UIL HOLDINGS CORPORATION

157 Church Street, New Haven CT 06510-2100
203-499-2000

Via Hand Delivery and Electronic Mail

March 24, 2015

Robert Stein
Chairman
Connecticut Siting Council
Ten Franklin Square
New Britain, CT 06051

Re: Petition No. 1120 – The United Illuminating Company Petition for a Declaratory Ruling that no Certificate of Environmental Compatibility and Public Need is Required for the Proposed Modifications to the Hawthorne Substation at 180 Hawthorne Drive, Fairfield, Connecticut

Dear Chairman Stein:

Please find enclosed the original and fifteen (15) copies of The United Illuminating Company's ("UI") supplemental submission of a report prepared by Black & Veatch entitled: *Hawthorne Substation Project Noise Evaluation.*

After a review of the proposed modifications, Black & Veatch concluded that "[t]he new expansion equipment, specifically the two (2) 115 kV 20 MVA capacitor banks and neutral reactors, could emit some discrete noise… but generally emit low sound levels that would not be discernible beyond the fence lines." Additionally, Black & Veatch concluded that the proposed modifications would "comply with noise regulations specified by the Town of Fairfield and State of Connecticut."

Very truly yours,

James R. Morrissey
Legal Analyst
UIL Holdings Corporation
As Agent for The United Illuminating Company

cc: Service List
Enclosures

FINAL

HAWTHORNE SUBSTATION PROJECT NOISE EVALUAITON

B&V PROJECT NO. 181503

PREPARED FOR

The United Illuminating Company

23 MARCH 2015

BLACK & VEATCH
Building a world of difference.®

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Executive Summary

The United Illuminating Company (UI) is proposing an expansion of the existing 115 kV to 13.8 kV Hawthorne Substation (Substation) currently located at 180 Hawthorne Drive, Fairfield, Connecticut. The site expansion will include the installation of two (2) 20 MVAR 115 kV capacitor banks.

The Substation is subject to state and local regulations regarding noise emissions. However, the Town of Fairfield regulations are more restrictive than those specified by the State of Connecticut. As such, the noise level standards in Chapter 78 of the Town Code have been used to determine regulatory compliance of the Substation. Based on the City of Fairfield zoning map the Substation site and adjacent properties to the east and south are currently zoned residential (R-3) and the General Electric property to the west and north is zoned industrial (DRD). To ensure compliance with the most restrictive noise limits the Substation related sound levels must not exceed the following limits:

- The sound levels associated with the Substation should not exceed 45 dBA along the residential zoning boundaries to the east and south.
- The sound levels associated with the Substation should not exceed 62 dBA along the industrial zoning boundaries to the north and west.

In order to characterize the existing acoustical environment surrounding the Substation site, an ambient sound level survey was conducted. The sound level survey was conducted at four (4) locations selected to evaluate current regulatory compliance along the Substation boundary and to represent nearby noise-sensitive receptors (homes). Measured ambient sound levels in the vicinity of the Substation ranged from 34 dBA to 51 dBA. During the early morning hours when the non-Substation noise sources had subsided, the measured ambient sound levels along the Substation property boundary, which included Substation noise, were as low as 38 dBA and 36 dBA. Therefore, based upon the Substation operating conditions at the time of the survey the facility was deemed compliant with noise regulations specified by both the Town of Fairfield and State of Connecticut.

An acoustical model was developed to predict the post expansion sound levels due solely to the Substation. The predicted Substation noise emissions do not include noise associated with either site development or construction. The primary noise sources associated with the future Substation that will remain are the two (2) existing transformers. The new expansion equipment, specifically the two (2) 115 kV 20 MVA capacitor banks and neutral reactors, could emit some discrete noise that may be audible in localized areas close to the equipment, but generally emit low sound levels that would not be discernible beyond the fence lines. The future Substation sound pressure levels along the adjacent industrial and residential zoning boundaries will be below 45 dBA and thus comply with noise regulations specified by the Town of Fairfield and State of Connecticut.

1.0 Introduction

The United Illuminating Company (UI) is proposing an expansion of the existing 115 kV to 13.8 kV Hawthorne Substation (Substation) currently located at 180 Hawthorne Drive, Fairfield, Connecticut. The major existing substation equipment includes two (2) transformers. Based on available design information and drawings, the site expansion will include the installation of two (2) 20 MVAR 115 kV capacitor banks and other non-noise related structures. For reference an aerial view of the existing Substation and surrounding vicinity is shown in Figure 1-1.

In support of the Substation expansion, a project noise evaluation has been conducted to address the following questions:

- *What noise regulations are applicable to the Substation?*
- *What are the current existing ambient sound levels in the vicinity of the Substation?*
- *Is the current Substation compliant with the applicable noise regulations?*
- *What are the expected environmental noise emissions associated with the future Substation?*
- *What (if any) noise mitigation measures are anticipated to be necessary for the future Substation to support compliance with the applicable noise regulations?*

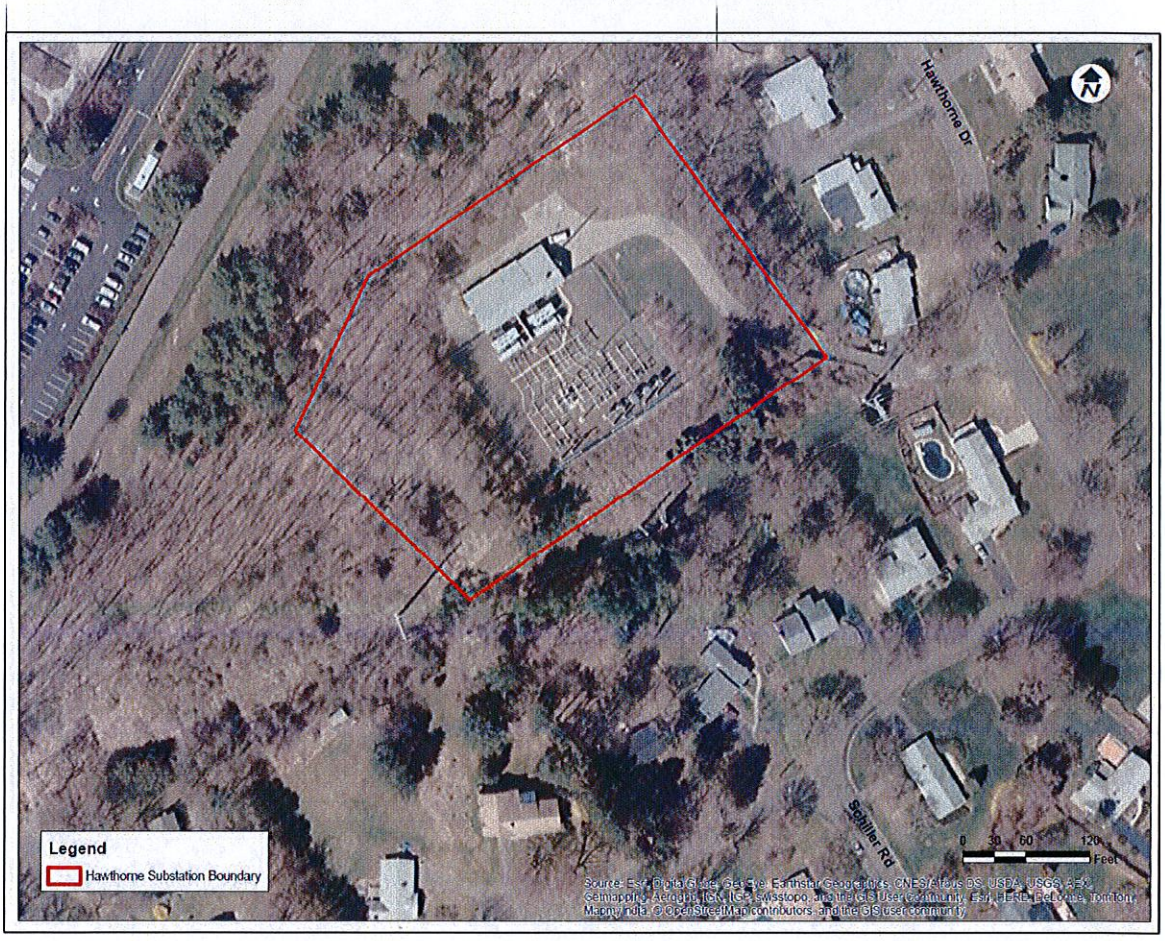


Figure 1-1 Aerial view of the Substation site and proposed property boundary

2.0 Applicable Noise Regulations

Regulations, standards, and guidelines related to environmental noise emissions were investigated and reviewed to determine applicability to the Substation. No quantifiable noise requirements or guidelines in Fairfield County were identified. However, the following sections summarize the noise regulations established by the State of Connecticut and the Town of Fairfield and the applicability of each.

