SCHOMER AND ASSOCIATES, INC.

BACKGROUND SOUND MEASUREMENTS AND ANALYSIS IN THE VICINITY OF CAPE VINCENT, NEW YORK

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BACKGROUND SOUND MEASUREMENTS AND ANALYSIS IN THE VICINITY OF CAPE VINCENT, NEW YORK

Executive Summary

The acoustic consulting engineering firm Hessler Associates, Inc., Haymarket, Virginia produced two sound level assessment reports for two wind projects proposed for Cape Vincent, New York: the first report in 2007 for BP and the second report in 2009 for AES-Acciona. Because there were concerns early on among local citizens that the BP report was misleading, the Wind Power Ethics Group (WPEG) contracted with Schomer and Associates, Champaign, Illinois to conduct an independent background sound survey of Cape Vincent. Hessler's BP study for the Cape Vincent Wind Power Facility appears to have selected the noisiest sites, the noisiest time of year, and the noisiest positions at each measurement site. Collectively, these choices resulted in a substantial overestimate of the a-weighted ambient sound level, 45-50 dB according to Hessler.

This study was designed to address a number of flaws noted in Hessler's BP study. First, a summer survey was planned so it would not coincide with the emergence of vocal adult insects (e.g., fall crickets and cicadas on August 1). Two monitoring sites were selected within the Town of Cape Vincent. One site was a rural residence and the other a small dairy farm. At each of these sites, two sound level meters and a single small weather station were run for one week of continuous data collection. At each site one meter was set up close to the house or farm building and a road. This site was called the "Hessler" position, because it was typical of sites selected by Hessler for his studies in Cape Vincent. The other position was called the Community position and it was located back away from the noise influences of roads, houses and farm operations. The Community position also reflected guidelines adopted by the Cape Vincent Planning Board whereby sound levels were to be measured at the property lines, not residences.

The analysis of the spectral (frequency) content of the sound showed that much of the difference in sound levels between Hessler's study and this study was attributable to insect noise, sounds near 5000 Hz. Hessler failed to remove insect sound from his data and recalculate A-weighted sound levels, even though he previously (2006) recommended this procedure to other scientists and engineers in a professional journal publication. Had he

followed his own advice, ambient sound levels would have been more comparable to the results in this study.

Furthermore, and more importantly, wind turbine sound spectra are low frequency and mid-frequency phenomena; therefore, higher frequency insect noise will not mask wind turbine sounds. So even if insect noise was present year round instead of for a few weeks it should still not be included in the ambient because it provides little or no masking of the wind turbine sound.

Other examples of Hessler's misleading choices include arbitrarily discarding sound data from one of his sites because the levels were too low. Remarkably, the levels at that site were more comparable to this study. Also, Hessler described position 3 in the BP study as "representative of a typical residence along NYS Rte 12E." However, he failed to show that the trailer in the photograph was a field office for a construction company installing a new Town of Cape Vincent water district. Furthermore, at the back of the trailer, out of view, was a marshalling yard for trucks, supplies and heavy equipment. The choice of this site and suggesting it is a typical residence was very misleading.

The accurate measurement of spectrally-relevant ambient sound is important because these levels are used by wind developers to assess wind turbine noise impacts on nearby, non-participating residents. Local Cape Vincent Planning Board guidelines suggest these impacts should not exceed 5 dB above the A-weighted ambient at the property lines of non-participating residents. New York State noise assessment policy states any new sound that exceed 6 dB above the A-weighted ambient should undergo a detailed assessment and the developer is required to mitigate any excessive noise. Therefore, using an inaccurate, elevated A-weighted ambient level, such as 47 dB, allows wind developers to place wind turbines much closer to non-participating residents in such a way that the A-weighted wind turbine noise level will be 52 dB (e.g., 5 dB above Hessler's elevated ambient level). A much more accurate and typical ambient level is 30 dB, which is an average of both "Hessler" and Community positions during daytime, evening and nighttime periods from this study. Using 30 dB as a typical A-weighted ambient level would then require wind developers to plan a wind farm where predicted noise at non-participating property lines would not exceed 35 dB, or 5 dB above this study's A-weighted ambient level. In summary, to adequately protect rural residents that are not participants in proposed wind farms it is essential to have accurate, unbiased assessments of ambient sounds.

In conclusion:

1. The Hessler position at a measurement site systematically and significantly yields higher sound levels than does the Community position.
2. The sound levels measured in this study show Cape Vincent to be a quiet rural area, much as depicted by the data for Hessler's position 4.
3. Measurements, such as those conducted at Hessler's position 3, are not indicative of the noise environment of typical residences in the Cape Vincent area.
4. Failure to remove insect noise in Hessler's study violated his own recommended survey and analytical techniques and substantially misrepresented typical ambient sound levels.
5. In assessing potential noise impacts from wind turbine development, rather than using 45-50 dB A-weighted levels as suggested by Hessler, a more accurate level would be 30 dB, which is the average value for the daytime, evening and nighttime L90 sound levels observed at both the "Hessler" and Community positions for sites A and B in this study. Arguably, the level should be down at 20 to 25 dB, since an A-weighted L90 of 20 dB occurs during the quietest nighttime hours, and the A-weighted L90 for the whole 9-hour night is 25 dB.

I. Introduction

A wind farm has been proposed by BP Alternative Energy N. A., Inc. to be established in the Cape Vincent area. Hessler Associates, Inc. has produced an assessment of current Cape Vincent ambient sound levels in their report dated November 27, 2007 entitled: Environmental Sound Level Survey- Summertime Conditions.[1] This survey appears to have selected from among the noisiest sites, the noisiest time of year, and the noisiest positions at each measurement site.

a. **Hessler chooses noisy positions at the sites**. For example, figure 1 (top) is taken from the Hessler report and is of his site 2. This picture portrays a quiet, pastoral site. Figure 1 bottom shows that this position actually is right in the middle of noisy farm machinery and two sheds, and not as near to the house where people reside.

b. **Hessler chooses noisy sites.** For example, Hessler describes his site 3 by: "The objective of this position [site] was to measure sound levels representative of those experienced at the homes along Route 12E, such as the farm house in the background of Figure 2.2.5." The Hessler figures for his site 3 depict a rather serene, treed, rural site. Hessler neglects to tell the reader that this site is the marshalling yard for heavy construction equipment for a large water project and less than 100 ft from part of the construction site. Figure 2 shows one of Hessler's site photos and a picture of the marshalling yard. Imagine it filled with large, running, diesel powered construction equipment. This, according to Hessler is "representative of…homes along Route 12E." This is simply false.

c. **Hessler chooses the noisiest time of year.** Hessler measures in late August and early September, when insect noise reaches its maximum. This insect noise dominates the Hessler results. Hessler states: "Figure 2.6.2 clearly shows that insect noise peaking at 5000 Hz strongly affected the overall sound levels when they were at a maximum and, significantly, also when they were at a minimum." He goes on to state: "In general, the continual dominance of insect noise, which is clearly unrelated to wind or atmospheric conditions, explains why the site sound levels—during the summer at least—do not exhibit any real dependence on wind speed." Finally, at the end of his conclusions Hessler states: "An additional field survey is

[1] A second report by Hessler for a second wind farm to be built and run by AES Acciona's was just made available in March 2009. It is very similar to the first report in scope and approach, and it suffers from the same deficiencies.

> planned for this winter to measure project area sound levels without any leaves on the trees and without any of this insect activity. A subsequent noise impact assessment will be prepared based on the results of both the summer and winter background surveys."

But the winter measurements never occurred. Only the insect noise dominated data are used. And the underlying allegation to all of the Hessler analysis is that the background, if loud enough, will mask the wind turbine noise. However, as is well known, masking primarily takes place in one-third-octave bands. The high-frequency (e.g., 5000 Hz) insect noise masks little of the wind-turbine noise. The presence of insect noise does nothing to mitigate the wind turbine noise; the measurement of insect noise only masks and obviscates the truth.

The purpose of this study is to document the difference in background sound between the time of year, type of site, and the position within a site chosen by Hessler, and those more indicative of the quiet, rural nature of the Cape Vincent area.

Schomer and Associates, Inc. was retained by the Wind Power Ethics Group (WPEG) to conduct an independent study including development of the test plan, selection of measurement sites, setting up of the instrumentation, setting up the data collection procedures, examining the data for quality control, analyzing the data, and reporting on the results. I visited the Cape Vincent area on June 8-11, 2008 to perform all the on-site aspects of this study listed above. Data quality control, analysis, and reporting were conducted at the Schomer and Associates offices in Champaign, IL.

Figure 2.2.3 *Position 2 Looking West towards Church of St. Vincent de Paul*

Figure 1. Top: “Quiet” Hessler view of his site 2. Bottom: View from opposite direction showing monitor area was actually nearby to farm machinery and sheds, and not very near to the house.

Figure 2. Left - Hessler's monitoring site #3 from the BP sound report with trailer on the left side of the image. Right – backside of trailer showing construction field office and marshalling yard.

II. Measurements

1. Site Selection and Layout

Two sites were selected in the Cape Vincent area based on their similarity to residential sites selected by Hessler for his study, the willingness of the owner to grant permission for this study, and the security of the equipment used for measurement. These two sites are within the project boundaries of BP's proposed Cape Vincent wind power facilities. One of the sites (site A) is a typical rural residence, and the other site (site B) is a working dairy farm. Two precision sound level meters were deployed for a week at site A, and subsequently for a week at site B. At each site, two positions were selected: the Hessler position which was near the road, and the Community position substantially farther from the road and more indicative of the area. The community positions were designed to provide data more compatible with the guideline adopted by the Cape Vincent Planning Board (e.g., noise measured at the property line). Figure 3 shows a map of the Cape Vincent area indicating the locations of site A and site B. Figures 4 and 5 show the general layouts of site A and site B, respectively. Figures 6 through 10 are photographs taken at site A, and figures 11 through 14 are photographs taken at site B.

2. Instrumentation

Measurements were conducted using two RION Model NA-28 precision integrating sound level meters (SLM) that meet the ANSI requirements for a Type 1 SLM and also meet the requirements of the recently-revised International Electrotechnical Commission (IEC) Standard (IEC 61672-1) for a Class 1 SLM. The SLMs were calibrated with a Norsonic Model 1251 calibrator that meets the Class 1 requirements of ANSI S1.40 for calibrators. Weather conditions were measured using a HOBO weather station that included sensors for wind speed, wind direction, temperature, and humidity. The HOBO weather station was always situated near the Community position. To further reduce the effects of low-frequency wind noise at the Community position, a special RION 8-inch windscreen was employed (see Figure 6). An ordinary 4-inch windscreen was used at the Hessler position.

