Appendix J: Baseline Sound Survey Report

BASELINE SOUND SURVEY REPORT

CARROLL COUNTY ENERGY
CARROLL COUNTY, OHIO

June 2013

PREPARED FOR:
Carroll County Energy LLC
31 Milk Street
Boston MA 02109

PREPARED BY:
Tetra Tech, Inc.
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Boston MA 02110

TETRA TECH

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LIST OF ACRONYMS

Acronym or Abbreviation	Full Phrase
µPa	microPascal
ANSI	American National Standards Institute
CCE	Carroll County Energy
dB	decibels
dBA	A-weighted decibels
EPA	United States Environmental Policy Act
Facility Site	the 77-acre Project parcel
ft	feet
GPS	global positioning system
HVAC	heating, ventilation, and cooling
Hz	hertz
INCE	Institute of Noise Control Engineers
kHz	kilohertz
L_{eq}	Equivalent Sound Level
LT	long-term measurement
NIST	National Institute of Standards and Technology
OPSB	Ohio Power Siting Board
Project	Carroll County Energy
ST	short-term measurement

1. INTRODUCTION

Tetra Tech, Inc. (Tetra Tech) has completed the Baseline Sound Survey Report for the Carroll County Energy LLC (CCE) proposed electric generating facility in Washington Township, Carroll County, Ohio (the Project). This survey was undertaken to assist CCE in complying with its permit application to the Ohio Power Siting Board (OPSB). OPSB Rule §4906-13-07(A)(3) defines certification requirements for the assessment of noise that must be addressed during the permitting process for electric power, gas and natural gas transmission facilities. The OPSB Rule does not define quantifiable sound limits either absolute or relative to existing conditions nor does it specifically require the completion of a baseline sound survey. However, precedent of recent energy facilities undergoing permitting has shown that the OPSB is generally requesting that applicants conduct a baseline sound survey to document existing pre-construction ambient sound levels.

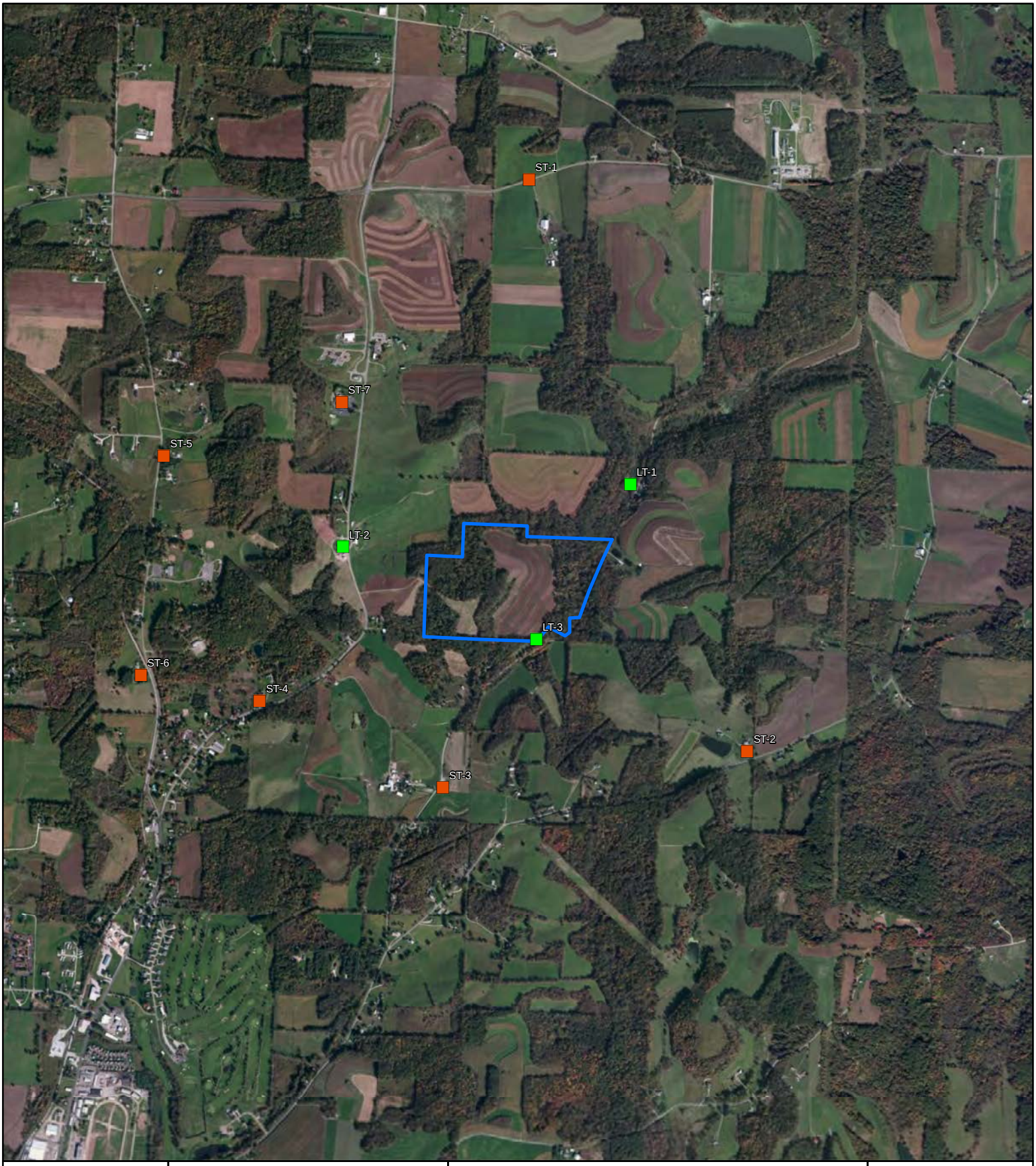
Sound pressure levels are frequently used in the assessment of compliance with regulatory limits and in determining potential impacts when used in conjunction with modeling results. Baseline sound measurements were collected in May 2013 to document existing conditions on and surrounding the Project. Resultant data can be used for comparative purposes, for impact analysis under the OPSB criteria, and for compliance with other applicable federal, state, and local ordinances or regulations. This report describes applicable noise descriptors and criteria; the baseline sound survey instrumentation and methodology; and data analysis results.

The Project is proposed to be located on an approximately 77-acre parcel (Facility Site) of privately owned lands within Carroll County, Ohio (Project Site). The Facility Site is approximately 2.5 miles northeast of the village of Carrollton. It is generally bounded by State Route 9 (Kensington Road) to west (set back approximately 0.5 mile), Mobile Road to the east, and rural agricultural lands to the north and south. An approximately 23-acre privately owned property also in agricultural use is located between the Facility Site and Route 9; this parcel will be temporarily used for construction laydown and parking and will be traversed by several easements associated with the Project.

Land uses surrounding the Facility Site are agricultural lands, consisting of soybeans, corn, pasture/grass and some livestock production and dairying, as well as patches of wooded areas. Residential density is low, with scattered homes present throughout the area; the nearest densely populated area is the village of Carrollton. Utility infrastructure (e.g., natural gas pipeline and electric transmission line corridors) extends through the vicinity of the Facility Site. North of the Facility Site, approximately 0.5-mile distant, Carroll County has designated property for commercial and industrial development, with several county-owned institutional facilities (e.g., Carroll Hills School, dog pound, Carroll County Transit, Golden Age Home) currently existing in this location. Approximately 1 mile further north and east is a Tennessee Gas Pipeline compressor station.