2.1 STATE OF CONNECTICUT

The state regulation governing noise is contained in the Regulations of Connecticut State Agencies (RCSA) Title 22a, Section 22a-69-1 to 22a-69-7.4. The statutes provide limits that are based on the noise zone and time of day. Noise zones are established based on the Standard Land Use Classification Manual of Connecticut.

- Class A noise zone generally includes residential areas where human beings sleep or areas where serenity and tranquility are essential to the intended use of the land such as residential areas (single and multi-family), hotels, hospitals, and religious facilities.
- Class B noise zone generally includes commercial areas where human beings converse and such conversation is essential to the intended use of the land such as retail business, professional services, and recreational activities.
- Class C noise zone generally includes industrial areas where protection against damage to hearing is essential and the necessity for conversation is limited such as manufacturing facilities, utility uses, and agricultural activities.

In accordance with these designations, property bordering the Substation to the north and west aligns with a Class B noise zone as it serves as the corporate headquarters for the General Electric Company. Additionally, property bordering the Substation to the south and east is residential and aligns with the Class A noise zone. Considering these designations and the noise limits detailed in RCSA Section 22a-69-3.5 the noise zone boundaries and corresponding noise limits adjacent to the Substation (Class C noise zone) are shown in Figure 2-1. For reference, daytime and nighttime hours are defined as the hours between 7:00 AM and 10:00 PM and 10:00 PM and 7:00 AM, respectively.

Compliance with the specified limits is determined by measuring the A-weighted sound pressure level at one (1) foot beyond the emitter's boundary inside the receptor's noise zone. The emitter's zone includes contiguous rights of way for streets, highways, railroads, and waters of the state.

In addition to these limits, there is a 5 dB penalty when a prominent discrete tone is present. Per the statute, a prominent discrete tone is "the presence of acoustic energy concentrated in a narrow frequency range". The determination of the tone is relative to the sound pressure levels in the adjacent frequency bands as specified in RCSA Section 22a-69-1.2 (r). If a discrete tone exists, the daytime and nighttime limits are reduced to 56 dBA and 46 dBA, respectively, for noise from a Class C noise zone to a Class A noise zone.

Although these limits are objective and straightforward, the statute also contains language that can be used to file a complaint. For example, Section 22a-69-1.5 states that "compliance of a source with these Regulations is not a bar to a claim of nuisance by any person. A violation of any portion of these regulations shall not be deemed to create a nuisance per se." This would seem to permit

some leeway in determining whether a source is a nuisance or not regardless of whether it meets the objective requirements.

Figure 2-1 Substation noise limits per the State of Connecticut

2.2 TOWN OF FAIRFIELD

The Town of Fairfield identifies noise level standards in Chapter 78 of the Town Code. Unlike the State of Connecticut which establishes limits based on land use, the Town of Fairfield noise level standards are specified for the zoning designations of the emitting and receiving land and are exclusive to the nighttime hours (10:00 PM to 7:00 AM Sunday through Thursday, 11:00 PM to 8:00 AM Friday and Saturday). Referencing the current City of Fairfield zoning map dated 26 July 2013 (http://www.fairfieldct.org) the Substation site and adjacent properties to the east and south are currently zoned residential (R-3) and the General Electric property to the west and north is zoned industrial (DRD). Based upon these zoning designations and the noise level standards in specified in Chapter 78 of the Town Code, the noise limits and corresponding zone boundaries adjacent to the Substation are shown in Figure 2-2.

Figure 2-2 Substation nighttime noise limits per the Town of Fairfield

2.3 NOISE REGULATION APPLICABILITY

Since the substation will operate during both daytime and nighttime hours the Substation will need to comply with the more restrictive nighttime limits. Based on the regulations reviewed, the nighttime limits specified by the Town of Fairfield are more stringent and have been used as the design basis for the Substation. Additionally, given the lower residential limit and proximity of the residential zoning boundary, compliance with the residential limits will result in compliance with the industrial boundary limits. Furthermore, regulatory compliance with the Town of Fairfield limits will also result in compliance with the limits specified by the State of Connecticut.

As such, to ensure compliance with the most restrictive noise limits the Substation related sound levels must not exceed the following limits:

- The sound levels associated with the Substation should not exceed 45 dBA along the residential zoning boundaries to the east and south (refer to Figure 2-2).
- The sound levels associated with the Substation should not exceed 62 dBA along the industrial zoning boundaries to the north and west (refer to Figure 2-2).)

3.0 Existing Acoustical Environment

An ambient sound level survey was conducted in order to characterize the existing acoustical environment in the area surrounding the Substation and to evaluate current regulatory compliance. This section describes the results of the survey and the nature of the existing acoustical environment.

3.1 SUBSTATION OPERATING CONDITIONS

Substation operating conditions and transformer loading fluctuates based on seasonal changes. During the survey, the Substation operation could be characterized as normal, steady state, conditions typical of spring operation. However, as the electric heat and/or air conditioner demand increases transformer loading and radiated sound levels are expected to increase. To account for these increased sound levels substation noise calculations detailed in Section 4.0 will consider peak loading conditions typical of the mid-summer months.

3.2 SURVEY PROCEDURE AND CONDITIONS

The ambient sound level survey was conducted March 10 through March 11, 2015. The survey procedure was based on relevant portions of general industry standards including, but not limited to ANSI S1.13, ANSI S12.9, and ANSI S12.18. Sound level measurements were conducted using Type 1 and Type 2 sound level meters that met the requirements of ANSI S1.4. The sound level meters were field calibrated immediately before and after each measurement period. All equipment had been laboratory calibrated within the last 12 months. A list of the measurement equipment utilized during the survey and copies of corresponding calibration certificates are included in Appendix A.

With the exception of a few periods of light precipitation during the afternoon hours of the survey, meteorological conditions were suitable for environmental noise monitoring. Temperatures ranged from approximately 33 to 45 °F and skies were generally clear. Wind speeds ranged from 0 to 5 mph with sporadic gusts up to 11 mph. The temperature, humidity, and wind speed trends during the hours of the ambient sound level survey are detailed in Appendix B.

Additionally, it is important to note that snow cover was present during the survey. However, when surveying the site the snow pack was generally hard/frozen simulating hard ground and thus was deemed acceptable for environmental sound level measurements.

In order to effectively quantify and qualify the existing daily sound levels surrounding the Substation, the ambient survey included continuous sound level monitoring and short-term (attended) sound level measurements. NML's were selected to evaluate current regulatory compliance along the Substation boundary and represent nearby noise-sensitive receptors (homes). Geographic coordinates and the location of each measurement location are summarized in Table 3-1 and identified on Figure 3-1.

Several sound level metrics were used to quantify the fluctuating environmental noise. These metrics included the L10, L50, and L90 sound levels. The L90 sound level is generally considered representative of the residual or background sound level (i.e., without discrete noise events such as occasional traffic, aircraft, etc.), the L50 sound level is considered the median sound level, and the L10 sound level is generally considered the intrusive sound level (i.e., with the occasional discrete events such as traffic, aircraft, etc.). For a more detailed discussion regarding the acoustical terminology referenced within this report please refer to Appendix C.