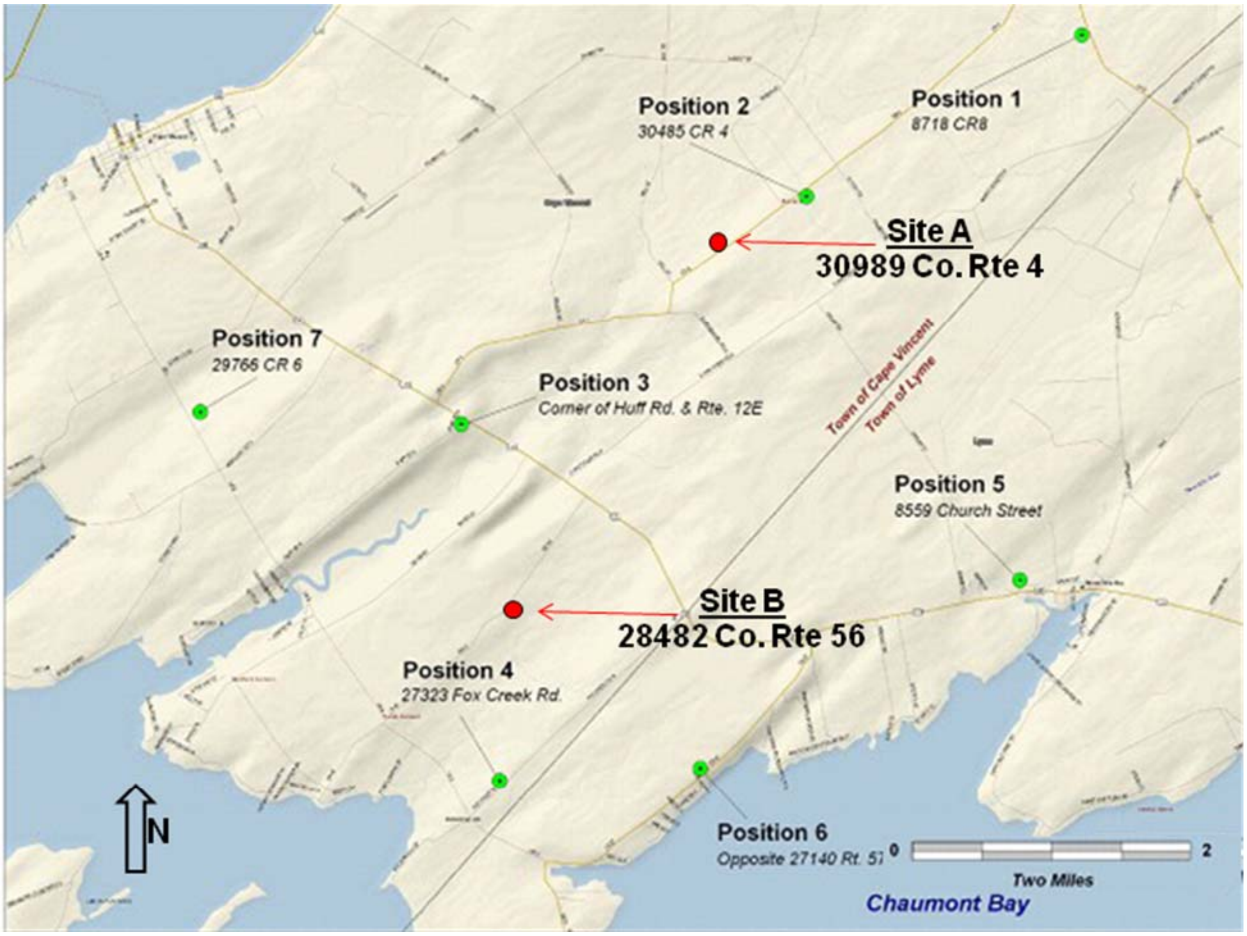

Figure 3. Map of the Cape Vincent area

Figure 4. Site A general layout

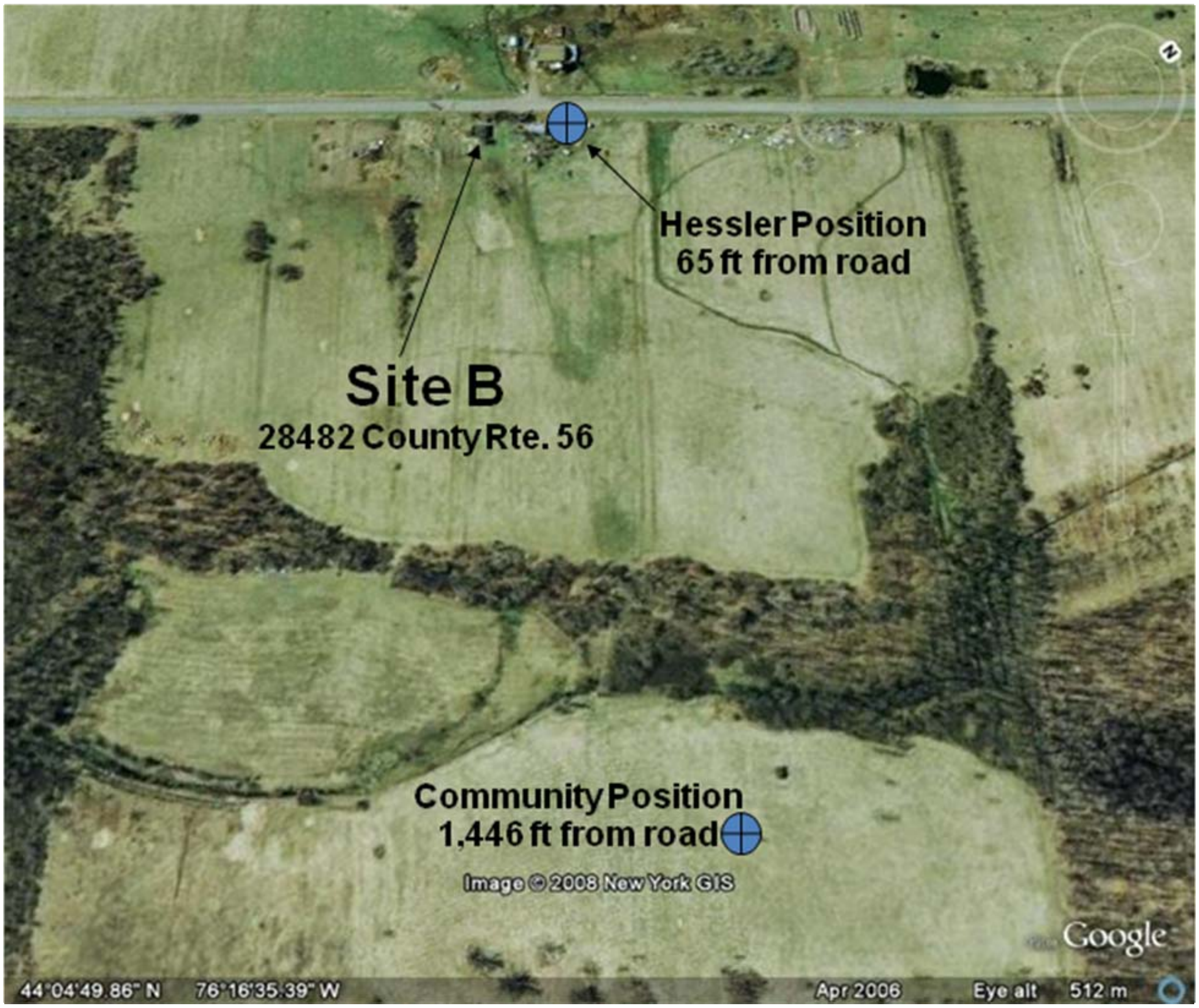

Figure 5. Site B general layout

Figure 6. Site A Community position - view looking west

Figure 7. Site A Community position - view looking east

Figure 8. Site A Hessler position - view looking north

Figure 9. View looking east

Figure 10. Site A Hessler position - view looking west

1. <u>Operation</u>

During the first week (June 10 – June 17, 2008), the two SLM's and the weather station were set up at site A. The SLMs were calibrated and all instruments were placed in operation. Data were collected daily from each instrument and batteries were replaced as required. Calibration was performed during the same servicing period. During the second week (June 17 – June 24, 2008), the same instrumentation was setup at site B. For two days after the second week (June 24 – June 26, 2008), both SLMs and the weather station were all co-located at the Community position of site B.

The RION SLMs were set to sequentially record one-third-octave-band, 1-second LEQ levels. The weather station was set to record data every 3 seconds, the shortest time interval available. Data were collected for the entire 24 hour day, except for the brief time required to collect data, calibrate, and replace batteries as required (typically 30 minutes).

Figure 11. Site B Community position - view looking south

Figure 12. Site B Community position - view looking north

Figure 13. Site B Hessler position - view looking east

Figure 14. Site B Hessler position - view looking west

The RION SLM has several built-in frequency weightings, including A, C, and the new Z-weighting.[2] The initial plan was to C-weight both RION SLMs because the C-weighting eliminates some of the low frequency wind noise. Inadvertently, one of the meters was set to Z-weighting for the first few days. For the last 2 days of the regular study, one unit was purposefully set to Z-weighting and both units were set to Z-weighting for the special 2-day wind study (that is the subject of a separate paper). Table 1 lists the weighting employed by monitor day and position.

Table 1. Weightings employed by the SLM's during the study

Date	Community Pos.	Hessler pos.
11-Jun	C	Z
12-Jun	C	Z
13-Jun	C	Z
14-Jun	C	C
15-Jun	C	C
16-Jun	C	C
17-Jun	C	C
18-Jun	C	C
19-Jun	C	C
20-Jun	C	C
21-Jun	C	C
22-Jun	C	C
23-Jun	Z	C
24-Jun	Z	C
25-Jun	Z	Z
26-Jun	Z	Z

[2] Z-weighting is defined in the new IEC SLM standard, IEC 61672-1. It gives a precise frequency weighting that takes the place of the undefined, so called "flat-weighting" or "un-weighted".

III. Data Analysis

As indicated above, this study had as its main purpose: comparing the sound levels measured by Hessler with the sound measured at sites and in positions that are more indicative of the Cape Vincent area. Hessler focuses on the L90 levels, and we concur with this focus. Since Hessler presents both LEQ and L90 data, we do also; but the focus is on the L90 data. For added information, Annex A contains figures analogous to the L90 data presented in the text but for the L50 metric.

Data collected from the SLMs were analyzed in 10 minute and 1 hour blocks of time. In both cases calculations were based on the original 1 second data. Calculations were performed to check that there were valid data from all three instruments (the two RION NA-28s and the HOBO weather station) for that second. Essentially the whole day had good data, except for the few minutes each day spent retrieving data, calibrating, and replacing batteries as required. Data collection took about 30 minutes so typically about three 10- minute blocks of data were lost each day. On very rare occasions a one hour block of data was lost. For each 10- minute or 1- hour block of data, 3 metrics were calculated: (1) LEQ, (2) L50 exceedance, (3) L90 exceedance. LEQ was calculated separately for the overall flat-weighted levels, the A-weighted levels, and all of the one-third-octave-band levels from 12.5 Hz to 20 kHz. The L50 and L90 exceedance levels were calculated solely on the basis of the 1-second A-weighted levels. The flat-weighted levels and the one-third-octave-band levels reported herein for L50 and L90 are those that occur in the second of time that contains the A-weighted L50 or L90, respectively. No separate calculations were performed to determine any L50 or L90 directly from the data except for the A-weighted data. Annex B, available only in soft form as an Excel file, contains the 10-minute LEQ, L90, and L50 data in separate tabs by day (from collection period to collection period). In each tab, LEQ is displayed first, while L90 and L50 are located to the right of LEQ, in that order). Hessler position and Community position data are located on the same tabs with Community position data at the top of the data sheet, and Hessler position data below. Annex C, also only available in soft form as an Excel file, contains the 1-hour LEQ, L90, and L50 data organized in the same way as Annex B.

The calculated 1 hour blocks of A- weighted LEQ's and L90's were plotted versus time for each week separately. Each of these four plots (Figure 15 through 18) compares the Hessler position with the Community position by site and by metric (LEQ or L90). Each of these four plots was converted into a "24-hour day plot" (Figure 19 through Figure 22) by averaging the data for the seven days of each week separately. In this averaging process, the L90 (and L50 of Annex A) averages were arithmetic, but the LEQ average was on an energy basis. In a similar fashion, the "24-hour day plot" data were converted into L_{day} (7 AM- 7 PM), $L_{evening}$ (7PM- 10 PM), and L_{night} (10 PM- 7 AM) data. These *day*, *evening,* and *night* levels are shown in Figures 23 through 26. As before, the L90 (and L50 of Annex A) data were averaged arithmetic plots, and the LEQ data were averaged on an energy basis.

Annex D, available only in soft form as an Excel file, contains the 1-hour A-weighted data portrayed in Figures 15 through 18 and Figures A1 and A2. The data are divided by date and by week (by site) into 14 tables. Annex E contains the "24-hour day plot" data portrayed in Figures 19 through 22 and Figures A3 and A4. The data are divided by week (by site) into 2 tables.

