NCIA Regional Noise Management Plan (RNMP)

Annual Report

Prepared for the

Albert Energy Regulator (AER)

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NCIA Regional Noise Management Plan (RNMP)

Annual Report to the Alberta Energy Regulator (AER)

2014 (covering the calendar year 2013)

1 Executive Summary

NCIA completed field validation measurements for the regional noise model in 2013. These results are compared to the Regional Noise Model of November 2011 (see Section 3).

A number of NCIA member site level noise models were updated in 2013 and early 2014 and those will be included in an update to the regional noise model and its outputs in 2014 (see Section 4.1). The most significant of these are:

1. **Keyera Corp.**:
    a. The product injection pump project described in the 2013 report was completed in 2013. A Noise Impact Assessment completed in the design phase of that project resulted in several modifications to the proposed pump installation, including an acoustically treated building and low noise valves.
    b. A brine storage pond was also constructed in 2013, which provides some sound attenuation in the northwest portion of the site.
    c. These changes will be incorporated into the 2014 NCIA Regional Noise Model update through SLR Consulting and reported on in the 2015 annual report.
    d. 2014 equipment additions include receipt pumps associated with the Cochin Pipeline reversal project and a de-ethanizer system. The Cochin pumps will be operational mid-year and the de-ethanizer will be operational late in the year.
    e. The hot oil furnace (HR-15.02) and aerial coolers (HT-16.04/06) in the existing fractionation plant are being modified in 2014 to reduce associated noise.
    f. Once these additions and modifications are complete there will be a requirement to update the site noise model, which is expected to be done in Q2 2014.

2. **North West Redwater Partnership (NWRP)**:
    a. During 2013 NWRP engaged the services of an acoustical consultant to aid in ensuring that operational noise as modeled per baseline model work completed in 2008 remains valid.
    b. NWRP used SLR Consulting for this work, and updated model work will be released upon final acceptance of reports for incorporation into the NCIA Regional Noise Model in 2014 and reported on in the 2015 annual report.

3. **Pembina Pipeline Corporation**:
    a. At the Redwater site, additional equipment was added and the site noise model was updated by Stantec and will be incorporated in the 2014 Regional Noise Model update and reported on in the 2015 annual report.

4. **Plains Midstream Canada**:
    a. Construction activities began on the Phase 1 Expansion project in 2013. This development began with earth works for a new facility brine pond.
    b. The expansion has resulted in the site conducting a noise impact assessment which was subsequently used to update the site Noise Model.
    c. SLR Consulting conducted the NIA and will use that information to update the Regional Noise Model in 2014, which will be reported on in the 2015 annual report.
    d. The Facility will be continuing on with the Phase 1 Expansion plans in 2014. This will include the final construction of the new facility brine pond, drilling of two new underground storage caverns, and relocating and expansion of the truck loading terminal.
    e. These activities may result in changes that require the facility to update the Regional Noise Model. This will be evaluated as we proceed with expansion activities.

5. **Shell Scotford**:
    a. The RNMP Model validation report conducted in September 2012 identified an anomalous reading south of the Site. The July 2012 monitoring results at a near approximate site did not compare well. A monitoring assessment was planned for the fall of 2013, however, plant outages prevented us from completing a meaningful survey. This is now scheduled for June 2014.
    b. The Upgrader Expansion model is 90% complete. Stack top measurements remain to be completed, however, theoretical values have been included in the meantime and this model will be included in the 2014 Regional Noise Model update.
    c. Current plan is to complete stack top measurements in 2014 and update the site model by the end of 2014.

6. **Sherritt International**:
    a. Owing to modifications made on the site, noise reductions of 2 to d 5 dBA were found from the previous site model. These changes will be included in the 2014 Regional Noise Model Update and reported on in the 2015 annual report.

2 AER Audits of NCIA Member Facilities

AER conducted site noise management plan audits of the following NCIA member companies in 2013 and early 2014:

- Dow Chemical Canada;
- Keyera Corp.;
- Pembina Pipelines; and
- Shell Scotford (Upgrader and expansion).

The audits were based on the NCIA Noise Management Plan Standard 2010-002 dated March 5, 2013 and were found to be satisfactory. Three of the four members provided follow up responses to the audits as requested by AER. Pembina Pipelines is currently working with AER to close out their audit.

3 2013 Monitoring results for Regional Noise Model

aci Acoustical Consultants Inc. completed sound monitoring surveys near Fort Saskatchewan in Alberta's Industrial Heartland as a means to validate the accuracy of the Regional Noise Model developed for the Northeast Capital Industrial Association (NCIA). A total of thirteen (13) 48-hour noise monitoring measurements were conducted in August. The complete Field Monitoring Report can be found in Appendix 2 of this report. Sampling locations are shown in Table 1 and Figure 1 below. Measured versus modeled results are shown in Table 2 (with further details in Appendix 3).

Table 1
Monitoring Location Details

Location No.	UTM Coordinates (approximate)		Description
	Easting (m)	Northing (m)	
1	354954	5954151	3 m south of 100 Ave, and 585 m west of Highway 15 near Mel Martin's Transfer Facility and approximately 600 m southwest of the Agrium Fort Saskatchewan Facility.
2	358273	5957259	95 m east of 125 Street and 1 km north of Highway 15 Near bend in River Road where it becomes 125 Street, between Dow and Keyera facilities.
3[1]	3583353	5959156	6 m east of 125 Street and 220 m north of Petrogas facility. This location was changed from the 2012 noise monitoring location in an effort to better quantify the contributions of the facilities north of the Dow facility.
4	361680	5961364	West side of Range Road 215, at intersection of entrance to substation, South of Shell Scotford facility.
5	361777	5964711	East side of Range Road 215, at intersection of unused driveway, North of Shell Scotford facility.
6	364322	5967894	East side of Range Road 213A, at intersection of road to pump jack, East of Agrium Redwater facility.
7	360235	5968660	South end of Range Road 220 (dead end), south of intersection with Township Road 564. West of Agrium Redwater facility.
8	358928	5965421	North side of Township Road 561, about halfway between Range Road 221 and dwelling at east end of Township Road 561. West of Pembina/Williams facility.
9	355872	5957574	5 m southwest of the intersection of Lamoureux Drive & Godbout Avenue, at Fort Augustus Park, across the river from Dow facility.
10	355925	5955818	30 m west of 119 Street, on North of side of Agrium Fort Saskatchewan facility truck delivery entrance.
11	358458	5963804	3 m northwest of Intersection of RR 221 and TR 560, Southwest of Pembina/Williams facility and across the river from Shell Scotford facility.
12	366660	5964360	Independent control/reference point. It was located 3 m east of RR 212 and 785 m north of TR 560.

The complete report is included as Appendix 1 of this report.

Table 2
Comparison of Measured versus Modeled (Predicted) Sound Levels

Receptor	Measured (M) and Predicted (P) Nighttime Sound Levels (Isolated dBA Leq)												Average Difference (dBA)
	Aug. 21-22			Aug. 22-23			Aug. 23-24			Aug. 24-25			
	M	P	Δ (P – M)	M	P	Δ (P – M)	M	P	Δ (P – M)	M	P	Δ (P – M)	
1	-	48.8	-	-	51.3	-	50.7	51.0	0.3	50.0	51.2	1.2	0.8
2	53.8	54.1	0.3	56.3	55.5	-0.8	-	55.0	-	-	55.2	-	-0.2
3	49.3	49.9	0.6	48.1	46.3	-1.8	-	45.5	-	-	45.8	-	-0.6
4	40.3	47.0	6.7	50.5	50.5	0.0	-	49.9	-	-	50.1	-	3.4
5	54.5	56.3	1.8	53.4	53.2	-0.2	-	52.5	-	-	52.8	-	0.8
6	47.1	40.0	-7.1	43.0	38.1	-4.9	-	37.5	-	-	37.8	-	-6.0
7	-	36.7	-	-	35.7	-	N/A	34.9	N/A	N/A	35.2	N/A	N/A
8	-	45.1	-	-	44.8	-	48.1	44.4	-3.7	47.6	44.5	-3.1	-3.4
9	-	48.9	-	-	45.8	-	47.4	45.0	-2.4	46.3	45.3	-1.0	-1.7
10	54.4	57.5	3.1	55.8	55.2	-0.6	-	54.8	-	-	55.0	-	1.3
11	-	38.3	-	-	39.5	-	44.0	38.7	-5.3	40.1	39.0	-1.1	-3.2

Locations 1, 2, 3, 5, 9 and 10:

At these locations, the predicted and measured values are well within the accuracy of the Regional Model and show good agreement.

Location 4:

As we saw last year, location 4 (on the first night; August 21-22) shows a significant discrepancy between the modeled value and the measured value, however shows excellent agreement on the second night (August 22-23). For the first night, the discrepancy shows the modeled result being higher than the measured result by some 6.7 dBA. As the wind was blowing from the south (to the plant and not from the plant) it is believed that the noise is attenuated with a wind from the south. It is therefore believed that the second night is more representative of the sound levels from this site. aci comments on this discrepancy in their field report, attached as Appendix 1. Further, additional work performed by aci at this location will be reported on separately.

Location 6:

For this location, the two measured values are higher than the model predictions by some 6 dBA or so (on average). This monitoring location is dominated by Agrium Redwater. Further investigation of this discrepancy is necessary to ascertain what the cause might be.

Location 7:

This location was dominated by construction noise from the North West Redwater Partnership build and therefore a comparison to the predicted sound levels was not completed.

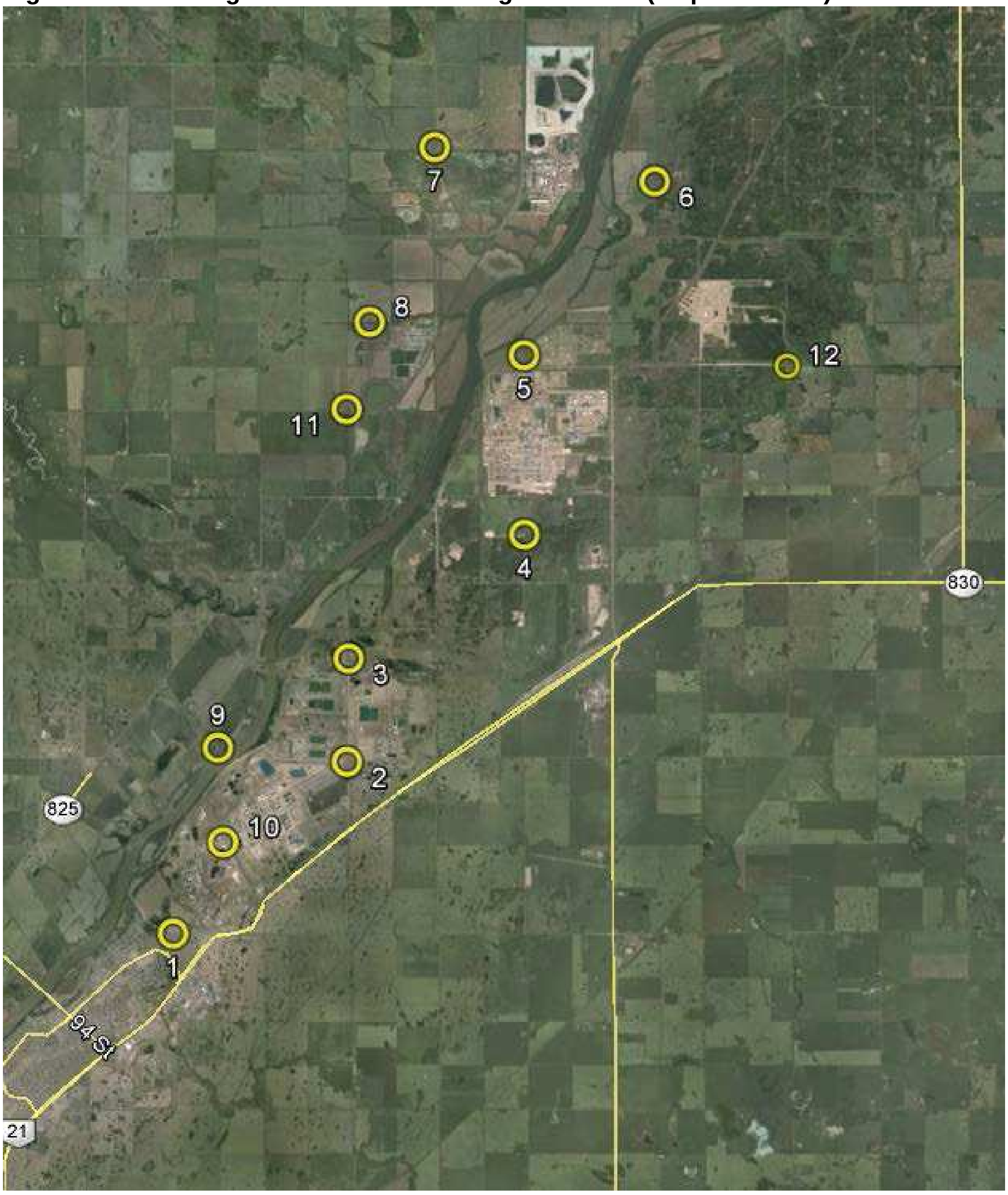
Locations 8 and 11:

At these locations, the noise was predominantly from the Pembina/Williams facility (see aci report) and as we know that additional noise sources have been added to that site, the site model used for these comparisons is not current, and therefore we would expect the predicted sound levels to be less than the measured values, which is what we see. It is worth noting that the average discrepancy is just outside the accuracy of the model.

Overall:

Overall, for most locations (excepting location 4 on the first night and location 6 on both nights) reasonable agreement was found between the measured sound levels and those predicted by the regional noise model.

Figure 1: NCIA Regional Noise Monitoring Locations (as per Table 1)



4 NCIA Member Compliance

Table 3 summarizes the compliance requirements for NCIA member and non-member companies vis a vis the NCIA RNMP.

Table 3
Compliance Requirements for NCIA Member Companies

NCIA Member	AER Regulated	RNMP Participant	Compliance Vehicle
Yes	Yes	Yes	NCIA - RNMP
No	Yes	No	AER to Determine
Yes	No	No	Municipality/AESRD
Yes	No	Yes	NCIA - RNMP
No	No	Yes	Potential NCIA-RNMP
No	No	No	Other Regulatory Jurisdictions

As of this date, Table 4 summarizes the NCIA member companies and their status with respect to Table 3 above.

Table 4
Summary of NCIA Member Company Information for RNMP

NCIA Member[1]	AER Regulated Status for Noise Control Directive 038	Filed an Annual Update with NCIA for 2013 (Appendix 3)	Developed a Site Noise Management Plan
Access Pipeline	AER regulated under Noise Control Directive 038.	Yes	Not Yet
Agrium Fort Saskatchewan	Not regulated	Yes	Yes
Agrium Redwater	Not regulated	Yes	Yes
Air Liquide Canada	Not regulated	Yes	Partly
ATCO Power	Hearland facility not operational.	Yes	Not Yet
Aux Sable Canada	Regulated under Section 11 of the OSCA and therefore D-038.	Yes	Yes

NCIA Member[1]	AER Regulated Status for Noise Control Directive 038	Filed an Annual Update with NCIA for 2013 (Appendix 3)	Developed a Site Noise Management Plan
BA Energy	Not operational, but will be regulated.	No	Not Yet
Canexus	Not regulated	No	Not Yet
Chemtrade West	Not regulated	Yes	Yes
Dow Chemical Canada	Regulated under D-038 Operator No. 0F05	Yes	Yes[2]
Enbridge Pipelines	Is regulated	Yes	Yes
Evonik	Not regulated	Yes	Partly
Fort Hills Energy Partnership	Not operational but will be regulated Operator No. 0XP9	No	Not Yet
Keyera Corp.	Regulated under D-038 Operator No. A5W1 LSD - 02-14-055-22W4 Facility No. F-12695	Yes	Yes
ME Global	Not regulated	Included with Dow's submission	Yes
North West Redwater Partnership	Not operational but will be regulated. LSD - E1/2-18-56-21-W4M	Yes	Not Yet
Oerlikon Metco (Canada)	Not regulated	Yes	Yes
Pembina NGL Corporation	Regulated under D-038	Yes	Yes
Plains Midstream Canada	Regulated under D-038 Operator No. 60 LSD - 14-55-22 W4M Facility No. 12699	Yes	Yes
Praxair Canada	Not regulated	Yes	Partly
Shell Chemicals	Not regulated	Yes	Yes
Shell Refinery	Regulated under Section 11 of the OSCA and therefore Noise Control Directive 038. AER Approval No. 11640.	Yes	Yes
Shell Upgrader	AER Approval No. 8522 regulated under D-038.	Yes	Yes
Sherritt International	Not regulated	Yes	Yes
Sasol Canada	Not operational but will be regulated	No	Not Yet

NCIA Member[1]	AER Regulated Status for Noise Control Directive 038	Filed an Annual Update with NCIA for 2013 (Appendix 3)	Developed a Site Noise Management Plan
Tervita Corporation	Not operational and is regulated by NRCB and subject to D-038.	No	Not Yet
Umicore Canada	Not Regulated	Yes	Yes
Williams Canada	PDH Not Operational	No	No

[1] **Bold** type in the above table signifies that these members have operational assets on the ground within Alberta's Industrial Heartland. Non-bold type means these companies are members, but do not have operational assets, at this time, in the region and were therefore not required to complete the annual input form, although some did provide updates on their projects.

[2] Dow's site leader conducted a site management system review in November of 2013. No actions or gaps were identified related to the Noise Management Plan.

5 Regional Noise Model

5.1 Improvements/Corrective Actions implemented in 2013 (Appendix 3)

1. For Keyera Corp. the product injection pump project described in the 2013 report was completed in 2013. A Noise Impact Assessment completed in the design phase of that project resulted in several modifications to the proposed pump installation, including an acoustically treated building and low noise valves. A brine storage pond was also constructed in 2013, which provides some sound attenuation in the northwest portion of the site.
2. At the Pembina Redwater site, additional equipment was added and the site noise model was updated and will be incorporated in the 2014 Regional Noise Model update and reported on in the 2015 annual report.
3. At the Plains Midstream Canada site construction activities began on the Phase 1 Expansion project in 2013. This development began with earth works for a new facility brine pond. The expansion has resulted in the site conducting a noise impact assessment which was subsequently used to update the site Noise Model and will be included in the Regional Noise Model update of 2014.
4. Sherritt International completed work on some piping modifications and vent pot modifications resulting in a decrease in noise being measured off the site. These changes will be included in the Regional Noise Model update occurring in 2014.
5. Changes made to a Dow site steam turbine in 2012 have resulted in significantly less venting of a seasonally operated steam vent during the summer season. In 2013, operation of this steam vent was reviewed. Since the spring 2012 turnaround, Dow has seen a significant decrease in the number of days that this steam vent is open. However the

intensity of the venting remains similar to prior to the turnaround. Since the intensity remains the same, Dow did not monitor noise from this vent in 2013.

5.2 Other Items for Follow-up Based on 2013 Field Measurements

1. Discrepancy between measured versus predicted sound levels at monitoring location #4 will be investigated further and reported on as part of next year's annual filing (see Appendix 1).

5.3 Next Steps for 2014

1. Once all of these model updates are completed (targeting Fall of 2014), the output files will be regenerated and made available to NCIA member companies by way of our Share Point site and will be available in both SoundPlan and CadnaA.
2. Update the Google Earth platform (for new company names and updated site models) and make it publicly available on the NCIA website for calm wind conditions.

6 Next Steps

- Document procedure that is being used for accessing the Regional Model outputs for both NCIA member companies and non-member companies.

APPENDIX 1

2013 Field Validation Monitoring Report

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Environmental Noise Survey

For The

Regional Noise Model Annual Field Validation Monitoring

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APEGGA Permit to Practice #P7735

aci Project #: 13-043
November 13, 2013

Executive Summary

aci Acoustical Consultants Inc., of Edmonton AB, was retained by the Northeast Capital Industrial Association (NCIA) to conduct an environmental noise survey within Alberta's Industrial Heartland (AIH). The purpose of the study was to conduct a single 48-hour noise monitoring at eleven (11) pre-specified locations within the AIH. An additional noise monitoring, spanning two (2) 48-hour periods, was conducted at a 12th monitoring location (which was determined by aci in consultation with the NCIA) as an independent control/reference point. The noise monitorings were conducted in support of the NCIA's Regional Noise Management Plan. In addition, the results from these noise monitorings will be used to validate the Regional Noise Level Assessment Model. All noise monitoring procedures and equipment used was in accordance with the requirements of the Alberta Energy Regulator (AER) Directive 038 on Noise Control. Site work was conducted for aci in August, 2013 by P. Froment, B.Sc., B.Ed. and S. Bilawchuk, M.Sc., P.Eng.

As part of the study, a total of thirteen (13) 48-hour noise monitorings were conducted throughout the Alberta's Industrial Heartland. Due to almost "ideal" weather conditions, the isolated L_{eq}Night dBA levels were relatively consistent throughout/between the two night-time periods for a majority of the noise monitoring locations. The noise levels at most locations consisted of low frequency components with occasional mid/high frequency components that could be attributed to the nearest facility relative to each individual noise monitoring location. Despite the noise being relatively low in frequency, none of the sites indicated any low frequency tonal components. Lastly, the noise from train passages were prevalent at all locations and tended to dominate the noise climate as they passed through, particularly when there were train whistles.

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1.0 Introduction

aci Acoustical Consultants Inc., of Edmonton AB, was retained by the Northeast Capital Industrial Association (NCIA) to conduct an environmental noise survey within Alberta's Industrial Heartland (AIH). The purpose of the study was to conduct a single 48-hour noise monitoring at eleven (11) pre-specified locations within the AIH. An additional noise monitoring, spanning two (2) 48-hour periods, was conducted at a 12th monitoring location (which was determined by aci in consultation with the NCIA) as an independent control/reference point. The noise monitorings were conducted in support of the NCIA's Regional Noise Management Plan. In addition, the results from these noise monitorings will be used to validate the Regional Noise Level Assessment Model. All noise monitoring procedures and equipment used was in accordance with the requirements of the Alberta Energy Regulator (AER) Directive 038 on Noise Control. Site work was conducted for aci in August, 2013 by P. Froment, B.Sc., B.Ed. and S. Bilawchuk, M.Sc., P.Eng.

2.0 Location Description

Alberta's Industrial Heartland (AIH) is located northeast of Edmonton, AB and extends into five different municipalities as shown in Figure 1. This includes 533 km^2 within the City of Fort Saskatchewan and the Counties of Lamont, Strathcona and Sturgeon, in addition to 49 km^2 in the City of Edmonton's "Edmonton Energy and Technology Park". The area has 40+ companies in various sectors that include producing and processing oil, gas and petrochemicals in addition to advanced manufacturing.

Topographically, the AIH does have some varying elevation changes however in general it can be considered relatively flat with no substantial hills. Areas with more significant changes in elevation are found adjacent to the North Saskatchewan River (the River) which divides the AIH from the southwest to the northeast (excluding the AIH area within the City of Edmonton's limits). The vegetation varies from open grain fields to thick dense vegetation. Due to the relative distance from the noise monitoring locations to the nearby facilities (with the exception of Monitor Location 12) and the relatively low frequency nature of the industrial noise, the level of vegetative sound absorption is considered negligible to low.

3.0 Measurement Methods

As part of the study, a total of thirteen (13) 48-hour noise monitorings were conducted at 12 locations[1] throughout the AIH, as shown in Figure 2. With the exception of Locations 3[2] and 12, the noise monitoring locations were identical to those identified in the "*Report on 2012 Noise Monitoring Results, NCIA Regional Noise model Project*" prepared for the NCIA by HFP Acoustical Consultants Corp. on March 4, 2013.

The noise monitorings were conducted collecting broadband A-weighted and C-weighted as well as 1/3 octave band sound levels and were conducted during "typical" operations at all facilities[3]. In particular, the chosen noise monitoring periods avoided any major shut-downs or outages that could adversely affect the "typical" noise levels (either louder or quieter) from a given facility. In addition, the monitorings were conducted in summer conditions (i.e. no snow cover) with little to no precipitation and low wind-speeds. Each noise monitoring was accompanied by a 48-hour digital audio recording for more detailed post process analysis. Three local weather monitoring stations were also used throughout all noise monitoring periods to obtain the wind speed, wind direction, temperature, relative humidity and rain fall data in 1-minute sampling periods. The barometric pressure was obtained from Environment Canada. Lastly, it should be noted that all measurements were performed in accordance with the methods described in the AER Directive 038 on Noise Control.

[1] Once again, please note that two (2) 48-hour monitorings were conducted at Monitoring Location 12.
[2] The reason for change in location for Location 3 will be discussed in the monitoring location description.
[3] This was verified by all of the various company representatives.

4.0 Noise Monitoring Location Description

In addition to Table 1, which provides the UTM coordinates and the start and end times for each noise monitoring, a brief discussion of each noise monitoring location can be found below. All noise measurement instrumentation was calibrated at the start of the measurements and then checked afterwards to ensure that there had been no significant calibration drift over the duration of the measurements. Refer to Appendix I for a detailed description of the measurement equipment used and for all calibration records.

Table 1. Noise Monitoring Locations with Start and End Times

Monitoring Location	UTM Coordinates (Approximate)		Start Time	End Time
	Easting (m)	Northing (m)		
1	354954	5954151	8-23-13, 14:00	8-25-13, 14:00
2	358273	5957259	8-21-13, 13:00	8-23-13, 13:00
3[1]	358353	5959156	8-21-13, 14:00	8-23-13, 14:00
4	361680	5961364	8-21-13, 14:00	8-23-13, 14:00
5	361777	5964711	8-21-13, 14:30	8-23-13, 14:30
6	364322	5967894	8-21-13, 15:30	8-23-13, 15:30
7	360235	5968660	8-23-13, 18:00	8-25-13, 18:00
8	358928	5965421	8-23-13, 18:00	8-25-13, 18:00
9	355872	5957574	8-23-13, 19:00	8-25-13, 19:00
10	355925	5955818	8-21-13, 13:00	8-23-13, 13:00
11	358458	5963804	8-23-13, 19:00	8-25-13, 19:00
12a[2]	366660	5964360	8-21-13, 16:00	8-23-13, 16:00
12b			8-23-13, 16:00	8-25-13, 16:00

4.1. Noise Monitor Location 1

The noise monitor at Location 1 was located approximately 3 m south of 100 Avenue and approximately 585 m west of Highway 15 as shown in Figure 2 and Figure 3. This put the noise monitor approximately 15 m east of the entrance to Mel Martin's Transfer Facility and approximately 600 m southwest of the Agrium Fort Saskatchewan Facility. This was the southernmost noise monitoring location found within the AIH. At this location, there was direct line-of-sight to 100 Avenue, Mel Martin's Transfer Facility and the Agrium Fort Saskatchewan Facility. There was no significant vegetation between the noise monitor and the Agrium facility to the northeast.

[1] Different from the 2012 noise monitoring.
[2] New location for 2013.

4.2. Noise Monitor Location 2

The noise monitor at Location 2 was located approximately 95 m east of 125 Street and approximately 1.0 km north of Highway 15 as shown in Figure 2 and Figure 4. This put the noise monitor approximately 120 m west of the Dow yard, 170 m north of the Dow rail yard and approximately 850 m east-southeast of the Keyera Facility. At this location, there was direct line-of-sight to Dow's main site to the east and to the rail yard to the south. There was no significant vegetation between the noise monitor and the aforementioned facilities.

4.3. Noise Monitor Location 3

The noise monitor at Location 3 was located approximately 6 m east of 125 Street and approximately 220 m north of the entrance to the Petrogas entrance as shown in Figure 2 and Figure 5. This put the noise monitor approximately 270 m northwest of the Petrogas facility and approximately 650 m east of the Plains Midstream Facility. At this location, there was no direct line-of-sight to any of the facilities due to the topography of the area. There was no significant vegetation between the noise monitor and the aforementioned facilities. This noise monitoring location was changed from the 2012 noise monitoring (entrance to the Keyera facility) in an effort to better quantify the contributions of the facilities north of the primary Dow facility.

4.4. Noise Monitor Location 4

The noise monitor at Location 4 was located approximately 725 m south of the south fence line of the Shell Scotford site and approximately 1.6 km east of 130 Street as shown in Figure 2 and Figure 6. This put the noise monitor at the entrance to the electrical substation to the west. At this location, there was direct line-of-sight to the Shell Scotford site and to the electrical substation to the west. There was no significant vegetation between the noise monitor and the Shell Scotford facility.

4.5. Noise Monitor Location 5

The noise monitor at Location 5 was located approximately 200 m north of Township Road 560A and 5 m east of Range Road 215 as shown in Figure 1 and Figure 7. This put the noise monitor approximately 300 m north of the north fence line for the Shell Scotford facility and approximately 135 m west of an industrial yard to the east. At this location, there was direct line-of-sight to the Shell Scotford site but not the industrial yard (due to the topography of the area). There was no significant vegetation between the noise monitor and the Shell Scotford facility.

4.6. Noise Monitor Location 6

The noise monitor at Location 6 was located approximately 1.0 km north of Township Road 562 and 3 m east of Range Road 213A as shown in Figure 1 and Figure 8. This put the noise monitor approximately 1.6 km east of the Agrium Redwater facility. Due to favorable topography between the noise monitor and Agrium there was direct line-of-sight to the Agrium site through a small row of deciduous trees across the road. There was no significant vegetation between the noise monitor and the Agrium facility. Note also that a weather monitor was placed at this location, adjacent to the noise monitor.

4.7. Noise Monitor Location 7

The noise monitor at Location 7 was located approximately 1.7 km north of Highway 643 (westbound) and 1.6 km west of Highway 643 (southbound) as shown in Figure 2 and Figure 9. Construction has commenced for the Northwest Redwater Partnership (NWR) refinery. The noise monitor was placed at the north fenceline of the NWR constuction site and thus had direct line-of-sight to the construction in the adjacent southwest and southeast quarter sections of land. The noise monitor also had direct line-of-sight to the Agrium Redwater facility (approximately 1.8 km east) and to the Evonik Gibbons facility (1.2 km southwest). There was no significant vegetation between the noise monitor and the aforementioned facilities. Note also that a weather monitor was placed at this location, adjacent to the noise monitor.

4.8. Noise Monitor Location 8

The noise monitor at Location 8 was located approximately 1.6 km south of Highway 643 (eastbound) and 400 m east of Range Road 221 as shown in Figure 2 and Figure 10. This put the noise monitor approximately 15 m north of the north fence line for the Pembina/Williams facility. At this location, there was direct line-of-sight to the Pembina/Williams site through a thin row of deciduous trees. There was no significant vegetation between the noise monitor and the aforementioned facilities[1].

4.9. Noise Monitor Location 9

The noise monitor at Location 9 was located approximately 5 m southwest of the intersection of Lamoureux Drive and Godbout Avenue as shown in Figure 2 and Figure 11. This put the noise monitor approximately 1.3 km northwest of the major structures at the Dow facility and approximately 1.4 km west of the Keyera facility. Due to favorable topography, there was direct line-of-sight to the facilities

[1] It should be noted that, although there appears to be a significant amount of vegetation around the noise monitor in Figure 10, this amount of vegetation is neither thick, nor dense enough to have significant impact on the results at this location.

across the River through a thin row of deciduous trees[1]. Despite the thin row of trees there was no significant vegetation between the noise monitor and the aforementioned facilities.

4.10. Noise Monitor Location 10

The noise monitor at Location 10 was located approximately 30 m west of 119 Street and 12 m north of the access road to the Agrium Fort Saskatchewan facility as shown in Figure 2 and Figure 12. This put the noise monitor approximately 750 northeast of the major structures at the Agrium facility and approximately 180 m west of the west fence-line of the Dow facility. There was direct line-of-sight to the Dow facility but not to the Agrium facility (due to the topography of the area). There was no significant vegetation between the noise monitor and the aforementioned facilities. Note also that a weather monitor was placed at this location, adjacent to the noise monitor.

4.11. Noise Monitor Location 11

The noise monitor at Location 11 was located approximately 3 m northwest of the intersection of Range Road 221 and Township Road 560 as shown in Figure 2 and Figure 13. This put the noise monitor approximately 1.7 km southwest of the major structures at the Pembina/Williams facility and approximately 330 m west of the Pembina/Williams rail yard. At this location, there was direct line-of-sight to the Pembina/Williams facility but not to the rail yard (due to the topography of the area). In addition, during the setup and takedown of the noise monitor, there was an internal combustion engine and pump operating that was drawing water from a nearby retention pond. This equipment was approximately 60 m to the south of the noise monitor. There was no significant vegetation between the noise monitor and the aforementioned facilities.

4.12. Noise Monitor Location 12

The noise monitor at Location 12 was the independent control/reference point. It was located approximately 3 m east of Range Road 212 and 785 m north of Township Road 560 as shown in Figure 2 and Figure 14. This put the noise monitor approximately 20 m south of the CP rail line and approximately 2.0 km southeast of the Enbridge facility. At this location, there was direct line-of-sight to the rail line. The noise monitor was bordered on all sides by a combination of dense vegetation and open grassy fields. Due to the distance from the noise monitor to the existing major facilities within the AIH, the vegetative absorption between the noise monitor and these facilities would be considered significant. Note also that a weather monitor was placed at this location, adjacent to the noise monitor.

[1] This was particularly observable during the night-time period.

5.0 Equivalent Sound Level & Statistical Descriptors

Environmental noise levels from industry are commonly described in terms of equivalent sound levels or L_{eq}. This is the level of a steady sound having the same acoustic energy, over a given time period, as the fluctuating sound. The concept is that the same amount of annoyance occurs from a sound having a high level for a short period of time as from a sound at a lower level for a longer period of time. In addition, this energy averaged sound level is often A-weighted to account for the reduced sensitivity of average human hearing to low frequency sounds and/or C-weighted to allow for more low frequency noise to be considered. These L_{eq} in dBA/dBC, which are the most common environmental noise measure, are often given for day-time (07:00 to 22:00) L_{eq}Day and night-time (22:00 to 07:00) L_{eq}Night while other criteria use the entire 24-hour period as L_{eq}24.

Another method of conveying long term noise levels utilizes statistical descriptors. These are calculated from a cumulative distribution of the sound levels over the entire measurement duration and then determining the sound level at xx % of the time. These descriptors can be used to provide a more detailed analysis of the varying noise climate.

For purposes of this study, the following equivalent sound levels and statistical descriptors will be presented and discussed:

L_{eq}Day	- Measured over the day-time (07:00 – 22:00)
L_{eq}Night	- Measured over the night-time (22:00 – 07:00)
L_{10}	- Sound level that was exceeded only 10% of the time. - Good measure of intermittent or intrusive noise
L_{50}	- Sound level that was exceeded 50% of the time (arithmetic average) - Good to compare to L_{eq} to determine steadiness of noise
L_{90}	- sound level that was exceeded 90% of the time - Good indicator of typical “ambient” noise levels

For further information refer to Appendix II for a description of the acoustical terminology and Appendix III for a list of common noise sources and their associated noise levels.

6.0 Results and Discussion

6.1. Environmental Noise Monitorings

The results of the thirteen (13) 48-hour noise monitorings can be found in Table 2[1] and are presented in Figures 15 – 117. The figures include the 1-minute broadband dBA and dBC L_{eq} sound levels[2], 1-hour dBA and dBC, L_{90}, L_{50}, L_{10} sound levels[3] and the 1/3 octave band L_{eq} sound levels[3] for each noise monitoring location. Table 2 provides results of each of the three daytime periods in addition to the isolated and non-isolated values for the two night-time periods. The isolation analysis for the night-time periods was performed in accordance with Section 4.3.2 of the AER Directive 038. A list of all non-typical noise events removed from each of the thirteen noise monitorings can be found in Appendix IV. In addition, all subjective observations made on-site during each daytime and night-time visit can be found in Appendix VI. Each event that was removed has been dated with its corresponding time period as well as the rationale for its removal. A detailed discussion of the results for each monitoring location can be found below.

Table 2. L_{eq} 24-Hour Results

Noise Monitoring Location	1st Daytime Period	1st Night-time Period (Non-Isolated)	1st Night-time Period (Isolated)	2nd Daytime Period	2nd Night-time Period (Non-isolated)	2nd Night-time Period (Isolated)	3rd Daytime Period
	L_{eq}Day (dBA)	L_{eq}Night (dBA)		L_{eq}Day (dBA)	L_{eq}Night (dBA)		L_{eq}Day (dBA)
1	61.3	54.5	50.7	56.6	54.1	50.0	53.8
2	53.0	54.2	53.8	54.4	56.7	56.3	56.2
3	52.1	51.4	49.3	51.9	52.7	48.1	51.7
4	43.7	42.2	40.3	43.6	50.8	50.5	50.4
5	53.9	54.7	54.5	54.1	54.0	53.4	53.6
6	51.8	47.7	47.1	54.5	44.2	43.0	55.1
7	54.7	57.4	N/A	58.7	56.3	N/A	57.6
8	48.6	48.6	48.1	44.8	47.7	47.6	45.5
9	49.9	50.0	47.4	46.4	47.5	46.3	54.6
10	53.0	55.3	54.4	54.7	56.3	55.8	56.7
11	48.1	47.8	44.0	46.7	45.1	40.1	46.2
12 (Period 1)	40.5	61.5	39.8	60.7	72.4	36.5	57.7
12 (Period 2)	59.2	57.4	32.2	65.0	64.2	36.6	61.4

[1] The results of each location will be discussed individually.
[2] The data indicated in the 1-minute L_{eq} traces shows the isolated night-time results, after removal of non-typical noise levels. This was done to indicate the relative steadiness of the noise levels and to make it easier to view the night-time data.
[3] Isolated and Non-isolated values are presented.

6.1.1. Noise Monitoring Location 1

The results of the noise monitoring conducted at Location 1 are provided in Table 2 and in Figures 15 - 22. The isolated L_{eq}Night values from Table 2 and the traces found in Figures 15 – 18 indicate relatively consistent noise levels throughout & between both night-time periods. The L_{10} values in Figures 19 – 20 indicate a high number of short intermittent events (particularly between 05:00 – 07:00) which can be attributed to the local traffic along 100 Avenue. The 1/3 octave band L_{eq} sound levels are relatively broadband with a decrease in the higher frequencies (2 kHz and above) and an elevated peak in the 25 Hz band. This is consistent with subjective observations made on-site which indicated low frequency noise emanating from the Agrium and Sheritt facilities to the northeast.

6.1.2. Noise Monitoring Location 2

The results of the noise monitoring conducted at Location 2 are provided in Table 2 and in Figures 23 - 30. The isolated L_{eq}Night values and the traces found in Figures 23 – 26 indicate relatively consistent noise levels throughout both night-time periods. There were however, several short duration increases in noise levels during both night-time monitoring periods. Based on subjective observations made on-site, in conjunction with the audio recording and the 1/3 octave band data, these short "spikes" in noise level can be attributed to the Dow Meter Station found approximately 135 m northeast of the monitor. In addition, it was noted that there was a significant amount of noise from the Dow rail yard to the south. The noise varied from the shunting of train cars to the revving of the train engines (observed during the first night-time site visit). The rail yard noise is consistent with observations made in the report entitled, "*Report on 2012 Noise Monitoring Results, NCIA Regional Noise Model Project*" prepared for the NCIA by HFP Acoustical Consultants Corp. on March 4, 2013. Lastly, when noise contributions from the Dow Meter Station and the rail yard were not present the noise at the noise monitor location was relatively broadband and largely from the east-northeast (Dow's primary facility).

6.1.3. Noise Monitoring Location 3

The results of the noise monitoring conducted at Location 3 are provided in Table 2 and in Figures 31 - 38. The isolated L_{eq}Night values and the traces found in Figures 31 – 34 indicate relatively consistent noise levels throughout both night-time periods. This was particularly true for the August 21 - 22, 2013 night-time period in which there was very little fluctuation in the isolated A-weighted noise levels. The L_{10} values in Figures 35 – 36 indicate a high number of short intermittent events (particularly after 06:00) which can be attributed to the local traffic along 125 Street and to several train passages along the rail line to the north. As indicated in Figures 37 – 38, the 1/3 octave band noise levels are relatively broadband, particularly in the mid-frequency bands with elevated noise levels in the lower (below 50 Hz) and higher frequency bands (8 – 12.5 kHz). This is consistent with subjective observations made on-site which indicated low frequency noise emanating from the south-southeast and high frequency noise from crickets in the nearby fields.

6.1.4. Noise Monitoring Location 4

The results of the noise monitoring conducted at Location 4 are provided in Table 2 and in Figures 39 - 46. The traces found in Figures 39 – 42 indicate relatively consistent noise levels throughout each night-time period. However, as indicated in Table 2, the overall noise levels vary significantly between the two night-time periods (10.2 dBA). Subjective observations during the August 21 – 22, 2013 night-time site visit indicated that the noise from the Shell Scottford facility (heard earlier during the initial setup) was not audible. Noise from the Shell Scottford facility was clearly audible the following night (August 22 – 23, 2013) and it is likely that the measured noise levels during the second night-time period are more indicative of the typical noise climate of the area. Operational information provided by Shell did not indicate a difference from one night to the next (particularly for equipment at the southern portion of the Shell Scottford facility), so additional operational information may be required. It is also important to note that the wind was light out of the south for the first night and even calmer out of the east for the second night, which may have had an impact on the measured results, however, the extent cannot be quantified. The 1/3 octave band L_{eq} sound levels indicate elevated noise levels in the lower frequency bands that gradually decrease as the frequency increases.

6.1.5. Noise Monitoring Location 5

The results of the noise monitoring conducted at Location 5 are provided in Table 2 and in Figures 47 - 54. The isolated L_{eq}Night values and the traces found in Figures 47 – 50 indicate relatively consistent noise levels throughout both night-time periods. This is further confirmed in Figures 51 – 52 where there is very little difference between the L_{10},L_{50} and L_{90} values which indicates that noise levels were relatively steady and are reflective of typical noise levels. The stability of the measured noise levels can be attributed to the proximity of the noise monitor to the Shell Scottford facility which was the most dominant noise source. The 1/3 octave band L_{eq} sound levels indicate elevated noise levels in the lower frequency bands that gradually decrease as the frequency increases.

6.1.6. Noise Monitoring Location 6

The results of the noise monitoring conducted at Location 6 are provided in Table 2 and in Figures 55 - 62. The isolated L_{eq}Night dBA values and the traces for the August 21 – 22, 2013 night-time monitoring period indicate noise levels that vary more significantly (11.9 dBA), in comparison to other locations. This variance could possibly be attributed to activities at the Agrium facility (though this has not been corroborated with the operating conditions of the Agrium facility during this monitoring period). The L_{eq}Night dBA values and the traces for the August 22 – 23, 2013 night-time monitoring period indicate noise levels that are more consistent throughout. Subjectively, the dominant noise source at this location was the Agrium facility to the west of the noise monitoring location. The noise was subjectively broadband with a slightly louder lower frequency content (below 100 Hz) which was confirmed in examining the 1/3 octave band L_{eq} traces.

6.1.7. Noise Monitoring Location 7

The results of the noise monitoring conducted at Location 7 are provided in Table 2 and in Figures 63 - 69. It should be noted that an isolation analysis was not conducted for this monitoring location due to the 24-hour construction activity at the NWR refinery which was found directly southeast – southwest of the noise monitor. The noise from the construction activities completely dominated any noise from the Agrium and Evonik facilities. Despite the inability to measure the contributions of the Agrium and Evonik facilities the results from this monitoring location provide a good indication of typical construction noise levels and composition (1/3 octave band L_{eq} sound levels), particularly at the early stages of earthwork. If the intent of this noise monitoring location is to capture the contributions of the Agrium and Evonik facilities, it is recommended that a more suitable location be selected in future noise surveys.

6.1.8. Noise Monitoring Location 8

The results of the noise monitoring conducted at Location 8 are provided in Table 2 and in Figures 70 - 77. The isolated L_{eq}Night values and the traces found in Figures 70 – 73 indicate relatively consistent noise levels throughout both night-time periods. This is further confirmed in Figures 74 – 75 where there is very little difference between the L_{10},L_{50} and L_{90} values which indicates that noise levels were relatively steady and are reflective of typical noise levels. The stability of the measured noise levels can be attributed to the proximity of the noise monitor to the Pembina/Williams facility which was subjectively the most dominant noise source. As indicated in the 1/3 octave band L_{eq} traces, the noise levels are relatively broadband, particularly in the mid-frequency bands with elevated noise levels in the lower frequency bands. Figure 77 indicates relatively high noise levels in the 10 – 12.5 kHz frequency bands which can be attributed to crickets in the nearby fields. There was flaring observed at the Pembina/Williams during the August 24 – 25, 2013 night-time site visit, however, flaring is typically a low - mid frequency noise source.

6.1.9. Noise Monitoring Location 9

The results of the noise monitoring conducted at Location 9 are provided in Table 2 and in Figures 78 - 85. The isolated L_{eq}Night values and the traces found in Figures 78 – 81 indicate relatively consistent noise levels throughout both night-time periods. This is further confirmed in Figures 82 – 83 where there is very little difference between the L_{10},L_{50} and L_{90} values which indicates that noise levels were relatively steady and are reflective of typical noise levels. With the exception of vehicle pass-by's and train passages[1] the noise climate was dominated from noise originating from the east side of the River. Subjectively, the noise was not emanating from one given direction (i.e. directly east) but instead seemed to span from the southeast to the northeast. The 1/3 octave band L_{eq} sound levels indicate elevated noise levels in the lower frequency bands that gradually decrease as the frequency increases.

6.1.10. Noise Monitoring Location 10

The results of the noise monitoring conducted at Location 10 are provided in Table 2 and in Figures 86 - 93. The isolated L_{eq}Night values and the traces found in Figures 86 – 89 indicate relatively consistent noise levels throughout both night-time periods. This is further confirmed in Figures 90 – 91 where there is very little difference between the L_{10},L_{50} and L_{90} values which indicates that noise levels were relatively steady and are reflective of typical noise levels. During all site visits it was noted that not one site dominated the noise climate of the area. Instead noise was distinctly audible from each site and was amplified when any particular facility was upwind from the noise monitoring location. The 1/3 octave band L_{eq} sound levels indicate elevated noise levels in the lower frequency bands that gradually decrease as the frequency increases.

6.1.11. Noise Monitoring Location 11

The results of the noise monitoring conducted at Location 11 are provided in Table 2 and in Figures 94 - 101. The isolated L_{eq}Night dBA values from Table 2 and the traces found in Figures 94-97

[1] Consistent with the March 4, 2013HFP report.

indicate relatively consistent noise levels throughout both night-time periods. The L_{10} values in Figures 98 – 99 indicate short intermittent events which can be directly attributed to the train whistles near the noise monitor. This is further confirmed in the 1/3 octave band L_{eq} sound level traces of both night-time periods where the isolated levels are significantly less than the measured values. Subjectively the noise arriving at this monitoring location was relatively broadband with the mid/high frequencies coming from the northeast (Provident/Williams facility) while noise in the lower frequency bands were difficult to localize. The 1/3 octave band L_{eq} sound levels indicate elevated noise levels in the lower frequency bands that gradually decrease as the frequency increases.

6.1.12. Noise Monitoring Location 12

The results of the noise monitoring conducted at Location 12 are provided in Table 2 and in Figures 102 - 117. As previously mentioned, this location was the independent control/reference point. Therefore, the results from this location span both of the 48-hour monitoring periods. As seen in all of the figures, there is a significant difference between the non-isolated L_{eq}Night noise levels in comparison to the isolated L_{eq}Night noise levels. This can be attributed to the proximity of the noise monitor to the adjacent CP rail line, the number of passages throughout the night-time periods (9, 19, 8 and 12, respectively) and the length of the train passages (averaged approximately 5 minutes). When examining strictly the L_{eq}Night dBA values the noise levels are relatively consistent throughout all night-time periods, particularly for the nights of August 21 - 22 & August 22 - 23. The 1/3 octave band L_{eq} sound levels indicate a similar trace to the other monitoring locations with elevated noise levels in the lower frequency bands that gradually decrease as the frequency increases. This is consistent will subjective observations made on-site which indicated low frequency noise coming from the general direction of the Shell Scottford facility.

6.2. General Subjective Observations for Noise Monitorings

- The noise arriving at most monitor locations consisted of low frequency components with occasional mid/high frequency components that could be attributed to a nearby facility.
- Despite the noise being relatively low in frequency, none of the sites indicated any specific low frequency tonal components.
- The noise from train passages were prevalent at all locations and tended to dominate the noise climate as they passed through, particularly when there were train whistles.

- Due to almost "ideal" weather conditions (relative to the 2012 noise monitoring period) the isolated L_{eq}Night dBA levels were relatively consistent throughout/between the two night-time periods for a majority of the noise monitoring locations.
- Noise levels measured and observed at Noise Monitor Location 7 provided a good indication of typical construction noise levels and composition (1/3 octave band L_{eq} sound levels), particularly at the early stages of earthwork.

6.3. Night-time Weather Conditions

As previously mentioned, 3 local weather monitoring stations were used throughout both 48-hour noise monitoring periods to obtain the wind speed, wind direction, temperature, relative humidity and rain fall data in 1-minute sampling periods. The barometric pressure was obtained from Environment Canada at the Edmonton City Center weather station (closest station). All weather data are presented in Appendix V. A brief discussion of each night-time period can be found below. In general the weather conditions throughout all night-time monitoring periods were "ideal" with light-moderate winds and no precipitation.

6.3.1. August 21-22, 2013

The wind was relatively calm (below 5 km/hr) and from the south at each of the weather stations at the start of the night-time period (22:00). The wind slowly increased throughout the night at weather monitor location 10, peaking at 04:00 with a wind speed of approximately 20 km/hr before decreasing to below 15 km/hr for the remainder of the night-time period. The wind at weather monitor locations 6 and 12 remained relatively calm throughout the entire night-time period and (with the exception of a 3 minute span for weather monitor location 6) remained below 10 km/hr. The wind was predominantly from the south-southwest at all weather monitor locations throughout the entire night-time period. The temperature was relatively consistent and ranged from 8°C – 15 °C while the humidity ranged from 60% – 80% for weather monitor location 6, 60% – 70% for weather monitor location 10 and 75% – 90% for weather monitor location 12. The weather stations did not record any rainfall at any weather monitor location.

6.3.2. August 22-23, 2013

The wind was relatively calm (below 5.0 km/hr) at the start of the monitoring (22:00) and, with the exception of an approximately 20 minute span, remained calm (below 7.5 km/hr) throughout the entire night-time period at all weather monitor locations. The wind was not from one given direction for a significant length of time which can be attributed to the low wind speed. The temperature was relatively consistent and ranged from 8°C – 18 °C while the humidity ranged from 65% – 95% for weather monitor location 6, 65% – 90% for weather monitor location 10 and 85% – 95% for weather monitor location 12. The weather stations did not record any rainfall at any weather monitor location.

6.3.3. August 23-24, 2013

The wind was relatively calm (below 5.0 km/hr) at the start of the monitoring (22:00) and, with the exception of a brief 5 minute period for weather monitor locations 7 and 10, the wind remained below 10 km/hr throughout the entire night-time period at all weather monitor locations. The wind was not from one given direction for a significant length of time which can be attributed to the low wind speed. The temperature was relatively consistent and ranged from 15°C – 20 °C while the humidity ranged from 68% – 89% for weather monitor location 7, 65% – 85% for weather monitor location 10 and 80% – 92% for weather monitor location 12. The weather stations did not record any rainfall at any weather monitor location.

6.3.4. August 24-25, 2013

The wind was relatively calm (below 5 km/hr) at the start of the night-time period (22:00) at each weather monitor location. The wind remained below 10 km/hr for all weather monitor locations with the exception of two brief periods for weather monitor location 7 and for approximately the last hour of the night-time period for weather monitor location 10. The wind was not consistently from one given direction for a significant length of time which can be attributed to the low wind speed. The temperature was relatively consistent and ranged from 12°C – 19 °C while the humidity ranged from 60% – 90% for weather monitor location 7, 85% – 95% for weather monitor location 10 and 70% – 90% for weather monitor location 12.

7.0 Conclusion

As part of the study, a total of thirteen (13) 48-hour noise monitorings were conducted throughout the Alberta's Industrial Heartland. Due to almost "ideal" weather conditions, the isolated L_{eq}Night dBA levels were relatively consistent throughout/between the two night-time periods for a majority of the noise monitoring locations. The noise levels at most locations consisted of low frequency components with occasional mid/high frequency components that could be attributed to the nearest facility relative to each individual noise monitoring location. Despite the noise being relatively low in frequency, none of the sites indicated any low frequency tonal components. Lastly, the noise from train passages were prevalent at all locations and tended to dominate the noise climate as they passed through, particularly when there were train whistles.

8.0 References

- *Report on 2012 Noise Monitoring Results*, *NCIA Regional Noise model Project*, prepared for the NCIA by HFP Acoustical Consultants Corp., March 4, 2013.
- Alberta Energy Resources Conservation Board (ERCB), *Directive 038 on Noise Control, 2007*, Calgary, Alberta
- International Organization for Standardization (ISO), *Standard 1996-1, Acoustics – Description, measurement and assessment of environmental noise – Part 1: Basic quantities and assessment procedures, 2003*, Geneva Switzerland.
- International Organization for Standardization (ISO), *Standard 9613-1, Acoustics – Attenuation of sound during propagation outdoors – Part 1: Calculation of absorption of sound by the atmosphere, 1993*, Geneva Switzerland.
- International Organization for Standardization (ISO), *Standard 9613-2, Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation, 1996*, Geneva Switzerland.

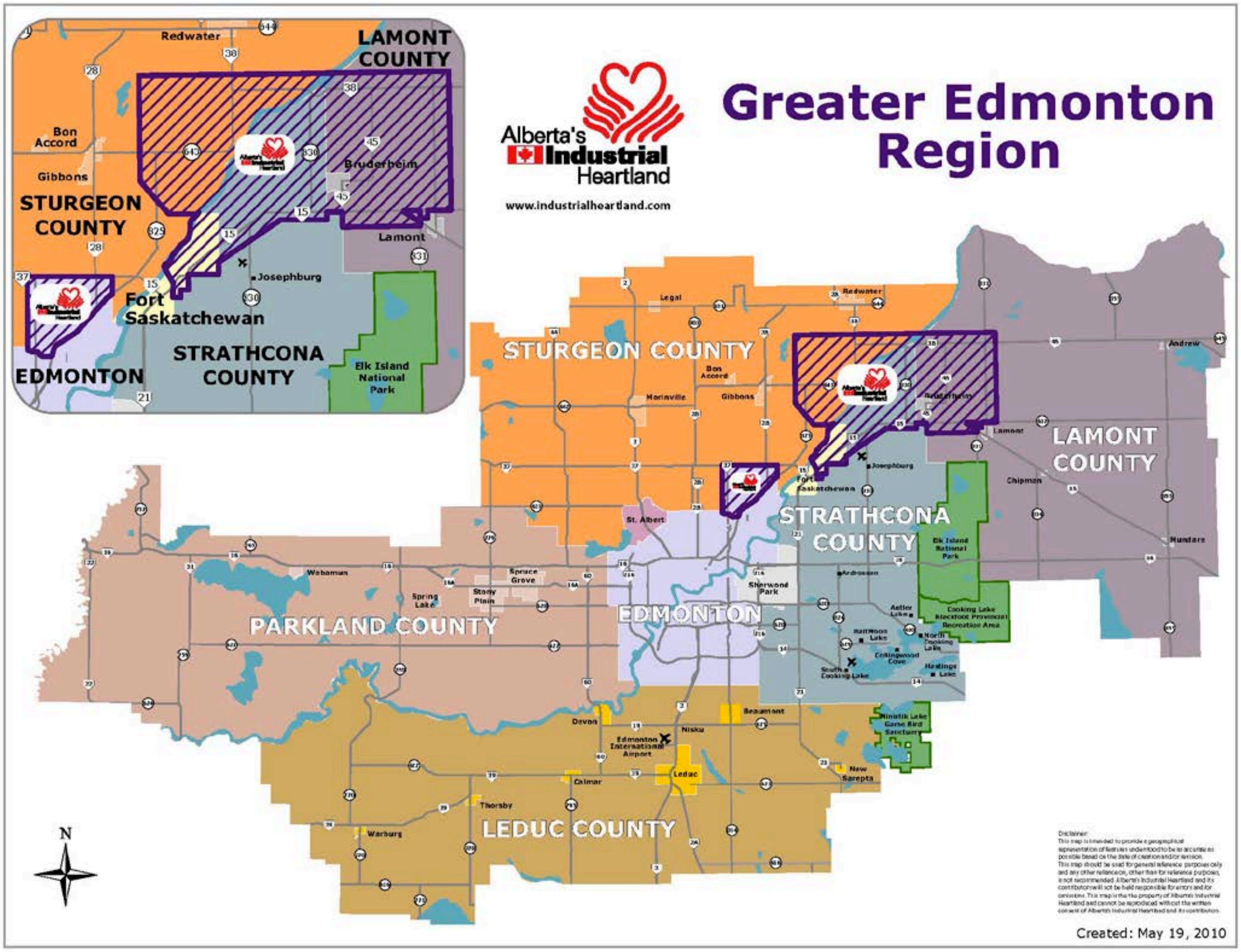

Figure 1. Study Area

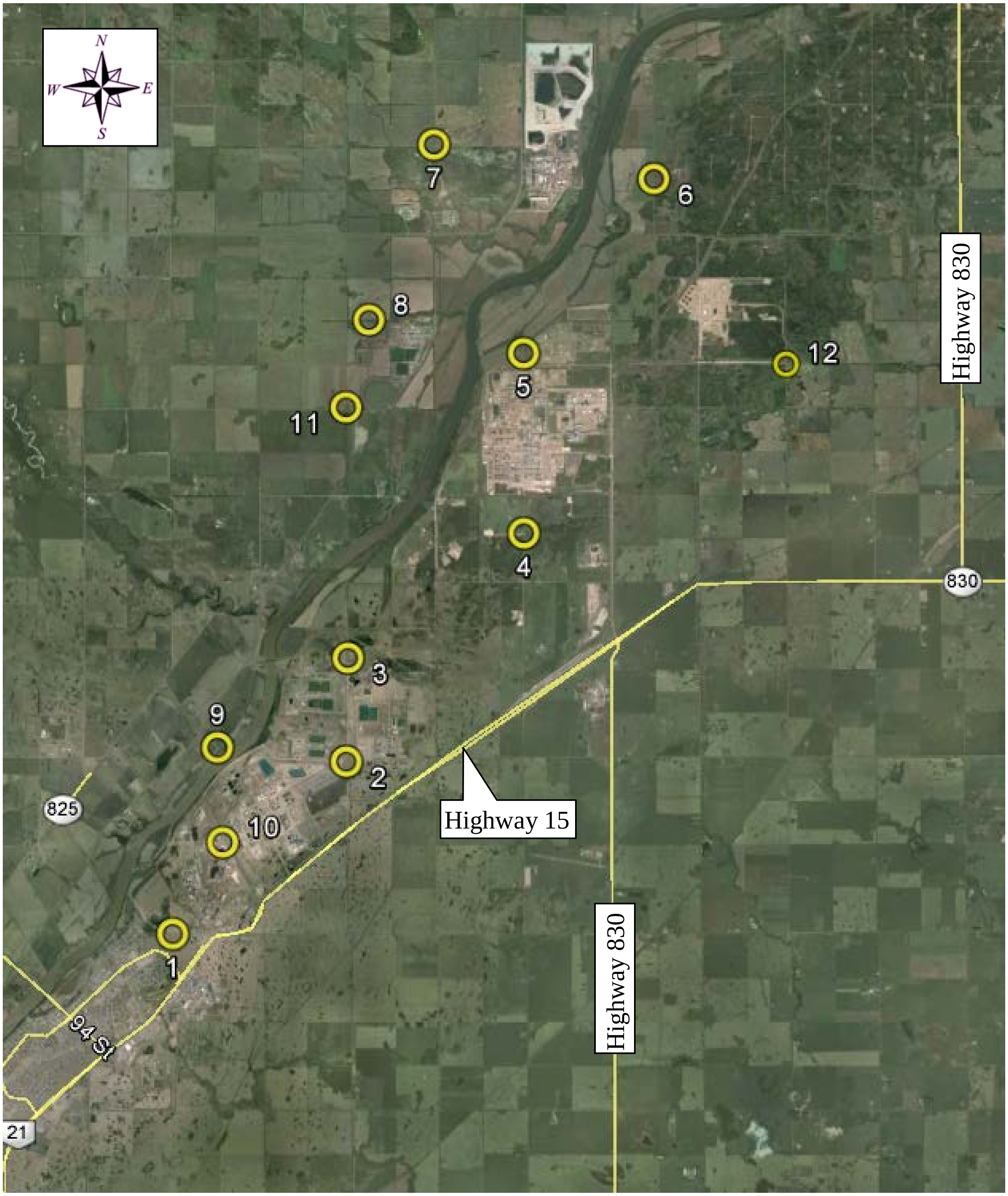

Figure 2. Study Area (With Noise Monitoring Locations)

Figure 3. Noise Monitor #1

Figure 4. Noise Monitor #2

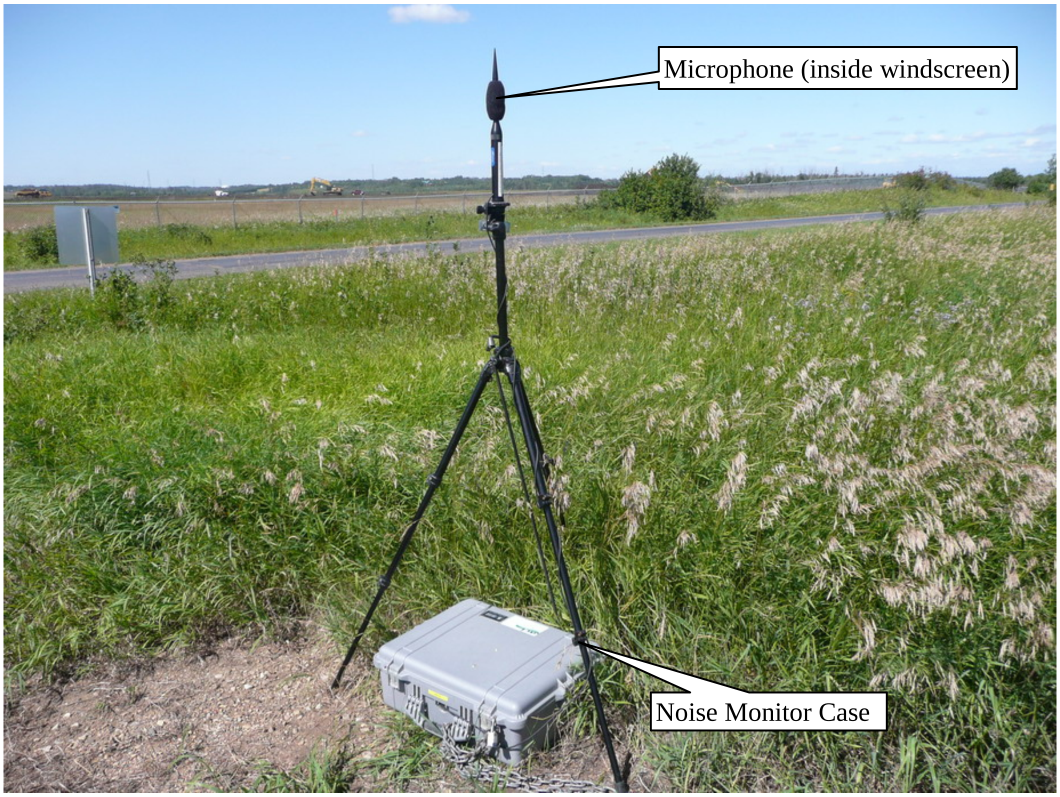

Figure 5. Noise Monitor #3

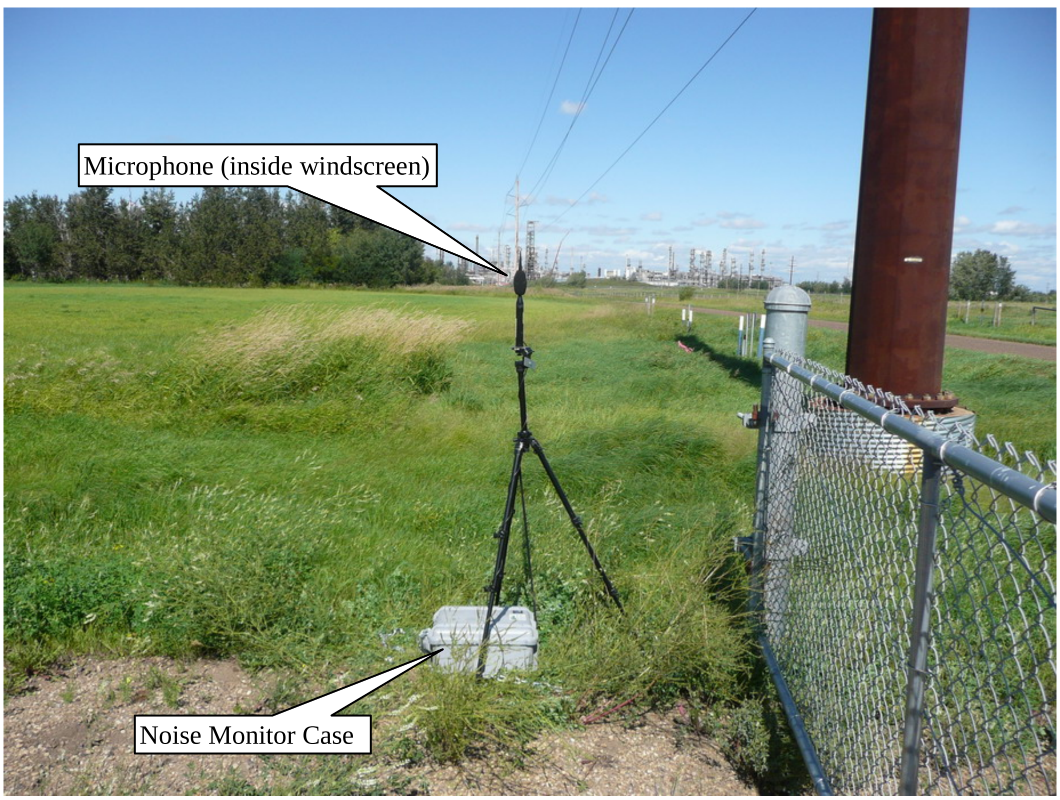

Figure 6. Noise Monitor #4

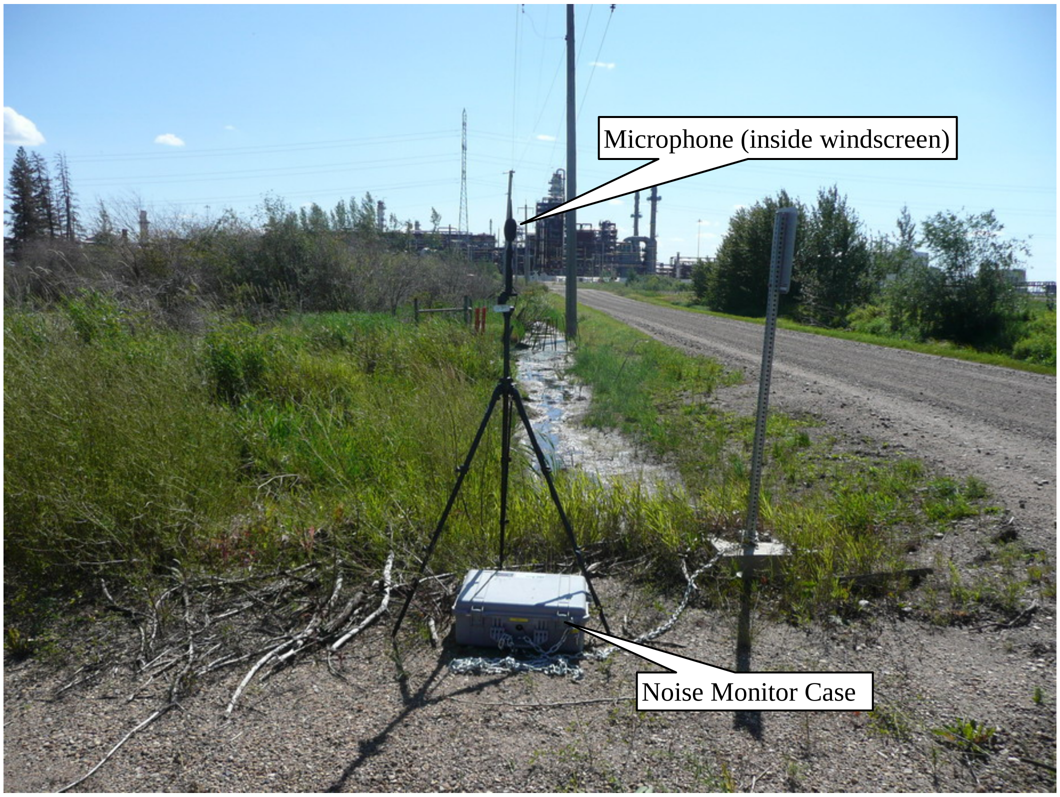

Figure 7. Noise Monitor #5

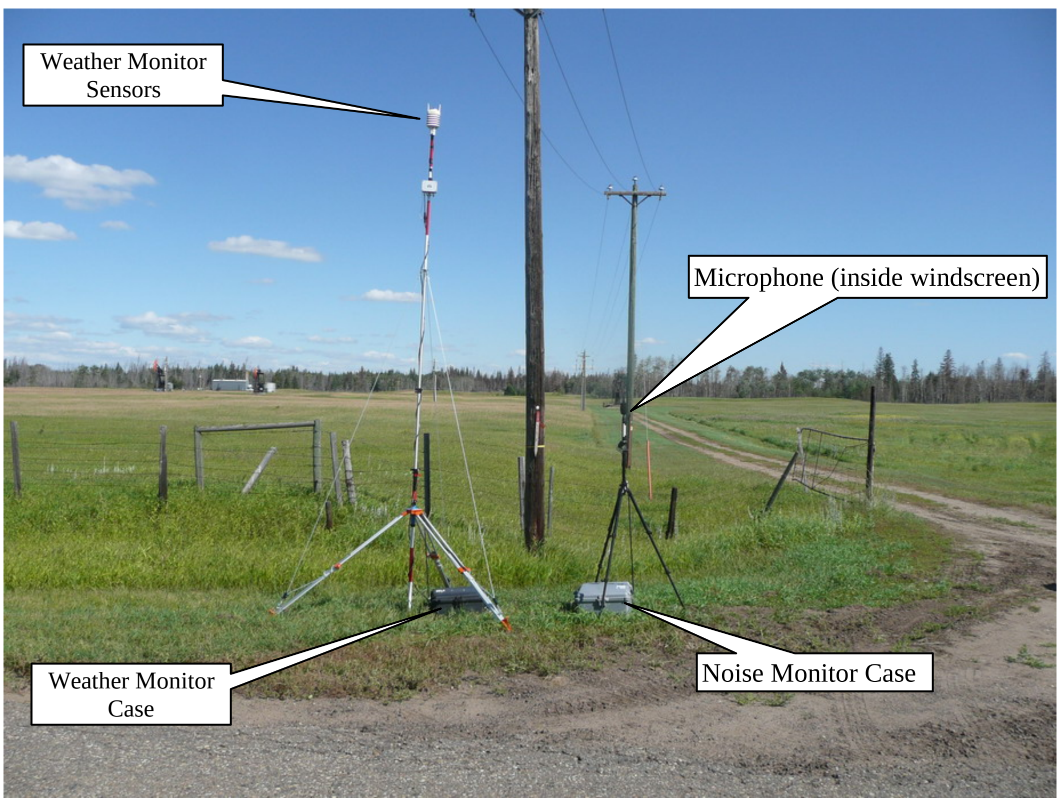

Figure 8. Noise Monitor #6 (With Weather Monitor)

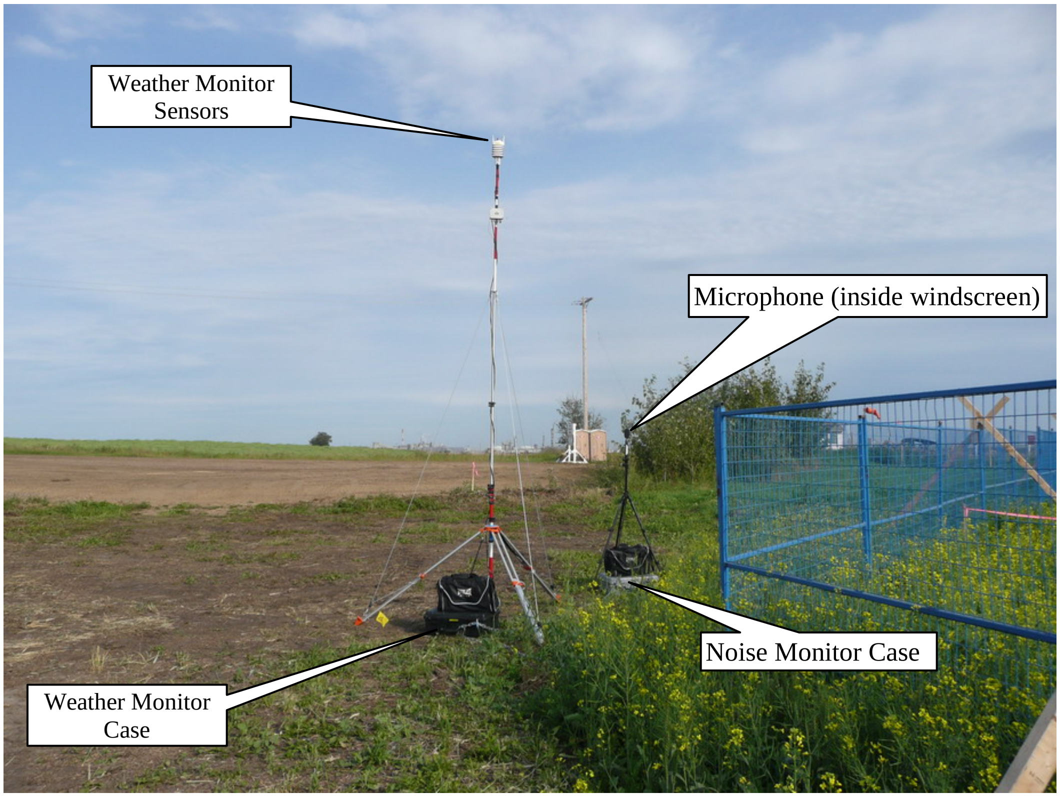

Figure 9. Noise Monitor #7 (With Weather Monitor)

Figure 10. Noise Monitor #8

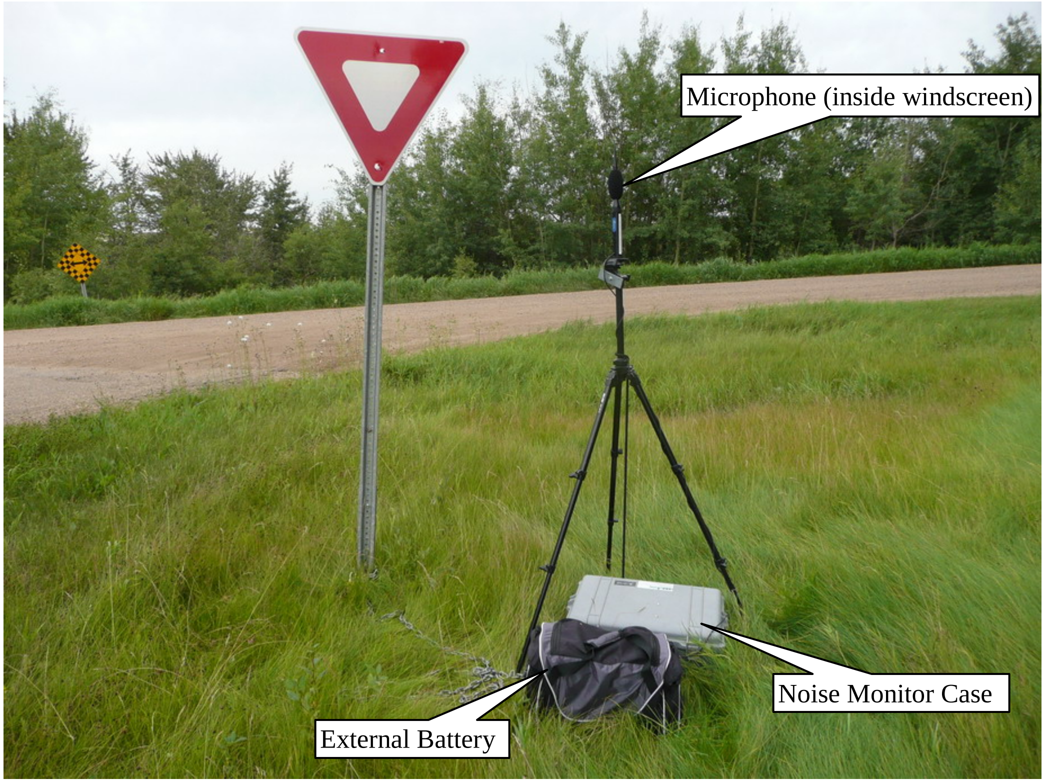

Figure 11. Noise Monitor #9

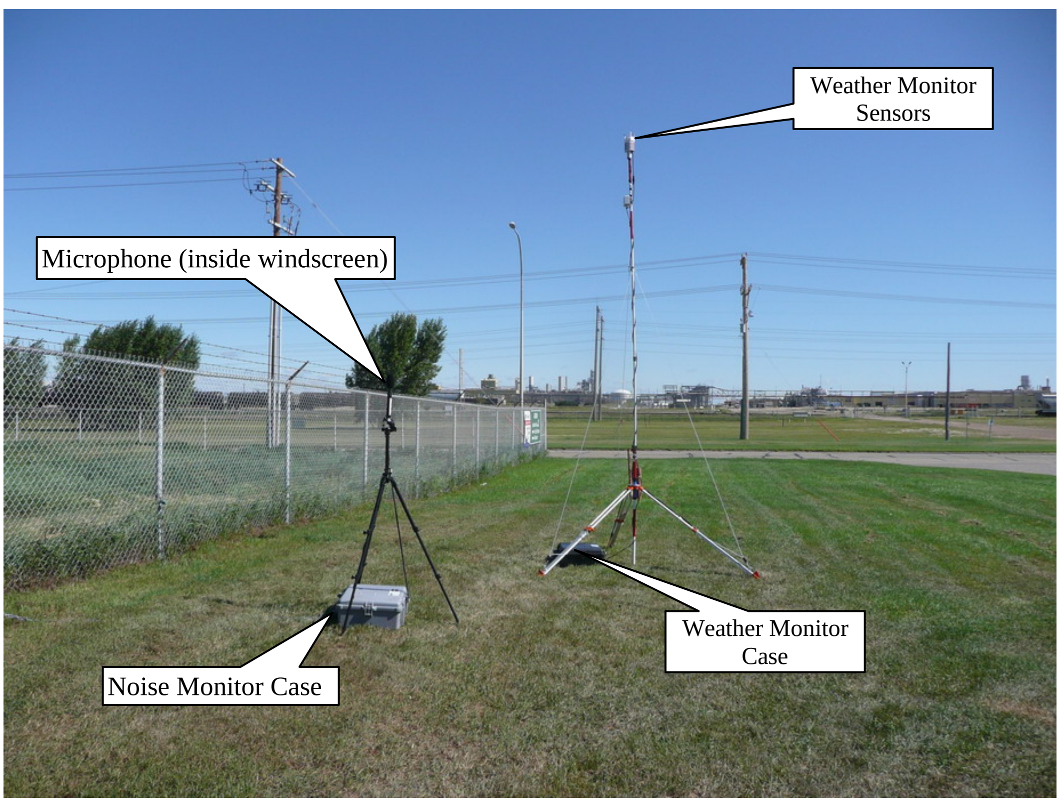

Figure 12. Noise Monitor #10 (With Weather Monitor)

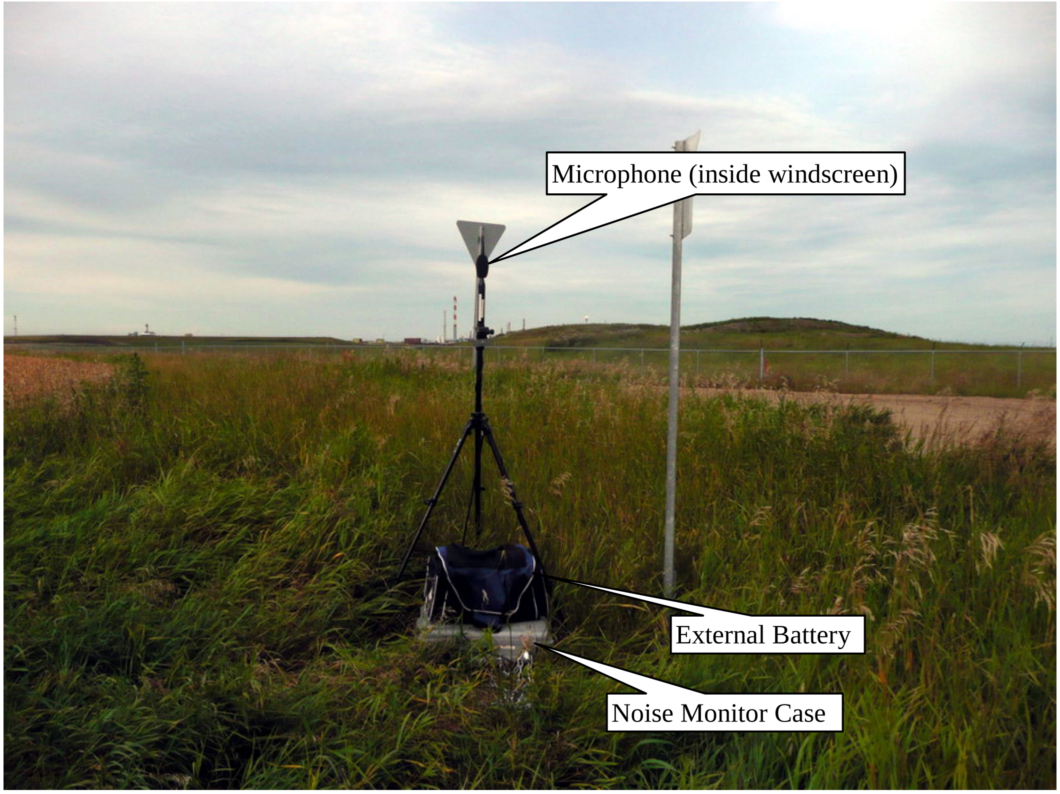

Figure 13. Noise Monitor #11

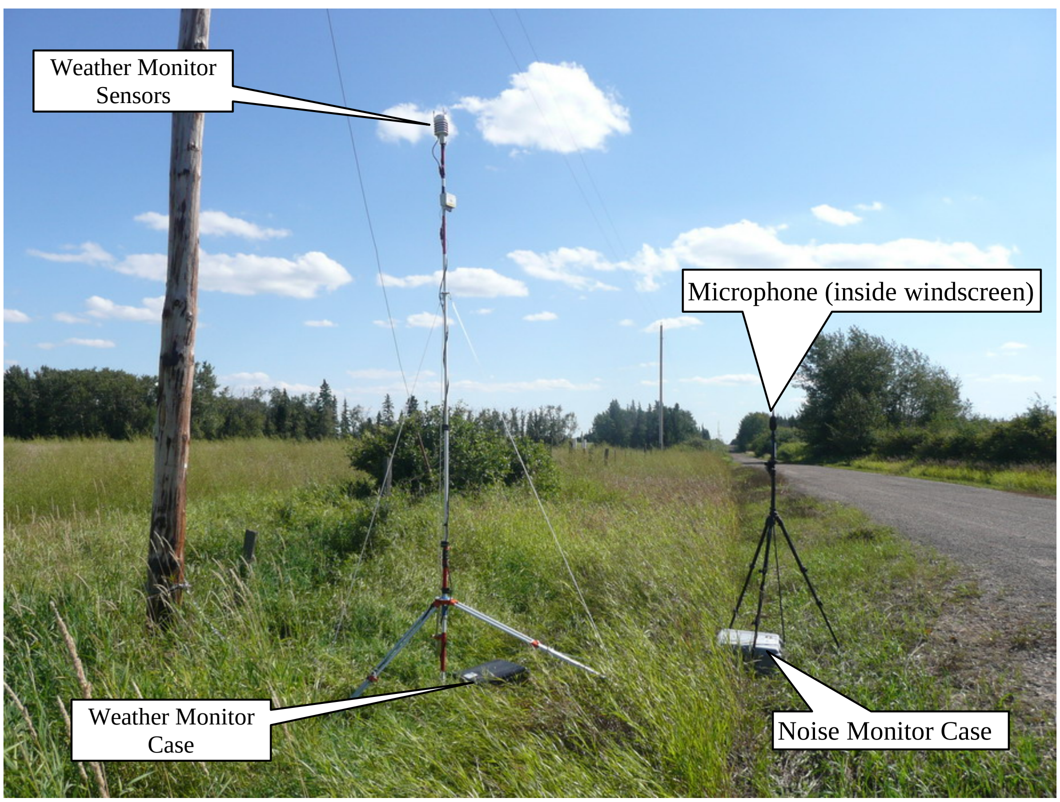

Figure 14. Noise Monitor #12 (With Weather Monitor)

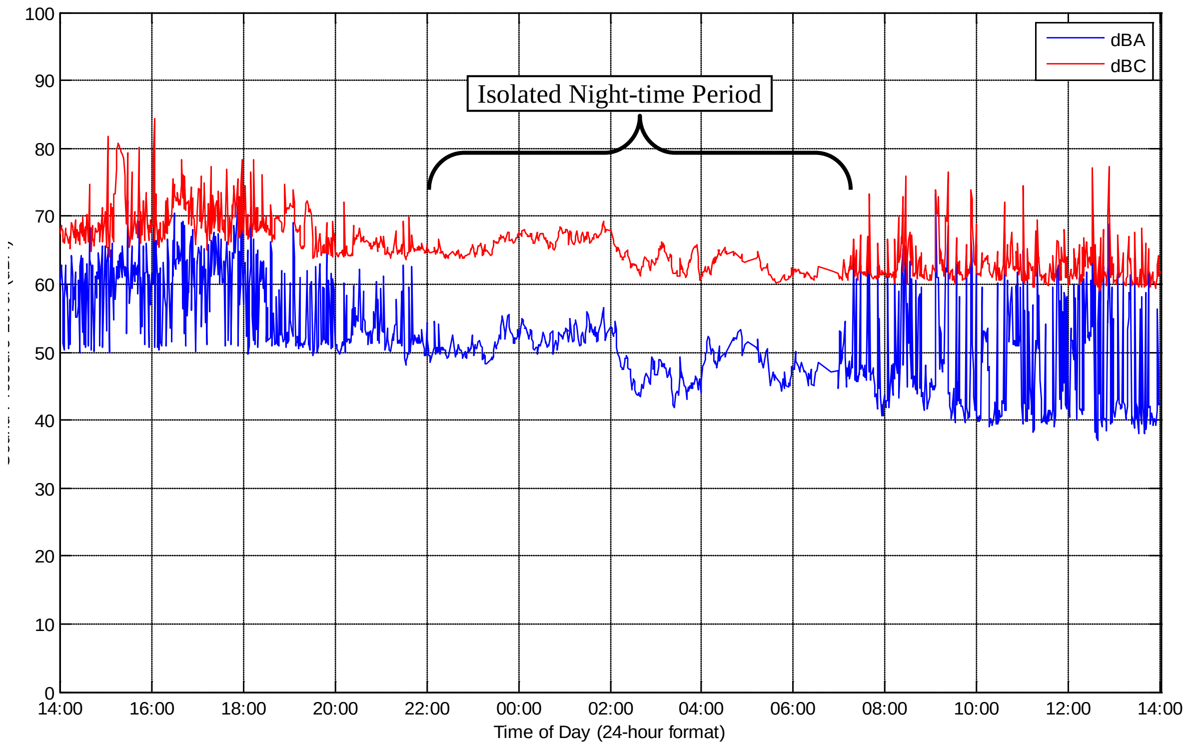

Figure 15. Noise Monitor #1, 1-Minute L_{eq} Sound Levels (August 23 - 24, 2013)

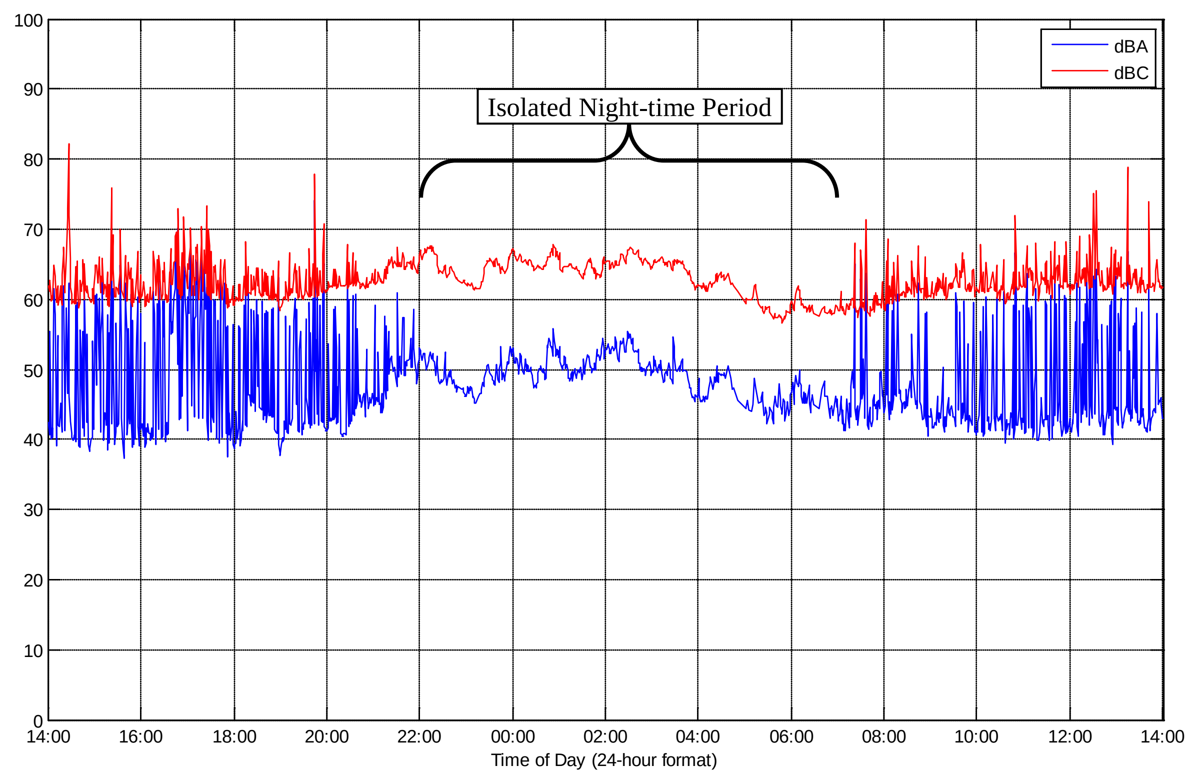

Figure 16. Noise Monitor #1, 1-Minute L_{eq} Sound Levels (August 24 - 25, 2013)

Noise Monitor #1

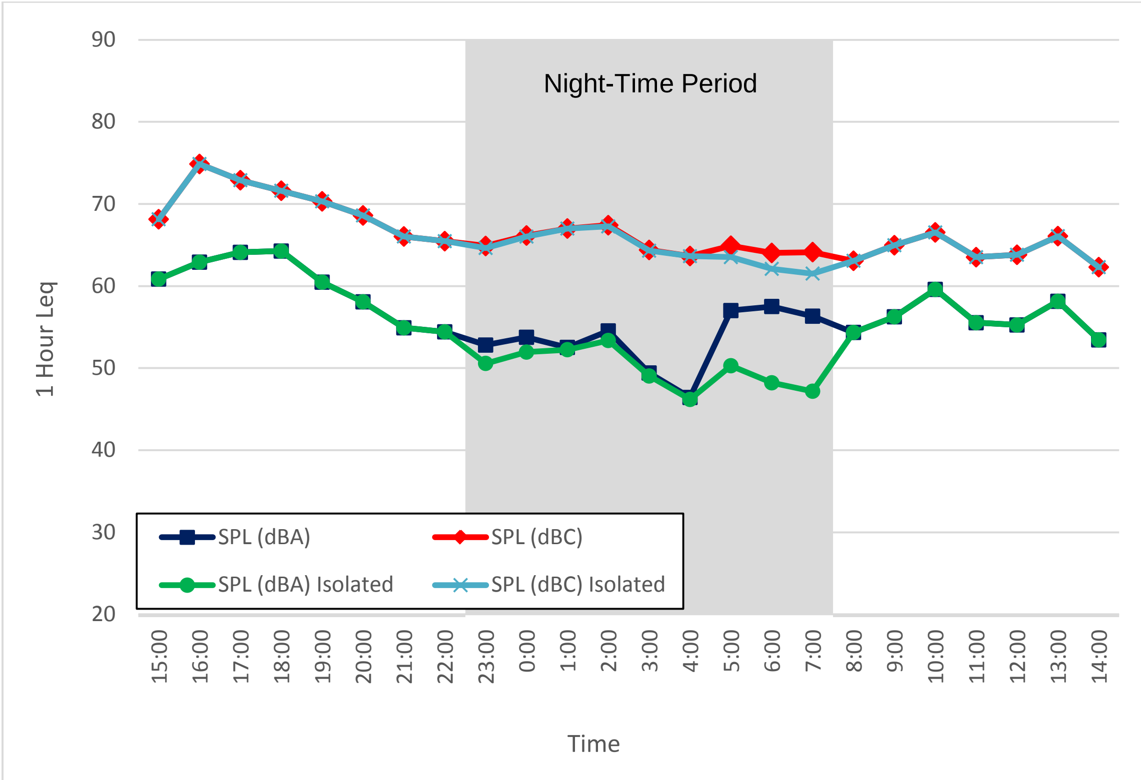

Figure 17. Noise Monitor #1, 1-Hour L_{eq} Sound Levels (August 23 - 24, 2013)

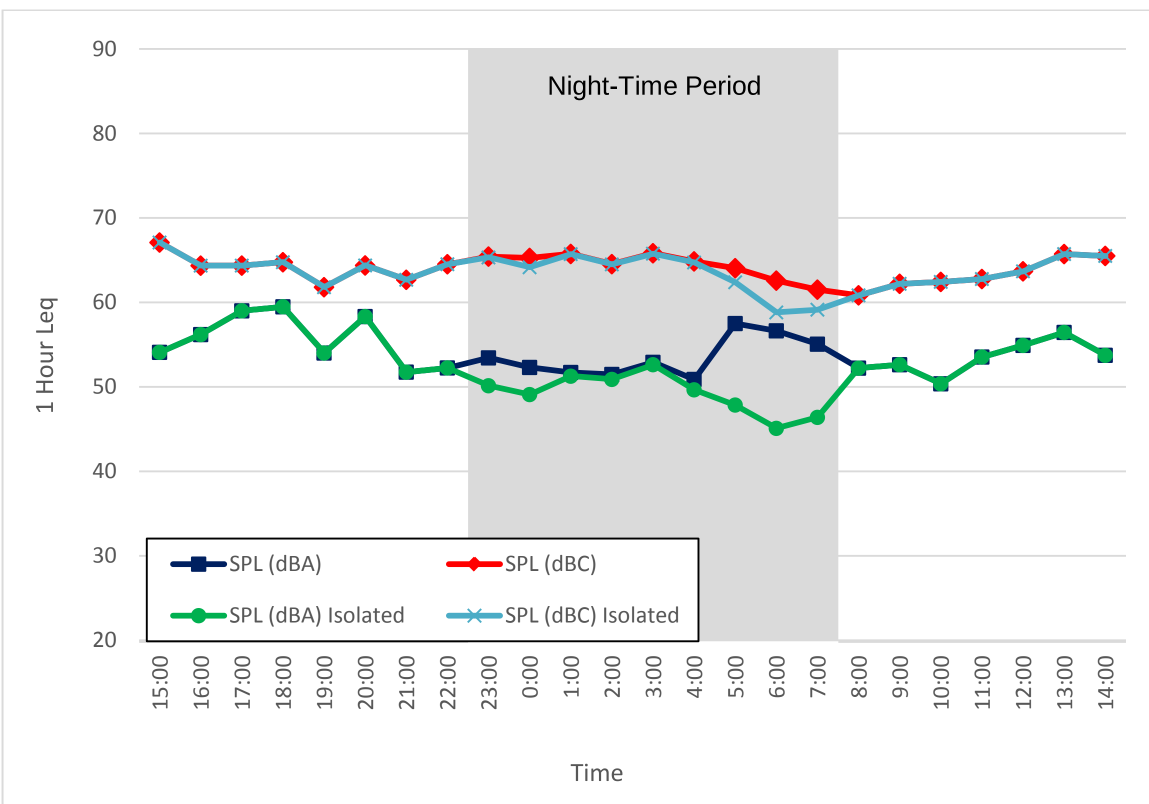

Figure 18. Noise Monitor #1, 1-Hour L_{eq} Sound Levels (August 24 - 25, 2013)

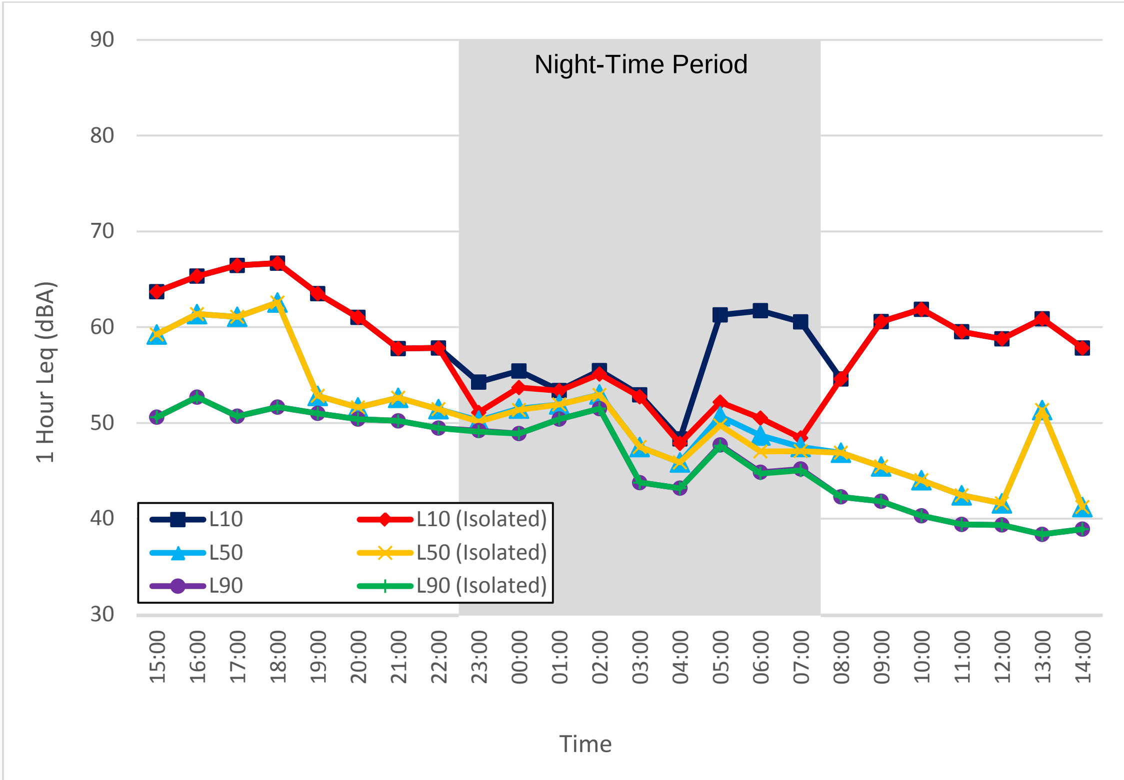

Figure 19. Noise Monitor #1, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (August 23 - 24, 2013)

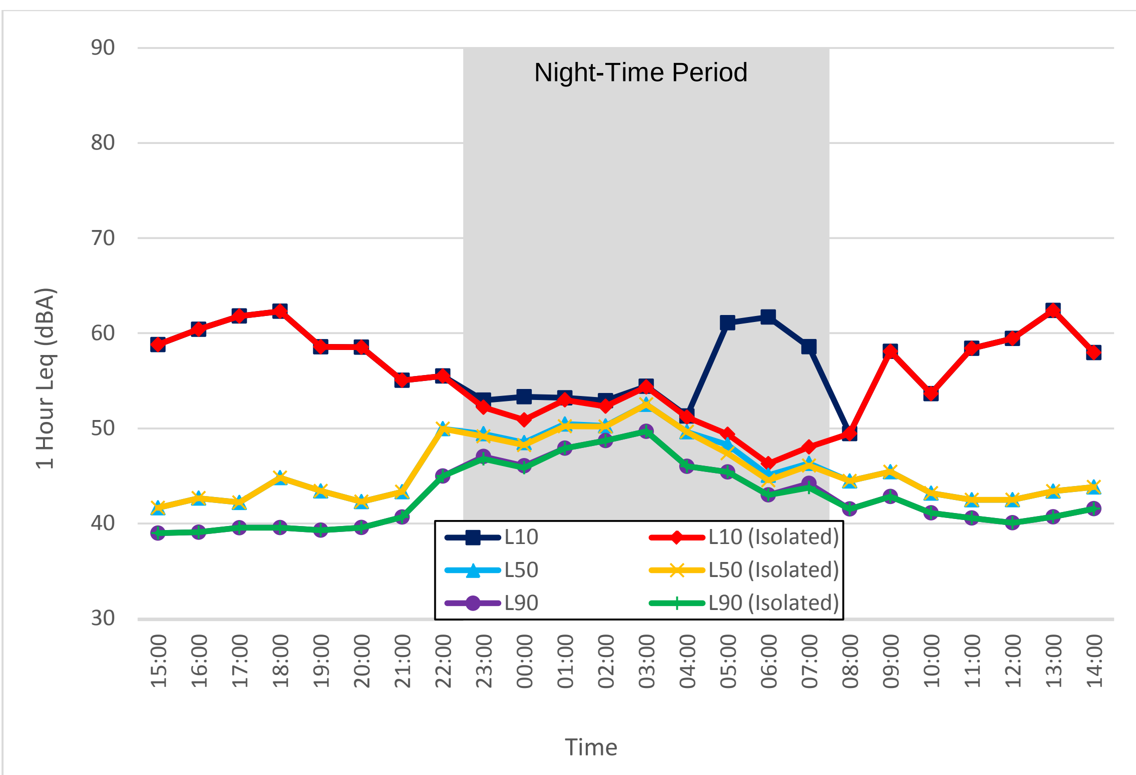

Figure 20. Noise Monitor #1, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (August 24 - 25, 2013)

Noise Monitor #1

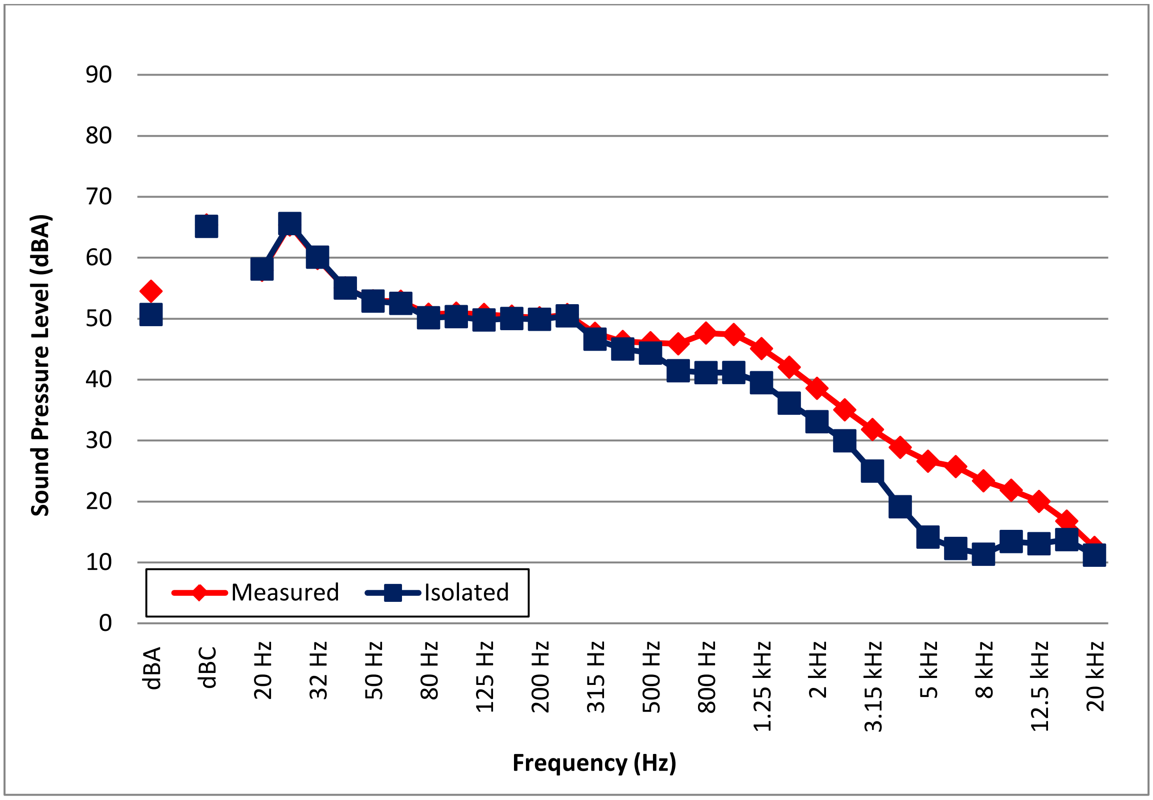

Figure 21. Noise Monitor #1, 1/3 Octave L_{eq} Sound Levels (August 23 - 24, 2013)

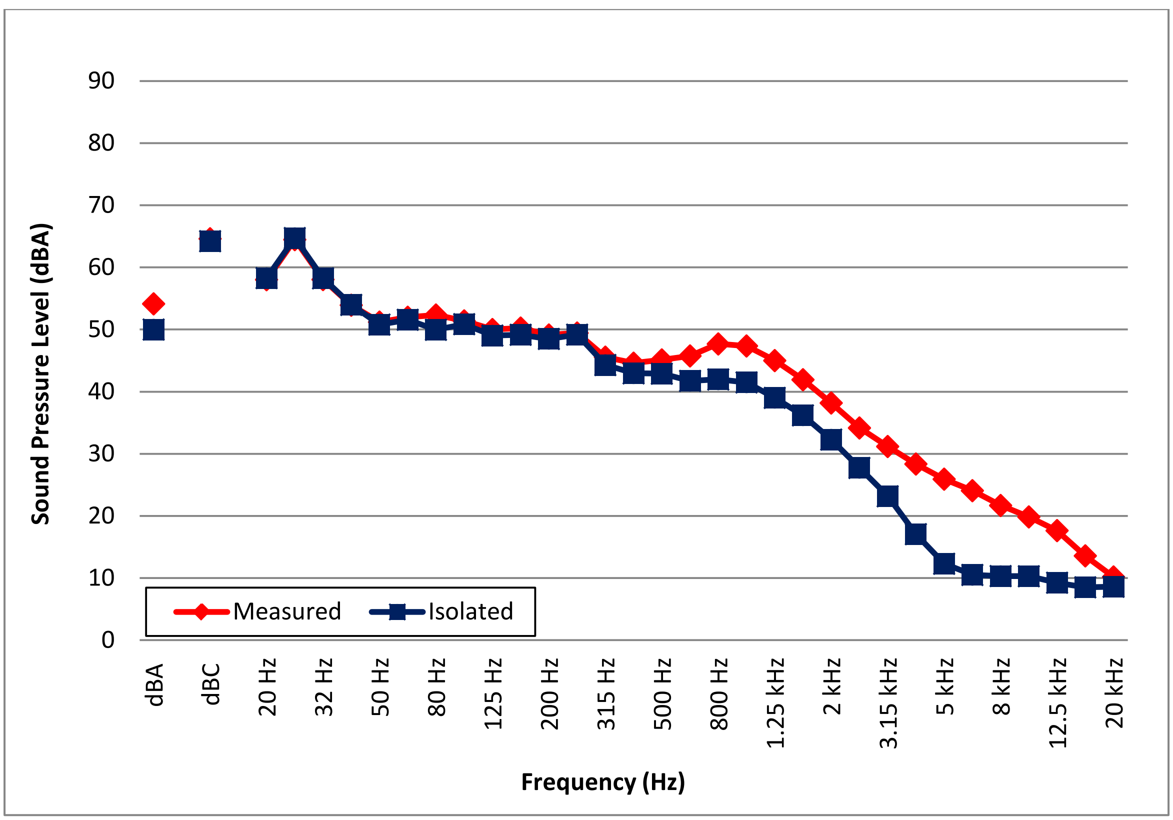

Figure 22. Noise Monitor #1, 1/3 Octave L_{eq} Sound Levels (August 24 - 25, 2013)

Noise Monitor #2

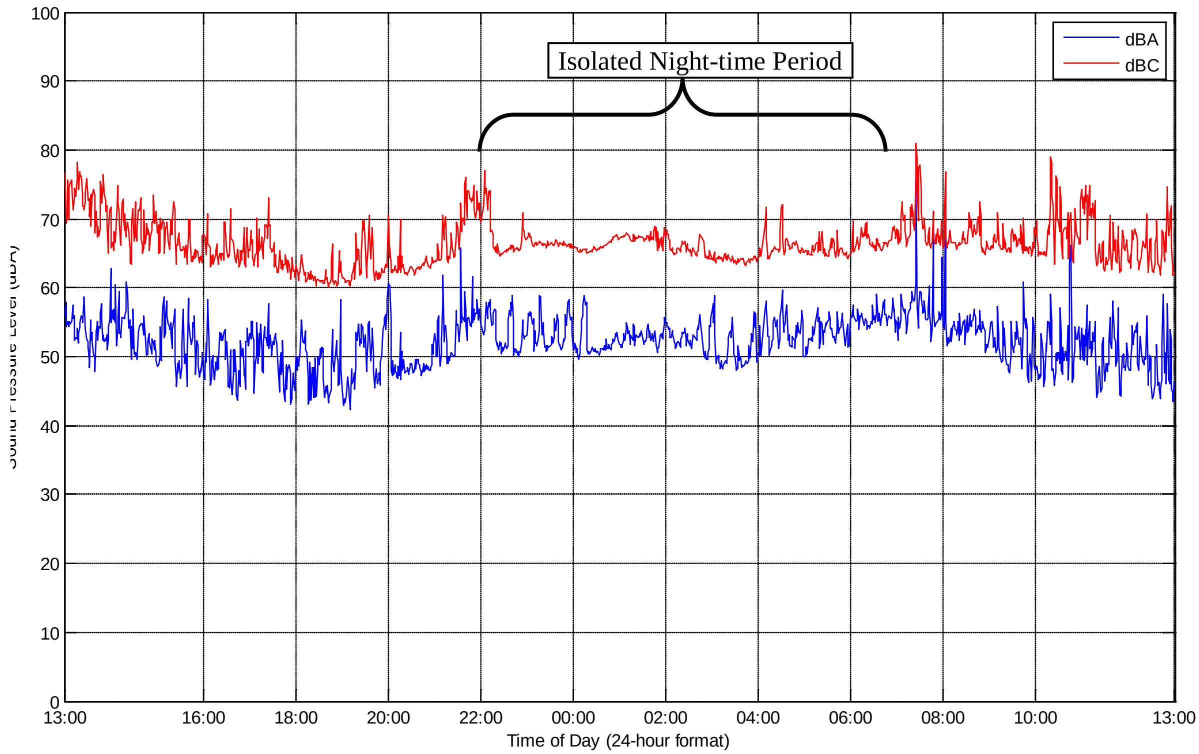

Figure 23. Noise Monitor #2, 1-Minute L_{eq} Sound Levels (August 21 - 22, 2013)

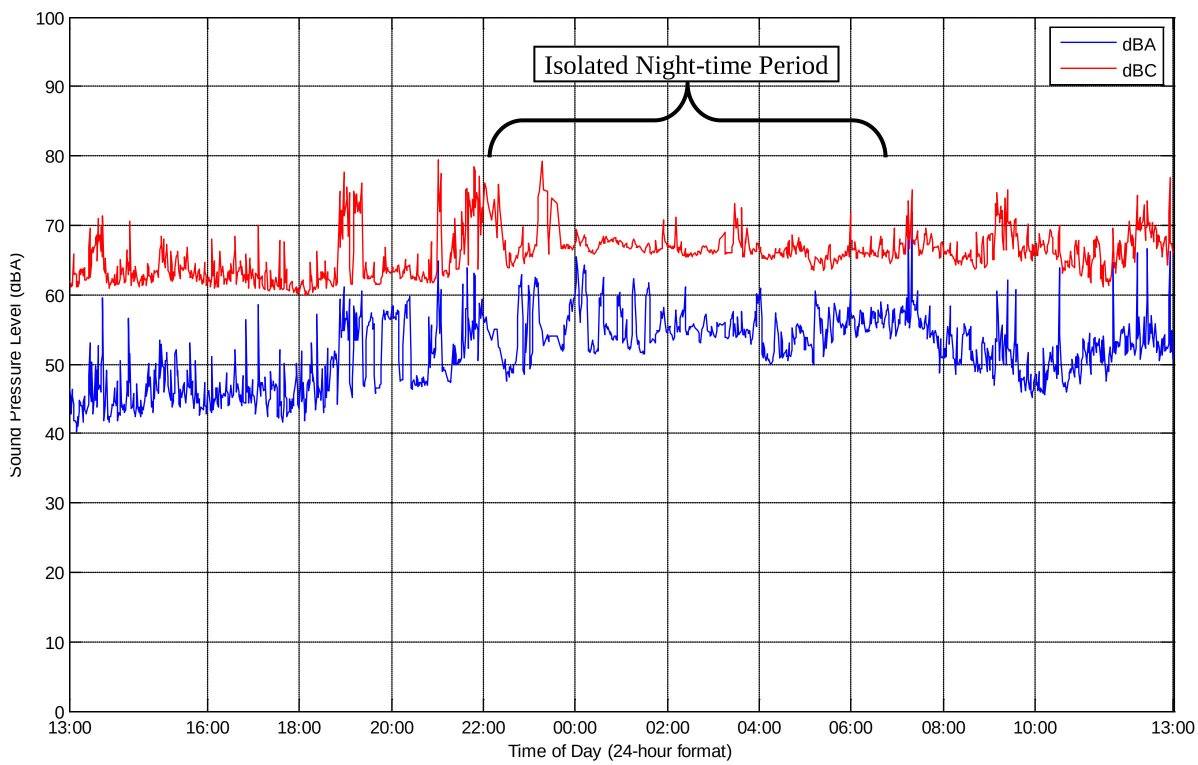

Figure 24. Noise Monitor #2, 1-Minute L_{eq} Sound Levels (August 22 - 23, 2013)