Table 3-1 Nosie Measurement Locations (NML's)

MEASUREMENT LOCATION	UTM COORDINATES ZONE 18 (m E/m N)	LOCATION DESCRIPTION	TYPE OF MONITORING
NML1	646614 / 4563983	Substation entrance road, approx. 90 feet NE of the Substation fence line, approx. 30 feet SW of Substation property boundary.	Short-term
NML2	646570 / 4563913	SW corner of Substation site, approx. 30 feet S of the Substation fence line, approx. 30 feet NE of Substation property boundary.	Continuous and Short-term
NML3	646595 / 4563813	Residential neighborhood SW of the Substation along Schiller Road.	Short-term
NML4	646686 / 4563995	Residential neighborhood NE of the Substation along Hawthorne Drive.	Short-term

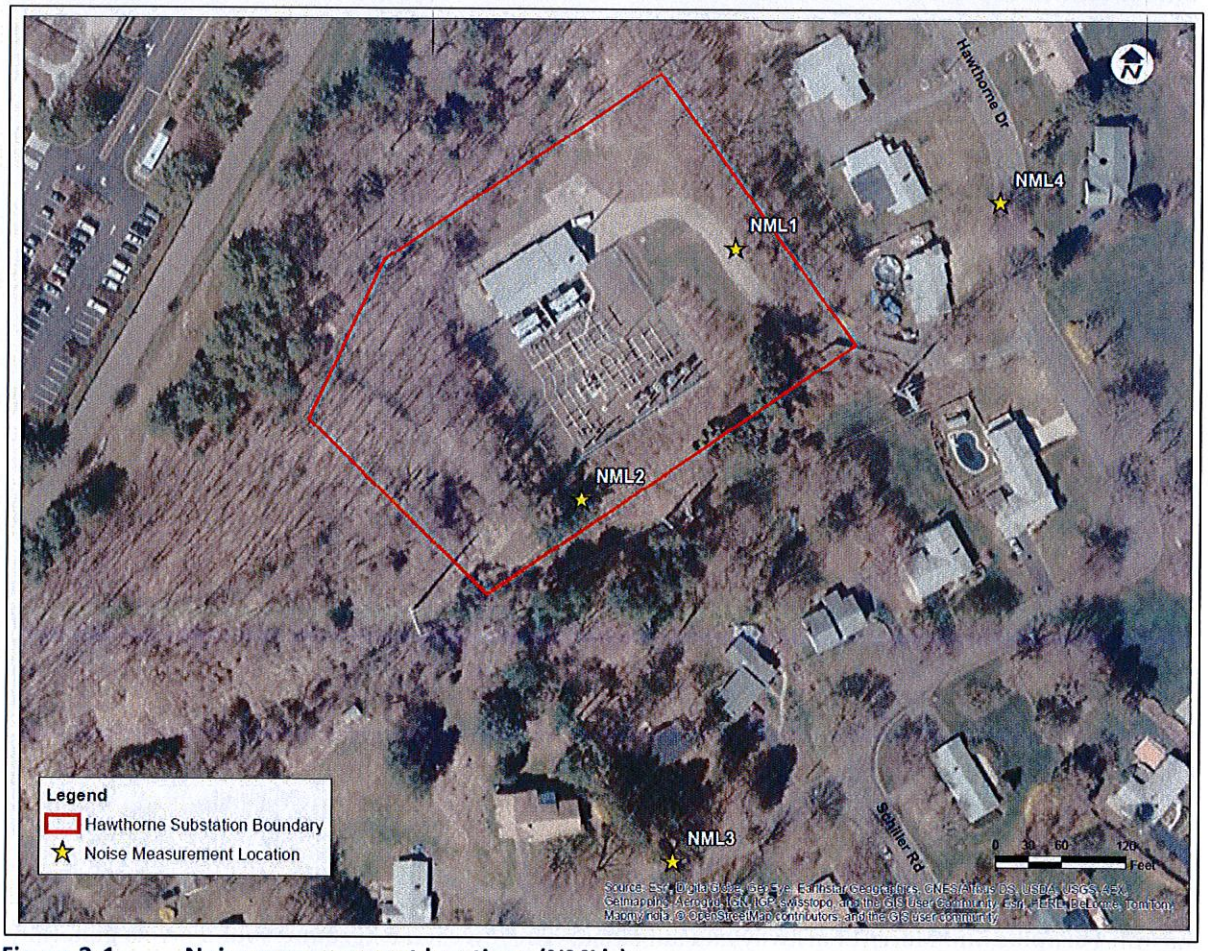


Figure 3-1 Noise measurement locations (NML's)

3.3 SURVEY RESULTS

The ambient sound level survey included continuous sound level monitors and short-term (attended) sound level measurements. Continuous sound level monitoring collected sound level data at NML2 throughout the survey period. Short-term, 10 to 20-minute, measurements were conducted periodically at all four NML's in order to qualify the existing overall conditions and quantify the existing spectral conditions during various daytime and nighttime hours. The subsequent sections detail the survey results at each measurement location.

3.3.1 NML1: Substation Northeast Boundary

Short-term sound level measurements were conducted at NML1 to assess the Substation's acoustical contribution along the northeast boundary and to evaluate the current regulatory status of the facility. Measurements were limited to short-term sound level measurements during both daytime and nighttime hours and are shown in Figure 3-2. Influential noise sources observed during the short-term measurements included distant traffic on Easton Turnpike and Merritt Parkway, air traffic, GE facility rooftop equipment, and birds. A faint hum from the Substation transformers was occasionally audible during the early morning periods when the traffic related influences had subsided.

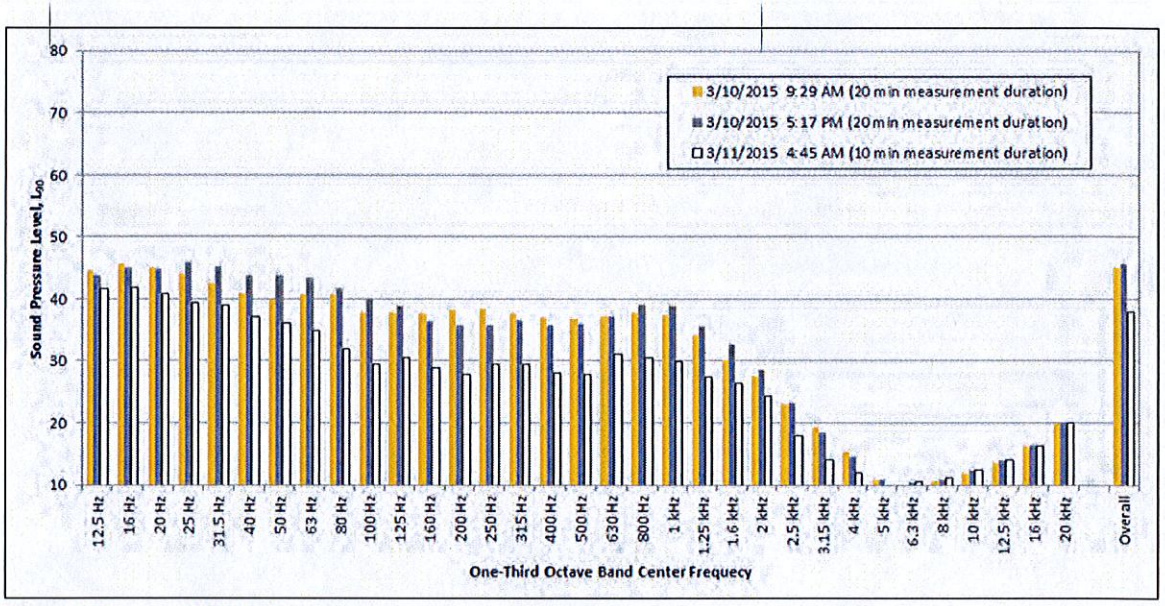


Figure 3-2 NML1 short-term measurement results.

3.3.2 NML2: Substation South Boundary

Sound level measurements were conducted at NML2 to assess the Substation's acoustical contribution along the southern boundary and to evaluate the current regulatory status of the facility. The 24-hour monitoring results are detailed in Figure 3-3 and provide an indication of the daily sound level trends. The background sound levels (L_{90}) ranged from 38 dBA to 51 dBA during the daytime hours (7:00 AM to 10:00 PM) and 36 dBA to 48 dBA during the nighttime hours (10:00 PM to 7:00 AM). The quietest periods occurred during the early morning hours when traffic on Easton Turnpike and Merritt Parkway had subsided. The lowest background sound levels generally occurred between the nighttime hours of 1:00 AM and 5:00 AM.

It is important to note that the L_{90} sound levels represent the background conditions without the influence of discrete events such as dogs barking, aircraft flyovers, etc. The L_{10} sound levels, shown in Figure 3-3, are generally representative of the higher sound levels that occurred during noisy discrete events.

Short-term sound level measurements were also conducted at NML2 during both daytime and nighttime hours and are shown in Figure 3-4. The short-term measurements are consistent with the continuous monitoring results. Influential noise sources observed during the short-term measurements included distant traffic on Easton Turnpike and Merritt Parkway, air traffic, GE facility rooftop equipment, distant train traffic, and birds. The Substation was inaudible at this location.