Background sound levels surrounding the Facility Site were found to vary both spatially and temporally depending on receptor proximity to area sound sources, roadways and natural sounds. Principal contributors to the existing acoustic environment are expected to include motor vehicle traffic, mobile farming equipment, farming activities such as plowing and irrigation, all-terrain vehicles, local roadways, compressor station and treatment works (for example, associated with the Golden Age Home), periodic aircraft flyovers and rail movements, and natural sounds such as birds, insects, and leaf or vegetation rustle during elevated wind conditions in areas near tree stands or established crops.

To document the existing ambient sound levels in the Project area, a combination of short-term and long-term sound measurements were conducted as part of baseline sound monitoring program. Locations selected such that they are distributed throughout the area surrounding the Project are expected to accurately represent the existing acoustic environment. Figure 1-1 shows the approximate Project fence line and the short-term (ST) and long-term (LT) baseline sound measurement locations.



Carroll County ENERGY

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Miles

Figure 1-1
Baseline Sound Monitoring Locations

Carroll County Energy
Carroll County, Ohio

Baseline Sound Monitoring Position

- Long-Term
- Short-Term
- Facility Site

OVERVIEW MAP

Document Path: P:\GIS\CarrollCountyEnergyCenter\GIS\Spatial\MXD\Misc\20130916_Baseline_Sound_Survey_Report.mxd

2. ENVIRONMENTAL NOISE DESCRIPTORS

Airborne sound levels are presented on a logarithmic scale to account for the large range of acoustic pressures that the human ear is exposed to and are expressed in units of decibels (dB). A decibel is defined as the ratio between a measured value and a reference value usually corresponding to the lower threshold of human hearing defined as 20 micropascals (µPa). Broadband sound includes sound energy summed across the entire audible frequency spectrum. In addition to broadband sound pressure levels, analysis of the various frequency components of the sound spectrum can be completed to determine tonal characteristics. The unit of frequency is Hertz (Hz), measuring the cycles per second of the sound pressure waves; typically the frequency analysis examines 11 octave (or 33 1/3 octave) bands ranging from 16 Hz (low) to 16,000 Hz (high). One third (1/3) octave bands take these ten octave bands and split them into three, giving a higher resolution and a more detailed description of the frequency content of the sound. Since the human ear does not perceive every frequency with equal loudness, spectrally varying sounds are often adjusted with a weighting filter. The A-weighted filter is applied to compensate for the frequency response of the human auditory system and is represented in dBA.

An inherent property of the logarithmic decibel scale is that the sound pressure levels of two separate sources are not directly additive. For example, if a sound of 50 dBA is added to another sound of 50 dBA, the result is a 3-decibel increase (or 53 dBA), not an arithmetic doubling of 100 dBA. The human ear does not perceive changes in the sound pressure level as equal changes in loudness.

The analysis of acoustic data requires special consideration of sound levels that will generally fluctuate over time. To account for the time-varying nature of environmental noise, a single descriptor known as the equivalent sound level (L_{eq}) is often used. The L_{eq} value is the sound energy averaged over a complete measurement period. It is defined as the steady, continuous sound level over a specified time that has the same acoustic energy as the actual varying sound levels over the same time. The metrics commonly used for environmental sound studies, including the L_{eq}, are reported as dBA. The equivalent sound level has been shown to provide both an effective and uniform method for describing time-varying sound levels and is widely used in acoustic assessments. Estimates of noise sources and outdoor acoustic environments, and the comparison of relative loudness are presented in Table 1-1.

Table 1-1 Sound Pressure Levels and Relative Loudness of Typical Noise Sources

Noise Source or Activity	Sound Level (dBA)	Subjective Impression
Jet aircraft takeoff from carrier (50 feet)	140	Threshold of pain
50-hp siren (100 feet)	130	
Loud rock concert near stage Jet takeoff (200 feet)	120	Uncomfortably loud
Float plane takeoff (100 feet)	110	
Jet takeoff (2,000 feet)	100	Very loud
Heavy truck or motorcycle (25 feet)	90	
Garbage disposal or food blender (2 feet) Pneumatic drill (50 feet)	80	Loud
Vacuum cleaner (10 feet)	70	Moderate
Passenger car at 65 mph (25 feet)	65	
Large store air-conditioning unit (20 feet)	60	
Light auto traffic (100 feet)	50	Quiet

Table 1-1 Sound Pressure Levels and Relative Loudness of Typical Noise Sources

Noise Source or Activity	Sound Level (dBA)	Subjective Impression
Quiet rural residential area with no activity	45	
Bedroom or quiet living room Bird calls	40	Faint
Typical wilderness area	35	
Quiet library, soft whisper (15 feet)	30	Very quiet
Wilderness with no wind or animal activity	25	Extremely quiet
High-quality recording studio	20	
Acoustic test chamber	10	Just audible
	0	Threshold of hearing

Adapted from: Beranek (1988) and United States Environmental Protection Agency (EPA) (1971)

3. AMBIENT SOUND LEVEL MEASUREMENTS

This section includes a description of the sound terminology, survey methodologies, areas surveyed, and measurement equipment used. Sound measurements were done by a full member of the Institute of Noise Control Engineers (INCE) or under their direct supervision. The locations of monitoring positions were determined by using a global positioning system (GPS) unit, and photographs were taken from the measurement points in the directions of receptors of interest and the Facility Site.

3.1 MEASUREMENT PROCEDURE AND INSTRUMENTATION

To establish existing acoustic conditions for the area surrounding the Facility Site, an ambient sound survey was conducted over a 7-day period from May 8 to May 15, 2013. The measurement locations were selected to be representative of noise sensitive areas nearest to the Facility Site in varying geographical directions. The ambient sound survey included both automated unattended long-term measurements (7-day) and short-term measurements with an engineer present (minimum 30-minute duration. Short-term measurements were made during both daytime (10:00 a.m. to 4:00 p.m.) and nighttime (10:00 p.m. to 2:00 a.m.) periods. Measurements were taken with a Larson Davis 831 real-time sound level analyzer equipped with a PCB model 377B02 ½-inch precision condenser microphone. This instrument has an operating range of 5 dB to 140 dB, and an overall frequency range of 8 to 20,000 Hz, and meets or exceeds all requirements set forth in the American National Standards Institute (ANSI) standards for Type 1 sound level meters for quality and accuracy (precision).

Table 3-1 lists the measurement equipment used. All instrumentation components, including microphones, accelerometers, preamplifiers and field calibrators, had current laboratory certified calibrations traceable to the National Institute of Standards Technology (NIST). The NIST laboratory calibration certifications for the measurement instrumentation used are in Appendix A.

Table 3-1 Measurement Equipment

Description	Manufacturer	Type
Signal Analyzer	Larson Davis	831
Preamplifier	Larson Davis	PRM902
Weather Transmitter	Vaisala	WXT520
Microphone	PCB	377B02
Windscreen	ACO Pacific	7-inch
Windscreen	Larson Davis	WS-15
Calibrator	Larson Davis	CAL200

The microphone and windscreen were tripod-mounted at an approximate height of 1.5 to 1.7 meters (4.9 to 5.6 feet) above grade away from effects of ground level noise and reflective surfaces. In addition, the sound level analyzer microphones were protected from wind-induced self-noise effects by a 180-millimeter (mm; 7 inch) diameter foam windscreen made of specially prepared open-pored polyurethane. Each sound analyzer was programmed to measure and log broadband A-weighted sound pressure levels in 10- and 1-minute time intervals, including a number of statistical parameters such as the average (L_{eq}) maximum (L_{max}), and statistical sound levels (L_{10}, L_{50}, and L_{90}). Data were collected for 1/1 and 1/3 octave bands spanning the frequency range of 8 Hz to 20 kHz. Following the completion of the measurement period, all measured data were downloaded to a computer for the purposes of storage and further analysis.

