA #4)	11:29 PM (04/26/11)	46.5	43.2	38.3	31.1	23.2	28.0	24.7	23.7	16.3	32.6
Houses on Chestnut R., Bender	11:36 PM (04/26/11)	46.4	43.9	39.6	29.0	22.5	23.0	21.7	23.5	14.9	30.7
& Oak Hill Rds, 1,175 ft. W to	11:40 PM (04/26/11)	45.0	42.9	41.0	29.6	23.4	23.9	25.5	23.6	17.8	32.1
NW of Proposed Comp. Units	**Average SPL**	**46.0**	**43.3**	**39.6**	**29.9**	**23.0**	**25.0**	**24.0**	**23.6**	**16.3**	**31.8**

Table D: **Millennium Minisink CS Pre-Construction Noise Survey: Meas'd Ambient Ln and the Associated Unweighted Octave-Band (O.B.) SPLs at the Closest NSA(s) within 1.0 Mile of the Minisink CS site, as Measured on April 26, 2011.**

Source No. & Dist (Ft)	SOURCE PWL & EST'D. SOUND LEVEL CONTRIBUTIONS AT SPEC. DISTANCE	PWL or SPL in dB Per Octave-Band Center Freq. (Hz) 31.5	63	125	250	500	1000	2000	4000	8000	A-Wt. Level	
1)	PWL of Turbine-Comp. Casing Noise	117	116	116	119	128	117	111	118	115	127	
	PWL of Eng.-Comp. Casing Noise (2 units)	120	119	119	122	131	120	114	121	118	130	
	NR of Noise Control	-10	-18	-24	-32	-45	-50	-50	-50	-50		
	Misc. Atten.	0	0	0	0	0	0	0	0	0		
650	Hemispherical Radiation	-54	-54	-54	-54	-54	-54	-54	-54	-54		
	Atm. Absorption (70% R.H., 60 deg F)	0	0	0	0	0	-1	-2	-5	-9		
	Source Sound Level Contribution	56	47	41	36	32	15	8	12	5	32	
2)	PWL of Unsilenced Turbine Exhaust	124	123	124	124	130	125	118	110	98	130	
	PWL of Unsil. Turbine Exhaust (2 units)	127	126	127	127	133	128	121	113	101	133	
	Atten of Exhaust Silencer	-8	-20	-31	-40	-50	-50	-48	-35	-25		
	Misc. Atten.	0	0	0	0	0	0	0	0	0		
650	Hemispherical Radiation	-54	-54	-54	-54	-54	-54	-54	-54	-54		
	Atm. Absorption (70% R.H., 60 deg F)	0	0	0	0	0	-1	-2	-5	-9		
	Source Sound Level Contribution	65	52	42	33	29	23	17	19	13	33	
3)	PWL of Body/Duct. of 2 Stage ile Silencer	100	98	92	86	82	82	78	78	74	87	
	PWL of Body/Duct. of Turbine Sil. (2 units)	103	101	95	89	85	85	81	81	77	90	
	NR of Noise Control	0	0	-2	-6	-10	-15	-15	-15	-15		
	Misc. Atten.	0	0	0	0	0	0	0	0	0		
650	Hemispherical Radiation	-54	-54	-54	-54	-54	-54	-54	-54	-54		
	Atm. Absorption (70% R.H., 60 deg F)	0	0	0	0	0	-1	-2	-5	-9		
	Source Sound Level Contribution	49	47	39	29	21	15	10	7	0	27	
4)	PWL of Turbine Intake System (w/silencer)	110	115	125	127	127	130	135	165	148	166	
	PWL of Turbine Int. System (w/sil.) (2 units)	113	118	128	130	130	133	138	168	151	169	
	NR of Noise Control	-6	-18	-38	-50	-65	-70	-70	-70	-70		
	NR of Air Filter	-2	-4	-8	-9	-13	-26	-27	-27	-33		
650	Hemispherical Radiation	-54	-54	-54	-54	-54	-54	-54	-54	-54		
	Atm. Absorption (70% R.H., 60 deg F)	0	0	0	0	0	-1	-2	-5	-9		
	Source Sound Level Contribution	51	42	28	17	0	0	0	12	0	20	
5)	PWL of Aboveground Piping	76	76	83	76	78	83	91	88	83	94	
	PWL of Aboveground Piping (2 units)	79	79	86	79	81	86	94	91	86	97	
	NR of Noise Control (Disch. Piping Insul.)	0	0	-1	-2	-8	-16	-18	-20	-20		
	Ground Level Shielding	0	0	0	0	0	0	0	0	0		
650	Hemispherical Radiation	-54	-54	-54	-54	-54	-54	-54	-54	-54		
	Atm. Absorption (70% R.H., 60 deg F)	0	0	0	0	0	-1	-2	-5	-9		
	Source Sound Level Contribution	25	25	31	23	19	15	20	12	3	24	
6)	PWL of Turbine L.O. Cooler	86	84	81	78	76	74	72	71	66	80	
	PWL of Turbine L.O. Cooler (2 units)	89	87	84	81	79	77	75	74	69	83	
	NR of Noise Control	0	0	0	0	0	0	0	0	0		
	Miscellaneous Shielding	0	0	0	0	0	0	0	0	0		
650	Hemispherical Radiation	-54	-54	-54	-54	-54	-54	-54	-54	-54		
	Atm. Absorption (70% R.H., 60 deg F)	0	0	0	0	0	-1	-2	-5	-9		Calc'd
	Source Sound Level Contribution	35	33	30	27	25	22	19	15	6	27	Ldn
Est'd otal Contribution f oposed Comp. nits		**66**	**54**	**46**	**39**	**34**	**27**	**24**	**22**	**15**	**37.3**	**43.7**

