
TO: Mike Barham, Helis Oil & Gas, L.L.C.

FROM: June Mire, Tetra Tech, Inc.

DATE: March 24, 2015

SUBJECT: Baseline Sound Survey, Helis Oil & Gas St. Tammany Energy Project

Dear Mr. Barham:

Tetra Tech Inc. (Tetra Tech) conducted a baseline sound survey on February 26, 2015, at the proposed drill pad location and the nearest noise sensitive receptors to characterize the existing acoustic environment prior to the start of construction related to exploration and drilling. This technical memo describes the noise level limits of St. Tammany Parish, the baseline sound survey methodology, and the results of the survey.

1.0 Regulatory Limits

A regulatory review was conducted to identify applicable noise requirements at the federal, state, and local levels of government. No federal regulations are directly applicable to the drilling project.

The state of Louisiana, via Louisiana Air Control Law, La. Rev. Stat. Ann. tit. 30 §2051–2066 (Louisiana 2012), has established general rules for the control and abatement of noise pollution, including a stipulation for the establishment of appropriate noise levels or limits for defined areas. To fulfill the State’s noise requirement, St. Tammany Parish, via the St. Tammany Parish Code of Ordinances Article IV Noise and Sound, has identified noise level limits by zoning code (Table 1). Construction noise, such as that associated with grading access roads, constructing the drill pad, and drilling, is exempt from the Parish’s daytime, but not nighttime, noise limits. Operational noise from natural resource extraction is subject to the Parish noise level limits for all time periods.

Table 1. St. Tammany Parish dBA L_{eq} Limits by Zoning District

Zoning District	Description	Weekday		Weekend	
		Daytime	Nighttime	Daytime	Nighttime
Class A (includes zones A-1, A-2, A-3, A-4, A-5, A-6, PUD, RC, and MH)	Residential	65	60	65	60
Class B (includes zones C-2, C-3, ID)	Commercial	70	60	70	60
Class C (includes zones M-1, M-2, and M-3)	Manufacturing	75	65	75	65
Class D (includes zones LC, C-I, R, and SA)		70	60	70	60
<p>Source: St. Tammany Parish 2014 http://www.stpgov.org/files/Council/St%20Tammany%20Parish%20code%20Feb%202014%20with%20links.pdf Class A: weekday daytime 7 a.m. – 9 p.m. and nighttime 9 p.m. – 7 a.m., weekend daytime 8 a.m. – 10 p.m. and nighttime 10 p.m. – 8 a.m. Classes B, C and D: entire week daytime 7 a.m. – 11 p.m. and nighttime 11 p.m. – 7 a.m. dBA L_{eq} = Time energy averaged A-weighted sound detectable by humans</p>					

1.1 Project Area Zoning

The land where the drill pad and access roads will be located is zoned as Class A, zone A-3 (suburban). Support facilities, such as the source pond and soil stockpile, are Class A, zone PUD (Planned Unit Development). Three noise sensitive areas (NSA) were identified near the drill pad location:

1. A cluster of single-family residences (Class A, zone A-2) 1.25 miles west of the drill pad location, southeast of the I-12 and LA 1088 interchange;
2. Another cluster of single-family residences (Class A, zone A-4) 1.7 miles west of the drill pad location, southwest of the I-12 and LA 1088 interchange; and
3. Lakeshore High School (ED-2 Secondary Education) approximately 1 mile north of the drill pad location. Zone ED-2 is not included in the Parish's noise regulatory limits. For purposes of noise monitoring, the high school is conservatively assumed to be Class A.

2.0 Baseline Sound Survey

The subsections that follow provide descriptions of the methods, monitoring positions, and results for the baseline sound survey.

2.1 Methods

Neither the Parish nor the State provides guidance on methods for assigning baseline sound levels near planned oil and gas developments. This sound survey implemented the approach typically used for oil and gas projects under the jurisdiction of the Federal Energy Regulatory Commission (FERC). The FERC approach includes a series of short-term (30-minute) sound level measurements during daytime (7:00 AM to 10:00 PM) and nighttime (10:00 PM and 7:00 AM) periods at the nearest NSAs, and a longer-term (12-to-24 hour) sound level measurement to identify diurnal variation at the drill pad site. "Sound" includes physical disturbances that are detectable by the human ear and "noise" is defined as any disagreeable or undesired sound. A-weighting of decibels (*i.e.*, dBA) is a method used to account for the relative loudness at frequencies such that it mimics the response of the human ear.