3.2 MONITORING LOCATIONS

Prior to launching the baseline sound survey, Tetra Tech consulted with CCE to select appropriate monitoring locations. Monitoring positions were selected based on their geographical location with respect to proposed Facility Site. Alternate monitoring positions were also chosen in the event that, upon arrival at any of the preferred monitoring positions, it was determined that one of the preferred monitoring positions would be unsuitable due to nearby or on-site noise sources, which could bias the results of the baseline sound survey.

Baseline sound measurements were taken at 10 monitoring locations (Figure 1-1). Table 3-2 lists the corresponding map identifier for Figure 1-1, the GPS coordinates, existing land uses, and a description of each location surveyed.

Table 3-2 Baseline Sound Monitoring Locations

Map ID	Noise Sensitive Use	Coordinates	Description
ST-1	Residential	40°37.241’ N, 81°3.566’ W	1175 Cobbler Road
ST-2	Residential	40°35.912’ N, 81°2.899’ W	1347 Andora Street
ST-3	Residential	40°35.827’ N, 81°3.828’ W	Near Residence
ST-4	Residential	40°36.028’ N, 81°4.387’ W	Near Residence
ST-5	Residential	40°36.598’ N, 81°4.680’ W	2136 Brenner Road
ST-6	Residential	40°36.088’ N, 81°4.749’ W	Near Residence
ST-7	Civic/Public	40°36.723’ N, 81°4.137’ W	School & Living Center
LT-1	Residential	40°36.533’ N, 81°3.256’W	Property Line (PL) / Near Residence
LT-2	Residential	40°36.387’ N, 81°4.133’W	PL / Near Residence
LT-3	Residential	40°36.172’ N, 81°3.543’W	PL / Near Residence

The following sections provide additional descriptions of each monitoring location as well as a photograph of where the monitoring location was established.

3.2.1 ST-1: Cobbler Road Residence

Monitoring location ST-1 (shown in the photograph to the right) is representative of farm property approximately 1,480 meters (4,880 feet) north of the Facility Site boundary, along Cobbler Road. Field observations identified sounds from local roadway traffic, birds, dogs and other natural sounds. During the daytime monitoring period, heavy trucks passed this location, which may have influenced the overall L_{eq} sound levels reported.

3.2.2 ST-2: Andora Road Residence

Monitoring location ST-2 (shown in the photograph to the left) is representative of farm residences near the pond on Bayside Court, approximately 920 meters (3,020 feet) southeast of the Facility Site boundary, along Andora Road NE. Field observations identified sounds from local traffic, dogs, crickets, frogs and other natural noises.

3.2.3 ST-3: Mobile Road NE Residence 1

Monitoring location ST-3 (shown in the photograph to the right), approximately 640 meters (2,120 feet) south of the Facility Site, is representative of several residences along Mobile Road NE. Field observations identified sounds from local roadway traffic, cows and natural sounds.

3.2.4 ST-4: Route 9 NE Residence

Monitoring location ST-4 (shown in the photograph to the right), approximately 760 meters (2,480 feet) southwest of the Facility Site boundary, is representative of several residences along Route 9. Field observations identified sounds from fairly steady traffic on Route 9 during the daytime period including heavy truck traffic, natural sounds and distant lawn maintenance activities.

3.2.5 ST-5: Brenner Road Residence 1

Monitoring location ST-5 (shown in the photograph to the left), approximately 1,650 meters (5,400 feet) west of the Facility Site boundary is representative of the residence at and near 2136 Brenner Road. Field observations identified sounds from light local traffic and natural sounds.

3.2.6 ST-6: Brenner Road Residence 2

Monitoring location ST-6 (shown in the photograph to the right) represents the residences near 1270 Brenner Road, approximately 1,220 meters (3,960 feet) west of the Project Site boundary and in proximity to the Carroll County Veterans Club playing fields. Field observations identified sounds from local traffic and distant lawnmowing activities during the daytime monitoring period. Nighttime levels were generally low with natural sounds dominating.

3.2.7 ST-7: School / Residential

Monitoring location ST-7 (shown in the photograph to the left) represents the area near Carroll Hills School and Carroll Golden Age Retreat on Route 9 northwest of the Facility Site. Field observations identified local traffic during the daytime measurement period, including heavy truck traffic. Additional elements of ambient sound at this location include heating, ventilation and cooling (HVAC) and mechanical noise from a wastewater treatment facility and nearby buildings, local traffic, dogs from local pound and natural sounds including crickets and frogs.

3.2.8 LT-1: Mobile Road NE Residence

Monitoring location LT-1 (shown in the photograph to the right) lies within the eastern portion of the Facility Site and represents a residence along Mobile Road NE.

3.2.9 LT-2: Kensington Road NE Residence

Monitoring location LT-2 (shown in the photograph below) lies within the western portion of the Project site boundary and is located at the Jenkins farm along Kensington Road NE.

3.2.10 LT-3: Mobile Road NE Residence

Monitoring location LT-3 (shown in the photograph below) represents a residence along Mobile Road NE. The monitoring station was located on southeast edge of the Facility Site. A direct line-of-site between the monitoring station and closest residences was possible through a forested buffer area.

4. SOUND SURVEY RESULTS AND CONCLUSIONS

Noise measurements were taken to document the existing baseline acoustic environment. The goal of the field program was to identify the regularly occurring baseline sound at monitoring positions near the Facility Site. Upon completion of the baseline sound survey, the results were tabulated into relevant time periods. The monitoring included the collection and reporting of the following data:

- Sound pressure level data present during daytime and nighttime test periods.
- For each time period, the following sound measurement descriptors were compiled:
    - Spectral octave-band analysis (31.5, 63, 125, 250, 500, 1K, 2K, 4K, and 8K Hz);
    - One hour L_{eq} statistical values, in dBA;
    - A narrative description of sounds audible during testing and a discussion of any anomalous or regularly occurring sounds identified during the monitoring program; and
    - A description of existing land uses near the measurement location.

Tables 4-1 and 4-2 present baseline monitoring results in terms of sound level metrics and octave band frequencies, respectively, for both short and long-term measurement locations. Figure 4-1 presents time history plots for the three long-term monitoring locations.

The analysis results contained with this report are intended to support the technical analysis required as part of the permitting process for the Project. The degree of audibility of a new or modified sound source is dependent in a large part on the relative level of the ambient noise. CCE will utilize this information to determine appropriate assumptions for assessing the potential for the Project to result in a change in the sound environment.