General Note: DIL, NR and PWL values on this spreadsheet should not be used as the specified values. Refer to the "Noise Control Measures" in the report or other specifications for the actual specified PWL of equipment, noise reduction (NR) of lagging or building construction, and DIL values of silencers associated with the prop. equipment.

Table E: Proposed Minisink CS (NY): Est'd Contribution at NSA #1

Source No. & Dist (Ft)	SOURCE PWL & EST'D. SOUND LEVEL CONTRIBUTIONS AT SPEC. DISTANCE	PWL or SPL in dB Per Octave-Band Center Freq. (Hz) 31.5	63	125	250	500	1000	2000	4000	8000	A-Wt. Level	
1)	PWL of Turbine-Comp. Casing Noise	117	116	116	119	128	117	111	118	115	127	
	PWL of Eng.-Comp. Casing Noise (2 units)	120	119	119	122	131	120	114	121	118	130	
	NR of Noise Control	-10	-18	-24	-32	-45	-50	-50	-50	-50		
	Misc. Atten.	0	0	0	0	0	0	0	0	0		
1125	Hemispherical Radiation	-59	-59	-59	-59	-59	-59	-59	-59	-59		
	Atm. Absorption (70% R.H., 60 deg F)	0	0	0	0	-1	-2	-3	-9	-15		
	Source Sound Level Contribution	51	42	36	31	26	10	2	4	0	27	
2)	PWL of Unsilenced Turbine Exhaust	124	123	124	124	130	125	118	110	98	130	
	PWL of Unsil. Turbine Exhaust (2 units)	127	126	127	127	133	128	121	113	101	133	
	Atten of Exhaust Silencer	-8	-20	-31	-40	-50	-50	-48	-35	-25		
	Misc. Atten.	0	0	0	0	0	0	0	0	0		
1125	Hemispherical Radiation	-59	-59	-59	-59	-59	-59	-59	-59	-59		
	Atm. Absorption (70% R.H., 60 deg F)	0	0	0	0	-1	-2	-3	-9	-15		
	Source Sound Level Contribution	60	47	37	28	23	18	11	11	2	28	
3)	PWL of Body/Duct. of 2 Stage ile ncer	100	98	92	86	82	82	78	78	74	87	
	PWL of Body/Duct. of Turbine Sil. (2 units)	103	101	95	89	85	85	81	81	77	90	
	NR of Noise Control	0	0	-2	-6	-10	-15	-15	-15	-15		
	Misc. Atten.	0	0	0	0	0	0	0	0	0		
1125	Hemispherical Radiation	-59	-59	-59	-59	-59	-59	-59	-59	-59		
	Atm. Absorption (70% R.H., 60 deg F)	0	0	0	0	-1	-2	-3	-9	-15		
	Source Sound Level Contribution	44	42	34	24	15	10	4	0	0	22	
4)	PWL of Turbine Intake System (w/silencer)	110	115	125	127	127	130	135	165	148	166	
	PWL of Turbine Int. System (w/sil.) (2 units)	113	118	128	130	130	133	138	168	151	169	
	NR of Noise Control	-6	-18	-38	-50	-65	-70	-70	-70	-70		
	NR of Air Filter	-2	-4	-8	-9	-13	-26	-27	-27	-33		
1125	Hemispherical Radiation	-59	-59	-59	-59	-59	-59	-59	-59	-59		
	Atm. Absorption (70% R.H., 60 deg F)	0	0	0	0	-1	-2	-3	-9	-15		
	Source Sound Level Contribution	46	37	23	12	0	0	0	4	0	15	
5)	PWL of Aboveground Piping	76	76	83	76	78	83	91	88	83	94	
	PWL of Aboveground Piping (2 units)	79	79	86	79	81	86	94	91	86	97	
	NR of Noise Control (Disch. Piping Insul.)	0	0	-1	-2	-8	-16	-18	-20	-20		
	Ground Level Shielding	0	0	0	0	0	0	0	0	0		
1125	Hemispherical Radiation	-59	-59	-59	-59	-59	-59	-59	-59	-59		
	Atm. Absorption (70% R.H., 60 deg F)	0	0	0	0	-1	-2	-3	-9	-15		
	Source Sound Level Contribution	20	20	26	18	13	10	14	4	0	19	
6)	PWL of Turbine L.O. Cooler	86	84	81	78	76	74	72	71	66	80	
	PWL of Turbine L.O. Cooler (2 units)	89	87	84	81	79	77	75	74	69	83	
	NR of Noise Control	0	0	0	0	0	0	0	0	0		
	Miscellaneous Shielding	0	0	0	0	0	0	0	0	0		
1125	Hemispherical Radiation	-59	-59	-59	-59	-59	-59	-59	-59	-59		
	Atm. Absorption (70% R.H., 60 deg F)	0	0	0	0	-1	-2	-3	-9	-15		Calc'd
	Source Sound Level Contribution	30	28	25	22	19	17	13	7	0	22	Ldn
Est'd Total Contribution of Proposed Comp. Units		**61**	**50**	**41**	**34**	**29**	**21**	**18**	**14**	**8**	**32.2**	**38.6**

