NCIA Regional Noise Management Plan (RNMP)

Annual Report

Prepared for the

Albert Energy Regulator (AER)

June 2013

revised August 2013

Suite 204, 9902-102 Street
Fort Saskatchewan, Alberta
T8L 2C2

NCIA
Northeast Capital Industrial Association

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June 3, 2013

Don South, R.E.T.
Technical Specialist Noise / Operations
Field and Operations Branch
Alberta Energy Regulator
Suite 1000, 250 - 5 Street SW
Calgary, Alberta
T2P OR4

Dear Don:

Re: 2013 Annual Regional Noise Management Plan Report from the Northeast Capital Industrial Association

Hi Don, please find attached (electronically) our 2013 annual report to the Alberta Energy Regulator from NCIA regarding the Regional Noise Management Plan.

This report is being submitted to demonstrate our participating members compliance with the Regional Noise Management Plan and the annual disclosure of information as per Section 5.4 of the *NCIA Standards and Guidelines: Noise Management Plan 2010-002 revised on March 5, 2013*.

Please let me know if you would like a hard copy of this report sent to you as well, or if the electronic copy (herewith) is sufficient.

I would be happy to discuss any of these materials further with you or your team should you so desire.

Regards,

Dr. Laurie J. Danielson
Executive Director
Phone: 780 992 1463

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NCIA Regional Noise Management Plan (RNMP)

Annual Report

to the Alberta Energy Regulator (AER)

2013

1 Executive Summary

NCIA completed field validation measurements for the regional noise model in 2012. Due to difficulties encountered in scheduling the monitoring surveys while all the plant's operations were considered normal, five of the eleven planned surveys were completed.

A number of NCIA member site level noise models are being updated this year and that will prompt an update to the regional noise model and its outputs later this year or early in 2014 (see Section 4.1). The most significant of these are:

1. Dow: Changes were made to a site steam turbine in 2012 which resulted in less venting of a seasonally operated steam vent during the summer season.
2. Keyera: A product injection pump project will be completed in 2013. Once this work is completed, the NCIA Regional Noise Model will be updated.
3. Keyera: Additional noise modeling is being conducted as part of the detailed engineering phase for construction of a de-ethanizer system at the Keyera site. These updates will be incorporated into the NCIA Regional Noise Model.
4. Williams and Pembina: initiated construction on an ROF de-ethanizer project in August 2012. An NIA for the proposed ROF Debottleneck Project was prepared in 2012, using information from NCIA. These changes to the site noise model will be incorporated into the NCIA Regional Noise Model.
5. Shell Scotford: A project to create an updated site noise model for the Upgrader (including the Expansion) was started in 2012 and is approximately 90% complete. The updated site noise model will be included in the NCIA Existing Regulatory Regional Noise Model later this year or early in 2014.

As of June 1st, 2013 NCIA's Regional Noise Management Plan was approved by the Energy Resources Conservation Board, now the Alberta Energy Regulator (see Appendix 1).

The current status of the RNMP is:

- Development of an RNMP Compliance Framework - **completed**
- Acknowledgement by ERCB that the Compliance Framework is acceptable – **completed**
- Development of a Noise Equipment Database Tool – **completed**
- Development of Regional Noise Model – **completed**
- Roll out of plan for NCIA member companies – **completed**
- Develop Orientation Package for member companies – **completed**
- Sign off by ERCB that RNMP is now in effect – **completed**

2 2012 Monitoring results for Regional Noise Model

HFP Acoustical 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). Due to difficulties encountered in scheduling the monitoring surveys while all the plant's operations were considered normal, only five of the eleven planned surveys were completed in two separate trips. One location was completed in July 2012 with a monitoring period of 24 hours, while the other four were completed in September 2012 with monitoring periods ranging from 37 to 48 hours. 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 and Figure 2 below.

Table 1
Monitoring Location Details

Location No.	UTM Coordinates (approximate)		Description
	Easting (m)	Northing (m)	
1	354954	5954151	South side of 100 Ave, at corner of driveway to workshop, Southwest of Agrium Ft. Sask. facility.
2	358273	5957259	Near bend in River Road where it becomes 125 Street, between Dow and Keyera facilities.
3	357107	5957341	North side of River Road, at gated Keyera entrance, west of main Keyera facility entrance.
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	At intersection of Lamoureux Drive & Godbout Avenue, at Fort Augustus Park, across the river from Dow facility.
10	355925	5955818	West of 119 Street, on North of side of Agrium Fort Saskatchewan facility truck delivery entrance.
11	358458	5963804	Intersection of Range Road 221 and Township Road 560, Southwest of Pembina/Williams facility and across the river from Shell Scotford facility.

The complete report is included as Appendix 2 of this report.

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

Location	Measured Energy Equivalent Sound Levels, dBA L_{eq}	Predicted Industrial Noise Contribution from Regional Noise Model	Difference, Predicted minus Measured
2	52.2	54.7	+2.5
3	51.1	53.3	+2.2
4	53.4	49.6	-3.8
5	55.7	52.2	-3.5
9	46.3	45.0	-1.3

<u>Locations 2, 3 and 9</u>:
Of the five measurement locations, three had good agreement with the predicted sound levels from the Regional Noise Model (locations #2, 3 and 9).

<u>Location 4 and 5</u>:
The measured sound levels at the remaining two locations near the Shell Scotford Complex (locations #4 and 5) are not within the targeted +/– 3 dBA of the predicted sound levels.

At the time that the Model was created, Shell's Upgrader Expansion was a proposed facility and therefore not included in the Regional Noise Model as part of the existing facilities. The reason for the discrepancy at Location #5 (highlighted in blue in Table 2) is most likely due to Shell's Upgrader Expansion operating, even though it has not yet been incorporated into the Regional Noise Model. Once the Model is updated to reflect the most recent conditions, the predicted sound levels are expected to approach the measured sound levels at Location #5 (see page 15 of Appendix 2).

The difference at Location #4 (highlighted in orange in Table 2) may also be minimally attributed to the absence of the Shell Upgrader Expansion in the Regional Noise Model, as well more detailed plant operational information is needed for the Shell Refinery, to make the discrepancy at this location understandable (see page 15 of Appendix 2).

This location (#4) will be investigated further in 2013 to better understand the discrepancy in the measured versus modeled results.

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

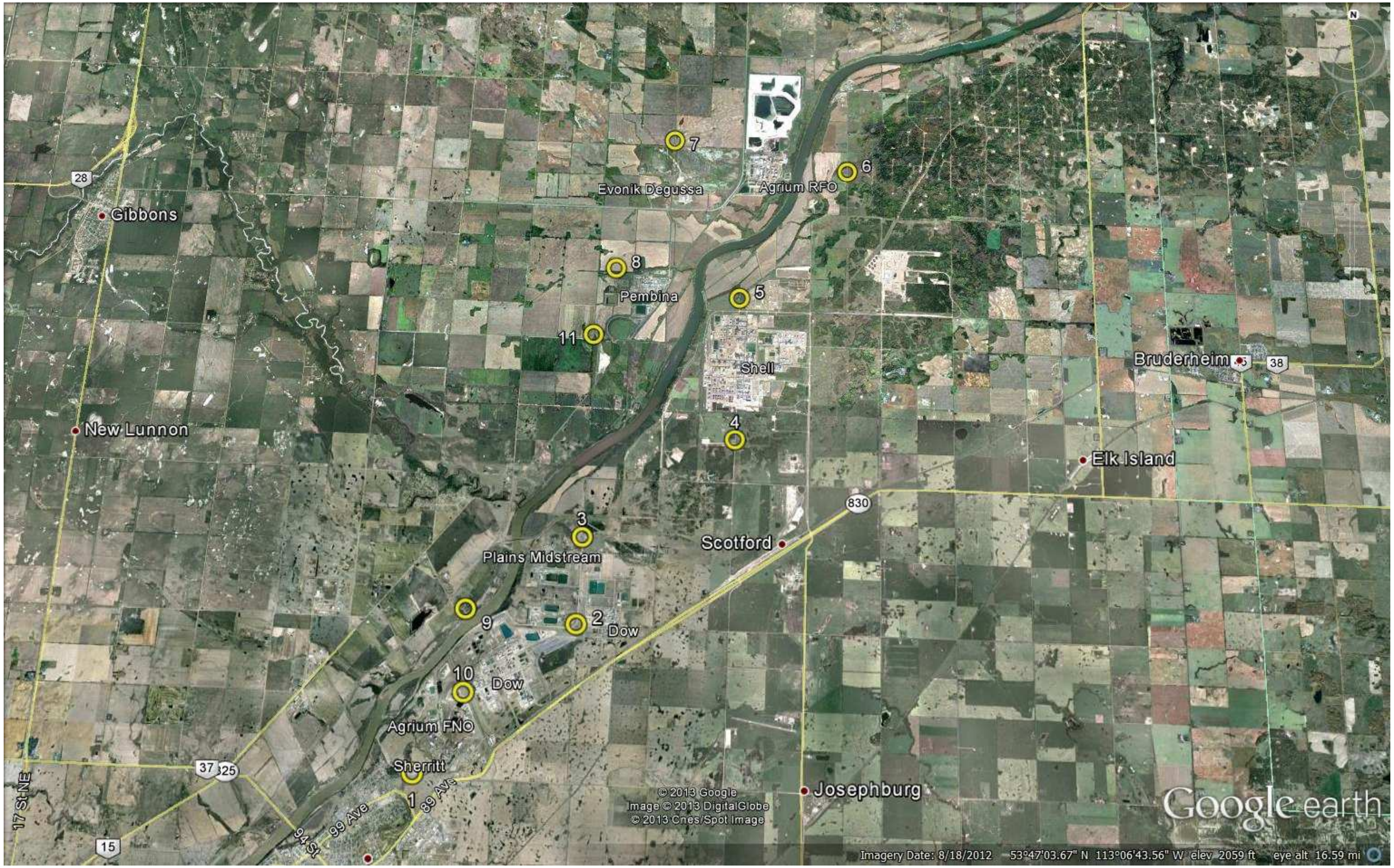
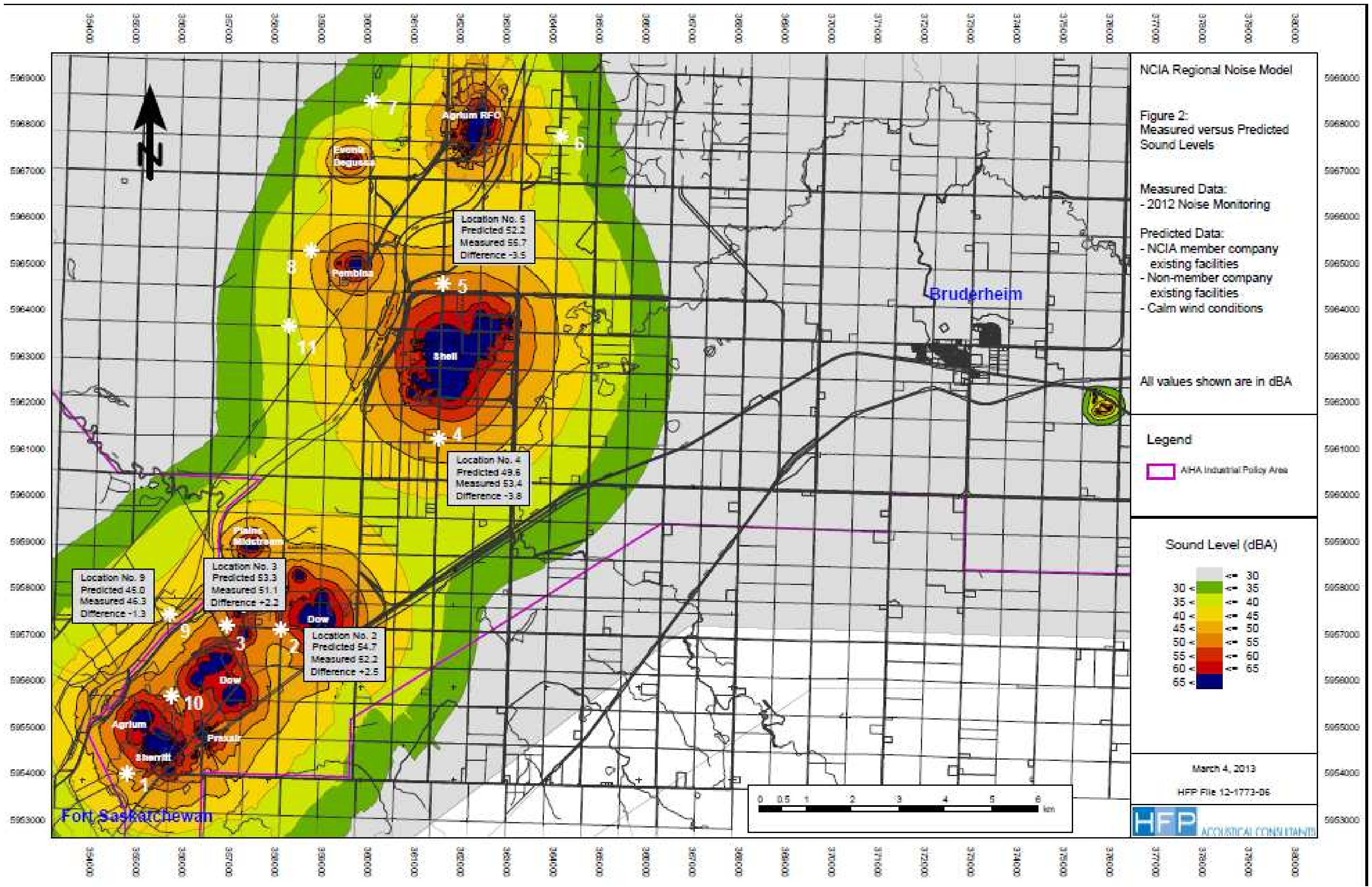


Figure 2: Measured versus modeled results (as per Table 2)



3 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	Yes
Aux Sable Canada	Regulated under Section 11 of the OSCA and therefore D-038.	Yes	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
BA Energy	Not operational, but will be regulated.	No	Not Yet
Chemtrade West	Not regulated	Yes	Yes[2]
Dow Chemical Canada	Regulated under D-038 Operator No. 0F05	Yes	Yes[3]
Enbridge Pipelines	Is regulated	Yes	Not Yet
Evonik Degussa Canada	Not regulated	Yes	Yes
Fort Hills Energy Partnership	Not operational but will be regulated Operator No. 0XP9	No	Not Yet
Keyera Energy	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
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	No	No
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
Sulzer Metco (Canada)	Not regulated	Yes	Yes[4]
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
Total E&P Canada	Not operational but will be regulated	No	Not Yet[5]
Umicore Canada	Not Regulated	Yes	Yes

[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] Chemtrade completed an internal audit/self assessment of their site noise management plan in August 2013.

[3] Dow completed an internal audit/self assessment of their site noise management plan in November 2012.

[4] Sulzer completed an internal audit/self assessment of their site noise management plan in August 2013.

[5] Total E&P Canada's project is on hold and they have sold the land for this project to Sasol Canada. As a result of that transaction, Total E&P Canada will not be NCIA members in 2014.

It should be noted, that despite many of our members not being regulated by the AER, most have agreed to participate in the RNMP on a voluntary basis.

4 Regional Noise Model

4.1 Improvements/Corrective Actions implemented in 2012 (Appendix 3)

1. 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, Dow will monitor noise from the seasonal steam vent to evaluate effectiveness of changes and ensure they are reflected in the NCIA Regional Noise Model.
2. A product injection pump project for Keyera was described in the 2012 report and involved a Noise Impact Assessment that resulted in several modifications to the proposed pump installation, including an acoustically treated building and low noise valves. These were to have been implemented in 2012 and equipment delivery delays pushed the work into 2013. Once these units are operational it is expected that further on-site monitoring will be done

to refine the computer noise model. Once this work is completed, Keyera will ensure that the NCIA Regional Noise Model is updated.

3. Additional noise modeling is being conducted as part of the detailed engineering phase for construction of a de-ethanizer system at the Keyera site. The design and regulatory components will be done in 2013 and equipment commissioning will occur in 2014. These updates will also be incorporated into the NCIA Regional Noise Model by Keyera.
4. Williams and Pembina initiated construction on the ROF de-ethanizer Project in August 2012. An NIA for the proposed ROF Debottleneck Project was prepared in 2012, using information from NCIA. The NIA will be submitted to the AER with the application to amend Pembina's AER approval for the ROF Debottleneck Project. Williams and Pembina have committed to doing a follow-up assessment of operational noise once the ROF de-ethanizer Project is in-service. As well, both companies have committed to doing a follow-up assessment of operational noise once the ROF debottleneck and RFS 2 are complete. Williams and Pembina will ensure that these changes to the site noise model are incorporated into the NCIA Regional Noise Model.
5. A project to create an updated site noise model for the Scotford Upgrader (including the Expansion) was started in 2012 and is approximately 90% complete. The previous model was included in the NCIA Proposed Regulatory Regional Model. Measurements will be completed in 2013 and the site noise model will be completed by Q4 2013. Shell will ensure that the updated site noise model is included in the NCIA Existing Regulatory Regional Noise Model later this year or early in 2014.

4.2 Other Items for Follow-up Based on 2012 Field Measurements

1. Discrepancy between measured versus predicted sound levels at monitoring location #4 will be investigated further this year and reported on as part of next year's annual filing (see Appendix 2).
2. Once all of these model updates are completed, the output files will be regenerated and made available to NCIA member companies by way of our Share Point site (we are looking at having these outputs on both SoundPlan and CadnaA going forward).

5 RNMP Current Status

In keeping with the provisions of the AER Noise Control Directive 038, NCIA has developed a RNMP. There are several elements to this plan:

- Development of an RNMP Compliance Framework - **completed**
- Acknowledgement by ERCB that the Compliance Framework is acceptable – **completed**
- Development of a Noise Equipment Database Tool – **completed**
- Development of Regional Noise Model – **completed**
- Roll out of plan for NCIA member companies – **completed**

- Develop Orientation Package for member companies – **completed**
- Sign off by ERCB that RNMP is now in effect – **completed**

6 Next Steps

- Develop procedures for annual updating of the RNMP Regional Model going forward.
- Develop procedures for accessing the Regional Model outputs for both NCIA member companies and non-member companies.
- Explore making the output files available in other software formats.
- Update the Google Earth platform (for new company names and updated site models) and make it available on the NCIA website for calm wind conditions.
- Complete 2013 noise survey of all 12 reference locations and assessment against the regional model.

APPENDIX 1

AER Approval of NCIA Regional Noise Management Plan

ERCB Energy Resources Conservation Board
Calgary Office Suite 1000, 250 – 5 Street SW, Calgary, Alberta, Canada T2P 0R4 Toll Free 1-855-297-8311 Fax 403-297-7336 www.ercb.ca

May 31, 2013

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

Dear Dr. Danielson:

Re: Northeast Capital Industrial Association (NCIA) Regional Noise Management Plan (RNMP)

The Energy Resources Conservation Board (ERCB) recognizes the significant work that has been put forward on the RNMP. This initiative is a good example of collaboration and aligning efforts for the purpose of dealing with complex challenges to ensure regulatory requirements are met or exceeded.

As per our correspondence to you on this file of December 10, 2007, and subsequent information that you have provided to the ERCB, we acknowledge that the NCIA regional noise baseline is now established through the NCIA regional noise model, that comprehensive public engagement has occurred and that NCIA members have implemented the requirements of the RNMP as per NCIA's standard 2010-001.

Accordingly, per Section 5.1 of Noise Control Directive 038, the ERCB agrees that CSL surveys are not practical within Alberta's Industrial Heartland owing to the large and growing industrial footprint in the area, and approves the detailed NCIA Noise Management Plan and NCIA Regional Noise Model for use in this area effective June 1, 2013.

Regards,

Robin King
Executive Manager
Field Surveillance and Operations Branch

cc: Don South, Field Surveillance and Operations Branch

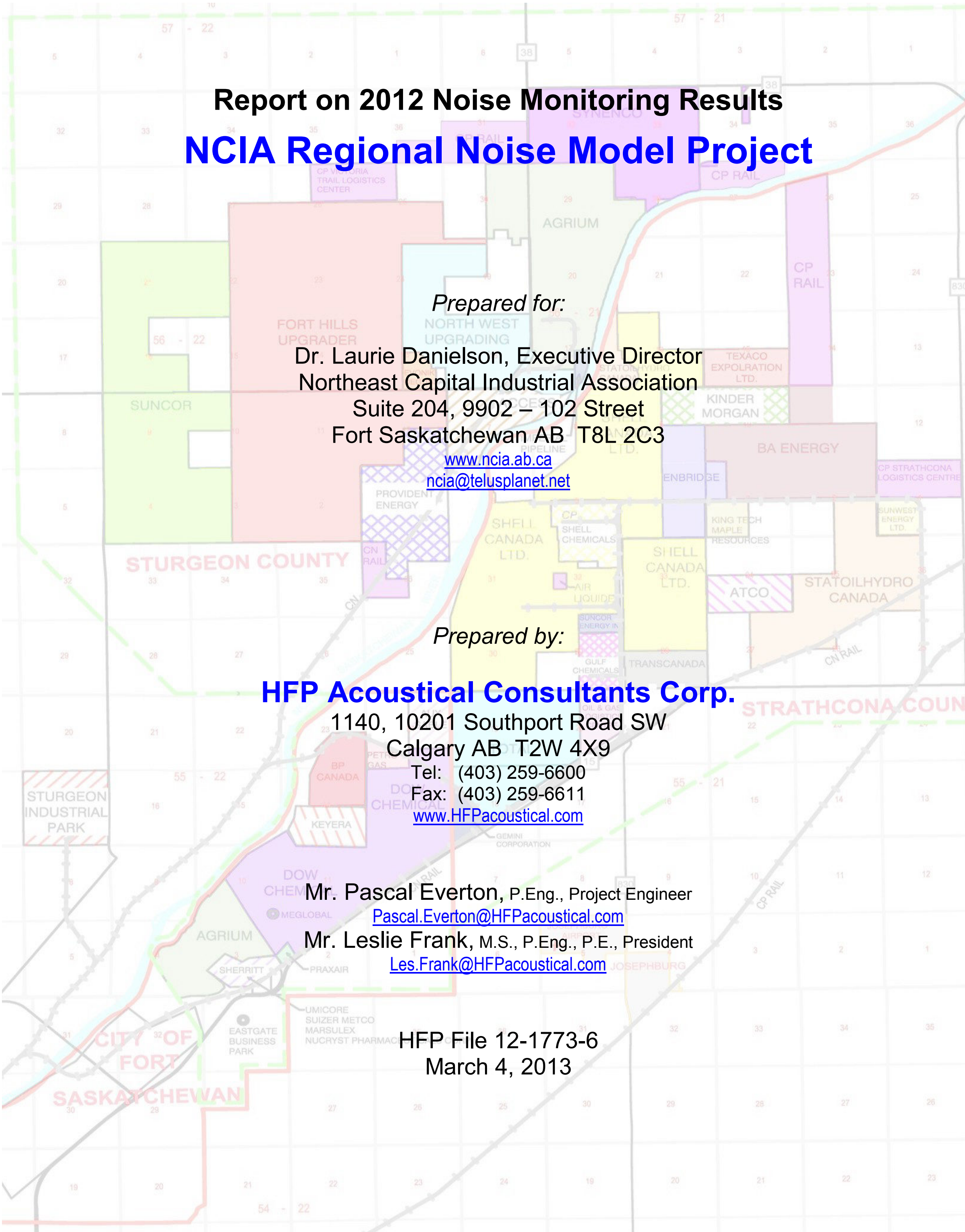
APPENDIX 2

2012 Field Validation Monitoring Report

ACOUSTICAL CONSULTANTS CORP.
Canadian Member of the HFP Engineering Group

Report on 2012 Noise Monitoring Results

NCIA Regional Noise Model Project



Prepared for:

Dr. Laurie Danielson, Executive Director
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Prepared by:

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Mr. Pascal Everton, P.Eng., Project Engineer
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HFP File 12-1773-6
March 4, 2013

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EXECUTIVE SUMMARY

Sound monitoring surveys were conducted 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). Due to difficulties encountered in scheduling the monitoring surveys while all the plant's operations were considered normal, five of the eleven planned surveys were conducted in two separate trips. One location was completed in July 2012 with a monitoring period of 24 hours, while the other four were completed in September 2012 with monitoring periods ranging from 37 to 48 hours.

The monitored isolated daytime and nighttime sound levels are presented below as well as the equivalent sound level (L_{eq}) averaged over the entire survey measurement period. The isolated sound levels have non-industrial related noise removed. Therefore, the isolated sound levels are more representative of the industrial sound contribution at each location.

Summary of 2012 Noise Monitoring Results

Location	Monitored Isolated Sound Level, dBA L_{eq}				Energy Equivalent Sound Level, dBA L_{eq}
	Daytime (07:00 – 22:00)	Nighttime (22:00 – 07:00)	Daytime (07:00 – 22:00)	Nighttime (22:00 – 07:00)	
	September 19 - 20, 2012		*September 20 - 21, 2012*		
Location 2	50.7	52.9	50.8	53.8	**52.2**
Location 3	50.0	50.0	51.3	52.5	**51.1**
Location 4	50.9	54.6	53.1	55.1	**53.4**
Location 9	43.3	44.1	48.0	48.4	**46.3**
	July 5 - 6, 2012				
Location 5	55.5	55.9	–	–	**55.7**

The wind conditions during the monitoring surveys were generally quite calm. Therefore, the Regional Noise Model was used to calculate predicted industrial noise contributions at each of the monitored locations, run under calm weather conditions. A comparison of the measured versus predicted sound levels is shown in the table on the following page.

Comparison of Measured versus Predicted Sound Levels

Location	Measured Energy Equivalent Sound Levels, dBA L_{eq}	Predicted Industrial Noise Contribution from Regional Noise Model	Difference, Predicted minus Measured
Location 2	52.2	54.7	+ 2.5
Location 3	51.1	53.3	+ 2.2
Location 4	53.4	49.6	– 3.8
Location 5	55.7	52.2	– 3.5
Location 9	46.3	45.0	– 1.3

Of the five measurement locations, three had good agreement with the predicted sound levels from the Regional Noise Model (locations #2, 3 and 9). The measured sound levels at the remaining two locations near the Shell Scotford Complex (locations #4 and 5) are not within the targeted +/– 3 dBA of the predicted sound levels. At the time that the Model was created, Shell's Upgrader Expansion was a proposed facility and therefore not included in the Regional Noise Model as part of the existing facilities. The reason for the discrepancy at Location #5 is most likely due to Shell's Upgrader Expansion operating, even though it has not yet been incorporated into the Regional Noise Model. Once the Model is updated to reflect the most recent conditions, the predicted sound levels are expected to approach the measured sound levels at Location #5. The difference at Location #4 may also be minimally attributed to the absence of the Shell Upgrader Expansion in the Regional Noise Model, as well more detailed plant operational information is needed for the Shell Refinery, to make the discrepancy at this location understandable.

As was noted in the results, a fair bit of variability existed in the data for the locations where measurements were conducted over two nights. Variability of up to 5.1 dBA was noted at one location, which suggests that monitoring over longer periods of time may be warranted to arrive at a more stable average sound level.

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PURPOSE

The Noise Best Practices Management Sub-Committee ("Committee") of the Northeast Capital Industrial Association ("NCIA") is involved in formulating a Regional Noise Management Plan ("RNMP") for their member companies in Alberta's Industrial Heartland ("Heartland"). Part of the Committee's work was to conduct a study to develop a regional noise level assessment tool, hereafter referred to as the Regional Noise Model (the "Model"). The Model is intended to guide additional investigation activities in areas where potential concerns are highlighted from the Model results.

As a means to validate the accuracy of the Model, HFP Acoustical Consultants Corp. ("HFP") was commissioned to conduct continuous noise monitoring at several locations throughout the Heartland. This report presents the results of the measurement surveys conducted in 2012 and compares their results to the Model's predicted sound levels.

MEASUREMENTS CONDUCTED

MEASUREMENT METHODOLOGY

The Energy Resources Conservation Board ("ERCB") *Directive 038: Noise Control* is a receptor-oriented noise regulation that allows the use of Regional Noise Management Plans for specific industrial areas. The noise measurement methods for a continuous noise monitoring survey are outlined in the ERCB Directive, and were adhered to during these noise monitoring surveys.

MONITORING LOCATIONS

A total of eleven locations distributed throughout the Heartland were chosen jointly by HFP and the NCIA Noise Best Practices Committee as locations that would be least affected by road and rail noise, and that are a fair distance from industrial facilities, in order to capture the cumulative effects of multiple facilities. To ensure the most representative field data collection with respect to comparison with the Model results, it was important to schedule the monitoring during normal operation of the industrial sites in the general vicinity of each measurement location. This proved to be a challenging task due to the number of facilities involved and various events such as site construction, cavern drilling and turnarounds at several facilities. Since there is a considerable distance between some locations, it was recognized that measurements could be performed near facilities that were operating normally even while distant facilities were not, as their influence on the overall sound level would be negligible. Therefore, an attempt was made to split the measurements into several separate trips. Locations near facilities that were operating normally would be captured during initial trips, while other locations would be completed at a later date when those nearby facilities were also operating normally. This approach still proved difficult to accomplish as some facilities were not operating normally for extended periods of time. As such, only five of the eleven surveys were completed in 2012.

Messrs. Pascal Everton, P.Eng., Chris Bibby, E.I.T., and Richard Wright, P.Eng. of HFP conducted the continuous noise monitoring surveys at a total of five locations in two separate trips (July 5 – 6, 2012 for Location #5; Sept 19 – 21, 2012 for Locations #2, 3, 4 and 9). Shell CanadaEnergy ("Shell") retained HFP separately to conduct noise monitoring surveys around their Scotford Complex, of which one location was common to a location selected for the NCIA monitoring survey (Location #5). Accordingly Shell agreed to share the data collected at that location with NCIA for the purposes of this study.

Table 1 presents a summary of the eleven monitoring locations chosen by HFP and the NCIA Committee for the validation monitoring measurements. The eleven locations are also illustrated on a map of the Heartland region in Figure 1.

Table 1
Model Validation Monitoring Locations

Location No.	Approximate UTM Coordinates (zone 12)		Description
	Easting (m)	Northing (m)	
1	354954	5954151	South side of 100 Ave, at corner of driveway to workshop, Southwest of Agrium Ft. Sask. facility.
2	358273	5957259	Near bend in River Road where it becomes 125 Street, between Dow and Keyera facilities.
3	357107	5957341	North side of River Road, at gated Keyera entrance, west of main Keyera facility entrance.
4	361680	5961364	West side of Range Road 215, at intersection of entrance to substation, South of Shell Scotford facility.
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7	360235	5968660	South end of Range Road 220 (dead end), south of intersection with Township Road 564. West of Agrium Redwater facility.
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9	355872	5957574	At intersection of Lamoureux Drive & Godbout Avenue, at Fort Augustus Park, across the river from Dow facility.
10	355925	5955818	West of 119 Street, on North of side of Agrium Fort Saskatchewan facility truck delivery entrance.
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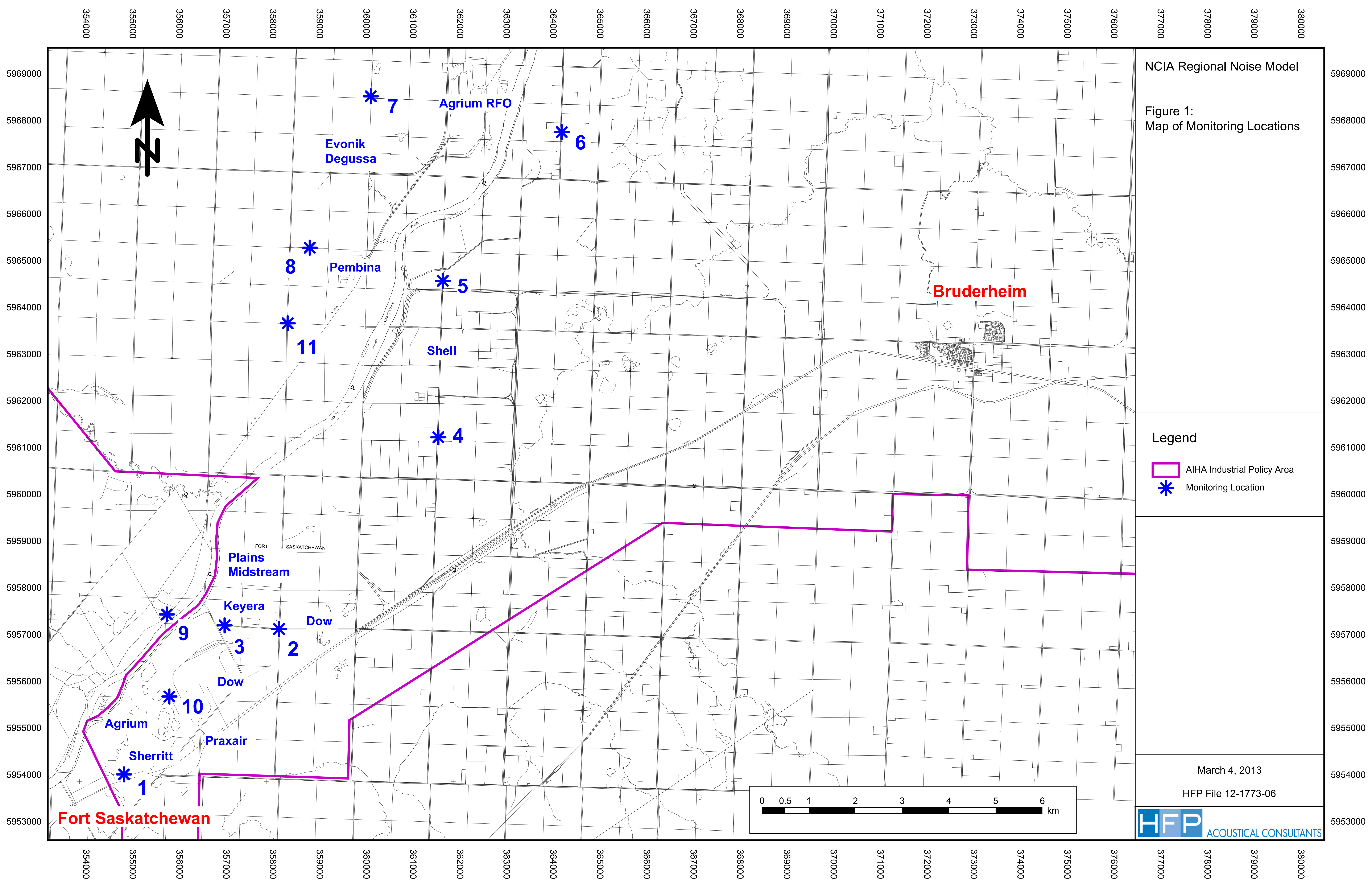
NCIA Regional Noise Model
Figure 1:
Map of Monitoring Locations
Legend
AIHA Industrial Policy Area
Monitoring Location
March 4, 2013
HFP File 12-1773-06
HFP ACOUSTICAL CONSULTANTS
0 0.5 1 2 3 4 5 6 km
Bruderheim
Fort Saskatchewan
Agrium RFO
Evonik
Degussa
Pembina
Shell
Plains
Midstream
Keyera
Dow
Dow
Agrium
Praxair
Sherritt
1
2
3
4
5
6
7
8
9
10
11
FORT SASKATCHEWAN
354000
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DURATION OF MONITORING

Continuous sound level measurements were conducted for durations between 24 to 48 hours at the five monitoring locations. Table 2 lists the sound measurement intervals completed for each of the five monitoring locations.

Table 2
Sound Measurement Intervals

Location No.	Start Time	End Time	Total Hours
2	Wed. Sept. 19, 2012; 20:00	Fri. Sept. 21, 2012; 18:00	46
3	Wed. Sept. 19, 2012; 19:00	Fri. Sept. 21, 2012; 19:00	48
4	Wed. Sept. 19, 2012; 18:30	Fri. Sept. 21, 2012; 10:30	37*
5	Thurs. July 5, 2012; 09:00	Fri. July 6, 2012; 09:00	24
9	Wed. Sept. 19, 2012; 21:00	Fri. Sept. 21, 2012; 18:30	45½

*Measurement at Location #4 was interrupted for 3 hours on Sept. 20, 2012.

MEASUREMENT INSTRUMENTATION

The sound measurement instrumentation used to conduct each continuous noise monitoring survey was as follows:

- Larson Davis 824 integrating sound level meter
- Larson Davis PRM 902 preamplifier
- GRAS TMS 40AE microphone
- Brüel & Kjær UA0237 wind screen
- Marantz Professional PMD 620 MP3 recorder
- Brüel & Kjær 4231 calibrator **or** Larson Davis LD200 calibrator (calibration date April 2012)

The sound measurement systems were calibrated at the beginning of the noise monitoring surveys and then checked at the end. A summary of the calibrations is provided in Appendix A. The Larson Davis 824 system is rated as a Type 1 system in reference to ANSI S1.4.1983 Standards and fulfills the instrumentation requirements of ERCB Directive 038.

At all measurement locations, the microphones were mounted on tripods that elevated them to an approximate height of 1.5 metres above the ground.

LEQ SOUND LEVEL DESCRIPTOR

Environmental sound level measurements have to contend with noise sources which constantly vary over time. For these measurements, there is a steady-state background sound level that exists from the noise of the facilities that slowly varies over time because of changes in sound propagation efficiencies due to varying atmospheric and/or terrain cover conditions. Along with these industrial noises, there are also short term continuously varying higher level noises. The most common of these are the sounds of local road or rail traffic, train whistles, birds chirping and the surrounding rural area. Therefore when undertaking sound measurements, it is a complex task to describe the sound level at a receptor point as it continuously varies over time. This has led to the development of single number noise descriptors. This allows noise monitoring to be undertaken of a constantly varying noise environment over an extended time period, with the results described as a single number.

The single number descriptor commonly used for environmental noise measurements and the descriptor required by Directive 038 is the energy equivalent sound level (L_{eq}). The L_{eq} value is the sound energy average over the entire measurement time period. It is defined as a calculated sound level over the measured time period that has the same acoustic energy as the actual fluctuating sound levels that occurred during the same period. The sound level measuring instrumentation used by HFP for this study records continuous 1 minute A-weighted L_{eq} sound levels. These 1 minute L_{eq} values are then used to calculate hourly, daytime and nighttime dBA L_{eq} values as required by Directive 038.

The L_{eq} values are based on a measurement of the A-weighted sound levels, as expressed in units of dBA. The dBA value accounts for the frequency content of the measured sound, and assesses it with a frequency response similar to that of the human ear.

METEOROLOGICAL CONDITIONS

Meteorological and ground conditions observed during onsite equipment checks were noted. The noise monitoring surveys were conducted during the summer and fall with mostly clear skies. There was no precipitation and winds were generally below 10 km/hr during the surveys.

Weather condition monitors were used to log 5-minute averages of meteorological conditions during both monitoring survey sessions. For the July 5 – 6, 2012 session, a weather monitor was placed at Location #5. For the September 19 – 21, 2012 session, two weather monitors were setup; one at Location #4 and the other at Location #9. The complete records of the 5-minute meteorological data are presented in Appendix C.

The meteorological conditions during the survey were in accordance with the requirements of Directive 038.

EFFECTS OF METEOROLOGICAL AND TERRAIN CONDITIONS

Various meteorological and seasonal conditions can affect the sound propagation efficiency between a facility and a residence. If the residence is located upwind from a distant noise source, a wind gradient could cause greater than normal sound attenuation to occur. This would result in lower sound levels at the residence than would normally occur with no wind. However if the residence is downwind of a distant noise source, the opposite effect would occur, resulting in higher sound levels than normal at the residence. Crosswinds do not significantly affect sound propagation efficiency in either respect. The maximum acceptable hourly average wind speed for noise monitoring in accordance to typical regulations is 15 km/hr, measured at microphone height. However from HFP's experience, usually wind speeds less than this are required to conduct a meaningful noise monitoring survey.

Also the types of vegetation, ground cover conditions and differing terrain conditions, (*i.e.*, tall grass, snow cover, wet ground, ploughed earth, or rocky ground) can affect the amount of sound absorption that occurs as sound waves pass over the ground. For example moist soil or soft fresh snow are highly sound absorptive, as opposed to hard packed ground or crusty snow which are highly sound reflective.

The Heartland area consists largely of rural prairie land along with large industrial facilities scattered in the region. The five monitoring locations are all relatively close to industrial facilities, therefore the majority of the land in the vicinity of the facility would generally be considered hard and reflective, yet land in the vicinity of each monitoring location would generally be considered soft and absorptive. Conversely, Location #9 is farther away from the industrial facilities, but is located on the west side of the Saskatchewan River, which is reflective.

RESULTS OF MEASUREMENTS

CONTINUOUS NOISE MONITORING DATA PRESENTATION

The measurement results presented in Appendix B are grouped in figures and tables by 24-hour segments. Table 3 below identifies the figure and table numbers for each location:

Table 3
Measurement Result Figure and Table Numbers

Location No.	Figure & Table Numbers	
	First 24-hour segment	**Second 24-hour segment**
2	Figures B1.1a to B1.1d; Table B1.1	Figures B1.2a to B1.2d; Table B1.2
3	Figures B2.1a to B2.1d; Table B2.1	Figures B2.2a to B2.2d; Table B2.2
4	Figures B3.1a to B3.1d; Table B3.1	Figures B3.2a to B3.2d; Table B3.2
5	Figures B4.1a to B4.1d; Table B4.1	n/a
9	Figures B5.1a to B5.1d; Table B5.1	Figures B5.2a to B5.2d; Table B5.2

The 1-minute L_{min}, L_{eq} and L_{max} values recorded during the survey at each location are presented in figures ending in “a”. These figures illustrate the short term variations in sound levels measured over the 24-hour period at each location.

The 1-hour L_{eq} sound levels were calculated from the 1-minute values and are presented graphically in figures ending in “b” and numerically in the tables. The calculated daytime (07:00 - 22:00), nighttime (22:00 - 07:00) and 24-hour L_{eq} values are presented at the bottom of each table. The C-weighted (dBC) hourly, daytime, nighttime and 24-hour L_{eq} values are also presented in the tables. The difference between the dBC and dBA values is sometimes used to determine if there are significant low-frequency components, yet more in the context of annoyance, and certainly outside the context of validating the Model.

The hourly L_{eq} values and the longer term L_{eq} values are of more use when describing the sound environment as a single number. It should be understood that the actual instantaneous sound level may vary considerably over the time period that the L_{eq} value represents.

ASSESSMENT OF NOISE MONITORING RESULTS

When the measured sound level contains noises other than those due to industrial facilities, the monitored values may not be totally representative of the effect of the industrial noise on the noise environment. In such cases, an appropriate "isolation analysis technique" may be used to determine the industrial noise "contribution" to the noise environment. This assessment technique is deemed acceptable to the ERCB. Examples of noise that may be isolated are invalid data due to weather (e.g. extraneous wind or rain generated noise), or abnormal data due to local activity (e.g. road grading), as well as wildlife, livestock, community, and/or transportation related noises. Isolation analysis was performed on both the daytime and nighttime monitoring data, to determine representative contributions of industrial noise at the various monitoring locations.

The isolated 1-minute L_{eq} values are presented in figures ending in "c", and the isolated 1-hour L_{eq} values are presented in figures ending in "d". The isolated nighttime L_{eq} values are also shown in Tables B1.1 through B5.2.

Location #2

This location was monitored for two nighttime periods between September 19 – 21, 2012. The dominant noise at this location appeared to be coming equally from Dow's East Site and the Wells unit from Dow's Main Site. During the daytime, there was a significant amount of noise at this location from Dow's rail yard activities and vehicle pass-bys on nearby River Road. During the nighttime, there were very few vehicle pass-bys and noise from Dow's rail yard was much less frequent. The average isolated sound level over the entire monitoring period at this location was 52.2 dBA L_{eq}.

Location #3

This location was monitored for two nighttime periods between September 19 – 21, 2012. The dominant audible sound at this location was from process equipment from Keyera's facility to the north as well as from the Dow's Main Site to the south. During the daytime, there was construction at the Keyera facility and frequent vehicles passing on nearby River Road. During the nighttime, construction was suspended and there were very few vehicle pass-bys. Some rail yard activities and train horns were audible at this location during both daytime and nighttime. The average isolated sound level over the entire monitoring period at this location was 51.3 dBA L_{eq}.

Location #4

This location was monitored for two nighttime periods between September 19 – 21, 2012. It is located approximately 725 meters south from the south fence line of Shell's Scotford Complex. The dominant audible sound at this location is the Shell Scotford Complex. There was a slight buzzing sound audible from nearby overhead power lines for most of the survey, however this did not contribute significantly to the sound at this location. Other intermittent sounds included birds chirping, livestock, aircraft flyovers and train horns. An equipment malfunction caused data to be lost for a period of almost three hours between 20:00 and 23:45, on the night of September 20. Although data logging resumed at about 22:45, the audio recording did not resume until about 7:45 on the morning of September 21. Therefore, data isolation was not performed for the period missing the audio recording. However, the sound levels during that period are quite steady and do not appear to be contaminated with any significant extraneous noise sources. Therefore, HFP opted to include this data in the analysis as it appears to be representative of the industrial noise contribution. The average isolated sound level over the entire monitoring period at this location was 53.4 dBA L_{eq}.

Location #5

This location was monitored for one nighttime period between July 5 – 6, 2012. This location is approximately 300 meters from the north fence line of Shell's Scotford Complex. The dominant audible sound at this location is the Shell Scotford Complex. Water running through a culvert near the microphone was also audible at times, being more audible during the afternoon on July 5, 2012. Other intermittent sounds included birds chirping, frogs croaking, train horns, train movements and local traffic. The average isolated sound level over the entire monitoring period at this location was 55.7 dBA L_{eq}.

Location #9

This location was monitored for two nighttime periods between September 19 – 21, 2012. It is located in a residential area, therefore there are more extraneous sounds due to localized community activity, such as dogs barking and local vehicle pass-bys, as well as from birds chirping. There is also a railroad crossing near this location.

Of the monitored locations, this one is farthest from any of the industrial sites and is across the North Saskatchewan River from most of the facilities. These two conditions make this location subject to larger variations in sound propagation due to atmospheric conditions.

This location suffered a loss of audio recordings from near the start of the survey to approximately 08:15 on the morning of September 20. Only the largest peaks in sound level were isolated during this period as they were likely caused by local train and vehicle pass-bys. The average isolated sound level over the entire monitoring period at this location was 46.3 dBA L_{eq}.

SUMMARY OF SOUND MONITORING RESULTS

Table 4 presents a summary of the monitored daytime, nighttime sound levels at each location. Both the unisolated and isolated sound levels are shown in the table, however, the unisolated data is **greyed out** as it is not used in any analyses and is included for information purposes only. For each location containing two nights of data, the highest measured sound level is indicated by a **bold red** value and the lowest measured sound level is indicated by a **bold blue** value.

Table 4
Summary of Monitored Sound Levels

Location	Data Isolation	Monitored Sound Level, dBA L_{eq}			
		Daytime (07:00 – 22:00)	Nighttime (22:00 – 07:00)	Daytime (07:00 – 22:00)	Nighttime (22:00 – 07:00)
		September 19 - 20, 2012		*September 20 - 21, 2012*	
Location 2	Unisolated	55.8	55.0	54.7	56.7
	Isolated	**50.7**	52.9	50.8	**53.8**
Location 3	Unisolated	63.5	58.5	62.3	58.7
	Isolated	**50.0**	50.0	51.3	**52.5**
Location 4	Unisolated	51.2	54.8	53.3	55.1
	Isolated	**50.9**	54.6	53.1	**55.1**
Location 9	Unisolated	49.6	53.0	54.8	52.3
	Isolated	**43.3**	44.1	48.0	**48.4**
		July 5 - 6, 2012			
Location 5	Unisolated	57.1	56.2	–	–
	Isolated	55.5	55.9	–	–

It is interesting to note that the minimum and maximum sound levels occurred during the same time periods, and that the sound levels measured during the second 24-hour period were consistently higher than the first at every location monitored between September 19 – 21, 2012. The span between minimum and maximum measured sound levels at each location ranged from 2.5 to 5.1 dBA. This indicates that a fair amount of variability exists in the monitored sound levels at these locations, and may suggest the need to conduct monitoring for extended periods of time in future studies to attempt to average out some atmospheric effects.

A summary of the time-weighted energy equivalent sound levels (L_{eq}) over the entire length of the surveys at each location are shown in Table 5. These values can be referred to as the "overall" monitored sound levels at each location.

Table 5
Equivalent Sound Levels Measured
Over Entire Survey Periods

Location	Isolated Sound Level, dBA L_{eq}	Hours of Valid Data	Isolated Sound Level, dBA L_{eq}	Hours of Valid Data	Energy Equivalent Sound Level, dBA L_{eq}
	September 19 – 20, 2012		*September 20 – 21, 2012*		
Location 2	51.9	13.3	52.4	12.8	**52.2**
Location 3	50.0	12.4	51.9	12.7	**51.1**
Location 4	52.7	22.1	54.4	13.5	**53.4**
Location 9	43.7	15.8	48.2	12.8	**46.3**
	July 5 – 6, 2012				
Location 5	55.7	23.1	–	–	**55.7**

COMPARISON OF 2012 MONITORED SOUND LEVELS TO REGIONAL NOISE MODEL PREDICTIONS

The NCIA Regional Noise Model was used to calculate the predicted industrial noise contribution at each monitoring location under similar meteorological conditions as were experienced during the monitoring periods (i.e. calm wind). The results are compared to the measured sound levels in Table 6. A graphical presentation of the comparison between measured and predicted values is also shown in Figure 2.

Table 6
Comparison of Measured versus Predicted Sound Levels

Location	Measured Energy Equivalent Sound Levels, dBA L_{eq}	Predicted Industrial Noise Contribution from Regional Noise Model	Difference, Predicted minus Measured
Location 2	52.2	54.7	+ 2.5
Location 3	51.1	53.3	+ 2.2
Location 4	53.4	49.6	– 3.8
Location 5	55.7	52.2	– 3.5
Location 9	46.3	45.0	– 1.3

Upon observation of the data, it is apparent that at most of the assessment locations, there is quite good agreement between the isolated measured (monitored) to the predicted (modeled) values. The last column in Table 6 shows these results as "Predicted minus Measured". In this analysis, the differences between measured and predicted values are more important than the absolute measured or predicted values themselves, as this relates to the suitability of the Regional Noise Model's use. Furthermore, the magnitudes of the differences are more important than the signs (negative or positive) of the differences, as this indicates the extent of variation that occurred between the measured and predicted values. Given the complexity of computer noise modeling, the size of the database within the Regional Noise Model, and the distances away from the facilities, a difference of less than +/– 3 dBA would be considered good.

The results presented in Table 6 show that these values were +2.5, +2.2, –3.8, –3.5, and –1.3 dBA, for the five locations assessed, respectively. The magnitude of two of these five values requires understanding of the environment, and is further addressed in the paragraphs below.

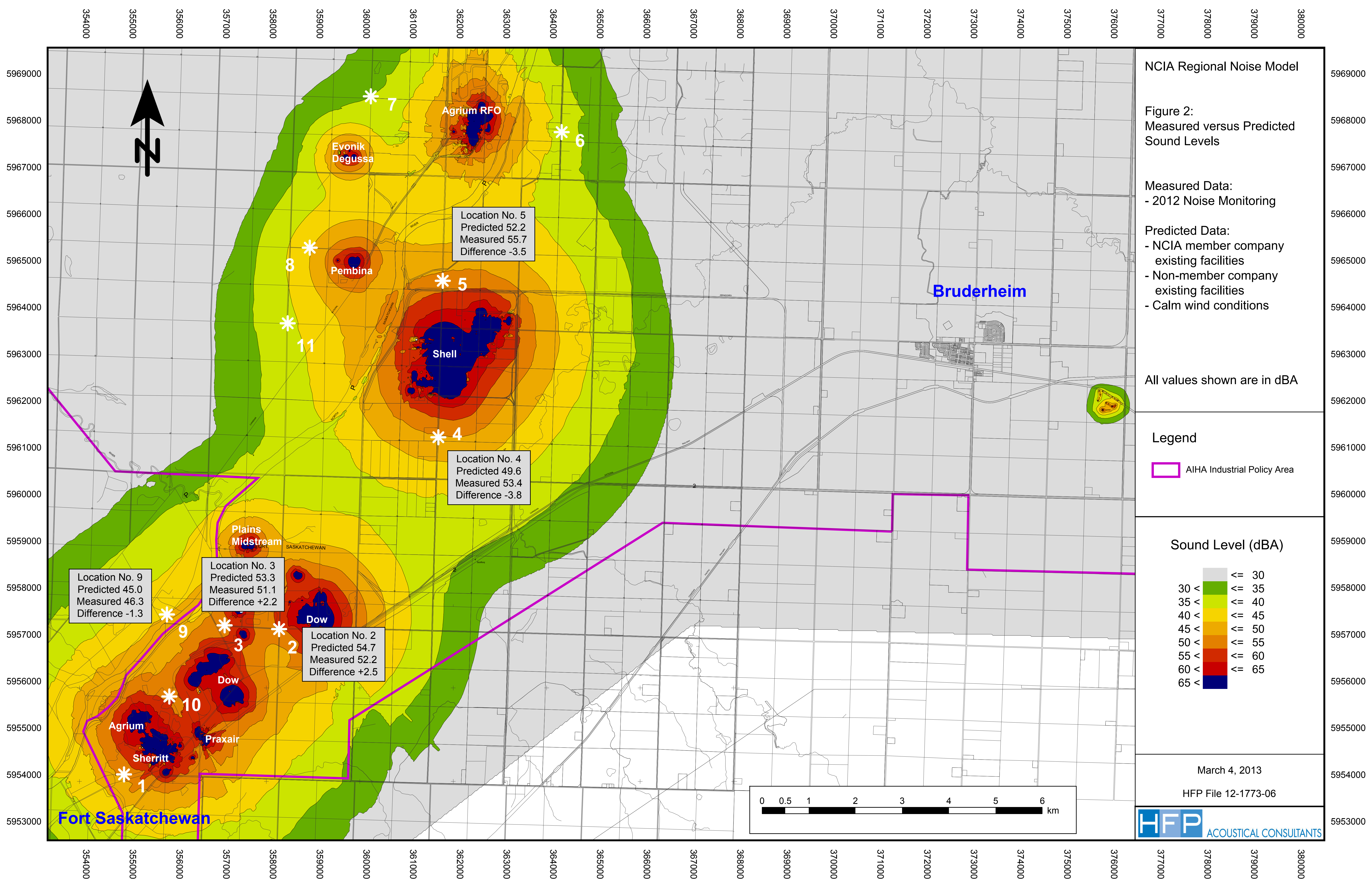
At Location 5, which is located approximately 300 meters north of the north fence line of the Shell Upgrader Expansion plants, the measured sound level values were 3.5 dBA higher than the predicted sound level values. The Model Validation Case (Figures C-1 through C-4 in the Regional Noise Model report) is the appropriate modeled case which is being used for all comparisons herein. The Shell Upgrader Expansion database was not included in the Model Validation Case, because at the time that this model was built and run, it replicated the Existing Regulatory Case with only existing facilities operating. The Shell Upgrader Expansion database was included in another modeled case, the Future Regulatory Case, as at that time the Shell Upgrader Expansion plant was not yet operational. Based upon what is known about this database, it would be expected that measured sound levels would be higher than the modelled sound levels for this location. This is because the Shell Upgrader Expansion plants were operational for the measurements, but were not included in the model database. As this is what has occurred, the measured minus modelled difference is understandable. Shell is presently in the process of measuring the majority of the Upgrader Expansion plant equipment noise sources (mostly already complete), and re-building the Upgrader Expansion plant computer noise model (partially complete), in an effort to yield a considerably more representative database to update the Regional Noise Model. This work will be complete in 2013.

At Location 4, which is located approximately 725 meters south of the south gate of the Shell Refinery plant, the measured sound level values were 3.8 dBA higher than the predicted sound level values. It is not known to Shell why the monitoring would measure high, or conversely why the model would predict low, at this location. It could be minimally attributed to the absence of the Shell Upgrader Expansion in the Regional Noise Model. More detailed operational information for the nearest plant, the Shell Refinery, would also be needed to make this understandable. Based upon preliminary presentation of these specific results, Shell is considering performing more detailed site investigations in 2013.

It should be understood that the results of all of the monitoring are in terms of the isolated Energy Equivalent Sound Level, L_{eq}. This infers that long-term averaging has occurred, that extraneous or invalid data has been discounted, and because of the nature of energy-averaging that measured values could be slightly high. This last aspect is especially true, as the monitored values varied marginally on a diurnal basis due to slightly differing atmospheric conditions.

It should also be understood that the results of all of the modeling could be slightly high. This is because semi-worst case conditions are utilized during the modelling process, such as all plant equipment is running at its maximum operating condition, all plant equipment is running continuously, all plant building doors are open for summer ventilation conditions, etc.

These two factors may offset each other to some degree. Historically, when unexplainable differences occur, further work is warranted. In summary, this has only happened at one out of the five locations assessed.


NCIA Regional Noise Model
Figure 2:
Measured versus Predicted Sound Levels
Measured Data:
- 2012 Noise Monitoring
Predicted Data:
- NCIA member company existing facilities
- Non-member company existing facilities
- Calm wind conditions
All values shown are in dBA
Legend
AIHA Industrial Policy Area
Sound Level (dBA)
<= 30
30 < <= 35
35 < <= 40
40 < <= 45
45 < <= 50
50 < <= 55
55 < <= 60
60 < <= 65
65 <
March 4, 2013
HFP File 12-1773-06
HFP ACOUSTICAL CONSULTANTS
Location No. 5
Predicted 52.2
Measured 55.7
Difference -3.5
Location No. 4
Predicted 49.6
Measured 53.4
Difference -3.8
Location No. 3
Predicted 53.3
Measured 51.1
Difference +2.2
Location No. 9
Predicted 45.0
Measured 46.3
Difference -1.3
Location No. 2
Predicted 54.7
Measured 52.2
Difference +2.5
Agrium RFO
Evonik Degussa
Pembina
Shell
Plains Midstream
Dow
Agrium
Sherritt
Praxair
Bruderheim
Fort Saskatchewan
0 0.5 1 2 3 4 5 6 km
354000 355000 356000 357000 358000 359000 360000 361000 362000 363000 364000 365000 366000 367000 368000 369000 370000 371000 372000 373000 374000 375000 376000 377000 378000 379000 380000
5969000 5968000 5967000 5966000 5965000 5964000 5963000 5962000 5961000 5960000 5959000 5958000 5957000 5956000 5955000 5954000 5953000

CONCLUSION

Due to difficulties encountered in scheduling the 2012 noise monitoring, five out of the eleven planned locations were monitored in two separate sessions. Location 5 was monitored in July 2012 while locations 2, 3, 4 and 9 were monitored in September 2012. Some of the scheduling difficulties that were encountered were plant turnarounds, unplanned events causing abnormal plant operation, activities not part of normal operations (e.g. cavern drilling and construction) and undesirable weather. Monitoring conducted in future years should require diligent coordination with the various plant operators to capture a time when all plants are operating normally. As this may be difficult to accomplish given the number of facilities involved, the monitoring will likely need to be split up into two or more sessions, as was done in 2012.

Of the five measurement locations, three had good agreement with the predicted sound levels from the Regional Noise Model (locations #2, 3 and 9). The two locations near the Shell Scotford Complex (locations #4 and 5) were not within the targeted +/– 3 dBA of the predicted sound levels. The reason for the discrepancy at Location #5 is most likely due to Shell's Upgrader Expansion operating, even though it has not yet been incorporated into the Regional Noise Model. At the time that the Model was created, Shell's Upgrader Expansion was a proposed facility and therefore not included in the Regional Noise Model as part of the existing facilities. Once the Model is updated to reflect the most recent conditions, the predicted sound levels are expected to approach the measured sound levels at Location #5. The difference at Location #4 may also be minimally attributed to the absence of the Shell Upgrader Expansion in the Regional Noise Model, as well as more detailed plant operational information is needed for the Shell Refinery, to make this understandable.

As was noted in the results, a fair bit of variability existed in the data for the locations where measurements were conducted over two nights. Variability of up to 5.1 dBA was noted at one location, which suggests that monitoring over longer periods of time may be warranted to arrive at a more stable average sound level.