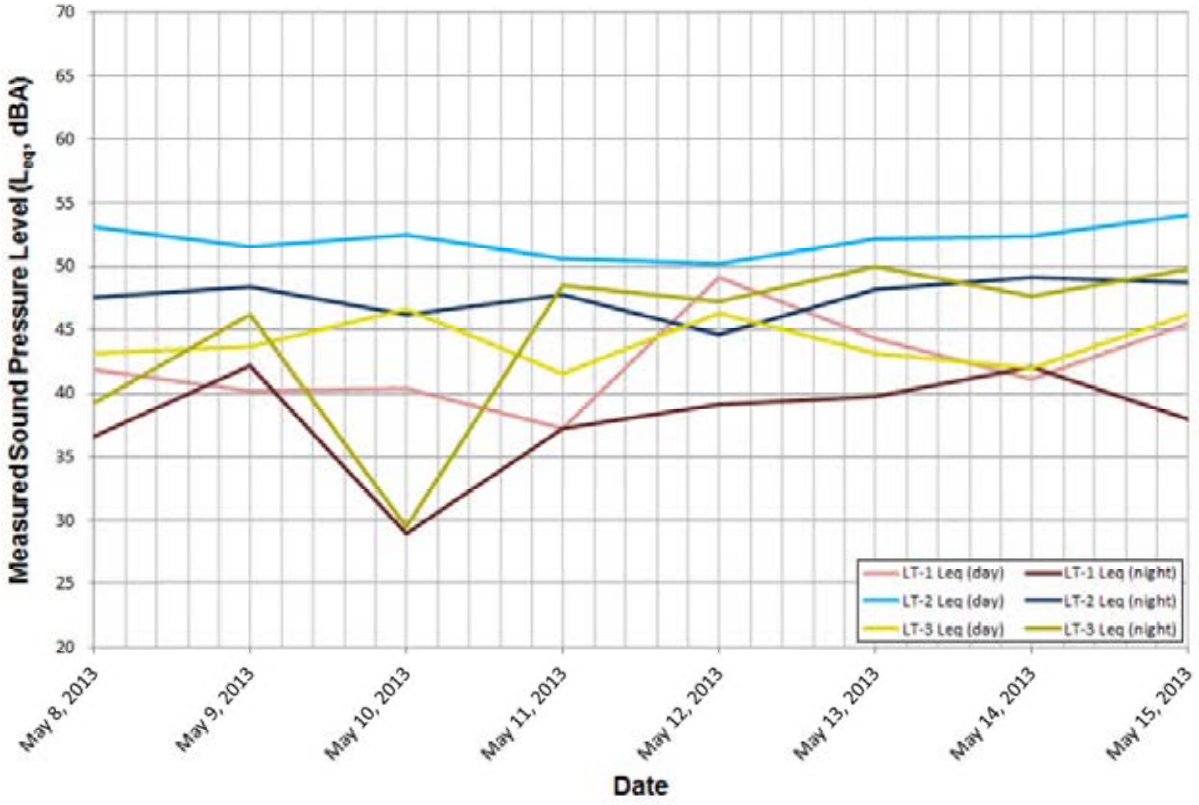
Table 4-1 Sound Monitoring Results – L_{eq}, dBA

Monitoring Location				Date	Time	Time Period	Sound Level Metrics (L_{eq}, dBA)
Map ID	Land Use	GPS Coordinates					
ST-1	Residential	40°37.241' N	81°3.566' W	5/15/2013	2:55 p.m.	Day	64
				5/15/2013	11:00 p.m.	Night	53
ST-2	Residential	40°35.912' N	81°2.899' W	5/16/2013	1:24 p.m.	Day	45
				5/16/2013	1:11 a.m.	Night	46
ST-3	Residential	40°35.827' N	81°3.828' W	5/16/2013	1:09 p.m.	Day	45
				5/7/2013	11:24 p.m.	Night	32
ST-4	Residential	40°36.028' N	81°4.387' W	5/16/2013	12:00 p.m.	Day	59
				5/8/2013	12:10 a.m.	Night	52
ST-5	Residential	40°36.598' N	81°4.680' W	5/16/2013	10:22 a.m.	Day	48
				5/15/2013	12:24 a.m.	Night	48
ST-6	Residential	40°36.088' N	81°4.749' W	5/16/2013	11:00 a.m.	Day	50
				5/8/2013	12:53 a.m.	Night	39
ST-7	Civic/Public	40°36.723' N	81°4.137' W	5/15/2013	3:40 p.m.	Day	56
				5/15/2013	11:42 p.m.	Night	52
LT-1 (Composite)	Residential	40°36.533' N	81°3.256' W	5/8/2013 to 5/15/2013		Day	42
						Night	36
LT-2 (Composite)	Residential	40°36.308' N	81°4.4152' W	5/8/2013 to 5/15/2013		Day	52
						Night	45
LT-3 (Composite)	Residential	40°36.172' N	81°3.543' W	5/8/2013 to 5/15/2013		Day	43
						Night	38

Table 4-2 Sound Monitoring Results – Composite L_{eq} Octave Band Center Frequencies

Monitoring Location		Time Period	Octave Band Sound Pressure Levels (dB)											
Map ID	Coordinates		8 Hz	16 Hz	31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	16 kHz
S-1	40°37.241' N, 81°3.566' W	Day	72	67	61	62	61	58	56	58	53	46	49	30
		Night	45	46	51	52	50	45	46	50	46	36	26	16
S-2	40°35.912' N, 81°2.899' W	Day	58	53	49	46	42	41	36	37	39	37	33	22
		Night	56	58	58	55	54	50	45	36	29	23	20	11
S-3	40°35.827' N, 81°3.828' W	Day	57	52	50	52	45	41	39	40	37	33	23	13
		Night	50	47	48	45	38	32	30	26	20	16	15	14
S-4	40°36.028' N, 81°4.387' W	Day	58	56	58	66	65	58	56	54	51	46	36	21
		Night	52	49	49	65	54	51	47	45	42	37	32	23
S-5	40°36.598' N, 81°4.680' W	Day	51	50	49	54	58	48	44	39	39	38	39	12
		Night	42	44	47	46	39	39	42	44	39	29	21	13
S-6	40°36.088' N, 81°4.749' W	Day	48	50	50	49	50	42	42	46	40	39	39	23
		Night	38	44	46	44	40	37	33	36	32	25	19	16
S-8	40°36.723' N, 81°4.137' W	Day	70	66	61	64	60	61	50	52	49	43	38	27
		Night	42	48	49	52	52	44	46	49	46	38	28	15
LT-1	40°36.533' N, 81°3.256'W	Day	55	52	53	49	44	41	38	35	32	31	22	12
		Night	48	47	54	43	39	36	33	29	23	21	15	8
LT-2	40°36.308' N, 81°4.4152'W	Day	68	63	58	61	59	51	47	47	41	35	28	19
		Night	61	56	54	54	52	45	41	41	35	29	21	15
LT-3	40°36.172' N, 81°3.543'W	Day	51	49	50	48	43	41	39	35	34	34	28	18
		Night	44	45	49	42	37	36	32	28	26	24	20	16

Figure 4-1 LT Time Histories – Sound Pressure Levels



5. REFERENCES

American National Standards Institute ANSI Standard S12.9-1996: Quantities and Procedures for Description and Measurement of Environmental Sound – Part 4: Noise Assessment and Prediction of Long-term Community Response.

American National Standards Institute ANSI/ASA Standard S1.4-2006: American National Standard Specification for Sound Level Meters.

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American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE), 1989 ASHRAE Handbook—Fundamentals, Atlanta, Georgia, 1989.

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APPENDIX A

MEASUREMENT EQUIPMENT & NIST LABORATORY CALIBRATION CERTIFICATIONS

Certificate of Calibration and Conformance

This document certifies that the instrument referenced below meets published specifications per Procedure PRD-P263; ANSI S1.4-1983 (R 2006) Type 1; S1.4A-1985; S1.43-1997 Type 1; S1.11-2004 Octave Band Class 0; S1.25-1991; IEC 61672-2002 Class 1; 60651-2001 Type 1; 60804-2000 Type 1; 61260-2001 Class 0; 61252-2002.