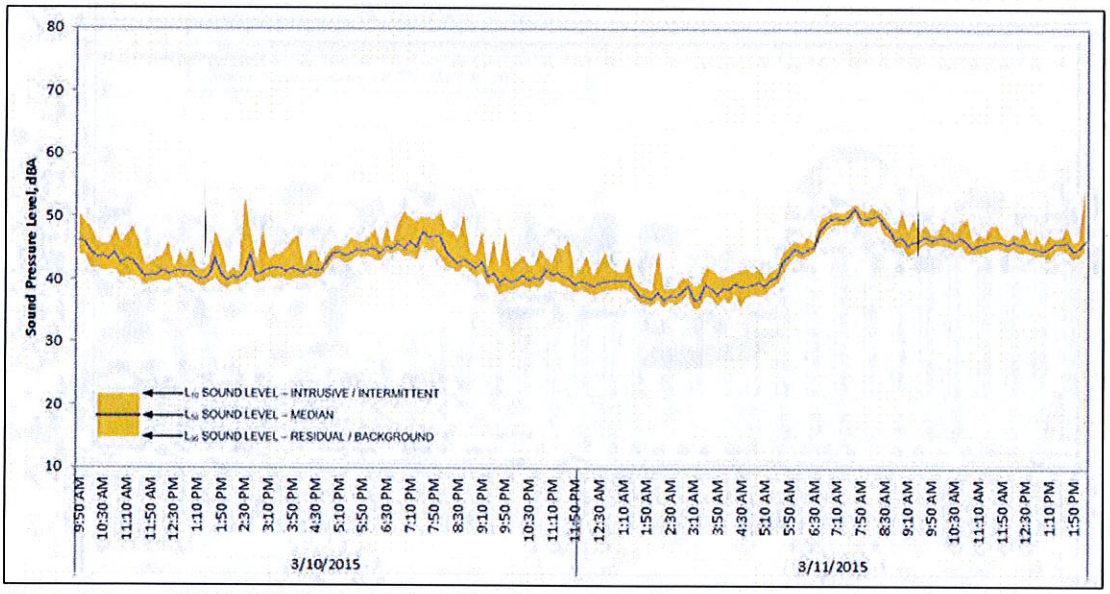


Figure 3-3 NML2 continuous monitoring results (10 min measurement interval).

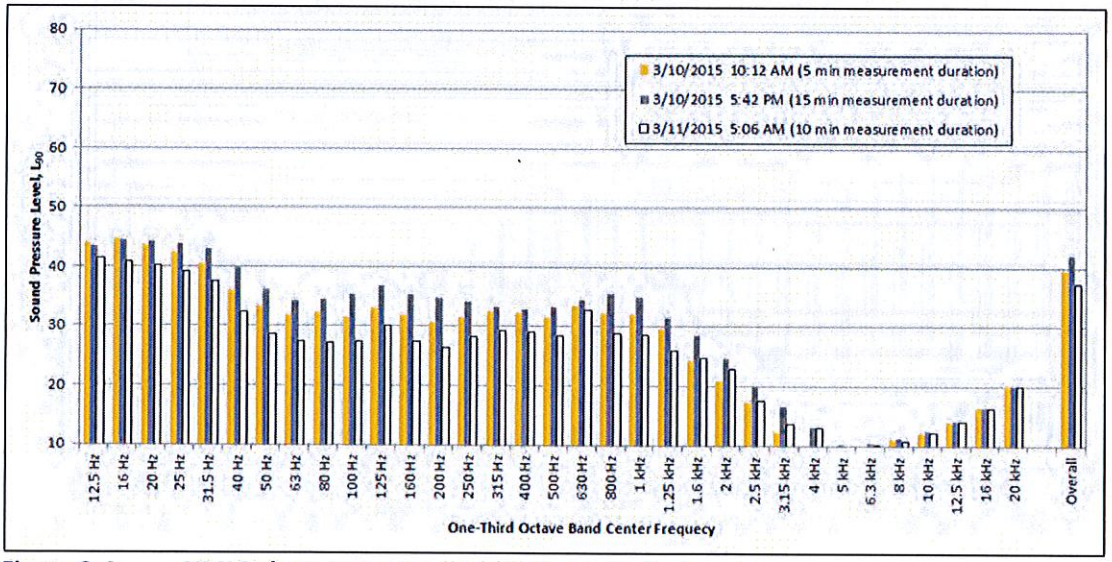


Figure 3-4 NML2 short-term measurement results (L_{90})

3.3.3 Supplemental Measurement Locations: NML3 and NML4

Short-term sound level measurements were conducted at NML3 and NML4 to represent the acoustical environment experience by the noise-sensitive receptors (homes) nearest to the Substation along Schiller Road and Hawthorne Drive, respectively. Measurements were limited to short-term sound level measurements during both daytime and nighttime hours and are shown in Figure 3-5 and Figure 3-6. Influential noise sources observed during the short-term measurements included distant traffic on Easton Turnpike and Merritt Parkway, air traffic, GE facility rooftop equipment, water trickle from periods of light drizzle, dogs barking, and birds. The Substation was inaudible at both locations.

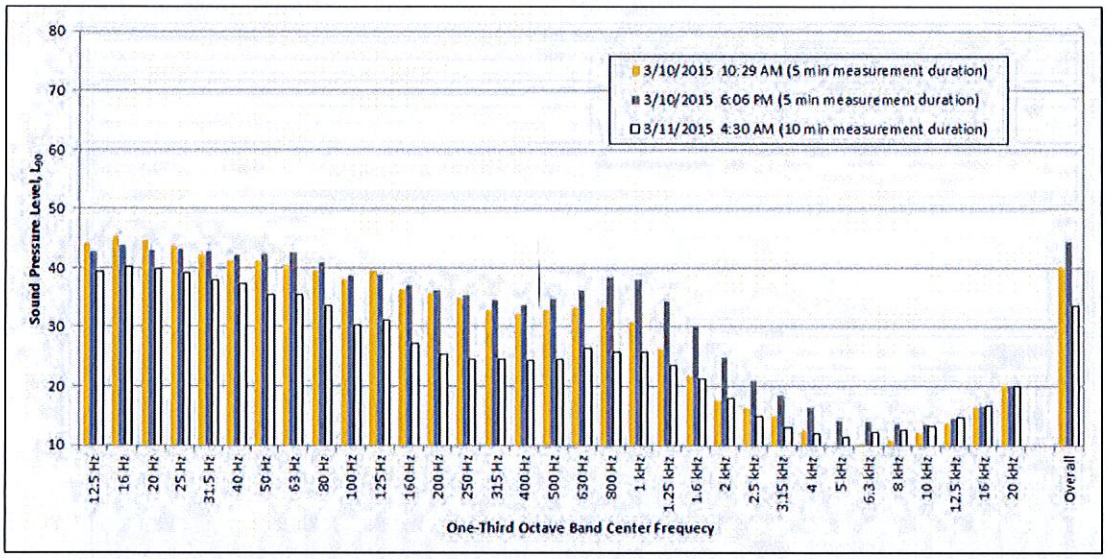


Figure 3-5 NML3 short-term measurement results

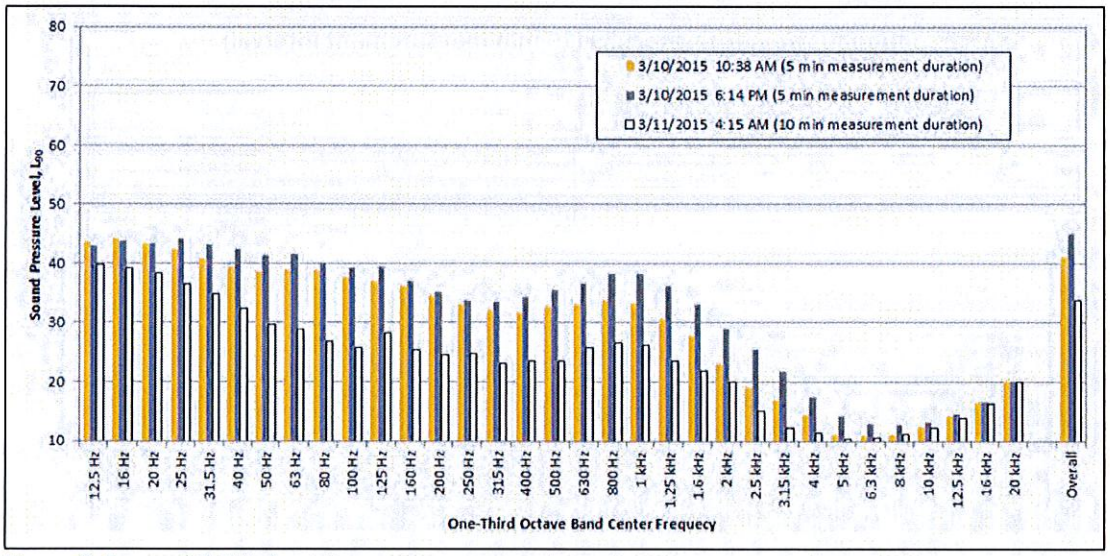


Figure 3-6 NML4 short-term measurement results

3.4 SURVEY RESULTS SUMMARY

As summarized in Table 3-2, the existing ambient sound levels in the vicinity of the Substation ranged from 34 dBA to 51 dBA at the four survey locations. The quietest periods occurred during the early morning hours when the distant traffic had subsided. In general, the existing ambient conditions at the nearest noise-sensitive receptors are influenced by distant traffic on Easton Turnpike and Merritt Parkway, air traffic, GE facility rooftop equipment, dogs barking, and birds.