APPENDIX A
RECORD OF CALIBRATION RESULTS

HFP File: 12-1773-6

Equipment Model	Equipment Serial No.	Calibration Level (dBA)	Date DD/MM/YY	Time	Calibrated By (Initials)	Notes
Larson Davis 824	A0404	94.0	05/07/12	08:39	RW	Pre-Calibration
Larson Davis 824	A0404	93.8	06/07/12	10:38	RW	Post-Calibration
Larson Davis 824	A0606	94.0	19/10/12	19:11	PE	Pre-Calibration
Larson Davis 824	A0606	94.0	21/10/12	18:52	CB	Post-Calibration
Larson Davis 824	A0412	94.0	19/10/12	18:51	PE	Pre-Calibration
Larson Davis 824	A0412	93.8	21/10/12	19:01	CB	Post-Calibration
Larson Davis 824	A0404	94.0	19/10/12	18:15	PE	Pre-Calibration
Larson Davis 824	A0404	93.8	21/10/12	18:23	CB	Post-Calibration
Larson Davis 824	A0970	94.0	19/10/12	20:30	PE	Pre-Calibration
Larson Davis 824	A0970	94.0	21/10/12	18:43	PE	Post-Calibration

APPENDIX B

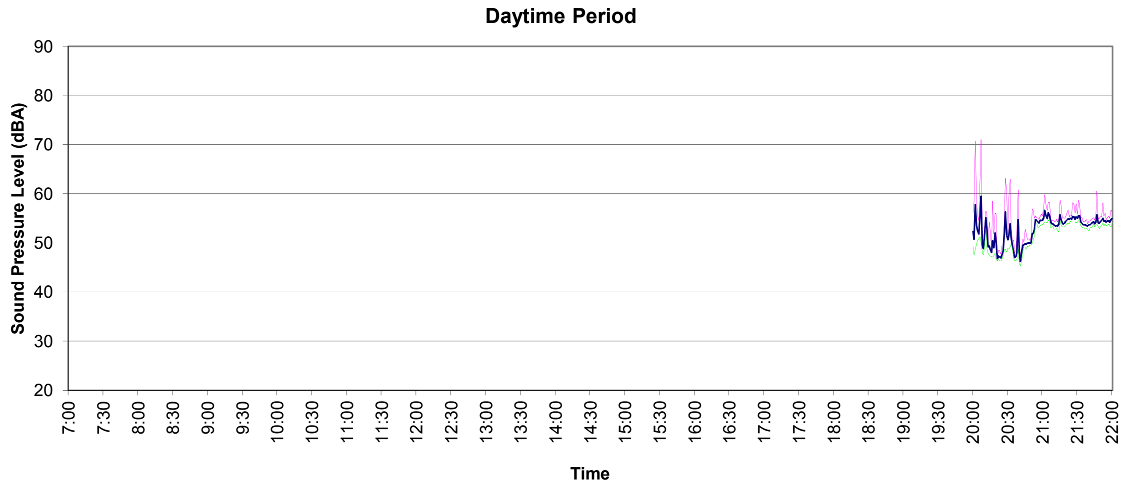
NOISE MONITORING DATA

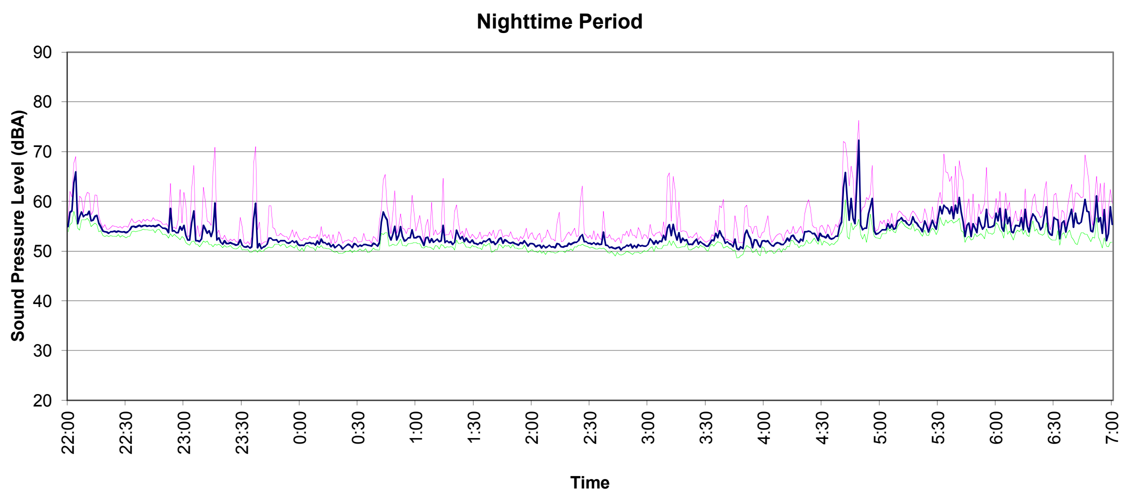
Table B1.1
NCIA
2012 Noise Monitoring
Monitored Hourly Leq Sound Levels
Location #2, Sept 19-20, 2012

Time Start Hour	Measured Sound Level (dBA Leq)	Measured Sound Level (dBC Leq)	Isolated Sound Level (dBA Leq)	Isolated Sound Level (dBC Leq)	Valid # of Minutes
20:00	52.1	67.0	50.6	63.6	38
21:00	54.5	63.9	54.5	63.9	57
22:00	**56.4**	**65.4**	**54.5**	**63.5**	**43**
23:00	**53.1**	**65.9**	**51.9**	**64.4**	**45**
0:00	**52.4**	**66.7**	**51.3**	**64.1**	**39**
1:00	**52.1**	**63.4**	**51.9**	**63.0**	**51**
2:00	**51.3**	**62.4**	**51.2**	**62.4**	**57**
3:00	**52.3**	**63.1**	**52.1**	**62.9**	**54**
4:00	**58.3**	**65.8**	**52.6**	**63.3**	**41**
5:00	**56.2**	**65.3**	**55.1**	**63.4**	**44**
6:00	**56.4**	**65.1**	**54.5**	**63.8**	**25**
7:00	59.0	67.3	54.1	64.3	19
8:00	59.3	68.8	55.6	67.2	22
9:00	58.4	67.0	51.9	65.0	17
10:00	58.5	69.9	50.8	67.9	12
11:00	54.6	66.7	47.6	65.1	22
12:00	49.1	62.8	44.7	61.0	35
13:00	49.8	63.7	44.2	61.4	36
14:00	53.7	68.7	46.3	65.5	22
15:00	52.6	65.2	46.7	62.7	23
16:00	53.9	66.5	47.7	65.8	29
17:00	53.1	63.5	45.4	61.4	20
18:00	50.3	62.6	45.9	61.2	34
19:00	58.7	72.7	48.9	65.7	13
15 hour daytime Leq:	55.8	67.4			
9 hour nighttime Leq:	55.0	65.0			
6.7 hour isolated daytime Leq:			50.7	64.2	
6.7 hour isolated nighttime Leq:			52.9	63.4	
24 hour Leq:	55.5	66.6			
13.3 hour isolated Leq:			51.9	63.8	

HFP File 12-1773-6

Figure B1.1a
NCIA
2012 Noise Monitoring
Monitored One-Minute Leq Sound Values
Location #2, Sept 19-20, 2012





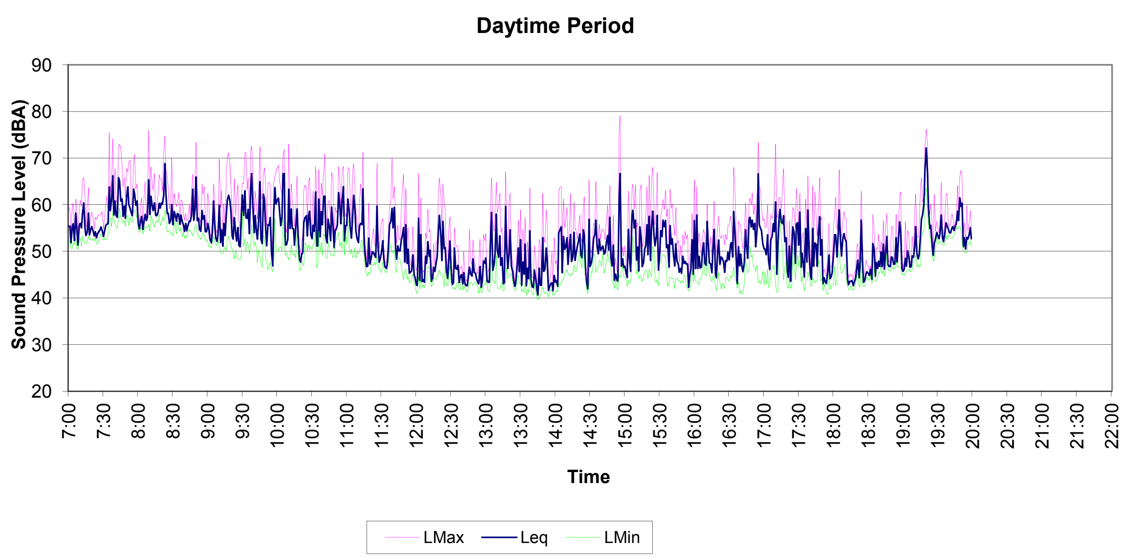
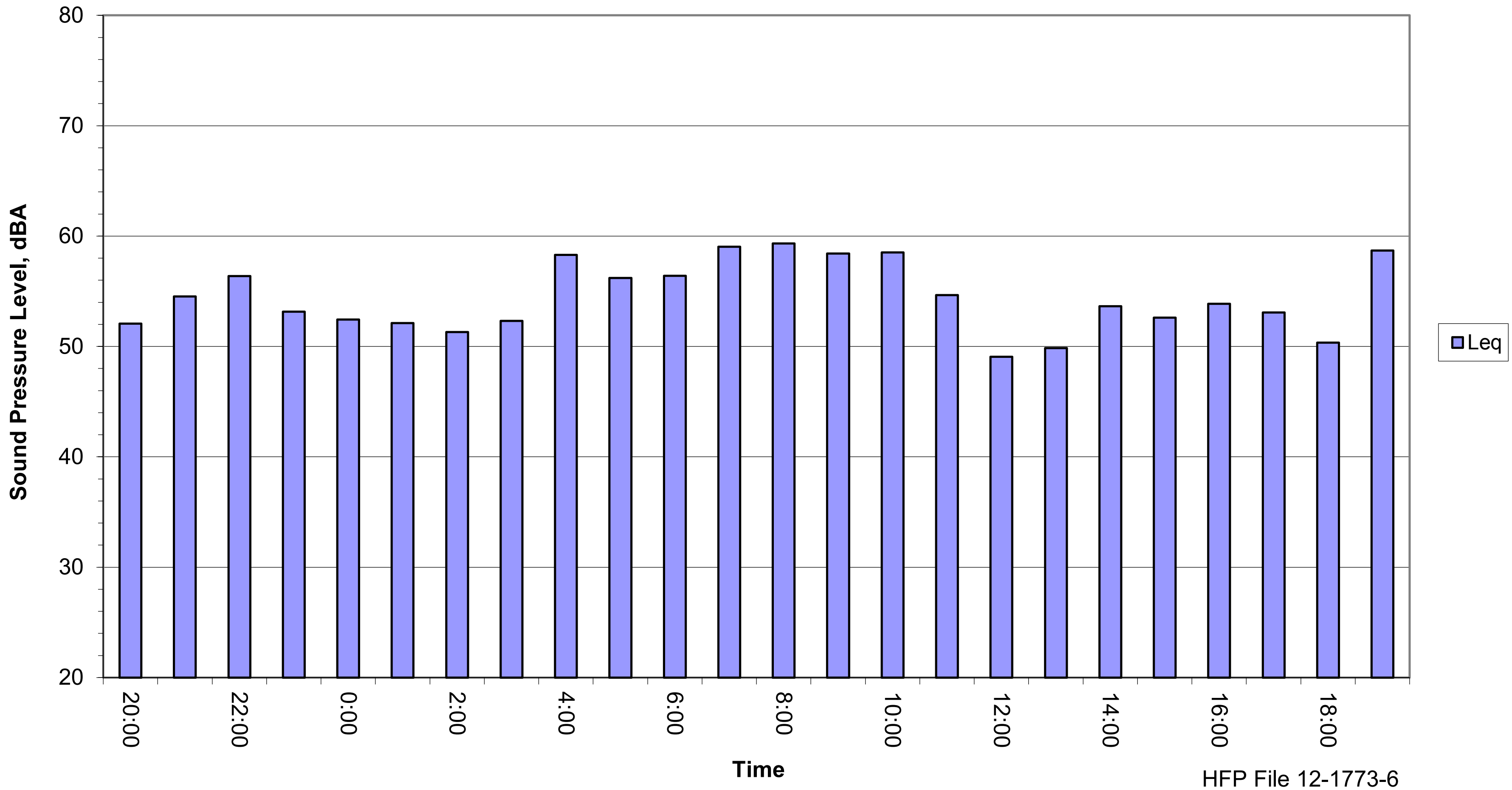
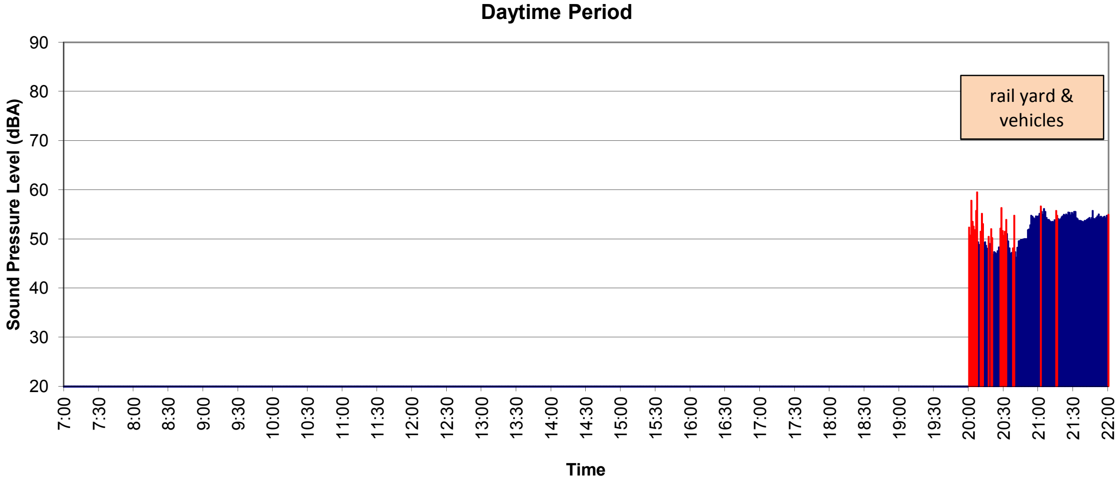


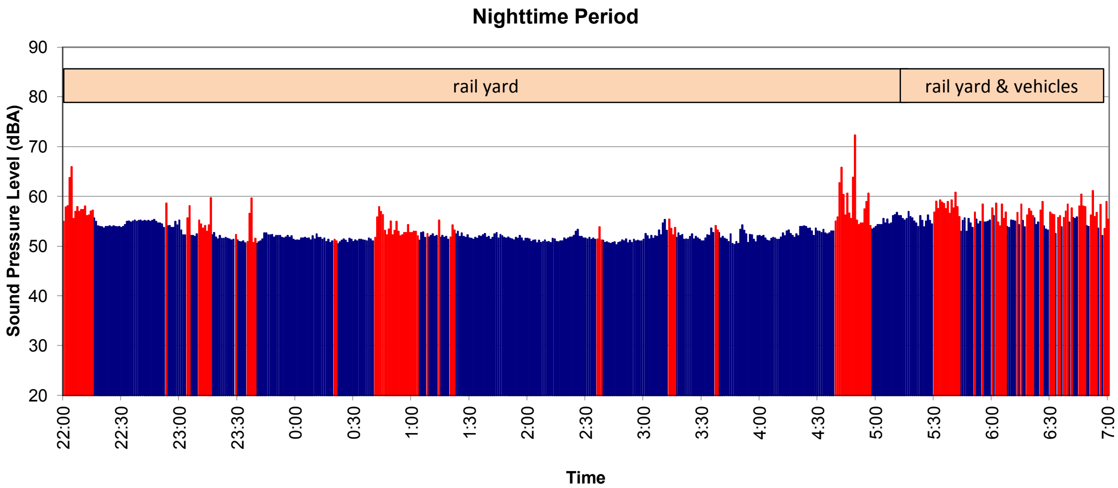
Figure B1.1b
NCIA
2012 Noise Monitoring
One-Hour Measured Values
Location #2, Sept 19-20, 2012

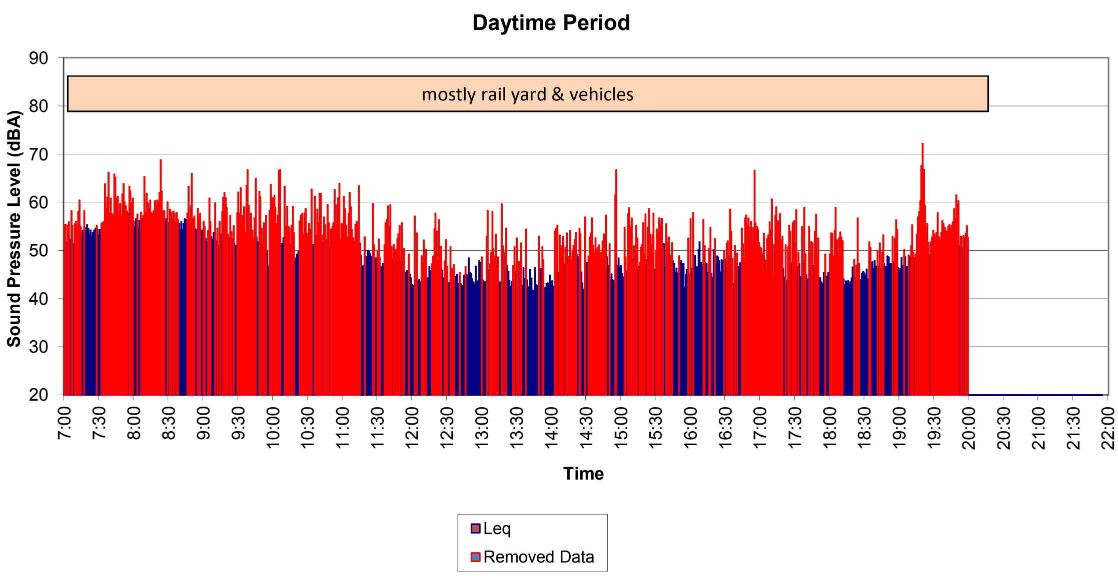


HFP File 12-1773-6

Figure B1.1c
NCIA
2012 Noise Monitoring
Isolated One-Minute Leq Sound Values
Location #2, Sept 19-20, 2012







HFP File 12-1773-6

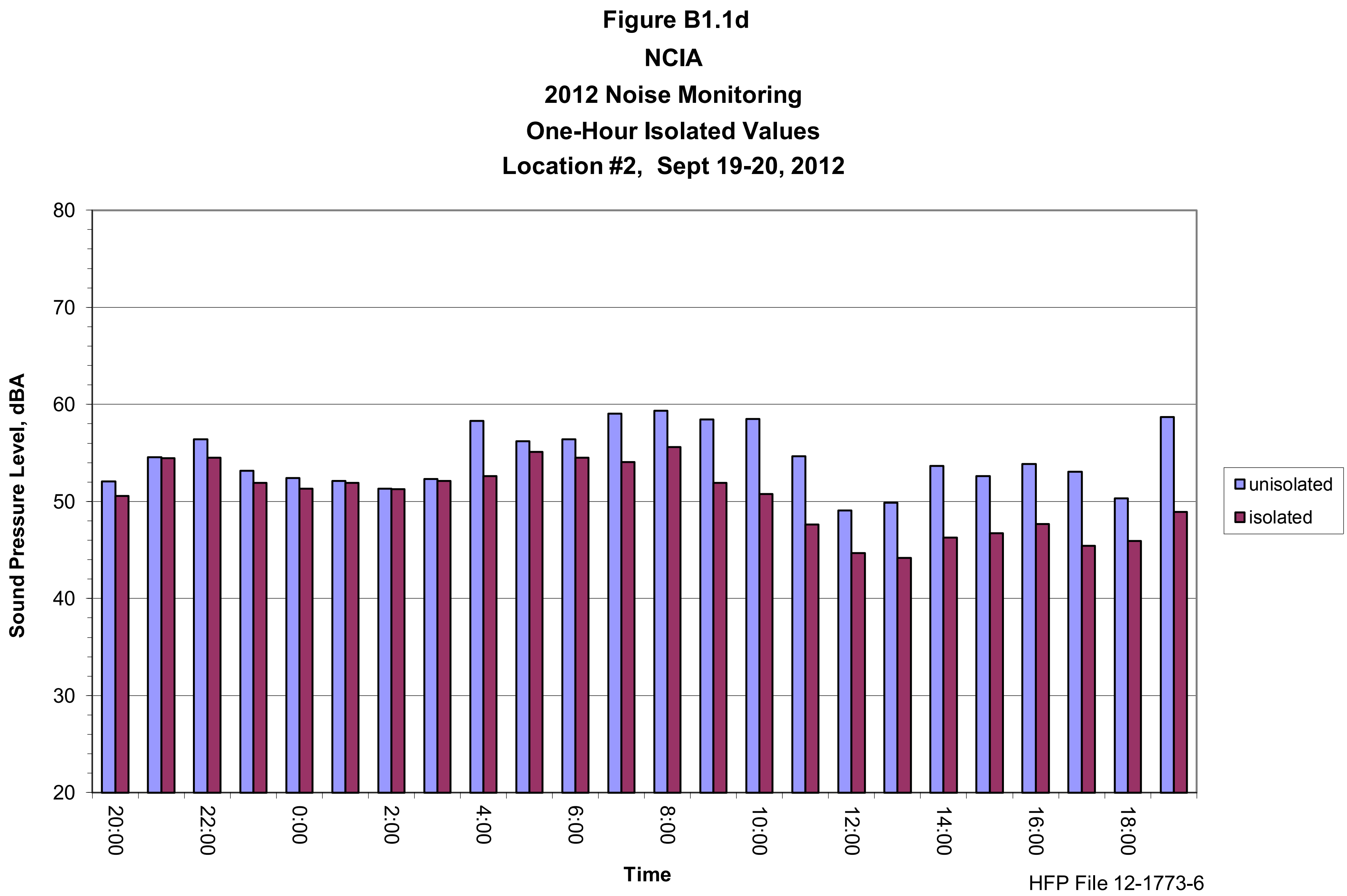


Figure B1.1d
NCIA
2012 Noise Monitoring
One-Hour Isolated Values
Location #2, Sept 19-20, 2012
Sound Pressure Level, dBA
80
70
60
50
40
30
20
20:00
22:00
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
Time
unisolated
isolated
HFP File 12-1773-6

Table B1.2
NCIA
2012 Noise Monitoring
Monitored Hourly Leq Sound Levels
Location #2, Sept 20-21, 2012

Time Start Hour	Measured Sound Level (dBA Leq)	Measured Sound Level (dBC Leq)	Isolated Sound Level (dBA Leq)	Isolated Sound Level (dBC Leq)	Valid # of Minutes
20:00	54.7	69.3	49.8	67.5	33
21:00	53.0	66.5	50.8	64.3	40
22:00	**60.2**	**69.8**	**54.8**	**66.6**	**12**
23:00	**59.3**	**71.9**	**52.8**	**68.8**	**7**
0:00	**53.2**	**66.2**	**52.8**	**66.0**	**58**
1:00	**54.4**	**66.1**	**52.8**	**64.4**	**25**
2:00	**52.0**	**64.9**	**51.8**	**64.6**	**52**
3:00	**54.0**	**65.8**	**53.4**	**65.0**	**49**
4:00	**55.8**	**64.6**	**54.7**	**64.0**	**51**
5:00	**55.5**	**64.4**	**54.1**	**64.0**	**45**
6:00	**58.3**	**66.2**	**56.8**	**65.4**	**27**
7:00	59.0	67.9	57.0	66.7	29
8:00	59.1	68.6	56.9	67.2	27
9:00	54.0	65.1	48.7	63.2	29
10:00	57.3	67.0	47.5	63.3	13
11:00	50.8	63.0	47.3	60.4	36
12:00	49.0	62.2	45.8	60.5	48
13:00	56.2	67.1	46.1	60.8	13
14:00	52.2	64.5	46.5	60.8	24
15:00	49.8	61.9	47.0	60.1	40
16:00	48.4	60.8	46.9	59.6	40
17:00	48.9	61.0	48.3	60.3	48
18:00	53.8	66.7	49.9	60.9	24
14 hour daytime Leq:	54.7	65.9			
9 hour nighttime Leq:	56.7	67.4			
7.4 hour isolated daytime Leq:			50.8	63.3	
5.4 hour isolated nighttime Leq:			53.8	65.1	
23 hour Leq:	55.6	66.6			
12.8 hour isolated Leq:			52.4	64.2	

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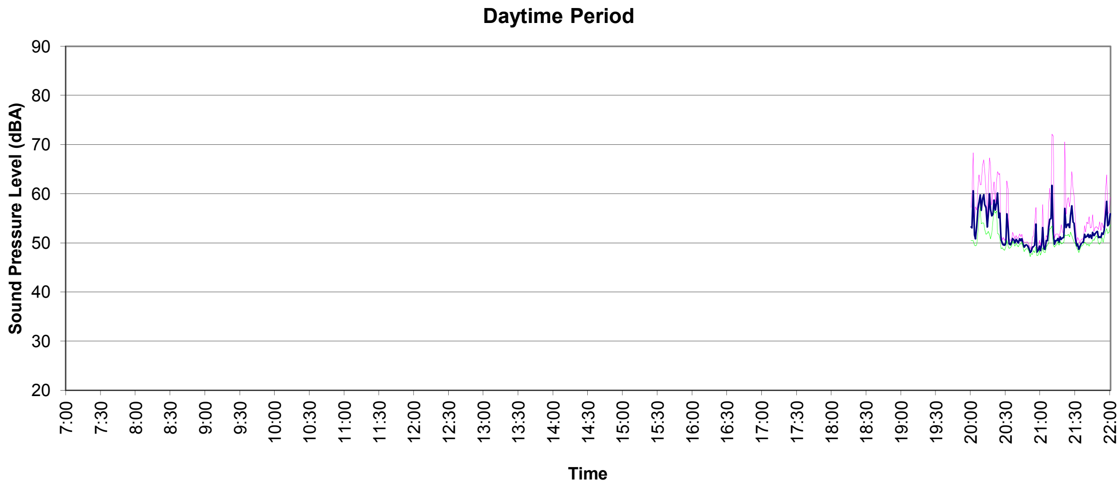
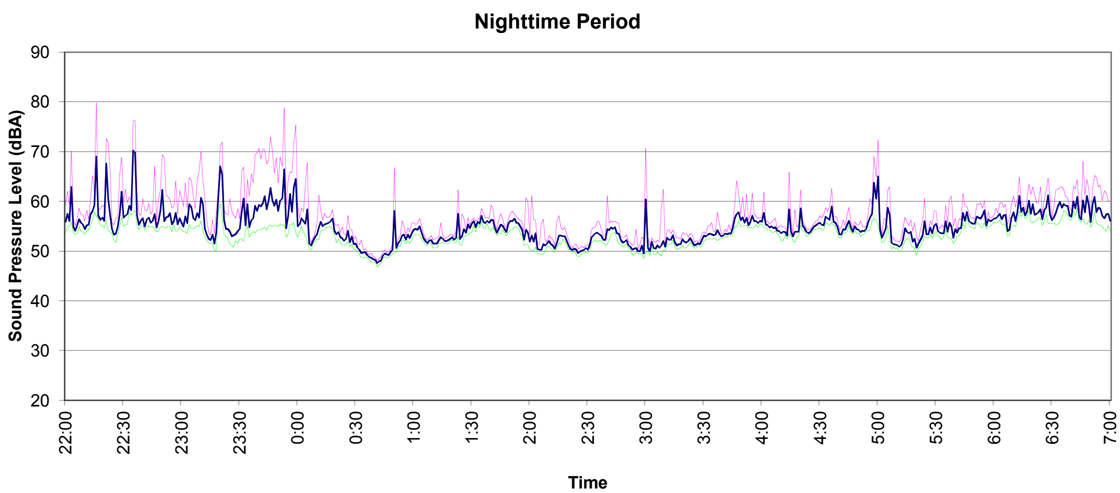
Figure B1.2a
NCIA
2012 Noise Monitoring
Monitored One-Minute Leq Sound Values
Location #2, Sept 20-21, 2012





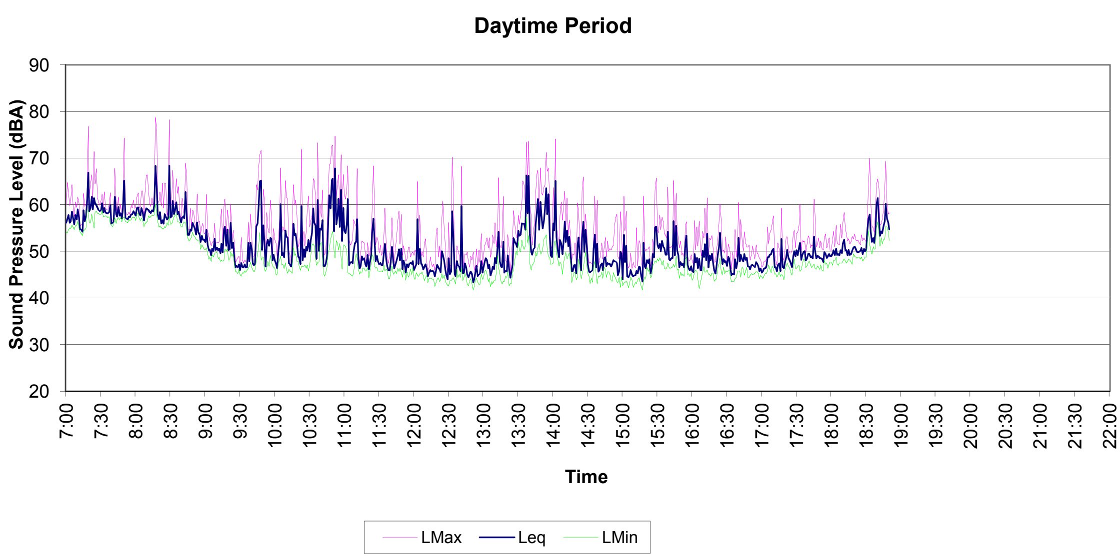


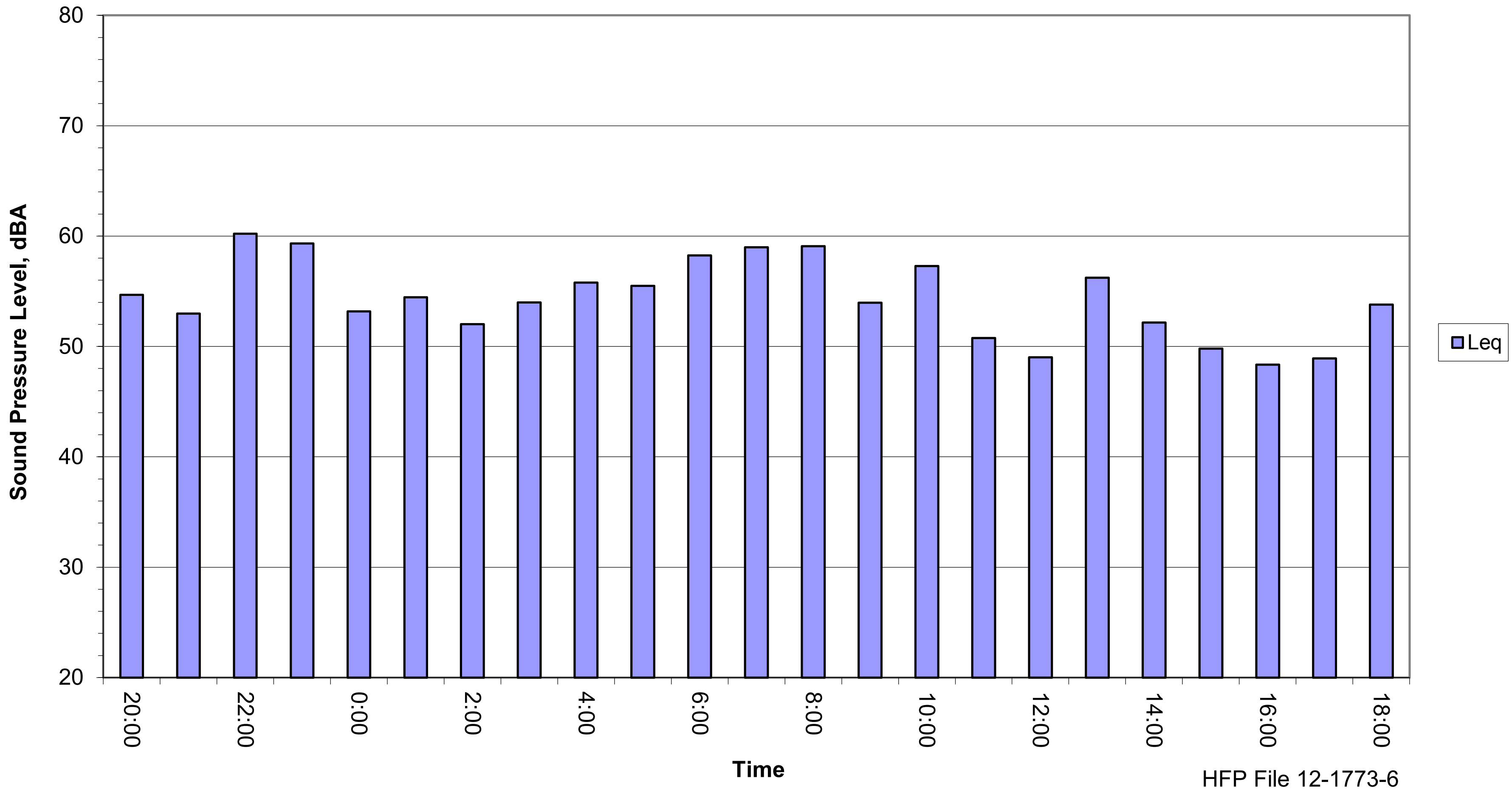
Figure B1.2b

NCIA

2012 Noise Monitoring

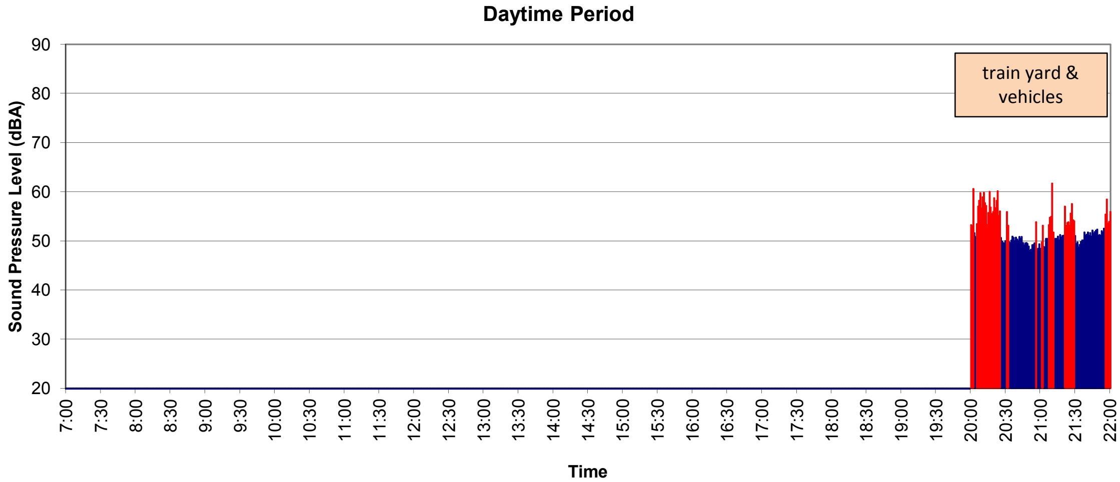
One-Hour Measured Values

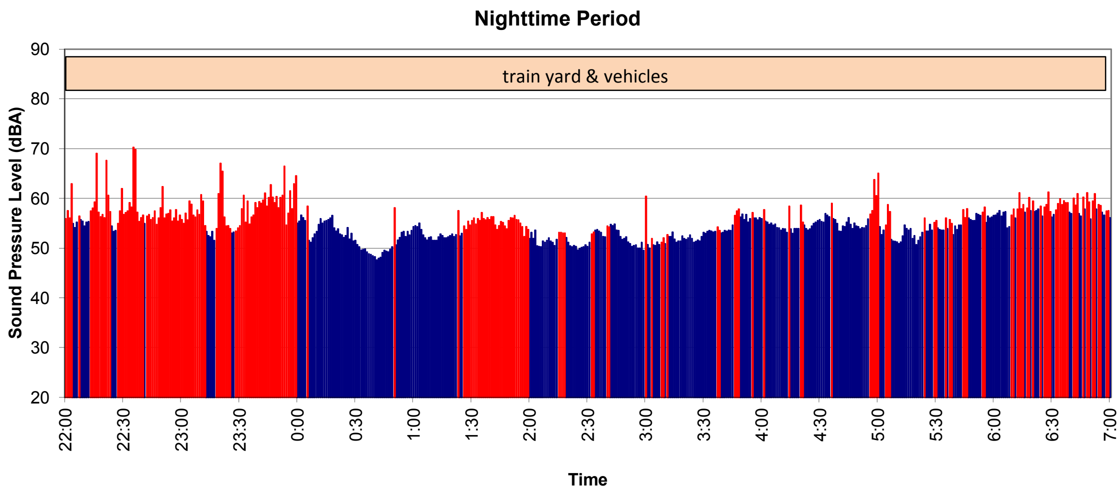
Location #2, Sept 20-21, 2012

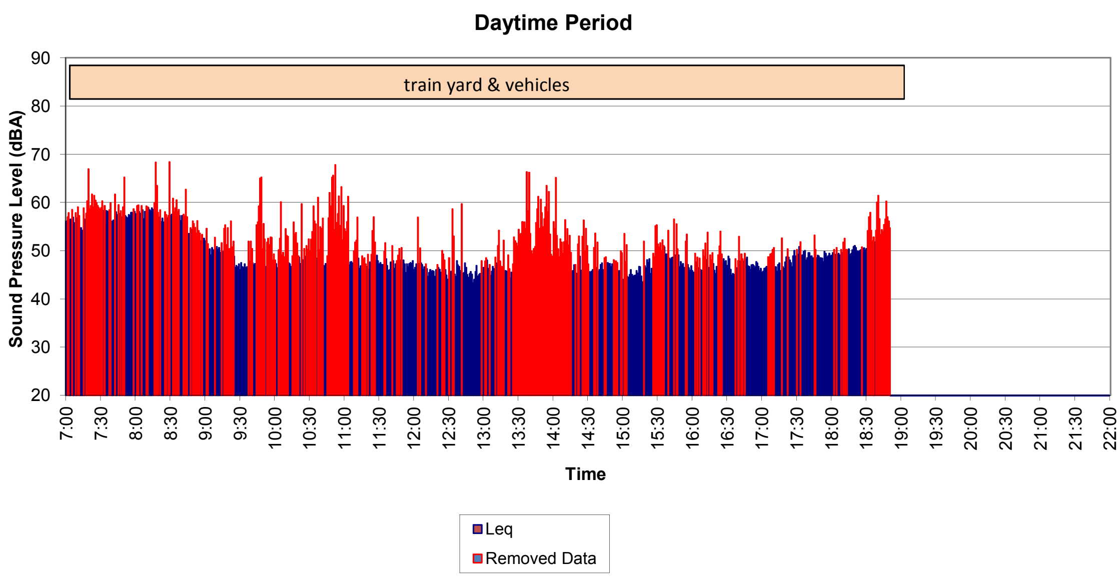


HFP File 12-1773-6

Figure B1.2c
NCIA
2012 Noise Monitoring
Isolated One-Minute Leq Sound Values
Location #2, Sept 20-21, 2012

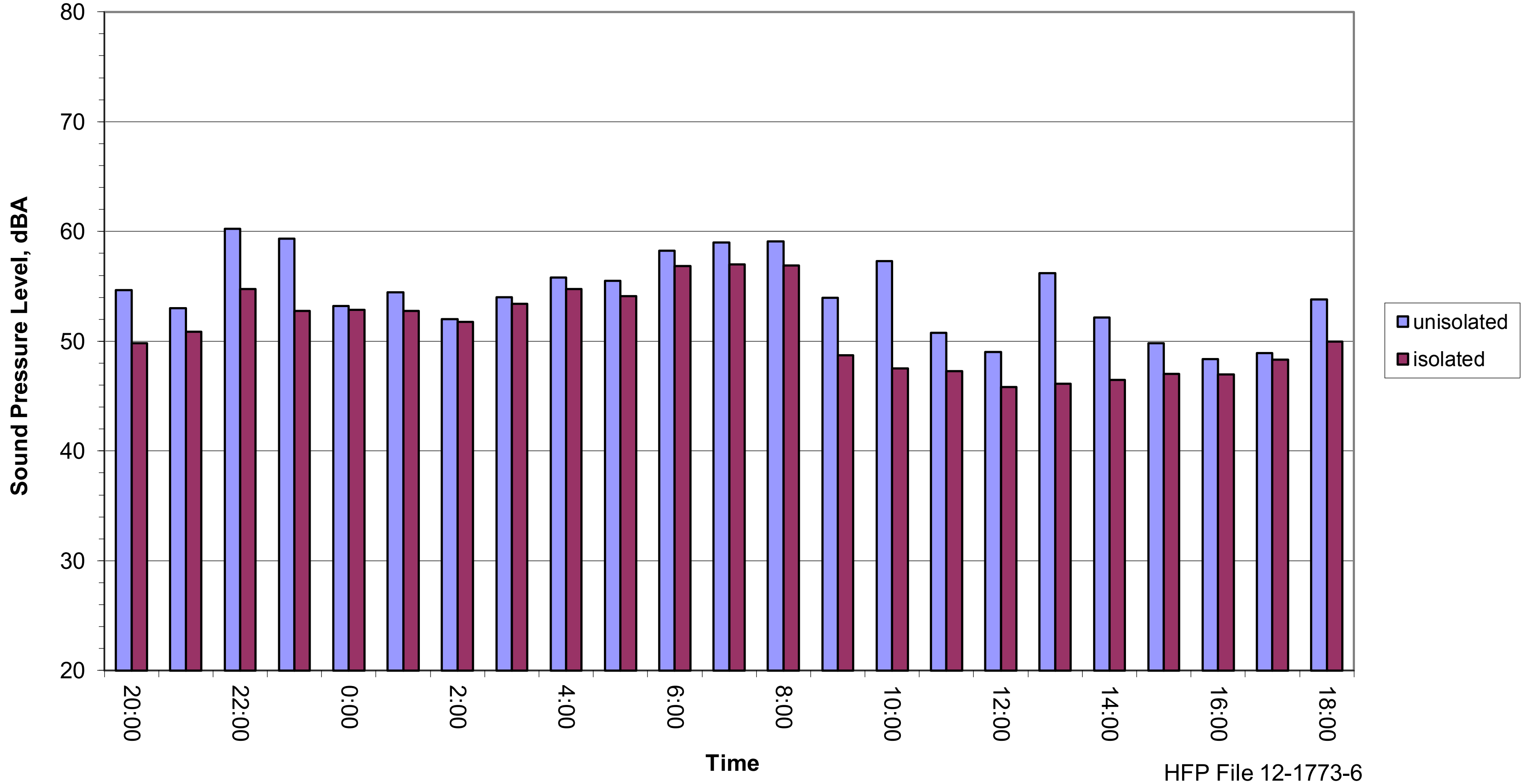






HFP File 12-1773-6

Figure B1.2d
NCIA
2012 Noise Monitoring
One-Hour Isolated Values
Location #2, Sept 20-21, 2012



HFP File 12-1773-6

Table B2.1
NCIA
2012 Noise Monitoring
Monitored Hourly Leq Sound Levels
Location #3, Sept 19-20, 2012

Time Start Hour	Measured Sound Level (dBA Leq)	Measured Sound Level (dBC Leq)	Isolated Sound Level (dBA Leq)	Isolated Sound Level (dBC Leq)	Valid # of Minutes
19:00	60.4	69.0	49.4	64.6	28
20:00	58.5	70.5	49.2	65.9	41
21:00	54.3	66.4	49.3	65.7	45
22:00	**54.6**	**66.4**	**50.7**	**65.4**	**54**
23:00	**53.9**	**66.4**	**50.4**	**65.6**	**49**
0:00	**53.3**	**66.8**	**50.4**	**65.7**	**52**
1:00	**53.5**	**65.5**	**50.3**	**64.8**	**55**
2:00	**50.8**	**64.8**	**50.1**	**64.7**	**57**
3:00	**53.2**	**64.8**	**53.2**	**64.8**	**60**
4:00	**48.4**	**63.9**	**48.4**	**63.9**	**59**
5:00	**59.8**	**67.5**	**51.1**	**65.1**	**29**
6:00	**66.1**	**71.7**	**51.0**	**65.6**	**3**
7:00	64.0	72.0	53.7	68.5	12
8:00	64.3	73.8	54.1	68.1	16
9:00	62.4	71.4	49.7	66.8	25
10:00	63.6	72.5	49.7	66.7	23
11:00	62.9	70.1	49.0	66.0	25
12:00	62.1	70.6	48.7	65.7	19
13:00	63.4	72.8	48.5	65.8	17
14:00	63.3	72.0	49.5	66.6	18
15:00	64.5	71.7	49.8	66.4	15
16:00	67.2	75.8	49.4	66.6	5
17:00	65.3	74.3	50.3	66.6	13
18:00	64.1	73.8	50.2	66.0	21
15 hour daytime Leq:	63.5	72.3			
9 hour nighttime Leq:	58.5	67.1			
5.4 hour isolated daytime Leq:			50.1	66.3	
7.0 hour isolated nighttime Leq:			50.8	65.0	
24 hour Leq:	62.2	71.0			
12.4 hour isolated Leq:			50.5	65.6	

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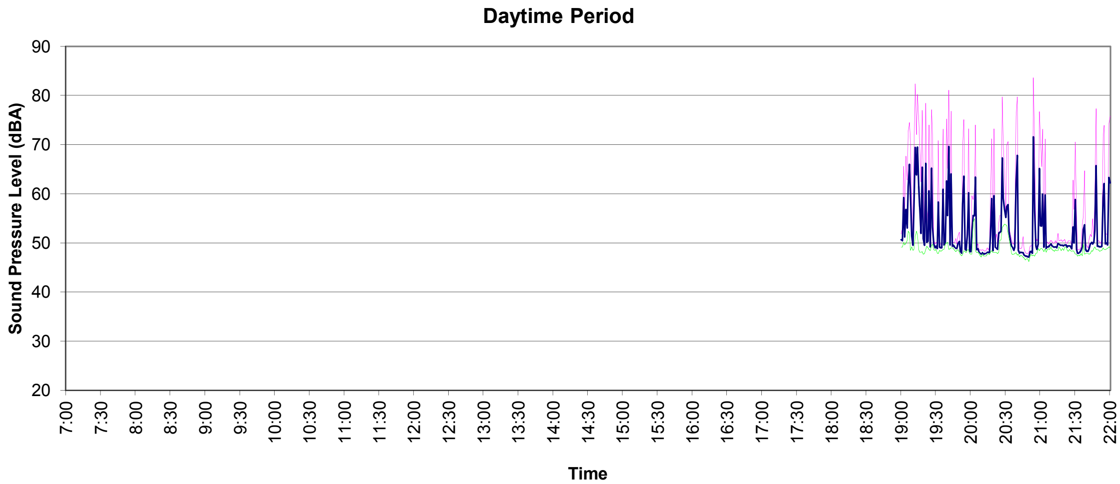
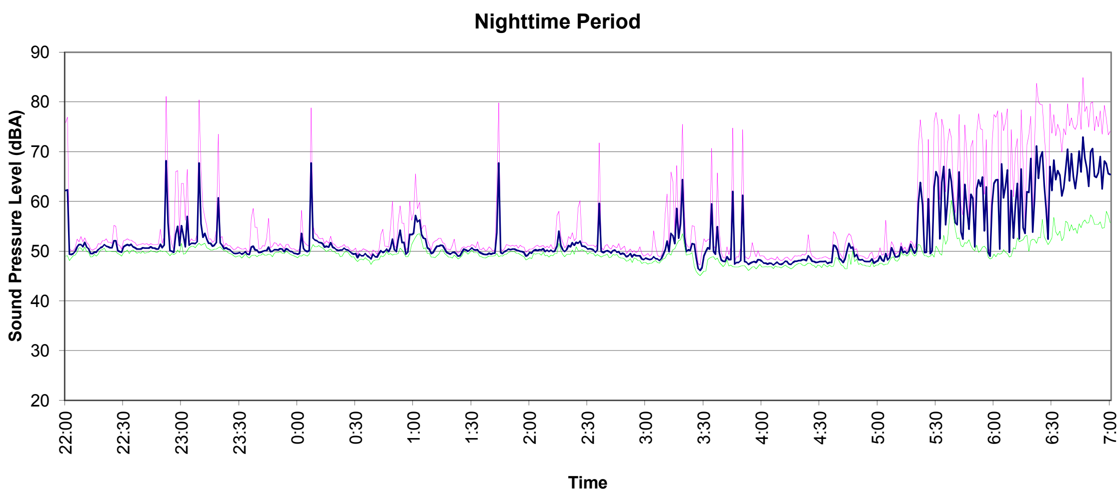
Figure B2.1a
NCIA
2012 Noise Monitoring
Monitored One-Minute Leq Sound Values
Location #3, Sept 19-20, 2012





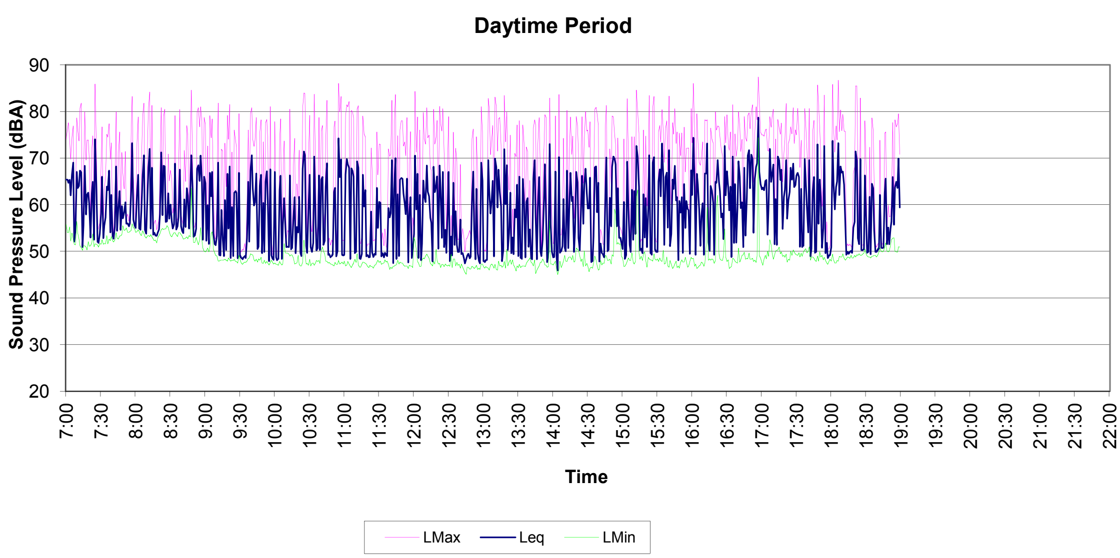


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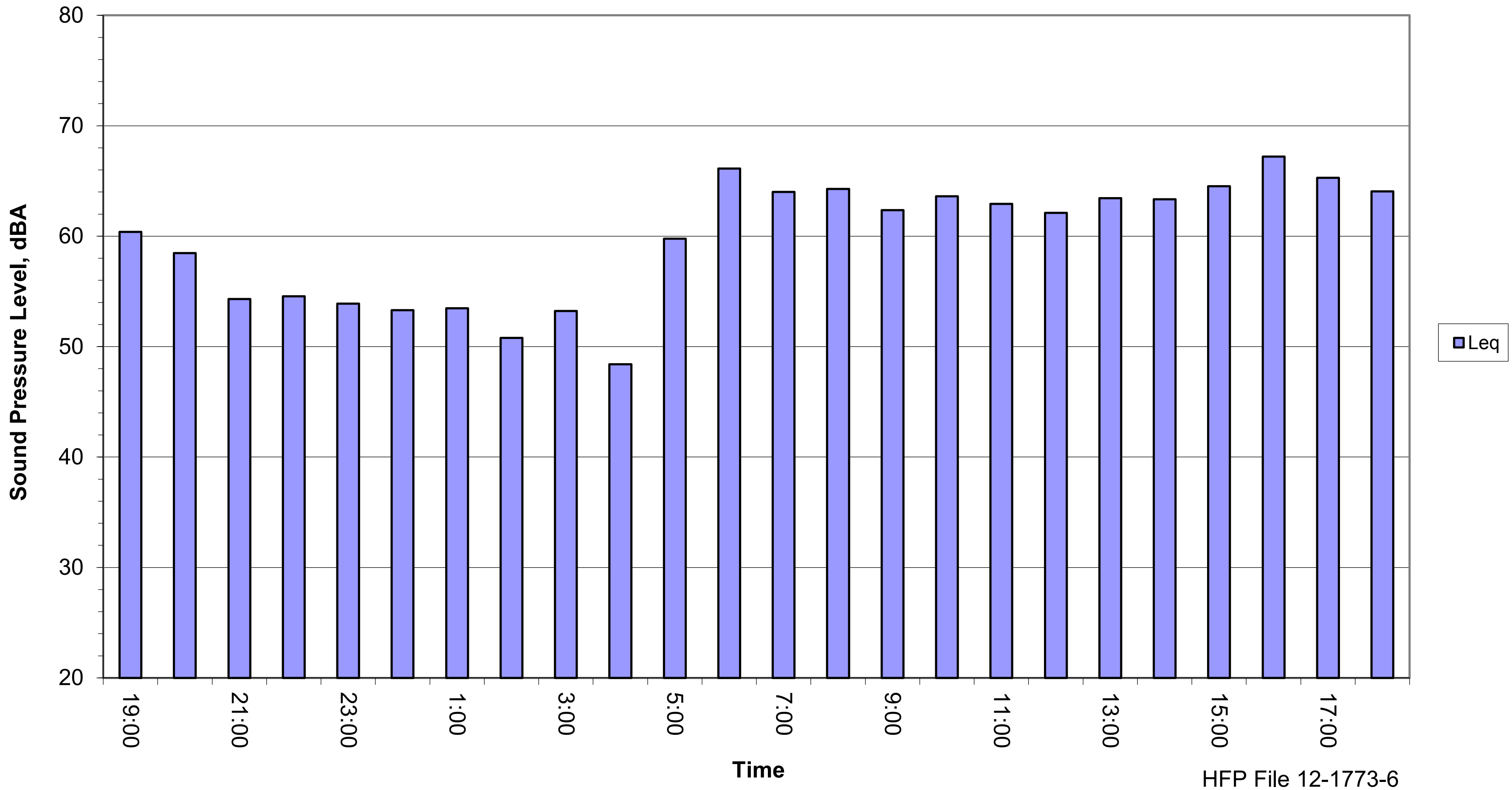
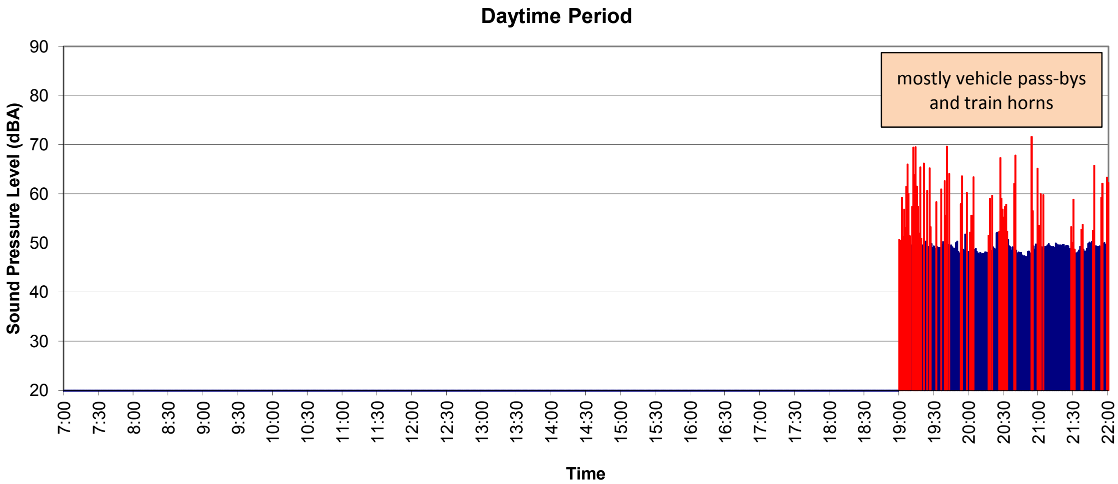
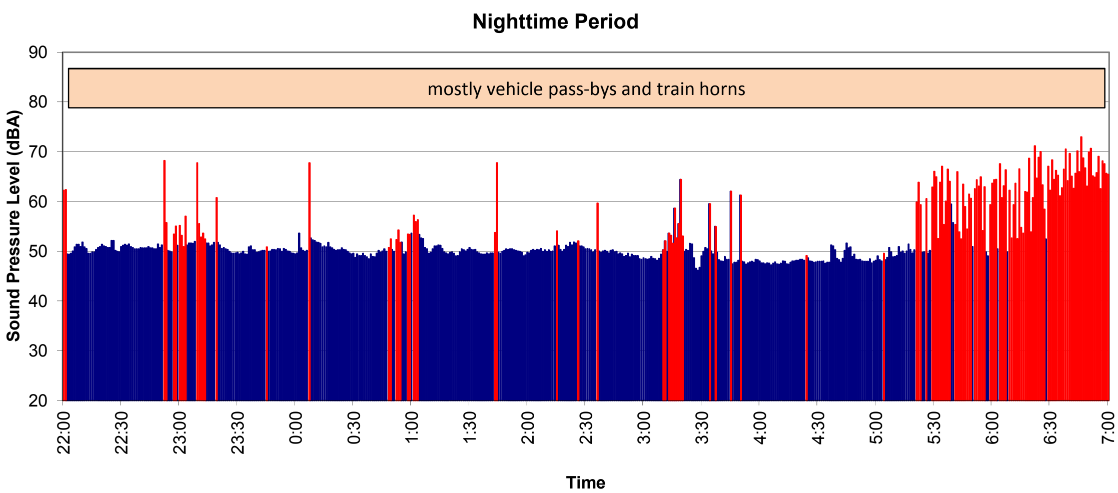
Figure B2.1b
NCIA
2012 Noise Monitoring
One-Hour Measured Values
Location #3, Sept 19-20, 2012



HFP File 12-1773-6

Figure B2.1c
NCIA
2012 Noise Monitoring
Isolated One-Minute Leq Sound Values
Location #3, Sept 19-20, 2012





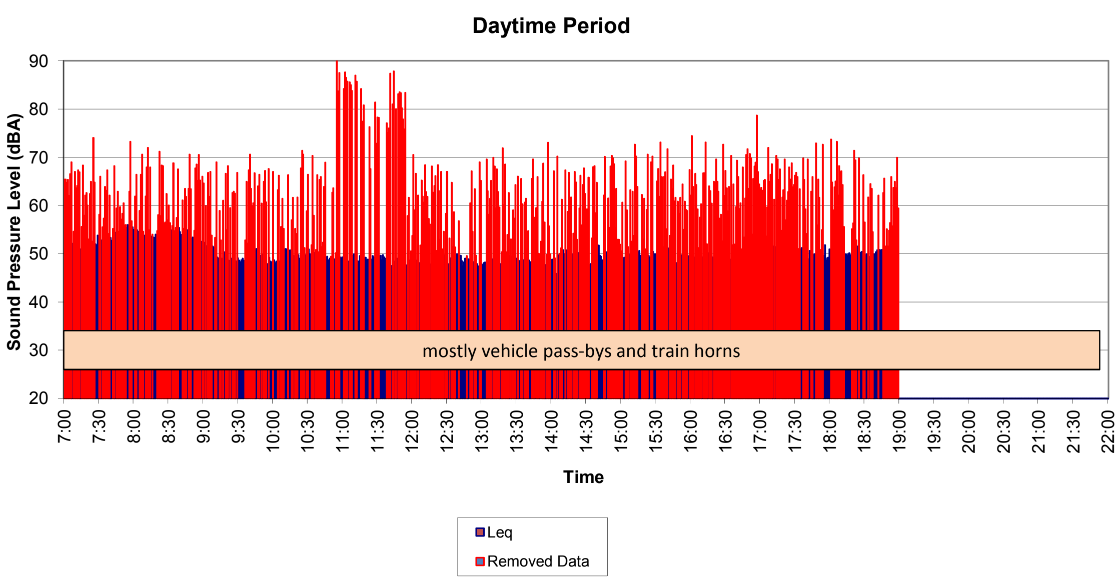
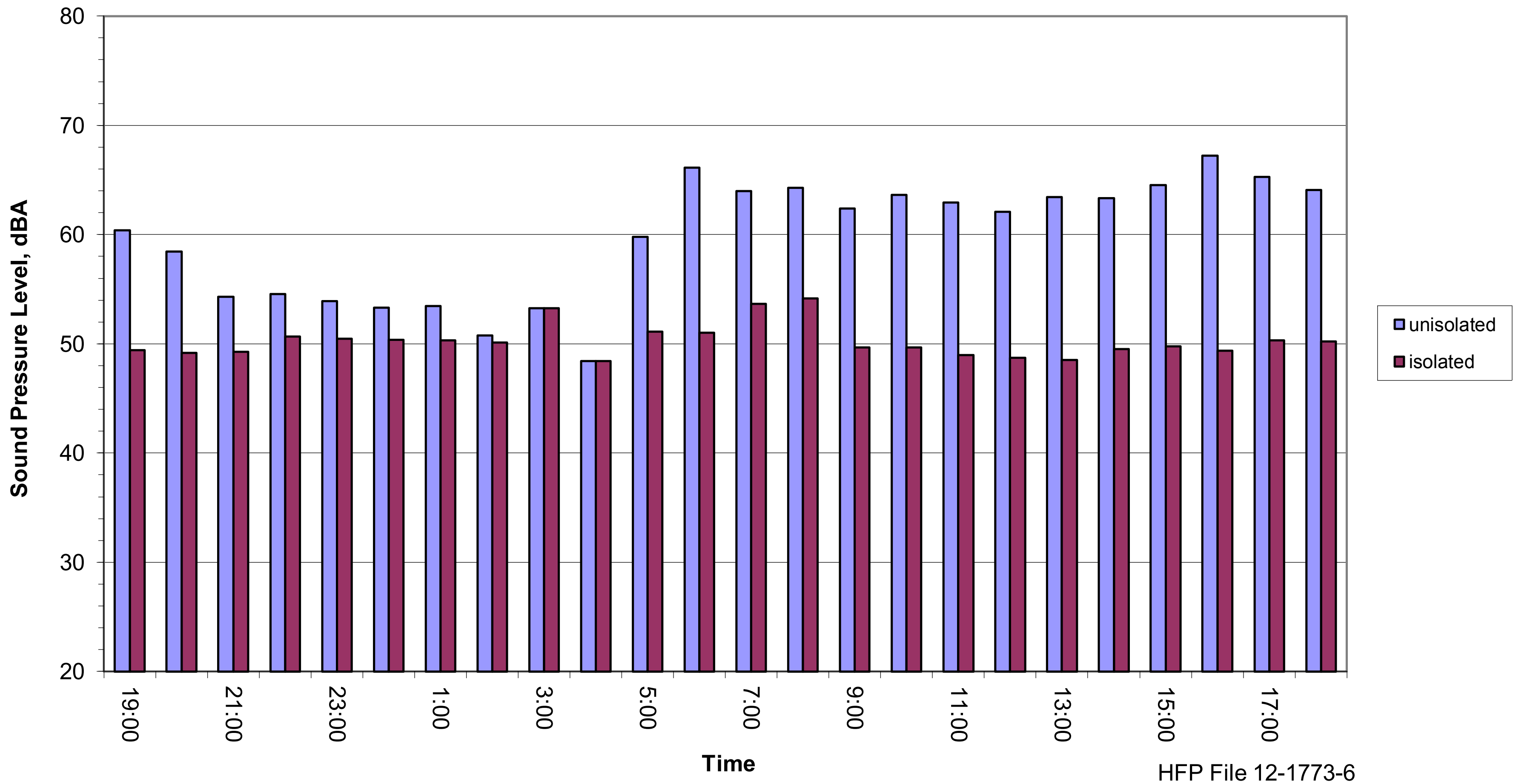


Figure B2.1d
NCIA
2012 Noise Monitoring
One-Hour Isolated Values
Location #3, Sept 19-20, 2012



HFP File 12-1773-6

Table B2.2
NCIA
2012 Noise Monitoring
Monitored Hourly Leq Sound Levels
Location #3, Sept 20-21, 2012

Time Start Hour	Measured Sound Level (dBA Leq)	Measured Sound Level (dBC Leq)	Isolated Sound Level (dBA Leq)	Isolated Sound Level (dBC Leq)	Valid # of Minutes
19:00	62.0	71.9	50.5	67.1	21
20:00	58.3	68.9	51.0	66.7	42
21:00	58.4	68.3	51.0	66.0	47
22:00	**53.9**	**66.6**	**50.7**	**65.7**	**49**
23:00	**57.3**	**67.8**	**51.8**	**66.3**	**37**
0:00	**55.6**	**67.9**	**52.4**	**67.0**	**56**
1:00	**55.4**	**68.2**	**53.8**	**67.8**	**58**
2:00	**53.3**	**67.5**	**52.5**	**67.1**	**52**
3:00	**54.5**	**67.1**	**51.2**	**66.7**	**32**
4:00	**57.4**	**67.7**	**52.7**	**66.3**	**43**
5:00	**60.2**	**68.2**	**53.1**	**65.9**	**33**
6:00	**64.8**	**70.9**	**52.7**	**66.8**	**12**
7:00	62.2	71.4	55.6	68.8	21
8:00	62.5	71.8	53.2	68.7	26
9:00	63.5	73.1	51.5	68.2	35
10:00	61.9	70.3	49.6	66.7	21
11:00	62.3	73.6	49.4	65.8	26
12:00	60.9	69.8	49.0	65.8	22
13:00	63.3	71.5	49.0	65.4	21
14:00	61.1	70.1	49.2	65.5	33
15:00	64.9	73.9	49.6	64.7	16
16:00	64.9	71.0	50.7	65.1	11
17:00	61.2	69.6	51.9	66.1	26
18:00	61.9	70.5	52.6	66.8	24
15 hour daytime Leq:	62.3	71.3			
9 hour nighttime Leq:	58.7	68.2			
6.5 hour isolated daytime Leq:			51.3	66.7	
6.2 hour isolated nighttime Leq:			52.5	66.7	
24 hour Leq:	61.3	70.4			
12.7 hour isolated Leq:			51.9	66.7	

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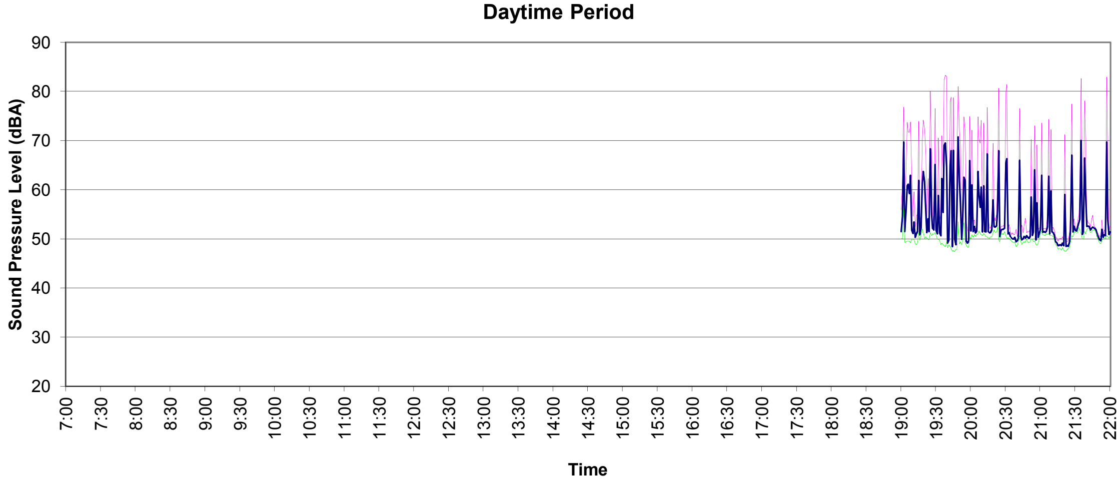
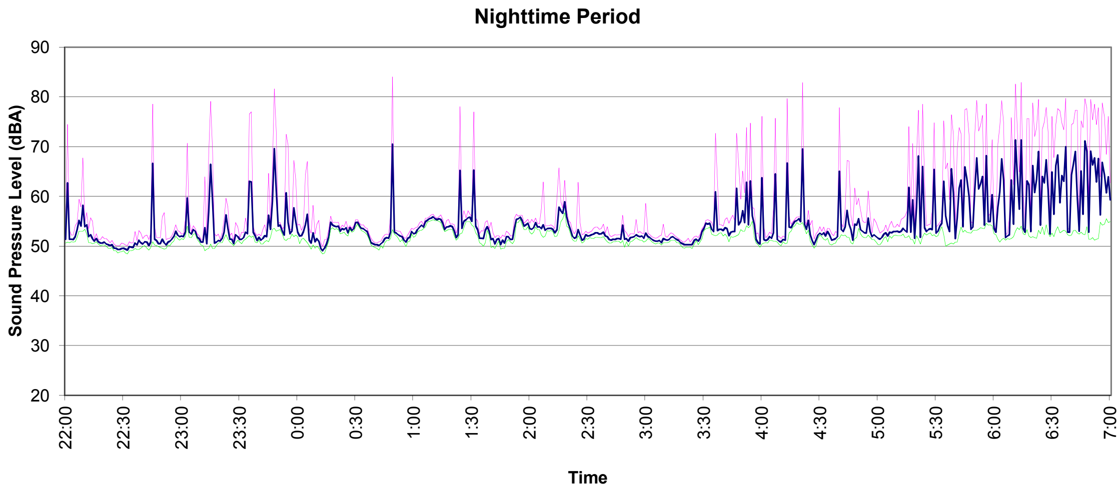
Figure B2.2a
NCIA
2012 Noise Monitoring
Monitored One-Minute Leq Sound Values
Location #3, Sept 20-21, 2012





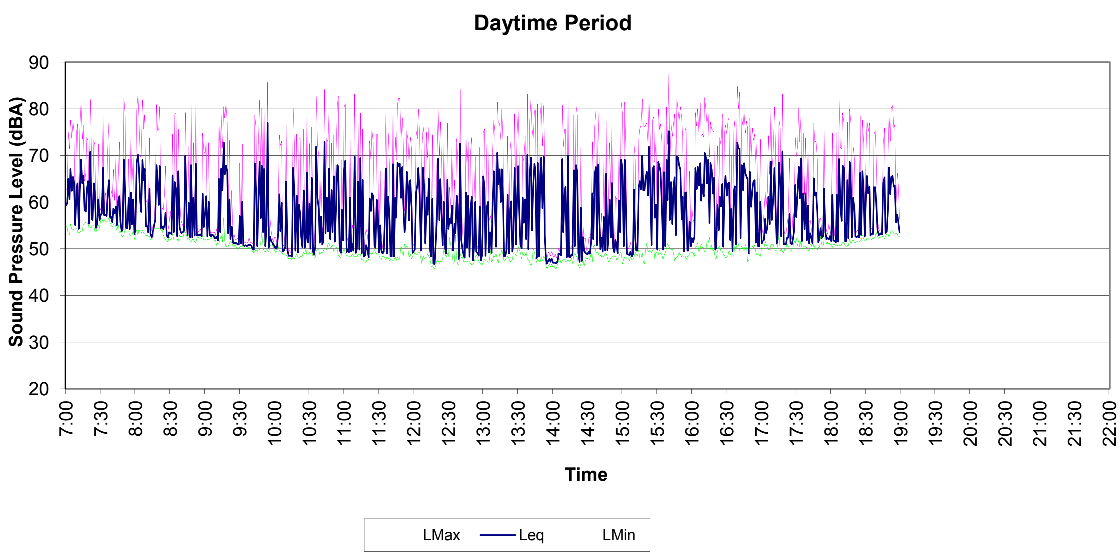


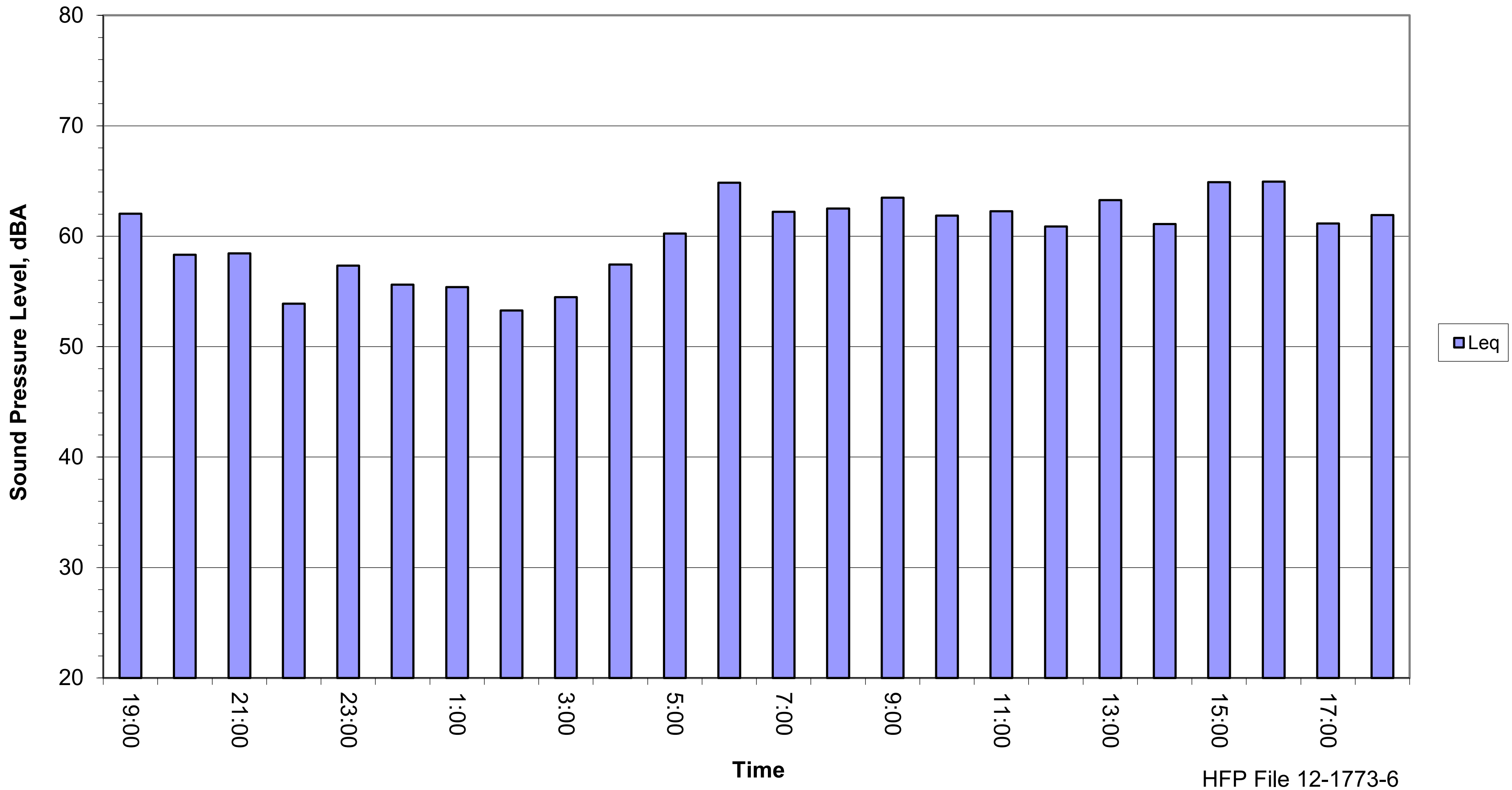
Figure B2.2b

NCIA

2012 Noise Monitoring

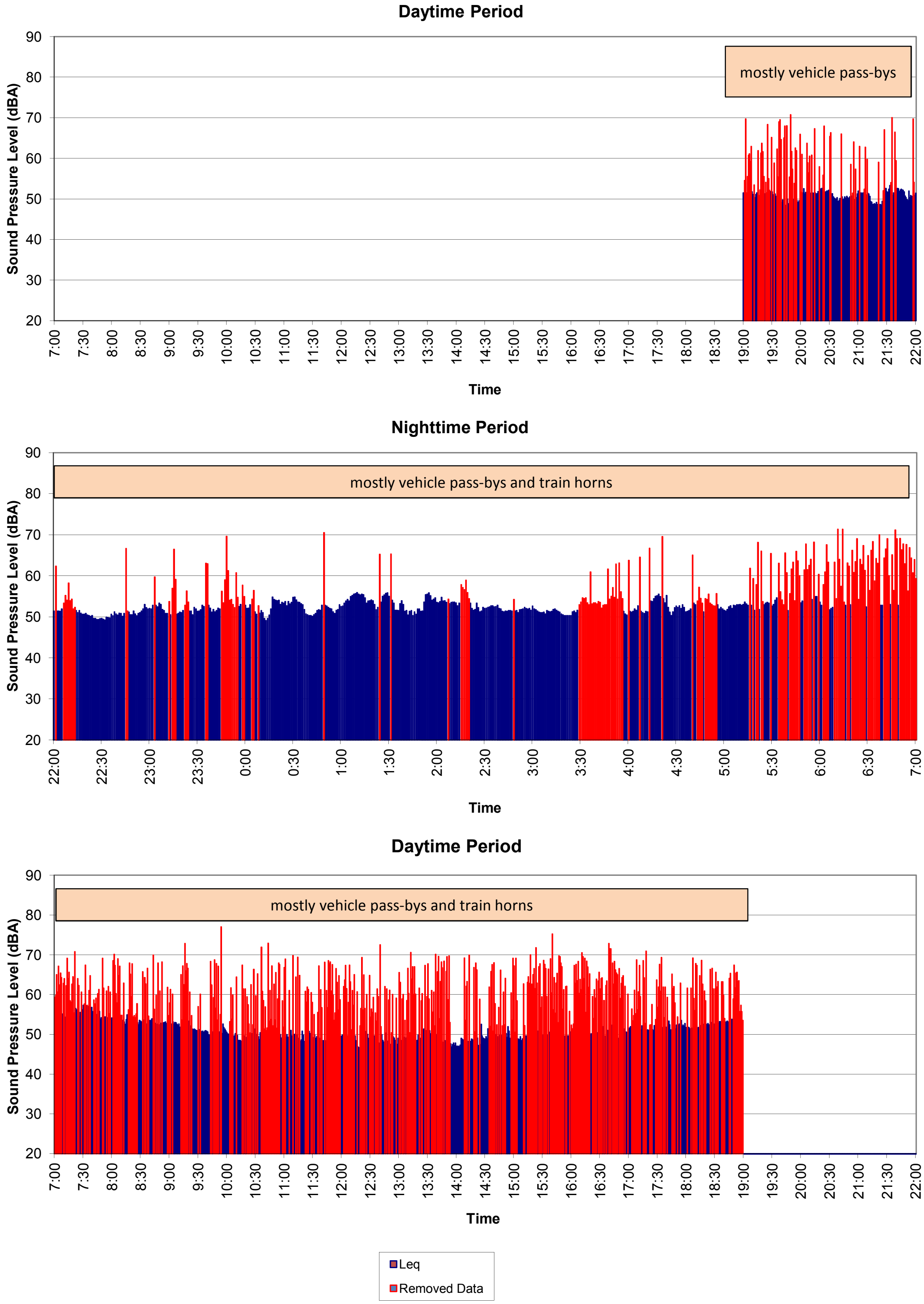
One-Hour Measured Values

Location #3, Sept 20-21, 2012



HFP File 12-1773-6

Figure B2.2c
NCIA
2012 Noise Monitoring
Isolated One-Minute Leq Sound Values
Location #3, Sept 20-21, 2012