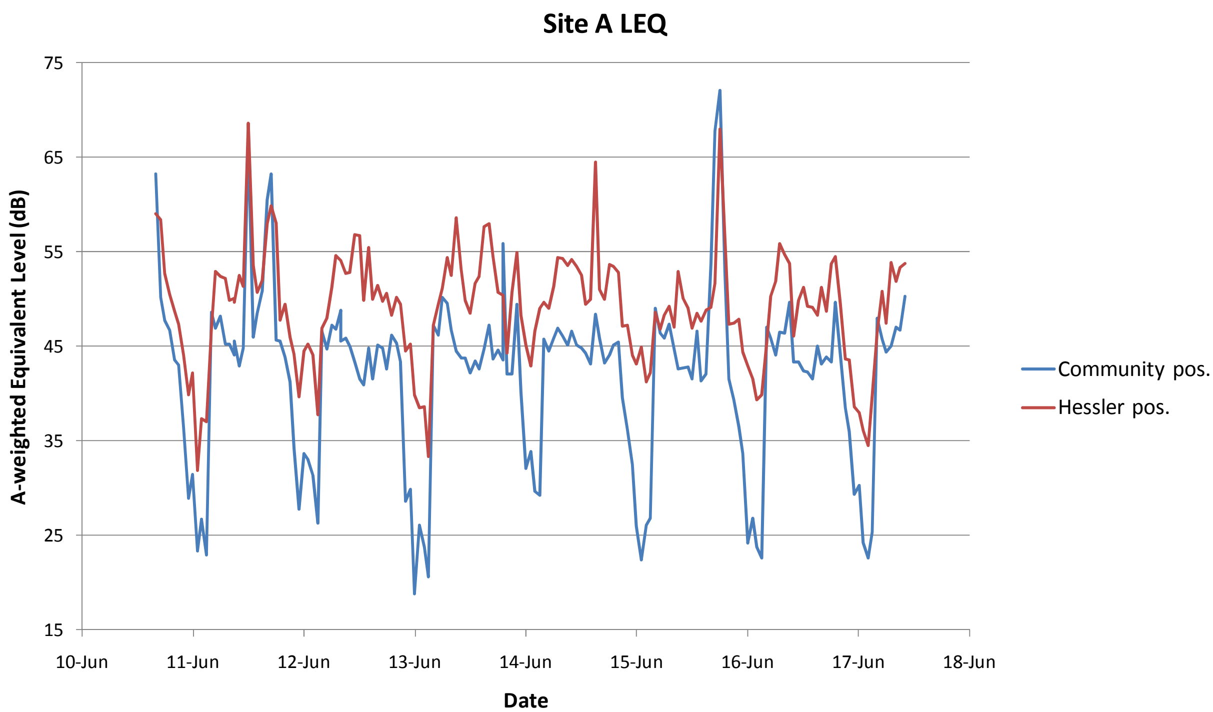

Figure 15. A-weighted LEQ for the week of site

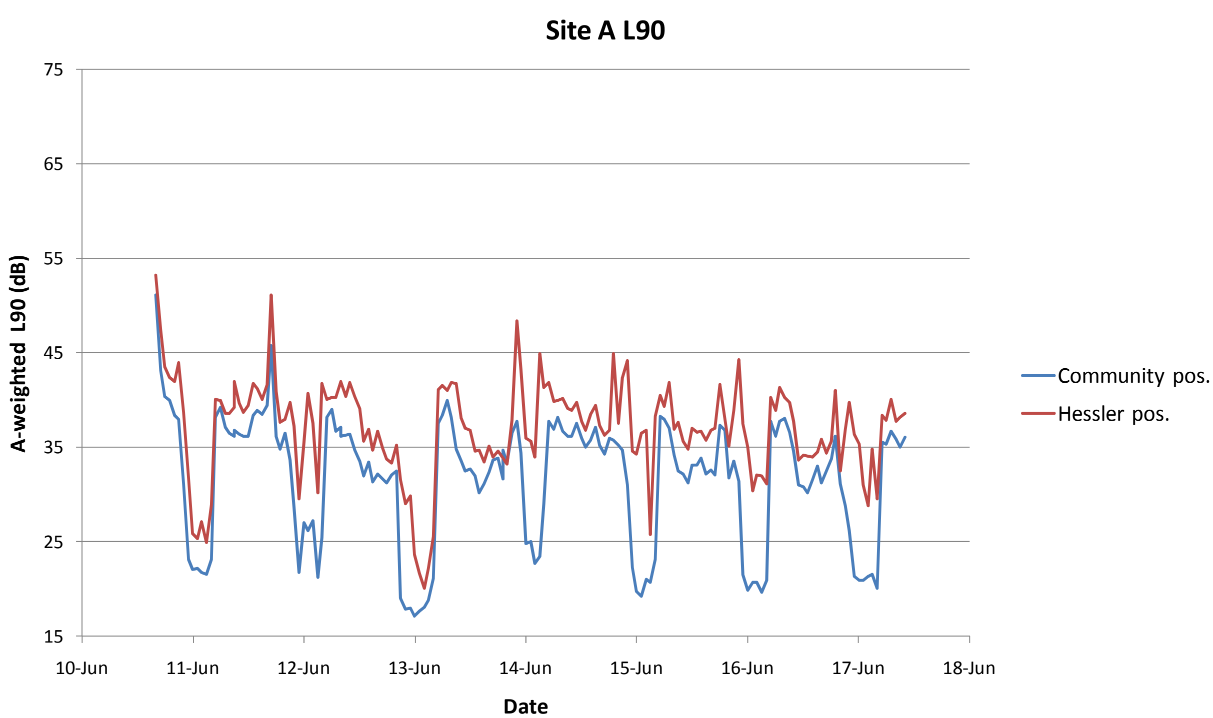

Figure 16. A-weighted L90 for week of site A

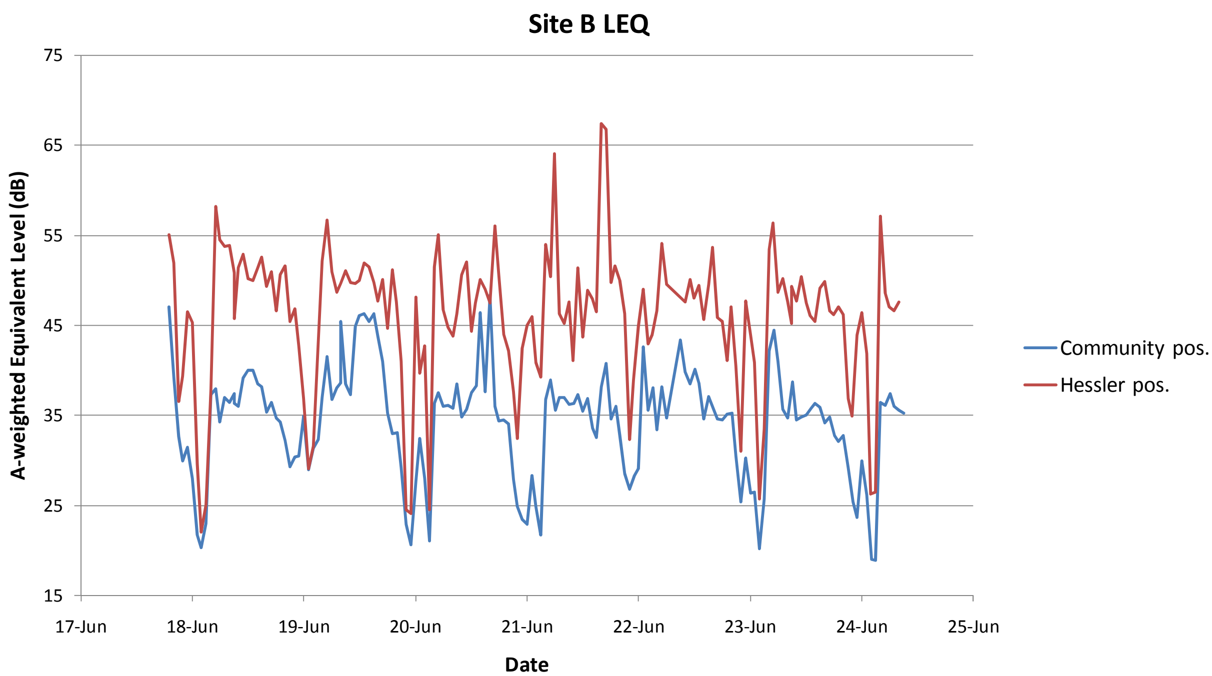

Figure 17. A-weighted LEQ for week of site B

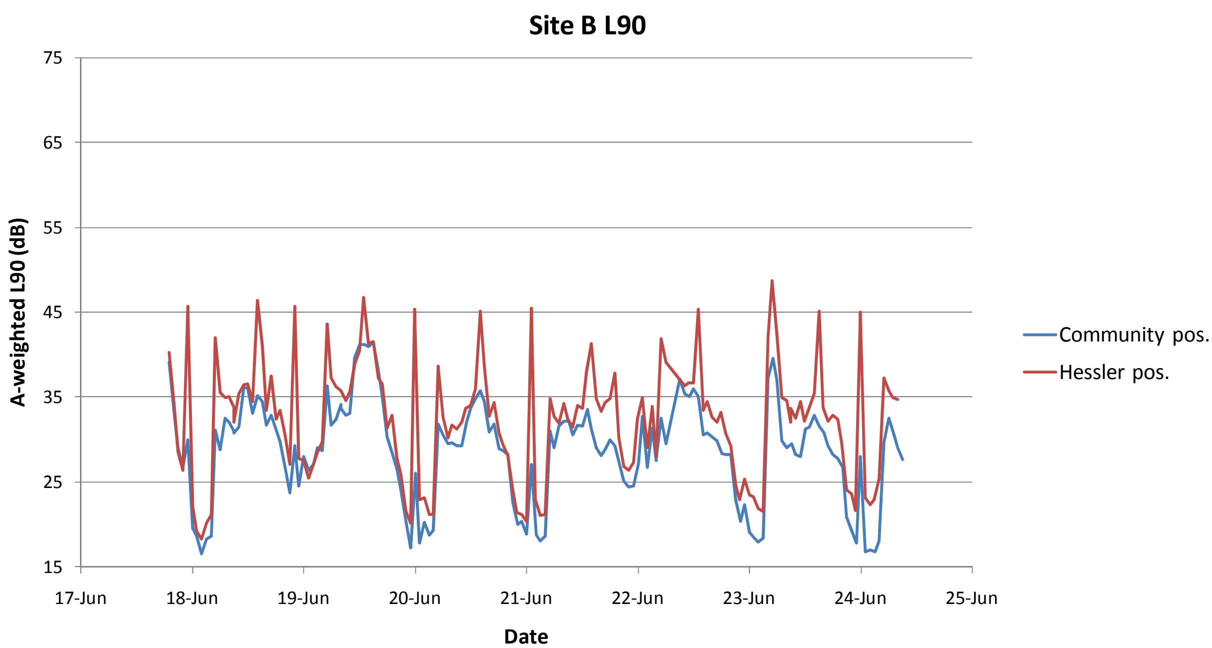

Figure 18. A-weighted L90 for week of site B

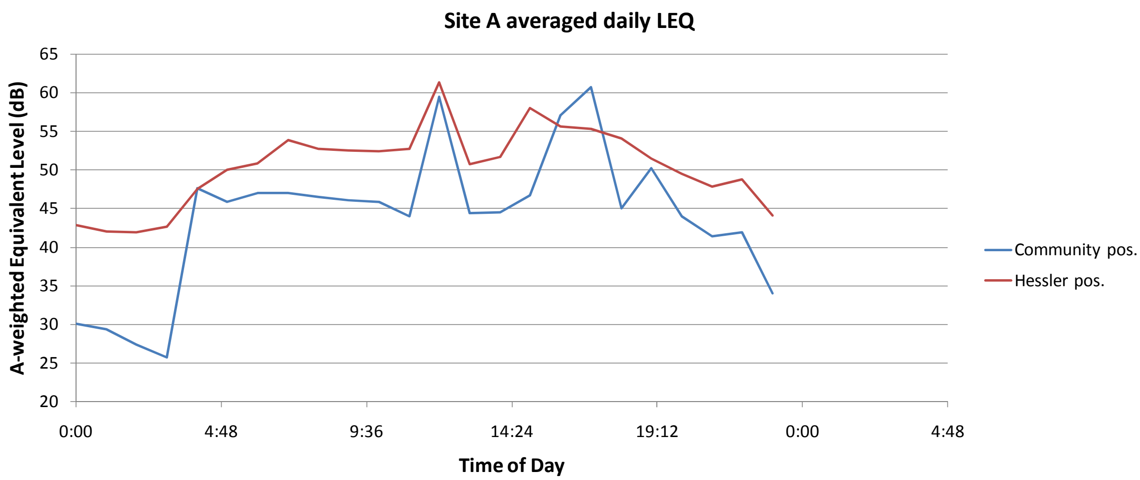

Figure 19. Averaged 24-hour A-weighted LEQ at site A

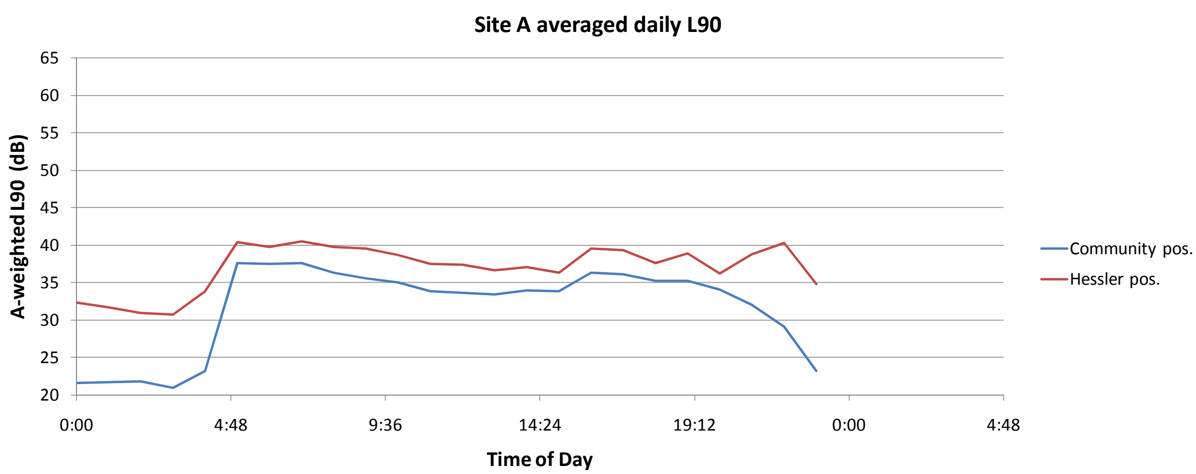

Figure 20. Averaged 24-hour A-weighted L90 at site A

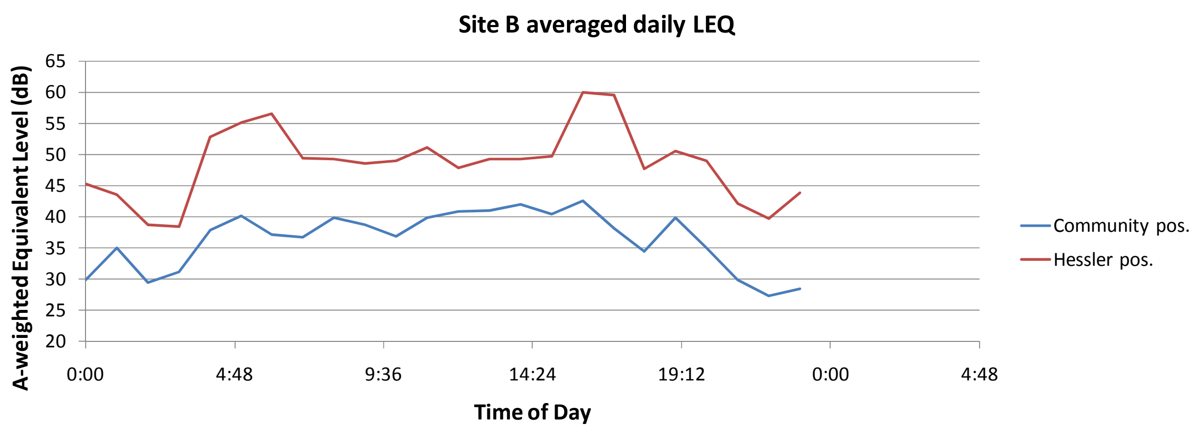

Figure 21. Averaged 24-hour A-weighted LEQ at site B

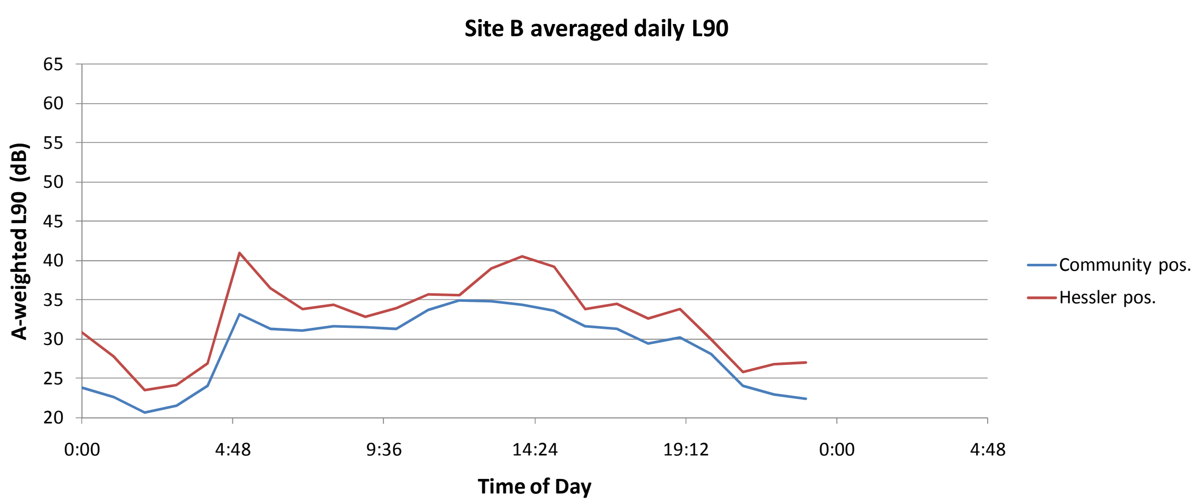

Figure 22. Averaged 24-hour A-weighted L90 at site B

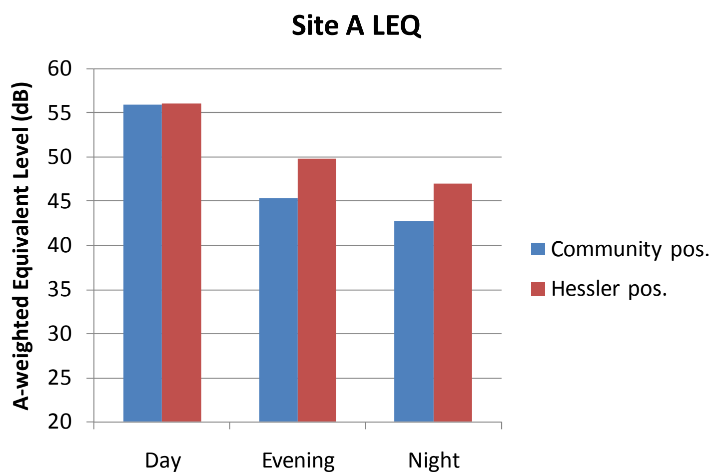

Figure 23. Site A comparison of A-weighted LEQ of day, evening, and night times

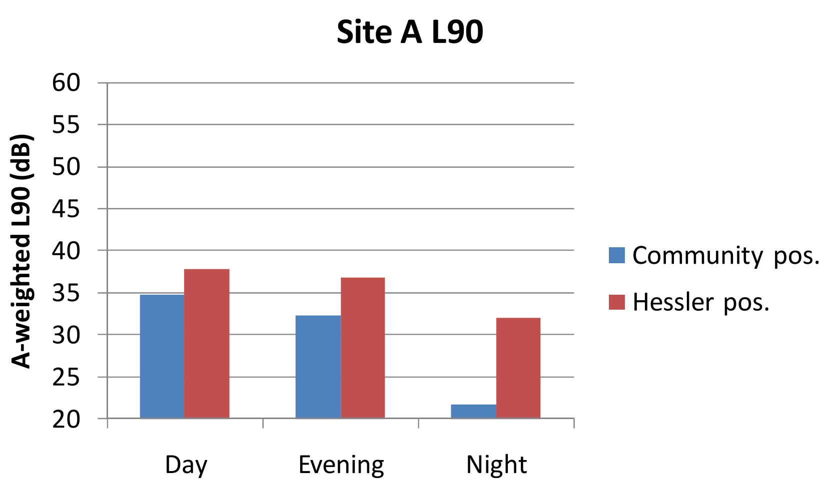

Figure 24. Site A comparison of A-weighted L90 of day, evening, and night times

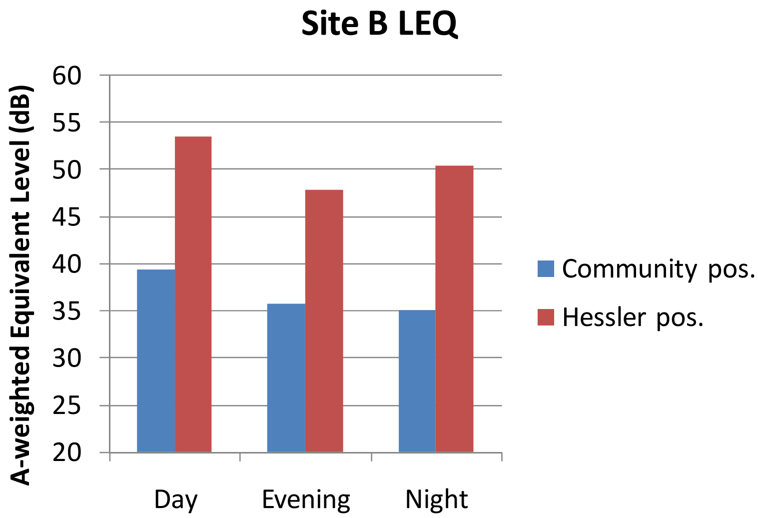

Figure 25. Site B comparison of A-weighted LEQ of day, evening, and night times

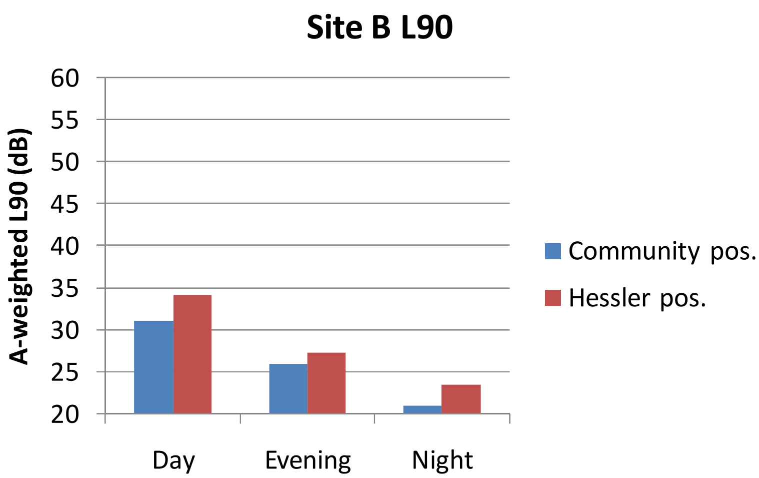

Figure 26. Site B comparison of A-weighted L90 of day, evening, and night times

Table 2 contains the time period data (*day, evening, night*) portrayed in Figures 23 through 26 and Figures A5 and A6. Table 2 contains 36 entries (3 time periods by 3 metrics by 2 positions by 2 sites). Figures 27 through 38 and Figures A7 through A12 contain the spectral data that correspond to the 36 entries in Table 2. Each of these 18 figures (3 time periods by 3 metrics by 2 sites) compares