Short-term measurements were conducted on February 26, 2015, during the daytime at two residential areas and at Lakeshore High School. The daytime measurements were conducted between 10:00 AM and 1:00 PM to avoid high traffic periods associated with the morning and evening commutes. Short-term nighttime measurements were conducted only at the residential NSAs because the high school is considered day use only.

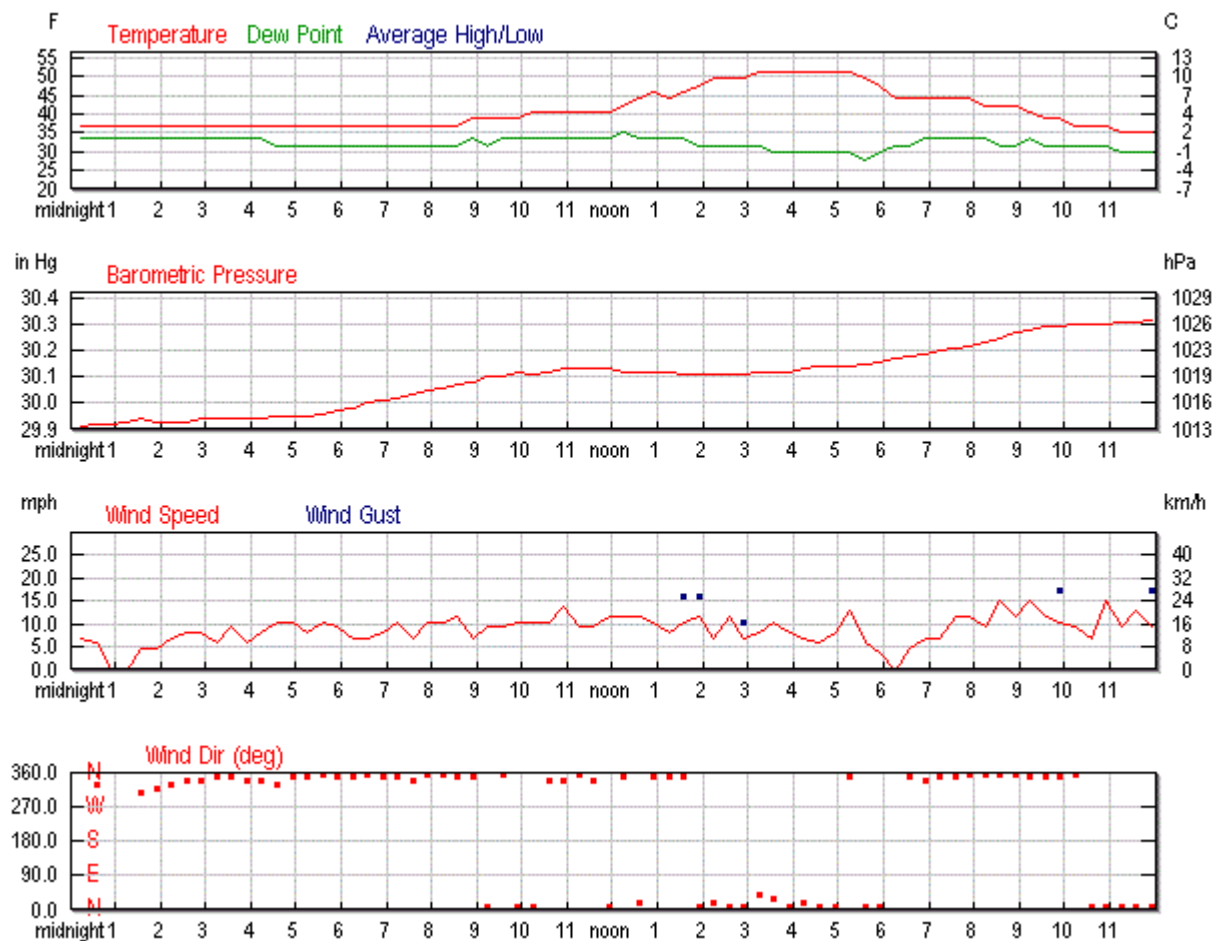
All sound level measurements were completed with Larson Davis 831 real-time sound level meters that have an operating range of 16 to 140 A-weighted decibels (dBA) and an overall frequency range of 8 to 20,000 Hertz. This American National Standards Institute (ANSI) Type 1 (precision) instrument was programmed to log data continuously. All sound level meters were calibrated in the field immediately before and after each measurement period. Additionally, these meters were laboratory calibrated within the last 12-month period; calibration certification sheets are provided