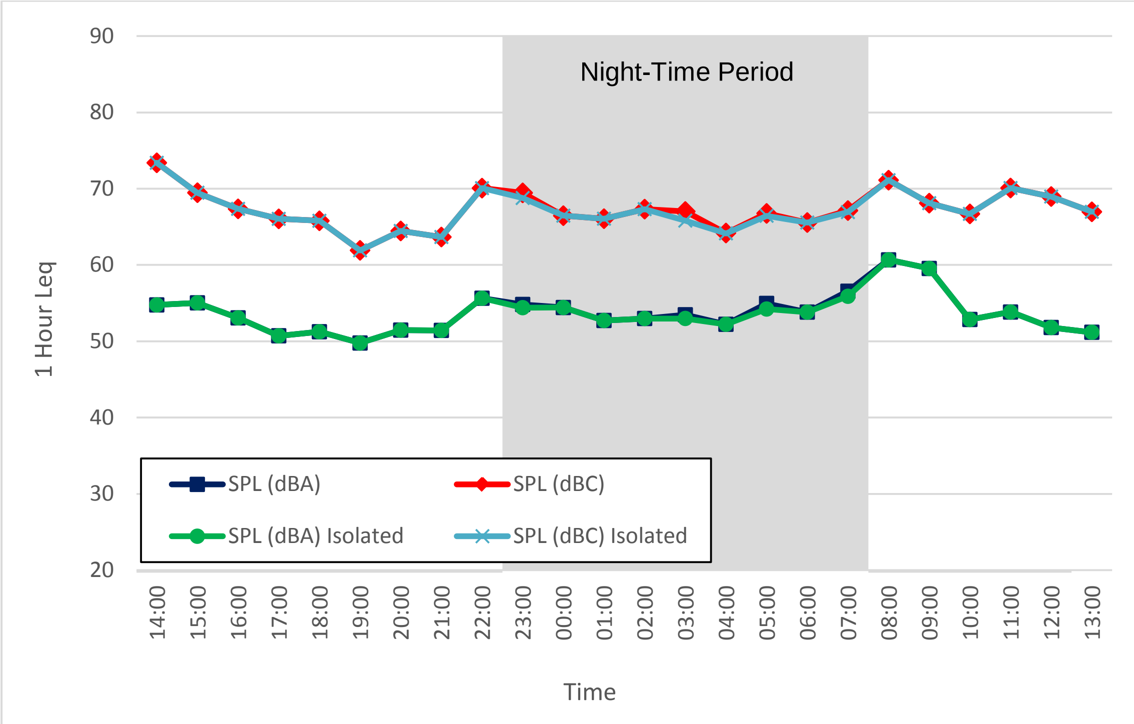

Figure 25. Noise Monitor #2, 1-Hour L_{eq} Sound Levels (August 21 - 22, 2013)

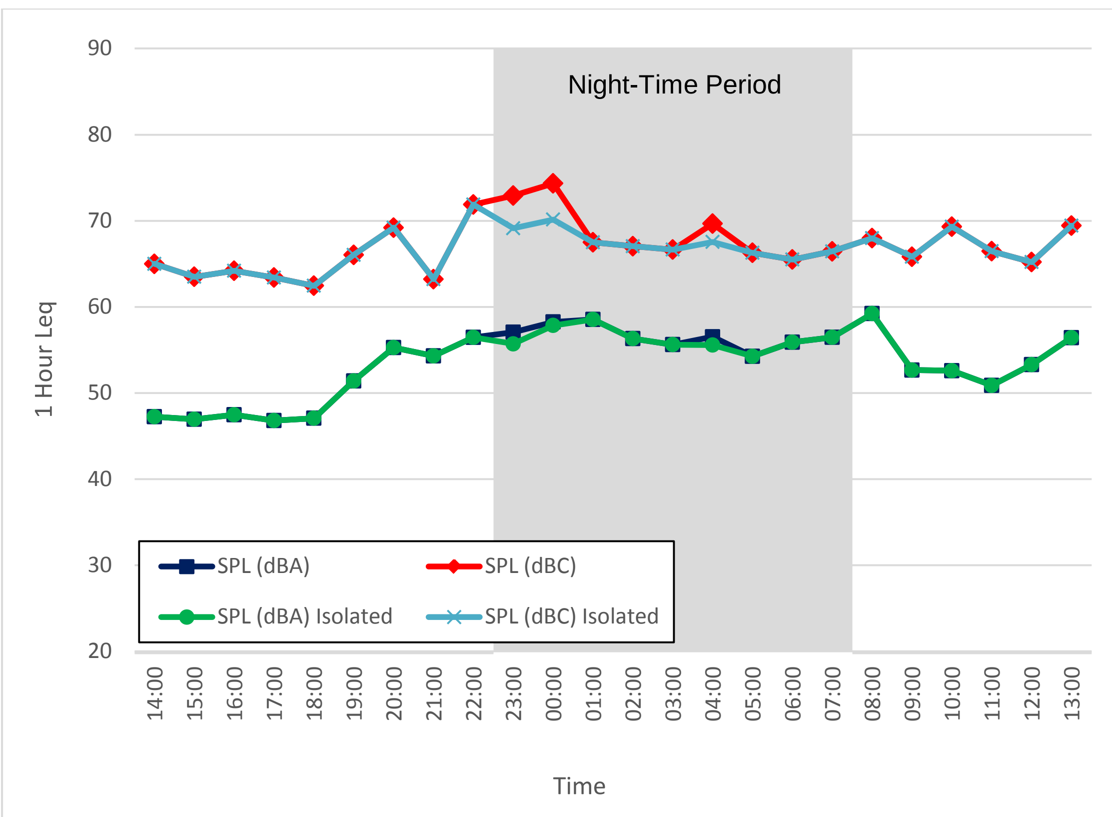

Figure 26. Noise Monitor #2, 1-Hour L_{eq} Sound Levels (August 22 - 23, 2013)

Noise Monitor #2

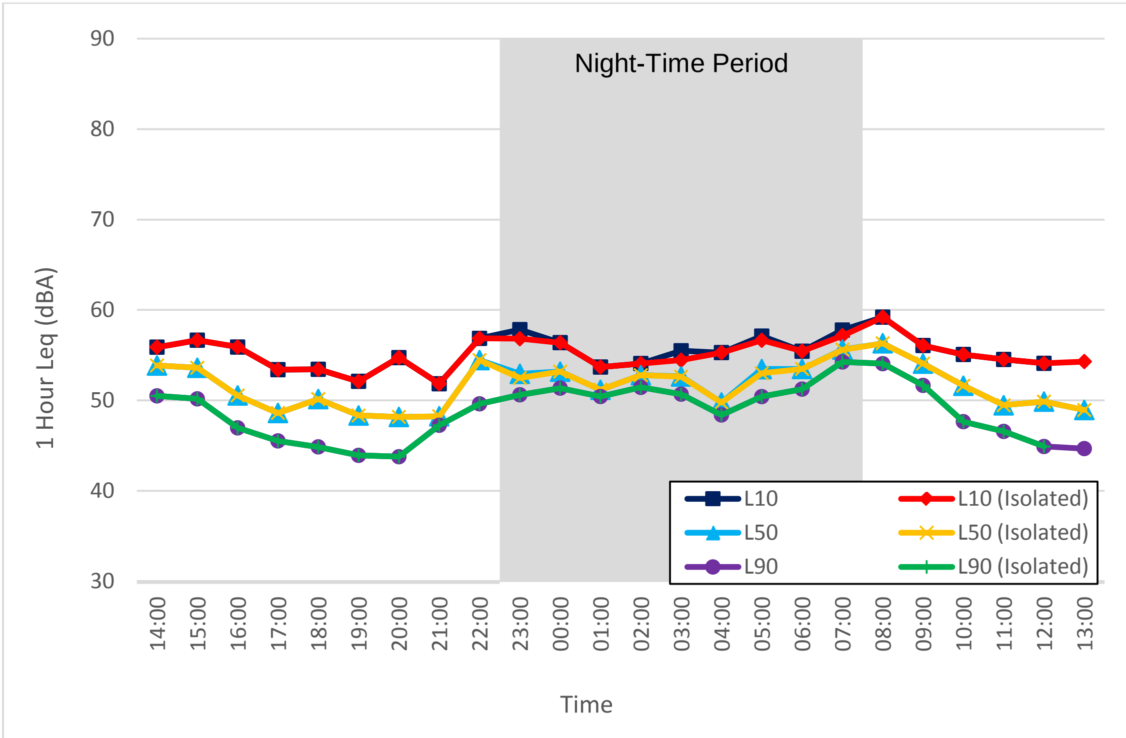

Figure 27. Noise Monitor #2, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (August 21 - 22, 2013)

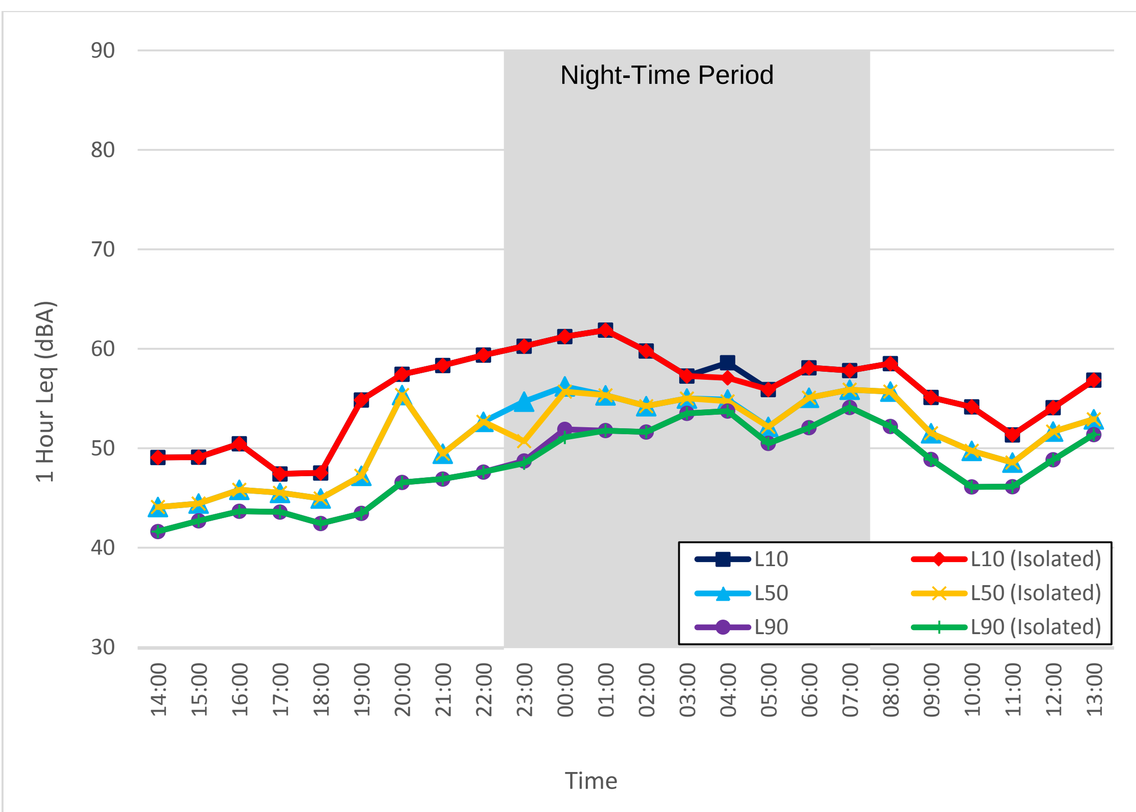

Figure 28. Noise Monitor #2, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (August 22 - 23, 2013)

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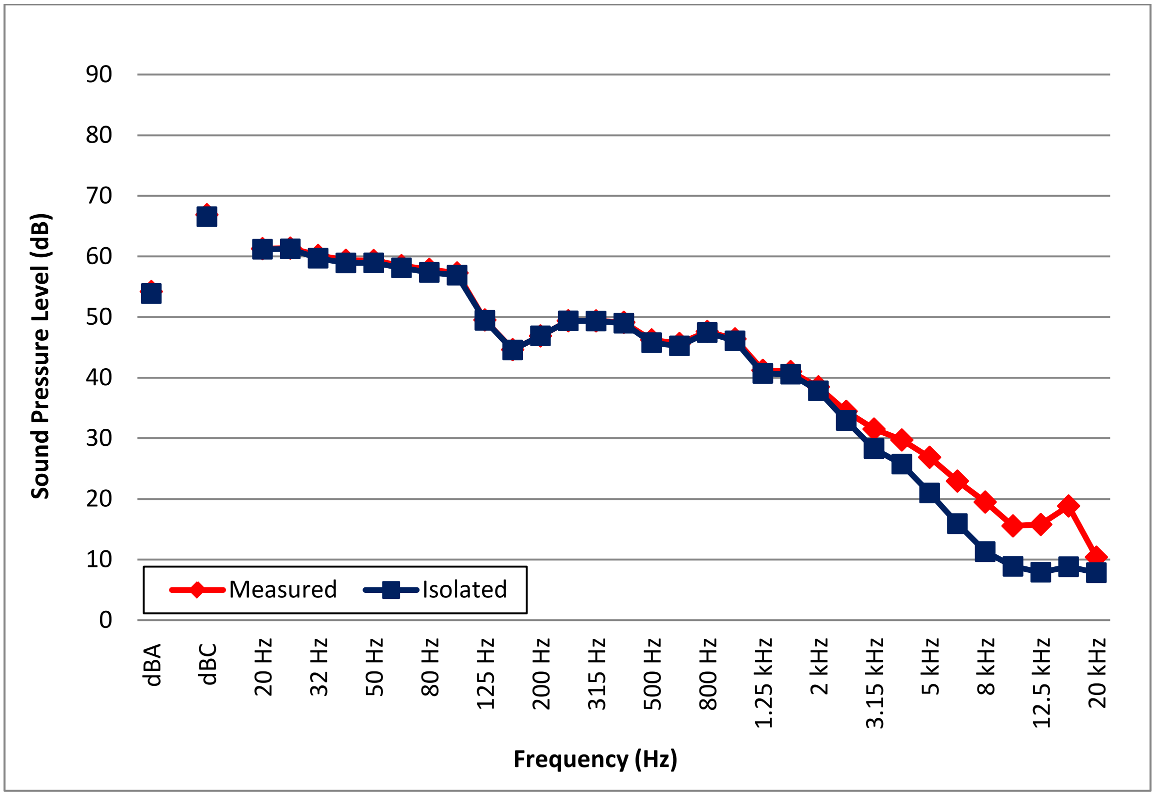

Figure 29. Noise Monitor #2, 1/3 Octave L_{eq} Sound Levels (August 21 - 22, 2013)

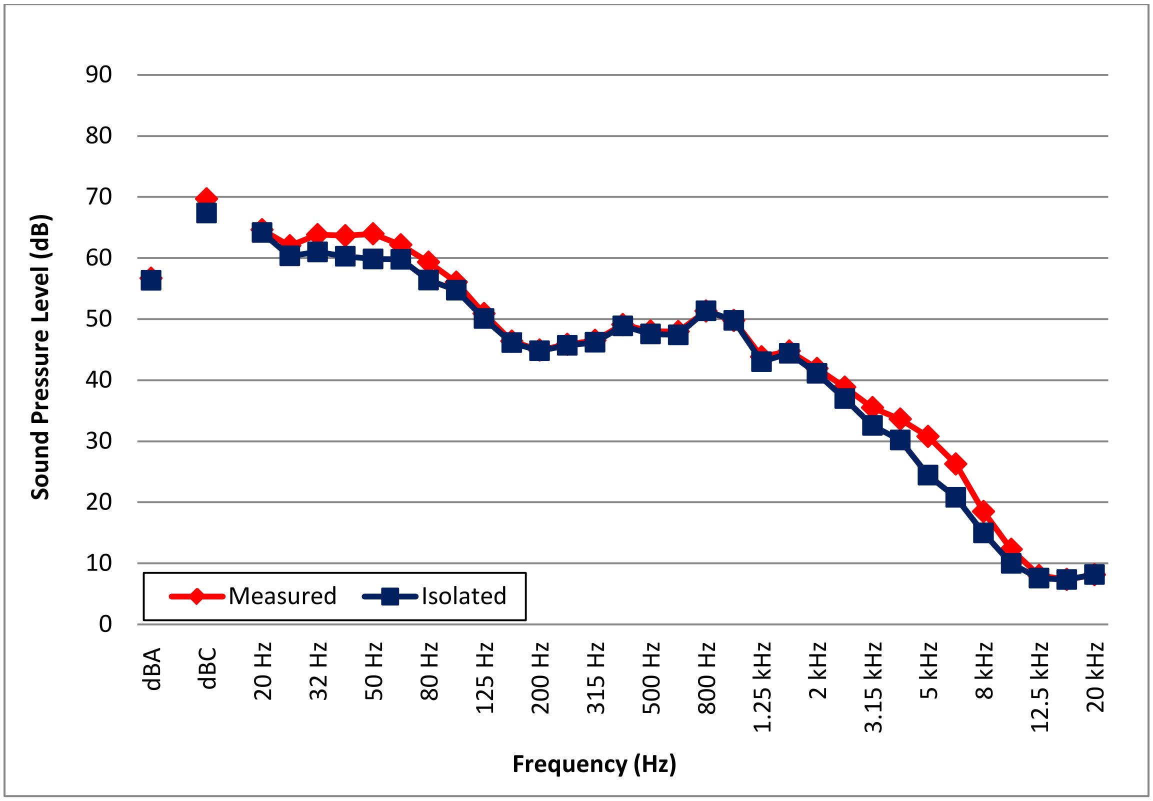

Figure 30. Noise Monitor #2, 1/3 Octave L_{eq} Sound Levels (August 22 - 23, 2013)

Noise Monitor #3

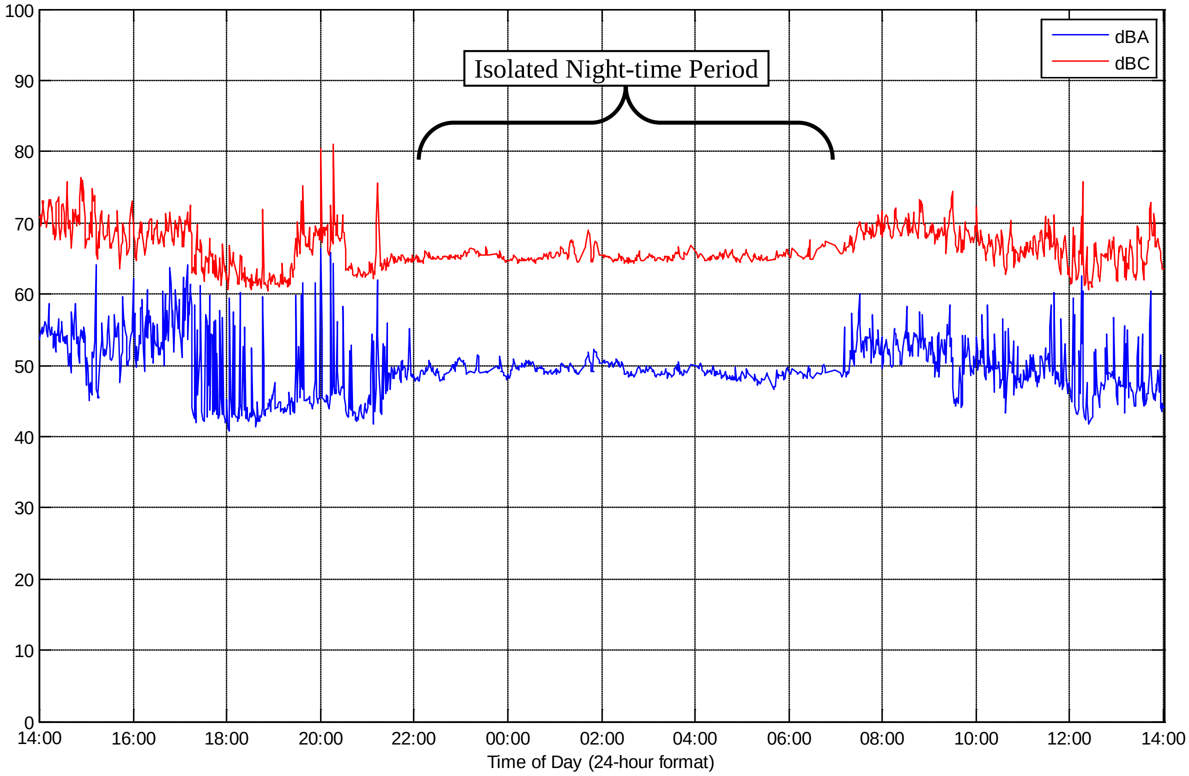

Figure 31. Noise Monitor #3, 1-Minute L_{eq} Sound Levels (August 21 - 22, 2013)

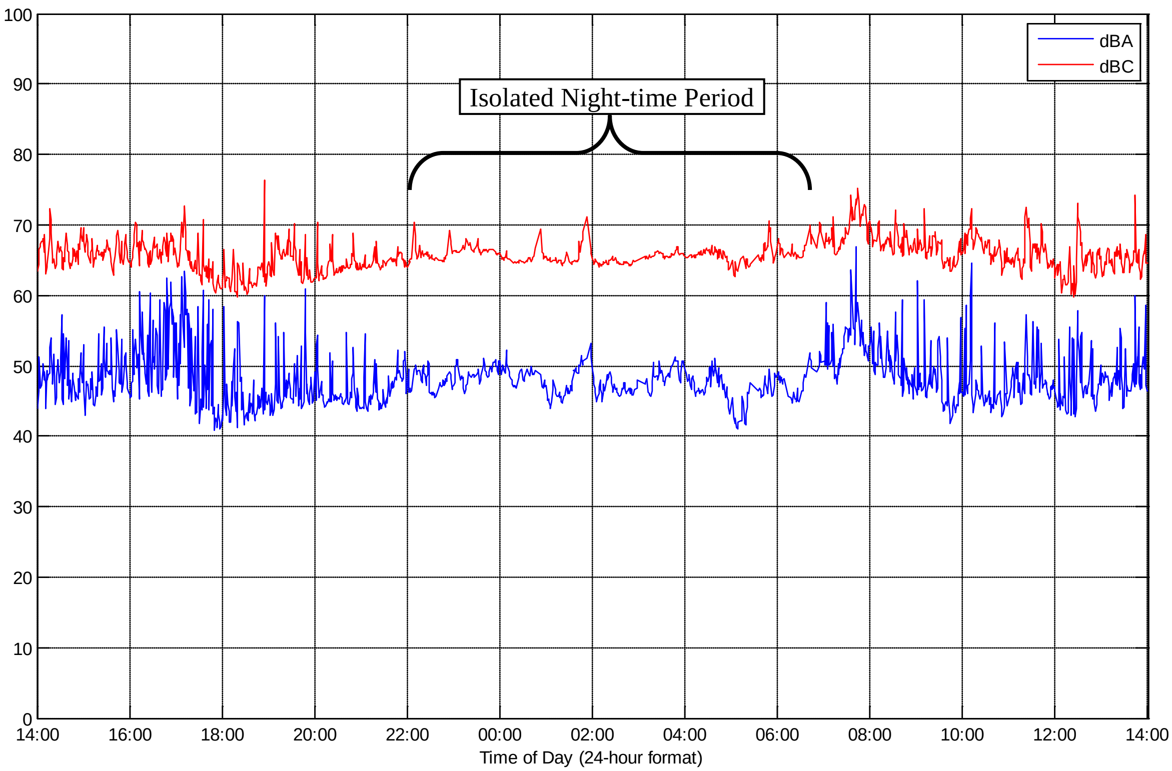

Figure 32. Noise Monitor #3, 1-Minute L_{eq} Sound Levels (August 22 - 23, 2013)

Noise Monitor #3

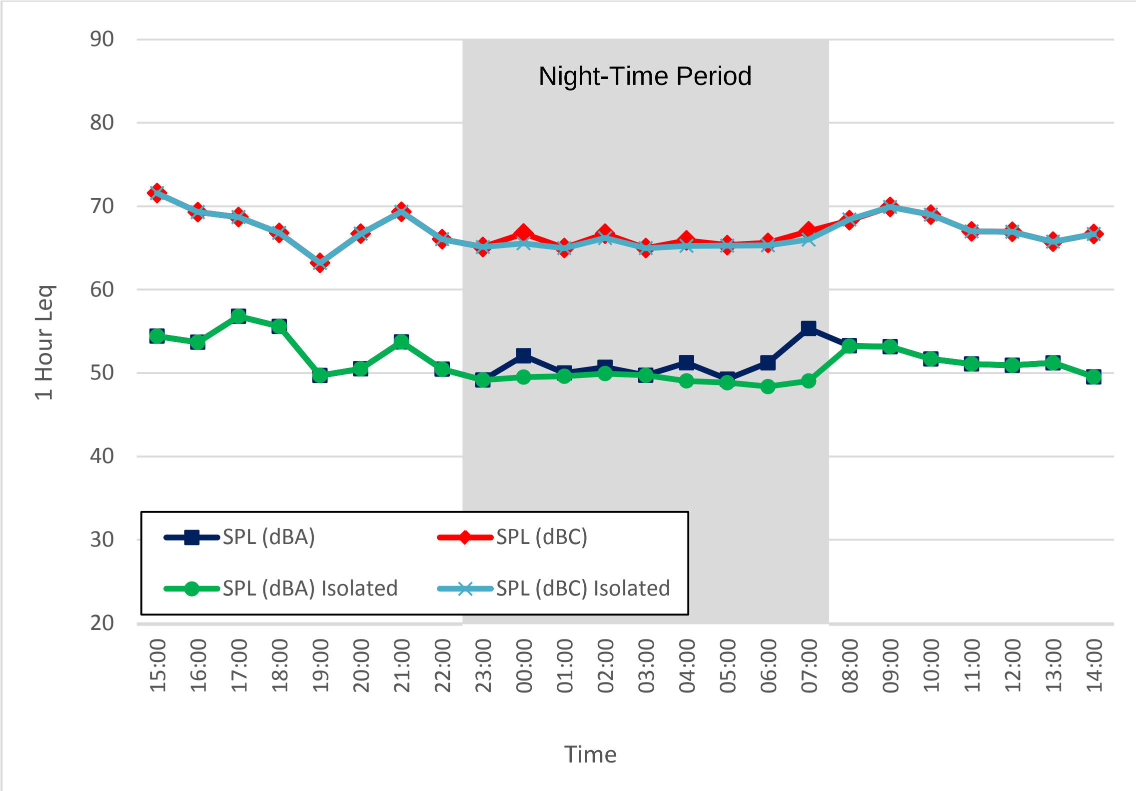

Figure 33. Noise Monitor #3, 1-Hour L_{eq} Sound Levels (August 21 - 22, 2013)

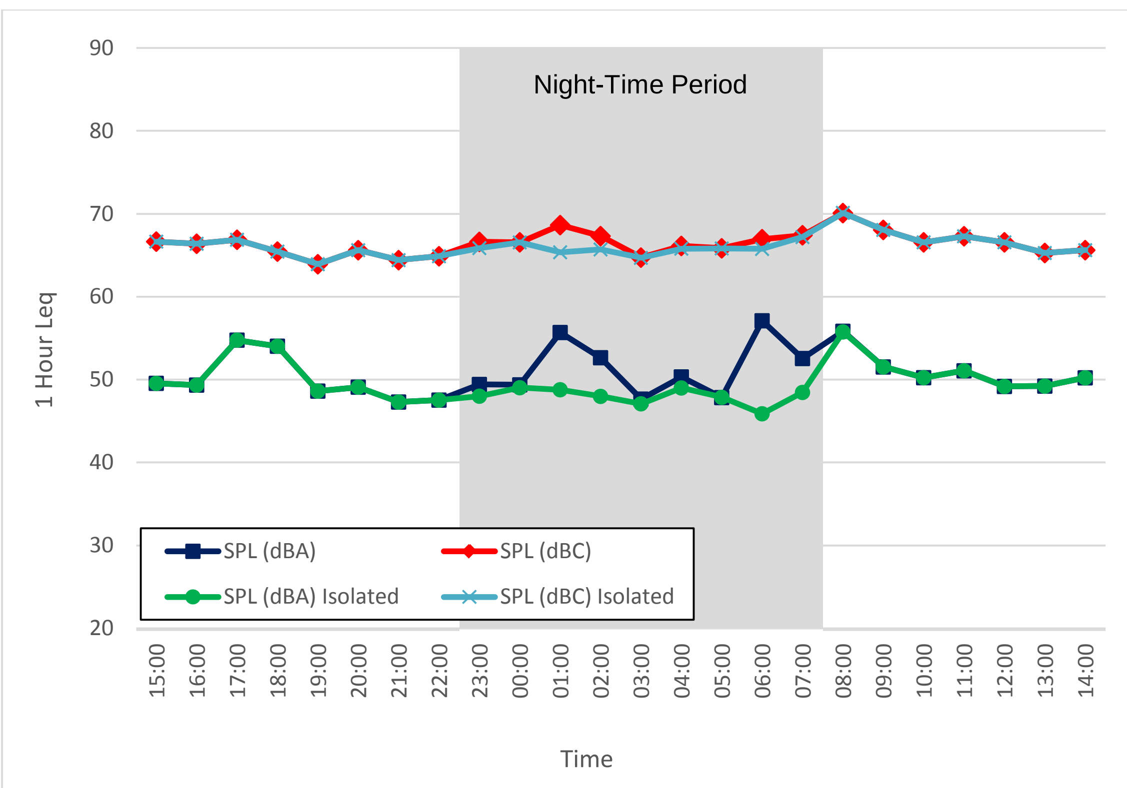

Figure 34. Noise Monitor #3, 1-Hour L_{eq} Sound Levels (August 22 - 23, 2013)

Noise Monitor #3

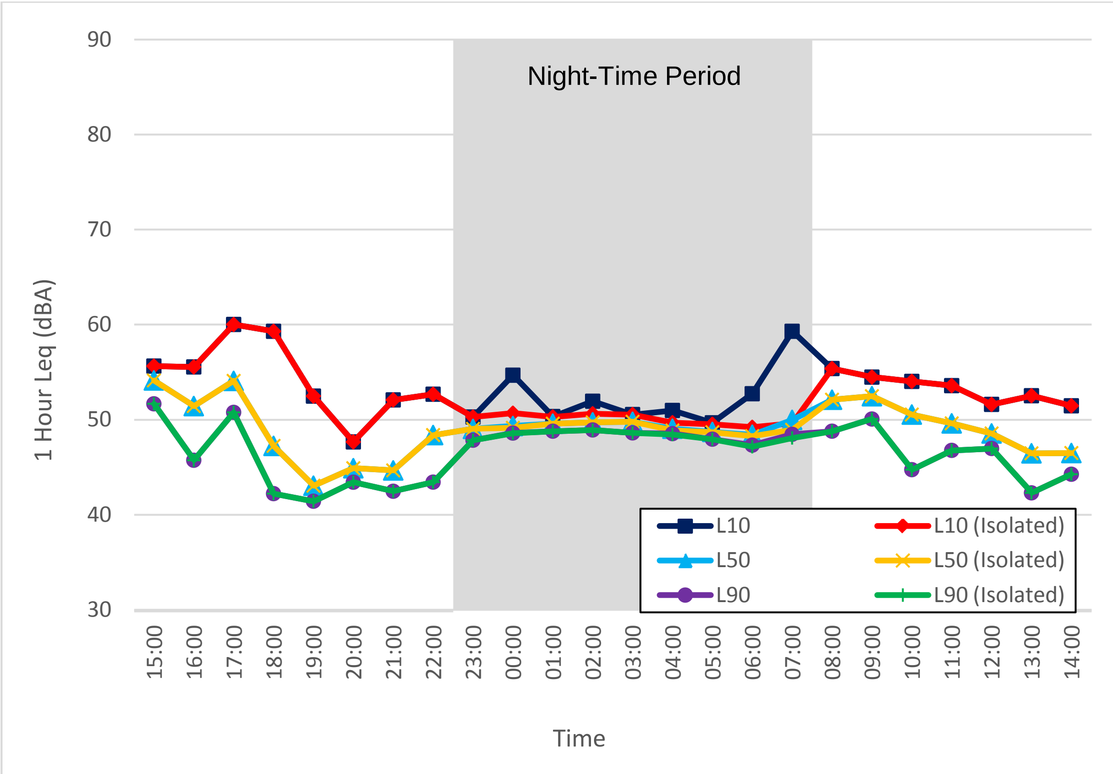

Figure 35. Noise Monitor #3, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (August 21 - 22, 2013)

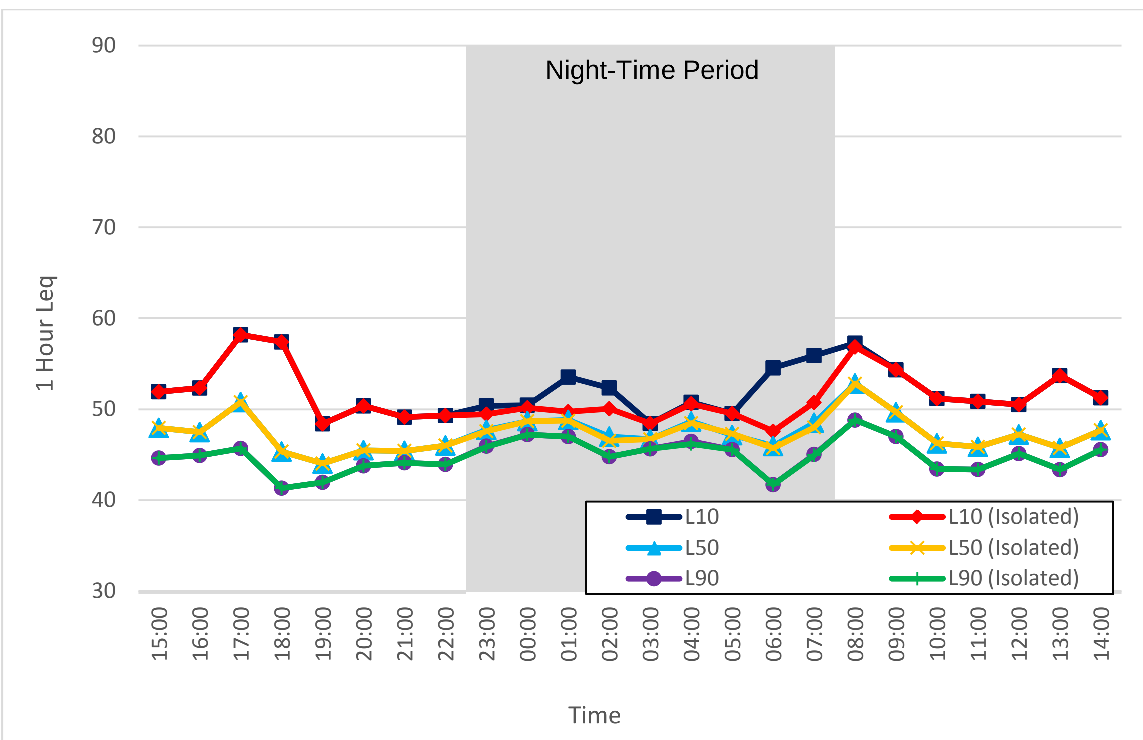

Figure 36. Noise Monitor #3, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (August 22 - 23, 2013)

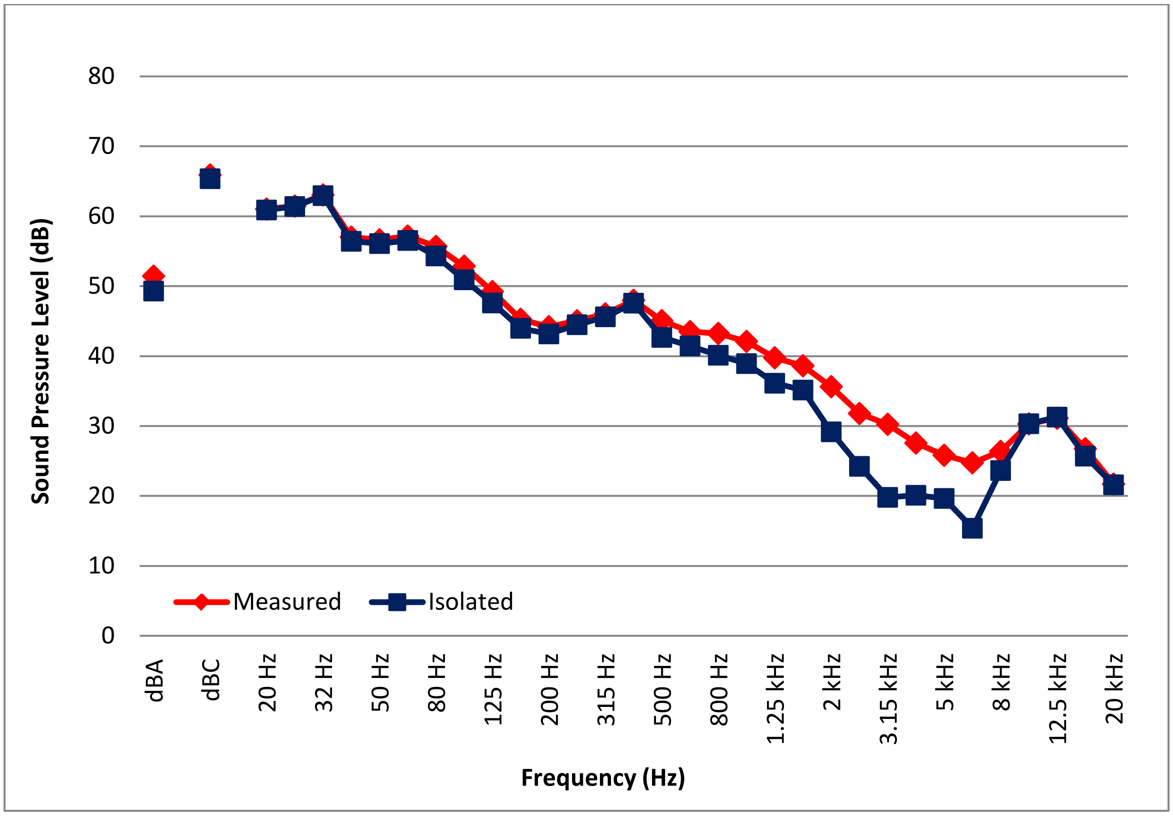

Figure 37. Noise Monitor #3, 1/3 Octave L_{eq} Sound Levels (August 21 - 22, 2013)

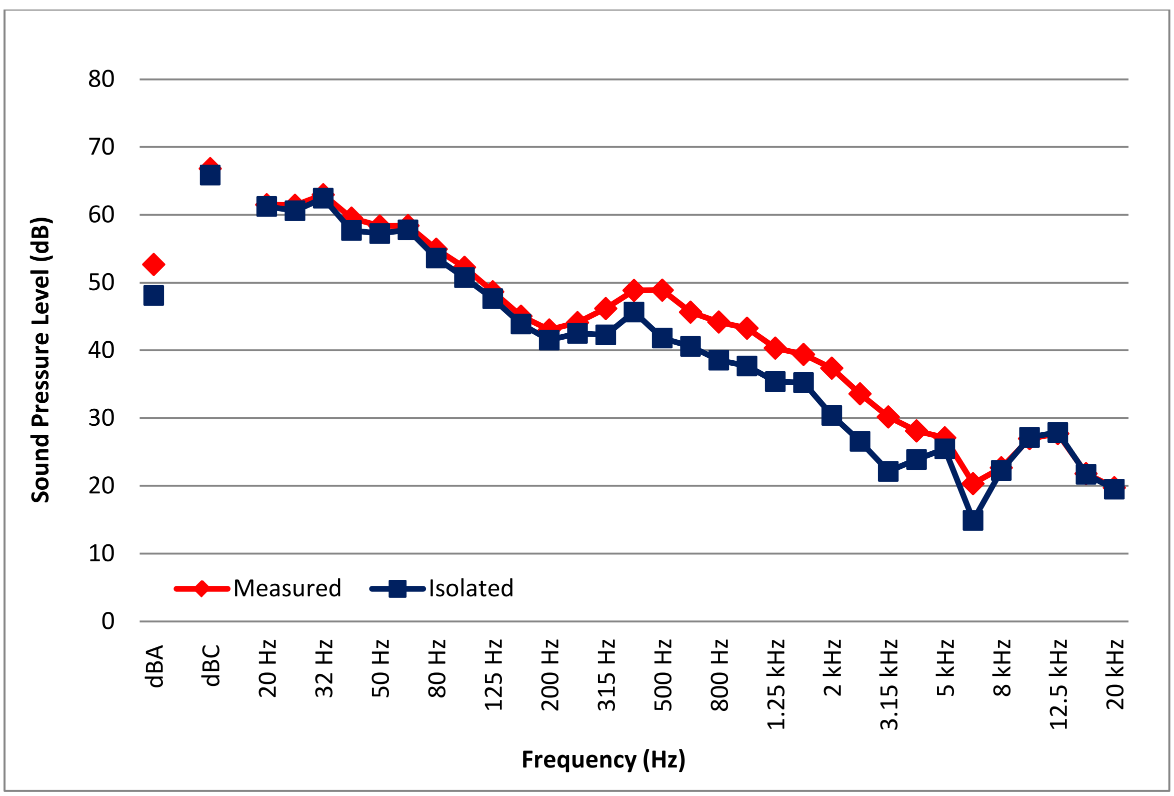

Figure 38. Noise Monitor #3, 1/3 Octave L_{eq} Sound Levels (August 22 - 23, 2013)

Noise Monitor #4

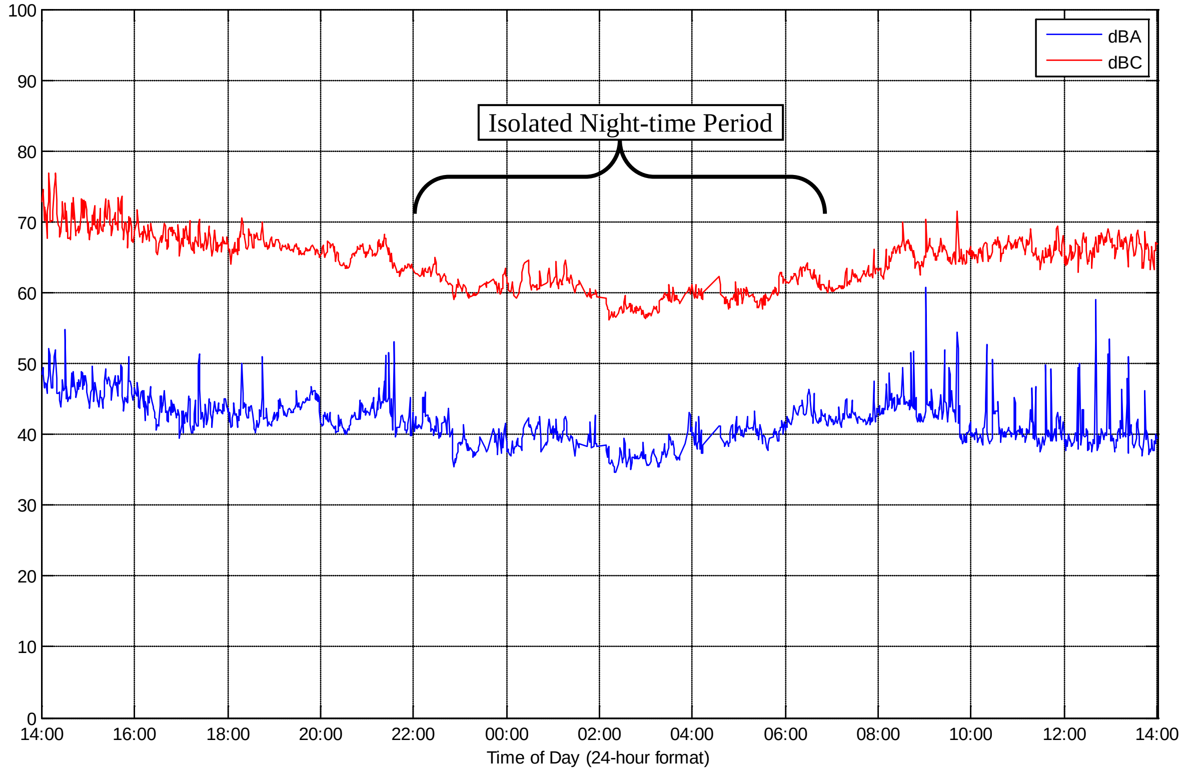

Figure 39. Noise Monitor #4, 1-Minute L_{eq} Sound Levels (August 21 - 22, 2013)

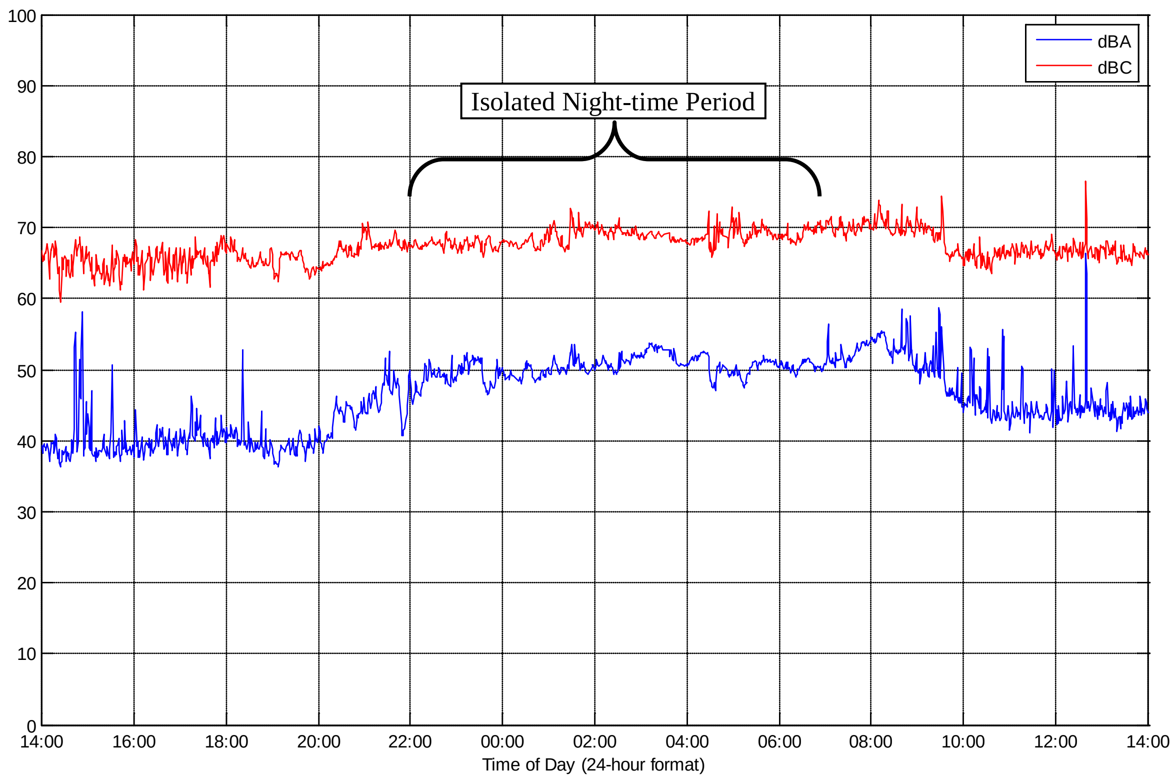

Figure 40. Noise Monitor #4, 1-Minute L_{eq} Sound Levels (August 22 - 23, 2013)

Noise Monitor #4

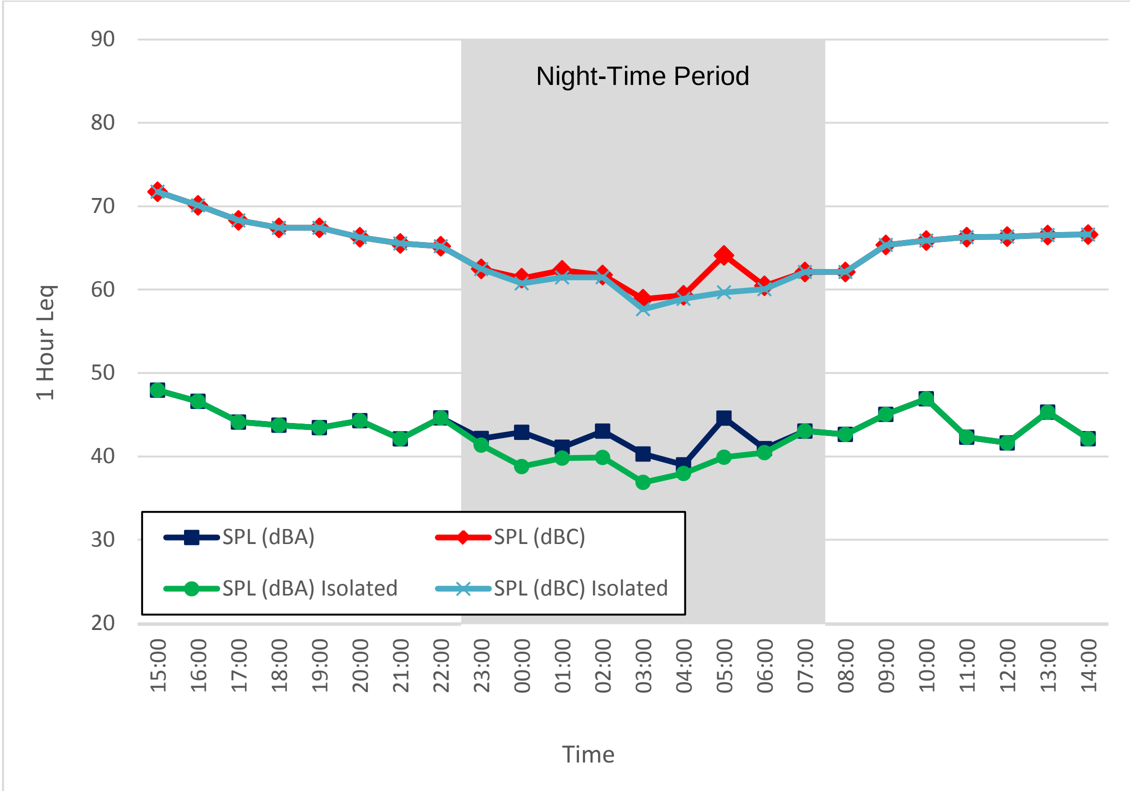

Figure 41. Noise Monitor #4, 1-Hour L_{eq} Sound Levels (August 21 - 22, 2013)

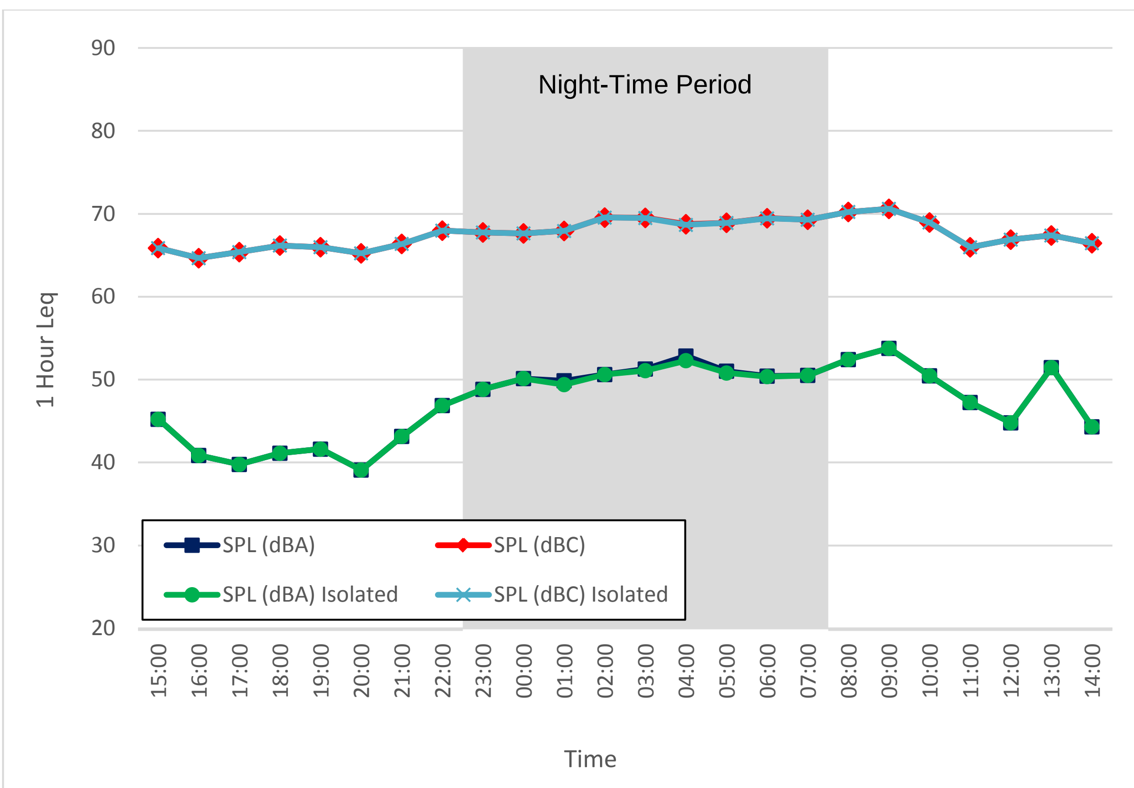

Figure 42. Noise Monitor #4, 1-Hour L_{eq} Sound Levels (August 22 - 23, 2013)

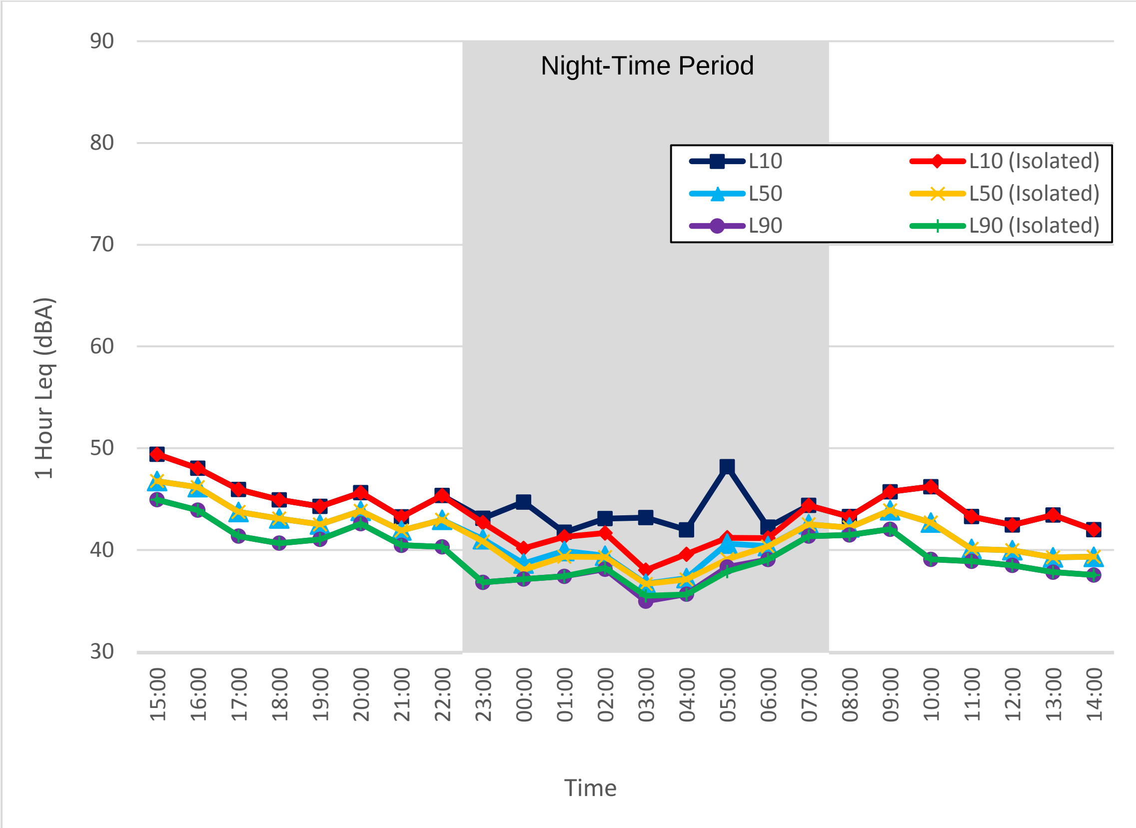

Figure 43. Noise Monitor #4, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (August 21 - 22, 2013)

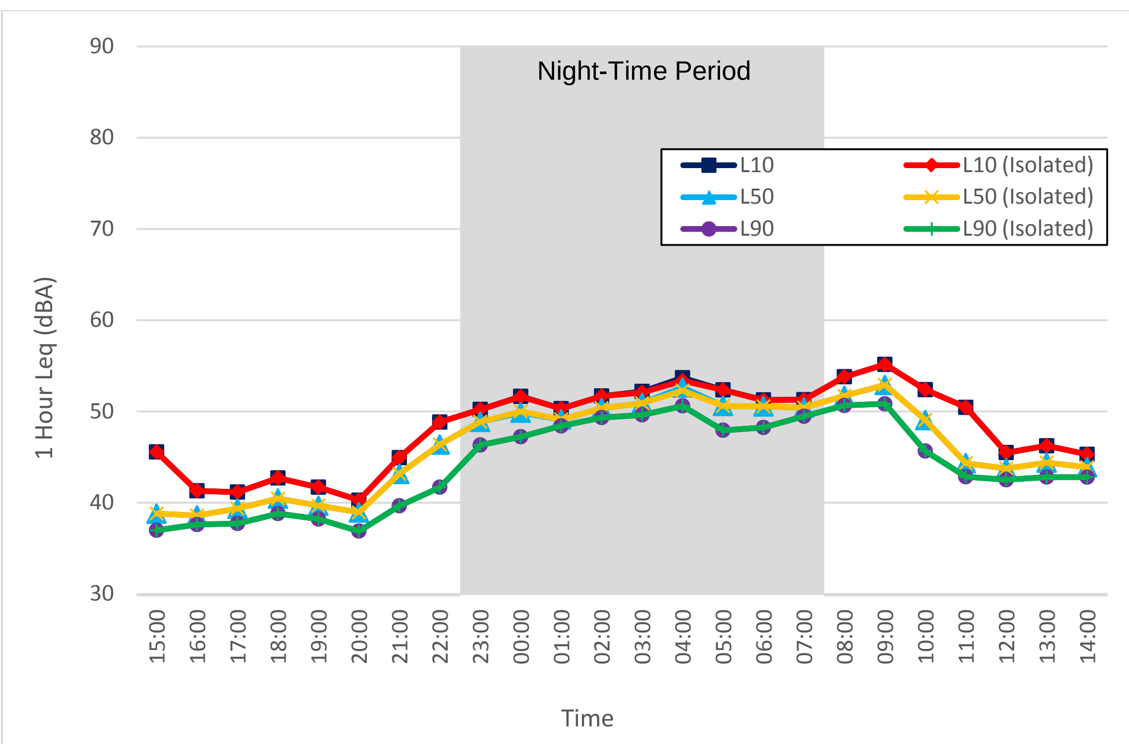

Figure 44. Noise Monitor #4, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (August 22 - 23, 2013)

Noise Monitor #4

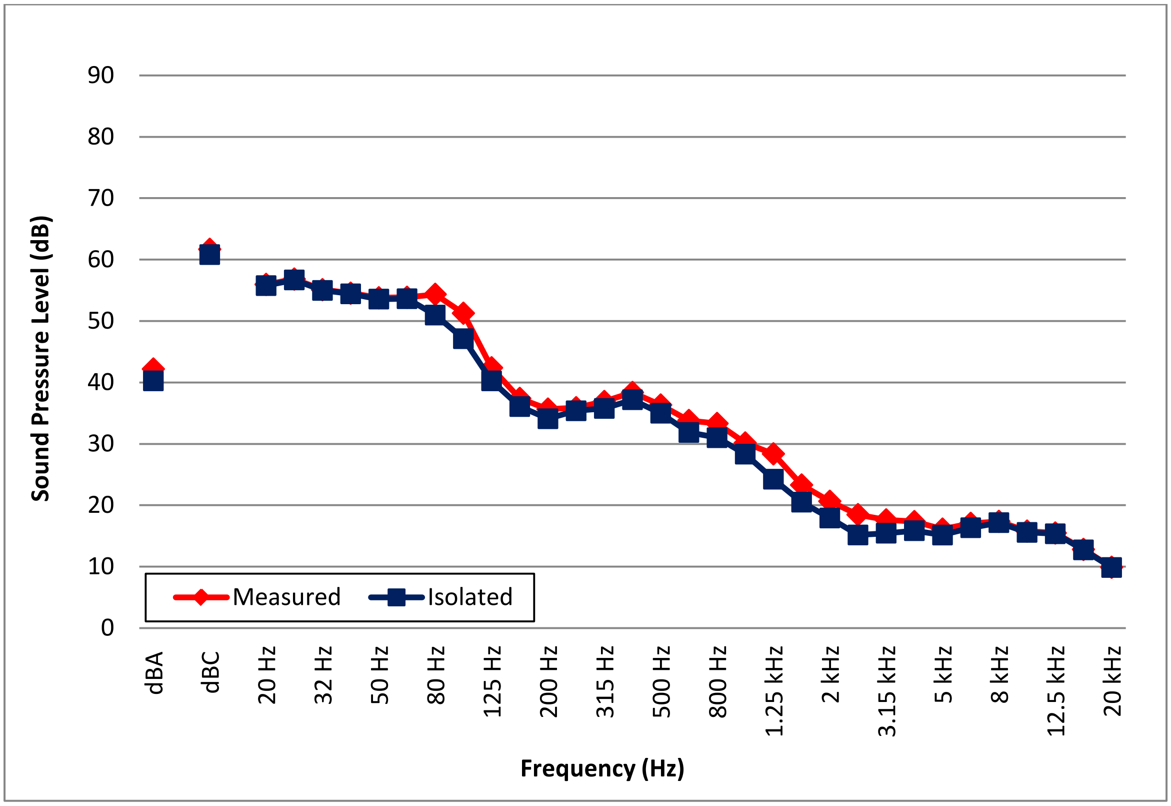

Figure 45. Noise Monitor #4, 1/3 Octave L_{eq} Sound Levels (August 21 - 22, 2013)

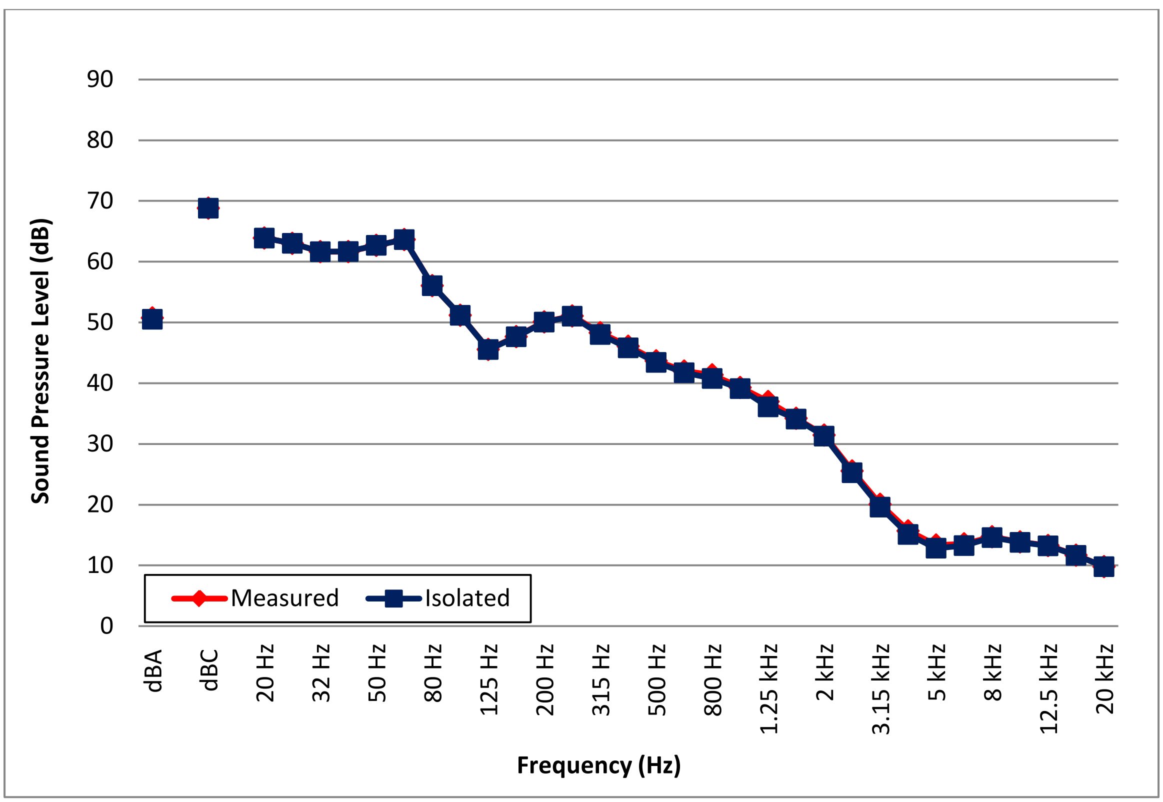

Figure 46. Noise Monitor #4, 1/3 Octave L_{eq} Sound Levels (August 22 - 23, 2013)

Noise Monitor #5

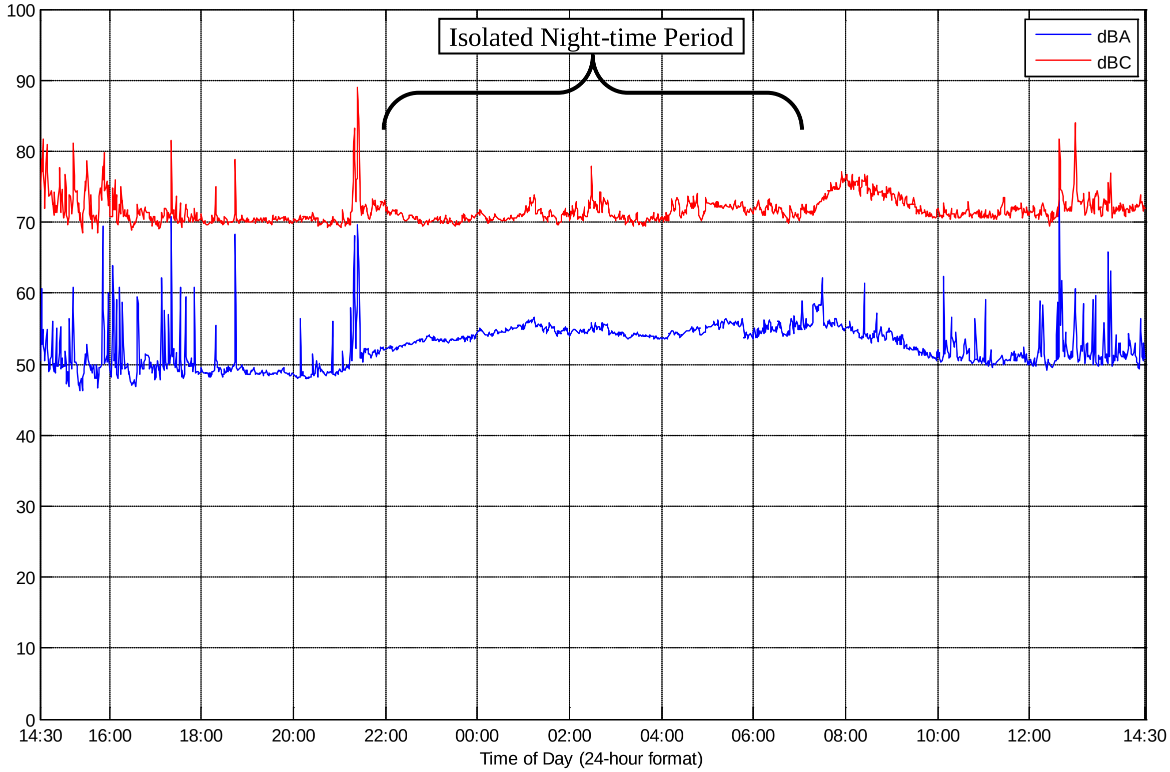

Figure 47. Noise Monitor #5, 1-Minute L_{eq} Sound Levels (August 21 - 22, 2013)

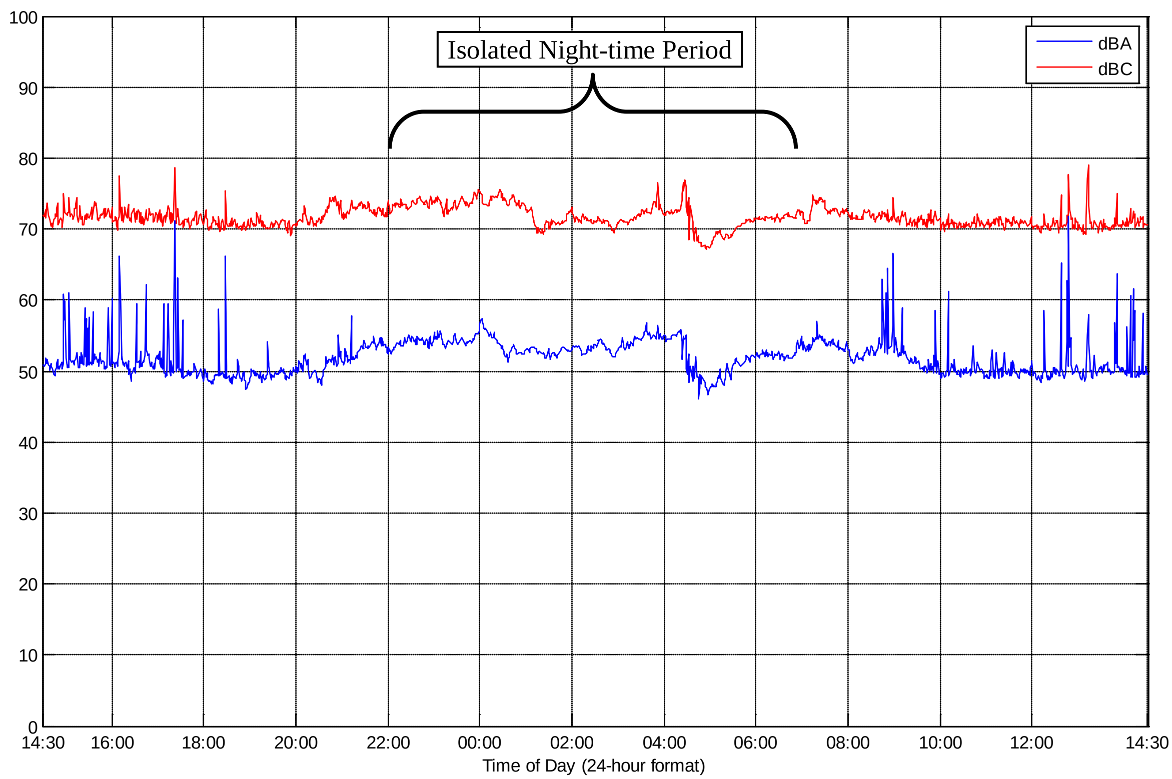

Figure 48. Noise Monitor #5, 1-Minute L_{eq} Sound Levels (August 22 - 23, 2013)

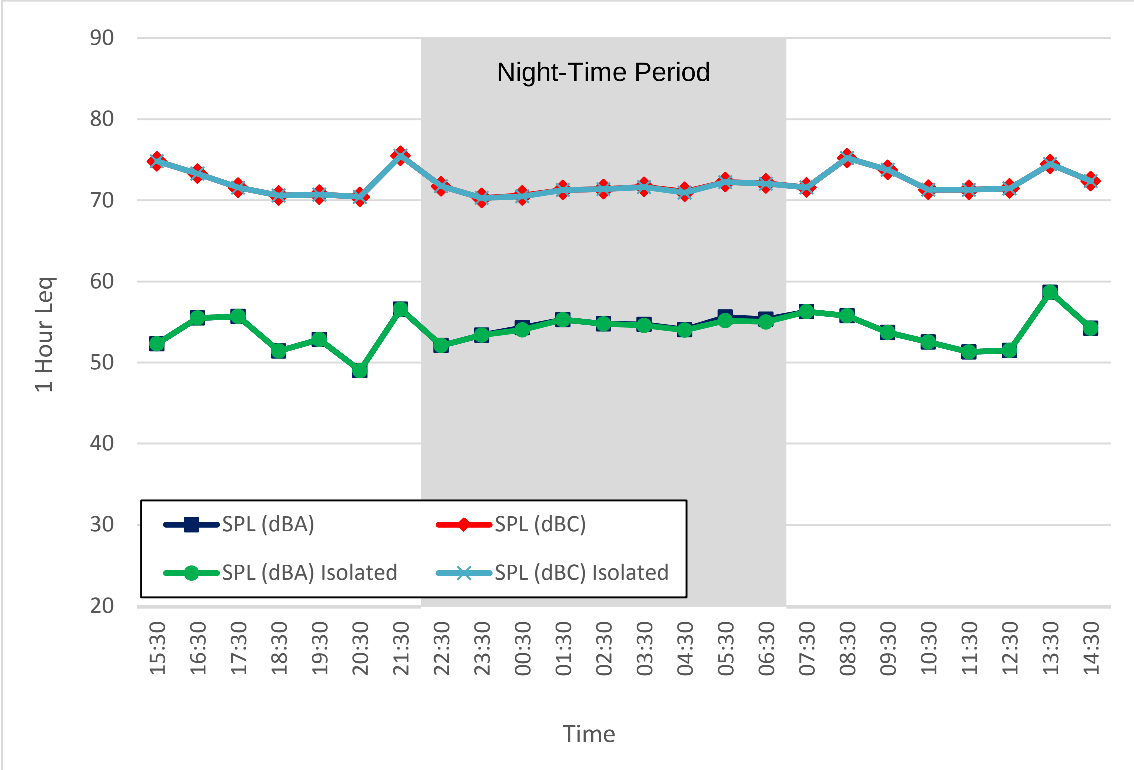

Figure 49. Noise Monitor #5, 1-Hour L_{eq} Sound Levels (August 21 - 22, 2013)

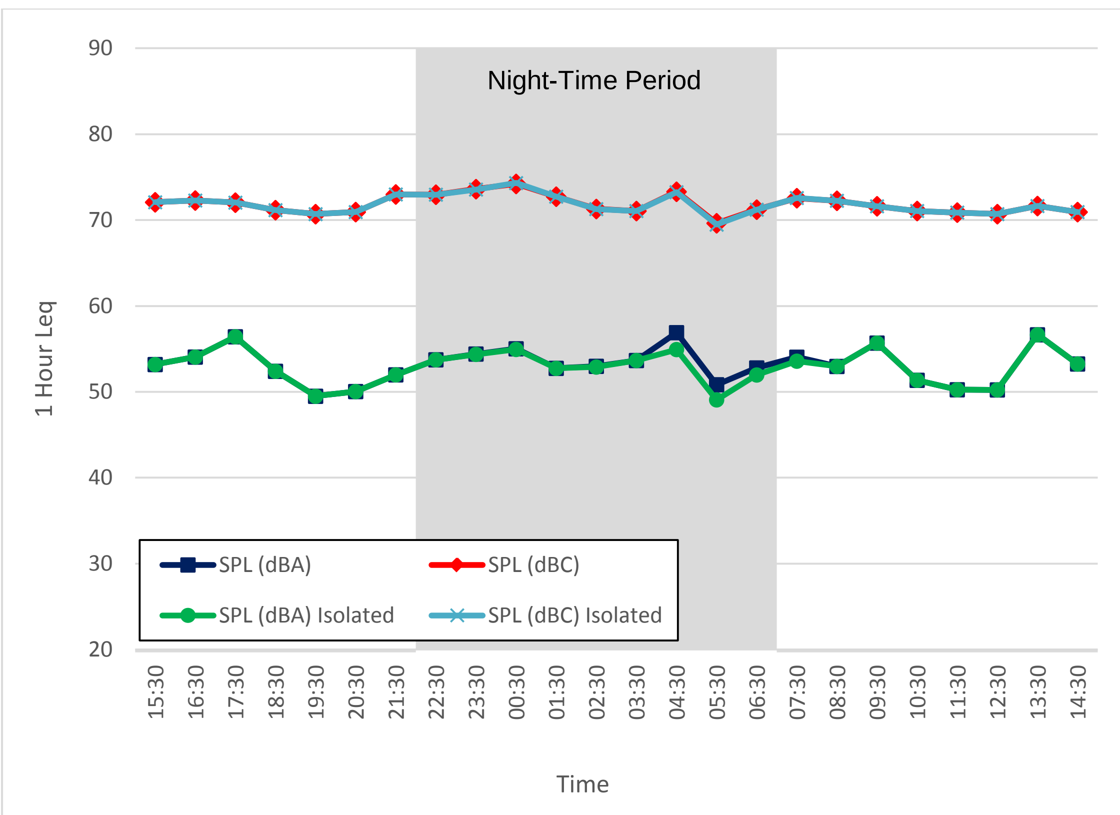

Figure 50. Noise Monitor #5, 1-Hour L_{eq} Sound Levels (August 22 - 23, 2013)

Noise Monitor #5

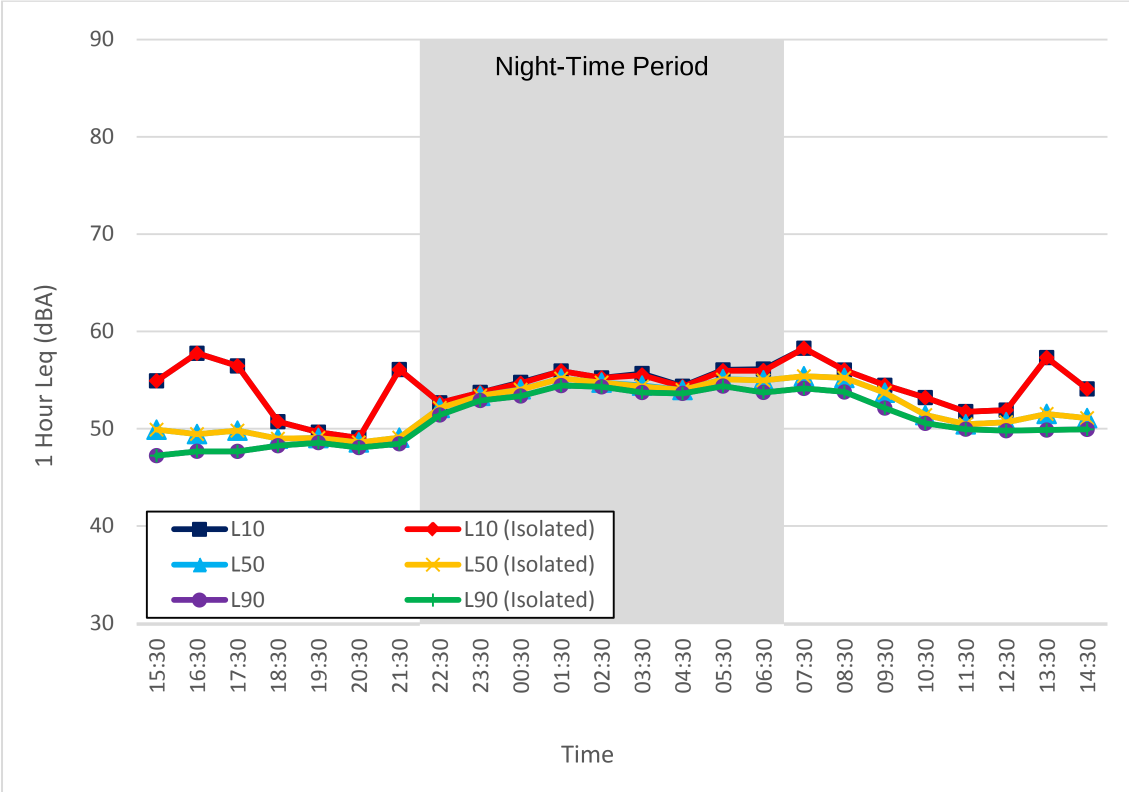

Figure 51. Noise Monitor #5, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (August 21 - 22, 2013)

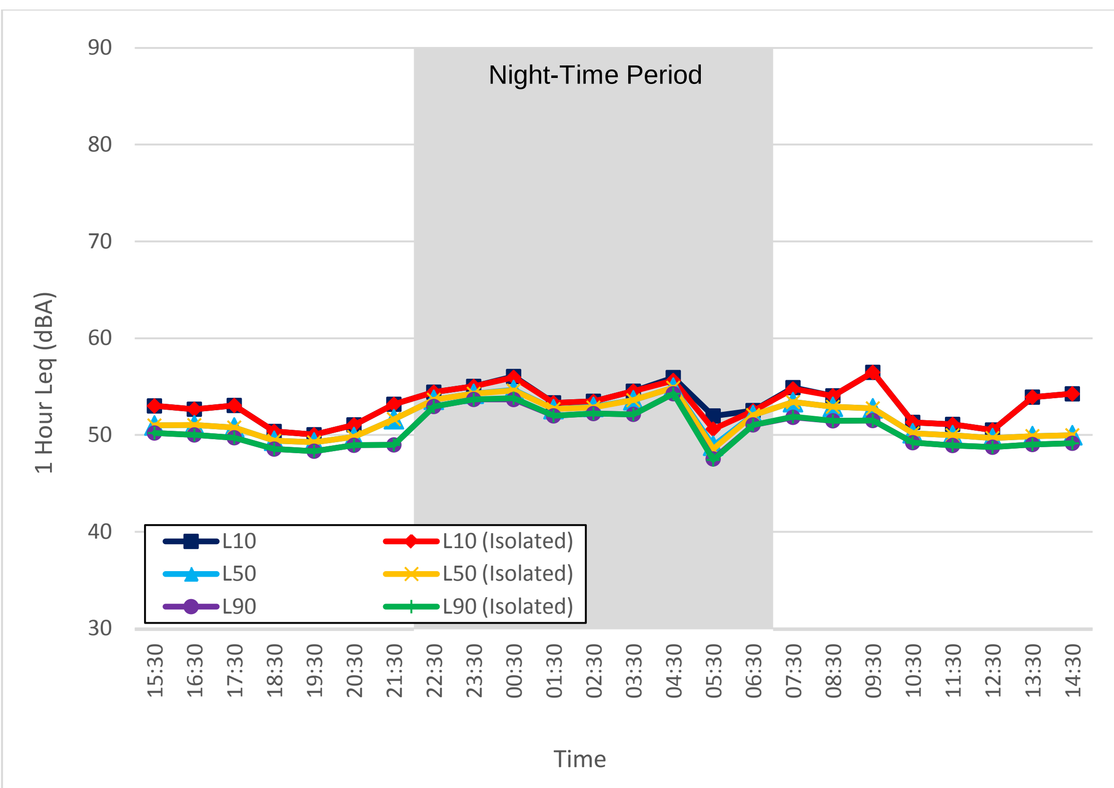

Figure 52. Noise Monitor #5, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (August 22 - 23, 2013)

Noise Monitor #5

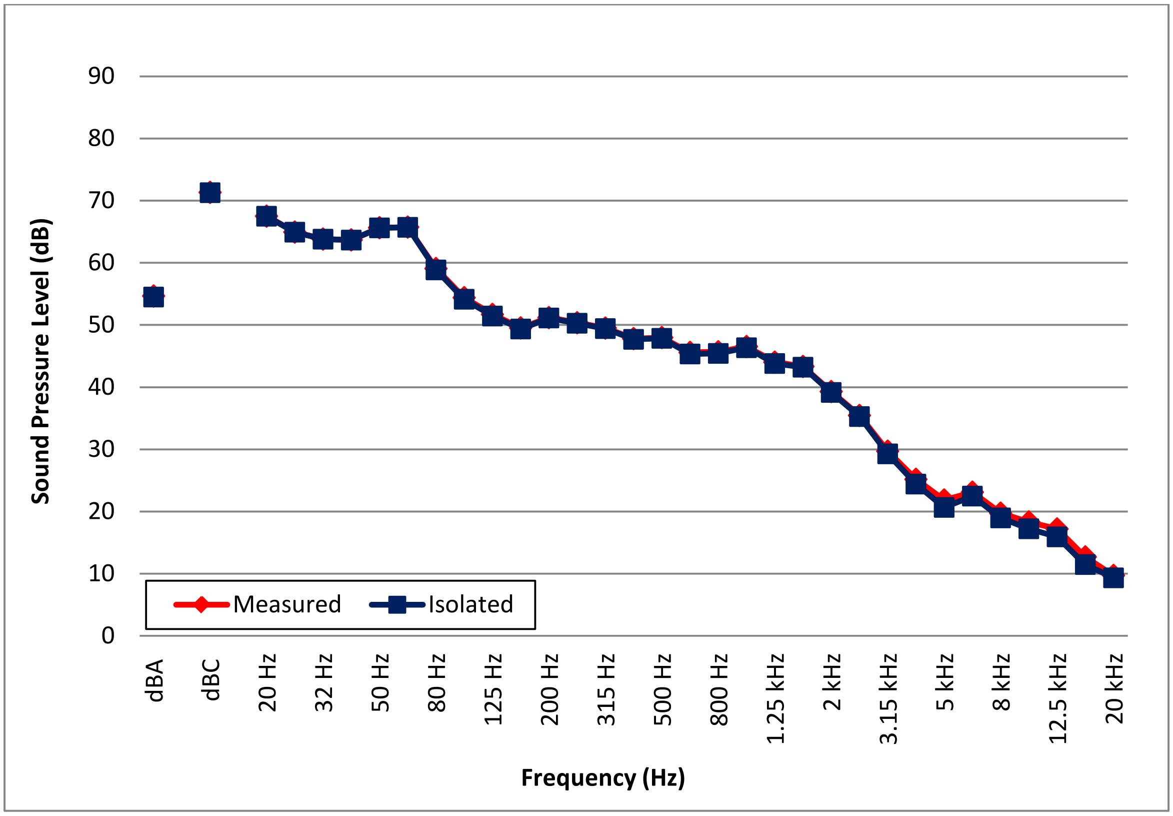

Figure 53. Noise Monitor #5, 1/3 Octave L_{eq} Sound Levels (August 21 - 22, 2013)

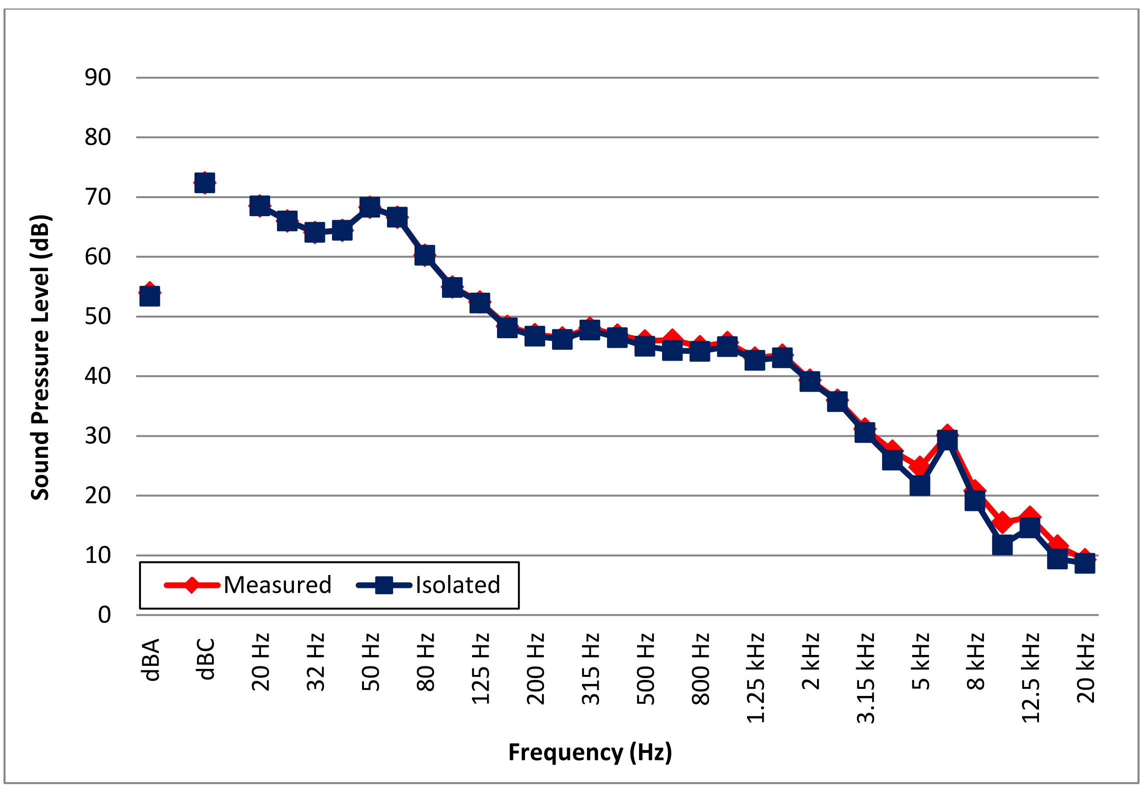

Figure 54. Noise Monitor #5, 1/3 Octave L_{eq} Sound Levels (August 22 - 23, 2013)

Noise Monitor #6

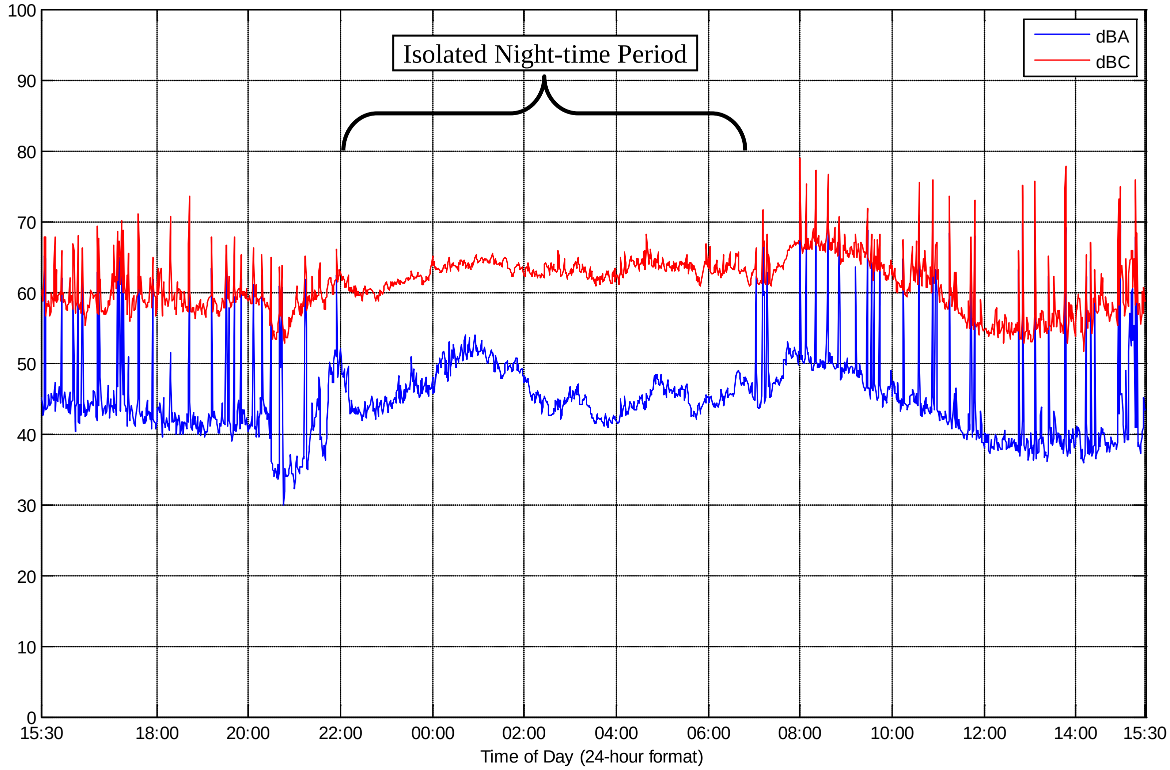

Figure 55. Noise Monitor #6, 1-Minute L_{eq} Sound Levels (August 21 - 22, 2013)

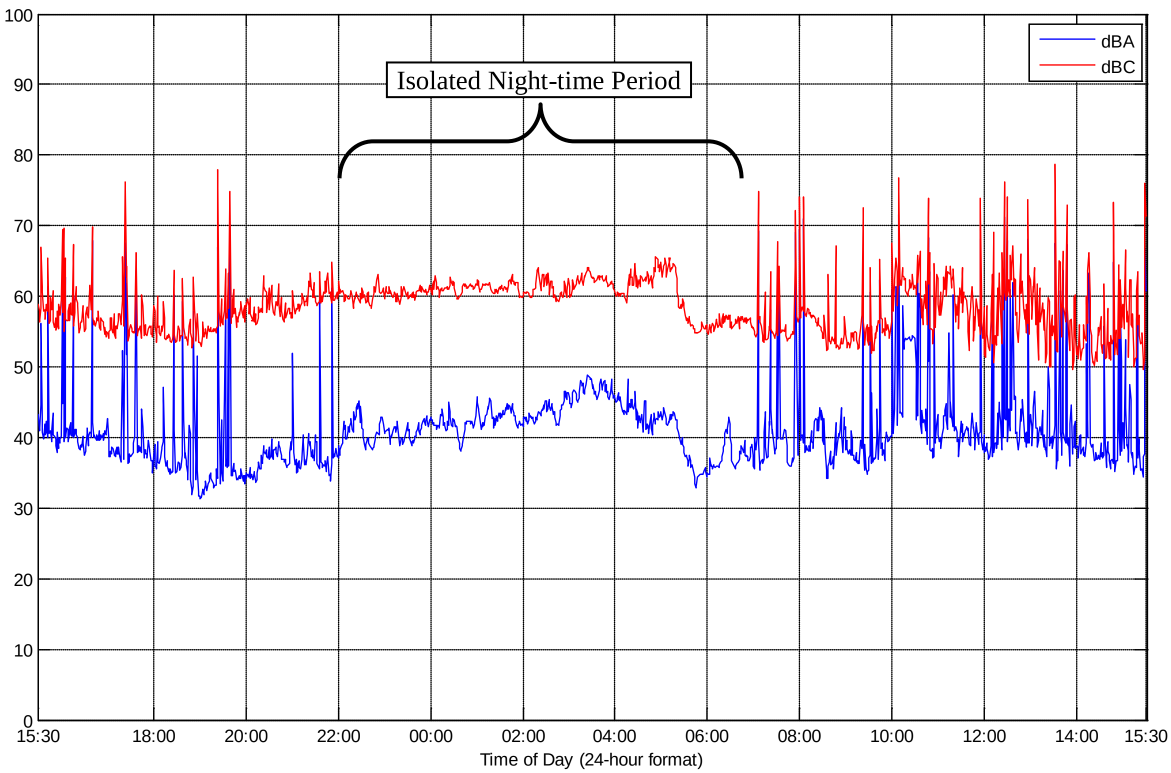

Figure 56. Noise Monitor #6, 1-Minute L_{eq} Sound Levels (August 22 - 23, 2013)

Noise Monitor #6

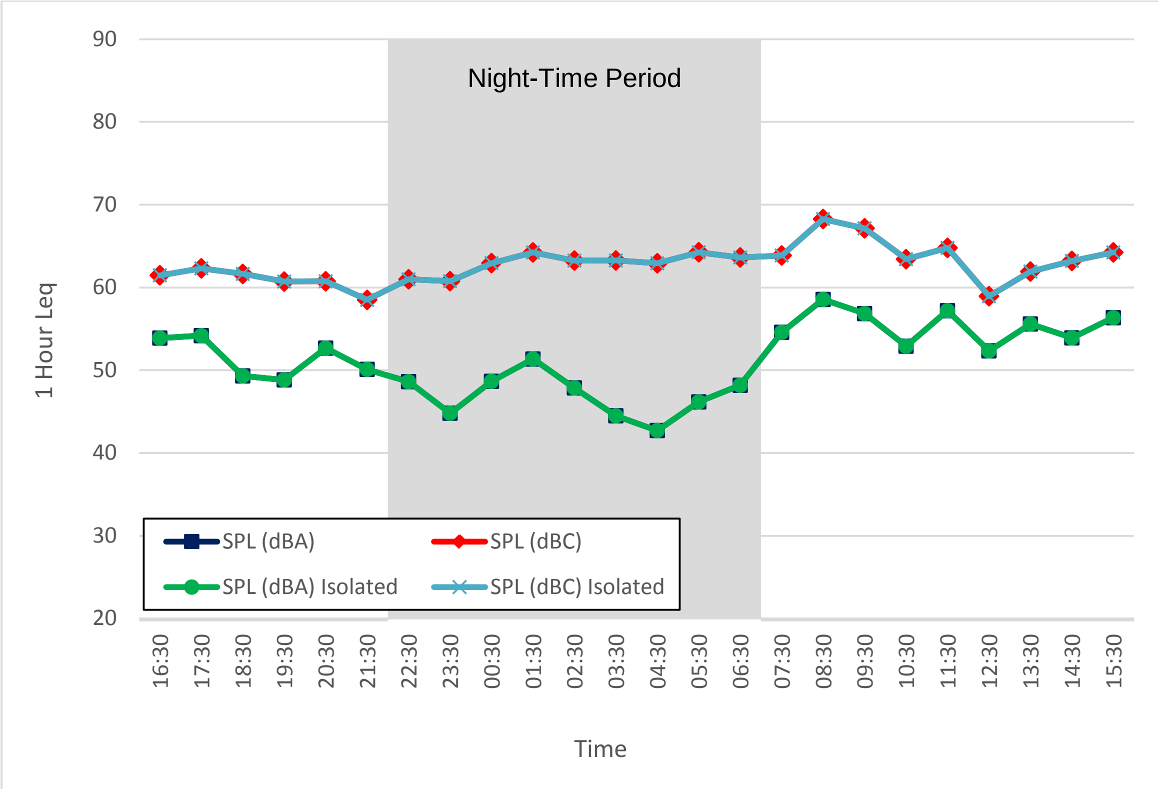

Figure 57. Noise Monitor #6, 1-Hour L_{eq} Sound Levels (August 21 - 22, 2013)

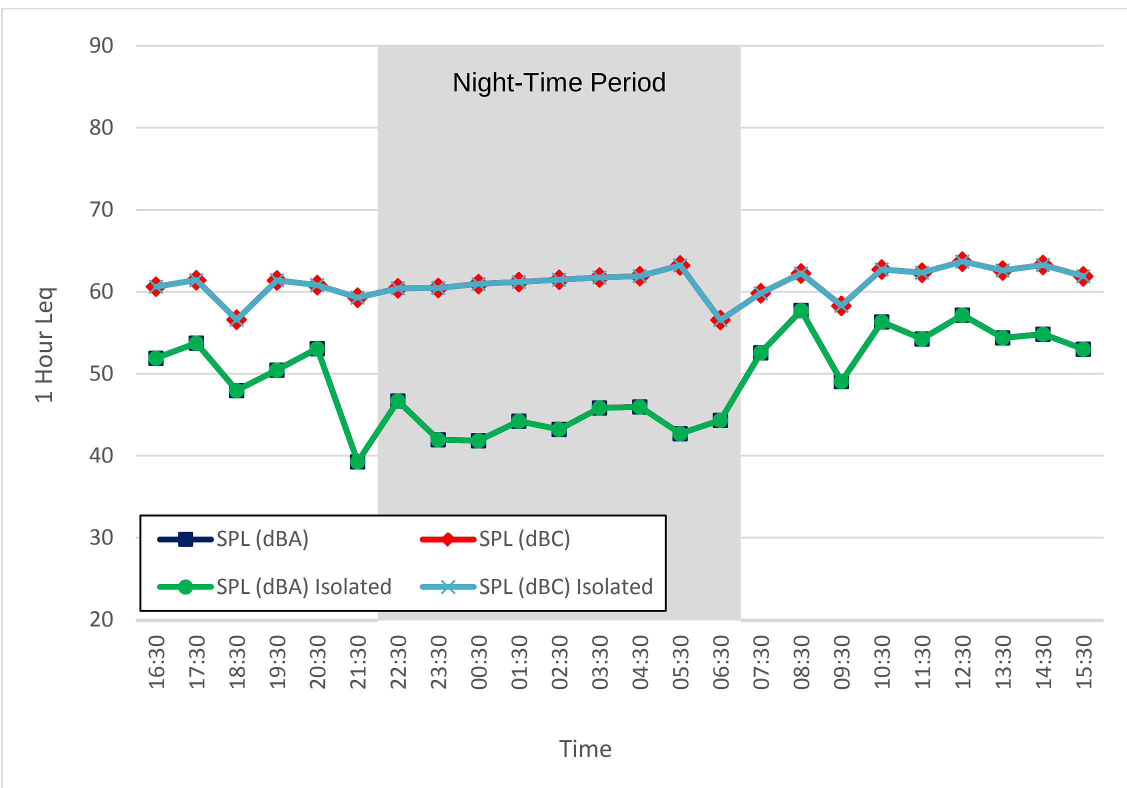

Figure 58. Noise Monitor #6, 1-Hour L_{eq} Sound Levels (August 22 - 23, 2013)

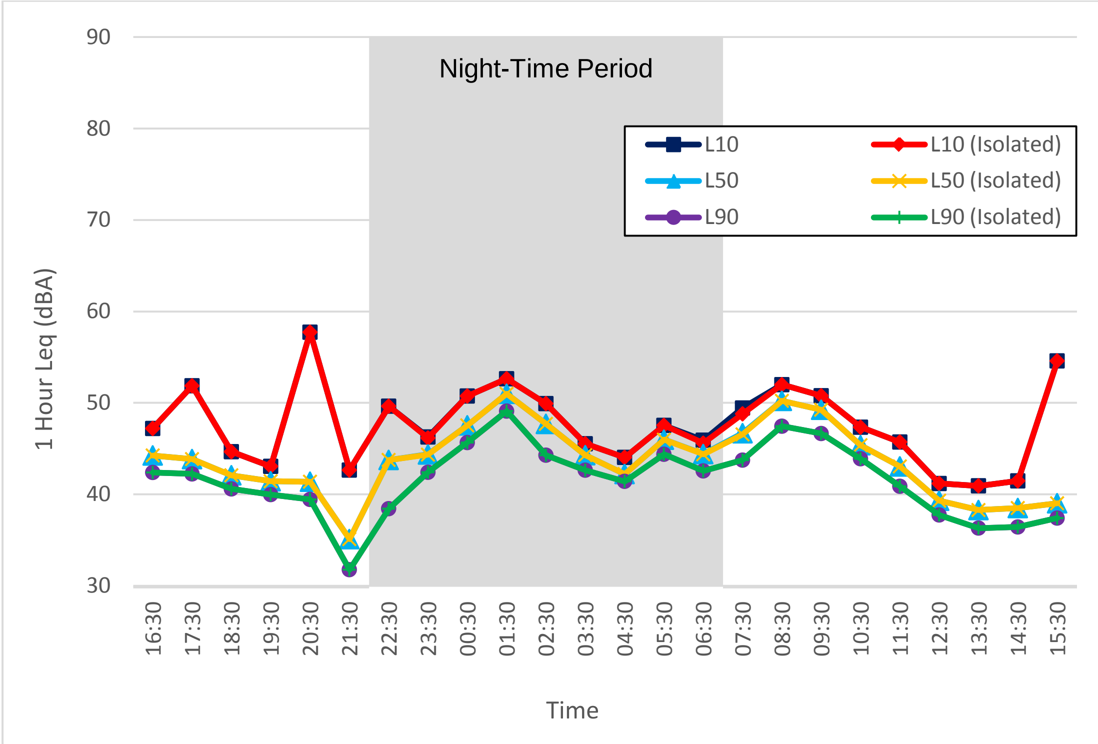

Figure 59. Noise Monitor #6, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (August 21 - 22, 2013)

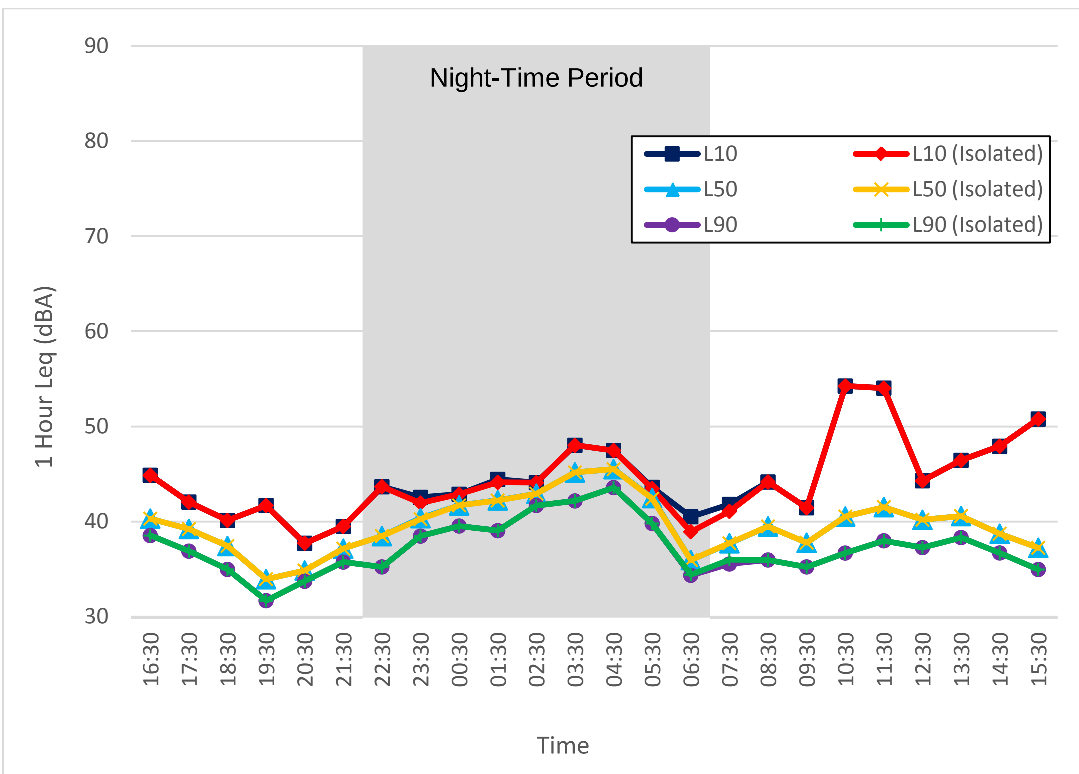

Figure 60. Noise Monitor #6, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (August 22 - 23, 2013)

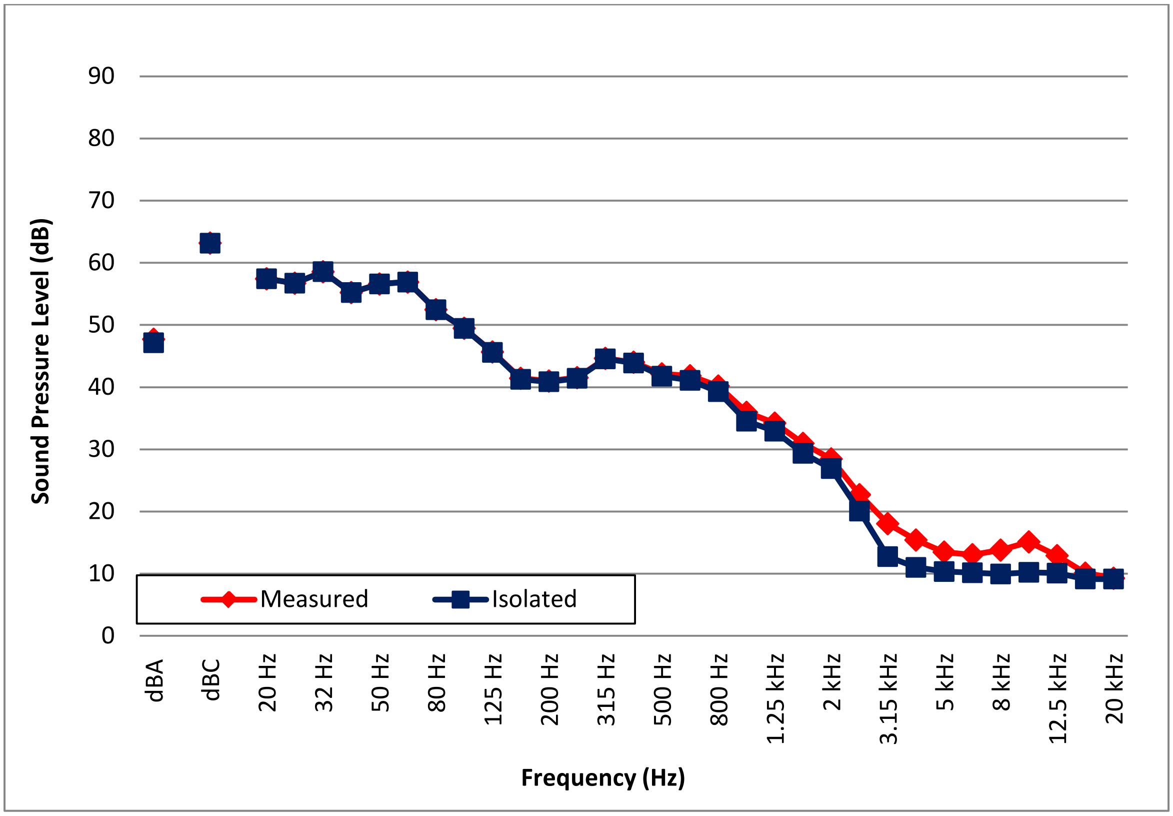

Figure 61. Noise Monitor #6, 1/3 Octave L_{eq} Sound Levels (August 21 - 22, 2013)

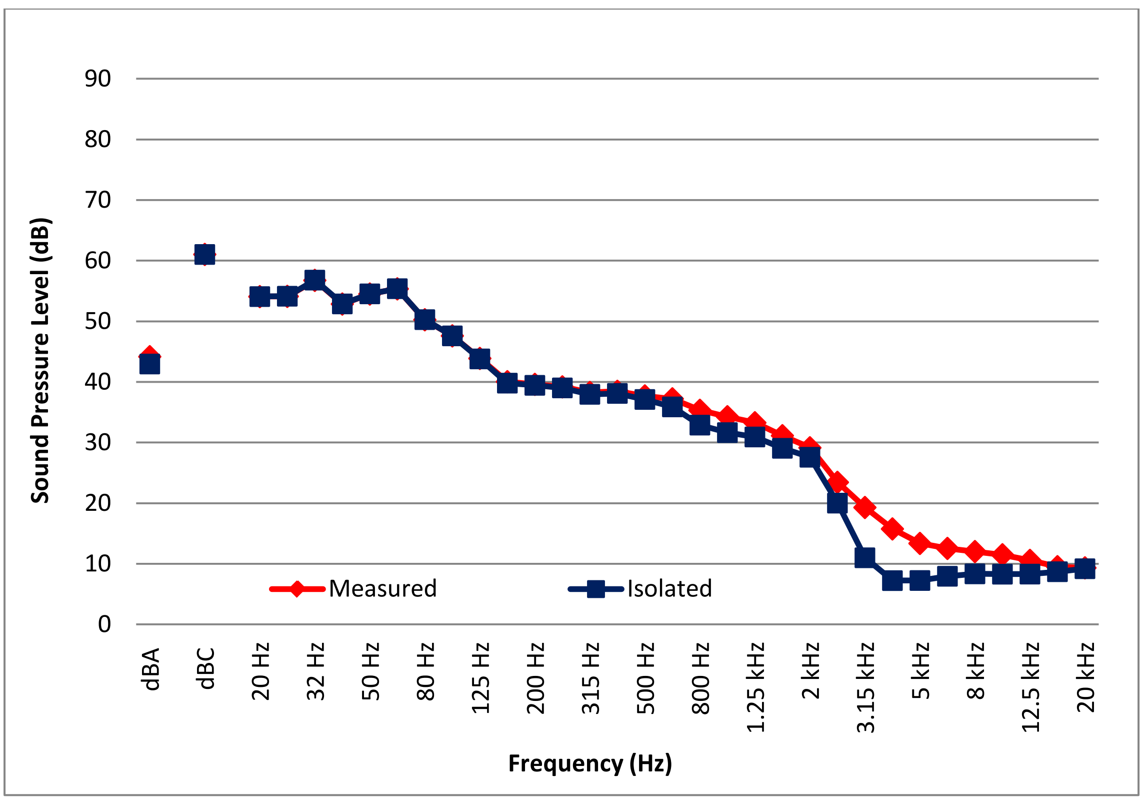

Figure 62. Noise Monitor #6, 1/3 Octave L_{eq} Sound Levels (August 22 - 23, 2013)