Table 3-2 Summary of Survey Results

LOCATION	RANGE OF DAYTIME BACKGROUND SOUND LEVELS (10 min L_{90}), dBA	RANGE OF NIGHTTIME BACKGROUND SOUND LEVELS (10 min L_{90}), dBA	OBSERVED NOISE SOURCES
NML1	45 (9:29 AM, 10 March)[1] 46 (5:17 PM, 10 March)[1]	38 (4:45 AM, 11 March)	Distant traffic, air traffic, GE facility rooftop equipment, faint substation xfmr hum, and birds
NML2	38 – 51	36 – 48	Distant traffic, air traffic, GE rooftop equipment, distant train traffic, and birds
NML3	40 (10:29 AM, 10 March)[2] 45 (6:06 PM, 10 March)[2]	34 (4:30 AM, 11 March)	Distant traffic, GE facility rooftop equipment, water trickle from periods of light drizzle, dogs barking, and birds
NML4	41 (10:38 AM, 10 March)[2] 45 (6:14 PM, 10 March)[2]	34 (4:45 AM, 11 March)	Distant traffic, air traffic, GE facility rooftop equipment, water trickle from periods of light drizzle, and birds

Notes:
1. **20 minute measurement period**
2. **5 minute measurement period**

3.5 CURRENT REGULATORY COMPLAINCE

As previously discussed, sound level measurements at NML1 and NLML2 were conducted to assess the Substation's acoustical contribution along the southern boundary and to evaluate the current regulatory status of the facility. It is important to note that these sound level measurements included non-Substation noise sources such as traffic and GE rooftop equipment. During the early morning hours when the non-Substation noise sources had subsided, the measured ambient sound levels, which included Substation noise, were as low as 38 dBA and 36 dBA at NML1 and NML2, respectively. As such, Substation sound levels characteristic of Spring operation are below the Town of Fairfield residential noise limit of 45 dBA. Therefore, based upon the Substation operating conditions at the time of the survey the facility can be deemed compliant with noise regulations specified by both the Town of Fairfield and State of Connecticut.

4.0 Future Substation Noise Emissions

The environmental noise emissions from the future Substation (after expansion) have been predicted in order to evaluate compliance with the applicable noise regulations. This section discusses noise emissions solely from the Substation and considers equipment currently installed and new future equipment associated with the Substation expansion. The Substation noise emissions are based on existing transformer sound levels (Appendix D) provided by the manufacturer and the site arrangement drawing (Appendix E) provided by the substation design team.

4.1 PROJECT NOISE MODELING

The environmental noise emissions associated with the Substation have been modeled using noise prediction software (Cadna/A version 4.4.145), which is based on methodologies specified in ISO 9613. The model simulated the outdoor propagation of sound from each noise source and accounted for sound wave divergence, atmospheric and ground sound absorption, and sound shielding due to interceding barriers, buildings, and terrain. A database was developed which specified the location, and octave-band sound levels of each noise source. A receptor grid was specified which covered the entire area of interest. The model calculated the sound pressure levels within the receptor grid based on the octave-band sound level contribution of each noise source. Finally, a noise contour plot was produced based on the overall sound pressure levels within the receptor grid, including at specific receptor locations.

To account for increased transformer sound levels associated with peak loading conditions modeling was based on normal operation consistent with Summer months which includes noise contributions from the transformer cooling fans. The Substation noise model did not consider any abnormal or upset operating conditions. Various structures associated with the Substation were included in the model to account for their shielding effect.

4.2 SUBSTATION EQUIPMENT SPECIFICATIONS

The primary noise sources associated with the future Substation will be the two (2) existing transformers. The new expansion equipment, specifically the two (2) 115 kV 20 MVA capacitor banks and neutral reactors could emit some low level, discrete noise that may be audible in localized areas close to the equipment. Equipment sound levels used to develop the acoustical model are shown in Table 4-1 and are based on manufacturer submitted data and in-house and empirical data from similar equipment.

Please note that any deviations from the current site arrangement, the assumed equipment specifications, or the acoustical design elements outlined herein, may affect the overall Substation noise emissions and thus the modeling results presented below. If such design or specification changes occur, the Substation noise emissions should be re-evaluated to determine the impacts of the proposed design change.

Table 4-1 Equipment Sound Levels for the Future Substation

EQUIPMENT	QTY	EQUIPMENT SOUND LEVELS	BASIS
GE Transformer (existing)	2	67 dBA per IEEE C57.12.90 9 (FOA, fans operation)	GE
115 kV 20 MVA Capacitor Bank	2	56 dBA at 3 ft	In-house[1]
Neutral Reactors	2	53 dBA at 3 ft	In-house[1]

Notes:
1. **In-house data is based on a combination of measured data of similar substation installations and information received from past equipment suppliers.**

4.3 REGULATORY COMPLIANCE

The calculated octave-band sound pressure levels associated with the future Substation are presented in Figure 4-1. It is important to note that the calculated noise emissions only include noise from the Substation and are exclusive of any other sound sources, including background noise. As shown, the future Substation sound pressure levels along the adjacent industrial and residential zoning boundaries are below 45 dBA and thus comply with noise regulations specified by the Town of Fairfield and State of Connecticut.

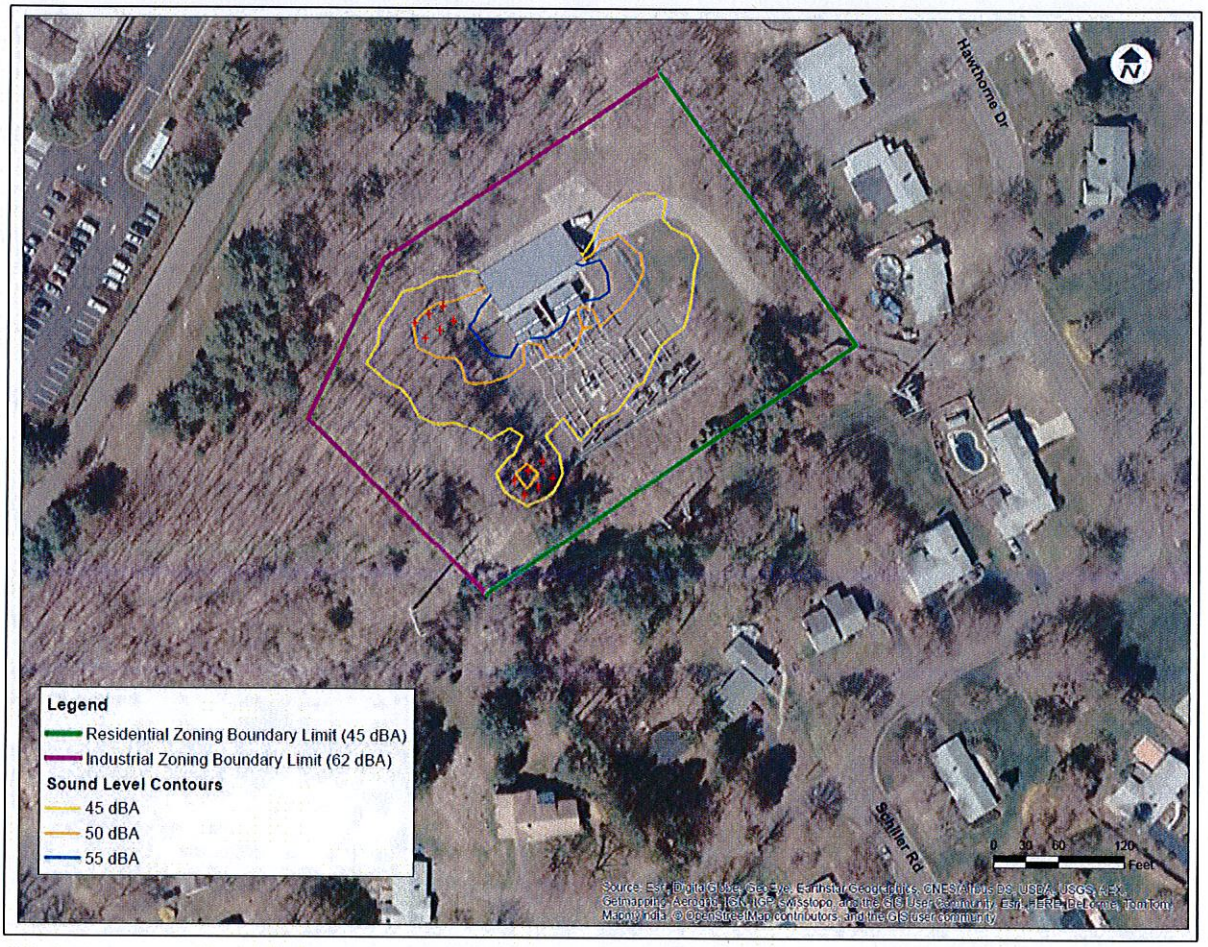
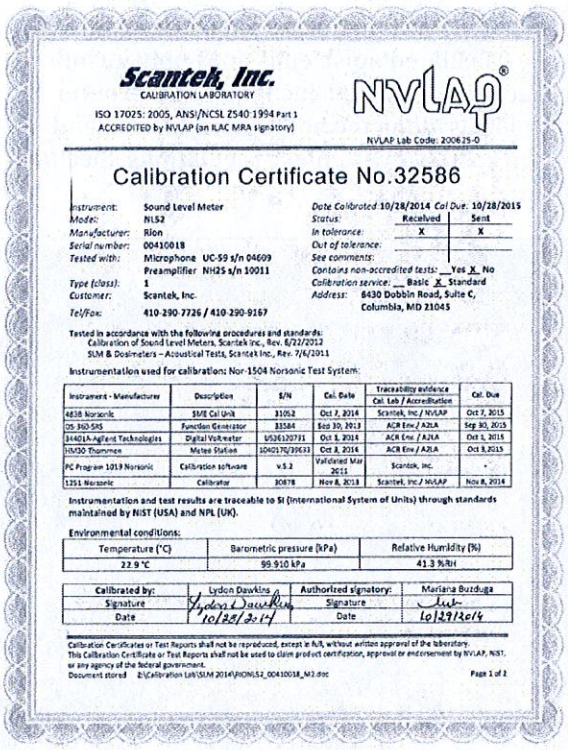