General Note: DIL, NR and PWL values on this spreadsheet should not be used as the specified values. Refer to the "Noise Control Measures" in the report or other specifications for the actual specified PWL of equipment, noise reduction (NR) of lagging or building construction, and DIL values of silencers associated with the prop. equipment.

Table F: Proposed Minisink CS (NY): Est'd Contribution at NSA #2

Source No. & Dist (Ft)	SOURCE PWL & EST'D. SOUND LEVEL CONTRIBUTIONS AT SPEC. DISTANCE	PWL or SPL in dB Per Octave-Band Center Freq. (Hz) 31.5	63	125	250	500	1000	2000	4000	8000	A-Wt. Level	
1)	PWL of Turbine-Comp. Casing Noise	117	116	116	119	128	117	111	118	115	127	
	PWL of Eng.-Comp. Casing Noise (2 units)	120	119	119	122	131	120	114	121	118	130	
	NR of Noise Control	-10	-18	-24	-32	-45	-50	-50	-50	-50		
	Misc. Atten.	0	0	0	0	0	0	0	0	0		
1125	Hemispherical Radiation	-59	-59	-59	-59	-59	-59	-59	-59	-59		
	Atm. Absorption (70% R.H., 60 deg F)	0	0	0	0	-1	-2	-3	-9	-15		
	Source Sound Level Contribution	51	42	36	31	26	10	2	4	0	27	
2)	PWL of Unsilenced Turbine Exhaust	124	123	124	124	130	125	118	110	98	130	
	PWL of Unsil. Turbine Exhaust (2 units)	127	126	127	127	133	128	121	113	101	133	
	Atten of Exhaust Silencer	-8	-20	-31	-40	-50	-50	-48	-35	-25		
	Misc. Atten.	0	0	0	0	0	0	0	0	0		
1125	Hemispherical Radiation	-59	-59	-59	-59	-59	-59	-59	-59	-59		
	Atm. Absorption (70% R.H., 60 deg F)	0	0	0	0	-1	-2	-3	-9	-15		
	Source Sound Level Contribution	60	47	37	28	23	18	11	11	2	28	
3)	PWL of Body/Duct. of 2 Stage ilencer	100	98	92	86	82	82	78	78	74	87	
	PWL of Body/Duct. of Turbine Sil. (2 units)	103	101	95	89	85	85	81	81	77	90	
	NR of Noise Control	0	0	-2	-6	-10	-15	-15	-15	-15		
	Misc. Atten.	0	0	0	0	0	0	0	0	0		
1125	Hemispherical Radiation	-59	-59	-59	-59	-59	-59	-59	-59	-59		
	Atm. Absorption (70% R.H., 60 deg F)	0	0	0	0	-1	-2	-3	-9	-15		
	Source Sound Level Contribution	44	42	34	24	15	10	4	0	0	22	
4)	PWL of Turbine Intake System (w/silencer)	110	115	125	127	127	130	135	165	148	166	
	PWL of Turbine Int. System (w/sil.) (2 units)	113	118	128	130	130	133	138	168	151	169	
	NR of Noise Control	-6	-18	-38	-50	-65	-70	-70	-70	-70		
	NR of Air Filter	-2	-4	-8	-9	-13	-26	-27	-27	-33		
1125	Hemispherical Radiation	-59	-59	-59	-59	-59	-59	-59	-59	-59		
	Atm. Absorption (70% R.H., 60 deg F)	0	0	0	0	-1	-2	-3	-9	-15		
	Source Sound Level Contribution	46	37	23	12	0	0	0	4	0	15	
5)	PWL of Aboveground Piping	76	76	83	76	78	83	91	88	83	94	
	PWL of Aboveground Piping (2 units)	79	79	86	79	81	86	94	91	86	97	
	NR of Noise Control (Disch. Piping Insul.)	0	0	-1	-2	-8	-16	-18	-20	-20		
	Ground Level Shielding	0	0	0	0	0	0	0	0	0		
1125	Hemispherical Radiation	-59	-59	-59	-59	-59	-59	-59	-59	-59		
	Atm. Absorption (70% R.H., 60 deg F)	0	0	0	0	-1	-2	-3	-9	-15		
	Source Sound Level Contribution	20	20	26	18	13	10	14	4	0	19	
6)	PWL of Turbine L.O. Cooler	86	84	81	78	76	74	72	71	66	80	
	PWL of Turbine L.O. Cooler (2 units)	89	87	84	81	79	77	75	74	69	83	
	NR of Noise Control	0	0	0	0	0	0	0	0	0		
	Miscellaneous Shielding	0	0	0	0	0	0	0	0	0		
1125	Hemispherical Radiation	-59	-59	-59	-59	-59	-59	-59	-59	-59		
	Atm. Absorption (70% R.H., 60 deg F)	0	0	0	0	-1	-2	-3	-9	-15		Calc'd
	Source Sound Level Contribution	30	28	25	22	19	17	13	7	0	22	Ldn
Est'd Total Contribution of Proposed Comp. Units		**61**	**50**	**41**	**34**	**29**	**21**	**18**	**14**	**8**	**32.2**	**38.6**

General Note: DIL, NR and PWL values on this spreadsheet should not be used as the specified values. Refer to the "Noise Control Measures" in the report or other specifications for the actual specified PWL of equipment, noise reduction (NR) of lagging or building construction, and DIL values of silencers associated with the prop. equipment.