Noise Monitor #7

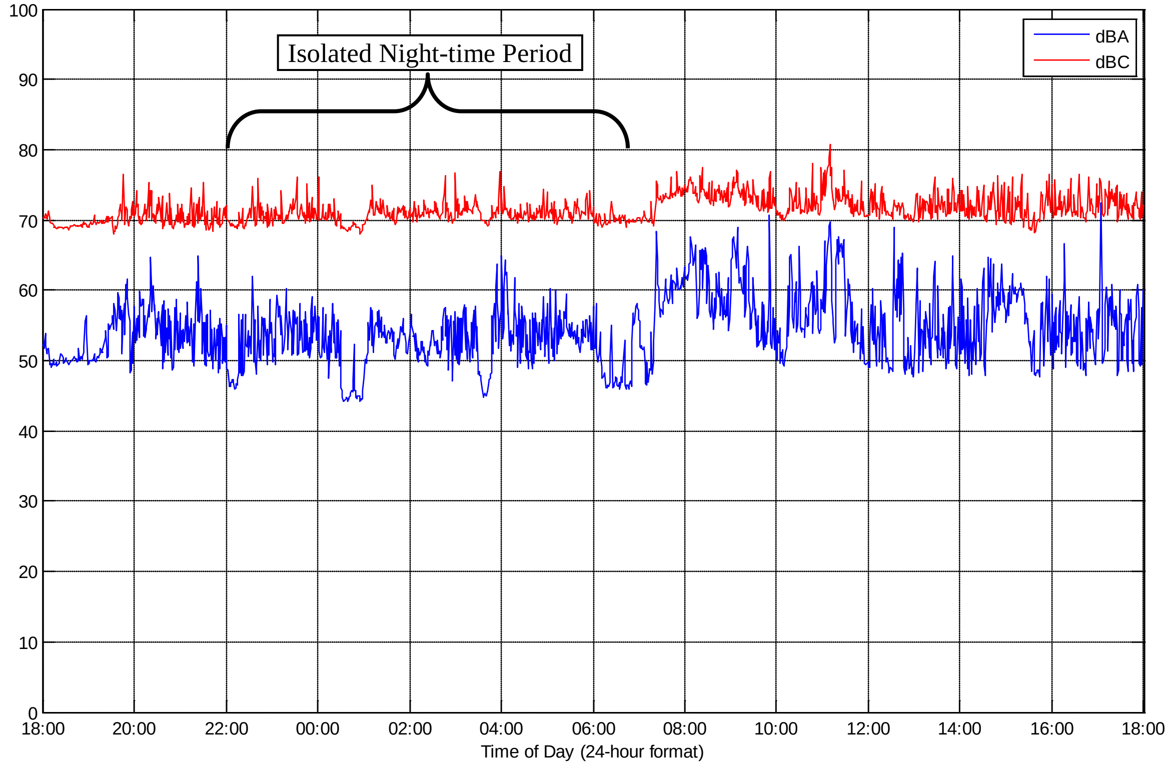

Figure 63. Noise Monitor #7, 1-Minute L_{eq} Sound Levels (August 23 - 24, 2013)

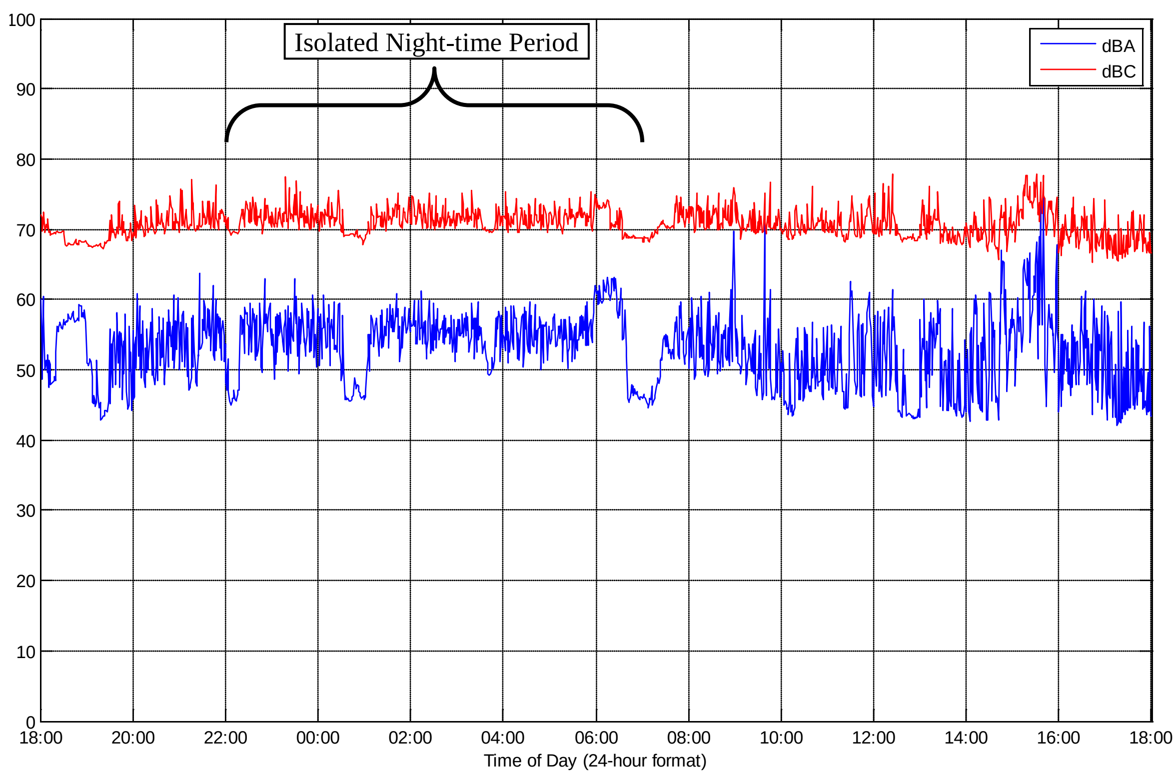

Figure 64. Noise Monitor #7, 1-Minute L_{eq} Sound Levels (August 24 - 25, 2013)

Noise Monitor #7

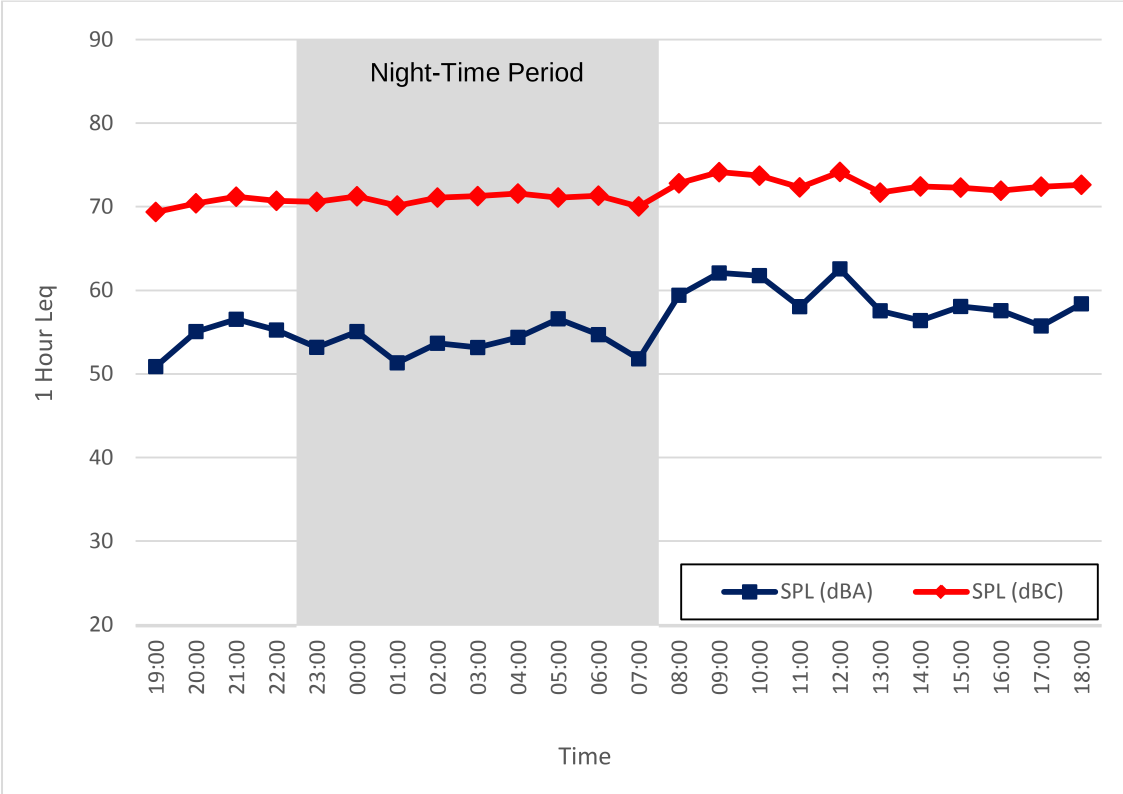

Figure 65. Noise Monitor #7, 1-Hour L_{eq} Sound Levels (August 23 - 24, 2013)

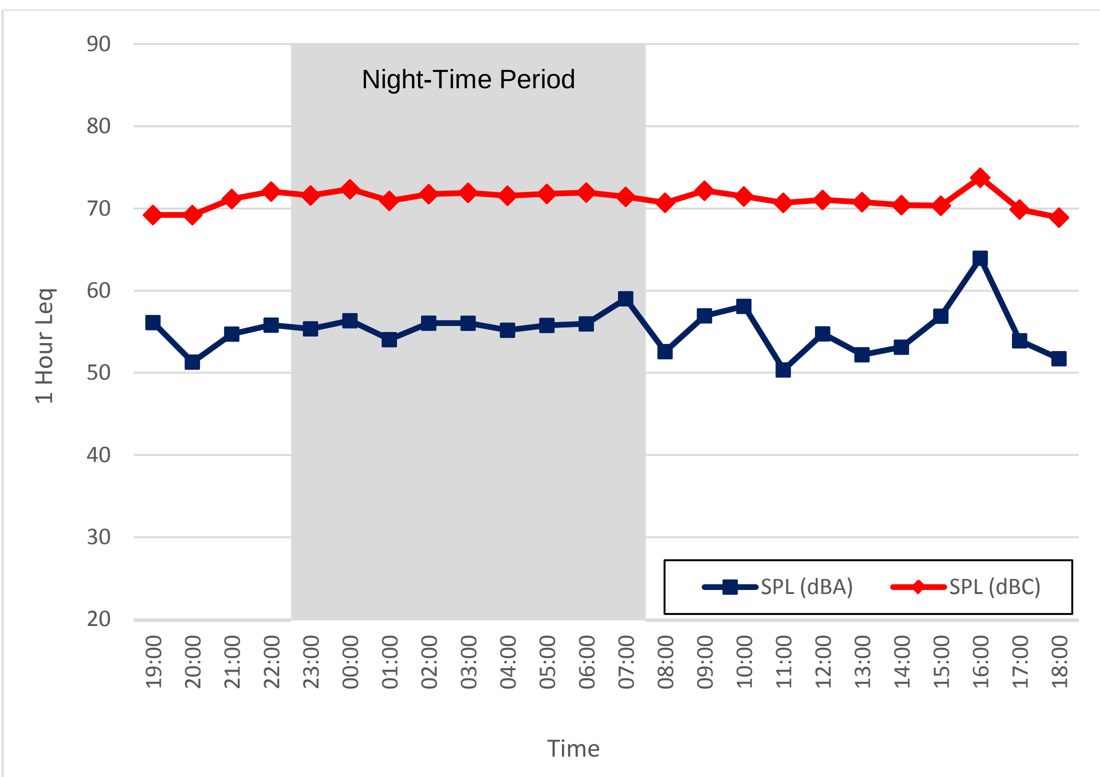

Figure 66. Noise Monitor #7, 1-Hour L_{eq} Sound Levels (August 24 - 25, 2013)

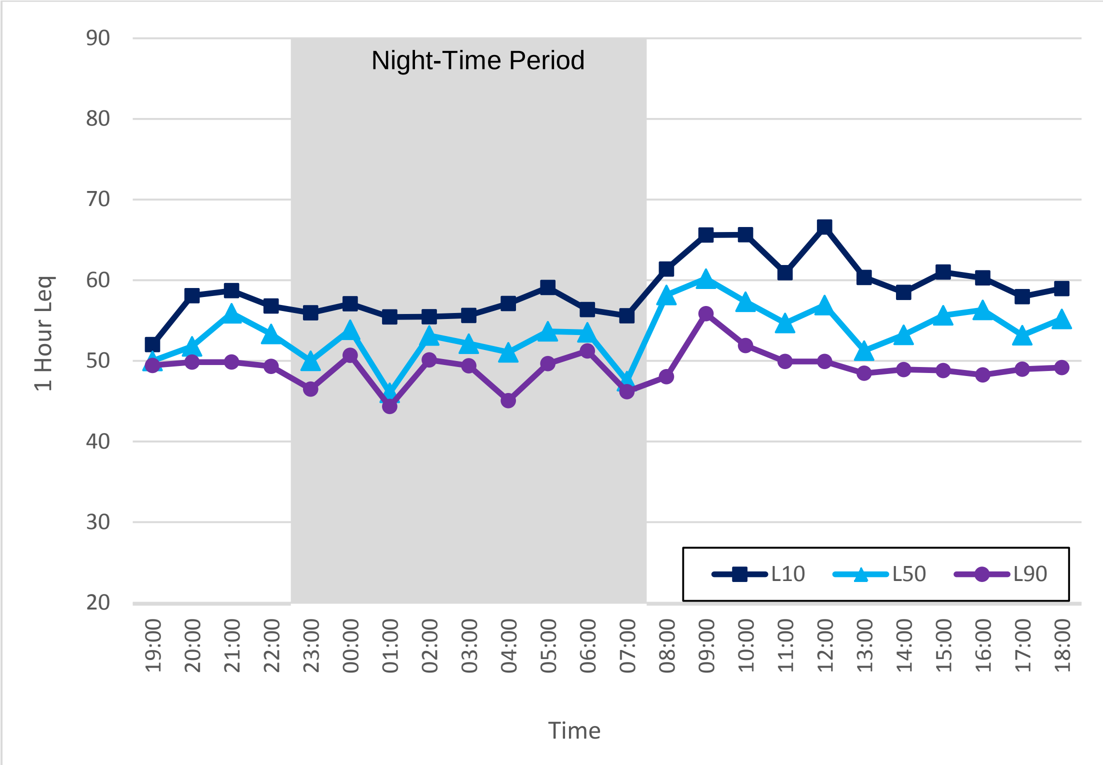

Figure 67. Noise Monitor #7, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (August 23 - 24, 2013)

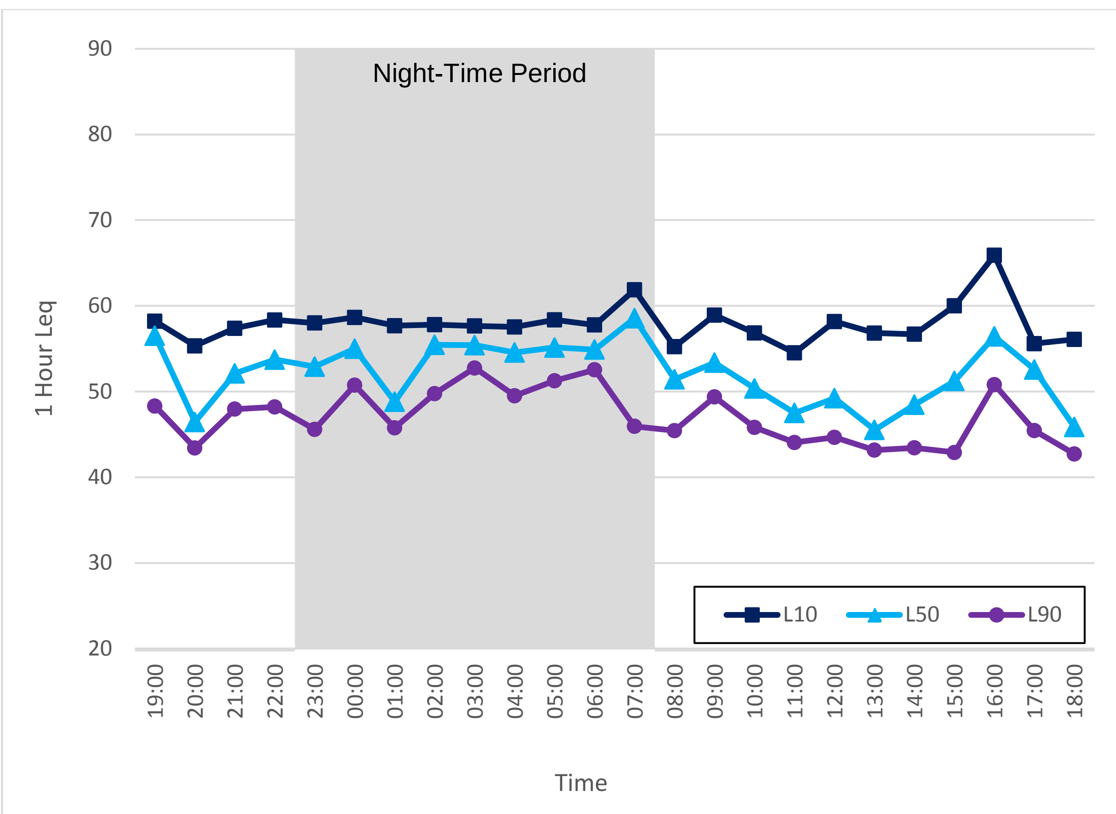

Figure 68. Noise Monitor #7, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (August 24 - 25, 2013)

Noise Monitor #7

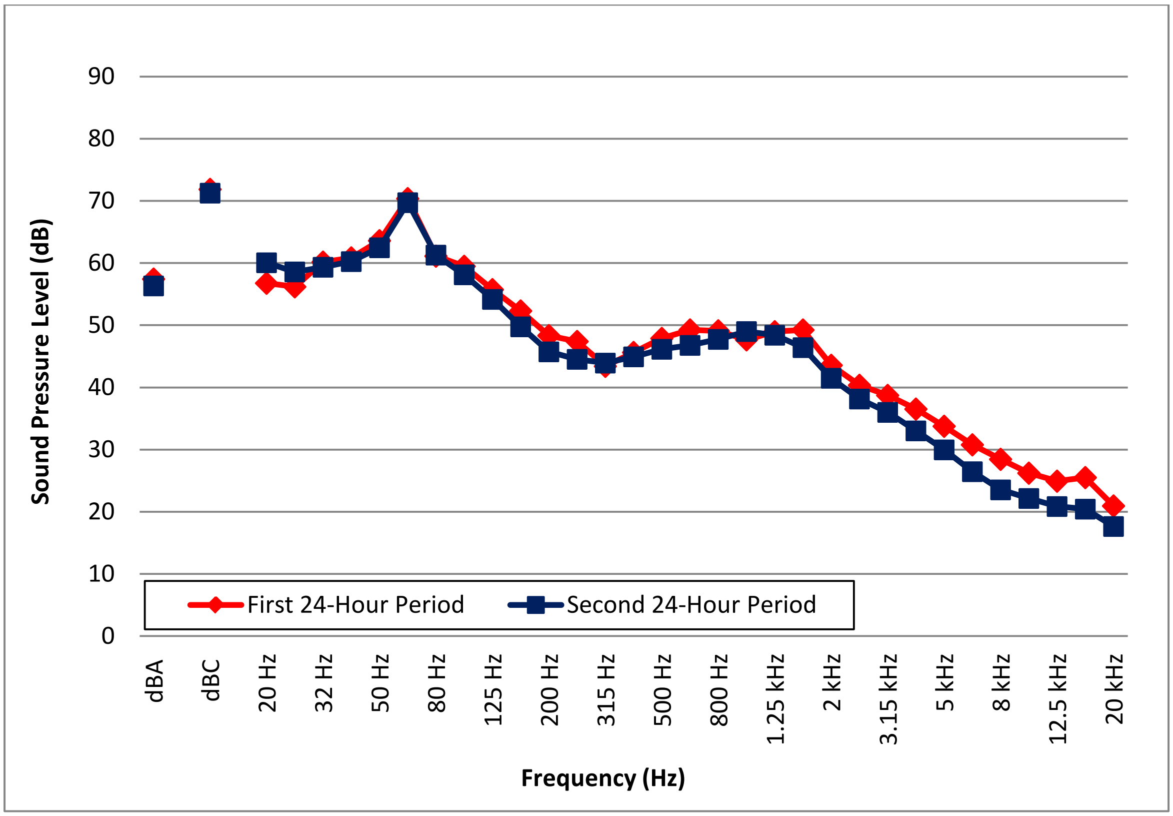

Figure 69. Noise Monitor #7, 1/3 Octave L_{eq} Sound Levels (August 23 - 25, 2013)

Noise Monitor #8

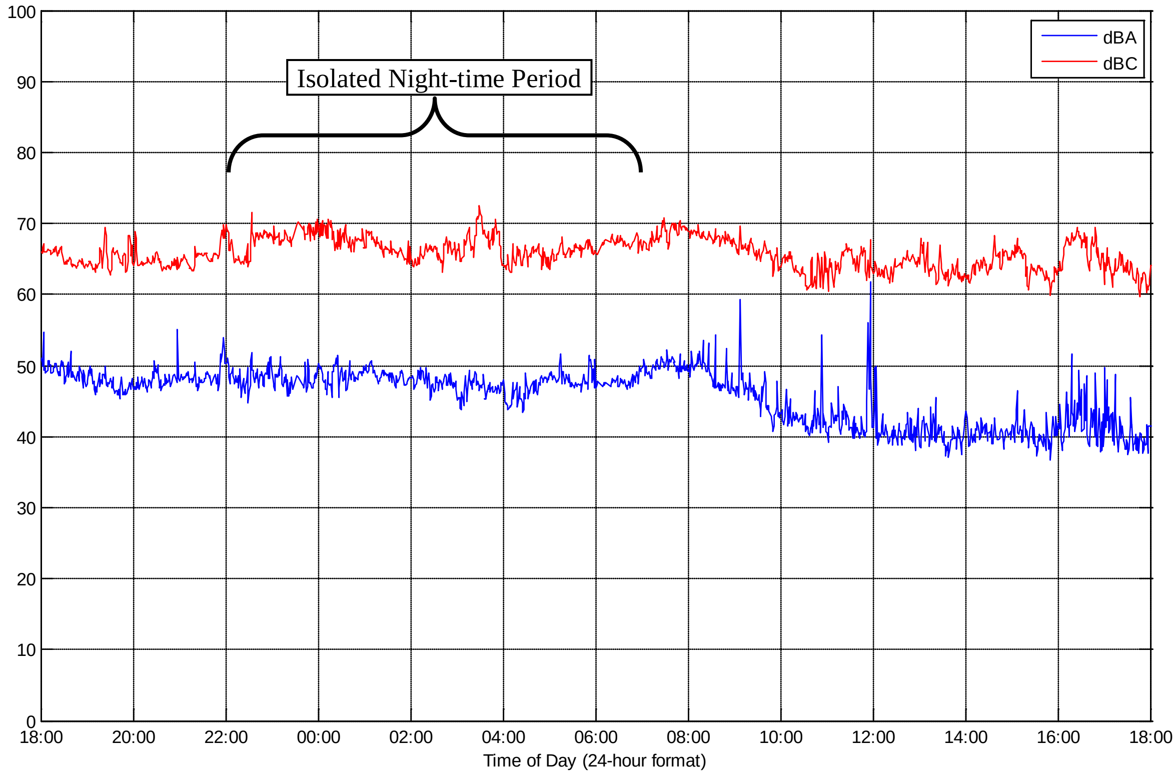

Figure 70. Noise Monitor #8, 1-Minute L_{eq} Sound Levels (August 23 - 24, 2013)

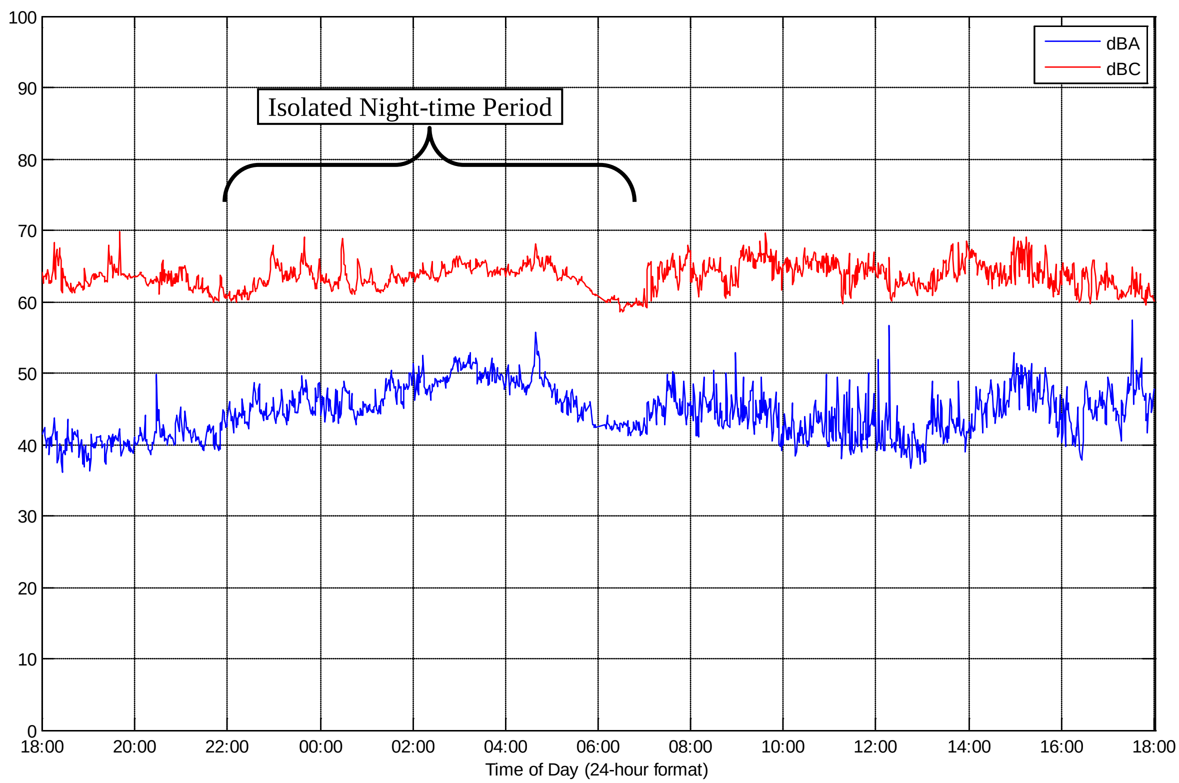

Figure 71. Noise Monitor #8, 1-Minute L_{eq} Sound Levels (August 24 - 25, 2013)

Noise Monitor #8

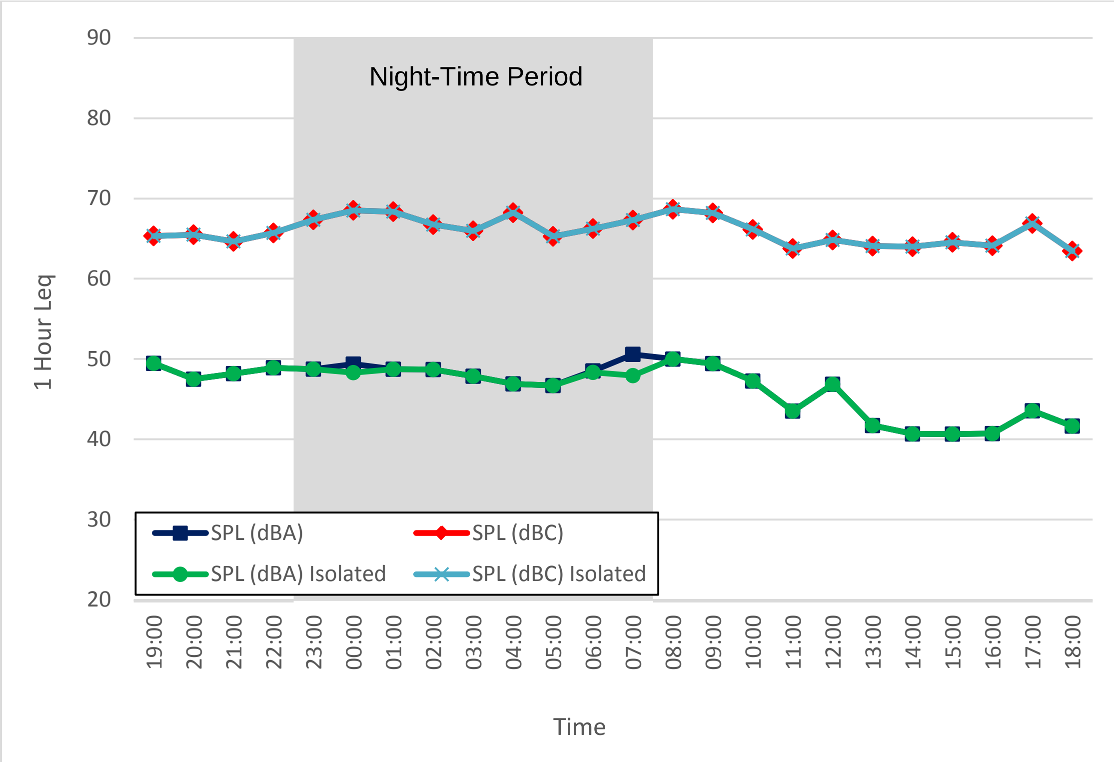

Figure 72. Noise Monitor #8, 1-Hour L_{eq} Sound Levels (August 23 - 24, 2013)

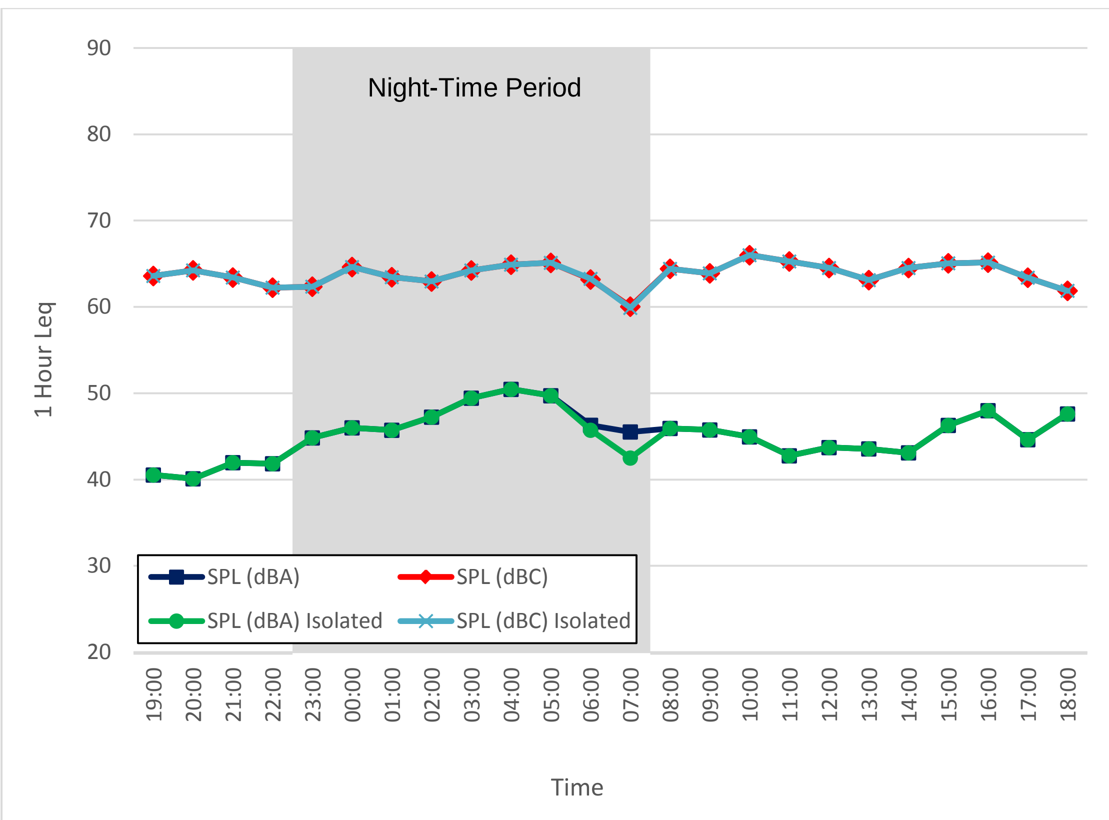

Figure 73. Noise Monitor #8, 1-Hour L_{eq} Sound Levels (August 24 - 25, 2013)

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Noise Monitor #8

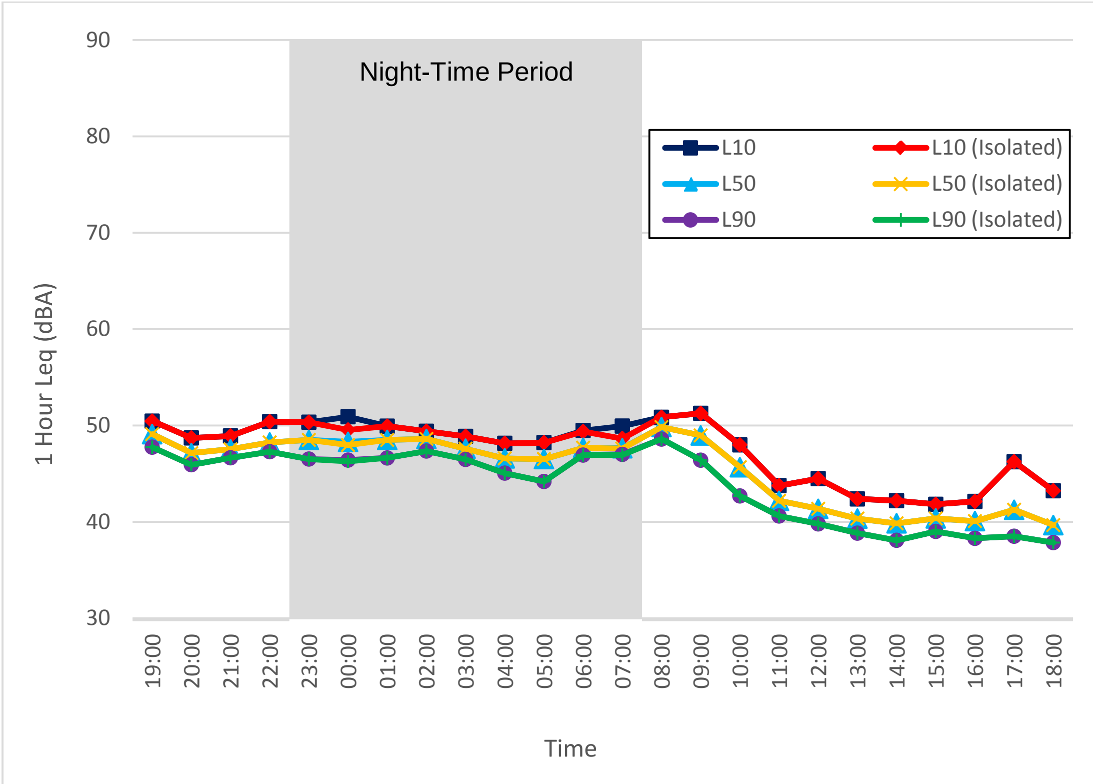

Figure 74. Noise Monitor #8, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (August 23 - 24, 2013)

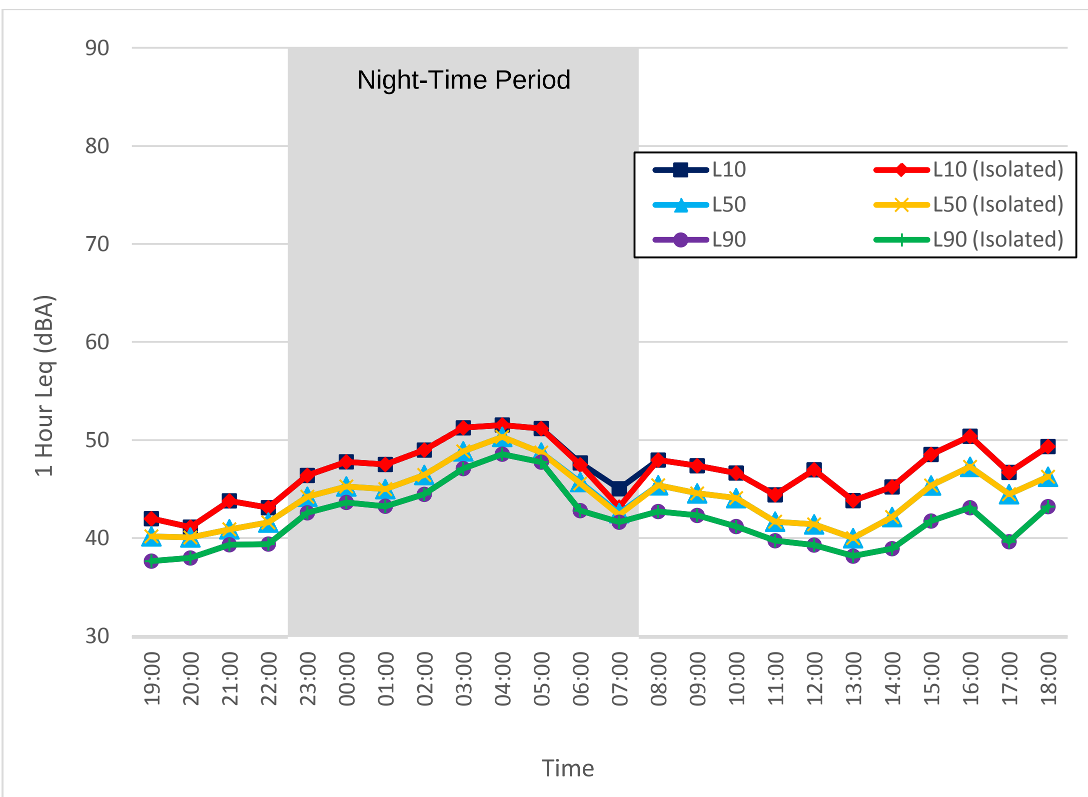

Figure 75. Noise Monitor #8, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (August 24 - 25, 2013)

Noise Monitor #8

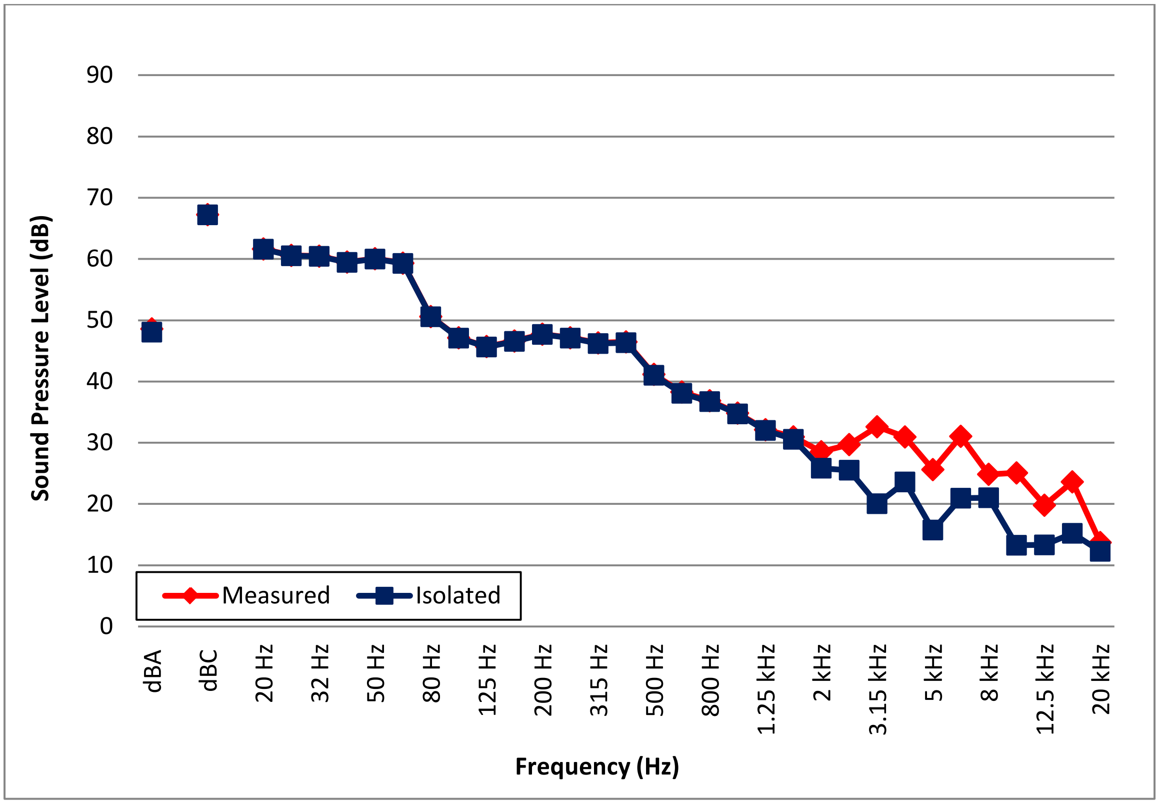

Figure 76. Noise Monitor #8, 1/3 Octave L_{eq} Sound Levels (August 23 - 24, 2013)

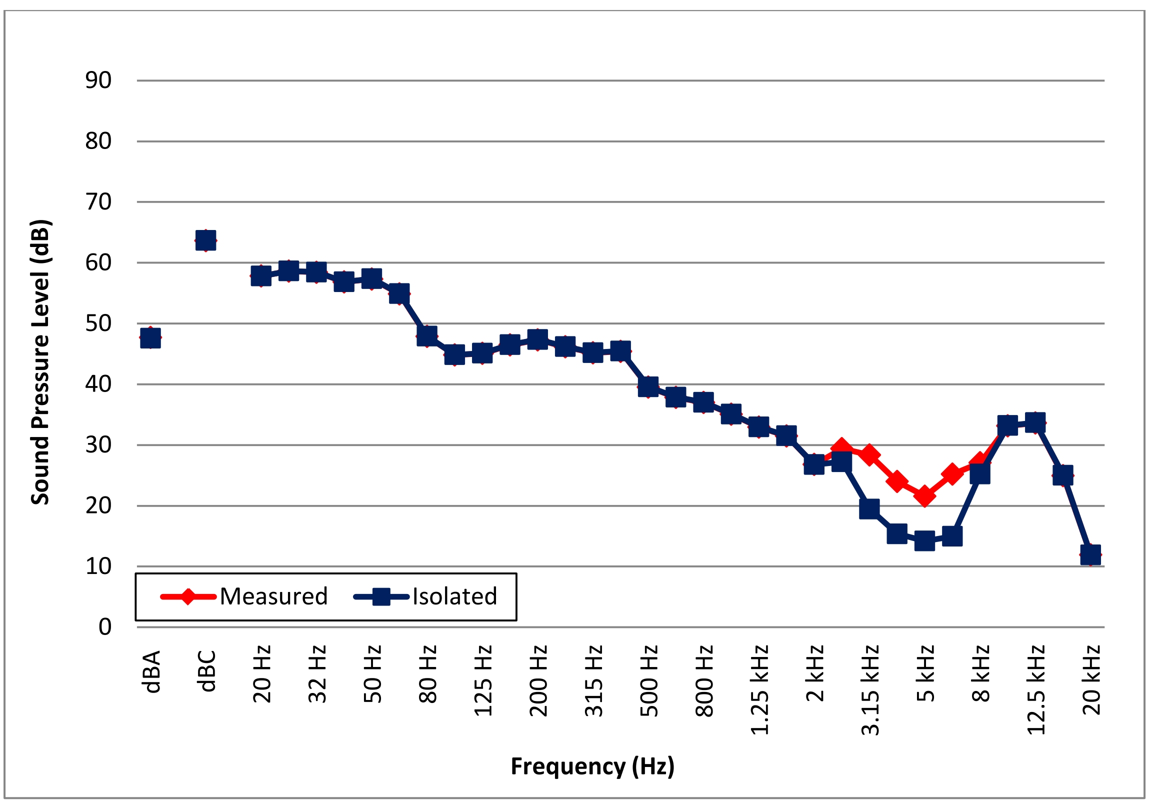

Figure 77. Noise Monitor #8, 1/3 Octave L_{eq} Sound Levels (August 24 - 25, 2013)

Noise Monitor #9

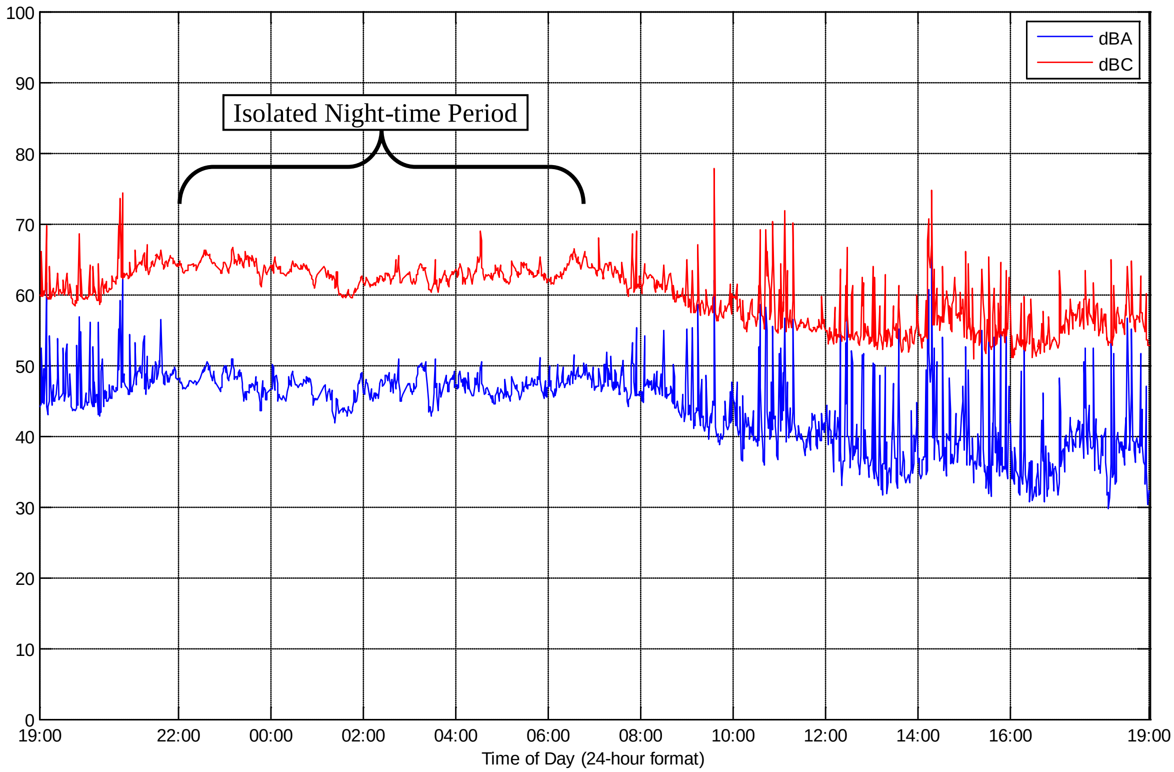

Figure 78. Noise Monitor #9, 1-Minute L_{eq} Sound Levels (August 23 - 24, 2013)

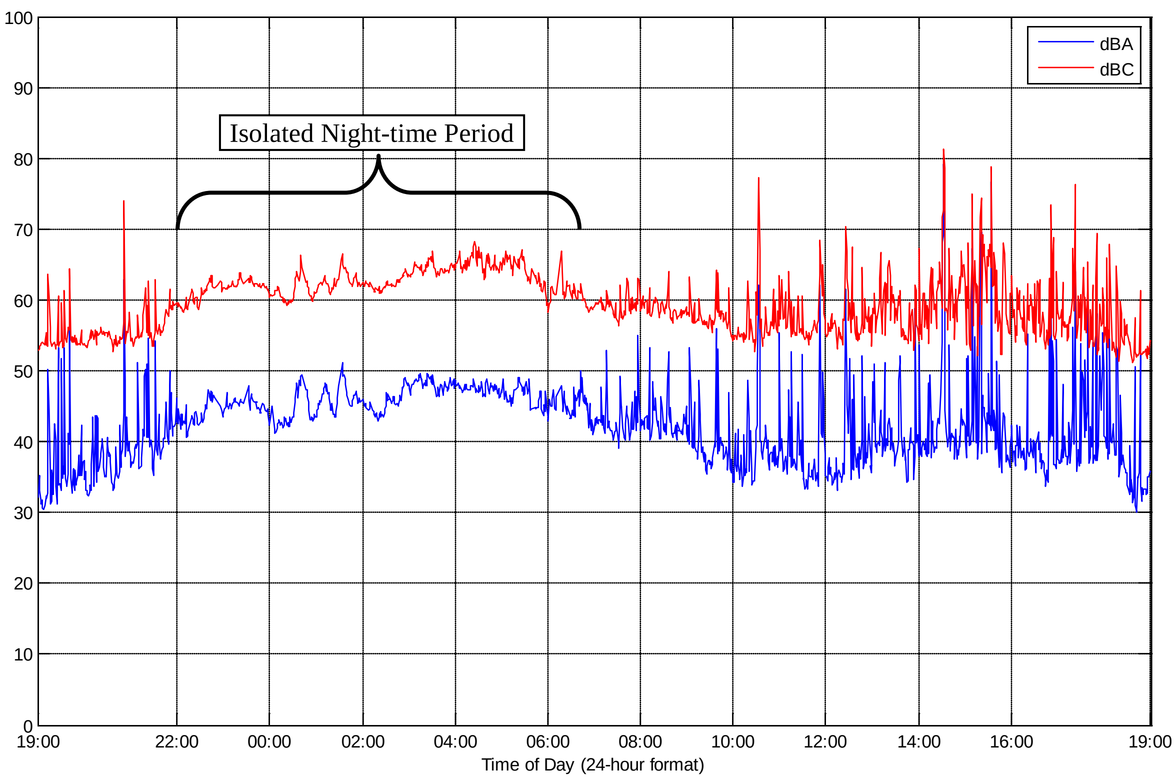

Figure 79. Noise Monitor #9, 1-Minute L_{eq} Sound Levels (August 24 - 25, 2013)

Noise Monitor #9

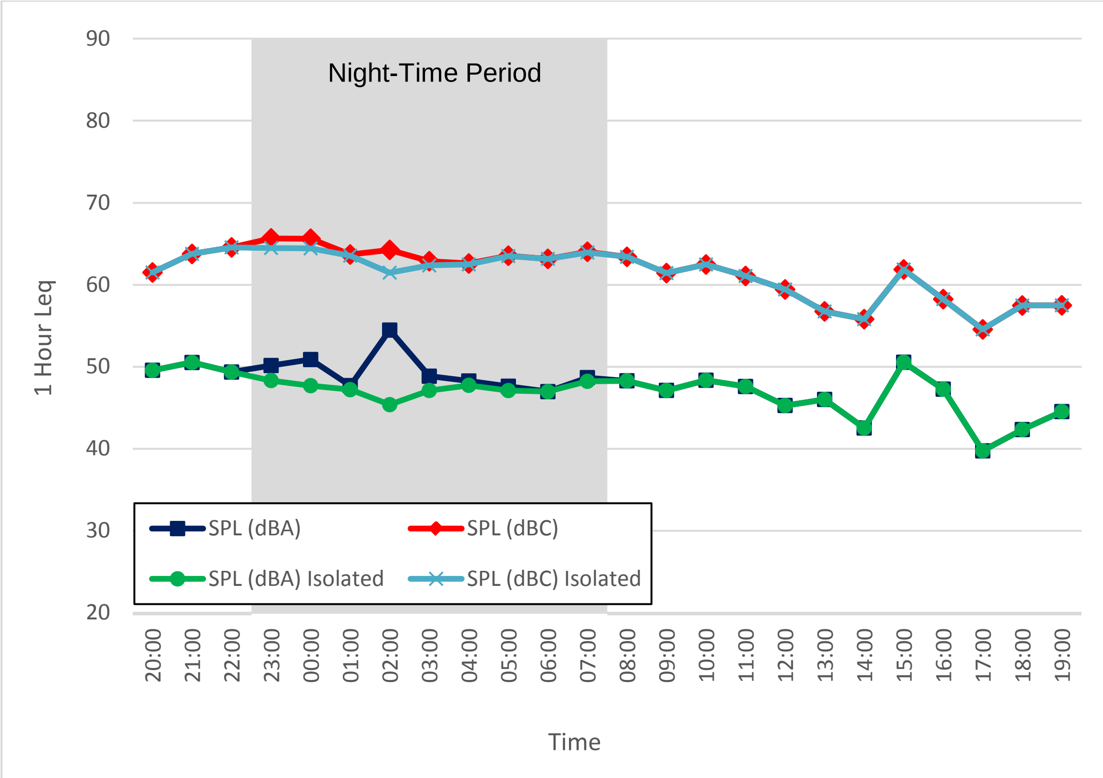

Figure 80. Noise Monitor #9, 1-Hour L_{eq} Sound Levels (August 23 - 24, 2013)

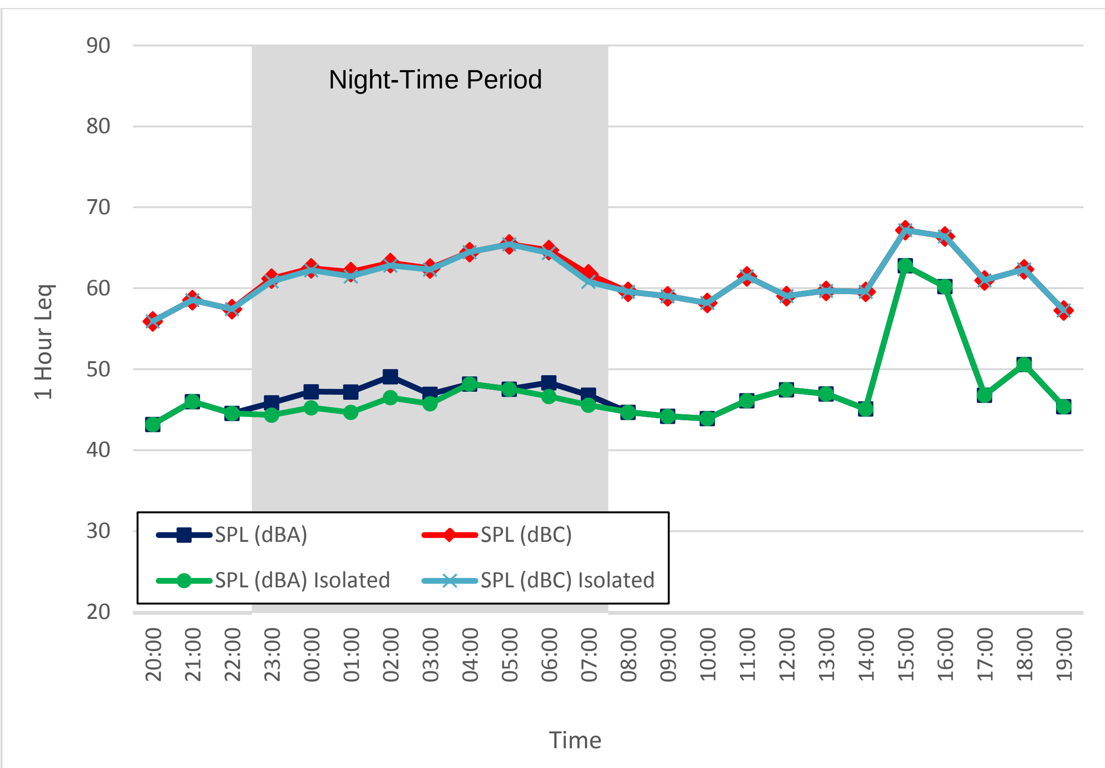

Figure 81. Noise Monitor #9, 1-Hour L_{eq} Sound Levels (August 24 - 25, 2013)

Noise Monitor #9

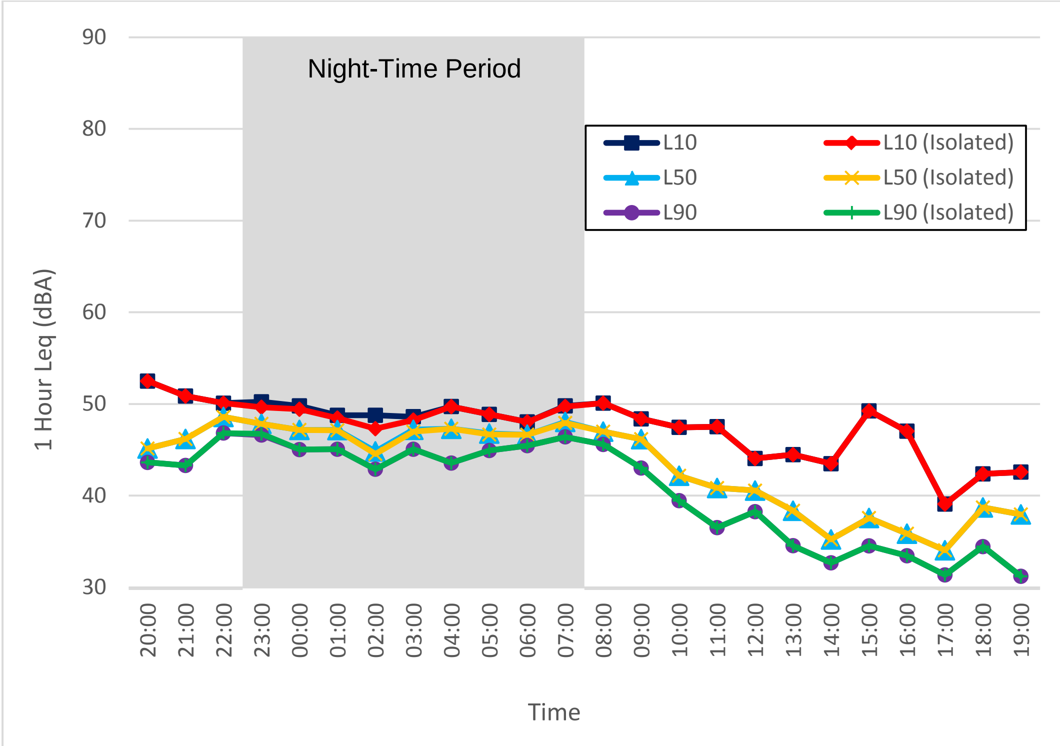

Figure 82. Noise Monitor #9, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (August 23 - 24, 2013)

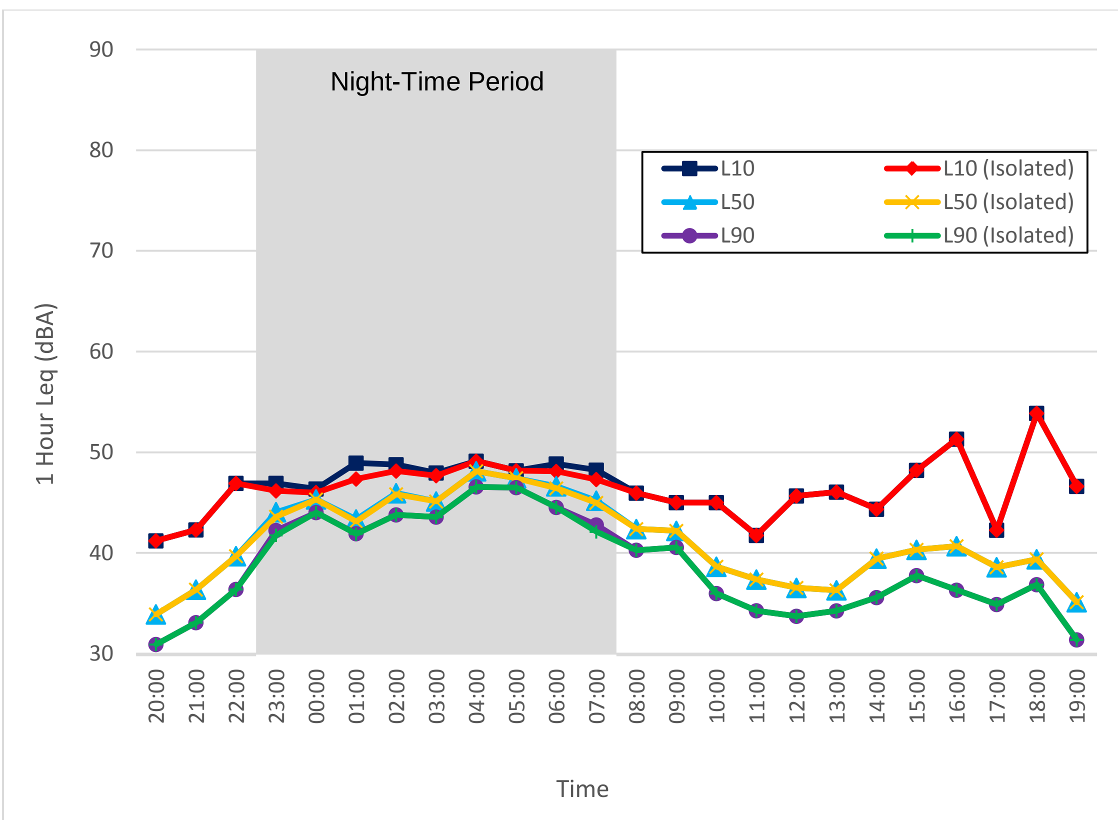

Figure 83. Noise Monitor #9, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (August 24 - 25, 2013)

Noise Monitor #9

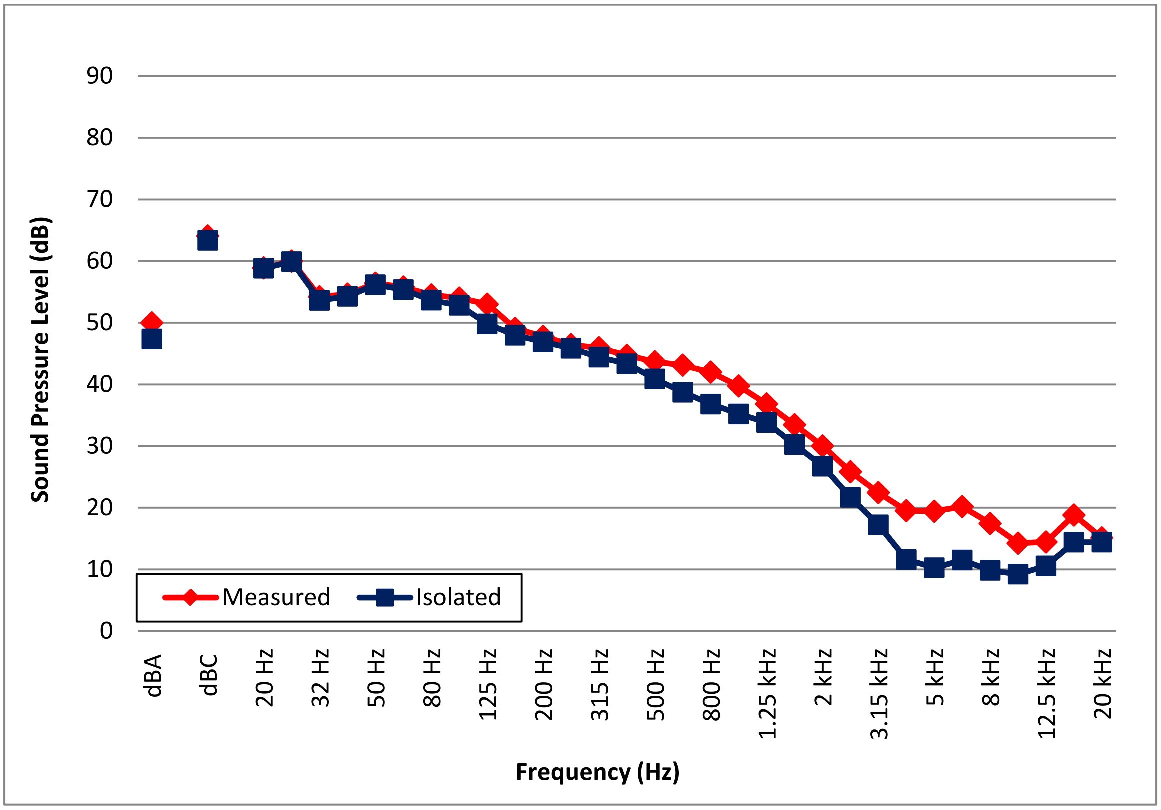

Figure 84. Noise Monitor #9, 1/3 Octave L_{eq} Sound Levels (August 23 - 24, 2013)

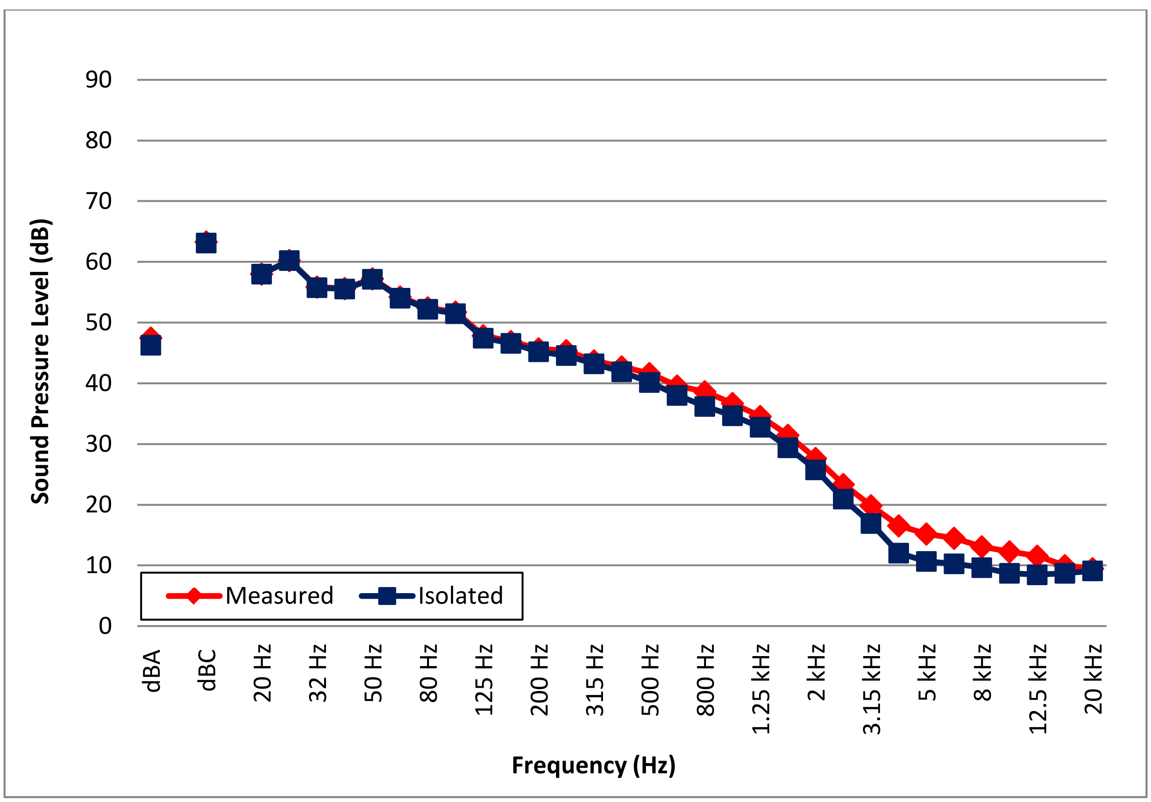

Figure 85. Noise Monitor #9, 1/3 Octave L_{eq} Sound Levels (August 24 - 25, 2013)

Noise Monitor #10

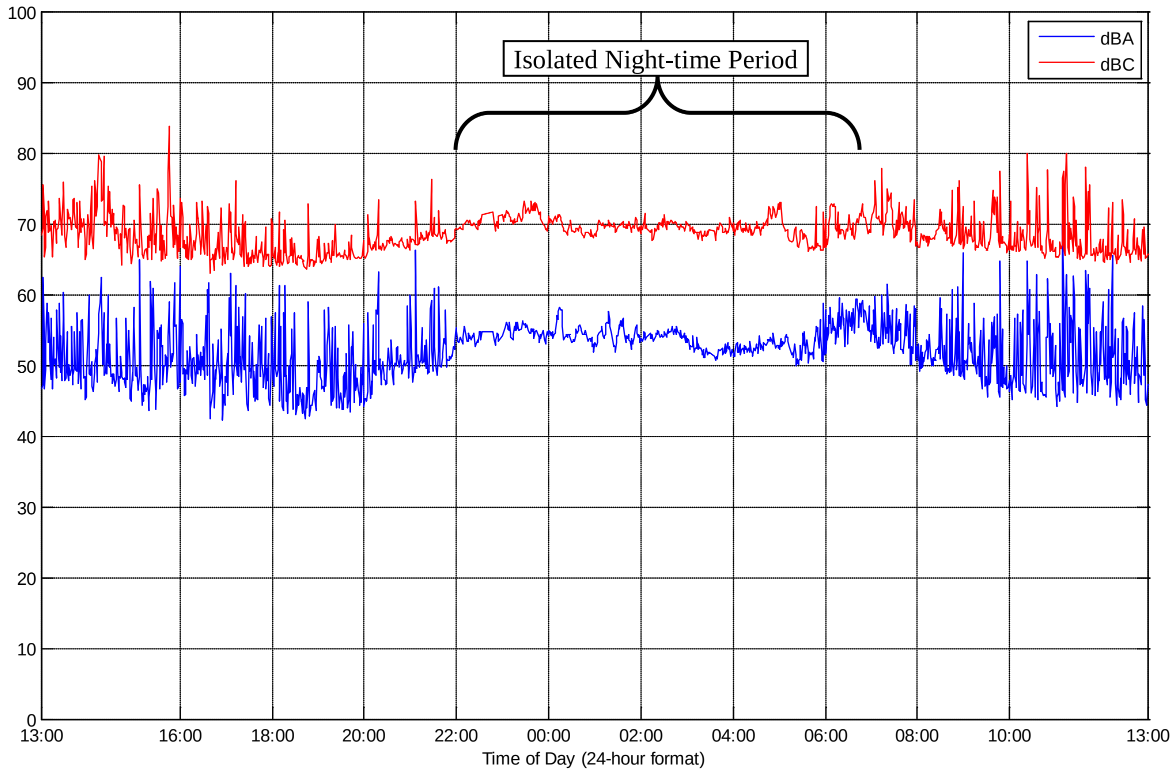

Figure 86. Noise Monitor #10, 1-Minute L_{eq} Sound Levels (August 21 - 22, 2013)

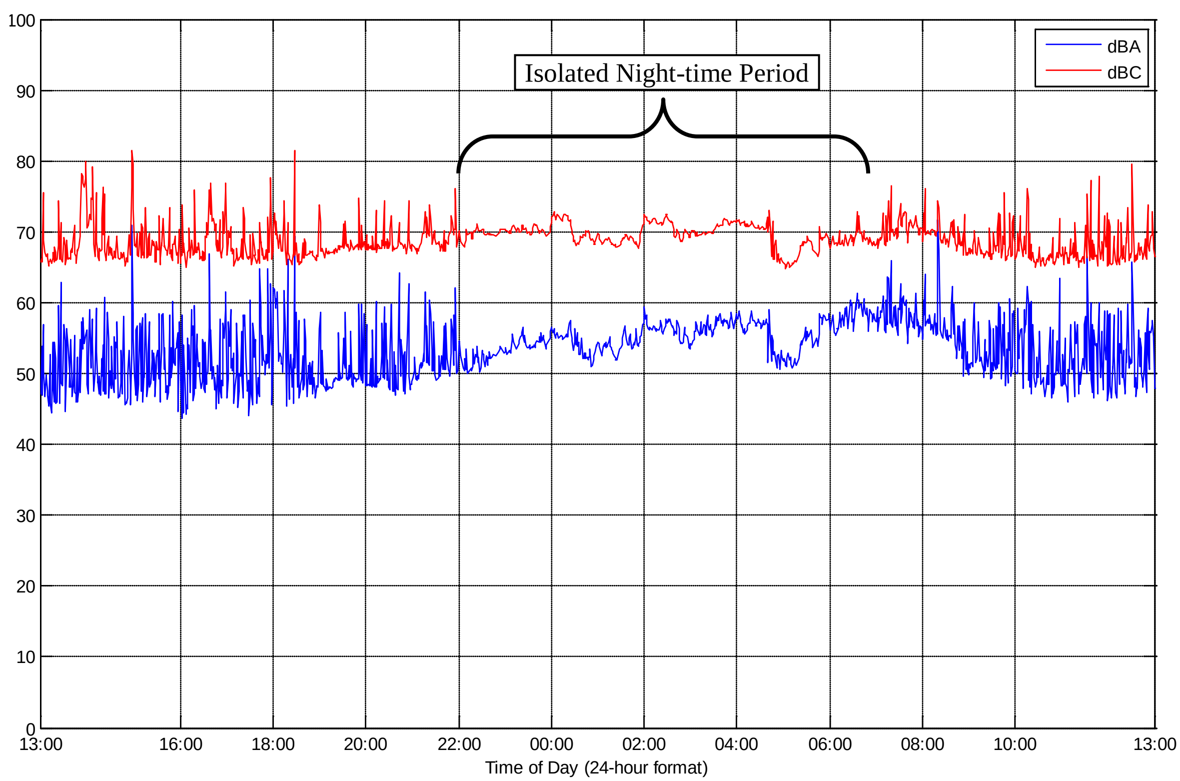

Figure 87. Noise Monitor #10, 1-Minute L_{eq} Sound Levels (August 22 - 23, 2013)

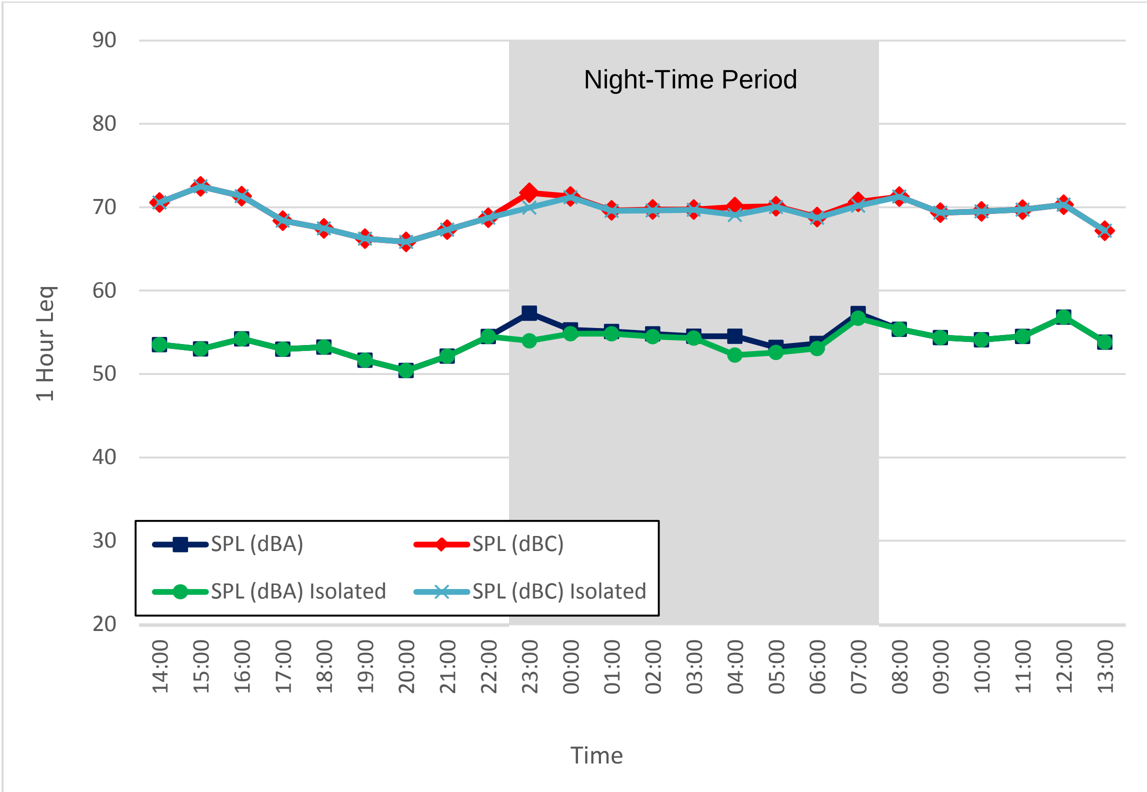

Figure 88. Noise Monitor #10, 1-Hour L_{eq} Sound Levels (August 21 - 22, 2013)

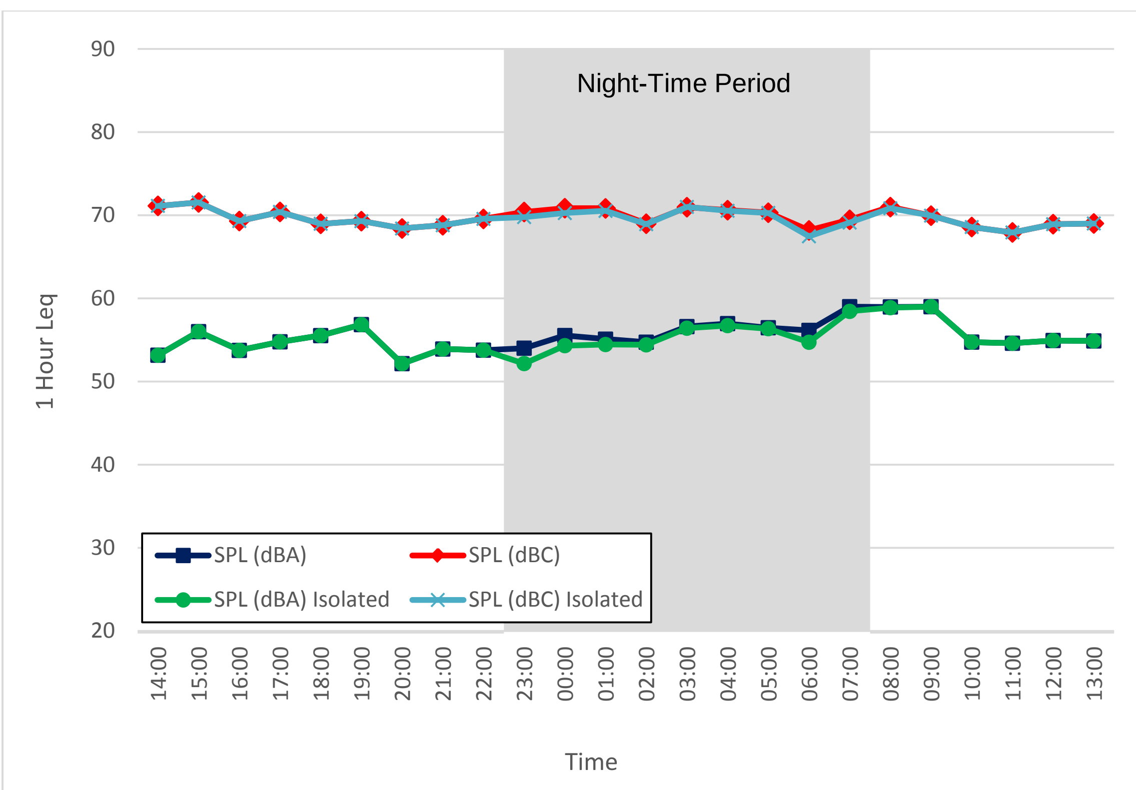

Figure 89. Noise Monitor #10, 1-Hour L_{eq} Sound Levels (August 22 - 23, 2013)

Noise Monitor #10

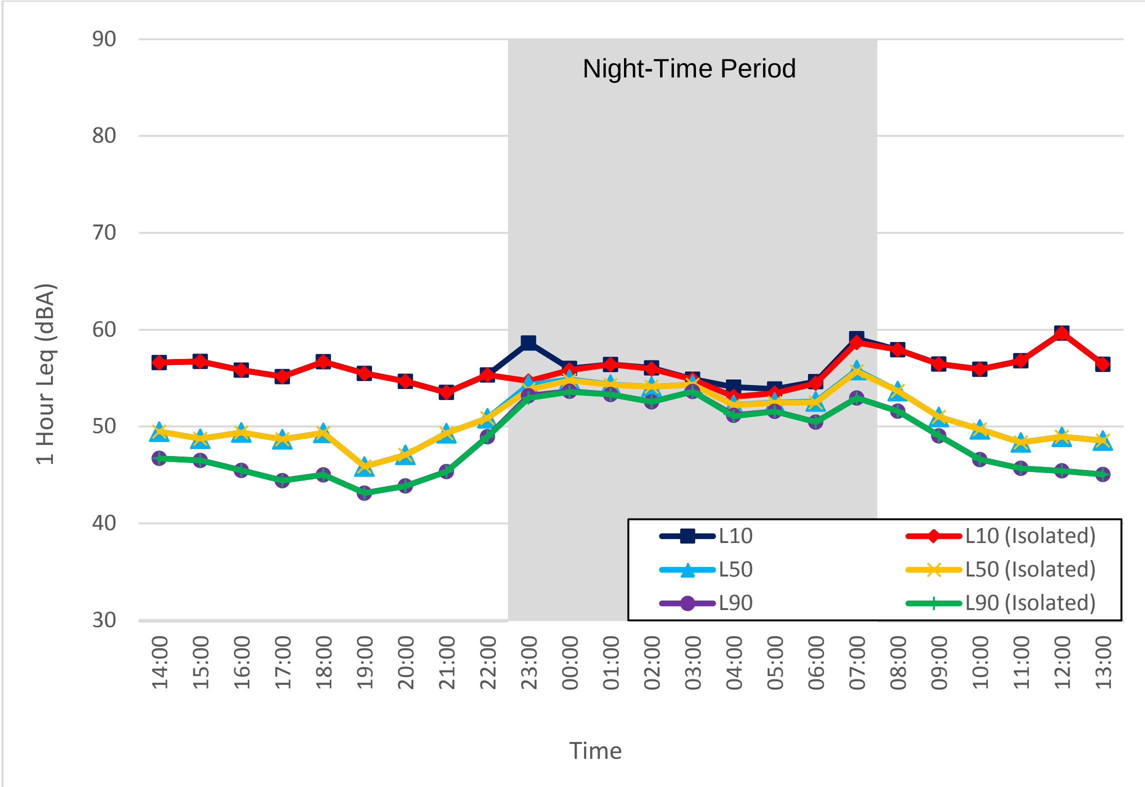

Figure 90. Noise Monitor #10, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (August 21 - 22, 2013)

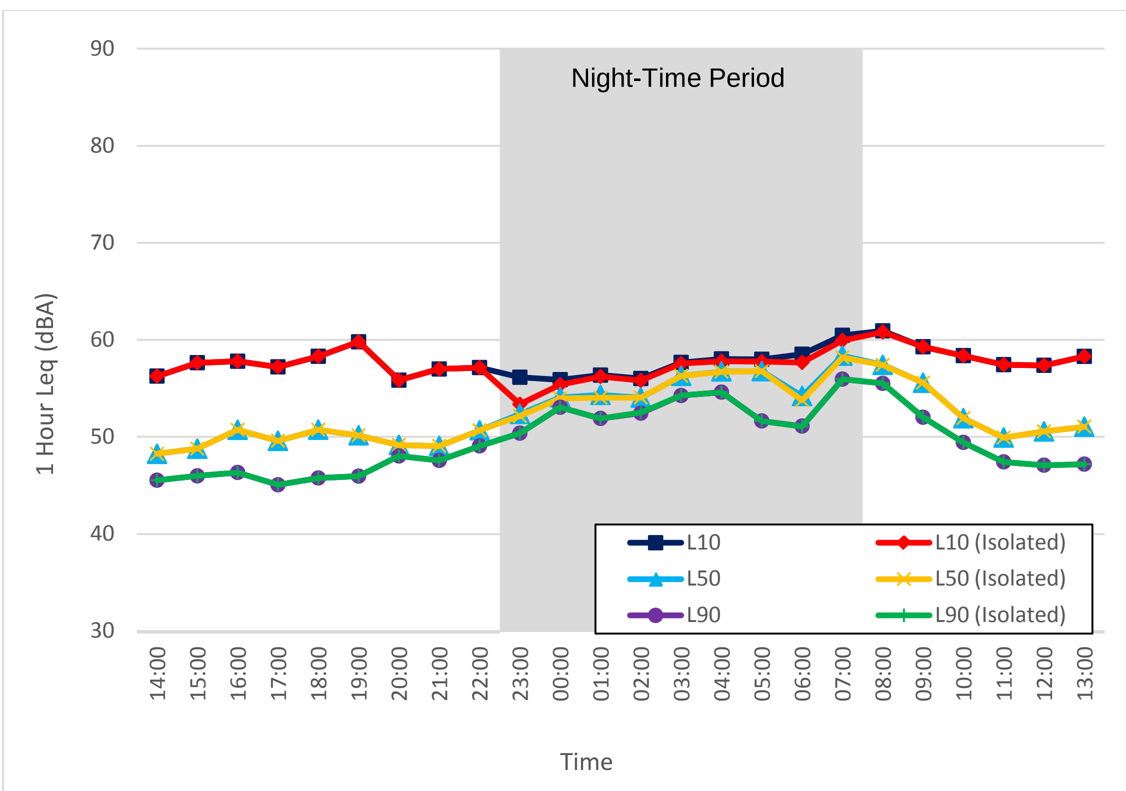

Figure 91. Noise Monitor #10, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (August 22 - 23, 2013)

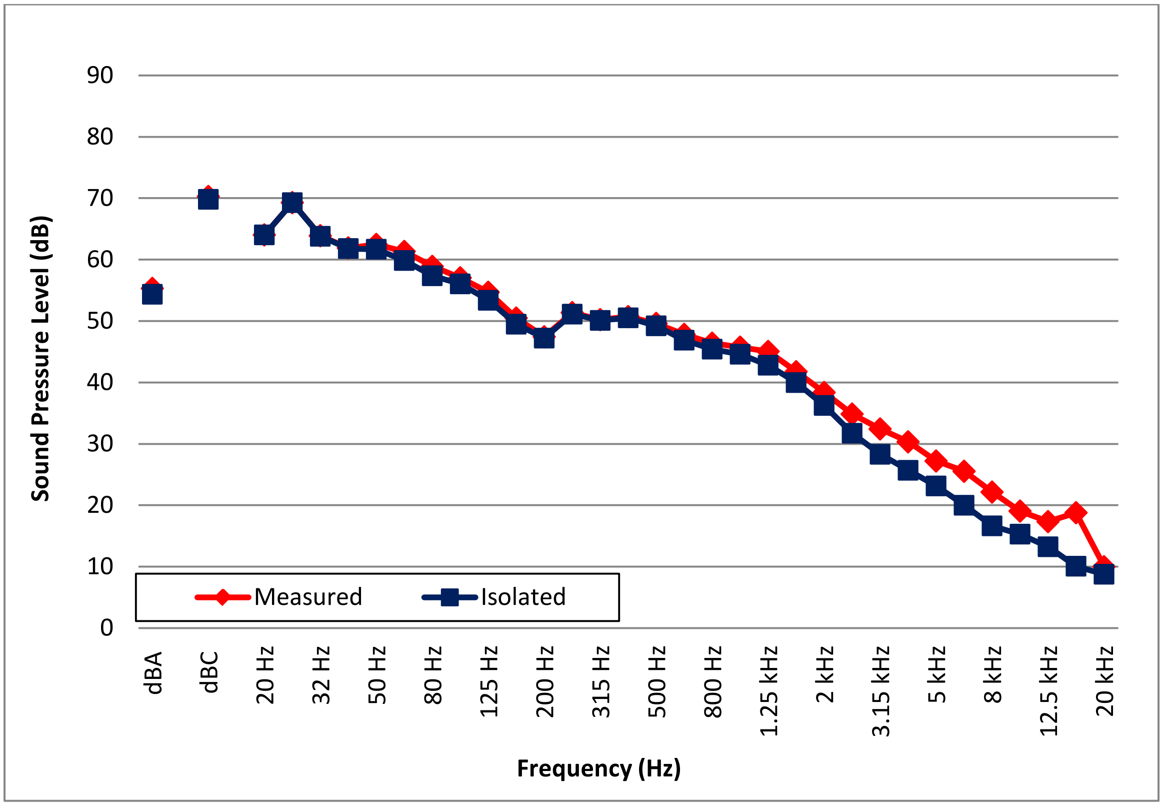

Figure 92. Noise Monitor #10, 1/3 Octave L_{eq} Sound Levels (August 21 - 22, 2013)

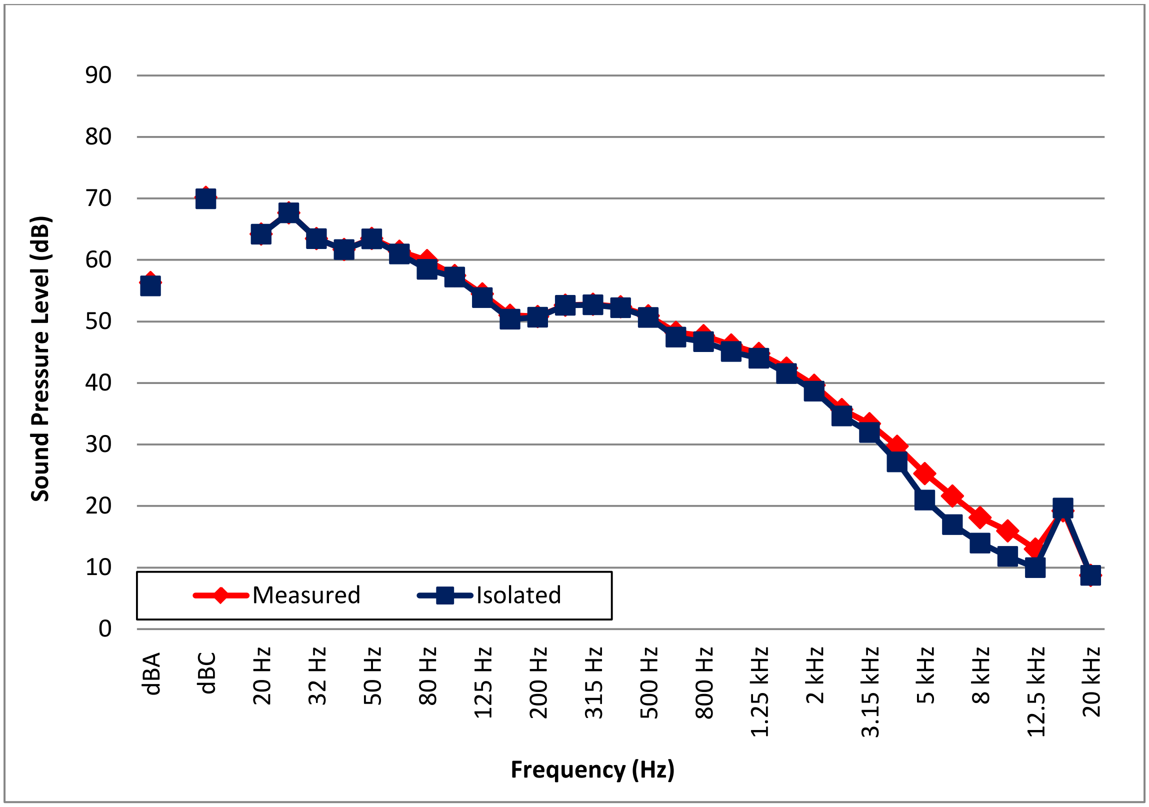

Figure 93. Noise Monitor #10, 1/3 Octave L_{eq} Sound Levels (August 22 - 23, 2013)

Noise Monitor #11

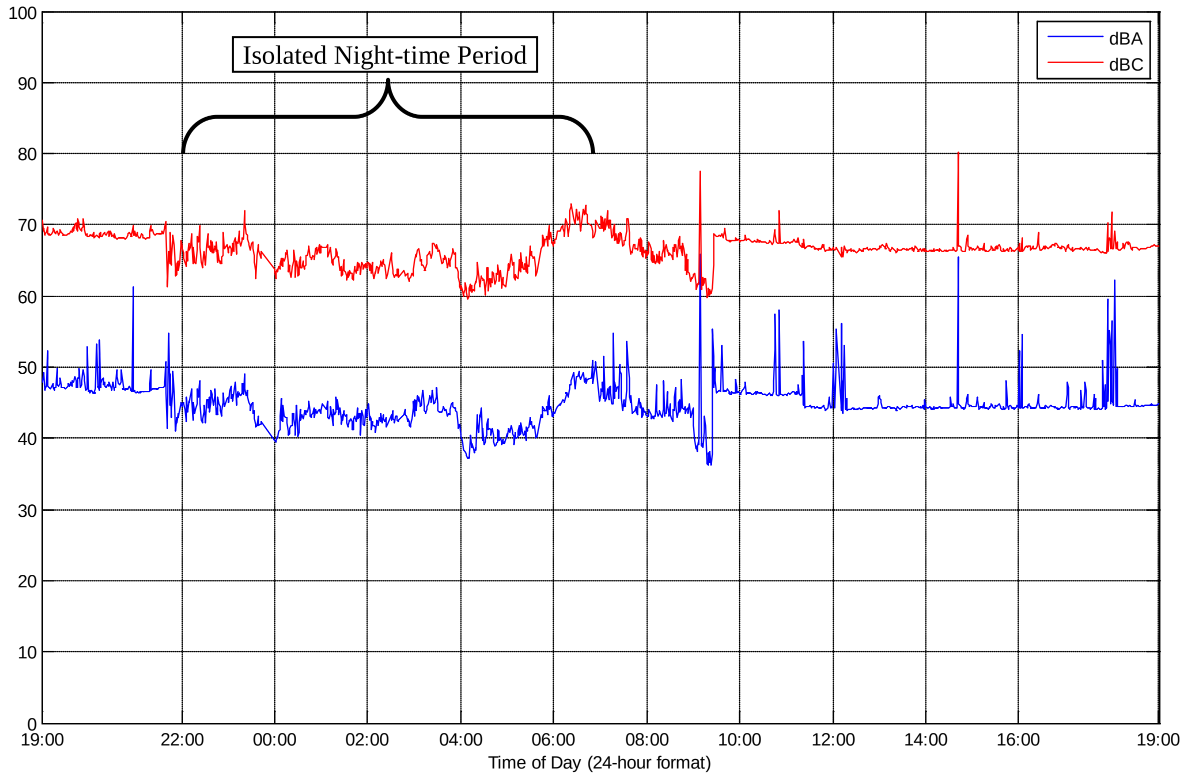

Figure 94. Noise Monitor #11, 1-Minute L_{eq} Sound Levels (August 23 - 24, 2013)

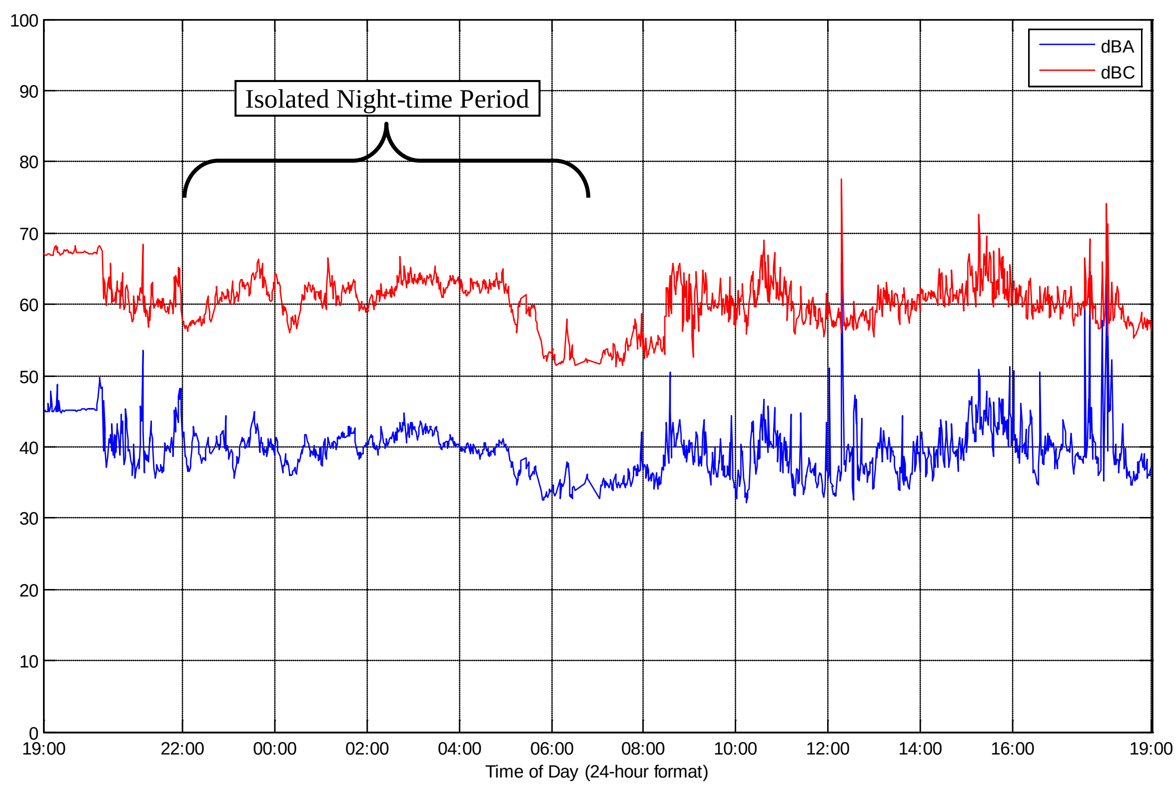

Figure 95. Noise Monitor #11, 1-Minute L_{eq} Sound Levels (August 24 - 25, 2013)

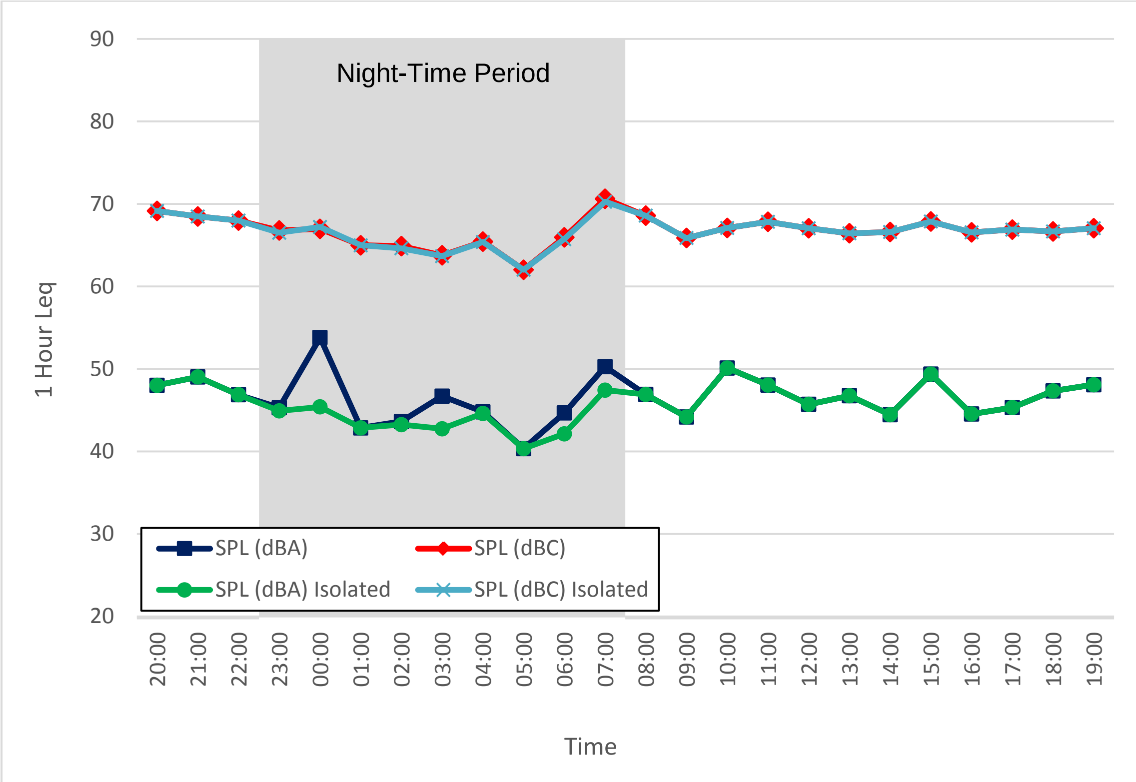

Figure 96. Noise Monitor #11, 1-Hour L_{eq} Sound Levels (August 23 - 24, 2013)

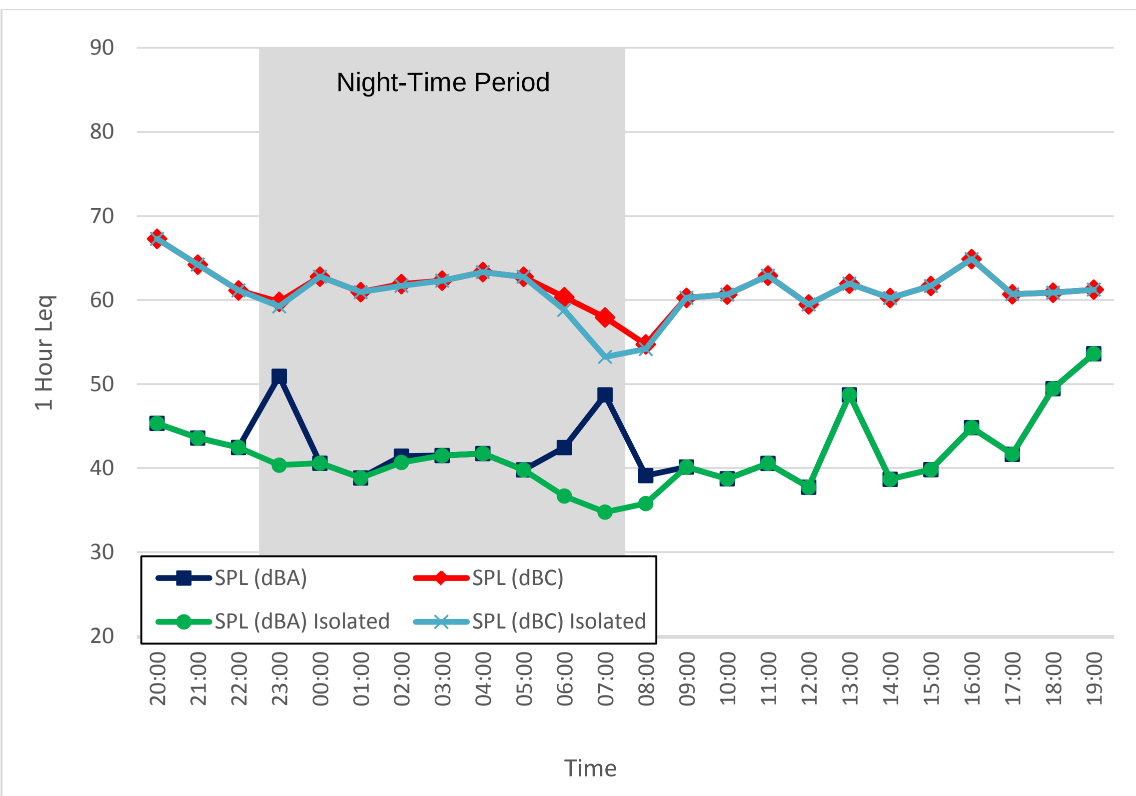

Figure 97. Noise Monitor #11, 1-Hour L_{eq} Sound Levels (August 24 - 25, 2013)

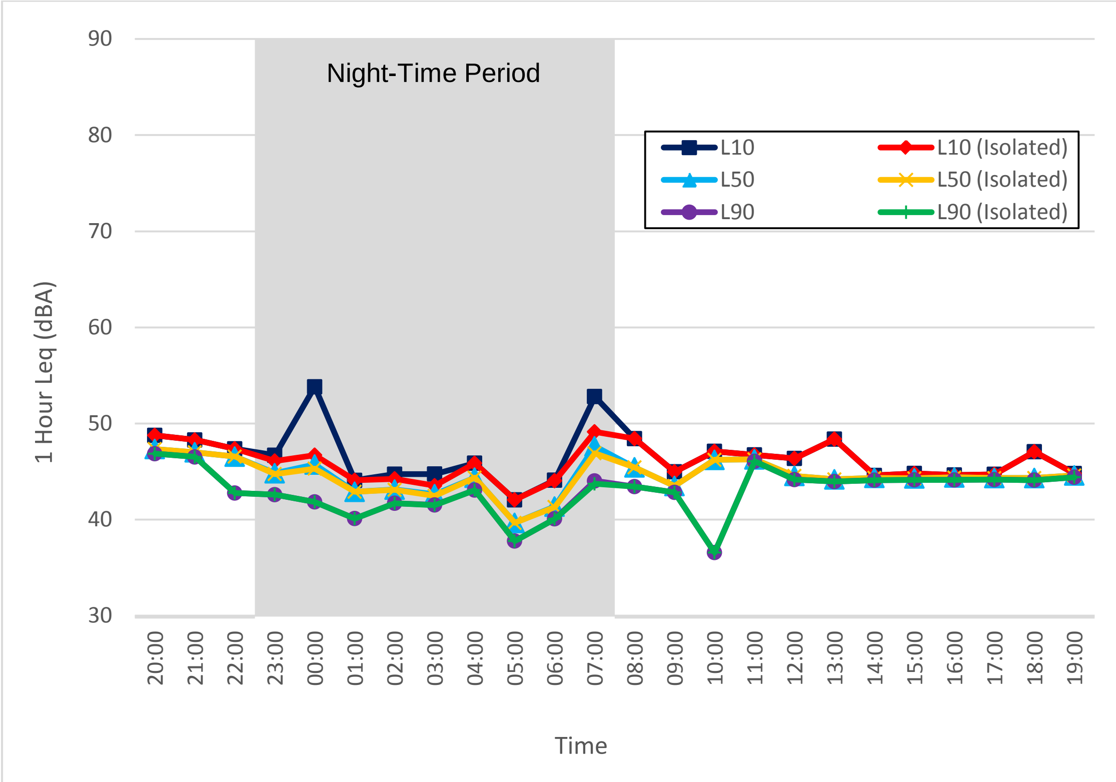

Figure 98. Noise Monitor #11, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (August 23 - 24, 2013)

Noise Monitor #11

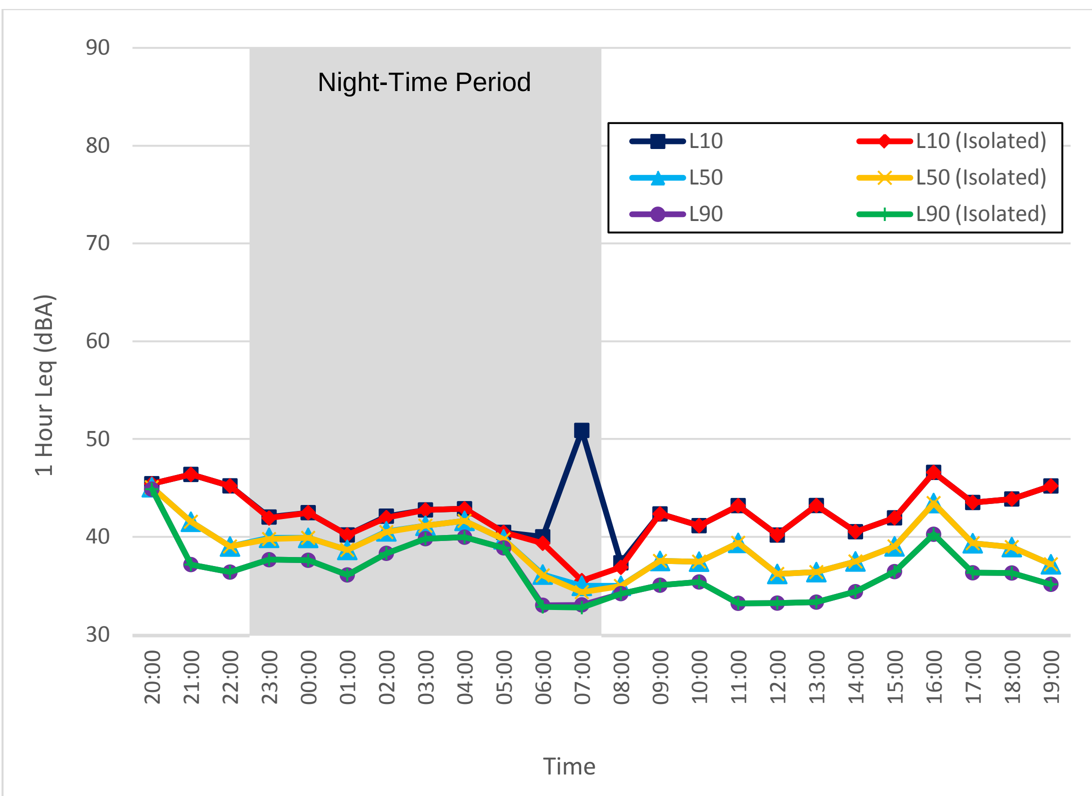

Figure 99. Noise Monitor #11, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (August 24 - 25, 2013)

Noise Monitor #11

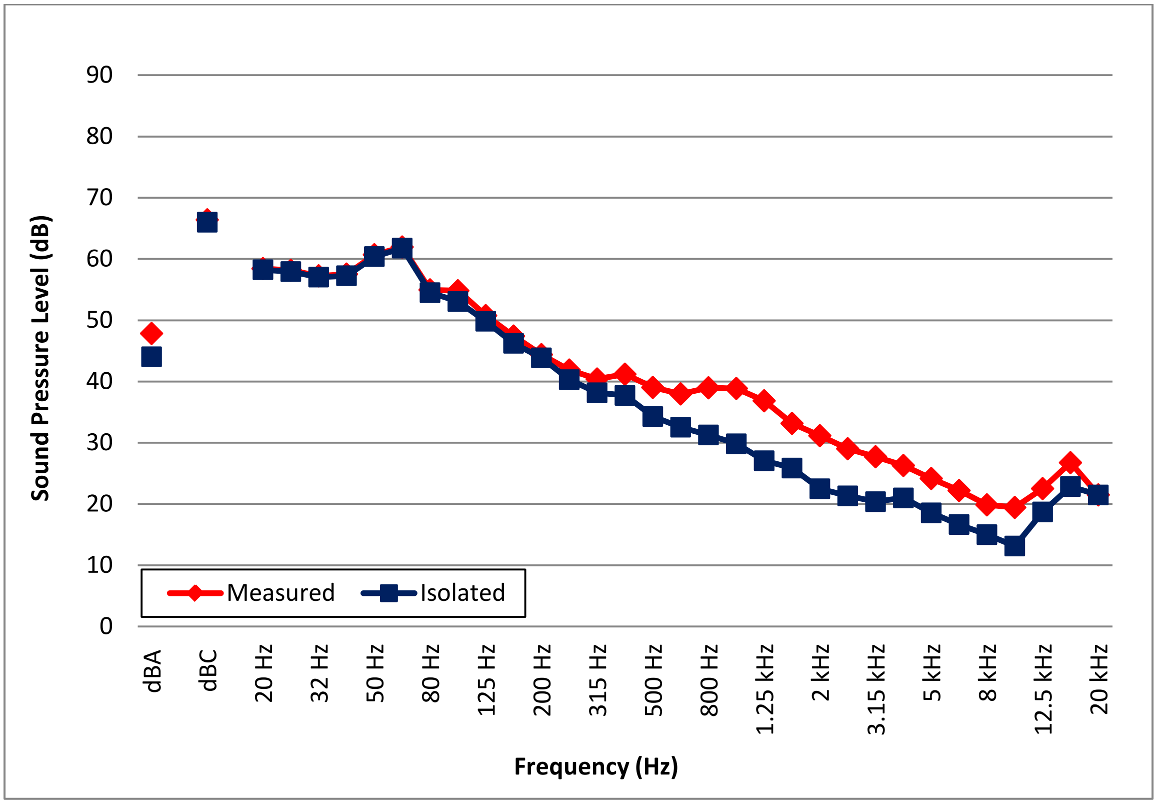

Figure 100. Noise Monitor #11, 1/3 Octave L_{eq} Sound Levels (August 23 - 24, 2013)

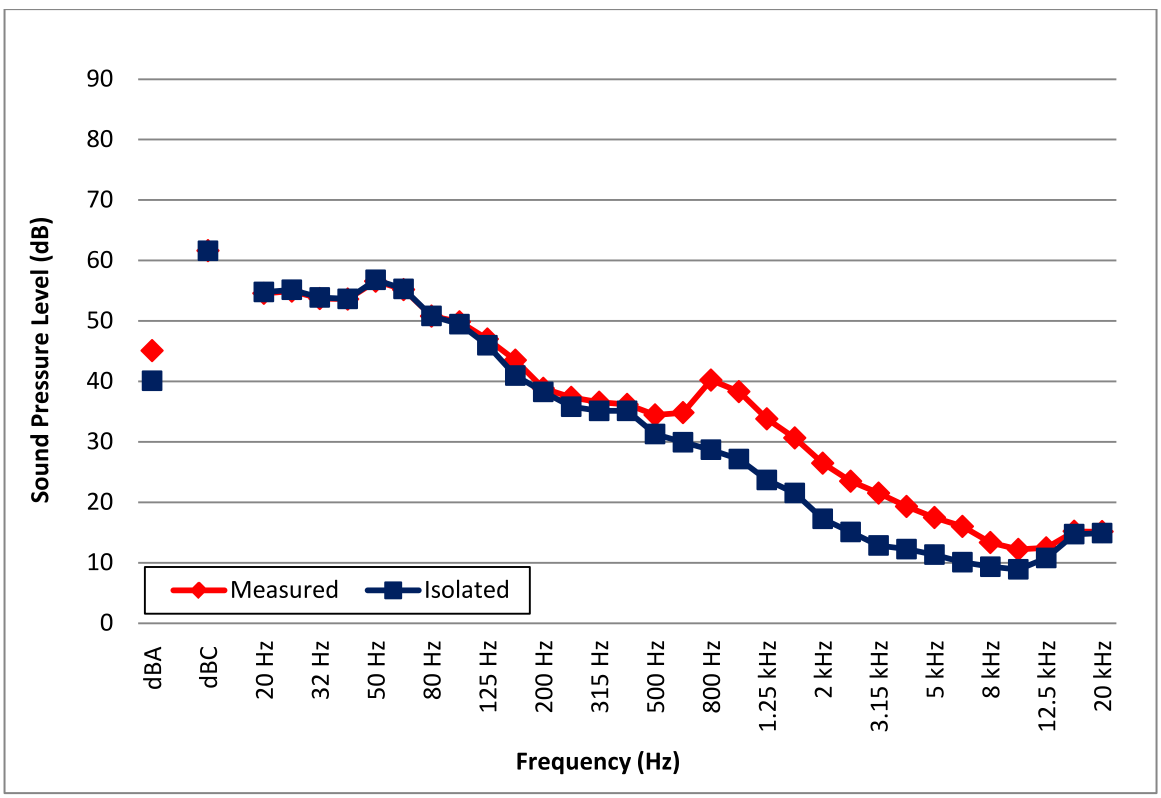

Figure 101. Noise Monitor #11, 1/3 Octave L_{eq} Sound Levels (August 24 - 25, 2013)