in Attachment 1. Short-term measurements were completed in 1-minute intervals over the course of at least 30 minutes. The long-term measurement was completed in 10-minute and 1-hour intervals. Several noise metrics were monitored, including the equivalent sound level (L_{eq}) and statistical levels such as the L_{10} , L_{50} , and L_{90} , which are used to distinguish long-term baseline sound levels from transitory events such as sirens and thunder. The sound metrics monitored are further defined as follows:

- **L_{eq} :** Conventionally expressed in dBA, the L_{eq} is the energy-averaged, A-weighted sound level for the complete time period. It is defined as the steady, continuous sound level over a specified time, which has the same acoustic energy as the actual varying sound levels over the specified period. The hourly L_{eq} is the metric used in the Parish's noise ordinance.
- **L_n :** This descriptor identifies the sound level that is exceeded "n" percent of the time over a measurement period (e.g., L_{90} = sound level exceeded 90 percent of the time). The sound level exceeded 10 percent of the time, L_{10} , closely corresponds to short-term, higher-level, intrusive noises (such as vehicle pass-by noise near a roadway). The sound level exceeded 90 percent of the time, L_{90} , closely corresponds to continuous, lower-level background noise (such as continuous noise from a distant industrial facility). L_{50} is the level exceeded 50 percent of the time, typically referred to the median sound level over a given period.

Full (1/1) and one-third (1/3) octave band sound pressure levels were also logged. Meteorological conditions during the sound survey were suitable for conducting acoustic surveys (Figure 1).

Figure 1. Meteorological Conditions (February 26, 2015)



Source: Weather Underground 2015 (www.wunderground.com)

Notes:

F = degree Fahrenheit

C = degree Celsius

Hg = inches of mercury

hPa = hectopascal

mph = mile per hour

km/h = kilometer per hour

N = North, W = West, S = South, E = East

2.2 Monitoring Positions

Four monitoring positions (MP) were selected for the sound survey to represent the existing acoustic environment. The locations of these MPs are described in the subsections that follow and shown on Figure 2.

2.2.1 MP-1 – Drill Pad

Unattended longer-term (14-hour) baseline monitoring was conducted at the location of the proposed drill pad. The monitoring equipment was deployed at 10:19 AM on February 26, 2015, and retrieved later that night at 11:59 PM to capture the diurnal variation of the site. Observed sound sources at the site included roadway traffic noise from I-12 and LA 1088, with secondary sound sources from light wind.



2.2.2 MP-2 – Lakeshore High School

Daytime short-term (30-minute) monitoring was conducted at the entrance to Lakeshore High School on February 26, 2015. The measurement began at 10:38 AM and was completed at 11:08 AM. The measurement was intentionally conducted during off-peak traffic conditions at the high school to be representative of lower daytime sound levels when classes are in session. Traffic noise on LA 1088 was the dominant sound source during the measurement, with additional traffic noise from I-12 in the distance. Additional sound sources included one aircraft flyover (helicopter) at 10:56 AM and periodic light winds. Nighttime monitoring was not conducted at the school because it is not typically in use at night.



2.2.3 MP-3 – Vacant Lot on Cypress Street, Mandeville

Daytime and nighttime short-term (30-minute) monitoring was conducted at a vacant lot adjacent to a single-family dwelling at 66121 Cypress Street. Measurements were conducted on February 26, 2015 from 11:41 AM to 12:15 PM (daytime), and again from 10:16 PM to 10:46 PM (nighttime). Monitoring was intentionally conducted during off-peak traffic conditions along I-12 and LA 1088 to represent a conservative (low) baseline sound level. No other sounds were readily identifiable over traffic noise during either the daytime or nighttime measurements.