Table G: Proposed Minisink CS (NY): Est'd Contribution at NSA #3

Source No. & Dist (Ft)	SOURCE PWL & EST'D. SOUND LEVEL CONTRIBUTIONS AT SPEC. DISTANCE	PWL or SPL in dB Per Octave-Band Center Freq. (Hz) 31.5	63	125	250	500	1000	2000	4000	8000	A-Wt. Level	
1)	PWL of Turbine-Comp. Casing Noise	117	116	116	119	128	117	111	118	115	127	
	PWL of Eng.-Comp. Casing Noise (2 units)	120	119	119	122	131	120	114	121	118	130	
	NR of Noise Control	-10	-18	-24	-32	-45	-50	-50	-50	-50		
	Misc. Atten.	0	0	0	0	0	0	0	0	0		
1175	Hemispherical Radiation	-59	-59	-59	-59	-59	-59	-59	-59	-59		
	Atm. Absorption (70% R.H., 60 deg F)	0	0	0	0	-1	-2	-4	-9	-16		
	Source Sound Level Contribution	51	42	36	30	26	9	1	3	0	27	
2)	PWL of Unsilenced Turbine Exhaust	124	123	124	124	130	125	118	110	98	130	
	PWL of Unsil. Turbine Exhaust (2 units)	127	126	127	127	133	128	121	113	101	133	
	Atten of Exhaust Silencer	-8	-20	-31	-40	-50	-50	-48	-35	-25		
	Misc. Atten.	0	0	0	0	0	0	0	0	0		
1175	Hemispherical Radiation	-59	-59	-59	-59	-59	-59	-59	-59	-59		
	Atm. Absorption (70% R.H., 60 deg F)	0	0	0	0	-1	-2	-4	-9	-16		
	Source Sound Level Contribution	60	47	37	27	23	17	10	10	1	28	
3)	PWL of Body/Duct. of 2 Stage ilencer	100	98	92	86	82	82	78	78	74	87	
	PWL of Body/Duct. of Turbine Sil. (2 units)	103	101	95	89	85	85	81	81	77	90	
	NR of Noise Control	0	0	-2	-6	-10	-15	-15	-15	-15		
	Misc. Atten.	0	0	0	0	0	0	0	0	0		
1175	Hemispherical Radiation	-59	-59	-59	-59	-59	-59	-59	-59	-59		
	Atm. Absorption (70% R.H., 60 deg F)	0	0	0	0	-1	-2	-4	-9	-16		
	Source Sound Level Contribution	44	42	34	23	15	9	3	0	0	22	
4)	PWL of Turbine Intake System (w/silencer)	110	115	125	127	127	130	135	165	148	166	
	PWL of Turbine Int. System (w/sil.) (2 units)	113	118	128	130	130	133	138	168	151	169	
	NR of Noise Control	-6	-18	-38	-50	-65	-70	-70	-70	-70		
	NR of Air Filter	-2	-4	-8	-9	-13	-26	-27	-27	-33		
1175	Hemispherical Radiation	-59	-59	-59	-59	-59	-59	-59	-59	-59		
	Atm. Absorption (70% R.H., 60 deg F)	0	0	0	0	-1	-2	-4	-9	-16		
	Source Sound Level Contribution	46	37	23	11	0	0	0	3	0	15	
5)	PWL of Aboveground Piping	76	76	83	76	78	83	91	88	83	94	
	PWL of Aboveground Piping (2 units)	79	79	86	79	81	86	94	91	86	97	
	NR of Noise Control (Disch. Piping Insul.)	0	0	-1	-2	-8	-16	-18	-20	-20		
	Ground Level Shielding	0	0	0	0	0	0	0	0	0		
1175	Hemispherical Radiation	-59	-59	-59	-59	-59	-59	-59	-59	-59		
	Atm. Absorption (70% R.H., 60 deg F)	0	0	0	0	-1	-2	-4	-9	-16		