Noise Monitor #12

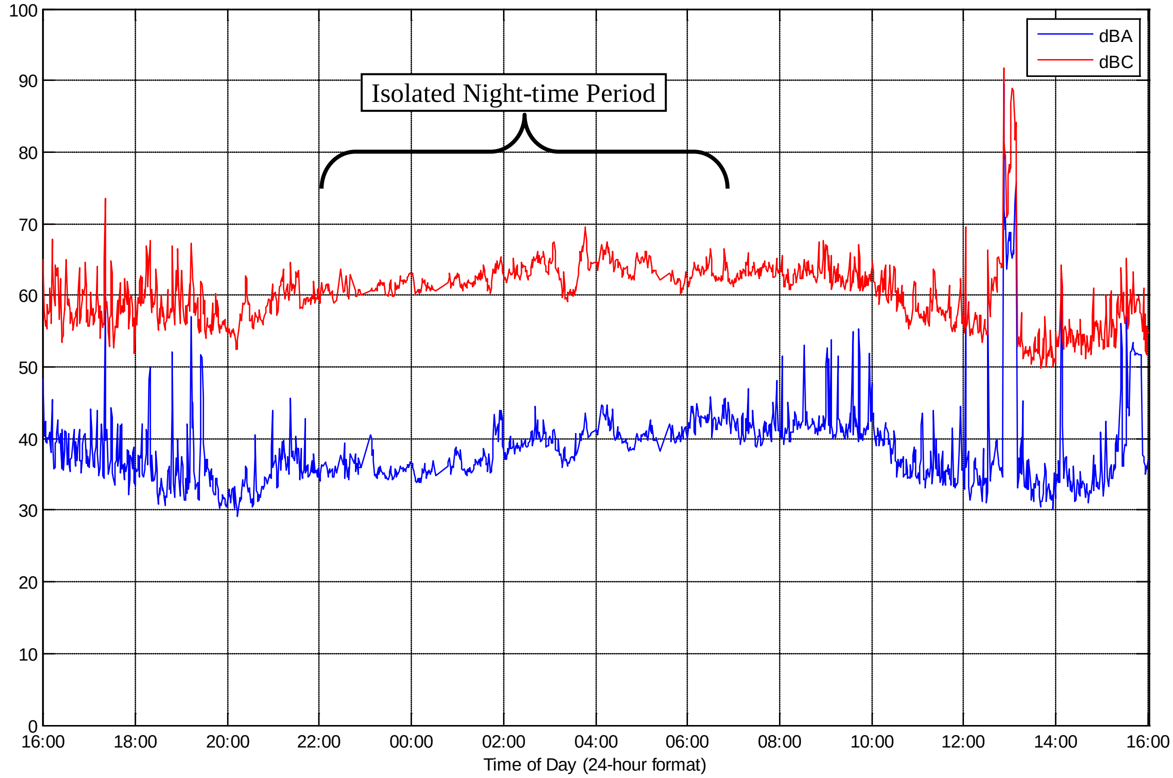

Figure 102. Noise Monitor #12, 1-Minute L_{eq} Sound Levels (August 21 - 22, 2013)

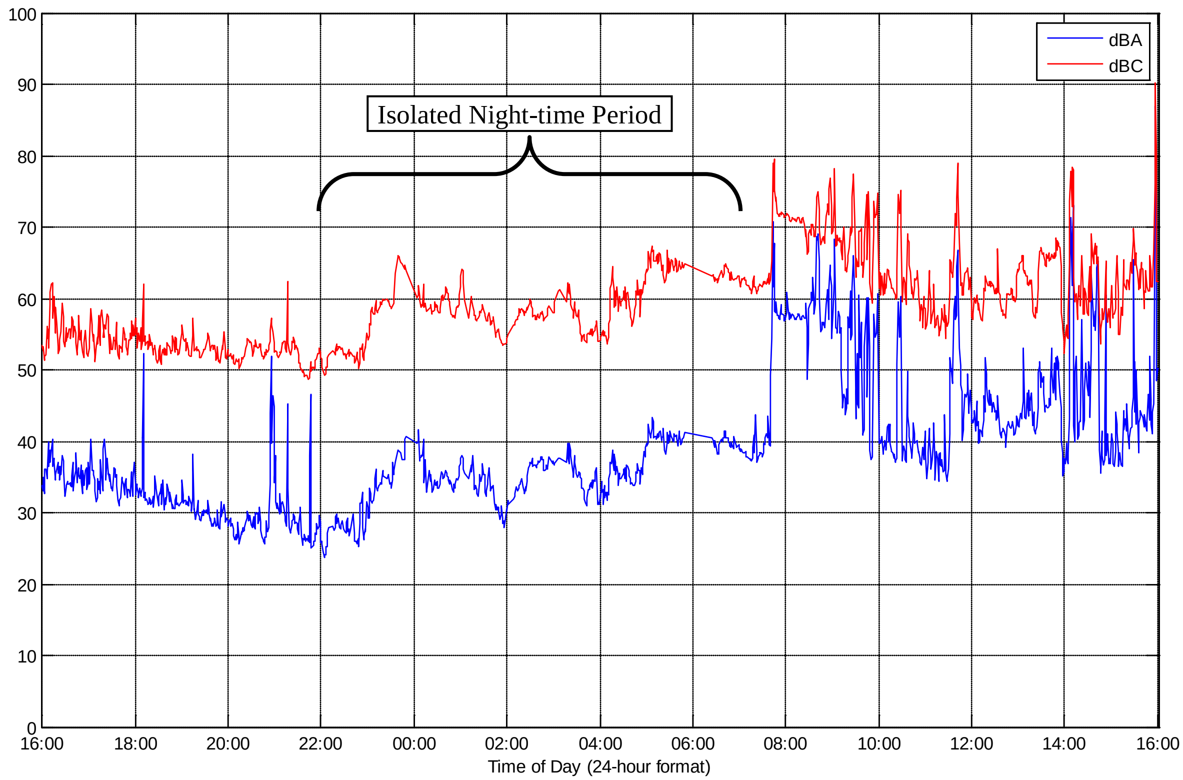

Figure 103. Noise Monitor #12, 1-Minute L_{eq} Sound Levels (August 22 - 23, 2013)

Noise Monitor #12

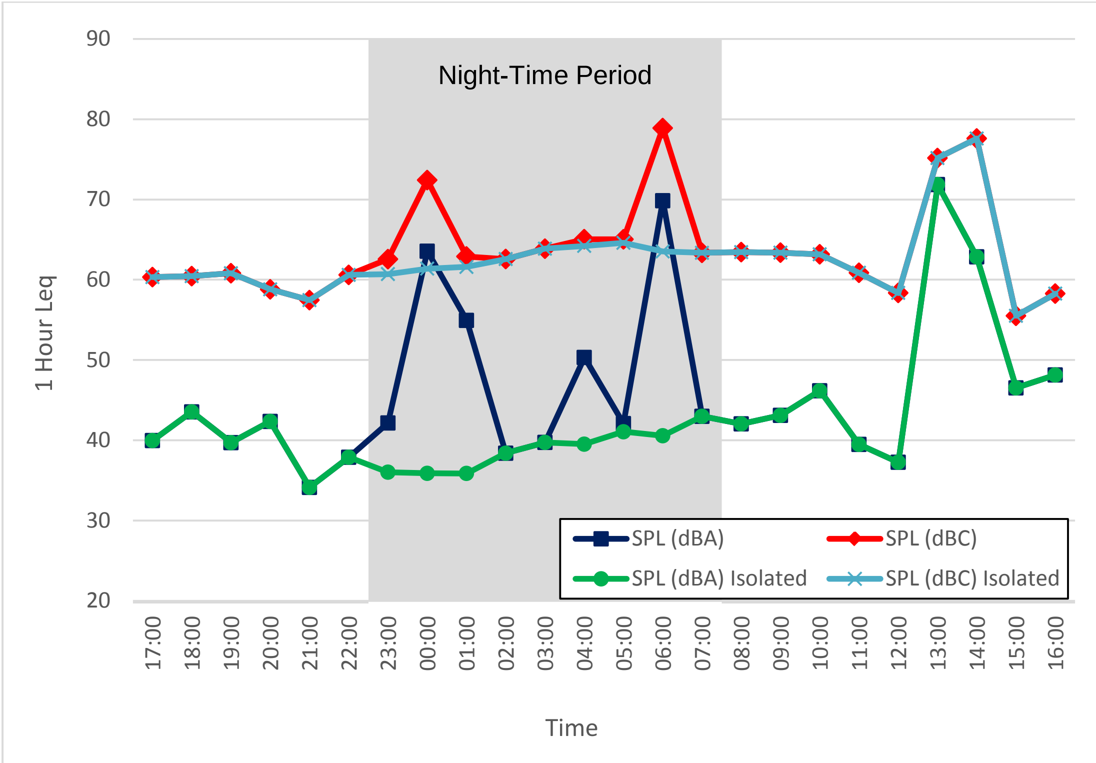

Figure 104. Noise Monitor #12, 1-Hour L_{eq} Sound Levels (August 21 - 22, 2013)

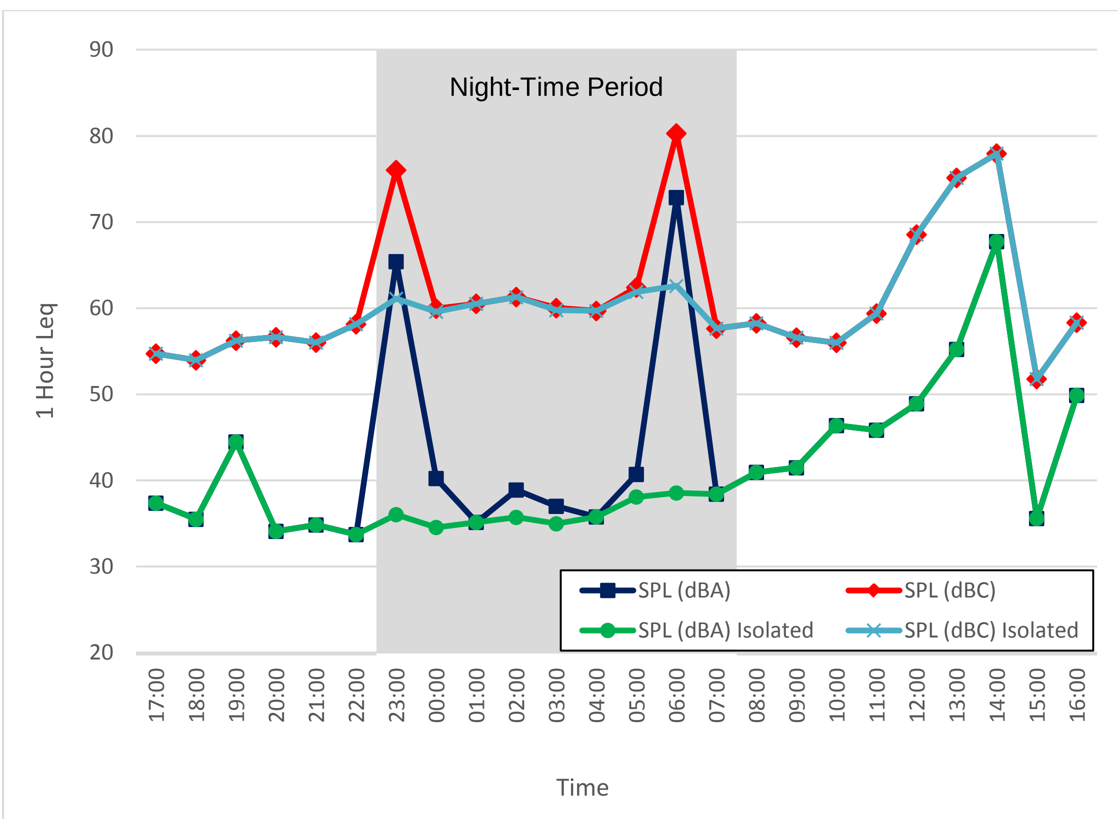

Figure 105. Noise Monitor #12, 1-Hour L_{eq} Sound Levels (August 22 - 23, 2013)

Noise Monitor #12

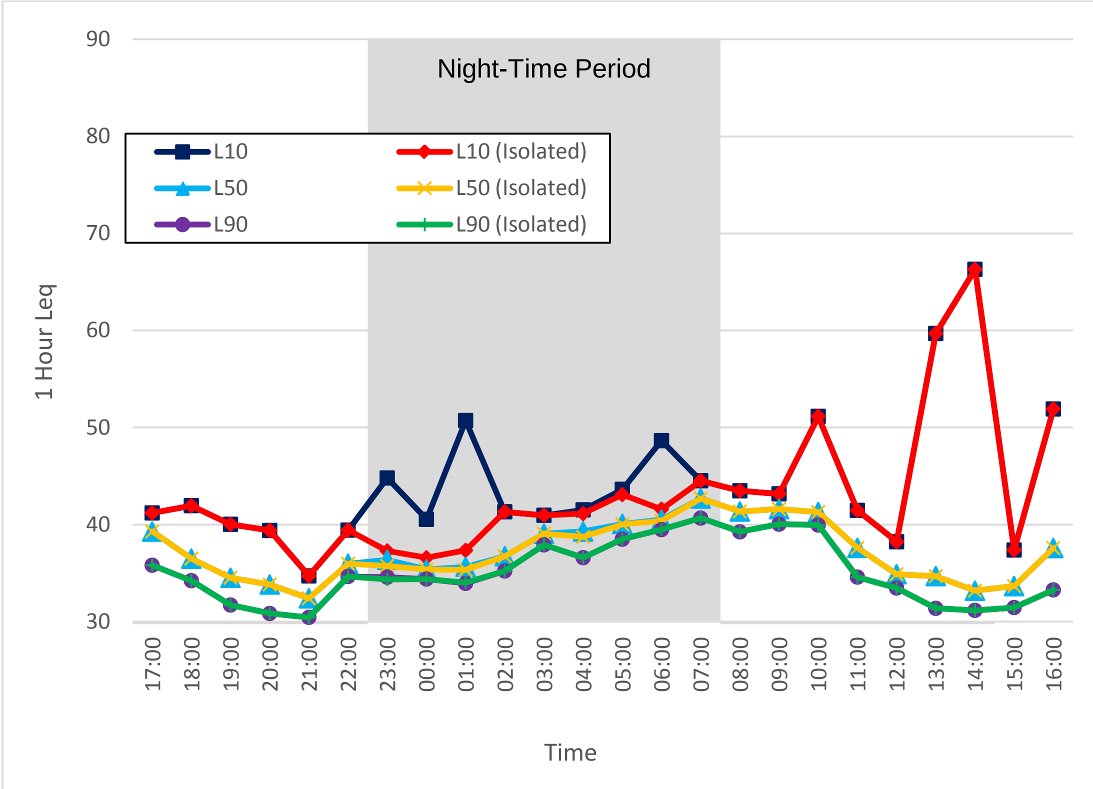

Figure 106. Noise Monitor #12, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (August 21 - 22, 2013)

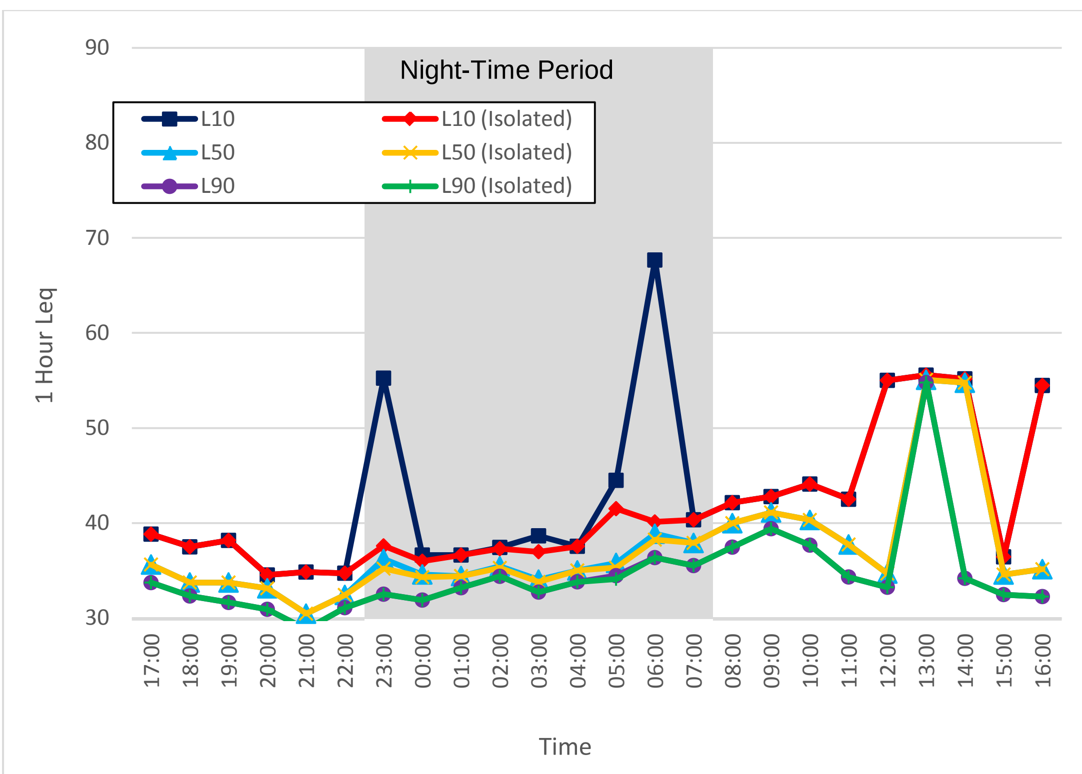

Figure 107. Noise Monitor #12, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (August 22 - 23, 2013)

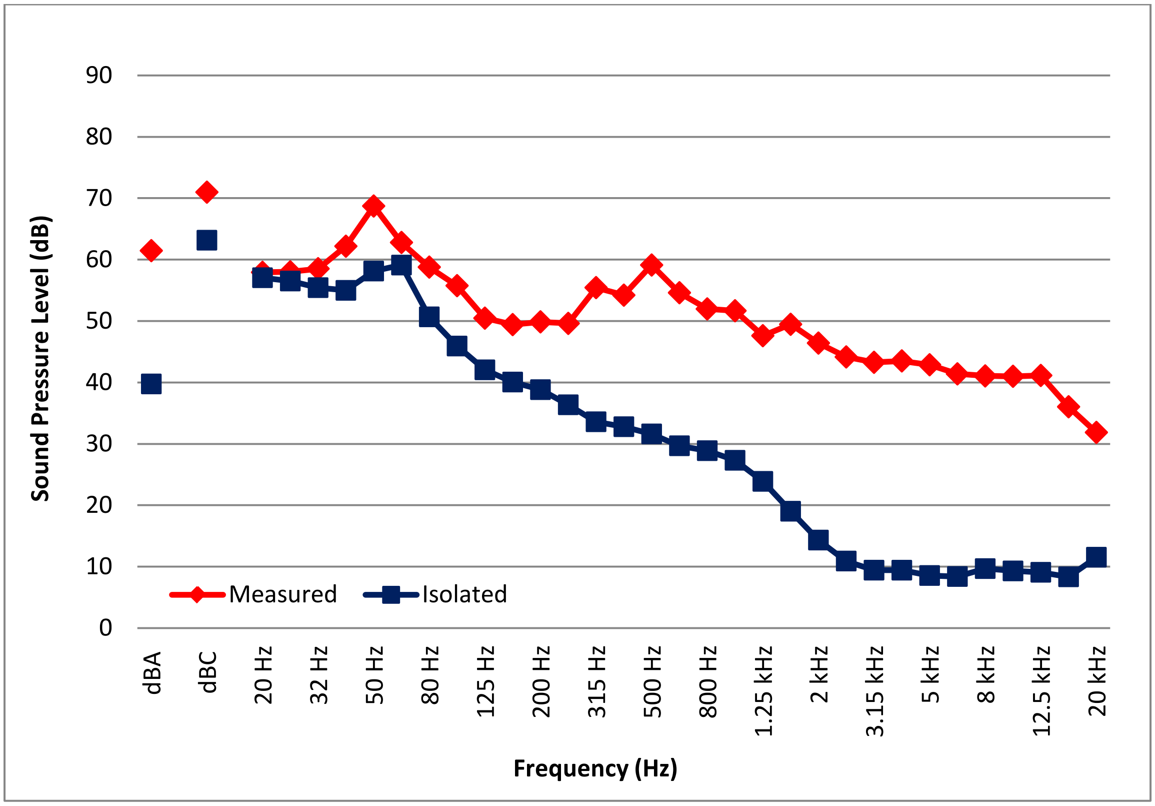

Figure 108. Noise Monitor #12, 1/3 Octave L_{eq} Sound Levels (August 21 - 22, 2013)

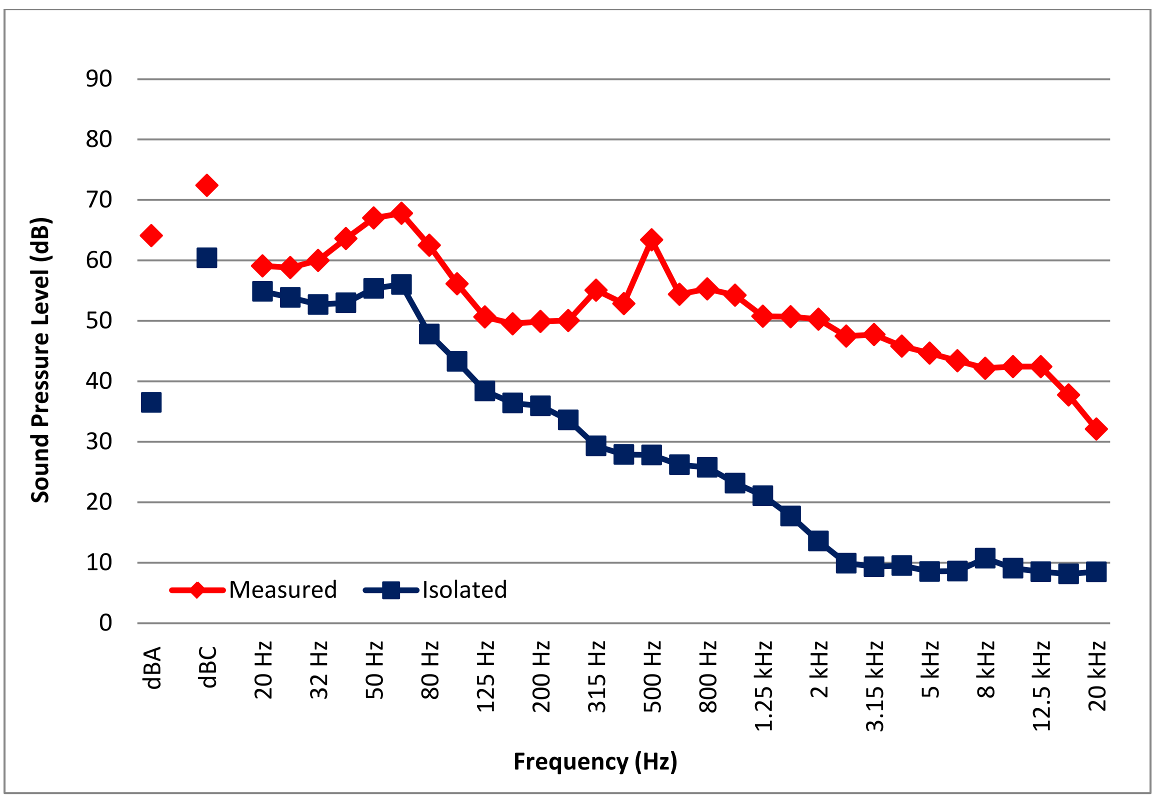

Figure 109. Noise Monitor #12, 1/3 Octave L_{eq} Sound Levels (August 22 - 23, 2013)

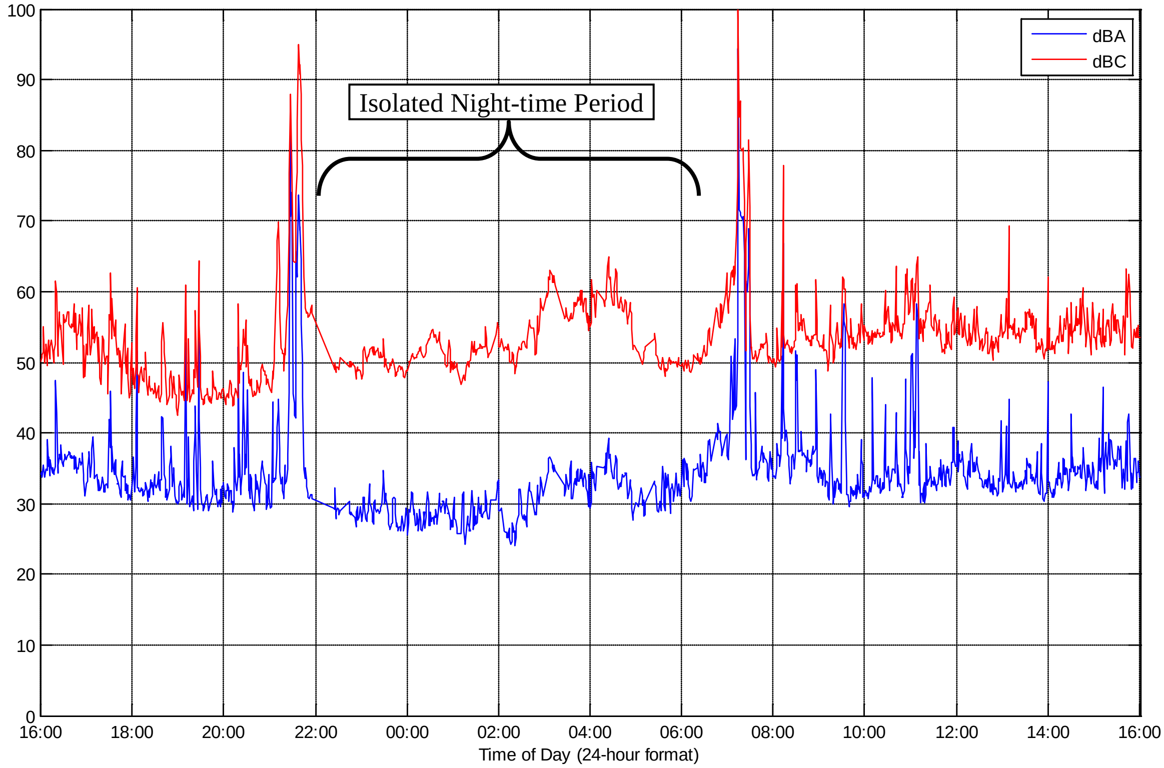

Figure 110. Noise Monitor #12, 1-Minute L_{eq} Sound Levels (August 23 - 24, 2013)

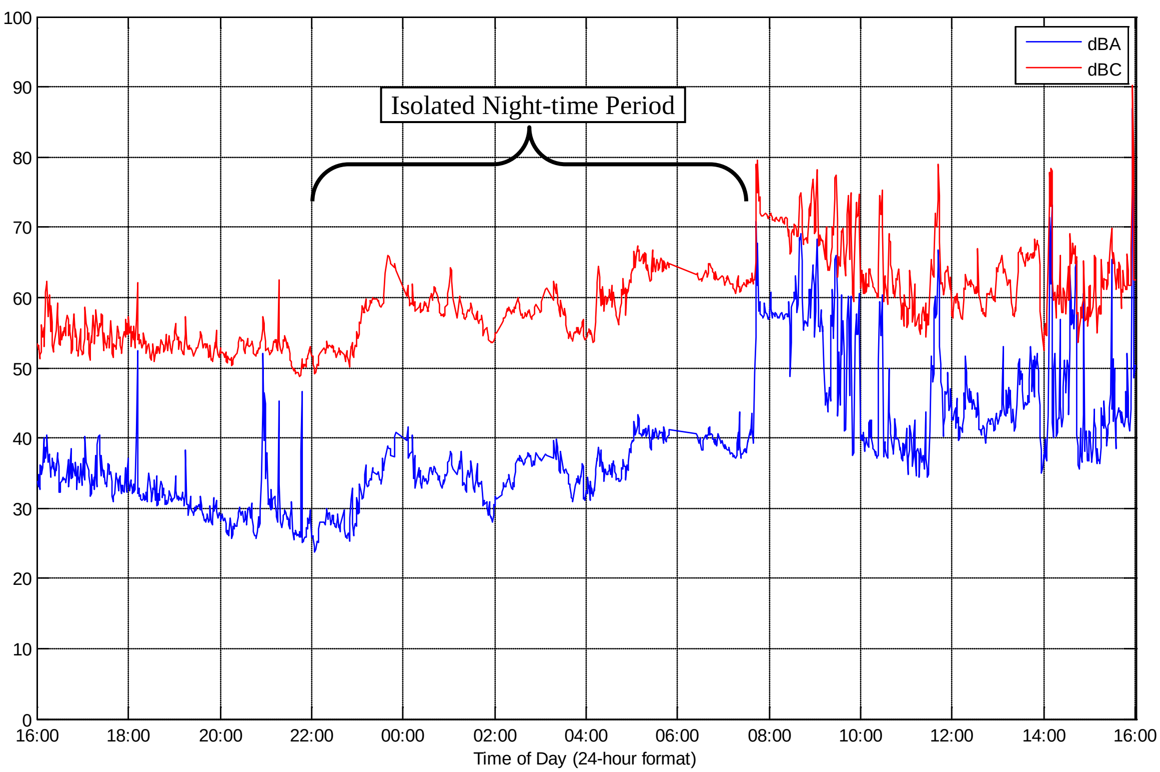

Figure 111. Noise Monitor #12, 1-Minute L_{eq} Sound Levels (August 24 - 25, 2013)

Noise Monitor #12

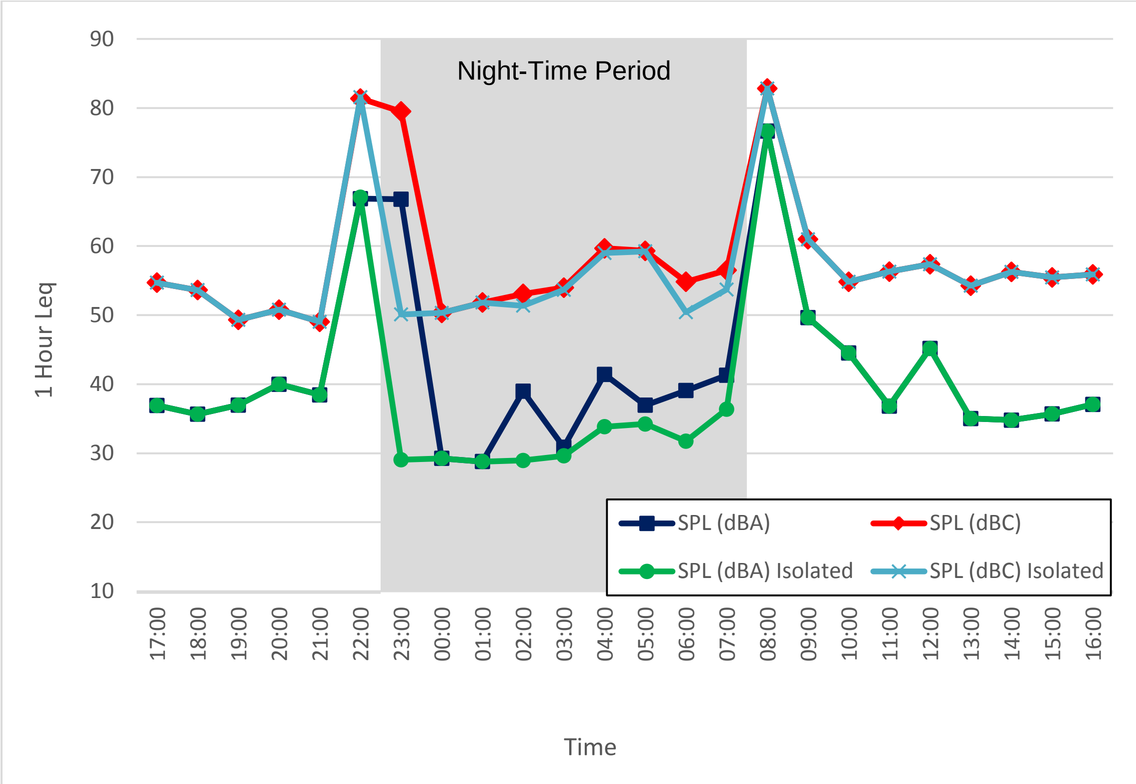

Figure 112. Noise Monitor #12, 1-Hour L_{eq} Sound Levels (August 23 - 24, 2013)

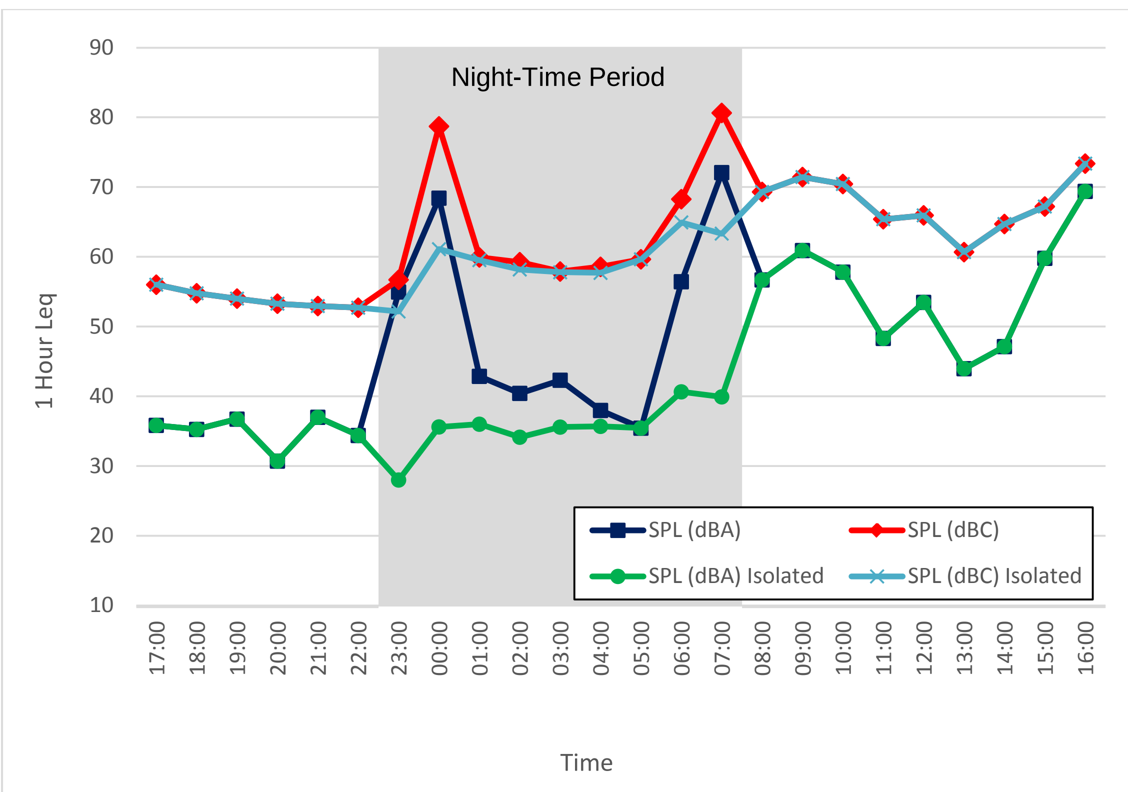

Figure 113. Noise Monitor #12, 1-Hour L_{eq} Sound Levels (August 24 - 25, 2013)

Noise Monitor #12

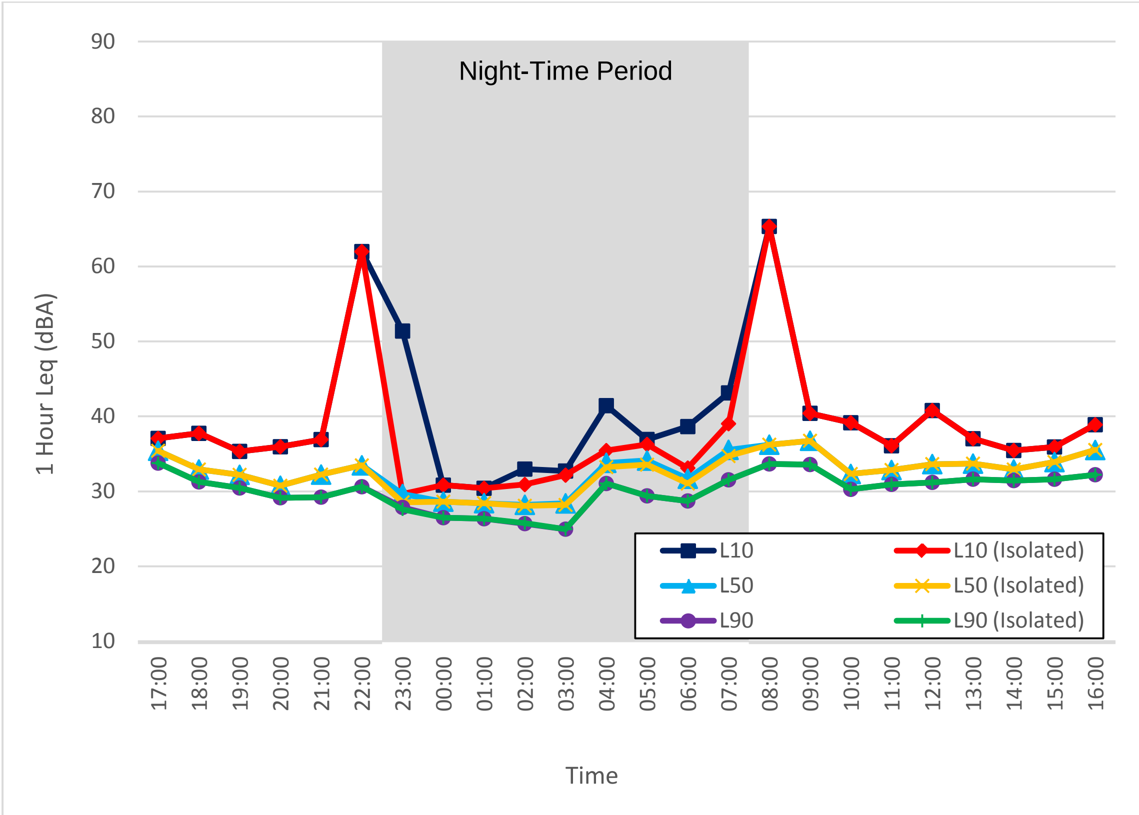

Figure 114. Noise Monitor #12, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (August 23 - 24, 2013)

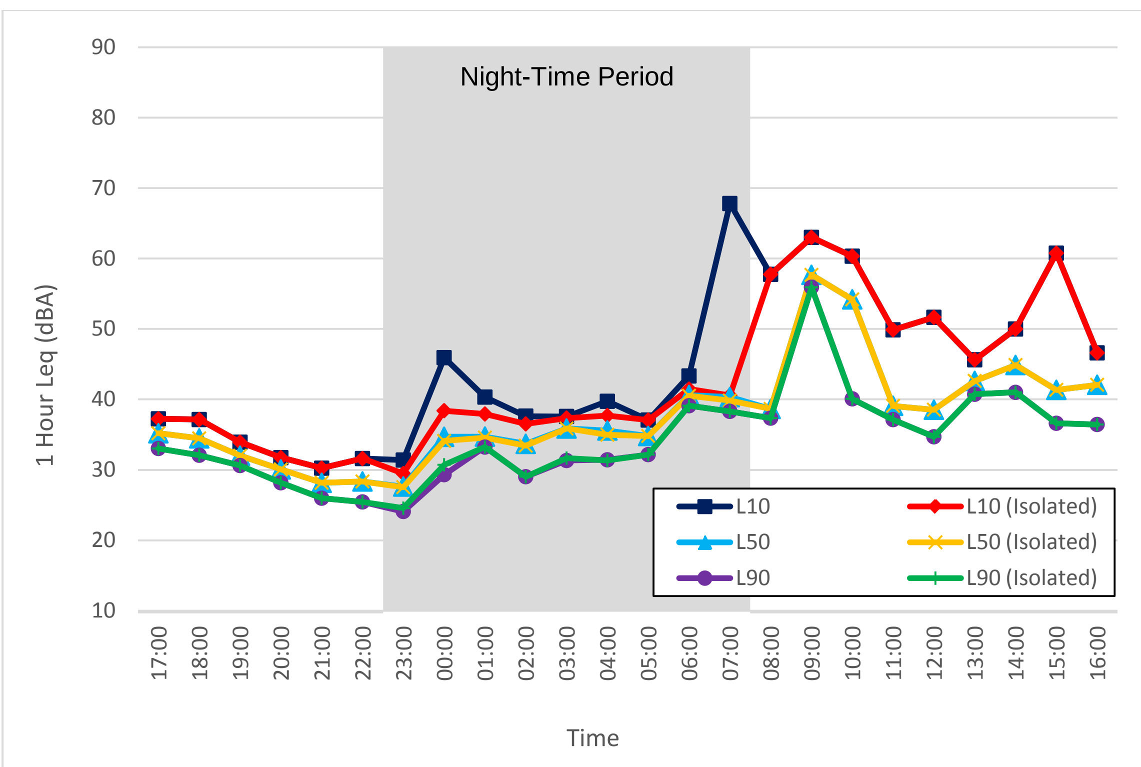

Figure 115. Noise Monitor #12, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (August 24 - 25, 2013)

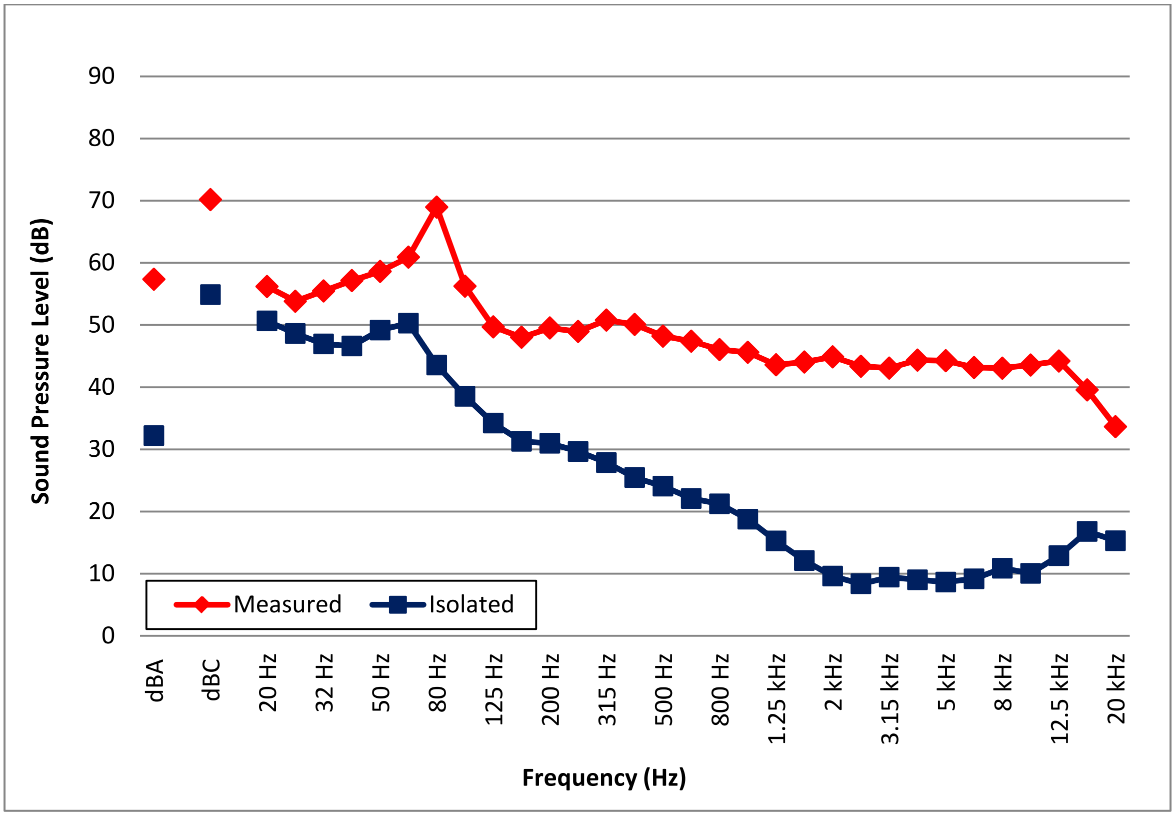

Figure 116. Noise Monitor #12, 1/3 Octave L_{eq} Sound Levels (August 23 - 24, 2013)

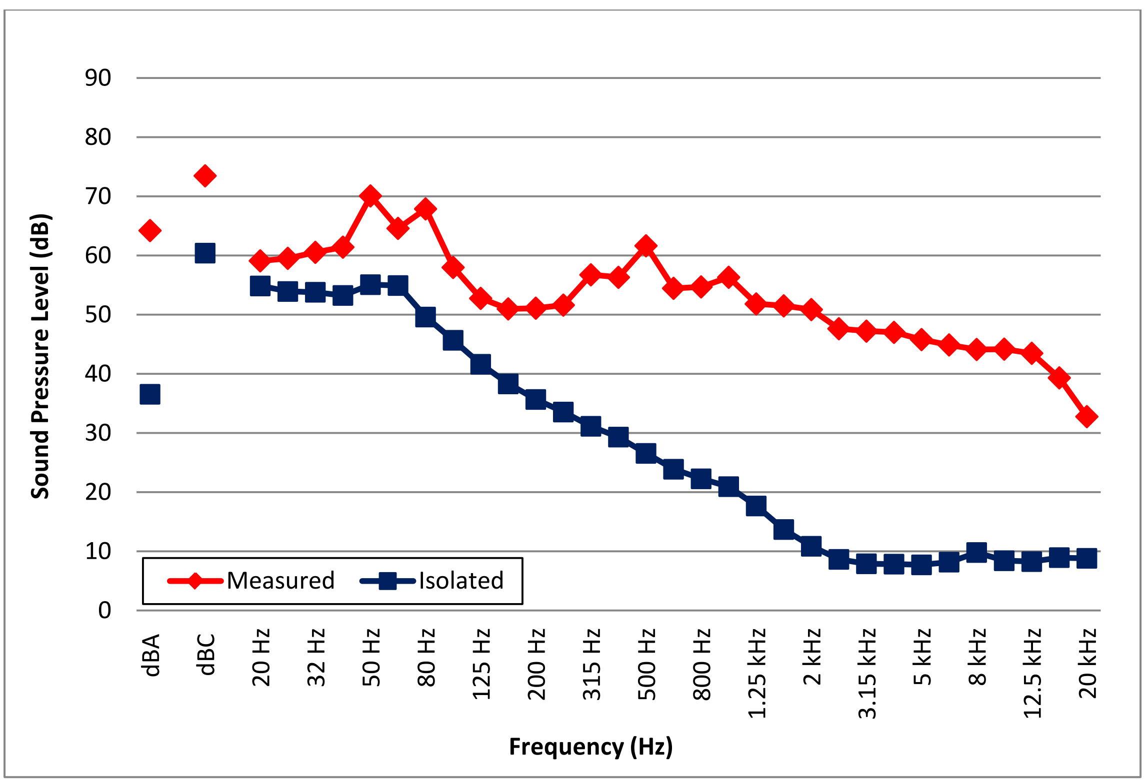

Figure 117. Noise Monitor #12, 1/3 Octave L_{eq} Sound Levels (August 24 - 25, 2013)

Appendix I MEASUREMENT EQUIPMENT USED

Noise Monitors

The environmental noise monitoring equipment used consisted of Brüel and Kjær Type 2250é2270 Precision Integrating Sound Level Meters enclosed in environmental cases with tripods, weather protective microphone hoods, and external batteries. The systems acquired data in 1-minute L_{eq} samples using 1/3 octave band frequency analysis and overall A-weighted and C-weighted sound levels. The sound level meters conform to Type 1, ANSI S1.4, ANSI S1.43, IEC 61672-1, IEC 60651, IEC 60804 and DIN 45657. The 1/3 octave filters conform to S1.11 – Type 0-C, and IEC 61260 – Class 0. The calibrator conforms to IEC 942 and ANSI S1.40. The sound level meters, pre-amplifiers and microphones were certified on June 27, 2013 / December 11, 2012 / December 11, 2012 / October 2, 2012 / October 2, 2012 / October 2, 2012 / October 1, 2012 and the calibrator (type B&K 4231) was certified on October 01, 2012 by a NIST NVLAP Accredited Calibration Laboratory for all requirements of ISO 17025: 1999 and relevant requirements of ISO 9002:1994, ISO 9001:2000 and ANSI/NCSL Z540: 1994 Part 1. All measurement methods and instrumentation conform to the requirements of the AER Directive 038. Simultaneous digital audio was recorded directly on the sound level meter using a 3.3 kHz sample rate for more detailed post-processing analysis. Refer to the next section in the Appendix for a detailed description of the various acoustical descriptive terms used.

Weather Monitors

The weather monitoring equipment used for the study consisted of Orion Weather Stations with WXT520 Self-Aspirating Radiation Shield Sensor Units, Weather MicroServer Data-loggers, and Lightning Arrestors. The Data-loggers and batteries were located in grounded, weather protective cases. The Sensor Units were mounted on sturdy survey tripods (with supporting guy-wires) at approximately 5.0 m above ground. The systems were set up to record data in 1-minute samples obtaining the wind-speed, peak wind-speed, and wind-direction in a rolling 2-minute average as well as the temperature, relative humidity, rain rate and total rain accumulation.

Record of Calibration Results

Description	Date	Time	Pre / Post	Calibration Level	Calibrator Model	Serial Number
Monitor #1	August 23, 2013	13:40	Pre	93.9 dBA	B&K 4231	2656414
Monitor #1	August 25, 2013	16:55	Post	93.8 dBA	B&K 4231	2656414
Monitor #2	August 21, 2013	12:50	Pre	93.9 dBA	B&K 4231	2656414
Monitor #2	August 23, 2013	14:00	Post	93.9 dBA	B&K 4231	2656414
Monitor #3	August 21, 2013	13:20	Pre	93.9 dBA	B&K 4231	2656414
Monitor #3	August 23, 2013	14:15	Post	93.8 dBA	B&K 4231	2656414
Monitor #4	August 21, 2013	13:50	Pre	93.9 dBA	B&K 4231	2656414
Monitor #4	August 23, 2013	14:30	Post	93.8 dBA	B&K 4231	2656414
Monitor #5	August 21, 2013	14:20	Pre	93.9 dBA	B&K 4231	2656414
Monitor #5	August 23, 2013	14:50	Post	93.8 dBA	B&K 4231	2656414
Monitor #6	August 21, 2013	15:05	Pre	93.9 dBA	B&K 4231	2656414
Monitor #6	August 23, 2013	15:40	Post	93.9 dBA	B&K 4231	2656414
Monitor #7	August 23, 2013	17:00	Pre	93.9 dBA	B&K 4231	2656414
Monitor #7	August 25, 2013	18:30	Post	93.9 dBA	B&K 4231	2656414
Monitor #8	August 23, 2013	17:30	Pre	93.9 dBA	B&K 4231	2656414
Monitor #8	August 25, 2013	19:00	Post	93.9 dBA	B&K 4231	2656414
Monitor #9	August 23, 2013	18:30	Pre	93.9 dBA	B&K 4231	2656414
Monitor #9	August 25, 2013	19:40	Post	93.8 dBA	B&K 4231	2656414
Monitor #10	August 21, 2013	12:15	Pre	93.9 dBA	B&K 4231	2656414
Monitor #10	August 23, 2013	13:10	Post	93.8 dBA	B&K 4231	2656414
Monitor #11	August 23, 2013	18:00	Pre	93.9 dBA	B&K 4231	2656414
Monitor #11	August 25, 2013	19:15	Post	93.8 dBA	B&K 4231	2656414
Monitor #12a	August 21, 2013	15:55	Pre	93.9 dBA	B&K 4231	2656414
Monitor #12a	August 23, 2013	15:15	Post	93.8 dBA	B&K 4231	2656414
Monitor #12b	August 23, 2013	15:15	Pre	93.9 dBA	B&K 4231	2656414
Monitor #12b	August 25, 2013	17:55	Post	93.9 dBA	B&K 4231	2656414

B&K 2250 Unit #1 SLM Calibration Certificate

Scantek, Inc.
CALIBRATION LABORATORY

ISO 17025: 2005, ANSI/NCSL Z540:1994 Part 1
ACCREDITED by NVLAP (an ILAC and APLAC signatory)

NVLAP®

NVLAP Lab Code: 200625-0

Calibration Certificate No.29118

Instrument:	**Sound Level Meter**	*Date Calibrated:* **6/28/2013**	*Cal Due:*	
Model:	**2250**	*Status:*	**Received**	**Sent**
Manufacturer:	**Brüel and Kjær**	*In tolerance:*	X	X
Serial number:	**2488495**	*Out of tolerance:*		
Tested with:	**Microphone 4189 s/n 2471133** **Preamplifier ZC0032 s/n 3271**	*See comments:*		
		Contains non-accredited tests: __**Yes** _X_ **No**		
Type (class):	**1**	*Calibration service:* __ **Basic** _X_ **Standard**		
Customer:	**ACI Acoustical Consultants Inc.**	*Address:* **5031 - 210 Street, Edmonton Alberta, CANADA T6M 0A8**		
Tel/Fax:	**780-414-6373 / -6376**			

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
483B-Norsonic	SME Cal Unit	25747	Jul 2, 2012	Scantek, Inc./ NVLAP	Jul 2, 2013
DS-360-SRS	Function Generator	61646	Nov 20, 2012	ACR Env./ A2LA	Nov 20, 2014
34401A-Agilent Technologies	Digital Voltmeter	MY41022043	Nov 20, 2012	ACR Env. / A2LA	Nov 20, 2013
DPI 141-Druck	Pressure Indicator	790/00-04	Nov 21, 2012	ACR Env./ A2LA	Nov 21, 2014
HMP233-Vaisala Oyj	Humidity & Temp.	V3820001	Sep 6, 2012	ACR Env./ A2LA	Mar 6, 2014
PC Program 1019 Norsonic	Calibration software	v.5.2	Validated Mar 2011	Scantek, Inc.	-
1251-Norsonic	Calibrator	30878	Dec 14, 2012	Scantek, Inc./ NVLAP	Dec 14, 2013

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 (%)
23.9 °C	98.895 kPa	55.6 %RH

Calibrated by:	Valentin Buzduga	**Authorized signatory:**	Mariana Buzduga
Signature		Signature	
Date	6/28/2013	Date	6/28/2013

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B&K 2250 Unit #1 Microphone Calibration Certificate

Scantek, Inc.
CALIBRATION LABORATORY

ISO 17025: 2005, ANSI/NCSL Z540:1994 Part 1
ACCREDITED by NVLAP (an ILAC and APLAC signatory)

NVLAP®
NVLAP Lab Code: 200625-0

Calibration Certificate No.29119

Instrument:	**Microphone**	*Date Calibrated:* **6/27/2013** *Cal Due:*		
Model:	**4189**	*Status:*	**Received**	**Sent**
Manufacturer:	**Brüel & Kjær**	*In tolerance:*	X	X
Serial number:	**2471133**	*Out of tolerance:*		
Composed of:		*See comments:*		
		Contains non-accredited tests: __Yes _X_ No		
Customer:	**ACI Acoustical Consultants Inc.**	*Address:*	**5031 - 210 Street, Edmonton Alberta, CANADA T6M 0A8**	
Tel/Fax:	**780-414-6373 / -6376**			

Tested in accordance with the following procedures and standards:
Calibration of Measurement Microphones, Scantek, Inc., Rev. 11/30/2010

Instrumentation used for calibration: N-1504 Norsonic Test System:

Instrument - Manufacturer	Description	S/N	Cal. Date	Traceability evidence Cal. Lab / Accreditation	Cal. Due
483B-Norsonic	SME Cal Unit	25747	Jul 2, 2012	Scantek, Inc./ NVLAP	Jul 2, 2013
DS-360-SRS	Function Generator	61646	Nov 20, 2012	ACR Env./ A2LA	Nov 20, 2014
34401A-Agilent Technologies	Digital Voltmeter	MY41022043	Nov 20, 2012	ACR Env. / A2LA	Nov 20, 2013
DPI 141-Druck	Pressure Indicator	790/00-04	Nov 21, 2012	ACR Env./ A2LA	Nov 21, 2014
HMP233-Vaisala Oyj	Humidity & Temp. Transmitter	V3820001	Sep 6, 2012	ACR Env./ A2LA	Mar 6, 2014
PC Program 1017 Norsonic	Calibration software	v.5.2	Validated Mar 2011	Scantek, Inc.	-
1253-Norsonic	Calibrator	28326	Dec 14, 2012	Scantek, Inc./ NVLAP	Dec 14, 2013
1203-Norsonic	Preamplifier	14059	Jan 4, 2013	Scantek, Inc./ NVLAP	Jan 4, 2014
4180-Brüel&Kjær	Microphone	2246115	Nov 21, 2011	NPL-UK / UKAS	Nov 21, 2013

Instrumentation and test results are traceable to SI - BIPM through standards maintained by NPL (UK) and NIST (USA)

Calibrated by:	Valentin Buzduga	**Authorized signatory:**	Mariana Buzduga
Signature		Signature	
Date	6/27/2013	Date	6/28/2013

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B&K 2270 Unit #2 Calibration Certificates

MANUFACTURER'S CERTIFICATE OF CONFORMANCE

We certify that Brüel & Kjær **-2270--D00-** Serial No. **3002718** has been tested and passed all production tests, confirming compliance with the manufacturer's published specification at the date of the test.

The final test has been performed using calibrated equipment, traceable to National or International Standards or by ratio measurements.

Brüel & Kjær is certified under ISO 9001:2008 assuring that all test data is retained on file and is available for inspection upon request.

Nærum 11-dec-2012

Torben Bjørn
Vice President, Operations

Please note that this document is not a calibration certificate.
For information on our calibration services please contact your nearest Brüel & Kjær office.

BA 0238 - 18

HEADQUARTERS: Brüel & Kjær Sound & Vibration Measurement A/S · DK-2850 Nærum · Denmark
Telephone: +45 7741 2000 · Fax: +45 4580 1405 · www.bksv.com · info@bksv.com
Local representatives and service organisations worldwide

Brüel & Kjær

Bruel & Kjær

Prepolarized Free-field 1/2" Microphone Type 4189

Calibration Chart

Serial No:	2850742	
Open-circuit Sensitivity*, S_0:	-26.0	dB re 1V/Pa
Equivalent to:	50.4	mV/Pa
Uncertainty, 95 % confidence level	0.2	dB
Capacitance:	13.4	pF
Valid At:		
Temperature:	23	°C
Ambient Static Pressure:	101.3	kPa
Relative Humidity:	50	%
Frequency:	251.2	Hz
Polarization Voltage, external:	0	V

Sensitivity Traceable To:
DPLA: Danish Primary Laboratory of Acoustics
NIST: National Institute of Standards and Technology, USA

IEC 61094-4: Type WS 2 F

Environmental Calibration Conditions:
99.7 kPa 22 °C 47 % RH

Procedure: 704215 Date: 26. Nov. 2012 Signature:

$^*K_0 = -26 - S_0$ Example: $K_0 = -26 - (-26.2) = +0.2$ dB

B&K 2270 Unit #3 Calibration Certificates

MANUFACTURER'S CERTIFICATE OF CONFORMANCE

We certify that Brüel & Kjær **-2270--D00-** Serial No. **3002730** has been tested and passed all production tests, confirming compliance with the manufacturer's published specification at the date of the test.

The final test has been performed using calibrated equipment, traceable to National or International Standards or by ratio measurements.

Brüel & Kjær is certified under ISO 9001:2008 assuring that all test data is retained on file and is available for inspection upon request.

Nærum 11-dec-2012

Torben Bjørn
Vice President, Operations

Please note that this document is not a calibration certificate.
For information on our calibration services please contact your nearest Brüel & Kjær office.

HEADQUARTERS: Brüel & Kjær Sound & Vibration Measurement A/S · DK-2850 Nærum · Denmark
Telephone: +45 7741 2000 · Fax: +45 4580 1405 · www.bksv.com · info@bksv.com
Local representatives and service organisations worldwide

Brüel & Kjær

Prepolarized Free-field 1/2" Microphone Type 4189

Bruel & Kjær — Calibration Chart

Serial No:	2850741	
Open-circuit Sensitivity*, S_0:	-26.0	dB re 1V/Pa
Equivalent to:	49.8	mV/Pa
Uncertainty, 95 % confidence level	0.2	dB
Capacitance:	14.1	pF
Valid At:		
Temperature:	23	°C
Ambient Static Pressure:	101.3	kPa
Relative Humidity:	50	%
Frequency:	251.2	Hz
Polarization Voltage, external:	0	V

Sensitivity Traceable To:
DPLA: Danish Primary Laboratory of Acoustics
NIST: National Institute of Standards and Technology, USA

IEC 61094-4: Type WS 2 F

Environmental Calibration Conditions:
99.7 kPa 22 °C 47 % RH

Procedure: 704215 **Date:** 26. Nov. 2012 **Signature:** AK

$^*K_0 = -26 - S_0$ Example: $K_0 = -26 - (-26.2) = +0.2$ dB

aci acoustical consultants inc

B&K 2270 Unit #4 SLM Calibration Certificate

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

NVLAP Lab Code: 200625-0

Calibration Certificate No.27282

Instrument:	**Sound Level Meter**	*Date Calibrated:* **10/2/2012** *Cal Due:*		
Model:	**2270**	*Status:*	**Received**	**Sent**
Manufacturer:	**Brüel and Kjær**	*In tolerance:*	X	X
Serial number:	**2644639**	*Out of tolerance:*		
Tested with:	**Microphone 4189 s/n 2643219** **Preamplifier ZC0032 s/n 8255**	*See comments:*		
		Contains non-accredited tests: __Yes _X_ No		
Type (class):	**1**	*Calibration service:* __ Basic _X_ Standard		
Customer:	**ACI Acoustical Consultants Inc.**	*Address:* **5031 - 210 Street, Edmonton Alberta, CANADA T6M 0A8**		
Tel/Fax:	**780-414-6373 / -6376**			

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
483B-Norsonic	SME Cal Unit	25747	Jul 2, 2012	Scantek, Inc./ NVLAP	Jul 2, 2013
DS-360-SRS	Function Generator	61646	Nov 16, 2011	ACR Env./ A2LA	Nov 16, 2013
34401A-Agilent Technologies	Digital Voltmeter	MY41022043	Dec 9, 2011	ACR Env. / A2LA	Dec 9, 2012
DPI 141-Druck	Pressure Indicator	790/00-04	Dec 13, 2010	ACR Env./ A2LA	Dec 13, 2012
HMP233-Vaisala Oyj	Humidity & Temp.	V3820001	Sep 6, 2012	ACR Env./ A2LA	Mar 6, 2014
PC Program 1019 Norsonic	Calibration software	v.5.2	Validated Mar 2011	Scantek, Inc.	-
1251-Norsonic	Calibrator	30878	Dec 13, 2011	Scantek, Inc./ NVLAP	Dec 13, 2012

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 (%)
24 °C	100.067 kPa	49.4 %RH

Calibrated by:	Valentin Buzduga	**Authorized signatory:**	Mariana Buzduga
Signature		Signature	
Date	10/02/2012	Date	10/02/2012

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B&K 2270 Unit #4 Microphone Calibration Certificate

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

NVLAP®

NVLAP Lab Code: 200625-0

Calibration Certificate No.27283

Instrument:	**Microphone**	*Date Calibrated:* **10/1/2012** *Cal Due:*		
Model:	**4189**	*Status:*	**Received**	**Sent**
Manufacturer:	**Brüel & Kjær**	*In tolerance:*	X	X
Serial number:	**2643219**	*Out of tolerance:*		
Composed of:		*See comments:*		

Contains non-accredited tests: __Yes _X_ No

Customer: **ACI Acoustical Consultants Inc.**
Tel/Fax: **780-414-6373 / -6376**
Address: **5031 - 210 Street, Edmonton Alberta, CANADA T6M 0A8**

Tested in accordance with the following procedures and standards:
Calibration of Measurement Microphones, Scantek, Inc., Rev. 11/30/2010

Instrumentation used for calibration: N-1504 Norsonic Test System:

Instrument - Manufacturer	Description	S/N	Cal. Date	Traceability evidence Cal. Lab / Accreditation	Cal. Due
483B-Norsonic	SME Cal Unit	25747	Jul 2, 2012	Scantek, Inc./ NVLAP	Jul 2, 2013
DS-360-SRS	Function Generator	61646	Nov 16, 2011	ACR Env./ A2LA	Nov 16, 2013
34401A-Agilent Technologies	Digital Voltmeter	MY41022043	Dec 9, 2011	ACR Env. / A2LA	Dec 9, 2012
DPI 141-Druck	Pressure Indicator	790/00-04	Dec 13, 2010	ACR Env./ A2LA	Dec 13, 2012
HMP233-Vaisala Oyj	Humidity & Temp. Transmitter	V3820001	Sep 6, 2012	ACR Env./ A2LA	Mar 6, 2014
PC Program 1017 Norsonic	Calibration software	v.5.2	Validated Mar 2011	Scantek, Inc.	-
1253-Norsonic	Calibrator	28326	Dec 13, 2011	Scantek, Inc./ NVLAP	Dec 13, 2012
1203-Norsonic	Preamplifier	14059	Jan 3, 2012	Scantek, Inc./ NVLAP	Jan 3, 2013
4180-Brüel&Kjær	Microphone	2246115	Nov 21, 2011	NPL-UK / UKAS	Nov 21, 2013

Instrumentation and test results are traceable to SI - BIPM through standards maintained by NPL (UK) and NIST (USA)

Calibrated by:	Valentin Buzduga	Authorized signatory:	Mariana Buzduga
Signature		Signature	
Date	10/02/2012	Date	10/2/2012

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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B&K 2250 Unit #5 SLM Calibration Certificate

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

NVLAP Lab Code: 200625-0

Calibration Certificate No.27284

Instrument:	**Sound Level Meter**	*Date Calibrated:* **10/2/2012** *Cal Due:*		
Model:	**2250**	*Status:*	**Received**	**Sent**
Manufacturer:	**Brüel and Kjær**	*In tolerance:*	X	X
Serial number:	**2722894**	*Out of tolerance:*		
Tested with:	**Microphone 4189 s/n 2719777** **Preamplifier ZC0032 s/n 13895**	*See comments:*		
		Contains non-accredited tests: __Yes X No		
Type (class):	**1**	*Calibration service:* __ Basic X Standard		
Customer:	**ACI Acoustical Consultants Inc.**	*Address:*	**5031 - 210 Street, Edmonton**	
Tel/Fax:	**780-414-6373 / -6376**		**Alberta, CANADA T6M 0A8**	

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
483B-Norsonic	SME Cal Unit	25747	Jul 2, 2012	Scantek, Inc./ NVLAP	Jul 2, 2013
DS-360-SRS	Function Generator	61646	Nov 16, 2011	ACR Env./ A2LA	Nov 16, 2013
34401A-Agilent Technologies	Digital Voltmeter	MY41022043	Dec 9, 2011	ACR Env. / A2LA	Dec 9, 2012
DPI 141-Druck	Pressure Indicator	790/00-04	Dec 13, 2010	ACR Env./ A2LA	Dec 13, 2012
HMP233-Vaisala Oyj	Humidity & Temp.	V3820001	Sep 6, 2012	ACR Env./ A2LA	Mar 6, 2014
PC Program 1019 Norsonic	Calibration software	v.5.2	Validated Mar 2011	Scantek, Inc.	-
1251-Norsonic	Calibrator	30878	Dec 13, 2011	Scantek, Inc./ NVLAP	Dec 13, 2012

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 (%)
24.7 °C	100.019 kPa	48.6 %RH

Calibrated by:	Valentin Buzduga	**Authorized signatory:**	Mariana Buzduga
Signature		Signature	
Date	10/02/2012	Date	10/2/2012

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B&K 2250 Unit #5 Microphone Calibration Certificate

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NVLAP®
NVLAP Lab Code: 200625-0

Calibration Certificate No.27285

Instrument:	**Microphone**	*Date Calibrated:* **10/1/2012**	*Cal Due:*
Model:	**4189**	*Status:*	**Received** / **Sent**
Manufacturer:	**Brüel & Kjær**	*In tolerance:*	X / X
Serial number:	**2719777**	*Out of tolerance:*	
Composed of:		*See comments:*	
		Contains non-accredited tests: __Yes _X_ No	
Customer:	**ACI Acoustical Consultants Inc.**	*Address:*	**5031 - 210 Street, Edmonton Alberta, CANADA T6M 0A8**
Tel/Fax:	**780-414-6373 / -6376**		

Tested in accordance with the following procedures and standards:
Calibration of Measurement Microphones, Scantek, Inc., Rev. 11/30/2010

Instrumentation used for calibration: N-1504 Norsonic Test System:

Instrument - Manufacturer	Description	S/N	Cal. Date	Traceability evidence Cal. Lab / Accreditation	Cal. Due
483B-Norsonic	SME Cal Unit	25747	Jul 2, 2012	Scantek, Inc./ NVLAP	Jul 2, 2013
DS-360-SRS	Function Generator	61646	Nov 16, 2011	ACR Env./ A2LA	Nov 16, 2013
34401A-Agilent Technologies	Digital Voltmeter	MY41022043	Dec 9, 2011	ACR Env. / A2LA	Dec 9, 2012
DPI 141-Druck	Pressure Indicator	790/00-04	Dec 13, 2010	ACR Env./ A2LA	Dec 13, 2012
HMP233-Vaisala Oyj	Humidity & Temp. Transmitter	V3820001	Sep 6, 2012	ACR Env./ A2LA	Mar 6, 2014
PC Program 1017 Norsonic	Calibration software	v.5.2	Validated Mar 2011	Scantek, Inc.	-
1253-Norsonic	Calibrator	28326	Dec 13, 2011	Scantek, Inc./ NVLAP	Dec 13, 2012
1203-Norsonic	Preamplifier	14059	Jan 3, 2012	Scantek, Inc./ NVLAP	Jan 3, 2013
4180-Brüel&Kjær	Microphone	2246115	Nov 21, 2011	NPL-UK / UKAS	Nov 21, 2013

Instrumentation and test results are traceable to SI - BIPM through standards maintained by NPL (UK) and NIST (USA)

Calibrated by:	Valentin Buzduga	**Authorized signatory:**	Mariana Buzduga
Signature		Signature	
Date	10/01/2012	Date	10/2/2012

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B&K 2250 Unit #6 SLM Calibration Certificate

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NVLAP Lab Code: 200625-0

Calibration Certificate No.27286

Instrument:	**Sound Level Meter**	*Date Calibrated:* **10/2/2012** *Cal Due:*		
Model:	**2250**	*Status:*	**Received**	**Sent**
Manufacturer:	**Brüel and Kjær**	*In tolerance:*	X	X
Serial number:	**2661161**	*Out of tolerance:*		
Tested with:	**Microphone 4189 s/n 2650730** **Preamplifier ZC0032 s/n 9935**	*See comments:* *Contains non-accredited tests:* __ **Yes** X **No**		
Type (class):	**1**	*Calibration service:* __ **Basic** X **Standard**		
Customer:	**ACI Acoustical Consultants Inc.**	*Address:* **5031 - 210 Street, Edmonton Alberta, CANADA T6M 0A8**		
Tel/Fax:	**780-414-6373 / -6376**			

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
483B-Norsonic	SME Cal Unit	25747	Jul 2, 2012	Scantek, Inc./ NVLAP	Jul 2, 2013
DS-360-SRS	Function Generator	61646	Nov 16, 2011	ACR Env./ A2LA	Nov 16, 2013
34401A-Agilent Technologies	Digital Voltmeter	MY41022043	Dec 9, 2011	ACR Env. / A2LA	Dec 9, 2012
DPI 141-Druck	Pressure Indicator	790/00-04	Dec 13, 2010	ACR Env./ A2LA	Dec 13, 2012
HMP233-Vaisala Oyj	Humidity & Temp.	V3820001	Sep 6, 2012	ACR Env./ A2LA	Mar 6, 2014
PC Program 1019 Norsonic	Calibration software	v.5.2	Validated Mar 2011	Scantek, Inc.	-
1251-Norsonic	Calibrator	30878	Dec 13, 2011	Scantek, Inc./ NVLAP	Dec 13, 2012

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 (%)
23.2 °C	99.991 kPa	51.9 %RH

Calibrated by:	Valentin Buzduga	**Authorized signatory:**	Mariana Buzduga
Signature		Signature	
Date	10/02/2012	Date	10/2/2012

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B&K 2250 Unit #6 Microphone Calibration Certificate

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NVLAP Lab Code: 200625-0

Calibration Certificate No.27287

Instrument:	**Microphone**	*Date Calibrated:* **10/1/2012** *Cal Due:*		
Model:	**4189**	*Status:*	**Received**	**Sent**
Manufacturer:	**Brüel & Kjær**	*In tolerance:*	**X**	**X**
Serial number:	**2650730**	*Out of tolerance:*		
Composed of:		*See comments:*		
		Contains non-accredited tests: __**Yes** _**X** **No**		
Customer:	**ACI Acoustical Consultants Inc.**	*Address:*	**5031 - 210 Street, Edmonton**	
Tel/Fax:	**780-414-6373 / -6376**		**Alberta, CANADA T6M 0A8**	

Tested in accordance with the following procedures and standards:
Calibration of Measurement Microphones, Scantek, Inc., Rev. 11/30/2010

Instrumentation used for calibration: N-1504 Norsonic Test System:

Instrument - Manufacturer	Description	S/N	Cal. Date	Traceability evidence Cal. Lab / Accreditation	Cal. Due
483B-Norsonic	SME Cal Unit	25747	Jul 2, 2012	Scantek, Inc./ NVLAP	Jul 2, 2013
DS-360-SRS	Function Generator	61646	Nov 16, 2011	ACR Env./ A2LA	Nov 16, 2013
34401A-Agilent Technologies	Digital Voltmeter	MY41022043	Dec 9, 2011	ACR Env. / A2LA	Dec 9, 2012
DPI 141-Druck	Pressure Indicator	790/00-04	Dec 13, 2010	ACR Env./ A2LA	Dec 13, 2012
HMP233-Vaisala Oyj	Humidity & Temp. Transmitter	V3820001	Sep 6, 2012	ACR Env./ A2LA	Mar 6, 2014
PC Program 1017 Norsonic	Calibration software	v.5.2	Validated Mar 2011	Scantek, Inc.	-
1253-Norsonic	Calibrator	28326	Dec 13, 2011	Scantek, Inc./ NVLAP	Dec 13, 2012
1203-Norsonic	Preamplifier	14059	Jan 3, 2012	Scantek, Inc./ NVLAP	Jan 3, 2013
4180-Brüel&Kjær	Microphone	2246115	Nov 21, 2011	NPL-UK / UKAS	Nov 21, 2013

Instrumentation and test results are traceable to SI - BIPM through standards maintained by NPL (UK) and NIST (USA)

Calibrated by:	Valentin Buzduga	**Authorized signatory:**	Mariana Buzduga
Signature		Signature	
Date	10/01/2012	Date	10/2/2012

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B&K 4231 Unit #6 Calibrator Calibration Certificate

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NVLAP®
NVLAP Lab Code: 200625-0

Calibration Certificate No.27292

Instrument:	**Acoustical Calibrator**	*Date Calibrated:* **10/1/2012** *Cal Due:*		
Model:	**4231**	*Status:*	**Received**	**Sent**
Manufacturer:	**Brüel and Kjær**	*In tolerance:*	**X**	**X**
Serial number:	**2656414**	*Out of tolerance:*		
Class (IEC 60942):	**1**	*See comments:*		
Barometer type:		*Contains non-accredited tests:* __Yes _X_ No		
Barometer s/n:				

Customer:	**ACI Acoustical Consultants Inc.**	*Address:*	**5031 - 210 Street, Edmonton**
Tel/Fax:	**780-414-6373 / -6376**		**Alberta, CANADA T6M 0A8**

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
483B-Norsonic	SME Cal Unit	25747	Jul 2, 2012	Scantek, Inc./ NVLAP	Jul 2, 2013
DS-360-SRS	Function Generator	61646	Nov 16, 2011	ACR Env./ A2LA	Nov 16, 2013
34401A-Agilent Technologies	Digital Voltmeter	MY41022043	Dec 9, 2011	ACR Env. / A2LA	Dec 9, 2012
DPI 141-Druck	Pressure Indicator	790/00-04	Dec 13, 2010	ACR Env./ A2LA	Dec 13, 2012
HMP233-Vaisala Oyj	Humidity & Temp. Transmitter	V3820001	Sep 6, 2012	ACR Env./ A2LA	Mar 6, 2014
8903A-HP	Audio Analyzer	2514A05691	Dec 1, 2010	ACR Env./ A2LA	Dec 1, 2013
PC Program 1018 Norsonic	Calibration software	v.5.2	Validated March 2011	Scantek, Inc.	-
4134-Brüel&Kjær	Microphone	456005	Mar 23, 2012	Scantek, Inc. / NVLAP	Mar 23, 2013
1203-Norsonic	Preamplifier	14059	Jan 3, 2012	Scantek, Inc./ NVLAP	Jan 3, 2013

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

Calibrated by:	Valentin Buzduga	**Authorized signatory:**	Mariana Buzduga
Signature		Signature	
Date	10/01/2012	Date	10/2/2012

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B&K 2250 Unit #7 SLM Calibration Certificate

Scantek, Inc.
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ISO 17025: 2005, ANSI/NCSL Z540:1994 Part 1
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NVLAP®
NVLAP Lab Code: 200625-0

Calibration Certificate No.27288

Instrument:	**Sound Level Meter**
Model:	**2250**
Manufacturer:	**Brüel and Kjær**
Serial number:	**2722859**
Tested with:	**Microphone 4189 s/n 2710791** **Preamplifier ZC0032 s/n 13398**
Type (class):	**1**
Customer:	**ACI Acoustical Consultants Inc.**
Tel/Fax:	**780-414-6373 / -6376**

Date Calibrated: **10/1/2012** *Cal Due:*

Status:	**Received**	**Sent**
In tolerance:	X	X
Out of tolerance:		
See comments:		

Contains non-accredited tests: __ **Yes** X **No**
Calibration service: __ **Basic** X **Standard**
Address: **5031 - 210 Street, Edmonton Alberta, CANADA T6M 0A8**

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
483B-Norsonic	SME Cal Unit	25747	Jul 2, 2012	Scantek, Inc./ NVLAP	Jul 2, 2013
DS-360-SRS	Function Generator	61646	Nov 16, 2011	ACR Env./ A2LA	Nov 16, 2013
34401A-Agilent Technologies	Digital Voltmeter	MY41022043	Dec 9, 2011	ACR Env. / A2LA	Dec 9, 2012
DPI 141-Druck	Pressure Indicator	790/00-04	Dec 13, 2010	ACR Env./ A2LA	Dec 13, 2012
HMP233-Vaisala Oyj	Humidity & Temp.	V3820001	Sep 6, 2012	ACR Env./ A2LA	Mar 6, 2014
PC Program 1019 Norsonic	Calibration software	v.5.2	Validated Mar 2011	Scantek, Inc.	-
1251-Norsonic	Calibrator	30878	Dec 13, 2011	Scantek, Inc./ NVLAP	Dec 13, 2012

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 (%)
22.7 °C	100.02 kPa	47.4 %RH

Calibrated by:	Valentin Buzduga	**Authorized signatory:**	Mariana Buzduga
Signature		Signature	
Date	10/01/2012	Date	10/2/2012

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B&K 2250 Unit #7 Microphone Calibration Certificate

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NVLAP®
NVLAP Lab Code: 200625-0

Calibration Certificate No.27289

Instrument:	**Microphone**	*Date Calibrated:* **10/1/2012** *Cal Due:*		
Model:	**4189**	*Status:*	**Received**	**Sent**
Manufacturer:	**Brüel & Kjær**	*In tolerance:*	X	X
Serial number:	**2710791**	*Out of tolerance:*		
Composed of:		*See comments:*		
		Contains non-accredited tests: __Yes _X_ No		
Customer:	**ACI Acoustical Consultants Inc.**	*Address:*	**5031 - 210 Street, Edmonton Alberta, CANADA T6M 0A8**	
Tel/Fax:	**780-414-6373 / -6376**			

Tested in accordance with the following procedures and standards:
Calibration of Measurement Microphones, Scantek, Inc., Rev. 11/30/2010

Instrumentation used for calibration: N-1504 Norsonic Test System:

Instrument - Manufacturer	Description	S/N	Cal. Date	Traceability evidence Cal. Lab / Accreditation	Cal. Due
483B-Norsonic	SME Cal Unit	25747	Jul 2, 2012	Scantek, Inc./ NVLAP	Jul 2, 2013
DS-360-SRS	Function Generator	61646	Nov 16, 2011	ACR Env./ A2LA	Nov 16, 2013
34401A-Agilent Technologies	Digital Voltmeter	MY41022043	Dec 9, 2011	ACR Env. / A2LA	Dec 9, 2012
DPI 141-Druck	Pressure Indicator	790/00-04	Dec 13, 2010	ACR Env./ A2LA	Dec 13, 2012
HMP233-Vaisala Oyj	Humidity & Temp. Transmitter	V3820001	Sep 6, 2012	ACR Env./ A2LA	Mar 6, 2014
PC Program 1017 Norsonic	Calibration software	v.5.2	Validated Mar 2011	Scantek, Inc.	-
1253-Norsonic	Calibrator	28326	Dec 13, 2011	Scantek, Inc./ NVLAP	Dec 13, 2012
1203-Norsonic	Preamplifier	14059	Jan 3, 2012	Scantek, Inc./ NVLAP	Jan 3, 2013
4180-Brüel&Kjær	Microphone	2246115	Nov 21, 2011	NPL-UK / UKAS	Nov 21, 2013

Instrumentation and test results are traceable to SI - BIPM through standards maintained by NPL (UK) and NIST (USA)

Calibrated by:	Valentin Buzduga	**Authorized signatory:**	Mariana Buzduga
Signature		Signature	
Date	10/01/2012	Date	10/2/2012

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Appendix II THE ASSESSMENT OF ENVIRONMENTAL NOISE (GENERAL)

Sound Pressure Level

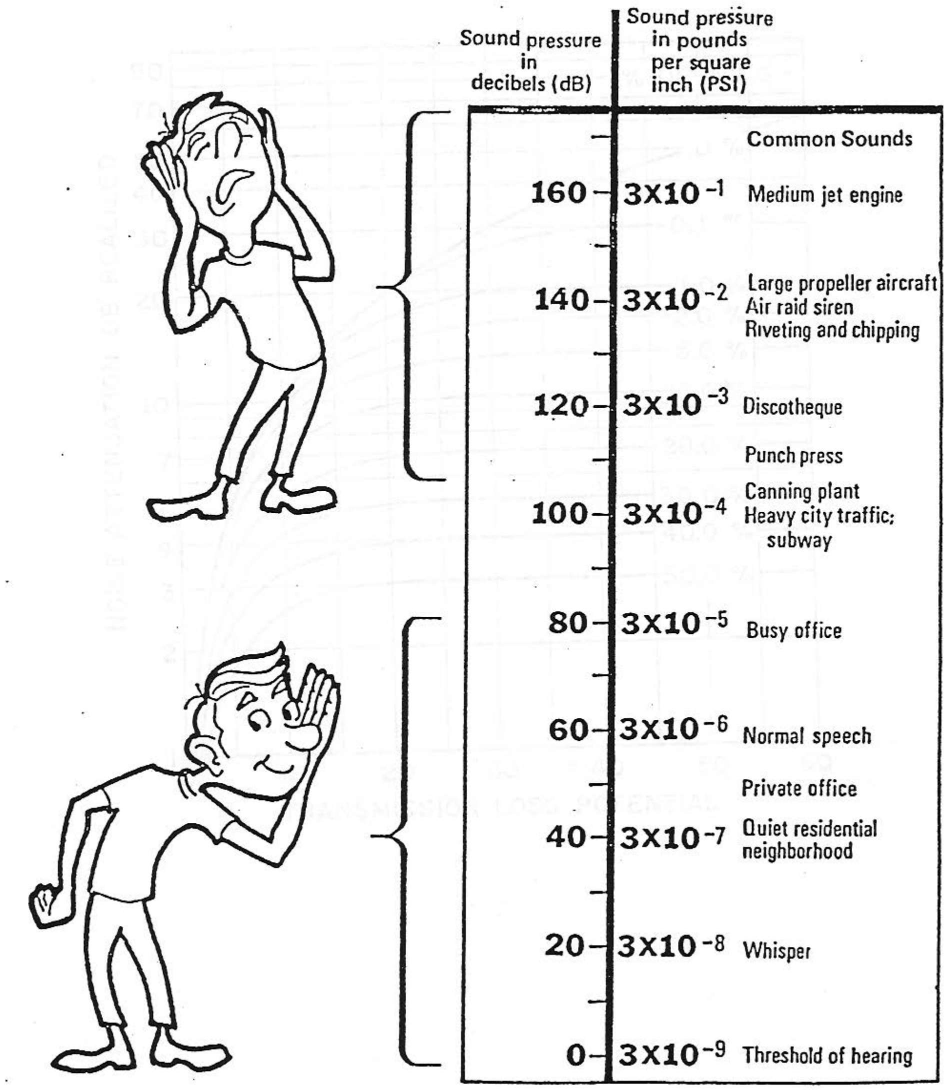
Sound pressure is initially measured in Pascal's (Pa). Humans can hear several orders of magnitude in sound pressure levels, so a more convenient scale is used. This scale is known as the decibel (dB) scale, named after Alexander Graham Bell (telephone guy). It is a base 10 logarithmic scale. When we measure pressure we typically measure the RMS sound pressure.

$$SPL = 10\log_{10}\left[\frac{P^{2}_{RMS}}{P^{2}_{ref}}\right] = 20\log_{10}\left[\frac{P_{RMS}}{P_{ref}}\right]$$

Where: SPL = Sound Pressure Level in dB
P_{RMS} = Root Mean Square measured pressure (Pa)
P_{ref} = Reference sound pressure level ($P_{ref} = 2\text{x}10^{-5}$ Pa = 20 μPa)

This reference sound pressure level is an internationally agreed upon value. It represents the threshold of human hearing for "typical" people based on numerous testing. It is possible to have a threshold which is lower than 20 μPa which will result in negative dB levels. As such, zero dB does not mean there is no sound!

In general, a difference of 1 – 2 dB is the threshold for humans to notice that there has been a change in sound level. A difference of 3 dB (factor of 2 in acoustical energy) is perceptible and a change of 5 dB is strongly perceptible. A change of 10 dB is typically considered a factor of 2. This is quite remarkable when considering that 10 dB is 10-times the acoustical energy!


Sound pressure in decibels (dB)
Sound pressure in pounds per square inch (PSI)
Common Sounds
160 3X10^{-1} Medium jet engine
140 3X10^{-2} Large propeller aircraft
Air raid siren
Riveting and chipping
120 3X10^{-3} Discotheque
Punch press
Canning plant
100 3X10^{-4} Heavy city traffic; subway
80 3X10^{-5} Busy office
60 3X10^{-6} Normal speech
Private office
40 3X10^{-7} Quiet residential neighborhood
20 3X10^{-8} Whisper
0 3X10^{-9} Threshold of hearing

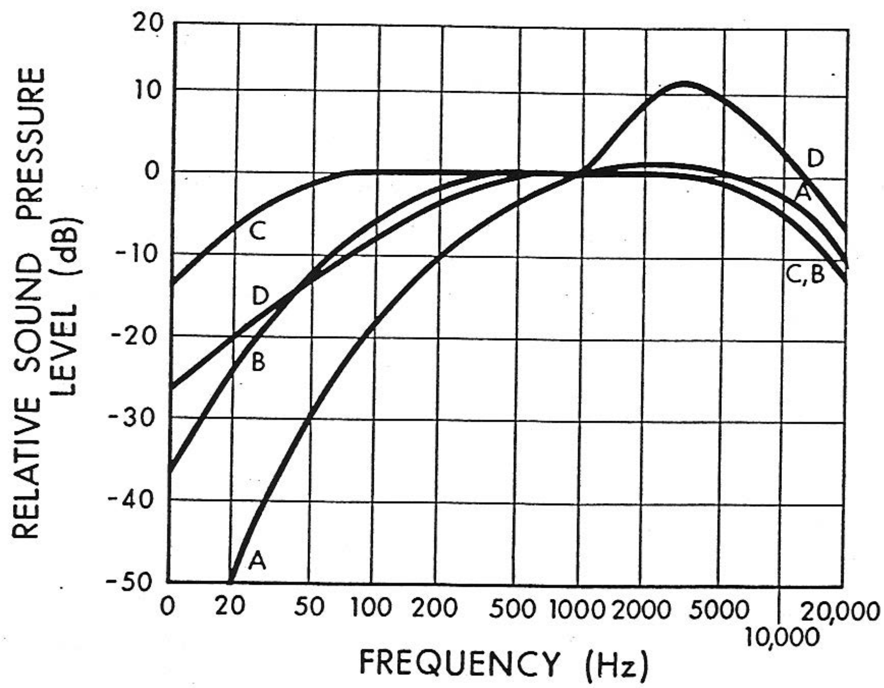
Frequency

The range of frequencies audible to the human ear ranges from approximately 20 Hz to 20 kHz. Within this range, the human ear does not hear equally at all frequencies. It is not very sensitive to low frequency sounds, is very sensitive to mid frequency sounds and is slightly less sensitive to high frequency sounds. Due to the large frequency range of human hearing, the entire spectrum is often divided into 31 bands, each known as a 1/3 octave band.

The internationally agreed upon center frequencies and upper and lower band limits for the 1/1 (whole octave) and 1/3 octave bands are as follows:

	Whole Octave			1/3 Octave	
Lower Band Limit	Center Frequency	Upper Band Limit	Lower Band Limit	Center Frequency	Upper Band Limit
11	**16**	22	14.1	**16**	17.8
			17.8	**20**	22.4
			22.4	**25**	28.2
22	**31.5**	44	28.2	**31.5**	35.5
			35.5	**40**	44.7
			44.7	**50**	56.2
44	**63**	88	56.2	**63**	70.8
			70.8	**80**	89.1
			89.1	**100**	112
88	**125**	177	112	**125**	141
			141	**160**	178
			178	**200**	224
177	**250**	355	224	**250**	282
			282	**315**	355
			355	**400**	447
355	**500**	710	447	**500**	562
			562	**630**	708
			708	**800**	891
710	**1000**	1420	891	**1000**	1122
			1122	**1250**	1413
			1413	**1600**	1778
1420	**2000**	2840	1778	**2000**	2239
			2239	**2500**	2818
			2818	**3150**	3548
2840	**4000**	5680	3548	**4000**	4467
			4467	**5000**	5623
			5623	**6300**	7079
5680	**8000**	11360	7079	**8000**	8913
			8913	**10000**	11220
			11220	**12500**	14130
11360	**16000**	22720	14130	**16000**	17780
			17780	**20000**	22390

Human hearing is most sensitive at approximately 3500 Hz which corresponds to the ¼ wavelength of the ear canal (approximately 2.5 cm). Because of this range of sensitivity to various frequencies, we typically apply various weighting networks to the broadband measured sound to more appropriately account for the way humans hear. By default, the most common weighting network used is the so-called "A-weighting". It can be seen in the figure that the low frequency sounds are reduced significantly with the A-weighting.



Combination of Sounds

When combining multiple sound sources the general equation is:

$$\Sigma SPL_n = 10\log_{10}\left[\sum_{i=1}^{n} 10^{\frac{SPL_i}{10}}\right]$$

Examples:

- Two sources of 50 dB each add together to result in 53 dB.
- Three sources of 50 dB each add together to result in 55 dB.
- Ten sources of 50 dB each add together to result in 60 dB.
- One source of 50 dB added to another source of 40 dB results in 50.4 dB

It can be seen that, if multiple similar sources exist, removing or reducing only one source will have little effect.

Sound Level Measurements

Over the years a number of methods for measuring and describing environmental noise have been developed. The most widely used and accepted is the concept of the Energy Equivalent Sound Level (L_{eq}) which was developed in the US (1970's) to characterize noise levels near US Air-force bases. This is the level of a steady state sound which, for a given period of time, would contain the same energy as the time varying sound. The concept is that the same amount of annoyance occurs from a sound having a high level for a short period of time as from a sound at a lower level for a longer period of time.
The L_{eq} is defined as:

$$L_{eq} = 10\log_{10}\left[\frac{1}{T}\int_0^T 10^{\frac{dB}{10}}\, dT\right] = 10\log_{10}\left[\frac{1}{T}\int_0^T \frac{P^2}{P_{ref}^2}\, dT\right]$$

We must specify the time period over which to measure the sound. i.e. 1-second, 10-seconds, 15-seconds, 1-minute, 1-day, etc**. An L_{eq} is meaningless if there is no time period associated**.

In general there a few very common L_{eq} sample durations which are used in describing environmental noise measurements. These include:

- L_{eq}24 - Measured over a 24-hour period
- L_{eq}Night - Measured over the night-time (typically 22:00 – 07:00)
- L_{eq}Day - Measured over the day-time (typically 07:00 – 22:00)
- L_{DN} - Same as L_{eq}24 with a 10 dB penalty added to the night-time

Statistical Descriptor

Another method of conveying long term noise levels utilizes statistical descriptors. These are calculated from a cumulative distribution of the sound levels over the entire measurement duration and then determining the sound level at xx % of the time.

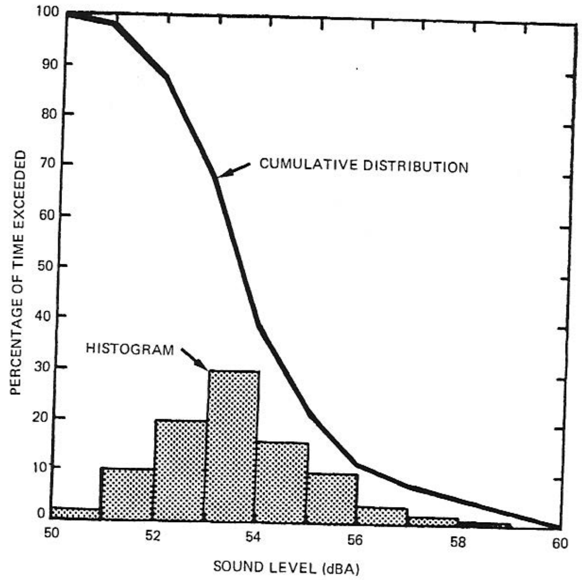


Figure 16.6 Statistically processed community noise showing histogram and cumulative distribution of A weighted sound levels.

Industrial Noise Control, Lewis Bell, Marcel Dekker, Inc. 1994

The most common statistical descriptors are:

- L_{min} - minimum sound level measured
- L_{01} - sound level that was exceeded only 1% of the time
- L_{10} - sound level that was exceeded only 10% of the time.
  - Good measure of intermittent or intrusive noise
  - Good measure of Traffic Noise
- L_{50} - sound level that was exceeded 50% of the time (arithmetic average)
  - Good to compare to L_{eq} to determine steadiness of noise
- L_{90} - sound level that was exceeded 90% of the time
  - Good indicator of typical "ambient" noise levels
- L_{99} - sound level that was exceeded 99% of the time
- L_{max} - maximum sound level measured

These descriptors can be used to provide a more detailed analysis of the varying noise climate:

- If there is a large difference between the L_{eq} and the L_{50} (L_{eq} can never be any lower than the L_{50}) then it can be surmised that one or more short duration, high level sound(s) occurred during the time period.
- If the gap between the L_{10} and L_{90} is relatively small (less than 15 – 20 dBA) then it can be surmised that the noise climate was relatively steady.

Sound Propagation

In order to understand sound propagation, the nature of the source must first be discussed. In general, there are three types of sources. These are known as 'point', 'line', and 'area'. This discussion will concentrate on point and line sources since area sources are much more complex and can usually be approximated by point sources at large distances.

Point Source

As sound radiates from a point source, it dissipates through geometric spreading. The basic relationship between the sound levels at two distances from a point source is:

$$\therefore SPL_1 - SPL_2 = 20\log_{10}\left(\frac{r_2}{r_1}\right)$$

Where: SPL_1 = sound pressure level at location 1, SPL_2 = sound pressure level at location 2
r_1 = distance from source to location 1, r_2 = distance from source to location 2

Thus, the reduction in sound pressure level for a point source radiating in a free field is **6 dB per doubling of distance**. This relationship is independent of reflectivity factors provided they are always present. Note that this only considers geometric spreading and does not take into account atmospheric effects. Point sources still have some physical dimension associated with them, and typically do not radiate sound equally in all directions in all frequencies. The directionality of a source is also highly dependent on frequency. As frequency increases, directionality increases.

Examples (note no atmospheric absorption):

- A point source measuring 50 dB at 100m will be 44 dB at 200m.
- A point source measuring 50 dB at 100m will be 40.5 dB at 300m.
- A point source measuring 50 dB at 100m will be 38 dB at 400m.
- A point source measuring 50 dB at 100m will be 30 dB at 1000m.

Line Source

A line source is similar to a point source in that it dissipates through geometric spreading. The difference is that a line source is equivalent to a long line of many point sources. The basic relationship between the sound levels at two distances from a line source is:

$$SPL_1 - SPL_2 = 10\log_{10}\left(\frac{r_2}{r_1}\right)$$

The difference from the point source is that the '20' term in front of the 'log' is now only 10. Thus, the reduction in sound pressure level for a line source radiating in a free field is **3 dB per doubling of distance**.

Examples (note no atmospheric absorption):

- A line source measuring 50 dB at 100m will be 47 dB at 200m.
- A line source measuring 50 dB at 100m will be 45 dB at 300m.
- A line source measuring 50 dB at 100m will be 44 dB at 400m.
- A line source measuring 50 dB at 100m will be 40 dB at 1000m.

Atmospheric Absorption

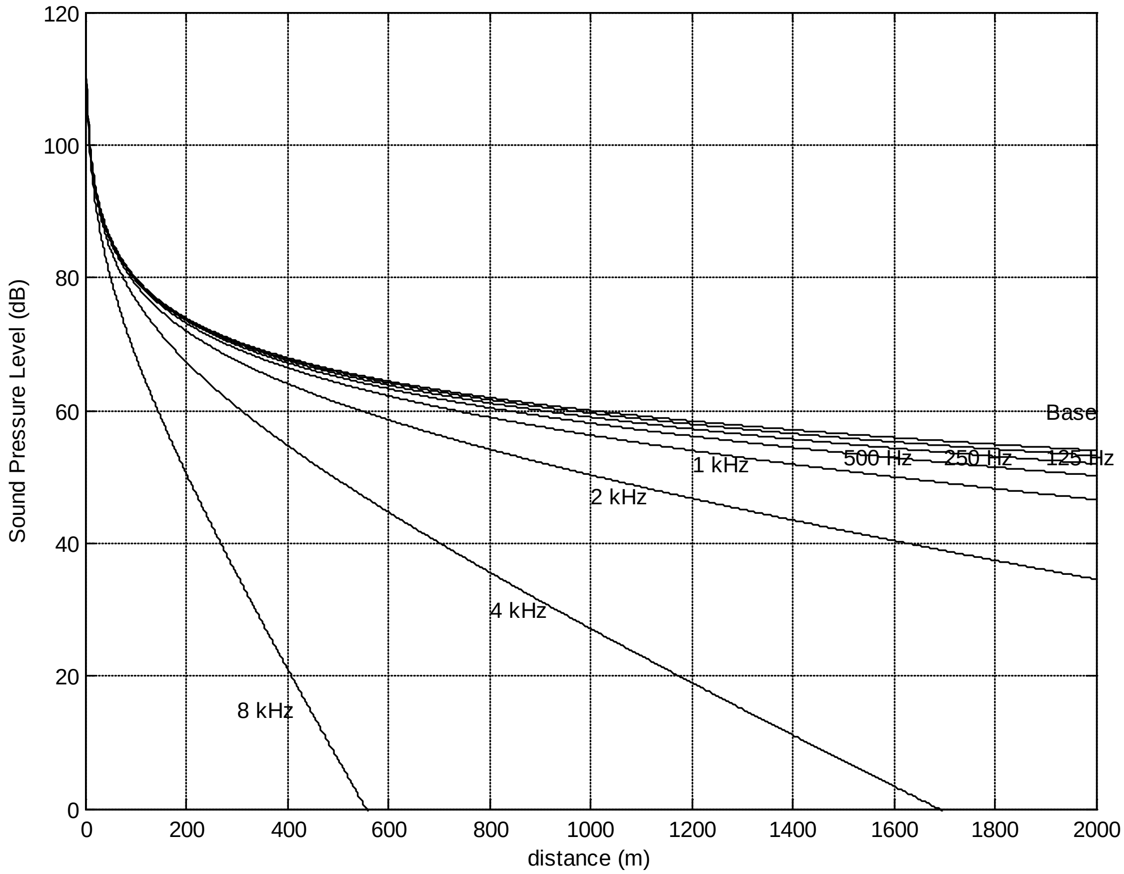
As sound transmits through a medium, there is an attenuation (or dissipation of acoustic energy) which can be attributed to three mechanisms:

1) **Viscous Effects** - Dissipation of acoustic energy due to fluid friction which results in thermodynamically irreversible propagation of sound.
2) **Heat Conduction Effects** - Heat transfer between high and low temperature regions in the wave which result in non-adiabatic propagation of the sound.
3) **Inter Molecular Energy Interchanges** - Molecular energy relaxation effects which result in a time lag between changes in translational kinetic energy and the energy associated with rotation and vibration of the molecules.

The following table illustrates the attenuation coefficient of sound at standard pressure (101.325 kPa) in units of dB/100m.

Temperature °C	Relative Humidity (%)	Frequency (Hz) 125	250	500	1000	2000	4000
30	20	0.06	0.18	0.37	0.64	1.40	4.40
	50	0.03	0.10	0.33	0.75	1.30	2.50
	90	0.02	0.06	0.24	0.70	1.50	2.60
20	20	0.07	0.15	0.27	0.62	1.90	6.70
	50	0.04	0.12	0.28	0.50	1.00	2.80
	90	0.02	0.08	0.26	0.56	0.99	2.10
10	20	0.06	0.11	0.29	0.94	3.20	9.00
	50	0.04	0.11	0.20	0.41	1.20	4.20
	90	0.03	0.10	0.21	0.38	0.81	2.50
0	20	0.05	0.15	0.50	1.60	3.70	5.70
	50	0.04	0.08	0.19	0.60	2.10	6.70
	90	0.03	0.08	0.15	0.36	1.10	4.10

- As frequency increases, absorption tends to increase
- As Relative Humidity increases, absorption tends to decrease
- There is no direct relationship between absorption and temperature
- **The net result of atmospheric absorption is to modify the sound propagation of a point source from 6 dB/doubling-of-distance to approximately 7 – 8 dB/doubling-of-distance (based on anecdotal experience)**



Atmospheric Absorption at 10°C and 70% RH

Meteorological Effects

There are many meteorological factors which can affect how sound propagates over large distances. These various phenomena must be considered when trying to determine the relative impact of a noise source either after installation or during the design stage.

Wind

- Can greatly alter the noise climate away from a source depending on direction
- Sound levels downwind from a source can be increased due to refraction of sound back down towards the surface. This is due to the generally higher velocities as altitude increases.
- Sound levels upwind from a source can be decreased due to a “bending” of the sound away from the earth’s surface.
- Sound level differences of ±10dB are possible depending on severity of wind and distance from source.
- Sound levels crosswind are generally not disturbed by an appreciable amount
- Wind tends to generate its own noise, however, and can provide a high degree of masking relative to a noise source of particular interest.

Temperature

- Temperature effects can be similar to wind effects
- Typically, the temperature is warmer at ground level than it is at higher elevations.
- If there is a very large difference between the ground temperature (very warm) and the air aloft (only a few hundred meters) then the transmitted sound refracts upward due to the changing speed of sound.
- If the air aloft is warmer than the ground temperature (known as an *inversion*) the resulting higher speed of sound aloft tends to refract the transmitted sound back down towards the ground. This essentially works on Snell’s law of reflection and refraction.
- Temperature inversions typically happen early in the morning and are most common over large bodies of water or across river valleys.
- Sound level differences of ±10dB are possible depending on gradient of temperature and distance from source.

Rain

- Rain does not affect sound propagation by an appreciable amount unless it is very heavy
- The larger concern is the noise generated by the rain itself. A heavy rain striking the ground can cause a significant amount of highly broadband noise. The amount of noise generated is difficult to predict.
- Rain can also affect the output of various noise sources such as vehicle traffic.

Summary

- In general, these wind and temperature effects are difficult to predict
- Empirical models (based on measured data) have been generated to attempt to account for these effects.
- Environmental noise measurements must be conducted with these effects in mind. Sometimes it is desired to have completely calm conditions, other times a “worst case” of downwind noise levels are desired.

Topographical Effects

Similar to the various atmospheric effects outlined in the previous section, the effect of various geographical and vegetative factors must also be considered when examining the propagation of noise over large distances.

Topography

- One of the most important factors in sound propagation.
- Can provide a natural barrier between source and receiver (i.e. if berm or hill in between).
- Can provide a natural amplifier between source and receiver (i.e. large valley in between or hard reflective surface in between).
- Must look at location of topographical features relative to source and receiver to determine importance (i.e. small berm 1km away from source and 1km away from receiver will make negligible impact).

Grass

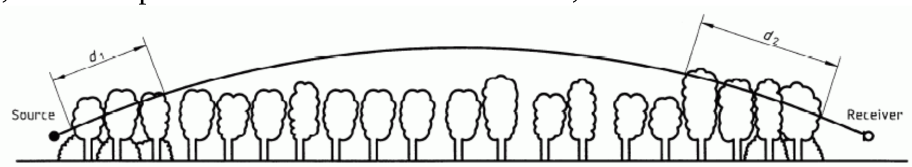
- Can be an effective absorber due to large area covered
- Only effective at low height above ground. Does not affect sound transmitted direct from source to receiver if there is line of sight.
- Typically less absorption than atmospheric absorption when there is line of sight.
- Approximate rule of thumb based on empirical data is:

$$A_g = 18\log_{10}(f) - 31 \qquad (dB/100m)$$

Where: A_g is the absorption amount

Trees

- Provide absorption due to foliage
- Deciduous trees are essentially ineffective in the winter
- Absorption depends heavily on density and height of trees
- No data found on absorption of various kinds of trees
- Large spans of trees are required to obtain even minor amounts of sound reduction
- In many cases, trees can provide an effective visual barrier, even if the noise attenuation is negligible.



NOTE — $d_f = d_1 + d_2$

For calculating d_1 and d_2, the curved path radius may be assumed to be 5 km.

Figure A.1 — Attenuation due to propagation through foliage increases linearly with propagation distance d_f through the foliage

Table A.1 — Attenuation of an octave band of noise due to propagation a distance d_f through dense foliage

Propagation distance d_f m	Nominal midband frequency Hz							
	63	125	250	500	1 000	2 000	4 000	8 000
	Attenuation, dB:							
$10 \leq d_f \leq 20$	0	0	1	1	1	1	2	3
	Attenuation, dB/m:							
$20 \leq d_f \leq 200$	0,02	0,03	0,04	0,05	0,06	0,08	0,09	0,12

Tree/Foliage attenuation from ISO 9613-2:1996

Bodies of Water

- Large bodies of water can provide the opposite effect to grass and trees.
- Reflections caused by small incidence angles (grazing) can result in larger sound levels at great distances (increased reflectivity, Q).
- Typically air temperatures are warmer high aloft since air temperatures near water surface tend to be more constant. Result is a high probability of temperature inversion.
- Sound levels can “carry” much further.

Snow

- Covers the ground for approximately 1/2 of the year in northern climates.
- Can act as an absorber or reflector (and varying degrees in between).
- Freshly fallen snow can be quite absorptive.
- Snow which has been sitting for a while and hard packed due to wind can be quite reflective.
- Falling snow can be more absorptive than rain, but does not tend to produce its own noise.
- Snow can cover grass which might have provided some means of absorption.
- Typically sound propagates with less impedance in winter due to hard snow on ground and no foliage on trees/shrubs.

Appendix III SOUND LEVELS OF FAMILIAR NOISE SOURCES

Used with Permission Obtained from ERCB Guide 38: Noise Control Directive User Guide (February 2007)

Source[1]	**Sound Level (dBA)**
Bedroom of a country home	30
Soft whisper at 1.5 m	30
Quiet office or living room	40
Moderate rainfall	50
Inside average urban home	50
Quiet street	50
Normal conversation at 1 m	60
Noisy office	60
Noisy restaurant	70
Highway traffic at 15 m	75
Loud singing at 1 m	75
Tractor at 15 m	78-95
Busy traffic intersection	80
Electric typewriter	80
Bus or heavy truck at 15 m	88-94
Jackhammer	88-98
Loud shout	90
Freight train at 15 m	95
Modified motorcycle	95
Jet taking off at 600 m	100
Amplified rock music	110
Jet taking off at 60 m	120
Air-raid siren	130

[1] Cottrell, Tom, 1980, *Noise in Alberta*, Table 1, p.8, ECA80 - 16/1B4 (Edmonton: Environment Council of Alberta).

SOUND LEVELS GENERATED BY COMMON APPLIANCES

Used with Permission Obtained from ERCB Guide 38: Noise Control Directive User Guide (February 2007)

Source[1]	**Sound level at 3 feet (dBA)**
Freezer	38-45
Refrigerator	34-53
Electric heater	47
Hair clipper	50
Electric toothbrush	48-57
Humidifier	41-54
Clothes dryer	51-65
Air conditioner	50-67
Electric shaver	47-68
Water faucet	62
Hair dryer	58-64
Clothes washer	48-73
Dishwasher	59-71
Electric can opener	60-70
Food mixer	59-75
Electric knife	65-75
Electric knife sharpener	72
Sewing machine	70-74
Vacuum cleaner	65-80
Food blender	65-85
Coffee mill	75-79
Food waste disposer	69-90
Edger and trimmer	81
Home shop tools	64-95
Hedge clippers	85
Electric lawn mower	80-90

[1] Reif, Z. F., and Vermeulen, P. J., 1979, "Noise from domestic appliances, construction, and industry," Table 1, p.166, in Jones, H. W., ed., *Noise in the Human Environment*, vol. 2, ECA79-SP/1 (Edmonton: Environment Council of Alberta).

Appendix IV DATA REMOVAL

Data Removal Noise Monitoring Location #1

Start Time	End Time	Duration (min)	Reason
22:06 August-23-13	22:08 August-23-13	2	Loud Vehicle Passby
22:30 August-23-13	22:32 August-23-13	2	Loud Vehicle Passby
22:34 August-23-13	22:36 August-23-13	2	Loud Vehicle Passby
22:37 August-23-13	22:37 August-23-13	0	Loud Vehicle Passby
22:42 August-23-13	22:43 August-23-13	1	Loud Vehicle Passby
23:06 August-23-13	23:07 August-23-13	1	Low Frequency Rumble
23:19 August-23-13	23:23 August-23-13	4	Loud Vehicle Passby
23:44 August-23-13	23:45 August-23-13	1	Loud Vehicle Passby
23:51 August-23-13	23:51 August-23-13	0	Loud Vehicle Passby
00:33 August-24-13	00:33 August-24-13	0	Loud Vehicle Passby
01:17 August-24-13	01:18 August-24-13	1	Loud Vehicle Passby
01:57 August-24-13	01:59 August-24-13	2	Loud Vehicle Passby
02:46 August-24-13	02:47 August-24-13	1	Aircraft Flyover
02:53 August-24-13	02:54 August-24-13	1	Loud Vehicle Passby
03:14 August-24-13	03:14 August-24-13	0	Loud Vehicle Passby
04:27 August-24-13	04:29 August-24-13	2	Loud Vehicle Passby
04:34 August-24-13	04:35 August-24-13	1	Loud Vehicle Passby
04:36 August-24-13	04:38 August-24-13	2	Loud Vehicle Passby
04:39 August-24-13	04:40 August-24-13	1	Loud Vehicle Passby
04:43 August-24-13	04:43 August-24-13	0	Loud Vehicle Passby
04:45 August-24-13	04:45 August-24-13	0	Loud Vehicle Passby
04:48 August-24-13	04:50 August-24-13	2	Loud Vehicle Passby
04:54 August-24-13	04:54 August-24-13	0	Loud Vehicle Passby
04:55 August-24-13	04:55 August-24-13	0	Loud Vehicle Passby
04:57 August-24-13	04:59 August-24-13	2	Loud Vehicle Passby
05:01 August-24-13	05:05 August-24-13	4	Loud Vehicle Passby
05:06 August-24-13	05:07 August-24-13	1	Loud Vehicle Passby
05:08 August-24-13	05:08 August-24-13	0	Loud Vehicle Passby
05:09 August-24-13	05:11 August-24-13	2	Loud Vehicle Passby
05:18 August-24-13	05:18 August-24-13	0	Loud Vehicle Passby
05:20 August-24-13	05:20 August-24-13	0	Loud Vehicle Passby
05:22 August-24-13	05:24 August-24-13	2	Loud Vehicle Passby
05:23 August-24-13	05:23 August-24-13	0	Loud Vehicle Passby
05:29 August-24-13	05:29 August-24-13	0	Loud Vehicle Passby
05:31 August-24-13	05:33 August-24-13	2	Loud Vehicle Passby
05:38 August-24-13	05:42 August-24-13	4	Loud Vehicle Passby

Data Removal Noise Monitoring Location #1 Cont.