Figure 4-1 Future Substation A-weighted sound pressure levels, normal operation consistent with summer months.

Appendix A. Ambient Survey Test Equipment

Table A-1 Ambient Survey Test Equipment

MODEL	SERIAL NUMBER	LAST CALIBRATION DATE
Rion Model NL-52	00410018	28 October 2014
Rion Model NL-42/EX	00321503	06 August 2014
CEL 177 Acoustic Calibrator	558038	15 July 2014



Scantek, Inc.
CALIBRATION LABORATORY
ISO 17025: 2005, ANSI/NCSL Z540:1994 Part 1
ACCREDITED by NVLAP (an ILAC MRA signatory)
NVLAP Lab Code: 200625-0

Calibration Certificate No.32586

Instrument: Sound Level Meter
Model: NL52
Manufacturer: Rion
Serial number: 00410018
Tested with: Microphone UC-59 s/n 04609
Preamplifier NH25 s/n 10011
Type (class): 1
Customer: Scantek, Inc.
Tel/Fax: 410-290-7726 / 410-290-9167

Date Calibrated: 10/28/2014 Cal Due: 10/28/2015
Status: Received X, Sent X
In tolerance:
Out of tolerance:
See comments:
Contains non-accredited tests: __Yes X No
Calibration service: __ Basic X Standard
Address: 6430 Dobbin Road, Suite C, Columbia, MD 21045

Tested in accordance with the following procedures and standards:
Calibration of Sound Level Meters, Scantek Inc., Rev. 6/22/2012
SLM & Dosimeters – Acoustical Tests, Scantek Inc., Rev. 7/6/2011

Instrumentation used for calibration: Nor-1504 Norsonic Test System:

Instrument - Manufacturer	Description	S/N	Cal. Date	Traceability evidence Cal. Lab / Accreditation	Cal. Due
4838 Norsonic	SME Cal Unit	31052	Oct 7, 2014	Scantek, Inc / NVLAP	Oct 7, 2015
05-360-SRS	Function Generator	33584	Sep 30, 2013	ACR Env / A2LA	Sep 30, 2015
34401A-Agilent Technologies	Digital Voltmeter	US36120731	Oct 3, 2014	ACR Env / A2LA	Oct 3, 2015
HM30-Thommen	Meteo Station	1040170/39633	Oct 8, 2014	ACR Env / A2LA	Oct 8,2015
PC Program 1019 Norsonic	Calibration software	v.5.2	Validated Mar 2011	Scantek, Inc.	-
1251-Norsonic	Calibrator	30878	Nov 8, 2013	Scantek, Inc / NVLAP	Nov 8, 2014

Instrumentation and test results are traceable to SI (International System of Units) through standards maintained by NIST (USA) and NPL (UK).

Environmental conditions:

Temperature (°C)	Barometric pressure (kPa)	Relative Humidity (%)
22.9 °C	99.910 kPa	41.3 %RH

Calibrated by:	Lydon Dawkins	Authorized signatory:	Mariana Buzduga
Signature	Lydon Dawkins	Signature	
Date	10/28/2014	Date	10/29/2014

Calibration Certificates or Test Reports shall not be reproduced, except in full, without written approval of the laboratory. This Calibration Certificate or Test Reports shall not be used to claim product certification, approval or endorsement by NVLAP, NIST, or any agency of the federal government.
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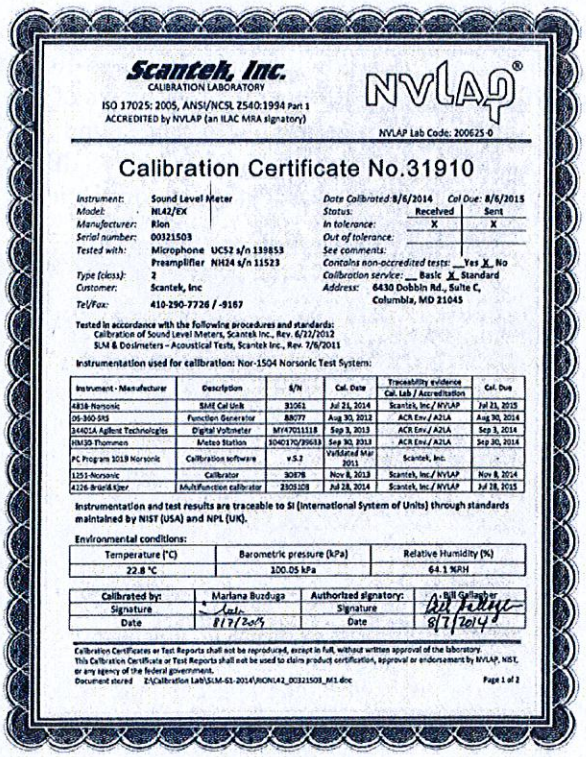

Scantek, Inc.
CALIBRATION LABORATORY
ISO 17025: 2005, ANSI/NCSL Z540:1994 Part 1
ACCREDITED by NVLAP (an ILAC MRA signatory)
NVLAP Lab Code: 200625-0

Calibration Certificate No.31910

Instrument: Sound Level Meter
Model: NL42/EX
Manufacturer: Rion
Serial number: 00321503
Tested with: Microphone UC52 s/n 139853
Preamplifier NH24 s/n 11523
Type (class): 2
Customer: Scantek, Inc
Tel/Fax: 410-290-7726 / -9167

Date Calibrated: 8/6/2014 Cal Due: 8/6/2015
Status: Received X, Sent X
In tolerance:
Out of tolerance:
See comments:
Contains non-accredited tests: __Yes X No
Calibration service: __ Basic X Standard
Address: 6430 Dobbin Rd., Suite C, Columbia, MD 21045

Tested in accordance with the following procedures and standards:
Calibration of Sound Level Meters, Scantek Inc., Rev. 6/22/2012
SLM & Dosimeters – Acoustical Tests, Scantek Inc., Rev. 7/6/2011

Instrumentation used for calibration: Nor-1504 Norsonic Test System:

Instrument - Manufacturer	Description	S/N	Cal. Date	Traceability evidence Cal. Lab / Accreditation	Cal. Due
4838-Norsonic	SME Cal Unit	31061	Jul 21, 2014	Scantek, Inc / NVLAP	Jul 21, 2015
05-360-SRS	Function Generator	88077	Aug 30, 2012	ACR Env / A2LA	Aug 30, 2014
34401A Agilent Technologies	Digital Voltmeter	MY47011118	Sep 3, 2013	ACR Env / A2LA	Sep 3, 2014
HM30-Thommen	Meteo Station	1040170/39633	Sep 30, 2013	ACR Env / A2LA	Sep 30, 2014
PC Program 1019 Norsonic	Calibration software	v.5.2	Validated Mar 2011	Scantek, Inc.	-
1251-Norsonic	Calibrator	30878	Nov 8, 2013	Scantek, Inc / NVLAP	Nov 8, 2014
4226-Brüel & Kjær	Multifunction calibrator	2303108	Jul 28, 2014	Scantek, Inc / NVLAP	Jul 28, 2015

Instrumentation and test results are traceable to SI (International System of Units) through standards maintained by NIST (USA) and NPL (UK).