HFP File 12-1773-6

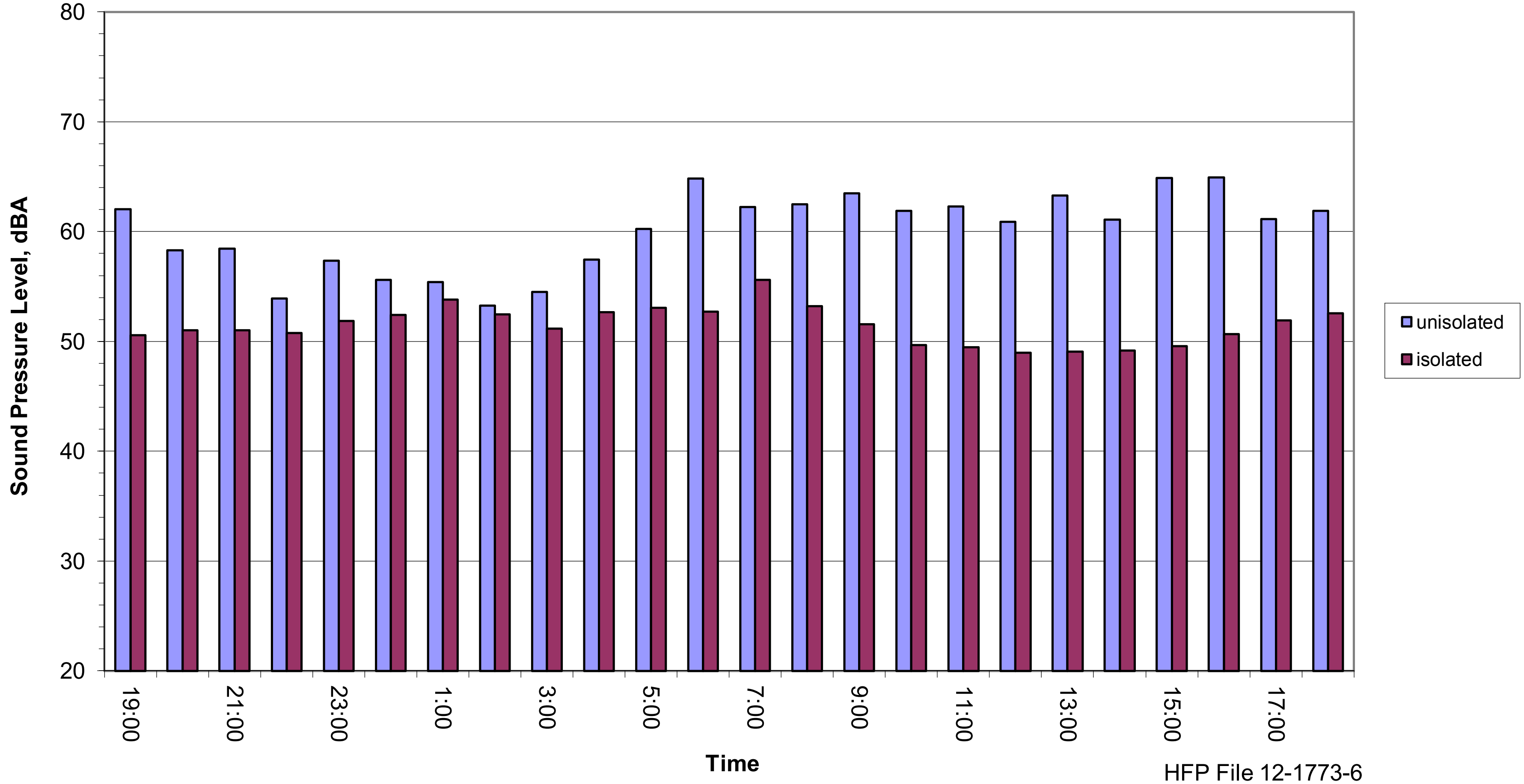
Figure B2.2d

NCIA

2012 Noise Monitoring

One-Hour Isolated Values

Location #3, Sept 20-21, 2012



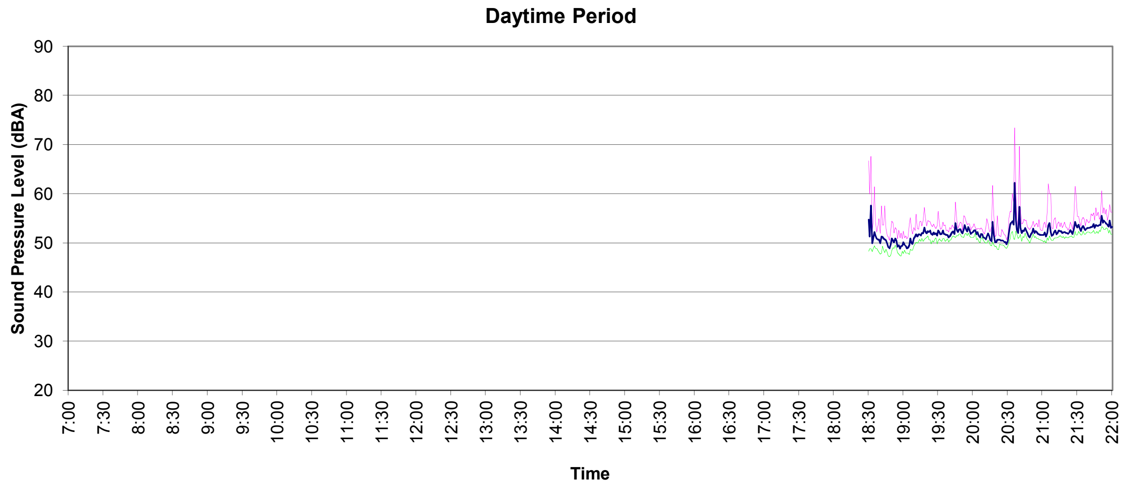
HFP File 12-1773-6

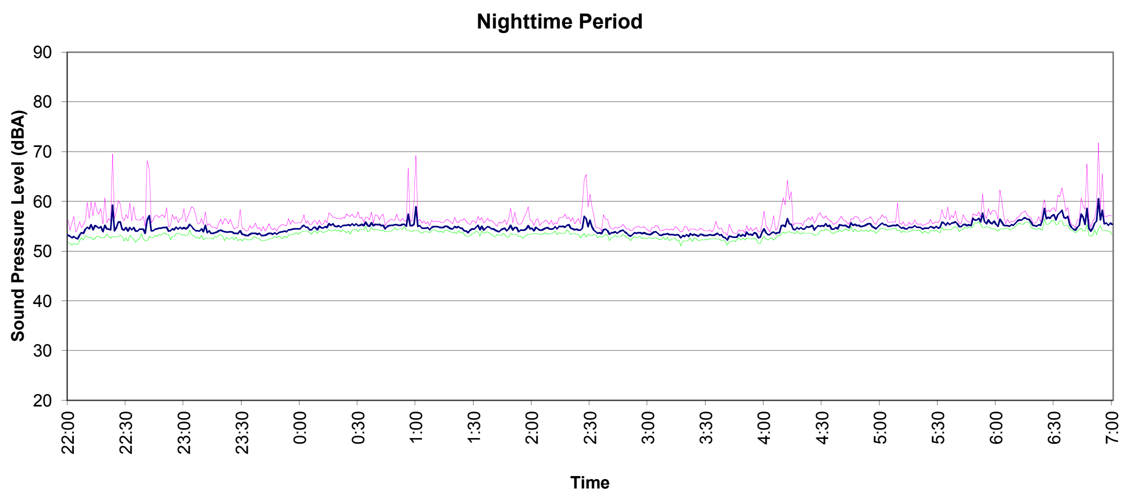
Table B3.1
NCIA
2012 Noise Monitoring
Monitored Hourly Leq Sound Levels
Location #4, Sept 19-20, 2012

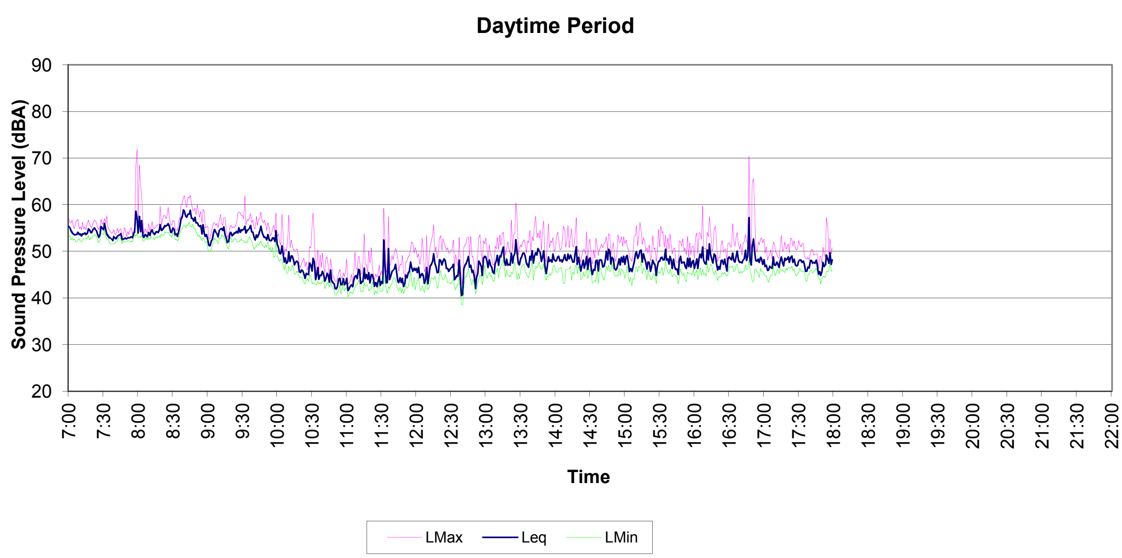
Time Start Hour	Measured Sound Level (dBA Leq)	Measured Sound Level (dBC Leq)	Isolated Sound Level (dBA Leq)	Isolated Sound Level (dBC Leq)	Valid # of Minutes
18:00	51.2	68.4	50.2	68.1	25
19:00	51.8	67.7	51.8	67.7	59
20:00	52.7	68.3	51.8	68.3	54
21:00	53.0	69.2	52.8	69.2	53
22:00	**54.6**	**68.8**	**54.3**	**68.9**	**49**
23:00	**53.9**	**69.3**	**53.9**	**69.3**	**60**
0:00	**55.1**	**69.7**	**55.1**	**69.7**	**58**
1:00	**54.7**	**69.7**	**54.6**	**69.7**	**59**
2:00	**54.4**	**68.6**	**54.2**	**68.6**	**57**
3:00	**53.2**	**68.0**	**53.2**	**68.0**	**60**
4:00	**54.8**	**70.0**	**54.8**	**70.0**	**54**
5:00	**55.3**	**70.4**	**55.3**	**70.4**	**59**
6:00	**56.2**	**72.0**	**55.9**	**71.9**	**53**
7:00	54.0	73.2	53.8	73.2	58
8:00	55.5	71.5	55.5	71.5	56
9:00	53.8	71.9	53.6	71.8	55
10:00	46.7	69.6	46.6	69.7	55
11:00	45.1	68.4	44.3	68.3	49
12:00	46.4	67.5	46.4	67.5	58
13:00	48.5	67.3	48.4	67.2	58
14:00	48.0	67.0	48.0	67.0	59
15:00	47.8	66.5	47.8	66.5	59
16:00	49.0	66.8	48.3	66.8	56
17:00	47.5	66.4	47.5	66.4	60
15 hour daytime Leq:	51.2	69.2			
9 hour nighttime Leq:	54.8	69.8			
13.6 hour isolated daytime Leq:			50.9	69.2	
8.5 hour isolated nighttime Leq:			54.6	69.7	
23.5 hour Leq:	52.9	69.4			
22.1 hour isolated Leq:			52.7	69.4	

HFP File 12-1773-6

Figure B3.1a
NCIA
2012 Noise Monitoring
Monitored One-Minute Leq Sound Values
Location #4, Sept 19-20, 2012

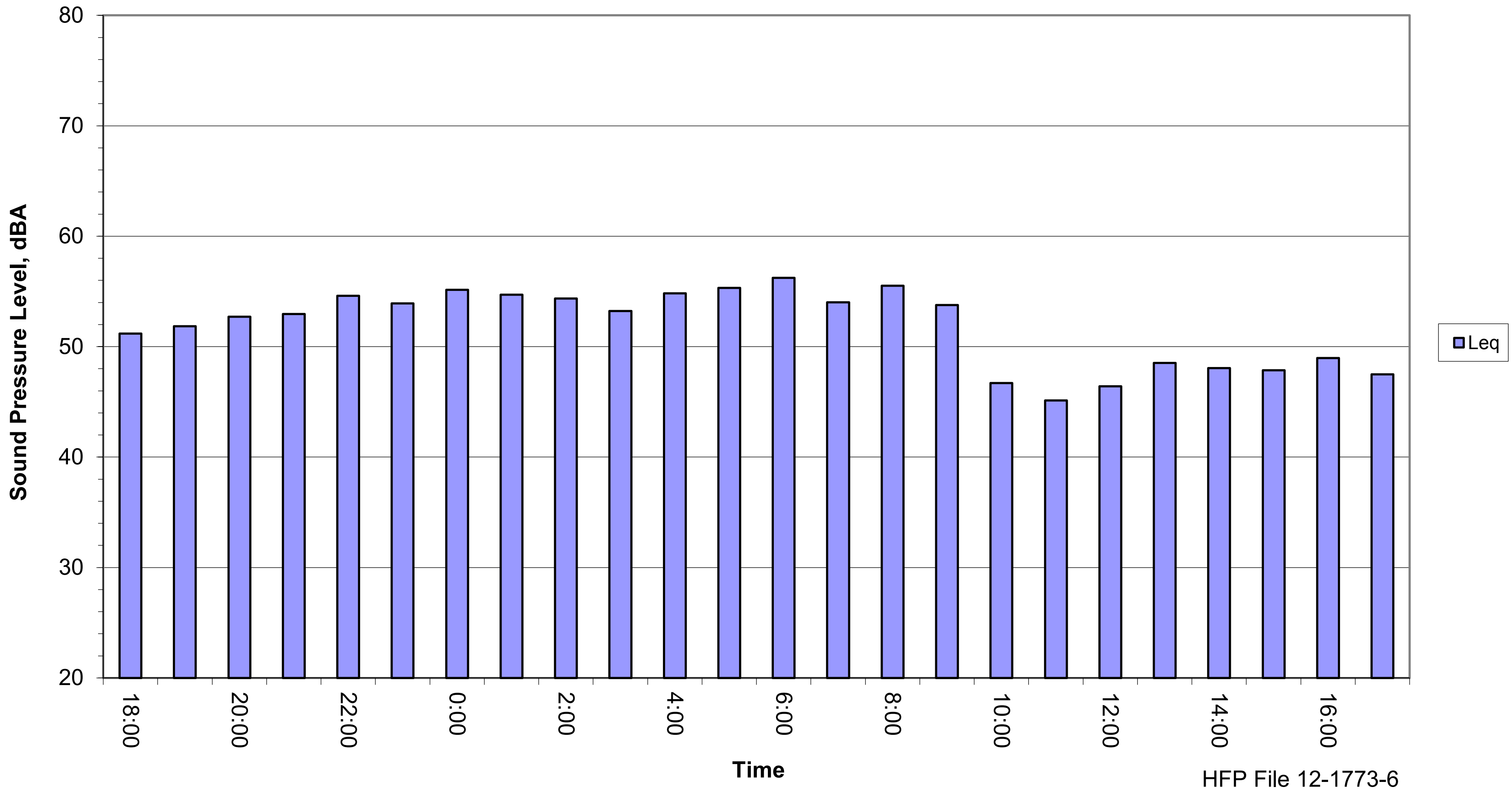






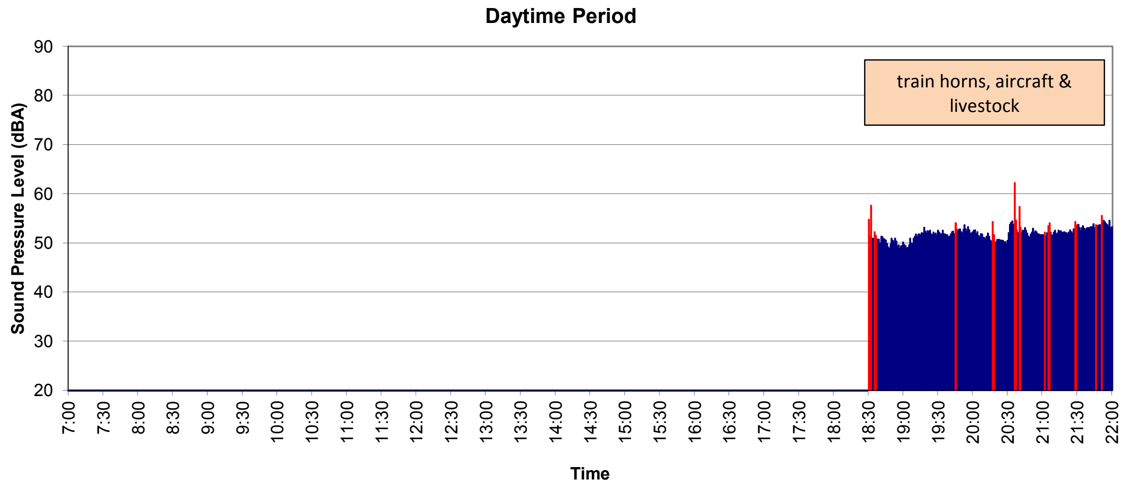
HFP File 12-1773-6

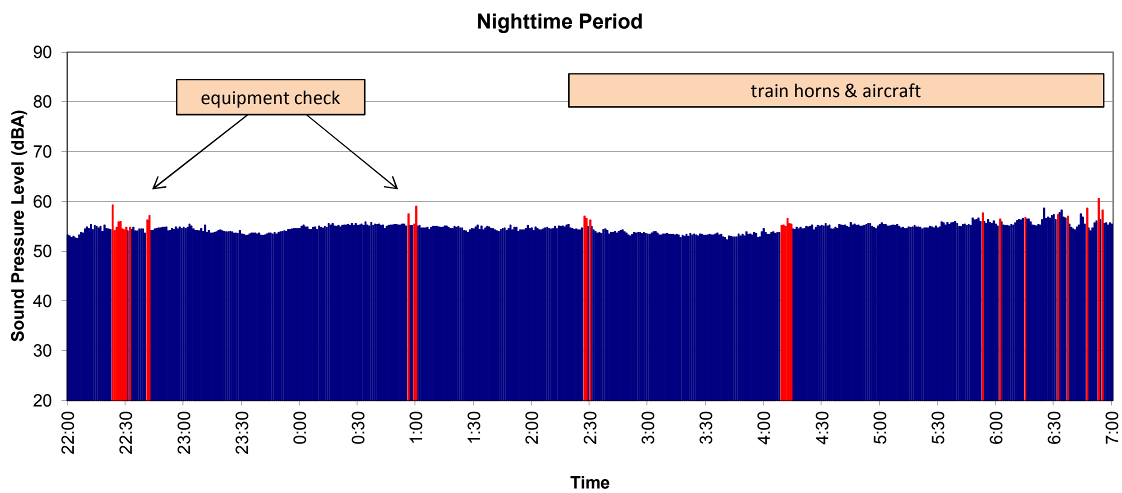
Figure B3.1b
NCIA
2012 Noise Monitoring
One-Hour Measured Values
Location #4, Sept 19-20, 2012

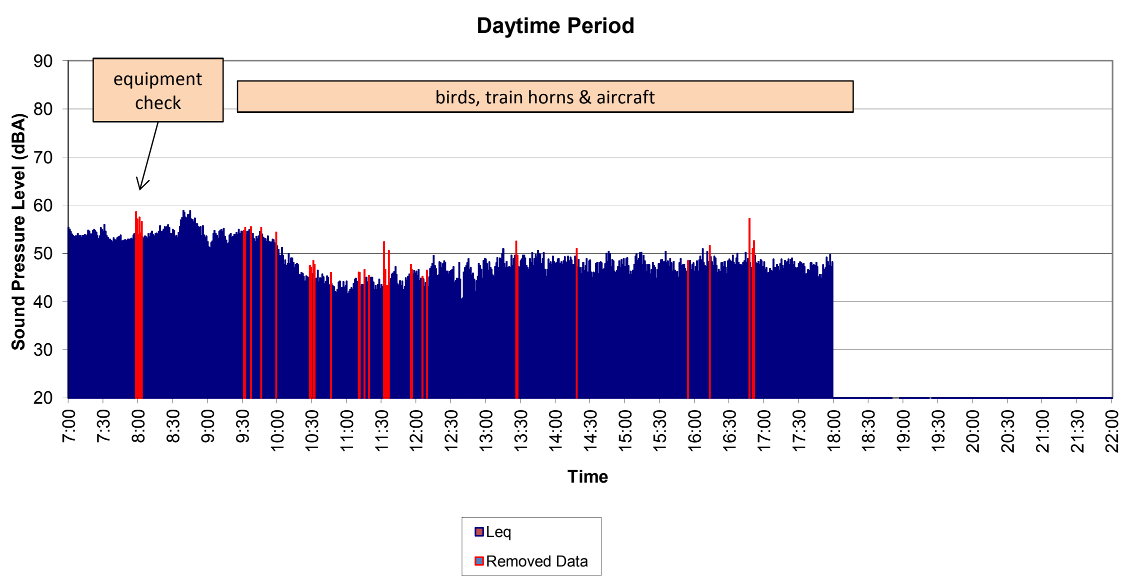


HFP File 12-1773-6

Figure B3.1c
NCIA
2012 Noise Monitoring
Isolated One-Minute Leq Sound Values
Location #4, Sept 19-20, 2012

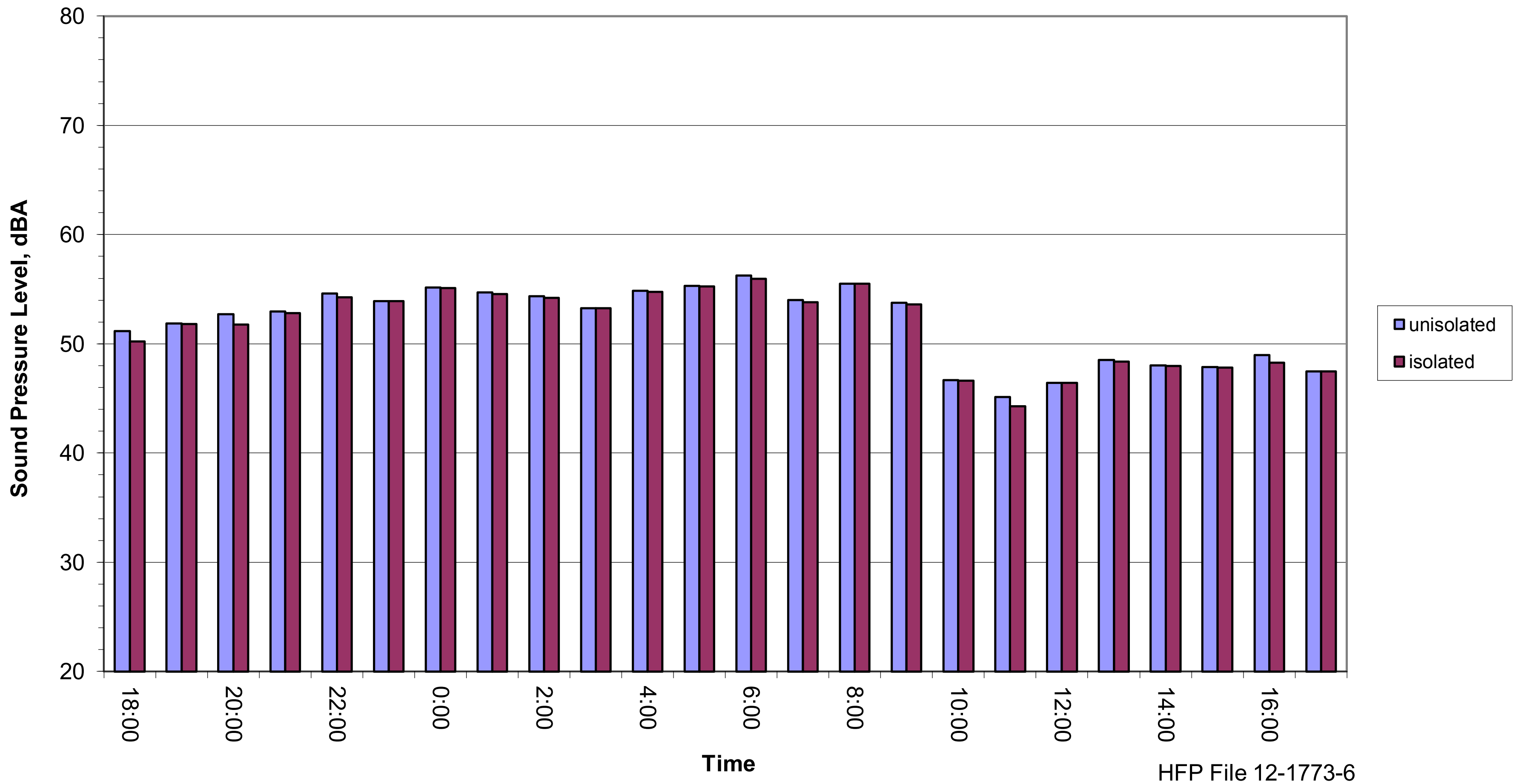






HFP File 12-1773-6

Figure B3.1d
NCIA
2012 Noise Monitoring
One-Hour Isolated Values
Location #4, Sept 19-20, 2012



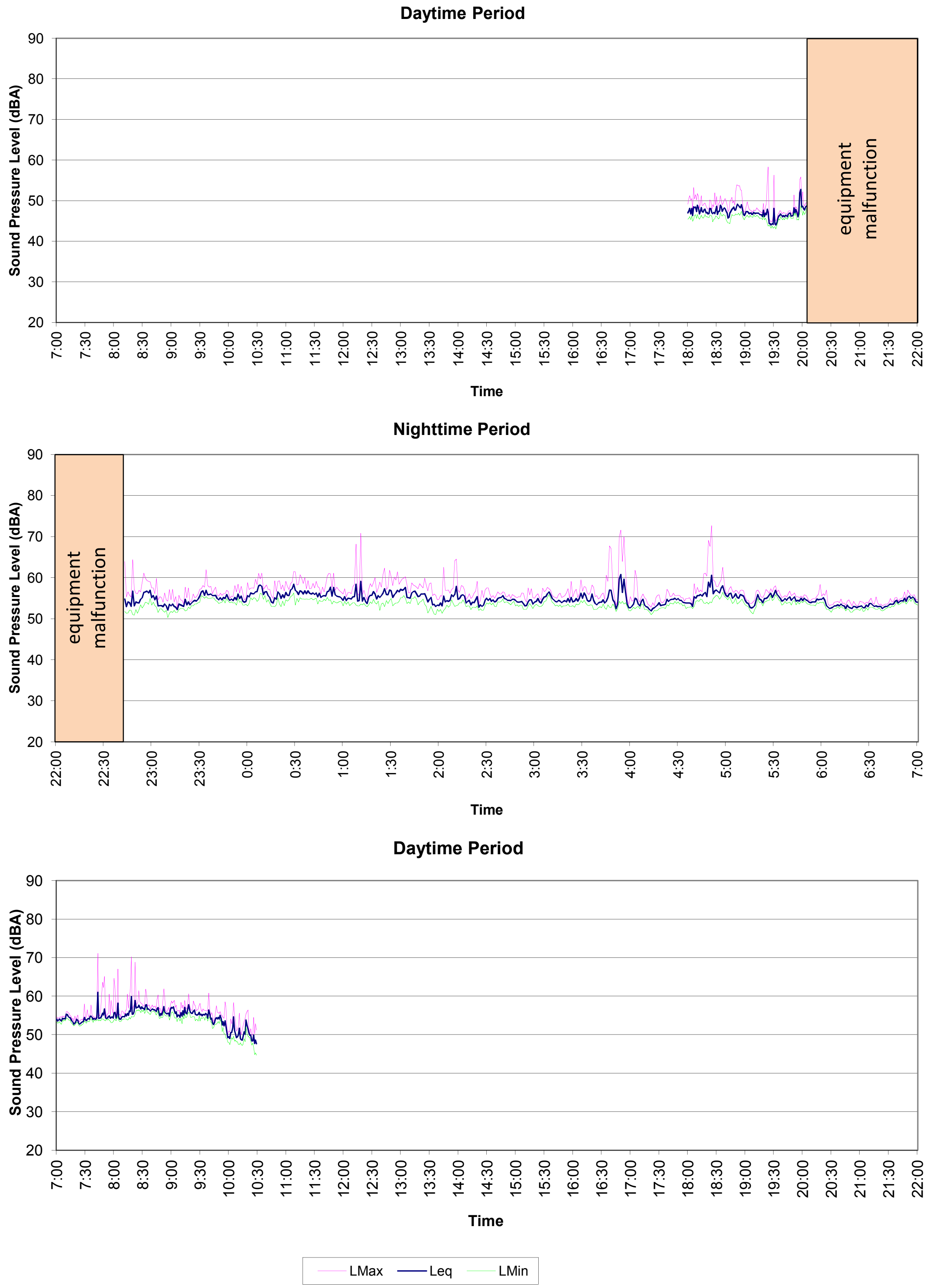
HFP File 12-1773-6

Table B3.2
NCIA
2012 Noise Monitoring
Monitored Hourly Leq Sound Levels
Location #4, Sept 20-21, 2012

Time Start Hour	**Measured Sound Level (dBA Leq)**	**Measured Sound Level (dBC Leq)**	**Isolated Sound Level (dBA Leq)**	**Isolated Sound Level (dBC Leq)**	**Valid # of Minutes**
18:00	47.7	66.1	47.5	66.0	54
19:00	46.9	66.4	46.9	66.4	58
20:00	48.3	68.2	48.3	68.2	5
21:00	0.0	0.0	0.0	0.0	0
22:00	**55.1**	**74.4**	**55.1**	**74.4**	**17**
23:00	**54.6**	**71.8**	**54.6**	**71.8**	**60**
0:00	**56.2**	**73.2**	**56.2**	**73.2**	**60**
1:00	**55.7**	**73.5**	**55.7**	**73.5**	**60**
2:00	**54.6**	**70.9**	**54.6**	**70.9**	**60**
3:00	**55.3**	**71.2**	**55.3**	**71.2**	**60**
4:00	**55.1**	**71.1**	**55.1**	**71.1**	**60**
5:00	**54.9**	**71.3**	**54.9**	**71.3**	**60**
6:00	**53.6**	**70.8**	**53.6**	**70.8**	**60**
7:00	54.5	72.1	54.4	72.0	57
8:00	56.2	73.3	56.0	73.4	51
9:00	55.1	72.1	55.1	72.1	60
10:00	50.4	68.9	49.7	68.6	26
6 hour daytime Leq:	53.3	70.8			
8.283 hour nighttime Leq:	55.1	72.0			
5.2 hour isolated daytime Leq:			53.1	70.7	
8.3 hour isolated nighttime Leq:			55.1	72.0	
13.87 hour Leq:	54.0	71.3			
13.5 hour isolated Leq:			54.4	71.5	

HFP File 12-1773-6

Figure B3.2a
NCIA
2012 Noise Monitoring
Monitored One-Minute Leq Sound Values
Location #4, Sept 20-21, 2012



HFP File 12-1773-6

Figure B3.2b

NCIA

2012 Noise Monitoring

One-Hour Measured Values

Location #4, Sept 20-21, 2012

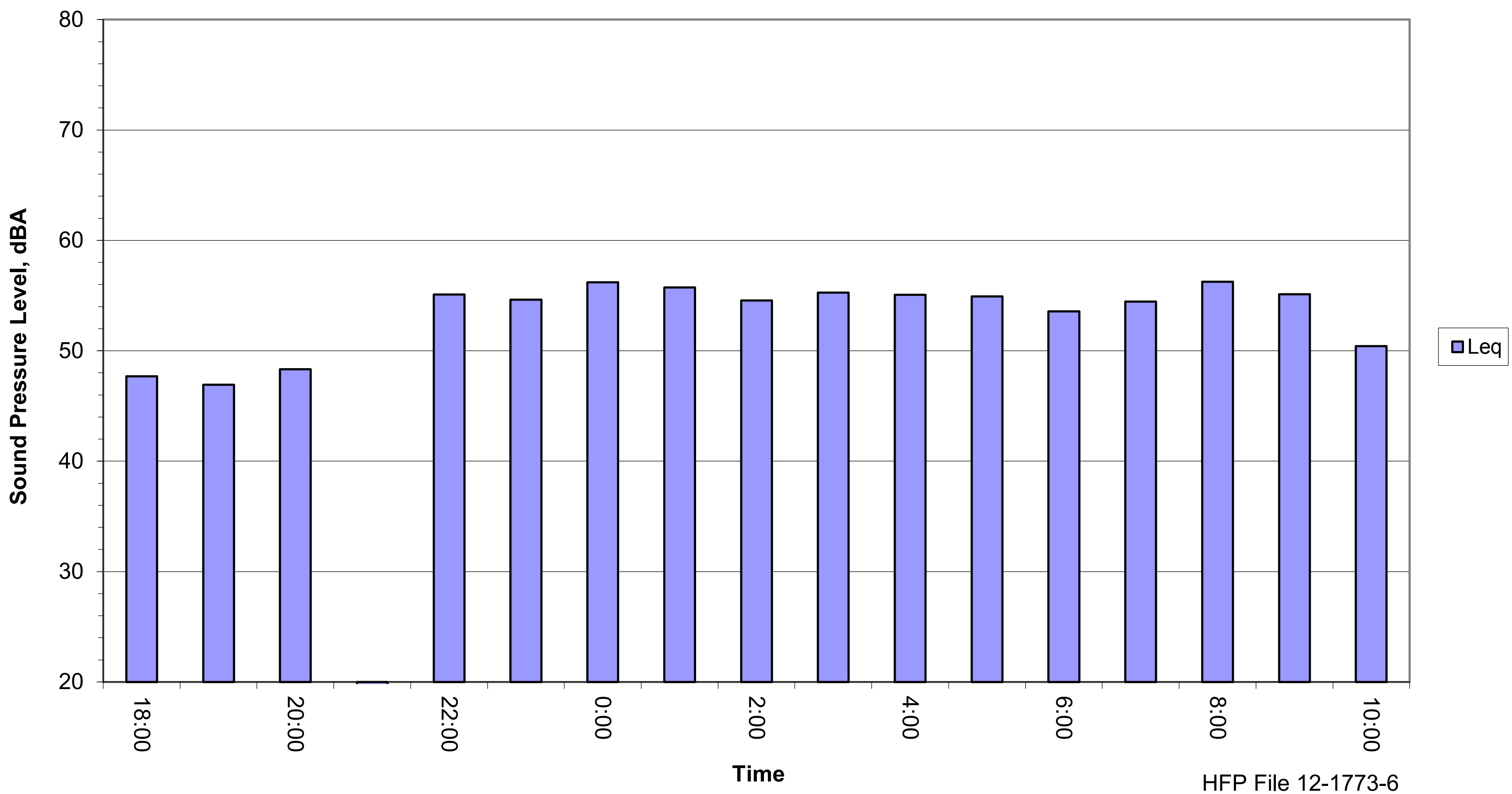


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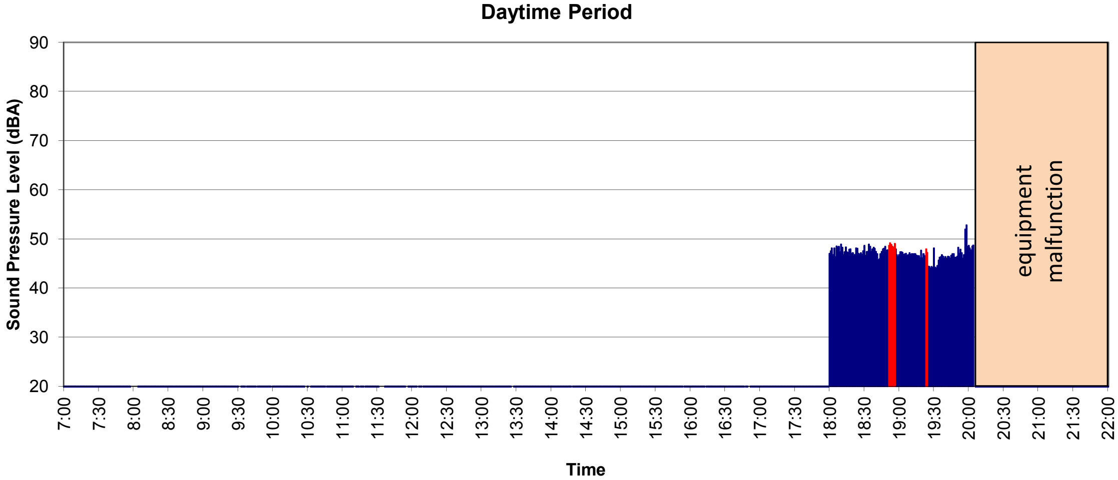
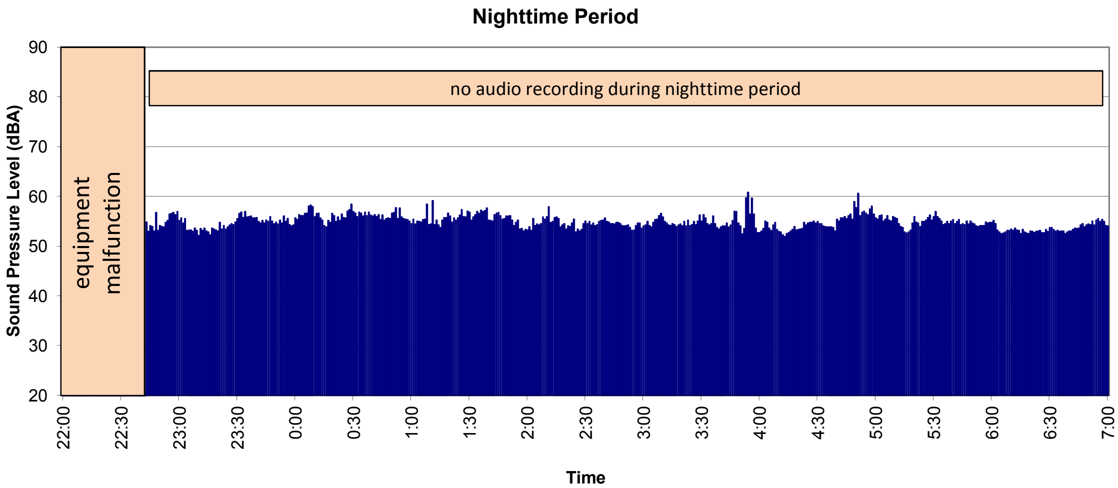
Figure B3.2c
NCIA
2012 Noise Monitoring
Isolated One-Minute Leq Sound Values
Location #4, Sept 20-21, 2012





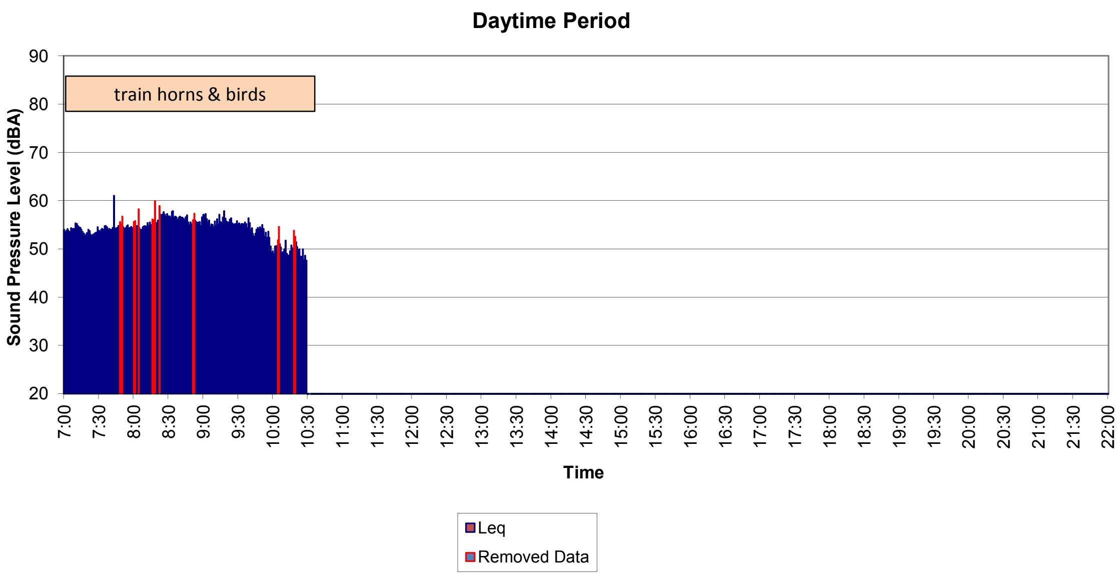
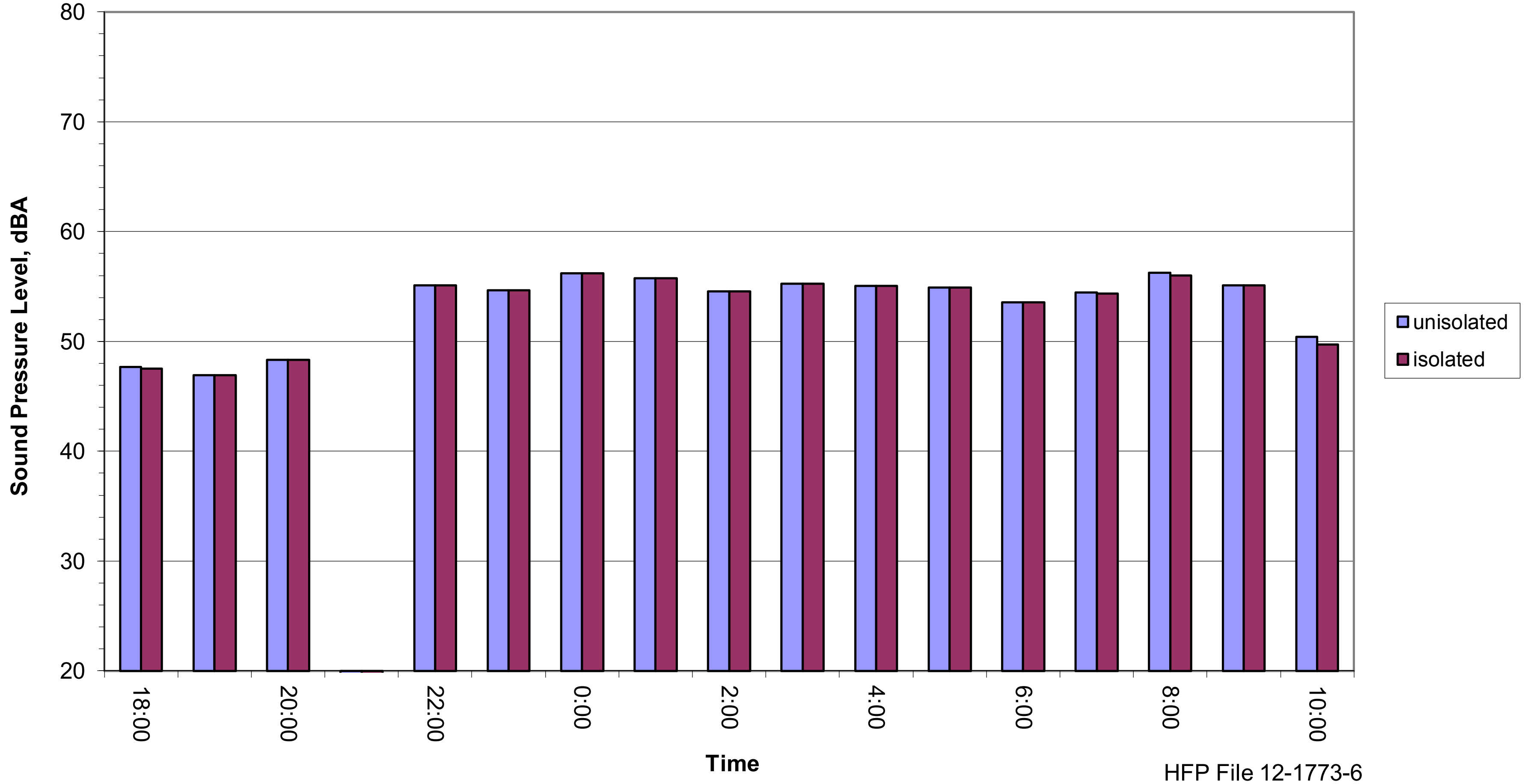


Figure B3.2d
NCIA
2012 Noise Monitoring
One-Hour Isolated Values
Location #4, Sept 20-21, 2012



HFP File 12-1773-6

Table B4.1
NCIA
2012 Noise Monitoring
Monitored Hourly Leq Sound Levels
Location #5, July 5-6, 2012

Time Start Hour	Measured Sound Level (dBA Leq)	Measured Sound Level (dBC Leq)	Isolated Sound Level (dBA Leq)	Isolated Sound Level (dBC Leq)	Valid # of Minutes
9:00	55.0	70.7	54.8	70.7	59
10:00	64.0	73.0	55.0	71.1	52
11:00	54.7	70.5	54.7	70.5	60
12:00	55.3	70.2	55.3	70.2	60
13:00	55.9	69.5	55.9	69.5	60
14:00	56.0	69.5	56.0	69.5	60
15:00	57.3	70.9	56.4	70.2	56
16:00	56.6	70.1	56.1	70.0	58
17:00	56.2	69.9	56.1	69.9	58
18:00	56.7	72.6	56.7	72.5	59
19:00	56.4	72.1	56.4	72.1	60
20:00	54.3	70.4	54.3	70.4	60
21:00	55.5	71.4	55.5	71.4	60
22:00	56.1	71.2	55.9	71.1	55
23:00	56.3	70.4	56.3	70.4	57
0:00	56.5	70.5	56.4	70.5	56
1:00	56.1	70.8	56.1	70.8	59
2:00	56.0	70.8	55.9	70.8	58
3:00	55.8	70.9	55.8	70.9	59
4:00	57.4	71.8	56.2	71.6	50
5:00	55.6	70.3	55.4	70.3	52
6:00	55.2	70.0	55.1	69.9	55
7:00	54.6	70.3	54.6	70.3	60
8:00	53.6	69.9	53.6	69.9	60
15 hour daytime Leq:	57.1	70.9			
9 hour nighttime Leq:	56.2	70.8			
14.7 hour isolated daytime Leq:			55.5	70.6	
8.4 hour isolated nighttime Leq:			55.9	70.7	
24 hour Leq:	56.8	70.8			
23.1 hour isolated Leq:			55.7	70.7	

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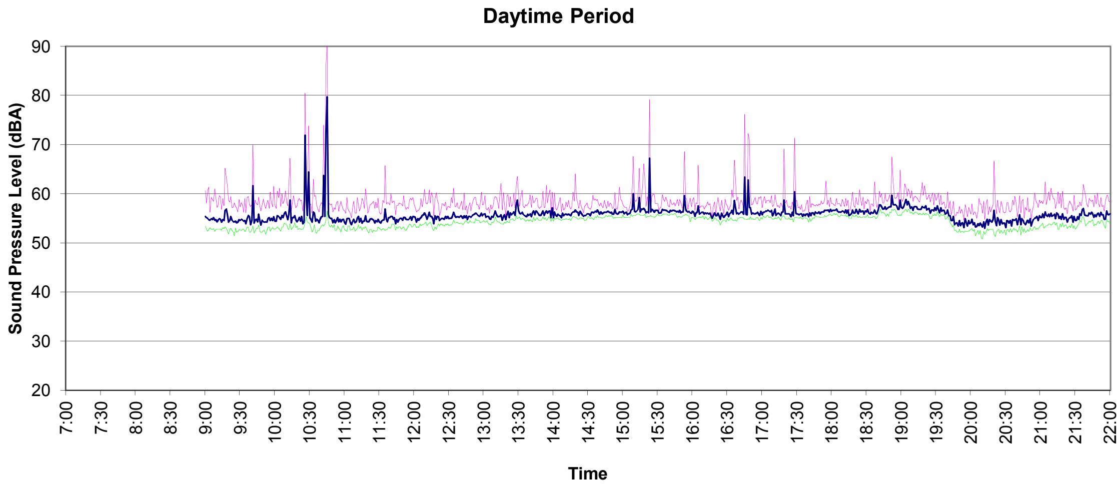
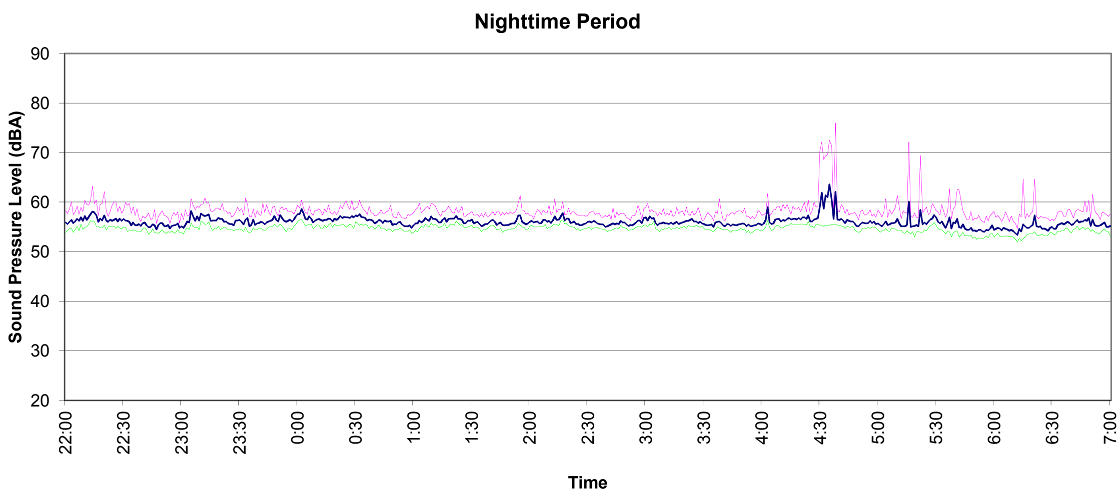
Figure B4.1a
NCIA
2012 Noise Monitoring
Monitored One-Minute Leq Sound Values
Location #5, July 5-6, 2012





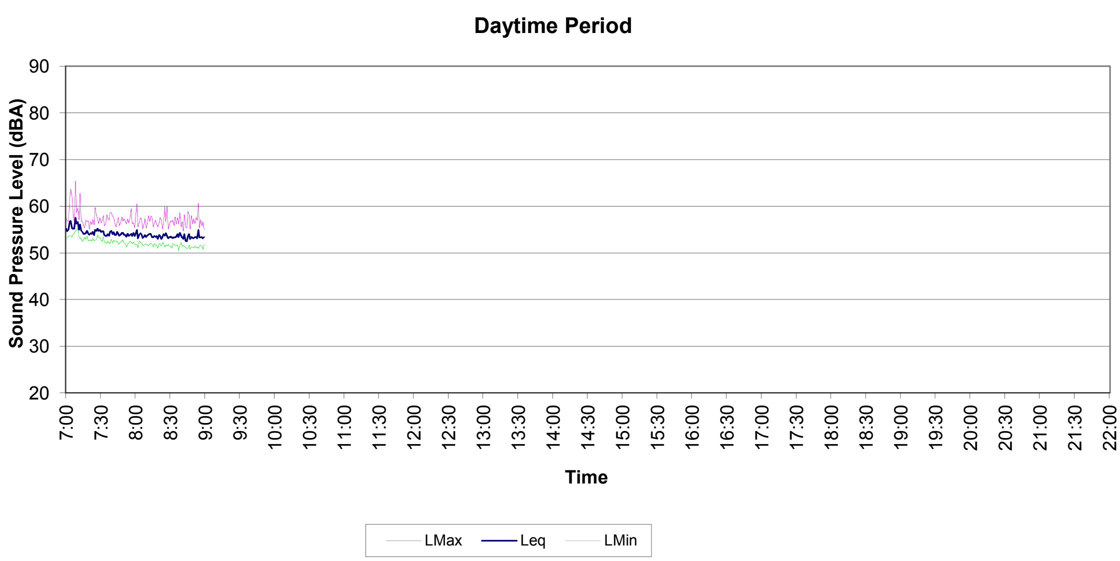
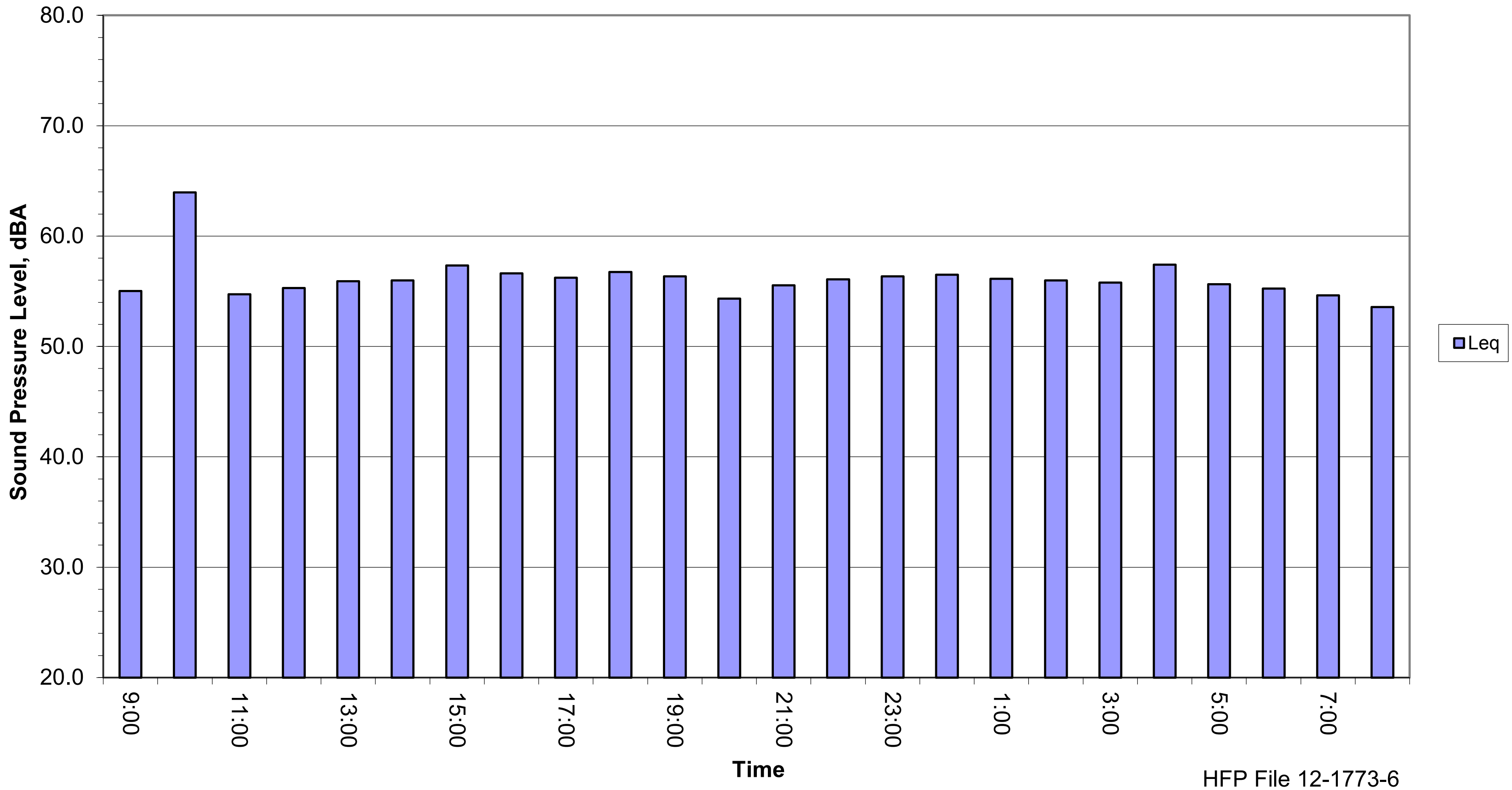
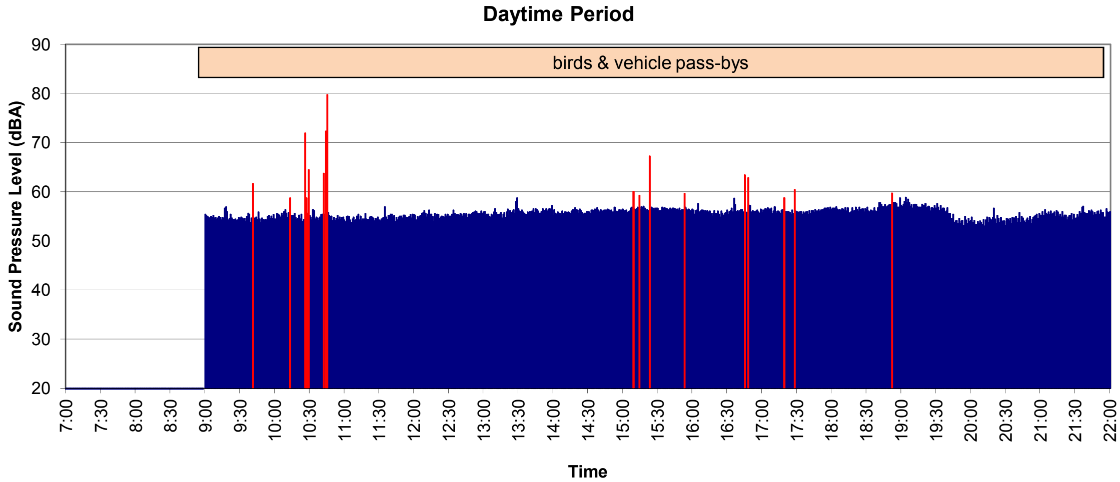


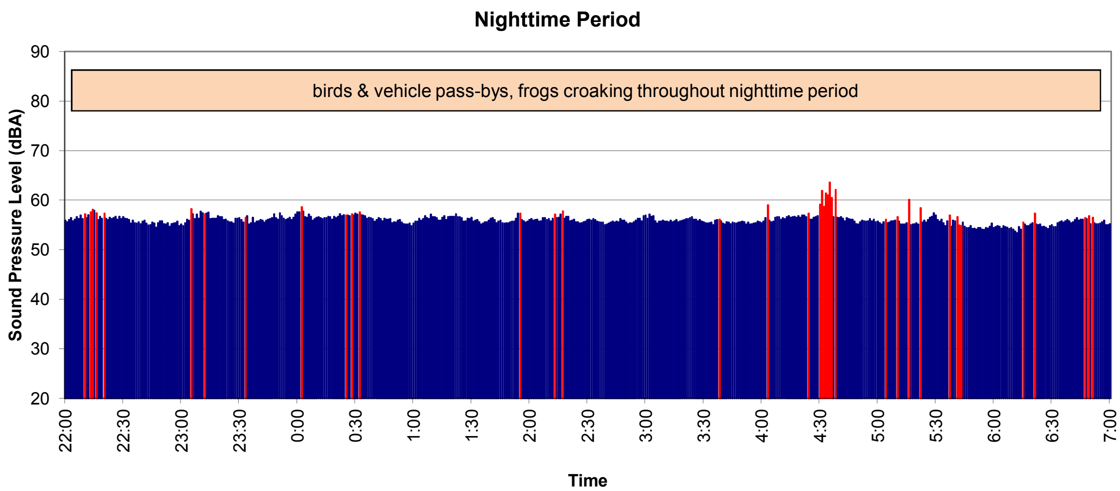
Figure B4.1b
NCIA
2012 Noise Monitoring
One-Hour Measured Values
Location #5, July 5-6, 2012

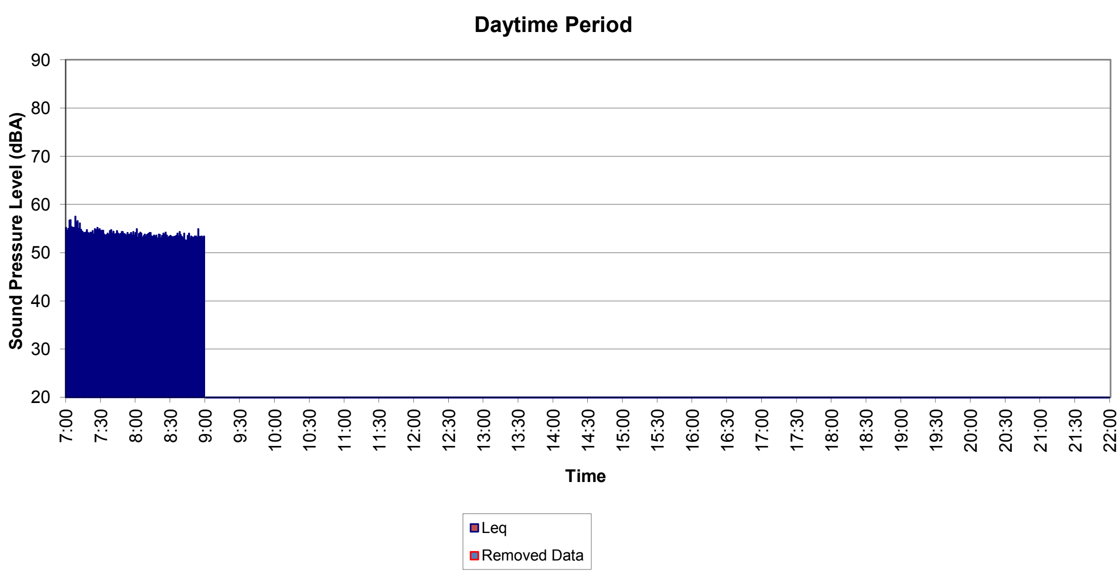


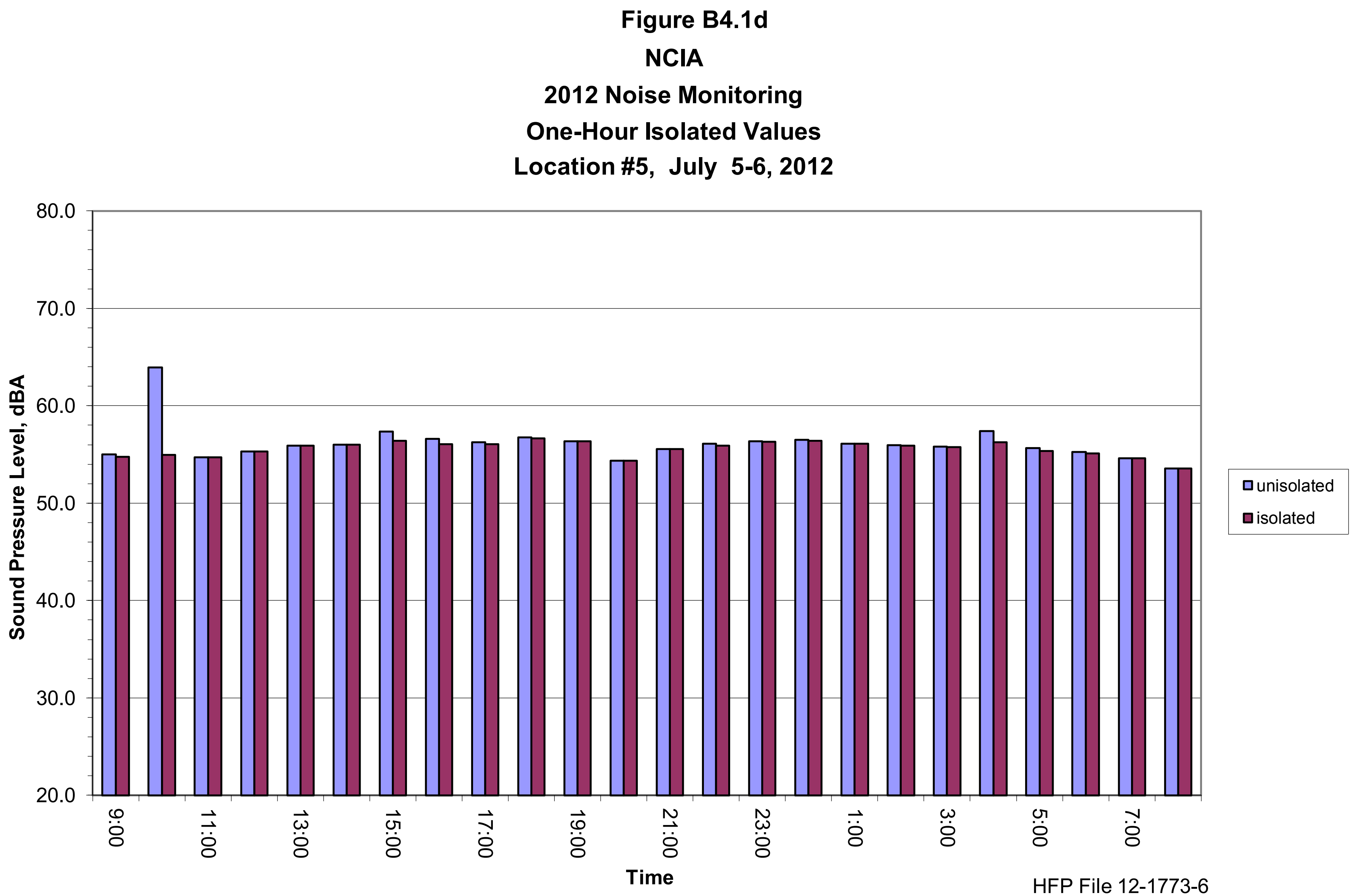
HFP File 12-1773-6

Figure B4.1c
NCIA
2012 Noise Monitoring
Isolated One-Minute Leq Sound Values
Location #5, July 5-6, 2012