Manufacturer:	Larson Davis	Temperature:	75.2	°F
Model Number:	831		24	°C
Serial Number:	2442	Rel. Humidity:	22	%
Customer:	Acoustical Consulting Services	Pressure:	1009	mbars
Description:	Sound Level Meter		1009	hPa

Note: As Found / As Left: In Tolerance

Upon receipt for testing, this instrument was found to be:

Within the Stated tolerance of the manufacturer's specification

Calibration Date: 30-Jan-12 Calibration Due:

Calibration Standards Used:

Manufacturer	Model	Serial Number	Cal Due	Traceability No.
Larson Davis	LDSigGen/2239	0760/0109	4/7/2012	2011-138647

This Certificate attests that this instrument has been calibrated under the stated conditions with Measurement and Test Equipment (M&TE) Standards traceable to the National Institute of Standards and Technology (NIST). All of the Measurement Standards have been calibrated to their manufacturers' specified accuracy / uncertainty. Evidence of traceability and accuracy is on file at The Modal Shop and/or Larson Davis Corporate Headquarters. An acceptable accuracy ratio between the Standard(s) and the item calibrated has been maintained. This instrument meets or exceeds the manufacturer's published specification unless noted.

This calibration complies with ISO 17025 and ANSI Z540. The collective uncertainty of the Measurement Standard used does not exceed 25% of the applicable tolerance for each characteristic calibrated unless otherwise noted.

The results documented in this certificate relate only to the item(s) calibrated or tested. Calibration interval assignment and adjustment are the responsibility of the end user. This certificate may not be reproduced, except in full, without the written approval of The Modal Shop.

Technician: Ed Devlin Signature:

THE MODAL SHOP INC.
A PCB GROUP CO.

The Modal Shop, Inc.
3149 East Kemper Road
Cincinnati, OH 45241
Phone: (513) 351-9919
(800) 860-4867
www.modalshop.com

Certificate of Calibration and Conformance

This document certifies that the instrument referenced below meets published specifications per Procedure PRD-P263; ANSI S1.4-1983 (R 2006) Type 1; S1.4A-1985; S1.43-1997 Type 1; S1.11-2004 Octave Band Class 0; S1.25-1991; IEC 61672-2002 Class 1; 60651-2001 Type 1; 60804-2000 Type 1; 61260-2001 Class 0; 61252-2002.

Manufacturer:	Larson Davis	Temperature:	72.5	°F
Model Number:	831		24	°C
Serial Number:	2258	Rel. Humidity:	23	%
Customer:		Pressure:	1007	mbars
Description:	Sound Level Meter		1007	hPa

Note: As Found / As Left: In Tolerance

Upon receipt for testing, this instrument was found to be:

Within the Stated tolerance of the manufacturer's specification

Calibration Date: 9-Jan-13 Calibration Due:

Calibration Standards Used:

Manufacturer	Model	Serial Number	Cal Due	Traceability No.
Larson Davis	LDSigGen/2239	0760/0109	4/16/2013	2012-157887

This Certificate attests that this instrument has been calibrated under the stated conditions with Measurement and Test Equipment (M&TE) Standards traceable to the National Institute of Standards and Technology (NIST). All of the Measurement Standards have been calibrated to their manufacturers' specified accuracy / uncertainty. Evidence of traceability and accuracy is on file at The Modal Shop and/or Larson Davis Corporate Headquarters. An acceptable accuracy ratio between the Standard(s) and the item calibrated has been maintained. This instrument meets or exceeds the manufacturer's published specification unless noted.

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Technician: Tim Rarden Signature:

THE MODAL SHOP INC.
A PCB GROUP CO.

The Modal Shop, Inc.
3149 East Kemper Road
Cincinnati, OH 45241
Phone: (513) 351-9919
(800) 860-4867
www.modalshop.com

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Manufacturer:	Larson Davis	Temperature:	72.5	°F
Model Number:	831		24	°C
Serial Number:	2544	Rel. Humidity:	22	%
Customer:		Pressure:	993	mbars
Description:	Sound Level Meter			hPa

Note: As Found / As Left: In Tolerance

Upon receipt for testing, this instrument was found to be:

Within the Stated tolerance of the manufacturer's specification

Calibration Date: 21-Mar-13 Calibration Due:

Calibration Standards Used:

Manufacturer	Model	Serial Number	Cal Due	Traceability No.
Larson Davis	LDSigGen/2239	0760/0109	4/16/2013	2012-154016

This Certificate attests that this instrument has been calibrated under the stated conditions with Measurement and Test Equipment (M&TE) Standards traceable to the National Institute of Standards and Technology (NIST). All of the Measurement Standards have been calibrated to their manufacturers' specified accuracy / uncertainty. Evidence of traceability and accuracy is on file at The Modal Shop and/or Larson Davis Corporate Headquarters. An acceptable accuracy ratio between the Standard(s) and the item calibrated has been maintained. This instrument meets or exceeds the manufacturer's published specification unless noted.

This calibration complies with ISO 17025 and ANSI Z540. The collective uncertainty of the Measurement Standard used does not exceed 25% of the applicable tolerance for each characteristic calibrated unless otherwise noted.

The results documented in this certificate relate only to the item(s) calibrated or tested. Calibration interval assignment and adjustment are the responsibility of the end user. This certificate may not be reproduced, except in full, without the written approval of The Modal Shop.

Technician: Tim Rarden Signature:

The Modal Shop, Inc.
3149 East Kemper Road
Cincinnati, OH 45241
Phone: (513) 351-9919
(800) 860-4867
www.modalshop.com

PCB PIEZOTRONICS
A PCB GROUP COMPANY

Certificate of Calibration and Conformance

Certificate Number 2013-168871

Instrument Model 831, Serial Number 0003140, was calibrated on 18JAN2013. The instrument meets factory specifications per Procedure D0001.8310, ANSI S1.4-1983 (R 2006) Type 1; S1.4A-1985 ; S1.43-1997 Type 1; S1.11-2004 Octave Band Class 1; S1.25-1991; IEC 61672-2002 Class 1; 60651-2001 Type 1; 60804-2000 Type 1; 61260-2001 Class 1; 61252-2002.

New Instrument
Date Calibrated: 18JAN2013
Calibration due:

Calibration Standards Used

MANUFACTURER	MODEL	SERIAL NUMBER	INTERVAL	CAL. DUE	TRACEABILITY NO.
Stanford Research Systems	DS360	61746	12 Months	06JUL2013	61746-070612

Reference Standards are traceable to the National Institute of Standards and Technology (NIST)

Calibration Environmental Conditions

Temperature: 23 ° Centigrade

Relative Humidity: 18 %

Affirmations

This Certificate attests that this instrument has been calibrated under the stated conditions with Measurement and Test Equipment (M&TE) Standards traceable to the U.S. National Institute of Standards and Technology (NIST). All of the Measurement Standards have been calibrated to their manufacturers' specified accuracy / uncertainty. Evidence of traceability and accuracy is on file at Provo Engineering & Manufacturing Center. An acceptable accuracy ratio between the Standard(s) and the item calibrated has been maintained. This instrument meets or exceeds the manufacturer's published specification unless noted.

The collective uncertainty of the Measurement Standard used does not exceed 25% of the applicable tolerance for each characteristic calibrated unless otherwise noted.

The results documented in this certificate relate only to the item(s) calibrated or tested. A one year calibration is recommended, however calibration interval assignment and adjustment are the responsibility of the end user. This certificate may not be reproduced, except in full, without the written approval of the issuer.