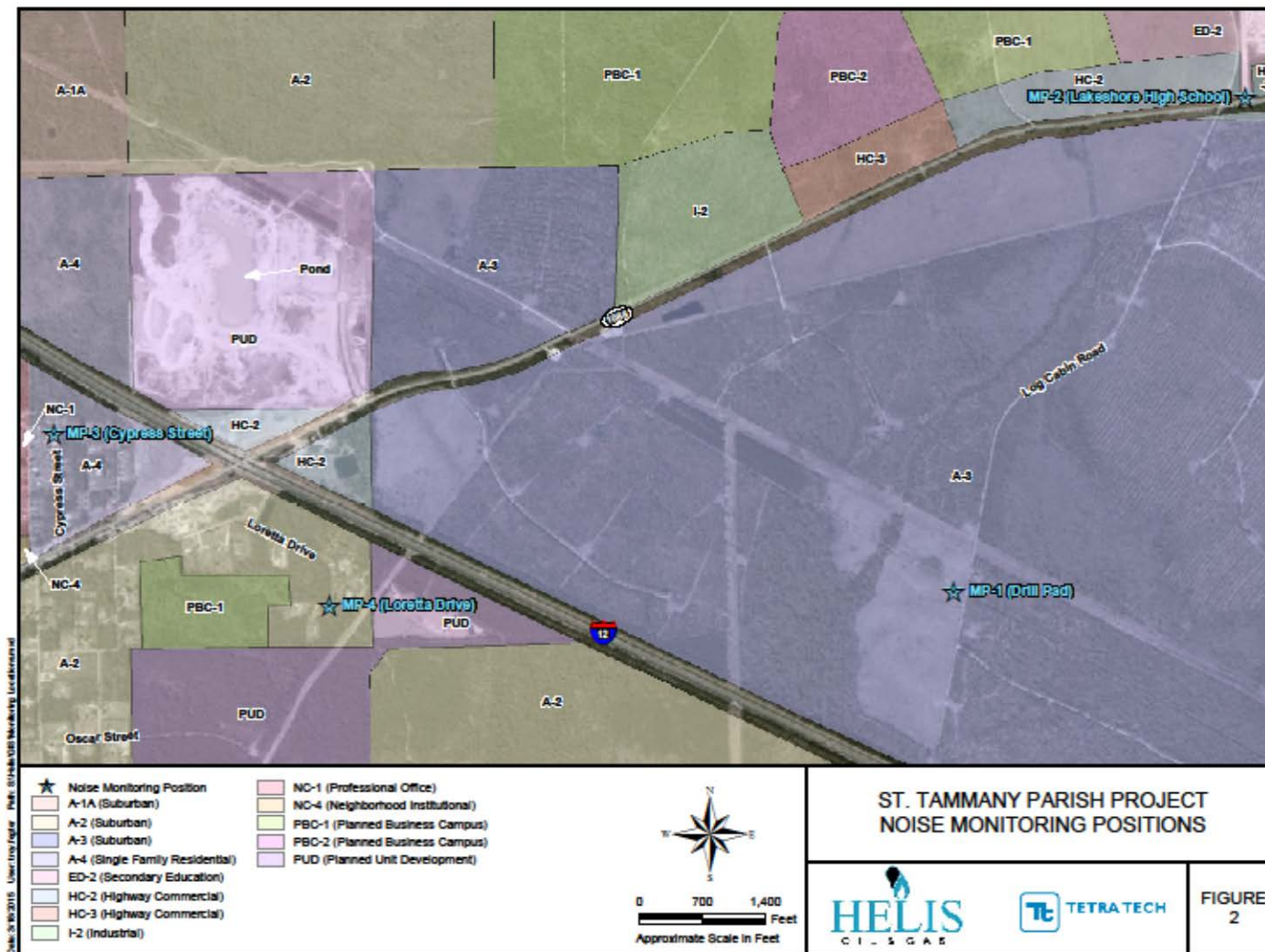


2.2.4 MP-4 – Residence at Loretta Drive, Mandeville

Daytime and nighttime short-term (30-minute) monitoring was conducted along a public right-of-way adjacent to a single-family dwelling at 65415 Loretta Drive. Measurements were conducted on February 26, 2015 from 11:41 AM to 12:15 PM (daytime), and again from 10:52 PM to 11:22 PM (nighttime). Monitoring was intentionally conducted during off-peak traffic conditions along I-12 and LA 1088 to represent a conservative (low) baseline sound level. No other sounds were readily identifiable over traffic noise during either the daytime or nighttime measurements.