HFP File 12-1773-6

Table B5.1
NCIA
2012 Noise Monitoring
Monitored Hourly Leq Sound Levels
Location #9, Sept 19-20, 2012

Time Start Hour	Measured Sound Level (dBA Leq)	Measured Sound Level (dBC Leq)	Isolated Sound Level (dBA Leq)	Isolated Sound Level (dBC Leq)	Valid # of Minutes
21:00	45.5	59.8	41.7	59.4	58
22:00	**42.3**	**59.7**	**39.3**	**59.0**	**55**
23:00	**49.2**	**63.0**	**41.9**	**60.9**	**56**
0:00	**46.8**	**63.8**	**42.2**	**61.3**	**57**
1:00	**55.8**	**65.3**	**42.6**	**61.0**	**54**
2:00	**40.1**	**59.0**	**40.1**	**59.0**	**60**
3:00	**59.2**	**65.6**	**39.5**	**60.9**	**51**
4:00	**39.0**	**59.9**	**39.0**	**59.9**	**60**
5:00	**54.2**	**65.2**	**46.6**	**60.7**	**46**
6:00	**51.9**	**64.0**	**50.3**	**63.2**	**55**
7:00	50.9	64.3	49.2	63.5	58
8:00	51.9	65.8	49.7	64.7	21
9:00	49.2	64.0	0.0	0.0	0
10:00	48.8	63.0	40.2	60.9	14
11:00	50.3	60.5	38.0	57.5	27
12:00	48.6	58.7	36.6	55.5	41
13:00	47.0	58.3	38.8	56.4	35
14:00	51.1	60.8	38.4	57.5	27
15:00	48.4	59.8	37.8	57.6	35
16:00	51.2	62.0	37.5	57.9	29
17:00	47.3	57.9	35.6	55.6	32
18:00	46.0	59.7	35.7	58.7	28
19:00	52.4	64.6	38.6	58.3	13
20:00	49.2	59.0	40.0	57.9	34
15 hour daytime Leq:	49.6	61.9			
9 hour nighttime Leq:	53.0	63.5			
7.5 hour isolated daytime Leq:			43.3	59.7	
8.2 hour isolated nighttime Leq:			44.1	60.8	
24 hour Leq:	51.2	62.6			
15.8 hour isolated Leq:			43.7	60.3	

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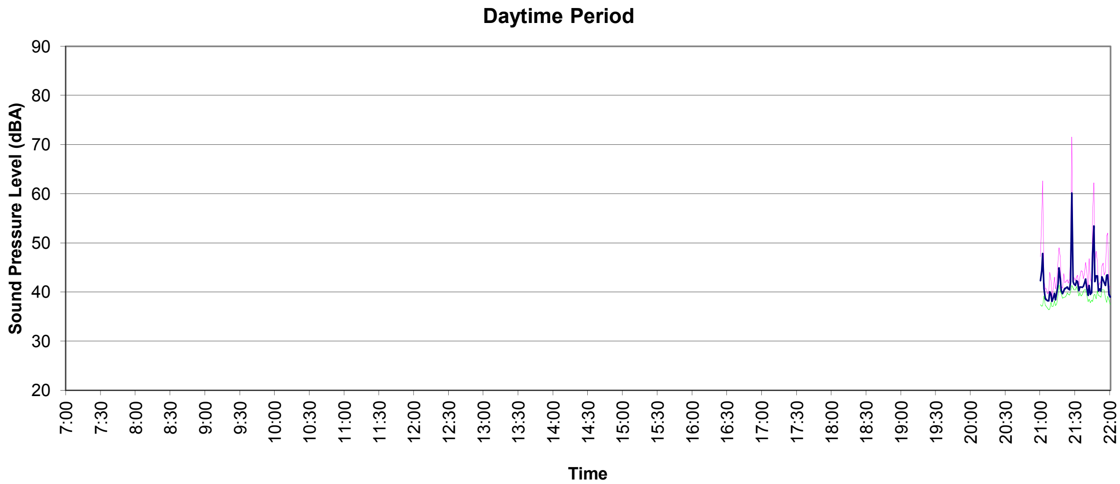
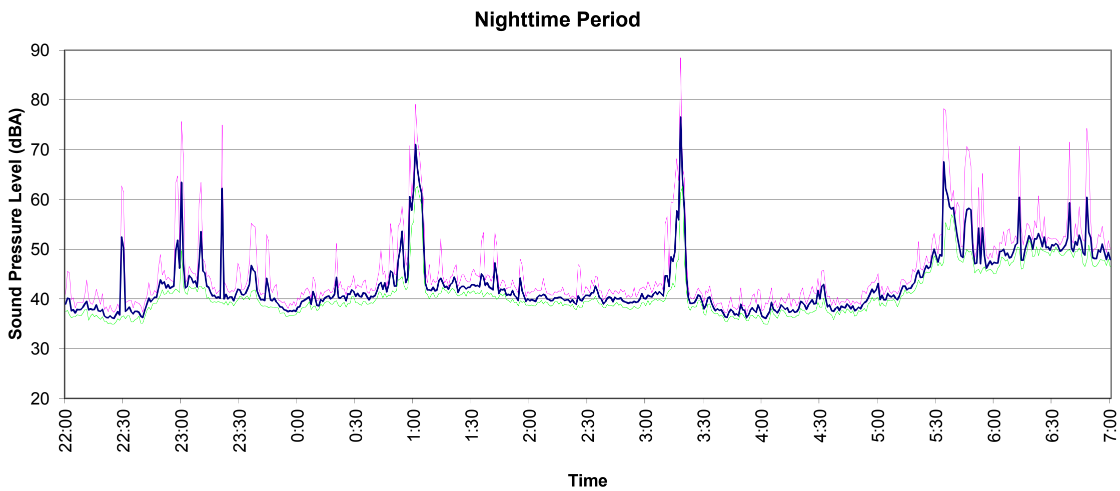
Figure B5.1a
NCIA
2012 Noise Monitoring
Monitored One-Minute Leq Sound Values
Location #9, Sept 19-20, 2012





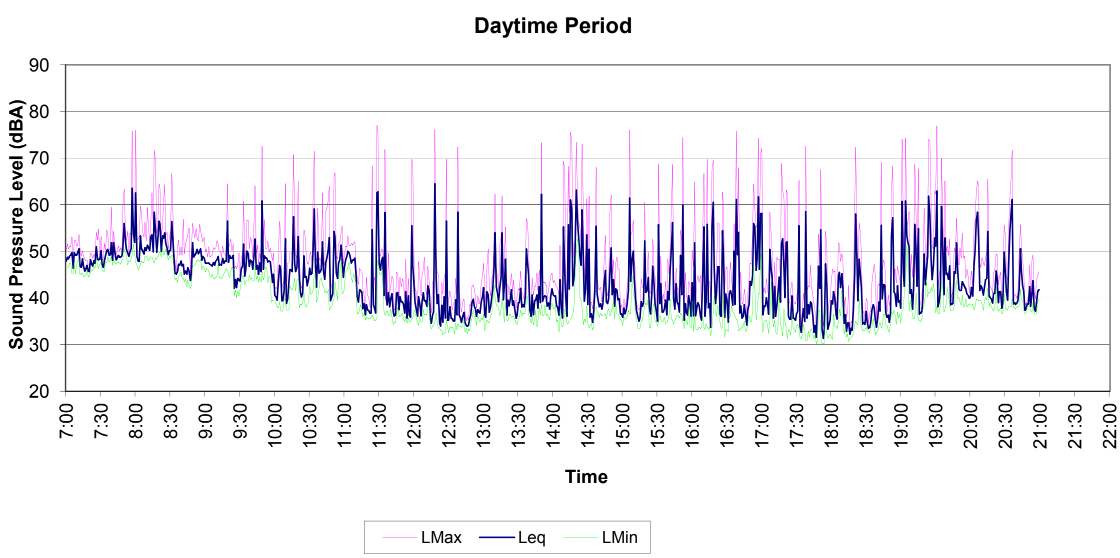


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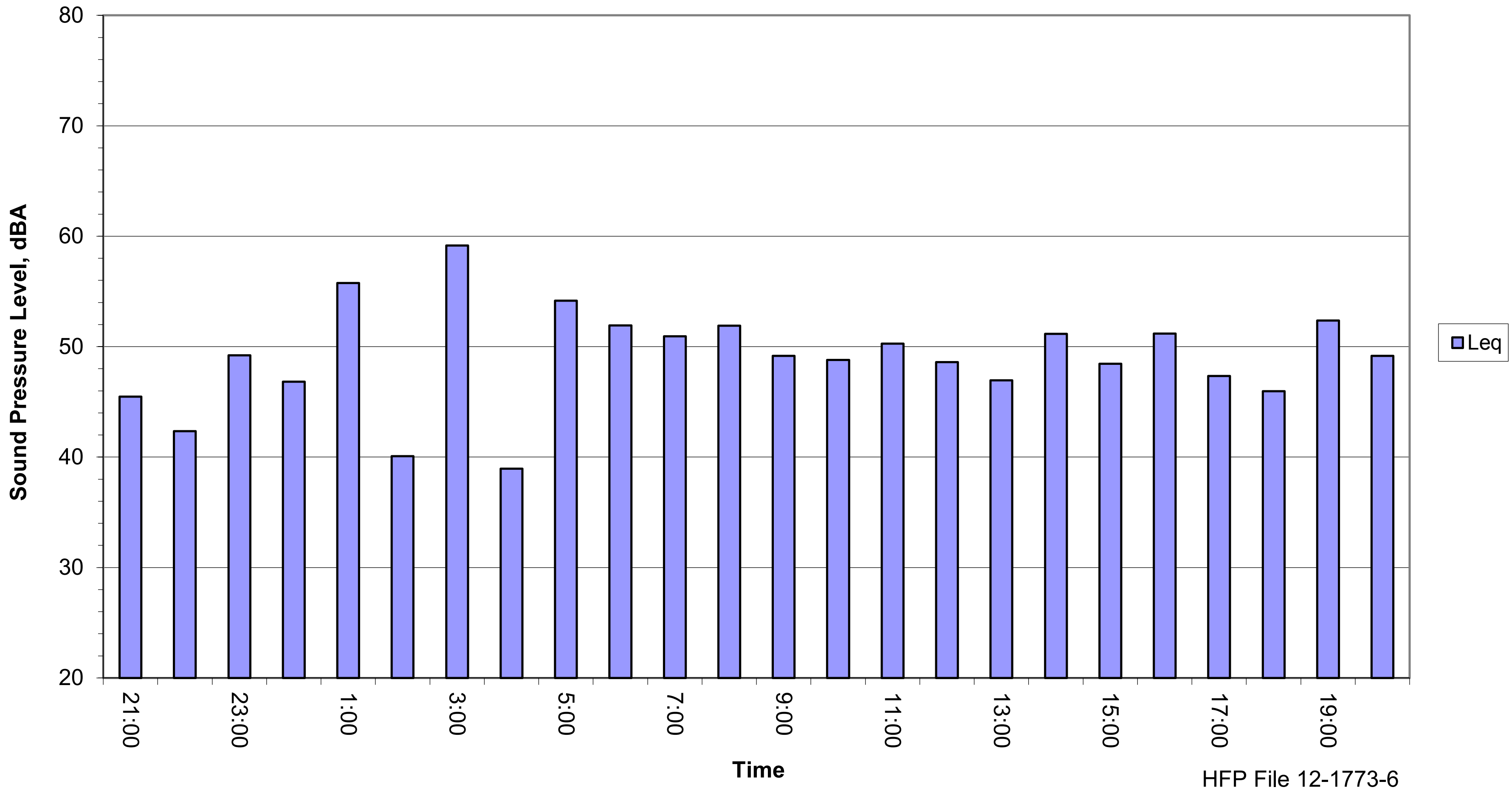
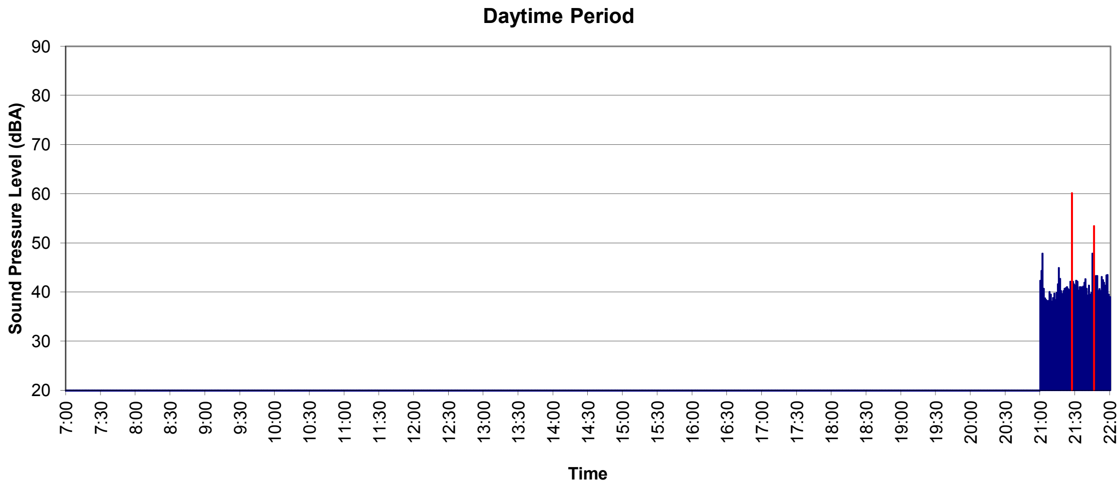
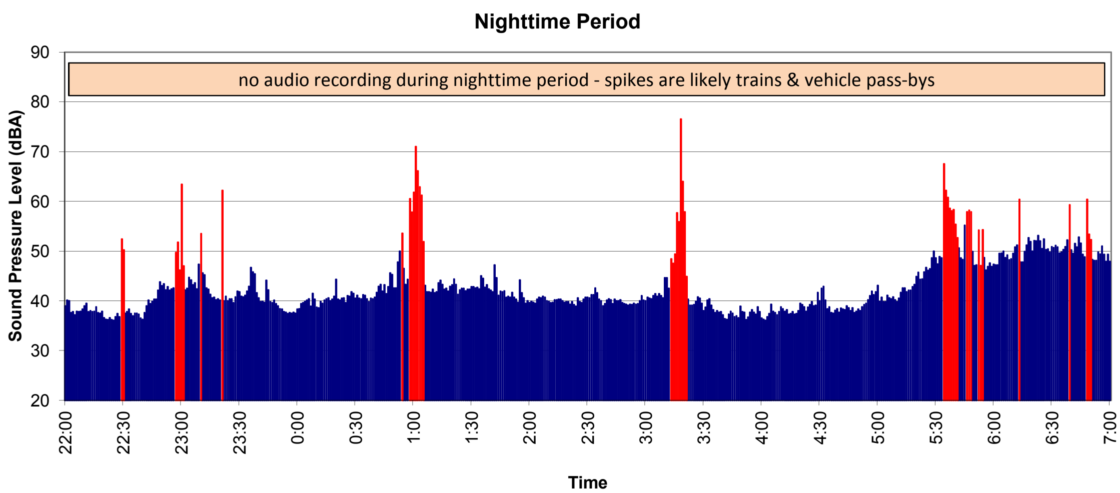
Figure B5.1b
NCIA
2012 Noise Monitoring
One-Hour Measured Values
Location #9, Sept 19-20, 2012



HFP File 12-1773-6

Figure B5.1c
NCIA
2012 Noise Monitoring
Isolated One-Minute Leq Sound Values
Location #9, Sept 19-20, 2012





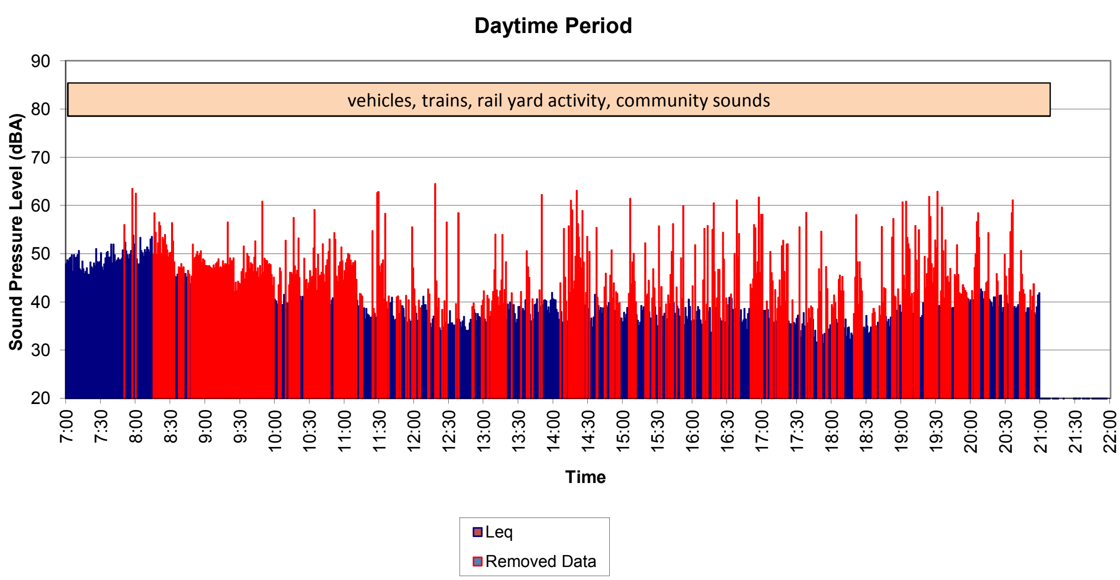
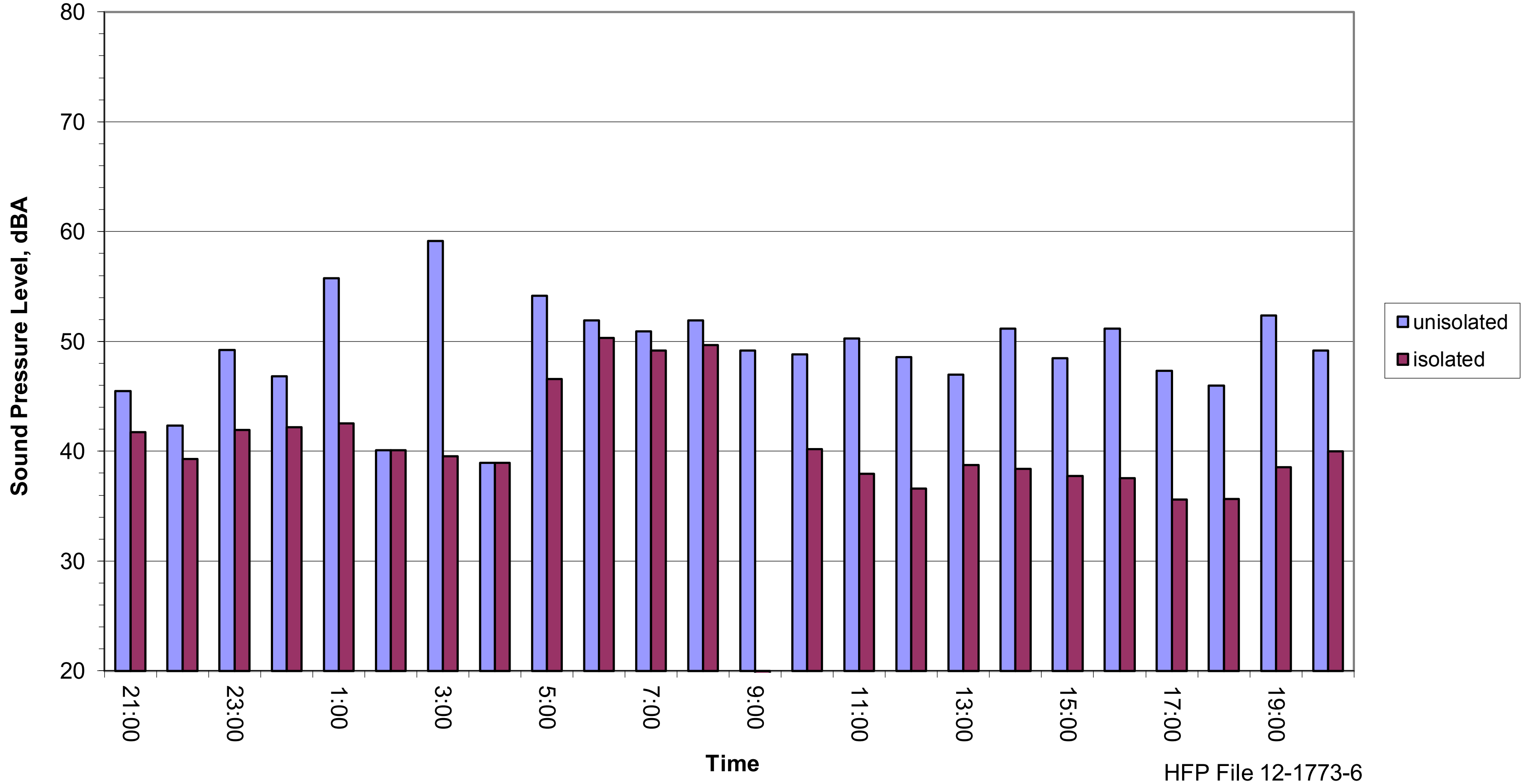


Figure B5.1d
NCIA
2012 Noise Monitoring
One-Hour Isolated Values
Location #9, Sept 19-20, 2012



HFP File 12-1773-6

Table B5.2
NCIA
2012 Noise Monitoring
Monitored Hourly Leq Sound Levels
Location #9, Sept 20-21, 2012

Time Start Hour	Measured Sound Level (dBA Leq)	Measured Sound Level (dBC Leq)	Isolated Sound Level (dBA Leq)	Isolated Sound Level (dBC Leq)	Valid # of Minutes
21:00	52.6	61.6	39.8	60.5	38
22:00	**52.4**	**65.8**	**43.6**	**61.2**	**28**
23:00	**48.7**	**63.5**	**45.1**	**61.9**	**45**
0:00	**44.4**	**61.2**	**43.6**	**60.4**	**50**
1:00	**45.8**	**61.5**	**45.7**	**61.3**	**56**
2:00	**57.7**	**67.1**	**46.9**	**61.5**	**46**
3:00	**52.4**	**64.0**	**47.3**	**62.1**	**47**
4:00	**49.5**	**63.1**	**48.9**	**62.9**	**49**
5:00	**52.8**	**66.7**	**51.7**	**65.9**	**53**
6:00	**52.2**	**65.5**	**51.4**	**65.0**	**58**
7:00	54.7	67.4	52.5	66.7	19
8:00	56.4	68.2	54.5	67.5	28
9:00	53.4	67.3	51.8	67.2	10
10:00	55.6	66.9	48.6	65.4	9
11:00	51.7	64.6	48.1	63.8	15
12:00	50.1	63.1	44.5	62.3	25
13:00	48.6	63.3	44.9	62.4	36
14:00	52.5	63.3	44.1	61.6	38
15:00	49.3	64.3	44.7	61.9	32
16:00	60.9	65.8	44.9	61.4	33
17:00	50.7	62.3	44.4	61.0	36
18:00	58.5	67.9	45.8	61.4	15
13 hour daytime Leq:	54.8	65.5			
9 hour nighttime Leq:	52.3	64.7			
5.6 hour isolated daytime Leq:			48.0	63.4	
7.2 hour isolated nighttime Leq:			48.4	63.0	
21.5 hour Leq:	54.0	65.2			
12.8 hour isolated Leq:			48.2	63.2	

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Figure B5.2a
NCIA
2012 Noise Monitoring
Monitored One-Minute Leq Sound Values
Location #9, Sept 20-21, 2012

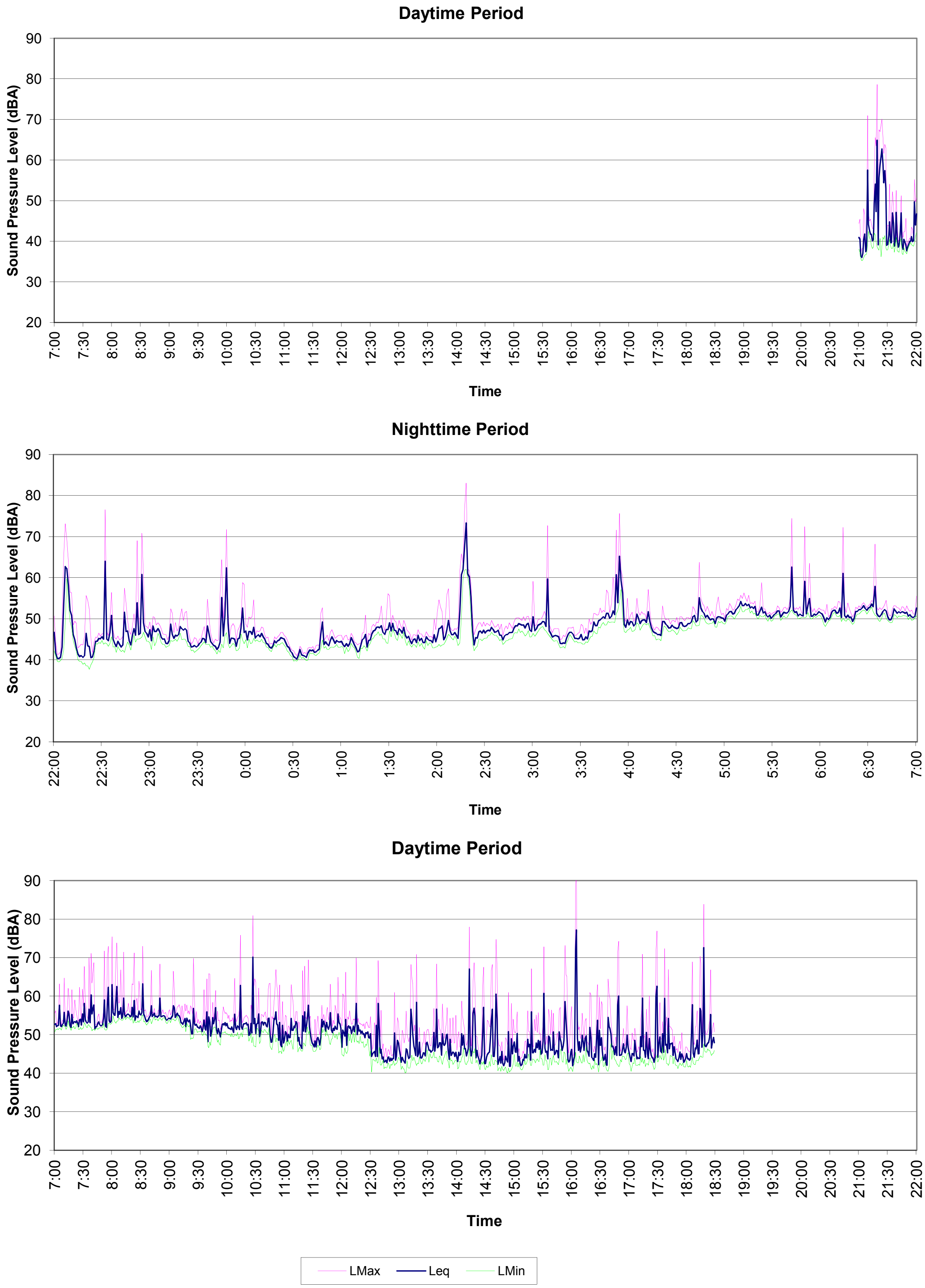
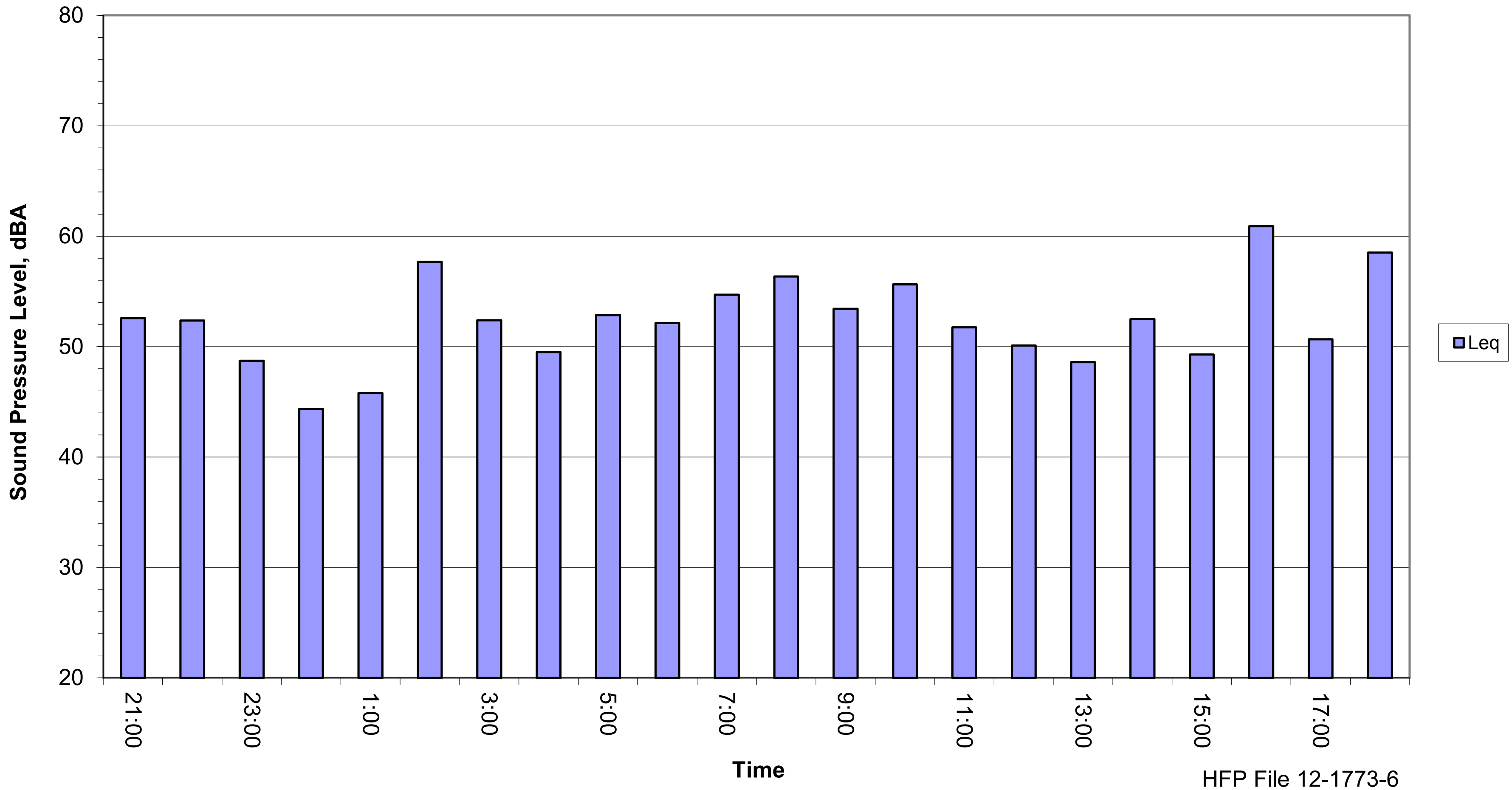
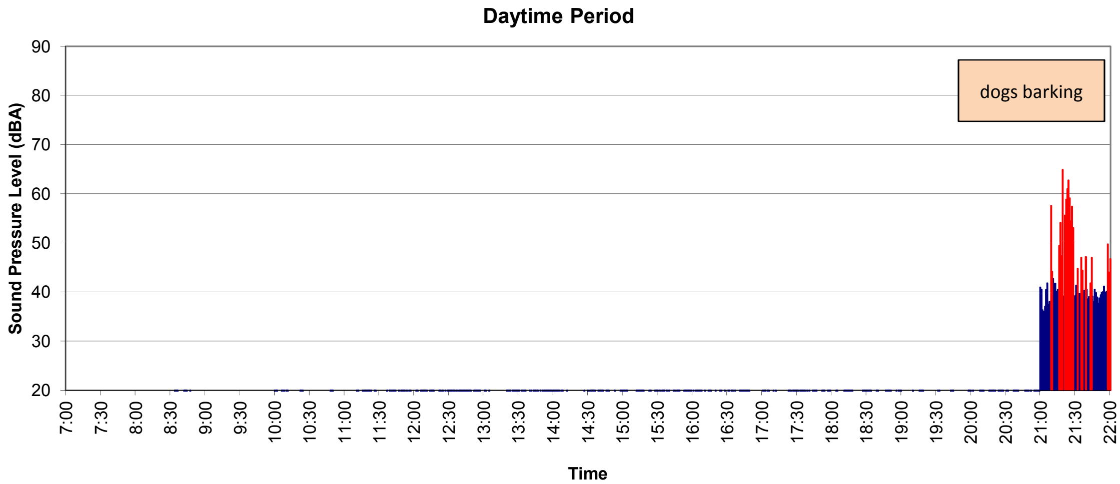


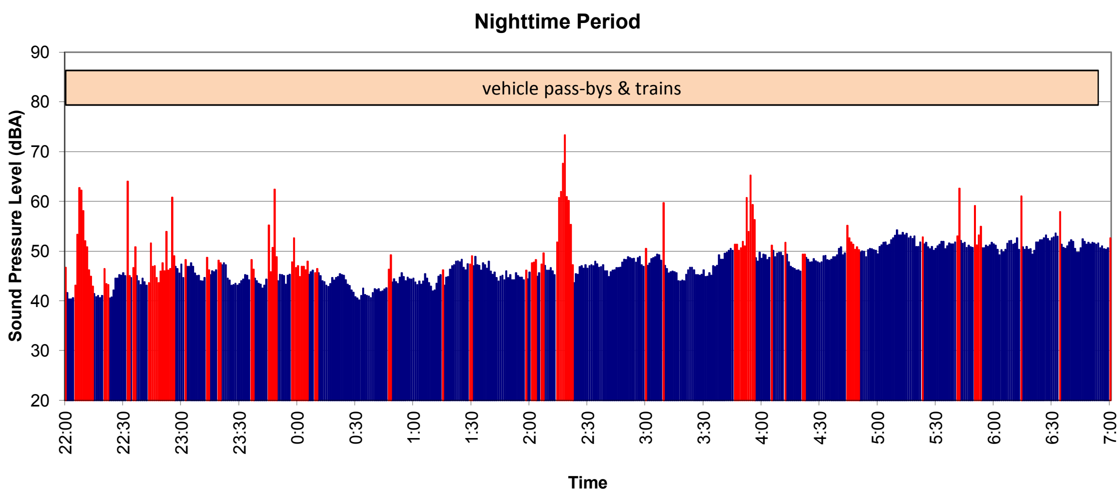
Figure B5.2b
NCIA
2012 Noise Monitoring
One-Hour Measured Values
Location #9, Sept 20-21, 2012

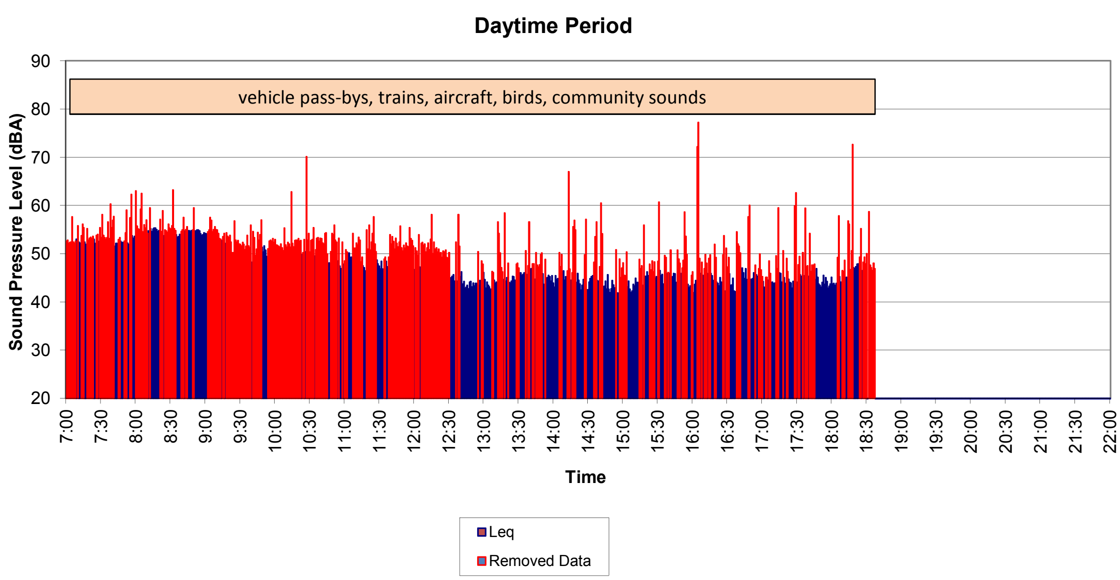


HFP File 12-1773-6

Figure B5.2c
NCIA
2012 Noise Monitoring
Isolated One-Minute Leq Sound Values
Location #9, Sept 20-21, 2012







HFP File 12-1773-6

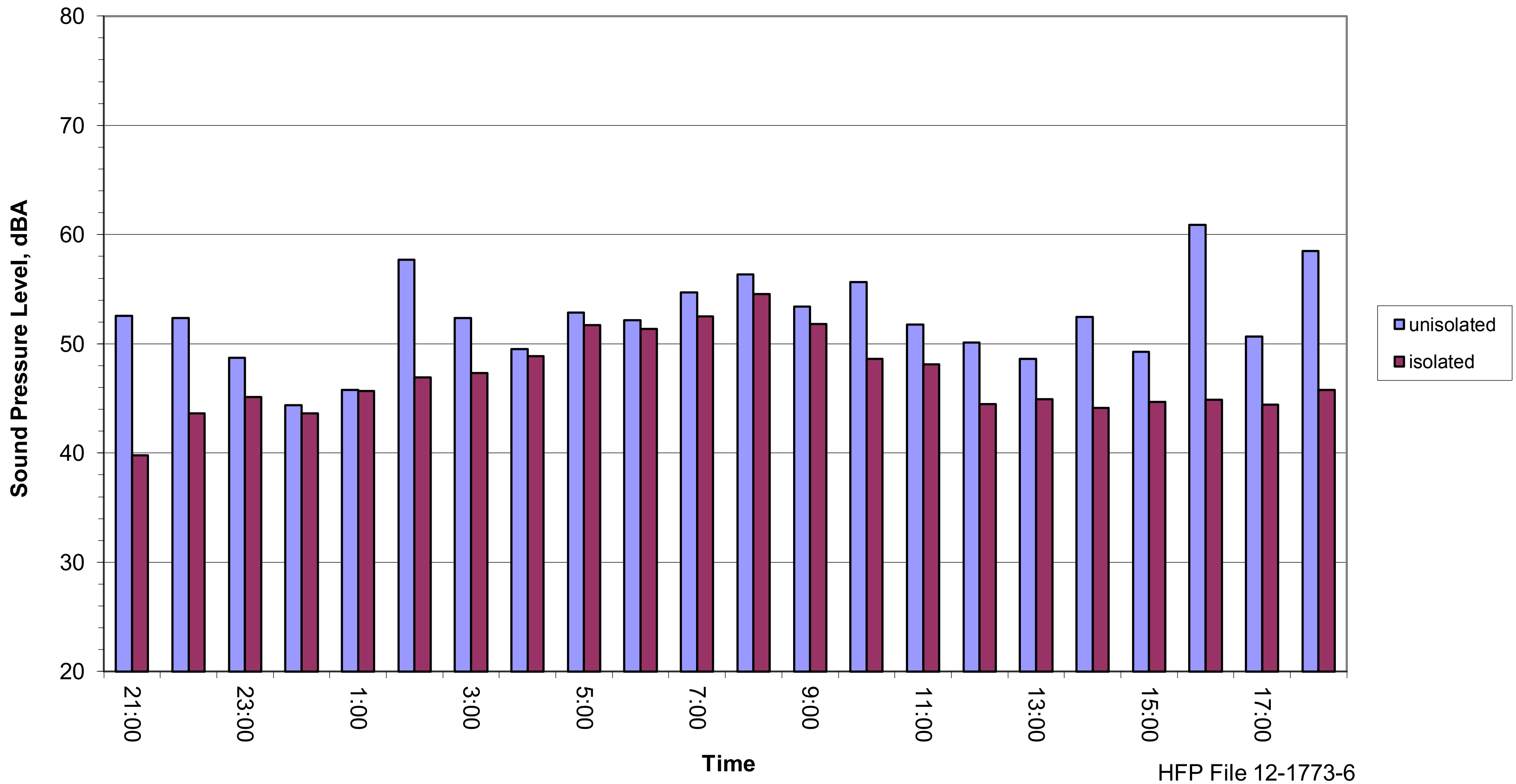
Figure B5.2d

NCIA

2012 Noise Monitoring

One-Hour Isolated Values

Location #9, Sept 20-21, 2012



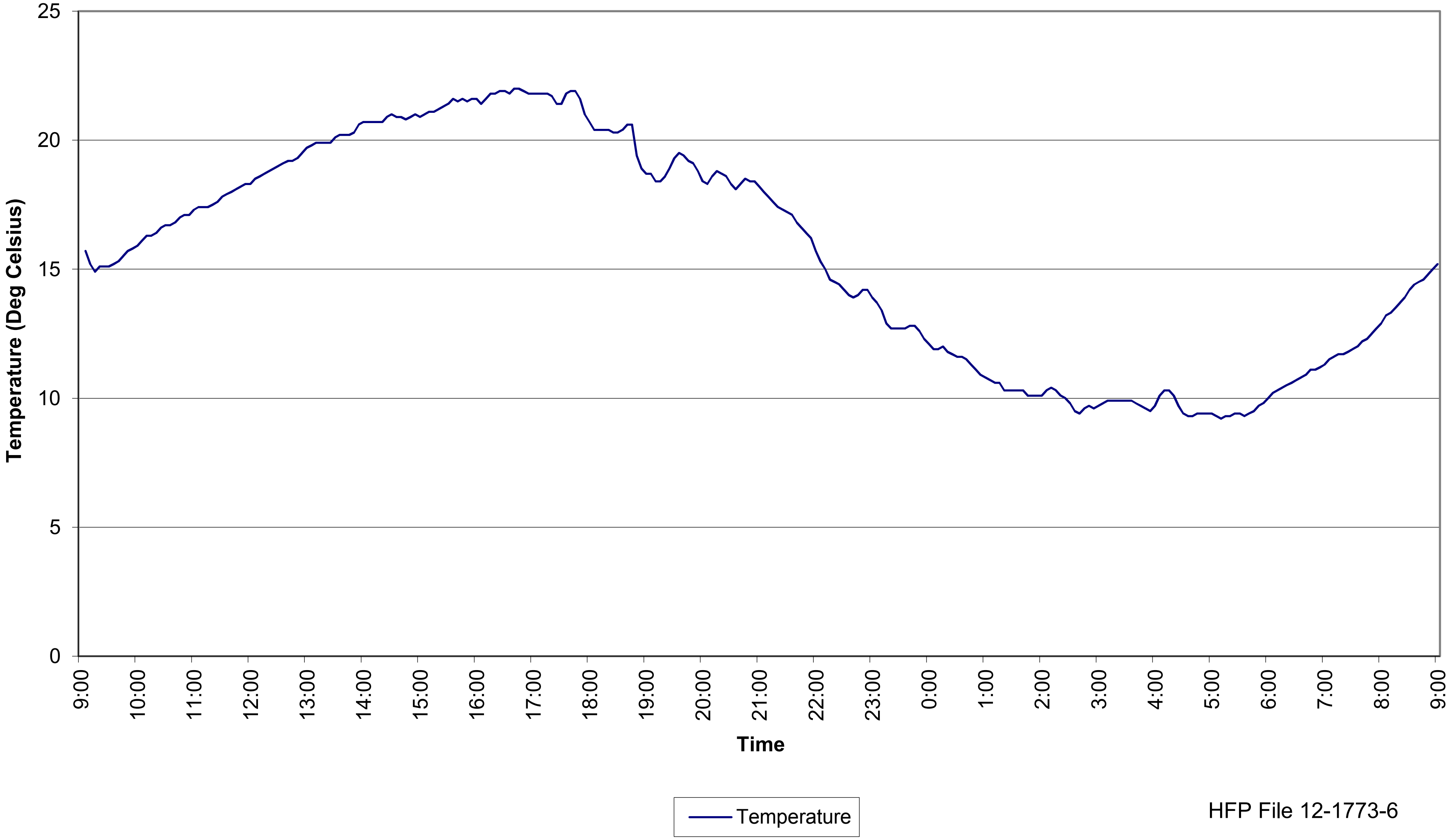
HFP File 12-1773-6

APPENDIX C

METEOROLOGICAL DATA

Figure C1.1a

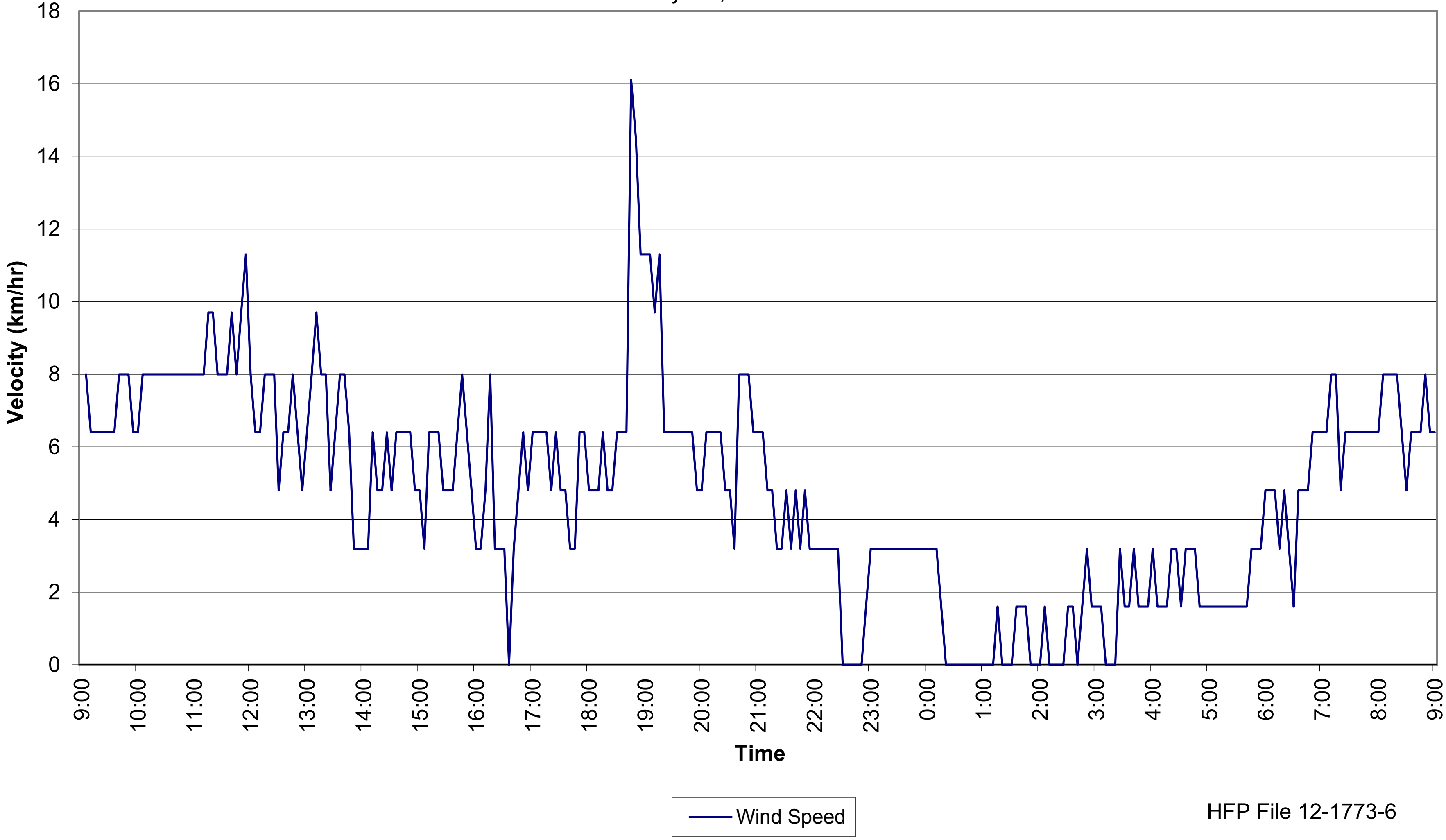
NCIA - 2012 Noise Monitoring
Location #5
Temperature 5-Minute Average
July 5-6, 2012



HFP File 12-1773-6

Figure C1.1b

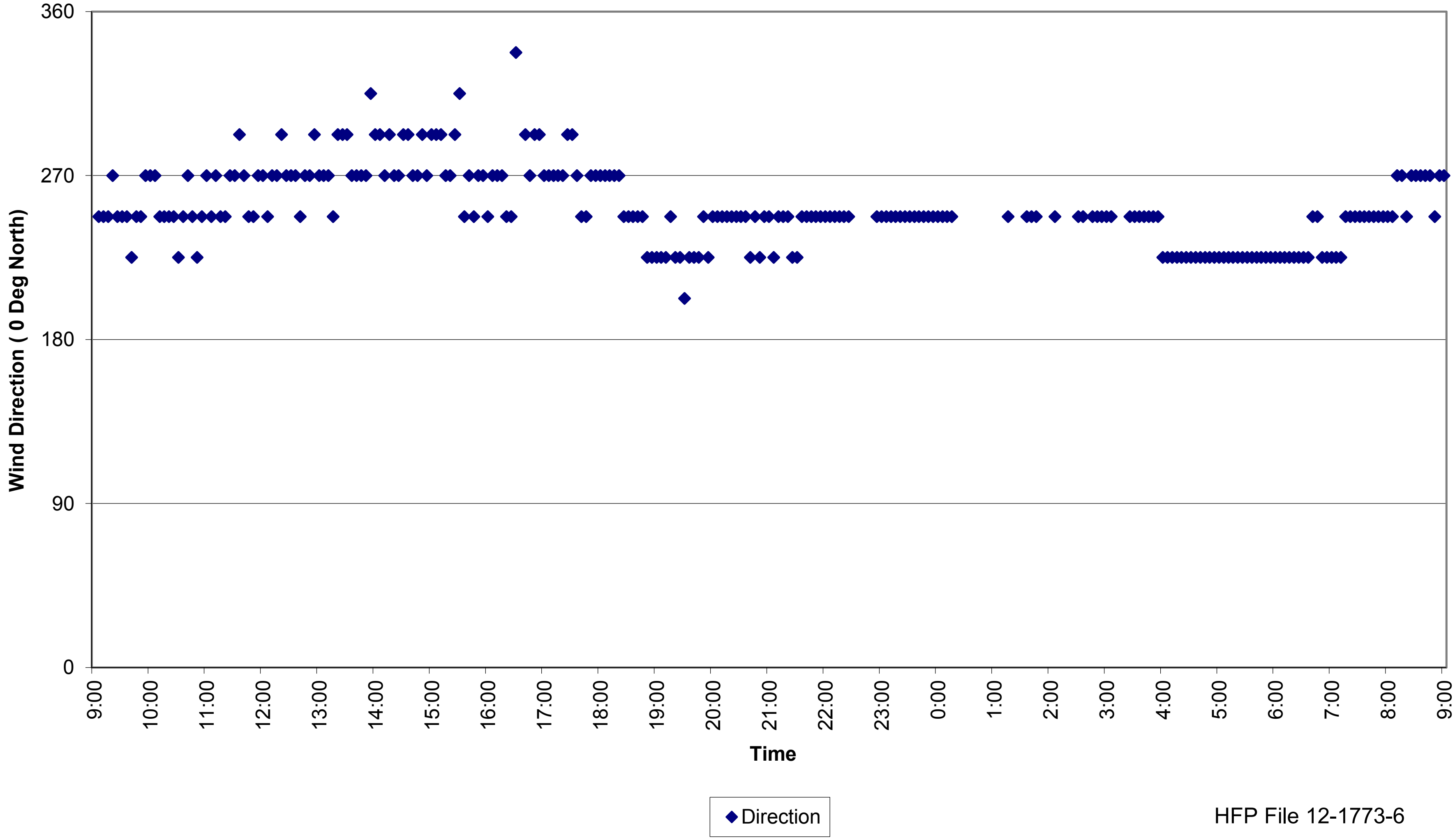
NCIA - 2012 Noise Monitoring
Location #5
Wind Speed 5-Minute Average
July 5-6, 2012



HFP File 12-1773-6

Figure C1.1c

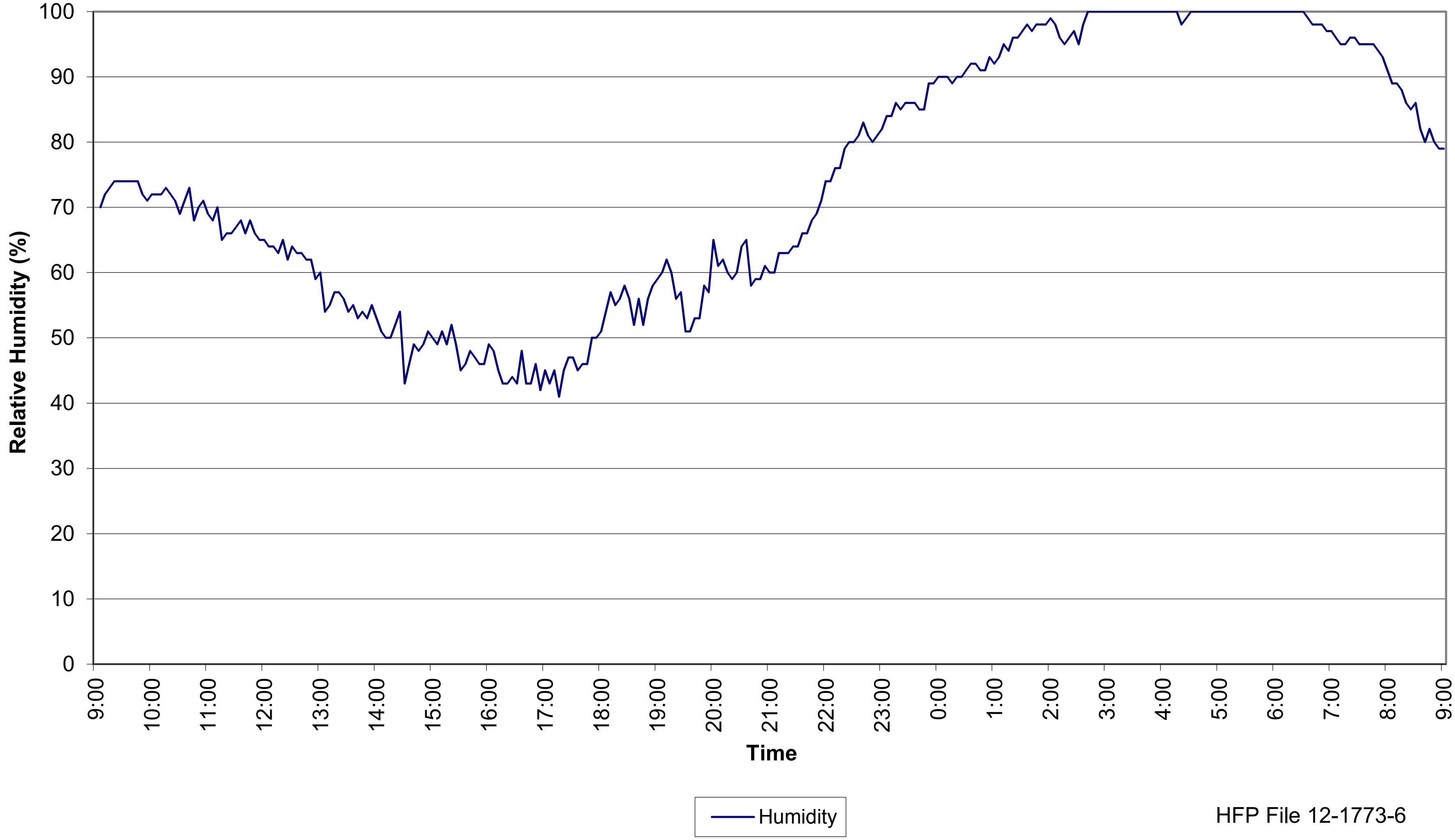
NCIA - 2012 Noise Monitoring
Location #5
Wind Direction 5-Minute Average
July 5-6, 2012



HFP File 12-1773-6

Figure C1.1d

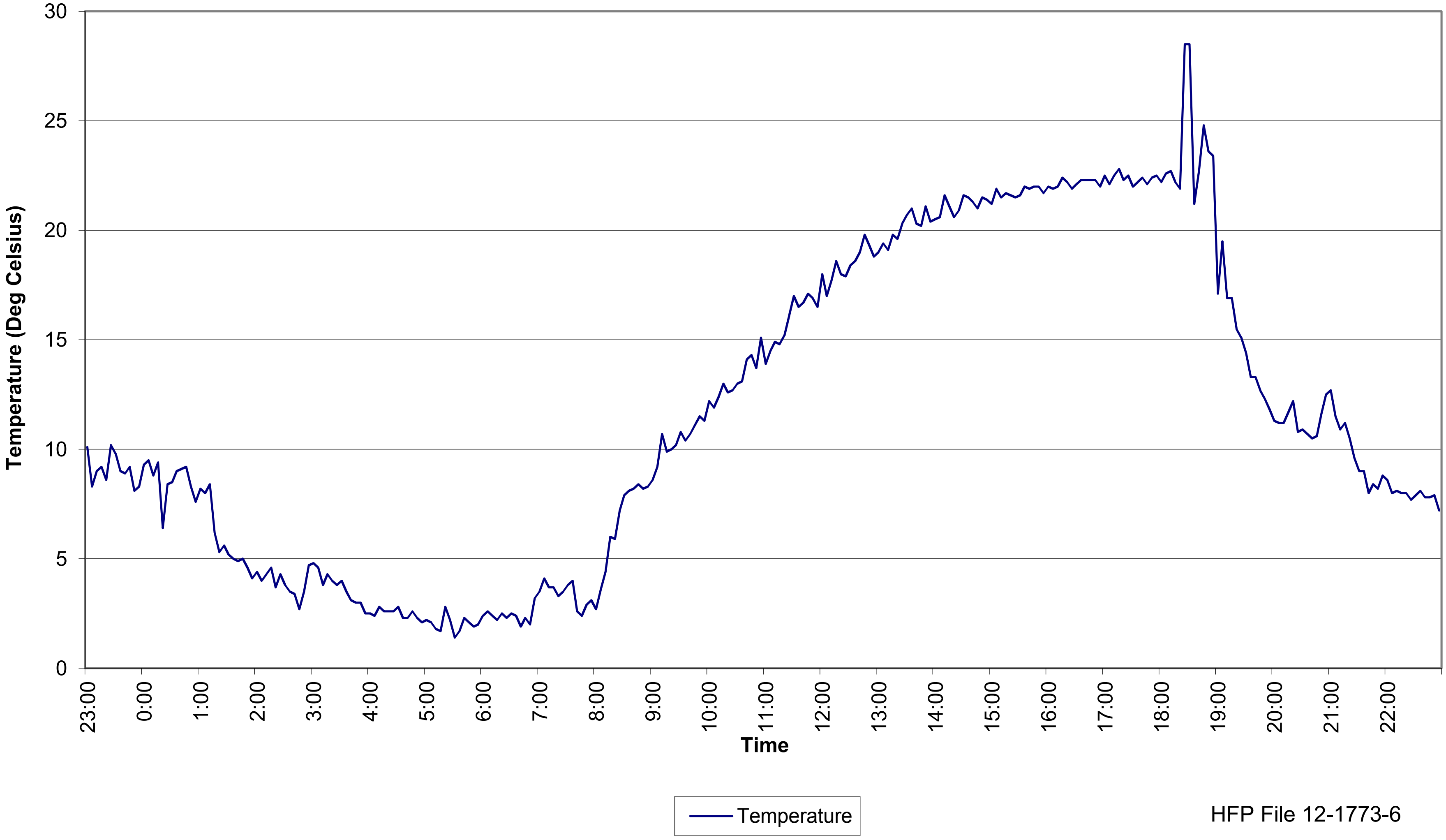
NCIA - 2012 Noise Monitoring
Location #5
Humidity 5-Minute Average
July 5-6, 2012



HFP File 12-1773-6

Figure C2.1a

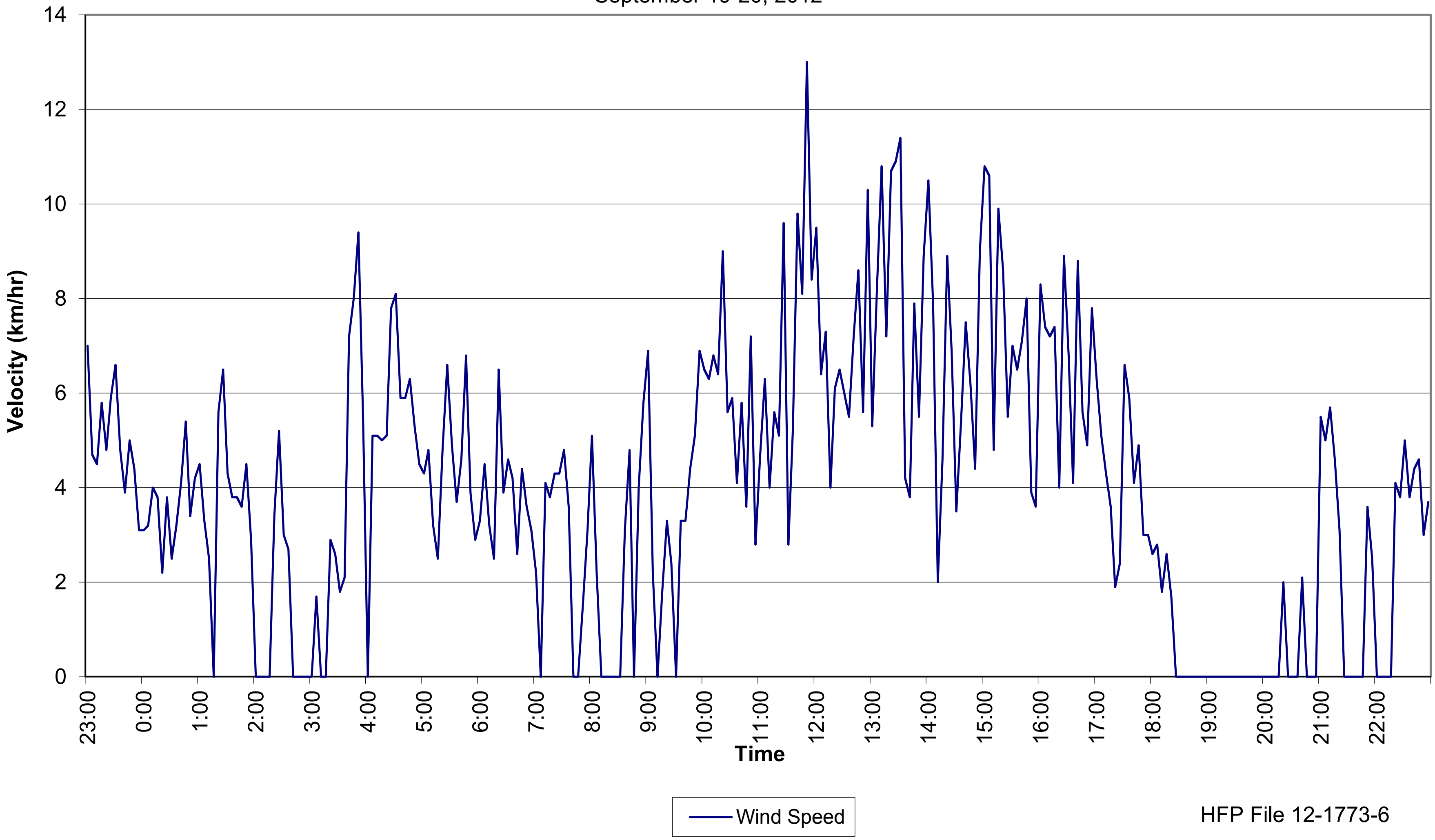
NCIA - 2012 Noise Monitoring
Location #4
Temperature 5-Minute Average
September 19-20, 2012



HFP File 12-1773-6

Figure C2.1b

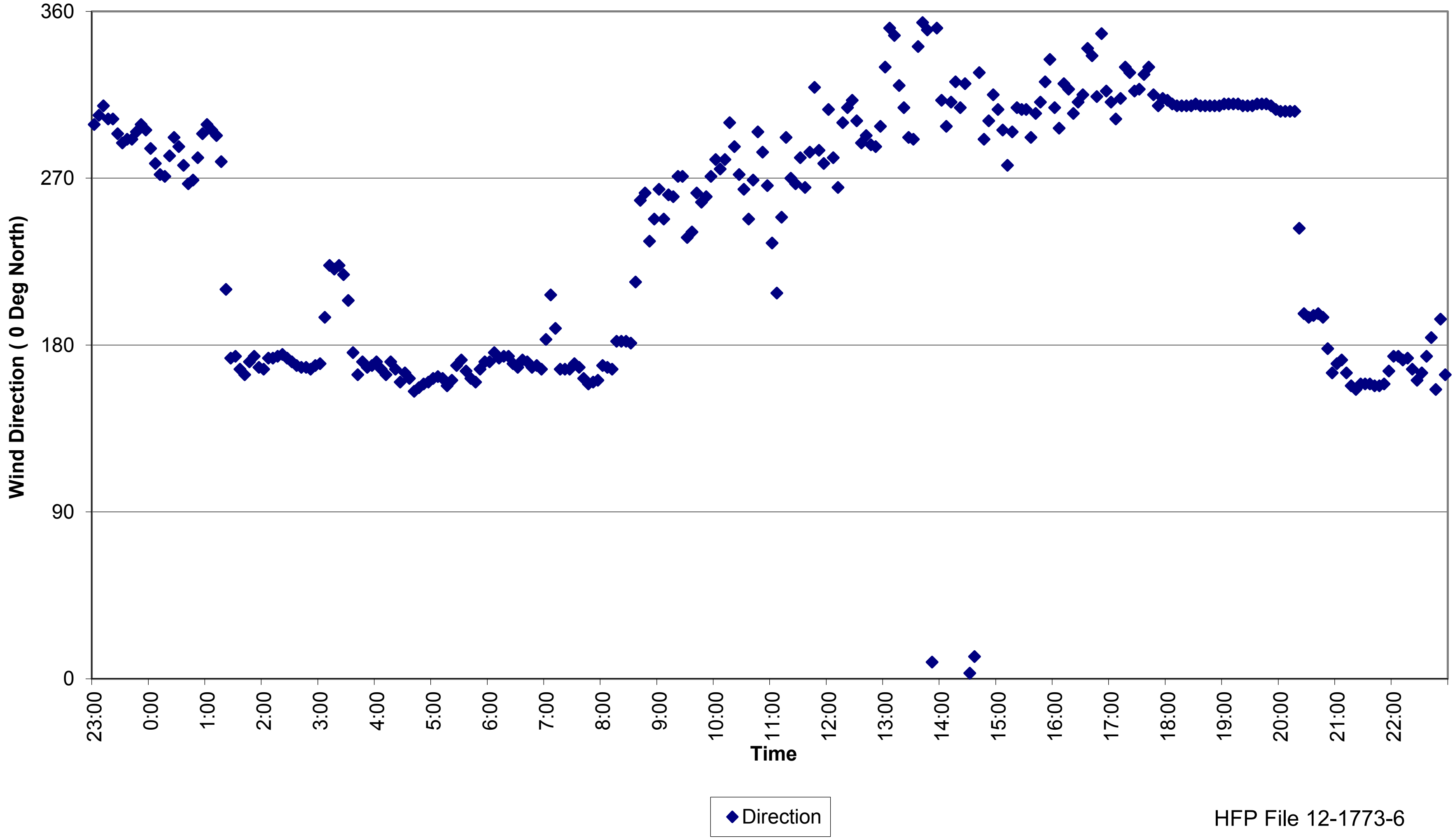
NCIA - 2012 Noise Monitoring
Location #4
Wind Speed 5-Minute Average
September 19-20, 2012