Tested with PRM831-023866

Signed: Ron Harris

Technician: Ron Harris

Provo Engineering and Manufacturing Center, 1681 West 820 North, Provo, Utah 84601
Toll Free: 888.258.3222 Telephone: 716.926.8243 Fax: 716.926.8215
ISO 9001-2008 Certified

THE MODAL SHOP INC
A PCB GROUP COMPANY

3149 East Kemper Rd.
Cincinnati, OH 45241
Ph : 513-351-9919
Fax: 513-458-2172
www.modalshop.com

~Certificate of Calibration~

Manufacturer: PCB
Model Number: 377B02
Serial Number: 118070
Description: Free-Field Microphone

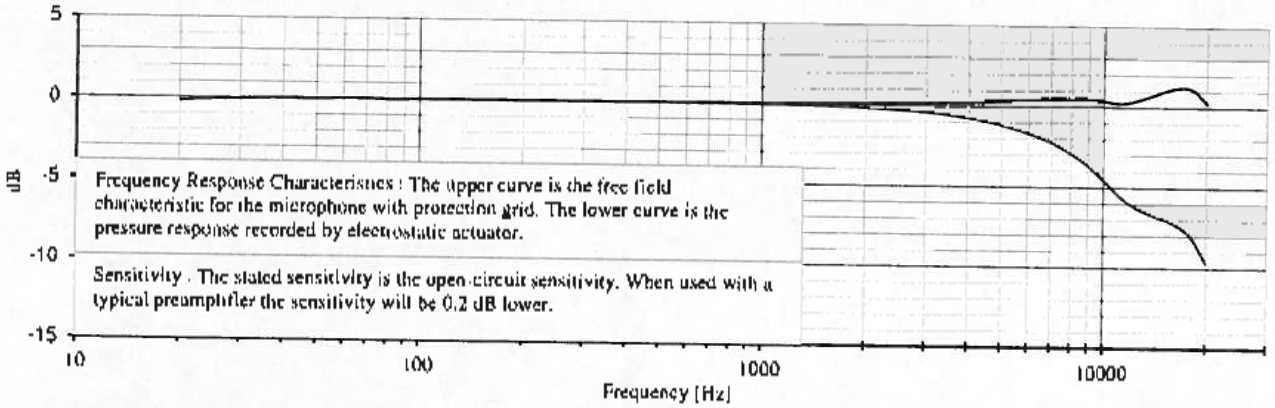
Asset ID:
Customer: TMS Rental
Calibration Date: Feb 12, 2013 14:12:23
Due Date:

Sensitivity:

250 Hz	1 kHz	
-26.31	-26.36	dB re. 1V/Pa
48.34	48.09	mV/Pa

Cal. Results: In Tolerance

Temperature:	73 (23)	°F (°C)
Humidity:	18	%
Ambient Pressure:	995.5	mbar
Polarization Voltage:	0	VDC



Traceability: The calibration is traceable through 681/280411-11.

Notes:
- Calibration results relate only to the items calibrated.
- This certificate may not be reproduced, except in full, without written permission.
- This calibration is performed in compliance with ISO 9001, ISO 17025 and ANSI Z540.
- Measurement uncertainty (250 Hz sensitivity calibration) at 95% confidence level: 0.30 dB.
- Calibrated per procedure PRD-P204.

User Note : As Found / As Left: In Tolerance.

Frequency Response with reference to level at 250 Hz

Frequency (Hz)	Upper (dB)	Frequency (Hz)	Upper (dB)	Frequency (Hz)	Upper (dB)	Frequency (Hz)	Upper (dB)
20	-0.19	630	0.02	4500	0.31		
25	-0.08	800	0.06	5000	0.36		
31.5	-0.04	1000	0.07	5600	0.42		
40	0.01	1120	0.08	6300	0.48		
50	-0.02	1250	0.09	7100	0.53		
63	0.05	1400	0.10	8000	0.53		
80	-0.02	1600	0.10	9000	0.54		
100	0.01	1800	0.11	10000	0.39		
125	0.01	2000	0.13	11200	0.26		
160	0.00	2240	0.14	12500	0.44		
200	0.00	2500	0.17	14000	0.80		
250	0.00	2800	0.20	16000	1.21		
315	0.01	3150	0.22	18000	1.17		
400	0.01	3550	0.24	20000	0.28		
500	0.03	4000	0.26				

ACCredited

Technician: Ed Devlin

Approval: Shaun O. Devlin

Reference Equipment Used:

Manuf.	*Model*	*Serial*	*Cal. Date*	*Due Date*
GRAS	40AG	77606	9/21/2012	9/21/2013

THE MODAL SHOP INC.
A PCB GROUP CO.

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Cincinnati, OH 45241
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www.modalshop.com

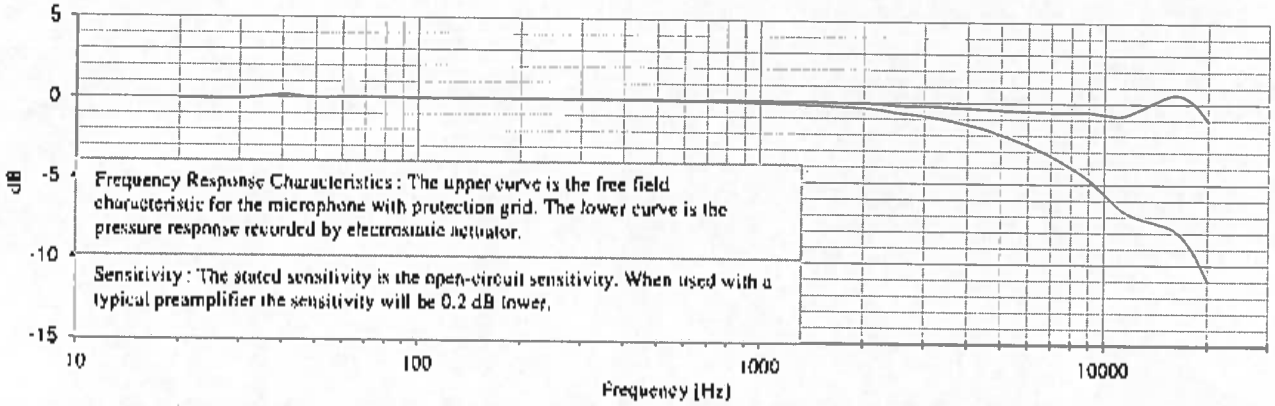
~Certificate of Calibration~

Manufacturer:	PCB	**Asset ID:**	
Model Number:	377B02	**Customer:**	TMS Rental
Serial Number:	LW135128	**Calibration Date:**	Apr 29, 2013 16:42:06
Description:	Free-Field Microphone	**Due Date:**	

Sensitivity:	**250 Hz**	**1 kHz**		**Temperature:**	72 (22)	°F (°C)
	-24.85	-24.98	dB re. 1V/Pa	**Humidity:**	42	%
	57.20	56.39	mV/Pa	**Ambient Pressure:**	993.3	mbar

Cal. Results: In Tolerance

Polarization Voltage: 0 VDC



Traceability: The calibration is traceable through 681/280411-11.

Notes: Calibration results relate only to the items calibrated.
This certificate may not be reproduced, except in full, without written permission.
This calibration is performed in compliance with ISO 9001, ISO 17025 and ANSI Z540.
Measurement uncertainty (250 Hz sensitivity calibration) at 95% confidence level: 0.30 dB.
Calibrated per procedure PRD-P204.