the Hessler position with the Community position[3]. The data for these 18 figures are contained in the 6 tables that comprise Annex F, which is also only available in soft form as an Excel file. The six tables are split out by the 3 time periods, and by the 2 sites, so each table contains 6 columns, LEQ for the Hessler and Community positions, L50 for the Hessler and Community positions, and L90 for the Hessler and Community positions. [4]

Table 2. Day, evening, and night sound values for site A and site B

		Day		Evening		Night	
		Community pos.	Hessler pos.	Community pos.	Hessler pos.	Community pos.	Hessler pos.
Site A	LEQ (dB)	55.9	56.0	45.3	49.7	42.7	47.0
	L50 (dB)	40.9	43.7	39.1	43.8	27.6	41.5
	L90 (dB)	34.8	37.8	32.3	36.9	21.7	32.1
Site B	LEQ (dB)	39.4	53.5	35.8	47.9	35.1	50.5
	L50 (dB)	35.7	43.0	31.1	36.1	27.0	32.8
	L90 (dB)	31.1	34.2	26.0	27.4	21.0	23.5

[3] Negative values were discarded for the bar graphs at high frequencies.
[4] Wind noise is a low frequency phenomenon such that Z-weighted wind noise data contains much more total sound energy than is contained in the energy sum of the one-third-octave-bands. In contrast, the C-weighted level is much closer to the energy sum of the one-third-octave-bands. Since they are so different, when assessing the wind noise phenomenon, it is not possible to meaningfully combine or compare C-weighted levels with Z-weighted levels. In order to complete the above analysis, the Z-weighted levels for the first 3 days of the Hessler position and the last 2 days of the Community position were replaced with the energy sum of the one-third-octave bands.