Environmental conditions:

Temperature (°C)	Barometric pressure (kPa)	Relative Humidity (%)
22.8 °C	100.05 kPa	64.1 %RH

Calibrated by:	Mariana Buzduga	Authorized signatory:	Bill Gallagher
Signature		Signature	
Date	8/7/2014	Date	8/7/2014

Calibration Certificates or Test Reports shall not be reproduced, except in full, without written approval of the laboratory. This Calibration Certificate or Test Reports shall not be used to claim product certification, approval or endorsement by NVLAP, NIST, or any agency of the federal government.
Document stored Z:\Calibration Lab\SLM-01-2014\RION\42_00321503_M1.doc
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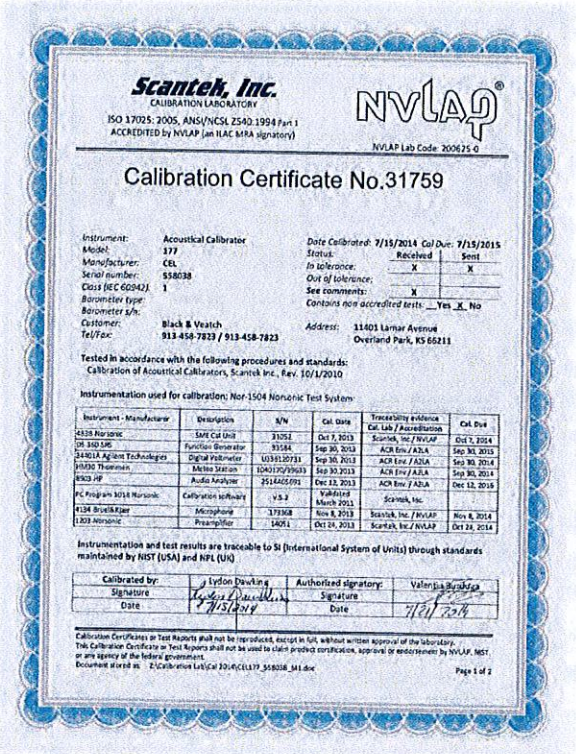

Scantek, Inc.
CALIBRATION LABORATORY
ISO 17025: 2005, ANSI/NCSL Z540-1994 Part 1
ACCREDITED by NVLAP (an ILAC MRA signatory)

NVLAP
NVLAP Lab Code: 200625-0

Calibration Certificate No.31759

Instrument:	Acoustical Calibrator	*Date Calibrated:* 7/15/2014	*Cal Due:* 7/15/2015
Model:	177	*Status:*	Received / Sent
Manufacturer:	CEL	*In tolerance:*	X / X
Serial number:	558038	*Out of tolerance:*	
Class (IEC 60942):	1	*See comments:*	X
Barometer type:		*Contains non accredited tests:*	__Yes _X_ No
Barometer s/n:			
Customer:	Black & Veatch	*Address:*	11401 Lamar Avenue
Tel/Fax:	913-458-7823 / 913-458-7823		Overland Park, KS 66211

Tested in accordance with the following procedures and standards:
Calibration of Acoustical Calibrators, Scantek Inc., Rev. 10/1/2010

Instrumentation used for calibration: Nor-1504 Norsonic Test System

Instrument - Manufacturer	Description	S/N	Cal. Date	Traceability evidence Cal. Lab / Accreditation	Cal. Due
4228 Norsonic	SPL Cal Unit	31252	Oct 7, 2013	Scantek, Inc / NVLAP	Oct 7, 2014
DS 360 SRS	Function Generator	93184	Sep 30, 2013	ACR Env / A2LA	Sep 30, 2015
34401A Agilent Technologies	Digital Voltmeter	US39120731	Sep 30, 2013	ACR Env / A2LA	Sep 30, 2014
HH30 Thermex	Meteo Station	1040130/39633	Sep 30,2013	ACR Env / A2LA	Sep 30, 2014
8903 HP	Audio Analyzer	2514A05691	Dec 12, 2013	ACR Env / A2LA	Dec 12, 2015
PC Program 3014 Norsonic	Calibration software	V.5.2	Validated March 2013	Scantek, Inc.	
4134 Brüel&Kjær	Microphone	173368	Nov 8, 2013	Scantek, Inc / NVLAP	Nov 8, 2014
1203 Norsonic	Preamplifier	14051	Oct 24, 2013	Scantek, Inc / NVLAP	Oct 24, 2014

Instrumentation and test results are traceable to SI (International System of Units) through standards maintained by NIST (USA) and NPL (UK)

Calibrated by:	Lydon Dawkins	Authorized signatory:	Valentin Ryabtsev
Signature	Lydon Dawkins	Signature	
Date	7/15/2014	Date	7/21/2014

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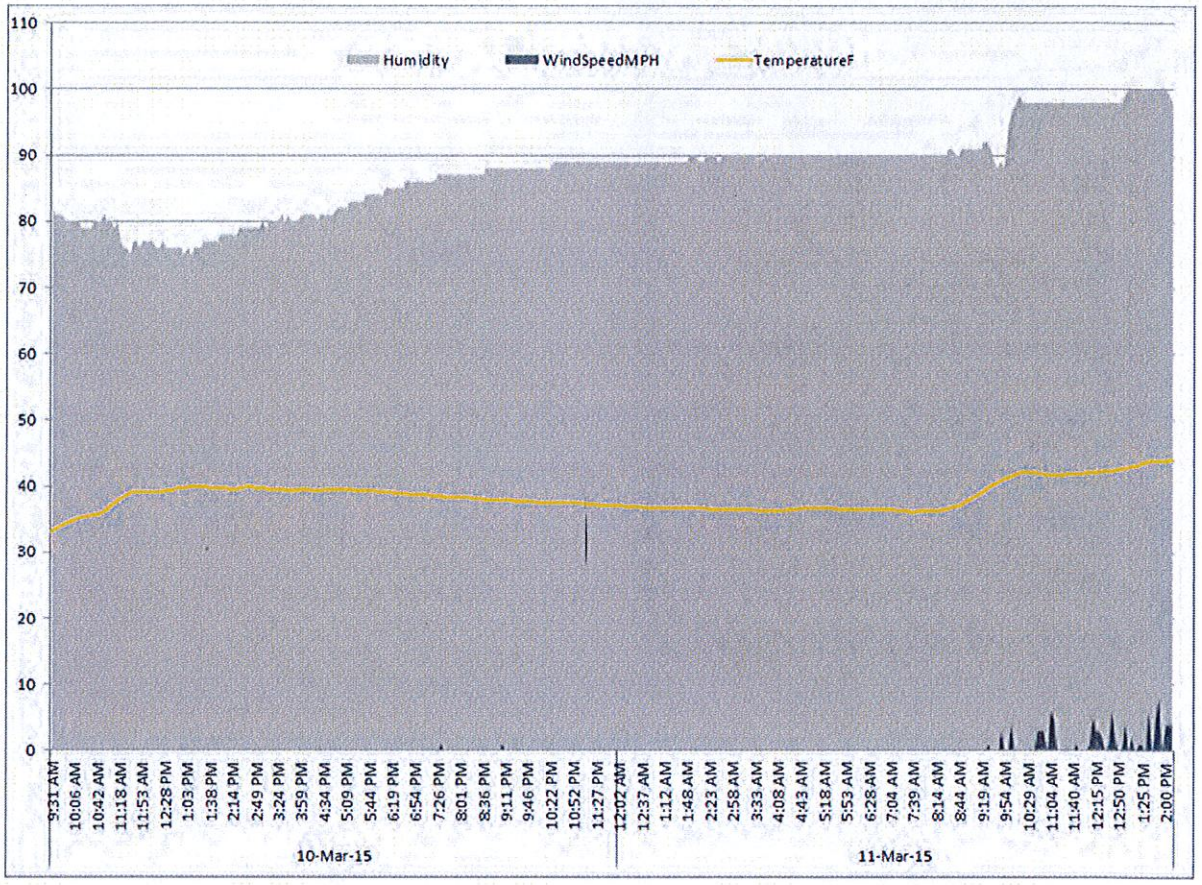
Page 1 of 2

Appendix B. Ambient Survey Meteorological Conditions



Appendix C. Acoustical Terminology

SOUND ENERGY

Sound is generated by the propagation of energy in the form of pressure waves. Being a wave phenomenon, sound is characterized by amplitude (sound level) and frequency (pitch). Sound amplitude is measured in decibels, dB. The decibel is the logarithmic ratio of a sound pressure to a reference sound pressure. Typically, 0 dB corresponds to the threshold of human hearing. A 3 dB change in a continuous broadband noise is generally considered "just barely perceptible" to the average listener. A 5 dB change is generally considered "clearly noticeable" and a 10 dB change is generally considered a doubling (or halving) of the apparent loudness (Bies and C.H. Hansen, Engineering Noise Control, 2009). For reference, the sound pressure levels and subjective loudness associated with common noise sources are shown in Table C-1.