Start Time	End Time	Duration (min)	Reason
05:45 August-24-13	05:45 August-24-13	0	Loud Vehicle Passby
05:47 August-24-13	05:47 August-24-13	0	Loud Vehicle Passby
05:51 August-24-13	05:52 August-24-13	1	Loud Vehicle Passby
06:02 August-24-13	06:02 August-24-13	0	Loud Vehicle Passby
06:05 August-24-13	06:06 August-24-13	1	Loud Vehicle Passby
06:11 August-24-13	06:13 August-24-13	2	Loud Vehicle Passby
06:25 August-24-13	06:26 August-24-13	1	Loud Vehicle Passby
06:31 August-24-13	06:31 August-24-13	0	Loud Vehicle Passby
06:33 August-24-13	06:35 August-24-13	2	Loud Vehicle Passby
06:36 August-24-13	06:48 August-24-13	12	Several Vehicles
06:50 August-24-13	06:57 August-24-13	7	Several Vehicles
06:51 August-24-13	06:52 August-24-13	1	Loud Vehicle Passby
22:04 August-24-13	22:04 August-24-13	0	Loud Vehicle Passby
22:20 August-24-13	22:20 August-24-13	0	Loud Vehicle Passby
22:36 August-24-13	22:36 August-24-13	0	Loud Vehicle Passby
22:46 August-24-13	22:46 August-24-13	0	Loud Vehicle Passby
22:49 August-24-13	22:49 August-24-13	0	Loud Vehicle Passby
22:51 August-24-13	22:53 August-24-13	2	Loud Vehicle Passby
22:55 August-24-13	22:55 August-24-13	0	Loud Vehicle Passby
23:14 August-24-13	23:15 August-24-13	1	Loud Vehicle Passby
23:18 August-24-13	23:18 August-24-13	0	Loud Vehicle Passby
23:22 August-24-13	23:22 August-24-13	0	Loud Vehicle Passby
23:25 August-24-13	23:25 August-24-13	0	Loud Vehicle Passby
23:32 August-24-13	23:32 August-24-13	0	Loud Vehicle Passby
23:40 August-24-13	23:40 August-24-13	0	Loud Vehicle Passby
23:51 August-24-13	23:52 August-24-13	1	Loud Vehicle Passby
00:15 August-25-13	00:16 August-25-13	1	Loud Vehicle Passby
01:29 August-25-13	01:29 August-25-13	0	Loud Vehicle Passby
01:36 August-25-13	01:36 August-25-13	0	Loud Vehicle Passby
02:21 August-25-13	02:21 August-25-13	0	Loud Vehicle Passby
03:43 August-25-13	03:45 August-25-13	2	Loud Vehicle Passby
04:13 August-25-13	04:13 August-25-13	0	Loud Vehicle Passby
04:28 August-25-13	04:28 August-25-13	0	Loud Vehicle Passby
04:31 August-25-13	04:32 August-25-13	1	Loud Vehicle Passby
04:36 August-25-13	04:38 August-25-13	2	Loud Vehicle Passby
04:40 August-25-13	04:42 August-25-13	2	Loud Vehicle Passby
04:46 August-25-13	04:46 August-25-13	0	Loud Vehicle Passby

Data Removal Noise Monitoring Location #1 Cont.

Start Time	End Time	Duration (min)	Reason
04:47 August-25-13	04:49 August-25-13	2	Loud Vehicle Passby
04:50 August-25-13	04:51 August-25-13	1	Loud Vehicle Passby
04:53 August-25-13	05:00 August-25-13	7	Several Vehicles
05:04 August-25-13	05:04 August-25-13	0	Loud Vehicle Passby
05:06 August-25-13	05:08 August-25-13	2	Loud Vehicle Passby
05:10 August-25-13	05:10 August-25-13	0	Loud Vehicle Passby
05:13 August-25-13	05:13 August-25-13	0	Loud Vehicle Passby
05:16 August-25-13	05:17 August-25-13	1	Loud Vehicle Passby
05:19 August-25-13	05:20 August-25-13	1	Loud Vehicle Passby
05:30 August-25-13	05:31 August-25-13	1	Loud Vehicle Passby
05:34 August-25-13	05:34 August-25-13	0	Loud Vehicle Passby
05:42 August-25-13	05:42 August-25-13	0	Loud Vehicle Passby
05:45 August-25-13	05:45 August-25-13	0	Loud Vehicle Passby
06:00 August-25-13	06:00 August-25-13	0	Loud Vehicle Passby
06:07 August-25-13	06:07 August-25-13	0	Loud Vehicle Passby
06:22 August-25-13	06:22 August-25-13	0	Loud Vehicle Passby
06:29 August-25-13	06:29 August-25-13	0	Loud Vehicle Passby
06:31 August-25-13	06:35 August-25-13	4	Loud Vehicle Passby
06:37 August-25-13	06:38 August-25-13	1	Loud Vehicle Passby
06:40 August-25-13	06:42 August-25-13	2	Loud Vehicle Passby
06:45 August-25-13	06:46 August-25-13	1	Loud Vehicle Passby
06:48 August-25-13	06:48 August-25-13	0	Loud Vehicle Passby
06:55 August-25-13	06:55 August-25-13	0	Loud Vehicle Passby
06:57 August-25-13	06:57 August-25-13	0	Loud Vehicle Passby
	TOTAL NIGHT #1	**70**	
	TOTAL NIGHT #2	**35**	
	TOTAL DATA	**105**	

Data Removal Noise Monitoring Location #2

Start Time	End Time	Duration (min)	Reason
22:01 August-21-13	22:03 August-21-13	2	Rail Activity from Dow Rail yard
22:58 August-21-13	22:58 August-21-13	0	Monitor Check
02:45 August-22-13	02:49 August-22-13	4	Rail Activity from Dow Rail yard
03:41 August-22-13	03:42 August-22-13	1	Loud Vehicle Passby
04:05 August-22-13	04:08 August-22-13	3	Rail Activity from Dow Rail yard
06:50 August-22-13	06:52 August-22-13	2	Train Whistle
22:00 August-22-13	22:01 August-22-13	1	Rail Activity from Dow Rail yard
22:04 August-22-13	22:04 August-22-13	0	Rail Activity from Dow Rail yard
22:06 August-22-13	22:06 August-22-13	0	Rail Activity from Dow Rail yard
22:08 August-22-13	22:09 August-22-13	1	Rail Activity from Dow Rail yard
22:11 August-22-13	22:13 August-22-13	2	Rail Activity from Dow Rail yard
22:15 August-22-13	22:17 August-22-13	2	Rail Activity from Dow Rail yard
22:19 August-22-13	22:19 August-22-13	0	Rail Activity from Dow Rail yard
22:22 August-22-13	22:26 August-22-13	4	Rail Activity from Dow Rail yard
23:14 August-22-13	23:16 August-22-13	2	Rail Activity from Dow Rail yard
23:19 August-22-13	23:22 August-22-13	3	Rail Activity from Dow Rail yard
23:27 August-22-13	23:28 August-22-13	1	Rail Activity from Dow Rail yard
23:30 August-22-13	23:35 August-22-13	5	Rail Activity from Dow Rail yard
23:37 August-22-13	23:38 August-22-13	1	Rail Activity from Dow Rail yard
23:39 August-22-13	23:41 August-22-13	2	Rail Activity from Dow Rail yard
03:00 August-23-13	03:01 August-23-13	1	Train Whistle
03:07 August-23-13	03:07 August-23-13	0	Nature
03:09 August-23-13	03:11 August-23-13	2	Loud Vehicle Passby
03:13 August-23-13	03:14 August-23-13	1	Train Passby
03:29 August-23-13	03:29 August-23-13	0	High Frequency Noise (unsure of location)
03:34 August-23-13	03:35 August-23-13	1	Rail Activity from Dow Rail yard
	TOTAL NIGHT #1	**12**	
	TOTAL NIGHT #2	**29**	
	TOTAL DATA	**41**	

Data Removal Noise Monitoring Location #3

Start Time	End Time	Duration (min)	Reason
23:13 August-21-13	23:16 August-21-13	3	Monitor Check
23:26 August-21-13	23:30 August-21-13	4	Train Whistle
23:36 August-21-13	23:45 August-21-13	9	Train Passby
00:09 August-22-13	00:10 August-22-13	1	Loud Vehicle Passby
01:33 August-22-13	01:38 August-22-13	5	Loud Vehicle Passby
01:41 August-22-13	01:42 August-22-13	1	Train Whistle
01:55 August-22-13	01:56 August-22-13	1	Train Whistle
03:47 August-22-13	03:48 August-22-13	1	Train Whistle
03:51 August-22-13	03:54 August-22-13	3	Train Whistle
03:56 August-22-13	04:01 August-22-13	5	Train Whistle
05:09 August-22-13	05:12 August-22-13	3	Loud Vehicle Passby
05:34 August-22-13	05:40 August-22-13	6	Loud Vehicle Passby
05:44 August-22-13	05:44 August-22-13	0	Loud Vehicle Passby
05:49 August-22-13	05:49 August-22-13	0	Loud Vehicle Passby
05:50 August-22-13	05:50 August-22-13	0	Loud Vehicle Passby
06:00 August-22-13	06:02 August-22-13	2	Loud Vehicle Passby
06:05 August-22-13	06:10 August-22-13	5	Vehicles
06:13 August-22-13	06:14 August-22-13	1	Loud Vehicle Passby
06:16 August-22-13	06:17 August-22-13	1	Loud Vehicle Passby
06:21 August-22-13	06:22 August-22-13	1	Loud Vehicle Passby
06:29 August-22-13	06:30 August-22-13	1	Loud Vehicle Passby
06:32 August-22-13	06:36 August-22-13	4	Loud Vehicle Passby
06:38 August-22-13	06:41 August-22-13	3	Loud Vehicle Passby
06:48 August-22-13	06:59 August-22-13	11	Loud Vehicle Passby
07:01 August-22-13	07:06 August-22-13	5	Loud Vehicle Passby
22:06 August-22-13	22:08 August-22-13	2	Train Whistle
22:15 August-22-13	22:15 August-22-13	0	Train Whistle
22:38 August-22-13	22:40 August-22-13	2	Loud Vehicle Passby
22:53 August-22-13	22:54 August-22-13	1	Loud Vehicle Passby
23:51 August-22-13	23:51 August-22-13	0	Loud Vehicle Passby
00:27 August-23-13	00:28 August-23-13	1	Loud Vehicle Passby
00:33 August-23-13	00:34 August-23-13	1	Loud Vehicle Passby
00:40 August-23-13	00:40 August-23-13	0	Loud Vehicle Passby
00:46 August-23-13	00:52 August-23-13	6	Train Passby
01:10 August-23-13	01:11 August-23-13	1	Loud Vehicle Passby
01:49 August-23-13	01:52 August-23-13	3	Train Whistle
01:54 August-23-13	01:57 August-23-13	3	Train Passby

Data Removal Noise Monitoring Location #3 Cont.

Start Time	End Time	Duration (min)	Reason
02:55 August-23-13	02:57 August-23-13	2	Loud Vehicle Passby
03:00 August-23-13	03:02 August-23-13	2	Train Whistle
03:03 August-23-13	03:07 August-23-13	4	Train Passby
03:12 August-23-13	03:12 August-23-13	0	Abnormal "pop"
04:59 August-23-13	05:00 August-23-13	1	Abnormal "pop"
05:02 August-23-13	05:02 August-23-13	0	Loud Vehicle Passby
05:10 August-23-13	05:12 August-23-13	2	Loud Vehicle Passby
05:26 August-23-13	05:35 August-23-13	9	Train Passby
05:59 August-23-13	06:00 August-23-13	1	Loud Vehicle Passby
06:10 August-23-13	06:11 August-23-13	1	Loud Vehicle Passby
06:12 August-23-13	06:14 August-23-13	2	Loud Vehicle Passby
06:16 August-23-13	06:17 August-23-13	1	Loud Vehicle Passby
06:21 August-23-13	06:21 August-23-13	0	Loud Vehicle Passby
06:29 August-23-13	06:31 August-23-13	2	Loud Vehicle Passby
06:38 August-23-13	06:41 August-23-13	3	Vehicles
06:46 August-23-13	06:48 August-23-13	2	Loud Vehicle Passby
06:49 August-23-13	06:50 August-23-13	1	Loud Vehicle Passby
06:52 August-23-13	06:52 August-23-13	0	Loud Vehicle Passby
06:58 August-23-13	07:00 August-23-13	2	Loud Vehicle Passby
	TOTAL NIGHT #1	**76.00**	
	TOTAL NIGHT #2	**55.00**	
	TOTAL DATA	**131.00**	

Data Removal Noise Monitoring Location #4

Start Time	End Time	Duration (min)	Reason
22:38 August-21-13	22:38 August-21-13	0	Loud Vehicle Passby
22:48 August-21-13	22:49 August-21-13	1	Loud Vehicle Passby
23:14 August-21-13	23:15 August-21-13	1	Train Whistle
23:27 August-21-13	23:32 August-21-13	5	Monitor Check
23:37 August-21-13	23:42 August-21-13	5	Monitor Check
00:24 August-22-13	00:27 August-22-13	3	Train Whistle
00:46 August-22-13	00:50 August-22-13	4	Loud Vehicle Passby
01:26 August-22-13	01:28 August-22-13	2	Train Whistle
01:35 August-22-13	01:39 August-22-13	4	Train Whistle
01:40 August-22-13	01:44 August-22-13	4	Train Whistle
01:51 August-22-13	01:52 August-22-13	1	Train Whistle
01:58 August-22-13	02:07 August-22-13	9	Train Passby
02:22 August-22-13	02:24 August-22-13	2	Train Whistle
03:45 August-22-13	03:49 August-22-13	4	Train Whistle
03:51 August-22-13	03:54 August-22-13	3	Train Whistle
04:15 August-22-13	04:34 August-22-13	19	Train Passby
04:38 August-22-13	04:40 August-22-13	2	Train Whistle
05:14 August-22-13	05:17 August-22-13	3	Train Whistle
05:40 August-22-13	05:43 August-22-13	3	Loud Vehicle Passby
23:45 August-22-13	23:47 August-22-13	2	Monitor Check
00:15 August-23-13	00:17 August-23-13	2	Vehicle Check
02:06 August-23-13	02:07 August-23-13	1	Train Whistle
02:10 August-23-13	02:10 August-23-13	0	Train Whistle
03:25 August-23-13	03:26 August-23-13	1	Train Whistle
03:31 August-23-13	03:36 August-23-13	5	Train Passby
03:46 August-23-13	03:46 August-23-13	0	Train Whistle
04:48 August-23-13	04:51 August-23-13	3	Train Whistle
05:05 August-23-13	05:05 August-23-13	0	Train Whistle
	TOTAL NIGHT #1	**75**	
	TOTAL NIGHT #2	**14**	
	TOTAL DATA	**89**	

Data Removal Noise Monitoring Location #5

Start Time	End Time	Duration (min)	Reason
23:59 August-21-13	00:00 August-22-13	1	Monitor Check
00:06 August-22-13	00:09 August-22-13	3	Monitor Check
02:45 August-22-13	02:47 August-22-13	2	Train Passby
04:15 August-22-13	04:15 August-22-13	0	Loud Vehicle Passby
05:02 August-22-13	05:04 August-22-13	2	Loud Vehicle Passby
05:25 August-22-13	05:27 August-22-13	2	Loud Vehicle Passby
05:31 August-22-13	05:32 August-22-13	1	Loud Vehicle Passby
05:42 August-22-13	05:42 August-22-13	0	Loud Vehicle Passby
05:56 August-22-13	05:58 August-22-13	2	Loud Vehicle Passby
06:40 August-22-13	06:41 August-22-13	1	Loud Vehicle Passby
22:39 August-22-13	22:40 August-22-13	1	Loud Vehicle Passby
23:31 August-22-13	23:35 August-22-13	4	Train Passby
23:37 August-22-13	23:40 August-22-13	3	Train Passby
02:02 August-23-13	02:02 August-23-13	0	Loud Vehicle Passby
03:40 August-23-13	03:40 August-23-13	0	Train Passby
03:43 August-23-13	03:46 August-23-13	3	Train Passby
04:35 August-23-13	04:36 August-23-13	1	Train Passby
04:42 August-23-13	04:42 August-23-13	0	Train Passby
04:50 August-23-13	04:52 August-23-13	2	Train Passby
05:15 August-23-13	05:16 August-23-13	1	Loud Vehicle Passby
05:25 August-23-13	05:26 August-23-13	1	Loud Vehicle Passby
05:37 August-23-13	05:39 August-23-13	2	Loud Vehicle Passby
05:42 August-23-13	05:44 August-23-13	2	Loud Vehicle Passby
06:29 August-23-13	06:29 August-23-13	0	Loud Vehicle Passby
06:38 August-23-13	06:39 August-23-13	1	Loud Vehicle Passby
06:45 August-23-13	06:47 August-23-13	2	Loud Vehicle Passby
	TOTAL NIGHT #1	**14**	
	TOTAL NIGHT #2	**23**	
	TOTAL DATA	**37**	

Data Removal Noise Monitoring Location #6

Start Time	End Time	Duration (min)	Reason
22:37 August-21-13	22:39 August-21-13	2	Loud Vehicle Passby
05:52 August-22-13	05:54 August-22-13	2	Loud Vehicle Passby
06:50 August-22-13	06:52 August-22-13	2	Loud Vehicle Passby
23:18 August-22-13	23:19 August-22-13	1	Monitor Check
23:26 August-22-13	23:28 August-22-13	2	Loud Vehicle Passby
00:49 August-23-13	00:50 August-23-13	1	Loud Vehicle Passby
04:35 August-23-13	04:36 August-23-13	1	Train Passby
05:48 August-23-13	05:50 August-23-13	2	Loud Vehicle Passby
06:33 August-23-13	06:35 August-23-13	2	Loud Vehicle Passby
	TOTAL NIGHT #1	**6**	
	TOTAL NIGHT #2	**9**	
	TOTAL DATA	**15**	

Data Removal Noise Monitoring Location #7

Start Time	End Time	Duration (min)	Reason
No Data Removed			

Data Removal Noise Monitoring Location #8

Start Time	End Time	Duration (min)	Reason
23:27 August-23-13	23:31 August-23-13	4	Monitor Check
23:34 August-23-13	23:37 August-23-13	3	Monitor Check
05:42 August-24-13	05:42 August-24-13	0	Train Passby
06:03 August-24-13	06:07 August-24-13	4	Excessive Bird Noise
06:13 August-24-13	06:18 August-24-13	5	Excessive Bird Noise
06:50 August-24-13	06:50 August-24-13	0	Excessive Bird Noise
05:45 August-25-13	05:48 August-25-13	3	Loud Vehicle Passby
05:58 August-25-13	06:08 August-25-13	10	Excessive Bird Noise
	TOTAL NIGHT #1	**16**	
	TOTAL NIGHT #2	**13**	
	TOTAL DATA	**29**	

Data Removal Noise Monitoring Location #9

Start Time	End Time	Duration (min)	Reason
22:09 August-23-13	22:11 August-23-13	2	Large Truck in Distance
22:16 August-23-13	22:18 August-23-13	2	Aircraft Flyover
22:24 August-23-13	22:26 August-23-13	2	Loud Vehicle Passby
22:49 August-23-13	22:52 August-23-13	3	Loud Vehicle Passby
23:56 August-23-13	23:59 August-23-13	3	Vehicle/Train
00:16 August-24-13	00:19 August-24-13	3	Monitor Check
01:01 August-24-13	01:08 August-24-13	7	Train Passby
02:52 August-24-13	02:57 August-24-13	5	Train Passby
03:42 August-24-13	03:44 August-24-13	2	Loud Vehicle Passby
04:18 August-24-13	04:21 August-24-13	3	Loud Vehicle Passby
06:43 August-24-13	06:44 August-24-13	1	Loud Vehicle Passby
06:50 August-24-13	06:51 August-24-13	1	Loud Vehicle Passby
22:15 August-24-13	22:17 August-24-13	2	Monitor Check
22:28 August-24-13	22:30 August-24-13	2	Monitor Check
22:49 August-24-13	22:51 August-24-13	2	Loud Vehicle Passby
22:53 August-24-13	22:55 August-24-13	2	Loud Vehicle Passby
23:26 August-24-13	23:27 August-24-13	1	Train Passby
23:28 August-24-13	23:31 August-24-13	3	Train Passby
00:03 August-25-13	00:05 August-25-13	2	Loud Vehicle Passby
00:42 August-25-13	00:46 August-25-13	4	Train Passby
01:30 August-25-13	01:32 August-25-13	2	Train Whistle
01:58 August-25-13	02:00 August-25-13	2	Loud Vehicle Passby
05:04 August-25-13	05:05 August-25-13	1	Excessive Bird Noise
05:18 August-25-13	05:20 August-25-13	2	Train Whistle
05:40 August-25-13	05:43 August-25-13	3	Loud Vehicle Passby
06:12 August-25-13	06:17 August-25-13	5	Train Passby
06:26 August-25-13	06:27 August-25-13	1	Loud Vehicle Passby
	TOTAL NIGHT #1	**34**	
	TOTAL NIGHT #2	**34**	
	TOTAL DATA	**68**	

Data Removal Noise Monitoring Location #10

Start Time	End Time	Duration (min)	Reason
22:06 August-21-13	22:07 August-21-13	1	Coyote
22:11 August-21-13	22:13 August-21-13	2	Loud Vehicle Passby
22:23 August-21-13	22:24 August-21-13	1	Loud Vehicle Passby
22:34 August-21-13	22:45 August-21-13	11	Train/Monitor Check
22:46 August-21-13	22:47 August-21-13	1	Train Whistle
22:56 August-21-13	22:59 August-21-13	3	Loud Vehicle Passby
23:22 August-21-13	23:24 August-21-13	2	Loud Vehicle Passby
23:32 August-21-13	23:33 August-21-13	1	Loud Vehicle Passby
23:45 August-21-13	23:46 August-21-13	1	Loud Vehicle Passby
23:51 August-21-13	23:52 August-21-13	1	Loud Vehicle Passby
00:49 August-22-13	00:51 August-22-13	2	Loud Vehicle Passby
01:06 August-22-13	01:07 August-22-13	1	Loud Vehicle Passby
01:22 August-22-13	01:23 August-22-13	1	Loud Vehicle Passby
02:09 August-22-13	02:11 August-22-13	2	Loud Vehicle Passby
02:37 August-22-13	02:37 August-22-13	0	Loud Vehicle Passby
03:05 August-22-13	03:05 August-22-13	0	Loud Vehicle Passby
03:17 August-22-13	03:17 August-22-13	0	Loud Vehicle Passby
03:30 August-22-13	03:35 August-22-13	5	Loud Vehicle Passby
03:43 August-22-13	03:45 August-22-13	2	Loud Vehicle Passby
04:29 August-22-13	04:29 August-22-13	0	Loud Vehicle Passby
04:37 August-22-13	04:37 August-22-13	0	Loud Vehicle Passby
04:42 August-22-13	04:42 August-22-13	0	Loud Vehicle Passby
04:46 August-22-13	04:46 August-22-13	0	Loud Vehicle Passby
04:54 August-22-13	04:54 August-22-13	0	Loud Vehicle Passby
04:55 August-22-13	04:55 August-22-13	0	Loud Vehicle Passby
05:14 August-22-13	05:16 August-22-13	2	Loud Vehicle Passby
05:40 August-22-13	05:41 August-22-13	1	Loud Vehicle Passby
06:26 August-22-13	06:27 August-22-13	1	Loud Vehicle Passby
06:53 August-22-13	06:55 August-22-13	2	Loud Vehicle Passby
22:01 August-22-13	22:02 August-22-13	1	Loud Vehicle Passby
22:04 August-22-13	22:05 August-22-13	1	Loud Vehicle Passby
22:12 August-22-13	22:13 August-22-13	1	Loud Vehicle Passby
22:14 August-22-13	22:15 August-22-13	1	Loud Vehicle Passby
22:45 August-22-13	22:48 August-22-13	3	Loud Vehicle Passby
22:50 August-22-13	22:51 August-22-13	1	Loud Vehicle Passby
22:55 August-22-13	22:57 August-22-13	2	Loud Vehicle Passby
23:03 August-22-13	23:04 August-22-13	1	Loud Vehicle Passby

Data Removal Noise Monitoring Location #10 Cont.

Start Time	End Time	Duration (min)	Reason
23:12 August-22-13	23:13 August-22-13	1	Loud Vehicle Passby
23:28 August-22-13	23:28 August-22-13	0	Loud Vehicle Passby
23:42 August-22-13	23:43 August-22-13	1	Loud Vehicle Passby
23:51 August-22-13	23:52 August-22-13	1	Loud Vehicle Passby
23:55 August-22-13	23:57 August-22-13	2	Loud Vehicle Passby
00:08 August-23-13	00:08 August-23-13	0	Loud Vehicle Passby
00:10 August-23-13	00:12 August-23-13	2	Loud Vehicle Passby
01:03 August-23-13	01:04 August-23-13	1	Loud Vehicle Passby
01:25 August-23-13	01:27 August-23-13	2	Loud Vehicle Passby
02:44 August-23-13	02:44 August-23-13	0	Train Passby
02:54 August-23-13	02:55 August-23-13	1	Loud Vehicle Passby
03:10 August-23-13	03:11 August-23-13	1	Train Whistle
03:56 August-23-13	03:56 August-23-13	0	Loud Vehicle Passby
04:33 August-23-13	04:33 August-23-13	0	Loud Vehicle Passby
05:18 August-23-13	05:19 August-23-13	1	Loud Vehicle Passby
05:33 August-23-13	05:35 August-23-13	2	Loud Vehicle Passby
05:40 August-23-13	05:42 August-23-13	2	Loud Vehicle Passby
05:51 August-23-13	05:51 August-23-13	0	Loud Vehicle Passby
05:53 August-23-13	05:53 August-23-13	0	Loud Vehicle Passby
05:56 August-23-13	05:57 August-23-13	1	Loud Vehicle Passby
06:00 August-23-13	06:00 August-23-13	0	Loud Vehicle Passby
06:02 August-23-13	06:03 August-23-13	1	Loud Vehicle Passby
06:05 August-23-13	06:05 August-23-13	0	Loud Vehicle Passby
06:24 August-23-13	06:24 August-23-13	0	Loud Vehicle Passby
06:42 August-23-13	06:42 August-23-13	0	Loud Vehicle Passby
06:53 August-23-13	06:53 August-23-13	0	Loud Vehicle Passby
06:59 August-23-13	06:59 August-23-13	0	Loud Vehicle Passby
	TOTAL NIGHT #1	**43**	
	TOTAL NIGHT #2	**30**	
	TOTAL DATA	**73**	

Data Removal Noise Monitoring Location #11

Start Time	End Time	Duration (min)	Reason
22:56 August-23-13	22:58 August-23-13	2	Coyotes
23:44 August-23-13	23:58 August-23-13	14	Monitor Check
01:02 August-24-13	01:03 August-24-13	1	Train Passby
01:04 August-24-13	01:06 August-24-13	2	Train Passby
02:26 August-24-13	02:29 August-24-13	3	Train Whistle
02:41 August-24-13	02:46 August-24-13	5	Train Whistle
03:33 August-24-13	03:35 August-24-13	2	Train Whistle
05:39 August-24-13	05:42 August-24-13	3	Loud Vehicle Passby
06:05 August-24-13	06:07 August-24-13	2	Loud Vehicle Passby
06:24 August-24-13	06:25 August-24-13	1	Loud Vehicle Passby
06:28 August-24-13	06:29 August-24-13	1	Loud Vehicle Passby
06:35 August-24-13	06:37 August-24-13	2	Loud Vehicle Passby
06:45 August-24-13	06:48 August-24-13	3	Loud Vehicle Passby
06:55 August-24-13	06:58 August-24-13	3	Loud Vehicle Passby
22:18 August-24-13	22:20 August-24-13	2	Train Whistle
22:39 August-24-13	22:41 August-24-13	2	Monitor Check
01:11 August-25-13	01:12 August-25-13	1	Train Whistle
05:22 August-25-13	05:26 August-25-13	4	Train Passby
05:29 August-25-13	05:29 August-25-13	0	Train Whistle
05:43 August-25-13	05:46 August-25-13	3	Loud Vehicle Passby
06:07 August-25-13	06:10 August-25-13	3	Loud Vehicle Passby
06:17 August-25-13	06:19 August-25-13	2	Loud Vehicle Passby
06:31 August-25-13	06:34 August-25-13	3	Loud Vehicle Passby
06:35 August-25-13	06:40 August-25-13	5	Loud Vehicle Passby
06:41 August-25-13	06:43 August-25-13	2	Loud Vehicle Passby
06:48 August-25-13	07:02 August-25-13	14	Loud Vehicle Passby
06:49 August-25-13	06:51 August-25-13	2	Loud Vehicle Passby
	TOTAL NIGHT #1	**44**	
	TOTAL NIGHT #2	**43**	
	TOTAL DATA	**87**	

Data Removal Noise Monitoring Location #12 (First Monitoring Period)

Start Time	End Time	Duration (min)	Reason
22:05 August-21-13	22:07 August-21-13	2	Train Whistle
22:15 August-21-13	22:16 August-21-13	1	Train Whistle
22:21 August-21-13	22:22 August-21-13	1	Nature
22:24 August-21-13	22:27 August-21-13	3	Nature
22:29 August-21-13	22:31 August-21-13	2	Nature
22:41 August-21-13	22:45 August-21-13	4	Train Passby
22:55 August-21-13	22:56 August-21-13	1	Loud Vehicle Passby
22:57 August-21-13	23:06 August-21-13	9	Monitor Check
00:29 August-22-13	00:30 August-22-13	1	Monitor Check
00:32 August-22-13	00:43 August-22-13	11	Train Passby
00:44 August-22-13	00:46 August-22-13	2	Monitor Check
03:09 August-22-13	03:10 August-22-13	1	Train Passby
03:56 August-22-13	03:58 August-22-13	2	Loud Vehicle Passby
04:04 August-22-13	04:07 August-22-13	3	Train Passby
05:20 August-22-13	05:24 August-22-13	4	Train Passby
05:26 August-22-13	05:36 August-22-13	10	Train Passby
05:42 August-22-13	05:43 August-22-13	1	Train Whistle
22:07 August-22-13	22:09 August-22-13	2	Train Engine
22:17 August-22-13	22:19 August-22-13	2	Train Engine
22:23 August-22-13	22:30 August-22-13	7	Train Passby
22:44 August-22-13	22:53 August-22-13	9	Train Passby
23:03 August-22-13	23:06 August-22-13	3	Train Whistle
23:08 August-22-13	23:12 August-22-13	4	Monitor Check
23:09 August-22-13	23:09 August-22-13	0	Train Passby
01:20 August-23-13	01:23 August-23-13	3	Loud Vehicle Passby
02:10 August-23-13	02:15 August-23-13	5	Train Passby
02:21 August-23-13	02:21 August-23-13	0	Train Whistle
02:43 August-23-13	02:47 August-23-13	4	Train Whistle
04:30 August-23-13	04:33 August-23-13	3	Train Whistle
04:34 August-23-13	04:36 August-23-13	2	Train Whistle
04:37 August-23-13	04:43 August-23-13	6	Train Whistle
04:47 August-23-13	04:47 August-23-13	0	Train Whistle
04:51 August-23-13	04:53 August-23-13	2	Train Whistle
05:09 August-23-13	05:09 August-23-13	0	Train Passby
05:11 August-23-13	05:13 August-23-13	2	Train Passby
05:19 August-23-13	05:38 August-23-13	19	Train Passby
05:47 August-23-13	05:50 August-23-13	3	Train Passby

Data Removal Noise Monitoring Location #12 (First Monitoring Period) Cont.

Start Time	End Time	Duration (min)	Reason
	TOTAL NIGHT #1	**58**	
	TOTAL NIGHT #2	**76**	
	TOTAL DATA	**134**	

Data Removal Noise Monitoring Location #12 (Second Monitoring Period)

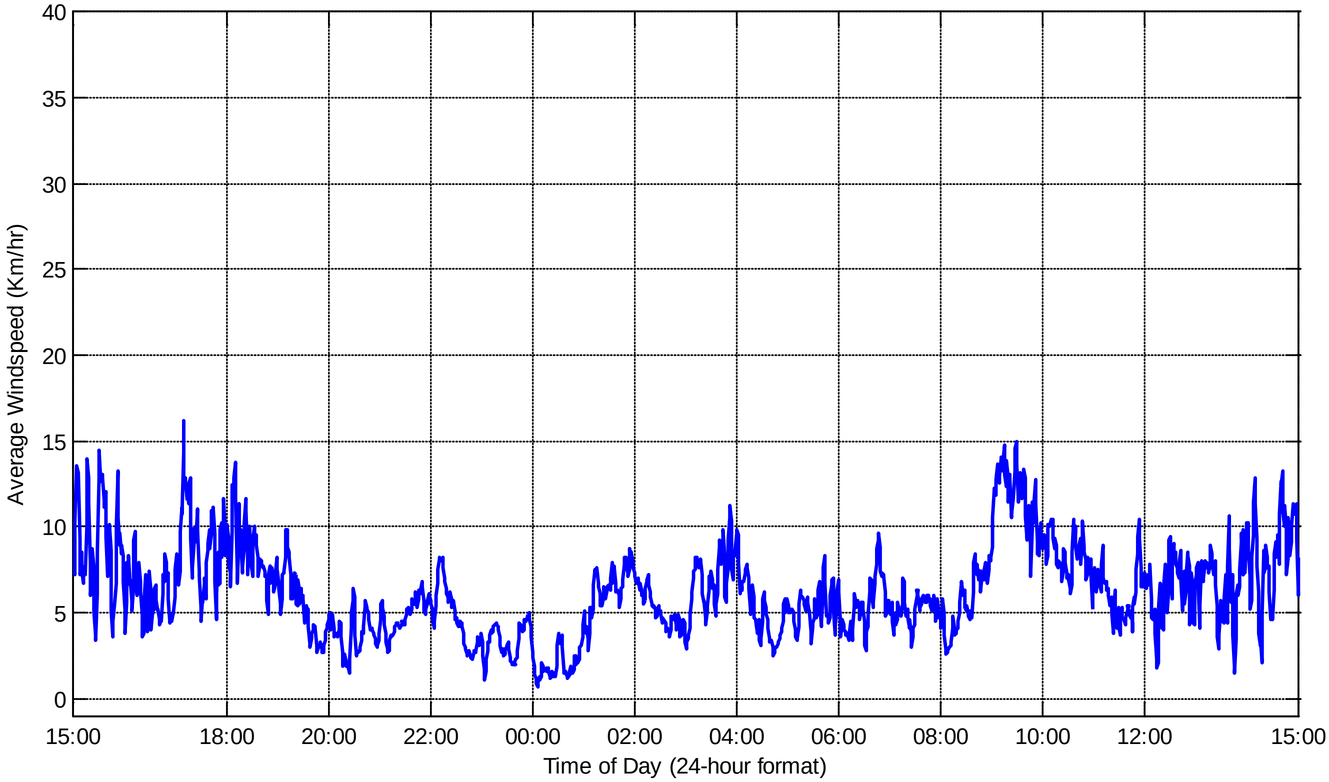
Start Time	End Time	Duration (min)	Reason
21:57 August-23-13	22:23 August-23-13	26	Train Passby
22:33 August-23-13	22:43 August-23-13	10	Monitor Check
22:50 August-23-13	22:51 August-23-13	1	Loud Vehicle Passby
01:07 August-24-13	01:10 August-24-13	3	Loud Vehicle Passby
01:50 August-24-13	01:56 August-24-13	6	Train Passby
02:04 August-24-13	02:06 August-24-13	2	Train Whistle
02:43 August-24-13	02:45 August-24-13	2	Train Passby
02:50 August-24-13	02:50 August-24-13	0	Train Passby
03:00 August-24-13	03:02 August-24-13	2	Loud Vehicle Passby
03:15 August-24-13	03:25 August-24-13	10	Train Passby
04:09 August-24-13	04:17 August-24-13	8	Nature
05:00 August-24-13	05:01 August-24-13	1	Loud Vehicle Passby
05:04 August-24-13	05:06 August-24-13	2	Loud Vehicle Passby
05:14 August-24-13	05:23 August-24-13	9	Train Passby
06:17 August-24-13	06:19 August-24-13	2	Geese
06:39 August-24-13	06:45 August-24-13	6	Excessive Bird Noise
06:54 August-24-13	06:57 August-24-13	3	Train Passby
22:11 August-24-13	22:15 August-24-13	4	Loud Vehicle Passby
22:39 August-24-13	22:41 August-24-13	2	Aircraft Flyover
23:22 August-24-13	23:25 August-24-13	3	Train Passby
23:37 August-24-13	23:38 August-24-13	1	Train Engine
23:45 August-24-13	23:47 August-24-13	2	Train Engine
23:51 August-24-13	00:03 August-25-13	12	Train Passby
00:17 August-25-13	00:19 August-25-13	2	Monitor Check
01:06 August-25-13	01:09 August-25-13	3	Human
01:11 August-25-13	01:13 August-25-13	2	Train Whistle
02:03 August-25-13	02:05 August-25-13	2	Train Whistle
02:06 August-25-13	02:08 August-25-13	2	Train Whistle
02:55 August-25-13	02:58 August-25-13	3	Loud Vehicle Passby
03:03 August-25-13	03:06 August-25-13	3	Train Whistle
03:09 August-25-13	03:16 August-25-13	7	Train Whistles

Data Removal Noise Monitoring Location #12 (Second Monitoring Period) Cont.

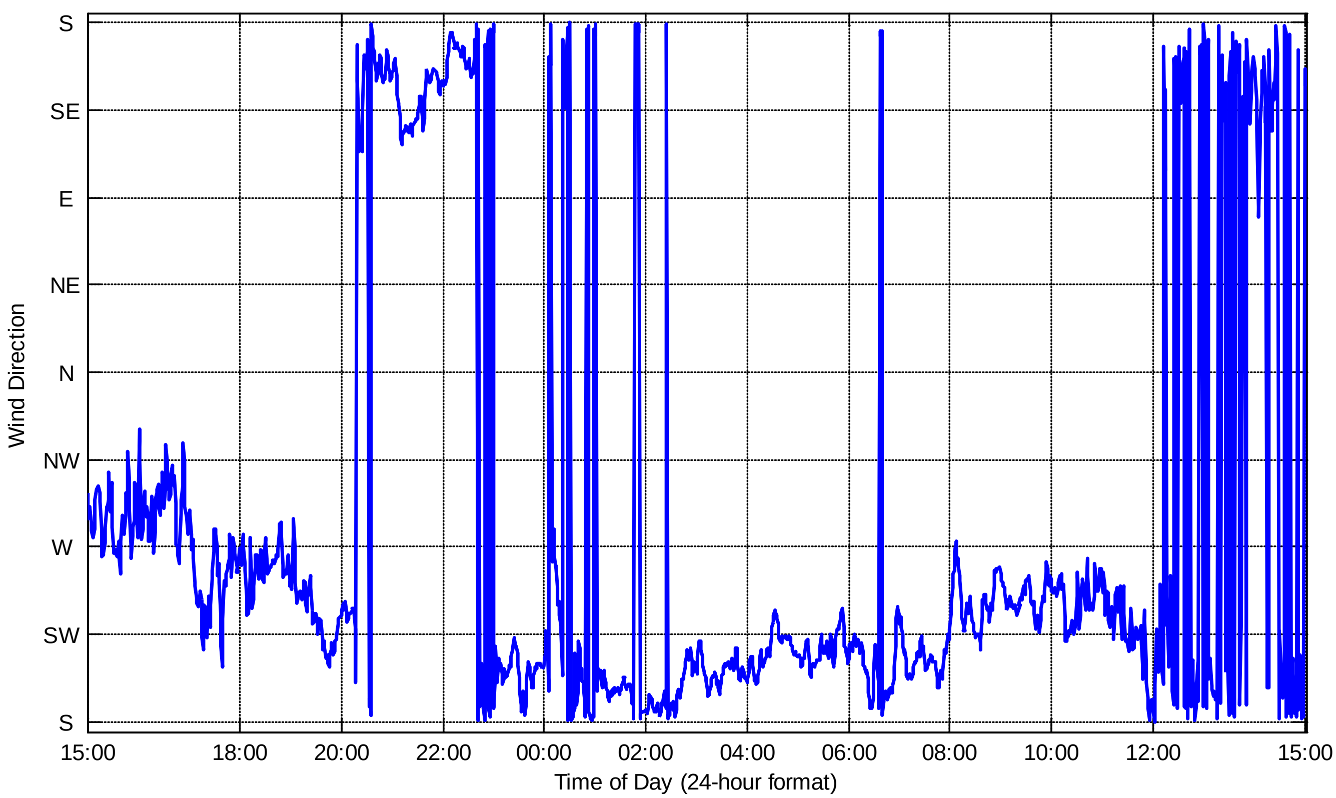
Start Time	End Time	Duration (min)	Reason
05:50 August-25-13	06:24 August-25-13	34	Train Passby
06:35 August-25-13	06:36 August-25-13	1	Train Whistle
06:55 August-25-13	06:55 August-25-13	0	Train Whistle
	TOTAL NIGHT #1	**93**	
	TOTAL NIGHT #2	**83**	
	TOTAL DATA	**176**	

Appendix V WEATHER DATA

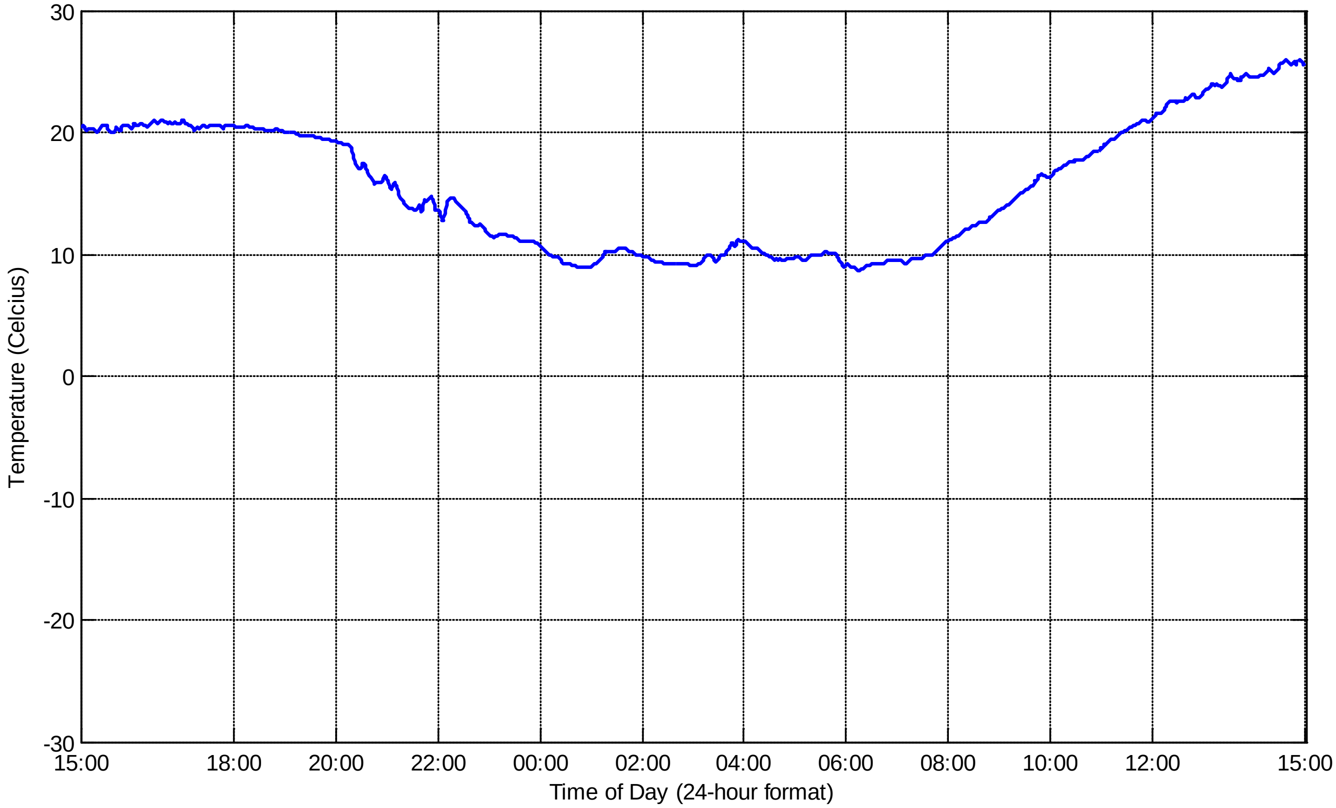
Weather Data from Weather Monitor Location 6



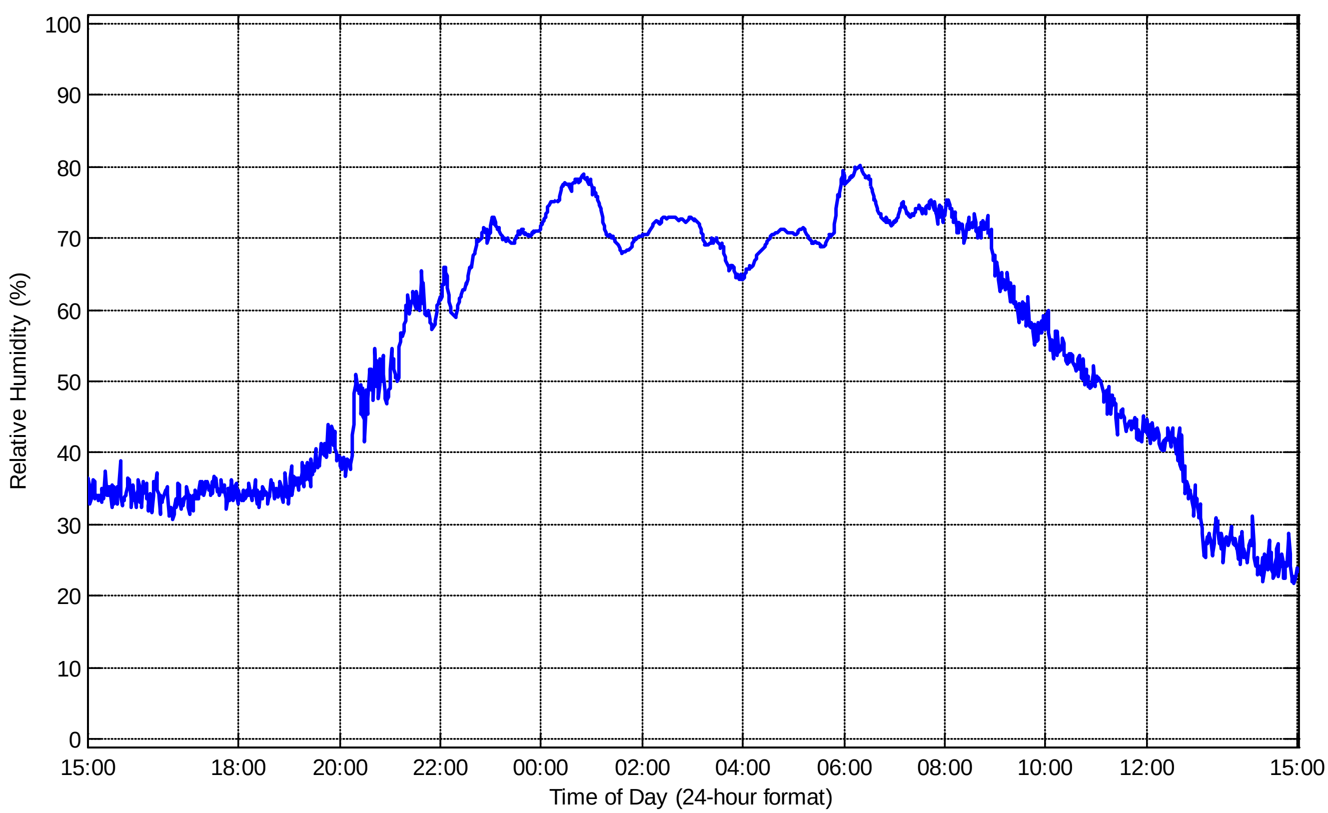
August 21 – 22, 2013 Monitored Wind Speed at Weather Monitor Location 6



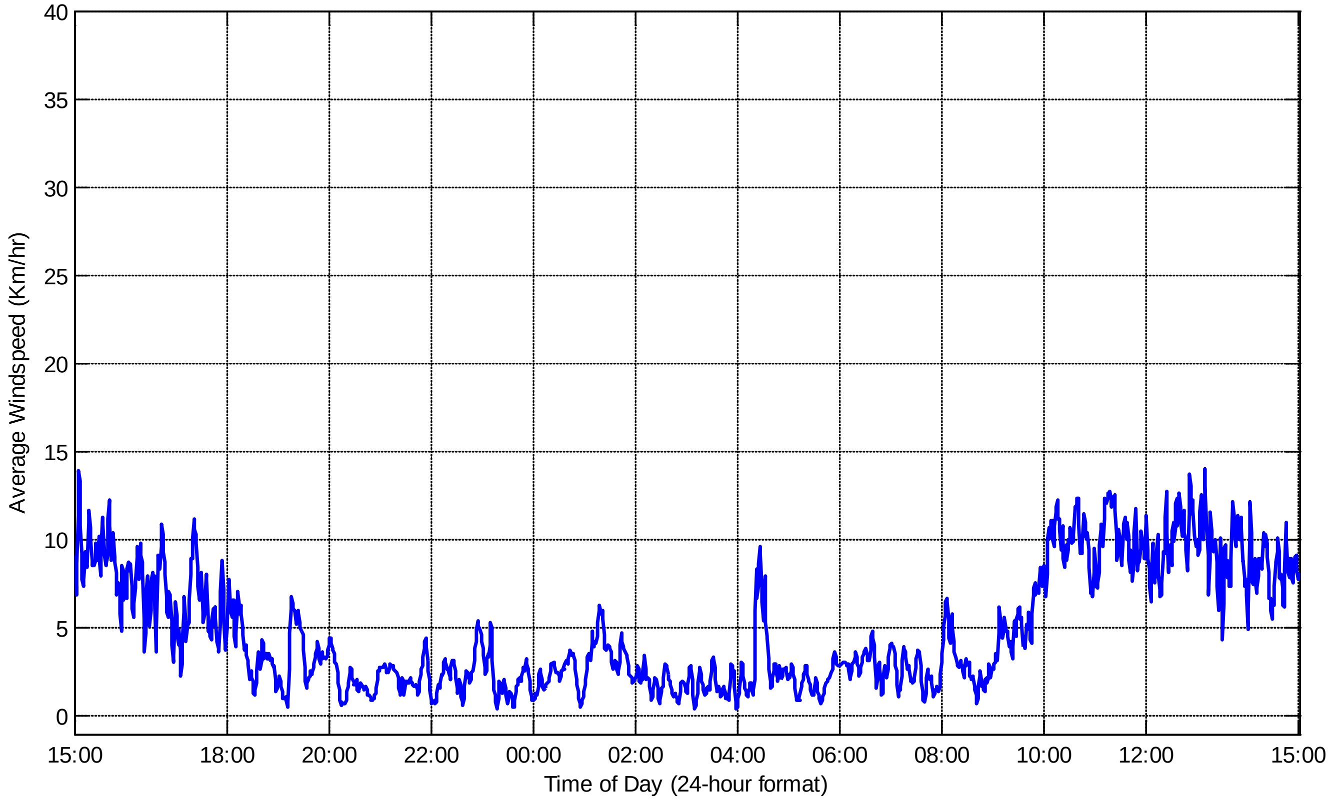
August 21 – 22, 2013 Monitored Wind Direction at Weather Monitor Location 6



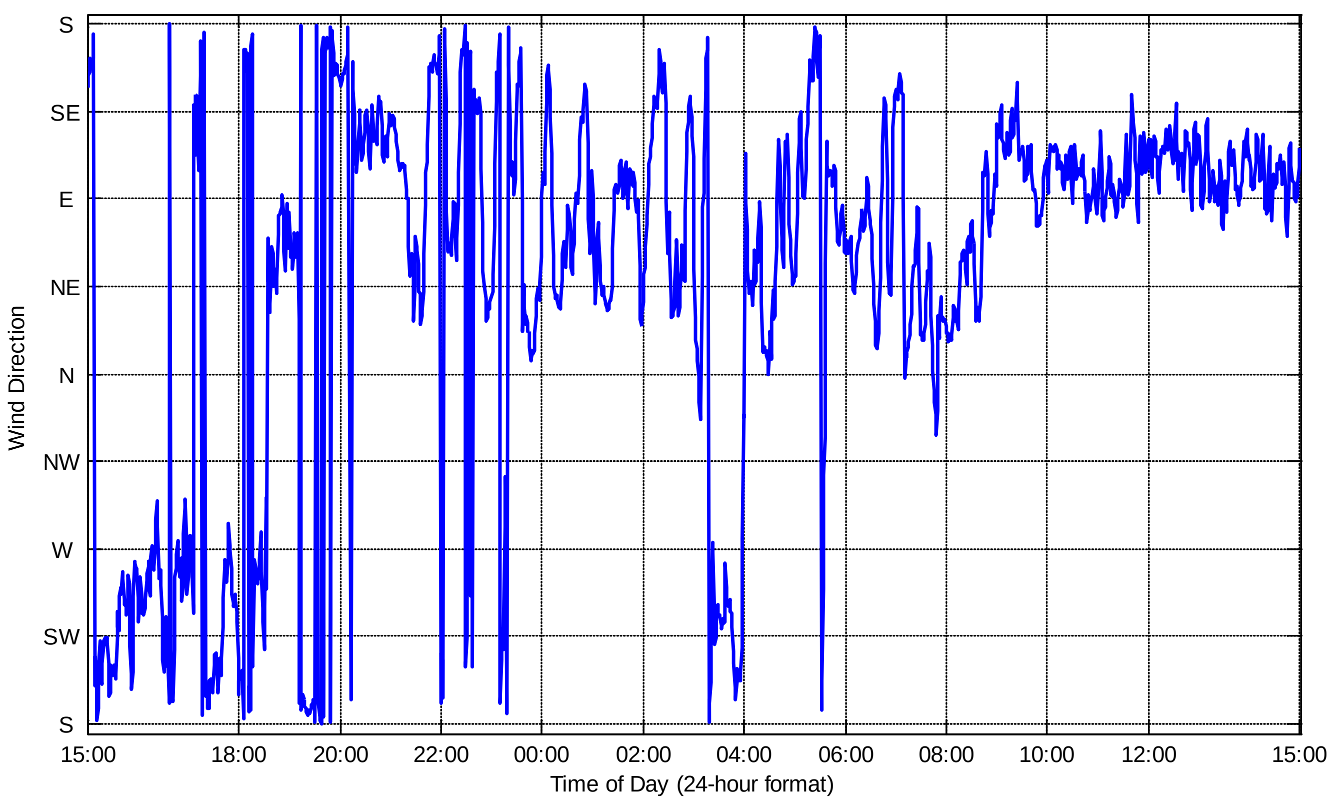
August 21 – 22, 2013 Monitored Temperature at Weather Monitor Location 6



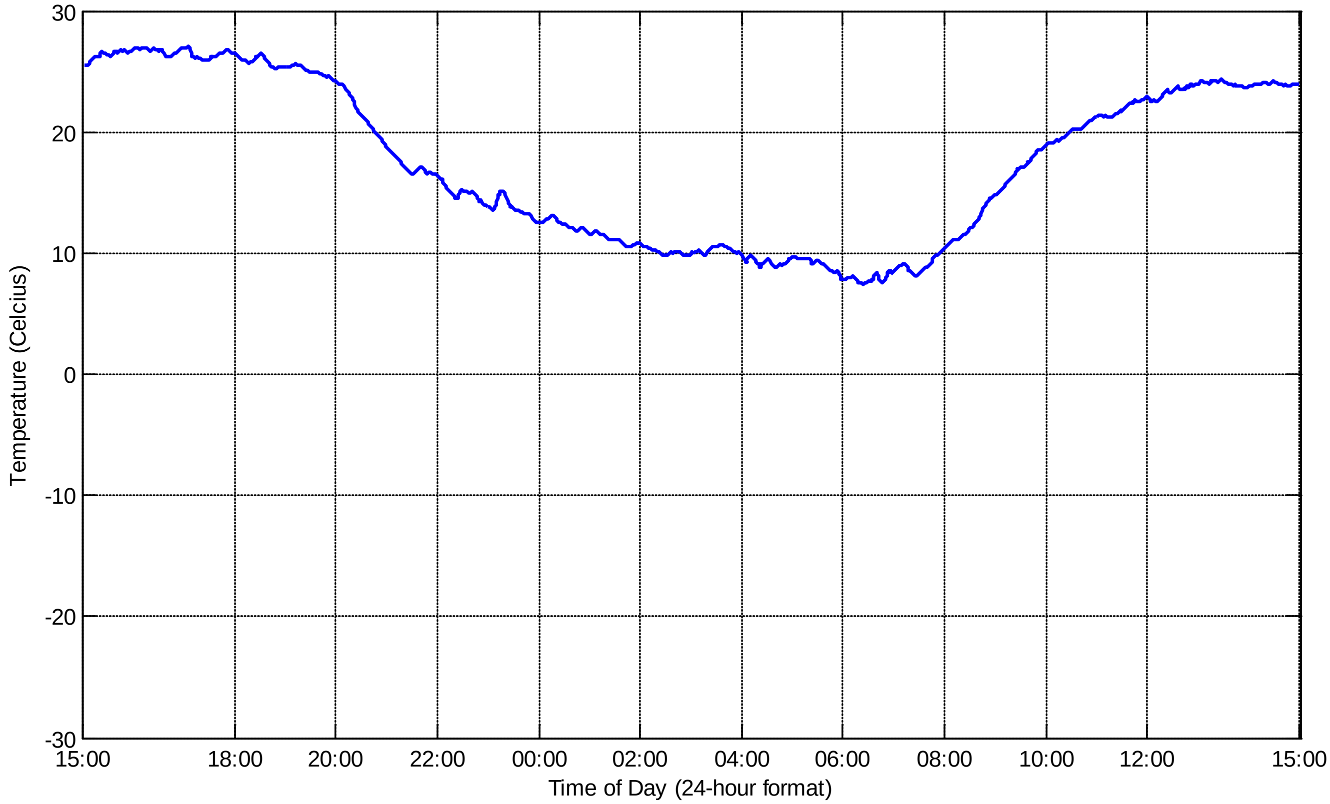
August 21 – 22, 2013 Monitored Humidity at Weather Monitor Location 6



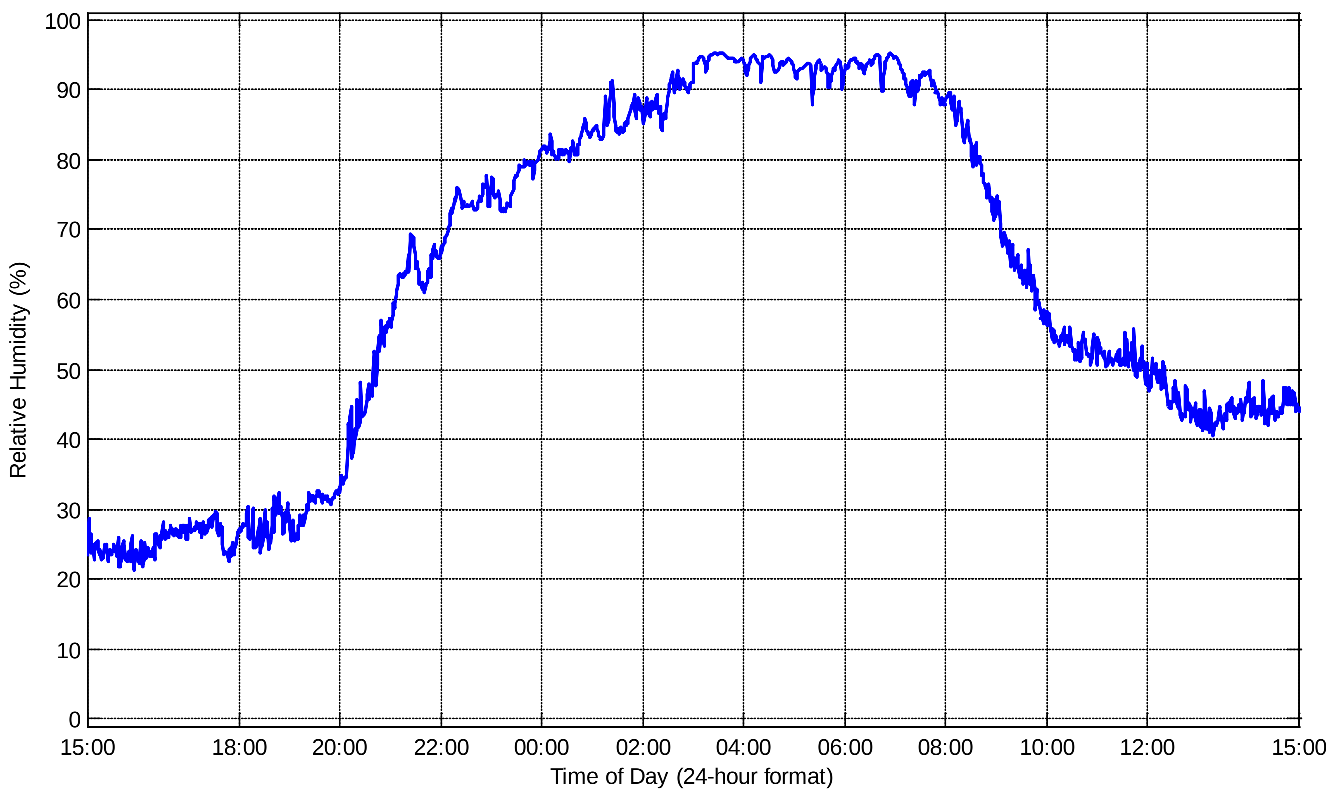
August 22 – 23, 2013 Monitored Wind Speed at Weather Monitor Location 6



August 22 – 23, 2013 Monitored Wind Direction at Weather Monitor Location 6



August 22 – 23, 2013 Monitored Temperature at Weather Monitor Location 6



August 22 – 23, 2013 Monitored Humidity at Weather Monitor Location 6

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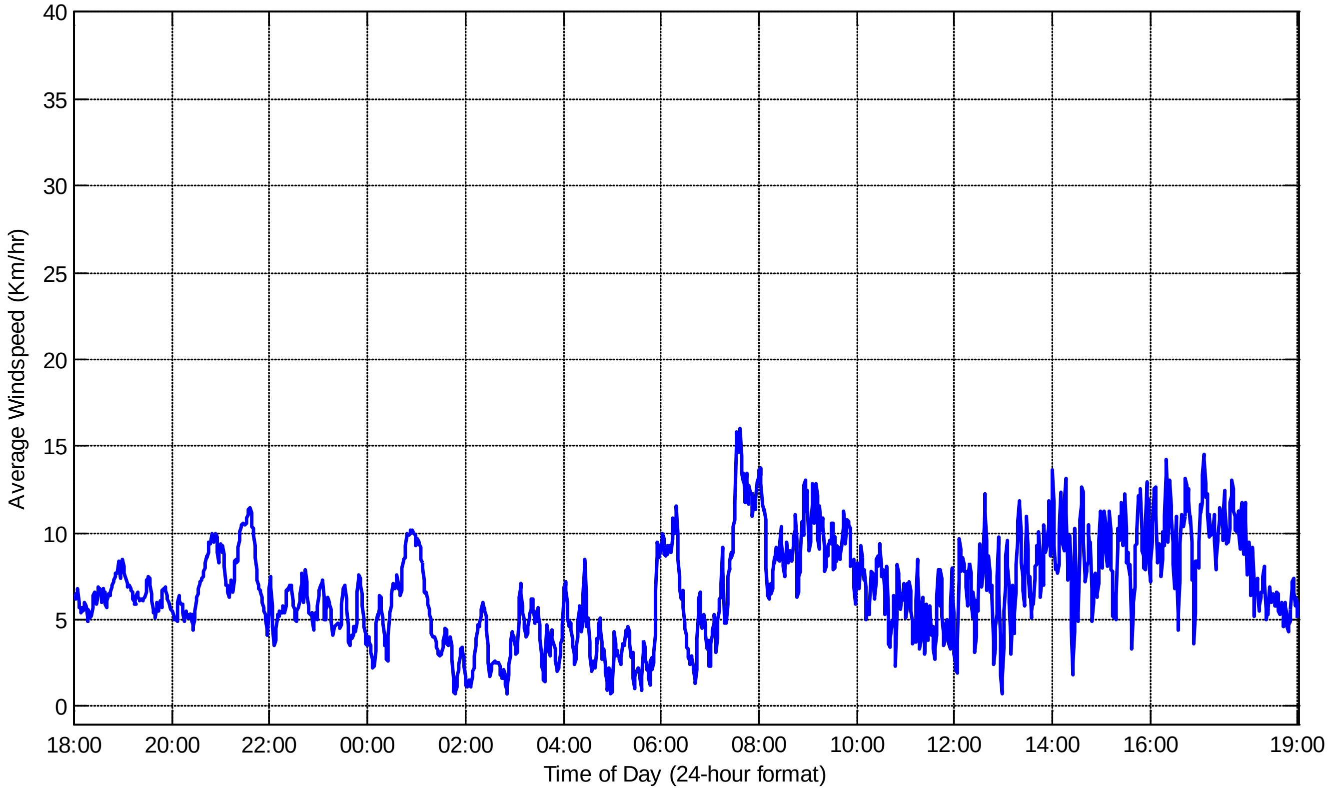
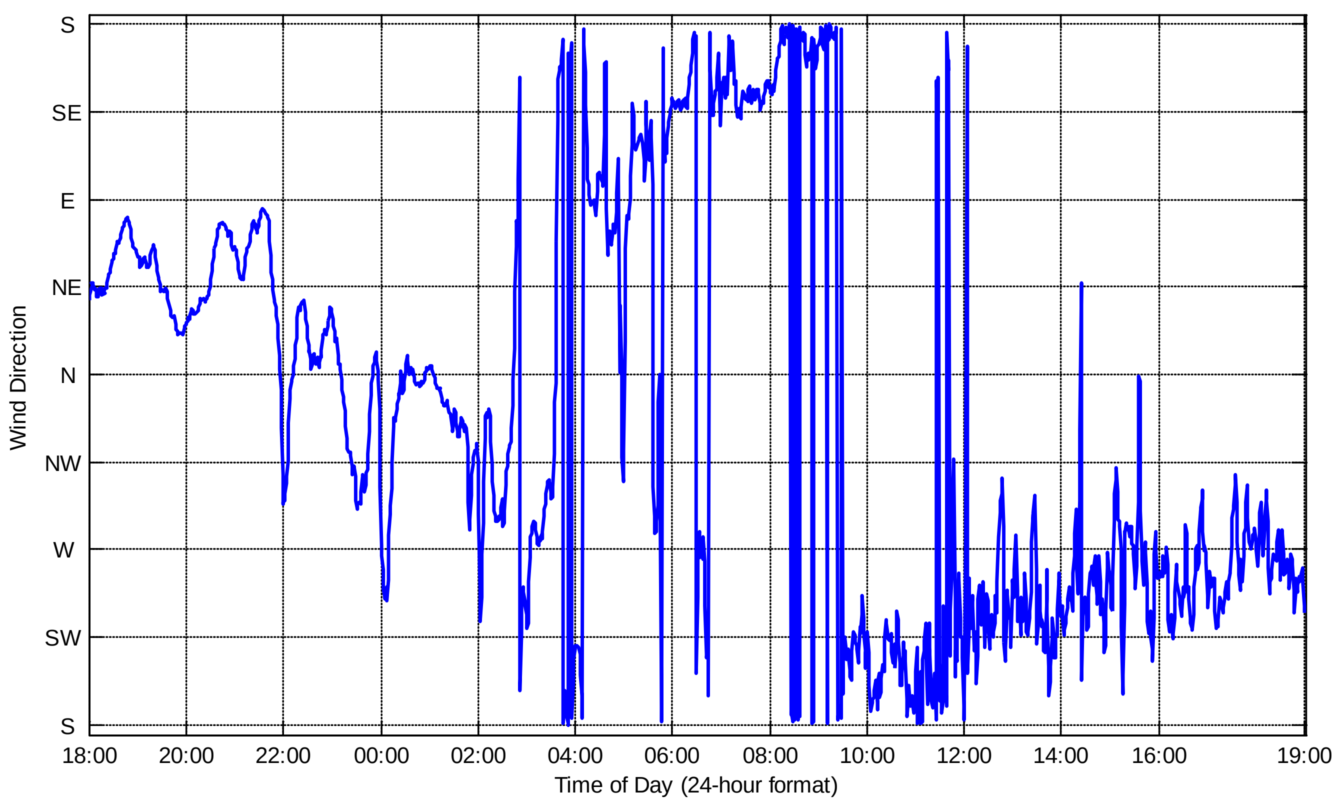
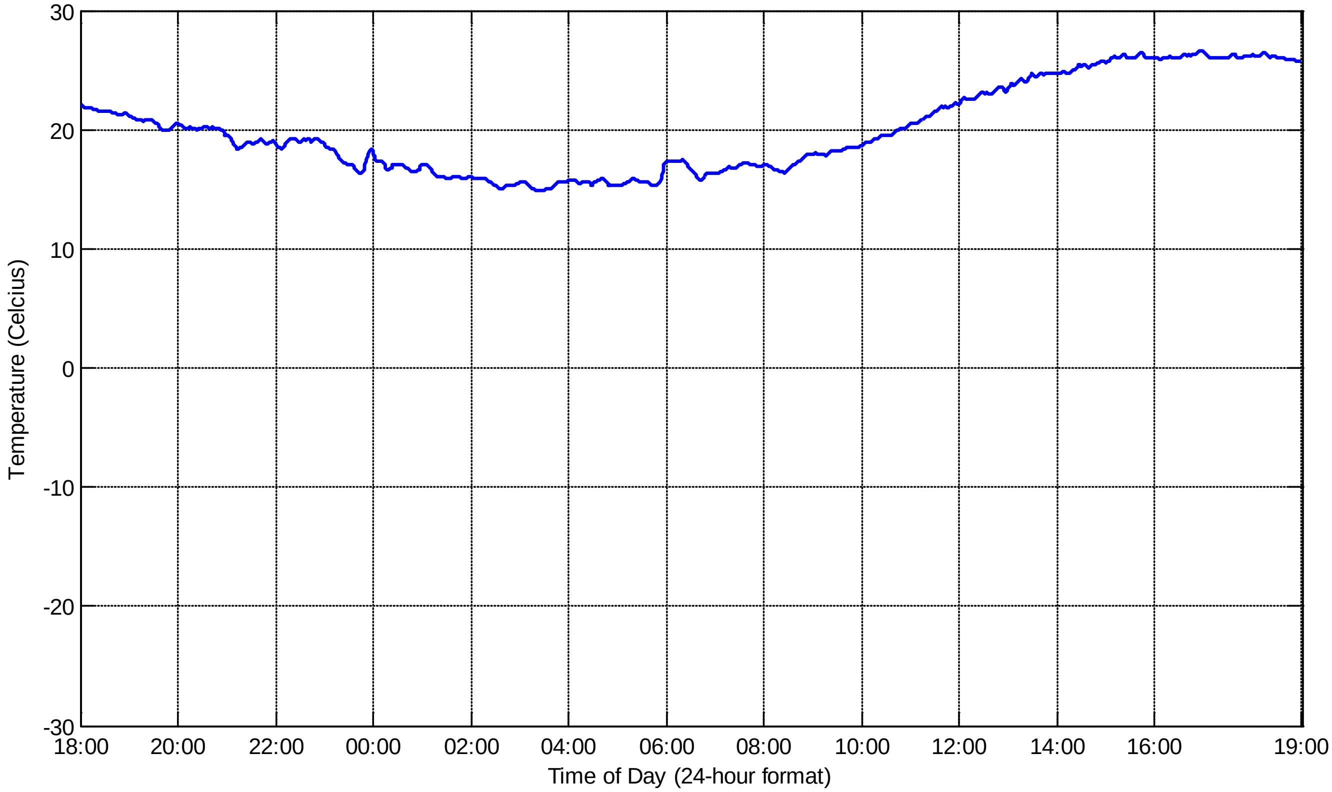
Weather Data from Weather Monitor Location 7



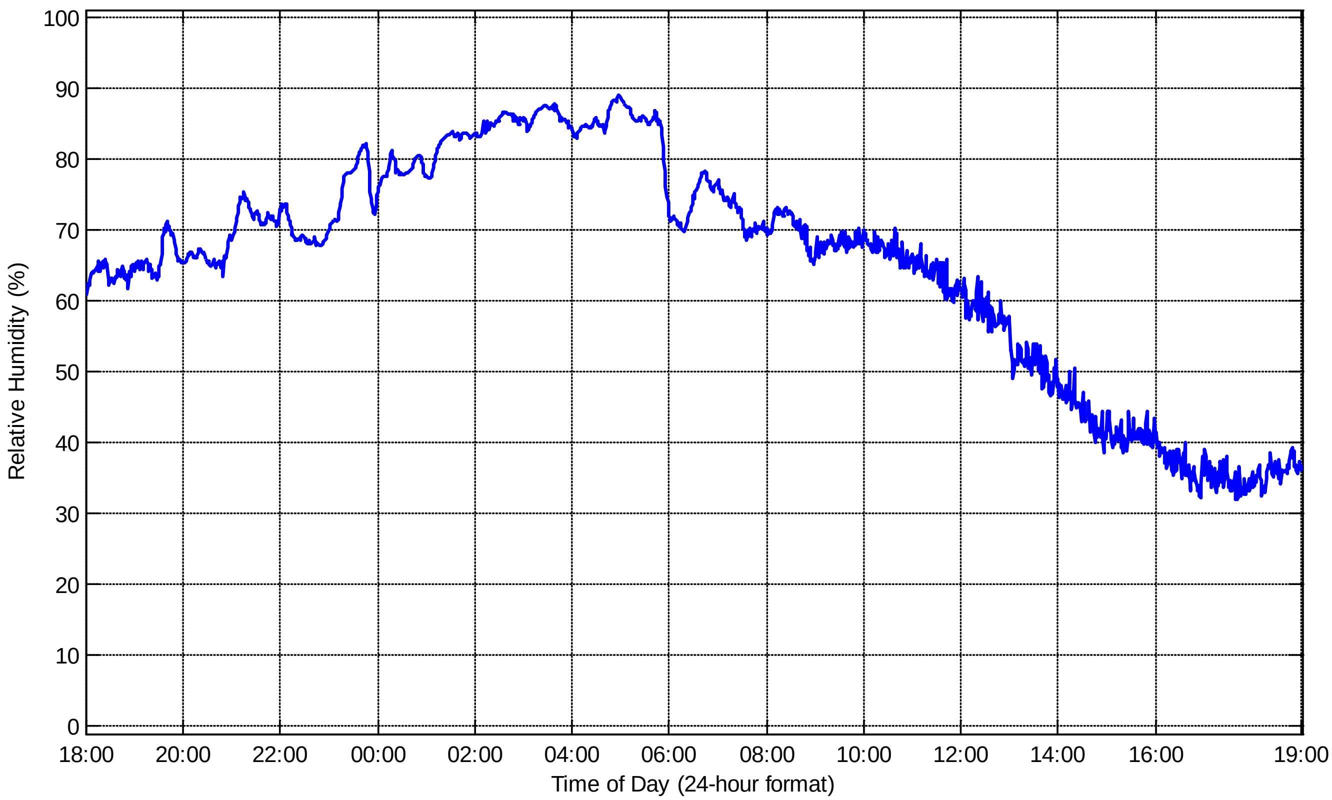
August 23 – 24, 2013 Monitored Wind Speed at Weather Monitor Location 7



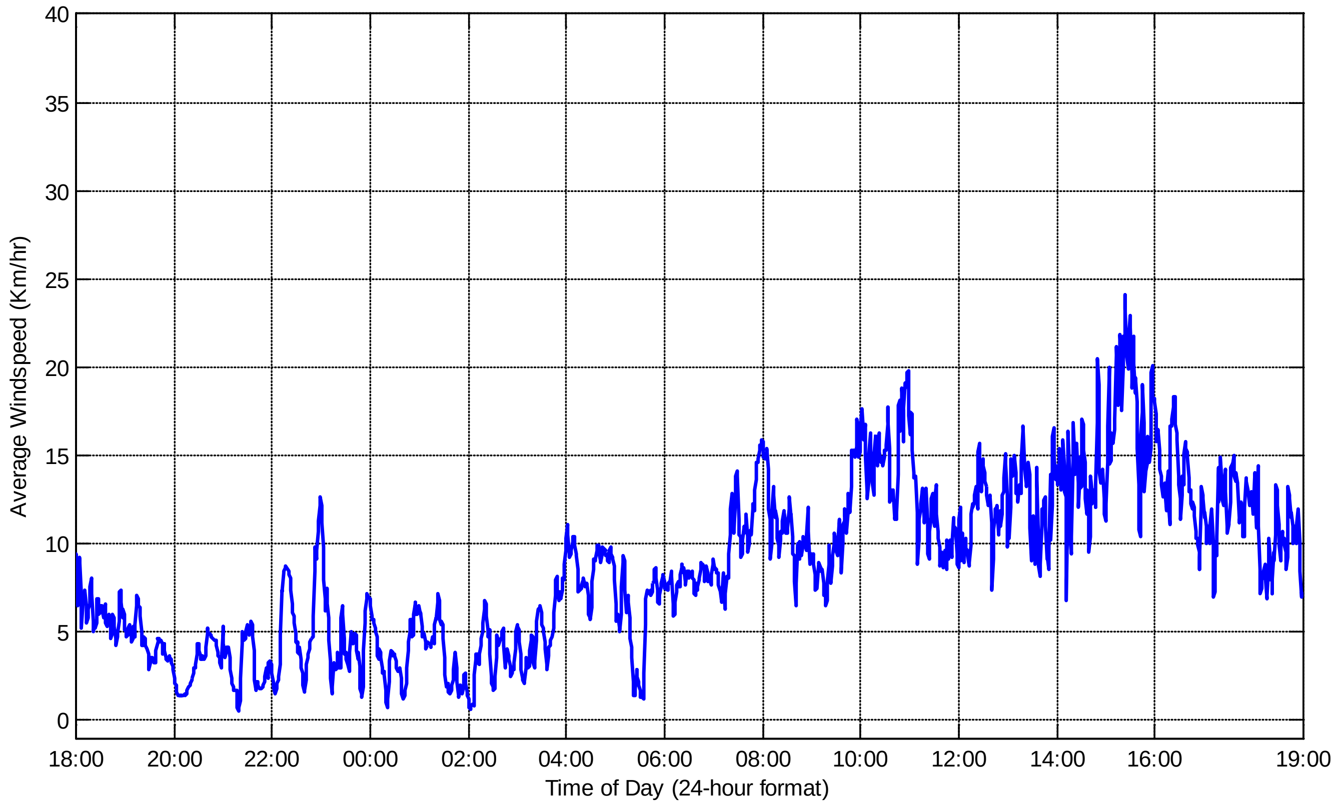
August 23 – 24, 2013 Monitored Wind Direction at Weather Monitor Location 7



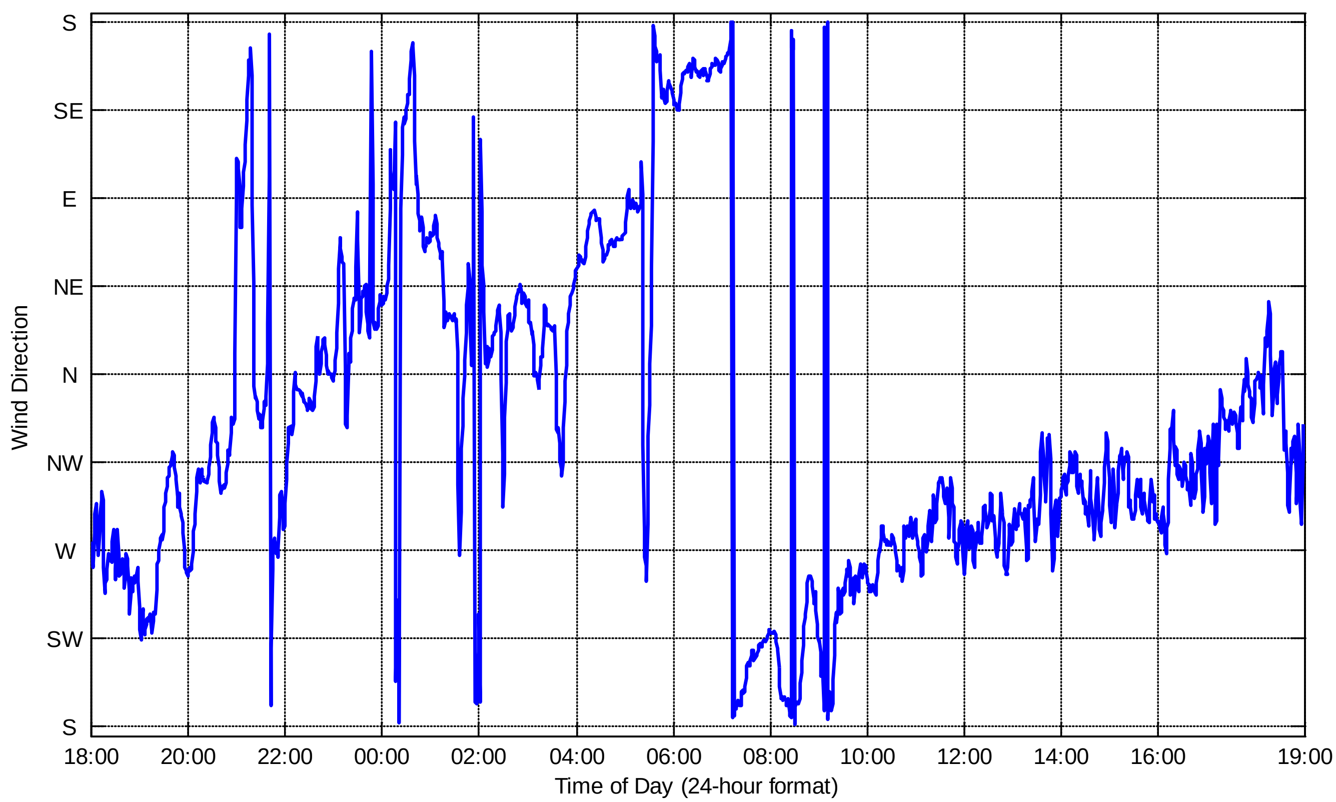
August 23 – 24, 2013 Monitored Temperature at Weather Monitor Location 7



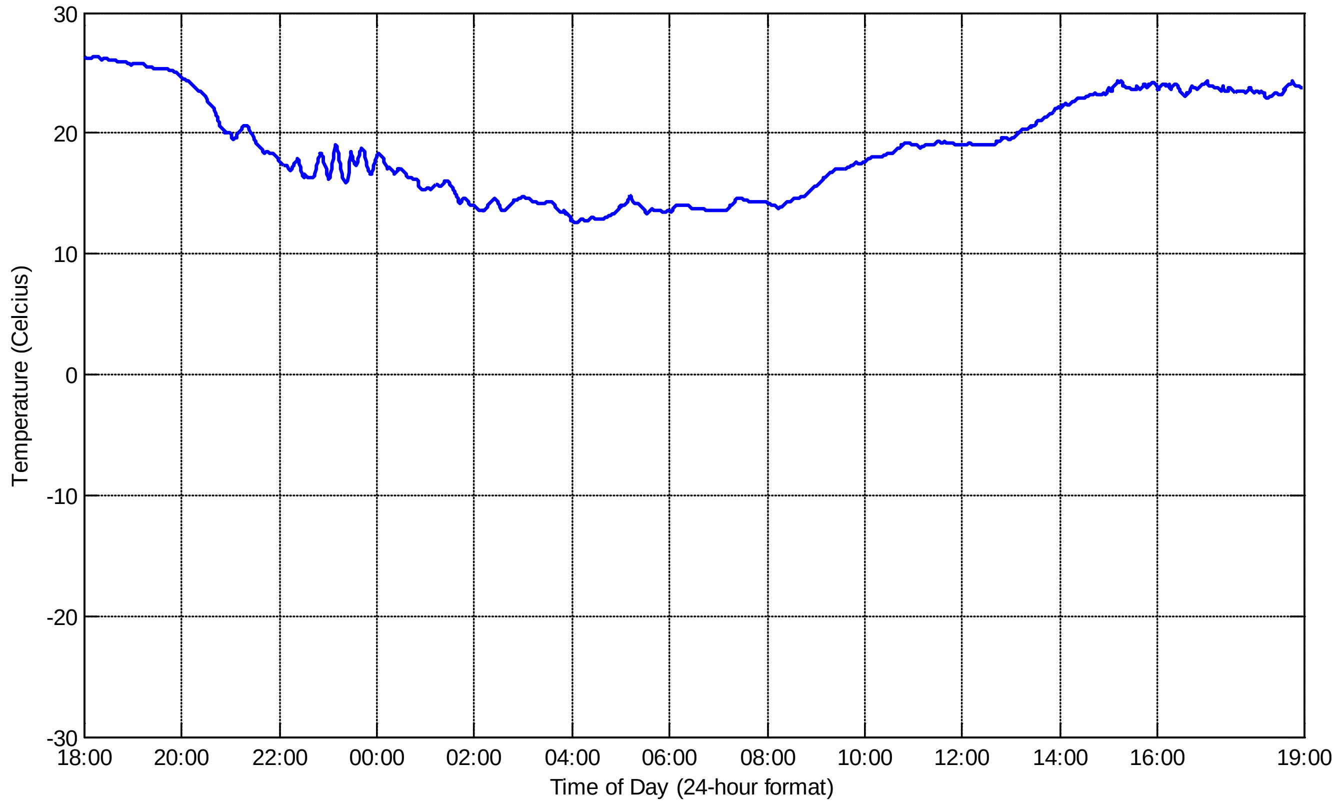
August 23 – 24, 2013 Monitored Humidity at Weather Monitor Location 7



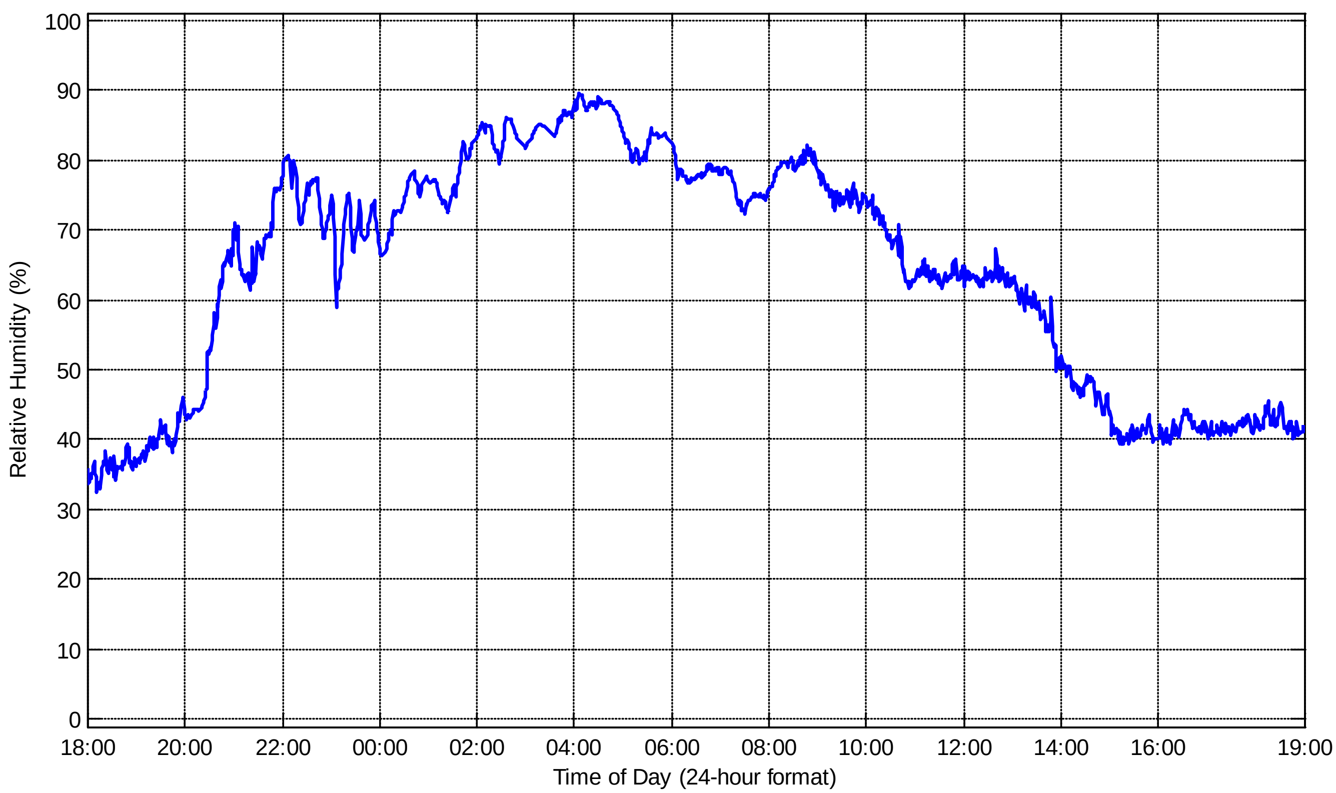
August 24 – 25, 2013 Monitored Wind Speed at Weather Monitor Location 7



August 24 – 25, 2013 Monitored Wind Direction at Weather Monitor Location 7

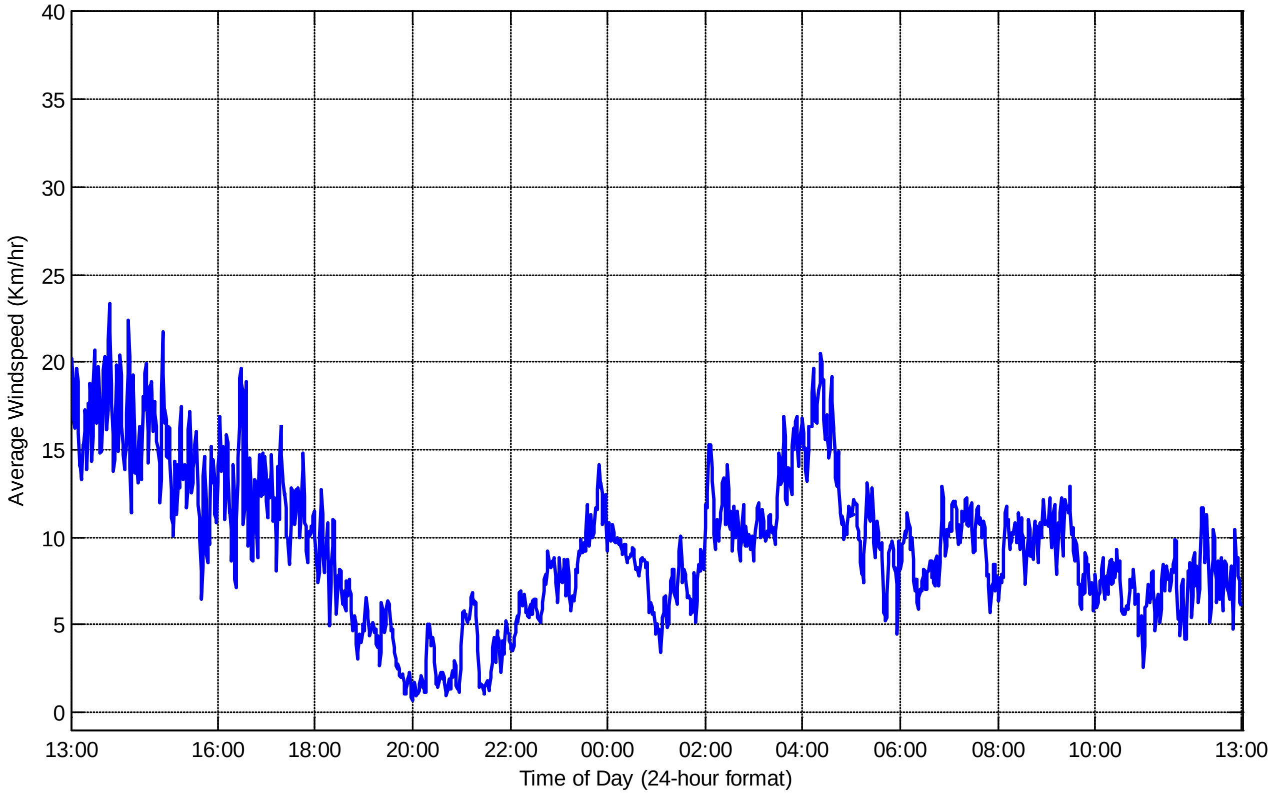


August 24 – 25, 2013 Monitored Temperature at Weather Monitor Location 7

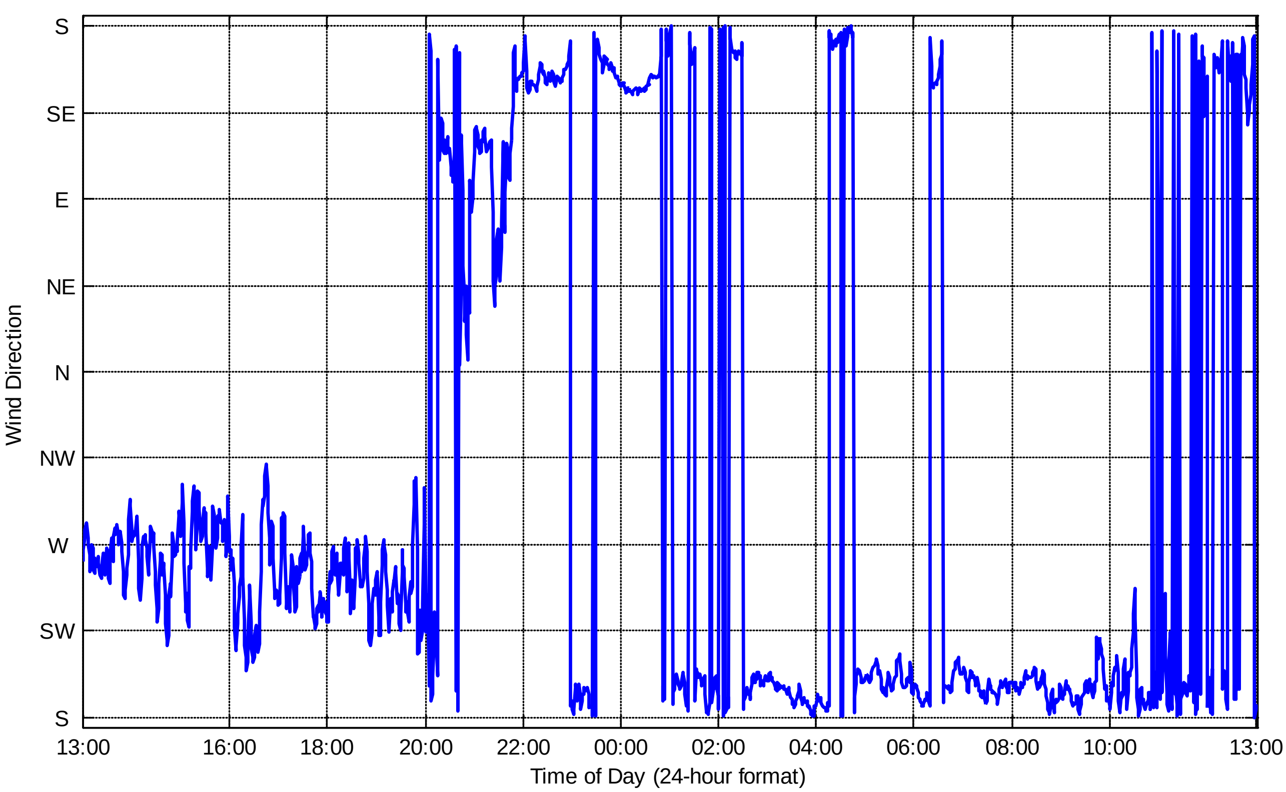


August 24 – 25, 2013 Monitored Humidity at Weather Monitor Location 7

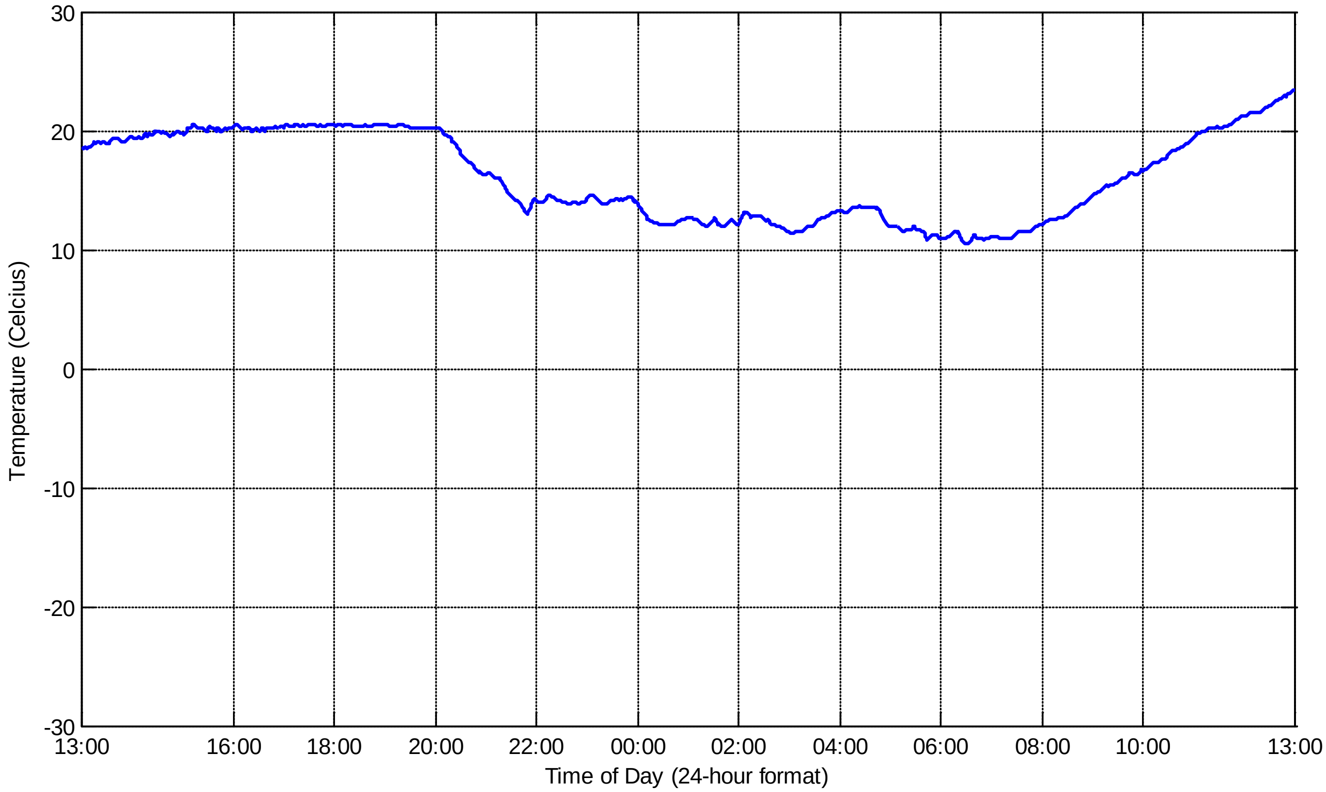
Weather Data from Weather Monitor Location 10



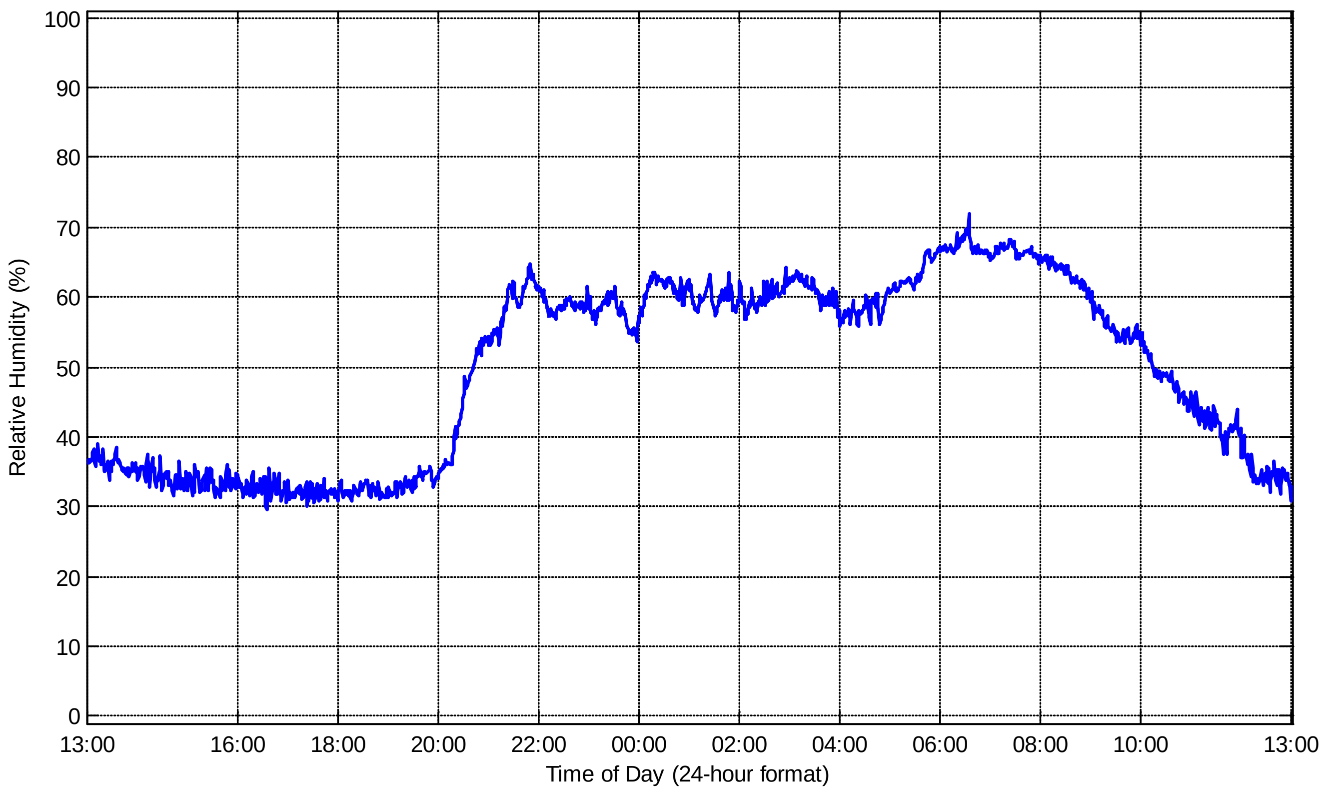
August 21 – 22, 2013 Monitored Wind Speed at Weather Monitor Location 10



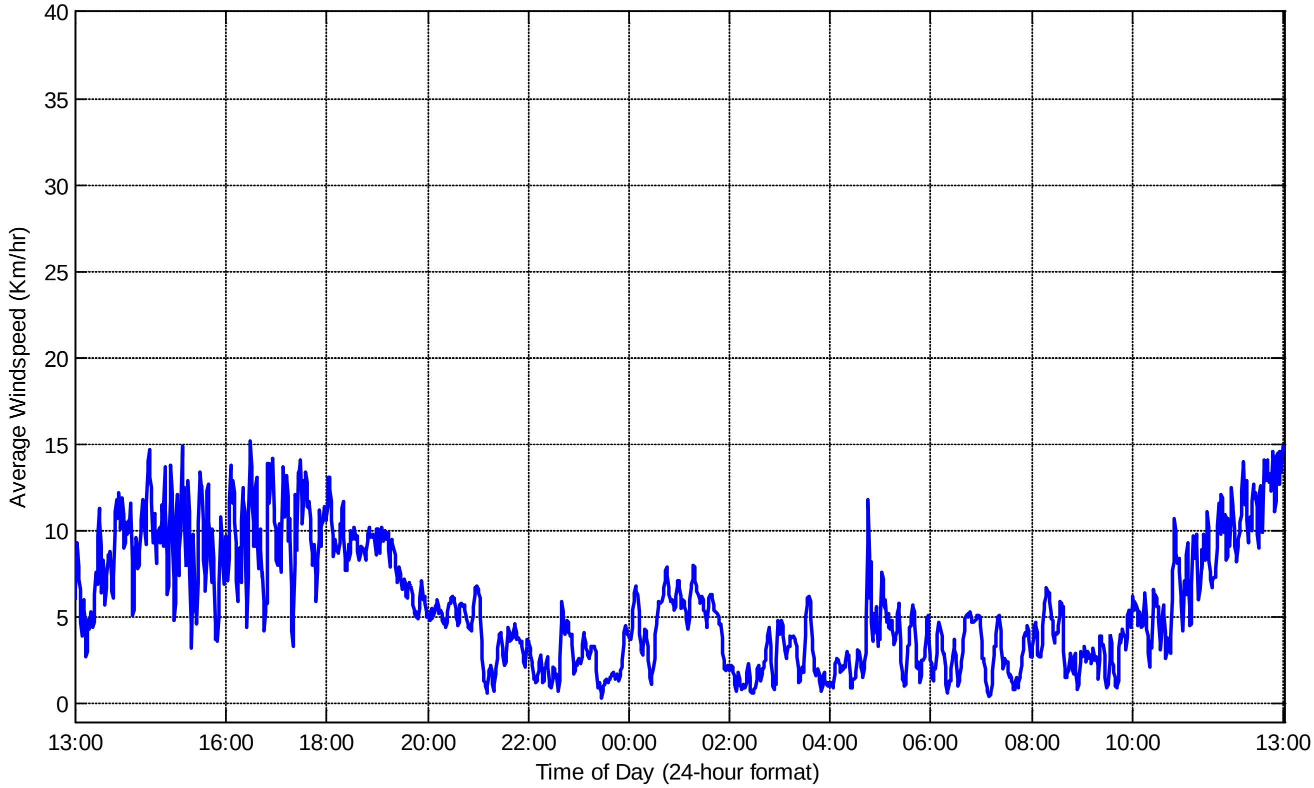
August 21 – 22, 2013 Monitored Wind Direction at Weather Monitor Location 10



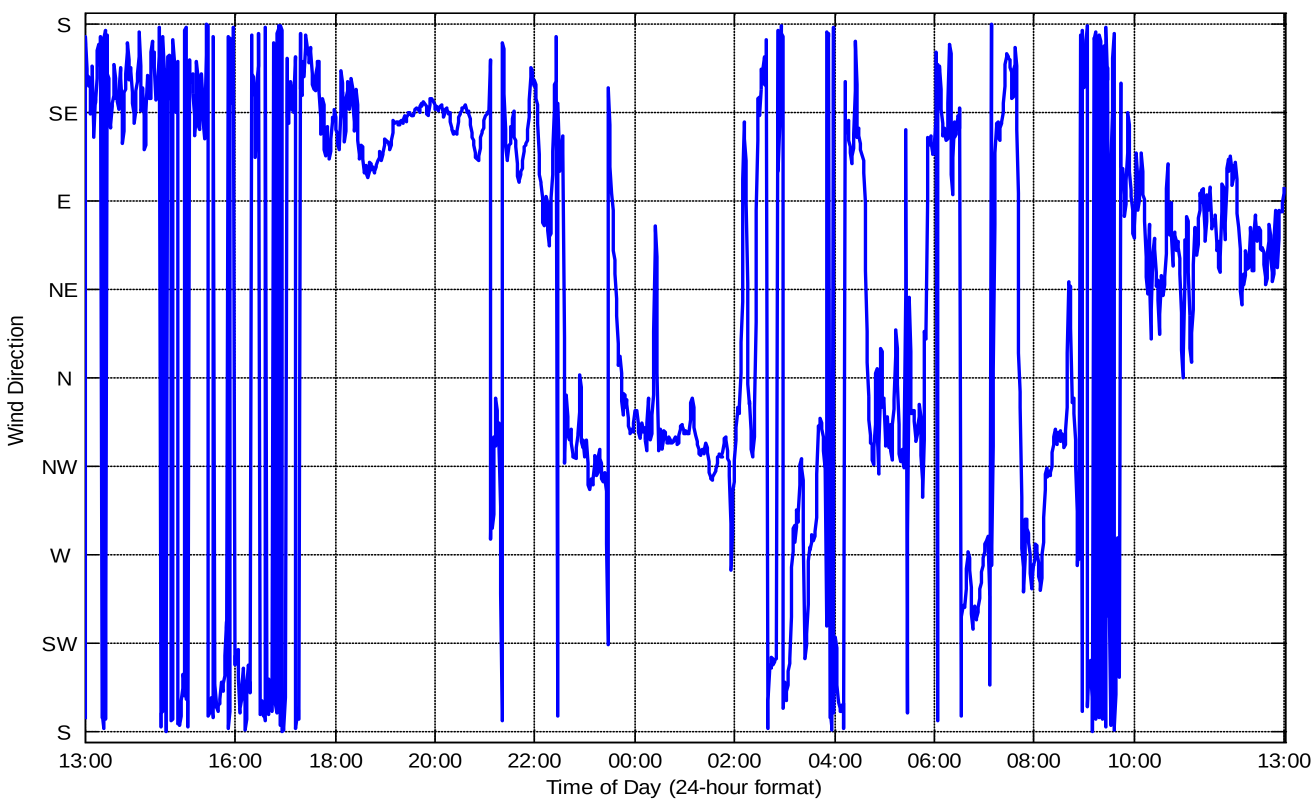
August 21 – 22, 2013 Monitored Temperature at Weather Monitor Location 10



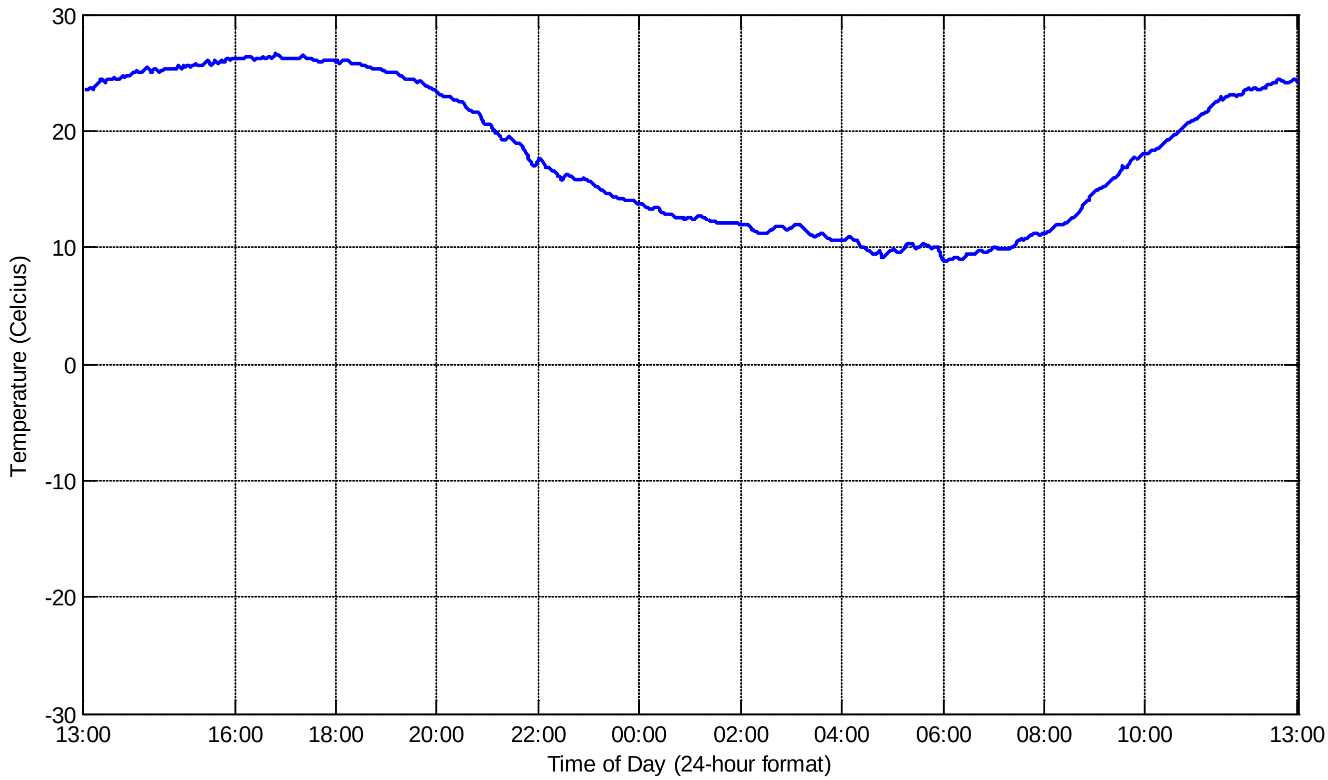
August 21 – 22, 2013 Monitored Humidity at Weather Monitor Location 10