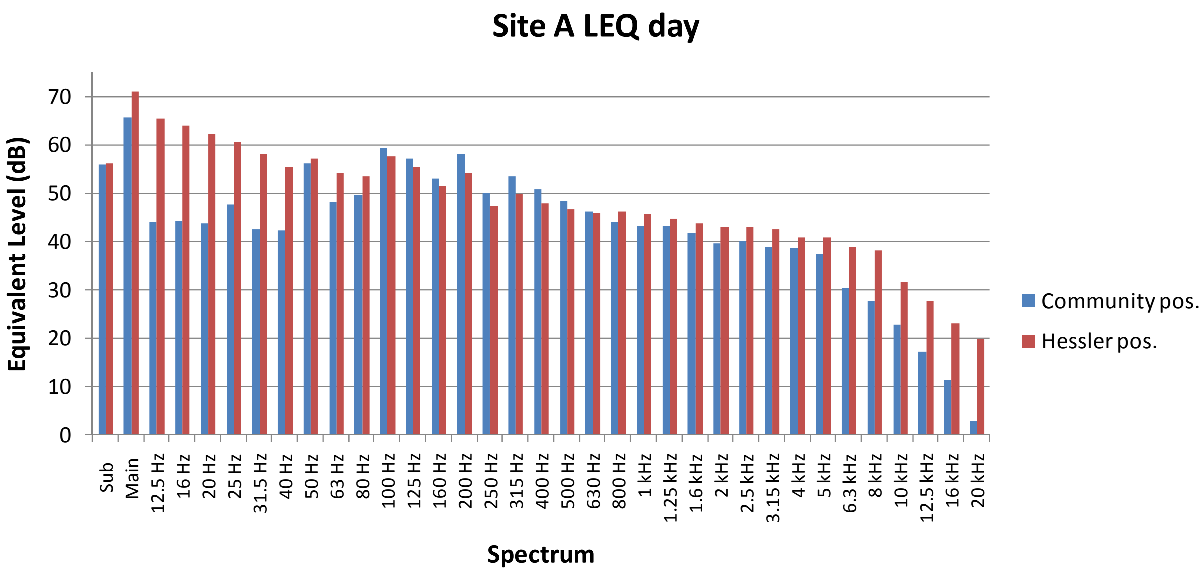

Figure 27. Site A averaged day-time LEQ spectrum

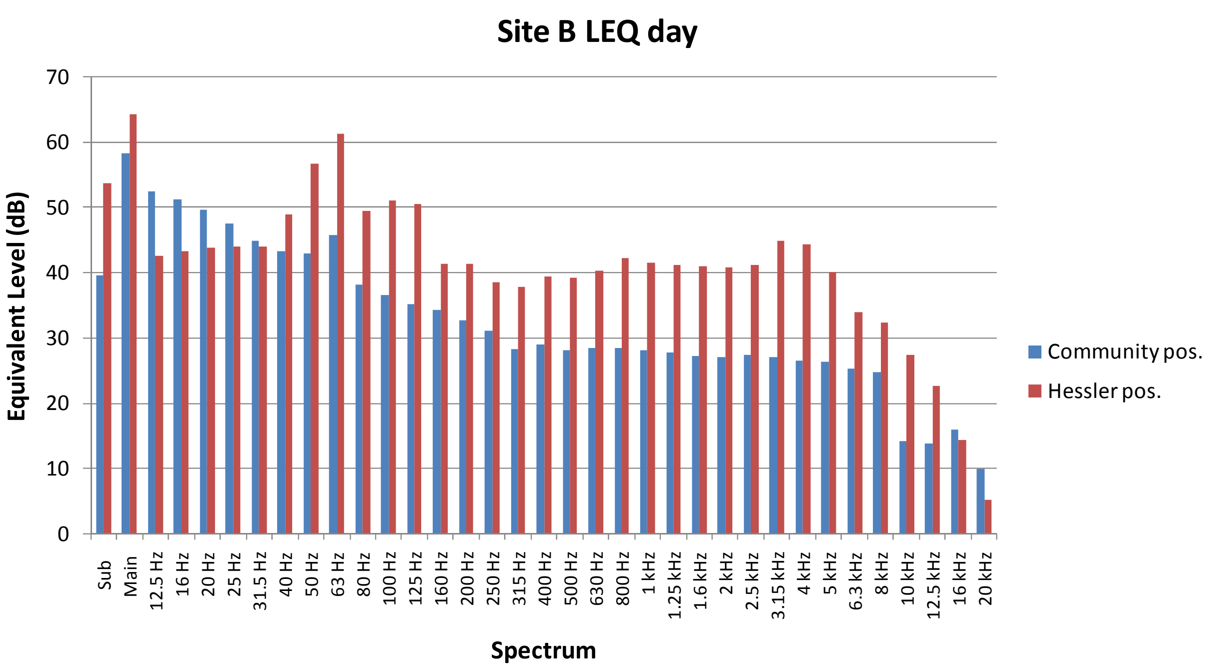

Figure 28. Site B averaged day-time LEQ spectrum

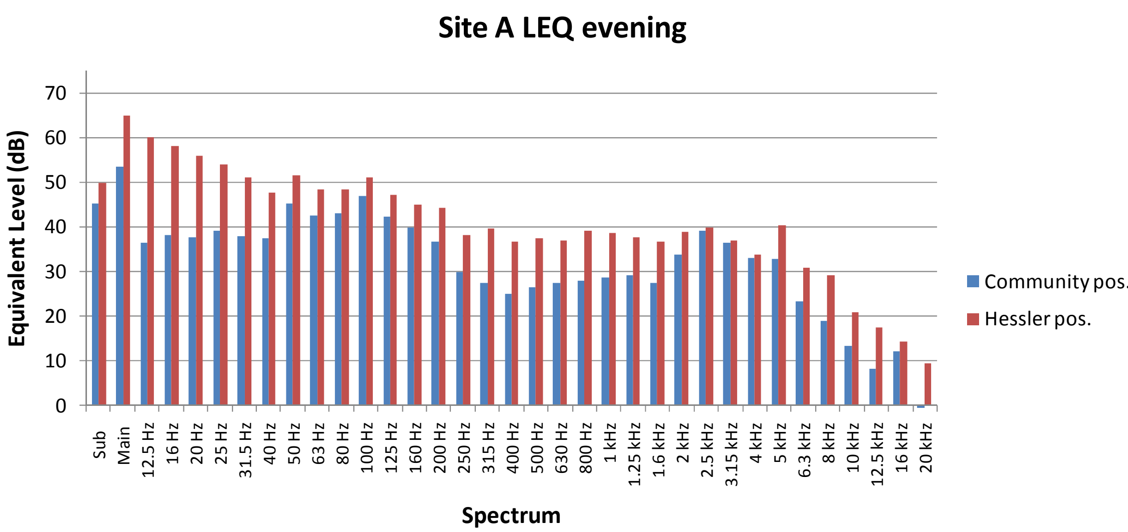

Figure 29. Site A averaged evening LEQ spectrum

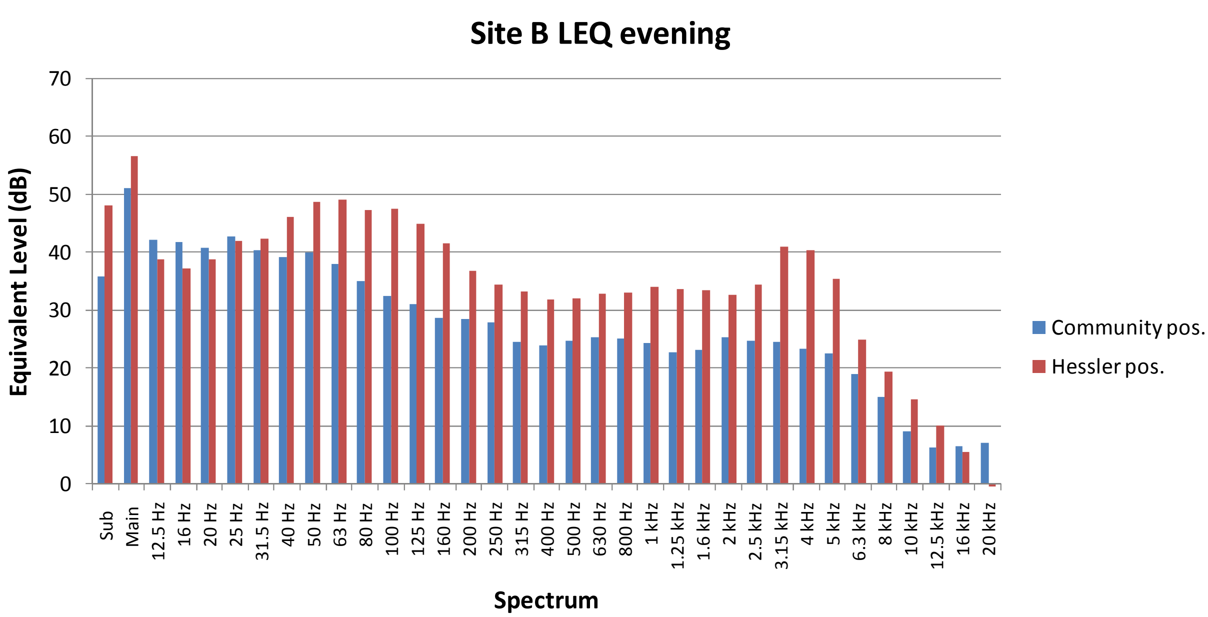

Figure 30. Site B averaged evening LEQ spectrum

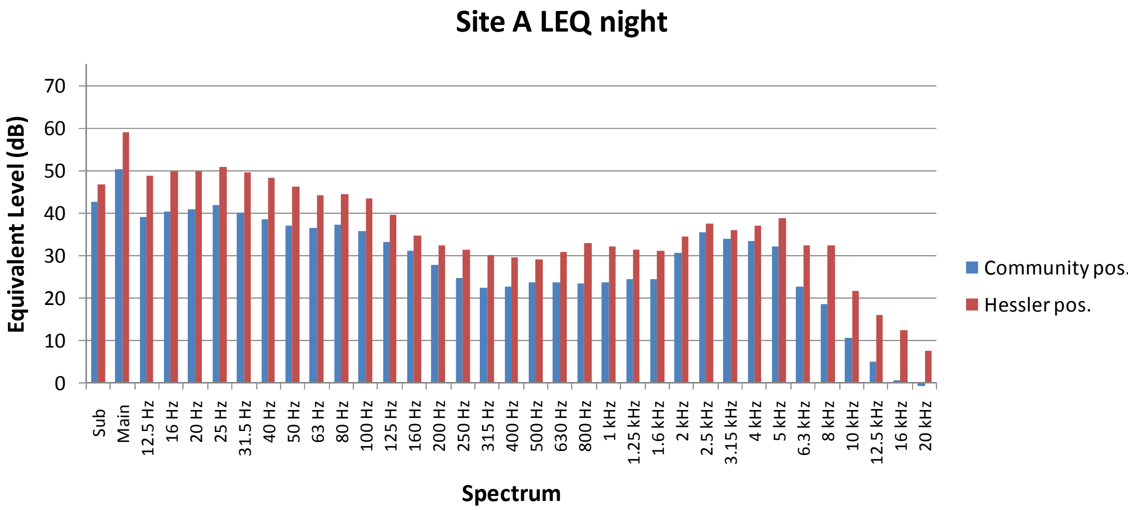

Figure 31. Site A averaged night-time LEQ spectrum

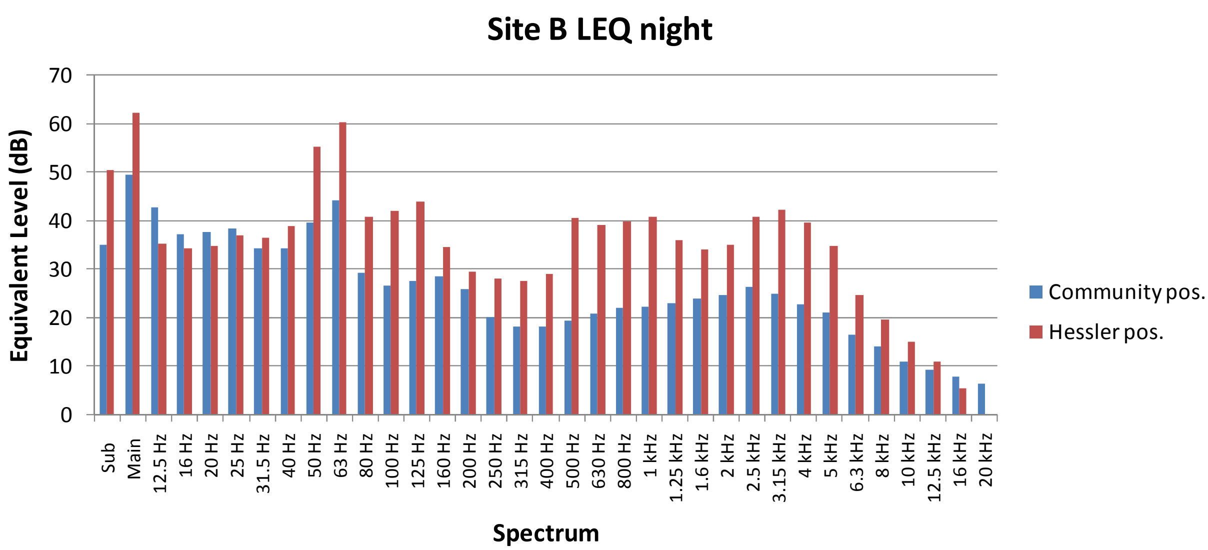

Figure 32. Site B averaged night-time LEQ spectrum

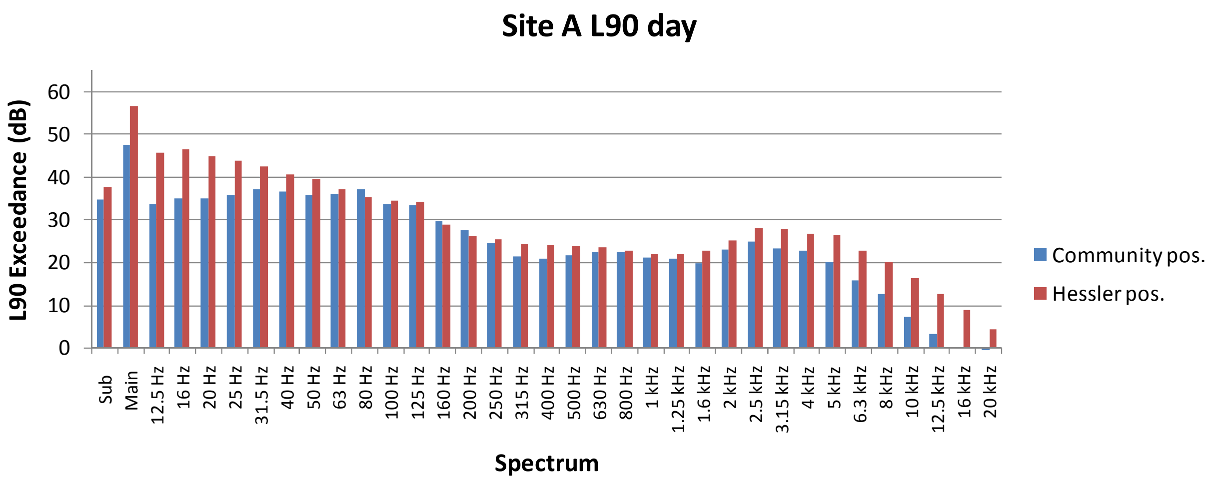

Figure 33. Site A averaged day-time L90 spectrum

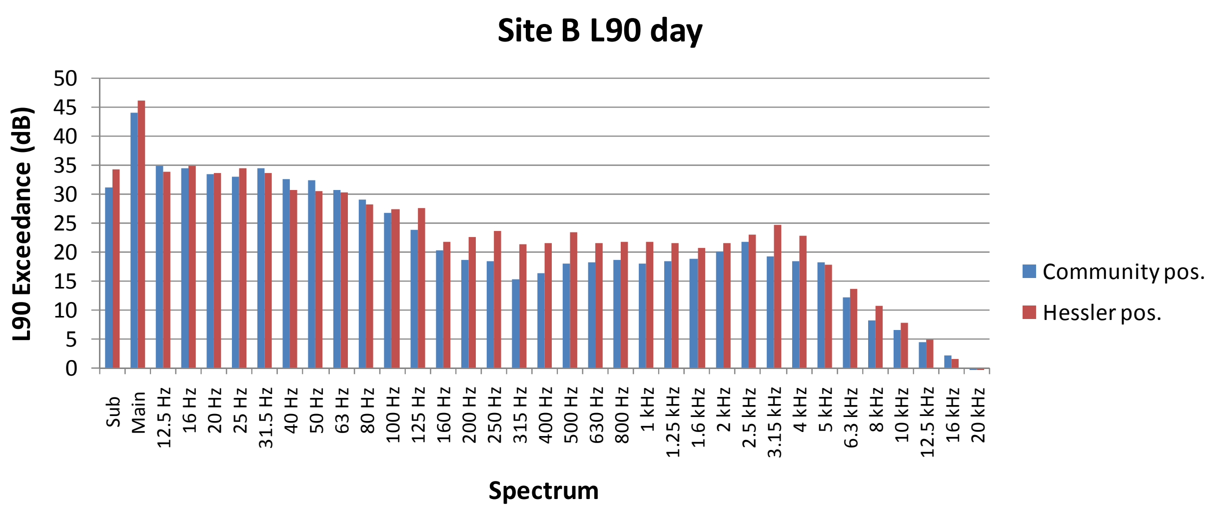

Figure 34. Site B averaged day-time L90 spectrum

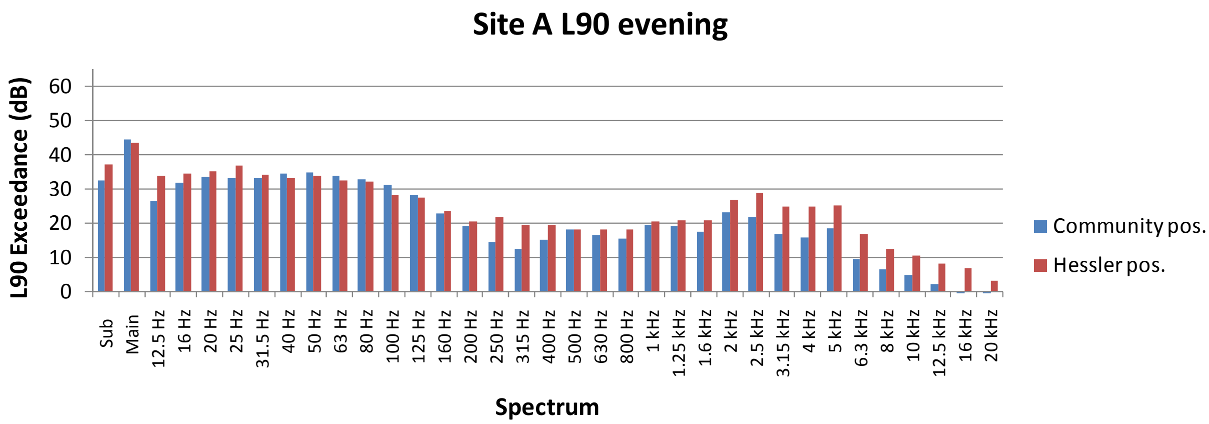

Figure 35. Site A averaged evening L90 spectrum

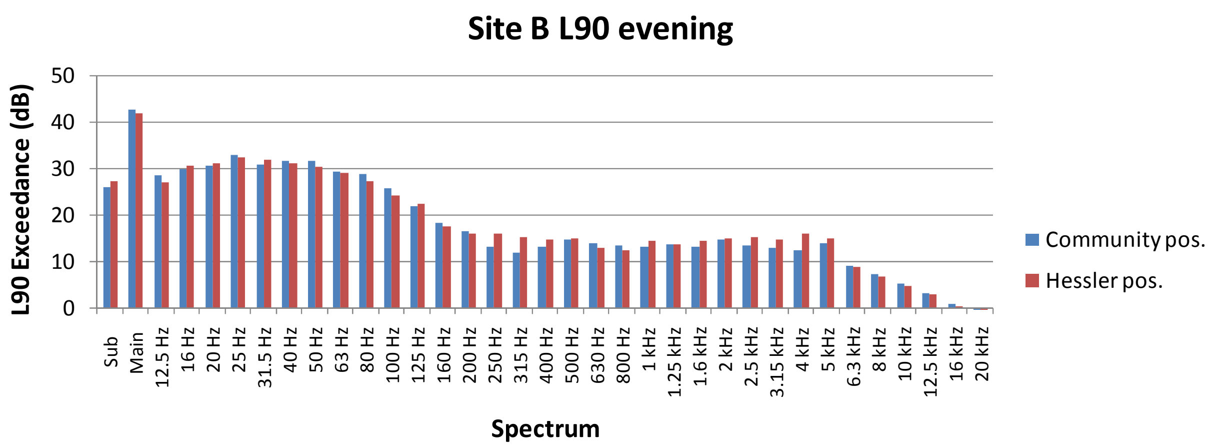

Figure 36. Site B averaged evening L90 spectrum

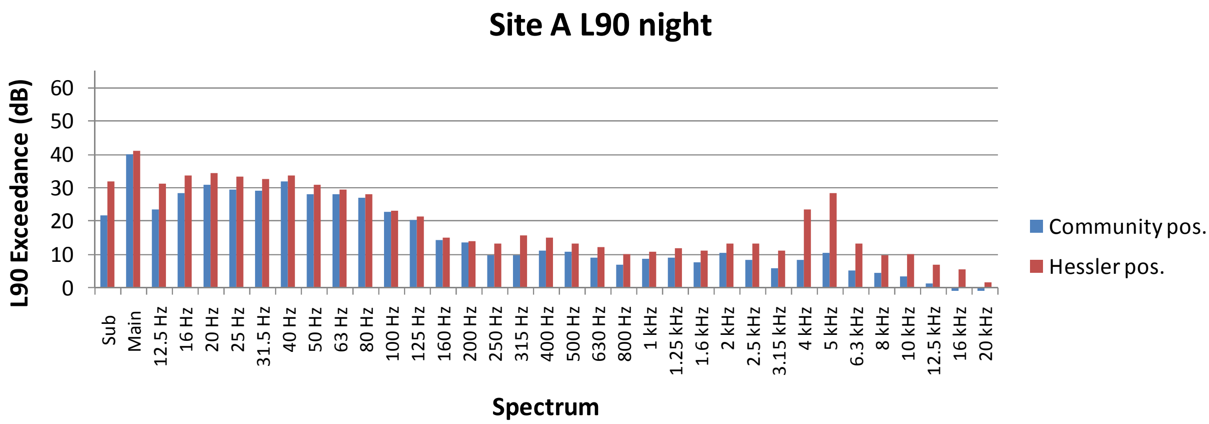

Figure 37. Site A averaged night-time L90 spectrum

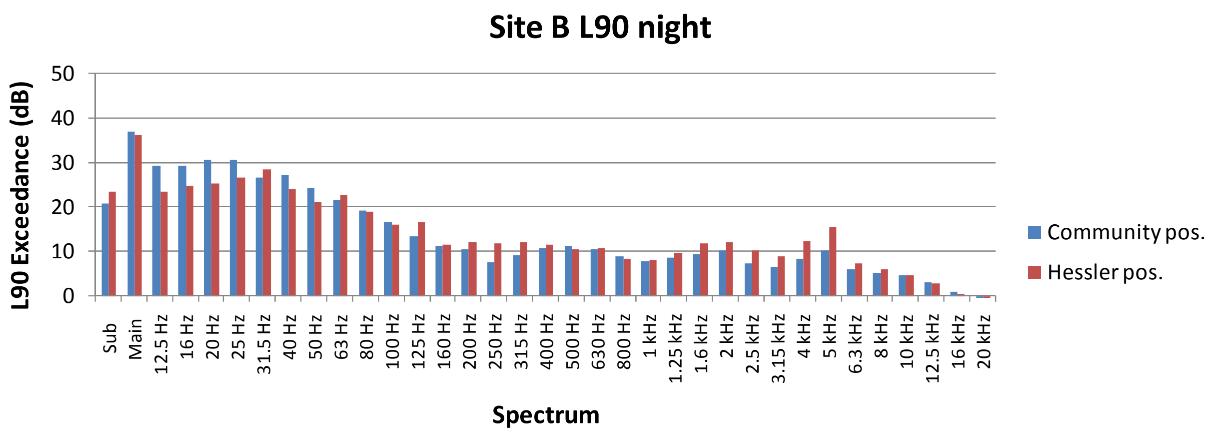

Figure 38. Site B averaged night-time L90 spectrum

IV. Discussion

At Site A there was a typical diurnal cycle with low sound levels at night and higher levels during the day (Fig. 16). A-weighted L90 ambient levels were below 25 dB at the Community position for all seven nights, and at the Hessler position for three nights. Site B had a similar daily pattern (Fig. 18). Nighttime A-weighted L90s were at or below 25 dB each night at the Community position and for 6 of 7 nights at the Hessler position. At both sites the upper range of the A-weighted L90s was approximately 45 dB.

At both sites A and B (see Figures 20 and 22), the A-weighted L90s were always higher at the Hessler positions. A-weighted L90 sound levels at the Hessler positions were 3 dB higher during daytime and up to 10 dB greater during nighttime. The A-weighted L90 sound levels increase around 5:00 AM, presumably from bird vocalizations, and then remain around 30-40 dB for the remainder of the day.

The day, evening and night ambient sound level data are summarized in Table 2 and, for L90 values, plotted in Figures 24 and 26. During the day, the A-weighted L90 sound levels were 3 dB greater at the Hessler position at both sites. The simple[5] daytime average A-weighted L90 for both sites and both positions was 35.5 dB. During the evening, the L90s at the Hessler position were 4.6 and 1.4 dB greater at sites A and B, respectively, and the simple-average A-weighted L90 for both positions and sites was 30.7 dB. During the night, the Community position was always quietest with A-weighted L90 levels averaging 21.7 and 21.0 dB for sites A and B, respectively (Table 2). The Hessler position was 10.4 and 2.5 dB louder at night at sites A and B, respectively. Combining both the Hessler and Community positions at both sites, the simple, A-weighted L90 average was 24.6 dB for nighttime ambient noise.

The results of the L90 sound spectrum analysis are displayed in Figures 33-38 for day, evening and nighttime. During all three time periods and at both sites, low frequency sound dominates the sound spectra. Of particular interest is the way insect noise, although not near its peak, is a factor in these spectra and the corresponding A-weighted levels. Insect noise is particularly evident in Figure 38, but it also is present in the data from Figures 33-37.

Data for the Community position at site A show that it is a quiet site, and data for the Community position at site B show that it is a very quiet site. Although the “Hessler” positions are noisier than the community positions, the Hessler position data are much quieter than the data reported by Hessler. In fact, these data are comparable only to the data for Hessler position 4, the data Hessler arbitrarily discarded because they were quieter than his other data. Overall, the data herein certainly support the contention that Hessler chose loud sites, loud positions within the sites, and the time-or-year when insect noise is loudest.

Overall, and especially Figures 24 and 26 taken together suggest that in Cape Vincent, daytime, evening, and nighttime A-weighted L90s average at 35.5, 30.7 and 24.6 dB, respectively. Thus, the overall day-evening-night simple arithmetic average is about 30 dB compared with Hessler’s reported average of 45 to 50 dB—a range of levels that exceed the true ambient by 15 to 20 dB—a huge error.