Frequency is measured in hertz, Hz (cycles per second). Most sound sources (except those with pure tones) contain sound energy over a wide range of frequencies. In order to analyze sound energy over the range of frequencies, the sound energy is typically divided into sections called octave bands. Octave bands are identified by their center frequencies including 31.5, 63, 125, 250, 500 1000, 2000, 4000, and 8000 Hz. For more detailed analyses, narrow bands such as ⅓-octave bands or 1/12-octave bands are employed. The sum of the sound energy in all of the octave bands for a source represents the overall sound level of the source.

The normal human ear can hear frequencies ranging from 20 Hz to 20,000 Hz. At typical sound pressure levels, the human ear is more sensitive to sounds in the middle and high frequencies (1,000 to 8,000 Hz) than sounds in the low frequencies. Various weighting networks have been developed to simulate the frequency response of the human ear. The A-weighting network was developed to simulate the frequency response of the human ear to sounds at typical environmental levels. The A-weighting network emphasizes sounds in the middle to high frequencies and de-emphasizes sounds in the low frequencies. Most sound level instruments can apply these weighting networks automatically. Any sound level to which the A-weighting network has been applied is expressed in A-weighted decibels, dBA. To characterize sound that contains relatively more low frequency energy—and to approximate the ear's response to relatively high sound levels—the C-weighting network was developed. C-weighting places more equal emphasis on low and high frequencies relative to A-weighting. Any sound level to which the C-weighting network has been applied is expressed in C-weighted decibels, dBC.

SOUND LEVEL METRICS

Noise in the environment is constantly fluctuating, such as when a car drives by, a dog barks, or a plane passes overhead. Therefore, noise metrics have been developed to quantify fluctuating environmental noise levels. These metrics include the equivalent-continuous sound level and the exceedance sound levels.

The equivalent-continuous sound level, L_{eq}, is used to represent the equivalent sound pressure level over a specified time period. The L_{eq} metric is the sound level of a steady-state sound that has the same (equivalent) total energy as the time-varying sound of interest, taken over a specified time period and covering a specified set of conditions. Thus, L_{eq} is a single-value level that expresses the time-averaged total energy of a widely varying or fluctuating sound level.

The exceedance sound level, Lx, is the sound level exceeded "x" percent of the sampling period and is referred to as a statistical sound level. The most common Lx values are L_{90}, L_{50}, and L_{10}. L_{90} is the

sound level exceeded 90 percent of the sampling period. The L_{90} sound level represents the sound level without the influence of loud, transient noise sources and is therefore often referred to as the residual or background sound level (ANSI S12.9, Quantities and Procedures for Description and Measurement of Environmental Sound, 2003). The L_{50} sound level is the sound level exceeded 50 percent of the sampling period or the median sound level. The L_{10} sound level is the sound level exceeded 10 percent of the sampling period. The L_{10} sound level represents the occasional louder noises and is often referred to as the intrusive sound level. As previously discussed, the L_{90} environmental sound level typically represents the background (residual) sound level.

The variation between the L_{90}, L_{50}, and L_{10} sound levels can provide an indication of the variability of the acoustical environment. If the acoustical environment is perfectly steady, all values are identical. A large variation between the values indicates the environment experiences highly fluctuating sound levels. For instance, measurements near a roadway with frequent passing vehicles may cause a large variation in the statistical sound levels.

TYPICAL COMMUNITY SOUND LEVELS

Typical background (residual) sound levels in various types of communities are outlined in Table C-2 for reference. However, it is important to remember that each community is unique with regard to the sources of noise that contribute to the background sound levels.

HUMAN RESPONSE TO SOUND

Human response to sound is highly individualized. Annoyance is the most common issue regarding community noise. The percentage of people claiming to be annoyed by noise will generally increase as environmental sound levels increase. However, many other factors will also influence people's response to noise. These factors can include the character of the noise, the variability of the sound level, the presence of tones or impulses, and the time of day of the occurrence. Additionally, non-acoustical factors, such as the person's opinion of the noise source, the ability to adapt to the noise, the attitude towards the noise and those associated with it, and the predictability of the noise can also influence people's response. Response to noise varies widely from one person to another and with any particular noise, individual responses will range from "highly annoyed" to "not annoyed".

Table C-1 Typical Sound Pressure Levels Associated with Common Noise Sources

SOUND PRESSURE LEVEL, dBA	SUBJECTIVE EVALUATION	COMMON OUTDOOR ENVIRONMENT OR SOURCE	COMMON INDOOR ENVIRONMENT OR SOURCE
140	Deafening	Jet aircraft at 75 ft	
130	Threshold of pain	Jet aircraft during takeoff at a distance of 300 ft	
120	Threshold of feeling	Elevated Train	Hard rock band
110	Extremely loud	Jet flyover at 1000 ft	Inside propeller plane
100	Very loud	Power mower, motorcycle at 25 ft, auto horn at 10 ft	
90	Very loud	Propeller plane flyover at 1000 ft, noisy urban street	Full symphony or band, food blender, noisy factory
80	Moderately loud	Diesel truck (40 mph) at 50 ft	Inside auto at high speed, garbage disposal, dishwasher
70	Loud	B-757 cabin during flight	Close conversation, vacuum cleaner, electric typewriter
60	Moderate	Air-conditioner condenser at 15 ft, near highway traffic	General office
50	Quiet		Private office
40	Quiet	Farm field with light breeze, birdcalls	Soft stereo music in residence
30	Very quiet	Quiet residential neighborhood	Bedroom, average residence (without TV and stereo)
20	Just audible		Human breathing
10	Threshold of hearing		
0			

Source: Adapted by Black & Veatch from *Architectural Acoustics*, by David M. Egan (1988) and *Architectural Graphic Standards*, by Ramsey and Sleeper (1994.

Table C-2 Typical Daytime Background Sound Levels in Various Types of Communities

TYPE OF COMMUNITY	TYPICAL DAYTIME BACKGROUND SOUND PRESSURE LEVEL, dBA
Very Quiet Rural Areas	31 to 35
Quiet Suburban Residential	36 to 40
Normal Suburban Residential	41 to 45
Urban Residential	46 to 50
Noisy Urban Residential	51 to 55
Very Noisy Urban Residential	56 to 60
Adjacent Freeway or Major Airport	n/a

Source: Adapted by Black & Veatch from *Community Noise*, by the U.S. Environmental Protection Agency, (December 1971).

Appendix D. Existing Transformer Sound Levels

POWER TRANSFORMER DEPARTMENT

GENERAL ELECTRIC

PITTSFIELD, MASS.

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RTP73-171
G.E. Reqn. 301-75946
C/O # 74570
S/N K546921/922

Sound Level Test (db)

	S/N K546921		S/N K546922	
	OA	FOA	OA	FOA
Total Avg. Sound Level(db)	44.0	66.3	47.6	66.5
Guarantee	55	67	55	67
Octave Band (Hz)				
Frequency				
25-75	14.7	38.9	21.4	39.2
75-150	31.7	51.8	39.3	52.7
150-300	29.6	53.6	33.2	53.8
300-600	38.6	58.2	42.5	58.6
600-1200	37.8	61.9	40.6	62.0
1200-2400	35.8	58.2	38.3	58.3
2400-4800	20.8	52.3	25.7	52.4
4800-9600	17.5	41.0	29.6	42.9

ENV. 170

Appendix E. Site Arrangement Drawing