	Source Sound Level Contribution	20	20	26	17	13	9	13	3	0	18	
6)	PWL of Turbine L.O. Cooler	86	84	81	78	76	74	72	71	66	80	
	PWL of Turbine L.O. Cooler (2 units)	89	87	84	81	79	77	75	74	69	83	
	NR of Noise Control	0	0	0	0	0	0	0	0	0		
	Miscellaneous Shielding	0	0	0	0	0	0	0	0	0		
1175	Hemispherical Radiation	-59	-59	-59	-59	-59	-59	-59	-59	-59		
	Atm. Absorption (70% R.H., 60 deg F)	0	0	0	0	-1	-2	-4	-9	-16		Calc'd
	Source Sound Level Contribution	30	28	25	21	19	16	12	6	0	21	Ldn
Est'd Total Contribution of Proposed Comp. Units		**61**	**49**	**41**	**33**	**29**	**21**	**17**	**13**	**8**	**31.7**	**38.1**

General Note: DIL, NR and PWL values on this spreadsheet should not be used as the specified values. Refer to the "Noise Control Measures" in the report or other specifications for the actual specified PWL of equipment, noise reduction (NR) of lagging or building construction, and DIL values of silencers associated with the prop. equipment.

Table H: Proposed Minisink CS (NY): Est'd Contribution at NSA #4

DESCRIPTION OF THE STATION NOISE ANALYSIS METHODOLOGY AND THE SOURCE OF SOUND DATA

In general, the predicted sound level contributed by the proposed units were calculated as a function of frequency from estimated octave-band sound power levels (PWLs) for each significant sound source associated with the replacement unit. The following summarizes the analysis procedure:

- Initially, unweighted octave-band PWLs for each noise source (without noise control) were determined from actual sound measurements performed by H&K on similar equipment and/or obtained from the equipment manufacturer.
- Then, expected noise reductions in dB per octave-band frequency due to any designated noise control measures for each source were subtracted from the estimated PWL.
- Next, octave-band SPLs for each source (with noise control) were determined by compensating for sound attenuation due to propagation (hemispherical radiation) and atmospheric sound absorption.
- Shielding from buildings, terrain or foliage has been conservatively ignored.
- Finally, the estimated octave-band SPLs for each source (with noise control and other sound attenuation effects) were corrected for A-weighting, and the total SPLs of all sound sources were logarithmically summed and corrected for A-weighting to provide the estimated A-wt. sound level contributed at the specified distance(s) by the proposed replacement compressor unit.