HFP File 12-1773-6

Figure C2.1c

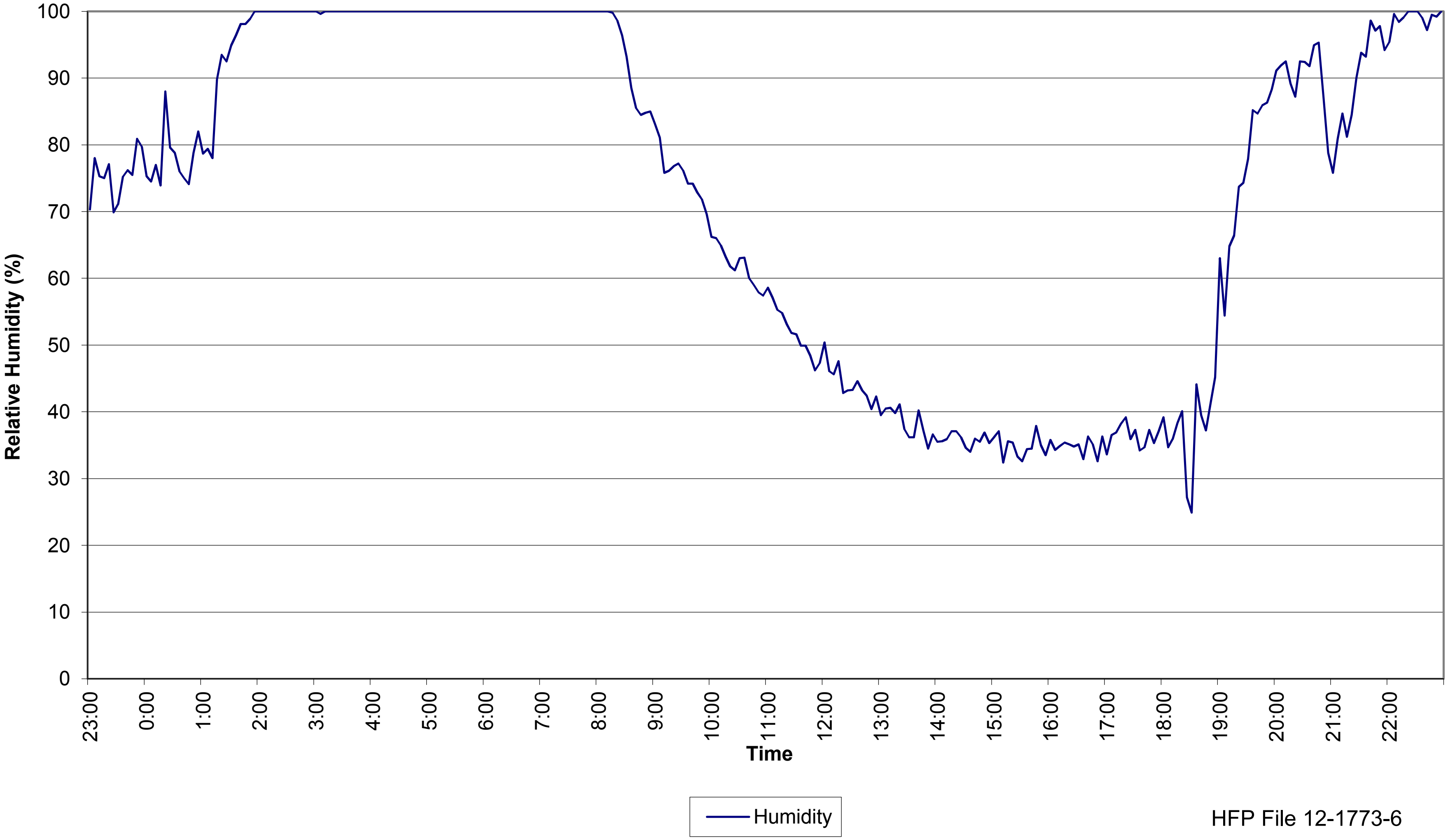
NCIA - 2012 Noise Monitoring
Location #4
Wind Direction 5-Minute Average
September 19-20, 2012



HFP File 12-1773-6

Figure C2.1d

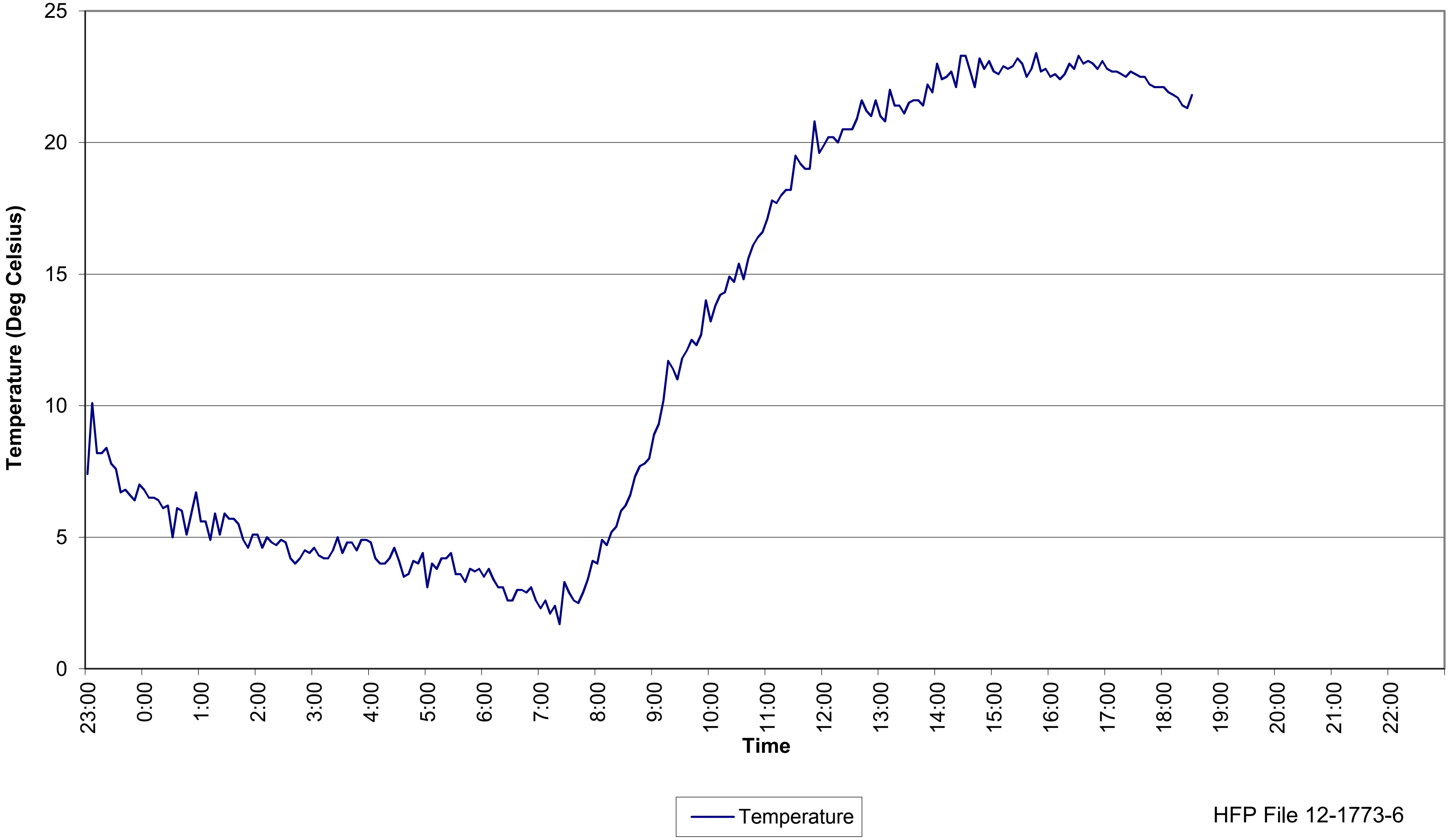
NCIA - 2012 Noise Monitoring
Location #4
Humidity 5-Minute Average
September 19-20, 2012



HFP File 12-1773-6

Figure C2.2a

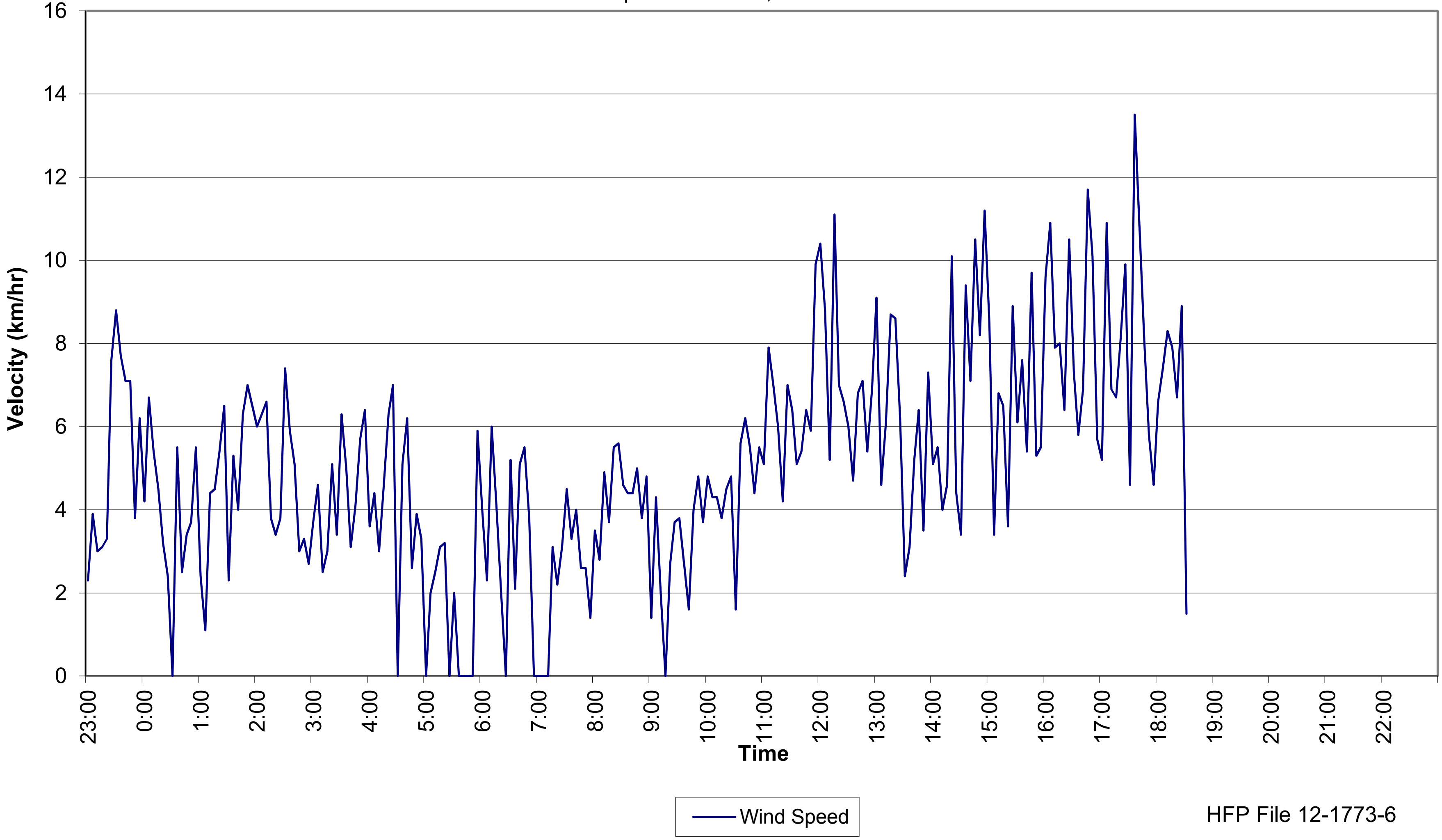
NCIA - 2012 Noise Monitoring
Location #4
Temperature 5-Minute Average
September 20-21, 2012



HFP File 12-1773-6

Figure C2.2b

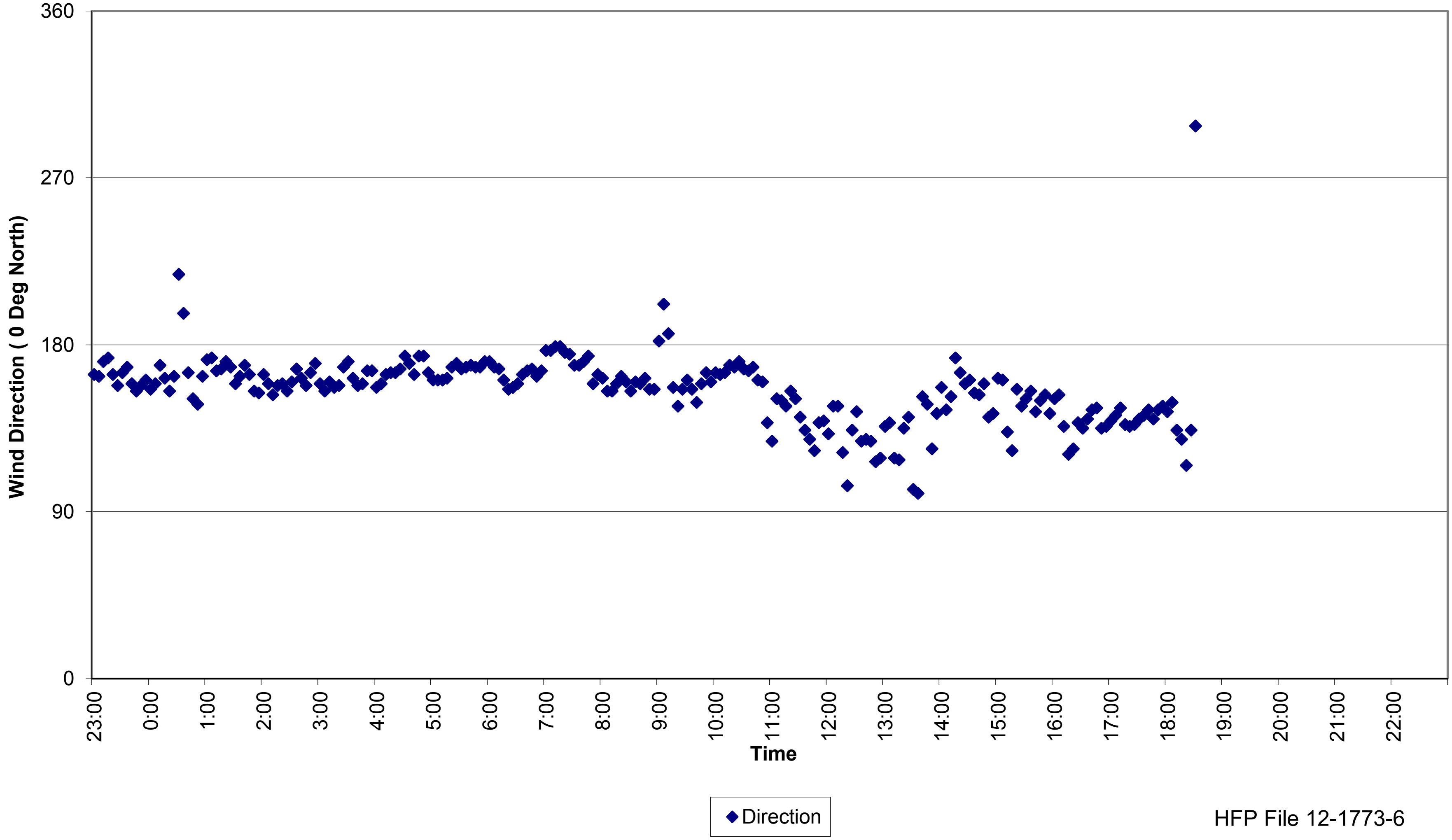
NCIA - 2012 Noise Monitoring
Location #4
Wind Speed 5-Minute Average
September 20-21, 2012



HFP File 12-1773-6

Figure C2.2c

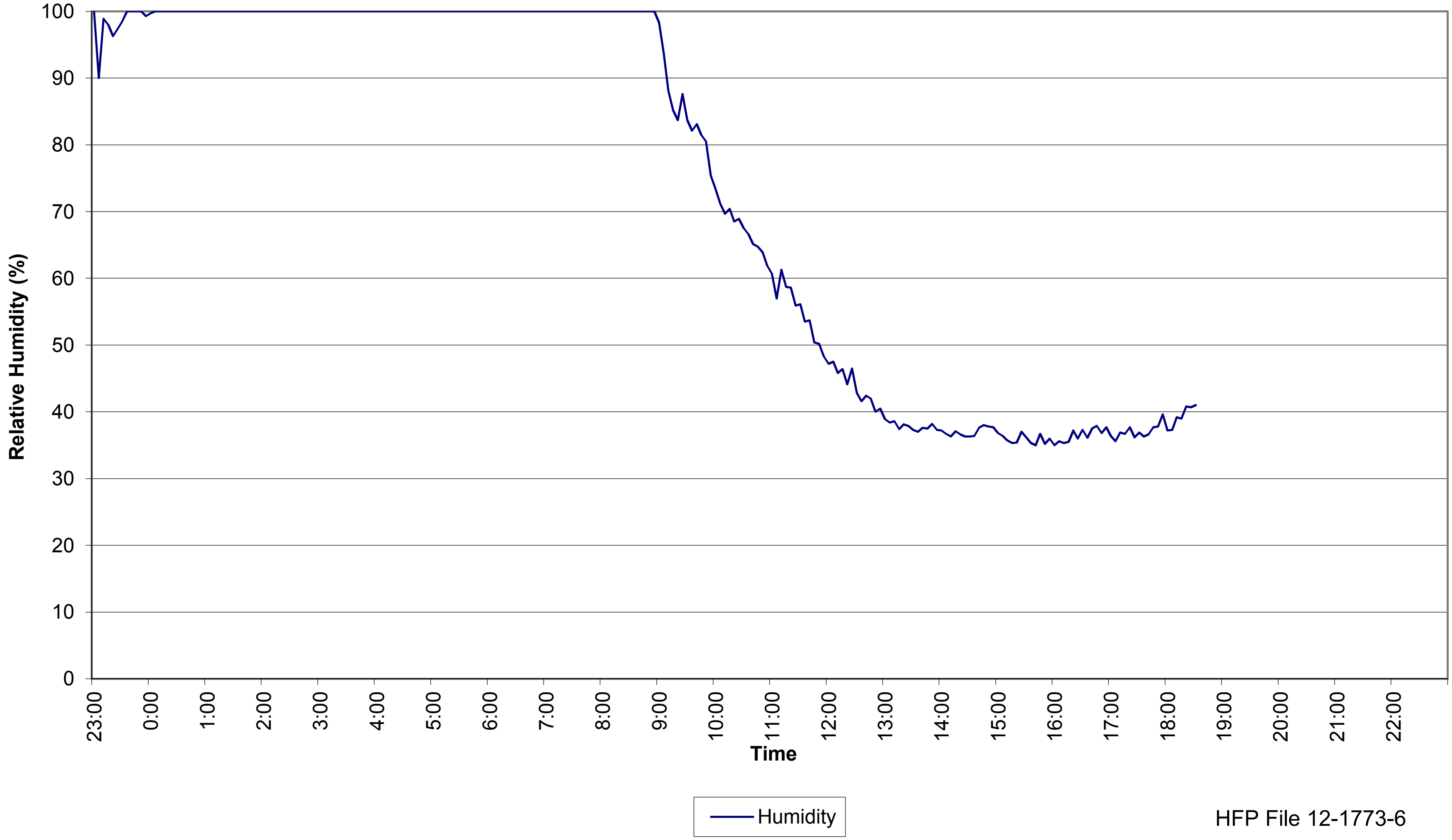
NCIA - 2012 Noise Monitoring
Location #4
Wind Direction 5-Minute Average
September 20-21, 2012



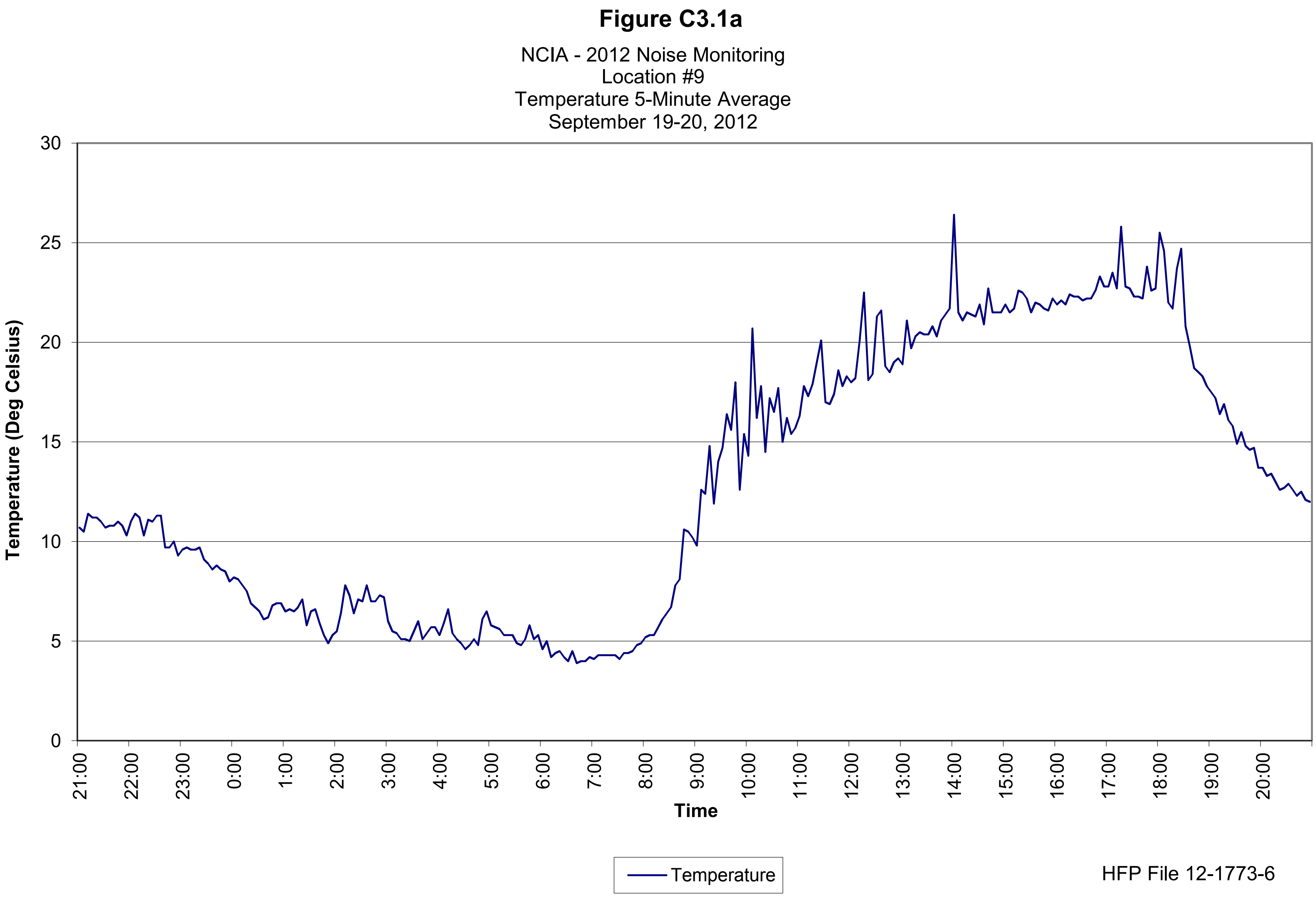
HFP File 12-1773-6

Figure C2.2d

NCIA - 2012 Noise Monitoring
Location #4
Humidity 5-Minute Average
September 20-21, 2012



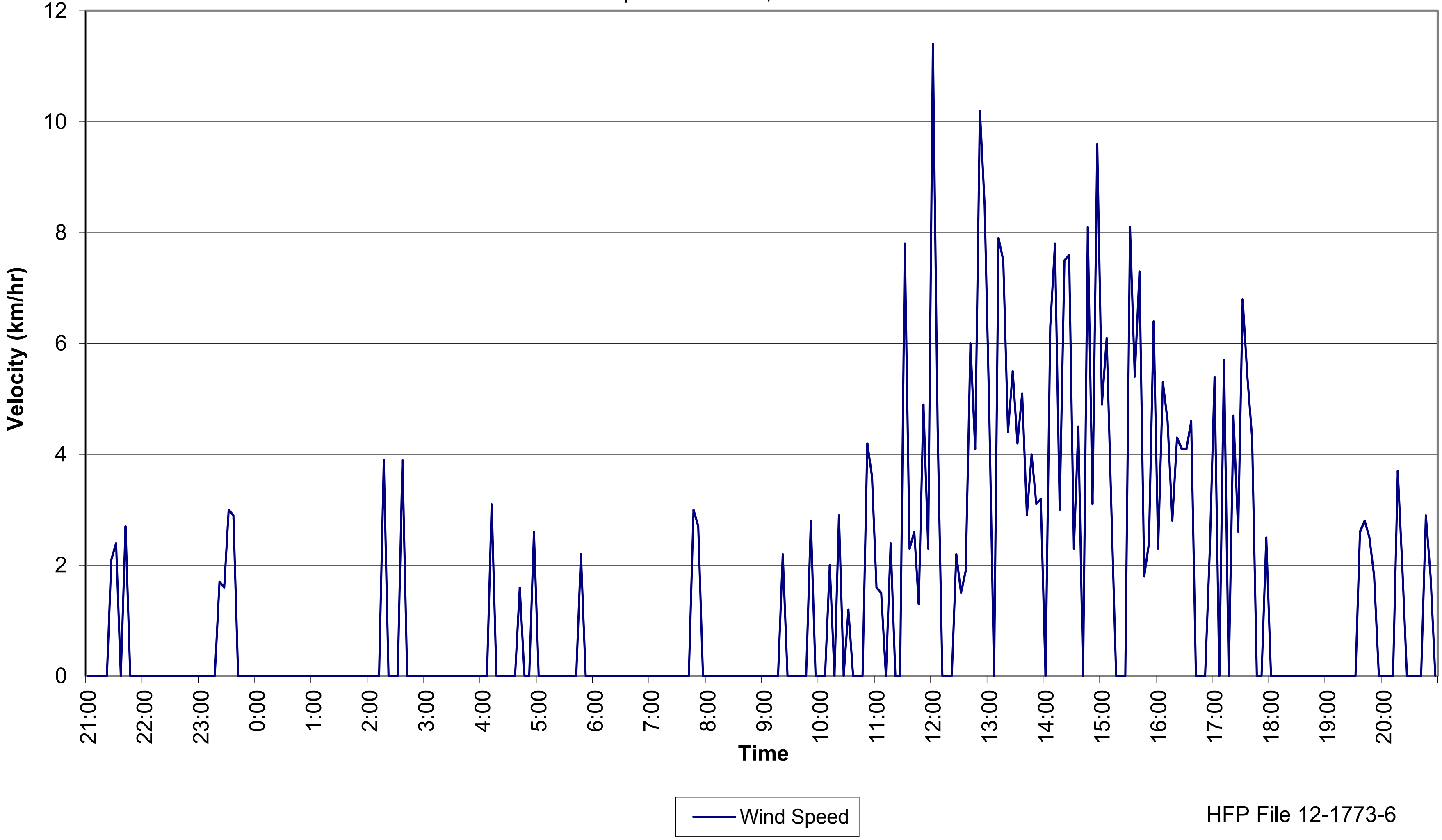
HFP File 12-1773-6



HFP File 12-1773-6

Figure C3.1b

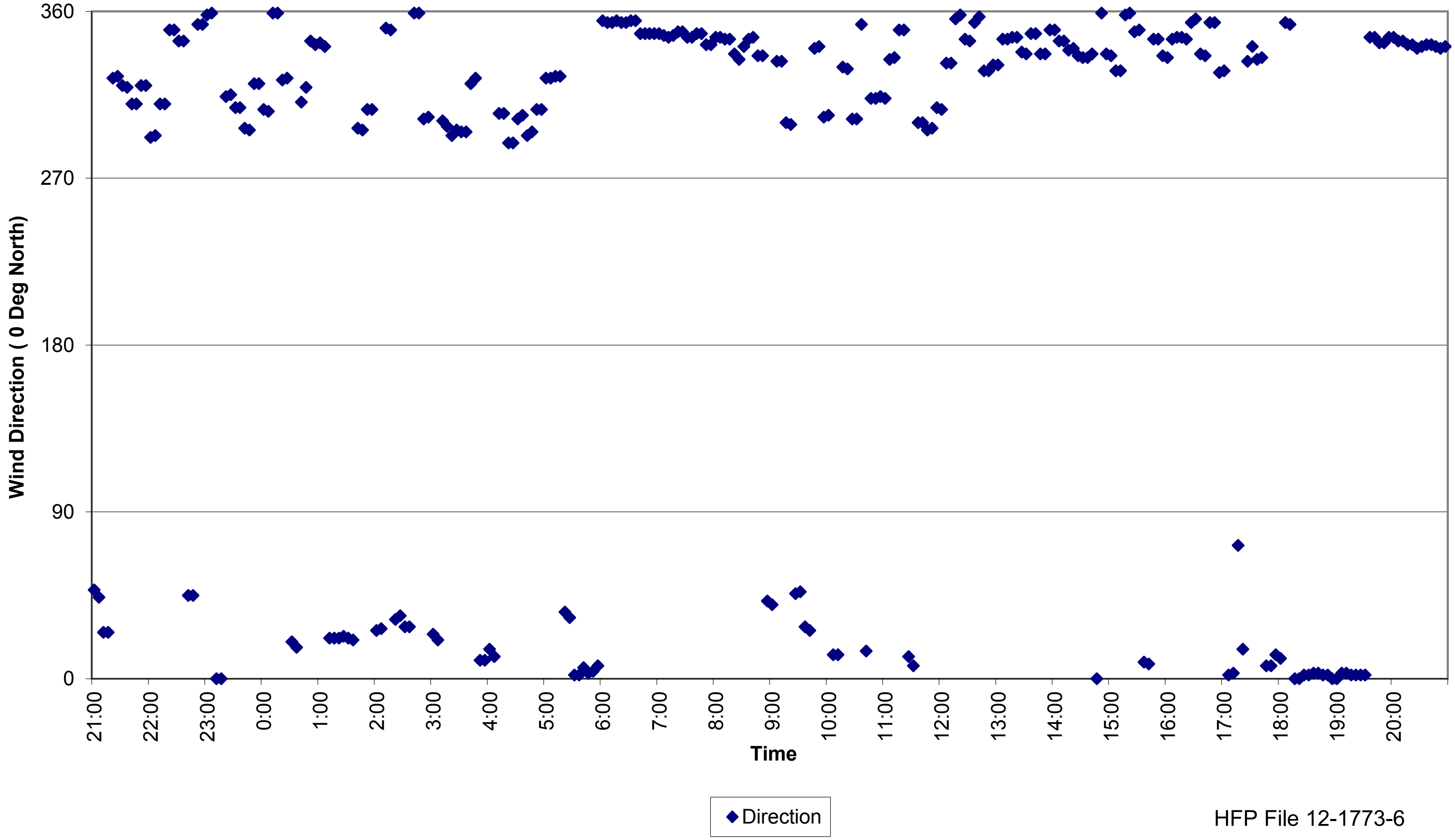
NCIA - 2012 Noise Monitoring
Location #9
Wind Speed 5-Minute Average
September 19-20, 2012



HFP File 12-1773-6

Figure C3.1c

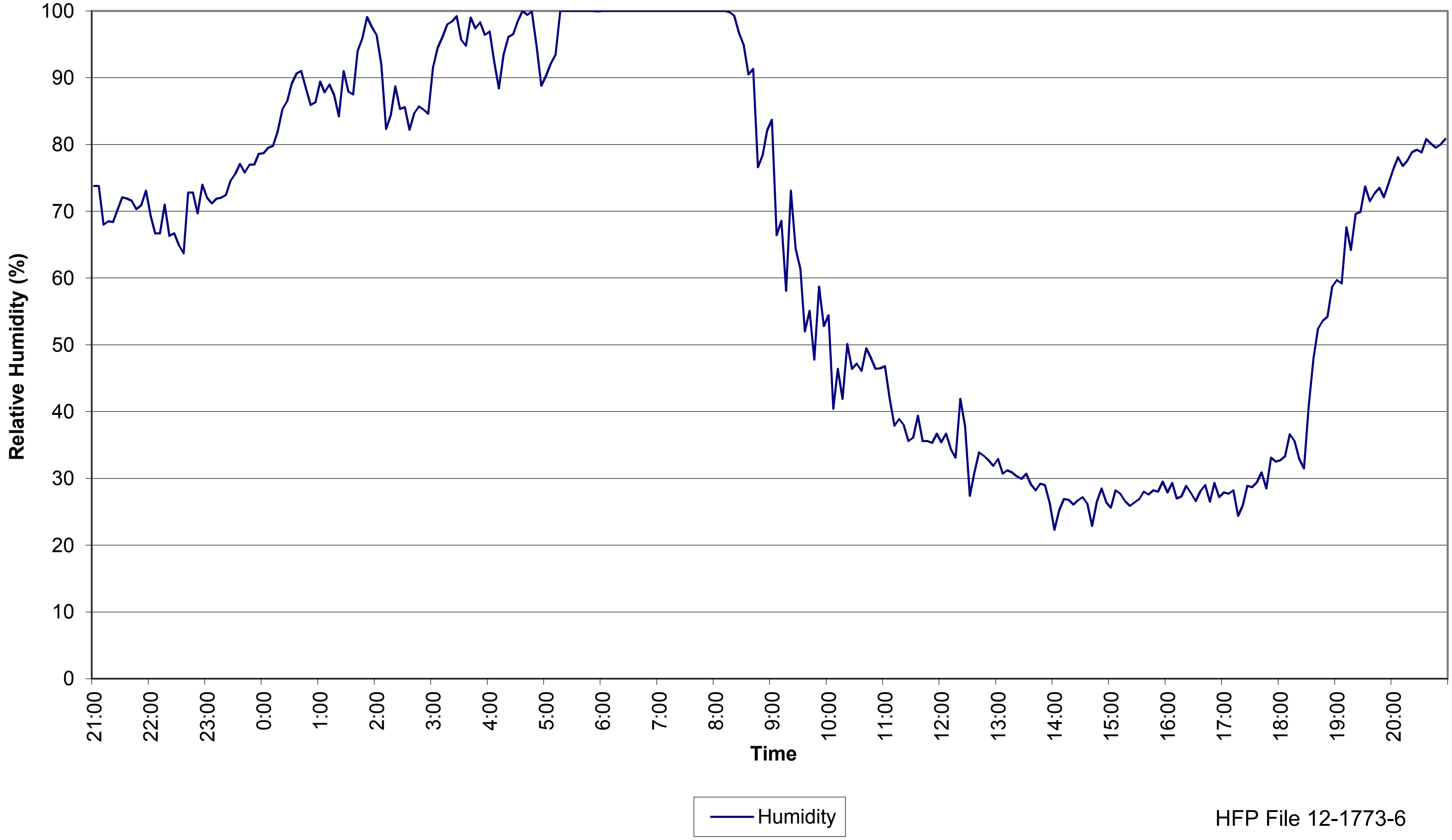
NCIA - 2012 Noise Monitoring
Location #9
Wind Direction 5-Minute Average
September 19-20, 2012



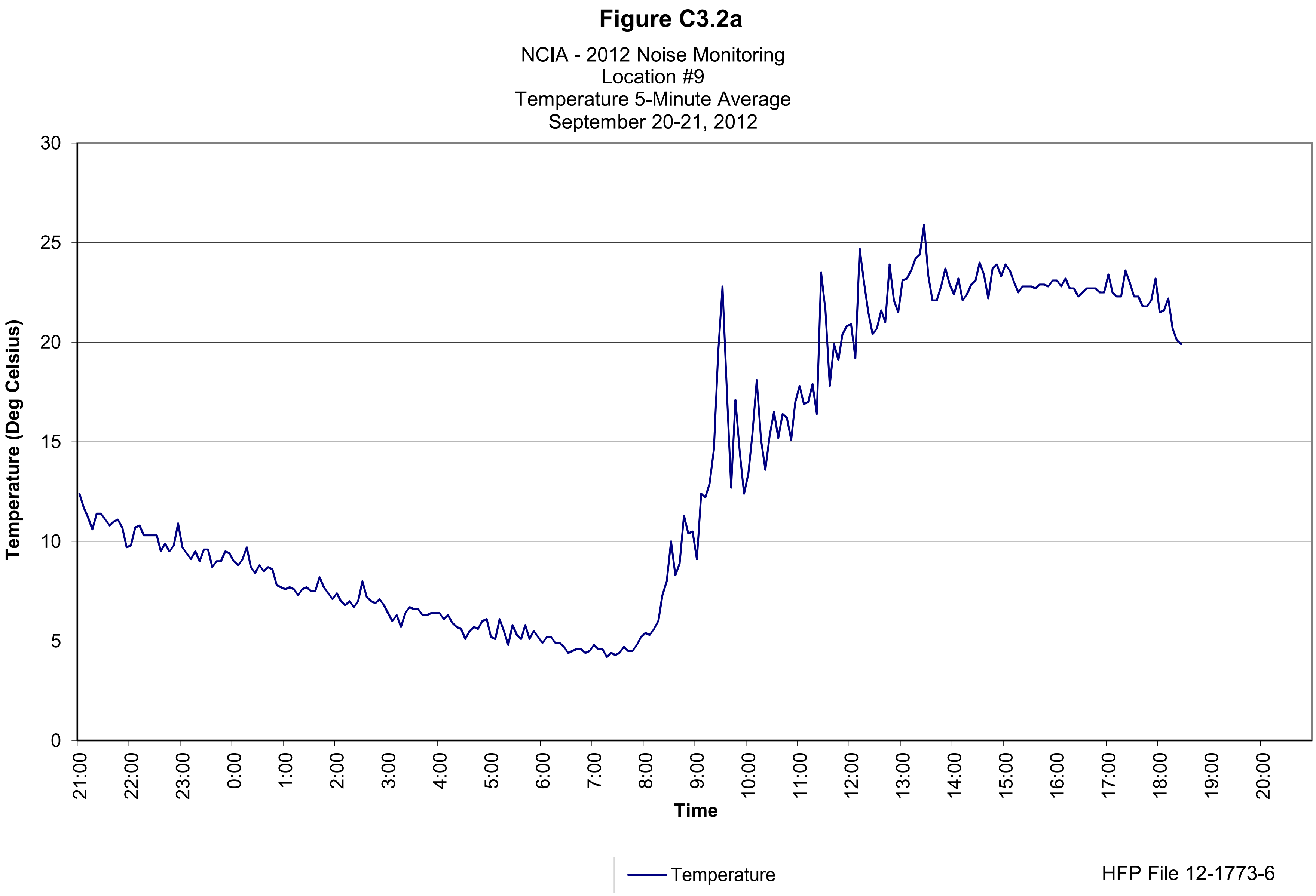
HFP File 12-1773-6

Figure C3.1d

NCIA - 2012 Noise Monitoring
Location #9
Humidity 5-Minute Average
September 19-20, 2012

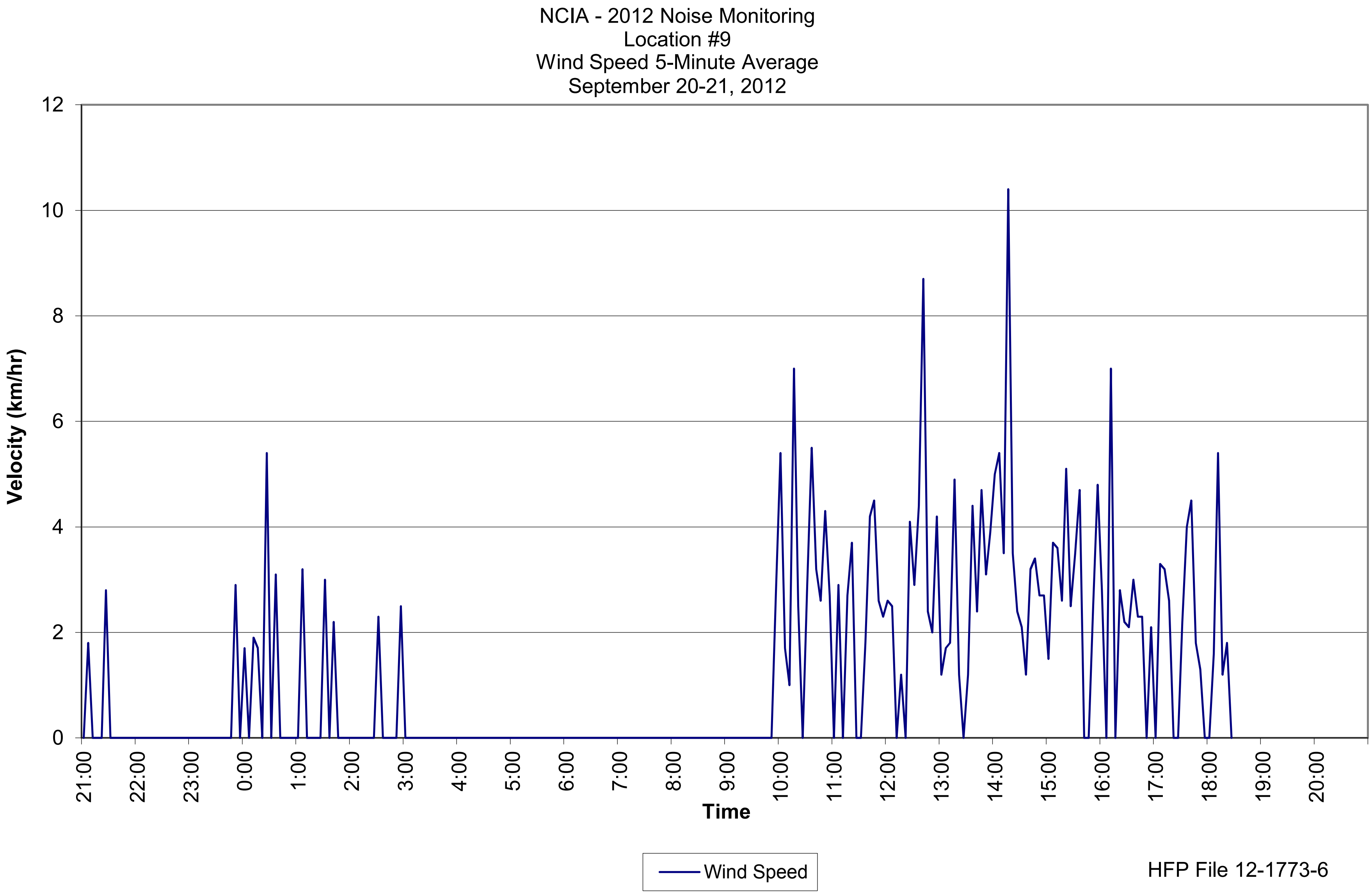


HFP File 12-1773-6



HFP File 12-1773-6

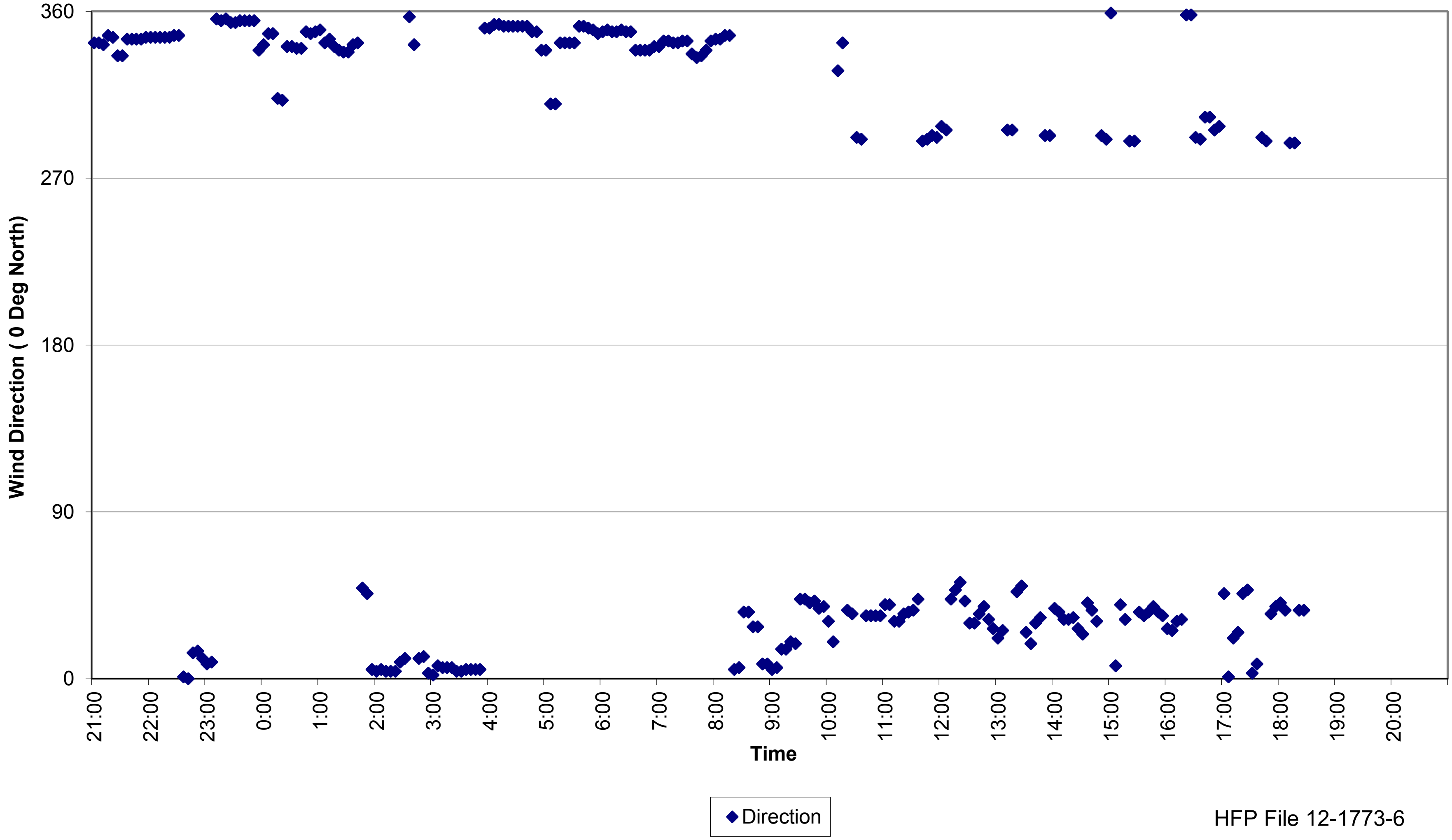
Figure C3.2b



HFP File 12-1773-6

Figure C3.2c

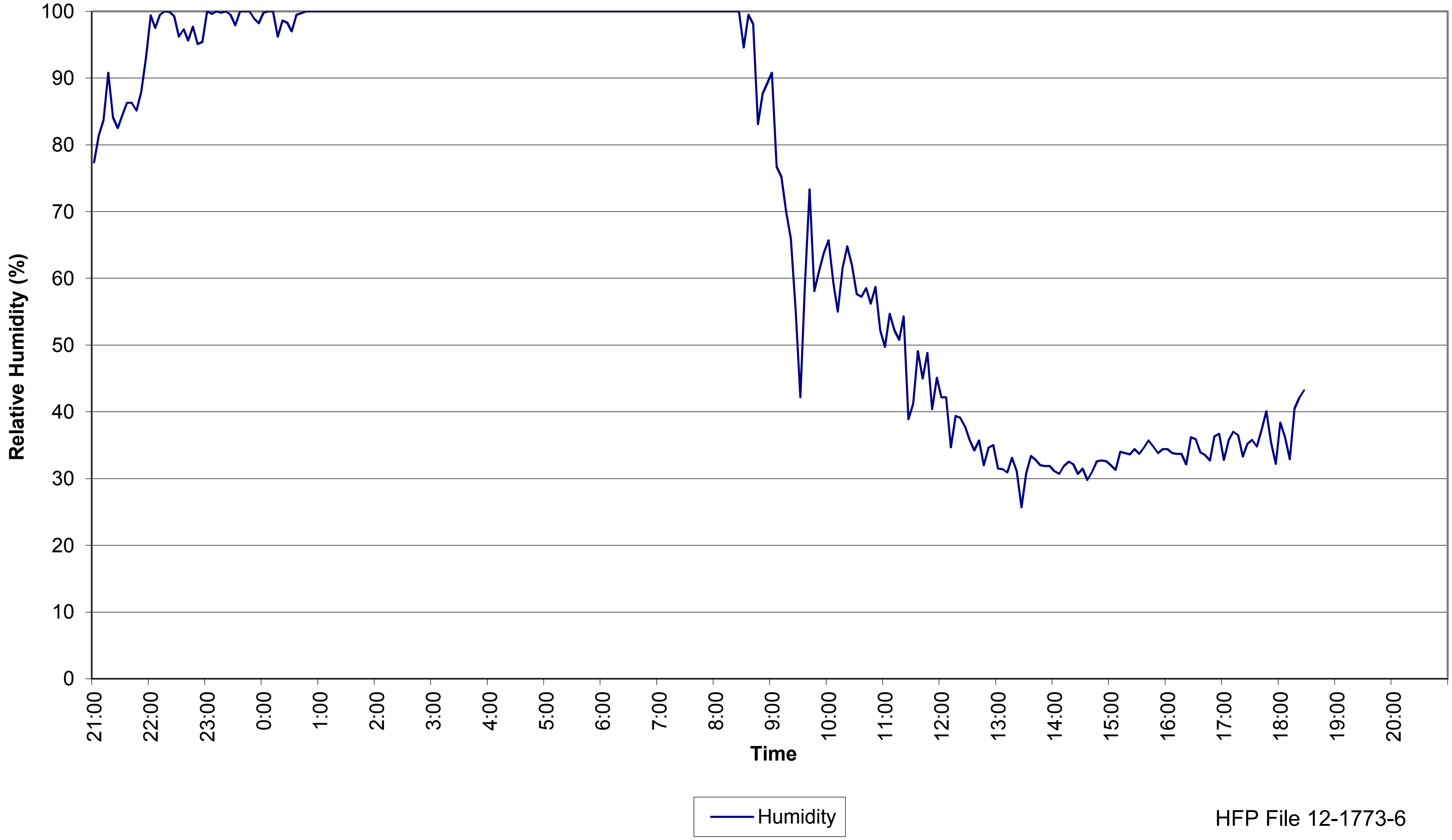
NCIA - 2012 Noise Monitoring
Location #9
Wind Direction 5-Minute Average
September 20-21, 2012



HFP File 12-1773-6

Figure C3.2d

NCIA - 2012 Noise Monitoring
Location #9
Humidity 5-Minute Average
September 20-21, 2012



HFP File 12-1773-6

APPENDIX 3

NCIA MEMBER COMPANY NOISE MANAGEMENT PLAN UPDATES

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 5-Mar-13	Rev. 1

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 2010-002 issued 3-Sep-10, revised 5-Mar-13 (attached), including the Procedure/Practice/Standard reference.	Access Pipeline has not received any noise complaints, and based on a 2009 Noise Impact Assessment is operating under all guideline levels. The 2009 Noise Impact Assessment was conducted to provide updated information regarding noise at the Sturgeon Terminal, but was not a regulatory requirement.
Attach results of any monitoring/assessments (fenceline outward) completed in 2012.	N/A
Disclose any improvements/corrective actions implemented in 2012 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.	N/A no actions were taken in 2012.
Disclose any improvements/projects that are planned for 2013 that would impact the noise level output for your site (either up or down); including any updates to your site noise model.	Additional traffic will be accessing site with the new truck loading project planned. Not sure the total impact, if any, to the noise level output for the site.
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 2012 including any actions taken to address them.	No noise complaints were received in 2012.

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.

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 2012.	Agrium completed quarterly offsite checks of it's 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 2012 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.	No noise mitigation was completed in 2012.
Disclose any improvements/projects that are planned for 2013 that would impact the noise level output for your site (either up or down); including any updates to your site noise model.	No projects are planned for 2013.
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 2012 including any actions taken to address them.	There were no recorded noise complaints for either Agrium Redwater or Fort Saskatchewan in 2012.

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.

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** 5-Mar-13	**Rev.** 1

Air Liquide

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 2010-002 issued 3-Sep-10, revised 5-Mar-13 (attached), including the Procedure/Practice/Standard reference.	Yes. Procedure ref. HSEQ-HEA-002
Attach results of any monitoring/assessments (fenceline outward) completed in 2012.	Last survey in 2008
Disclose any improvements/corrective actions implemented in 2012 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.	None.
Disclose any improvements/projects that are planned for 2013 that would impact the noise level output for your site (either up or down); including any updates to your site noise model.	None. We are planning do another survey this year.
Disclose any audit/self-assessment evaluation (qualitative evaluation only, with senior site leader sign-off) completed for your site noise management plan.	Annual survey is conducted. eg. Hearing Protection and conservation program self audit check list.
Provide a Noise Complaint summary for all noise complaints received in 2012 including any actions taken to address them.	None

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.

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** 5-Mar-13	**Rev.** 1

Aux Sable 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 2010-002 issued 3-Sep-10, revised 5-Mar-13 (attached), including the Procedure/Practice/Standard reference.	Aux Sable's design incorporated many features to minimize environmental noise. Aux Sable has not yet implemented the March 5, 2013 Noise Protocol, but are working toward the implementation.
Attach results of any monitoring/assessments (fenceline outward) completed in 2012.	Aux Sable conducted a "fenceline outward" noise assessment in October, 2012 to satisfy a noise assessment for a future business development project. The October, 2012 assessment provided almost exact results to results that were previously submitted
Disclose any improvements/corrective actions implemented in 2012 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.	None.
Disclose any improvements/projects that are planned for 2013 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.	None.
Provide a Noise Complaint summary for all noise complaints received in 2012 including any actions taken to address them.	Aux Sable has had zero noise complaints.

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.

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** 5-Mar-13	**Rev.** 1

Add your Company Name Here

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 2010-002 issued 3-Sep-10, revised 5-Mar-13 (attached), including the Procedure/Practice/Standard reference.	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). Action item: K. Dragowska to obtain Standard 2010-002 from NCIA.
Attach results of any monitoring/assessments (fenceline outward) completed in 2012.	A report was submitted via email on December 31, 2012 and another report with respect to our Pneuveyor project was sent via email on January 2, 2013.
Disclose any improvements/corrective actions implemented in 2012 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.	A full report was sent via email on January 2, 2013.
Disclose any improvements/projects that are planned for 2013 that would impact the noise level output for your site (either up or down); including any updates to your site noise model.	No improvements/projects that would impact the noise level output of both the CSC and Sulphides facilities are planned for 2013. The site noise model of both sites will remain the same.
Disclose any audit/self-assessment evaluation (qualitative evaluation only, with senior site leader sign-off) completed for your site noise management plan.	Submitted via email on August 16th, 2013
Provide a Noise Complaint summary for all noise complaints received in 2012 including any actions taken to address them.	No complaints have been received in 2012.

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.

CHEMTRADE

RESPONSIBLE CARE CANADA ESHA PROCEDURES			
Title:	**Environmental Noise Management and Control**	**Doc ID:**	**CHE-FSK-ESH-001**
		Rev Number:	**1.0**
Site:	**Fort Saskatchewan CSC & Sulphides**	**Approval Date:**	**December 23, 2011**
Department:	**ESHA**	**Approver:**	**Nola Ruhl**
Area:	**Responsible Care**	**Approver Title:**	**EHS Manager Canada**

1 PURPOSE

1.1 This procedure establishes requirements and guidelines for the identification, evaluation and control of noise impacts.

2 SCOPE

This procedure applies to the Chemtrade Fort Saskatchewan CSC and Sulphides sites.

3 RESPONSIBILITY AND AUTHORITY

3.1 ESHA Representative

3.1.1 The EHS Manager is responsible for maintaining this procedure.

3.2 Management

3.2.1 The Plant Manager of the CSC and Sulphides sites is responsible for maintaining equipment in good condition and avoiding activities which produce unnecessary noise.

3.3 Western Resource Team

3.3.1 The Western Resource Team (Engineering) is responsible for selecting replacement equipment that produces lower noise, where reasonably possible, and for selecting new installation equipment that produces the lowest noise, as reasonably possible.

4.0 DEFINITIONS

4.1 A-Weighted Sound Level or dBA

A measurement of overall Sound Pressure Level which accounts for the frequency content of the measured sound and assesses it with a frequency response similar to that of the human ear.

4.2 C-Weighted Sound Level or dBC

A measurement of overall Sound Pressure Level which accounts for the frequency content of the measured sound and assesses it with a frequency response in the low frequencies.

4.3 Equivalent Continuous Sound Level or Leq

A single number descriptor commonly used for environmental noise measurement and criteria. It is used to quantify sound which constantly varies over time, such as commonly occurring in outdoor environment. It is defined as the average Sound pressure Level over a specific time period that has the same acoustic energy as the actual fluctuating Sound pressure levels during the same time period. Time periods commonly used for Leq measurements and criteria are the daytime (07:00 – 22:00 hours) and night time (22:00 – 707:00 hours) periods.

4.4 Octave
The interval in frequency between two sounds having a frequency ratio of two.

5.0 PROCEDURE:

5.1 Goals and Objectives

The Chemtrade Fort Saskatchewan sites will:

- **5.1.1** Undertake regular monitoring of the existing sites and site equipment to establish what the current noise emission levels are.
- **5.1.2** Minimize noise levels impacting the environment by implementing noise control measures that can be practicably implemented.
- **5.1.3** Maintain an effective noise monitoring program.
- **5.1.4** Educate employees on environmental noise and the potential impact of their job on environmental noise from the sites.

5.2 Monitoring Requirements (commencing in 2012)

5.2.1 General
Three type of monitoring will be performed at the sites:

- 5.2.1.1 Onsite - Occupational noise exposure assessment (every 2 years). An external Consultant is retained for this assessment.
- 5.2.1.2 Onsite – Environmental noise levels (annually). See Attachment A. Key areas around the CSC and Sulphides sites will be monitored. These will include areas where noise-producing equipment is found. Measurements from year-to-year will be compared for changes.
- 5.2.1.3 Offsite – Environmental noise levels (annually). The same locations as those used by HFP Acoustical Consultants in their reports for the CSC (HFP File 08-C 1773-4 September 21, 2010) and Sulphides (HFP File 08-C 1773-4 July 29, 2010) facilities will be used. See 4.2.6.

NOTE: Due to the proximity of Industry and Hwy 15, the perimeter approach to "offsite" monitoring is not done for the Sulphides site (only done at the CSC). Therefore, what is being labelled as "offsite" monitoring at the Sulphides site, is actually within the fence line.

Occasional ad hoc testing may be done under any of these types of testing. These will be recorded and reported as appropriate.

Onsite occupational noise exposure assessments shall be conducted according to the requirements of the Alberta OHS Code, Part 16 Noise Exposure.

Onsite and offsite environmental noise levels shall be capable of measuring the A-weighted (dBA) and/or C-weighted (dBC) continuous energy equivalent sound level (Leq) of steady, intermittent, and fluctuating sounds. It must be able to accumulate the data and calculate the Leqs 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 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.

It is important that the sound level meters used for noise surveys be properly calibrated and functioning. The meter used for onsite measurements will be calibrated immediately before use with an acoustic calibrator.

The sound level meters used for noise measurements made under this directive 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 ANSI S1.40-1984 or latest revision;
- have their calibration confirmed immediately after each measurement session using the same calibrator and a record of calibration results must be included in the report; and
- be calibrated by the instrument manufacturer, an authorized instrument calibration facility, or another agency within a two-year period immediately preceding the measurements. Records of calibration must be maintained, although formal calibration certificates are not necessary. 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.

5.2.2 Measurement Limitations

Monitoring must be completed while specific variables are within adequate levels to achieve uncompromised data.

5.2.2.1 Wind Direction

Measurement shall be taken downwind. For approximate measurement locations for specific wind direction, reference tables 1 and 2 later in this document.

5.2.2.2 Wind Speed

Measurements should be completed when wind speed does **not exceed 5 km/hr**. Greater wind speeds generate skewed noise measurement.

5.2.2.3 External Noise Sources

External noise sources shall be avoided, where possible, as these may skew measurement data.

5.2.3 Monitoring Measurements

Measurements will include:

1. Sound Pressure Level – A-weight (dBA)
2. Sound Pressure Level – C-weight (dBC)
3. Wind direction (degrees)
4. Wind Speed (km/hr)
5. Time of Day

5.2.4 Information Management

Measurements will be captured in documents for CSC Noise Monitoring Data and Sulphides Noise Monitoring Data, located on the Chemtrade Document Management System (DMS) Sharepoint site located at http://portal.chemtradeglobaldata.com/. Data will be posted in read-only documents under each site in the ESHA folder under General Information > Noise Monitoring.

5.2.5 Communication

If sound pressure levels are in excess of 75 dBA or if the difference in dBA and dBC measurements is greater than 20 dB, an incident must be recorded in the Chemtrade Information Management System (IMS) as a near miss environmental noise complaint. An investigation shall be conducted to determine the cause.

5.2.6 Offsite Monitoring Locations

The predominant wind speed and direction in the area is 9.5 kph (based on 2010 data) and WNW or 281.25° to 258.75° (based on data from 1990-2002) measured through the Fort Air Partnership monitoring sites.

Table 1: Sulphides Site Offsite Monitoring Locations (See Attachment A)

No	Description	UTM Coordinates	
		UTM Easting	UTM Northing
1	Between workshop and cylinder fill building.	356445.3	5954485.2
2	West of office, south of liquid sulphur pump.	356398.0	5954486.4
3	Crossing flare stack north and pump house west.	356374.2	5954532.1
4	Crossing hot oil building west and pump house north.	356396.9	5954531.4
5	Crossing hot oil building west and 5m west of building 33	356418.8	5954530.5
6	10 m north of west side of cylinder fill building	356449.5	5954514.0
7	West of flare stack, side of road.	359852.8	5967288.2

NOTE: Due to the proximity of Industry and Hwy 15, the perimeter approach to "offsite" monitoring is not done for the Sulphides site (only done at the CSC). Therefore, what is being labeled as "offsite" monitoring at the Sulphides site, is actually within the fence line.

These are shown on the Sulphides Plot Plan at the end of this document.

Table 2: CSC Site Offsite Monitoring Locations (See Attachment A)

No	Description	UTM Coordinates	
		UTM Easting	UTM Northing
1	West corner of site		
2	Southwest side of site √		
3	South of site		
4	Southeast side of site		
5	East corner of site		
6	Northeast side of site		
7	North corner of site		
8	North-Northwest side of site		
9	West-Northwest side of site		

These are shown on the CSC Plot Plan at the end of this document.

Selection criteria for monitoring locations is that these were the same locations used for the baseline noise assessment in 2010.

5.3 Noise Abatement

The Western Resource Team will assist in researching and implementing feasible and established engineering controls to minimize and/or eliminate noise.

Equipment alterations including elimination (i.e.: removal of the equipment), engineering controls (i.e.: the addition or removal of something to make equipment quieter) and administrative control (i.e.: running the equipment differently to reduce noise) are all addressed through the Chemtrade Management of Change (MOC) process which includes a review of noise impacts.

Additional noise and the litigation of noise will be considered for all new projects as well as projects where there may be an opportunity to upgrade or retrofit equipment for noise mitigation.

5.4 Self Assessments

The EHS Manager reviews the Noise Management Program annually. This includes an examination of noise survey results, a review any noise complaints and their follow-up, review of worker training records and review of capital projects and changes made which may impact environmental noise from either facility.

5.5 Reporting

An annual report is generated for the Northeast Capital Industrial Association (NCIA) and submitted within the calendar year. This report will include at a minimum:

- Results of monitoring for the reporting year (qualitative evaluation),
- Improvements/corrective action(s) implementation status,
- Additions and projects,
- An evaluation of the self assessment for the year (senior site sign off), and
- A summary of any noise complaints and actions taken.

6.0 TRAINING

Personnel conducting noise monitoring must review this procedure, the ERCB Directive 38 and the manual on the operation of the noise monitor being used.

Employees at the CSC and Sulphides sites must complete the Fort Saskatchewan Noise Monitoring Module on the Chemtrade Total Learning Management (TLM) system. This module covers a review of this procedure and ERCB Directive 38.

Training will be conducted and recorded through the Chemtrade "The Learning Manager" (TLM) system.

7.0 RECORD REQUIREMENTS

7.1 General Records

Records of testing, weather data, and reports must all be filed together and retained for at least 2 years.

7.2 Information Related to a Noise Complaint

All records relating to a complaint must be kept a minimum of 2 years.

7.3 Training Records

Training records must be maintained a minimum of 3 years within the TLM system.

7.4 Calibrations and Repairs to Noise Monitors

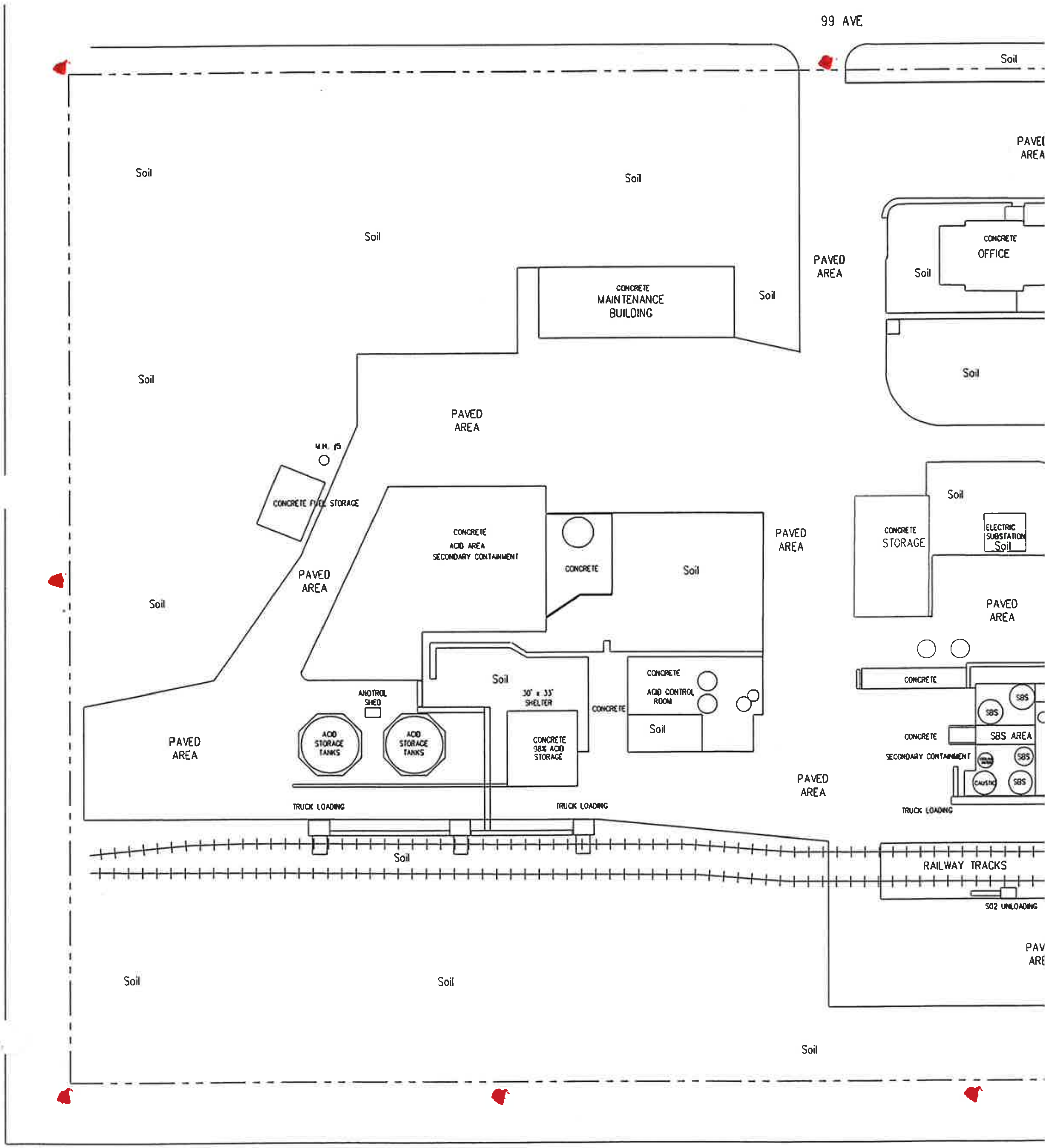
Records of calibration and repairs of noise monitors must be kept a minimum of 2 years.