Figure 2. Ambient Air Monitoring Locations



2.3 Results

The acoustic environment in the proposed project area is consistent with a moderately developed area near major roadways, with the dominant sound sources being traffic on I-12 and LA 1088. Additional detected sound sources included periodic aircraft flyover and light winds. Table 2 summarizes the results of the baseline sound survey, including the daytime and nighttime L_{eq} and statistical sound levels (L_n). Measurement results are reported in dBA, representing the human receptivity to sound.

Table 2. Baseline Sound Levels (dBA)

Monitoring Position	UTM Coordinates Zone 15/16		L_{eq}		L_{10}		L_{50}		L_{90}	
	X	Y	Day	Night	Day	Night	Day	Night	Day	Night
MP-1 (drill pad)	213837.35	3365554.23	47	41	48	42	45	40	42	38
MP-2 (Lakeshore High)	214910.43	3367173.42	59	N/A	60	N/A	45	N/A	39	N/A
MP-3 (Cypress St.)	787345.14	3366199.67	60	59	62	61	60	58	58	55
MP-4 (Loretta Dr.)	211727.08	3365617.11	60	60	62	61	59	55	55	51
Note: MP-1, MP-2 and MP-4 are located in UTM Zone 16 and MP-3 is located in UTM Zone 15 (UTM = Universal Transverse Mercator); dBA = A-weighted decibel										

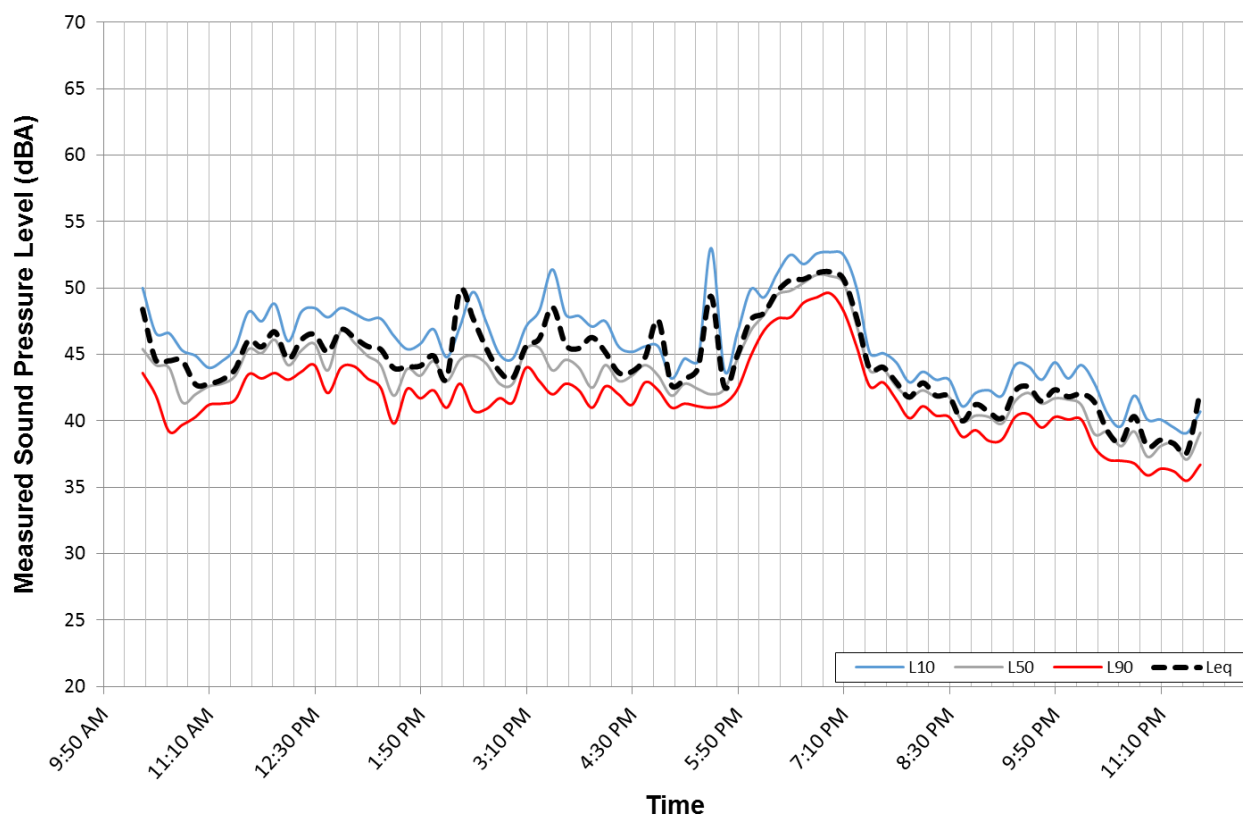
The results of the baseline sound survey indicate that sound levels at MP-1 (the drill pad) have the most diurnal variability, with an almost 6 dBA L_{eq} decrease at night. Sound levels at MP-2 (Lakeshore High School) show the greatest variability in L_n values. The L_{10} is greater than the L_{90} indicating that brief, intermittent roadway noise occurs against a relatively quiet background sound level. In contrast, sound levels at the residential areas (MP-3 and MP-4) near the interchange of I-12 and LA 1088 are more uniform, indicated by the similarity in L_{eq} and L_n values across time. These measurements indicate that traffic noise is consistently present in both residential areas.