The biggest factor responsible for Hessler’s higher measure of ambient sound in Cape Vincent was the inclusion of insect sounds. Hessler stated, “..insect noise peaking at 5000 Hz strongly affected the overall sound levels when they were at a maximum and, significantly, also when they were at a minimum.” In Figure 2.6.2 of his report insect sound levels (e.g. 4000 to 8000 Hz) were 35-55 dB compared to 10-25 dB in this study. Hessler’s failure to remove insect noise contradicts what he recommends in his November 2006 article appearing in The Journal of Sound and Vibration entitled “Baseline Environmental Sound Levels for Wind Turbine Projects:”

> *“To exclude certain contaminating noise and to correct measured sound levels for self-induced wind noise, it is necessary to record not only the A-weighted sound level but also the octave-band frequency content of the background sound level. For example, this approach allows the mathematical subtraction of high-frequency insect noise from summertime survey results yielding a modified A-weighted sound level that can be used as a year-round design basis. Without this adjustment, one might easily overestimate the long-term background level, particularly the nighttime level, that is present at the site. It is the lowest sound level that is consistently present and available to mask project noise that is sought in every baseline ambient sound survey.*

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[5] The simple average was calculated by taking the arithmetic average of the four levels (sites A and B by positions Hessler and Community).

In contrast to Hessler's BP study, the current study was designed to avoid insect noise by scheduling the survey period prior to the emergence of adult fall crickets and cicadas (e.g., August 1). Actually, the results in this report are more aligned with Hessler's journal recommendation to seek the lowest sound level that is consistently present.

Furthermore, and more importantly, wind turbine sound spectra are low frequency and mid-frequency phenomena; therefore, higher frequency insect noise will not mask wind turbine sounds. So even if insect noise was present year round instead of for a few weeks it should still not be included in the ambient because it provides little or no masking of the wind turbine sound.

In summary, Hessler's claim that A-weighted ambient sound levels of 45-50 dB are typical for Cape Vincent is incorrect and misleading. Results in this study showed A-weighted L90 ambient sound levels averaged: 24.6 dB at night, 30.7 dB for evenings and 35.5 dB during daytime; and the overall (arithmetic) average of these three A-weighted L90 levels is 30.3 dB. Importantly, these sound levels represent an average of both the "Hessler" and Community positions, not just the Community position averages. These results demonstrate that selection of monitoring sites, position within the site, and time of year all markedly affect the "measured" background sound in Cape Vincent.

V. Conclusions

1. The Hessler position at a measurement site systematically and significantly yields higher sound levels than does the Community position.
2. The sound levels measured in this study show Cape Vincent to be a quiet rural area, much as depicted by the data for Hessler's position 4.
3. Measurements, such as those conducted at Hessler's position 3, are not indicative of the noise environment of typical residences in the Cape Vincent area.
4. Failure to remove insect noise in Hessler's study violated his own recommended survey and analytical techniques and substantially misrepresented typical ambient sound levels.
5. In assessing potential noise impacts from wind turbine development, rather than using 45-50 dB A-weighted levels as suggested by Hessler, a more accurate level would be 30 dB, which is the average value for the day, evening and night L90 sound levels observed at both the "Hessler" and Community positions for sites A and B in this study. Arguably, the level should be down at 20 to 25 dB, since an A-weighted L90 of 20 dB occurs during the quietest nighttime hours, and the A-weighted L90 for the whole 9-hour night is 25 dB.