8.0 ASSOCIATED DOCUMENTS

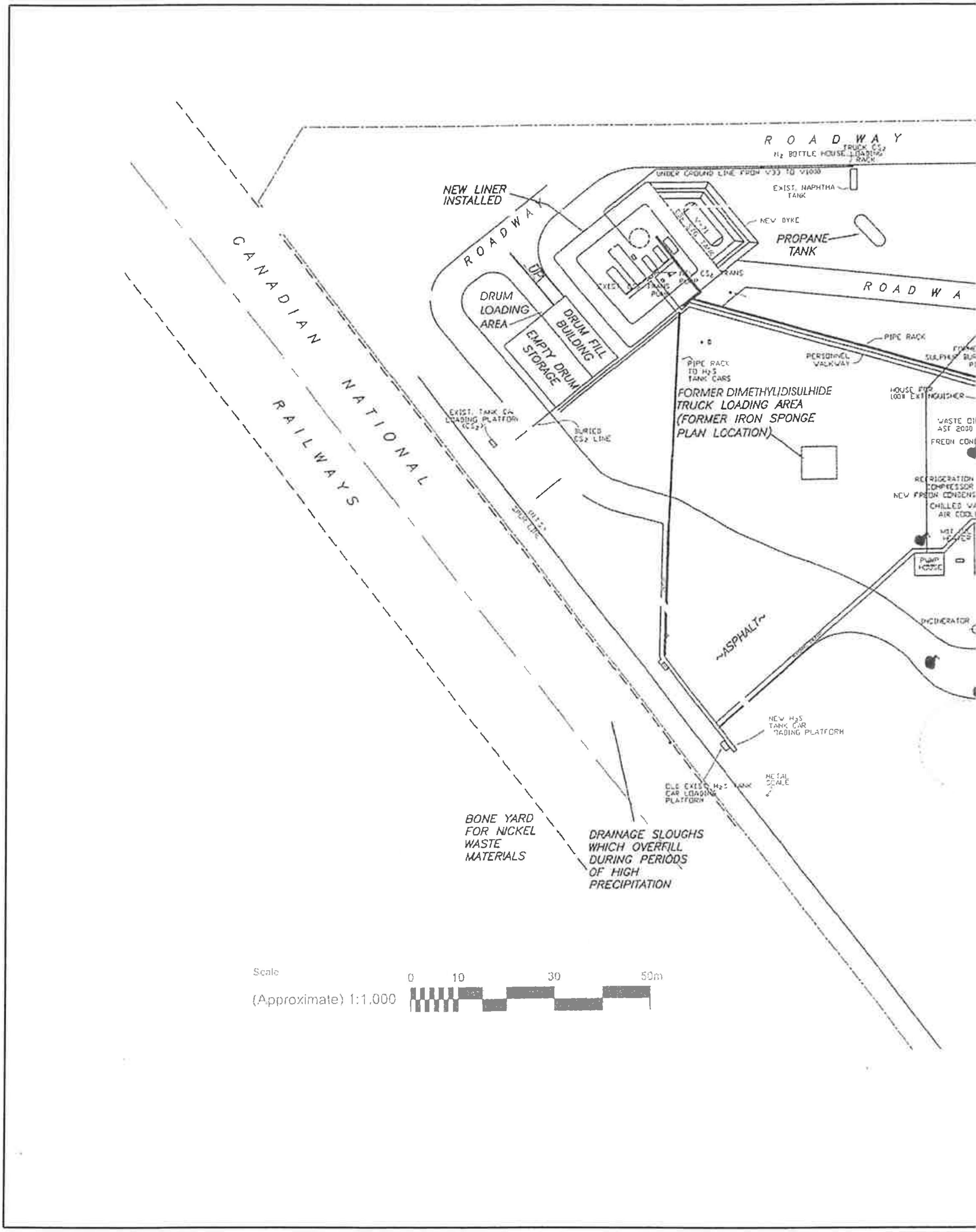
8.1 NCIA Document 2010-00 *Noise Management Plan* September 3, 2010

8.2 AB OHS Code 2009, Part 16 *Noise Exposure*

8.3 ERCB Directive 38 *Noise Control* February 2007



99 AVE
Soil
PAVED AREA
CONCRETE OFFICE
CONCRETE MAINTENANCE BUILDING
M.H. #5
CONCRETE FUEL STORAGE
CONCRETE ACID AREA SECONDARY CONTAINMENT
CONCRETE
CONCRETE STORAGE
ELECTRIC SUBSTATION
ANOTROL SHED
ACID STORAGE TANKS
30' x 33' SHELTER
CONCRETE 98% ACID STORAGE
CONCRETE ACID CONTROL ROOM
SBS AREA
SBS
CAUSTIC
CONCRETE SECONDARY CONTAINMENT
TRUCK LOADING
RAILWAY TRACKS
SO2 UNLOADING


ROADWAY
TRUCK CS2 LOADING RACK
N2 BOTTLE HOUSE
UNDER GROUND LINE FROM V33 TO V1000
EXIST. NAPHTHA TANK
NEW LINER INSTALLED
NEW DYKE
PROPANE TANK
ROADWAY
ROADWAY
DRUM LOADING AREA
DRUM FILL BUILDING
EMPTY DRUM STORAGE
CANADIAN NATIONAL RAILWAYS
PIPE RACK
PERSONNEL WALKWAY
PIPE RACK TO H2S TANK CARS
FORMER DIMETHYL)DISULHIDE TRUCK LOADING AREA (FORMER IRON SPONGE PLAN LOCATION)
EXIST. TANK CAR LOADING PLATFORM (CS2)
BURIED CS2 LINE
PUMP HOUSE
INCINERATOR
~ASPHALT~
NEW H2S TANK CAR LOADING PLATFORM
OLD EXIST. H2S TANK CAR LOADING PLATFORM
METAL SCALE
BONE YARD FOR NICKEL WASTE MATERIALS
DRAINAGE SLOUGHS WHICH OVERFILL DURING PERIODS OF HIGH PRECIPITATION
Scale
(Approximate) 1:1,000
0 10 30 50m

CHEMTRADE

NCIA office, Fort Saskatchewan
#204 9902-102 Street
Fort Saskatchewan, AB
Attn.: Dr. Laurie J. Danielson, P. Chem.
Executive Director, Northeast Capital Industrial Association

January 31, 2013

RE: Environmental Noise Monitoring Results following the pneuveyor overhaul project at the Fort Saskatchewan CSC site

General information

The Meter

A Cirrus Model CR171A Noise Meter was used for all sound measurements. The meter was last calibrated on November 7, 2011 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 on December 28, 2012.

The measurements

Noise measurements were taken by Nola Ruhl on January 25, 2012 and Kathryn Dragowska on January 3, 2013.

Results:

ID/description Date	Linear Sound Pressure Levels (dB L_{eq}) at Octave Band Frequencies (Hz)									dBA
	31.5	63	125	250	500	1000	2000	4000	8000	
23 – Pneuveyor January 25, 2012	73.7	71.5	68.5	77.5	78.8	78.0	84.0	71.7	63.7	86.3
Pneuveyor **January 3, 2013**	71.4	65.5	67.1	66.5	73.3	82.4	79.3	74.8	65.5	84.9
24 – Silencer January 25, 2012	73.1	75.2	69.6	82.5	86.1	90.0	88.8	84.8	81.7	93.7
Silencer **January 3, 2013**	68.0	64.9	63.3	70.9	70.4	68.7	68.1	62.7	58.3	73.8
CSC # 2* (Pneuveyor = OFF) December 28, 2012	72.6	63.8	61.4	63.5	60.4	55.1	50.7	48.0	45.2	61.3
CSC # 2* (Pneuveyor = ON) **January 3, 2013**	71.5	63.8	57.5	63.1	59.8	56.5	51.1	45.4	46.1	61.2
Paved area – West side* (Pneuveyor = ON) **January 3, 2013**	70.6	63.4	58.9	64.3	61.2	58.5	52.8	49.8	52.2	63.2

* Refer to Chemtrade Environmental Noise Monitoring and Control Procedure CHE-FSK-ESH-001

CHEMTRADE

Discussion

In 2012, Chemtrade has overhauled a pneuveyor system and installed a new noise reduction silencer at the CSC site. One of the main purposes of this project was to reduce the noise exposure for the operations staff working in the area but equally, to decrease the overall noise emission.

In 2012, the data collected near the area where the pneuveyor and silencer are located is significantly higher to the data collected this year. Moreover, if we compare the noise data collected with the pneuveyor in the "ON" position and the "OFF" position, we see that results are almost identical. That said, the objective of reducing noise exposure as well as the overall noise emission has been achieved.

If you have any questions or concerns, please contact me at 780-288-3984 or Nola Ruhl, my Supervisor, at 780-992-4724.

Yours truly,

Kathryn Dragowska
EHS Supervisor, Chemtrade West GP Inc.

cc: H. Zuczek, Plant Manager – Sulphides a
N. J. Ruhl. P.Eng., CCEP, Director, Environmental Health & Safety Canada
D. Burroughs, Director, Environmental Health & Safety North America

Cirrus Research plc

Measurement Summary Report

Name	23
Time	25/01/2012 10:10:47 AM
Duration	00:01:09
Instrument	G056962, CR:171A

Summary

LAeq	86.3 dB
LAE	104.7 dB
LAFMax	87.6 dB

LAF1	87.4 dB
LAF5	87.1 dB
LAF10	87.0 dB
LAF50	86.3 dB
LAF90	85.6 dB
LAF95	85.3 dB
LAF99	83.9 dB

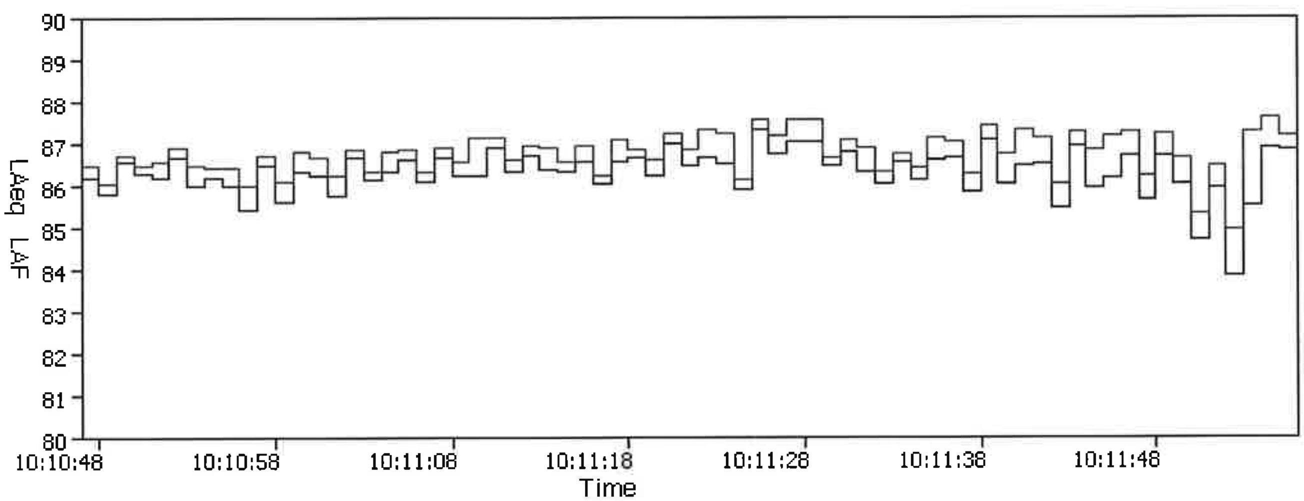
Calibration Information

No Calibration Found

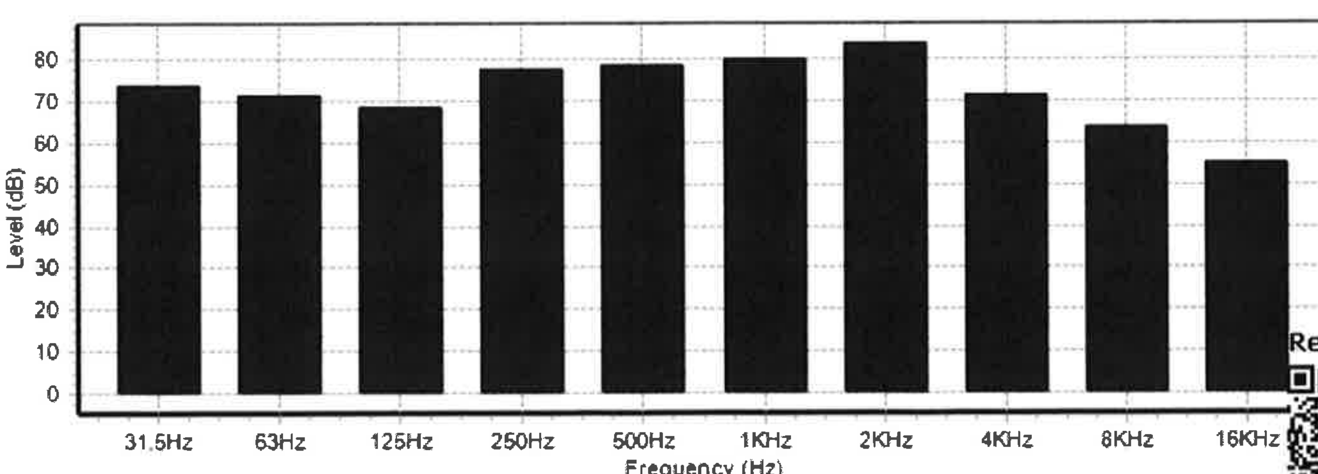
Place

Ft.Sask CSC Hydrate Blowe...

Time History



Frequency Bands



Report ID

Cirrus Research plc

Measurement Summary Report

Name	Pneuveyor
Time	03/01/2013 3:36:48 PM
Duration	00:01:02
Instrument	G056962, CR:171A

Summary

LAeq	84.9 dB
LAE	102.8 dB
LAFMax	88.0 dB

LAF1	87.6 dB
LAF5	87.2 dB
LAF10	87.0 dB
LAF50	84.1 dB
LAF90	82.6 dB
LAF95	82.3 dB
LAF99	81.8 dB

Calibration Information

03/01/2013 3:35:15 PM 0.58 dB

Place

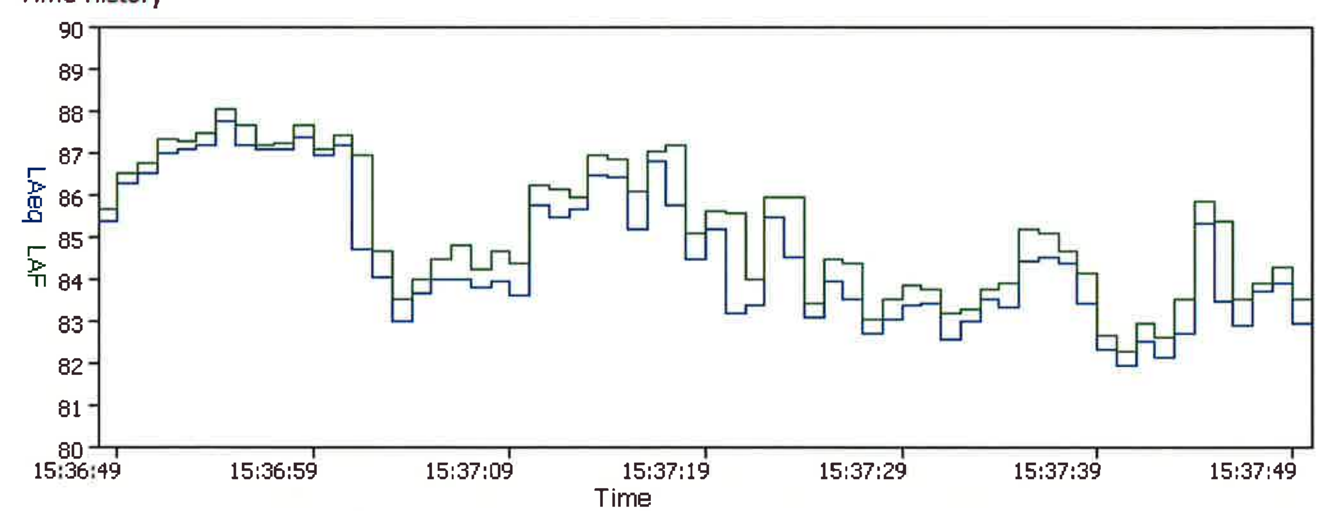
Fort Saskatchewan CSC

Chemtrade

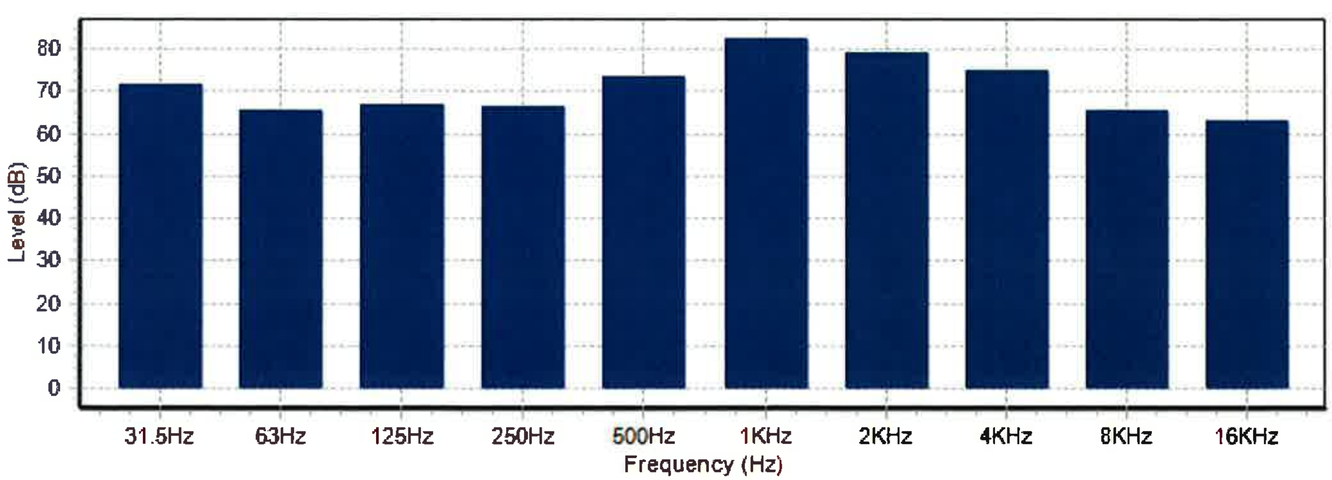
Project

New Pneuveyor system_Janu...

Time History



Frequency Bands



Report ID

Cirrus Research plc

Measurement Summary Report

Name	24
Time	25/01/2012 10:12:10 AM
Duration	00:00:57
Instrument	G056962, CR:171A

Summary

LAeq	93.7 dB
LAE	111.3 dB
LAFMax	95.9 dB

LAF1	95.0 dB
LAF5	94.7 dB
LAF10	94.5 dB
LAF50	93.6 dB
LAF90	92.7 dB
LAF95	92.6 dB
LAF99	92.4 dB

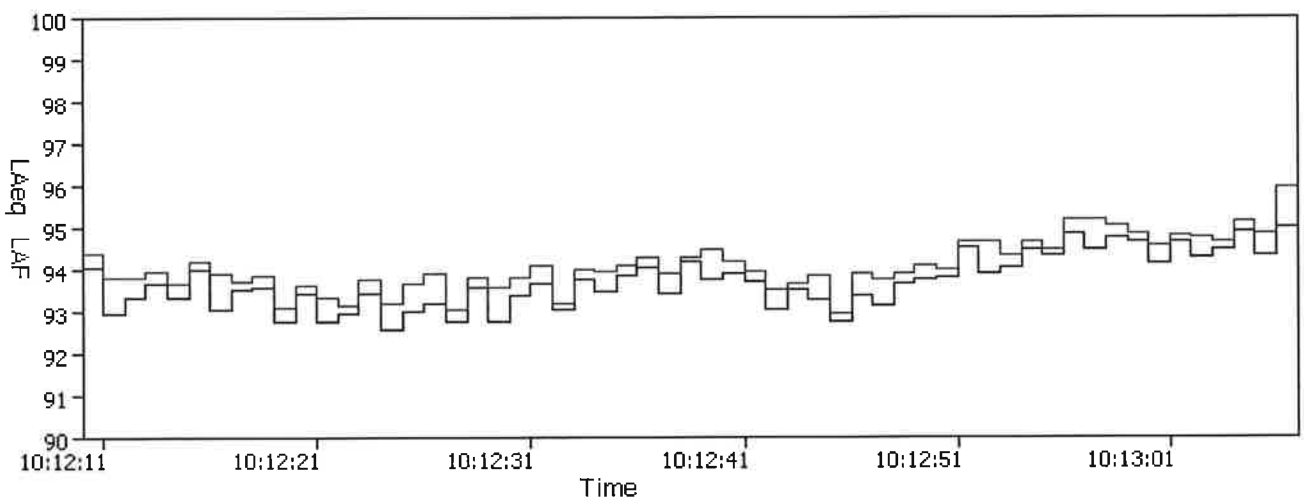
Calibration Information

No Calibration Found

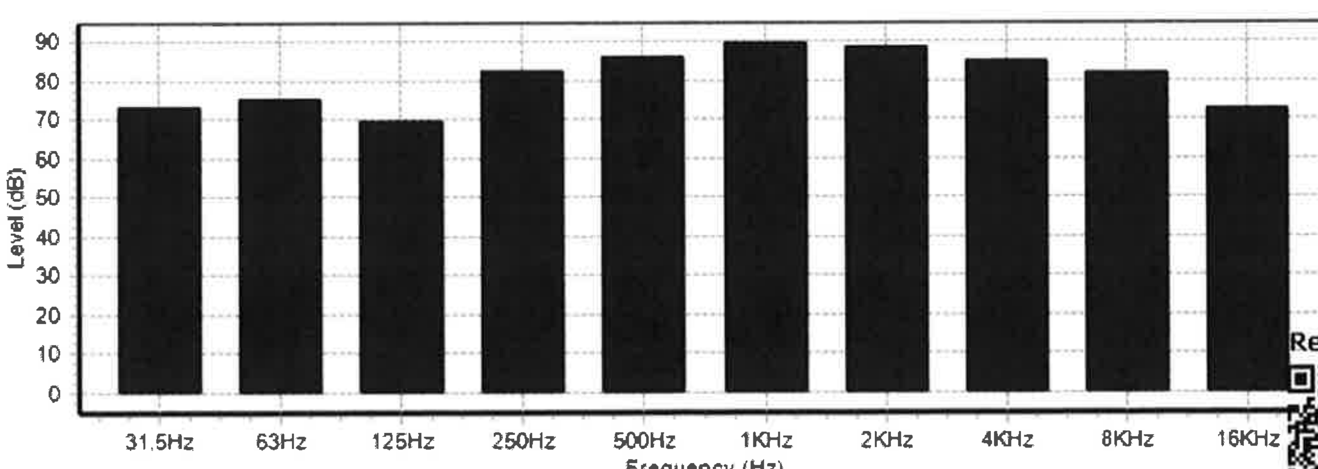
Place

Ft.Sask CSC Hydrate Blowe...

Time History



Frequency Bands



Report ID

Cirrus Research plc

Measurement Summary Report

Name	Silencer	**Summary**		LAF1	74.8 dB
Time	03/01/2013 3:38:00 PM	LAeq	73.8 dB	LAF5	74.5 dB
Duration	00:01:02	LAE	91.7 dB	LAF10	74.3 dB
Instrument	G056962, CR:171A	LAFMax	75.3 dB	LAF50	73.7 dB
				LAF90	73.1 dB
				LAF95	73.0 dB
				LAF99	72.8 dB

Calibration Information

03/01/2013 3:35:15 PM 0.58 dB

Place

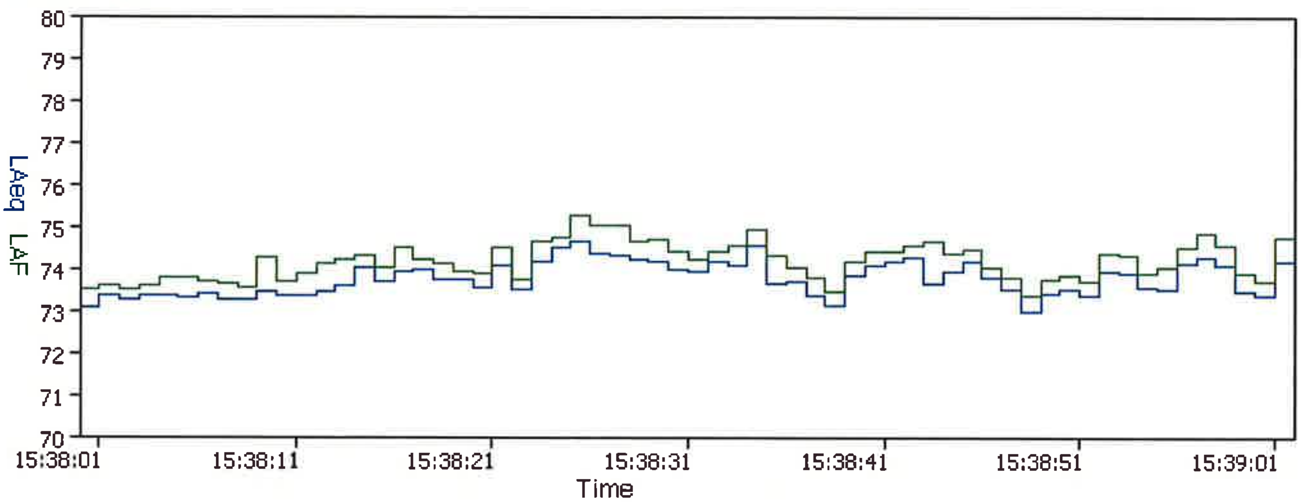
Fort Saskatchewan CSC

Chemtrade

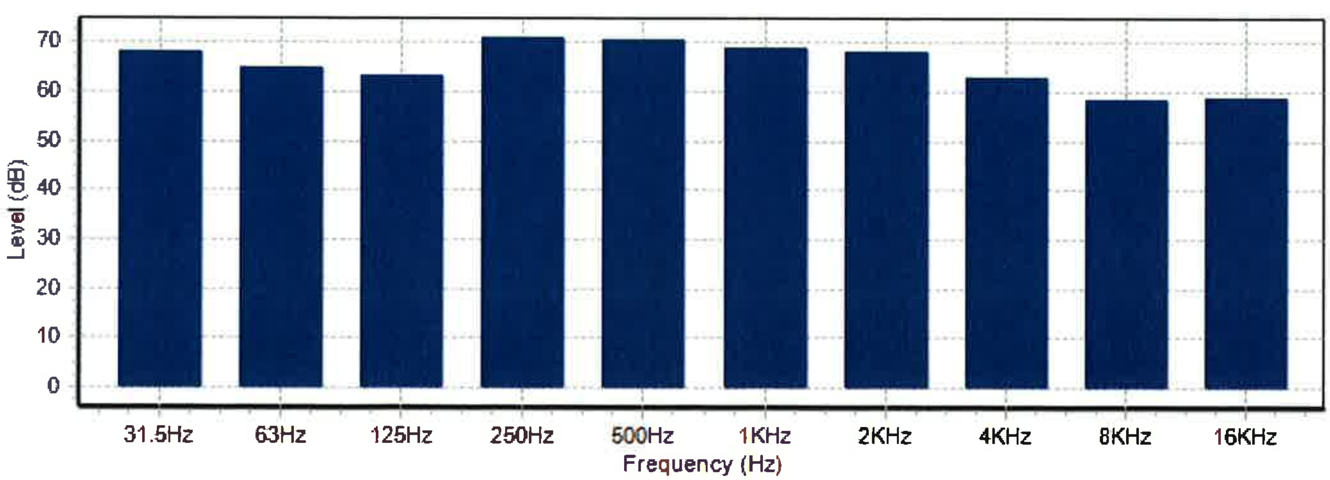
Project

New Pneuveyor system_Janu...

Time History



Frequency Bands



Report ID

Measurement Summary Report

Name	CSC # 2 - Pneuveyor OFF	**Summary**		LAF1	64.0 dB
Time	28/12/2012 11:21:13 AM	LAeq	61.2 dB	LAF5	62.0 dB
Duration	00:00:33	LAE	76.4 dB	LAF10	61.6 dB
Instrument	G056962, CR:171A	LAFMax	70.1 dB	LAF50	61.0 dB
				LAF90	60.4 dB
				LAF95	60.3 dB
				LAF99	60.1 dB

Calibration Information

28/12/2012 11:20:54 AM 1.38 dB

28/12/2012 11:25:52 AM 1.38 dB

Place

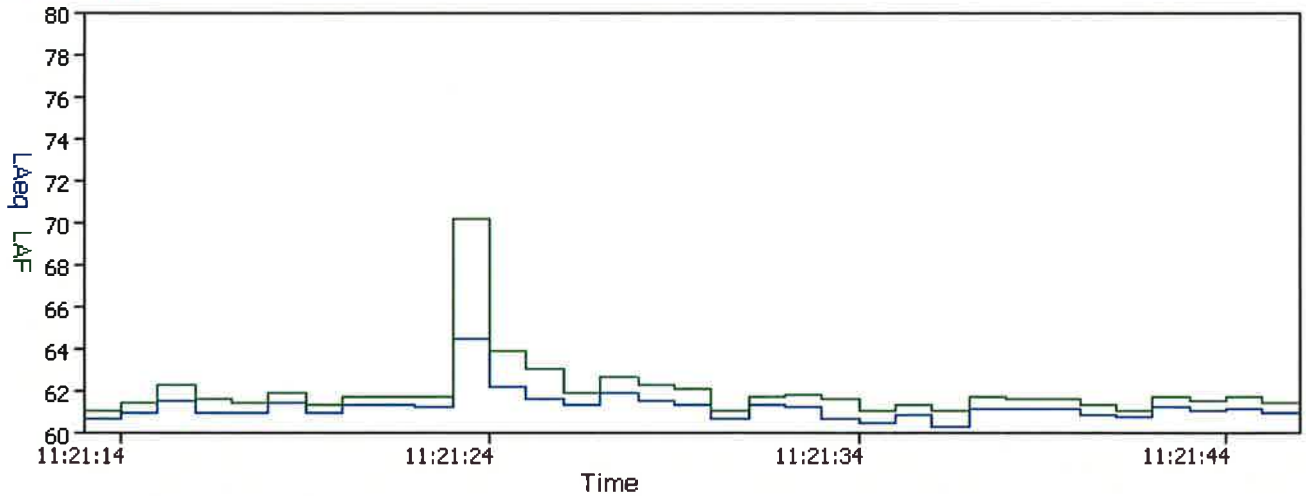
Fort Saskatchewan CSC

Chemtrade

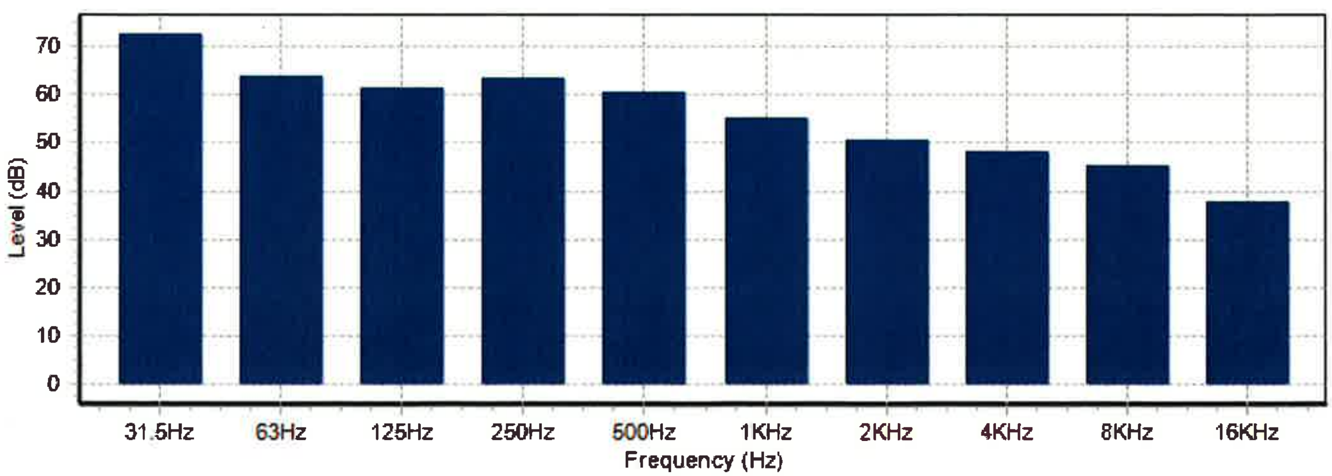
Project

2012 CSC Noise measuremen...

Time History



Frequency Bands



Report ID

Cirrus Research plc

Measurement Summary Report

Name	CSC # 2- Pneuveyor ON
Time	03/01/2013 3:41:44 PM
Duration	00:01:02
Instrument	G056962, CR:171A

Summary

LAeq	61.2 dB
LAE	79.1 dB
LAFMax	63.7 dB

LAF1	62.8 dB
LAF5	62.1 dB
LAF10	61.8 dB
LAF50	61.0 dB
LAF90	60.5 dB
LAF95	60.4 dB
LAF99	60.1 dB

Calibration Information

03/01/2013 3:35:15 PM 0.58 dB

Place

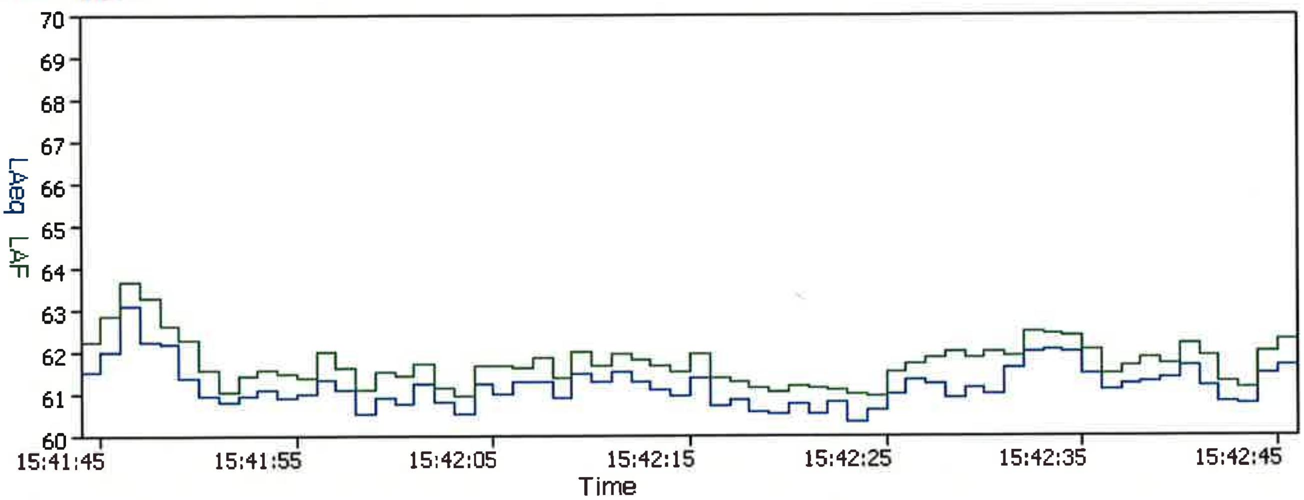
Fort Saskatchewan CSC

Chemtrade

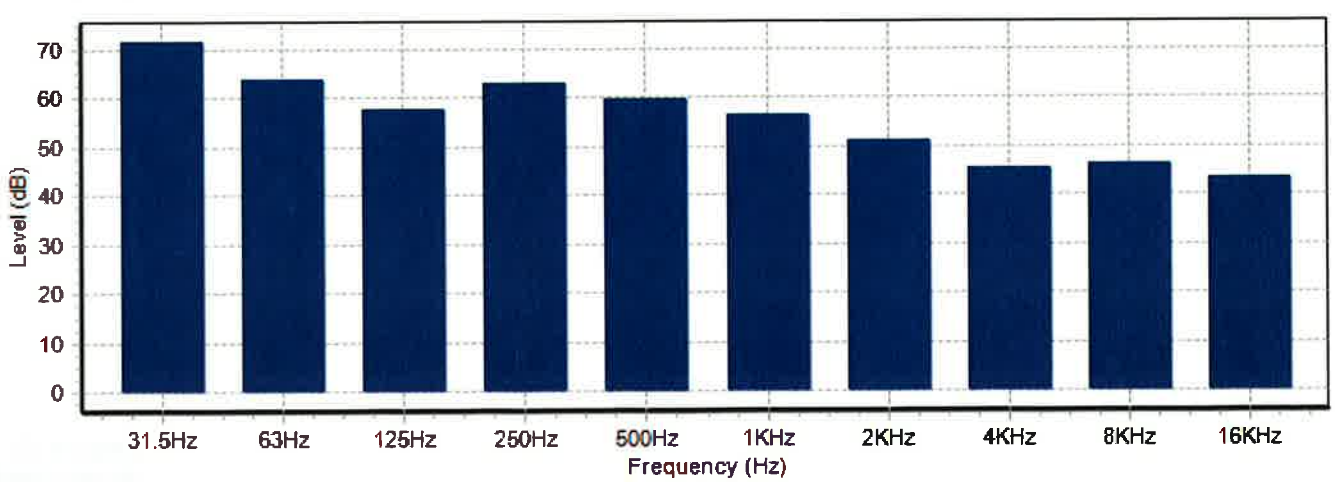
Project

New Pneuveyor system_Janu...

Time History



Frequency Bands



Report ID

Measurement Summary Report

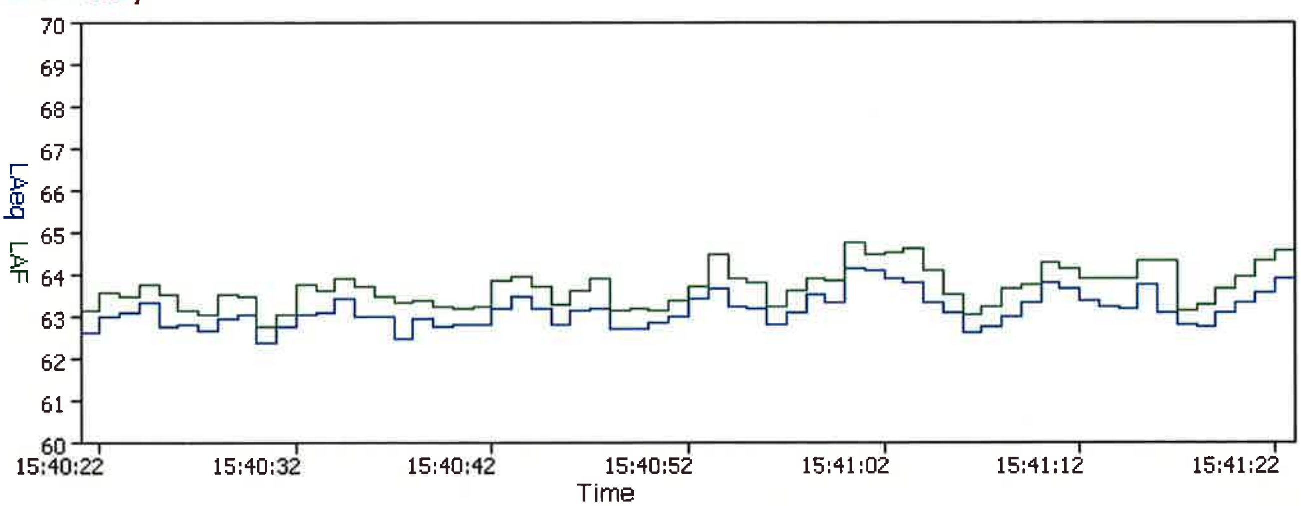
Name	Paved area - West side	**Summary**		LAF1	64.2 dB
Time	03/01/2013 3:40:21 PM	LAeq	63.1 dB	LAF5	64.0 dB
Duration	00:01:02	LAE	81.1 dB	LAF10	63.7 dB
Instrument	G056962, CR:171A	LAFMax	64.8 dB	LAF50	63.0 dB
				LAF90	62.5 dB
				LAF95	62.3 dB
				LAF99	62.2 dB

Calibration Information
03/01/2013 3:35:15 PM 0.58 dB

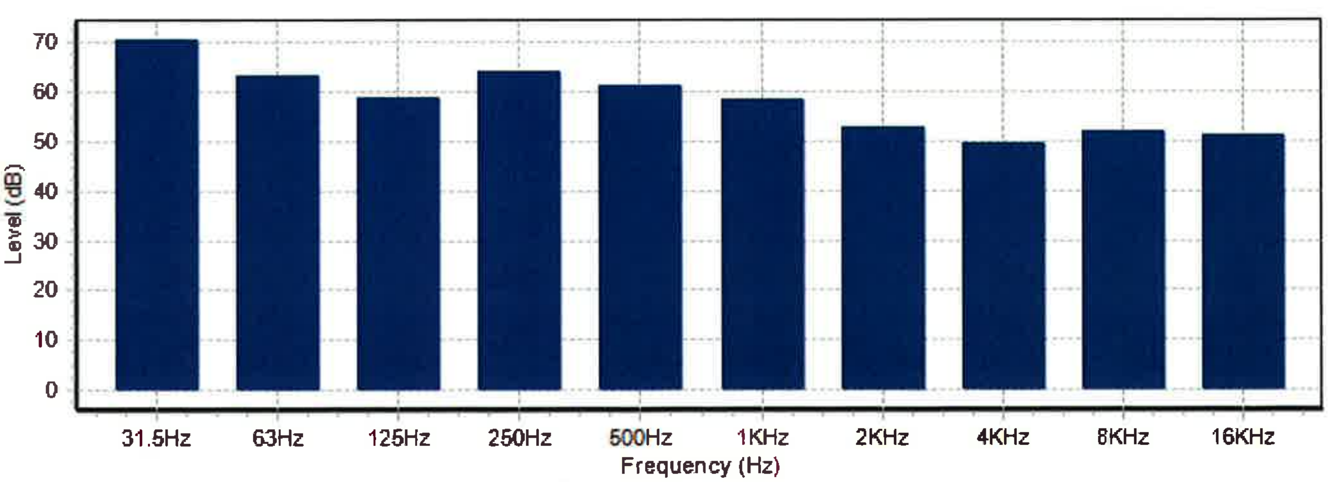
Place
Fort Saskatchewan CSC
Chemtrade

Project
New Pneuveyor system_Janu...

Time History



Frequency Bands



Report ID

CHEMTRADE

NCIA office, Fort Saskatchewan
#204 9902-102 Street
Fort Saskatchewan, AB
Attn.: Dr. Laurie J. Danielson, P. Chem.
Executive Director, Northeast Capital Industrial Association

December 31, 2012

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 Sulphides sites for 2012 as per the Chemtrade Environmental Noise Monitoring and Control Procedure CHE-FSK-ESH-001.

General information

The Meter

A Cirrus Model CR171A Noise Meter was used for all sound measurements. The meter was last calibrated on November 7, 2011 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 on December 28, 2012.

The measurements

Noise measurements were taken by Kathryn Dragowska on December 28, 2012

Weather information

The wind direction on December 28, 2012 was out of the WSW and the wind speed varied between 2-5km/h.

Fort Saskatchewan CSC

Noise measurements were taken on December 28, 2012 at the same locations as those outline 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	71.3	62.3	59.6	59.1	56.8	55.8	50.3	45.9	43.2	59.4
2	72.6	63.8	61.4	63.5	60.4	55.1	50.7	48.0	45.2	61.2
3	71.8	67.1	59.8	58.5	61.3	51.5	45.2	40.6	37.1	59.3
4	80.8	75.9	68.9	61.9	57.4	54.2	48.5	45.0	42.4	60.4
5	72.7	65.7	63.4	59.6	55.1	54.02	51.02	47.01	41.61	58.8
6	77.3	68.8	61.6	59.1	56.6	53.0	48.4	48.4	46.5	58.7
7	79.6	68.2	63.1	60.7	54.7	50.6	45.3	41.2	38.1	57.1
8	82.0	66.5	64.5	64.7	56.1	52.5	46.6	41.4	39.9	59.6
9	75.5	67.4	63.4	59.9	55.8	53.2	45.0	38.2	35.1	57.8

CHEMTRADE

Fort Saskatchewan Sulphides
Noise measurements were taken on December 28, 2012 at the same locations as those outline 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	72.8	70.0	67.5	64.1	60.1	57.2	53.0	48.6	46.5	62.6
2	74.5	71.8	68.5	66.9	64.7	61.9	61.0	57.1	58.3	67.9
3	79.6	75.7	68.3	61.0	57.4	55.3	52.9	50.4	46.3	61.3
4	67.8	69.0	64.0	63.0	58.6	60.6	61.5	55.0	48.7	65.8
5	76.7	73.0	65.5	60.9	59.7	57.9	55.0	49.1	44.0	62.4
6	73.8	70.7	65.2	61.2	59.0	56.0	52.2	47.1	43.0	61.0
7	77.9	74.1	67.0	62.0	56.8	54.7	51.1	47.1	41.5	60.3

Discussion

2012 noise measurement results are consistent with those taken by Nola Ruhl on December 22, 2011. Variations are attributed to the differences in traffic along adjacent roadways.

In 2012, Chemtrade has overhauled a pneuveyor system and installed a new noise reduction silencer at the CSC site. One of the main purposes of this project was to reduce the noise exposure for the operations staff working in the area but equally, to decrease the overall noise emission. The objective was achieved and a supplementary report with relevant data demonstrating this improvement will be forwarded to NCIA.

If you have any questions or concerns, please contact me at 780-288-3984 or Nola Ruhl, my Supervisor, at 780-992-4724.

Yours truly,

Kathryn Dragowska
EHS Supervisor, Chemtrade West GP Inc.

cc: H. Zuczek, Plant Manager – Sulphides a
N. J. Ruhl. P.Eng., CCEP, Director, Responsible Care Canada
D. Burroughs, Director, Responsible Care North America

Date Printed 28/12/2012

Cirrus Research plc

Measurement Summary Report

Name	CSC # 1	**Summary**		LAF1	61.8 dB
Time	28/12/2012 11:17:44 AM	LAeq	59.4 dB	LAF5	60.8 dB
Duration	00:00:32	LAE	74.4 dB	LAF10	60.3 dB
Instrument	G056962, CR:171A	LAFMax	64.0 dB	LAF50	59.1 dB
				LAF90	58.3 dB
				LAF95	58.1 dB
				LAF99	58.0 dB

Calibration Information

28/12/2012 11:17:02 AM 1.11 dB

28/12/2012 11:20:54 AM 1.38 dB

Place

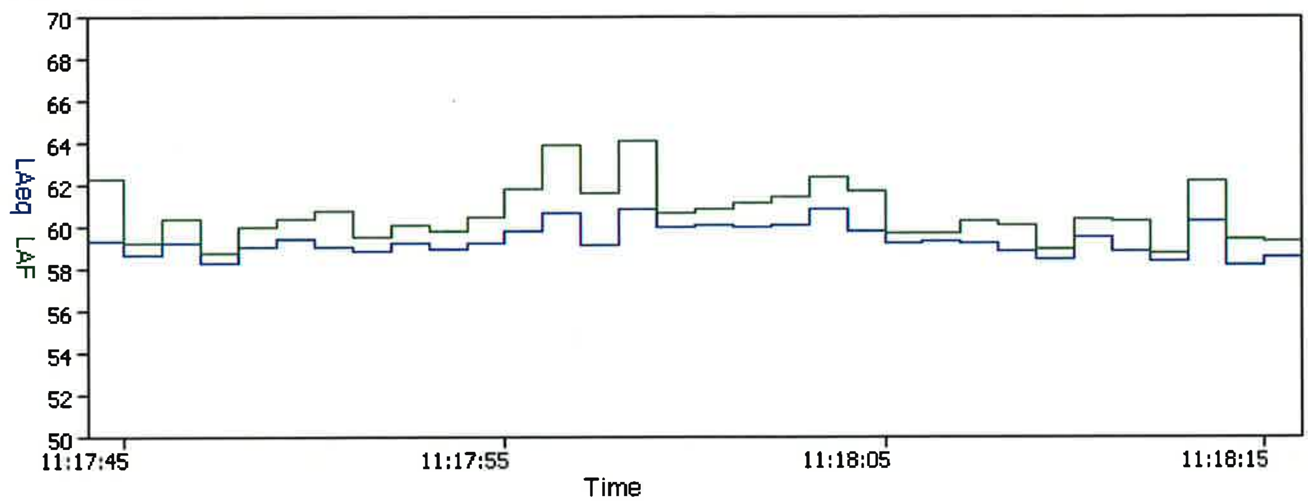
Fort Saskatchewan CSC

Chemtrade

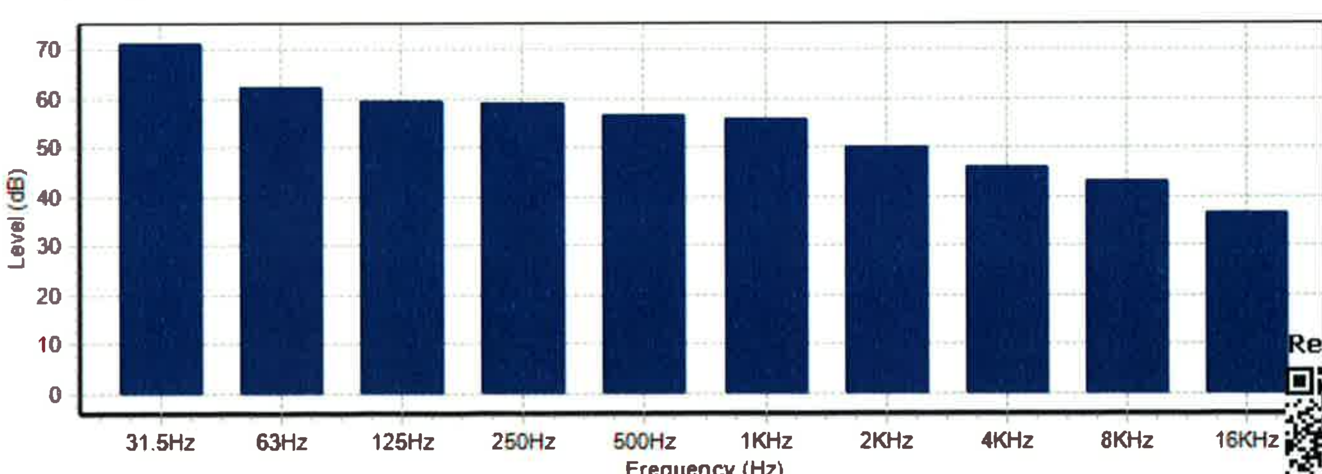
Project

2012 CSC Noise measuremen...

Time History



Frequency Bands



Report ID

Cirrus Research plc

Measurement 1:1 Octave Report

Name	CSC # 1
Time	28/12/2012 11:17:44 AM
Duration	00:00:32
Instrument	G056962, CR:171A

Calibration Information

28/12/2012 11:17:02 AM 1.11 dB

28/12/2012 11:20:54 AM 1.38 dB

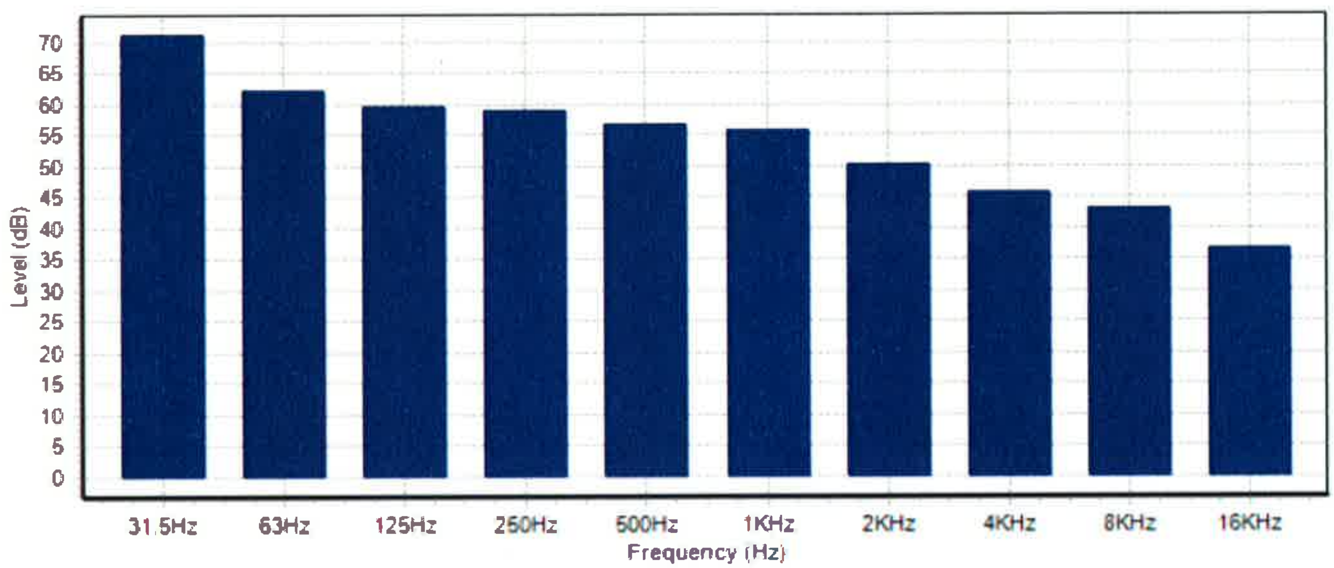
Place

Fort Saskatchewan CSC

Chemtrade

Project

2012 CSC Noise measuremen...



Band	31.5Hz	63Hz	125Hz	250Hz	500Hz	1KHz	2KHz	4KHz	8KHz	16KHz	NR	NC
Leq dB	71.3	62.3	59.6	59.1	56.8	55.8	50.3	45.9	43.2	36.8	56.0	55.0

Report ID

Cirrus Research plc

Measurement Summary Report

Name	CSC # 2	**Summary**		LAF1	64.0 dB
Time	28/12/2012 11:21:13 AM	LAeq	61.2 dB	LAF5	62.0 dB
Duration	00:00:33	LAE	76.4 dB	LAF10	61.6 dB
Instrument	G056962, CR:171A	LAFMax	70.1 dB	LAF50	61.0 dB
				LAF90	60.4 dB
				LAF95	60.3 dB
				LAF99	60.1 dB

Calibration Information

28/12/2012 11:20:54 AM 1.38 dB

28/12/2012 11:25:52 AM 1.38 dB

Place

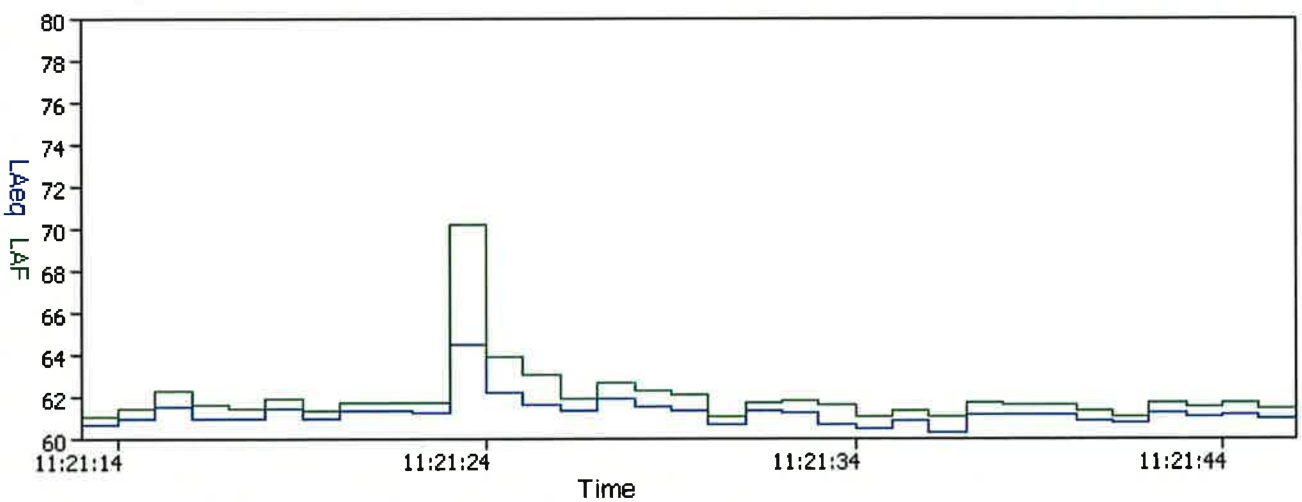
Fort Saskatchewan CSC

Chemtrade

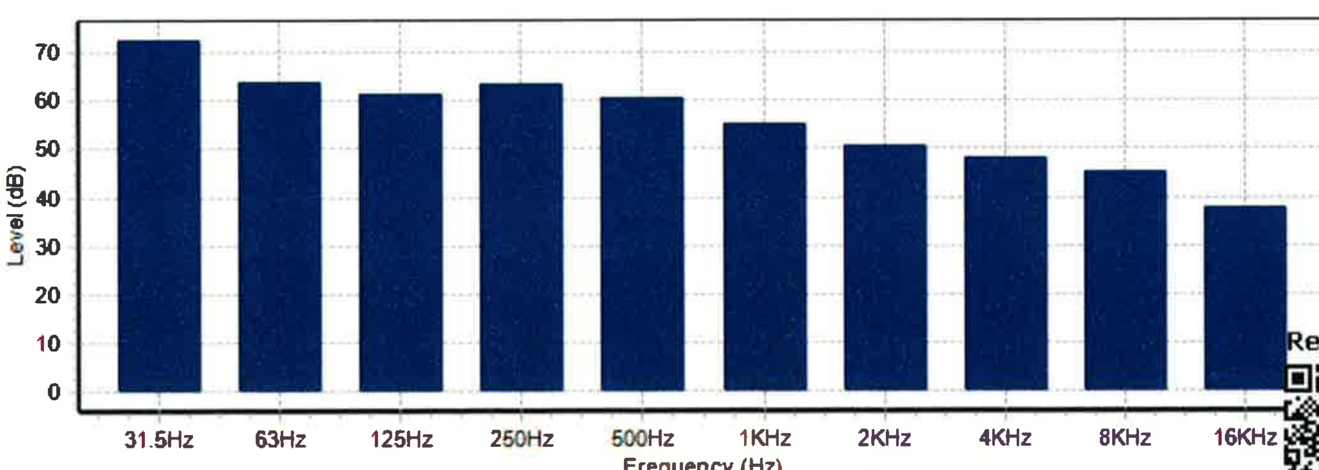
Project

2012 CSC Noise measuremen...

Time History



Frequency Bands



Report ID

Cirrus Research plc

Measurement 1:1 Octave Report

Name	CSC # 2
Time	28/12/2012 11:21:13 AM
Duration	00:00:33
Instrument	G056962, CR:171A

Calibration Information

28/12/2012 11:20:54 AM 1.38 dB

28/12/2012 11:25:52 AM 1.38 dB

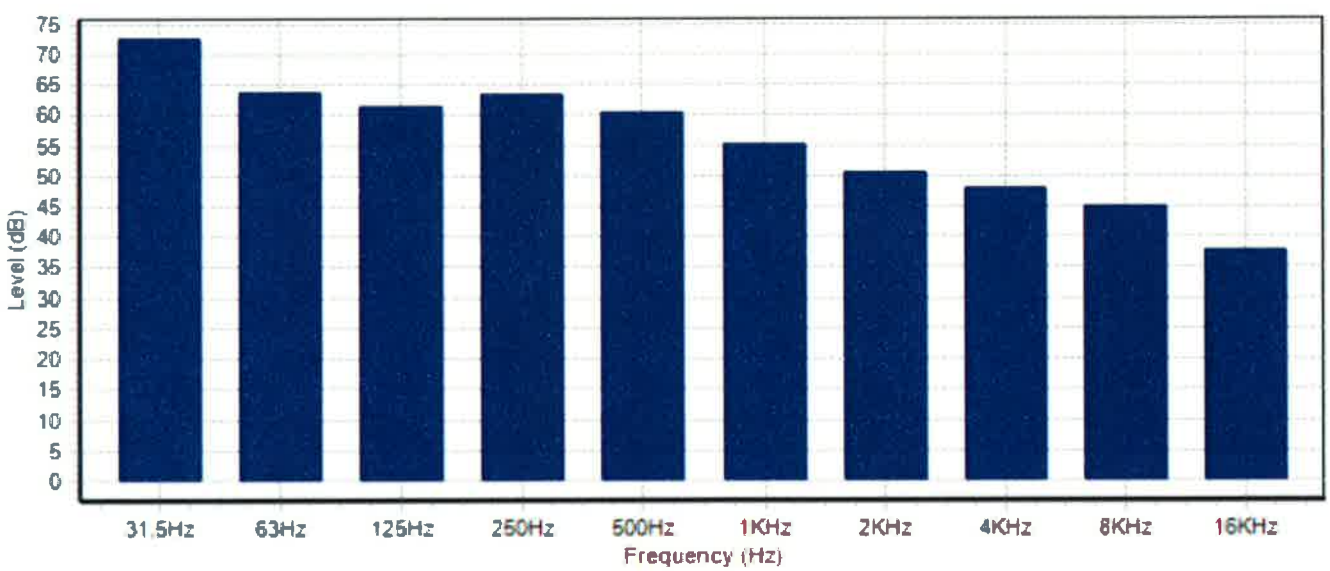
Place

Fort Saskatchewan CSC

Chemtrade

Project

2012 CSC Noise measuremen...



Band	31.5Hz	63Hz	125Hz	250Hz	500Hz	1KHz	2KHz	4KHz	8KHz	16KHz	NR	NC
Leq dB	72.6	63.8	61.4	63.5	60.4	55.1	50.7	48.0	45.2	37.9	58.0	60.0

Report ID

Cirrus Research plc

Measurement Summary Report

Name	CSC # 3
Time	28/12/2012 11:26:50 AM
Duration	00:00:32
Instrument	G056962, CR:171A

Summary

LAeq	59.3 dB
LAE	74.4 dB
LAFMax	69.5 dB

LAF1	69.0 dB
LAF5	66.8 dB
LAF10	59.1 dB
LAF50	56.1 dB
LAF90	55.1 dB
LAF95	54.8 dB
LAF99	54.5 dB

Calibration Information

28/12/2012 11:25:52 AM 1.38 dB

28/12/2012 11:29:03 AM 1.50 dB

Place

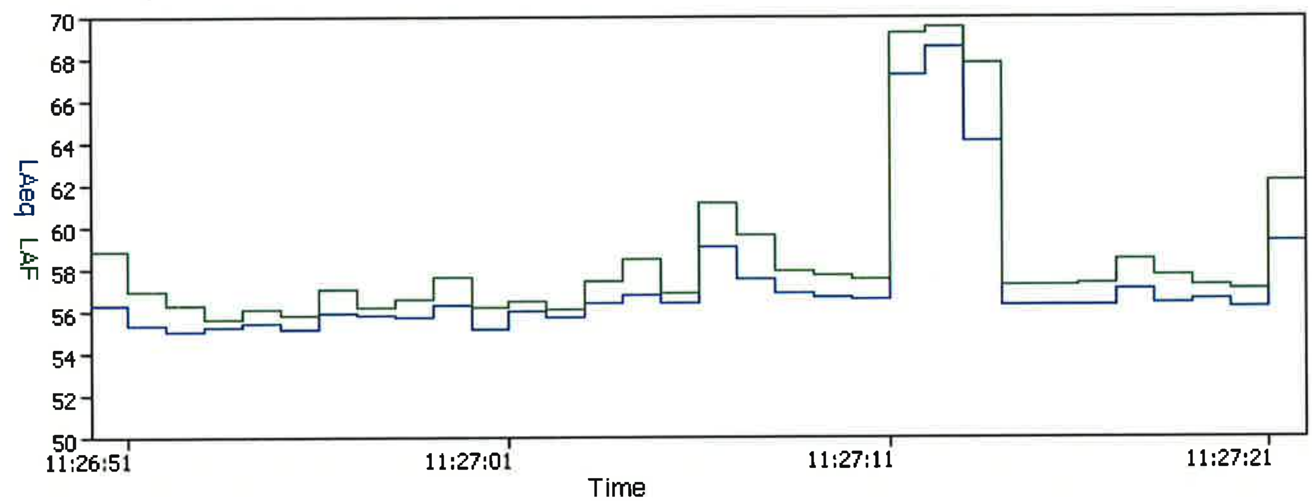
Fort Saskatchewan CSC

Chemtrade

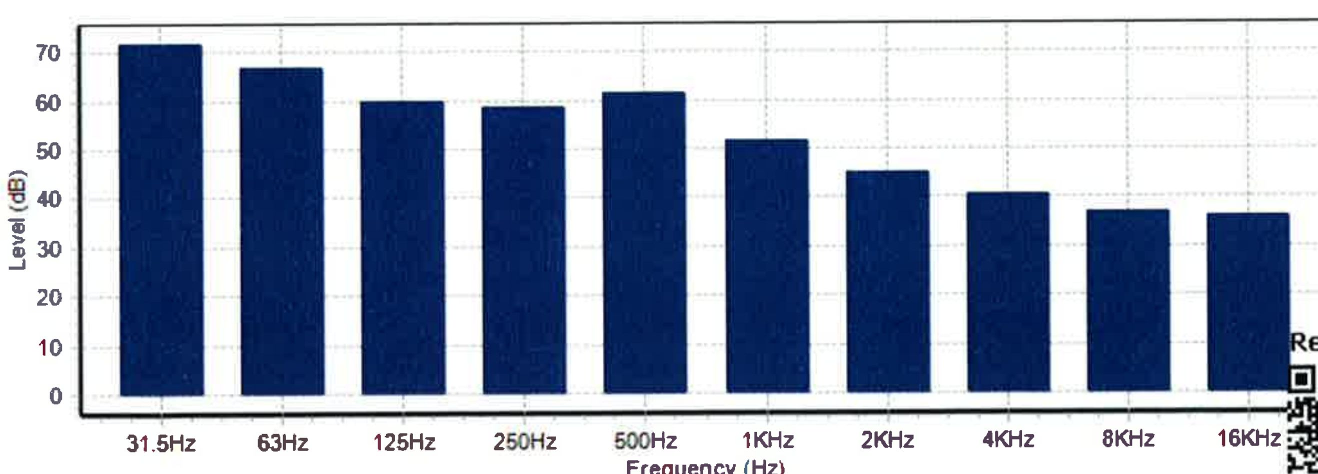
Project

2012 CSC Noise measuremen...

Time History



Frequency Bands



Report ID

Cirrus Research plc

Measurement 1:1 Octave Report

Name	CSC # 3
Time	28/12/2012 11:26:50 AM
Duration	00:00:32
Instrument	G056962, CR:171A

Calibration Information

28/12/2012 11:25:52 AM 1.38 dB

28/12/2012 11:29:03 AM 1.50 dB

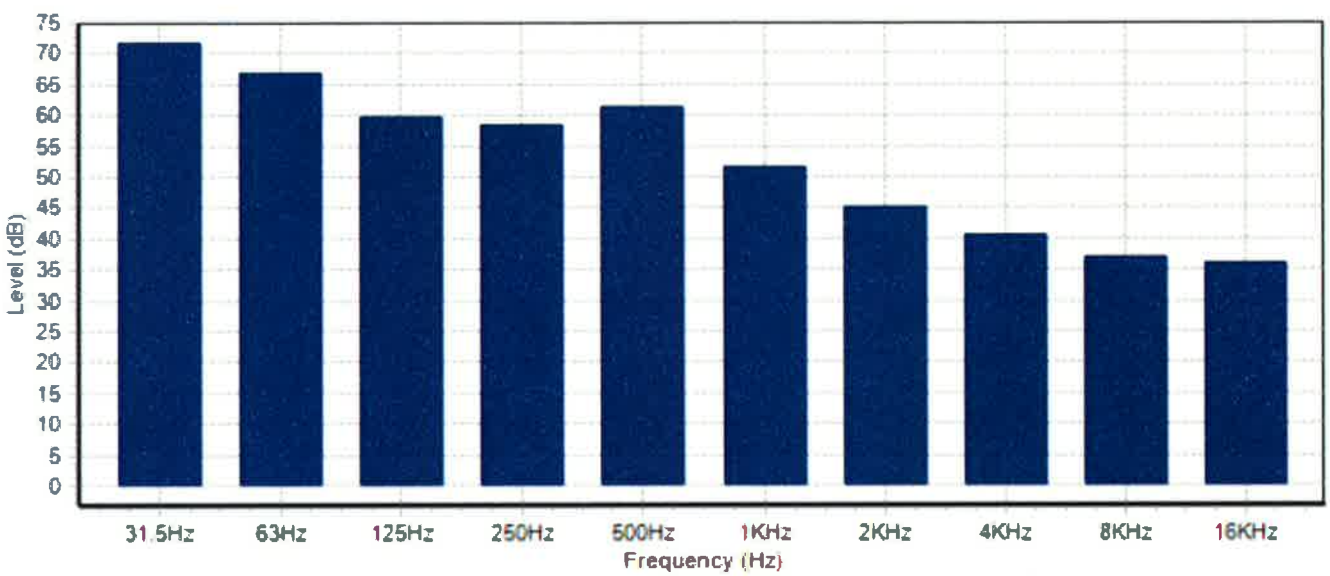
Place

Fort Saskatchewan CSC

Chemtrade

Project

2012 CSC Noise measuremen...



Band	31.5Hz	63Hz	125Hz	250Hz	500Hz	1KHz	2KHz	4KHz	8KHz	16KHz	NR	NC
Leq dB	71.8	67.0	59.8	58.5	61.3	51.5	45.2	40.6	37.1	36.1	59.0	60.0

Report ID

Cirrus Research plc

Measurement Summary Report

Name	CSC # 4
Time	28/12/2012 11:29:35 AM
Duration	00:00:33
Instrument	G056962, CR:171A

Summary

LAeq	60.4 dB
LAE	75.6 dB
LAFMax	68.0 dB

LAF1	64.9 dB
LAF5	63.4 dB
LAF10	62.6 dB
LAF50	59.8 dB
LAF90	56.7 dB
LAF95	56.3 dB
LAF99	55.3 dB

Calibration Information

28/12/2012 11:29:03 AM 1.50 dB

28/12/2012 11:31:42 AM 1.50 dB

Place

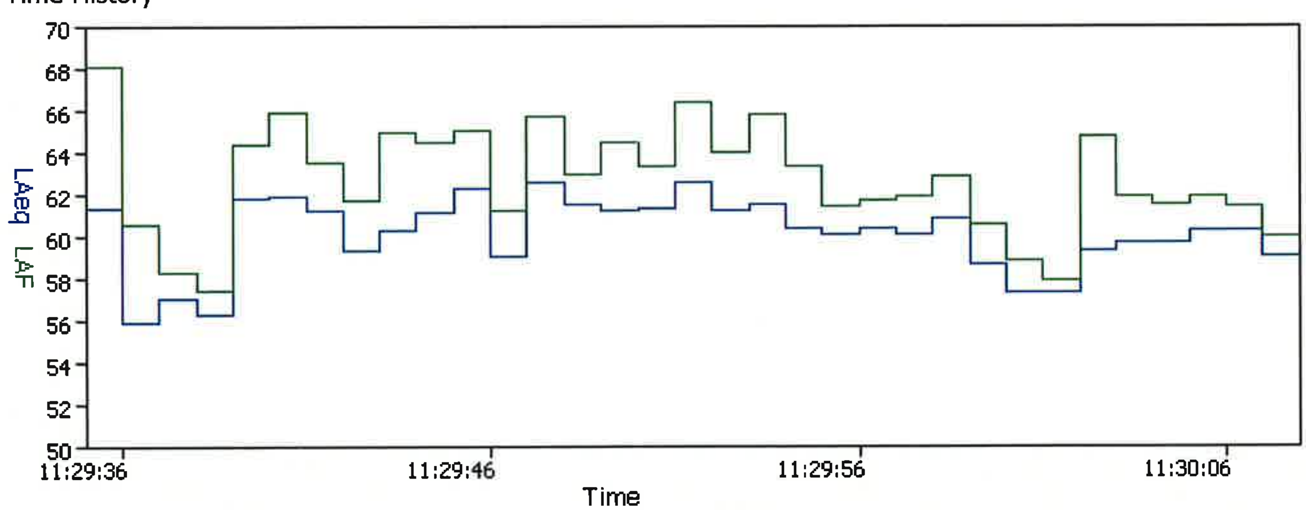
Fort Saskatchewan CSC

Chemtrade

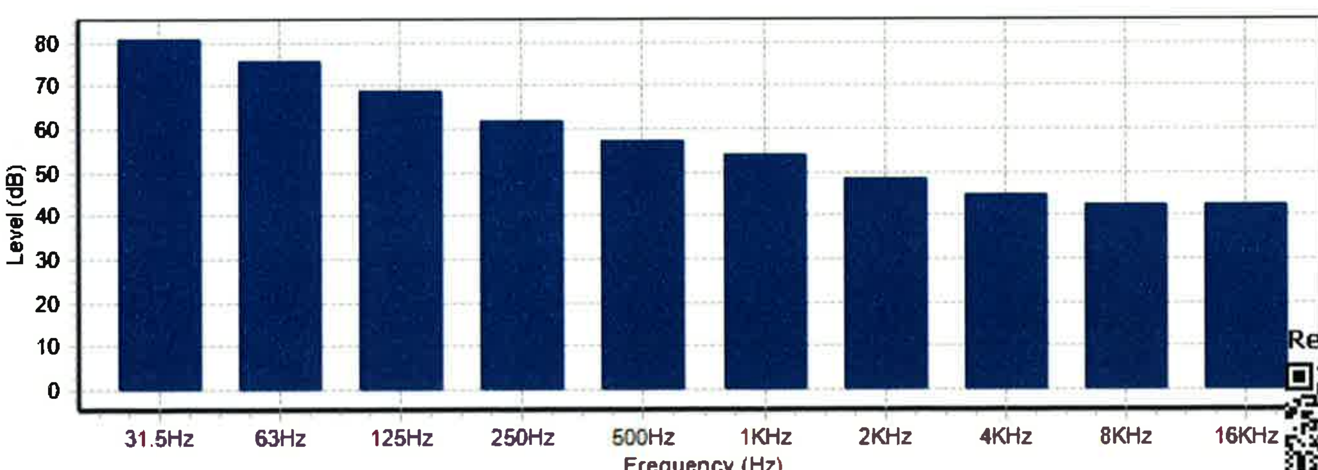
Project

2012 CSC Noise measuremen...

Time History



Frequency Bands



Report ID

Cirrus Research plc

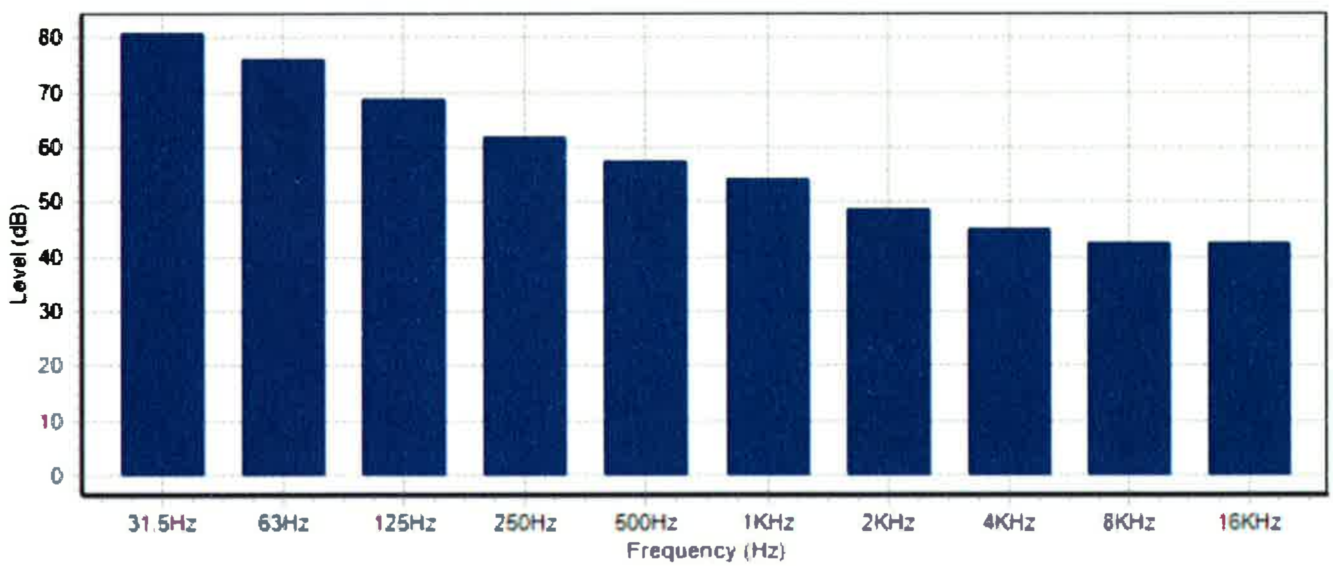
Measurement 1:1 Octave Report

Name	CSC # 4
Time	28/12/2012 11:29:35 AM
Duration	00:00:33
Instrument	G056962, CR:171A

Calibration Information
28/12/2012 11:29:03 AM 1.50 dB
28/12/2012 11:31:42 AM 1.50 dB

Place
Fort Saskatchewan CSC
Chemtrade

Project
2012 CSC Noise measuremen...