DESCRIPTION OF THE CONSTRUCTION NOISE ANALYSIS METHODOLOGY AND THE SOURCE OF SOUND DATA

Type of Equipment	Equipment Power Rating or Capacity	Est'd Number Required	Est'd A-Wt. Sound Level at 50 Ft.: Note (1)	Resulting A-Wt. PWL of Single Piece of Equip.	Assumed Max. No. Operating at One Time	Est'd Max. A-Wt. PWL or Sound Level of Equip.
Diesel Generator	250 to 400 HP	1 to 2	81 dBA	113 dBA	1	113
Bulldozer	250 to 700 HP	1 to 2	85 dBA	117 dBA	1	117
Grader	450 to 600 HP	1 to 2	85 dBA	117 dBA	1	117
Backhoe	130 to 210 HP	1 to 2	80 dBA	112 dBA	1	112
Front End Loader	150 to 250 HP	1 to 2	85 dBA	117 dBA	1	117
Truck Loaded	40 Ton	As needed	82 dBA	115 dBA	1	115

Est'd Total Maximum A-Wt. PWL (dBA) of All Construction Site Equipment	123	Calc'd Ldn Note (4)
Atten. (dB) due to Hemispherical Sound Propagation (850 Ft.): Note (2)	-54	
Est'd Attenuation (in dB) due to Air Absorption and/or Foliage: Note (3)	-5	
Est'd Sound Level (dBA) at the Closest NSA Considering a Maximum Number of Equipment Operating at One Time	64 dBA	64 dBA

Table I: **Minisink CS (NY): Est'd Sound Contribution at the Closest NSA (i.e., NSA #1; approximately 650 ft. E to SE of Site Center) during Peak Construction Activity**

Note (1): Noise Emission Levels of construction equipment based on an EPA Report (meas'd sound data for a railroad construction project) and measured sound data in the field by H&K or other published sound data.

Note (2): Noise attenuation due to hemispherical sound propagation: Sound propagates outwards in all directions (i.e., length, width, height) from a point source, and the sound energy of a noise source decreases with increasing distance from the source. In the case of hemispherical sound propagation, the source is located on a flat continuous plane/surface (e.g., ground), and the sound radiates hemispherically from the source.

The following equation is the theoretical decrease of sound energy when determining the resulting SPL of a noise source at a specific distance ("r") of a receiver from a source sound power level (PWL):

Decrease in SPL ("hemispherical propagation") from a noise source = 20*log(r) – 2.3 dB, where "r" is distance of the receiver from the noise source. For example, if the distance "r" is 1900 feet between the site and closest NSA, the "hemispherical propagation" = **20*log(650) – 2.3 dB = 54 dB**.

Note (3): Noise attenuation due to air absorption & foliage: Air absorbs sound energy, and the amount of absorption ("attenuation") is dependent on temperature and relative humidity (R.H.) of the air and the frequency of sound. For standard day conditions (i.e., no wind, 60 deg. F. and 70% R.H.), the attenuation due to air absorption for the medium frequency" (i.e., 1000 Hz O.B. SPL) is approximately **1.5 dB** per 1,000 feet. In addition, foliage such as forest/trees between the Station site and nearby NSAs can have a sound attenuation effect depending on the amount/thickness of the foliage.

Note (4): Calc'd Ldn equal to the est'd A-wt. sound level since construction activities will occur only during daytime.

ORANGE COUNTY

H&K contacted Orange County regarding any applicable Noise Requirements via email on May 20, 2011. Orange County responded, via email, on May 23, 2011 that "Orange County does not have any ordinance for noise, but the Town of Minisink does." The text from the H&K and Orange County emails follows:

H&K Email Text to Orange County (May 20, 2011)

David E. Church, AICP
Planning Commissioner, Orange County
1887 County Building
124 Main Street
Goshen, NY 10924

Phone: (845) 615-3840
Fax: (845) 291-2533

RE: Proposed Minisink Compressor Station

Hoover and Keith (H&K) is an acoustical consultant that is working for Hatch Mott and MacDonald on a proposed Compressor Station project in the Town of Minisink, in Orange County, NY. The Minisink Compressor Station will boost the pressure of the existing Millennium Pipeline.