Paul Schomer, Ph.D., P.E.
Member, Board Certified, Institute of Noise Control Engineering

Annex A: L50 Data Summaries

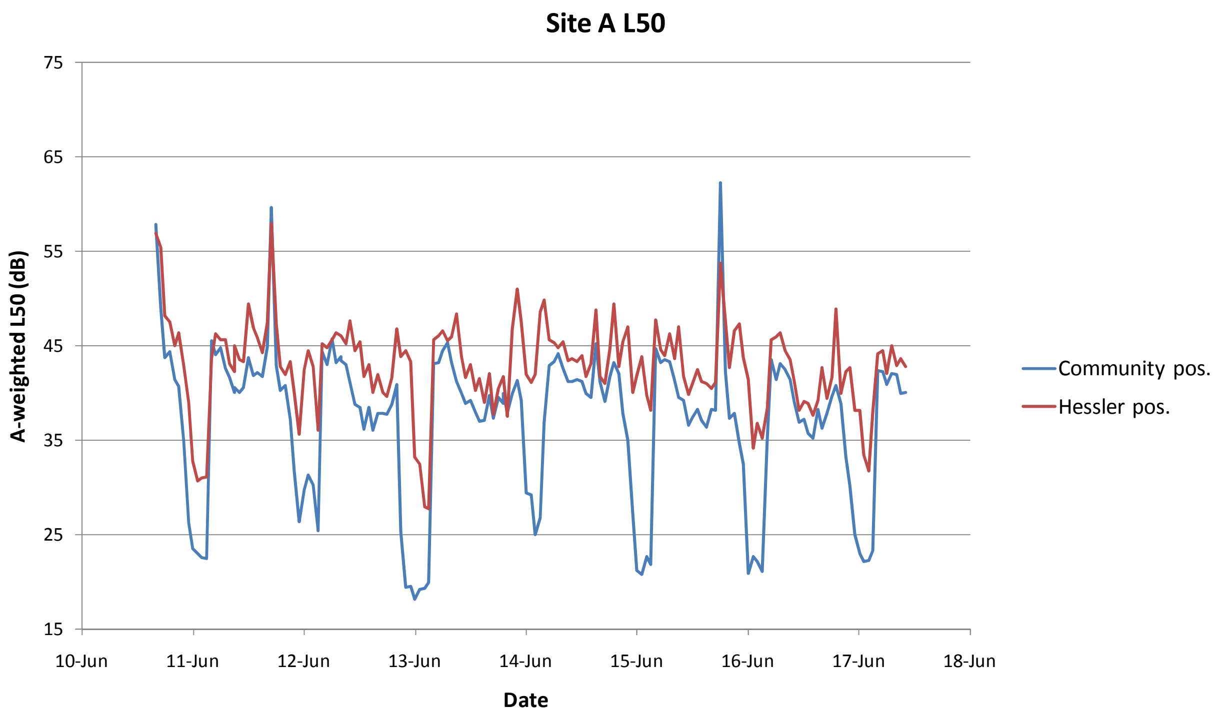

Figure 39. A-weighted L50 for week of site A

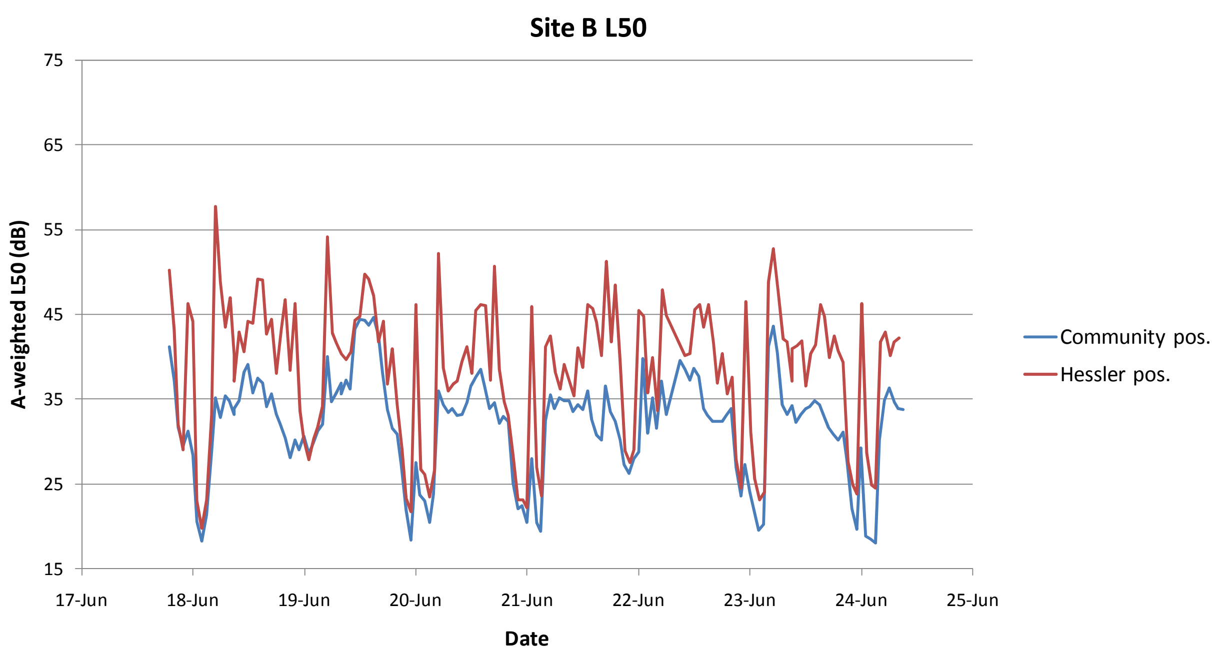

Figure 40. A-weighted L50 for week of site B

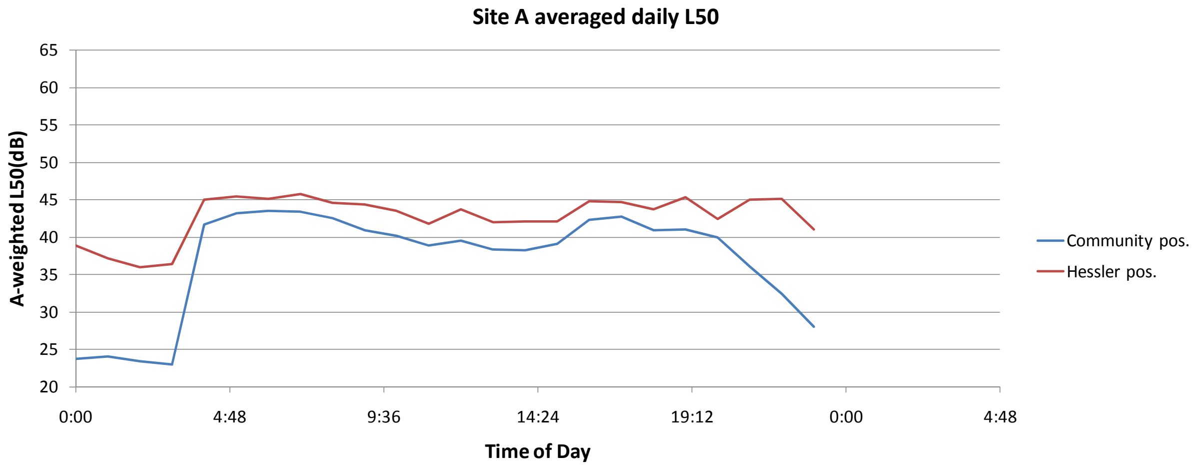

Figure 41. Averaged 24-hour A-weighted L50 at site A

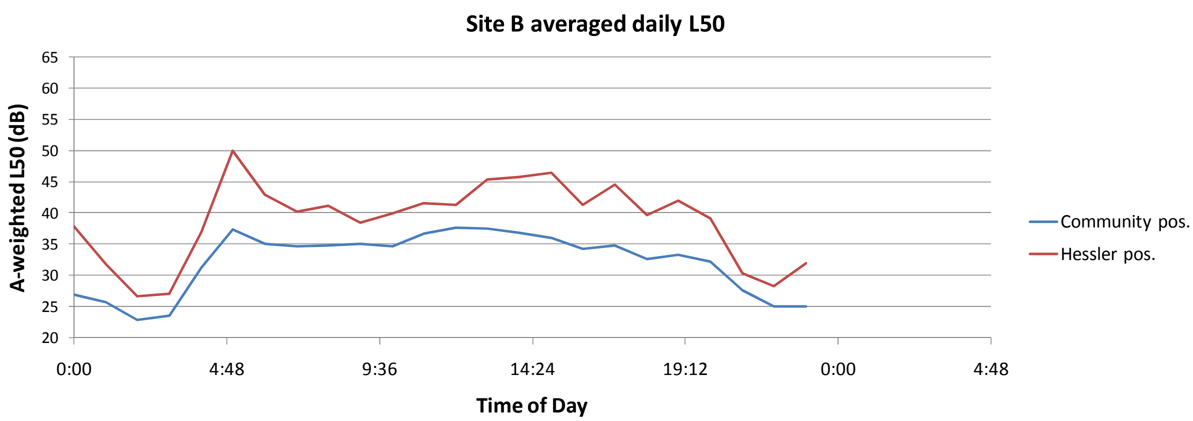

Figure 42. Averaged 24-hour A-weighted L50 at site B

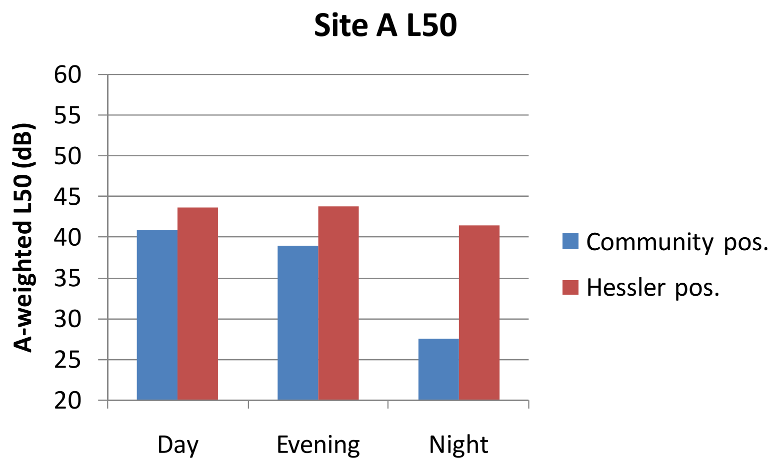

Figure 43. Site A comparison of A-weighted L50 of day, evening, and night times

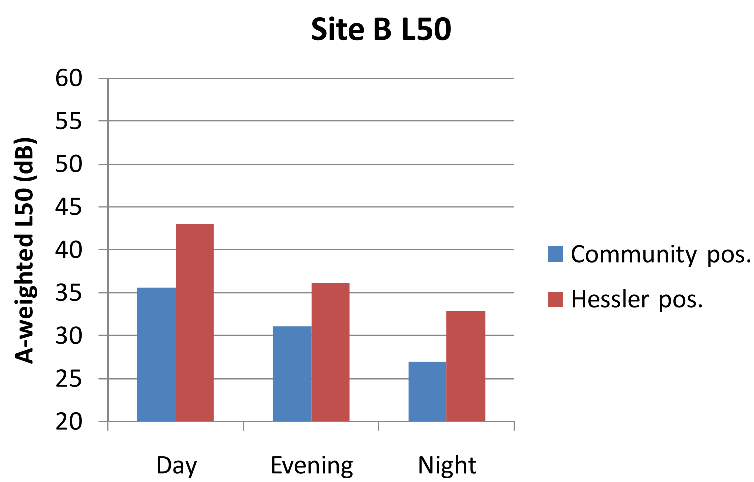

Figure 44. Site B comparison of A-weighted L50 of day, evening, and night times

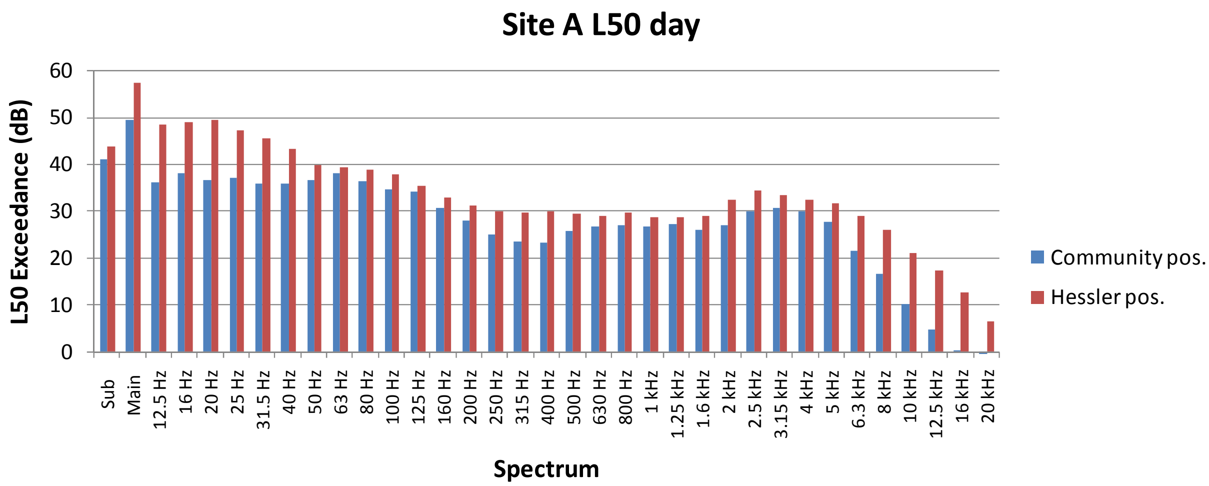

Figure 45. Site A averaged day-time L50 spectrum

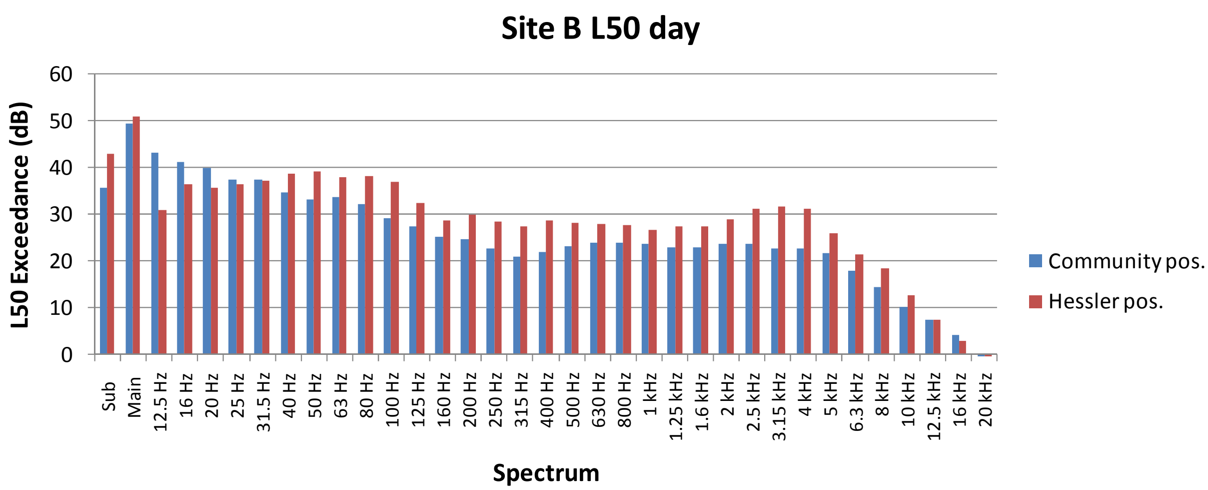

Figure 46. Site B averaged day-time L50 spectrum

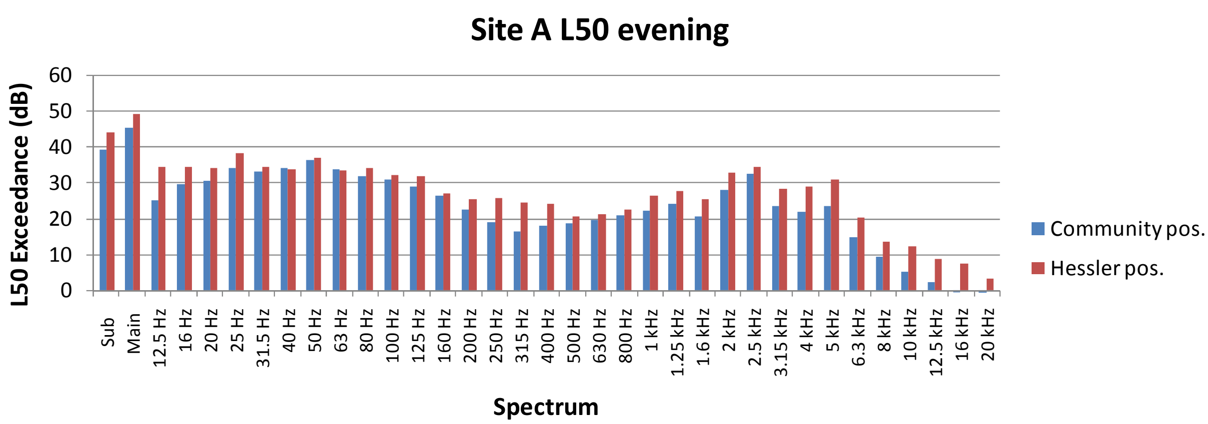

Figure 47. Site A averaged evening L50 spectrum

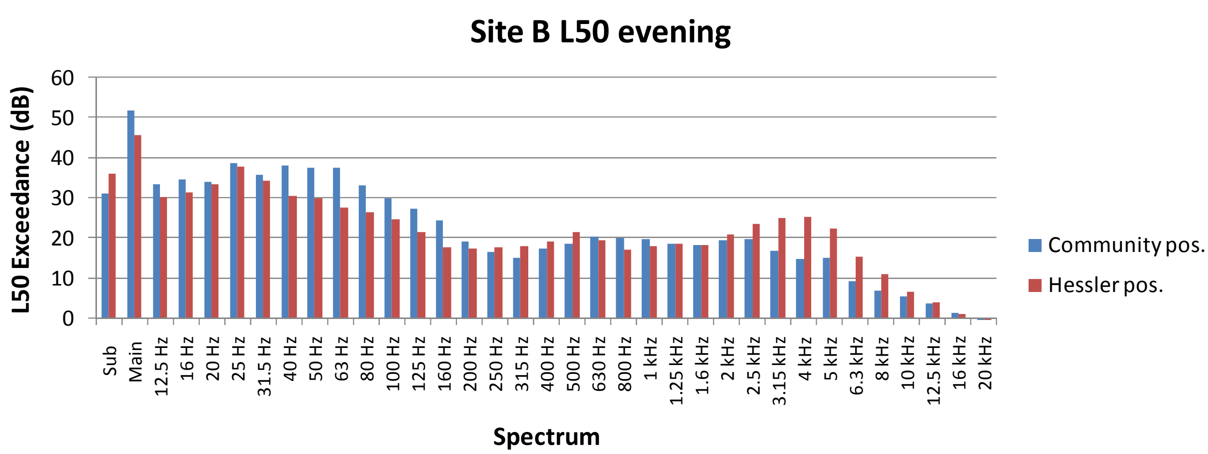

Figure 48. Site B averaged evening L50 spectrum

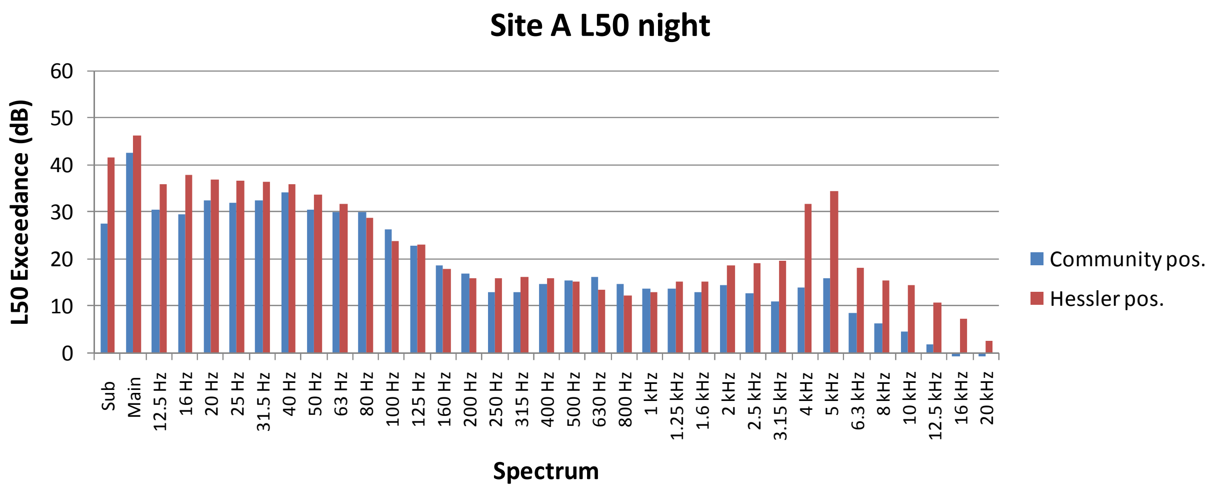

Figure 49. Site A averaged night-time L50 spectrum

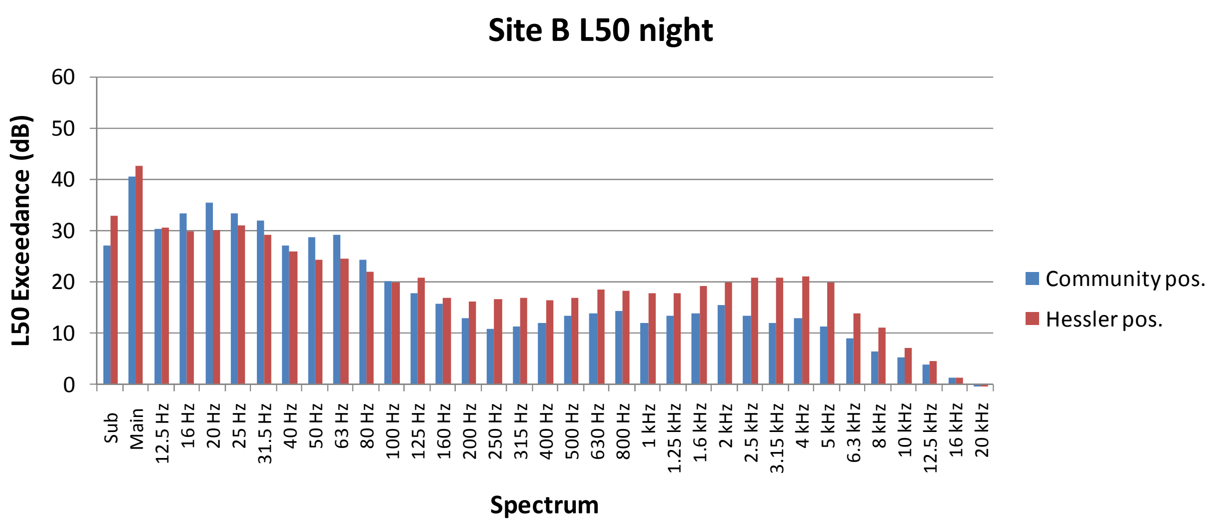

Figure 50. Site B averaged night-time L50 spectrum

Annex B: 10-minute LEQ, L90, L50 organized by date

(Data only available in soft form)

Annex C: 1-hour LEQ, L90, L50 organized by data

(Data only available in soft form)

Annex D: 1-hour A-Weighted data portrayed in figures 13-18

(Data only available in soft form)

Annex E: Averaged 24-hour sound levels portrayed in Figures 19 - 24

Table 3. Annex E - Site A averaged 24-hour sound levels portrayed in Figures 19-24

	LEQ (dB)		L50 (dB)		L90 (dB)	
Hour	Community pos.	Hessler pos.	Community pos.	Hessler pos.	Community pos.	Hessler pos.
0:00	30.1	42.8	23.8	38.8	21.6	32.2
1:00	29.4	42.0	24.1	37.2	21.7	31.6
2:00	27.4	41.9	23.5	36.0	21.8	30.9