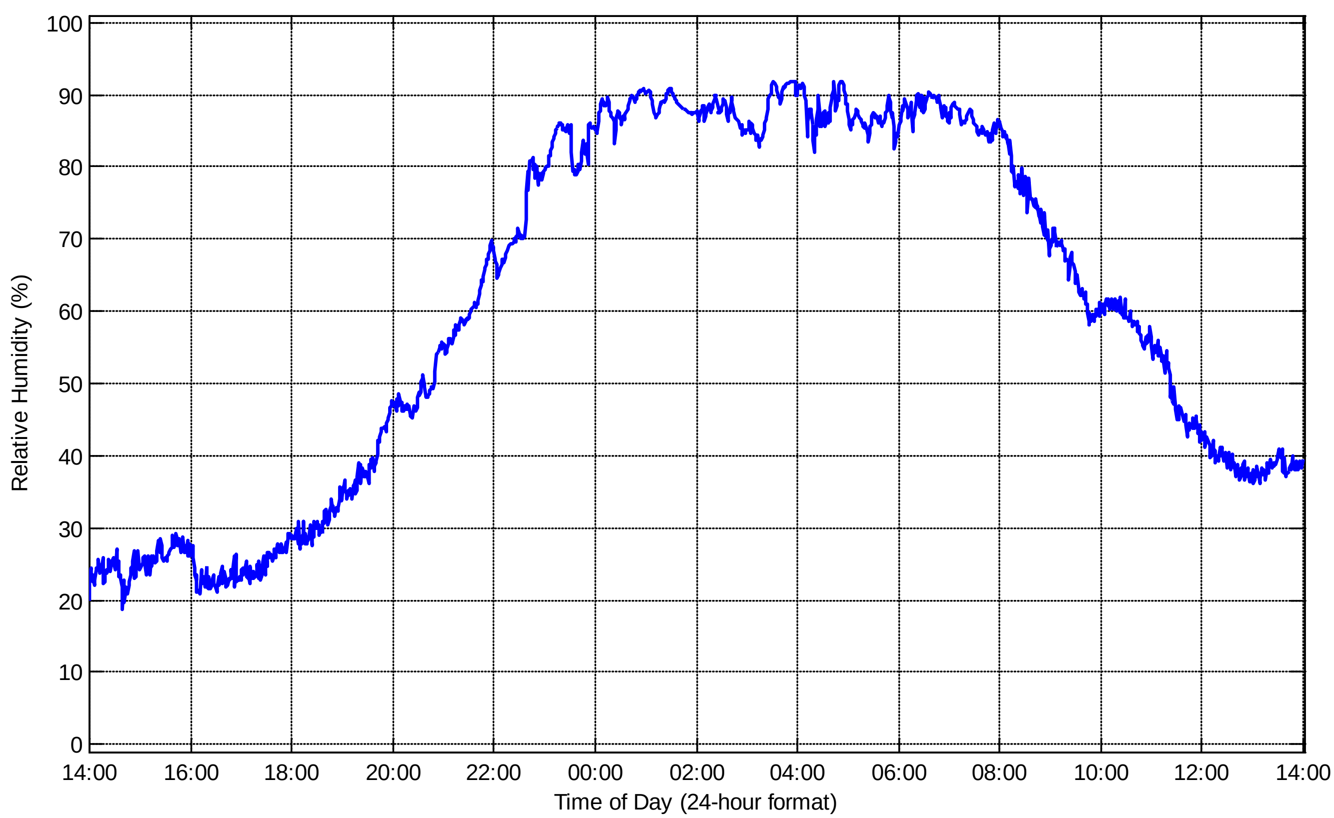
August 22 – 23, 2013 Monitored Wind Speed at Weather Monitor Location 10



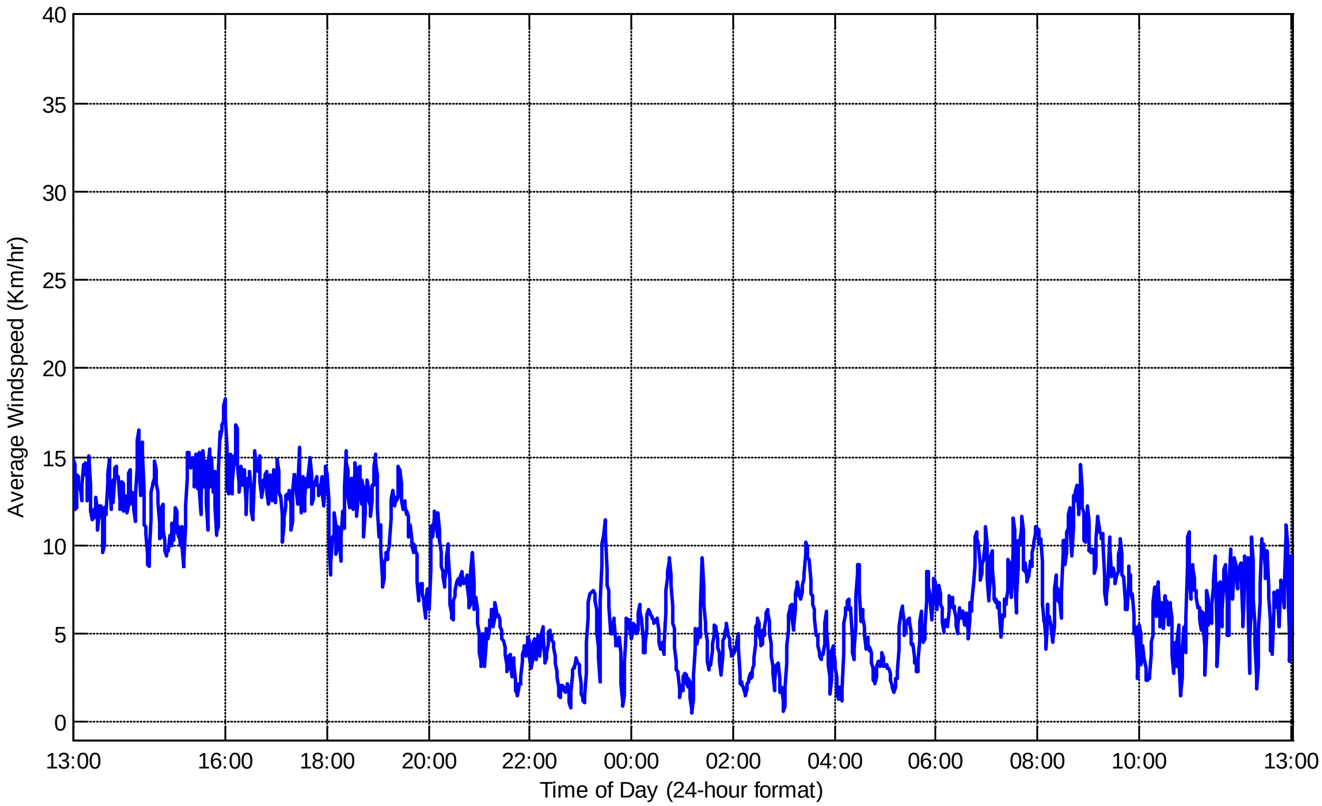
August 22 – 23, 2013 Monitored Wind Direction at Weather Monitor Location 10



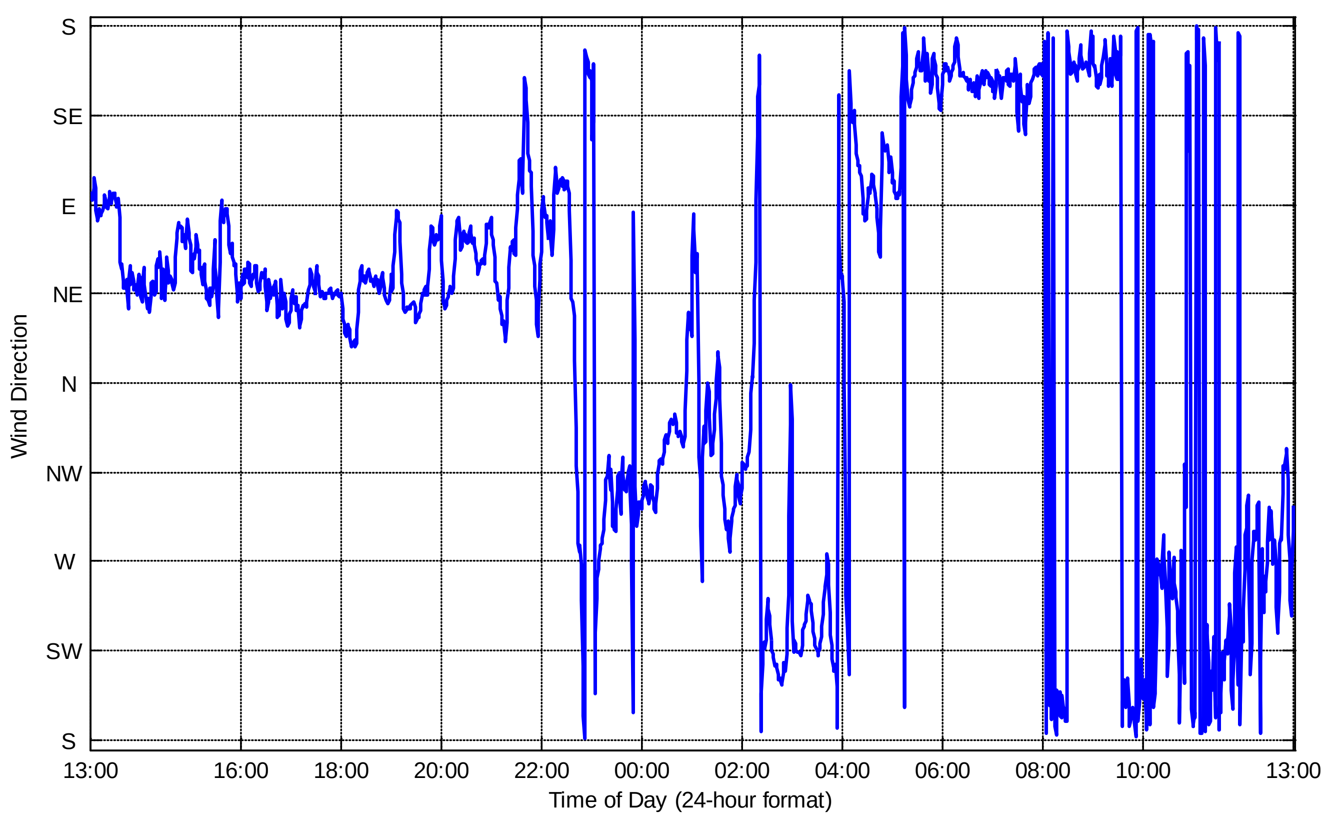
August 22 – 23, 2013 Monitored Temperature at Weather Monitor Location 10



August 22 – 23, 2013 Monitored Humidity at Weather Monitor Location 10



August 23 – 24, 2013 Monitored Wind Speed at Weather Monitor Location 10



August 23 – 24, 2013 Monitored Wind Direction at Weather Monitor Location 10

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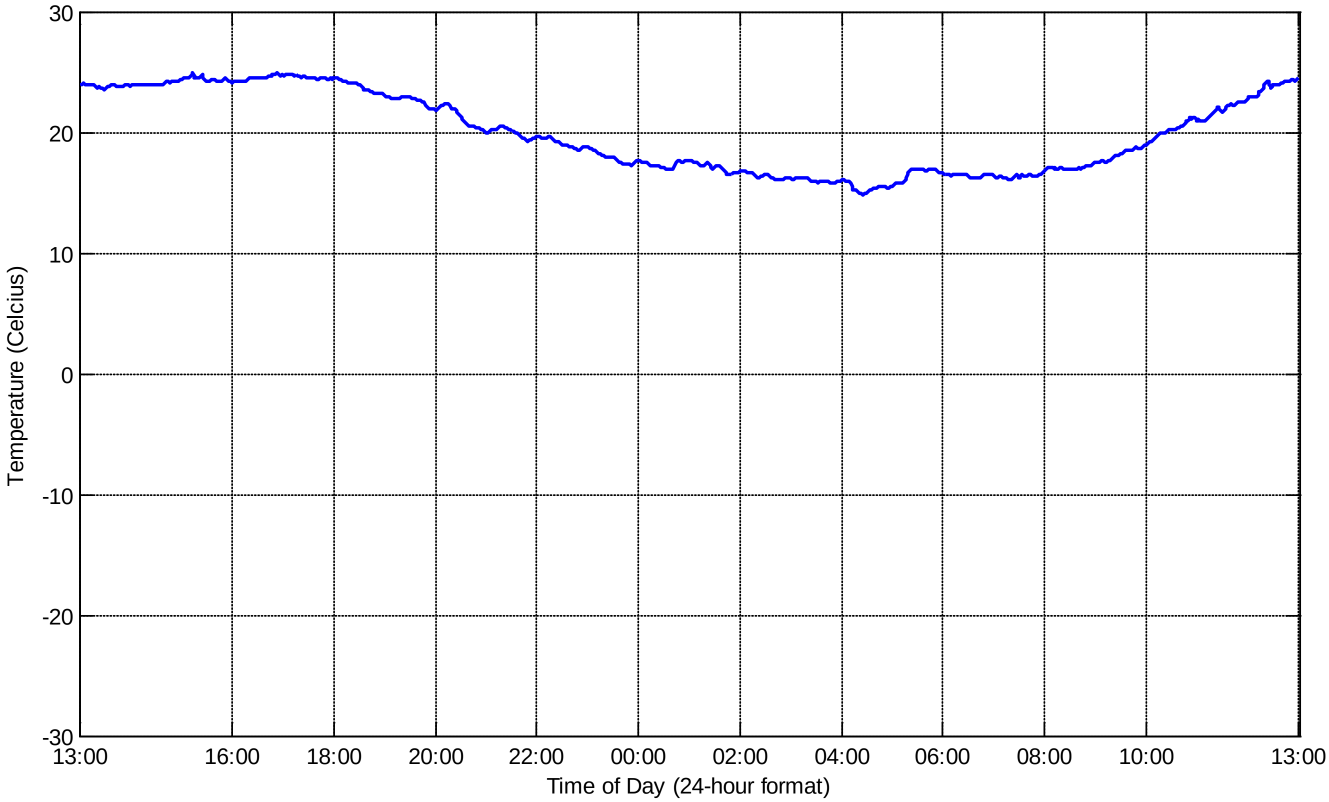
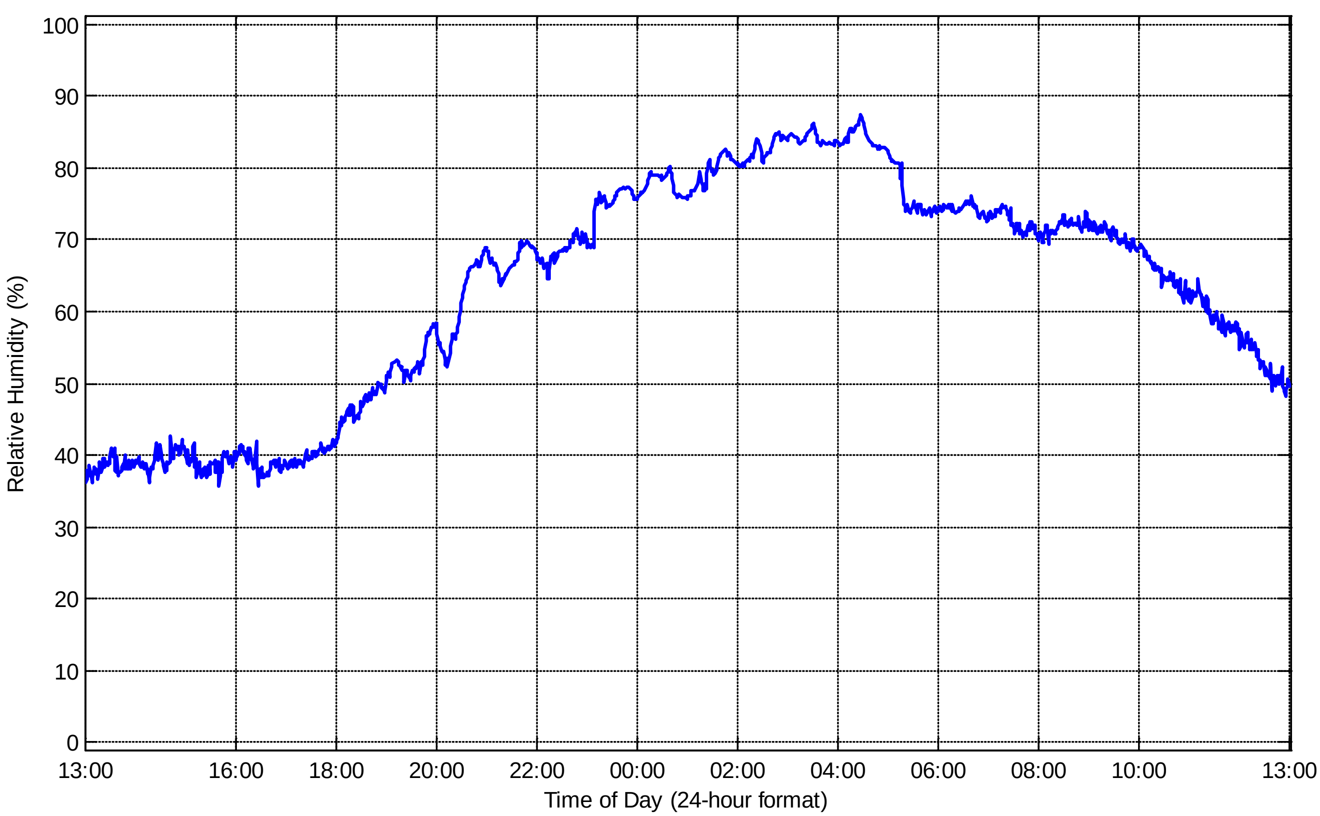
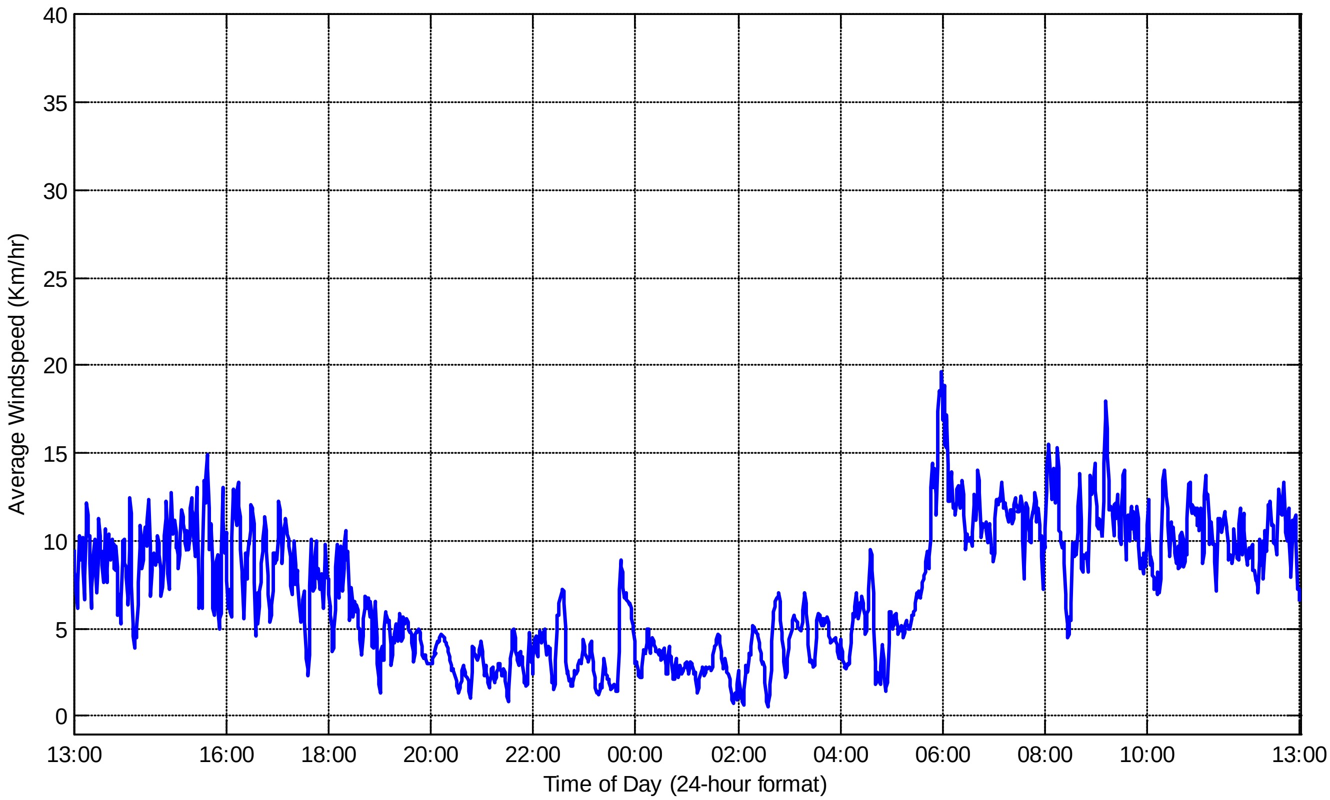


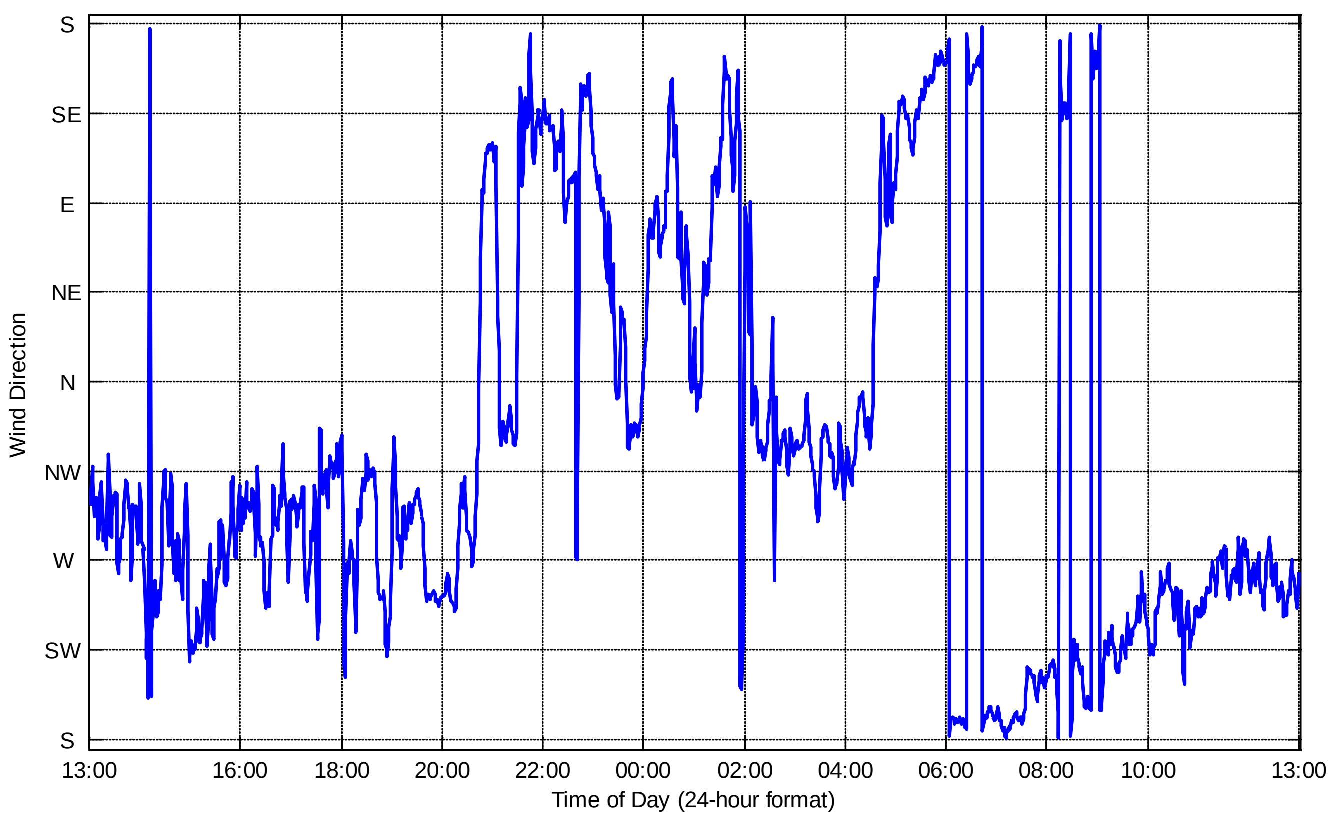
August 23 – 24, 2013 Monitored Temperature at Weather Monitor Location 10



August 23 – 24, 2013 Monitored Humidity at Weather Monitor Location 10



August 24 – 25, 2013 Monitored Wind Speed at Weather Monitor Location 10



August 24 – 25, 2013 Monitored Wind Direction at Weather Monitor Location 10

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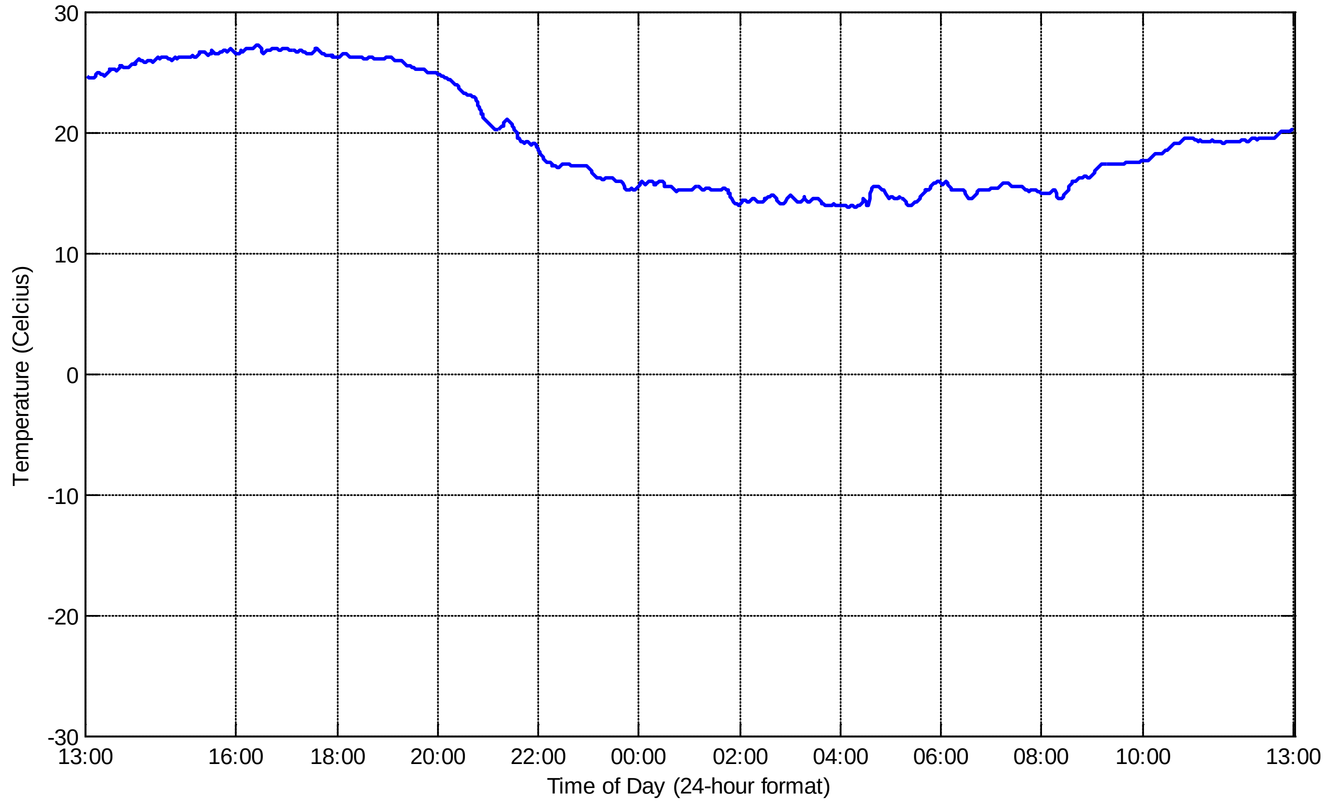
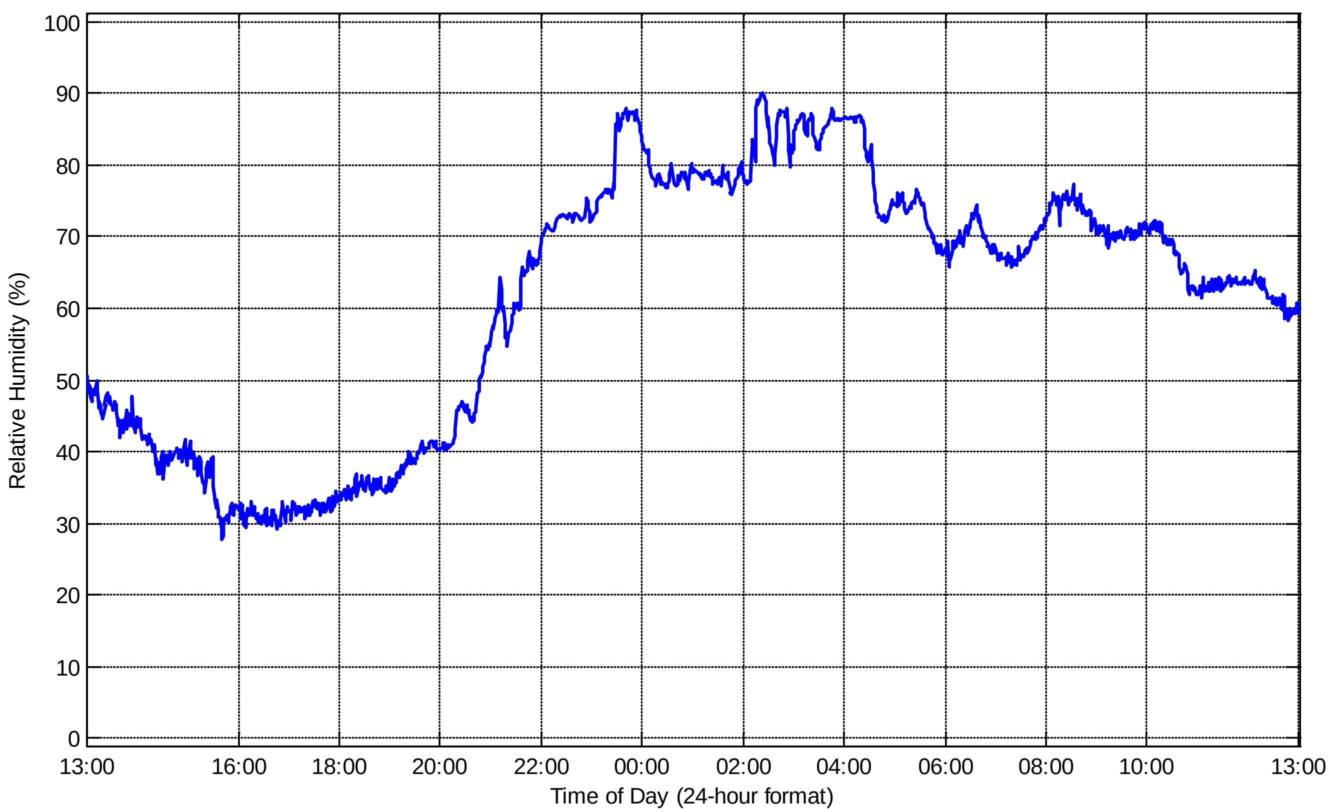
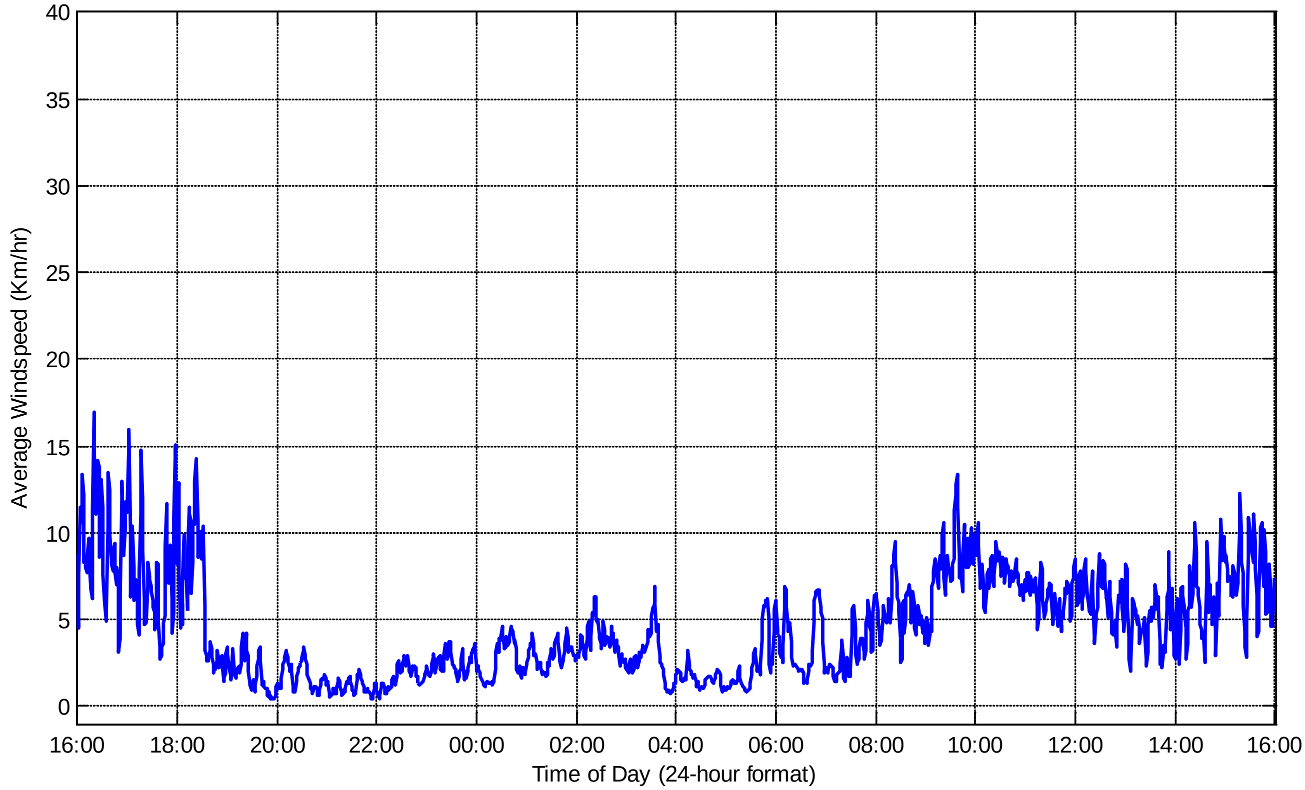


August 24 – 25, 2013 Monitored Temperature at Weather Monitor Location 10

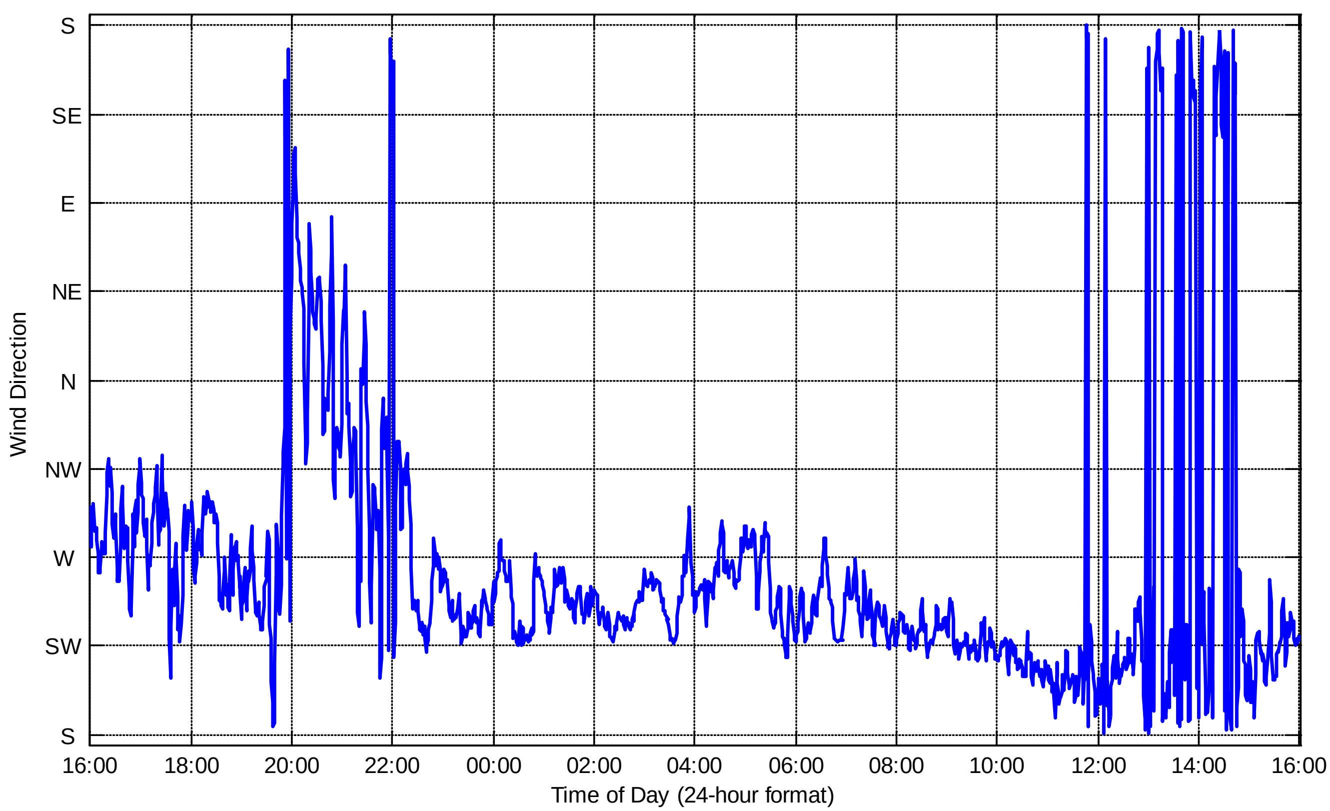


August 24 – 25, 2013 Monitored Humidity at Weather Monitor Location 10

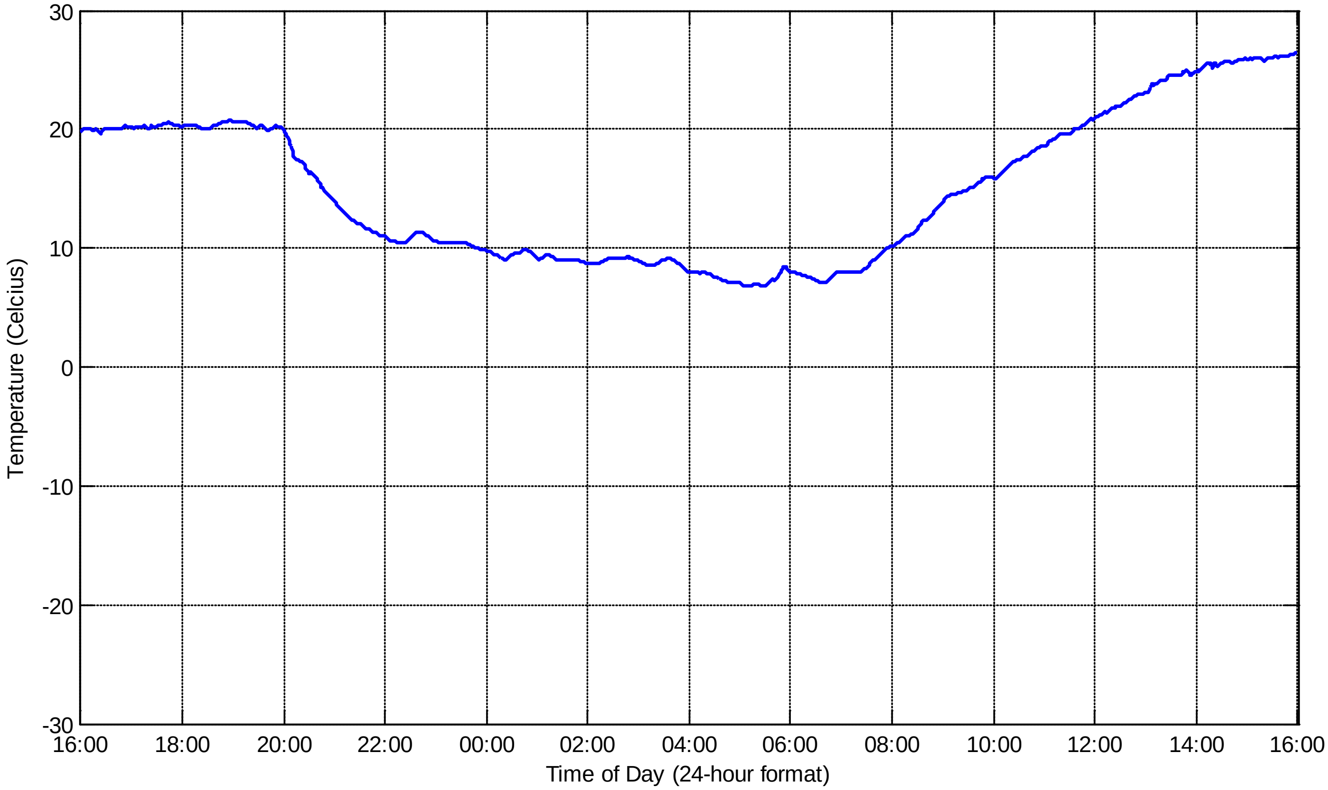
Weather Data from Weather Monitor Location 12



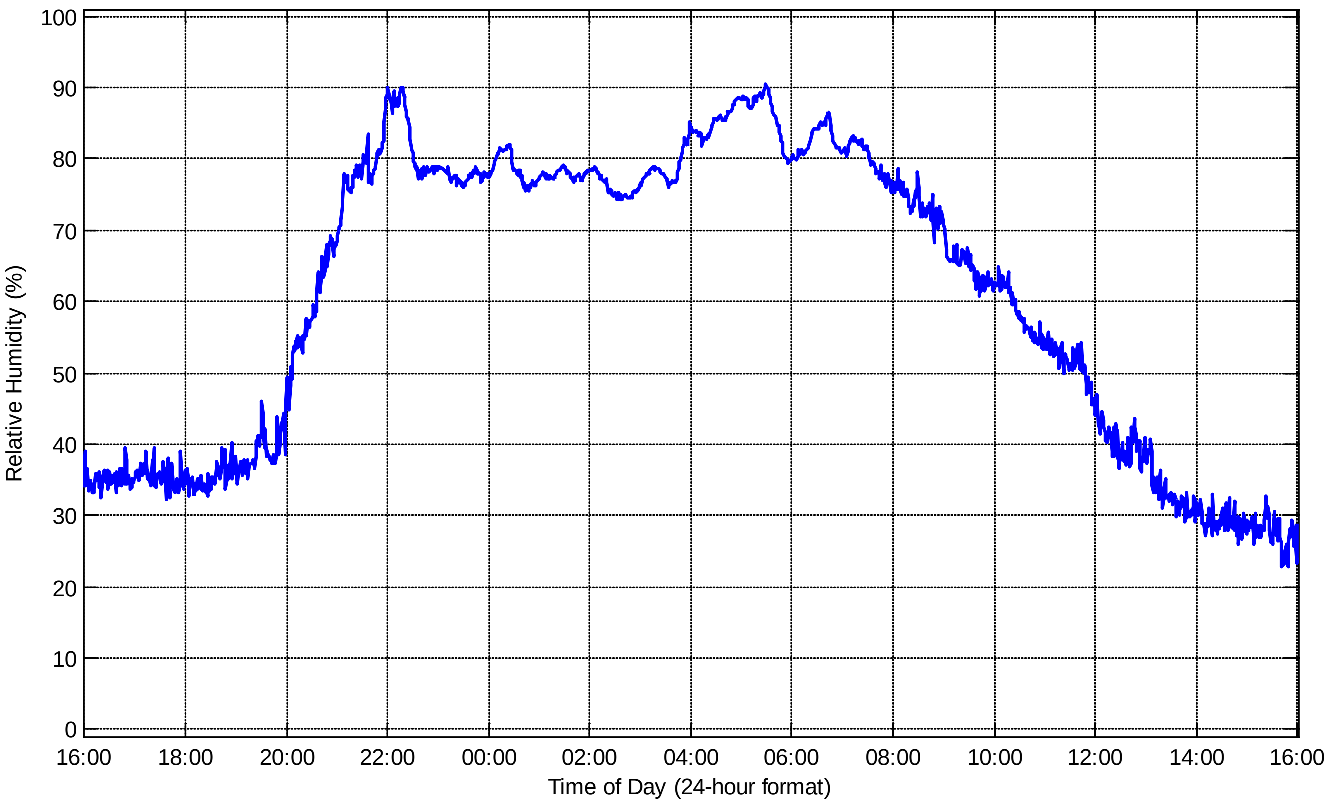
August 21 – 22, 2013 Monitored Wind Speed at Weather Monitor Location 12



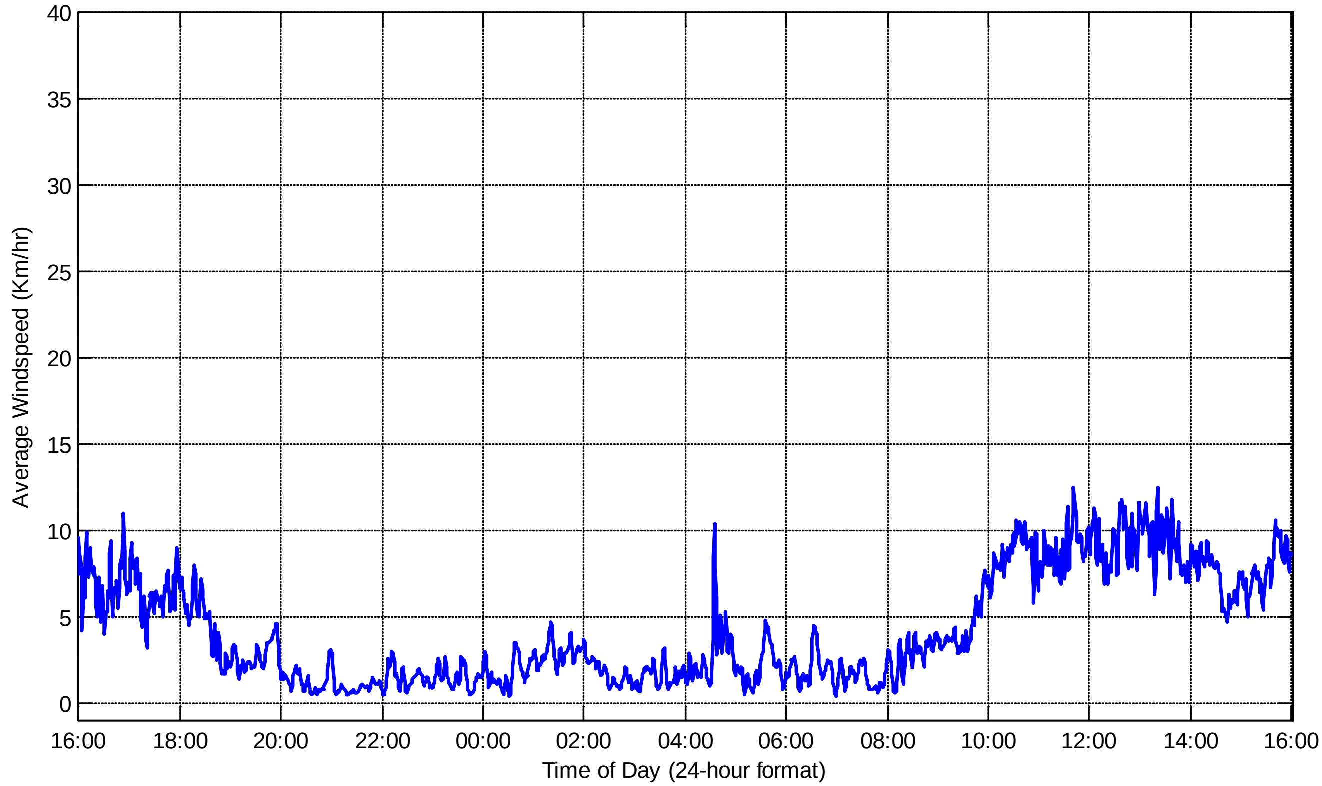
August 21 – 22, 2013 Monitored Wind Direction at Weather Monitor Location 12



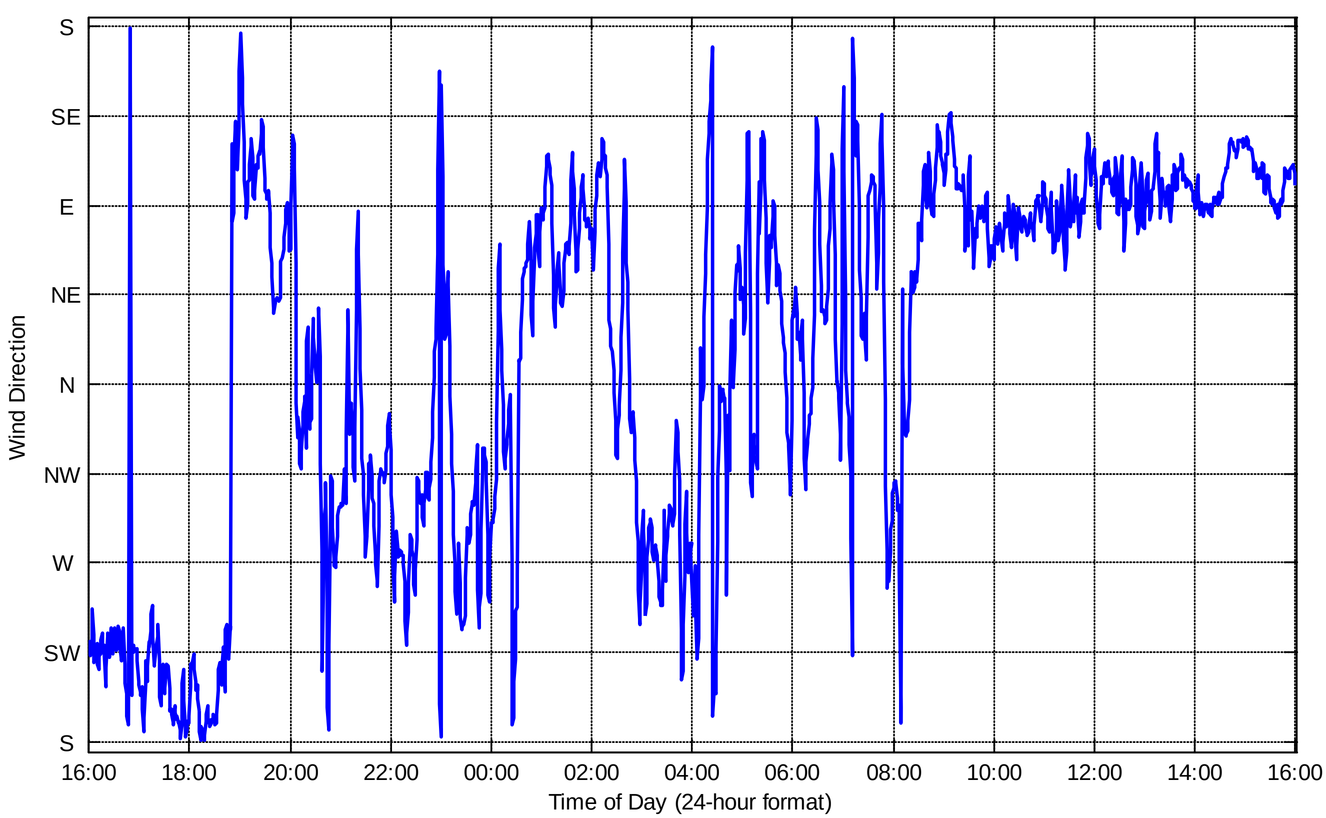
August 21 – 22, 2013 Monitored Temperature at Weather Monitor Location 12



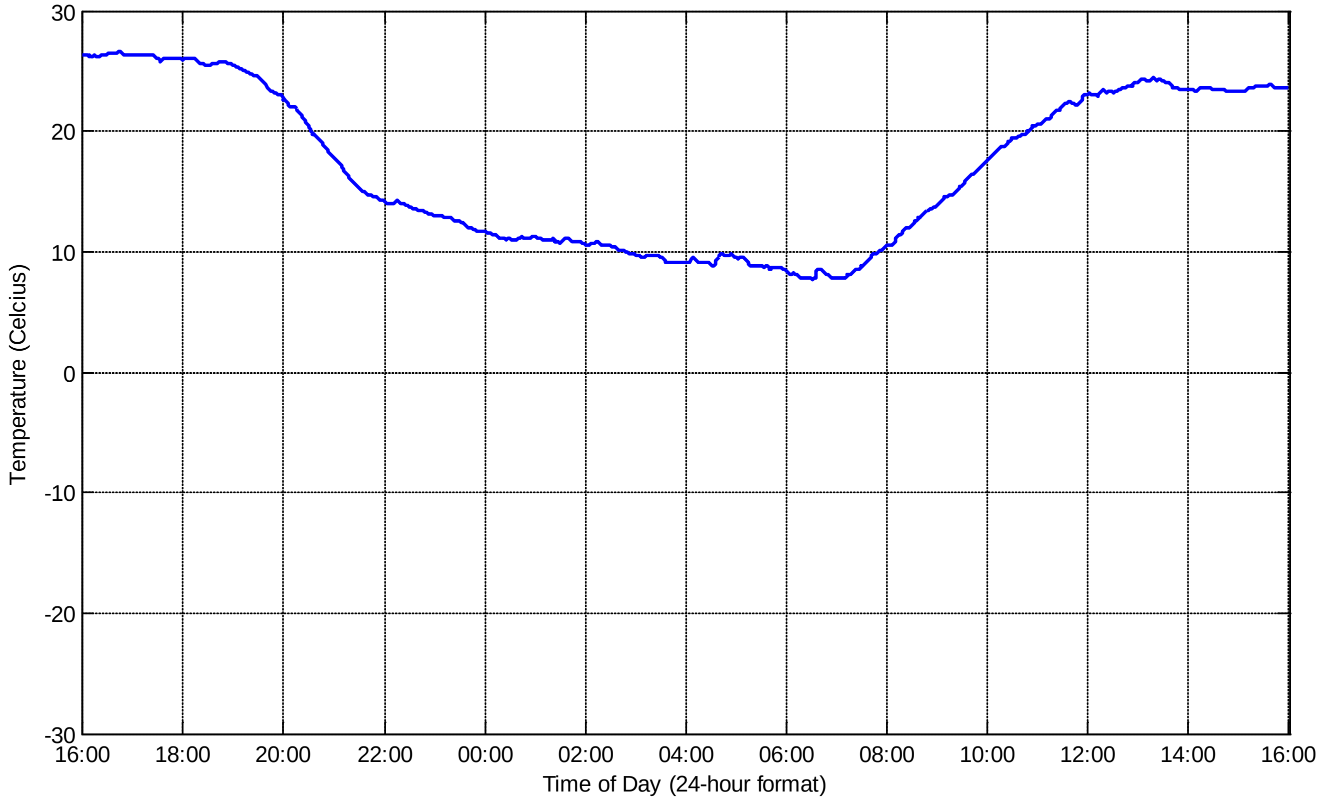
August 21 – 22, 2013 Monitored Humidity at Weather Monitor Location 12



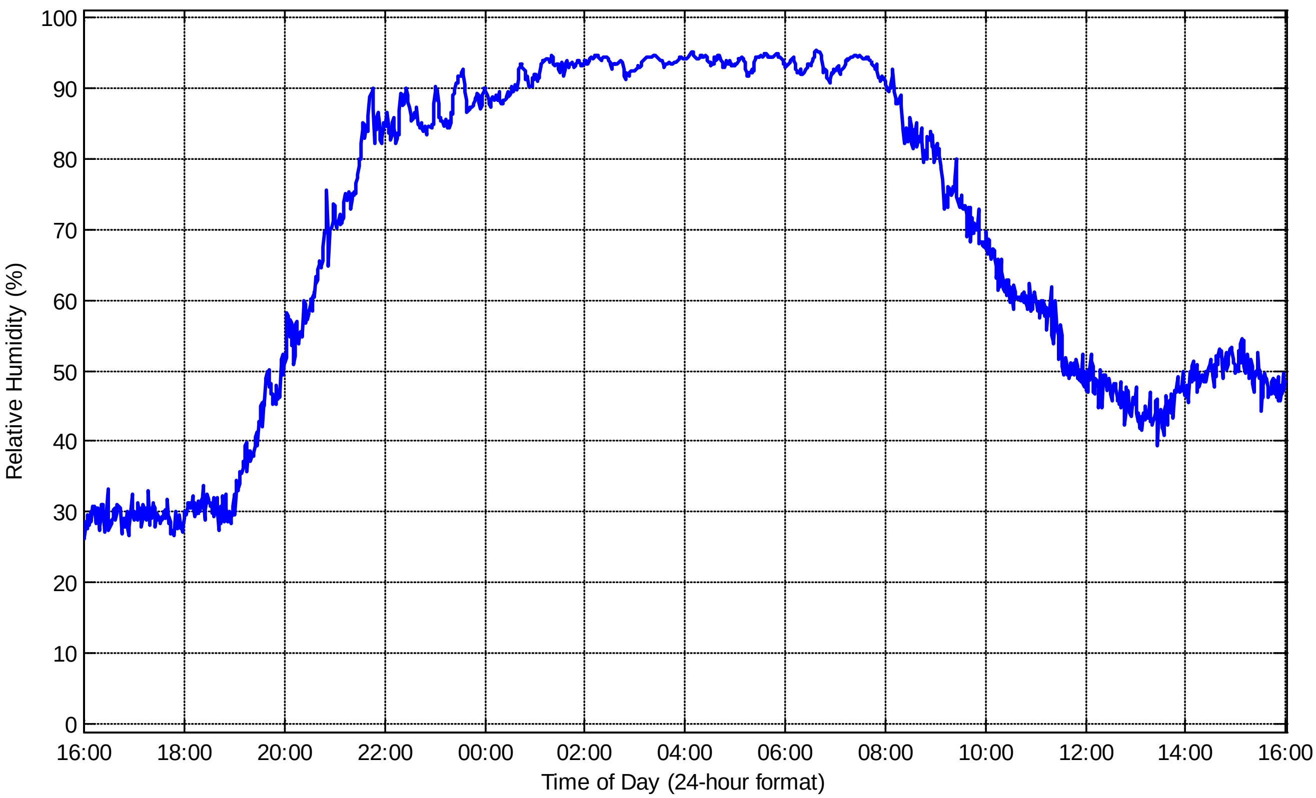
August 22 – 23, 2013 Monitored Wind Speed at Weather Monitor Location 12



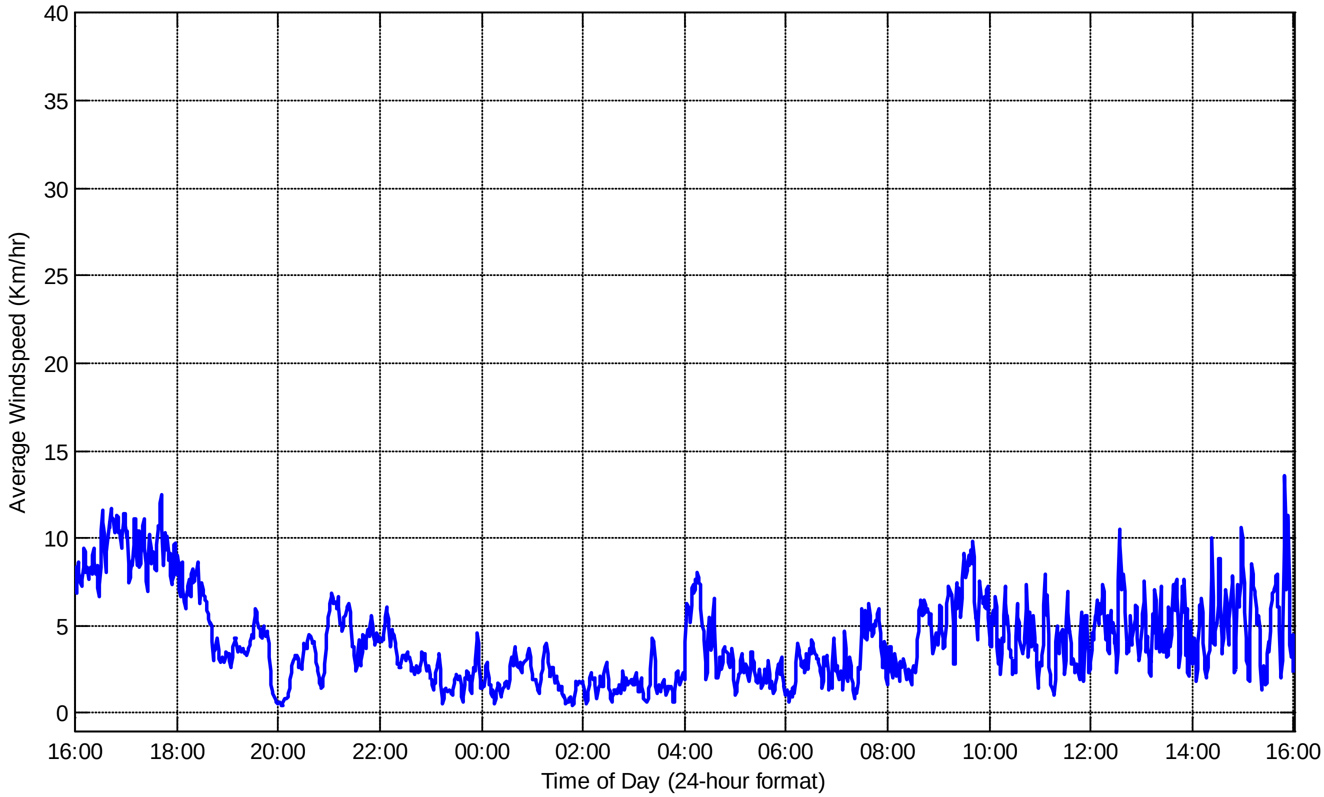
August 22 – 23, 2013 Monitored Wind Direction at Weather Monitor Location 12



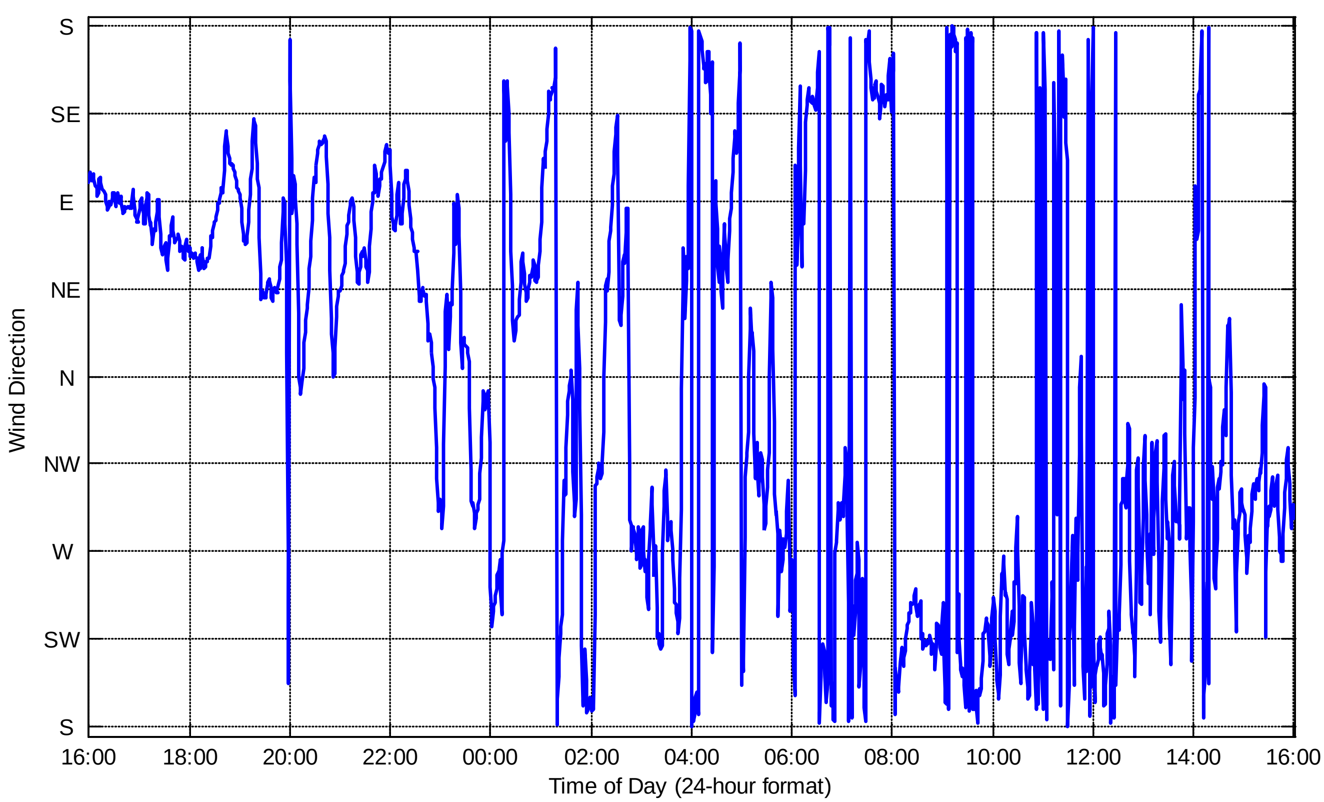
August 22 – 23, 2013 Monitored Temperature at Weather Monitor Location 12



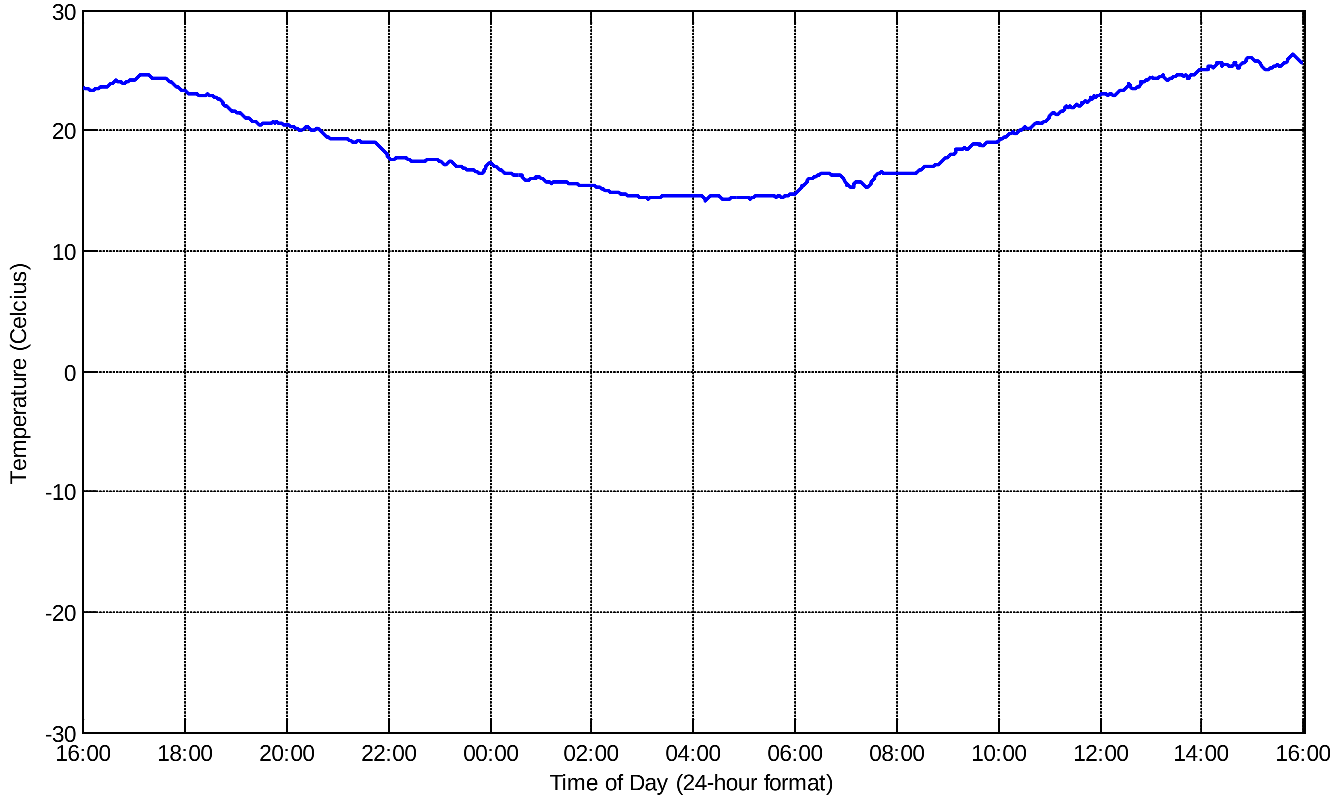
August 22 – 23, 2013 Monitored Humidity at Weather Monitor Location 12



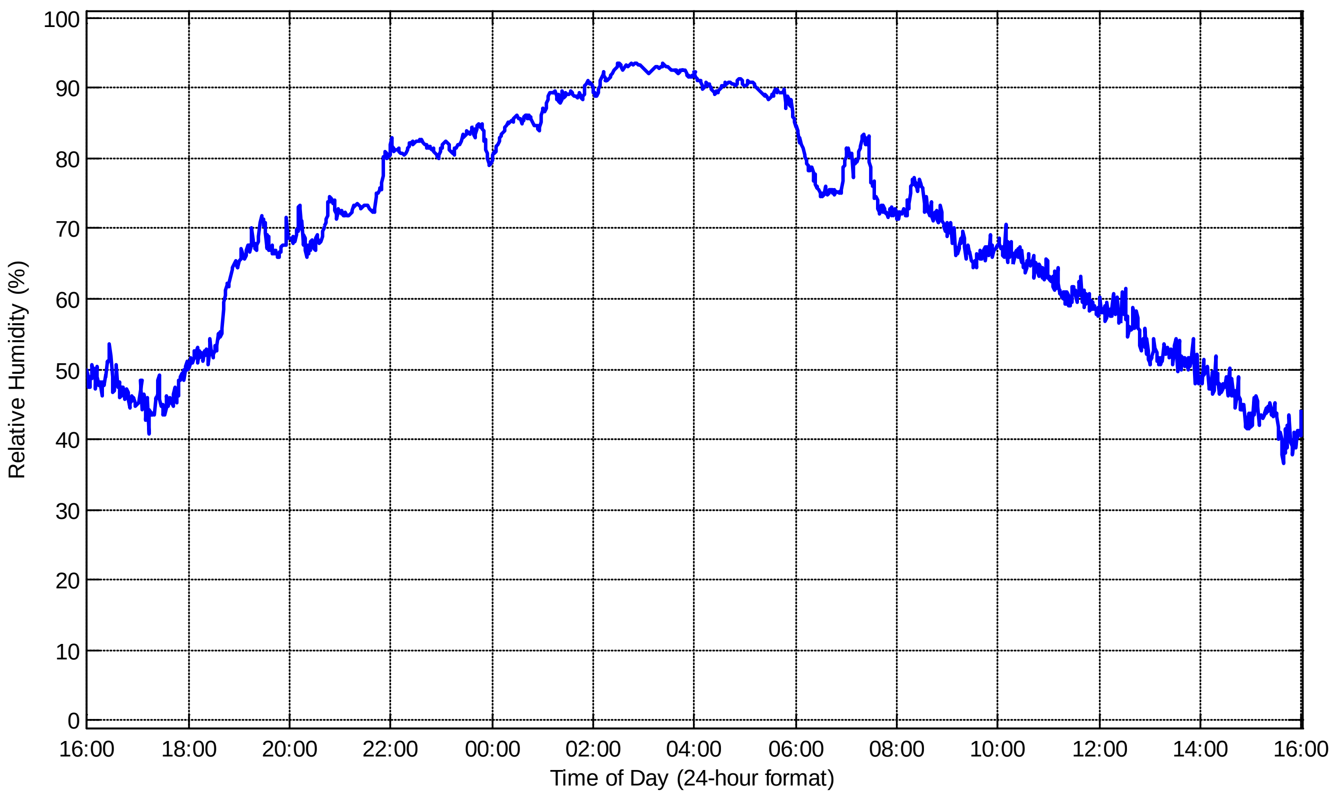
August 23 – 24, 2013 Monitored Wind Speed at Weather Monitor Location 12



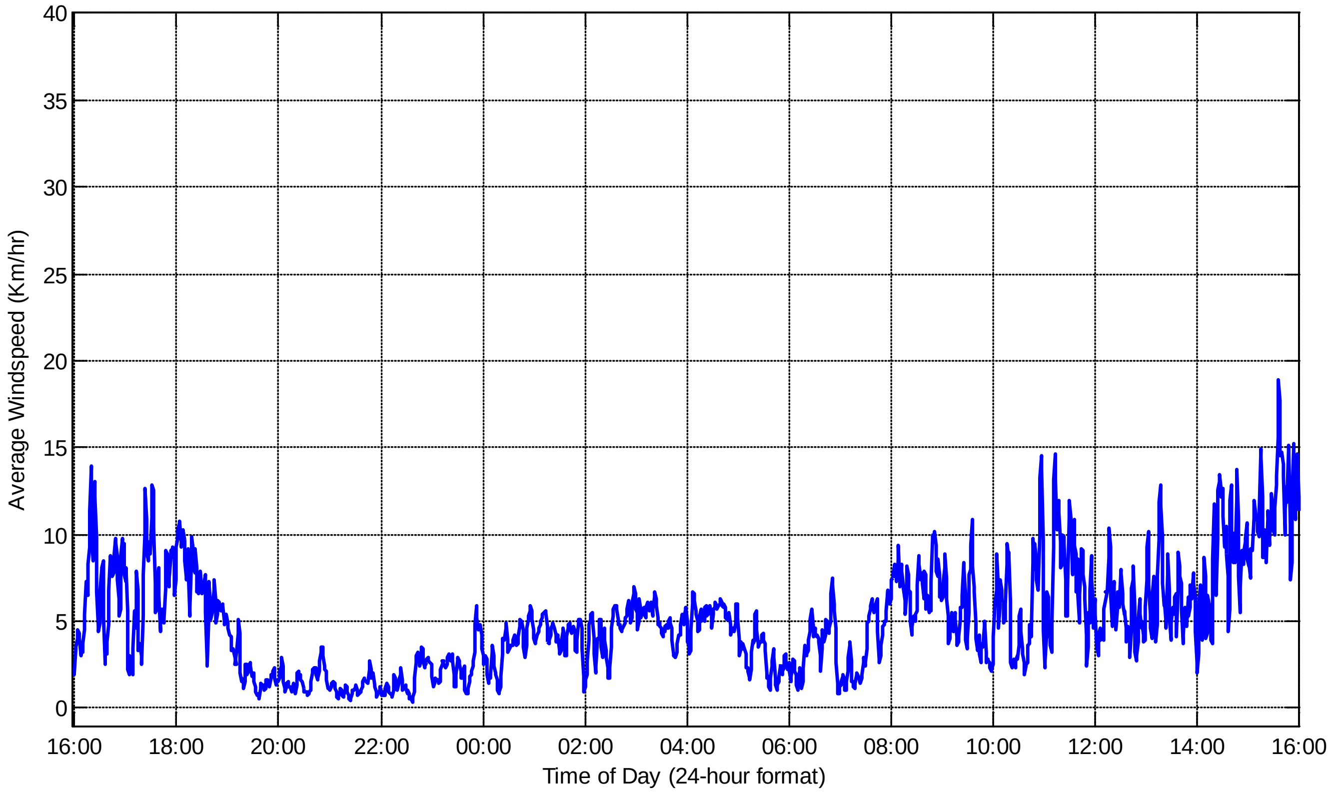
August 23 – 24, 2013 Monitored Wind Direction at Weather Monitor Location 12



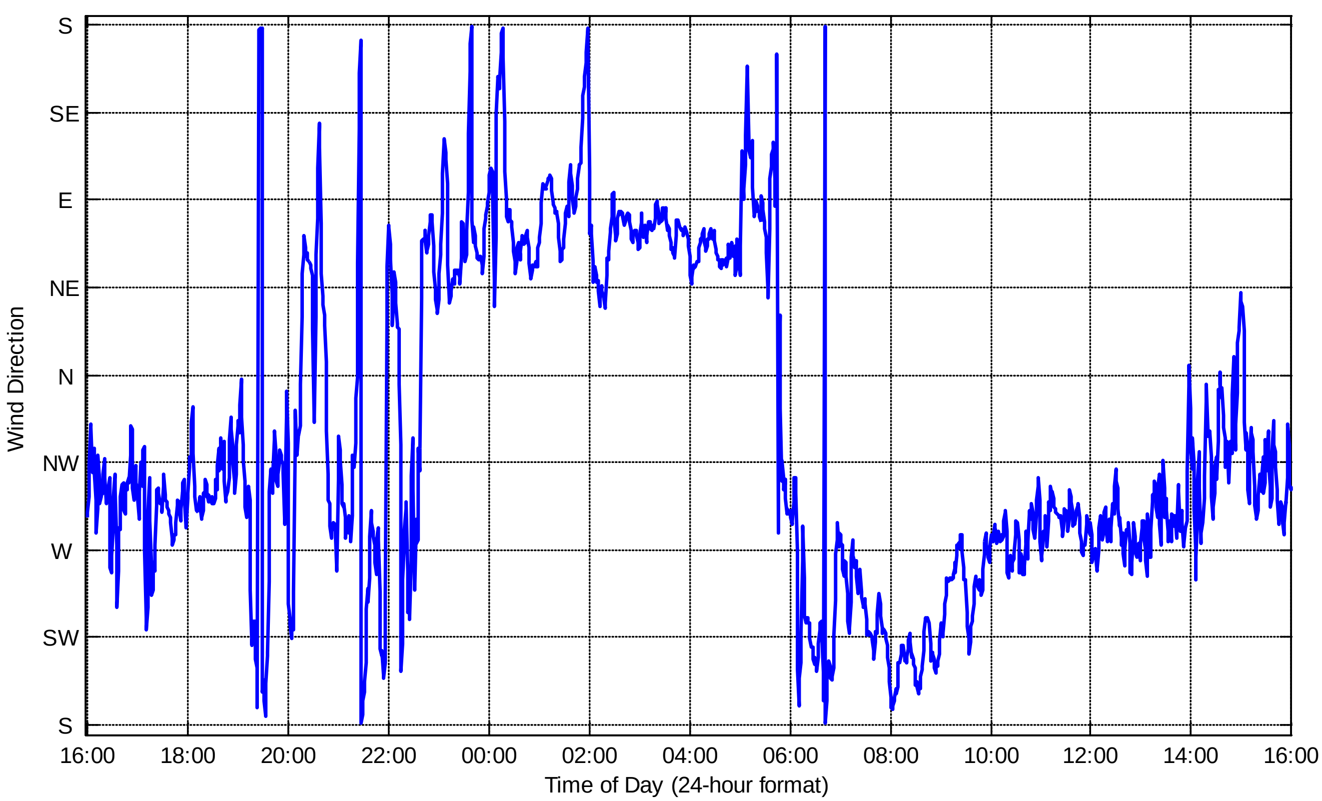
August 23 – 24, 2013 Monitored Temperature at Weather Monitor Location 12



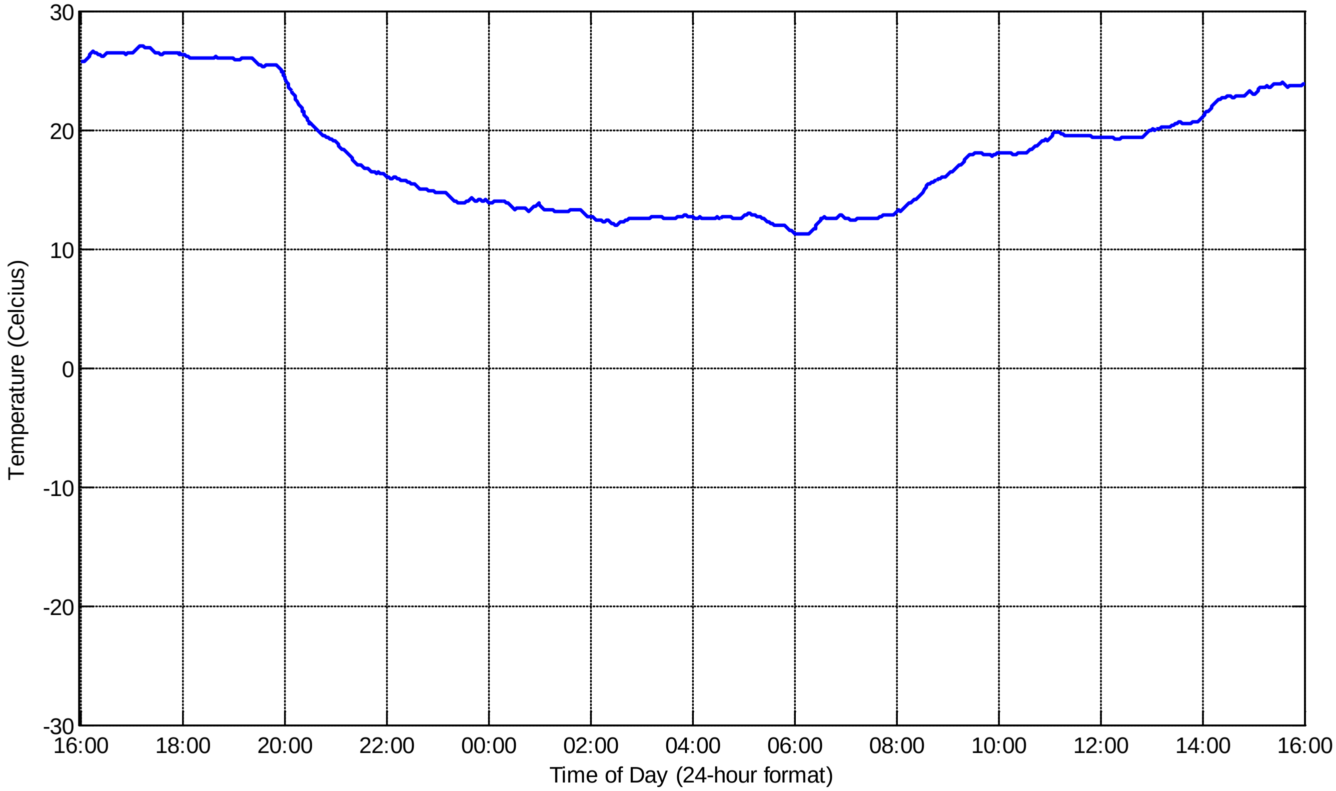
August 23 – 24, 2013 Monitored Humidity at Weather Monitor Location 12



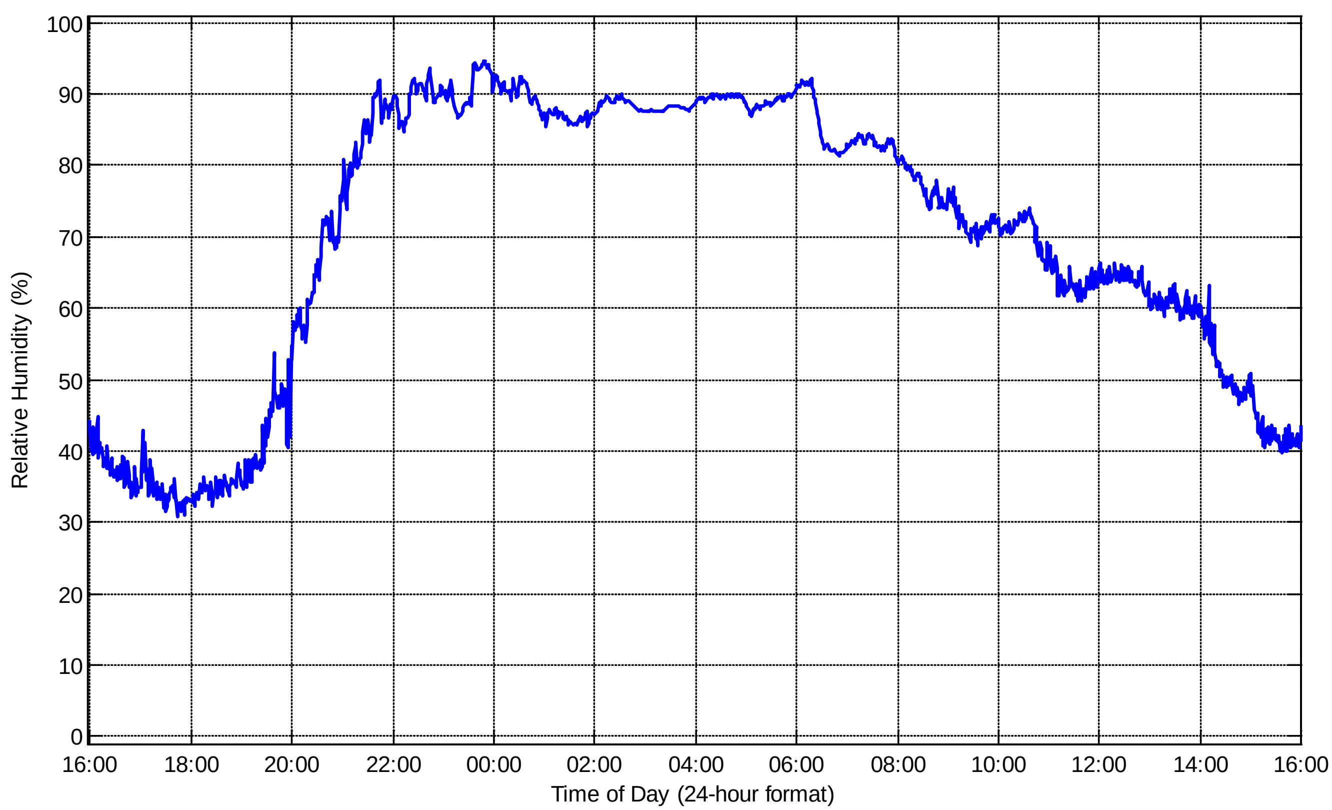
August 24 – 25, 2013 Monitored Wind Speed at Weather Monitor Location 12



August 24 – 25, 2013 Monitored Wind Direction at Weather Monitor Location 12



August 24 – 25, 2013 Monitored Temperature at Weather Monitor Location 12



August 24 – 25, 2013 Monitored Humidity at Weather Monitor Location 12

Barometric Pressure*

Date/Time	Stn Press (kPa)	Date/Time	Stn Press (kPa)	Date/Time	Stn Press (kPa)
8/21/13 00:00	93.84	8/22/13 16:00	93.29	8/24/13 08:00	92.85
8/21/13 01:00	93.88	8/22/13 17:00	93.23	8/24/13 09:00	92.86
8/21/13 02:00	93.91	8/22/13 18:00	93.18	8/24/13 10:00	92.87
8/21/13 03:00	93.93	8/22/13 19:00	93.18	8/24/13 11:00	92.9
8/21/13 04:00	93.97	8/22/13 20:00	93.21	8/24/13 12:00	92.88
8/21/13 05:00	94.02	8/22/13 21:00	93.21	8/24/13 13:00	92.87
8/21/13 06:00	94.06	8/22/13 22:00	93.2	8/24/13 14:00	92.89
8/21/13 07:00	94.13	8/22/13 23:00	93.16	8/24/13 15:00	92.89
8/21/13 08:00	94.17	8/23/13 00:00	93.17	8/24/13 16:00	92.88
8/21/13 09:00	94.18	8/23/13 01:00	93.16	8/24/13 17:00	92.88
8/21/13 10:00	94.17	8/23/13 02:00	93.18	8/24/13 18:00	92.89
8/21/13 11:00	94.17	8/23/13 03:00	93.18	8/24/13 19:00	92.87
8/21/13 12:00	94.15	8/23/13 04:00	93.18	8/24/13 20:00	92.91
8/21/13 13:00	94.14	8/23/13 05:00	93.23	8/24/13 21:00	92.97
8/21/13 14:00	94.12	8/23/13 06:00	93.2	8/24/13 22:00	92.95
8/21/13 15:00	94.06	8/23/13 07:00	93.23	8/24/13 23:00	92.94
8/21/13 16:00	94.02	8/23/13 08:00	93.22	8/25/13 00:00	92.96
8/21/13 17:00	93.99	8/23/13 09:00	93.19	8/25/13 01:00	92.94
8/21/13 18:00	93.96	8/23/13 10:00	93.16	8/25/13 02:00	92.95
8/21/13 19:00	93.94	8/23/13 11:00	93.13	8/25/13 03:00	92.92
8/21/13 20:00	93.95	8/23/13 12:00	93.08	8/25/13 04:00	92.93
8/21/13 21:00	93.97	8/23/13 13:00	93.05	8/25/13 05:00	92.94
8/21/13 22:00	93.96	8/23/13 14:00	93	8/25/13 06:00	92.97
8/21/13 23:00	93.94	8/23/13 15:00	92.95	8/25/13 07:00	93
8/22/13 00:00	93.93	8/23/13 16:00	92.9	8/25/13 08:00	93.01
8/22/13 01:00	93.93	8/23/13 17:00	92.85	8/25/13 09:00	93.05
8/22/13 02:00	93.91	8/23/13 18:00	92.79	8/25/13 10:00	93.13
8/22/13 03:00	93.87	8/23/13 19:00	92.78	8/25/13 11:00	93.18
8/22/13 04:00	93.88	8/23/13 20:00	92.76	8/25/13 12:00	93.19
8/22/13 05:00	93.82	8/23/13 21:00	92.77	8/25/13 13:00	93.22
8/22/13 06:00	93.82	8/23/13 22:00	92.74	8/25/13 14:00	93.26
8/22/13 07:00	93.81	8/23/13 23:00	92.69	8/25/13 15:00	93.26
8/22/13 08:00	93.79	8/24/13 00:00	92.68	8/25/13 16:00	93.23
8/22/13 09:00	93.75	8/24/13 01:00	92.69	8/25/13 17:00	93.27
8/22/13 10:00	93.71	8/24/13 02:00	92.67	8/25/13 18:00	93.26
8/22/13 11:00	93.66	8/24/13 03:00	92.7	8/25/13 19:00	93.3
8/22/13 12:00	93.58	8/24/13 04:00	92.76	8/25/13 20:00	93.36
8/22/13 13:00	93.5	8/24/13 05:00	92.76	8/25/13 21:00	93.41
8/22/13 14:00	93.43	8/24/13 06:00	92.78	8/25/13 22:00	93.48
8/22/13 15:00	93.36	8/24/13 07:00	92.81	8/25/13 23:00	93.46

* Obtained from Environment Canada taken from the Edmonton City Centre Weather Station (AWOS)

Appendix VI FIELD VALIDATION MONITORING DATA SHEETS

aci Acoustical Consultants Inc.
5031 – 210 Street
Edmonton, Alberta, Canada T6M 0A8
Phone: (780) 414-6373, Fax: (780) 414-6376
www.aciacoustical.com

NCIA Regional Noise Model Annual Field Validation Monitoring Data Sheet

Site # 01 **Description:** Monitor Location R01

Line of Sight: Direct to Agrium and Sheritt and to Mel Martin's Transfer

Pre-Calibrate Date/Time: August 23, 2013 13:40 **Level:** 93.9 (dBA) **Unit #** 6

Post-Calibrate Date/Time: August 25, 2013 16:55 **Level:** 93.8 (dBA) **Initials:** PF

	SLM Unit #	Weather Unit #	Daily Store Time	L_{eq} (s)	dBA	dBC	1/3 Octave	Audio Quality
Monitor Parameters	2	N/A	22:00	1:00	☑	☑	☑	☑ Low (3 kHz max) ☐ Fair (6 kHz max) ☐ Medium (10 kHz max) ☐ High (20 kHz max)

Start Date/Time: August 23, 2013 13:40 **End Date/Time:** August 25, 2013 16:55

Site Sketch:

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Setup (Day 1) **Date/Time:** August 23, 2013 13:40

Weather: 23.7 C, 2.6 m/s from the east (107), Overcast

Subjective Observations: - Noise from the Agrium facility when there are lulls in traffic along the adjacent road - relatively broadband. Currently facility noise and not new construction noise. (around 49.0 dBA)

- Drop off after the 2 kHz octave band
- Rail noise will potentially be an issue at times. CN rail line to the east.
- potential from Highway when the wind is from that direction. Also, some truck traffic going into Mel's Transfer facility

Site Visit (Night 1) **Date/Time:** August 23, 2013 22:10

Weather: 19.6 C, 0.5 m/s from the East (90), overcast (cannot see stars)

Subjective Observations: - noise from the east dominates. Can distinctly hear Sheritt and Agrium separately.

- Very broadband that drops off the 2 kHz octave band
- No other noise sources from any other directions. All noise is facility noise and not construction noise

Site Visit (Day 2) **Date/Time:** August 24, 2013 10:40

Weather: 20.8 C, 0.5 m/s from the SW (216), Sunny Very calm.

Subjective Observations: Agrium and Sheritt are again the loudest noise sources. Noise from the Mel Martin's transfer facility. (Semi-truck idling)

- Can hear rail activity in the distance

Site Visit (Night 2) **Date/Time:** August 24, 2013, 00:40

Weather: 14 C, Very light east wind, clear sky

Subjective Observations:

Same as previous night.

There is a "rolling/banging" noise from the direction of Sherritt/Agrium.

Take-Down Day 3) **Date/Time:** August 25, 2013 16:55

Weather: 24 C, Light northern wind, mostly sunny

Subjective Observations: - industrial noise from Agrium/Sheritt facilities

- potential from road directly adjacent to monitor
- otherwise same as before.

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Site # R02 **Description:** NCIA R2 Location

Line of Sight: Direct to Keyera and Dow

Pre-Calibrate Date/Time: August 21, 2013 **Level:** 93.9 (dBA) **Unit #** 6

Post-Calibrate Date/Time: August 23, 2013 14:00 **Level:** 93.9 (dBA) **Initials:** PF

	SLM Unit #	Weather Unit #	Daily Store Time	L_{eq} (s)	dBA	dBC	1/3 Octave	Audio Quality
Monitor Parameters	5	N/A	22:00	1:00	☑	☑	☑	☑ Low (3 kHz max) ☐ Fair (6 kHz max) ☐ Medium (10 kHz max) ☐ High (20 kHz max)

Start Date/Time: August 21, 2013 12:50 **End Date/Time:** August 23, 2013 14:00

Site Sketch:

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Setup (Day 1) **Date/Time:** August 21,2013

Weather: Windy (+15 km/hr), Sunny, Approximately 18

Subjective Observations: Noise from Dow is very audible. Particularly in the high frequencies

- noise not as audible from the north due to the wind conditions
- difficult to hear anything else due to wind.

also noise from vehicle traffic from access road

Site Visit (Night 1) **Date/Time:** August 21, 2013 23:00

Weather: 12.4 C, Calm (0.8 m/s) from 159, Clear Skies

Subjective Observations: - Noise from the west is dominant over noise from east.

- Sudden increase in noise level from the east. Unsure where it is coming from. High pitch
- Noise from the south from a train engine revving its engine continually.
- With the exception of high frequency noise not much noise from east.
- Dominance is from the west and south.

Site Visit (Day 2) **Date/Time:** August 22, 2013 14:20

Weather: 25 C, Calm (2.5 m/s) from SE (102), Mostly Sunny

Subjective Observations: - Noise sources from the south are more audible.

- Possibility that the noise is from Highway 15.
- There are some contributions from Dow today (plant to the east) whereas it was not as audible on August 21
- 1/3 Octave trace confirms the subjective observation about the traffic noise.
- Not much noise from the west during this period.

Site Visit (Night 2) **Date/Time:** August 23, 2013 00:15

Weather: 13.6 C, 2.0 m/s from NW (343), Clear skies (can see the stars) Very calm!

Subjective Observations: - noise is coming from the east (high pitch) and west (internal combustion engine)

- very high frequency from Dow. Shut off while on-site.
- noise not necessarily from the stacks but instead just north of stacks in central cluster of facility
- noise from west is more just general facility noise. No new construction from either site.
- again relatively broadband. However, this extends just beyond 4 kHz

Take-Down Day 3) **Date/Time:** August 23, 2013 14:00

Weather: 24 C, Light northern wind, mostly sunny

Subjective Observations: Dow is very audible and dominant

Train to the south is also very loud with several whistles. Nothing from the west

Again was relatively broadband with exception of low frequency content from train engine

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Site # R03 **Description:** NCIA R3 Location

Line of Sight: Direct to Plains Midstream. Below a hill between road and PetroGas

Pre-Calibrate Date/Time: August 21, 2013 **Level:** 93.9 (dBA) **Unit #** 6

Post-Calibrate Date/Time: August 23, 2013 **Level:** 93.8 (dBA) **Initials:** PF

	SLM Unit #	Weather Unit #	Daily Store Time	L_{eq} (s)	dBA	dBC	1/3 Octave	Audio Quality
Monitor Parameters	6	N/A	22:00	1:00	☑	☑	☑	☑ Low (3 kHz max) ☐ Fair (6 kHz max) ☐ Medium (10 kHz max) ☐ High (20 kHz max)

Start Date/Time: August 21, 2013 13:20 **End Date/Time:** August 23, 2013 14:15

Site Sketch:

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Setup (Day 1) **Date/Time:** August 21,2013

Weather: Windy (+15 km/hr), Sunny, Approximately 18

Subjective Observations: Noise from Plains Site is dominant. Scrapers, excavators, graders all performing work

- occasional from road, though not very busy
- cannot hear anything from PetroGas. Likely due to wind conditions

Site Visit (Night 1) **Date/Time:** August 21, 2013 23:16

Weather: 12.4 C, Calm (0.8 m/s) from 159, Clear Skies

Subjective Observations:

- Noise is now distinctly audible from the southeast. It does not appear to be from the PetroGas facility but instead further to the south-southeast.
-Crickets are audible at this location and will potentially need to be taken out.
- The noise levels are relatively broadband at this location as verified remotely. There is a drop off after approximately 2 kHZ band.

Site Visit (Day 2) **Date/Time:** August 22, 2013 14:30

Weather: 25 C, Calm (2.5 m/s) from SE (102), Mostly Sunny

Subjective Observations: - Noise is from the south, likely due to the wind.

- There is equipment operating across the field (road). This again includes bulldozers, excavators, etc.
- Noise from nature but not as distinguishable
- new construction to the southwest as well. Backup beepers, engines revving, etc.
- Most of the noise is in the middle bands not as broadband as previous night visit.

Site Visit (Night 2) **Date/Time:** August 23, 2013 00:00

Weather: 13.6 C, 2.0 m/s from NW (343), Clear skies (can see the stars) Very calm!

Subjective Observations: Noise is now distributed between the facility to the west and the facility to the southeast. Subjectively, the location to the west is still louder however it is not overly dominant

- The noise can be defined as "Facility" noise whereas earlier in the day the noise predominantly new construction
- The trace of the noise is not as broadband as previous night.
- Again, a lot of noise from crickets

Take-Down Day 3) **Date/Time:** August 23, 2013 14:15

Weather: 23.7 C, 2.6 m/s from the east (107), Overcast

Subjective Observations: - very quiet from the west. There is still "new construction" to the northwest

- more audible from the east over the hill but still relatively quiet. Crickets again are very loud. Particularly during lulls from the new construction. Dow is audible (I think I called it Keyera before)
- trace was again broadband but varied depending on the equipment in the northwest

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Site # R04 **Description:** NCIA R4 Location

Line of Sight: Direct to Shell Scottsford

Pre-Calibrate Date/Time: August 21, 2013 **Level:** 93.9 (dBA) **Unit #** 6

Post-Calibrate Date/Time: August 23, 2013 14:30 **Level:** 93.8 (dBA) **Initials:** PF

	SLM Unit #	Weather Unit #	Daily Store Time	L_{eq} (s)	dBA	dBC	1/3 Octave	Audio Quality
Monitor Parameters	1	N/A	22:00	1:00	☑	☑	☑	☑ Low (3 kHz max) ☐ Fair (6 kHz max) ☐ Medium (10 kHz max) ☐ High (20 kHz max)

Start Date/Time: August 21, 2013 13:50 **End Date/Time:** August 23, 2013 14:30

Site Sketch:

Setup (Day 1) **Date/Time:** August 21,2013

Weather: Windy (+15 km/hr), Sunny, Approximately 18

Subjective Observations: Noise from Shell Scottsford dominant. Distinctly audible even with wind from west

- no vehicles passed by at all during the setup.

- potential from power lines above the monitoring location. Though not audible during the setup

Site Visit (Night 1) **Date/Time:** August 21, 2013 23:34

Weather: 11 C, Calm (0.8 m/s) from SW, Clear skies

Subjective Observations: very quiet. Nothing audible from Shell Scotford.

- Noise from the power lines is the dominant source.

- The levels and the noise sources were verified remotely

- It should be noted for each location that the train is often audible in the distance. It is not always dominant however still prevalent. Particularly with the train whistle.

Site Visit (Day 2) **Date/Time:** August 22, 2013 14:45

Weather: 25 C, Calm (2.5 m/s) from SE (102), Mostly Sunny

Subjective Observations: - Shell Scotford dominates the noise climate

- Definitely audible today and distinct in its direction from monitor

- Powerlines again are interfering. Strongly recommended that the location be changed next year to a location further away from the powerlines.

- again relatively quiet and broadband with lower frequency rumble present (Confirmed remotely)

Site Visit (Night 2) **Date/Time:** August 22, 2013 23:45

Weather: 13.7 C, 0.5 m/s from the SE (130), Clear skies (Can see stars) Very calm!

Subjective Observations: - Shell Scotford dominates the noise climate

- Definitely audible today and distinct in its direction from monitor

- subjectively seems much louder than previous night. Should be verified between monitoring nights

- Similar to R05, the location of lower frequencies are not apparent.

- Similar to other locations, the noise is considered "Facility" noise and not new construction noise

Take-Down Day 3) **Date/Time:** August 23, 2013 14:30

Weather: 23.5 C, 1.6 m/s from the SE (119), Overcast

Subjective Observations: - Shell Scotford dominates the noise climate

- Definitely audible today and distinct in its direction from monitor

- Similar to R05, the lower frequencies sources are not apparent.

- a mix of Facility noise and new construction noise

- noise from powerlines audible once again. This location should be moved next year further to the north

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NCIA Regional Noise Model Annual Field Validation Monitoring Data Sheet

Site # R05 **Description**: NCIA R5 Location

Line of Sight: Direct to Shell Scottsford

Pre-Calibrate Date/Time: August 21, 2013 **Level:** 93.9 (dBA) **Unit #** 6

Post-Calibrate Date/Time: August 23, 2013 14:50 **Level:** 93.8 (dBA) **Initials:** PF

	SLM Unit #	Weather Unit #	Daily Store Time	L_{eq} (s)	dBA	dBC	1/3 Octave	Audio Quality
Monitor Parameters	7	N/A	22:00	1:00	☑	☑	☑	☑ Low (3 kHz max) ☐ Fair (6 kHz max) ☐ Medium (10 kHz max) ☐ High (20 kHz max)

Start Date/Time: August 21, 2013 14:20 **End Date/Time:** August 23, 2013 14:50

Site Sketch:

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Setup (Day 1) **Date/Time:** August 21,2013

Weather: Windy (+15 km/hr), Sunny, Approximately 19

Subjective Observations: Noise from Shell to South dominates.

- 1 large Truck passed by when setting up. It dominated for the time
- no other noise distinctly audible

Site Visit (Night 1) **Date/Time:** August 22, 2013 00:04

Weather: 11 C, Calm (0.8 m/s) from SW, Clear skies

Subjective Observations: - Shell Scotford dominates by a large margin. No other no source is audible

- Noise is typical of an industrial facility
- some crickets at this location but not significant in comparison to the Shell site
- It is again (in comparison to other monitoring sites) relatively broadband. Reducing after the 2 kHz band

Site Visit (Day 2) **Date/Time:** August 22, 2013 15:00

Weather: 25 C, Calm (2.5 m/s) from SE (180), Mostly Sunny

Subjective Observations: - Shell Scotford dominates by a large margin. No other no source is audible

- Noise is typical of an industrial facility
- It is again (in comparison to other monitoring sites) relatively broadband. Reducing after the 2 kHz band
- Very similar to previous night

Site Visit (Night 2) **Date/Time:** August 22, 23:35

Weather: 13.7 C, 0.5 m/s from the SE (130), Clear skies (Can see stars) Very calm!

Subjective Observations: - Shell Scotford dominates by a large margin. No other no source is audible

- Noise is typical of an industrial facility but tends to have lower frequency content vs other site visits
- Still broadband but a little higher in lower frequencies
- Nothing from site to the west across the river despite being highly visible.

Take-Down Day 3) **Date/Time:** August 23, 2013 14:50

Weather: 23.5 C, 1.6 m/s from the SE (119), Overcast

Subjective Observations: - Shell Scotford dominates by a large margin. No other no source is audible

- Still broadband but a little higher in lower frequencies
- Nothing from site to the west across the river despite being highly visible.
- Similar to other site visits

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NCIA Regional Noise Model Annual Field Validation Monitoring Data Sheet

Site # R06 **Description:** NCIA R6 Location

Line of Sight: Direct to Agrium through trees

Pre-Calibrate Date/Time: August 21, 2013 **Level:** 93.9 (dBA) **Unit #** 6

Post-Calibrate Date/Time: August 23, 2013 15:40 **Level:** 93.9 (dBA) **Initials:** PF

	SLM Unit #	Weather Unit #	Daily Store Time	L_{eq} (s)	dBA	dBC	1/3 Octave	Audio Quality
Monitor Parameters	4	4	22:00	1:00	☑	☑	☑	☑ Low (3 kHz max) ☐ Fair (6 kHz max) ☐ Medium (10 kHz max) ☐ High (20 kHz max)

Start Date/Time: August 21, 2013 15:05 **End Date/Time:** August 23, 2013 15:40

Site Sketch:

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Setup (Day 1) **Date/Time:** August 21,2013

Weather: Calming (+10 km/hr), Sunny, Approximately 20

Subjective Observations: Noise from Agrium dominates. Can even hear vehicles honking horns

- 3 Vehicle pass-by's when setting up. It dominated for the time
- no other noise distinctly audible

Site Visit (Night 1) **Date/Time:** August 22, 2013

Weather: 11 C, Calm (0.8 m/s) from SW 216, Clear skies

Subjective Observations:
- Agrium totally dominates the noise climate
- No other facility noise can be heard from any other direction.
- No apparent noise from any wildlife
- Relatively broadband with noise levels dropping off after the 2 kHz band
- Noise typical of industrial site

Site Visit (Day 2) **Date/Time:** August 22, 2013 15:10

Weather: 25 C, Calm (2.5 m/s) from SE (180), Mostly Sunny

Subjective Observations:
- Agrium totally dominates the noise climate
- No other facility noise can be heard from any other direction.
- noise from wildlife is audible but just in lulls in Agrium
- noise from Agrium is facility noise and also new construction (dozers, etc.)
- Relatively broadband with noise levels dropping off after the 2 kHz band

Site Visit (Night 2) **Date/Time:** August 22, 2013 23:20

Weather: 13.7 C, 0.5 m/s from the SE (130), Clear skies (Can see stars) Very calm!

Subjective Observations:
- Agrium totally dominates the noise climate
- No other facility noise can be heard from any other direction.
- Noise typical of industrial site (i.e. no new construction noise) which is different from earlier in the day
- Relatively broadband with noise levels dropping off after the 2 kHz band (similar to other site visits)

Take-Down Day 3) **Date/Time:** August 23, 2013 15:40

Weather: 23.8 C, 1.7 m/s from East (092), Overcast

Subjective Observations:
- Noise from pump jacks is the only noise source audible
- very faint from Agrium and it is not consistent
- High pitch from the pump jacks. Could be an electric motor
- noise from crickets potentially

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NCIA Regional Noise Model Annual Field Validation Monitoring Data Sheet

Site # R07 **Description**: NCIA R7 Location (Monitor right at the end of the road to the west attached to blue fence)

Line of Sight: Direct to Agrium through trees

Pre-Calibrate Date/Time: August 23, 2013 17:00 **Level:** 93.9 (dBA) **Unit #** 6

Post-Calibrate Date/Time: August 25, 2013 18:30 **Level:** 93.9 (dBA) **Initials:** PF

	SLM Unit #	Weather Unit #	Daily Store Time	L_{eq} (s)	dBA	dBC	1/3 Octave	Audio Quality
Monitor Parameters	4	4	22:00	1:00	☑	☑	☑	☑ Low (3 kHz max) ☐ Fair (6 kHz max) ☐ Medium (10 kHz max) ☐ High (20 kHz max)

Start Date/Time: August 23, 2013 **End Date/Time:** August 25, 2013 18:30

Site Sketch:

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Setup (Day 1) **Date/Time:** August 23, 2013

Weather: 23.8 C, 3.3 m/s from the east 96, Overcast

Subjective Observations: - Noise from construction totally dominates over any noise from Agrium and the site to the southwest (Evonik). The construction is operating 24/7. The location is in both the southwest and southeast quarters directly adjacent to last year's monitoring. Equipment includes: haul trucks, dozers, excavators, etc

-They are also repairing the RGE RD 220 from TWP RD 564.

- Will get a good handle on the noise from construction

Site Visit (Night 1) **Date/Time:** August 23, 2013 23:10

Weather: 17.7 C, 1.3 m/s from the Northwest (318), overcast, cannot see any stars

Subjective Observations: Noise is again from construction

- The 1/3 octave trace is typical of that of construction. Low frequency from engines.
- higher frequencies from machines further away.

Site Visit (Day 2) **Date/Time:** August 24, 2013 11:35

Weather: 22.0 C, 1.2 m/s from SE (130), sunny. Again very calm

Subjective Observations: - Construction dominates. Cannot hear any of the facilities

-equipment includes haul trucks, excavators, gensets, rollers,

- Higher levels in the lower frequencies and again typical of construction noise

Site Visit (Night 2) **Date/Time:** August 24, 2013, 11:30

Weather: 18 C, essentially calm, clear sky

Subjective Observations: Construction activity completely dominates.
Same as previous times

Take-Down Day 3) **Date/Time:** August 25, 2013 18:30

Weather: 22 C, Sunny, Light wind from the north

Subjective Observations: - no construction at all. Noise could be heard from Agrium and Evonik

- very low frequency noise could be heard from Evonik.
- noise from Agrium is broadband and typical of the other facilities in the area.

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Site # 08 **Description:** Noise Monitor Location R08

Line of Sight: Through trees you can see the facility to the southeast. Can see Evonik to north but much further away.

Pre-Calibrate Date/Time: August 23, 2013 17:30 **Level:** 93.9 (dBA) **Unit #** 6

Post-Calibrate Date/Time: August 25, 2013 19:00 **Level:** 93.9 (dBA) **Initials:** PF

	SLM Unit #	Weather Unit #	Daily Store Time	L_{eq} (s)	dBA	dBC	1/3 Octave	Audio Quality
Monitor Parameters	7	N/A	22:00	1:00	☑	☑	☑	☑ Low (3 kHz max) ☐ Fair (6 kHz max) ☐ Medium (10 kHz max) ☐ High (20 kHz max)

Start Date/Time: August 23, 2013 17:30 **End Date/Time:** August 25, 2013 19:00

Site Sketch:

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Setup (Day 1) **Date/Time:** August 23, 2013 17:30

Weather: Sunny, 24 C, 1.3 m/s from NE (036)

Subjective Observations: - apparent from the southeast and east and northeast

-will need to verify what is there

Site Visit (Night 1) **Date/Time:** August 23, 2013 23:30

Weather: 17.7 C, 1.3 m/s from the Northwest (318), overcast, cannot see any stars

Subjective Observations: - dominant to the southeast again.

- I believe it might be Pembina/Williams or Fort Hills
- Potential from wildlife though again that would be between the lulls from the facility.

Site Visit (Day 2) **Date/Time:** August 24, 2013 11:50

Weather: 22.0 C, 1.2 m/s from SE (130), sunny. Again very calm

Subjective Observations: - noise from Pembina/Williams dominates

- New construction can be heard from site as well as facility noise
- noise from aircraft flyover
- relatively broadband and quiet when considering proximity (approx. 40 dBA)

Site Visit (Night 2) **Date/Time:** August 24, 2013, 23:00

Weather: 17C, essentially calm, clear sky

Subjective Observations:

Provident/Williams completely dominates. Flaring is occurring. No other facilities audible

Take-Down Day 3) **Date/Time:** August 25, 2013 19:00

Weather: 21C, relatively calm, mostly sunny

Subjective Observations: - noise to the southeast dominates again.

- noise is again broadband
- no other facilities are audible.

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Site # 09 **Description**: Noise Monitor Location R09

Line of Sight: Direct over the trees to the facilities to the east. Easier seen at night that it spans to the south and north

Pre-Calibrate Date/Time: August 23, 2013 18:30 **Level:** 93.9 (dBA) **Unit #** 6

Post-Calibrate Date/Time: August 25, 2013 19:40 **Level:** 93.8 (dBA) **Initials:** PF

	SLM Unit #	Weather Unit #	Daily Store Time	L_{eq} (s)	dBA	dBC	1/3 Octave	Audio Quality
Monitor Parameters	6	N/A	22:00	1:00	☑	☑	☑	☑ Low (3 kHz max) ☐ Fair (6 kHz max) ☐ Medium (10 kHz max) ☐ High (20 kHz max)

Start Date/Time: August 23, 2013 18:30 **End Date/Time:** August 25, 2013 19:40

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Site Sketch:

Setup (Day 1) **Date/Time:** August 23, 2013 18:30

Weather: Sunny, 24 C, 3.8 m/s from NE (036)

Subjective Observations: - apparent from the southeast and east and northeast

- almost entirely from the east however there is resident contributions in the area with vehicle pass-by's.

Site Visit (Night 1) **Date/Time:** August 24, 2013 00:10

Weather: 17.7 C, 1.3 m/s from the North (348), overcast, cannot see any stars

Subjective Observations: - the noise is coming entirely from the east.

- When standing outside the noise appears as a wall coming from the southeast, east and northeast
- 1/3 Octave trace indicates higher levels in the lower frequencies which can be confirmed subjectively
- Higher frequency content can be heard coming from directly east of the monitor. All other directions from the monitor are lower frequencies.

Site Visit (Day 2) **Date/Time:** August 24, 2013 12:30

Weather: 24.0 C, 0.7 m/s from the SW (240), Sunny. Again, very calm

Subjective Observations: - facilities to the east can be heard faintly

- a lot more residential noise from vehicles, lawnmowers, etc.
- noise from nature, (crickets, birds, etc)
- relatively quiet (35 dBA) with lower frequencies but they are not subjectively noticeable.

Site Visit (Night 2) **Date/Time:** August 24, 2013, 22:15

Weather: 18 C, 2.3 m/s from north, feels calm, clear sky

Subjective Observations: take picture location

Train nearby. Train horn blasting (22:16-22:19)

Industry to the SE (other side of river) completely dominates.

Noise from NE (Shell Scottford) not specifically discernible

Take-Down Day 3) **Date/Time:** August 25, 2013 19:40

Weather: 21 C, calm, mostly sunny

Subjective Observations: - noise is primarily from the northeast.

- typical of other site visits with low frequency content.
- occasional noise from residents.