Band	31.5Hz	63Hz	125Hz	250Hz	500Hz	1KHz	2KHz	4KHz	8KHz	16KHz	NR	NC
Leq dB	80.8	75.9	68.9	61.8	57.4	54.2	48.5	45.0	42.4	42.5	55.0	60.0

Report ID

Cirrus Research plc

Measurement Summary Report

Name	CSC # 5	**Summary**		LAF1	65.1 dB
Time	28/12/2012 11:31:59 AM	LAeq	58.8 dB	LAF5	60.9 dB
Duration	00:00:33	LAE	74.0 dB	LAF10	59.8 dB
Instrument	G056962, CR:171A	LAFMax	70.5 dB	LAF50	58.1 dB
				LAF90	56.7 dB
				LAF95	56.4 dB
				LAF99	56.0 dB

Calibration Information

28/12/2012 11:31:42 AM 1.50 dB

28/12/2012 11:35:29 AM 1.55 dB

Place

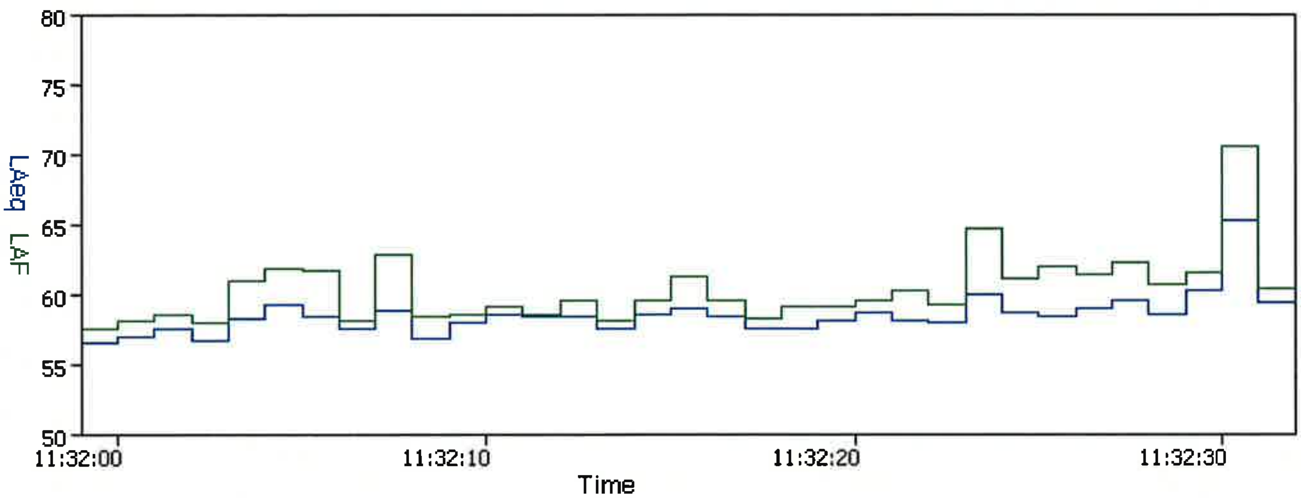
Fort Saskatchewan CSC

Chemtrade

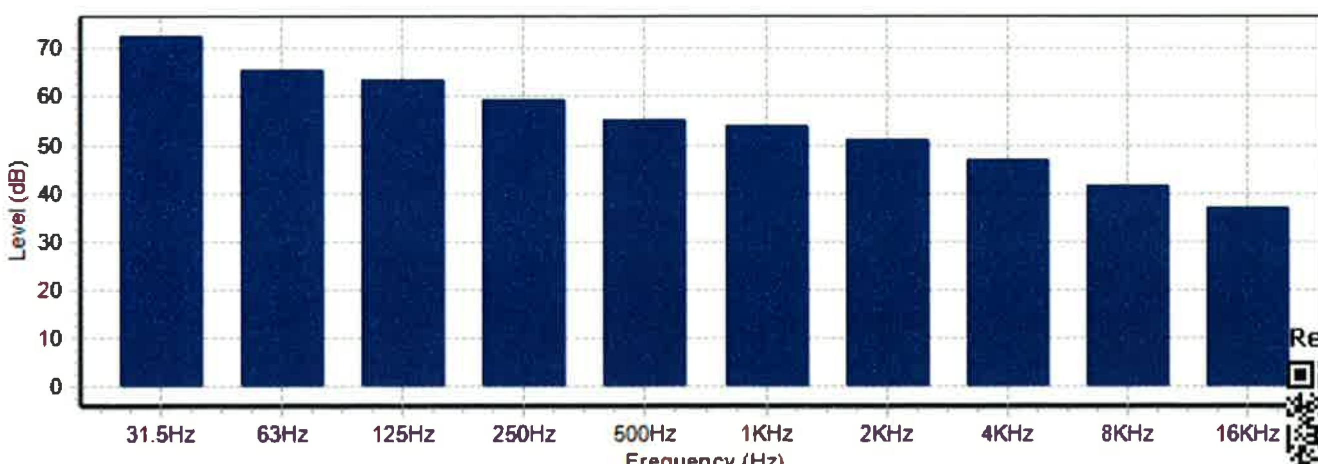
Project

2012 CSC Noise measuremen...

Time History



Frequency Bands



Report ID

Date Printed 28/12/2012

Cirrus Research plc

Measurement 1:1 Octave Report

Name	CSC # 5
Time	28/12/2012 11:31:59 AM
Duration	00:00:33
Instrument	G056962, CR:171A

Calibration Information

28/12/2012 11:31:42 AM 1.50 dB

28/12/2012 11:35:29 AM 1.55 dB

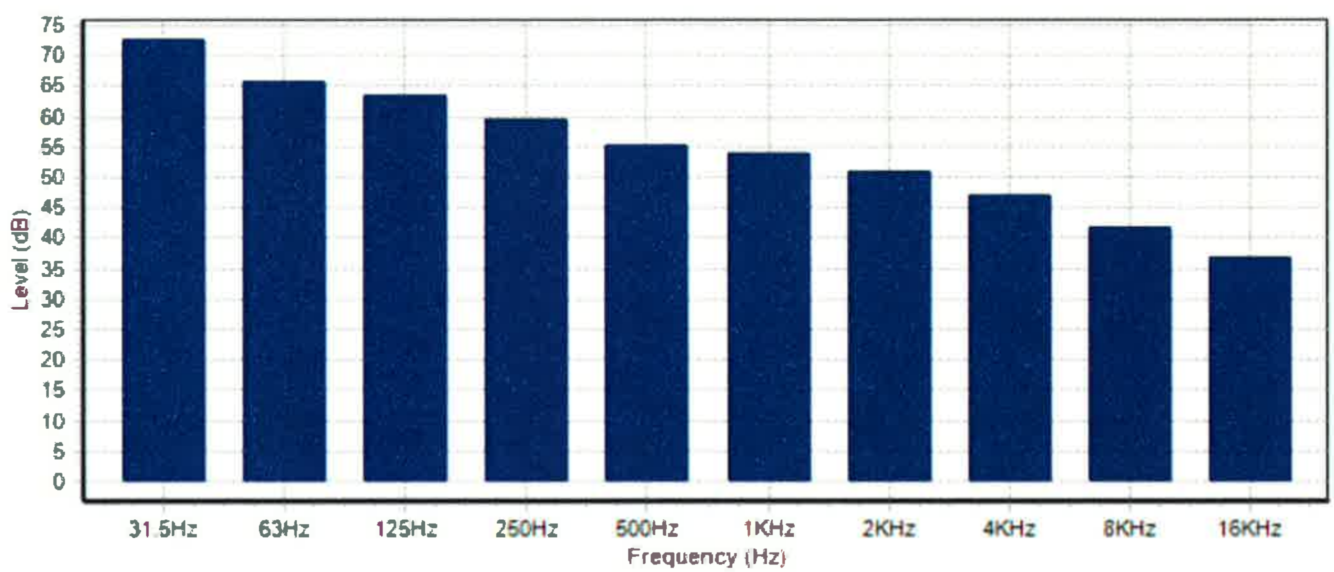
Place

Fort Saskatchewan CSC

Chemtrade

Project

2012 CSC Noise measuremen...



Band	31.5Hz	63Hz	125Hz	250Hz	500Hz	1KHz	2KHz	4KHz	8KHz	16KHz	NR	NC
Leq dB	72.7	65.7	63.4	59.6	55.1	54.0	51.0	47.0	41.6	36.8	55.0	55.0

Report ID

Cirrus Research plc

Measurement Summary Report

Name	CSC # 6
Time	28/12/2012 11:36:04 AM
Duration	00:00:33
Instrument	G056962, CR:171A

Summary

LAeq	58.7 dB
LAE	73.9 dB
LAFMax	61.8 dB
LAF1	60.7 dB
LAF5	60.2 dB
LAF10	59.8 dB
LAF50	58.4 dB
LAF90	57.4 dB
LAF95	57.0 dB
LAF99	56.7 dB

Calibration Information

28/12/2012 11:35:29 AM 1.55 dB

28/12/2012 11:47:56 AM 1.56 dB

Place

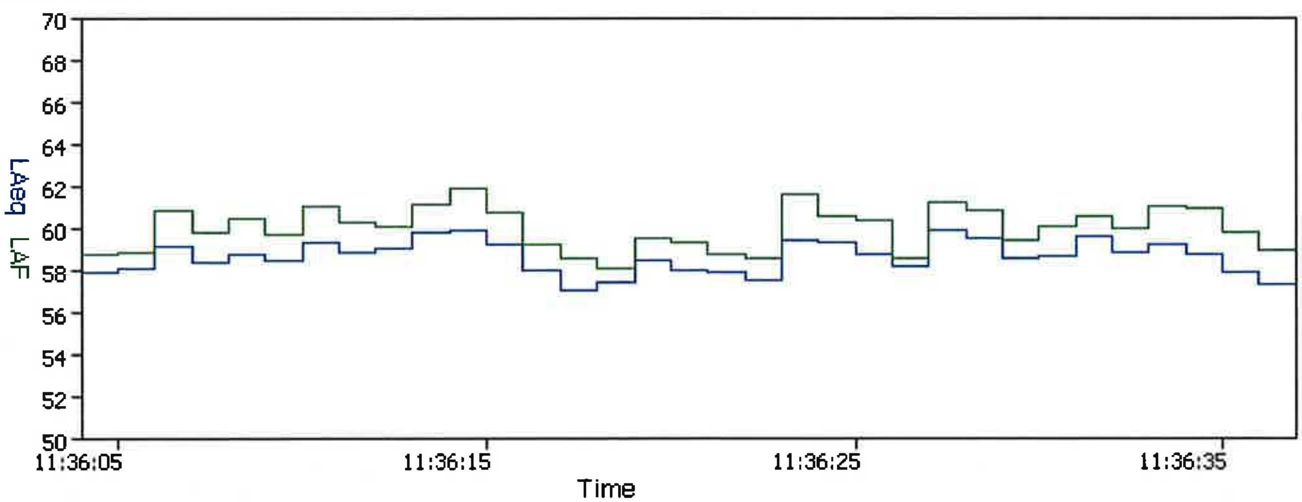
Fort Saskatchewan CSC

Chemtrade

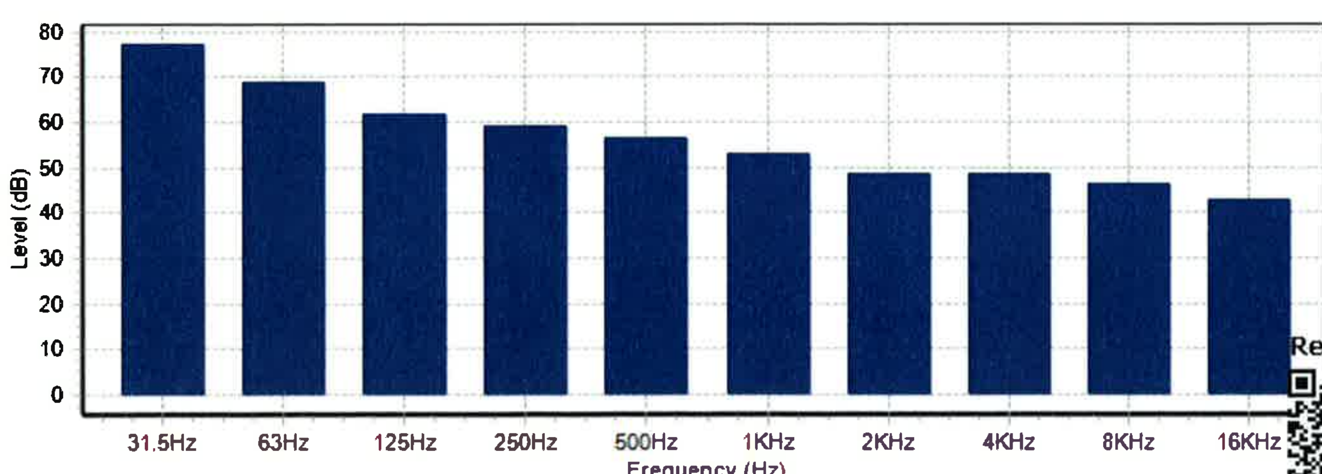
Project

2012 CSC Noise measuremen...

Time History



Frequency Bands



Report ID

Cirrus Research plc

Measurement 1:1 Octave Report

Name	CSC # 6
Time	28/12/2012 11:36:04 AM
Duration	00:00:33
Instrument	G056962, CR:171A

Calibration Information

28/12/2012 11:35:29 AM 1.55 dB

28/12/2012 11:47:56 AM 1.56 dB

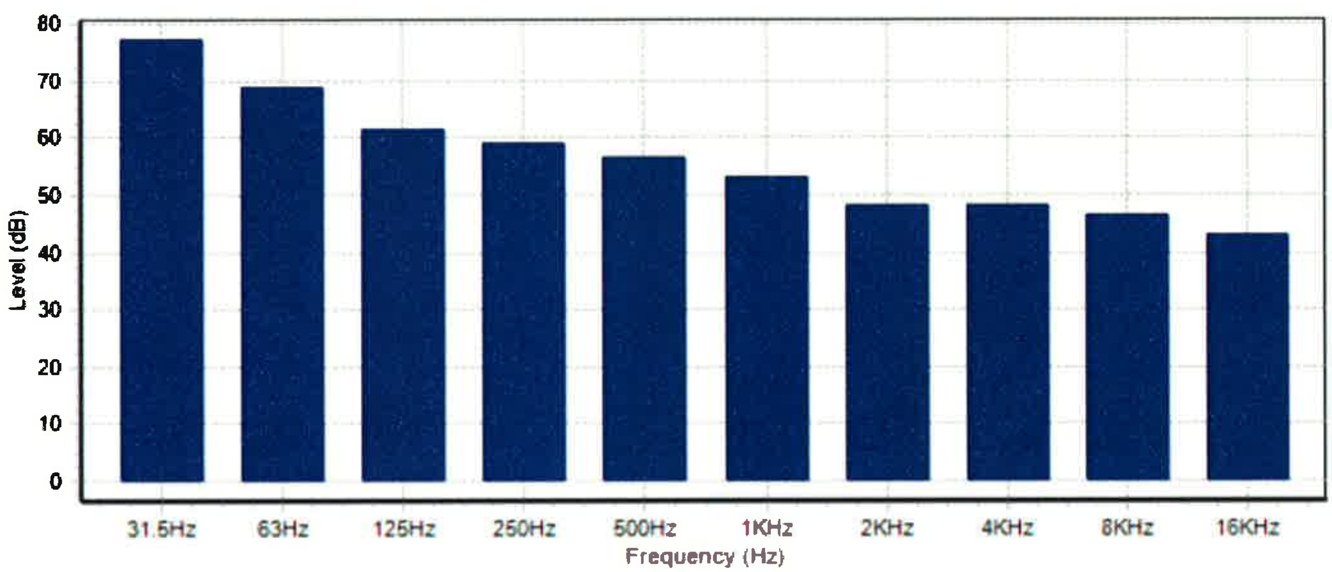
Place

Fort Saskatchewan CSC

Chemtrade

Project

2012 CSC Noise measuremen...



Band	31.5Hz	63Hz	125Hz	250Hz	500Hz	1KHz	2KHz	4KHz	8KHz	16KHz	NR	NC
Leq dB	77.3	68.8	61.6	59.1	56.6	53.0	48.4	48.4	46.5	42.9	54.0	55.0

Report ID

Date Printed 28/12/2012

Cirrus Research plc

Measurement Summary Report

Name	CSC # 7
Time	28/12/2012 11:48:23 AM
Duration	00:00:33
Instrument	G056962, CR:171A

Summary

LAeq	57.1 dB
LAE	72.3 dB
LAFMax	62.8 dB

LAF1	60.6 dB
LAF5	58.8 dB
LAF10	58.3 dB
LAF50	56.8 dB
LAF90	55.6 dB
LAF95	55.3 dB
LAF99	54.9 dB

Calibration Information

28/12/2012 11:47:56 AM 1.56 dB

28/12/2012 11:50:59 AM 1.60 dB

Place

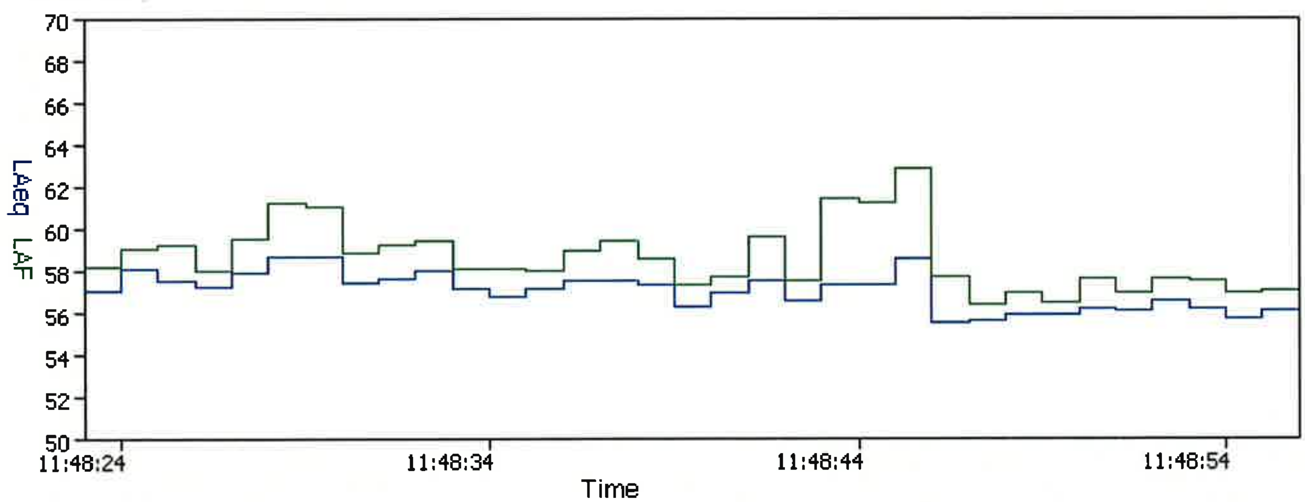
Fort Saskatchewan CSC

Chemtrade

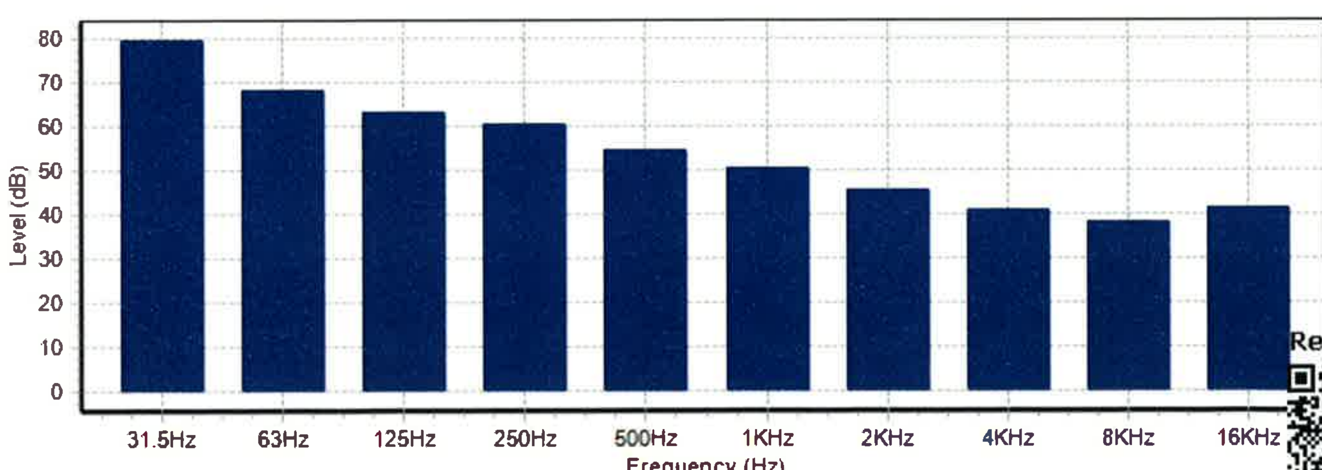
Project

2012 CSC Noise measuremen...

Time History



Frequency Bands



Report ID

Cirrus Research plc

Measurement 1:1 Octave Report

Name	CSC # 7
Time	28/12/2012 11:48:23 AM
Duration	00:00:33
Instrument	G056962, CR:171A

Calibration Information

28/12/2012 11:47:56 AM 1.56 dB

28/12/2012 11:50:59 AM 1.60 dB

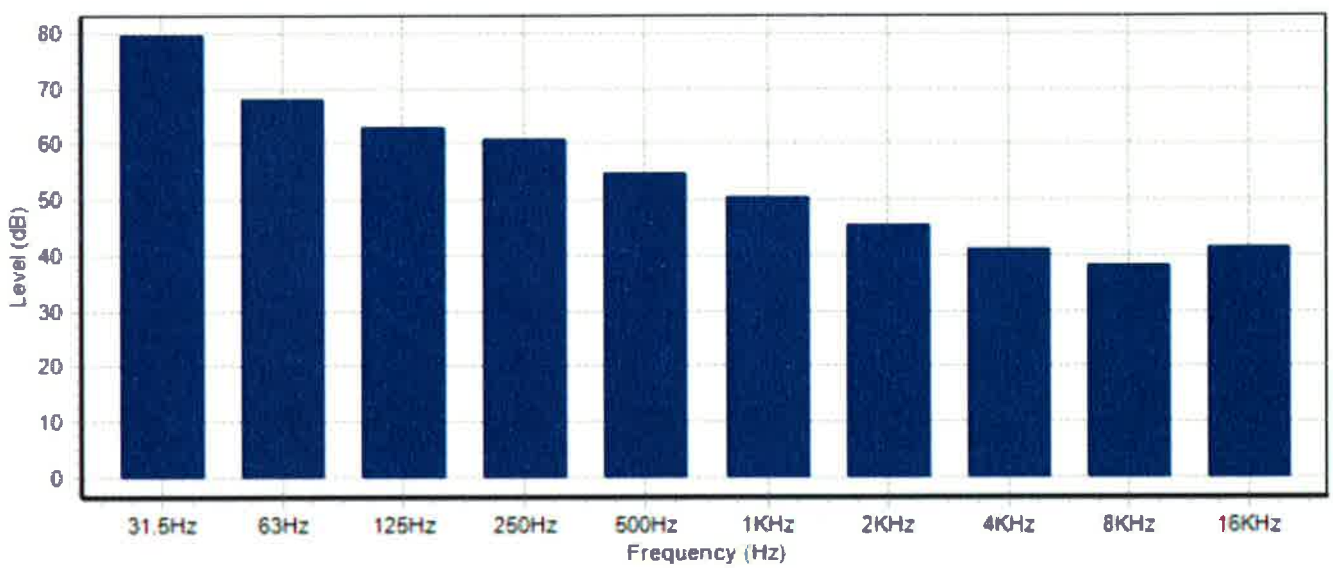
Place

Fort Saskatchewan CSC

Chemtrade

Project

2012 CSC Noise measuremen...



Band	31.5Hz	63Hz	125Hz	250Hz	500Hz	1KHz	2KHz	4KHz	8KHz	16KHz	NR	NC
Leq dB	79.6	68.2	63.1	60.7	54.7	50.6	45.3	41.2	38.1	41.5	53.0	55.0

Report ID

Cirrus Research plc

Measurement Summary Report

Name	CSC # 8
Time	28/12/2012 11:51:23 AM
Duration	00:00:33
Instrument	G056962, CR:171A

Summary

LAeq	59.6 dB
LAE	74.8 dB
LAFMax	63.8 dB

LAF1	61.2 dB
LAF5	60.5 dB
LAF10	60.2 dB
LAF50	59.5 dB
LAF90	58.7 dB
LAF95	58.4 dB
LAF99	57.9 dB

Calibration Information

28/12/2012 11:50:59 AM 1.60 dB

28/12/2012 11:53:38 AM 1.65 dB

Place

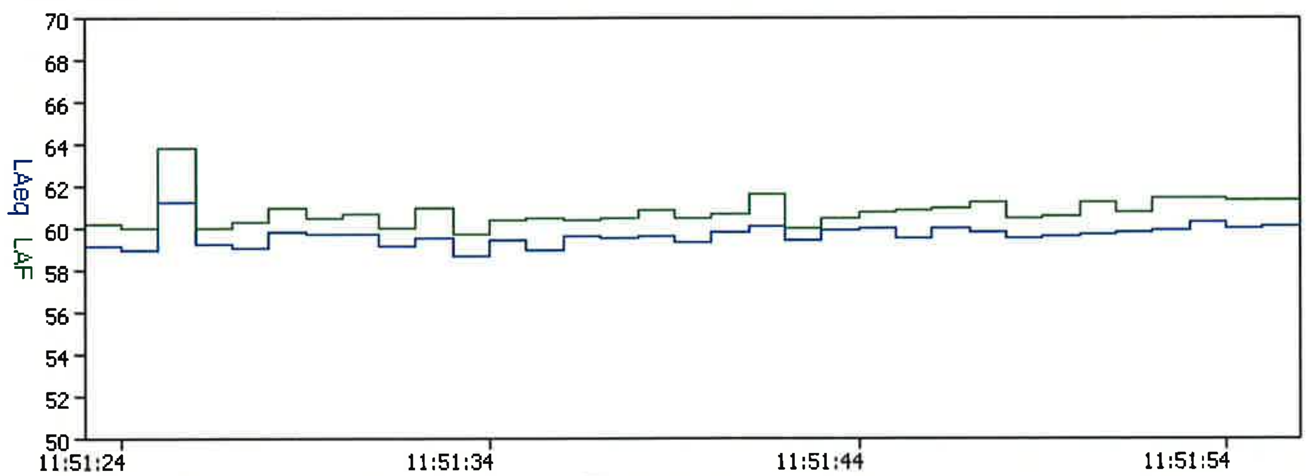
Fort Saskatchewan CSC

Chemtrade

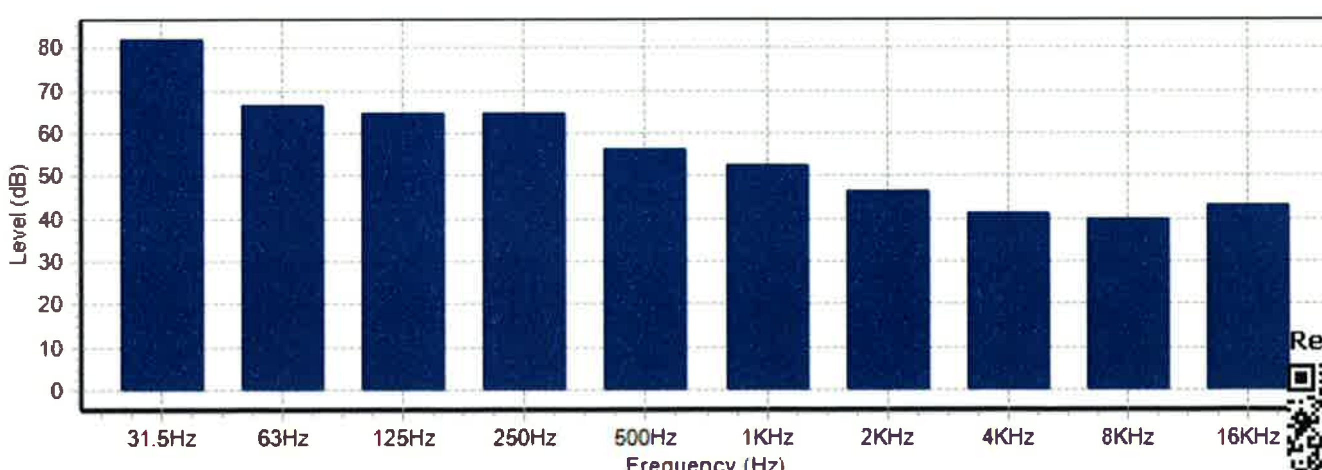
Project

2012 CSC Noise measuremen...

Time History



Frequency Bands



Report ID

Cirrus Research plc

Measurement 1:1 Octave Report

Name	CSC # 8
Time	28/12/2012 11:51:23 AM
Duration	00:00:33
Instrument	G056962, CR:171A

Calibration Information

28/12/2012 11:50:59 AM 1.60 dB

28/12/2012 11:53:38 AM 1.65 dB

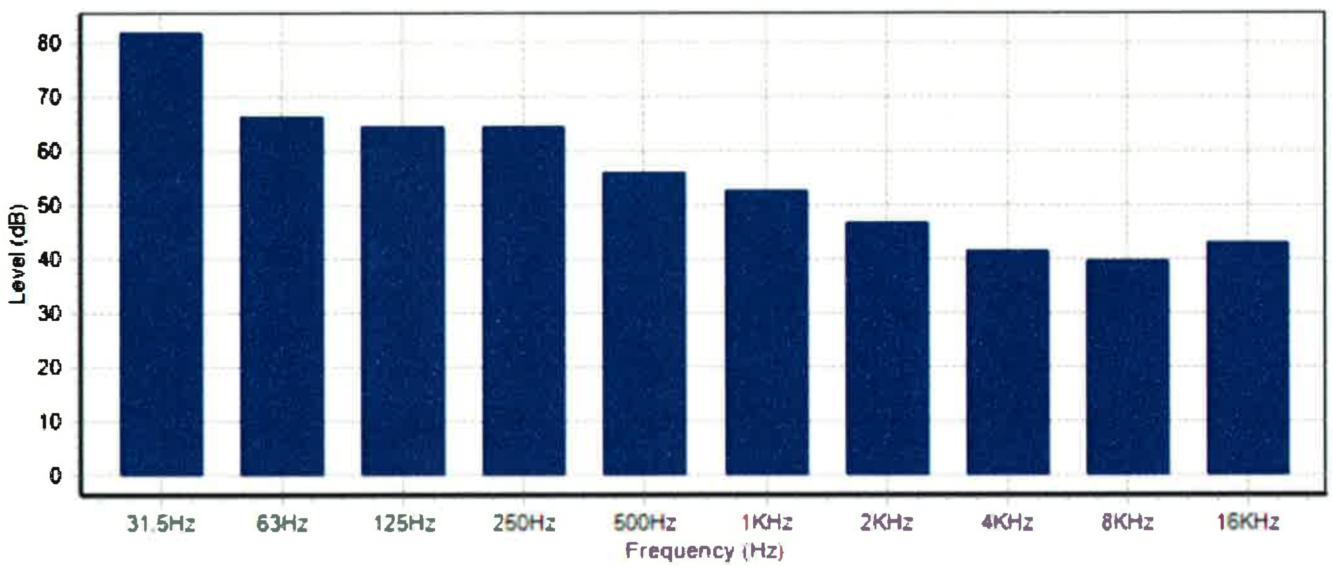
Place

Fort Saskatchewan CSC

Chemtrade

Project

2012 CSC Noise measuremen...



Band	31.5Hz	63Hz	125Hz	250Hz	500Hz	1KHz	2KHz	4KHz	8KHz	16KHz	NR	NC
Leq dB	82.0	66.5	64.5	64.7	56.1	52.5	46.6	41.4	39.9	43.1	57.0	60.0

Report ID

Date Printed 28/12/2012

Cirrus Research plc

Measurement Summary Report

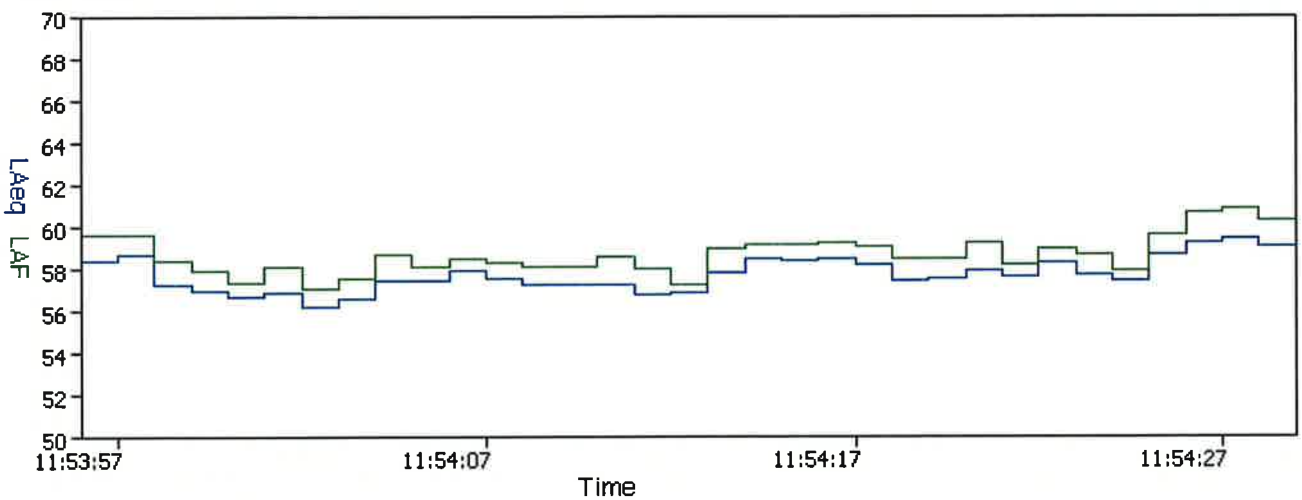
Name	CSC # 9	**Summary**		LAF1	59.9 dB
Time	28/12/2012 11:53:56 AM	LAeq	57.8 dB	LAF5	59.1 dB
Duration	00:00:33	LAE	72.9 dB	LAF10	58.8 dB
Instrument	G056962, CR:171A	LAFMax	60.8 dB	LAF50	57.5 dB
				LAF90	56.5 dB
				LAF95	56.3 dB
				LAF99	56.0 dB

Calibration Information
28/12/2012 11:53:38 AM 1.65 dB

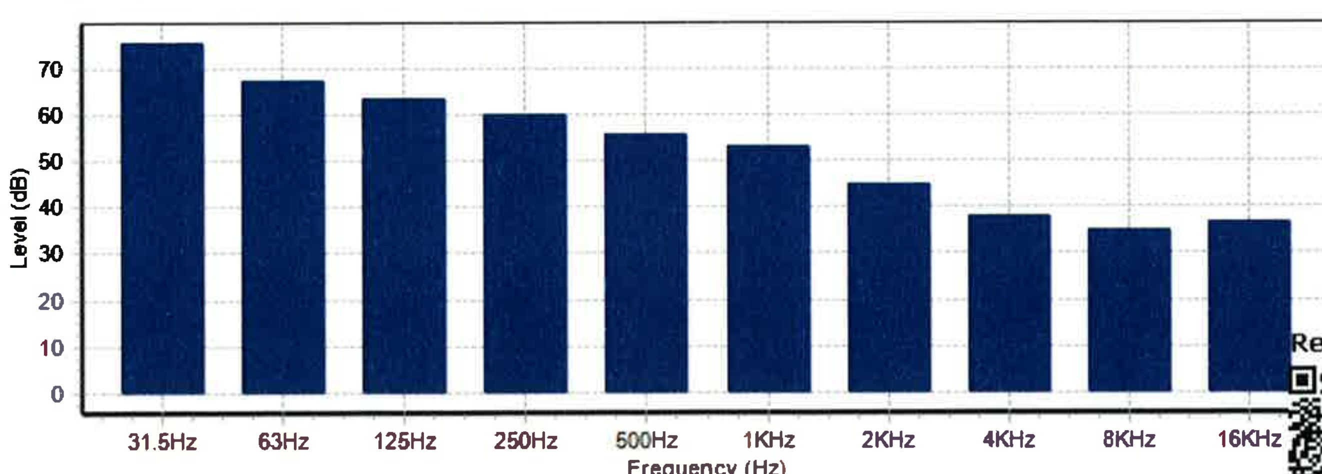
Place
Fort Saskatchewan CSC
Chemtrade

Project
2012 CSC Noise measuremen...

Time History



Frequency Bands



Report ID

Cirrus Research plc

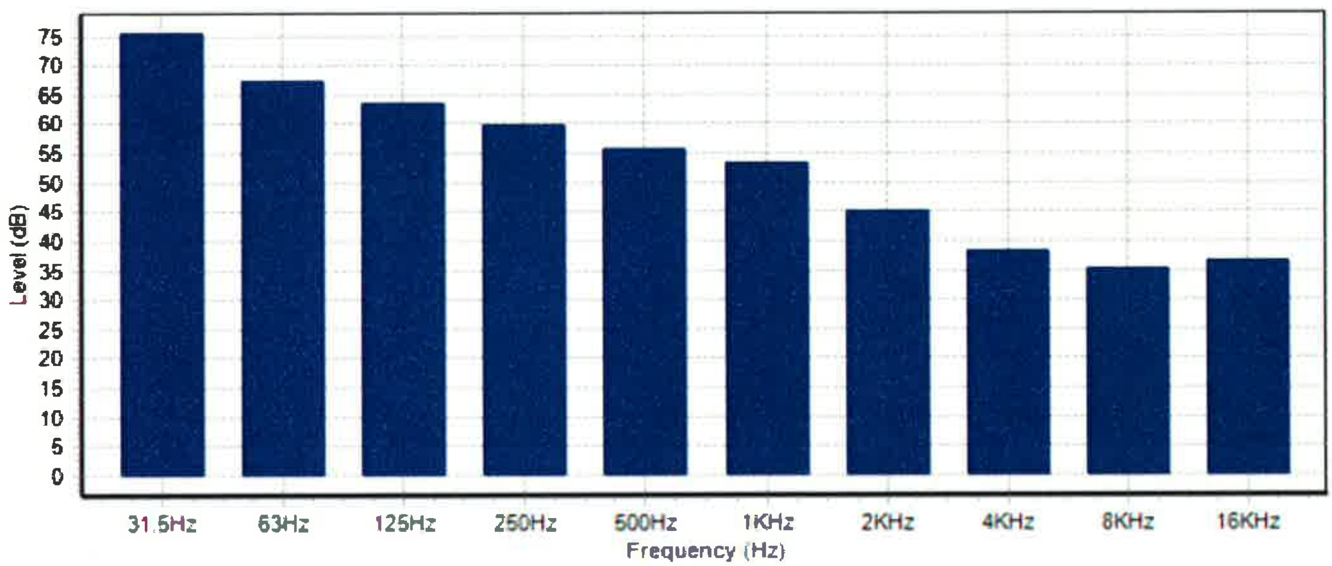
Measurement 1:1 Octave Report

Name	CSC # 9
Time	28/12/2012 11:53:56 AM
Duration	00:00:33
Instrument	G056962, CR:171A

Calibration Information
28/12/2012 11:53:38 AM 1.65 dB

Place
Fort Saskatchewan CSC
Chemtrade

Project
2012 CSC Noise measuremen...



Band	31.5Hz	63Hz	125Hz	250Hz	500Hz	1KHz	2KHz	4KHz	8KHz	16KHz	NR	NC
Leq dB	75.5	67.4	63.4	59.9	55.8	53.2	45.0	38.2	35.1	36.5	54.0	55.0

Report ID

Date Printed 28/12/2012

Cirrus Research plc

Measurement Summary Report

Name	Sulphides # 1	**Summary**		LAF1	65.4 dB
Time	28/12/2012 1:45:24 PM	LAeq	62.6 dB	LAF5	64.3 dB
Duration	00:01:03	LAE	80.6 dB	LAF10	63.7 dB
Instrument	G056962, CR:171A	LAFMax	69.6 dB	LAF50	62.2 dB
				LAF90	61.3 dB
				LAF95	61.2 dB
				LAF99	61.0 dB

Calibration Information

28/12/2012 1:45:14 PM 1.27 dB

28/12/2012 1:49:43 PM 1.33 dB

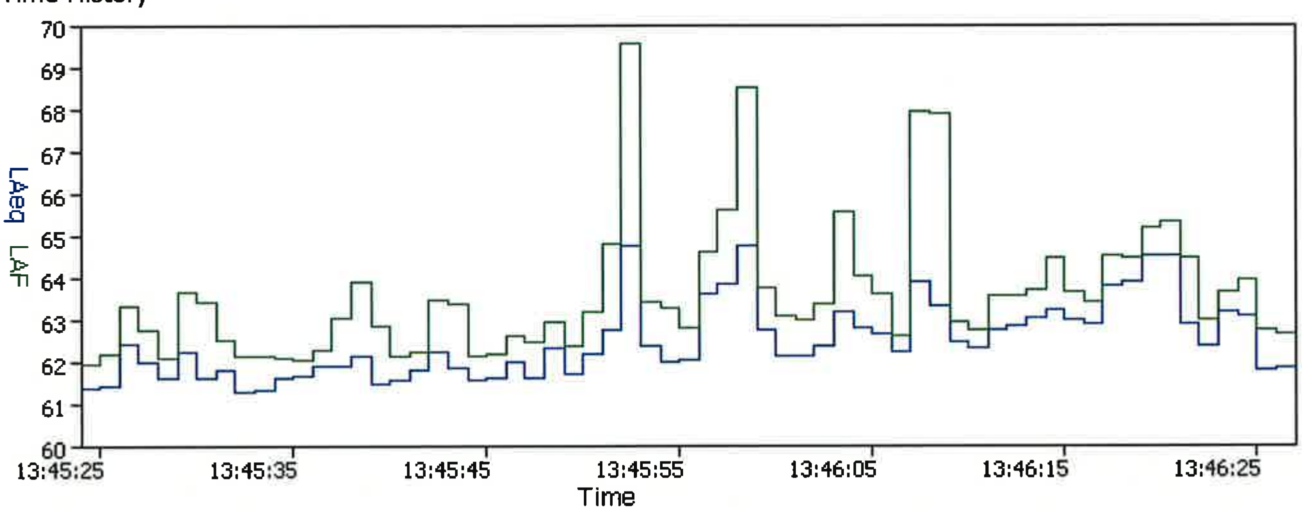
Place

Fort Saskatchewan Sulphid...

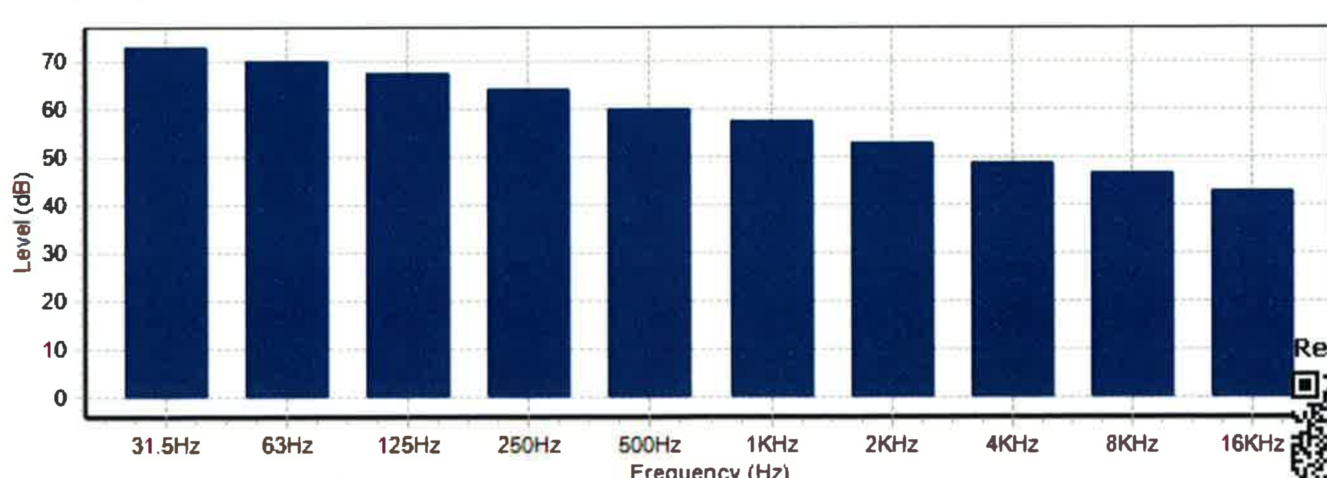
Project

2012 CSC Noise measuremen...

Time History



Frequency Bands



Report ID

Date Printed 28/12/2012

Cirrus Research plc

Measurement 1:1 Octave Report

Name	Sulphides # 1
Time	28/12/2012 1:45:24 PM
Duration	00:01:03
Instrument	G056962, CR:171A

Calibration Information

28/12/2012 1:45:14 PM 1.27 dB

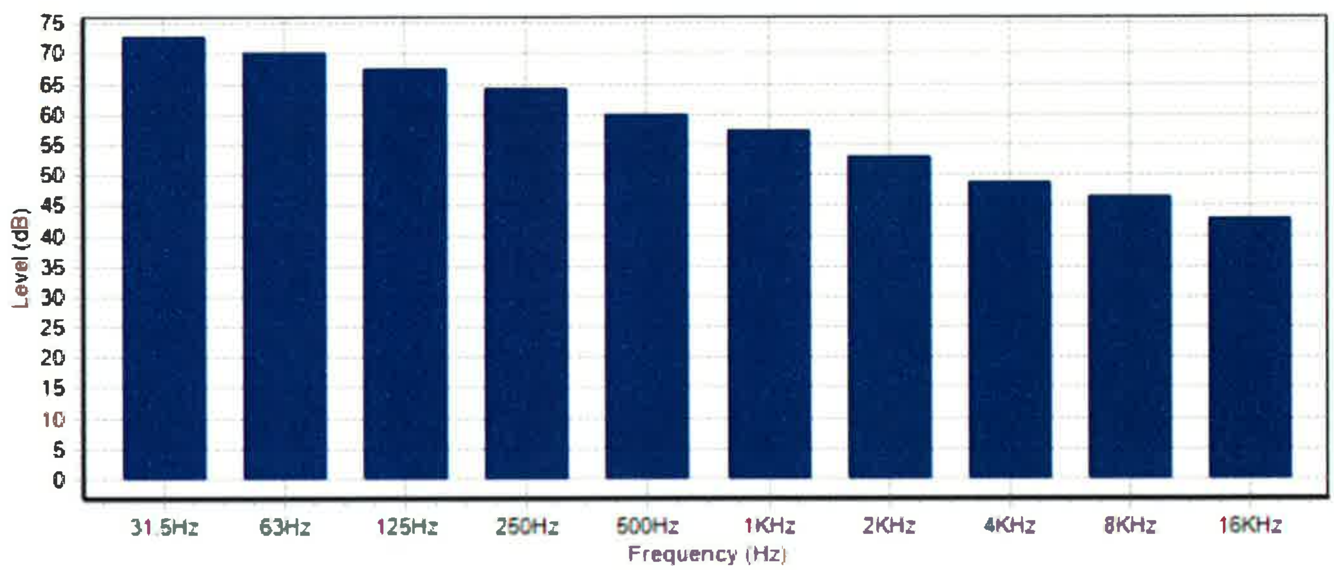
28/12/2012 1:49:43 PM 1.33 dB

Place

Fort Saskatchewan Sulphid...

Project

2012 CSC Noise measuremen...



Band	31.5Hz	63Hz	125Hz	250Hz	500Hz	1KHz	2KHz	4KHz	8KHz	16KHz	NR	NC
Leq dB	72.8	70.0	67.5	64.1	60.0	57.2	53.0	48.6	46.5	42.7	58.0	60.0

Report ID

Cirrus Research plc

Measurement Summary Report

Name	Sulphides # 2
Time	28/12/2012 1:47:22 PM
Duration	00:01:03
Instrument	G056962, CR:171A

Summary

LAeq	67.9 dB
LAE	85.9 dB
LAFMax	72.1 dB

LAF1	71.4 dB
LAF5	69.8 dB
LAF10	68.7 dB
LAF50	67.5 dB
LAF90	66.9 dB
LAF95	66.8 dB
LAF99	66.5 dB

Calibration Information

28/12/2012 1:45:14 PM 1.27 dB

28/12/2012 1:49:43 PM 1.33 dB

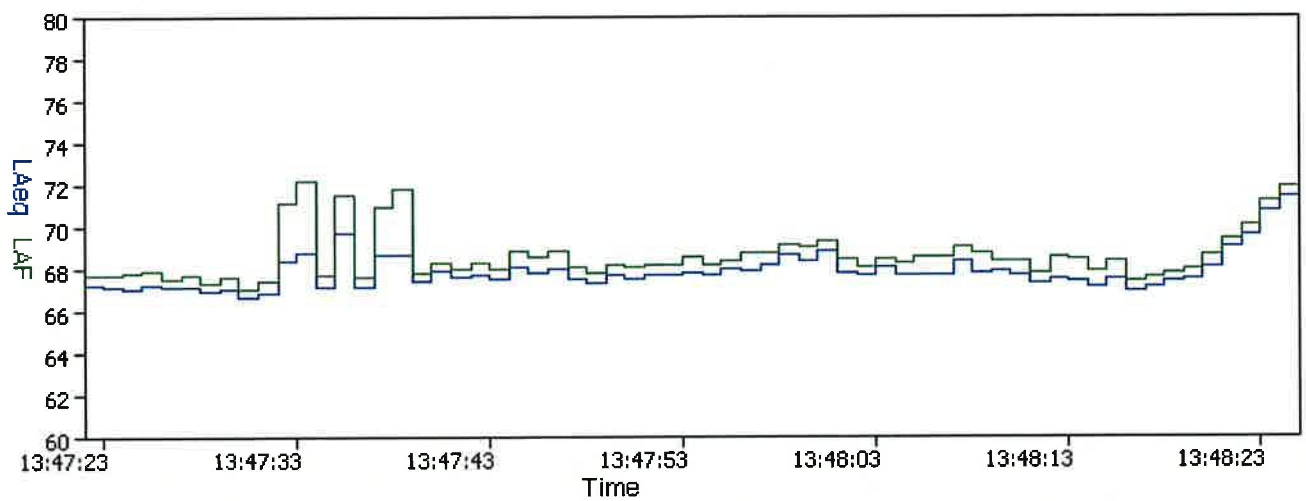
Place

Fort Saskatchewan Sulphid...

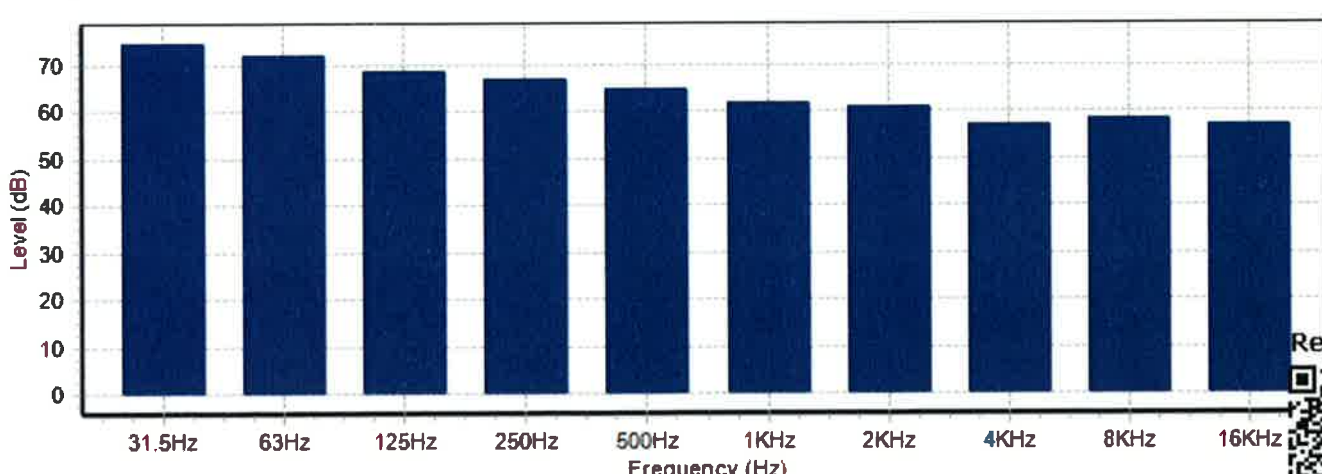
Project

2012 CSC Noise measuremen...

Time History



Frequency Bands



Report ID

Cirrus Research plc

Measurement 1:1 Octave Report

Name	Sulphides # 2
Time	28/12/2012 1:47:22 PM
Duration	00:01:03
Instrument	G056962, CR:171A

Calibration Information

28/12/2012 1:45:14 PM 1.27 dB

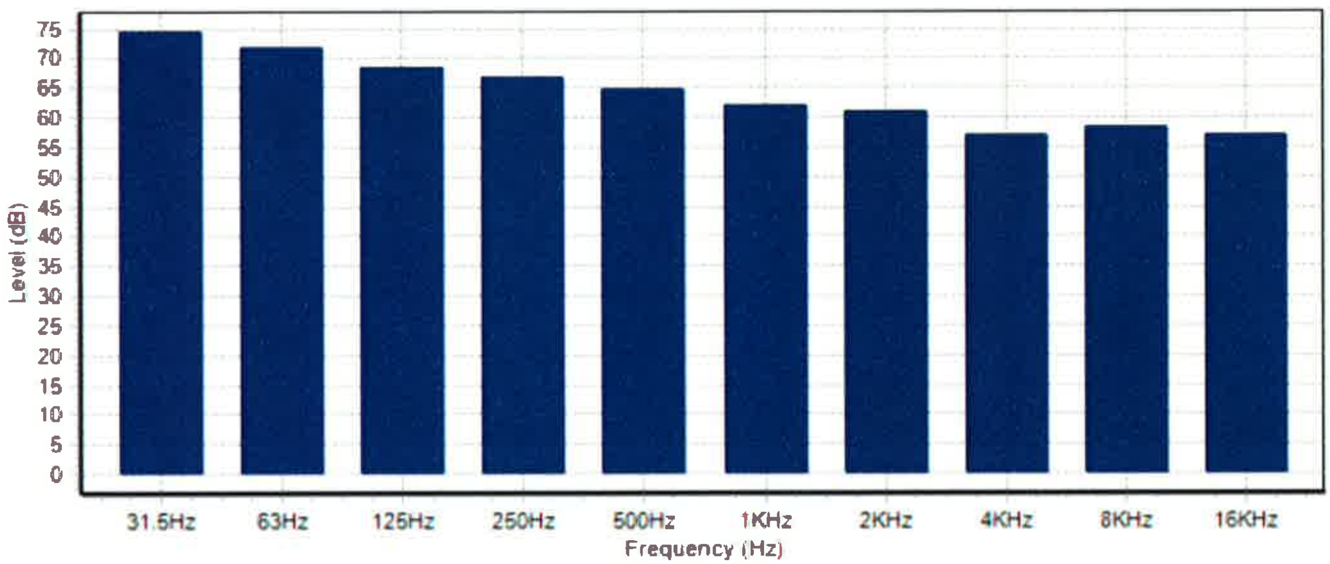
28/12/2012 1:49:43 PM 1.33 dB

Place

Fort Saskatchewan Sulphid...

Project

2012 CSC Noise measuremen...



Band	31.5Hz	63Hz	125Hz	250Hz	500Hz	1KHz	2KHz	4KHz	8KHz	16KHz	NR	NC
Leq dB	74.5	71.8	68.5	66.9	64.7	61.9	61.0	57.1	58.3	57.0	65.0	65.0

Report ID

Cirrus Research plc

Measurement Summary Report

Name	Sulphides # 3
Time	28/12/2012 1:50:02 PM
Duration	00:01:02
Instrument	G056962, CR:171A

Summary

LAeq	61.3 dB
LAE	79.2 dB
LAFMax	70.1 dB
LAF1	67.8 dB
LAF5	64.1 dB
LAF10	62.9 dB
LAF50	60.4 dB
LAF90	58.9 dB
LAF95	58.6 dB
LAF99	58.0 dB

Calibration Information

28/12/2012 1:49:43 PM 1.33 dB

28/12/2012 1:56:26 PM 1.44 dB

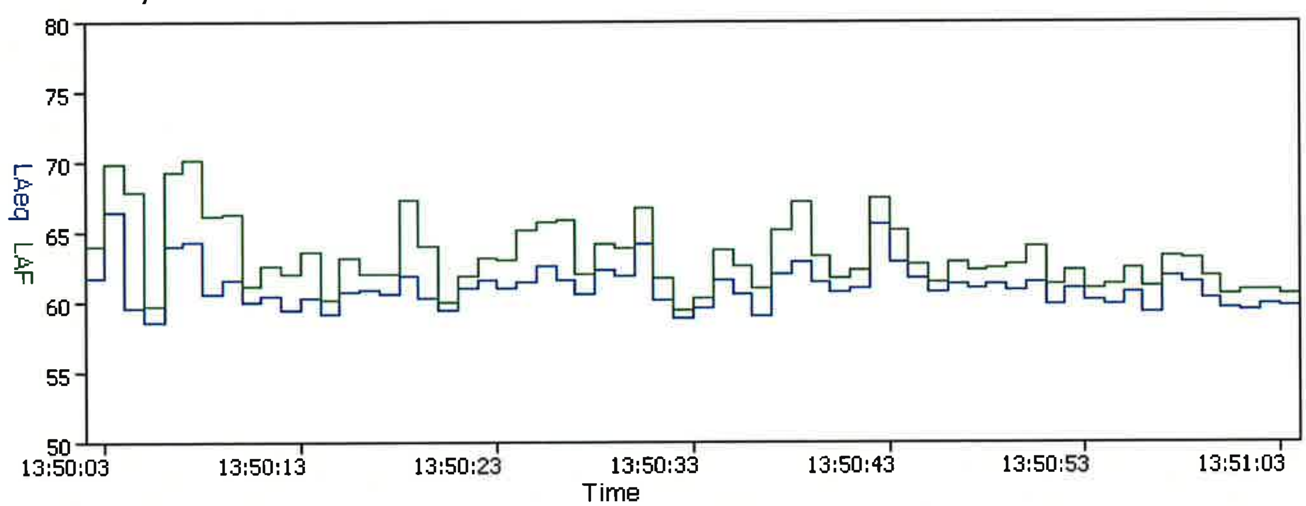
Place

Fort Saskatchewan Sulphid...