3:00	25.7	42.6	23.0	36.4	21.0	30.7
4:00	47.6	47.5	41.7	45.0	23.2	33.8
5:00	45.9	50.0	43.2	45.4	37.6	40.3
6:00	47.1	50.8	43.5	45.0	37.5	39.7
7:00	47.0	53.9	43.4	45.7	37.6	40.5
8:00	46.4	52.7	42.5	44.5	36.3	39.7
9:00	46.0	52.5	40.9	44.3	35.6	39.5
10:00	45.8	52.4	40.1	43.5	35.0	38.7
11:00	44.0	52.7	38.9	41.8	33.8	37.4
12:00	59.5	61.3	39.6	43.7	33.7	37.4
13:00	44.4	50.7	38.4	42.0	33.4	36.6
14:00	44.5	51.7	38.3	42.1	33.9	37.0
15:00	46.7	58.0	39.2	42.1	33.9	36.3
16:00	57.1	55.6	42.3	44.8	36.3	39.5
17:00	60.7	55.3	42.7	44.7	36.1	39.3
18:00	45.0	54.0	40.9	43.7	35.2	37.6
19:00	50.3	51.5	41.1	45.3	35.2	38.9
20:00	43.9	49.5	39.9	42.4	34.1	36.2
21:00	41.4	47.9	36.1	45.0	32.0	38.8
22:00	41.9	48.7	32.5	45.1	29.1	40.2
23:00	34.1	44.1	28.0	41.0	23.2	34.7

Table 4. Annex E - Site B averaged 24-hour sound levels portrayed in Figures 19-24

	LEQ (dB)		L50 (dB)		L90 (dB)	
Hour	Community pos.	Hessler pos.	Community pos.	Hessler pos.	Community pos.	Hessler pos.
0:00	29.8	45.2	27.0	37.9	23.8	30.9
1:00	35.0	43.5	25.8	31.8	22.6	27.8
2:00	29.5	38.8	22.9	26.7	20.7	23.5
3:00	31.1	38.4	23.7	27.2	21.6	24.2
4:00	37.8	52.8	31.4	37.1	24.1	27.0
5:00	40.1	55.2	37.4	50.0	33.2	41.0
6:00	37.1	56.6	35.1	43.0	31.3	36.5
7:00	36.7	49.5	34.8	40.2	31.1	33.9
8:00	39.8	49.3	34.8	41.2	31.7	34.4
9:00	38.8	48.6	35.0	38.5	31.6	32.8
10:00	36.8	49.0	34.7	40.0	31.4	33.9
11:00	39.9	51.2	36.7	41.6	33.8	35.7
12:00	40.8	47.9	37.7	41.3	35.0	35.6
13:00	40.9	49.3	37.5	45.3	34.9	39.0
14:00	42.0	49.3	36.8	45.8	34.4	40.5
15:00	40.4	49.8	36.0	46.4	33.6	39.3
16:00	42.6	60.0	34.3	41.4	31.7	33.9
17:00	38.1	59.5	34.8	44.6	31.3	34.5
18:00	34.4	47.8	32.6	39.7	29.5	32.6
19:00	39.8	50.6	33.3	42.0	30.2	33.9
20:00	34.9	49.0	32.2	39.1	28.1	30.0
21:00	29.8	42.2	27.7	30.4	24.1	25.9
22:00	27.2	39.7	25.0	28.4	23.0	26.9
23:00	28.4	43.9	25.1	32.1	22.5	27.0

Annex F: Spectra for the data portrayed in Figures 31-48

(Data only available in soft form)