User Note : As Found / As Left: In Tolerance.

Frequency Response with reference to level at 250 Hz

Frequency (Hz)	Upper (dB)	Frequency (Hz)	Upper (dB)	Frequency (Hz)	Upper (dB)	Frequency (Hz)	Upper (dB)
20	-0.08	630	0.02	4500	-0.37		
25	-0.08	800	0.02	5000	-0.43		
31.5	-0.04	1000	-0.01	5600	-0.47		
40	0.16	1120	0.00	6300	-0.50		
50	0.00	1250	0.00	7100	-0.54		
63	0.06	1400	-0.01	8000	-0.53		
80	0.04	1600	-0.03	9000	-0.53		
100	-0.01	1800	-0.04	10000	-0.66		
125	0.00	2000	-0.04	11200	-0.73		
160	0.00	2240	-0.09	12500	-0.36		
200	0.00	2500	-0.18	14000	0.15		
250	0.00	2800	-0.19	16000	0.58		
315	0.00	3150	-0.22	18000	0.11		
400	0.00	3550	-0.27	20000	-1.03		
500	0.01	4000	-0.33				

ACCREDITED

Technician: EAD

Approval:

Reference Equipment Used:

Manuf.	*Model*	*Serial*	*Cal. Date*	*Due Date*
GRAS	40AG	77606	9/21/2012	9/21/2013

~ Calibration Report ~

Microphone Model: 377B02 Serial Number: LW131849 Description: 1/2" Free-Field Microphone

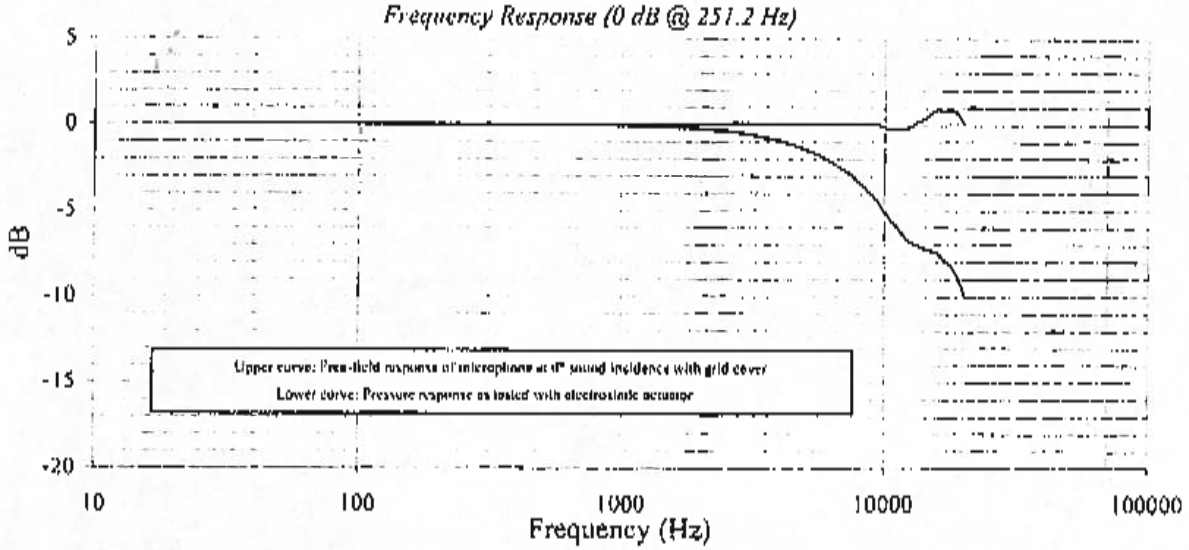
Calibration Data

Open Circuit Sensitivity @ 251.2 Hz: 56.38 mV/Pa
-24.98 dB re 1V/Pa

Polarization Voltage, External: 0 V
Capacitance: 11.8 pF

Temperature: 72 °F (22°C) Ambient Pressure: 982 mbar Relative Humidity: 48 %

Frequency Response (0 dB @ 251.2 Hz)



Freq (Hz)	Lower (dB)	Upper (dB)	Freq (Hz)	Lower (dB)	Upper (dB)	Freq (Hz)	Lower (dB)	Upper (dB)	Freq (Hz)	Lower (dB)	Upper (dB)
20.0	0.02	0.02	1584.9	-0.16	0.05	6683.4	-2.45	0.07	-	-	-
25.1	0.00	0.00	1678.8	-0.18	0.05	7079.5	-2.69	0.09	-	-	-
31.6	0.01	0.01	1778.3	-0.20	0.05	7498.9	-2.97	0.10	-	-	-
39.8	0.02	0.02	1883.7	-0.22	0.06	7943.3	-3.34	0.05	-	-	-
50.1	0.02	0.02	1995.3	-0.25	0.06	8414.0	-3.68	0.05	-	-	-
63.1	0.02	0.02	2113.5	-0.28	0.06	8912.5	-4.08	0.03	-	-	-
79.4	0.02	0.02	2238.7	-0.31	0.06	9440.6	-4.50	0.02	-	-	-
100.0	0.01	0.01	2371.4	-0.35	0.06	10000.0	-5.10	-0.15	-	-	-
125.9	0.01	0.01	2511.9	-0.38	0.08	10592.5	-5.63	-0.23	-	-	-
158.5	0.01	0.01	2660.7	-0.42	0.09	11220.2	-6.03	-0.17	-	-	-
199.5	0.00	0.00	2818.4	-0.47	0.09	11885.0	-6.53	-0.21	-	-	-
251.2	0.00	0.00	2985.4	-0.53	0.09	12589.3	-6.84	-0.07	-	-	-
316.2	0.00	0.01	3162.3	-0.61	0.07	13335.2	-7.00	0.19	-	-	-
398.1	-0.01	-0.01	3349.7	-0.69	0.05	14125.4	-7.20	0.39	-	-	-
501.2	-0.02	0.02	3548.1	-0.76	0.06	14962.4	-7.33	0.64	-	-	-
631.0	-0.03	0.01	3758.4	-0.85	0.05	15848.9	-7.44	0.91	-	-	-
794.3	-0.05	0.04	3981.1	-0.94	0.06	16788.0	-7.90	0.82	-	-	-
1000.0	-0.07	0.05	4217.0	-1.05	0.06	17782.8	-8.20	0.91	-	-	-
1059.3	-0.08	0.05	4466.8	-1.16	0.07	18836.5	-8.85	0.66	-	-	-
1122.0	-0.09	0.05	4731.5	-1.29	0.08	19952.6	-9.83	0.10	-	-	-
1188.5	-0.10	0.05	5011.9	-1.45	0.08	-	-	-	-	-	-
1258.9	-0.11	0.05	5308.8	-1.61	0.09	-	-	-	-	-	-
1333.5	-0.12	0.06	5623.4	-1.80	0.08	-	-	-	-	-	-
1412.5	-0.13	0.06	5956.6	-2.00	0.07	-	-	-	-	-	-
1496.2	-0.15	0.05	6309.6	-2.21	0.08	-	-	-	-	-	-

Technician: Lenard Lukasik Date: August 20, 2012

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CALIBRATION CERT #1661.01

PCB PIEZOTRONICS
VIBRATION DIVISION
3425 Walden Avenue, Depew, New York, 14043
TEL: 888-684-0013 FAX: 716-685-3886 www.pcb.com

~ Calibration Report ~

Microphone Model: 377B02 Serial Number: LW135145 Description: 1/2" Free-Field Microphone