The longer-term measurement at MP-1 was conducted to identify variations in sound levels over the course of the monitoring period. A time history plot of the L_{eq} and L_n sound level metrics is provided in Figure 3. Sound levels are relatively homogeneous at the drill pad site, with only small changes between daytime and nighttime hours. At 2:20 PM, an unidentified acoustic event, possibly a siren or other relatively high intensity sound source, was detected. The monitored L_{eq} and L_n sound levels from approximately 6:00 PM to 7:00 PM are within a few dBA of one another, with L_{eq} sound levels of approximately 50 dBA likely coinciding with traffic during the evening rush hour.

Residents in both residential locations currently experience sound levels close to the limits set by the Parish. Assuming traffic was typical on the day we monitored, noise levels are likely even higher during peak traffic periods or when roads are wet. Baseline noise levels at night at MP-4 equal to the nighttime sound level limit for Class A lands (60 dBA L_{eq}). Baseline noise levels at night at MP-3 are only slightly below the limit (59 dBA L_{eq}).

It is unlikely that sound generated by project activities at the drill pad site or the staging area would be of sufficient strength to cause an exceedance of the Parish's limits. However, baseline sound levels in the residential areas are already at or above nighttime limits, so any additional sound could be perceived by residents as excessive. Consequently, it is important to monitor background sound throughout the project to document the cause of any exceedances of the sound level limits. The acoustic signature, timing, and duration of exceedances will be analyzed to distinguish non-project sources from project-related sources of sound.

Figure 3. MP-1 (Drill Pad) Time History




ATTACHMENT 1
CALIBRATION CERTIFICATES
FOR SOUND MEASUREMENT EQUIPMENT
(3 PAGES)



~Calibration Certificate~

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

Manufacturer:	Larson Davis	Asset ID:	
Model:	CAL200	Calibration Date:	Feb 06, 2015 15:52:27
Serial Number:	8163	Due Date:	
Description:	Acoustic Calibrator	Technician:	Wayne Underwood
Customer:	Tetra Tech EC	Approval:	

Calibration Results:

Measured SPL : 94.03 dB re. 20 μ Pa	Temperature:	23 °C (74 °F)
Measured Frequency : 1,000.00 Hz	Humidity:	16.00%
	Pressure:	1001.0 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 : 683/281764-12

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	9542	9/15/2014	9/15/2015

Calibration Certificate

Certificate Number 2015001437

Customer:

Hilton Garden Inn Covington/Mandeville
350 Holiday Square Boulevard
Covington, LA 70433, United States

Model Number 831
Serial Number 0003847
Test Results Pass
Initial Condition As Manufactured
Description Larson Davis Model 831

Procedure Number D0001.8384
Technician Ron Harris
Calibration Date 16 Feb 2015
Calibration Due
Temperature 23.11 °C ± 0.01 °C
Humidity 50.1 %RH ± 0.5 %RH
Static Pressure 86.43 kPa ± 0.03 kPa

Evaluation Method **Tested with:**

PRM831, S/N 036754
377B02, S/N 150589

Data reported in dB re 20 µPa.