We are investigating if there are any applicable local noise ordinances for the proposed Minisink Compressor Station, which would be located between S.R. 284 and Jacobs Road, and north of County Road 1.

Can you please indicate if Orange County has an applicable noise ordinance for the proposed Minisink Compressor Station? If so, please provide the relevant noise ordinance or requirement with a reply to this email. Alternatively, you can fax it to (248) 473-8785.

For your information, the proposed Minisink Compressor Station is a Federal Energy Regulatory Commission (FERC) certificated project. FERC requires that the sound level contribution of a natural gas facility (i.e., compressor station) not exceed a sound level of 55 dBA Ldn at any existing Noise Sensitive Area (NSA), which includes residences, churches, hospital, etc. FERC also requires that this is verified with a Post-Construction Sound Survey. FERC also requires that any applicable local noise ordinances are met.

I apologize, but I need to know this information quickly. I could not find any information on the Orange County website.

Please feel free to call me at (248) 473-8722 if you have any questions or comments.

Thank you.

Brian Hellebuyck.

Brian R. Hellebuyck
Hoover and Keith, Inc.
(248) 473-8722
(248) 473-8785 (fax)
bhellebuyck@hoover-keith.com

Orange County Email Text Response to H&K (May 23, 2011)

Mr. Hellebuyck,

Orange County does not have any ordinance for noise, but the Town of Minisink does. Please contact the Town and inquire about that regulation - the Town Hall phone number is 845-726-3700.

Best,
Kelly Dobbins

Kelly M. Dobbins
Senior Planner/Project Manager
Orange County Planning Dept/OCWA
124 Main St.
Goshen, NY 10924
phone: 845-615-3847
fax: 845-291-2533

TOWN OF MINISINK

H&K contacted the Town of Minisink on May 23, 2011 regarding any applicable noise regulations or ordinances. Mr. Paul Sutton, Building Inspector, Town of Minisink requested that I send a FAX request for this information so that he could fax the information back to H&K. Mr. Sutton answered the FAX request with a voice mail message indicating that the Town of Minisink does not have any applicable noise ordinance or noise requirement for the Station. The text from the H&K FAX and Town of Minisink voice mail transcript follows:

H&K FAX Text to Town of Minisink (May 23, 2011)

DATE: May 23, 2011

TO: Mr. Paul Sutton
Building Inspector
Town of Minisink
Orange County, NY
(845) 726-3700 / (845) 726-4205 (FAX)

SUBJECT: Proposed Minisink Compressor Station
Town of Minisink Noise Ordinance / Noise Requirements
(Sent via FAX)

Per our conversation this morning, Hoover and Keith (H&K) is an acoustical consultant that is working for Hatch Mott and MacDonald on a proposed Compressor Station project in the Town of Minisink, in Orange County, NY. The Minisink Compressor Station will compress natural gas on the existing Millennium Pipeline.

We are investigating if there are any applicable local noise ordinances for the proposed Minisink Compressor Station, which would be located between S.R. 284 and Jacobs Road, and north of County Road 1. Per your request, H&K is faxing this request to you so that you can fax the Minisink noise ordinance and/or noise requirements back. My fax number is: (248) 473-8785.

For your information, the proposed Minisink Compressor Station is a Federal Energy Regulatory Commission (FERC) certificated project. FERC requires that the sound level contribution of a natural gas facility (i.e., compressor station) not exceed a sound level of 55 dBA Ldn at any existing Noise Sensitive Area (NSA), which includes residences, churches, hospital, etc. FERC also requires that this is verified with a Post-Construction Sound Survey. FERC also requires that any applicable local noise ordinances are met.

Thank you for your assistance and please feel free to call me at (248) 473-8722 if you have any questions or comments.

Sincerely
Hoover & Keith Inc.
Brian R. Hellebuyck, PE

Town of Minisink, Paul Sutton, Building Inspector (May 24, 2011)
Transcript of Voice Mail Message

Good Morning, Mr. Hellebuyck

This is Paul Sutton, Building Inspector, Town of Minisink.

I spoke with you earlier this morning on reference to a noise ordinance for Town of Minisink.

I was wrong in quoting you that we do have a noise ordinance…but it's only reference to certain parts of the Code such as blasting, logging and all terrain vehicles….and we do not have anything that would address new construction or something that has manufacturing or a pumping station.