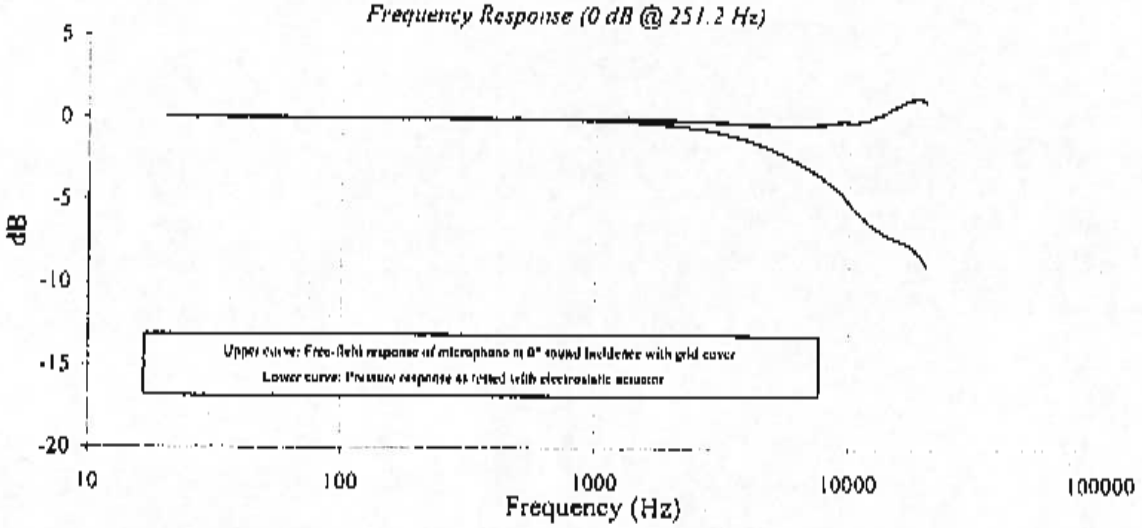
Calibration Data

Open Circuit Sensitivity @ 251.2 Hz: 49.25 mV/Pa
-26.15 dB re 1V/Pa

Polarization Voltage, External: 0 V
Capacitance: 12.5 pF

Temperature: 71 °F (22°C) Ambient Pressure: 997 mbar Relative Humidity: 29 %

Frequency Response (0 dB @ 251.2 Hz)



Freq (Hz)	Lower (dB)	Upper (dB)	Freq (Hz)	Lower (dB)	Upper (dB)	Freq (Hz)	Lower (dB)	Upper (dB)	Freq (Hz)	Lower (dB)	Upper (dB)
20.0	0.08	0.08	1584.9	-0.26	-0.05	6683.4	-2.87	-0.35	-	-	-
25.1	0.02	0.02	1678.8	-0.28	-0.05	7079.5	-3.10	-0.32	-	-	-
31.6	0.04	0.04	1778.3	-0.31	-0.06	7498.9	-3.34	-0.27	-	-	-
39.8	0.02	0.02	1883.7	-0.34	-0.06	7943.3	-3.65	-0.26	-	-	-
50.1	0.04	0.04	1995.3	-0.38	-0.07	8414.0	-3.95	-0.22	-	-	-
63.1	0.03	0.03	2113.5	-0.42	-0.08	8912.5	-4.26	-0.15	-	-	-
79.4	0.01	0.01	2238.7	-0.47	-0.10	9440.6	-4.60	-0.08	-	-	-
100.0	0.01	0.01	2371.4	-0.52	-0.11	10000.0	-5.11	-0.16	-	-	-
125.9	0.04	0.04	2511.9	-0.58	-0.12	10592.5	-5.56	-0.16	-	-	-
158.5	-0.01	-0.01	2660.7	-0.64	-0.13	11220.2	-5.89	-0.03	-	-	-
199.5	-0.01	-0.01	2818.4	-0.70	-0.14	11885.0	-6.29	0.03	-	-	-
251.2	0.00	0.00	2985.4	-0.78	-0.16	12589.3	-6.54	0.23	-	-	-
316.2	-0.02	-0.01	3162.3	-0.87	-0.19	13335.2	-6.84	0.35	-	-	-
398.1	-0.03	-0.03	3349.7	-0.96	-0.22	14125.4	-7.04	0.55	-	-	-
501.2	-0.03	0.01	3548.1	-1.06	-0.24	14962.4	-7.18	0.79	-	-	-
631.0	-0.06	-0.02	3758.4	-1.17	-0.27	15848.9	-7.36	0.99	-	-	-
794.3	-0.06	0.03	3981.1	-1.29	-0.29	16788.0	-7.53	1.19	-	-	-
1000.0	-0.11	0.01	4217.0	-1.42	-0.31	17782.8	-7.81	1.30	-	-	-
1059.3	-0.13	0.00	4466.8	-1.56	-0.33	18836.5	-8.19	1.32	-	-	-
1122.0	-0.13	0.01	4731.5	-1.70	-0.33	19952.6	-8.80	1.13	-	-	-
1188.5	-0.15	0.00	5011.9	-1.87	-0.34	-	-	-	-	-	-
1258.9	-0.17	-0.01	5308.8	-2.05	-0.35	-	-	-	-	-	-
1333.5	-0.11	0.07	5623.4	-2.23	-0.35	-	-	-	-	-	-
1412.5	-0.17	0.02	5956.6	-2.45	-0.38	-	-	-	-	-	-
1496.2	-0.23	-0.03	6309.6	-2.65	-0.36	-	-	-	-	-	-

Technician: Milton Munger Date: December 14, 2012

ACCREDITED
CALIBRATION CERT #1463.01

PCB PIEZOTRONICS
VIBRATION DIVISION
3425 Walden Avenue, Depew, New York, 14043
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THE MODAL SHOP INC.
3149 East Kemper Rd.
Cincinnati, OH 45241
Ph: 513-351-9919
Fax: 513-458-2172
www.modalshop.com

~Calibration Certificate~

Manufacturer:	Larson Davis	Asset ID:	
Model:	CAL200	Calibration Date:	May 06, 2013 14:22:29
Serial Number:	8807	Due Date:	
Description:	Acoustic Calibrator	Technician:	EAD
Customer:	TMS Rental	Approval:	

Calibration Results:

Measured SPL : 94.19 dB re. 20µPa		Temperature:	23 °C (73 °F)
Measured Frequency : 1,000.00 Hz		Humidity:	43.30%
		Pressure:	992.2 mbar

Upon receipt for calibration, the instrument was found to be:
WITHIN the stated tolerance of the manufacturer's specification.

Note: **As Found / As Left: In Tolerance.**

Measurement uncertainty at 95% confidence level: 0.3 dB

The subject instrument was calibrated to the indicated specification using standards stated below or to accepted values of natural physical constants. This document certifies that the instrument met the following specification upon its return to the customer.

This calibration is traceable through : 681/280411-11

Notes:
The calibration was performed under operating procedures intended to implement the requirements of ISO 9001, ISO 17025 and ANSI Z540. Unless otherwise noted, the reported value is both "as found" and "as left" data. Calibration results relate only to the items calibrated. This certificate may not be reproduced, except in full, without written permission.

Reference Equipment Used:

Manuf.	*Model*	*Serial*	*Cal. Date*	*Due Date*
GRAS	40AG	77606	9/21/2012	9/21/2013

Summary: Application Appendix J: Baseline Sound Survey Report electronically filed by Ms. Miranda R Leppla on behalf of Carroll County Energy LLC