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NCIA Regional Noise Model Annual Field Validation Monitoring Data Sheet

Site # R10 **Description:** NCIA R10 Location

Line of Sight: Direct to Agrium Facility

Pre-Calibrate Date/Time: August 21, 2013 **Level:** 93.9 (dBA) **Unit #** 6

Post-Calibrate Date/Time: August 23, 2013 **Level:** 93.8 (dBA) **Initials:** PF

	SLM Unit #	Weather Unit #	Daily Store Time	L_{eq} (s)	dBA	dBC	1/3 Octave	Audio Quality
Monitor Parameters	2	5	22:00	1:00	☑	☑	☑	☑ Low (3 kHz max) ☐ Fair (6 kHz max) ☐ Medium (10 kHz max) ☐ High (20 kHz max)

Start Date/Time: August 21, 2013 12:15 **End Date/Time:** August 23, 2013 13:10

Site Sketch:

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Setup (Day 1) **Date/Time:** August 21,2013

Weather: Windy (+15 km/hr), Sunny, Approximately 18

Subjective Observations: Noise from Agrium dominates

-also noise from vehicle traffic from access road

- difficult to hear anything else due to wind.

Site Visit (Night 1) **Date/Time:** August 21, 2013 22:37

Weather: 12.4 C, Calm (0.8 m/s) from 159, Clear Skies

Subjective Observations: - Plant to South and South west distinctly audible (Agrium, verify other plant)

- Plant to northeast distinctly audible as well as plant to the east. (Dow, Praxair, MEG Global)
- Not one location dominates, but all have an equal contribution, (Subjectively)
- As verified with the SLM (remotely), the noise is relatively broadband with no audible tones

Site Visit (Day 2) **Date/Time:** August 22, 2013 14:00

Weather: 25 C, Calm (2.5 m/s) from SE (102), Mostly Sunny

Subjective Observations: Again, noise is primarily from the south, southwest. (Agrium)

- Plant to the southeast is again audible but very faint in comparison to the plant to the south and southwest
- As verified with the SLM (remotely), the noise is relatively broadband with no audible tones

Site Visit (Night 2) **Date/Time:** August 23, 2013 00:30

Weather: 12.8 C, Calm 1.7 m/s from NW (335), Clear Skies (can see stars) Very Calm!

Subjective Observations: Noise from the northeast is now dominant. It also appears as though there is a distinction from northeast to east (i.e. two parts to the facility)

- the site to the direct south is partially audible but not really contributing to the noise levels.
- noise from all sources can be defined as Facility noise and not new construction noise.
- with a slight shift in wind they all equally contribute.

Take-Down Day 3) **Date/Time:** August 23, 2013 13:10

Weather: 23.7 C, 2.6 m/s from the east (107), Overcast

Subjective Observations: -noise from the east. (Dow)

- also from the southeast
- nothing audible from the west and southwest.
- rail activity when picking up monitor

aci Acoustical Consultants Inc.
5031 – 210 Street
Edmonton, Alberta, Canada T6M 0A8
Phone: (780) 414-6373, Fax: (780) 414-6376
www.aciacoustical.com

NCIA Regional Noise Model Annual Field Validation Monitoring Data Sheet

Site # 11 **Description:** Noise Monitor Location R11

Line of Sight: Direct to Pembina/Williams to the northeast and to the large facilities to the east

Pre-Calibrate Date/Time: August 23, 2013 17:30 **Level:** 93.9 (dBA) **Unit #** 6

Post-Calibrate Date/Time: August 25, 2013 19:15 **Level:** 93.8 (dBA) **Initials:** PF

	SLM Unit #	Weather Unit #	Daily Store Time	L_{eq} (s)	dBA	dBC	1/3 Octave	Audio Quality
Monitor Parameters	1	N/A	22:00	1:00	☑	☑	☑	☑ Low (3 kHz max) ☐ Fair (6 kHz max) ☐ Medium (10 kHz max) ☐ High (20 kHz max)

Start Date/Time: August 23, 2013 18:00 **End Date/Time:** August 25, 2013 19:15

Site Sketch:

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Setup (Day 1) **Date/Time:** August 23, 2013 18:00

Weather: Sunny, 24 C, 1.3 m/s from NE (036)

Subjective Observations: - at the time of setup there was a small combustion engine being used to either pump water out or into a small retention pond to the south of the intersection just beyond the trees. There is no indication if this pump is permanent or temporary and if it under use all of the time.

- Will have to investigate during other site visits.

-Due to small engine noise from any other location is inaudible

Site Visit (Night 1) **Date/Time:** August 23, 2013 23:52

Weather: 17.7 C, 1.3 m/s from the North (348), overcast, cannot see any stars

Subjective Observations: - Noise is primarily from the far east. Will have to verify on map.

- low frequency Facility rumble.

- though the facility to the northeast is visible it is not audible even though the slight breeze is from the north

-

Site Visit (Day 2) **Date/Time:** August 24, 2013 12:10

Weather: 22.0 C, 1.2 m/s from SE (130), sunny. Again very calm

Subjective Observations: - the small internal combustion engine again dominates

- will take picture of it to add to file

- might need to reconsider location if the pumping continues into the night-time

- 1/3 octave spectrum is consistent with engine

Site Visit (Night 2) **Date/Time:** August 24, 2103, 22:45

Weather: 18 C, essentially calm, clear,

Subjective Observations: Water running or being pumped in pond immediately to the south (no engine noise)

Mid/high frequency noise from the northeast (perhaps Provident/Williams). Flaring is occurring

Low frequency noise from east and northeast but hard to localize

Take-Down Day 3) **Date/Time:** August 25, 2013 19:15

Weather: 22 C, Calm with light wind from north, mostly sunny

Subjective Observations: Train noise from the east,

- new construction noise from the northeast

- facility noise from the east though not very loud.

- flaring occurring again.

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NCIA Regional Noise Model Annual Field Validation Monitoring Data Sheet

Site # R12 **Description:** NCIA R12 Location

Line of Sight: No direct line of sight to any location

Pre-Calibrate Date/Time: August 21, 2013 **Level:** 93.9 (dBA) **Unit #** 6

Post-Calibrate Date/Time: August 23, 2013 15:15 **Level:** 93.8 (dBA) **Initials:** PF

	SLM Unit #	Weather Unit #	Daily Store Time	L_{eq} (s)	dBA	dBC	1/3 Octave	Audio Quality
Monitor Parameters	3	6	22:00	1:00	☑	☑	☑	☑ Low (3 kHz max) ☐ Fair (6 kHz max) ☐ Medium (10 kHz max) ☐ High (20 kHz max)

Start Date/Time: August 21, 2013 15:55 **End Date/Time:** August 23, 2013 15:15

Site Sketch:

N W E S

Setup (Day 1) **Date/Time:** August 21,2013

Weather: Windy (+10 km/hr), Sunny, Approximately 20

Subjective Observations: In the distance you can hear CP rail

-no other apparent noise sources

- relatively quiet

Site Visit (Night 1) **Date/Time:** August 22, 2013 00:30

Weather: 10 C, calm (1.3 m/s) from SW 227, Clear Skies

Subjective Observations: no apparent dominant noise source

- noise coming from general west direction, again not from a distinct source.
- potential from nature in the early morning

-relatively quiet

Site Visit (Day 2) **Date/Time:** August 22, 2013 15:28

Weather: 26.2 C, 3.4 m/s from south (213), Partly Sunny

Subjective Observations: - Similar to previous night visit

- noise coming from general west direction, again not from a distinct source.
- relatively quiet
- relatively broadband

Site Visit (Night 2) **Date/Time:** August 22, 2013 23:05

Weather: 12 C, 0.5 m/s from the NW (290), Clear skies (Can see stars) Very Calm!

Subjective Observations: no apparent dominant noise source

- noise coming from general west direction, again not from a distinct source.

-relatively quiet

- can hear livestock in the distance (cows)
- similar trace to previous site visits

Take-Down Day 3) **Date/Time:** August 23, 2013 15:15

Weather: 23.8 C, 1.7 m/s from East (092), Overcast

Subjective Observations: - noise from Highway from the southeast and also faint traffic noise from directly east

- subjectively there is no noise from the west. No low frequency rumble which was audible during other site visits.
- again very quiet.

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Phone: (780) 414-6373, Fax: (780) 414-6376
www.aciacoustical.com

NCIA Regional Noise Model Annual Field Validation Monitoring Data Sheet

Site # R12 **Description**: NCIA R12 Location

Line of Sight: No direct line of sight to any location

Pre-Calibrate Date/Time: August 23, 2013 15:15 **Level:** 93.9 (dBA) **Unit #** 6

Post-Calibrate Date/Time: August 25, 2013 17:55 **Level:** 93.9 (dBA) **Initials:** PF

	SLM Unit #	Weather Unit #	Daily Store Time	L_{eq} (s)	dBA	dBC	1/3 Octave	Audio Quality
Monitor Parameters	3	6	22:00	1:00	☑	☑	☑	☑ Low (3 kHz max) ☐ Fair (6 kHz max) ☐ Medium (10 kHz max) ☐ High (20 kHz max)

Start Date/Time: August 23, 2013 15:15 **End Date/Time:** August 25, 2013 17:55

Site Sketch:

N
W E
S

Setup (Day 1) **Date/Time:** August 23, 2013 15:15

Weather: 23.8 C, 1.7 m/s from East (092), Overcast

Subjective Observations: - noise from Highway from the southeast and also faint traffic noise from directly east

-no other apparent noise sources

- relatively quiet

- nothing observable from the west

Site Visit (Night 1) **Date/Time:** August 23, 2013 22:36

Weather: 17.6 C, 0.7 m/s from the north (20), overcast, no stars very calm again

Subjective Observations: - very quiet

- only audible noise from facilities is to the southwest

- low rumble

- really quiet (30 dBA) and broadband, no tones

Site Visit (Day 2) **Date/Time:** August 24, 2013 11:00

Weather: 21.3 C, 0.5 m/s from the West (222), Sunny, Vey calm!

Subjective Observations: - similar to previous sites visits.

- Slighly audible hum/rumble from the west. Not distinct from a given facility

- Potential from aircraft flyovers.

- Noise from nature.

- Really quiet again (approx. 30 dBA) and broadband, no tones

Site Visit (Night 2) **Date/Time:** August 24, 2013, 00:00

Weather: 14 C, essentially calm, clear sky

Subjective Observations:

Train at 23:53-00:00. Rail noise dominant for a very long time because train makes a big loop around monitor location

Shell Scottford dominates with low frequency and some mid frequency hum (no tones)

Quite broadband, similar to the previous night.

Take-Down Day 3) **Date/Time:** August 25, 2013 17:55

Weather: Calm with brief wind from the north, 22 C, mostly sunny

Subjective Observations: Train just as I was picking up the monitor

-otherwise similar to all previous site visits. Noise very faint from the west.

APPENDIX 2

Comparison of Model Predictions
Versus
2013 Measured Sound Levels

Via Email: ncia@telusplanet.net

September 8, 2014

Dr. Laurie J. Danielson
Northeast Capital Industrial Association
Suite 204, 9902 - 102 Street
Fort Saskatchewan, AB T8L 2C3

SLR Project No.: 203.50029.00000

Dear Dr. Danielson:

RE: COMPARISON OF PREDICTED TO MEASURED SOUND LEVELS FOR 2013 MONITORING PROGRAM – REV 1

SLR Consulting (Canada) Ltd. (SLR) has been asked by the Northeast Capital Industrial Association (NCIA) to provide predictions from NCIA's Regional Noise Model (RNM) at 11 locations in the Alberta Industrial Heartland (AIH). The purpose of the predictions is for comparison to measured sound levels obtained from a noise survey conducted by ACI Acoustical Consultants Inc. (ACI) between August 21, 2013 and August 25, 2013. The results of the noise survey are available in a November 2013 report by ACI[1].

The easting and northing coordinates of Locations 1 through 11 listed in the ACI report were used as receptor points in the RNM. The height of all receptors was 1.5 metres above the ground. Location 12 was not included as a receptor point as it was a monitoring location chosen to measure ambient sound levels in the region, absent from industrial noise contribution.

Meteorological conditions used for the model runs were taken from Section 6.3 and Appendix V of the ACI report. The ACI report presents 1-minute wind speed, wind direction, temperature, and humidity data for each of three weather station locations. Hourly barometric pressure data was provided for the City of Edmonton. Average meteorological conditions were determined for each nighttime period (10:00 pm – 7:00 am) by SLR from the ACI data. The averages were a numerical average of all data over all weather stations.

The wind direction on the first night (August 21-22) was predominantly from the SSW. However, on the following three nights the wind speed was low and the wind direction varied. Following from the conclusions drawn by ACI in Section 6.3 of their report, SLR chose to run the model predictions for calm winds on these last three nights. The modeled meteorological conditions corresponding to the four nights of monitoring are shown in Table 1 (attached).

Table 2 (attached) gives the measured sound levels, predicted sound levels, and the difference between the predicted and measured sound level for each location and each night. The measured sound levels are the isolated nighttime values presented in Table 2 of the ACI report.

[1] Froment, P., "Environmental Noise Survey for the Regional Noise Model Annual Field Validation Monitoring," ACI, Edmonton, AB, ACI Project #13-043, 2013.

Note that there were no isolated nighttime values reported by ACI for Location 7 due to continuous construction noise activity near that location.

The results presented show average differences between -6.0 to +3.4, where a negative number indicates that the predicted value is less than the measured value. Most locations result in a reasonable agreement between the model predictions and measured sound levels.

NICA and ACI are encouraged to contact SLR for any assistance in providing further interpretation of the prediction results, or measured differences.

Yours sincerely,
SLR Consulting (Canada) Ltd.

Prepared by:

Chris Bibby, M.A.Sc., E.I.T.
Project Engineer

Reviewed by:

Pascal Everton, P.Eng.
Principal Engineer

Enc.

- Table 1: Meteorological Data used for Noise Modelling
- Table 2: Predicted Sound Levels and Measured Differences

CB/lah

TABLES

Northeast Capital Industrial Association
Comparison of Predicted to Measured Sound Levels
for 2013 Monitoring Program – Rev 1
SLR Project No.: 203.50029.00000

Table 1: Meteorological Data used for Noise Modelling

	Aug. 21-22	Aug. 22-23	Aug. 23-24	Aug. 24-25
Wind Speed (km/h)	5.93	0	0	0
Wind Direction	SSW	-	-	-
Temperature (˚C)	10.63	11.19	16.37	14.37
Humidity (% RH)	70.74	87.70	81.63	82.22
Barometric Pressure (kPa)	93.90	93.18	92.72	92.94

Table 2: Predicted Sound Levels and Measured Differences

Receptor	Measured (M) and Predicted (P) Nighttime Sound Levels (Isolated dBA Leq)												Average Difference (dBA)
	Aug. 21-22			Aug. 22-23			Aug. 23-24			Aug. 24-25			
	M	P	Δ (P – M)	M	P	Δ (P – M)	M	P	Δ (P – M)	M	P	Δ (P – M)	
1	-	48.8	-	-	51.3	-	50.7	51.0	0.3	50.0	51.2	1.2	0.8
2	53.8	54.1	0.3	56.3	55.5	-0.8	-	55.0	-	-	55.2	-	-0.2
3	49.3	49.9	0.6	48.1	46.3	-1.8	-	45.5	-	-	45.8	-	-0.6
4	40.3	47.0	6.7	50.5	50.5	0.0	-	49.9	-	-	50.1	-	3.4
5	54.5	56.3	1.8	53.4	53.2	-0.2	-	52.5	-	-	52.8	-	0.8
6	47.1	40.0	-7.1	43.0	38.1	-4.9	-	37.5	-	-	37.8	-	-6.0
7	-	36.7	-	-	35.7	-	N/A	34.9	N/A	N/A	35.2	N/A	N/A
8	-	45.1	-	-	44.8	-	48.1	44.4	-3.7	47.6	44.5	-3.1	-3.4
9	-	48.9	-	-	45.8	-	47.4	45.0	-2.4	46.3	45.3	-1.0	-1.7
10	54.4	57.5	3.1	55.8	55.2	-0.6	-	54.8	-	-	55.0	-	1.3
11	-	38.3	-	-	39.5	-	44.0	38.7	-5.3	40.1	39.0	-1.1	-3.2

APPENDIX 3

NCIA MEMBER COMPANY NOISE MANAGEMENT PLAN UPDATES

<table>
<tr><td rowspan="1">NCIA Northeast Capital Industrial Association</td><td>NCIA Standards and Guidelines</td><td colspan="2">Document Number
2010-003</td></tr>
<tr><td colspan="2">Noise Management Plan Reporting Requirements as per Section 5.4 of this Standard</td><td>Rev. Date
14-Apr-14</td><td>Rev.
2</td></tr>
</table>

Access Pipeline Inc.:

Note, please provide as much detail as you can for the following, attaching any clarifying or required documents with your submission.

If you have any questions, please call Laurie Danielson @ 780.992.1463

Input Description	Member Site Comments
Confirmation that site has implemented a best management practice to address environmental noise as per NCIA Noise Management Plan Standard 2010-003 issued 3-Sep-10, revised 5-Mar-13, revised 14-Apr-14 (attached), including the Procedure/Practice/Standard reference. Note, if you have not provided an electronic copy of your site plan to NCIA, please do so.	-under review internally to develop a Noise Management Plan
Attach results of any monitoring/assessments (fenceline outward) completed in 2013. Note, you are not required to conduct any off-site monitoring, however if you did, please provide those results electronically to NCIA.	n/a
Disclose any improvements/corrective actions implemented in 2013 or status thereof that would impact the noise level output for your site (either up or down). Did those changes result in a requirement to update your site noise model? If so, have you provided your updated site model to SLR Consulting for incorporation into the NCIA Regional Noise Model as per the process outlined for this purpose?	n/a

Disclose any improvements/projects that are approved for 2014 that would impact the noise level output for your site (either up or down). Will these changes result in a requirement to update your site noise model? If so, when do you anticipate having an updated site model available?	n/a
Disclose any audit/self-assessment evaluation (qualitative evaluation only, with senior site leader sign-off) completed for your site noise management plan.	Self –assessments attached
Provide a Noise Complaint summary for all noise complaints received in 2013 including any actions taken to address them.	No noise complaints received

This information is being collected as per the NMP Standard 2010-003 Document attached, section 5.4. All information provided will be disclosed to the AER as part of the required NCIA Annual Reporting on the Regional Noise Management Plan.

Further, the Annual Report will be a public document available on our website once finalized.

FFA Consultants in Acoustics and Noise Control

Noise Impact Assessment

Access Pipeline Inc.
Sturgeon Terminal
LSD 04-18-56-21 W4M

Prepared For & Requested By

Mr. Cyril Karvonen, R.E.T.
Access Pipeline Inc.

Prepared By

Mr. Shane Smith, EIT, M.Sc.
Mr. Clifford Faszer, P. Eng.
FFA Consultants in Acoustics and Noise Control Ltd.

June 2, 2009

FFA File 108-1940-01

304, 605 – 1st Street S.W., Calgary, Alberta T2P 3S9
Telephone: (403) 508-4996 Fax: (403) 508-4998 info@ffaacoustics.com

Executive Summary

Access Pipeline Inc. (Access) has constructed and commissioned a diluent pumping station (Sturgeon Terminal) in LSD 04-18-56-21 W4M. As per the application process of the Alberta Energy Resources Conservation Board (ERCB), Access retained FFA Consultants in Acoustics and Noise Control Ltd. (FFA) to complete a Noise Impact Assessment for this facility prior to construction. The results of this assessment determined the potential for compliance of the then-proposed facility with the allowable sound level limits of the ERCB Noise Control Directive 038 (Directive 038). This report serves to provide Access with an updated NIA for the Sturgeon Terminal, and has been completed using measurements of the actual facility as constructed. The assessment additionally provides the foundation to develop and evaluate noise control measures for the Access facility should the results indicate that the predicted sound level exceeds the allowable sound level limits of Directive 038. Access retained the services of FFA to complete this evaluation.

FFA completed sound pressure level measurements of the significant noise sources associated with the existing facility equipment during a site visit on May 26, 2009. Using accepted acoustical engineering techniques, the sound pressure level data was used to calculate sound power levels. The sound power levels were incorporated into ENM, an environmental noise propagation model. The noise propagation model was used to predict the facility sound level at the nearest residence located approximately 430 metres southeast of the facility fence line. The results of the model are combined with the ambient sound level to determine the cumulative result as established in Directive 038. The overall result (cumulative sound level) is compared with the Permissible Sound Level (PSLs) of Directive 038 in order to determine potential compliance. The results of the modelling along with the PSLs of Directive 038 are presented in the following table.

Predicted Sound Levels
Access Sturgeon Terminal
LSD 04-18-56-21 W4M

Location & Sound Level Descriptor	Daytime Sound Level (dBA L_{eq})	Nighttime Sound Level (dBA L_{eq})
Residence – 430 metres Southeast		
Predicted Cumulative Sound Level	50.4	42.9
ERCB Permissible Sound Level	55.0	45.0

FFA File 108-1940-01

The results of the environmental noise propagation model confirm that the Access facility by itself potentially complies with both the daytime and nighttime PSLs of Directive 038 at the residence assessed. A check of the dBC – dBA value indicates that the facility would also comply with the LFN requirements of Directive 038. Access is advised that additional facilities exist which are in proximity to the residence assessed. These facilities are expected to contribute to the sound environment; however, they were not considered in this assessment. Should a noise complaint be filed, a more detailed analysis examining the noise impact of all nearby facilities would be necessary.

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Glossary I

Appendix A -- Permissible Sound Level Determination

Residence – 430 metres Southeast A-1

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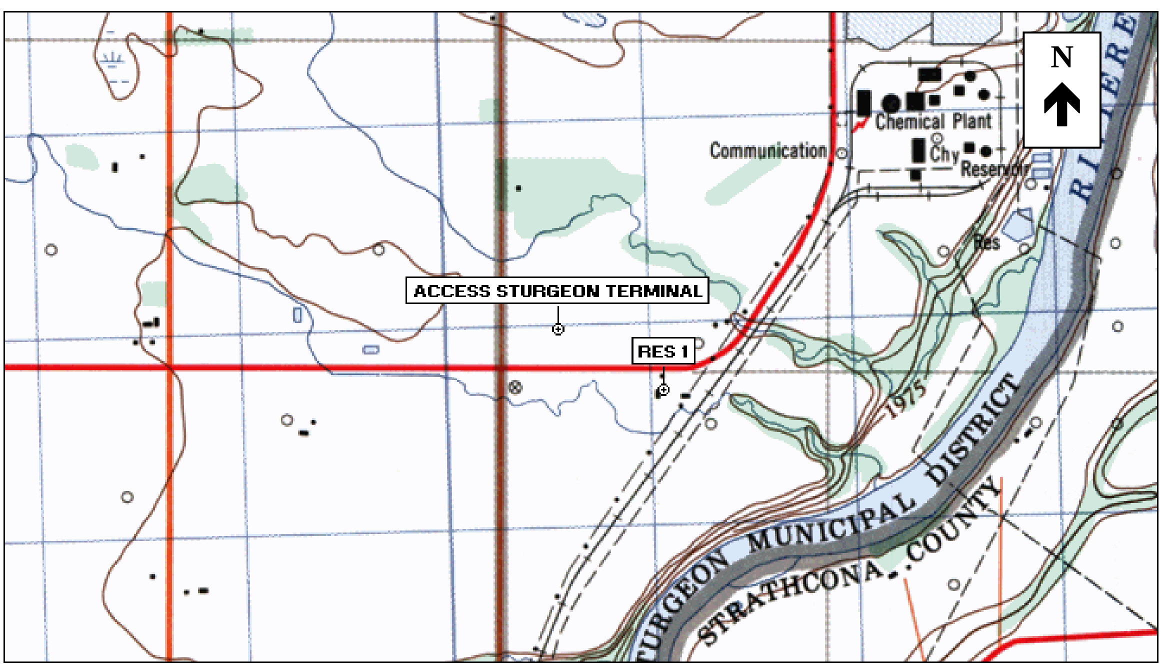
Background & Scope

Access Pipeline Inc. (Access) has constructed and commissioned a diluent pumping station (Sturgeon Terminal) in LSD 04-18-56-21 W4M. As per the application process of the Alberta Energy Resources Conservation Board (ERCB), Access retained FFA Consultants in Acoustics and Noise Control Ltd. (FFA) to complete a Noise Impact Assessment for this facility prior to construction. The results of this assessment determined the potential for compliance of the then-proposed facility with the allowable sound level limits of the ERCB Noise Control Directive 038 (Directive 038). This report serves to provide Access with an updated NIA for the Sturgeon Terminal, and has been completed using measurements of the actual facility as constructed. The assessment additionally provides the foundation to develop and evaluate noise control measures for the Access facility should the results indicate that the predicted sound level exceeds the allowable sound level limits of Directive 038. Access retained the services of FFA to complete this evaluation.

Site Description & Residence Locations

The Access Sturgeon Terminal is located in LSD 04-18-56-21 W4M, approximately 12 kilometres south of Redwater, Alberta, in the Alberta Industrial Heartland. The residence considered in this assessment is located approximately 430 metres southeast of the facility fence line. The topography of the area consists of relatively flat agricultural land. Figure 1 presents a map of the study area indicating the location of the residence, the Access facility site and other area features.

Figure 1
Study Area Map
Access Sturgeon Terminal
LSD 04-18-56-21 W4M



FFA File 108-1940-01

Site Description & Residence Locations (continued)

The facility location in Figure 1 was plotted on this copy of the National Topographic System Universal Transverse Mercator 1000 metre grid map with information recorded during the study area visit using a hand held global positioning system (GPS) device.

Facility Equipment

The Access Sturgeon Terminal consists of a number of electric motor-driven pumps housed in insulated metal buildings. The Shipping Pump Building (B-308) contains two WEG 1250 HP electric motors operating at 3587 RPM. Each motor drives a 3 stage, 2275 GPM at 3560 RPM Sulzer pump. During the site visit, one of the two pumps was in operation as the second pump serves as a maintenance back-up.

The Diluent Q.A. Building (B-312) contains four WEG 3 HP electric motors operating at 1765 RPM as well as various piping and pumping equipment. All four pumps were in operation during the site visit.

The Booster Pump Building (B-306) contains a pump driven by a Reliance Electric 200 HP electric motor operating at 3575 RPM. Two additional electric motor-driven pumps are also housed in B-306; however, these were not in operation during the site visit.

Finally, the Injection Pump Building (B-310) contains a WEG 20 HP electric motor operating at 1175 RPM and driving a reciprocating pump. A WEG 5 HP electric motor drives an additional pump within the building. Not in operation during the site visit were five pumps, each driven by a Reliance Electric 125 HP electric motor.

Approach

FFA completed sound pressure level measurements of the significant noise sources associated with the existing facility equipment during a site visit on May 26, 2009. Using accepted acoustical engineering techniques, the sound pressure level data was used to calculate sound power levels. Data regarding the topography and vegetation of the area surrounding the facility site was noted during the site visit and supplemented with commercially available information. This information was used as input parameters for an environmental noise propagation computer model to predict the facility sound level at a nearby residence located approximately 430 metres southeast of the facility fence line. The results of the model are combined with the ambient sound level to determine the cumulative result as established in Directive 038. The overall result (cumulative sound level) is compared with the Permissible Sound Level (PSLs) of Directive 038 in order to determine potential compliance.

The results of the model are presented as the individual component sound levels as well as the overall facility sound level contribution and the overall predicted cumulative sound level. Noise control measures, if warranted or requested, are developed and evaluated within the noise propagation model with the predicted sound level after implementation reported for the point of interest. Acoustical specifications, if required, are developed and reported along with the recommendations.

Noise Criteria

Directive 038 is a receiver-oriented noise regulation that applies to energy industry facilities in the Province of Alberta under the jurisdiction of the ERCB. Directive 038 requires the completion of a Noise Impact Assessment for any permanent facility where there is a reasonable expectation of a continuous noise source. Directive 038 specifies allowable sound levels for energy industry facilities at designated receptor points including residences. Directive 038 indicates that in lieu of a residence within 1500 metres of the fence line of a facility, a level of 40 dBA L_{eq} must not be exceeded at this distance during the nighttime. These specified limits are the permissible sound levels (PSLs).

Directive 038 requires that all facilities licensed after October 17, 1988 meet the PSLs. Actual compliance is only determined by comparing the permissible sound levels to the Comprehensive Sound Level (cumulative sound level or CSL) of a valid comprehensive sound survey. Although it is not mandatory to complete a comprehensive sound survey after the commissioning of a new, expanded or revamped facility, the ERCB expects that the CSL of the facility comply with the applicable PSLs. Noise Impact Assessments determine the CSL by adding the contribution of the facility to the ambient sound level.

Directive 038 provides two methods for determining the ambient sound environment. The more common of the two utilizes an average ambient sound environment as defined in Directive 038. The definition states that the average ambient sound level is 5 dBA less than the applicable basic sound level (BSL) for the dwelling unit or residence. The second less commonly used method requires the completion of a valid ambient sound level survey; the results of which then define the ambient sound level for a dwelling unit or residence.

The PSLs are derived from information regarding the area population density, proximity to heavily travelled transportation routes including motor vehicle routes, rail lines, aircraft flyways and other specified adjustments. The PSL during the daytime is adjusted to a level 10 dBA above the nighttime level.

The available information indicates that the residence considered in this assessment is within 500 metres of Alberta Highway 643. As such, this residence is potentially subject to placement in Transportation Category 2 of the nighttime basic sound level (BSL) matrix. The ERCB defines Proximity to Transportation Category 2 of the BSL determination matrix as a residence located within 500 metres of a numbered highway or heavily traveled road that has a minimum traffic count of 10 vehicles per nighttime hour. The most recent (2007) Alberta Transportation data indicates that the Average Annual Daily Traffic (AADT) count along this section of Highway 643 is 2310 vehicles per day. Assuming 10% of the traffic occurs during the nighttime period, it is reasonably concluded with the available information that the traffic volume of this is road satisfies the ERCB definition. Therefore, this residence is placed in Proximity to Transportation Category 2 pending additional information that would support reclassification.

Noise Criteria (continued)

Table 1 presents the PSLs for the locations assessed. The detailed evaluation of the PSLs is presented in Appendix A.

Table 1
Permissible Sound Levels
Access Sturgeon Terminal
LSD 04-18-56-21 W4M

Location	ERCB Daytime Permissible Sound Level (dBA L_{eq})	ERCB Nighttime Permissible Sound Level (dBA L_{eq})
Residence – 430 metres Southeast	55.0	45.0

FFA File 108-1940-01

The CSL is the sound level in dBA L_{eq} as measured at the nearest, most impacted, or complainant's residence. This includes the sound of the facility and other environmental sounds. To assess compliance with PSLs, abnormal or non-facility related noise events must be identified and excluded from the data, with a minimum period of six continuous hours, three hours during the daytime and three hours during the nighttime, remaining. This removal process results in the isolated facility sound level.

The L_{eq} is the A-weighted equivalent continuous sound level. This index is an energy average of the varying sound level over a specified period. The L_{eq} index considers both the sound level and the length of time that the sound level occurs. The use of this index permits the description of a varying sound level environment as a single number. As the L_{eq} is an "average" level, the measured sound level may exceed the criterion level from time to time, as long as the duration of the excess is limited.

Low Frequency Noise

Directive 038 indicates that low frequency noise (LFN) emanating from a facility can create concern from nearby residents in some situations where the overall dBA value is satisfactory. In response to this issue, Directive 038 outlines the methodology for the evaluation of facility-related low frequency noise. In summary, the Directive requires the simultaneous measurement of the overall “A” weighted sound level (dBA L_{eq}) and the overall “C” weighted sound level (dBC L_{eq}). Directive 038 defines two requirements in the identification of a low frequency noise situation. Firstly, there must be a 20 dB or greater difference in the measured overall valid dBA L_{eq} value when subtracted from the measured overall valid dBC L_{eq} value for the corresponding period. Secondly, a tone must be present at a frequency below 250 hertz as per the tonal definition requirements outlined in the Directive. This is determined through measurement of the linear 1/3 octave band sound pressure level data for the corresponding period. If these two conditions are met and an LFN situation is confirmed, a 5 dBA penalty is added to the measured comprehensive sound level.

Low Frequency Noise (continued)

The low frequency noise components of Directive 038 are considered a second stage investigation response to a low frequency noise compliant situation. Licensees are encouraged to evaluate the potential of a low frequency noise situation when preparing the Noise Impact Assessment by initially evaluating the overall dBC - dBA values. A predicted difference of less than 20 dB combined with an overall predicted sound level of 5 dBA less than the nighttime PSL will provide licensees with a greater level of assurance that a low frequency noise complaint will not occur.

Sound Pressure Level Measurements

Sound pressure level measurements of the existing equipment were conducted at the facility site on May 26, 2009. The sound pressure level measurements were conducted with a Brüel & Kjær Model 2260 Investigator. The sound measurement system was field calibrated with a Brüel & Kjær Model 4231 calibrator at the start of measurements and then checked upon completion. The Brüel & Kjær Model 2260 measures the 1/3 octave band sound pressure level and the overall 'A' weighted sound level in real time.

Sound Power Level Calculations

Sound power levels of the significant noise sources associated with the facility equipment were calculated from the results of the sound pressure level measurements. All calculations followed accepted acoustical engineering evaluation methods for the determination of sound power levels from sound pressure levels for large machinery.

Sound Power Level Calculations (continued)

Table 2 presents the calculated octave band sound power levels of the facility equipment. The values are order ranked from highest to lowest overall dBA sound power level. Table 2 additionally presents the overall dBC sound power level for each source.

Table 2
Source Sound Power Levels
Access Sturgeon Terminal
LSD 04-18-56-21 W4M

Source Description	Sound Power Level (dBZ *re:* 10^{-12} W)										
	Octave Band Centre Frequency (Hz)									Sum (dBC)	Sum (dBA)
	31.5	63	125	250	500	1000	2000	4000	8000		
B-308: Shipping Pump Building – 2 x WEG 1250 HP Electric Motor @ 3587 RPM / Sulzer Pump (1 Running)											
Building Ground Void	84.7	114.1	93.7	97.2	94.6	92.3	88.4	83.0	71.5	113.5	97.5
Building	90.6	100.0	86.9	89.3	86.3	89.2	90.2	84.8	65.1	101.1	94.7
Powered Wall Vent	62.4	85.5	72.2	76.7	84.7	89.0	89.1	85.3	72.6	94.0	93.9
Building Skid	80.0	106.3	89.6	95.6	90.3	87.9	83.9	78.9	66.7	106.2	93.4
Wall Vent	70.7	98.3	83.3	86.3	86.8	88.9	87.6	83.8	69.0	99.2	93.4
Closed Equipment Door	72.1	87.8	76.1	80.9	87.7	87.5	85.4	79.4	64.7	93.5	91.5
Building Ground Void	83.9	100.4	91.5	90.5	88.2	84.0	80.5	75.1	63.5	101.0	89.9
Building Skid	79.4	96.4	86.2	89.1	83.5	81.1	79.1	73.8	60.4	97.3	87.0
B-312: Diluent Q.A. Building – 4 x WEG 3 HP Electric Motors @ 1765 RPM											
Building Ground Void	85.5	86.4	86.4	90.2	82.3	79.5	73.7	69.4	61.5	93.6	85.7
Building	88.3	87.0	84.6	86.9	85.3	76.2	71.4	66.7	NA	92.8	84.9
Powered Wall Vent	90.3	85.9	92.6	79.9	75.3	75.1	74.9	71.2	65.7	94.5	82.3
Wall Vent	70.8	74.2	75.6	80.9	78.1	70.3	70.8	67.3	60.2	84.4	79.2
Building Skid	79.6	77.7	77.6	77.8	74.9	65.8	58.2	57.5	47.6	83.9	74.8
B-306: Booster Pump Building – Reliance Electric 200 HP Electric Motor @ 3575 RPM											
Powered Wall Vent	96.8	90.2	98.5	92.6	88.1	85.3	83.4	78.5	72.1	101.2	91.6
Building	92.5	95.0	92.7	88.8	84.0	76.9	68.5	62.3	NA	98.0	85.3
Building Skid	84.7	90.6	91.3	85.7	76.1	66.1	58.7	54.4	43.1	94.5	80.5
Wall Vent	74.6	77.8	77.5	78.2	77.7	74.7	70.1	62.5	48.4	84.5	79.2
B-310: Injection Pump Building – WEG 20 HP Electric Motor @ 1175 RPM / WEG 5 HP Electric Motor @ 3480 RPM											
Building Skid	90.8	90.9	86.6	89.4	83.3	71.5	67.7	63.1	53.5	95.0	84.2
Building	91.3	92.1	86.6	78.4	78.0	67.8	64.2	56.3	NA	94.1	78.1
Closed Equipment Door	77.4	81.7	74.9	71.5	73.7	64.7	60.5	61.6	50.0	83.5	73.1
Wall Vent	75.1	80.4	71.6	66.8	67.5	58.7	53.4	54.5	NA	81.2	67.3
Various Piping											
B-308 Outlet Piping West Section 1	80.7	90.8	91.8	97.7	103.4	106.2	109.2	108.7	95.7	113.3	114.2
B-308 to B-307 Piping Section 1	76.1	93.1	88.5	96.2	100.1	103.9	106.2	103.3	92.1	110.0	110.6
B-308 to B-307 Piping Section 2	76.4	87.7	89.8	94.9	100.9	103.5	102.2	98.8	87.3	107.9	107.8
B-308 Outlet Piping West Section 3	80.5	91.0	82.1	89.5	90.8	101.6	103.6	100.1	85.1	106.8	107.7
B-308 Outlet Piping West Section 2	77.9	87.9	83.6	92.4	93.8	100.5	103.4	99.8	83.4	106.5	107.3
B-308 Outlet Piping North Section 1	74.6	86.6	78.2	90.3	91.5	102.0	102.1	97.5	79.6	105.9	106.6
B-308 Outlet Piping North Section 2	78.0	80.4	76.2	89.7	89.4	99.5	100.3	94.9	75.6	103.7	104.4

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NA – Not Available

Sound Power Level Calculations (continued)

Order ranked sound pressure levels at a distant point of reception may differ from the facility order ranked sound power levels. This can occur for a number of reasons including the frequency composition of each noise source, the physical height of the noise source above the ground, acoustical shielding at the site or the topography between the site and the receiver.

Noise Model

ENM Windows, an environmental noise assessment software package from RTA Technology Pty. Ltd., was employed to determine the environmental noise impact of the facility equipment. The noise prediction program completes complex sound propagation calculations that included the effects of the environment, terrain, and topography. The algorithms of the model are based on methods and research well recognized in the acoustics community and follow the CONCAWE algorithms. Acoustics Australia, an acoustics community publication has published two papers regarding algorithms and validation of the ENM software (Tonin 1985, 1997). FFA has employed the use of the ENM software at the firm since 1998 with the principal utilizing this software in previous employment since 1992. Over 1500 facilities have been modelled using the ENM software since 1998 with the predicted results comparable to the measured results where data was available.

The calculated source sound power levels, complete with the physical information regarding the facility site equipment layout along with the reception location were entered in the model. The meteorological conditions selected favoured the transmission of sound from the facility site to the point of reception, thus emulating a period during which the facility could experience noise complaints. Table 3 lists the selected conditions.

Table 3
Modeled Conditions
Access Sturgeon Terminal
LSD 04-18-56-21 W4M

Parameter	Modeled Input
Temperature	+15°C
Wind Velocity	5.0 kph
Wind Direction	From the facility to the reception point.
Relative Humidity	70%
Topography	Yes
Terrain Category	Rural
Ground Type	Grass
Receiver Height Above Ground	1.5m
Temperature Gradient (°C/100m)	0

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The model input and results during the modelling process and, where warranted, additional calculations were completed outside of the model to verify the ENM results.

Results

Table 4 presents the overall predicted facility sound pressure level and the source sound pressure level contributions as dBA and dBC values for the residence located 430 metres southeast of the facility site. The source sound level contribution values are order ranked by the "A" weighted contribution level.

Table 4
Order Ranked Sound Pressure Levels
Residence – 430 metres Southeast
Access Sturgeon Terminal
LSD 04-18-56-21 W4M

Source	Source Sound Level Contribution (dBC)	Source Sound Level Contribution (dBA)
B-308 Outlet Piping West Section 1	34.8	34.4
B-308 to B-307 Piping Section 1	33.7	31.6
B-308 Outlet Piping North Section 1	30.3	30.3
B-308 to B-307 Piping Section 2	30.6	28.8
B-308 Outlet Piping North Section 2	27.5	27.9
B-308 Outlet Piping West Section 2	28.9	27.5
B-308 Outlet Piping West Section 3	30.2	27.4
B-308 Grnd Void (north half)	51.7	26.7
B-308 Pwr Wall Vents	27.6	26.5
B-308 Building	37.3	25.1
B-306 Pwr Wall Vents	35.5	22.1
B-308 Skid (north half)	43.8	19.3
B-308 Wall Vents	35.7	15.9
B-308 Grnd Void (south half)	38.4	14.9
B-308 Closed Equip Door	25.5	14.3
B-306 Building	34.3	12.5
B-312 Pwr Wall Vents	28.5	11.8
B-308 Skid (south half)	34.2	10.8
B-306 Skid	30.6	10.0
B-310 Skid	31.8	8.5
B-312 Building	27.0	8.0
B-310 Building	32.0	7.6
B-312 Ground Void	26.4	6.2
B-306 Wall Vents	17.8	0.2
B-312 Wall Vents	13.5	-1.1
B-310 Closed Equip Door	20.8	-1.5
B-312 Skid	18.7	-3.3
B-310 Wall Vents	19.3	-5.1
Facility Contribution Sum	**53.3**	**39.7**

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Note: Sound Pressure level values below the reference level of 20 microPascals are indicated by a negative sign preceding the value.

Results (continued)

Access has indicated that a steady-state operation of the equipment at the facility site is anticipated. The facility was modeled with the doors of the pump buildings in the closed position as this configuration was stated by Access to exist during all ambient conditions. Access has also indicated that the equipment in operation during the site visit will be typical of normal future operations. It should be noted that one of the five 125 HP motors in B-310, all of which were not operating during the site visit, is expected to operate normally. FFA is of the opinion that this pump would not have a significant effect on the facility sound levels due to its low HP rating compared to the equipment in B-308.

Discussion of Results

Table 5 presents the overall predicted facility sound level contributions and the predicted cumulative sound levels along with the PSLs of Directive 038.

Table 5
Predicted Sound Levels
Access Sturgeon Terminal
LSD 04-18-56-21 W4M

Location & Sound Level Descriptor	Daytime Sound Level (dBA L_{eq})	Nighttime Sound Level (dBA L_{eq})
Residence – 430 metres Southeast		
Ambient Sound Level (BSL – 5 dB)[1]	50.0	40.0
Predicted Facility Sound Level Contribution	39.7	39.7
Predicted Cumulative Sound Level[2]	50.4	42.9
ERCB Permissible Sound Level	55.0	45.0

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Note 1: The ambient sound level is calculated as stipulated by the Directive and is not derived from measurements at this location.
Note 2: The cumulative sound level is the sum of the ERCB defined ambient sound level plus the predicted facility sound level contribution and is used to determine compliance with the PSL.

A comparison of the predicted cumulative sound level to the allowable sound levels indicates that the existing facility potentially complies with the daytime and nighttime PSLs of Directive 038 at the residence location assessed.

Discussion of Results (continued)

Table 6 presents the overall predicted facility dBC and dBA values along with the differences in these values for each residence assessed. A difference of 20 dB or greater is an initial requirement in determining if a low frequency component could exist.

Table 6
dBC – dBA Low Frequency Evaluation
Access Sturgeon Terminal
LSD 04-18-56-21 W4M

Location	Predicted Sound Levels		
	dBC	dBA	dBC - dBA
Residence – 430 metres Southeast	53.3	39.7	13.6

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Table 6 indicates that the dBC - dBA value for the residence assessed is below the maximum of 20 dB as permitted by Directive 038. Therefore, the Access facility is predicted to comply with the LFN requirements of Directive 038.

Access is advised that additional facilities exist which are in proximity to the residence assessed. These facilities are expected to contribute to the sound environment; however, they were not considered in this assessment. Should a noise complaint be filed, a more detailed analysis examining the noise impact of all nearby facilities would be necessary.

Conclusion

The results of the environmental noise propagation model confirm that the Access facility by itself potentially complies with both the daytime and nighttime PSLs of Directive 038 at the residence assessed. A check of the dBC – dBA value indicates that the facility would also comply with the LFN requirements of Directive 038.

Glossary

Glossary

Ambient Sound Level	All noises that exist in an area and are not related to a facility covered by Directive 038. Ambient noise includes sound from other industrial noise not subject to this directive, transportation sources, animals and nature.
A-weighted sound level	The sound level as measured on a sound level meter using a setting that emphasizes the middle frequency components similar to the frequency response of the human ear.
Background Sound Level	All noises that exist in an area including existing facility covered by Directive 038. Background noise includes sound from other industrial noise not subject to this directive, transportation sources, animals and nature.
Basic Nighttime Sound Level (BSL)	The A weighted L_{eq} sound level commonly observed to occur in the designated land-use categories with industrial presence (ERCB Directive Glossary). The BSL in the initial building block from which the PSL is determined.
Calibration	A procedure used for the adjustment of a sound level meter using a reference source of a known sound pressure level and frequency. Calibration must take place before and after the sound level measurements.
Comprehensive Sound Level (CSL)	The sound level that is a composite of different airborne sounds from many sources far away from and near the point of measurement. The CSL does include industrial components and must be measured with them, but it should exclude abnormal noise events. The CSL is used to determine whether a facility is complying with Directive 038.
C-weighted sound level	The C-weighting approximates the sensitivity of human hearing at the industrial noise levels (above 85 dBA). The C-weighted sound level is more sensitive to the sounds used to assess the low-frequencies than the A-weighted sound level. It is sometimes used to assess the low-frequency content of complex sound environments

Daytime	Defined as the hours from 07:00 to 22:00.
Daytime adjustment	An adjustment that allows a 10 dBA increase above the basic sound level for nighttime, as daytime sound levels are generally about 10 dBA higher than nighttime values.
dB (decibel)	A unit of measure of sound pressure that compresses a large range of numbers into a more meaningful scale.
dBA	The decibel (dB) sound pressure level filtered through the A filtering network to approximate human hearing response. See dB and A-weighted sound level.
dBC	The decibel (dB) sound pressure level filtered through the C filtering network. See dB and C-weighted Sound Level.
Energy equivalent sound level (L_{eq})	The L_{eq} is a single-number average, A-weighted sound level that represents cumulative acoustical energy as measured over a specified time interval. This interval should be specified in brackets following the L_{eq} (e.g.: L_{eq} (9) is a nine-hour L_{eq}).
ENM	Environmental noise prediction software created by RTA Technology Pty. Ltd.
Facility	Any operation used in exploration, processing, development and transportation of energy resources.
Infringement	Locating a residence within the existing noise footprint (boundary) of a facility, such that the facility could be seen as not complying with Directive 038.
L_{eq}	See Energy equivalent sound level.
Nighttime	Defined as the hours from 22:00 to 07:00.
Noise	Generally understood as unwanted sound.
Noise Exposure Forecast (NEF) (Airport specific)	The NEF contours are site specific to each airport and take into account such factors as air traffic volume, proximity to runways, flight paths and aircraft type and size.

Noise Impact Assessment (NIA)	Identifies the expected sound level emanating from a facility as measured 15 m from the nearest or most impacted permanently or seasonally occupied dwelling. It also identifies what the permissible sound level is and how it was calculated.
Octave	A series of electronic filters separate sound into discrete frequency bands, making it possible to know how sound energy is distributed as a function of frequency. The octave band has a centre frequency that is double the centre frequency of the octave band preceding it.
1/3 Octave	The 1/3 octave band analysis provides a finer breakdown of sound distribution as a function of frequency.
Permissible Sound Level (PSL)	The maximum sound level that a facility should not exceed at a point 15m from the nearest or most impacted dwelling unit.
Representative Conditions	Those conditions typical for an area and/or the nature of a complaint. Sound levels must be taken only when representative conditions exist; this may necessitate a survey of extensive duration (two or more consecutive nights).
Sound Monitoring Survey	The measurement and recording of sound levels and pertinent related information over a given time period.
Sound Level Meter	An instrument designed and calibrated to respond to sound and to give objective, reproducible measurements of sound pressure levels. It normally has several features that enable its frequency response and averaging times to be changed.
Sound Pressure Level	The ratio, expressed in decibels, of sound pressure to a reference pressure equal to the human threshold of hearing.
Sound Power Level	The acoustic power radiated from a given sound source related to a reference power level (typically 10^{-12} watts) expressed in decibels.
Spectrum	A wide range or sequence of frequencies.

Tonal components (low frequency noise)	The tonal component test consists of two parts. The first must demonstrate that the sound pressure level of any one linear, (Z-weighted), 1/3 octave bands between 20 and 250 Hz is 10 dBZ or more than the sound pressure level of at least one of the adjacent bands within two 1/3 octave bandwidths. In addition, there must be a minimum of a 5 dBZ drop from the band containing the tone within two bandwidths on the opposite side. The second part is that the tonal component must be a pronounced peak, clearly obvious within the spectrum.
Windscreen	A specialized piece of porous sponge that fits over the microphone to reduce the noise generated by the wind blowing across the microphone.

Appendix A

Permissible Sound Level Determination

Residence – 430 metres Southeast

Permissible Sound Level Determination
Access Sturgeon Terminal
ERCB Noise Control Directive 038

Basic Nighttime Sound Level (BSL)	**Nighttime** (22:00-07:00) (dBA L_{eq})	**Daytime** (07:00-22:00) (dBA L_{eq})

Proximity to Transportation*	Dwelling Unit Density per ¼ Section of Land**			Nighttime	Daytime
	1 – 8 Dwellings (dBA)	9 – 160 Dwellings (dBA)	>160 Dwellings (dBA)		
Category 1	40	43	46		
Category 2	45	48	51	45	45
Category 3	50	53	56		
			Daytime Adjustment	N/A	10
			Basic Sound Level	45	55

Class A Adjustments

Class	Reason for Adjustment	Value (dBA L_{eq})	Nighttime	Daytime
A1	Seasonal Adjustment (wintertime)	0 to +5	0	0
A2	Ambient Monitoring Adjustment	-10 to +10	N/A	N/A
	Class Adjustment = Sum of A1 and A2 (as applicable), but not to exceed a maximum of 10 dBA L_{eq}			
		Total Class A Adjustments	0	0

Class B Adjustments

Class	Duration of Activity	Value (dBA L_{eq})	Nighttime	Daytime
B1	1 day	+15		
B2	7 days	+10		
B3	< or = to 60 days	+5		
B4	> 60 days	0	0	0
	Class B Adjustment = one only of B1, B2, B3 or B4			
		Class B Adjustment	0	0
		PERMISSIBLE SOUND LEVEL	**45**	**55**

*Proximity to Transportation Category Definitions

Category 1 — Dwelling units more than 500m from heavily traveled roads and/or rail lines and not subject to frequent aircraft flyovers.

Category 2 — Dwelling units more than 30m but less than 500m from heavily traveled roads and/or rail lines and not subject to frequent aircraft flyovers.

Category 3 — Dwelling units less than 30m from heavily traveled roads and/or rail lines and subject to frequent aircraft flyovers.

** Density per quarter section
refers to a quarter section with the affected dwelling at the centre (a 451 metre radius). For quarter sections with various land uses or mixed densities the density chosen is then averaged for the area under consideration.

FFA File 108-1940-01

Faszer Farquharson & Associates Ltd.

Consultants in Acoustics & Noise Control

Noise Impact Assessment

Access Pipeline
Trim Blend Facility
SW 18-56-21 W4M

Prepared For

Access Pipeline

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March 14, 2005

FFA File 105 – 1156 - 01

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Executive Summary

In order to determine the environmental noise impact of their proposed Trim Blend Facility to be located in SW 18-56-21 W4M Access Pipeline (Access) commissioned a Noise Impact Assessment. The results will be used to determine compliance of this proposed facility with the Alberta Energy and Utilities Board (EUB) Noise Control Directive (Directive) ID 99-8, and to develop noise control measures for the proposed facility equipment if necessary. Sunstone Projects Ltd., on behalf of Access, retained Faszer Farquharson & Associates, Consultants in Acoustics & Noise Control to compete this evaluation.

Sound power levels of the significant noise sources that will be present at the facility were calculated from a combination of manufacturer's sound pressure level data, file data of previously measured units and theoretical assessment techniques. These sound power levels were incorporated into RTA Technology Pty. Ltd.'s software, ENM, to predict the proposed facility sound level at the three nearest residences to the proposed facility location. The modelled results were then compared with the permissible sound levels (PSLs) of the EUB Directive to determine the potential for compliance.

The results of the modelling along with the PSLs of the EUB Directive are presented in the following table.

Predicted Facility Sound Levels
Access Trim Blend Facility SW 18-56-21 W4M

Location	Predicted Facility Sound Level (dBA)	EUB Daytime Permissible Sound Level (dBA L_{eq})	EUB Nighttime Permissible Sound Level (dBA L_{eq})
Residence 1 – 624 m East	23.1	55.0	45.0
Residence 2 – 663 m North	22.0	55.0	45.0
Residence 3 – 1327 m Southwest	10.7	55.0	45.0

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The results of the environmental noise propagation model indicate that the proposed facility would potentially comply with both the daytime and nighttime PSLs of the EUB Directive at the locations assessed.

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Glossary I

Appendix A -- Permissible Sound Level Determination

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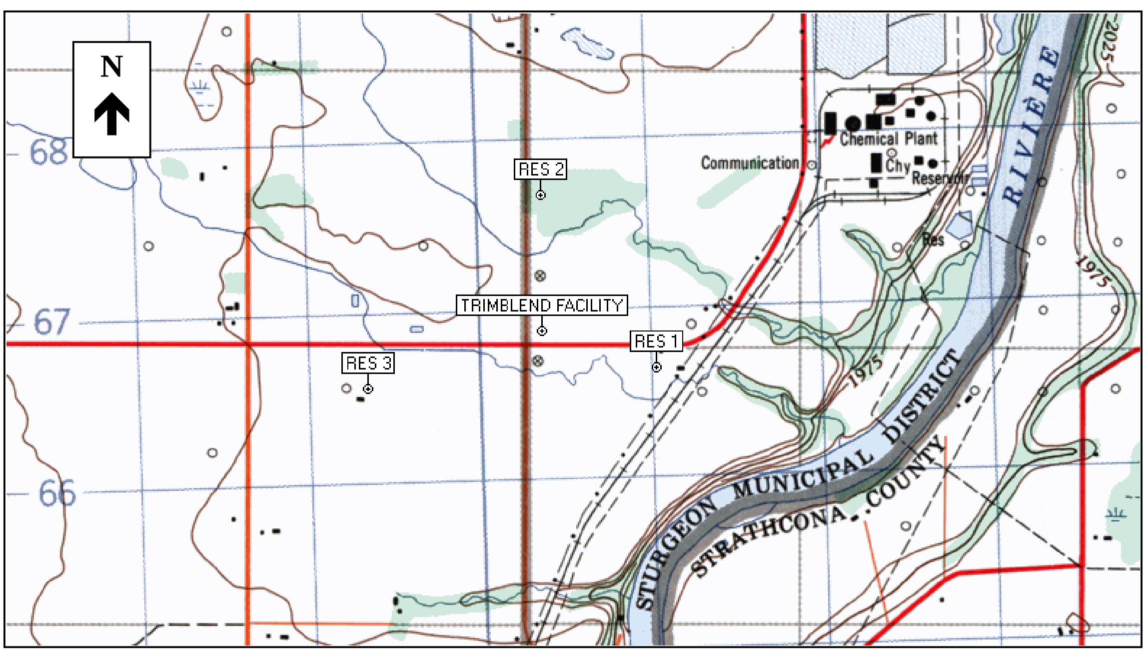
Background & Scope

Access Pipeline (Access) commissioned an environmental noise impact assessment of their proposed Trim Blend Facility to be located in SW 18-56-21 W4M. The results of this assessment will be used to determine the proposed facility's potential for compliance with the Alberta Energy and Utilities Board (EUB) Noise Control Directive ID 99-8 (Directive). The assessment may also be used to develop noise control measures for the proposed facility equipment should the results indicate potential non-compliance. Access, via Sunstone Projects Ltd., retained the services of Faszer Farquharson & Associates Ltd., Consultants in Acoustics & Noise Control to complete this evaluation.

Site Description & Residence Locations

The proposed Access Trim Blend Facility will be located in SW 18-56-21 W4M approximately 14 kilometres south of Redwater, Alberta. The nearest residence (Res 1) to the proposed facility site is located approximately 624 metres east. Two other residences of interest are located within the study area. Residence 2 (Res 2) is located approximately 663 metres north of the proposed facility site and Residence 3 (Res 3) is located approximately 1327 metres southwest of the proposed facility site. The land use in the area is generally agricultural with the topography noted as flat to gently rolling from the available documents. Figure 1 presents a map of the study area indicating the location of the residences and the proposed facility site along with other area features.

Figure 1
Study Area Map
Access Trim Blend Facility SW 18-56-21 W4M



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Site Description & Residence Locations (continued)

The facility and residence locations in Figure 1 were plotted on this copy of the National Topographic System Universal Transverse Mercator 1000 metre grid map using information provided by Access.

Facility Equipment

Access is proposing to construct a pump station with tank storage. The proposed facility will include two 600 HP electric motor driven shipping pumps that will be housed in an insulated metal building; one 250 HP electric motor driven diluent injection pump that will be housed in an insulated metal building; two 30 HP externally located electric motor driven booster pumps and two 50 HP externally located electric motor driven booster pumps. One mixing pump will be mounted on the side of each storage tank (3) at the proposed facility.

Approach

Faszer Farquharson & Associates used a combination of manufacturer's data, file data of similar equipment and theoretical assessment techniques to determine sound pressure levels of the significant noise sources associated with the proposed facility equipment to calculate sound power levels for the proposed facility. Data regarding the topography and vegetation of the area surrounding the proposed facility site, along with the location of the nearest residence with respect to the proposed facility site, was obtained from Access as well as commercial sources. That data was supplemented with file information on similar units. This information was used as input parameters for an environmental noise propagation computer model to calculate the proposed facility sound level at the nearest residence and a second residence of interest.

The modelled results are presented both as individual source sound levels, as well as the overall facility sound level. The results are reviewed and compared with the PSLs of the EUB Directive to determine the potential for compliance at the nearest or most impacted residence. If required, noise control measures can then be developed for the most significant noise sources, and the expected change in sound level can be predicted at the residence of interest.

Criteria

The EUB Directive is a receiver-oriented noise regulation that applies to energy industry facilities operating in the Province of Alberta under EUB jurisdiction. This Directive requires that a Noise Impact Assessment be completed for any permanent facility where there is a reasonable expectation of a continuous noise source. This Directive specifies allowable sound levels for energy industry facilities at designated receptor points including residences. In lieu of a residence within 1500 metres of a facility, the Directive indicates that a level of 40 dBA L_{eq} should not be exceeded at this distance during the nighttime. These specified limits are the permissible sound levels (PSLs).

Criteria (continued)

The Directive requires that all facilities licensed after October 17, 1988 meet the PSLs of the Directive. Actual compliance can only be determined by comparing the comprehensive sound level to the permissible sound levels of a valid comprehensive sound survey. Although it is not mandatory that a comprehensive sound survey be completed, the EUB expects that the comprehensive sound level of the facility comply with the applicable PSLs. The PSLs are derived from information regarding the area population density; proximity to heavily travelled transportation routes including motor vehicle routes, rail lines, aircraft flyways and other specified adjustments. The PSL during the daytime may be adjusted to a level 10 dBA above the nighttime level. Table 1 presents the PSLs for the residences assessed. The detailed evaluation of the PSLs is presented in Appendix A.

Table 1
Permissible Sound Levels
Access Trim Blend Facility SW 18-56-21 W4M

Location	Daytime Permissible Sound Level (dBA L_{eq})	Nighttime Permissible Sound Level (dBA L_{eq})
Residence 1 – 624 m East	55.0	45.0
Residence 2 – 663 m North	55.0	45.0
Residence 3 – 1327 m Southwest	55.0	45.0

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Residence 1 and Residence 3 are located within 500 metres of Alberta Provincial Primary Highway 643 and thereby potentially subject to an adjustment of the basic nighttime sound level (BSL) based the proximity of the residences to the highway combined with the traffic volume. Proximity to Transportation Category 2 of the BSL determination matrix requires that a residence be located within 500 metres of a numbered highway or heavily travelled road and that the road have a minimum traffic count of 10 vehicles per nighttime hour. The most recent (2004) Alberta Transportation data indicates that the Average Annual Daily Traffic (AADT) count along this section of Provincial Primary Highway 643 of 1940 vehicles per day. The EUB defines a heavily travelled road as having a vehicle count of at least 10 vehicles per nighttime hour. When this definition is applied to the available traffic data it may be reasonably concluded that this road would be classified as a heavily travelled road with the assumption that 10% of the traffic volume would occur during the nighttime period, therefore the residences have been placed in Proximity to Transportation Category 2.

Residences 1, 2 & 3 are all located within the Alberta Industrial Heartland zone. The EUB has indicated that residences within this area of the Alberta Industrial Heartland zone are subject to PSLs of 45 dBA during the nighttime and 55 dBA during the daytime. Additional information regarding the setting of the PSLs for residences within the Alberta Industrial Heartland zone is available from the EUB.

Sound Power Level Calculations

Sound power levels of the significant noise sources for the proposed facility were calculated from manufacturer's sound pressure level data, file data of previously measured equipment similar to that proposed and theoretical assessment techniques. These calculations followed accepted acoustical engineering evaluation methods for the determination of sound power levels from sound pressure levels for large machinery. Table 2 presents the calculated sound power levels of the equipment for the proposed facility. The values are order ranked from highest to lowest overall dBA sound power level.

Table 2
Source Sound Power Levels
Access Trim Blend Facility SW 18-56-21 W4M

Source Description	Sound Power Level (dB *re:* 10^{-12} W)									
	Octave Band Centre Frequency (Hz)									Sum (dBA)
	31.5	63	125	250	500	1000	2000	4000	8000	
50 HP Booster Pump	83.6	81.2	80.4	87.6	90.9	93.1	93.5	87.5	80.8	98.1
30 HP Booster Pump	80.5	78.2	77.4	84.6	87.9	90.1	90.5	84.5	77.7	95.1
Tank Mixer Pump	81.8	83.6	78.7	83.1	87.7	90.8	88.2	80.6	74.2	94.1
Diluent Injection Pump Bldg Wall Vents	77.6	75.3	74.5	81.7	84.9	87.2	87.5	81.6	74.8	92.2
Shipping Pump Bldg Wall Vents	78.7	86.5	84.7	85.1	81.7	80.1	81.2	75.5	74.3	86.7
Shipping Pump Building	90.5	92.2	84.5	80.9	75.5	60.9	60.9	48.3	47.1	76.8
Diluent Injection Pump Bldg	83.6	75.2	68.4	71.6	72.9	62.1	61.5	48.5	41.8	71.8

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Order ranked sound pressure levels at a distant point of reception may differ from the facility order ranked sound power levels. This can occur for a number of reasons including the frequency composition of each noise source, the physical height of the noise source above the ground, acoustical shielding at the site or the topography between the site and the receiver.

Noise Model

Faszer Farquharson & Associates employed the use of ENM, a leading environmental noise assessment software package from RTA Technology Pty. Ltd., for this assessment. The calculated source sound power levels, complete with the physical information regarding the proposed site layout and the location of the residences were entered in the model. The selected meteorological conditions favoured the transmission of sound from the facility site to each point of reception, thus emulating a period during which the proposed facility may experience noise complaints. complaints Table 3 presents the selected modelling conditions.

Table 3
Modelled Conditions
Access Trim Blend Facility SW 18-56-21 W4M

Parameter	Modelled Input
Temperature	+25°C
Wind Velocity	5.0 kph
Wind Direction	From the facility to the residences
Relative Humidity	50%
Topography	Yes
Terrain Category	Rural
Ground Type	Grass
Temperature Gradient (°C/100m)	0
Receiver Height Above Ground	1.5m

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Faszer Farquharson & Associates reviewed model input and results during the modelling process and, where warranted, additional calculations were completed outside of the model to verify the ENM results.

Results

Table 4 presents the predicted facility sound pressure level results order ranked for each significant noise source to Residence 1 located approximately 624 metres east of the proposed facility site.

Table 4
Order Ranked Sound Pressure Levels
Residence 1 - 624 m East
Access Trim Blend Facility SW 18-56-21 W4M

Source	Source Sound Level Contribution (dBA)
50 HP Booster Pump 1	16.0
50 HP Booster Pump 2	16.0
Tank Mixer Pump 3	13.7
Tank Mixer Pump 2	13.3
30 HP Booster Pump 1	13.1
30 HP Booster Pump 2	13.1
Tank Mixer Pump 1	12.5
Diluent Injection Pump Bldg Wall Vents	10.1
Shipping Pump Bldg Wall Vents	7.4
Shipping Pump Building	7.1
Diluent Injection Pump Bldg	-5.3
Facility Sum	**23.1**

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Note: A negative (-) sign preceding the sound pressure level indicates a value below the reference level of 20 μPa.

Table 5 presents the predicted facility sound pressure level results order ranked for each significant noise source to Residence 2 located approximately 663 metres north of the proposed facility site.

Table 5
Order Ranked Sound Pressure Levels
Residence 2 – 663 m North
Access Trim Blend Facility SW 18-56-21 W4M

Source	Source Sound Level Contribution (dBA)
50 HP Booster Pump 1	14.9
50 HP Booster Pump 2	14.9
Tank Mixer Pump 3	12.6
Tank Mixer Pump 2	12.3
30 HP Booster Pump 1	11.9
30 HP Booster Pump 2	11.9
Tank Mixer Pump 1	11.5
Diluent Injection Pump Bldg Wall Vents	9.0
Shipping Pump Bldg Wall Vents	6.5
Shipping Pump Building	6.4
Diluent Injection Pump Bldg	-6.1
Facility Sum	**22.0**

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Note: A negative (-) sign preceding the sound pressure level indicates a value below the reference level of 20 μPa.

Results (continued)

Table 6 presents the predicted facility sound pressure level results order ranked for each significant noise source to Residence 3 located approximately 1327 metres southwest of the proposed facility site.

Table 6
Order Ranked Sound Pressure Levels
Residence 3 – 1327 m Southwest
Access Trim Blend Facility SW 18-56-21 W4M

Source	Source Sound Level Contribution (dBA)
50 HP Booster Pump 1	3.1
50 HP Booster Pump 2	3.1
Tank Mixer Pump 3	1.1
Tank Mixer Pump 2	0.9
Tank Mixer Pump 1	0.6
30 HP Booster Pump 1	0.2
30 HP Booster Pump 2	0.1
Shipping Pump Building	-1.1
Diluent Injection Pump Bldg Wall Vents	-2.8
Shipping Pump Bldg Wall Vents	-2.8
Diluent Injection Pump Bldg	-14.6
Facility Sum	**10.7**

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Note: A negative (-) sign preceding the sound pressure level indicates a value below the reference level of 20 μPa.

The modelling was completed with all equipment operating at full speed. Actual operations may vary. The proposed facility was modelled with the vents of the pump buildings in the open position, as this is expected to occur during warmer ambient temperatures.

Discussion of Results

Table 7 presents the overall predicted proposed facility sound levels, along with the PSLs of the EUB Directive for the residences assessed.

Table 7
Predicted Facility Sound Levels
Access Trim Blend Facility SW 18-56-21 W4M

Location	Predicted Facility Sound Level (dBA)	EUB Daytime Permissible Sound Level (dBA L_{eq})	EUB Nighttime Permissible Sound Level (dBA L_{eq})
Residence 1 – 624 m East	23.1	55.0	45.0
Residence 2 – 663 m North	22.0	55.0	45.0
Residence 3 – 1327 m Southwest	10.7	55.0	45.0

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Discussion of Results (continued)

A comparison of the predicted to the allowable sound levels indicates that the proposed facility would potentially comply with the daytime and nighttime PSLs at the residences assessed.

Comments & Recommendations

The results serve to document the predicted environmental noise impact of the proposed Access Trim Blend Facility. Faszer Farquharson & Associates recognizes that the proposed Access facility is approximately 1400 metres west-southwest of the existing Agrium Redwater Facility. The results of this assessment indicate that the existing sound level contribution of other area facilities could be high as 45.0 dBA at Residence 1, 45.0 dBA at Residence 2 and 45.0 dBA at Residence 3 for the level of the combined facilities to comply with the allowable nighttime level. Faszer Farquharson & Associates recommends that Access dialog with other area facilities, industry groups in the area and EUB Staff to ensure that environmental noise impact of their facility in combination with the others will be within the allowable levels of the EUB Directive.

Conclusion

The results of the environmental noise propagation model indicate that the proposed Access Trim Diluent facility would potentially comply with both the daytime and nighttime PSLs of the EUB Noise Directive at the residences assessed.

Glossary

Glossary

Ambient Sound Level	All noises that exist in an area and are not related to a facility covered by ID 99-8. Ambient noise includes sound from other industrial noise not subject to this directive, transportation sources, animals and nature.
A-weighted sound level	The sound level as measured on a sound level meter using a setting that emphasizes the middle frequency components similar to the frequency response of the human ear.
Background Sound Level	All noises that exist in an area including existing facilities covered by ID 99-8. Background noise includes sound from other industrial noise not subject to this directive, transportation sources, animals and nature.
Basic Nighttime Sound Level (BSL)	The A weighted L_{eq} sound level commonly observed to occur in the designated land-use categories with industrial presence (EUB Directive Glossary). The BSL in the initial building block from which the PSL is determined.
Calibration	A procedure used for the adjustment of a sound level meter using a reference source of a known sound pressure level and frequency. Calibration must take place before and after the sound level measurements.
Comprehensive Sound Level (CSL)	The sound level that is a composite of different airborne sounds from many sources far away from and near the point of measurement. The CSL does include industrial components and must be measured with them, but it should exclude abnormal noise events. The CSL is used to determine whether a facility is complying with ID 99-8.
Daytime	Defined as the hours from 07:00 to 22:00.
Daytime adjustment	An adjustment that allows a 10 dBA increase above the basic sound level for nighttime, as daytime sound levels are generally about 10 dBA higher than nighttime values.

dB (decibel) — A unit of measure of sound pressure that compresses a large range of numbers into a more meaningful scale.

dBA — The decibel (dB) sound pressure level filtered through the A filtering network to approximate human hearing response.

See dB and A-weighted sound level.

Energy equivalent sound level (L_{eq}) — The L_{eq} is a single-number average, A-weighted sound level that represents cumulative acoustical energy as measured over a specified time interval. This interval should be specified in brackets following the L_{eq} (e.g.: L_{eq} (9) is a nine-hour L_{eq}).

ENM — Environmental noise prediction software created by RTA Technology Pty. Ltd.

Facility — Any operation used in exploration, processing, development and transportation of energy resources.

Infringement — Locating a residence within the existing noise footprint (boundary) of a facility, such that the facility could be seen as not complying with ID 99-8.

L_{eq} — *See Energy equivalent sound level.*

Nighttime — Defined as the hours from 22:00 to 07:00.

Noise — Generally understood as unwanted sound.

Noise Exposure Forecast (NEF) ***(Airport specific)*** — The NEF contours are site specific to each airport and take into account such factors as air traffic volume, proximity to runways, flight paths and aircraft type and size.

Noise Impact Assessment (NIA) — Identifies the expected sound level emanating from a facility as measured 15 m from the nearest or most impacted permanently or seasonally occupied dwelling. It also identifies what the permissible sound level is and how it was calculated.

Octave	A series of electronic filters separate sound into discrete frequency bands, making it possible to know how sound energy is distributed as a function of frequency. The octave band has a centre frequency that is double the centre frequency of the octave band preceding it.
1/3 Octave	The 1/3 octave band analysis provides a finer breakdown of sound distribution as a function of frequency.
Permissible Sound Level (PSL)	The maximum sound level that a facility should not exceed at a point 15m from the nearest or most impacted dwelling unit.
Representative conditions	Those conditions typical for an area and/or the nature of a complaint. Sound levels must be taken only when representative conditions exist; this may necessitate a survey of extensive duration (two or more consecutive nights).
Sound monitoring survey	The measurement and recording of sound levels and pertinent related information over a given time period.
Sound level meter	An instrument designed and calibrated to respond to sound and to give objective, reproducible measurements of sound pressure levels. It normally has several features that enable its frequency response and averaging times to be changed.
Sound pressure level	The ratio, expressed in decibels, of sound pressure to a reference pressure equal to the human threshold of hearing.
Sound power level	The acoustic power radiated from a given sound source related to a reference power level (typically 10^{-12} watts) expressed in decibels.
Spectrum	A wide range or sequence of frequencies.
Windscreen	A specialized piece of porous sponge that fits over the microphone to reduce the noise generated by the wind blowing across the microphone.

Appendix A

Permissible Sound Level Determination

Residence 1 – 624 m East

Permissible Sound Level (PSL) Determination
Access Trim Blend Facility SW 18-56-21 W4M
AEUB Noise Control Directive

Basic Nighttime Sound Level (BSL)	**Nighttime** (22:00-07:00)	**Daytime** (07:00-22:00)

Proximity to Transportation*	Dwelling Unit Density per ¼ Section of Land		
	1 – 8 Dwellings	9 – 160 Dwellings	>160 Dwellings
Category 1	40	43	46
Category 2	45	48	51
Category 3	50	53	56

	Nighttime	Daytime
BSL	45	45
Daytime Adjustment	N/A	10
Basic Sound Level	45	55

Class A Adjustments

Class	Reason for Adjustment	Value (dBA L_{eq})
A1	Seasonal Adjustment (1 Nov – 31 Mar)	+5
A2	Absence of Both Tonal and Impulse/Impact Components	+5
A3	Ambient Monitoring Adjustment	-10 to +10
	Class Adjustment = Sum of A1, A2 and A3 (as applicable), but not to exceed a maximum of 10 dBA L_{eq}	

	Nighttime	Daytime
Total Class A Adjustments	0	0

Class B Adjustments

Class	Duration of Activity	Value (dBA L_{eq})
B1	1 day	+15
B2	1 week	+10
B3	< or = to 2 months	+5
B4	> 2 months	0
	Class B Adjustment = one only of B1, B2, B3 or B4	

	Nighttime	Daytime
Class B Adjustment	0	0
PERMISSIBLE SOUND LEVEL (dBA)	**45**	**55**

*Proximity to Transportation Category Definitions

Category 1	Dwelling units more than 500m from heavily travelled roads and/or rail lines and not subject to frequent aircraft flyovers.
Category 2	Dwelling units more than 30m but less than 500m from heavily travelled roads and/or rail lines and not subject to frequent aircraft flyovers.
Category 3	Dwelling units less than 30m from heavily travelled roads and/or rail lines and subject to frequent aircraft flyovers.

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Residence 2 – 663 m North

Permissible Sound Level (PSL) Determination
Access Trim Blend Facility SW 18-56-21 W4M
AEUB Noise Control Directive

Basic Nighttime Sound Level (BSL)

Proximity to Transportation*	Dwelling Unit Density per ¼ Section of Land			Nighttime (22:00-07:00)	Daytime (07:00-22:00)
	1 – 8 Dwellings	9 – 160 Dwellings	>160 Dwellings		
Category 1	40	43	46	40	40
Category 2	45	48	51		
Category 3	50	53	56		
Daytime Adjustment				N/A	10
Basic Sound Level				40	50

Class A Adjustments

Class	Reason for Adjustment	Value (dBA L_{eq})	Nighttime	Daytime
A1	Seasonal Adjustment (1 Nov – 31 Mar)	+5		
A2	Absence of Both Tonal and Impulse/Impact Components	+5		
A3	Ambient Monitoring Adjustment	-10 to +10	+5	+5
	Class Adjustment = Sum of A1, A2 and A3 (as applicable), but not to exceed a maximum of 10 dBA L_{eq}			
Total Class A Adjustments			+5	+5

Class B Adjustments

Class	Duration of Activity	Value (dBA L_{eq})	Nighttime	Daytime
B1	1 day	+15		
B2	1 week	+10		
B3	< or = to 2 months	+5		
B4	> 2 months	0	0	0
Class B Adjustment = one only of B1, B2, B3 or B4				
Class B Adjustment				

	Nighttime	Daytime
PERMISSIBLE SOUND LEVEL (dBA)	**45**	**55**

*Proximity to Transportation Category Definitions

Category 1	Dwelling units more than 500m from heavily travelled roads and/or rail lines and not subject to frequent aircraft flyovers.
Category 2	Dwelling units more than 30m but less than 500m from heavily travelled roads and/or rail lines and not subject to frequent aircraft flyovers.
Category 3	Dwelling units less than 30m from heavily travelled roads and/or rail lines and subject to frequent aircraft flyovers.

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Residence 3 – 1327 m Southwest

Permissible Sound Level (PSL) Determination
Access Trim Blend Facility SW 18-56-21 W4M
AEUB Noise Control Directive

Basic Nighttime Sound Level (BSL)

Proximity to Transportation*	Dwelling Unit Density per ¼ Section of Land			Nighttime (22:00-07:00)	Daytime (07:00-22:00)
	1 – 8 Dwellings	9 – 160 Dwellings	>160 Dwellings		
Category 1	40	43	46	45	45
Category 2	45	48	51		
Category 3	50	53	56		
Daytime Adjustment				N/A	10
Basic Sound Level				45	55

Class A Adjustments

Class	Reason for Adjustment	Value (dBA L_{eq})
A1	Seasonal Adjustment (1 Nov – 31 Mar)	+5
A2	Absence of Both Tonal and Impulse/Impact Components	+5
A3	Ambient Monitoring Adjustment	-10 to +10
	Class Adjustment = Sum of A1, A2 and A3 (as applicable), but not to exceed a maximum of 10 dBA L_{eq}	

	Nighttime	Daytime
Total Class A Adjustments	0	0

Class B Adjustments

Class	Duration of Activity	Value (dBA L_{eq})	Nighttime	Daytime
B1	1 day	+15		
B2	1 week	+10		
B3	< or = to 2 months	+5		
B4	> 2 months	0	0	0
	Class B Adjustment = one only of B1, B2, B3 or B4			

Class B Adjustment

	Nighttime	Daytime
PERMISSIBLE SOUND LEVEL (dBA)	**45**	**55**

*Proximity to Transportation Category Definitions

Category 1	Dwelling units more than 500m from heavily travelled roads and/or rail lines and not subject to frequent aircraft flyovers.
Category 2	Dwelling units more than 30m but less than 500m from heavily travelled roads and/or rail lines and not subject to frequent aircraft flyovers.
Category 3	Dwelling units less than 30m from heavily travelled roads and/or rail lines and subject to frequent aircraft flyovers.

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Agrium Redwater and Fort Saskatchewan

Input Description	Member Site Comments
Confirmation that site has implemented a best management practice to address environmental noise as per NCIA Noise Management Plan Standard 2010-002 issued 3-Sep-10, revised 5-Mar-10 (attached), including the Procedure/Practice/Standard reference (i.e. SOP-AG.RW-200-002).	Agrium has documented and implemented a Noise Management Plan. The plan consists of the following documents: ESP 3.07.01 Noise Management Overview ESP 3.07.02 Noise Management Program ESP 3.07.03 Noise Source List ESP 3.07.04 Monitoring Program
Attach results of any monitoring/assessments (fenceline outward) completed in 2013.	In addition to the NCIA Regional Noise Model Annual Field Validation in the summer, Agrium completed quarterly offsite checks of its Redwater and Fort Sask facilities at set locations to identity any abnormal change in the offsite noise profile of our facilities. No issues were identified during these checks.
Disclose any improvements/corrective actions implemented in 2013 or status thereof that would impact the noise level output for your site (either up or down); including any updates to your site noise model.	As part of Agrium's management of change (MOC) process, Agrium proactively engaged HFP to assess sound level issues with and provide noise control options for the installation of a proposed compressor and gas turbine (CGT-902) for an end of life replacement requirement. The project has incorporated those suggestions into their design. Replacement is one to two years down the road. The noise from this piece of equipment is primarily occupational hygiene related, with minimum offsite environmental impact. Agrium also engaged Noise Solutions in our boiler replacement project to develop an appropriate Request For Proposal (RFP) from boiler vendors that would include noise mitigation within the scope of the request. The RFP was generated, and Noise Solutions has also been engaged to review these proposals to ensure they adequately address noise control in their design. This project is also one to two years down the road, but when completed, it is expected that the environmental and occupational noise levels from the Utilities boiler plant will be reduced as a result of the noise control requirements included in the design criteria.
Disclose any improvements/projects that are planned for 2014 that would impact the noise	No projects are planned for 2014.

level output for your site (either up or down); including any updates to your site noise model.	
Disclose any audit/self-assessment evaluation (qualitative evaluation only, with senior site leader sign-off) completed for your site noise management plan.	Agrium is reviewing our quarterly offsite noise monitoring program to improve the quality of the information gathering to allow a more meaningful assessment of the results obtained.
Provide a Noise Complaint summary for all noise complaints received in 2013 including any actions taken to address them.	There were no recorded noise complaints for either Agrium Redwater or Fort Saskatchewan in 2013.

This information is being collected as per the NMP Standard 2010-002 Document attached, section 5.4. All information provided will be disclosed to the ERCB as part of the required NCIA Annual Reporting on the Regional Noise Management Plan.

Further, the Annual Report will be a public document available on our website once finalized.

<table>
<tr><td rowspan="1">NCIA Northeast Capital Industrial Association</td><td>NCIA Standards and Guidelines</td><td colspan="2">Document Number
2010-003</td></tr>
<tr><td colspan="2">Noise Management Plan Reporting Requirements as per Section 5.4 of this Standard</td><td>Rev. Date
14-Apr-14</td><td>Rev.
2</td></tr>
</table>

<u>Air Liquide Canada – Scotford Site:</u>

Note, please provide as much detail as you can for the following, attaching any clarifying or required documents with your submission.

If you have any questions, please call Laurie Danielson @ 780.992.1463

Input Description	**Member Site Comments**
Confirmation that site has implemented a best management practice to address environmental noise as per NCIA Noise Management Plan Standard 2010-003 issued 3-Sep-10, revised 5-Mar-13, revised 14-Apr-14 (attached), including the Procedure/Practice/Standard reference. Note, if you have not provided an electronic copy of your site plan to NCIA, please do so.	Yes, followed internal SFD/CGN-0-101.
Attach results of any monitoring/assessments (fenceline outward) completed in 2013. Note, you are not required to conduct any off-site monitoring, however if you did, please provide those results electronically to NCIA.	N/A
Disclose any improvements/corrective actions implemented in 2013 or status thereof that would impact the noise level output for your site (either up or down). Did those changes result in a requirement to update your site noise model? If so, have you provided your updated site model to SLR Consulting for incorporation into the NCIA Regional Noise Model as per the process outlined for this purpose?	Winterization with insulation on critical equipment including outside equipment. No

Disclose any improvements/projects that are approved for 2014 that would impact the noise level output for your site (either up or down). Will these changes result in a requirement to update your site noise model? If so, when do you anticipate having an updated site model available?	None to disclose at this time.
Disclose any audit/self-assessment evaluation (qualitative evaluation only, with senior site leader sign-off) completed for your site noise management plan.	Noise survey conducted in 2013 – see attached map
Provide a Noise Complaint summary for all noise complaints received in 2013 including any actions taken to address them.	None

This information is being collected as per the NMP Standard 2010-003 Document attached, section 5.4. All information provided will be disclosed to the AER as part of the required NCIA Annual Reporting on the Regional Noise Management Plan.

Further, the Annual Report will be a public document available on our website once finalized.

	NCIA Standards and Guidelines	Document Number 2010-003	
Noise Management Plan Reporting Requirements as per Section 5.4 of this Standard		Rev. Date 14-Apr-14	Rev. 2

ATCO Power

Note, please provide as much detail as you can for the following, attaching any clarifying or required documents with your submission.

If you have any questions, please call Laurie Danielson @ 780.992.1463

Input Description	Member Site Comments
Confirmation that site has implemented a best management practice to address environmental noise as per NCIA Noise Management Plan Standard 2010-003 issued 3-Sep-10, revised 5-Mar-13, revised 14-Apr-14 (attached), including the Procedure/Practice/Standard reference. Note, if you have not provided an electronic copy of your site plan to NCIA, please do so.	It is ATCO Power's intention to prepare and implement a plan, when a final design is available and the project is approved. As a result, ATCO Power has not yet implemented a best practice plan.
Attach results of any monitoring/assessments (fenceline outward) completed in 2013. Note, you are not required to conduct any off-site monitoring, however if you did, please provide those results electronically to NCIA.	N/A
Disclose any improvements/corrective actions implemented in 2013 or status thereof that would impact the noise level output for your site (either up or down). Did those changes result in a requirement to update your site noise model? If so, have you provided your updated site model to SLR Consulting for incorporation into the NCIA Regional Noise Model as per the process outlined for this purpose?	N/A

Disclose any improvements/projects that are approved for 2014 that would impact the noise level output for your site (either up or down). Will these changes result in a requirement to update your site noise model? If so, when do you anticipate having an updated site model available?	N/A
Disclose any audit/self-assessment evaluation (qualitative evaluation only, with senior site leader sign-off) completed for your site noise management plan.	N/A
Provide a Noise Complaint summary for all noise complaints received in 2013 including any actions taken to address them.	N/A

This information is being collected as per the NMP Standard 2010-003 Document attached, section 5.4. All information provided will be disclosed to the AER as part of the required NCIA Annual Reporting on the Regional Noise Management Plan.

Further, the Annual Report will be a public document available on our website once finalized.

NCIA Northeast Capital Industrial Association	NCIA Standards and Guidelines	Document Number 2010-002	
Noise Management Plan Reporting Requirements as per Section 5.4 of this Standard		Rev. Date Feb. 12, 2014	Rev. 1

Aux Sable Canada

Note, please provide as much details as you can for the following, attaching any clarifying or required documents with your submission.

If you have any questions, please call Laurie Danielson @ 780.992.1463

Input Description	Aux Sable Comments
Confirmation that site has implemented a best management practice to address environmental noise as per NCIA Noise Management Plan Standard 2010-002 issued 3-Sep-10, revised 5-Mar-13 (attached), including the Procedure/Practice/Standard reference.	Aux Sable's facility design incorporated many features to minimize environmental noise and meet requirements of the AER Directive 038 and NCIA RNMP. Aux Sable's Noise Management Plan is included in this report. The document is called Aux Sable Fort Saskatchewan Site Noise Management Plan.
Attach results of any monitoring/assessments (fenceline outward) completed in 2013.	No sound monitoring was completed in 2013. The most recent sound survey was a "fenceline outward" and a residence noise monitoring/assessments conducted from September 20 to October 5, 2012 to satisfy a noise assessment for a future development project. Attached is the Aux Sable Canada Comprehensive Sound Survey completed by Patching Associates Acoustical Engineering Ltd. on September 20 – October 5, 2012 for this study.
Disclose any improvements/corrective actions implemented in 2013 or status thereof that would impact the noise level output for your site (either up or down); including any updates to your noise model.	None
Disclose any improvements/projects that are planned that would impact the noise level output for your site (either up or down); including any updates to your site noise model.	None
Disclose any audit/self-assessment evaluation (qualitative evaluation only, with senior site leader sign-off) completed for your site noise management plan.	A detailed occupational Noise Maps of the facility with doors assumed open and closed were completed in September 2012 (see attached) for industrial Hygiene purposes.
Provide a Noise Complaint summary for all noise complaints received in 2013 including any actions taken to address them.	Aux Sable has had zero noise complaints. As such, there were no recorded noise complaints in 2013.

This information is being collected as per the NMP standard 2010-002 Document attached, section 5.4. All information provided will be disclosed to the AER as part of the required NCIA Annual Reporting on the Regional Noise Management Plan.

Further, the Annual Report will be a public document available on our website once finalized.

Noise Management Plan
Aux Sable Canada LP
Fort Saskatchewan
2014 Plan

Prepared for:

Colin McEwen
Aux Sable Canada LP

Prepared by:

Justin Caskey, P.Eng.
Edmund Obasi, B.Sc., M.Math.

of

Patching Associates Acoustical Engineering Ltd.
Consultants in Acoustics, Noise Control and Vibration

February 12, 2014
PAAE File: 2013-3876

Notice

This report has been prepared by Patching Associates Acoustical Engineering Ltd (PAAE) in response to a specific request for service from, and for the exclusive use of, the Client to whom it is addressed. The findings contained in this report are based, in part, upon information provided by others. The information contained in this study is not intended for the use of, nor is it intended to be relied upon, by any person, firm, or corporation other than the Client to whom it is addressed, with the exception of the applicable regulating authority and/or industrial associations to whom this document may be submitted.

PAAE accepts no liability or responsibility for any damages that may be suffered or incurred by any third party as a result of the use of, reliance on, or any decision made based on this report.

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Introduction

Aux Sable Canada LP (AUX) retained Patching Associates Acoustical Engineering Ltd. (PAAE) to complete a Noise Management Plan (NMP) that meets the requirements of the Northeast Capital Industrial Association (NCIA) Standards 2010-002 issued 3-Sep-10, revised 5-Mar-13.

The Aux Sable's NMP would be provided as an input into the NCIA Regional Noise Management Plan report to the Alberta Energy Regulator (AER) for the Aux Sable Fort Saskatchewan Facility Site.

The Noise Management Plan Reporting Requirements as per Section 5.4 of this Standard is first presented below followed by the Site NMP.

NCIA Northeast Capital Industrial Association	NCIA Standards and Guidelines	Document Number 2010-002	
Noise Management Plan Reporting Requirements as per Section 5.4 of this Standard		Rev. Date Feb. 12, 2014	Rev. 1

Aux Sable Canada
Note, please provide as much details as you can for the following, attaching any clarifying or required documents with your submission.

If you have any questions, please call Laurie Danielson @ 780.992.1463

Input Description	Aux Sable Comments
Confirmation that site has implemented a best management practice to address environmental noise as per NCIA Noise Management Plan Standard 2010-002 issued 3-Sep-10, revised 5-Mar-13 (attached), including the Procedure/Practice/Standard reference.	Aux Sable's facility design incorporated many features to minimize environmental noise and meet requirements of the AER Directive 038 and NCIA RNMP. Aux Sable's Noise Management Plan is included in this report. The document is called Aux Sable Fort Saskatchewan Site Noise Management Plan.
Attach results of any monitoring/assessments (fenceline outward) completed in 2013.	No sound monitoring was completed in 2013. The most recent sound survey was a "fenceline outward" and a residence noise monitoring/assessments conducted from September 20 to October 5, 2012 to satisfy a noise assessment for a future development project. Attached is the Aux Sable Canada Comprehensive Sound Survey completed by Patching Associates Acoustical Engineering Ltd. on September 20 – October 5, 2012 for this study.
Disclose any improvements/corrective actions implemented in 2013 or status thereof that would impact the noise level output for your site (either up or down); including any updates to your noise model.	None
Disclose any improvements/projects that are planned that would impact the noise level output for your site (either up or down); including any updates to your site noise model.	None
Disclose any audit/self-assessment evaluation (qualitative evaluation only, with senior site leader sign-off) completed for your site noise management plan.	A detailed occupational Noise Maps of the facility with doors assumed open and closed were completed in September 2012 (see attached) for industrial Hygiene purposes.
Provide a Noise Complaint summary for all noise complaints received in 2013 including any actions taken to address them.	Aux Sable has had zero noise complaints. As such, there were no recorded noise complaints in 2013.

This information is being collected as per the NMP standard 2010-002 Document attached, section 5.4. All information provided will be disclosed to the AER as part of the required NCIA Annual Reporting on the Regional Noise Management Plan.
Further, the Annual Report will be a public document available on our website once finalized.

Aux Sable Fort Saskatchewan Site Noise Management Plan

Policy

Aux Sable is committed to reducing the environmental noise impacts of its operations to the extent practical. This Site Noise Management Plan is part of the Aux Sable's ongoing commitment to the environment, our neighbours, and social performance. The Aux Sable Leadership Team is committed to controlling noise and supports the contents of this Site Noise Management Plan. The following summarizes Aux Sable Canada Ltd. Environmental, Health & Safety Policy.

AUX SABLE
Environmental, Health & Safety Policy

POLICY STATEMENT
Aux Sable is committed to meeting or exceeding applicable laws, regulations and appropriate industry standards relative to the protection of the Environment, Health and Safety. Aux Sable executives, management, staff and contractors are each responsible to understand and fulfill the expectations inherent in this policy.

KEY POLICY ELEMENTS

Resources
Aux Sable will provide the necessary resources to ensure that all employees are properly trained as required to operate the facilities and conduct company business in a safe, environmentally conscious and responsible manner. Contractors working in the facility will be evaluated on a regular basis and provided the necessary site training to ensure they perform their work consistent with this policy.

Environmental, Health, and Safety Management Systems

- ***Planning***—Aux Sable will strive for Continuous Improvement by maintaining, enhancing, and improving written Environmental, Health and Safety Management Systems through assessments of potential environmental, health and safety hazards related to company activities and eliminate, minimize or mitigate adverse affects in a timely manner.
- ***Measurement and Evaluation***—Aux Sable will set measurable targets and evaluate performance through effective Environmental, Health and Safety Management Systems as well as establishing plans to improve performance and report these findings to appropriate parties on a regular basis.
- ***Review and Improve***—At appropriate intervals, Aux Sable will obtain an objective review of the effectiveness of the Environmental, Health and Safety Management Systems and take all necessary corrective actions based on the findings to ensure Continuous Improvement.

Employee Participation
All Aux Sable Employees are expected to participate in all aspects of the Environmental, Health and Safety Management Systems which includes reviews, improvements and problem solving activities related to the Environment, Health and Safety.

Communication
Aux Sable will maintain regular communication with employees, contractors and other stake holders on Environmental, Health and Safety matters as well as provide appropriate Regulatory Agencies with information as required by state and federal regulations.

Tim Stauft, P.Eng.
President & Chief Executive Officer

January 1, 2014

AUX SABLE

Scope

Noise is regulated by the Alberta Energy Regulator (AER) Directive 038 Noise Control Directive. The Fort Saskatchewan Industrial Heartland Area is considered an area where a Comprehensive Sound Level (CSL) survey is not practical for determining compliance of a facility due to the large industrial base in a relatively small area. As such, all NCIA (Northeast Capital Industrial Association) member companies in the Industrial Heartland are encouraged to participate in the Regional Noise Management Plan (RNMP) developed by the NCIA.

The RNMP is designed with the intent of minimizing to the extent practical, the noise levels impacting on the environment from member companies and their associated industrial facilities. The RNMP ensures that NCIA member companies adopt best practices and principles in noise management and that each member company will implement a Site NMP (Noise Management Plan) independently.

Each NMP must include:

- Identification of noise sources,
- Assessment of current noise mitigation programs,
- Evaluation of the performance effectiveness of noise control devices,
- Routine noise monitoring and measurement program,
- Best practices programs,
- Continuous improvement programs, and
- Must be externally auditable.

This document is created to ensure that the operations of the Aux Sable Facility would include the implementation of effective systems and programs that would help to minimize the noise impacts of the Aux Sable Facility operations to the extent practical, consistent with the goals and objectives of the NCIA Regional Noise Management Plan.

Purpose

Noise is actively managed by implementing practical noise controls, and proactively assessing the impact and control during project design stage, and also measuring and monitoring to ensure controls are effective. The purpose of this Site Noise Management Plan is to establish the systems and programs required to minimize to the extent practical the noise impacts of the Aux Sable Fort Saskatchewan Site.

Goals and Objectives

Aux Sable is committed to reducing the environmental noise impacts of its operations and will:

- Minimize to the extent practical, noise levels impacting on the environment.
- Maintain a fenceline noise monitoring program to evaluate the facility noise level trend and to determine if there are any significant changes to sound emanating from the facility thereby reducing the likelihood of noise impacts on the environment.
- Assign employees to manage the site noise monitoring, mitigation and continuation improvement programs.
- Ensure employees associated with noise sources are aware of the impact on the environment and the processes to control it, consistent with the company's industrial hygiene and occupational noise exposure control objectives.
- Design new and modified equipment to minimize occupational and environmental noise.

Training Requirements

Personnel conducting noise monitoring must review the site NMP, the AER Directive 038 Noise Control Directive and the manual on the operation of the sound level monitors being used. Where required, the service of an experienced acoustical expert would be utilized. Aux Sable workers are also educated on noise through various safety trainings on hearing conservation. As stated in the Aux Sable's EH&S Policy, Aux Sable is committed to providing the necessary resources to ensure that all employees are properly trained as required to operate the facilities and conduct company business in a safe, environmentally conscious and responsible manner.

Noise Abatement Strategies

New facilities and modifications to existing facilities are designed and built to control occupational noise exposure levels and environmental noise levels. Aux Sable recognizes that it is not practical or possible to totally eliminate all sources of noise. However, it is expected that wherever possible, noise control practices and mitigation will be in place to minimize noise as much as possible. Some of the occupational and environmental noise abatement strategies would include:

- Maintaining a noise control standard when procuring new equipment or taking into consideration noise impacts when planning new facilities or modifications of existing facilities.
- Ensuring that all internal combustion engines are fitted with appropriate muffler systems.
- Equipping facility related vehicles including trucks with appropriate mufflers.
- Closing equipment building doors and windows whenever possible.
- Utilizing low noise cooler fans with Variable Frequency Drives (VFD) for lower speed during nighttime whenever practical.
- Where possible, scheduling noisy events during daytime hours of 7 AM to 8 PM in order to reduce potential noise disturbances.
- Maintaining an up to date noise model of the facility.
- Take advantage of acoustical screening from existing on-site buildings to shield dwellings from noisy activities where practicable.
- Having an active representation on the NCIA Noise Best Practices Sub-committee and attending noise conferences in order to stay current with the best available noise control technologies.
- Procurement practices to ensure equipment that is equivalent to Best Available Technology Economically Achievable (BATEA) standards for noise is purchased and to promote continuous improvement in design by setting expectations for contractors and manufacturers.
- Keeping record of all noise complaint filed by residents. In the event that a valid noise complaint is received, Aux Sable will consult the NCIA and additionally respond promptly in accordance with the ERCB Noise Complaint Investigation procedures specified in Directive 038.
- Ensuring that appropriate personal hearing protection devices (e.g., ear muffs and ear plugs) are available to employees and contractors to minimize hearing loss as stipulated in the Alberta Occupational Health and Safety (OH&S) standard. As per Alberta OH&S standards, hearing protection are required at 85 dBA, and double hearing protection (ear muffs & plugs) must be worn and signage must be present when noise levels are at or exceed 105 dBA. Generally, areas with noise levels greater than 85 dBA must have signs indicating that hearing protection is required. No unprotected exposure is permitted for exposure level greater than 115 dBA.
- Ensuring that the personal hearing protection devices are approved and classified or graded by the Canadian Standards Association (CSA).
- Ensure there are up-to-date employee and contractor's orientation training and awareness for reducing noise exposure.
- Ensure there are appropriate programs of Audiometric Testing of exposed workers for hearing conservation thereby minimizing hearing loss, the frequency of the audiometric testing and procedures must be consistent with the Alberta OH&S standards.

Onsite & Offsite Monitoring Requirements

Aux Sable follows the AER Directive 038 regulatory requirements for completing equipment diagnostic measurements and fenceline noise monitoring on site. All sound monitoring equipment and calibration records must meet the AER Directive 038 requirements. Additionally, onsite spot measurements are conducted for creating detailed onsite Noise Maps required for Industrial Hygiene/Occupational Health and Safety purposes as stipulated in the Alberta Occupational Health and Safety (OH&S) standard.

Offsite noise monitoring is addressed through the NCIA regional noise model.

Aux Sable has a current Noise Model prepared by Patching Associates Acoustical Engineering Ltd. and submitted to the NCIA for inclusion to the regional noise model. The current Aux Sable facility Noise Model includes the identification of all the existing and proposed noise sources within the facility fenceline. The site noise model is updated whenever equipment is added or removed from the site to keep it current.

Aux Sable has had zero noise complaints and in the event of receiving valid external noise complaint, Aux will consult the NCIA, and additionally respond promptly in accordance with the ERCB Noise Complaint Investigation procedures specified in Directive 038.

Site Noise Sources

The Aux Sable site noise sources are detailed in the current Noise Model for the facility and included in the NCIA regional noise model. Aux Sable will update the model anytime there are changes to the equipment configuration at the site and will inform NCIA accordingly.

Audit & Self-Assessment Requirements

The Aux Sable's Environmental, Health and Safety (EH&S) manager reviews the procedures in the Noise Management Plan annually. This includes an examination of the noise survey results to determine if there are any significant changes to sound emanating from the facility, a review of noise complaints if any and their follow-ups, review of worker training records and review of planned expansions which may impact environmental noise from the facility. Sound monitoring surveys of the facility may be completed as part of the audit process if there have been significant changes to the number of noise generating equipment at the site. The Audit results and findings will be included in the annual summary to NCIA to be included in the NCIA Annual Noise Report to the AER. The audit/self-assessment must meet the requirements stipulated in Section 5.3 of the NCIA Standards 2010-002.

Reporting Requirements

Aux Sable has the responsibility to provide input into the Annual Regional Noise Management Plan report, which is submitted to the ERCB by the NCIA. The report must meet the reporting requirements stipulated in Section 5.4 of the NCIA Standards and Guidelines.

The information to be provided is as follows:

- Confirmation that the Aux Sable Facility site has implemented a best management practice to address environmental noise as per NCIA Noise Management Plan Standard 2010-002 issued 3-Sep-10, revised 5-Mar-13.
- Results of any monitoring/assessments (fenceline outward) completed in the reporting year.
- Disclosure of improvements/corrective actions implemented for the reporting year.
- Disclosure of any improvements and planned projects that would impact the noise level output for the site (either up or down).
- Disclosure of any audit/self-assessment evaluation (qualitative evaluation only) with senior leader sign-off completed for the site noise management plan.
- A summary of any noise complaints and actions taken.

Chemtrade West

Note, please provide as much detail as you can for the following, attaching any clarifying or required documents with your submission.

If you have any questions, please call Laurie Danielson @ 780.992.1463

Input Description	Member Site Comments
Confirmation that site has implemented a best management practice to address environmental noise as per NCIA Noise Management Plan Standard 2010-003 issued 3-Sep-10, revised 5-Mar-13, revised 14-Apr-14 (attached), including the Procedure/Practice/Standard reference. Note, if you have not provided an electronic copy of your site plan to NCIA, please do so.	Both the CSC and Sulphides facilities have implemented a management program to address environmental noise as per NCIA Noise Management Plan Standard 2010-001 issues 3-Sept-10 (copy was sent by email on December 31, 2012 to Laurie Danielson). Chemtrade has also implemented an industrial hygiene monitoring program throughout all facilities 2013.
Attach results of any monitoring/assessments (fenceline outward) completed in 2013. Note, you are not required to conduct any off-site monitoring, however if you did, please provide those results electronically to NCIA.	No new monitoring/assessments completed beyond the fenceline for 2013.
Disclose any improvements/corrective actions implemented in 2013 or status thereof that would impact the noise level output for your site (either up or down). Did those changes result in a requirement to update your site noise model? If so, have you provided your updated site model to SLR Consulting for incorporation into the NCIA Regional Noise Model as per the process outlined for this purpose?	Chemtrade has developed and implemented an Industrial Hygiene program throughout all facilities in 2013. Facilities will follow a recommended monitoring schedule.

Disclose any improvements/projects that are approved for 2014 that would impact the noise level output for your site (either up or down). Will these changes result in a requirement to update your site noise model? If so, when do you anticipate having an updated site model available?	None to disclose at this time. The site noise model will remain the same at both facilities.
Disclose any audit/self-assessment evaluation (qualitative evaluation only, with senior site leader sign-off) completed for your site noise management plan.	None to disclose at this time.
Provide a Noise Complaint summary for all noise complaints received in 2013 including any actions taken to address them.	There has been no noise complaints received in 2013.

This information is being collected as per the NMP Standard 2010-003 Document attached, section 5.4. All information provided will be disclosed to the AER as part of the required NCIA Annual Reporting on the Regional Noise Management Plan.

Further, the Annual Report will be a public document available on our website once finalized.

NCIA office, Fort Saskatchewan
#204 9902- 102 Street
Fort Saskatchewan, AB
Executive Director, Northeast Capital Industrial Association

RE: Environmental Noise Monitoring Results for the Fort Saskatchewan CSC and Sulphides sites

The following are Environmental Noise Monitoring Results for the Fort Saskatchewan CSC and Sulfides sites for 2013 as per the Chemtrade Environmental Noise Monitoring and Control Procedure CHE-FSK-ESH-001.

General Information

Instrument

A Cirrus Model CR171A Noise Meter was used for all sound measurements. The meter was last calibrated October 2013, using techniques recommended by International Standards IEC 61672-1:2002, IEC 60651:1979, IEC 60804:2001, IEC 60942:1997, IEC 61252:1993, ANSI S1.4-1983 and ANSI S1.43-1997. An acoustic calibrator designed specifically for the meter, was used to check the calibration prior to the meter being used.

The Measurements

Noise measurements were taken by April Booker on October 2, 2013 (Sulfides) and November 4, 2013 (CSC).

Weather Information

The wind direction on October 2, 2013 was out of SE and the wind speed was varied 8-10 mph; November 4, 2013 was out of the SW and the wind speed varied between 15-18 mph.

Fort Saskatchewan CSC

Noise measurements were taken on November 4, 2013 at the same locations as those outlined in CHE-FSK-ESH-001.

CSC Noise Measurement Results

ID	Linear Sound Pressure Levels (dB L_{eq}) at Octave Band Frequencies (Hz)									dBA
	31.5	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**	
1	76.2	73.5	66.5	57.3	58.8	54.6	49.2	47.6	30.3	61.3
2	72.2	74.1	64.3	59.6	63.2	64.7	70.1	70.3	63.5	74.5
3	69.8	71.3	63.2	55.9	56.4	55.1	51.1	45.8	40.9	58.6
4	76.1	71.9	65.4	59.1	59.7	61.8	64.7	66.2	58.9	68.7
5	72.6	71.2	64.9	68.7	58.2	56.8	52.9	50.1	43.8	60.4
6	72.5	71.8	64.3	56.8	58.1	54.3	51.7	50.8	43.7	61.9
7	73.8	77.2	66.3	65.9	58.8	53.9	53.8	49.8	42.9	62.1
8	77.1	73.9	68.1	63.4	57.8	51.9	45.6	45.1	44.9	59.8
9	81.6	75.3	70.1	64.2	63.1	61.8	64.1	64.2	57.1	68.5

11652 99 Avenue, PO Box 3180, Fort Saskatchewan, Alberta T8L 2T2
T 780-998-2225 F 780-998-0959
Web Site: www.chemtradelogistics.com

Fort Saskatchewan Sulphides

Noise measurements were taken on October 2, 2013 at the same locations as those outlined in CHE-FSK-ESH-001.

Sulphides Noise Measurement Results

ID	Linear Sound Pressure Levels (dB L_{eq}) at Octave Band Frequencies (Hz)									dBA
	31.5	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**	
1	74.0	78.4	69.8	69.3	63.8	60.8	56.2	50.9	44.8	66.1
2	69.5	69.1	68.5	63.2	59.8	55.9	56.8	53.2	51.4	62.9
3	71.8	68.3	64.8	57.6	53.4	53.9	51.2	44.9	42.1	58.9
4	69.7	68.8	67.3	54.9	66.1	67.9	65.8	58.1	48.2	68.9
5	74.1	70.5	67.2	60.4	56.8	54.2	53.6	44.9	38.5	59.2
6	71.3	69.2	70.5	66.8	57.8	55.5	53.1	45.6	38.5	61.4
7	69.6	67.2	63.3	56.4	52.3	50.3	45.2	38.9	32.5	54.6

Discussion

2013 noise measurement results are consistent with those taken by Pinchin West Ltd. on November 28, 2013 (CSC) and April 10, 2014(Sulfides). Variations are attributed to the cold weather, wind speed and differences in traffic along adjacent roadways.

There were no projects undertaken in 2013 which would have any significant impact on the overall noise generated at either the CSC of Sulphide sites.

If you have any questions or concerns, please contact me at 780-992-4735.

Yours truly,

April Booker, CCEP
EHS Supervisor, Chemtrade West GP Inc.

cc: H. Zuczek, Plant Manager – Sulfides and CSC
C. Harding, CIH - EHS Project Manager North America

Dow Chemical Canada ULC
Bag 16, Highway 15
Fort Saskatchewan, Alberta
T8L 2P4, Canada

May 23, 2014

Northeast Capital Industrial Association
Laurie Danielson, Executive Director
#204, 9902 - 102 Street
Fort Saskatchewan, AB T8L 2C3

Dear Dr. Danielson,

Subject: 2013 Noise Management Annual Report
Dow Chemical Canada ULC (Dow) Fort Saskatchewan Site

Please find attached Dow Chemical Canada ULC (Dow) input into the NCIA Regional Noise Management Plan report to the Alberta Energy Regulator (AER) along with a copy of the Noise Management Plan for the Dow Fort Saskatchewan Industrial Site. MEGlobal Canada Inc. (MEGlobal) operates a production facility within the Dow Site and is included in this submission.

Please call Marcella deJong at 780 - 992 - 8529 or myself at 780 - 998 - 5720 if you require any further information or clarification.

Yours truly,

Mike Dziarmaga, P. Eng.
Responsible Care Leader
Dow Alberta Operations

Copy: Pravind Ramdial, Responsible Care Leader MEGlobal Canada Inc.

Dow Fort Saskatchewan Site
2013 Noise Management Annual Report
Prepared for Northeast Capital Industrial Association (NCIA)

This report provides Dow and MEGlobal's 2013 input to the NCIA Regional Noise Management Plan report to be submitted to the AER in May 2014. Based on AER licensed assets on the Fort Saskatchewan Site, Dow is required to follow AER Noise Directive 38 and provide input into the NCIA report. The Dow power plant is governed by the Alberta utilities Commission Rule 012: Noise Control. MEGlobal participates in the Noise Management Plan and provides this information on a voluntary basis.

Input Description	Dow and MEGlobal Comments
Confirmation that site has implemented a best management practice to address environmental noise as per NCIA Noise Management Plan Standard 2010-003 issued 3-Sep-10, revised 5-Mar-10, revised 14-Apr-14 (attached), including the Procedure/Practice/Standard reference.	A Noise Management Plan was developed by Dow and MEGlobal for submission to NCIA for inclusion in the 2011 NCIA report to the AER. This plan has been updated and the revised version is attached to this annual report. Noise management is done on a site wide basis without separation of which facilities are required to follow AER Directive 38 and AUC Rule 012.
Attach results of any monitoring/assessments (fenceline outward) completed in 2013. *Note, you are not required to conduct any off-site monitoring, however if you did, please provide those results electronically to NCIA.*	No noise monitoring or assessments (fenceline outward) were completed in 2013. The most recent noise model was completed in 2011 for all sources (other than on-site transportation) within the Dow Fort Saskatchewan Site, including MEGlobal.
Disclose any improvements/corrective actions implemented in 2013 or status thereof that would impact the noise level output for your site (either up or down). *Did those changes result in a requirement to update your site noise model?* *If so, have you provided your updated site model to SLR Consulting for incorporation into the NCIA Regional Noise Model as per the process outlined for this purpose?*	Changes were made to a Dow site steam turbine in 2012 which has resulted in significantly less venting of a seasonally operated steam vent during the summer season. In 2013, operation of this steam vent was reviewed. Since the spring 2012 turnaround, we have seen a significant decrease in the number of days that this steam vent has been open. However, the intensity of the venting remains similar to prior to the turnaround. Since the intensity remains the same, Dow did not monitor noise from this vent in 2013.
Disclose any improvements/projects that are approved for 2014 that would impact the noise level output for your site (either up or down). *Will these changes result in a requirement to update your site noise model?* *If so, when do you anticipate having an updated site model available?*	In 2014, Dow will continue track the frequency of time that the steam vent is operated as well as the valve position to ensure that the frequency remains reduced from pre-turnaround and will plan for field monitoring only if the intensity of the sound when the vent is operating changes over time.

Disclose any audit/self-assessment evaluation (qualitative evaluation only, with senior site leader sign-off) completed for your site noise management plan.	The noise management plan falls within the Pollution Prevention section of Dow and MEGlobal's Operating Discipline Management System (ODMS). A site management system review was conducted in November 2013 by the site leader. No actions or gaps were identified related to the Noise Management Plan.
Provide a Noise Complaint summary for all noise complaints received in 2013 including any actions taken to address them.	There were no noise complaints in 2013 related to Dow or MEGlobal operations at the site.

Dow Fort Saskatchewan Site Noise Management Plan

Policy

The Dow Chemical Canada ULC Fort Saskatchewan site follows the Operating Discipline Management System (ODMS) of the Dow Chemical Company to manage environmental noise and hearing conservation.

MEGlobal Canada Inc. (MEGlobal) Operations on the Dow Fort Saskatchewan Site follows ODMS and is included in this Noise Management Plan.

Scope

This document is created to define how the Dow Chemical Canada ULC Fort Saskatchewan site complies with the ODMS requirements concerning Noise Minimization and Hearing Conservation outlined in:

- Section E (noise minimization to meet community expectations and applicable government requirements) of 06.07 L1 Pollution Prevention
- Section C14 (employee hearing conservation) of 06.05 L1 Employee Health and Safety
- Section A2 (all equipment must be designed to control noise levels) of 06.03 EH&S Engineering Design and Control

Purpose

This document summarizes how the Dow Fort Saskatchewan Site meets the Northeast Capital Industrial Association (NCIA) requirement for a Noise Management Plan including identification, evaluation and control of noise impacts at this site.

This Noise Management Plan meets the requirements of NCIA Standard and Guideline #2010-003, as amended.

Based on AER licensed assets on the Fort Saskatchewan Site, Dow is required to follow AER Noise Directive 38 and provide input into the NCIA report. The Dow power plant is governed by the Alberta Utilities Commission Rule 012: Noise Control.

Goals / Objectives

Dow and MEGlobal, as Responsible Care® Companies will:

- Minimize, to the extent possible, noise levels impacting on the environment including minimizing nighttime and low frequency noise
- Maintain a noise monitoring program to reduce the likelihood of noise impacts on the environment
- Assign employees to manage the site noise monitoring, mitigation and continuous improvement.
- Ensure employees associated with noise sources are aware of the impact on the environment and the processes in place to control
- Design new and modified equipment to minimize noise.

Training Requirements

Workers are educated on noise through:

- All workers receive initial and three year recurring Environmental Training (Instructor led or MyLearning), which includes environmental noise.
- Noise exposed workers receive MyLearning training on hearing conservation.
- Personnel conducting noise monitoring receive training from the Industrial Hygiene specialists.
- Personnel delivering unit industrial hygiene programs receive MyLearning training on these programs.