So if you stay with your 55 decibels I would believe that would be fine. If you have any other questions feel free to get back to me. Have a good day.

Summary of Typical Metrics for Regulating Environmental Noise & Acoustical Terminology Discussed in the Report

(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) Human Perception of Change in Sound Level

- A **3 dB** change of sound level is barely perceivable by the human ear
- A **5 or 6 dB** change of sound level is noticeable
- If sound level increases by **10 dB**, it appears as if the sound intensity has doubled.

(3) A-Weighted Sound Level (dBA): The A-wt. sound level is a single-figure sound rating, expressed in decibels, 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.

(4) Background or Ambient Noise: The total noise produced by all other sources associated with a given environment in the vicinity of a specific sound source of interest, and includes any Residual Noise.

(5) Sound Pressure Level (L_p or SPL): Ten times the common logarithm to the base 10 of the ratio of the mean square sound pressure to the square of a reference pressure. Therefore, the sound pressure level is equal to 20 times the common logarithm of the ratio of the sound pressure to a reference pressure (20 micropascals or 0.0002 microbar).

(6) Octave Band 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 octave band SPL frequency ranges. Then, the relative loudness of two sounds can be compared frequency range by frequency range. As an illustration, two noise sources can have the same dBA rating and yet sound completely different. For example, a high-

pitched sound concentrated at a frequency of 2000 Hz could have the same dBA rating as a much louder low-frequency sound concentrated at 50 Hz.

(7) 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.).

(8) 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.

(9) Day-Night 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 approx. **6.4 dB** above the measured L_{eq}.

(10) Sound Level Meter (SLM): An instrument used to measure sound pressure level, sound level, octave-band SPL, or peak sound pressure level, separately or in any combinations thereof. The measured weighted SPL (i.e., A-Wt. Sound Level or dBA) is obtained by the use of a SLM having a standard frequency-filter for attenuating part of the sound spectrum.

SOUND LEVELS FOR TYPICAL ACTIVITIES **REFERENCE AND COMMUNITY RESPONSES**

Subjective Human Response and Conversation	Home and Industrial (Indoor Noise)	dBA Scale (Level)	Community and Traffic (Outdoor Noise)	Reference Loudness	Community Reaction To Outdoor Noise
		-- 140 --	Aircraft Carrier		
Threshold of Pain			Military Jet Aircraft		
		-- 130 --			
			Large Siren at 100 Ft.		
			Jet Takeoff at 200 Ft.	16 Times	
	Rock Band (Max.)	-- 120 --		as Loud	
Threshold of			Thunderstorm Activity		
Discomfort	Discotheque (Max.)			8 Times	
		-- 110 --	Elevated Train	as Loud	
	Symphonic Music (Max.)				
Maximum Vocal Effort			Auto Horn at 5 Ft.	4 Times	
	Industrial Plant	-- 100 --		as Loud	
Very Loud			Compacting Trash Truck		
	Newspaper Printing Rm.			2 Times	
Shouting in Ear		-- 90 --	Heavy Truck at 25 Ft.	as Loud	Vigorous Action
	Food Blender				and Law Suits
	Symphonic Music (Typ.)		Motorcycle at 25 Ft.	Reference	
Shouting		-- 80 --		Loudness	Threats of
	Garbage Disposal		Small Truck at 25 Ft.		Legal Action
Very Annoying	Alarm Clock		Heavy Traffic at 50 Ft.		Appeals to Officials
		-- 70 --		1/2 as Loud	Widespread
Moderately Loud	Vacuum Cleaner		Avg. Traffic at 100 Ft.		Complaints
	Electric Typewriter				
Normal Conversation		-- 60 --		1/4 as Loud	Sporadic Complaints
	Air Conditioner at 20 Ft.				
			Light Traffic at 100 Ft.		No Reaction,
	Typical Office	-- 50 --		1/8 as Loud	Although Noise
Quiet					is Noticeable
	Living Room		Typical Suburban Area		
	Bedroom	-- 40 --			
			Birdsong		
Very Quiet	Library				
		-- 30 --			
Soft Whisper	Broadcasting Studio		Rural Area		
				Just Audible	
		-- 20 --			
				Threshold	
		-- 10 --		of Hearing	
Hoover & Keith Inc. (Consultants in Acoustics)					
11391 Meadowglen, Suite D					
Houston, Texas 77082		-- 0 --			

-end of report-