Compliance Standards

Compliant to Manufacturer Specifications and the following standards when combined with Calibration Certificate from procedure D0001.8378:

IEC 60651:2001 Type 1	ANSI S1.4-2014 Class 1
IEC 60804:2000 Type 1	ANSI S1.4 (R2006) Type 1
IEC 61252:2002	ANSI S1.11 (R2009) Class 1
IEC 61260:2001 Class 1	ANSI S1.25 (R2007)
IEC 61672:2013 Class 1	ANSI S1.43 (R2007) Type 1

Issuing lab certifies that the instrument described above meets or exceeds all specifications as stated in the referenced procedure (unless otherwise noted). It has been calibrated using measurement standards traceable to the SI through the National Institute of Standards and Technology (NIST), or other national measurement institutes, and meets the requirements of ISO/IEC 17025:2005. Test points marked with a ‡ in the uncertainties column do not fall within this laboratory's scope of accreditation.

The quality system is registered to ISO 9001:2008.

This calibration is a direct comparison of the unit under test to the listed reference standards and did not involve any sampling plans to complete. No allowance has been made for the instability of the test device due to use, time, etc. Such allowances would be made by the customer as needed.

The uncertainties were computed in accordance with the ISO Guide to the Expression of Uncertainty in Measurement (GUM). A coverage factor of approximately 2 sigma (k=2) has been applied to the standard uncertainty to express the expanded uncertainty at approximately 95% confidence level.

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Description	Standards Used		
	Cal Date	Cal Due	Cal Standard
SRS DS360 Ultra Low Distortion Generator	07/08/2014	07/08/2015	006311
Hart Scientific 2626-S Humidity/Temperature Sensor	05/16/2014	05/16/2015	006943
Larson Davis CAL200 Acoustic Calibrator	08/06/2014	08/06/2015	007027
Larson Davis Model 831	03/05/2014	03/05/2015	007182
1/2 inch Microphone - P - 0V	03/11/2014	03/11/2015	007185
Larson Davis CAL291 Residual Intensity Calibrator	09/26/2014	09/26/2015	007287

Larson Davis, a division of PCB Piezotronics, Inc
1681 West 820 North
Provo, UT 84601, United States
716-684-0001



Calibration Certificate

Certificate Number 2015001438

Customer:

Hilton Garden Inn Covington/Mandeville
350 Holiday Square Boulevard
Covington, LA 70433, United States

Model Number 831
Serial Number 0003848
Test Results Pass
Initial Condition As Manufactured
Description Larson Davis Model 831

Procedure Number D0001.8384
Technician Ron Harris
Calibration Date 16 Feb 2015
Calibration Due
Temperature 23.3 °C ± 0.01 °C
Humidity 50.6 %RH ± 0.5 %RH
Static Pressure 86.43 kPa ± 0.03 kPa

Evaluation Method **Tested with:**

PRM831, S/N 036755
377B02, S/N 150728

Data reported in dB re 20 µPa.

Compliance Standards

Compliant to Manufacturer Specifications and the following standards when combined with Calibration Certificate from procedure D0001.8378:

IEC 60651:2001 Type 1	ANSI S1.4-2014 Class 1
IEC 60804:2000 Type 1	ANSI S1.4 (R2006) Type 1
IEC 61252:2002	ANSI S1.11 (R2009) Class 1
IEC 61260:2001 Class 1	ANSI S1.25 (R2007)
IEC 61672:2013 Class 1	ANSI S1.43 (R2007) Type 1

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Larson Davis Model 831	03/05/2014	03/05/2015	007182
1/2 inch Microphone - P - 0V	03/11/2014	03/11/2015	007185
Larson Davis CAL291 Residual Intensity Calibrator	09/26/2014	09/26/2015	007287

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