Abatement Strategies	New facilities and modifications to existing facilities are designed and built to control noise levels. Engineering controls are addressed through the Management of Change process and ODMS 06.03 EH&S Design and Control. All projects are reviewed by EH&S regulatory personnel opposite the Alberta Operations Project Regulatory Review Checklist, which includes noise abatement and models. The Dow Management of Change system includes a similar review for changes to site facilities.
Onsite / Offsite Monitoring Requirements	Dow and MEGlobal follow ODMS and AER regulatory requirements for noise monitoring on site. Offsite noise monitoring is addressed through the NCIA regional noise model. Dow has a current Noise Model prepared by HFP Acoustical Consultants Corp which includes all significant site sources within the fenceline other than on-site transportation sources. The site noise model is updated if equipment is added or removed from the site that would significantly impact noise levels. The regional noise model is validated periodically by NCIA. If any discrepancies are noted during NCIA field validation related to the Dow site, Dow will work toward resolving the discrepancy and may validate the Dow noise model with field measurements if required. Dow responds to external noise complaints appropriately, including monitoring if necessary. Dispatch Noise Complaint Procedure EH&S On-Call Noise Complaint Procedure EH&S On-Call Noise Complaint Logsheet Individual production units do their own noise surveys at least every five years, or when equipment is added, modified or removed. The onsite noise monitoring program is managed as per in ODMS 06.05.C14 Personal noise dosimetry is done periodically on a frequency depending on exposure.
Site Noise Sources	Site noise sources are detailed in the site Noise Model and included in the NCIA regional noise model. In addition, each unit has an area noise map.
Audit / Self Assessment Requirements	Intensive EH&S ODMS based integrated audits are conducted at 3 to 5 year frequencies for all site units/departments and include ODMS elements related to noise and hearing conservation. Periodic self assessments are conducted by unit/department ODMS element owners and results are reviewed with leaders at unit and department management system reviews. Results of unit, department and site self assessments are reviewed by the Site Leader at the annual site management system review. These self assessments include environmental noise and hearing conservation. The hearing conservation program is designed to minimize job induced hearing loss and meets the Alberta OH&S Code as well as Dow corporate requirements for a noise exposure and control program. This program is reviewed annually. This Noise Management Plan is reviewed once per year by the Responsible Care Leader.

Reporting Requirements

Annual reports will be generated for the NCIA. This report will include the following information for the calendar year:

- Confirmation that the site has implemented a Noise Management Program and that it has been reviewed/updated as required.
- Results of any monitoring / assessments (fenceline outward)
- Improvements/Corrective Actions implemented
- Improvement / projects that have resulted in changed noise levels on the site
- Audit/Self Assessment evaluation
- Information on any external noise complaints received and actions taken

Ownership

The AER Regulatory Specialist manages the Noise Management Program and reports to NCIA as required.

Revision History

Approval

Approved by Date: January 2012

Carol Moen (Dow Responsible Care Leader)

Pravind Ramdial (MEGlobal Responsible Care Leader)

Review History

The following documents the review history for this file.

Date	Reviewed By	Position
April 2013	Mike Dziarmaga	Dow Responsible Care Leader
May 2014	Mike Dziarmaga	Dow Responsible Care Leader

Revision History

The following information documents at least the last 3 changes to this document, with all the changes listed for the last 6 months.

Date	Revised By	Changes
January 2012	Marcella deJong	New document.
April 2013	Marcella deJong	Updated Reporting Requirements to match with updated NCIA NMP Standard dated 5-Mar-13.
May 2014	Marcella deJong	Updated with clarifications suggested during AER audit of the Noise Management Plan and to meet the current NCIA standard revised in April 2014.

NCIA Northeast Capital Industrial Association	NCIA Standards and Guidelines	Document Number 2010-003	
Noise Management Plan Reporting Requirements as per Section 5.4 of this Standard		**Rev. Date** 14-Apr-14	**Rev.** 2

Enbridge Pipelines

Note, please provide as much detail as you can for the following, attaching any clarifying or required documents with your submission.

If you have any questions, please call Laurie Danielson @ 780.992.1463

Input Description	Member Site Comments
Confirmation that site has implemented a best management practice to address environmental noise as per NCIA Noise Management Plan Standard 2010-003 issued 3-Sep-10, revised 5-Mar-13, revised 14-Apr-14 (attached), including the Procedure/Practice/Standard reference. Note, if you have not provided an electronic copy of your site plan to NCIA, please do so.	Yes
Attach results of any monitoring/assessments (fenceline outward) completed in 2013. Note, you are not required to conduct any off-site monitoring, however if you did, please provide those results electronically to NCIA.	See Report, Noise management Plan Stonefell
Disclose any improvements/corrective actions implemented in 2013 or status thereof that would impact the noise level output for your site (either up or down). Did those changes result in a requirement to update your site noise model? If so, have you provided your updated site model to SLR Consulting for incorporation into the NCIA Regional Noise Model as per the process outlined for this purpose?	

Disclose any improvements/projects that are approved for 2014 that would impact the noise level output for your site (either up or down). Will these changes result in a requirement to update your site noise model? If so, when do you anticipate having an updated site model available?	None to disclose at this time.
Disclose any audit/self-assessment evaluation (qualitative evaluation only, with senior site leader sign-off) completed for your site noise management plan.	Noise management Plan
Provide a Noise Complaint summary for all noise complaints received in 2013 including any actions taken to address them.	No complaint

This information is being collected as per the NMP Standard 2010-003 Document attached, section 5.4. All information provided will be disclosed to the AER as part of the required NCIA Annual Reporting on the Regional Noise Management Plan.

Further, the Annual Report will be a public document available on our website once finalized.

Noise Management Plan

For The

Stonefell Station

at

NE-04-56-21-W4M

Enbridge Pipelines (Athabasca) Inc.

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1.0 Purpose

Enbridge Pipelines (Athabasca) Inc. ("Enbridge") is a member of the Northeast Capital Industrial Association (NCIA). The NCIA has developed a Regional Noise Management Plan (RNMP) to comply with the requirement of the Alberta Energy Regulator (AER) Directive 038, Noise Control. In accordance with the RNMP and the AER Directive 038, Enbridge has developed this Noise Management Plan (NMP). The NMP establishes requirements and guidelines for the identification, evaluation, control, and reporting of noise impacts.

2.0 Scope

This NMP applies to the Enbridge Stonefell Station located at NE-04-56-21-W4M. The location of the facility is indicated in Figure 1.

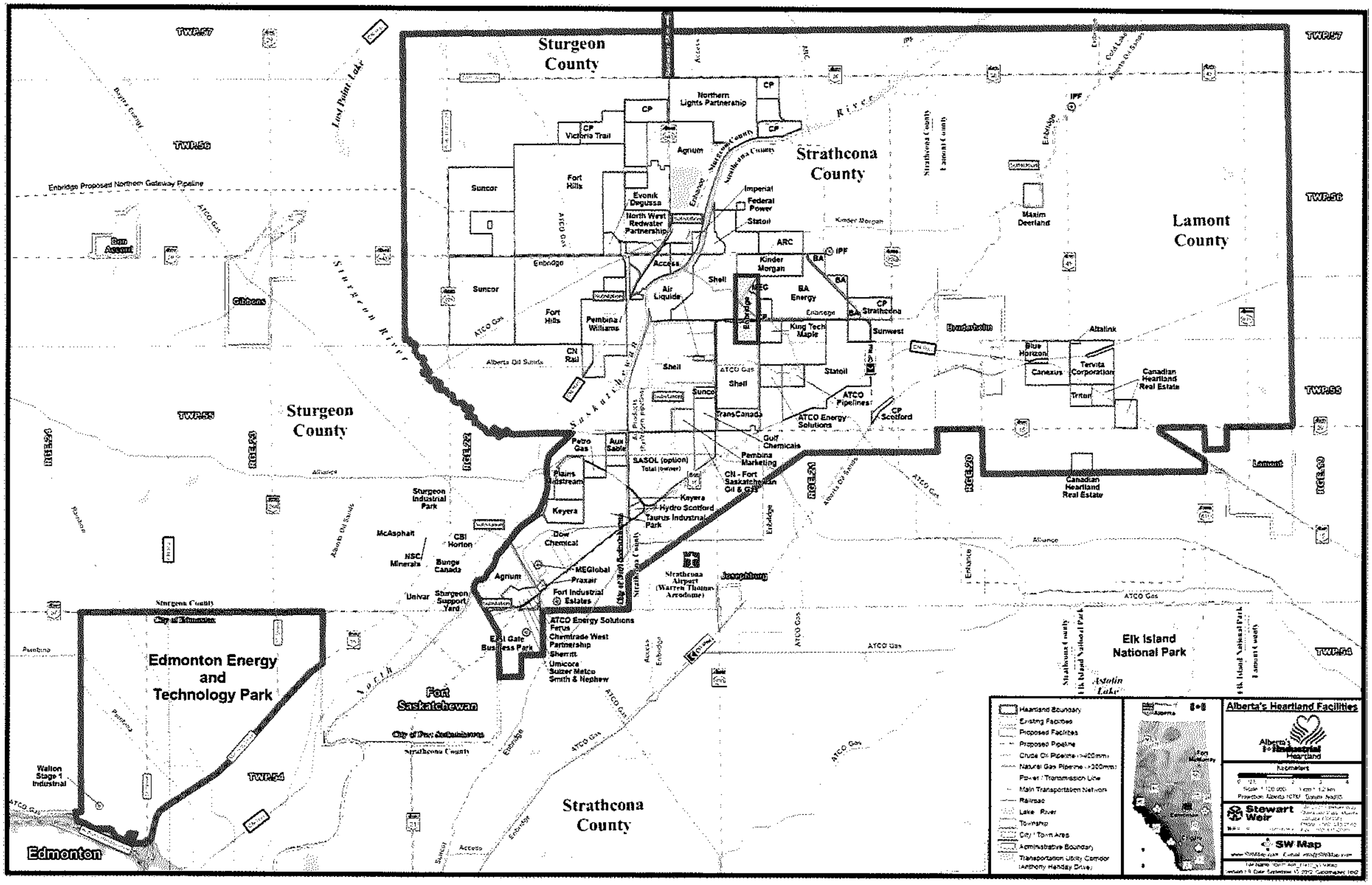


Figure 1. Enbridge Stonefell Station Location

3.0 Definitions

A-weighted sound level (dBA)
The sound level as measured on a sound level meter using a setting that emphasizes the middle frequency components similar to the frequency response of the human ear at levels typical of rural backgrounds in mid frequencies.

Bands (octave, 1/3 octave)
A series of electronic filters separate sound into discrete frequency bands, making it possible to know how sound energy is distributed as a function of frequency. Each octave band has a centre frequency that is double the centre frequency of the octave band preceding it. The 1/3 octave band analysis provides a finer breakdown of sound distribution as a function of frequency.

C-weighted sound level (dBC)
The C-weighting approximates the sensitivity of human hearing at industrial noise levels (above about 85 dBA). The C-weighted sound level (i.e., measured with the C-weighting) is more sensitive to sounds at low frequencies than the A-weighted sound level and is sometimes used to assess the low-frequency content of complex sound environments.

dB (decibel)
A unit of measure of sound pressure that compresses a large range of numbers into a more meaningful scale. The internationally agreed upon threshold for hearing is 2×10^{-5} Pa (0 dB), while the sensation of pain is about 2×10^{2} Pa (140 dB). Generally, an increase of 10 dB is perceived as twice as loud. The sound pressure level (SPL) in dB is defined as:

$$SPL = 10 \log_{10}\left(\frac{{P_{RMS}}^2}{{P_{ref}}^2}\right) = 20 \log_{10}\left(\frac{P_{RMS}}{P_{ref}}\right)$$

Where:

SPL = Sound Pressure Level in dB
P_{RMS} = Root Mean Square measured pressure (Pa)
P_{ref} = Reference sound pressure level ($P_{ref} = 2\mathrm{x}10^{-5}$ Pa = 20 mPa)

Energy equivalent sound Level (L_{eq})
The L_{eq} is the average A-weighted sound level over a specified period of time. It is a single-number representation of the cumulative acoustical energy measured over a time interval, T. The time interval must be specified in order for the L_{eq} to be valid. If a sound level is constant over the measurement period, the L_{eq} will equal the constant sound level.

Environmental Noise
Displeasing, distracting or physically harmful human or machine created sound that disrupts the environment. The dominant sources of environmental noise are transportation, industrial and recreational activities. Generally this refers to noise outside a facility boundary.

Frequency
The number of cycles of a periodic phenomenon per second. Unit: hertz (Hz)

Industrial Hygiene/Occupational Health and Safety
Noise levels regulated by statute or law in a place of work. Generally this refers to noise within the facility boundaries.

Noise impact assessment (NIA) [AER Directive 038]
An NIA identifies the expected sound level emanating from a facility as measured 15 m from the nearest or most impacted permanently or seasonally occupied dwelling. It also identifies what the permissible sound level is and how it was calculated.

Permissible sound level (PSL) [AER Directive 038]
The maximum sound level that a facility must not exceed at a point 15 m from the nearest or most impacted dwelling unit. The PSL is the sum of the BSL, daytime adjustment, Class A adjustment, and Class B adjustment.

Sound pressure level (SPL)
The decibel equivalent of the pressure of sound waves at a specific location, which is measured with a microphone. Because human reaction and material behaviors vary with frequency, the sound pressure level may be measured using frequency bands or with an overall weighting scale such as the A-weighting system. The sound pressure level depends on the noise sources, as well as on the location and environment of the measurement path. *See also dB (decibel)*

Sound power level (PWL, or Lw)
The decibel equivalent of the rate of energy (or power) emitted in the form of noise. The sound power level (in dB) of a noise source, emitting sound energy W in watts, is given by:

$$PWL = 10\log_{10}\left(\frac{W}{W_{ref}}\right)$$

Where:

PWL = Sound Power Level in dB
W = Sound Power of Noise Source (Watts)
W_{ref} = Reference sound power level ($W_{ref} = 10^{-12}$ Watts)

4.0 Requirements

4.1. Goals and Objectives

Enbridge will:

- Conduct facility fence-line sound level measurements at the outset of the NMP and again at such a time if there is a significant change to the noise levels resulting from modifications or additions to the facility (i.e. project specific post-commissioning);
- Minimize the noise levels impacting the environment, to the extent practical and reasonable by implementing noise control measures during modifications or additions to the facility or in response to a valid noise complaint where noise abatement is deemed to be required;
- Educate employees on environmental noise and the potential impact of their job on environmental noise from the facility;
- Maintain and update the NMP annually with support from management; and
- Submit an annual report to the NCIA.

4.2. Facility Environmental Sound Level Measurements

4.2.1. General Requirements

At the outset of the NMP, Enbridge will conduct sound level measurements at the facility fence-line, during normal equipment operations at the facility, to determine the baseline noise levels. Subsequent sound level measurements will be conducted if there are any changes to the facility that result in a significant change in the noise levels, such as modifications to existing equipment, buildings or tanks, or additions of new equipment, buildings, or tanks.

4.2.2. Sound Level Measurement Equipment Requirements

The equipment used for the sound level measurements must conform with the minimum requirements of the AER Directive 038; specifically:

- Instrumentation used to conduct sound level measurements must be able to measure the A-weighted (dBA) and C-weighted (dBC) continuous energy equivalent sound level (L_{eq}) of steady, intermittent, and fluctuating sounds. It must be able to accumulate the data and calculate the L_{eq}s over the time periods required and must meet the minimum technical specifications in the International Electrotechnical Commission (IEC) publication 60804 or its latest revision for **Type II sound level meters.**
- The sound level measurement instrumentation necessary to conduct the 1/3 octave band sound pressure level measurements to characterize the presence of tonal components must meet the minimum technical specification in IEC publication 225-1966 or American National Standards Institute (ANSI) publication S1.11-1966 for Class II filter sets used in conjunction with conventional sound level meters that meet the minimum technical specifications in IEC publication 651-1979 or ANSI publication S1.4-1983 for Type II sound level meters.
- Calibrators must be recertified in accordance with ANCI publication S1.40-1984 (or latest revision), which requires that a calibrator be recalibrated at least once per year.
- The sound level meter used for noise measurements must:
  - meet the requirements in ANSI S1.4-1983 and S1.4A-1985 (or latest revision);
  - be calibrated immediately prior to the measurement with a sound calibrator meeting the requirements of ANCI S1.40-1984 (or latest revision);
  - have their calibration confirmed immediately after the measurement using the same calibrator and include a record of calibration results in the report; and

- be calibrated by the instrument manufacturer, and authorized instrument calibration facility, or another agency acceptable to the AER within a two-year period immediately preceding the measurements. Meters which fail a pre-use or post-use calibration test (i.e. the meter does not read within ±1 dB) must be reviewed for accuracy, applicability, and cause of deviation. Any data found to be corrupt will not be used.

- Users must also ensure that the instrumentation is working within the manufacturer's specifications and limitations.

4.2.3. Weather Condition Requirements

Invalid data may result if wind speeds are greater than those shown in Table 1. Wind can greatly affect the sound levels measured. Appropriate judgement must be used in determining the applicability of Table 1. Specifically, when conducting facility fence-line or close-in equipment sound level measurements, the wind speed should be no greater than approximately 15 km/hr and near calm conditions are recommended to minimize the differences between upwind and downwind conditions at different locations along the fence-line.

Table 1. Acceptable Sound Level Measurement Weather Conditions

Parameter	Preferred Condition
Ground Cover	No Snow, Water, or Ice (Frozen) ground cover
Precipitation	No steady precipitation
Wind Speed	- Less than 500 m from noise source - Crosswind: 15 km/hr limit - Downwind: 15 km/hr limit - 500 - 1000 m from noise source - Crosswind: 10 km/hr limit - Downwind: 10 km/hr limit - Greater than 1,000 m from noise source - Crosswind: 10 km/hr limit - Downwind: 10 km/hr limit

4.2.4. Reporting Requirements

The report for the sound level measurements must include the following:

- Diagram and description of sound level measurement locations (note: ideally these measurement locations will remain consistent each time sound level measurements are conducted, however, future additions to the facility may result in parts or all of the fence-line changing. If this occurs, then new sound level measurement locations will be required. It is important to maintain as many of the historical locations as possible).
- Description of sound level measurement methods.
- Description of sound level measurement equipment and equipment calibration information including field calibration results and calibration/certification certificates for sound level meter and field calibrator.
- Diagram and description of facility layout, building and tank information, and full noise producing equipment list with sizes and locations.
- Sound Pressure Level (SPL) measurement results in broadband dBA, dBC, and spectral 1/3 octave band data for each measurement location.
- Local meteorological conditions during the time of the sound level measurements including the following:
    - Wind Speed
    - Wind Direction
    - Temperature
    - Relative Humidity
- Operational conditions of the various noise producing equipment (i.e. motor load rating, flow rates, etc.).
- Any relevant subjective observations related to sources associated with the Enbridge facility as well as significant noise sources from outside of the Enbridge facility.

4.3. Facility Occupational Health and Safety Sound Level Measurements

Management of noise from an occupational health and safety perspective, including measurement, personal protective equipment requirements, and audiometric testing is addressed in Enbridge's Operations and Maintenance Manual (OMM), Book 2 Safety (Subject 13-02-03) Standard. The requirements for facility signs and markers are included in the OMM Book 3: Pipeline Facilities (03-02-03) Standard.

4.4. Noise Impact Assessments for Modifications or Additions to Facility

4.4.1. General Noise Impact Assessment Requirements

Any modifications to the existing facility that will result in significant changes to the environmental noise levels will require the generation of a noise impact assessment (NIA), as per AER Directive 038. This may include modifications to existing equipment, buildings or tanks, or additions of new equipment, buildings, or tanks. A NIA must be conducted by a qualified acoustical engineering consultant and must follow the procedures and reporting information specified in AER Directive 038. Given that the facility is located within the NCIA region, it is incumbent on the NIA to make use of the NCIA regional noise model to determine current noise climate and then determine the projected impacts on current noise climate that will result from the proposed facility changes.

4.4.2. Noise Abatement

As part of the NIA process, it may be determined that noise abatement is required. Any noise abatement may be considered through the following means:

- Established engineering control practices and standards for selecting new equipment and for abatement of existing noise sources which are periodically reviewed to ensure alignment with best practices.
- Engineering/Design which can be completed in tandem with the acoustical consultant through modifications to the noise model to determine the required noise abatement and appropriate applications.
- Purchasing/Procurement which would involve the suppliers of the updated/new equipment in the noise abatement process (i.e. off-the-shelf noise abatement options and quieter equipment options).

4.4.3. Reporting to the NCIA

Upon receiving regulatory approval for the proposed facility changes, the following information contained within the NIA must be provided to the NCIA so that the regional noise model can be updated:

- Facility layout information
- Building dimensions and locations
- Tank dimensions and location
- Information for all significant noise producing equipment including:

- Location of equipment (coordinates)
- Sound Power Levels in Octave Bands and broadband dBA
- Height of equipment
- Is equipment located within a building or outside
- Any other relevant operational information (i.e. intermittent operations or limited to day/night, etc.)

4.5. Noise Impact Assessments for Modifications or Additions to Facility

Personnel conducting any of the following must review this NMP to ensure compliance:

- Generation of a NIA;
- Facility sound level measurements for either environmental noise or OHS noise; or
- Implementation of noise abatement.

4.6. Self Assessments

Enbridge will review the NMP annually, including:

- Results from any NIAs conducted;
- Results from any facility sound level measurements conducted (environmental or OHS);
- Review of any improvements or corrective action(s) implemented; and
- Review of any noise complaints (environmental or OHS) including actions taken.

4.7. Annual Reporting to NCIA

Enbridge will submit annual reports to the NCIA regarding the status of the noise levels at the Stonefell Station, including:

- Indication of any significant changes to the facility equipment, buildings, and tanks;
- Information contained within the NIA for approved projects;
- Results of facility sound level measurements (environmental noise and OHS) conducted within the last year;
- Indication of any improvements or corrective action(s) implemented (i.e., noise abatement);
- Information regarding audits and self assessment evaluations (qualitative evaluation only, with responsible authority sign-off); and
- Summary of any noise complaints (environmental or OHS) including actions taken.

5.0 Responsibility and Authority

Enbridge Operations is responsible for maintaining this procedure, with support from the Enbridge Regional Environmental Analyst.

Enbridge Operations is responsible for maintaining the equipment at the Stonefell Station in good condition and avoiding activities which may produce unnecessary noise.

6.0 Records Retention

6.1. General Records

All records of facility sound level measurements, weather data, and summary reports must all be filed together and retained for at least 5 years.

6.2. Information Related to a Noise Complaint

All records relating to a complaint must be retained for at least 5 years.

6.3. Information Related to a Noise Impact Assessment

All records relating to a noise impact assessment for new installations or modifications to existing installations must be retained for at least 5 years.

7.0 Reference Documents

- Alberta Energy Regulator (AER), *Directive 038 on Noise Control, 2007*, Calgary, Alberta.
- Northeast Capital Industrial Association (NCIA), *Noise Management Plan,* Document Number 2010-001, September 03, 2010.
- Enbridge Pipelines Inc., Pipeline Facilities Operations & Maintenance Manuals, Book 2, 13-02-03.

8.0 Signature

This NMP is hereby authorized by Jim Mason of Enbridge Pipelines
(Print Name)

(Athabasca) Inc., Dated 06/11/2014 at Edmonton
(mm/dd/yyyy) *(City)*

Signed Jim Mason.

NCIA Northeast Capital Industrial Association	NCIA Standards and Guidelines	Document Number 2010-003	
Noise Management Plan Reporting Requirements as per Section 5.4 of this Standard		Rev. Date 14-Apr-14	Rev. 2

Company Name (enter here): Evonik Canada Inc., Gibbons Site

Note, please provide as much detail as you can for the following, attaching any clarifying or required documents with your submission.

If you have any questions, please call Laurie Danielson @ 780.992.1463

Input Description	Member Site Comments
Confirmation that site has implemented a best management practice to address environmental noise as per NCIA Noise Management Plan Standard 2010-003 issued 3-Sep-10, revised 5-Mar-13, revised 14-Apr-14 (attached), including the Procedure/Practice/Standard reference. Note, if you have not provided an electronic copy of your site plan to NCIA, please do so.	Confirmed. See attached Evonik Gibbons Site documents: OHS Medical Services Policy Manual – Industrial Hygiene, Topic – Hearing Conservation program.
Attach results of any monitoring/assessments (fenceline outward) completed in 2013. Note, you are not required to conduct any off-site monitoring, however if you did, please provide those results electronically to NCIA.	No monitoring or assessment was required or carried out in 2013.
Disclose any improvements/corrective actions implemented in 2013 or status thereof that would impact the noise level output for your site (either up or down).	Improvement – Tank Farm office installation of noise reducing ceiling.
Did those changes result in a requirement to update your site noise model?	No
If so, have you provided your updated site model to SLR Consulting for incorporation into the NCIA Regional Noise Model as per the process outlined for this purpose?	No

Disclose any improvements/projects that are approved for 2014 that would impact the noise level output for your site (either up or down). Will these changes result in a requirement to update your site noise model? If so, when do you anticipate having an updated site model available?	None to disclose at this time.
Disclose any audit/self-assessment evaluation (qualitative evaluation only, with senior site leader sign-off) completed for your site noise management plan.	2012 assessment and evaluation conducted by corporate Evonik ESHQ / OH experts. Suitable Report excerpts available upon request.
Provide a Noise Complaint summary for all noise complaints received in 2013 including any actions taken to address them.	No complaints

This information is being collected as per the NMP Standard 2010-003 Document attached, section 5.4. All information provided will be disclosed to the AER as part of the required NCIA Annual Reporting on the Regional Noise Management Plan.

Further, the Annual Report will be a public document available on our website once finalized.

Hans Schubbauer, Evonik Gibbons Site Mgr

[signature] Jun 4, 2014

Hearing Conservation Program

COPY
JLS, Jun 4, 2014

Purpose:

Noise is one of the most common workplace hazards. Employers in Alberta are responsible for minimizing the noise hazard at their workplace and must comply with the province's Occupational Health and Safety Code.

Since noise-induced hearing loss cannot be repaired, prevention is the key. The primary goal of a Hearing Conservation Program is to prevent noise-induced hearing loss. Many activities make up a hearing conservation program and the major components include noise measurement, engineering and administrative controls, personal protection, audiometric testing, worker education and administrative aspects such as record keeping and evaluation.

Noise Surveys

Noise surveys will be done whenever equipment changes or building structure changes are made.

A copy of report will be kept by site field team and Occupational Health Center.

The results of each noise survey will be posted on Occupational Health and Safety Board X 1 week.

Site field team will be responsible for posting hearing protection signs in designated hearing protection areas.

Audiogram Evaluation

1. Identify employees with an abnormal threshold shift from their baseline audiogram. The criteria of a change in hearing threshold relative to the baseline audiogram is an average of 15 dB or more at 2 consecutive ranges between 3000 and 8000 Hz.

2. For employees with identified abnormal shift, repeat the audiogram within 30 days. This audiogram should be preceded by a 14-hour period with no exposure to sound pressure levels of 85 dBA or more. Personal hearing protection may be used where necessary to achieve this limited exposure. This audiogram will then be compared with the baseline audiogram.

   The most current audiogram following a 15-hour quiet period after a confirmed abnormal shift should be properly evaluated and verified by the site physician or specialist. This audiogram should be established as the new baseline and be used as the baseline audiogram for the comparison with future audiograms. The new baseline test will be identified on an employee's audiometric record.

3. If the retest audiogram continues to show an abnormal shift, update the employee's exposure history both by review of his work exposure to noise and by interview with the employee for non-Evonik exposure. The employee will be notified by the Site Physician of any change of hearing acuity.

4. Review medical records for previous history of illnesses, injuries or treatments possibly associated with hearing change. Review family history.

5. If the hearing loss is determined to be unrelated to Evonik employment the employee should be so advised and encouraged to consult his personal physician.

6. If the hearing loss is potentially Evonik related, refer the employee to an ENT specialist for diagnostic evaluation, with copies of all audiograms and all relevant information, at company expense.

7. The employee will have a repeat audiogram within a time frame determined by the site physician. If their hearing continues to decrease in spite of the proper use of approved hearing protection, a recommendation will likely be made to management that the employee should not be permitted to work in a high-noise area.

   If the hearing loss is determined to have Evonik causality, (as determined by noise exposure history) and shows an average 35 dBA loss over frequencies 1000 Hz, 2000 Hz and 3000 Hz bilaterally, a Worker's Compensation claim will be initiated on behalf of the employee.

COPY

Audiometric Testing Program

All employees should be given audiometric tests with their pre-placement examination.

Audiograms shall be done on all employees assigned to jobs which require exposures to sound pressure levels of 85 dBA or above for an 8 hour shift and 82 dBA for a 12 hour shift. Audiograms done every two years mandatory but encouraged to have done annually.

All new employees will be tested 6 months after initial exposure to sound pressure levels above 82 dBA.

The site physician may designate employees to be placed under an increased intensity of surveillance whenever severe or unexplained hearing loss is observed regardless of age or current job assignment.

Valid Baseline Audiogram

Baseline audiograms should be preceded by a 14 hour quiet period. A 14 hour quiet period is 14 hours either away from workplace noise or when in the workplace, the employee uses personal hearing protection at any time he is exposed to noise levels of 82 dBA or above.
Employees shall be advised to avoid high off the job noise exposures (ie chain saws, lawn mowers, tractors etc.) prior to baseline test and re-test audiograms.

1. Audiograms will be done by a person registered with OH&S as an audiogram technologist.

   i) Audiograms will be done yearly.

   ii) The frequencies of 500, 1000, 2000, 3000, 4000, 6000 and 8000 Hz will be tested.

   iii) Sound pressure level in room for audiometric testing will meet OH&S regulations. (see next page)

   iv) Audiometer will be calibrated yearly in accordance with standards set out in ANSI S3.6 - 1996

2. All audiograms done will be compared with the employee's baseline audiogram.

3. Results of each audiogram will be given to each employee in writing.

4. Each employee audiogram will be reviewed by our company physician and referred to specialist if results indicate need for further evaluation.

5. All new employees will have a hearing protection indoctrination (watching a film on hearing protection and physically shown the proper way to wear hearing protection - ear plugs and ear muffs. Following this new employees will be requested to write a quiz.

   This will be repeated on an annual basis to noise exposed workers.

6. If worker has had previous audiograms done at other locations, consent is obtained to request a copy of these audiograms. Once obtained the copy will be maintained on their permanent medical record.

   A noise exposure and case history for noise will be completed by new employees and kept on their medical file. (Form: Preplacement Medical Record)

PERMISSABLE BACKGROND NOISE CONDITIONS FOR AUDIOMETRIC TESTING

Octave Bank Centre Frequency	Maximum Level (decibels)
500	30
1000	30
2000	37
4000	47
8000	52

<table>
<tr><td rowspan="1"></td><td>NCIA Standards and Guidelines</td><td colspan="2">Document Number
2010-003</td></tr>
<tr><td colspan="2">Noise Management Plan Reporting Requirements as per Section 5.4 of this Standard</td><td>Rev. Date
14-Apr-14</td><td>Rev.
2</td></tr>
</table>

Keyera Corp. – Fort Saskatchewan Site

Note, please provide as much detail as you can for the following, attaching any clarifying or required documents with your submission.

If you have any questions, please call Laurie Danielson @ 780.992.1463

Input Description	**Member Site Comments**
Confirmation that site has implemented a best management practice to address environmental noise as per NCIA Noise Management Plan Standard 2010-003 issued 3-Sep-10, revised 5-Mar-13, revised 14-Apr-14 (attached), including the Procedure/Practice/Standard reference. Note, if you have not provided an electronic copy of your site plan to NCIA, please do so.	Confirmed. The site has a noise management plan based on the current NCIA standard. The document is called KFS Site Noise Management Plan. NCIA has a copy of the current plan.
Attach results of any monitoring/assessments (fenceline outward) completed in 2013. Note, you are not required to conduct any off-site monitoring, however if you did, please provide those results electronically to NCIA.	No off-site monitoring was completed in 2013.
Disclose any improvements/corrective actions implemented in 2013 or status thereof that would impact the noise level output for your site (either up or down). Did those changes result in a requirement to update your site noise model? If so, have you provided your updated site model to SLR Consulting for incorporation into the NCIA Regional Noise Model as per the process outlined for this purpose?	The product injection pump project described in the 2012 report was completed in 2013. A Noise Impact Assessment completed in the design phase of that project resulted in several modifications to the proposed pump installation, including an acoustically treated building and low noise valves. A brine storage pond was also constructed in 2013, which provides some sound attenuation in the northwest portion of the site. These changes will be incorporated into the 2014 NCIA Regional Noise Model through SLR Consulting.

Disclose any improvements/projects that are approved for 2014 that would impact the noise level output for your site (either up or down). Will these changes result in a requirement to update your site noise model? If so, when do you anticipate having an updated site model available?	2014 equipment additions include receipt pumps associated with the Cochin Pipeline reversal project and a de-ethanizer system. The Cochin pumps will be operational mid-year and the de-ethanizer will be operational late in the year. The hot oil furnace (HR-15.02) and aerial coolers (HT-16.04/06) in the existing fractionation plant are being modified in 2014 to reduce associated noise. Once these additions and modifications are complete there will be a requirement to update the site noise model, which is expected to be done in Q2 2014.
Disclose any audit/self-assessment evaluation (qualitative evaluation only, with senior site leader sign-off) completed for your site noise management plan.	Additional noise modeling is being conducted as part of the detailed engineering phase for construction of a new fractionation plant at the site. The design and regulatory components will be done in 2014/15 and equipment commissioning will occur in 2016. The site plan is expected to be updated following a 2014 AER audit.
Provide a Noise Complaint summary for all noise complaints received in 2013 including any actions taken to address them.	There were no noise complaints received in 2013.

This information is being collected as per the NMP Standard 2010-003 Document attached, section 5.4. All information provided will be disclosed to the AER as part of the required NCIA Annual Reporting on the Regional Noise Management Plan.

Further, the Annual Report will be a public document available on our website once finalized.

KEYERA ENERGY

Noise Management Plan

Keyera Fort Saskatchewan (KFS)

This document contains information regarding site specific policies, procedures, and training in the area of noise management.

1. Purpose

The Northeast Capital Industrial Association (NCIA) has developed a collaborative method for addressing noise management within the region occupied by its member companies. Known as the Regional Noise Management Plan (RNMP), it represents a practical method of compliance with the intent of AER noise control legislation. All NCIA member companies are required to follow the RNMP, part of which is that each member company will develop and maintain a site Noise Management Plan (NMP). This ensures that industry has implemented effective systems and programs to minimize noise impacts to the extent practical.

2. Site Noise Management Policy

KFS is committed to minimizing the noise impact of our operations to the extent practical. Noise and associated mitigation are part of our daily operations and considered as part of all new projects.

3. Goals and Objectives

The goals of this plan are to:

- ensure regulatory compliance
- establish noise control performance and improvement objectives
- define communication strategies
- define roles and responsibilities

4. Training Requirements

All KFS staff will receive annual NMP awareness training, which consists of a review and sign off of the plan. All engineering design personnel working on site projects will also be made aware of the plan to ensure appropriate noise considerations for new equipment.

5. Monitoring and Measurement

As part of Keyera's industrial hygiene Standard Operating Practice, site noise surveys are conducted every three years or as otherwise required. These surveys are retained for the life of the facility.

More frequent surveys could be triggered if a hazard is identified in response to:

- any change in process that will have a noise impact
- a change in personal health
- maintenance or operating activities which could produce a noise impact

All survey measurements are carried out by trained personnel familiar with the concepts of noise measurement and control, using appropriate calibrated equipment.

If maintenance or operating activities could create an unusual off-site noise impact, monitoring will be considered at the nearest affected receptor(s). If unacceptable results are obtained appropriate mitigation for the circumstances will be put in place.

The site participates in a joint Community Advisory Panel (CAP) with neighboring industry, which provides direct communication with public and community members 4-6 times per year. At all of these meetings the community representatives are able to raise any industrial concerns they may have (noise or otherwise). We also use the NRCAER UPDATEline to provide advance notice to the community of upcoming non-routine work that could have short term noise or other impacts.

In the event the site receives an external noise concern, the protocol described in Appendix A will be used to document the occurrence and associated follow up actions.

6. Abatement Strategies

In priority order, site noise abatement may include:

- Noise reduction at the source (ie. at the design stage)
- Interference with the noise path (eg. sound absorbing enclosures)
- Hearing protection

As part of the engineering design process, noise is a consideration in selecting new equipment. A Management of Change (MOC) process is also in place to trigger appropriate reviews when process or equipment changes that could impact site noise are made.

7. Self-Assessment

An annual review of the NMP will be conducted to ensure compliance with the plan and objectives. This will be conducted by site management and will include reviews of the documented program, staff training, noise monitoring results, and corrective action status. Site management will sign off on this self-assessment annually, typically in the fall, using the document in Appendix B.

8. Reporting

An annual noise report is provided to the NCIA, including but not limited to:

- Monitoring results (qualitative)
- Status of improvements or corrective actions

- New additions/projects that affect noise
- Self-Assessment evaluation
- Noise concern summary with actions taken

9. Endorsement

Signed:

Name: Jarrod Beztilny

Title: General Manager, Operations – NGL Facilities

Date: May 13, 2014

KFS Noise Management Plan

Appendix A – Noise Concern Protocol

Date:	Received By:
Time:	Duration of Call:

Caller Name:	Contact Number:
Description of Concern:	
Location:	Weather Conditions:

Investigation Findings/Follow Up Actions:		
Call Back Info:		
Keyera Rep:	Date:	Time:

Concern Closure (requires sign off from Site Management):

Name:	Date:

Completed reports are to be filed under 580.4 NCIA EH&S Committee.

KFS Noise Management Plan

Appendix B – Annual Self-Assessment Protocol

Item	Comments
Review Site Noise Management Plan document and make any required changes.	
Review site noise training records.	
Review any on-site monitoring results.	
Review any off-site monitoring results.	
Review any external noise concerns and ensure follow up actions are complete.	
Review expected equipment changes , additions, or improvements for the upcoming calendar year.	

Self-Assessment Completion (requires sign off from Site Management):

Name(s):	Date:

Completed assessments are to be filed under 580.4 NCIA EH&S Committee.

North West Redwater Partnership

Note, please provide as much detail as you can for the following, attaching any clarifying or required documents with your submission.

If you have any questions, please call Laurie Danielson @ 780.992.1463

Input Description	Member Site Comments
Confirmation that site has implemented a best management practice to address environmental noise as per NCIA Noise Management Plan Standard 2010-003 issued 3-Sep-10, revised 5-Mar-13, revised 14-Apr-14 (attached), including the Procedure/Practice/Standard reference. Note, if you have not provided an electronic copy of your site plan to NCIA, please do so.	The North West Redwater (NWR) Sturgeon Refinery Project is beginning construction phase, and is not operational at this time. It is not expected to be operational until 2017. As the NWR project is entering the Detailed Engineering Design phase, with preliminary Project site preparation underway, NWR is pleased to confirm compliance with its original approval conditions relative to noise management. NWR has engaged the ongoing services of a specialized acoustical consultant to provide input into our engineering and procurement plans, ensuring that such plans meet with the noise model as reported to the ERCB at the time of project approval. This interactive process reflects a best- management practice to address facility noise impacts.
Attach results of any monitoring/assessments (fenceline outward) completed in 2013. Note, you are not required to conduct any off-site monitoring, however if you did, please provide those results electronically to NCIA.	NWR does not have completed and issued reports for assessments as completed during 2013. NWR did conduct some noise modeling specific to certain construction activities, and the reports are expected to be complete within 2014
Disclose any improvements/corrective actions implemented in 2013 or status thereof that would impact the noise level output for your site (either up or down). Did those changes result in a requirement to update your site noise model? If so, have you provided your updated site model to SLR Consulting for incorporation into the NCIA Regional Noise Model as per the process outlined for this purpose?	During 2013 NWR had engaged the services of an acoustical consultant to aid in ensuring that operational noise as modeled per baseline model work completed in 2008 remains valid. NWR used SLR Consulting for this work, and updated model work will be released upon final acceptance of reports for incorporation into the NCIA Regional Noise Model.

Disclose any improvements/projects that are approved for 2014 that would impact the noise level output for your site (either up or down). Will these changes result in a requirement to update your site noise model? If so, when do you anticipate having an updated site model available?	As the base case for the NWR Project is still as reflected in the 2008 noise report accepted by regulators, and the Project is just under construction during 2013 through 2016, there are no further improvements to report at this time. Updated model work will be released in 2014 upon final acceptance of updated report.
Disclose any audit/self-assessment evaluation (qualitative evaluation only, with senior site leader sign-off) completed for your site noise management plan.	No such audit/self-assessment was completed during 2013.
Provide a Noise Complaint summary for all noise complaints received in 2013 including any actions taken to address them.	No noise complaints were received during 2013.

This information is being collected as per the NMP Standard 2010-003 Document attached, section 5.4. All information provided will be disclosed to the AER as part of the required NCIA Annual Reporting on the Regional Noise Management Plan.

Further, the Annual Report will be a public document available on our website once finalized.

NCIA Northeast Capital Industrial Association	**NCIA Standards and Guidelines**	**Document Number** **2010-003**
Noise Management Plan Reporting Requirements as per Section 5.4 of this Standard	**Rev. Date** **14-Apr-14**	**Rev.** **2**

Oerlikon Metco

Note, please provide as much detail as you can for the following, attaching any clarifying or required documents with your submission.

If you have any questions, please call Laurie Danielson @ 780.992.1463

Input Description	**Member Site Comments**
Confirmation that site has implemented a best management practice to address environmental noise as per NCIA Noise Management Plan Standard 2010-003 issued 3-Sep-10, revised 5-Mar-13, revised 14-Apr-14 (attached), including the Procedure/Practice/Standard reference. Note, if you have not provided an electronic copy of your site plan to NCIA, please do so.	Yes. MSP2-3 Occupational Health and Personal Safety
Attach results of any monitoring/assessments (fenceline outward) completed in 2013. Note, you are not required to conduct any off-site monitoring, however if you did, please provide those results electronically to NCIA.	None completed
Disclose any improvements/corrective actions implemented in 2013 or status thereof that would impact the noise level output for your site (either up or down). Did those changes result in a requirement to update your site noise model? If so, have you provided your updated site model to SLR Consulting for incorporation into the NCIA Regional Noise Model as per the process outlined for this purpose?	None

Disclose any improvements/projects that are approved for 2014 that would impact the noise level output for your site (either up or down). Will these changes result in a requirement to update your site noise model? If so, when do you anticipate having an updated site model available?	None do disclose at this time
Disclose any audit/self-assessment evaluation (qualitative evaluation only, with senior site leader sign-off) completed for your site noise management plan.	None in 2013
Provide a Noise Complaint summary for all noise complaints received in 2013 including any actions taken to address them.	No complaints received in 2013

This information is being collected as per the NMP Standard 2010-003 Document attached, section 5.4. All information provided will be disclosed to the AER as part of the required NCIA Annual Reporting on the Regional Noise Management Plan.

Further, the Annual Report will be a public document available on our website once finalized.

Pembina/Williams Redwater Site:

Note, please provide as much detail as you can for the following, attaching any clarifying or required documents with your submission.

If you have any questions, please call Laurie Danielson @ 780.992.1463

Input Description	Member Site Comments
Confirmation that site has implemented a best management practice to address environmental noise as per NCIA Noise Management Plan Standard 2010-003 issued 3-Sep-10, revised 5-Mar-13, revised 14-Apr-14 (attached), including the Procedure/Practice/Standard reference. Note, if you have not provided an electronic copy of your site plan to NCIA, please do so.	Yes, Redwater site has implemented a best management practice to address environmental noise as per NCIA Noise Management Plan.
Attach results of any monitoring/assessments (fenceline outward) completed in 2013. Note, you are not required to conduct any off-site monitoring, however if you did, please provide those results electronically to NCIA.	Pembina did not complete any fenceline outward monitoring / assessments.
Disclose any improvements/corrective actions implemented in 2013 or status thereof that would impact the noise level output for your site (either up or down). Did those changes result in a requirement to update your site noise model? If so, have you provided your updated site model to SLR Consulting for incorporation into the NCIA Regional Noise Model as per the process outlined for this purpose?	Pembina added additional equipment onsite and as a result the site noise model was updated. Updated site model has been provided to SLR for inclusion in the 2014 Regional Noise Model update.

Disclose any improvements/projects that are approved for 2014 that would impact the noise level output for your site (either up or down). Will these changes result in a requirement to update your site noise model? If so, when do you anticipate having an updated site model available?	None to disclose at this time.
Disclose any audit/self-assessment evaluation (qualitative evaluation only, with senior site leader sign-off) completed for your site noise management plan.	None completed, although an AER audit of our site management plan is scheduled for 2014.
Provide a Noise Complaint summary for all noise complaints received in 2013 including any actions taken to address them.	Pembina did not receive any noise complaints in 2013.

This information is being collected as per the NMP Standard 2010-003 Document attached, section 5.4. All information provided will be disclosed to the AER as part of the required NCIA Annual Reporting on the Regional Noise Management Plan.

Further, the Annual Report will be a public document available on our website once finalized.

Stantec

To:	Derek Costeloe Pembina Pipeline Corporation	From:	Jonathan Chui and Lina Wang Stantec
File:	Project 560 and RFS Ⅱ Propane Loading Project NIA	Date:	May 12, 2014

Reference: Project 560 and RFS || Propane Loading Project Noise Assessment

1 INTRODUCTION

Stantec Consulting Ltd. (Stantec) was retained by Pembina Pipeline Corporation (Pembina)to prepare a noise impact assessment (NIA) associated with two proposed projects within the Pembina Redwater Fractionate (RFS) site, located within Sturgeon County, in Alberta's Industrial Heartland. These two projects are Project 560 and RFSII Propane Loading Project (the Project).

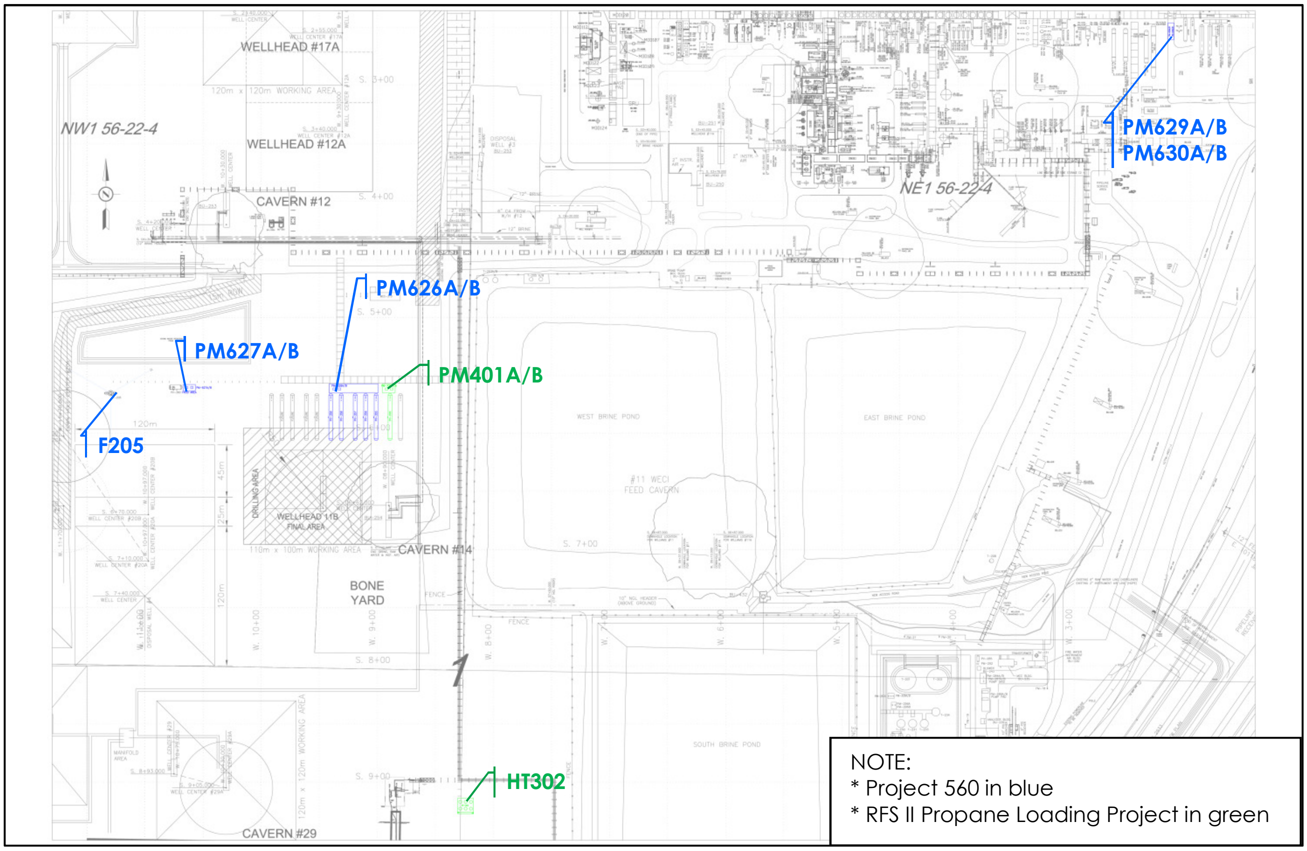
Project 560 will make use of existing plant capacity by introducing a new feed into the facility and include addition NGL storage, process pumps, a flare stack, inlet filter system, and a new nitrogen utility skid. The RFS II Propane Loading Project involves the conversion of an existing condensate rail rack to propane service and includes the addition of propane storage, loading pumps, and aerial coolers. The rail traffic is not expected to be increased due to the proposed Project. A proposed plot plan showing the noise emitting equipment is presented in Figure 1.

The purpose of this memo is to assess any compliance issue when comparing to the Alberta Energy Regulator (AER) Directive 038: Noise Control with consideration of the Northeast Capital Industrial Association (NCIA) Regional Noise Management Plan (RNMP) requirements. AER and NCIA have worked together to set permissible sound levels (PSLs) specifically for the Alberta Industrial Heartland.

This memo presents the modelling results for the Project and recommends noise mitigation if required.

Reference: Project 560 and RFS || Propane Loading Project Noise Assessment

Figure 1 Project 560 and RFSII Propane Loading Project Plot Plan



Reference: Project 560 and RFS || Propane Loading Project Noise Assessment

2 SETTING

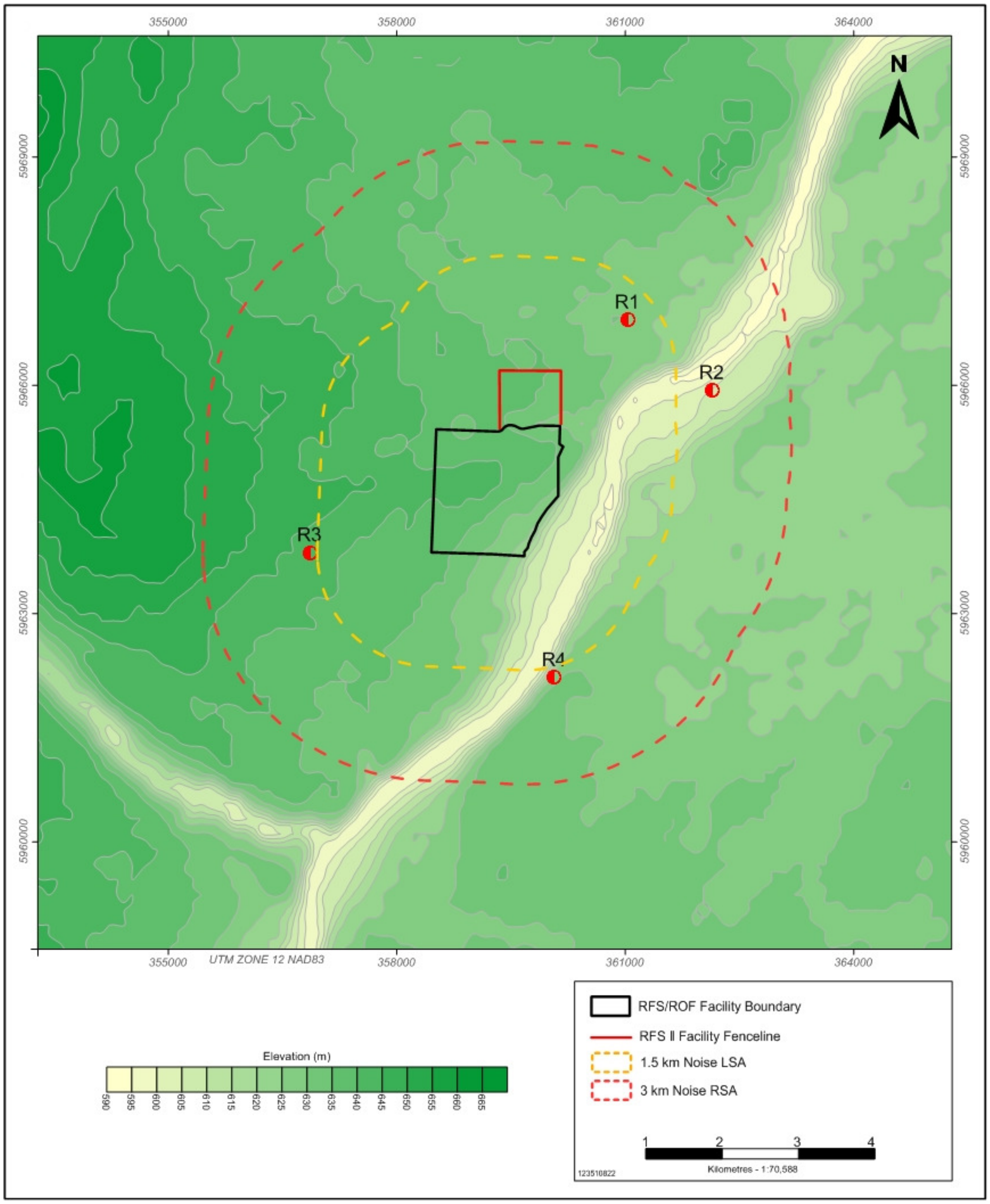
The noise local study area (LSA) and regional study area (RSA) are defined as a 1.5 km and 3.0 km distance from the facility boundary, respectively. The four closest residential receptors identified within the 3.0 km RSA were included in the model. These receptors are consistent with those used in the latest Pembina RFSII NIA (RFSII 2013 NIA). Table 1 presents the receptor Universal Transverse Mercator (UTM) coordinates and approximate distances from the receptors to the RFS facility boundary. Figure 2 shows the noise study areas and receptor locations for the Project.

Table 1 Summary of Receptor Locations

Receptor ID	Location		Orientation from the Project	Distance to the RFS facility boundary (km)
	Easting	Northing		
R1	361033	5966861	north-northeast	1.0
R2	362140	5965931	east-northeast	2.0
R3	356859	5963801	west-southwest	1.6
R4	360069	5962158	south	1.7

Reference: Project 560 and RFS || Propane Loading Project Noise Assessment

Figure 2 Noise Study Area and Receptor Location



Reference: Project 560 and RFS || Propane Loading Project Noise Assessment

3 MODELLING

Noise prediction was conducted using Cadna/A acoustic modeling software (DataKustik 2013), based on the internationally accepted sound propagation algorithms (ISO 1993, 1996). The modelling inputs are presented in Table 2.

Table 2 Acoustic Modelling Parameters

Item	Model Parameter	Model Setting
1	Temperature	10°C
2	Relative humidity	70%
3	Wind speed	Downwind condition; wind speed of 1 to 5 m/s
4	Noise source identification	Refer to Section 5
5	Sound power levels in Octave Band Center Frequency	Refer to Section 5
6	Noise propagation model	Cadna/A (DataKustik 2013)
7	Standard	ISO 9613
8	Ground conditions and attenuation factor	ground absorption (G) of 0.5 soft porous ground (50% absorptive) partly hard ground (50% reflective)
9	Terrain parameters	terrain data incorporated in model with 50m resolution
10	Reflection parameters	1 order of reflection

Reference: Project 560 and RFS || Propane Loading Project Noise Assessment

4 CUMULATIVE EFFECTS ASSESMENT

The cumulative effects assessment includes the following three assessment cases: Base Case, Project Case, and Application Cumulative Case.

4.1 BASE CASE

The Base Case based on the Planned Development Case cumulative sound level presented in Pembina RFSII NIA (Table 8-5) will be used as the Project Base Case, which includes: RFS II, ROF, ambient sound levels, and noise contribution from the regulated existing facilities and approved projects.

Table 3 Base Case Sound Level Compared to PSL

Receptor ID	Base Case Sound Level				ERCB PSL		Meets ERCB Daytime or Night time PSL?	
	Daytime (dBA)		Night time dBA)		Daytime (dBA)	Night time (dBA)	Daytime (dBA)	Night time (dBA)
	Low	High	Low	High				
R1	52.3	53.6	48.9	51.5	55	45	Yes	No
R2	52.8	53.5	46.9	49.1	57	47	Yes	No
R3	46.1	46.9	40.9	43.0	50	40	Yes	No
R4	53.5	54.6	49.1	51.6	57	47	Yes	No

Table 3 shows that the Base Case nighttime sound levels at all four receptors exceed the AER PSLs due to the third-parties regulated exiting and approved facilities.

4.2 PROJECT CASE

Since the submission of the RFSII Noise Impact Assessment (NIA) in 2013, there has been equipment modification at the RFS site in addition to the proposed Project. These modified equipment noise emission will be included in the Project Case. Table 4 summarizes the noise sources for the Project Case and Table 5 summarizes the sound power levels for these noise sources.

Reference: Project 560 and RFS || Propane Loading Project Noise Assessment

Table 4 Noise Sources Specification for the Project Case

Project Description	ID	Equipment Description	Quantity	Rating (kW)	Operating condition
SCO Product Pumps Addition	PM-296A/B	SCO Product Pump and Motor	2	64 (pump) 112 (motor)	One operating and one standby
Propane Product Booster Pumps Replacement	PM-207 A/B	SCO Product Pump	2	37 (pumps of 18.5 kW with 1800 rpm replaced by 37 kW with 1200 rpm pumps)	
Cooler Addition	HT-204	Aerial Cooler	two bays and four fans with VFD motors	22 (each motor)	100% load operating during daytime and 70% operating during nighttime
Project 560	PM-626A/B	NGL feed pumps	2	93.2	One operating and one standby
	PM-627A/B	Flare Knock Out Drum Pump	2	18.6	
	FB-205A/B	Flare Stack Blower	2	149.1	
	PM-629A/B	Filter Backwash Pump	2	55.9	
	PM-630A/B	Filter Drain Pump	2	37.3	
RFS II Propane Loading Project	PM-401A/B	Propane Loading pumps	2	93.2	
	HT-302	Aerial cooler	two bays and four fans with VFD motors	22.4	100% load operating during daytime and 70% operating during nighttime

Reference: Project 560 and RFS || Propane Loading Project Noise Assessment

Table 5 Sound Power Level for Noise Sources

Project Description	Equipment ID	Noise Source	Sound Power Level (dB) in Octave Band Center Frequency (Hz) per Unit									Total	
			31.5	63	125	250	500	1000	2000	4000	8000	dBA	dB
SCO Product Pumps Addition	PM-296A/B	SCO Product Pump and Motor	92	92	94	96	98	99	97	93	86	103	105
Propane Product Booster Pumps Replacement	PM-207 A/B	SCO Product Pump	88	89	91	93	94	96	93	89	82	100	101
Cooler Addition	HT-204	Aerial Cooler Discharge (Daytime)	94	98	101	99	96	92	89	80	75	98	106
		Aerial Cooler Discharge (Nighttime)	90	94	97	95	92	88	85	76	71	94	102
		Aerial Cooler Inlet (Daytime)	92	97	101	99	96	93	90	82	77	98	105
		Aerial Cooler Inlet (Nighttime)	88	93	97	95	92	89	86	78	73	94	101
Project 560	PM-626A/B	NGL feed pumps	95	96	98	100	102	103	101	96	89	107	109
	PM-627A/B	Flare Knock Out Drum Pump	85	86	88	90	91	93	91	86	79	97	99
	FB-205A/B	Flare Stack Blower	93	93	96	98	101	101	101	99	99	107	108
	PM-629A/B	Filter Backwash Pump	92	92	94	96	98	99	98	93	86	104	105
	PM-630A/B	Filter Drain Pump	90	90	92	94	96	97	95	91	84	101	103
RFS II Propane Loading Project	PM-401A/B	Propane Loading pumps	95	96	98	100	102	103	101	96	89	107	109
	HT-302	Aerial Cooler Discharge (Daytime)	97	101	104	102	99	95	92	83	78	101	108
		Aerial Cooler Discharge (Nighttime)	93	97	100	98	95	91	88	79	74	97	104
		Aerial Cooler Inlet (Daytime)	93	98	102	100	97	94	91	83	78	99	106
		Aerial Cooler Inlet (Nighttime)	89	94	98	96	93	90	87	79	74	95	102

The prediction for the Project Case noise sources assumes the following:

- All pumps are running at 1800 rpm.
- Noise emissions for the pumps and motors were established using equipment specifications and referenced formulae from acoustic literature (Bies and Hansen 2003; Crocker 2007; and Beranek and Ver 1992).
- Noise Emission for aerial coolers and blowers referenced the vendor data and assumptions.

Aerial cooler HT-240 and HT-302 are equipped with variable frequency drive (VFD). The sound pressure level rating for these two coolers is 80 dBA at 1 m at full fan speed. During the nighttime period, the fan speed will be reduced as a noise mitigation measure. The reduced fan speed operation is expected to reduce the noise emission level by 4 dBA from the cooler fan during the nighttime period. The acoustic model included the implementation of a reduced fan speed during the nighttime period.

Table 6 summarizes the Project Case noise contribution at Receptors R1 to R4 and the difference between dBA and dBC values for all receptors. The predicted results show that the difference is less than 20 dB for all receptors; therefore, the potential for low frequency noise effects from the Project is not likely a concern.

Table 6 Predicted Sound level at Receptors

Receptor ID	Daytime			Nighttime			Greater than 20 dB?
	dBA $L_{eq}(15)$	dBC $L_{eq}(15)$	dBC - dBA	dBA $L_{eq}(9)$	dBC $L_{eq}(9)$	dBC - dBA	
R1	24.4	35.2	10.8	23.2	32.6	9.4	No
R2	21.3	33.3	12.0	19.3	30.2	10.9	No
R3	24.5	34.9	10.4	23.5	32.5	9.0	No
R4	24.5	35.8	11.3	23.2	33.1	9.9	No

4.3 APPLICATION CUMULATIVE CASE

Since the Base Case sound levels at receptors exceed the nighttime PSLs, the noise contribution due to the new facility must be "no net increase" according to AER Directive 038. Therefore, the sound levels changes between Base Case and Application Cumulative Case will be assessed in this section.

Reference: Project 560 and RFS || Propane Loading Project Noise Assessment

This section discusses the Application Cumulative Case sound levels. The cumulative sound level includes the noise contribution from the Base Case (see Section 4.1) and the Project Case (see Section 4.2). The Project noise effect on the existing acoustic environment is assessed by comparing the cumulative results to the Base Case sound levels.

Table 7 summarizes the cumulative effects of the Base Case and the Project Case. The cumulative results are calculated by adding (logarithmically) the noise contribution from the Base Case (Table 3) to the Project Case (Table 6) noise contribution at the four receptors.

The Application Cumulative Case results show that the net increase (value shown in brackets) indicates a change in sound level from the Base Case as a result of the proposed projects (Project 560, RFSII Propane Loading Project, and additional equipment at RFS site).

During the nighttime period, the predicted increase from Base Case sound level due to the Project potentially ranges from 0.05 to 0.08 dBA at R3, and the maximum increases is 0.01 dBA at receptors R1, R2 and R3. This level of increase is not perceptible to the average person as the typical threshold for an increase in sound level that is considered to be barely perceptible by human ear varies from 1 to 5 dBA (Health Canada 2011). In addition, the Project noise contribution is at least 17dB lower than the Base Case night time noise contribution at all receptors. The addition of the Project is considered to have no net increase to the Base Case.

Table 7 Application Case Cumulative Sound Level

Receptor ID	Base Case Sound Level				Project Case Predicted Sound Level		Application Cumulative Sound Level [a]			
	Daytime (dBA)		Night time (dBA)		Daytime (dBA)	Nighttime (dBA)	Daytime (dBA)		Night time (dBA)	
	Low	High	Low	High			Low	High	Low	High
R1	52.3	53.6	48.9	51.5	24.4	23.2	52.3 [0.01]	53.6 [0.01]	48.9 [0.01]	51.5 [0.01]
R2	52.8	53.5	46.9	49.1	21.3	19.3	52.8 [0.00]	53.5 [0.00]	46.9 [0.01]	49.1 [0.00]
R3	46.1	46.9	40.9	43.0	24.5	23.5	46.1 [0.03]	46.9 [0.03]	40.9 [0.08]	43.1 [0.05]
R4	53.5	54.6	49.1	51.6	24.5	23.2	53.5 [0.01]	54.6 [0.00]	49.1 [0.01]	51.6 [0.01]

NOTES:
[a] Logarithmic addition of Base Case and Project Case sound levels

Reference: Project 560 and RFS || Propane Loading Project Noise Assessment

In conclusion, the Project plus the additional equipment modifications at the RFS site since the submission of RFSII NIA February 2013 has negligible noise effect to receptors R1 to R4 when added to the results presented in the RFSII 2013 NIA. There is no change in the key findings as presented in the RFSII 2013 NIA report.

Respectfully submitted,

Stantec Consulting Ltd.

Entity

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Team Lead, Noise Management Group
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Attachment: Attachment

c.

Plains Midstream Canada:

Note, please provide as much detail as you can for the following, attaching any clarifying or required documents with your submission.

If you have any questions, please call Laurie Danielson @ 780.992.1463

Input Description	Member Site Comments
Confirmation that site has implemented a best management practice to address environmental noise as per NCIA Noise Management Plan Standard 2010-003 issued 3-Sep-10, revised 5-Mar-13, revised 14-Apr-14 (attached), including the Procedure/Practice/Standard reference. Note, if you have not provided an electronic copy of your site plan to NCIA, please do so.	The Facility has an Environmental Noise Management Practice. The practice is part of the site ISO 14001 certified management system (FSK-P-36-00-12).
Attach results of any monitoring/assessments (fenceline outward) completed in 2013. Note, you are not required to conduct any off-site monitoring, however if you did, please provide those results electronically to NCIA.	One noise impact assessment (NIA) was completed for the Fort Saskatchewan Facility in 2013 in conjunction with the Phase 1 Expansion project. The assessment determined the predicted receptor noise contributions of the Facility and the Phase 1 Expansion range from 31.5 to 40.9 dBA Leq. These values, calculated using the Facility diagnostic noise model, are slightly lower than the Regional Noise Model Facility Baseline for most of the receptors. The cumulative industrial noise contributions of the Facility and the Phase 1 Expansion range from 44.3 to 50.0 dBA Leq. These values are equal to the Regional Noise Model cumulative industrial baseline at all receptors, except at one receptor where the value is slightly lower than the Regional Noise Model cumulative industrial baseline. The complete report has been provided to NCIA.
Disclose any improvements/corrective actions implemented in 2013 or status thereof that would impact the noise level output for your	Construction activities began on the Phase 1 Expansion project in 2013. This development began with earth works for a new facility brine

site (either up or down). Did those changes result in a requirement to update your site noise model? If so, have you provided your updated site model to SLR Consulting for incorporation into the NCIA Regional Noise Model as per the process outlined for this purpose?	pond. The expansion has resulted in the site conducting a noise impact assessment which was subsequently used to update the Regional Noise Model. SLR Consulting conducted the NIA and updated the model with the information.
Disclose any improvements/projects that are approved for 2014 that would impact the noise level output for your site (either up or down). Will these changes result in a requirement to update your site noise model? If so, when do you anticipate having an updated site model available?	The Facility will be continuing on with the Phase 1 Expansion plans in 2014. This will include the final construction of the new facility brine pond, drilling of two new underground storage caverns, and relocating and expansion of the truck loading terminal. These activities may result in changes that require the facility to update the Regional Noise Model. This will be evaluated as we proceed with expansion activities.
Disclose any audit/self-assessment evaluation (qualitative evaluation only, with senior site leader sign-off) completed for your site noise management plan.	Facility NIA conducted by third party consultant in 2013 to evaluate compliance with NCIA bylaws, the site noise management plan and to provide data to update the Regional Noise Model.
Provide a Noise Complaint summary for all noise complaints received in 2013 including any actions taken to address them.	No noise complaints were received by the Facility in 2013.

This information is being collected as per the NMP Standard 2010-003 Document attached, section 5.4. All information provided will be disclosed to the AER as part of the required NCIA Annual Reporting on the Regional Noise Management Plan.

Further, the Annual Report will be a public document available on our website once finalized.

global environmental solutions

Plains Midstream Canada
Fort Saskatchewan Site Phase 1 Expansion Project

Noise Impact Assessment

March 21, 2014
SLR Project No.: 203.50001.00000

SLR

NOISE IMPACT ASSESSMENT
FORT SASKATCHEWAN SITE
PHASE 1 EXPANSION PROJECT

SLR PROJECT NO.: 203.50001.00000

Submitted by
SLR Consulting (Canada) Ltd.
#1140, 10201 Southport Road SW
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For
Solstice Projects Inc.
350, 550 – 11 Avenue SW
Calgary, AB T2R 1M7

March 21, 2014

Association of Professional Engineers and Geoscientists of Alberta
Permit to Practice P05449

Prepared by:

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RICHARD G. WRIGHT
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MARCH 21, 2013

Richard Wright, P.Eng.
Principal Engineer

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Distribution: 1 PDF – Solstice Projects Inc.
1 copy – SLR Consulting (Canada) Ltd.

EXECUTIVE SUMMARY

Plains Midstream Canada is planning to expand the storage facilities at their Fort Saskatchewan Site (FSS). New equipment installed at the site as part of the Phase 1 Expansion will include the following:

- 3 condensate injection pumps (600 hp each; includes 1 standby unit)
- 2 condensate booster pumps (500 hp each; includes 1 standby unit)
- 1 brine transfer pump building containing 4 brine transfer pumps (200 hp each) and 2 leak detection pumps (67 hp each)
- 2 water wash injection pumps (700 hp each)
- 2 disposal pump buildings, each containing 1 disposal brine pump (671 hp)
- 2 loading pumps (80 hp each)

The closest dwellings to FSS range between 515 m and 1,360 m from the site boundary. A noise impact assessment was performed to evaluate industrial noise contributions from the Phase 1 Expansion Project at these receptors. The assessment includes development of a diagnostic computer noise model of the existing FSS facilities, calculation of FSS noise contributions at the closest dwellings, identification of noise mitigation measures for the existing site, evaluation of incremental noise contributions produced by new equipment at FSS, and prediction of cumulative industrial noise levels at the closest receptors resulting from the Phase 1 Expansion Project.

FSS is a member company of the Northeast Capital Industrial Association (NCIA) participating in the NCIA Regional Noise Management Plan (RNMP) and NCIA Regional Noise Model. The Alberta Energy Regulator (AER) approved the NCIA RNMP and NCIA Regional Noise Model as a compliance framework for NCIA member companies with the implication that compliance with Directive 038 is based on conformance with the RNMP, the Regional Noise Model baseline and receptor impact.

The predicted noise contributions of FSS at the closest receptors, as determined by the Regional Noise Model baseline, range from 32.0 to 40.8 dBA. These values are derived from the FSS component of the Regional Noise Model, which is based on a *basic noise model* of the site prepared and submitted to NCIA in 2010. The predicted noise contributions of the existing FSS facilities, as determined by the recently developed diagnostic noise model of FSS, range from 30.7 to 40.0 dBA L_{eq}. These results include noise contributions from a fired heater (H-650) installed at FSS in 2011, which does not form part of the FSS *basic noise model* submitted to NCIA in 2010. This heater only operates during regeneration cycles that occur intermittently at FSS. It usually operates for 12 to 14 hours per regeneration cycle. Although the total operating time of the heater is only about 320 to 640 hours per year, it is a significant source of environmental noise at FSS when it does operate. The predicted receptor noise contributions of FSS when H-650 is not operating range from 29.0 to 38.3 dBA L_{eq}.

The Phase 1 Expansion includes 5 large condensate pumps and 2 large water wash pumps, all located outdoors. The wash water pumps will be enclosed in a Utilidor system to prevent freezing in wintertime. This enclosure system will also provide mitigation of environmental noise emissions from the pumps. Noise mitigation is also recommended for the condensate pumps, comprised of acoustical blankets fitted to the pump casings.

The predicted receptor noise contributions of FSS (with H-650 operation) and the Phase 1 Expansion range from 31.5 to 40.9 dBA L_{eq}. These values, calculated using the FSS diagnostic noise model, are slightly lower than the Regional Noise Model FSS baseline for most of the receptors. The cumulative industrial noise contributions of FSS (with H-650 operation) and the Phase 1 Expansion range from 44.3 to 50.0 dBA L_{eq}. These values are equal to the Regional Noise Model cumulative industrial baseline at all receptors, except at one receptor where the value is slightly lower than the Regional Noise Model cumulative industrial baseline.

<table>
<tr><td rowspan="2"></td><td rowspan="2">NCIA Standards and Guidelines</td><td colspan="2">Document Number
2010-003</td></tr>
<tr></tr>
<tr><td colspan="2">Noise Management Plan Reporting Requirements as per Section 5.4 of this Standard</td><td>Rev. Date
14-Apr-14</td><td>Rev.
2</td></tr>
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Praxair Canada Inc Fort Saskatchewan Air Separation Plant

Note, please provide as much detail as you can for the following, attaching any clarifying or required documents with your submission.

If you have any questions, please call Laurie Danielson @ 780.992.1463

Input Description	**Member Site Comments**
Confirmation that site has implemented a best management practice to address environmental noise as per NCIA Noise Management Plan Standard 2010-003 issued 3-Sep-10, revised 5-Mar-13, revised 14-Apr-14 (attached), including the Procedure/Practice/Standard reference. Note, if you have not provided an electronic copy of your site plan to NCIA, please do so.	On the June 11, 2010 report completed by HFP Acoustical Consultants Corp. the report states that in general terms, this facility does not produce a significant amount of noise. Last sound survey was completed by Mike Carter October 30, 2013 and shows < 60 dba at fenceline which is consistent with the study results which were around 56 db.
Attach results of any monitoring/assessments (fenceline outward) completed in 2013. Note, you are not required to conduct any off-site monitoring, however if you did, please provide those results electronically to NCIA.	Attached
Disclose any improvements/corrective actions implemented in 2013 or status thereof that would impact the noise level output for your site (either up or down). Did those changes result in a requirement to update your site noise model? If so, have you provided your updated site model to SLR Consulting for incorporation into the NCIA Regional Noise Model as per the process outlined for this purpose?	No changes to the way the facility operates. No improvements or corrective actions undertaken in 2013.

Disclose any improvements/projects that are approved for 2014 that would impact the noise level output for your site (either up or down). Will these changes result in a requirement to update your site noise model? If so, when do you anticipate having an updated site model available?	No changes planned in 2014 that will impact noise level of the facility.
Disclose any audit/self-assessment evaluation (qualitative evaluation only, with senior site leader sign-off) completed for your site noise management plan.	Results of our local 2013 sound survey would have been communicated to the appropriate personnel.
Provide a Noise Complaint summary for all noise complaints received in 2013 including any actions taken to address them.	No noise complaints received in 2013.

This information is being collected as per the NMP Standard 2010-003 Document attached, section 5.4. All information provided will be disclosed to the AER as part of the required NCIA Annual Reporting on the Regional Noise Management Plan.

Further, the Annual Report will be a public document available on our website once finalized.

NCIA Northeast Capital Industrial Association	NCIA Standards and Guidelines	Document Number 2010-003	
Noise Management Plan Reporting Requirements as per Section 5.4 of this Standard		**Rev. Date** 14-Apr-14	**Rev.** 2

Praxair Canada Inc Fort Saskatchewan Carbon Dioxide Plant

Note, please provide as much detail as you can for the following, attaching any clarifying or required documents with your submission.

If you have any questions, please call Laurie Danielson @ 780.992.1463

Input Description	Member Site Comments
Confirmation that site has implemented a best management practice to address environmental noise as per NCIA Noise Management Plan Standard 2010-003 issued 3-Sep-10, revised 5-Mar-13, revised 14-Apr-14 (attached), including the Procedure/Practice/Standard reference. Note, if you have not provided an electronic copy of your site plan to NCIA, please do so.	An On-site sound survey was completed on July 24, 2013 by Rishi Sookai.
Attach results of any monitoring/assessments (fenceline outward) completed in 2013. Note, you are not required to conduct any off-site monitoring, however if you did, please provide those results electronically to NCIA.	No changes
Disclose any improvements/corrective actions implemented in 2013 or status thereof that would impact the noise level output for your site (either up or down). Did those changes result in a requirement to update your site noise model? If so, have you provided your updated site model to SLR Consulting for incorporation into the NCIA Regional Noise Model as per the process outlined for this purpose?	No changes

Disclose any improvements/projects that are approved for 2014 that would impact the noise level output for your site (either up or down). Will these changes result in a requirement to update your site noise model? If so, when do you anticipate having an updated site model available?	No changes
Disclose any audit/self-assessment evaluation (qualitative evaluation only, with senior site leader sign-off) completed for your site noise management plan.	No changes
Provide a Noise Complaint summary for all noise complaints received in 2013 including any actions taken to address them.	No noise complaints received in 2013.

This information is being collected as per the NMP Standard 2010-003 Document attached, section 5.4. All information provided will be disclosed to the AER as part of the required NCIA Annual Reporting on the Regional Noise Management Plan.

Further, the Annual Report will be a public document available on our website once finalized.

Shell Scotford Manufacturing (Refinery and Chemicals)

Note, please provide as much detail as you can for the following, attaching any clarifying or required documents with your submission.

If you have any questions, please call Laurie Danielson @ 780.992.1463

Input Description	Member Site Comments
Confirmation that site has implemented a best management practice to address environmental noise as per NCIA Noise Management Plan Standard 2010-003 issued 3-Sep-10, revised 5-Mar-13, revised 14-Apr-14 (attached), including the Procedure/Practice/Standard reference. Note, if you have not provided an electronic copy of your site plan to NCIA, please do so.	Noise as an environmental aspect is managed as part of the Scotford Manufacturing Management System which is certified to International Organization for Standardization [ISO 14001(2004)], and verified under the Responsible Care® Codes and Principles. Scotford Manufacturing Management System
Attach results of any monitoring/assessments (fenceline outward) completed in 2013. Note, you are not required to conduct any off-site monitoring, however if you did, please provide those results electronically to NCIA.	A site monitoring assessment was planned for the Fall of 2013, however plant outages were a barrier to completing a representative survey. The survey was rescheduled for July 2014.
Disclose any improvements/corrective actions implemented in 2013 or status thereof that would impact the noise level output for your site (either up or down). Did those changes result in a requirement to update your site noise model? If so, have you provided your updated site model to SLR Consulting for incorporation into the NCIA Regional Noise Model as per the process outlined for this purpose?	None directly associated with the Scotford Manufacturing facilities. No significant infrastructure has been added and no new operational units/ equipment has come on line. Annual shutdown activities typically result in higher traffic which can impact noise locally.

Disclose any improvements/projects that are approved for 2014 that would impact the noise level output for your site (either up or down). Will these changes result in a requirement to update your site noise model? If so, when do you anticipate having an updated site model available?	None to disclose at this time.
Disclose any audit/self-assessment evaluation (qualitative evaluation only, with senior site leader sign-off) completed for your site noise management plan.	2014 Awareness Orientation continued at operational, project, C&P, HSSE levels. A NMP pointer reference was prepared and included as part of the Site EMS. Internal management system audit to include noise management in 2013, results to be confirmed.
Provide a Noise Complaint summary for all noise complaints received in 2013 including any actions taken to address them.	No complaints on record in 2013 attributable to noise from Scotford.

This information is being collected as per the NMP Standard 2010-003 Document attached, section 5.4. All information provided will be disclosed to the AER as part of the required NCIA Annual Reporting on the Regional Noise Management Plan.

Further, the Annual Report will be a public document available on our website once finalized.

Shell Scotford Upgrader

Note, please provide as much detail as you can for the following, attaching any clarifying or required documents with your submission.

If you have any questions, please call Laurie Danielson @ 780.992.1463

Input Description	Member Site Comments
Confirmation that site has implemented a best management practice to address environmental noise as per NCIA Noise Management Plan Standard 2010-003 issued 3-Sep-10, revised 5-Mar-13, revised 14-Apr-14 (attached), including the Procedure/Practice/Standard reference. Note, if you have not provided an electronic copy of your site plan to NCIA, please do so.	NCIA has the latest version of the Upgrader Site NMP (SUG.HSSE.ENV.AIR.NOIS.M.002 revised June 16, 2012).
Attach results of any monitoring/assessments (fenceline outward) completed in 2013. Note, you are not required to conduct any off-site monitoring, however if you did, please provide those results electronically to NCIA.	A monitoring assessment was planned for the fall of 2013, however, plant outages prevented us from completing a meaningful survey. This is now scheduled for June 2014.
Disclose any improvements/corrective actions implemented in 2013 or status thereof that would impact the noise level output for your site (either up or down). Did those changes result in a requirement to update your site noise model? If so, have you provided your updated site model to SLR Consulting for incorporation into the NCIA Regional Noise Model as per the process outlined for this purpose?	Expansion model is 90% complete. Stack top measurements remain to be completed, however, theoretical values have been instituted in the meantime and the model is ready for inclusion into the RNM. Plan is to complete stack top measurements in 2014 and update model by end of year.

Disclose any improvements/projects that are approved for 2014 that would impact the noise level output for your site (either up or down). Will these changes result in a requirement to update your site noise model? If so, when do you anticipate having an updated site model available?	None to disclose at this time.
Disclose any audit/self-assessment evaluation (qualitative evaluation only, with senior site leader sign-off) completed for your site noise management plan.	Site NMP has set internal audit frequency to a 3 year cycle with the first one being in 2015. However, AER audited our site NMP in Q1 2014, which will fulfill our internal auditing requirement so next audit is 2017.
Provide a Noise Complaint summary for all noise complaints received in 2013 including any actions taken to address them.	No noise complaints received.

This information is being collected as per the NMP Standard 2010-003 Document attached, section 5.4. All information provided will be disclosed to the AER as part of the required NCIA Annual Reporting on the Regional Noise Management Plan.

Further, the Annual Report will be a public document available on our website once finalized.

March 27. 2014

TO: Northern Capital Industrial Association (NCIA)

MEMORANDUM
H&S Department

Re: Sherritt/Corefco Noise Management Report: 2013

This is a summary of Sherritt International's activity with respect to the Noise Management plan at the operating facility in Fort Saskatchewan as part of our membership with the NCIA. Sherritt is committed to work towards the reduction of noise that may affect neighbouring communities and within the plant boundaries

Historical

In the past, we have been under the regulation by the Alberta Energy and Utilities Board (EUB) which is now called the Energy Resource Conversation Board (ERCB) Directive 38 (Noise Control Directive) and had to be aware of the City of Fort Saskatchewan Municipal No. C25-95 (The Bylaw)

In the past we have been in compliance with all the requirements. With following the NCIA RNMP (Regional Noise Management Plan), we will fall within the requirements of these regulations and strive for continuous improvement within our facility.

Sherritt International Noise Management Plan

The Sherritt Noise Management (FSSMP001-021) is in place and meets the requirements that are outlined by the NCIA.

Environmental Noise Studies (fence line outward)

The readings of fence line environmental noise points that was conducted in 2013 indicate that, during normal operating conditions, the noise produced at Sherritt have decreased by 2 to 5 dB from the previous noise model performed in 2011. These updated readings are not yet incorporated in the Regional Noise model.

Improvements/corrective actions

Piping modifications on vents pots in Nickel Reduction lowered the noise from the vents at the measured point by 5 dBA.

Noise Complaint's

There were no noise complaints for the 2013 year.

Planned Work

Continual updating of plant noise maps in addition to measuring any new installations that produce noise. Plans will be put into place as a result of recommendations prescribed in the assessments and as per the Noise Management Plan.

If there are any further questions or concerns about this report, please contact myself, Candy Wagner, about the information presented.

Regards

Candy Wagner, CRSP, ROHT
Health and Safety Advisor: Hygiene

1. INTRODUCTION

Noise is produced as a consequence of our operations on site. Noise can have long term health effects and may cause nuisance noise for our neighbors. Measures must be taken to control our noise emissions, reduce noise being transmitted to the community, and worker exposure.

2. OWNERSHIP

The owner of the Noise Management Code of Practice (NMP) is the Fort Site Health and Safety Department. This Code of Practice was developed to guide all activities that may impact the level of noise at the Fort Site.

The NMP must be adhered to in order to aid in the reduction of our overall noise footprint, occupationally and environmentally.

3. PURPOSE

The NMP is a requirement of the Alberta Occupational Health and Safety Code (OH&S Code) Part 16 and as well as a requirement of Northeast Capital Industrial Association (NCIA) membership for the Regional Noise Management Plan (RNMP).

The goal of the RNMP is to allow growth and to encourage the continuous improvement of industry in the region without further impacting the neighboring communities and established companies.

4. OBJECTIVE

The objectives of this practice are to provide guidance to:

- Minimize, where reasonably practicable, noise levels impacting the environment and workers.
- Maintain a noise monitoring program for occupational and environmental exposures.
- Ensure personnel associated with noise sources are aware of the impact on the surrounding workers and environment.

5. DEFINITIONS

Occupational noise: Noise, as per Alberta OH&S code, is where workers are, or may be, exposed to noise at a work site in excess of 85 dB(A). This is the level where the noise exposure controls need to be implemented as well as a Noise Management Code of Practice.

This is noise that is within the facility boundaries.

Environmental noise: Environmental Noise is any noise that can be considered distracting to the neighboring communities, as per the Energy Resources Conservation Board (ERCB).

This is noise that is propagated from the facility and outside the facility's boundaries.

6. NOISE CONTROL AND ABATEMENT

Duty to Reduce

An employer must ensure that all reasonably practicable measures are used to reduce the noise to which workers are exposed in areas of the work site where workers may be present.

Noise control design

217(1) An employer must ensure that the following are designed and constructed in such a way that the continuous noise levels generated are not more than 85 dBA or are as low as reasonably practicable.

(a) A new work site;
(b) Significant physical alterations. Renovations or repairs to an existing work site or work area;
(c) A work process introduces to the work site or work area
(d) Significant equipment introduced to the work site or work area

217(2) Subsection (1) does not apply to alterations, renovations or repairs begun or work process or equipment introduced before April 30, 2004.

(OH&S Code: Part 16, Noise Exposure, Duty to Reduce 216 and 217

Methods of Control

1. Noise hazard signs will be placed in areas of elevated sound levels above the Noise Exposure Limit of 85 dB(A)

2. All new projects and equipment will take into consideration noise mitigating options to help reduce the occupational and environmental noise impact:

    a. Engineering options will be considered with the installation of new equipment/processes to achieve a workplace noise level of 85 dB(A) or less. An effort will be put forth to try to get the least noise producing equipment that is *reasonably practicable*,[1] through the 4 types of engineering controls:
        i. Substitution – replacement with quieter models.
        ii. Modification – change the way the equipment run so that it generates less noise. (Example: reduction of vibration, improved lubrication, balancing, running at a different speed)
        iii. Isolation – removing workers from the environment where the area of noise is.
            1. Segregating noisy areas with sound barriers or partitions.
            2. Isolating the equipment in an enclosure.
            3. Using sound absorbent material to cover noisy equipment.
        iv. Maintenance – proper care of equipment can ensure that that it is operating under optimal conditions.

3. Installation of devices that can impact neighboring communities, such as silencers, which have the capacity for sound traveling longer distances (especially at elevations) need to be considered for low frequency noise. (Characterization of the low frequency noise is defined as 20dB difference between dB(A) and dB(C) readings.

Noise Events

When significant noise disruption occurs over 85 dBA (e.g. Planned shutdown or process upset which results in excess venting) a notification will be sent out to the site by the operating unit.

As per the direction of the operating unit, the community will be informed through the Northeast Region Community Awareness Emergency Response (NRCAER) system. Security will update the communication to NRCAER as required.

1 Using the terms "reasonably practicable" and "impracticable" are not intended to provide an opportunity or excuse for not meeting the requirements of the Code. Uses of these terms indicate the preferred action that should be taken, and are associated with the minimum requirements that should be met.

HEARING PROTECTION

- The range of 85 dB(A) to 105 dB(A) requires the use of single hearing protection (muffs or plugs)
- The range of 105 dB(A) to 114 dB(A) requires the use of double hearing protection. (muffs and plugs).
- Noise levels above 114 dB(A) require the use of double hearing protection and time limitations.
- Appropriate signage must be placed in areas where above conditions are known to exist. (see Appendix 1 for signage)
- Hearing protection is available to all those that go into areas of noise exceeding the Occupational Exposure Limit.
- Hearing protection will be purchased to meet the standard set out in the Occupational Health and Safety code and CSA Z94.2-02.

Measuring and Monitoring Noise Levels

Occupational Noise:

Measurement will follow *CSA Z107.56-94 (R1999)*, Standard for Measurement of Occupational Noise Exposure, by a qualified person. Noise will be assessed:

- For a production unit (area), at least every 4 years, but also taking into process/equipment changes into consideration, this may require it to be conducted sooner.
- For individual workers based on job tasks and may be reassessed when requested at least every 4 years.
- When new noise generating/mitigating equipment or new work processes are introduced.
- When work practices and/or work procedures change.
- When there are complaints or increased noise levels in their work area.

Environmental Noise:

Regional Noise Modeling will be completed in conjunction with the NCIA or at the request of site management to meet the City of Fort Saskatchewan bylaw requirements. The Site no longer has an ERCB license, therefore, ERCB D38: Noise Control does not apply to the site, however, the city bylaws do apply. Sherritt accepts that the NCIA RNMP is the best practice and will be applied to the site.

7. MEDICAL MONITORING

- All new employees must have a baseline audiometric test within the first six months of employment.
- Audiometric test should be redone based on noise exposure. All exposed workers should, at a minimum, be tested biannually to maintain a baseline value for the worker.
- All hearing test must be carried out by a qualified audiometric technician with approved equipment.
- Abnormal shifts in hearing test results will be reviewed by the Health Centre as per the audiometric program.

8. ROLES AND RESPONSIBILITIES

Management ensures that

- Planning is put into place to ensure that projects will adhere to this practice with the goal of reduction of our noise footprint and understand the requirements for the 'duty to reduce'.
- Communication of a known noise event to the site before the event can occur.
- Communication of a known noise event that will possibly affect offsite receptors to security for placement on the NRCAER system.
- There are appropriate resources provided for managing the Noise Management Code of Practice and participation with the NCIA.
- Those Workers/Supervisors are trained as per the TRAINING section of this practice.
- Areas have appropriate signage.
- Recommendations from surveys to be implemented.
- They understand their responsibilities and comply with the content of this practice.

Program Administrator (Health and Safety Advisor) ensures that:

- This practice's effectiveness through ongoing surveillance and evaluation of the following:
  - Compliance with regulatory requirements
  - Documented practice procedures
  - Workplace practices
  - Training Program.
- The practice is reviewed annually and updated as necessary.
- Regulatory changes are reviewed as required and are incorporated into the practice and communicated as necessary.
- There will be a company representative with the NCIA RNMP committee.
- They participate in an environmental noise impact study to aid in the updating of the RNMP model with the assistance of the Health and Safety Advisor and C&RA Advisors. The studies will be completed in conjunction with the NCIA or at the request of site management to meet the City of Fort Saskatchewan bylaw requirements.
- The annual report is compiled and issued to the NCIA.
- They understand their responsibilities and comply with the content of this practice.

Health and Safety Hygiene Advisor ensures that:

- Area and equipment surveys are conducted in each operating unit where workers are performing tasks where noise may be a concern.
- Personal noise dose surveys to determine individual job task exposures.
- Equipment noise surveys are conducted when there are changes, updates or modifications that will affect the noise impact to the unit.
- They aid the Program Administrator to ensure that all current regulations are reflected in this practice.
- They support Engineering in determining design priorities for upgrading and/or replacement.
- Contribute monitoring results for reporting year for NCIA annual report.
- They understand their responsibilities and comply with the content of this practice.

C&RA Advisor ensures that:

- They support the site in managing regulator interfaces for environmental noise concerns.
- They aid the Program Administrator to ensure that all current regulations are reflected in this practice.
- Off-site noise complaints are managed and entered into AIRTAS.
- They contribute to the Annual Offsite Noise Complaint Summary Report for any reports not covered by AIRTAS.
- They understand their responsibilities and comply with the content of this practice.

Supervisor and/or Site Contact ensures that:

- Workers are wearing the appropriate hearing protection for the area and task.
- A hazard assessment is completed for any task or activity that may change the type of hearing protection that is required.
- Any perceived noise level increases are reported to the Health and Safety Department: Hygiene Advisor for measurement.
- Workers are trained in the hazard of the exposure to excess noise, in the correct use of hearing protection and control measures.
- Communication of noise producing activities occurs to: Workers in the area, as well as (if necessary) the public through security.
- They understand their responsibilities and comply with the content of this practice.

Workers are required to ensure that:

- They wear hearing protection as deemed by area signage and/or hazard assessment.
- Any perceived noise increases are reported for further investigation to their supervisors or Site Contact.
- They participate in the medical monitoring.
- They co-operate with personal noise dosimeter testing.
- They participate in training.
- They understand their responsibilities and comply with the content of this practice.

Engineering/Project Leads ensure that:

- The most practicable and lowest noise options for replacement equipment have been considered, (See section: Noise Control and Abatement)
- They will contact the Health and Safety Department Hygiene Advisor to conduct an area noise survey before and after introducing a piece of noise generating equipment.
- Current area noise levels are taken into consideration when replacing noise generating equipment.
- Workers in the area, as well as (if necessary) the public, are notified of noise producing activities
- Any noise reduction projects are reported to the Program Administrator.
- They understand their responsibilities and comply with the content of this practice.

Purchasing Department ensures that:

- They should support Engineering to provide adequate consideration to all low noise options.
- Hearing protection purchased meets current standards in the Occupational Health and Safety Code.
- They understand their responsibilities and comply with the content of this practice.

Health Services ensures that:

- An audiometric program is developed and maintained that is consistent with the Occupational Health and Safety Code and this practice.
- They are qualified to perform audiometric testing with approved equipment.
- They understand their responsibilities and comply with the content of this practice.

Training and Development ensures that:

- Frequency of training and training standard is determined and developed with consultation from the Health and Safety Advisor, Hygiene.
- They understand their responsibilities and comply with the content of this practice.

9. REPORTING REQUIREMENTS

The annual noise management report to the NCIA will include:

- Results on monitoring for the reporting year.
  - Monitoring of workers/areas/equipment
  - Environmental
- Corrective actions and improvements
- Additions and projects
- Offsite noise complaint summary including actions taken
- Audit/Self Assessment evaluation

Training

All workers potentially exposed to noise levels exceeding the Occupational Exposure Limits require instruction on the hazards of noise. They need to be trained in the aspects of:

1. How to recognize a noise hazard.
2. Effects of overexposure to noise.
3. Proper use and selection of hearing protection.
4. Control measures.

OFF-SITE NOISE COMPLAINTS

All noise complaints that originate from offsite (public, neighboring industry, etc.) are received and managed by Security in accordance with Security Procedure 19.4B. Security completes the *Noise Complaint Investigation* form (se-029) and forwards to a site distribution list. C&RA ensures the complaint is recorded in AIRTAS and action items are assigned.

At this time, offsite noise complaints are not reportable to any regulatory agency.

10. REFERENCES

CCOHS, Canadian Centre for Occupational Health and Safety
http://www.ccohs.ca/oshanswers/prevention/ppe/ear_prot.html

Workplace Health and safety Bulletin: Noise in the Workplace
http://employment.alberta.ca/documents/WHS/WHS-PUB_hs003.pdf

Occupational Health and Safety, Act, Regulation and Code, 2006
http://employment.alberta.ca/cps/rde/xchg/hre/hs.xsl/307.html

ERCB directive 038 – Noise Control
http://www.ercb.ca/docs/Documents/directives/Directive038.pdf

NCIA Standards and Guidelines, Document Number 2010-001
Noise Management Plan.

Acronyms defined.

C&RA	Compliance and Regulatory Affairs Department of Sherritt
NCIA	Northern Capital Industrial Association
NMP	Noise Management Code of Practice
RNMP	Regional Noise Management Plan
NRCAER	Northeast Region Community Awareness Emergency Response
OEL	Occupational Exposure Limit
dB(A)	A measure of sound power that resembles how the ear reacts to noise
dB(C)	A measure of sound power that is often used to determine low frequency noise problems
ERCB	Energy Resources Conversation Board -- Formerly known as the EUB.

Appendix 1: Signage

sherritt

PLANT NOISE SIGN PROGRAM

Posted in a conspicuous place at the entrance to or on the periphery of each area in which noise levels range between 85dBA and 105dBA. Any worker exposed to this range of noise levels shall wear hearing protection such as MUFFS or PLUGS regardless of the time exposure.

Posted in a conspicuous place at the entrance to or on the periphery of each area in which noise levels exceed 106dBA. Any worker exposed to noise levels that exceed 106dBA shall wear hearing protection such as MUFFS AND PLUGS in combination regardless of the time exposure.

HFP ACOUSTICAL CONSULTANTS CORP.
Canadian Member of the HFP Engineering Group

October 3, 2013

Ms. Candy Wagner, CRSP, ROHT
Health and Safety Advisor, Hygiene
Sherritt International Corporation
10101 – 114 Street, Box 3388
Fort Saskatchewan, AB T8L 2T3

Dear Candy:

Re: Acoustical Consulting Services
Perimeter Noise Measurements – Noise Management Plan
Sherritt Integrated Site – Fort Saskatchewan
HFP File 13-1207-08

Sherritt International Corporation (Sherritt) is a member company of the Northeast Capital Industrial Association (NCIA), and Sherritt's Fort Saskatchewan Integrated Site is a participant in the NCIA Regional Noise Management Plan (RNMP). Accordingly, Sherritt's Integrated Site is included in NCIA's Regional Noise Model.

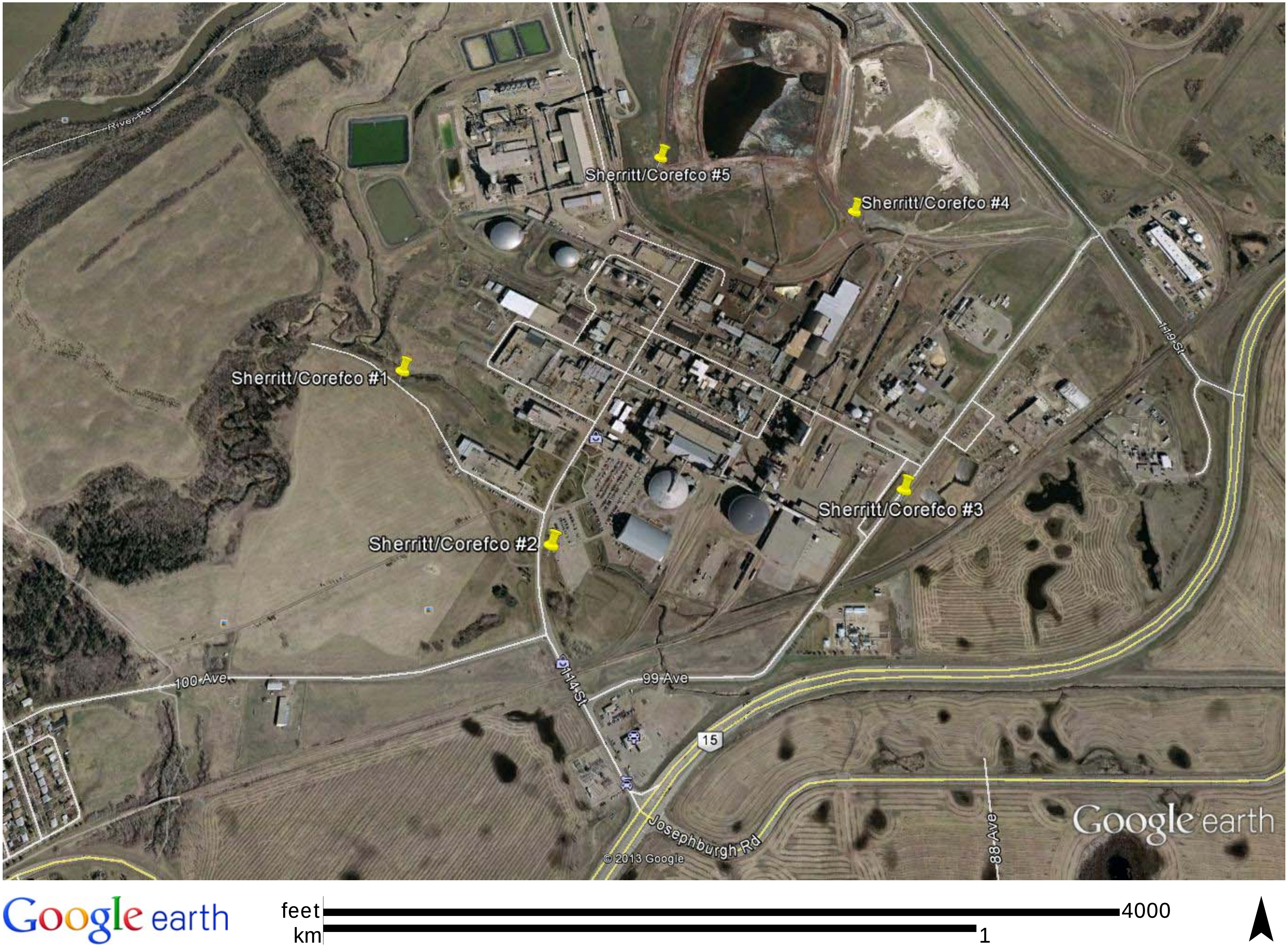
Sherritt retained HFP Acoustical Consultants Corp. (HFP) to conduct perimeter noise measurements around the Sherritt Integrated Site. The main purpose of the noise measurements is to compile a database of annual noise measurements in order to monitor overall noise emissions from the site. The perimeter noise survey database is presented in Appendix A.

Noise measurements were performed at five (5) off-site locations around the perimeter of Sherritt's Integrated Site on August 29, 2013. In 2011, these five (5) locations shown in Figure 1 were established as reference points for the development of a database of annual facility noise measurements for Sherritt's Integrated Site. These are widely-separated, off-site locations where the overall noise from the site was observed to be the dominant audible sound.

Suite 1140, 10201 Southport Road SW **Calgary AB Canada T2W 4X9**
Phone: 403.259.6600 **Fax: 403.259.6611**

6001 Savoy Drive, Suite 215 Houston, Texas USA 77036
Phone: 713.789.9400 Fax: 713.789.5493

Figure 1



Sherritt/Corefco #5
Sherritt/Corefco #4
Sherritt/Corefco #1
Sherritt/Corefco #3
Sherritt/Corefco #2
River Rd
119 St
100 Ave
99 Ave
114 St
15
Josephburgh Rd
88 Ave
© 2013 Google
Google earth
feet
4000
km
1

METHODOLOGY

Five (5) off-site noise measurement points around the perimeter of the Integrated Site (defined as fenceline points) were identified in 2011 by Sherritt and HFP during the site visit. Short-term sound pressure level measurements were performed at each off-site location on August 29, 2013 over a 30-second interval. The five locations are more or less located around the perimeter of Sherritt's Integrated Site in a uniform array at distances ranging from approximately 175 m to 350 m from process areas on-site.

The designations, UTM coordinates and descriptions of the locations selected for off-site measurements are listed in Table 1.

Table 1: Off-Site Noise Measurement Locations for Sherritt's Integrated Site

Location # Designation	UTM Coordinates		Description
	North	East	
Sherritt/Corefco #1 Southwest	5954686.7	355090.1	Near corner of perimeter fence, just west of double power pole.
Sherritt/Corefco #2 Main Gate	5954346.4	355362.9	South side of parking lot, near a choke cherry tree.
Sherritt/Corefco #3 East Gate	5954427.7	355977.6	Southwest corner of Ferus perimeter fence.
Sherritt/Corefco #4 Feed Sheds	5955000.9	355948.9	3-way intersection west of Gypsum Stack #1 & 2, near power pole #97.
Sherritt/Corefco #5 Maintenance	5955141.4	355578.2	Next to well on west side of Metals Pond.

Observations of the main audible noise sources that were noted during each measurement are recorded in Table 2. Relevant temperature and wind conditions for each measurement were also obtained from 5-minute weather data logged at each measurement location. The predominant noise source during the 2013 site visit was found to be facility-related noise. Short-term noise measurements were conducted in the absence of non-facility noise such as nearby road traffic noise.

The 2013 measurement noise data will be added to the annual noise measurement database (to be issued under separate cover) in order to monitor overall noise emissions from Sherritt's Integrated Site.

Table 2: 2013 Off-Site Noise Measurement Observations

Location # Designation	Time	Temp (^oC)	Wind Speed (k/h)	Wind Direction	Observations
Sherritt/Corefco #1 Southwest	10.03 AM to 10.06 AM	18.6	3	NW	Facility (vent) noise dominant; some audible corona noise.
Sherritt/Corefco #2 Main Gate	10.17 AM to 10.21 am	20	3	N	Facility noise dominant.
Sherritt/Corefco #3 East Gate	10.47 AM to 10.52 AM	20	6	NNW	Phos dome vent fan audible; facility noise dominant.
Sherritt/Corefco #4 Feed Sheds	9.06 AM to 9.11 AM	16	8	N	Facility noise dominant.
Sherritt/Corefco #5 Maintenance	9.24 AM to 9.29 AM	17	6	N	Facility noise dominant.

RESULTS

The sound pressure level data collected at each off-site location during the 2013 site visit include third-octave band, equivalent continuous sound pressure levels over a 30-second interval. Five short-term measurements were conducted at each off-site location for improved data confidence (when compared with a single measurement at each location). This dataset was post-processed to provide the average sound pressure levels in octave band frequencies as shown in Table 3. At Sherritt/Corefco #1 - Southwest, octave band data from 2000 Hz were excluded due to audible corona noise from nearby power transmission lines.

Table 3: 2013 Off-Site Octave Band Sound Pressure Levels - August 29, 2013

Location # - Designation	Octave Band Sound Pressure Level (dB)								
	31.5	63	125	250	500	1000	2000	4000	8000
Sherritt/Corefco #1 - Southwest	69.7	61.4	53.7	51.6	51.5	47.0	-	-	-
Sherritt/Corefco #2 - Main Gate	68.4	66.3	60.7	54.2	51.1	47.8	42.9	37.1	31.2
Sherritt/Corefco #3 - East Gate	69.1	66.2	67.1	58.6	54.6	55.2	52.9	42.4	31.4
Sherritt/Corefco #4 - Feed Sheds	73.6	66.2	61.6	55.4	49.5	48.4	45.8	41.9	25.1
Sherritt/Corefco #5 - Maintenance	76.2	69.6	64.4	55.7	52.8	50.0	46.6	46.7	26.1

"-" excluded due to audible corona noise

Noise model calculation results for the Sherritt Integrated Site, shown in Table 4, are based on the current Sherritt/Corefco noise model which also includes the previously developed Agrium, Sulzer-Metco and Smith & Nephew noise models as mentioned in the foregoing 2011 HFP report[1,2]. The predicted noise levels determined by the model calculations are based on wind speed and wind direction that coincides with the wind conditions during the 2013 measurements.

The predicted noise levels were compared with the 2013 measured noise levels at the five off-site locations. The last column of Table 4 shows the difference in noise levels between the predicted and measured values, whereby a positive value indicates the magnitude in decibels by which the measured level is below the predicted level and a negative value indicates that the measured level is above the predicted level.

Table 4: Predicted Noise Levels vs. 2013 Measured Perimeter Noise Levels

Location # - Designation	Wind Direction	Wind Speed (km/h)	Predicted Noise Level (dBA)	2013 Measured Noise Level (dBA)	∆ (Predicted - 2013 Measured) (dB)
Sherritt/Corefco #1 - Southwest	NNW	3	56.0	51.7	+ 4.3
Sherritt/Corefco #2 - Main Gate	N	3	55.0	53.5	+ 1.5
Sherritt/Corefco #3 - East Gate	NNW	6	58.1	59.7	- 1.6
Sherritt/Corefco #4 - Feed Sheds	N	8	59.1	54.4	+ 4.7
Sherritt/Corefco #5 - Maintenance	N	6	63.2	56.6	+ 6.6

Comparison of the measured and predicted values indicates that the computer noise model results agree with the measured values to a margin of ± 2 to + 5 dB at four of the five perimeter locations. Most of the predicted values are higher than the measured values which may be a reflection of facility operating conditions at the time of the survey as compared to the modeled operating conditions. The noise model is based on the simultaneous operation of all facilities on-site at typical capacity.

In conclusion, the 2013 measurement values are below the computer noise model predictions at four (4) locations under the specified wind conditions. At the Sherritt/Corefco #3 - East Gate location, the measured level is 1.6 dB above the predicted noise level.

[1] HFP Acoustical Consultants Corp., 2011. *Sherritt/Corefco Computer Noise Model Update - Sherritt International. Fort Saskatchewan Integrated Site.* HFP File 11-1207-07. December 1, 2011. Calgary, Alberta.
[2] The 2011 noise models comprise the most recent update of the computer noise models for the Sherritt Integrated Site.

Please feel free to contact me if you have any questions regarding the information contained herein.

Sincerely,

HFP Acoustical Consultants Corp.
Anita Joh, M.Des.Sc.
Project Consultant

H:\PROJECTS\1200 series\1200-1225\1207\1207-8\13-1207-08 Sherritt Fort Saskatchewan - Perimeter Noise Survey Database Report.doc

Appendix A
Sherritt Integrated Site – Perimeter Noise Survey Database

Survey No.: 2 **Survey Date: August 29, 2013** **Performed by: Anita Joh, HFP Acoustical Consultants**

Location # - Designation	Time	Temp (°C)	Wind		Sound Level (dBA)	Observations
			Speed (k/h)	Direction		
Sherritt/Corefco #1 - Southwest	10:03 AM	18.6	3.0	NW	51.7	Facility (vent) noise dominant; some audible corona noise.
Sherritt/Corefco #2 - Main Gate	10:17 AM	20.0	3.0	N	53.5	Facility noise dominant.
Sherritt/Corefco #3 - East Gate	10:47 AM	20.0	6.0	NNW	59.7	Phos dome vent fan audible; facility noise dominant.
Sherritt/Corefco #4 - Feed Sheds	9:06 AM	16.0	8.0	N	54.4	Facility noise dominant.
Sherritt/Corefco #5 - Maintenance	9:24 AM	17.0	6.0	N	56.6	Facility noise dominant.

Survey No.: 1 **Survey Date: October 13, 2011** **Performed by: Nigel Maybee, HFP Acoustical Consultants**

Location # - Designation	Time	Temp (°C)	Wind		Sound Level (dBA)	Observations
			Speed (k/h)	Direction		
Sherritt/Corefco #1 - Southwest	12:09 PM	7.9	19.7	WNW	52.6	Facility noise dominant.
Sherritt/Corefco #2 - Main Gate	12:24 PM	8.0	20.2	WNW	54.8	Facility noise dominant; road traffic audible to south.
Sherritt/Corefco #3 - East Gate	12:17 PM	7.9	18.6	WNW	62.7	Phos dome vent fan prominent; facility noise also dominant.
Sherritt/Corefco #4 - Feed Sheds	10:42 AM	7.2	17.5	W	60.3	Facility noise dominant.
Sherritt/Corefco #5 - Maintenance	10:56 AM	7.5	19.3	WNW	60.9	Facility noise dominant.

Umicore Canada

Note, please provide as much detail as you can for the following, attaching any clarifying or required documents with your submission.

If you have any questions, please call Laurie Danielson @ 780.992.1463

Input Description	Member Site Comments
Confirmation that site has implemented a best management practice to address environmental noise as per NCIA Noise Management Plan Standard 2010-003 issued 3-Sep-10, revised 5-Mar-13, revised 14-Apr-14 (attached), including the Procedure/Practice/Standard reference. Note, if you have not provided an electronic copy of your site plan to NCIA, please do so.	Code of Practice (COP-323-7) Noise Exposure Management Plan included in Umicore Canada Inc. Management System. Reference to 'environmental noise' included in the Umicore Canada Inc. Air Quality Management Program (COP-319-2).
Attach results of any monitoring/assessments (fenceline outward) completed in 2013. Note, you are not required to conduct any off-site monitoring, however if you did, please provide those results electronically to NCIA.	Not applicable – noise monitoring conducted inside the plant and from an industrial hygiene perspective.
Disclose any improvements/corrective actions implemented in 2013 or status thereof that would impact the noise level output for your site (either up or down). Did those changes result in a requirement to update your site noise model? If so, have you provided your updated site model to SLR Consulting for incorporation into the NCIA Regional Noise Model as per the process outlined for this purpose?	Management of Change (MOC) program includes elements to identify potential changes/ impacts with respect to noise exposure. Removed process screening equipment in early 2013 – reduced noise levels inside the plant slightly from an industrial hygiene perspective.

Disclose any improvements/projects that are approved for 2014 that would impact the noise level output for your site (either up or down). Will these changes result in a requirement to update your site noise model? If so, when do you anticipate having an updated site model available?	None to disclose at this time.
Disclose any audit/self-assessment evaluation (qualitative evaluation only, with senior site leader sign-off) completed for your site noise management plan.	Noise monitoring conducted twice per year inside the plant from an industrial hygiene perspective. Internal audits are conducted annually on the environmental components/programs of the Management System as per ISO 14001.
Provide a Noise Complaint summary for all noise complaints received in 2013 including any actions taken to address them.	Did not receive any noise complaints in 2013.

This information is being collected as per the NMP Standard 2010-003 Document attached, section 5.4. All information provided will be disclosed to the AER as part of the required NCIA Annual Reporting on the Regional Noise Management Plan.

Further, the Annual Report will be a public document available on our website once finalized.