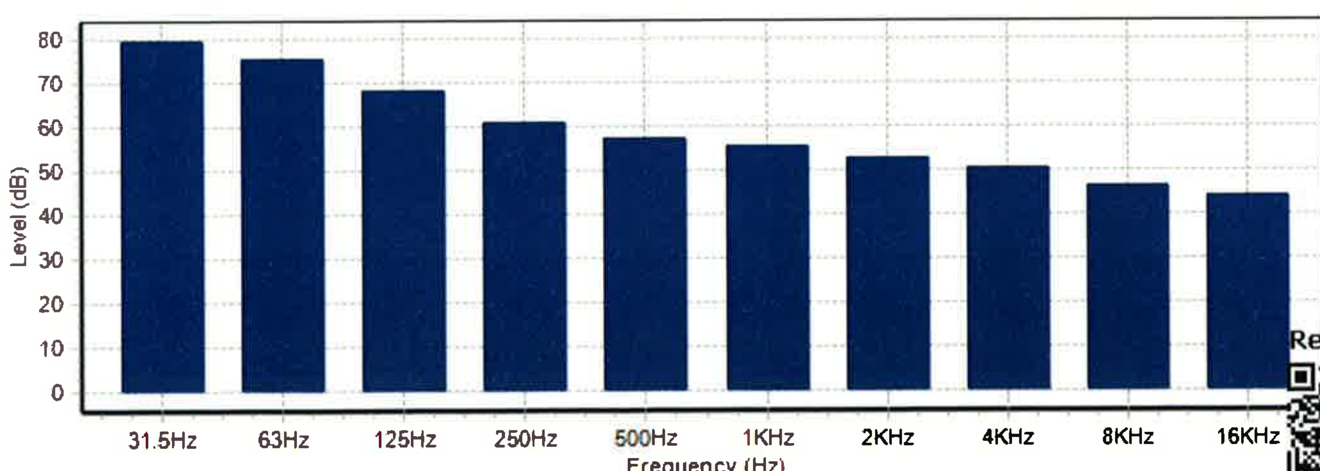
Project

2012 CSC Noise measuremen...

Time History



Frequency Bands



Report ID

Cirrus Research plc

Measurement 1:1 Octave Report

Name	Sulphides # 3
Time	28/12/2012 1:50:02 PM
Duration	00:01:02
Instrument	G056962, CR:171A

Calibration Information

28/12/2012 1:49:43 PM 1.33 dB

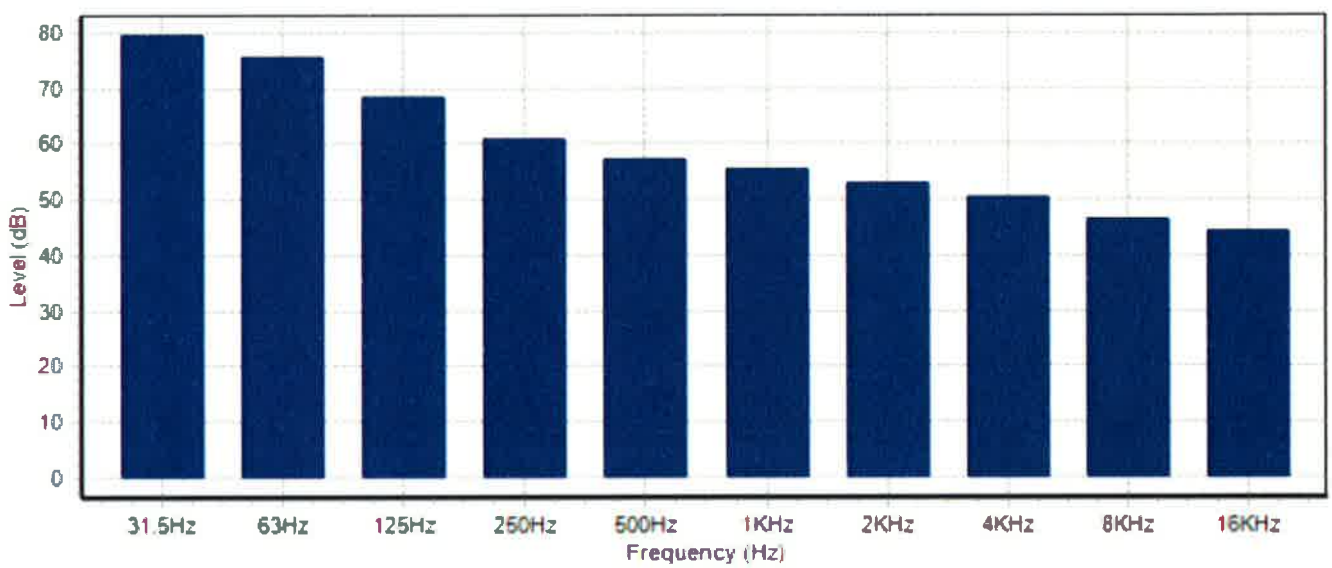
28/12/2012 1:56:26 PM 1.44 dB

Place

Fort Saskatchewan Sulphid...

Project

2012 CSC Noise measuremen...



Band	31.5Hz	63Hz	125Hz	250Hz	500Hz	1KHz	2KHz	4KHz	8KHz	16KHz	NR	NC
Leq dB	79.6	75.7	68.3	61.0	57.4	55.3	52.9	50.4	46.3	44.2	56.0	60.0

Report ID

Date Printed 28/12/2012

Cirrus Research plc

Measurement Summary Report

Name	Sulphides # 4
Time	28/12/2012 1:51:34 PM
Duration	00:01:03
Instrument	G056962, CR:171A

Summary

LAeq	65.8 dB
LAE	83.8 dB
LAFMax	71.2 dB

LAF1	68.1 dB
LAF5	66.9 dB
LAF10	66.6 dB
LAF50	65.6 dB
LAF90	64.7 dB
LAF95	64.6 dB
LAF99	64.4 dB

Calibration Information

28/12/2012 1:49:43 PM 1.33 dB

28/12/2012 1:56:26 PM 1.44 dB

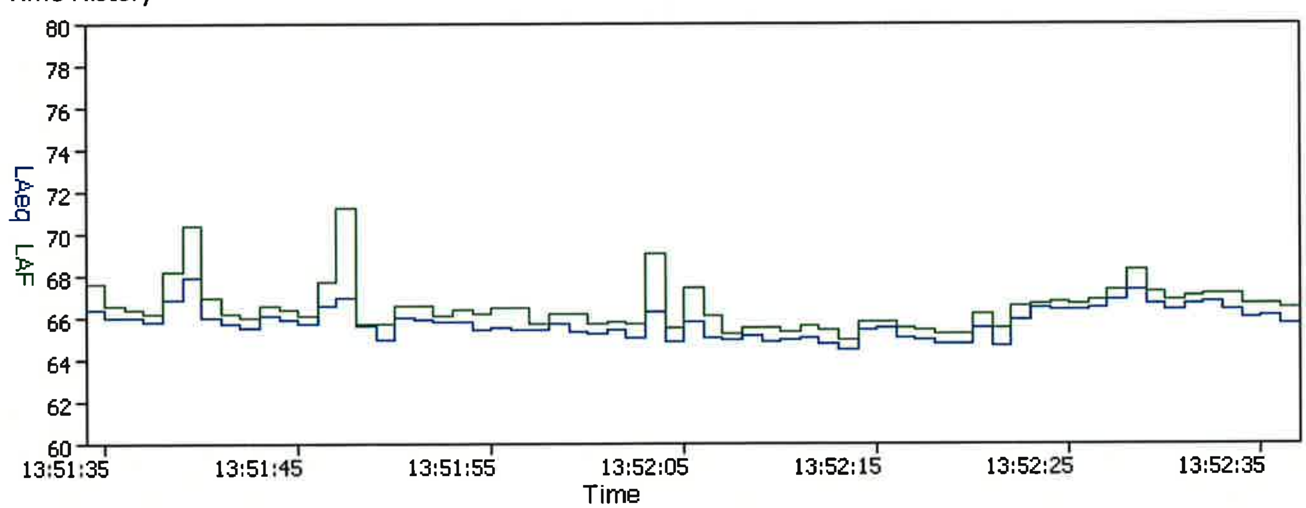
Place

Fort Saskatchewan Sulphid...

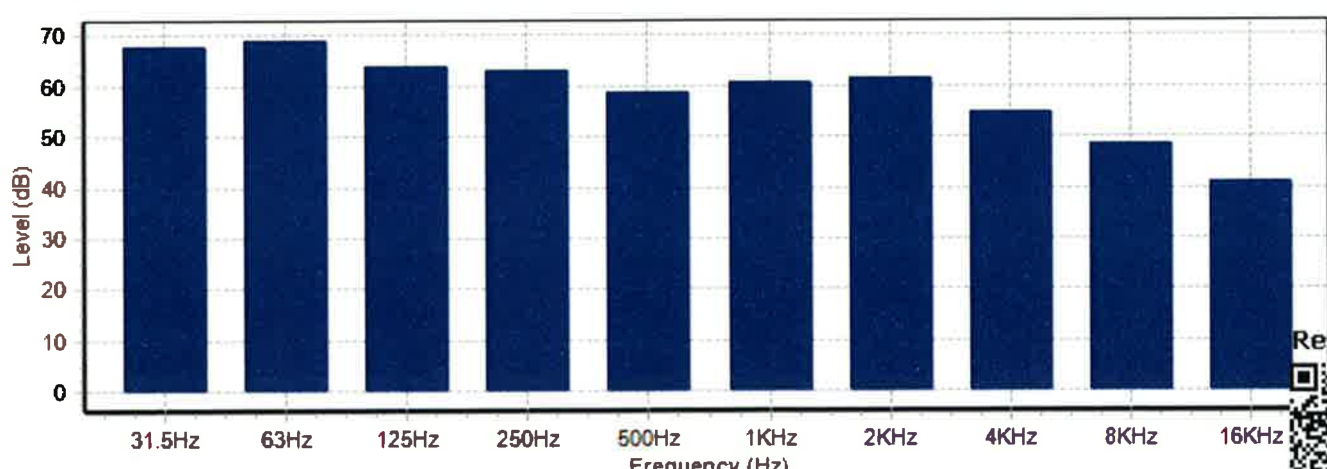
Project

2012 CSC Noise measuremen...

Time History



Frequency Bands



Report ID

Cirrus Research plc

Measurement 1:1 Octave Report

Name	Sulphides # 4
Time	28/12/2012 1:51:34 PM
Duration	00:01:03
Instrument	G056962, CR:171A

Calibration Information

28/12/2012 1:49:43 PM 1.33 dB

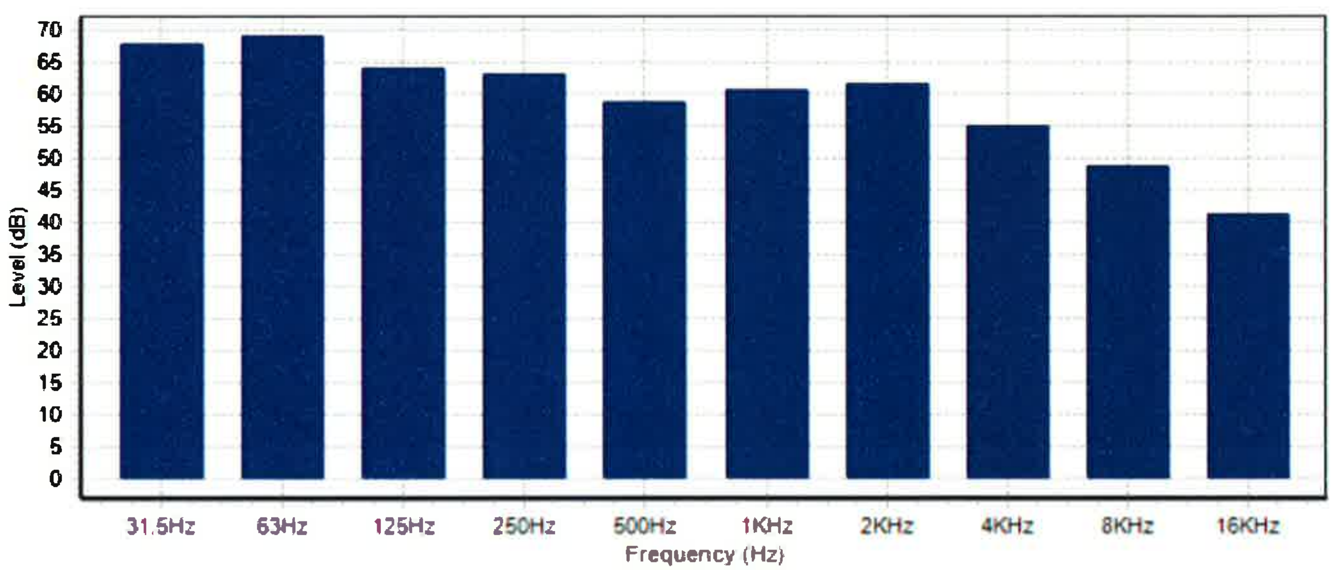
28/12/2012 1:56:26 PM 1.44 dB

Place

Fort Saskatchewan Sulphid...

Project

2012 CSC Noise measuremen...



Band	31.5Hz	63Hz	125Hz	250Hz	500Hz	1KHz	2KHz	4KHz	8KHz	16KHz	NR	NC
Leq dB	67.8	69.0	64.0	63.0	58.6	60.6	61.5	55.0	48.7	41.1	65.0	65.0

Report ID

Cirrus Research plc

Measurement Summary Report

Name	Sulphides # 5
Time	28/12/2012 1:53:56 PM
Duration	00:01:04
Instrument	G056962, CR:171A

Summary

LAeq	62.4 dB
LAE	80.5 dB
LAFMax	64.7 dB
LAF1	63.9 dB
LAF5	63.4 dB
LAF10	63.1 dB
LAF50	62.3 dB
LAF90	61.6 dB
LAF95	61.4 dB
LAF99	60.5 dB

Calibration Information

28/12/2012 1:49:43 PM 1.33 dB

28/12/2012 1:56:26 PM 1.44 dB

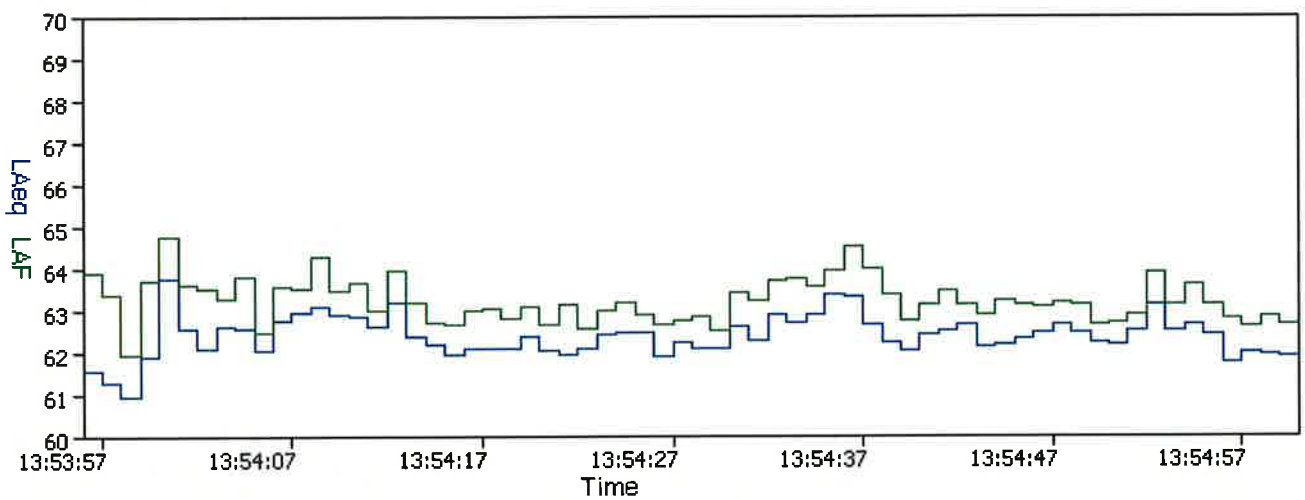
Place

Fort Saskatchewan Sulphid...

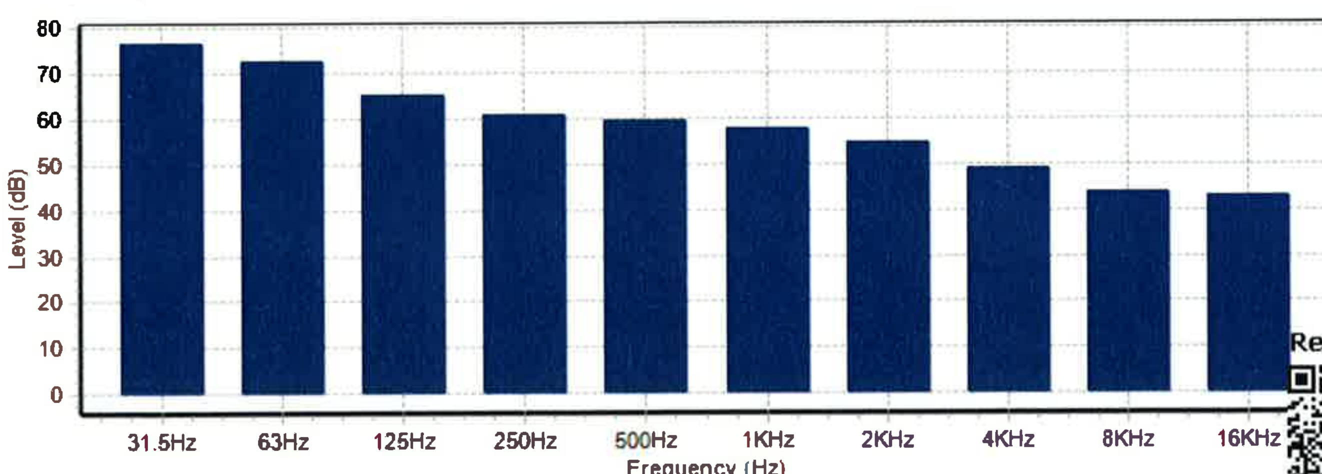
Project

2012 CSC Noise measuremen...

Time History



Frequency Bands



Report ID

Cirrus Research plc

Measurement 1:1 Octave Report

Name	Sulphides # 5
Time	28/12/2012 1:53:56 PM
Duration	00:01:04
Instrument	G056962, CR:171A

Calibration Information

28/12/2012 1:49:43 PM 1.33 dB

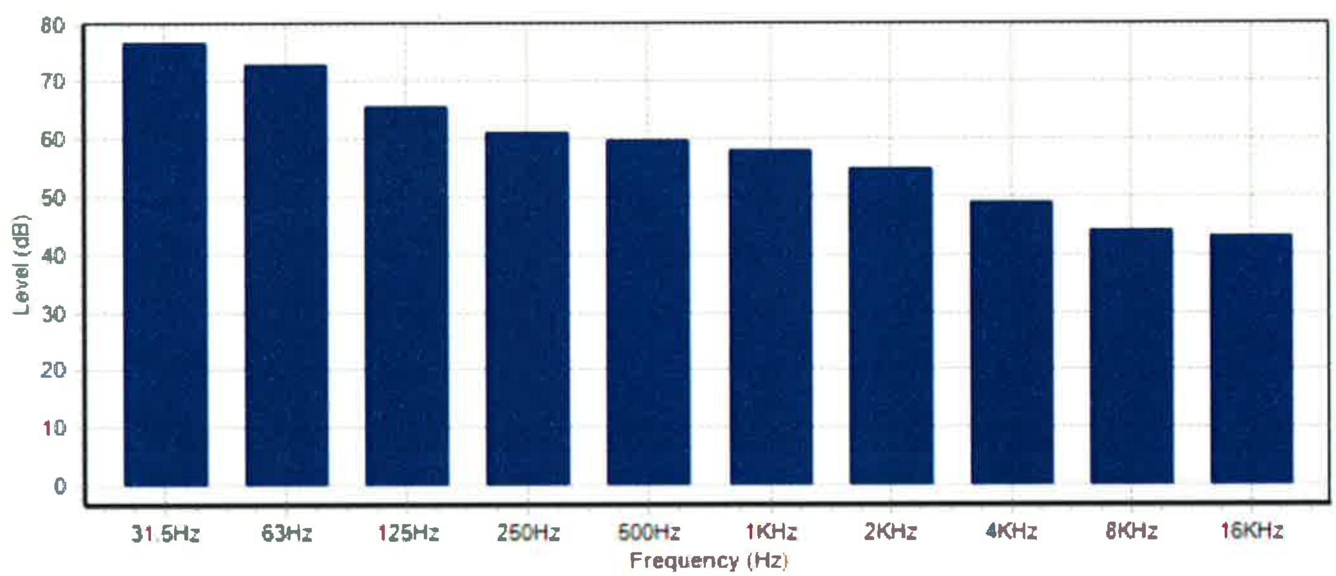
28/12/2012 1:56:26 PM 1.44 dB

Place

Fort Saskatchewan Sulphid...

Project

2012 CSC Noise measuremen...



Band	31.5Hz	63Hz	125Hz	250Hz	500Hz	1KHz	2KHz	4KHz	8KHz	16KHz	NR	NC
Leq dB	76.7	72.9	65.5	60.9	59.7	57.9	55.0	49.1	44.0	43.0	58.0	60.0

Report ID

Cirrus Research plc

Measurement Summary Report

Name	Sulphides # 6
Time	28/12/2012 1:56:40 PM
Duration	00:01:03
Instrument	G056962, CR:171A

Summary

LAeq	61.0 dB
LAE	79.0 dB
LAFMax	65.4 dB

LAF1	63.0 dB
LAF5	62.4 dB
LAF10	62.0 dB
LAF50	60.8 dB
LAF90	59.8 dB
LAF95	59.7 dB
LAF99	59.3 dB

Calibration Information

28/12/2012 1:56:26 PM 1.44 dB

28/12/2012 3:02:58 PM 0.73 dB

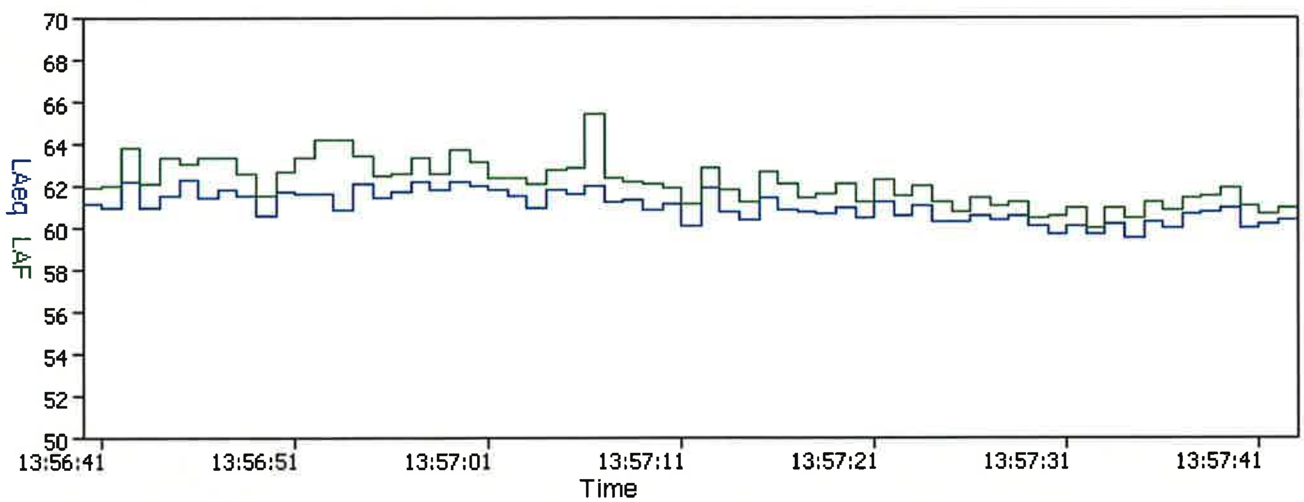
Place

Fort Saskatchewan Sulphid...

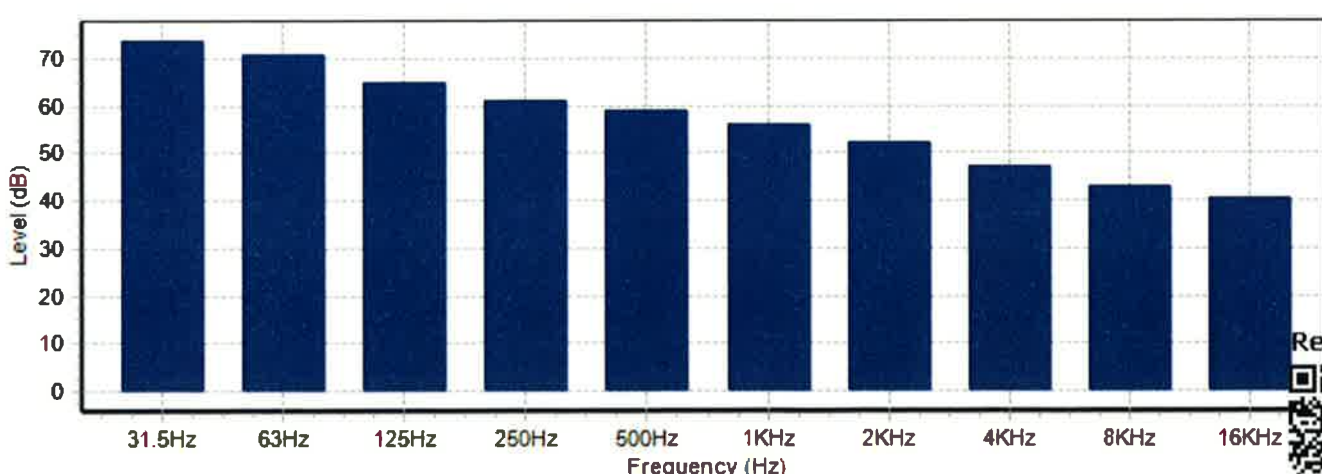
Project

2012 CSC Noise measuremen...

Time History



Frequency Bands



Report ID

Date Printed 28/12/2012

Cirrus Research plc

Measurement 1:1 Octave Report

Name	Sulphides # 6
Time	28/12/2012 1:56:40 PM
Duration	00:01:03
Instrument	G056962, CR:171A

Calibration Information

28/12/2012 1:56:26 PM 1.44 dB

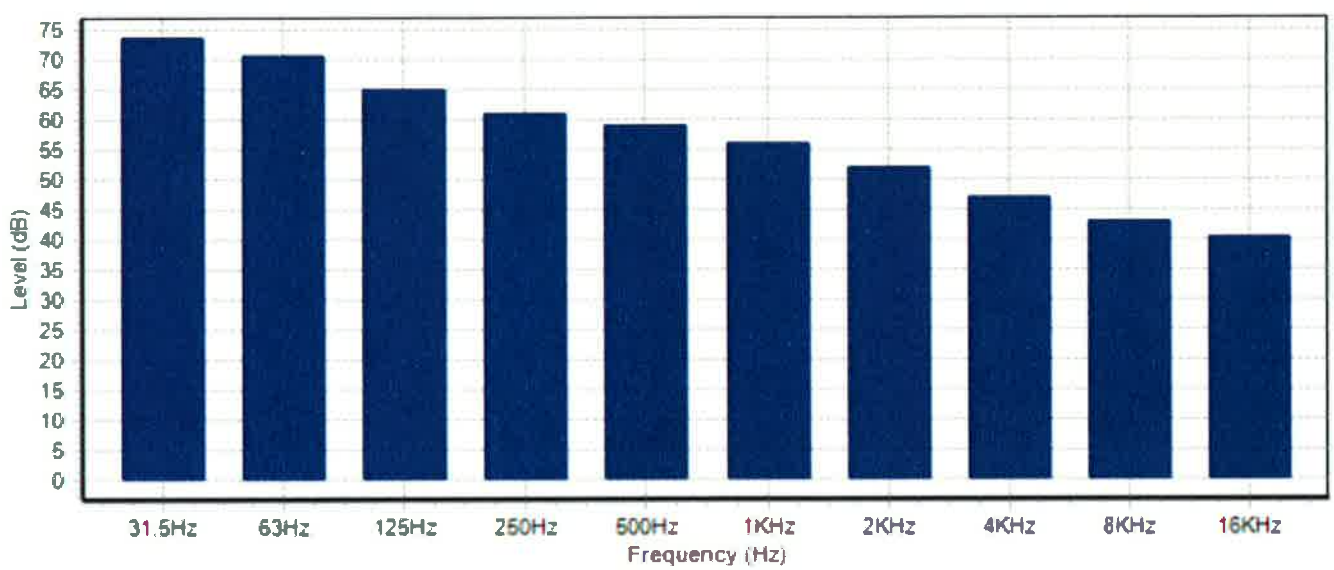
28/12/2012 3:02:58 PM 0.73 dB

Place

Fort Saskatchewan Sulphid...

Project

2012 CSC Noise measuremen...



Band	31.5Hz	63Hz	125Hz	250Hz	500Hz	1KHz	2KHz	4KHz	8KHz	16KHz	NR	NC
Leq dB	73.8	70.7	65.2	61.2	59.0	56.0	52.2	47.1	43.0	40.6	57.0	60.0

Report ID

Date Printed 28/12/2012

Cirrus Research plc

Measurement Summary Report

Name	Sulphides # 7
Time	28/12/2012 1:59:18 PM
Duration	00:01:02
Instrument	G056962, CR:171A

Summary

LAeq	60.3 dB
LAE	78.2 dB
LAFMax	71.0 dB

LAF1	67.9 dB
LAF5	64.2 dB
LAF10	62.0 dB
LAF50	59.1 dB
LAF90	57.7 dB
LAF95	57.4 dB
LAF99	57.0 dB

Calibration Information

28/12/2012 1:56:26 PM 1.44 dB

28/12/2012 3:02:58 PM 0.73 dB

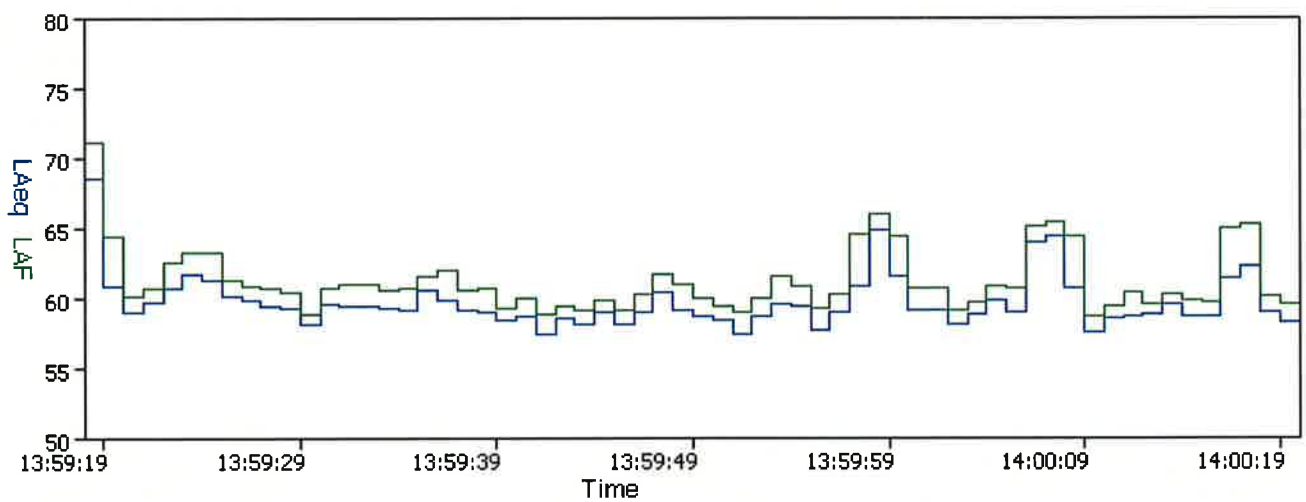
Place

Fort Saskatchewan Sulphid...

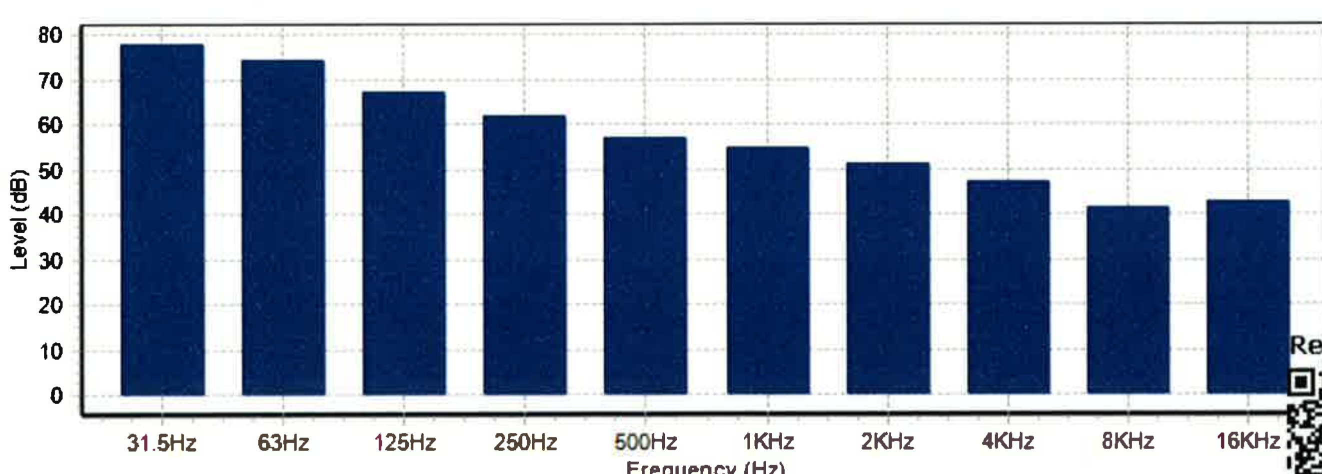
Project

2012 CSC Noise measuremen...

Time History



Frequency Bands



Report ID

Cirrus Research plc

Measurement 1:1 Octave Report

Name	Sulphides # 7
Time	28/12/2012 1:59:18 PM
Duration	00:01:02
Instrument	G056962, CR:171A

Calibration Information

28/12/2012 1:56:26 PM 1.44 dB

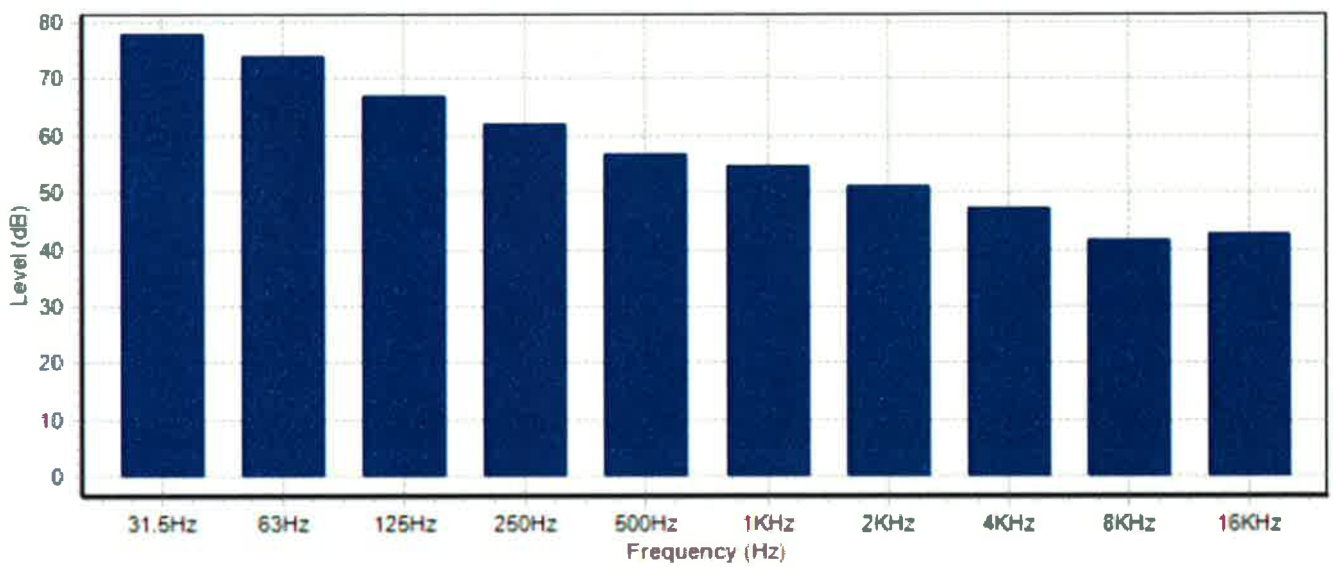
28/12/2012 3:02:58 PM 0.73 dB

Place

Fort Saskatchewan Sulphid...

Project

2012 CSC Noise measuremen...



Band	31.5Hz	63Hz	125Hz	250Hz	500Hz	1KHz	2KHz	4KHz	8KHz	16KHz	NR	NC
Leq dB	77.9	74.1	67.0	62.0	56.8	54.7	51.1	47.1	41.5	42.5	55.0	60.0

Report ID

CHEMTRADE

NCIA office, Fort Saskatchewan
#204 9902-102 Street
Fort Saskatchewan, AB
Attn.: Dr. Laurie J. Danielson, P. Chem.
Executive Director, Northeast Capital Industrial Association

August 16, 2013

RE: Annual self-assessment of Chemtrade's Environmental Noise Management program for the Fort Saskatchewan CSC and Sulphides sites

As per the Chemtrade Environmental Noise Monitoring and Control Procedure CHE-FSK-ESH-001, Henry Zuczek (senior site leader) and Kathryn Dragowska (EHS Supervisor) have performed an annual self-assessment of our program. The following items have been examined and corrective actions have been noted below:

Items examined:

1. Noise survey results from 2012
2. Review of any noise complaints and their follow-up
3. Review of worker training records (TLM)
4. Review of capital projects and changes made which may impact environmental noise from either facility
5. General review of the procedure

Corrective actions required:

Page	Section	Item	Target date	PPR	Progress
3	5.2.1	Sound level meter to be calibrated by the instrument manufacturer or an authorized instrument calibration facility. before or on November 7, 2013	11/7/2013	K. Dragowska	Arrangements are in progress. Measure is scheduled to be sent by mid-September 2013
3	5.2.4	2012 reports are posted on the Chemtrade Document Management System (DMS, Chemtrade's Sharepoint), however, not under the Noise Monitoring folder as specified in procedure.	8/16/2013	K. Dragowska	Task completed

4	5.2.6	Identifying numbers have been added onto the map to simplify finding the locations where measurements need to be taken	8/16/2013	K. Dragowska	Task completed
N/A	N/A	Action items for annual self-assessment requirement to be added to Chemtrade's compliance calendar (internal best practice).	8/16/2013	K. Dragowska	Task completed

End of corrective actions.

If there are any questions concerning this assessment, please contact Kathryn Dragowska at (780) 288-3984.

Yours truly,

Henry Zuczek
Regional Manufacturing Manager

Kathryn Dragowska
EH&S Supervisor

cc: April Booker – EH&S Supervisor
Susan Fern-McDougall – EH&S Director

Dow Chemical Canada ULC
Bag 16, Highway 15
Fort Saskatchewan, Alberta
T8L 2P4, Canada

April 10, 2013

Northeast Capital Industrial Association
Laurie Danielson, Executive Director
#204, 9902 - 102 Street
Fort Saskatchewan, AB T8L 2C3

Dear Dr. Danielson,

Subject: 2012 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 ERCB 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,

Michael Dziarmaga

Mike Dziarmaga, P. Eng.
Associate EH&S Operations Director

Copy: Pravind Ramdial, Responsible Care Leader MEGlobal Canada Inc.
EH&S File: \\Fsnt06\environment\Approved\Regulatory Affairs\ERCB\Reports\NCIA Noise\2012 Noise Management Annual Report to NCIA.docx
ERCB Noise Model Binder

Dow Fort Saskatchewan Site
2012 Noise Management Annual Report
Prepared for Northeast Capital Industrial Association (NCIA)

This report provides Dow and MEGlobal's 2012 input to the NCIA Regional Noise Management Plan report to be submitted to the ERCB in May 2013. Based on ERCB licensed gas plant, wells and caverns on the Fort Saskatchewan Site, Dow is required to follow ERCB 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 2010-002 issued 3-Sep-10, revised 5-Mar-10 (attached), including the Procedure/Practice/Standard reference (i.e. SOP-AG.RW-200-002).	A Noise Management Plan was developed in early 2012 for Dow and MEGlobal and was submitted to NCIA in early 2012 for inclusion in the May 2012 NCIA report to the ERCB. No changes to this plan have been made since submission. Noise management is done on a site wide basis without separation of which facilities are required to follow ERCB Directive 38 or AUC Rule 012.
Attach results of any monitoring/assessments (fenceline outward) completed in 2012.	No noise monitoring or assessments (fenceline outward) were completed in 2012. The most recent noise model was completed in 2011 for all sources within the Dow Fort Saskatchewan Site, including MEGlobal.
Disclose any improvements/corrective actions implemented in 2012 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.	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.
Disclose any improvements/projects that are planned for 2013 that would impact the noise level output for your site (either up or down); including any updates to your site noise model.	In 2013, Dow will monitor noise from the seasonal steam vent to evaluate effectiveness of changes.
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 2012 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 2012 including any actions taken to address them.	There were no noise complaints in 2012 related to Dow or MEGlobal operations at the site.

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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.

Based on ERCB licensed gas plant, wells and caverns on the Fort Saskatchewan Site, Dow is required to follow ERCB 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 opposite the Alberta Operations Project and MOC Regulatory Review Checklist, which includes noise abatement and models. \\Fsnt06\environment\Approved\Projects\Alberta Operations Project and MOC Regulatory Review Checklist.xlsx
Onsite / Offsite Monitoring Requirements	Dow and MEGlobal follow ODMS and ERCB 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 site sources within the fenceline. The site noise model is updated if equipment is added or removed from the site that would significantly impact noise levels. 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 and annual site/unit/department Management System Reviews. These assessments include environmental noise and hearing conservation. The hearing conservation program is reviewed annually.

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
- Additions / 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
- Planned improvements to noise management practice, noise abatement work or noise model work in the following year.

Ownership

The ERCB 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

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.

	NCIA Standards and Guidelines	Document Number 2010-002	
Noise Management Plan Reporting Requirements as per Section 5.4 of this Standard		Rev. Date 5-Mar-13	Rev. 1

Enbridge Pipelines 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 2010-002 issued 3-Sep-10, revised 5-Mar-13 (attached), including the Procedure/Practice/Standard reference.	A Site Noise Management Plan will be developed for the Enbridge Stonefell Pump Station by the end of 2013. The Stonefell Pump Station was constructed and brought on line in the fall of 2012.
Attach results of any monitoring/assessments (fenceline outward) completed in 2012.	No monitoring or assessments were completed in 2012.
Disclose any improvements/corrective actions implemented in 2012 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.	No improvements or corrective actions were completed in 2012. A Noise Impact Assessment was completed in 2010 for the Stonefell Pump Station. The results are attached.
Disclose any improvements/projects that are planned for 2013 that would impact the noise level output for your site (either up or down); including any updates to your site noise model.	There are no planned improvements or projects for 2013.
Disclose any audit/self-assessment evaluation (qualitative evaluation only, with senior site leader sign-off) completed for your site noise management plan.	There were no evaluations completed in 2012.
Provide a Noise Complaint summary for all noise complaints received in 2012 including any actions taken to address them.	There were no noise complaints in 2012.

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.

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

Environmental Noise Impact Assessment
For

Waupisoo Capacity Expansion Project
At
Stonefell Station
At
SE-09-56-21-W4M

Prepared for:
Enbridge Pipelines (Athabasca) Inc.

Prepared by:
S. Bilawchuk, M.Sc., P.Eng.

aci Acoustical Consultants Inc.
Edmonton, Alberta
APEGGA Permit to Practice #P7735

aci Project #: 10-009
March 29, 2010

Executive Summary

aci Acoustical Consultants Inc., of Edmonton AB, was retained by Enbridge Pipelines (Athabasca) Inc. to conduct an environmental noise impact assessment (NIA) for the proposed Waupisoo Capacity Expansion Project (the Project) in northeast Alberta. This report is specific to the proposed Stonefell Station at SE-09-56-21-W4M. The purpose of the work was to generate a computer noise model of the Project under Baseline Case and Application Case conditions and compare the resultant sound levels to the Alberta Energy Resources Conservation Board (ERCB) permissible sound level guidelines (ERCB Directive 038 on Noise Control, 2007).

The results of the Baseline Case noise modeling indicated noise levels that are under the respective permissible sound levels and dBC – dBA sound levels that are less than 20 dB for all adjacent receptors. Further, the Baseline Case noise modeling results matched with noise monitoring results conducted within the area in 2007.

The results of the Application Case noise modeling, with Project only noise sources and the average ambient sound level of 35 dBA included indicated noise levels well below the ERCB Directive 038 PSLs of 40 dBA L_{eq}Night[1] for all surrounding residential and 1,500 m receptors. The Project-only noise levels were more than 5 dBA below the PSLs, providing a large margin for any errors associated with the modeling results. In addition, the dBC sound levels are projected to be less than 20 dB greater than the dBA sound levels, resulting in a low possibility of any low frequency tonal noise.

The results of the Cumulative Case noise modeling indicated that noise levels will be under the respective permissible sound levels and that dBC – dBA sound levels will be less than 20 dB for all adjacent receptors. Further, the relative increase in noise levels with the addition of Project related noise sources will be minimal.

Given the relatively low Application Case noise modeling results and the relatively minor increases in sound levels relative to the Baseline Case, the overall impact of the Project on the local noise climate is minimal and no additional noise mitigation is required.

[1] The term L_{eq} represents the energy equivalent sound level. This is a measure of the equivalent sound level for a specified period of time accounting for fluctuations. Night-time is defined from 22:00 – 07:00

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1.0 Introduction

aci Acoustical Consultants Inc., of Edmonton AB, was retained by Enbridge Pipelines (Athabasca) Inc. to conduct an environmental noise impact assessment (NIA) for the proposed Waupisoo Capacity Expansion Project (the Project) in northeast Alberta. This report is specific to the proposed Stonefell Station at SE-09-56-21-W4M. The purpose of the work was to generate a computer noise model of the Project under Baseline Case and Application Case conditions and compare the resultant sound levels to the Alberta Energy Resources Conservation Board (ERCB) permissible sound level guidelines (ERCB Directive 038 on Noise Control, 2007).

2.0 Project Location and Description

The Project spans from the Cheecham Terminal to the Stonefell Station and ultimately to the Edmonton Terminal, as shown in Fig. 1. Along the way, there will be 6 pumping stations including:

- **Cheecham:** Replace two existing pump units with 2 x 5,750 hp pump/motor units (1800 rpm) add 2 x 5,750 pump/motor units (1800 rpm) and 4 x 6000 hp VFD units.
- **Leismer**: Construct new station with 4 x 5,750 hp pump/motor units (1800 rpm), 4 x 6,000 hp VFD units.
- **Roundhill**: Construct new station with 3 x 5,750 hp pump/motor units (1800 rpm), 3 x 6,000 hp VFD units.
- **Small Benn**: Replace two existing pump units with 2 x 5,750 hp pump/motor units (1800 rpm), add 1 x 5,750 hp pump/motor unit (1800 rpm), and 3 x 6000 hp VFD units.
- **Abee:** Construct new station with 3 x 5,750 hp pump/motor units (1800 rpm), 3 x 6,000 hp VFD units.
- **Stonefell**: Construct new station with 2 x 5,750 hp pump/motor units (1800 rpm), 2 x 6,000 hp VFD units.

Currently, the Cheecham Terminal and the Small Benn Station exist and are in operation. These two locations are proposed to have upgrades to the pumping capacity. The other four Stations have not yet been fully built. Near the Stonefell Station, construction has begun on large storage tanks that were associated with the previous Bruderheim Pump Station. Note that the tanks are not owned by Enbridge. Construction on this project has stopped due to market conditions and the termination of construction on the adjacent BA Energy Upgrader. As a result, although the tanks physically exist, the future plans are unknown. As a result, the tanks have been included in the noise model. There are currently no significant noise sources on site. As part of the Project, two 5,750 hp pump units will be added. There will also be associated VFD and other electrical equipment.

The subject of this specific NIA is the Stonefell Station located at SE-09-56-21-W4M. The Stonefell Station, as shown in Fig. 2, is located approximately 2 km northeast of the Shell Scottford Facility northeast of the City of Fort Saskatchewan. The area is known as the Alberta Industrial Heartland (AIH) has significant current and proposed industrial development. Immediately to the east of the Stonefell Station is the BA Energy Upgrader. Construction for the BA Energy Upgrader began in 2006 but was stopped in 2008 and has since remained dormant. In addition, there are several other industrial facilities within approximately 5 km of the Project including:

- Shell Scottford Complex
- Gulf Chemicals Complex
- Agrium RFO
- Williams / Provident Energy Facility
- Evonik / Degussa Facility

These facilities have known noise levels and have been included in the assessment.

There are also numerous facilities which have been proposed for the surrounding area including:

- Several new Upgraders at the Shell Scottford Complex (to the east and north of the existing facility)
- Statoil Upgrader to the east of the proposed new Shell Upgraders)
- BA Energy Upgrader (northeast of the Shell Facility, construction stopped since 2008).
- Northwest Upgrading facility to the west of the Agrium RFO

Given the recent economic situation, all of these facilities have been "shelved" with the exception of the Northwest Upgrading Facility. When these other facilities will be built and what their final noise contribution will be is unknown at this time. As such, they have not been included in the assessment.

There is one resident located approximately 1,500 m northwest of the Project and another located approximately 1,800 m south of the Project. Most of the nearby residents have moved away from the area with the land being purchased by industry or by the County of Strathcona.

Topographically, the area surrounding the Project is relatively flat with only minor changes in elevation throughout (i.e. less than 5 m). To the west and northwest is the North Saskatchewan River which has a river valley that drops down approximately 35 m. The land is generally covered in field grasses with patches of bushes and trees. As such, the vegetative sound absorption is considered significant.

3.0 Measurement & Modeling Methods

3.1. Environmental Noise Monitoring

Baseline noise monitoring was not conducted as part of the Project. However, In recent years, there have been many noise monitoring conducted in the area by acoustical consultants working for industrial clients as well as by the ERCB directly. In particular, aci conducted baseline noise monitoring at the southern residential receptor in March, 2007[1]. This data will be used for comparison purposes for the Baseline Case noise model.

3.2. Computer Noise Modeling (General)

The computer noise modeling was conducted using the CADNA/A (version 3.72.131) software package. CADNA/A allows for the modeling of various noise sources such as road, rail, and stationary sources. Topographical features such as land contours, vegetation, and bodies of water and meteorological conditions such as temperature, relative humidity, wind-speed and wind-direction are considered in the assessment. The modeling methods used met or exceeded the requirements of the ERCB Directive 038 on Noise Control.

The calculation method used for noise propagation follows the International Standards Organization (ISO) 9613-2. All receiver locations were assumed as being downwind from the source(s). In particular, as stated in Section 5 of the ISO 9613-2 document:

> "*Downwind propagation conditions for the method specified in this part of IS0 9613 are as specified in 5.4.3.3 of IS0 1996-2:1987, namely*

[1] *Upgrader Project, Volume 2, Section 3, NOISE.* Submitted to Alberta Energy and Utilities Board and Alberta Environment by North American Oil Sand Corporation (now StatoilHydro), December 2007.

- *wind direction within an angle of ± 45^0 of the direction connecting the centre of the dominant sound source and the centre of the specified receiver region, with the wind blowing from source to receiver, and*
- *wind speed between approximately 1 m/s and 5 m/s, measured at a height of 3 m to 11 m above the ground.*

The equations for calculating the average downwind sound pressure level LAT(DW) in this part of IS0 9613, including the equations for attenuation given in clause 7, are the average for meteorological conditions within these limits. The term average here means the average over a short time interval, as defined in 3.1.

These equations also hold, equivalently, for average propagation under a well-developed moderate ground-based temperature inversion, such as commonly occurs on clear, calm nights".

Due to the large size of the study area and the density of vegetation within the study area, vegetative sound absorption was included in the model. A ground absorption coefficient of 0.5 was used along with a temperature of 10^0C and a relative humidity of 70%. As a result, all sound level propagation calculations are considered conservatively representative of summertime conditions (as specified in Directive 038).

As part of the study, three main scenarios were modeled. These include:

1) Baseline Case: This includes all noise sources associated with existing operation industrial facilities in the area. Given the numerous existing noise levels, the ASL was not included.
2) Application Case: This includes all noise sources and buildings associated with the Project alone (i.e. no existing industrial noise sources) and the average rural ambient sound level (ASL) of 35 dBA.
3) Cumulative Case: This includes all noise sources associated with the Baseline Case and all noise sources and buildings associated with the Project. Given the numerous existing noise levels, the ASL was not included.

The computer noise modeling results were calculated in two ways. First, sound levels were calculated at various 1,500 m receiver locations. Second, sound levels were calculated using a 10 m x 10 m receptor grid pattern within the entire study area. This provided color noise contours for easier visualization and evaluation of the results.

3.3. Noise Sources

The noise sources for the equipment associated with the Baseline Case and Application Case are provided in Appendix I. The data were obtained either from noise measurement assessments carried out for other projects using similar operating equipment combined with aci in-house information and calculations using methods presented in various texts. All sound power levels (PWLs) used in the modeling are considered conservative.

All noise sources have been modeled as point sources at their appropriate heights[1]. Sound power levels for all noise sources were modeled using octave-band information. Buildings and storage tanks were included in the modeling calculations because of their ability to provide shielding as well as reflection for noise[2]. At the time of report generation, specific information about the buildings (other than dimensions and generic construction) is unknown. Refer to Appendix I for building and tank dimensions.

3.4. Modeling Confidence

As mentioned previously, the algorithms used for the noise modeling follow the ISO 9613 standard. The published accuracy for this standard is ±3 dBA between 100 m – 1,000 m. Accuracy levels beyond 1,000 m are not published. Professional experience based on similar noise models and measurements conducted over large distances shows that, as expected, as the distance increases, the associated accuracy in prediction decreases. Experience has shown that environmental factors such as wind, temperature inversions, topography and ground cover all have increasing effects over distances larger than approximately 1,500 m. As such, for all receptors within approximately 1,500 m of the various noise sources, the prediction confidence is considered high, while for all receptors beyond 1,500 m, the prediction confidence is considered moderate.

[1] The heights for many of the sources are generally slightly higher than actual. This makes the model more conservative
[2] Exterior building and tank walls were modeled with an absorption coefficient of 0.21 which is generally highly reflective.

4.0 Permissible Sound Levels

Environmental noise levels from industrial noise sources 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. In addition, this energy averaged level is A–weighted to account for the reduced sensitivity of average human hearing to low frequency sounds. These L_{eq} in dBA, 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. Refer to Appendix II for a detailed description of the acoustical terms used and Appendix III for a list of common noise sources.

The document which most directly relates to the Permissible Sound Levels (PSL's) for this NIA is the ERCB Directive 038 on Noise Control (2007). Directive 038 sets the PSL at the receiver location based on population density and relative distances to heavily traveled road and rail as shown in Table 1. In most instances, there is a Basic Sound Level (BSL) of 40 dBA for the night-time (night-time hours are 22:00 – 07:00) and 50 dBA for the day-time (day-time hours are 07:00 – 22:00). At this location, however, the PSLs are higher due to the long standing noise sources in the area. Specific PSLs at the two adjacent receptors have been determined by the ERCB[1] to be **45 dBA L_{eq}Night and 55 dBA L_{eq}Day at the Northwest Resident and 47 dBA L_{eq}Night and 57 dBA L_{eq}Day at the Southeast Resident**. These PSLs were used for the Baseline Case and Cumulative Case scenarios. In addition, receptors were placed at a 1,500 m radius from the Project.

Directive 038 also specifies that new facilities must meet a PSL-Night of 40 dBA at 1,500 m from the facility fence-line if there are no closer dwellings. As such, the PSLs at a distance of 1,500 m are an **L_{eq}Night of 40 dBA and an L_{eq}Day of 50 dBA.** These PSLs were used for the Application Case scenario (i.e. Project noise sources only, without existing industrial noise sources). Refer to Appendix IV for a detailed determination of the permissible sound levels.

The PSLs provided are related to noise associated with activities and processes at the Project and are not related to vehicle traffic on nearby highways (or access roads). This includes all traffic related to the construction and operation of the Facility. Noises from traffic sources are not covered by any regulations or guidelines at the municipal, provincial, or federal levels. As such, an assessment of the noises related to vehicle traffic was not conducted. In addition, construction noise is not specifically

[1] Permissible Sound Level information provided via e-mail correspondence from Don South of the ERCB, March 16-17, 2010.

regulated by Directive 038. However, construction noise mitigation recommendations are provided in Section 5.4.1.

Table 1. Basic Night-Time Sound Levels (as per ERCB Directive 038)

Proximity to Transportation	Dwelling Density per Quarter 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

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 not subject to frequent aircraft flyovers

5.0 Results and Discussion

5.1. Baseline Case

The results of the Baseline Case noise modeling are presented in Table 2 and illustrated in Fig. 3. The modeled noise levels at the residential receptors and all of the 1,500 m receptor locations are modeled to currently be under their respective PSLs with existing industrial noise.

Table 2. Baseline Case Modeled Sound Levels

Receptor (Distance From Project)	Baseline Case L_{eq}Night (dBA)	PSL-Night (dBA)	Compliant
Residence 1 (1,500 m)	43.6	45.0	YES
Residence 2 (1,800 m)	39.0	47.0	YES
R1 (1,500 m)	38.3	N/A	N/A
R2 (1,500 m)	33.3	N/A	N/A
R3 (1,500 m)	28.9	N/A	N/A
R4 (1,500 m)	28.4	N/A	N/A
R5 (1,500 m)	39.9	N/A	N/A
R6 (1,500 m)	44.9	N/A	N/A
R7 (1,500 m)	42.3	N/A	N/A
R8 (1,500 m)	43.8	N/A	N/A

As stated in Section 3.1, a comprehensive sound level survey was conducted at Residence 2. The noise monitor was located approximately 40 m west of the house in an open area of the yard. At this location, there was partial line-of-sight to RG RD 213 but none to the nearby existing facilities or the Project location. The noise monitor was started at 15:00 on Thursday March 22, 2007, and ran for 22 hours until 13:00 on Friday March 23, 2007.

The results of the noise monitoring indicated a night-time noise level of approximately 37 – 39 dBA with strong low frequency content near 63 Hz. This matches well with the noise modeling results of 38.6 dBA for Residence 2.

In addition to the broadband A-weighted (dBA) sound levels, the modeling results at the various receptor locations indicated C-weighted (dBC) sound levels will be less than 20 dB above the dBA sound levels, as shown in Table 3. As specified in Directive 038, if the dBC – dBA sound levels are less than 20 dB, the noise is not considered to have a low frequency tonal component. Again, the results obtained through the noise monitoring in 2007 indicated low frequency noise near 63 Hz with a dBC - dBA sound level of approximately 16 dB which is similar to that modeled.

Table 3. Baseline Case Modeled dBA and dBC Sound Levels

Receptor (Distance From Project)	Baseline Case L_{eq}Night (dBA)	Baseline Case L_{eq}Night (dBC)	dBC - dBA	Tonal
Residence 1 (1,500 m)	43.6	51.9	8.3	NO
Residence 2 (1,800 m)	39.0	53.4	14.4	NO
R1 (1,500 m)	38.3	44.5	6.2	NO
R2 (1,500 m)	33.3	48.1	14.8	NO
R3 (1,500 m)	28.9	41.1	12.2	NO
R4 (1,500 m)	28.4	41.7	13.3	NO
R5 (1,500 m)	39.9	53.9	14.0	NO
R6 (1,500 m)	44.9	56.9	12.0	NO
R7 (1,500 m)	42.3	54.4	12.1	NO
R8 (1,500 m)	43.8	52.1	8.3	NO

5.2. Application Case

The results of the Application Case noise modeling are presented in Table 4 and illustrated in Fig. 4. The modeled noise levels at the residential receptors and all of the 1,500 m receptor locations are modeled to be under their respective PSLs with the Project noise sources and with the 35 dBA ASL. In addition, the noise levels resulting from the existing and Project noise sources alone (i.e. no ASL) will be well more than 5 dBA below the PSL. This provides a large margin for any errors associated with the noise model as well as any low frequency noise that may be produced.

Table 4. Application Case Modeled Sound Levels

Receptor (Distance From Project)	ASL-Night (dBA)	Application Case L_{eq}Night (dBA)	ASL + Application Case L_{eq}Night (dBA)	PSL-Night (dBA)	Compliant
Residence 1 (1,500 m)	35.0	22.0	35.2	40.0	YES
Residence 2 (1,800 m)	35.0	22.7	35.2	40.0	YES
R1 (1,500 m)	35.0	26.0	35.5	40.0	YES
R2 (1,500 m)	35.0	27.1	35.7	40.0	YES
R3 (1,500 m)	35.0	31.2	36.5	40.0	YES
R4 (1,500 m)	35.0	25.4	35.5	40.0	YES
R5 (1,500 m)	35.0	25.0	35.4	40.0	YES
R6 (1,500 m)	35.0	30.9	36.4	40.0	YES
R7 (1,500 m)	35.0	27.2	35.7	40.0	YES
R8 (1,500 m)	35.0	21.9	35.2	40.0	YES

In addition to the broadband A-weighted (dBA) sound levels, the modeling results at the various receptor locations indicated C-weighted (dBC) sound levels will be less than 20 dB above the dBA sound levels, as shown in Table 5. As specified in Directive 038, if the dBC – dBA sound levels are less than 20 dB, the noise is not considered to have a low frequency tonal component.

Table 5. Application Case Modeled dBA and dBC Sound Levels

Receptor (Distance From Project)	Application Case L_{eq}Night (dBA)	Application Case L_{eq}Night (dBC)	dBC - dBA	Tonal
Residence 1 (1,500 m)	22.0	27.6	5.6	NO
Residence 2 (1,800 m)	22.7	28.1	5.4	NO
R1 (1,500 m)	26.0	32.8	6.8	NO
R2 (1,500 m)	27.1	33.5	6.4	NO
R3 (1,500 m)	31.2	36.5	5.3	NO
R4 (1,500 m)	25.4	30.2	4.8	NO
R5 (1,500 m)	25.0	29.9	4.9	NO
R6 (1,500 m)	30.9	36.3	5.4	NO
R7 (1,500 m)	27.2	32.9	5.7	NO
R8 (1,500 m)	21.9	27.5	5.6	NO

5.3. Cumulative Case

The results of the Cumulative Case noise modeling are presented in Table 6 and illustrated in Fig. 5. The modeled noise levels at the residential receptors and all of the 1,500 m receptor locations are modeled to currently be under their respective PSLs with existing industrial noise. Further, the relative increase in noise levels with the addition of the Project noise sources will be minimal at all locations with the exception of the 1,500 m R3 receptor. This is simply a function of the relative difference in distances from the existing noise sources and the Project noise sources to the receptor. The overall noise levels will still be well under the PSLs. As a result, the addition of the Project noise sources will have a minimal impact on the surrounding noise climate.

Table 6. Cumulative Case Modeled Sound Levels

Receptor (Distance From Project)	Baseline Case L_{eq}Night (dBA)	Cumulative Case L_{eq}Night (dBA)	Relative Increase (dBA)	PSL-Night (dBA)	Compliant
Residence 1 (1,500 m)	43.6	43.6	0.0	45.0	YES
Residence 2 (1,800 m)	39.0	39.1	0.1	47.0	YES
R1 (1,500 m)	38.3	38.5	0.2	N/A	N/A
R2 (1,500 m)	33.3	33.3	0.0	N/A	N/A
R3 (1,500 m)	28.9	33.2	4.3	N/A	N/A
R4 (1,500 m)	28.4	30.2	1.8	N/A	N/A
R5 (1,500 m)	39.9	40.0	0.1	N/A	N/A
R6 (1,500 m)	44.9	45.1	0.2	N/A	N/A
R7 (1,500 m)	42.3	42.4	0.1	N/A	N/A
R8 (1,500 m)	43.8	43.9	0.1	N/A	N/A

In addition to the broadband A-weighted (dBA) sound levels, the modeling results at the various receptor locations indicated C-weighted (dBC) sound levels will be less than 20 dB above the dBA sound levels, as shown in Table 7. As specified in Directive 038, if the dBC – dBA sound levels are less than 20 dB, the noise is not considered to have a low frequency tonal component.

Table 7. Cumulative Case Modeled dBA and dBC Sound Levels

Receptor (Distance From Project)	Cumulative Case L_{eq}Night (dBA)	Cumulative Case L_{eq}Night (dBC)	dBC - dBA	Tonal
Residence 1 (1,500 m)	43.6	51.9	8.3	NO
Residence 2 (1,800 m)	39.1	53.4	14.3	NO
R1 (1,500 m)	38.5	44.8	6.3	NO
R2 (1,500 m)	33.3	42.1	8.8	NO
R3 (1,500 m)	33.2	42.4	9.2	NO
R4 (1,500 m)	30.2	42.0	11.8	NO
R5 (1,500 m)	40.0	53.9	13.9	NO
R6 (1,500 m)	45.1	56.9	11.8	NO
R7 (1,500 m)	42.4	54.4	12.0	NO
R8 (1,500 m)	43.9	52.1	8.2	NO

5.4. Noise Mitigation Measures

The results of the noise modeling indicated that no specific additional noise mitigation measures are required for Project equipment.

5.4.1. Construction Noise

Although there are no specific construction noise level limits detailed by Directive 038, there are general recommendations for construction noise mitigation. This includes all activities associated with construction of the facility, well-pads (including drilling), borrow-pits, etc. The document states:

> "*While Directive 038 is not applicable to construction noise, licensees should attempt to take the following reasonable mitigating measures to reduce the impact on nearby dwellings of construction noise from new facilities or modifications to existing facilities. Licensees should:*
>
> - *Conduct construction activity between the hours of 07:00 and 22:00 to reduce the potential impact of construction noise;*
> - *Advise nearby residents of significant noise-causing activities and schedule these events to reduce disruption to them;*
> - *Ensure all internal combustion engines are fitted with appropriate muffler systems; and*
> - *Take advantage of acoustical screening from existing on-site buildings to shield dwellings from construction equipment noise.*
>
> *Should a valid complaint be made during construction, the licensee is expected to respond expeditiously and take appropriate action to ensure that the issue has been managed responsibly.*"

6.0 Conclusion

The results of the Baseline Case noise modeling indicated noise levels that are under the respective permissible sound levels and dBC – dBA sound levels that are less than 20 dB for all adjacent receptors. Further, the Baseline Case noise modeling results matched with noise monitoring results conducted within the area in 2007.

The results of the Application Case noise modeling, with Project only noise sources and the average ambient sound level of 35 dBA included indicated noise levels well below the ERCB Directive 038 PSLs of 40 dBA L_{eq}Night for all surrounding residential and 1,500 m receptors. The Project-only noise levels were more than 5 dBA below the PSLs, providing a large margin for any errors associated with the modeling results. In addition, the dBC sound levels are projected to be less than 20 dB greater than the dBA sound levels, resulting in a low possibility of any low frequency tonal noise.

The results of the Cumulative Case noise modeling indicated that noise levels will be under the respective permissible sound levels and that dBC – dBA sound levels will be less than 20 dB for all adjacent receptors. Further, the relative increase in noise levels with the addition of Project related noise sources will be minimal.

Given the relatively low Application Case noise modeling results and the relatively minor increases in sound levels relative to the Baseline Case, the overall impact of the Project on the local noise climate is minimal and no additional noise mitigation is required. A short form (ERCB form) noise impact assessment is presented in Appendix V.

7.0 References

- Alberta Energy Resources Conservation Board (ERCB), *Directive 038 on Noise Control, 2007*, Calgary, Alberta
- *Upgrader Project, Volume 2, Section 3, NOISE.* Submitted to Alberta Energy and Utilities Board and Alberta Environment by North American Oil Sand Corporation (now StatoilHydro), December 2007.
- 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.
- *Power Plant Construction Noise Emissions*. Allan M. Teplitzky & Eric W. Wood, Internoise '78 Conference Proceedings, pp 279 – 284.
- *Environmental Codes of Practice for Steam Electric Power Generation – Construction Phase*. Report EPS 1/PG/3, Environment Canada, 1989.

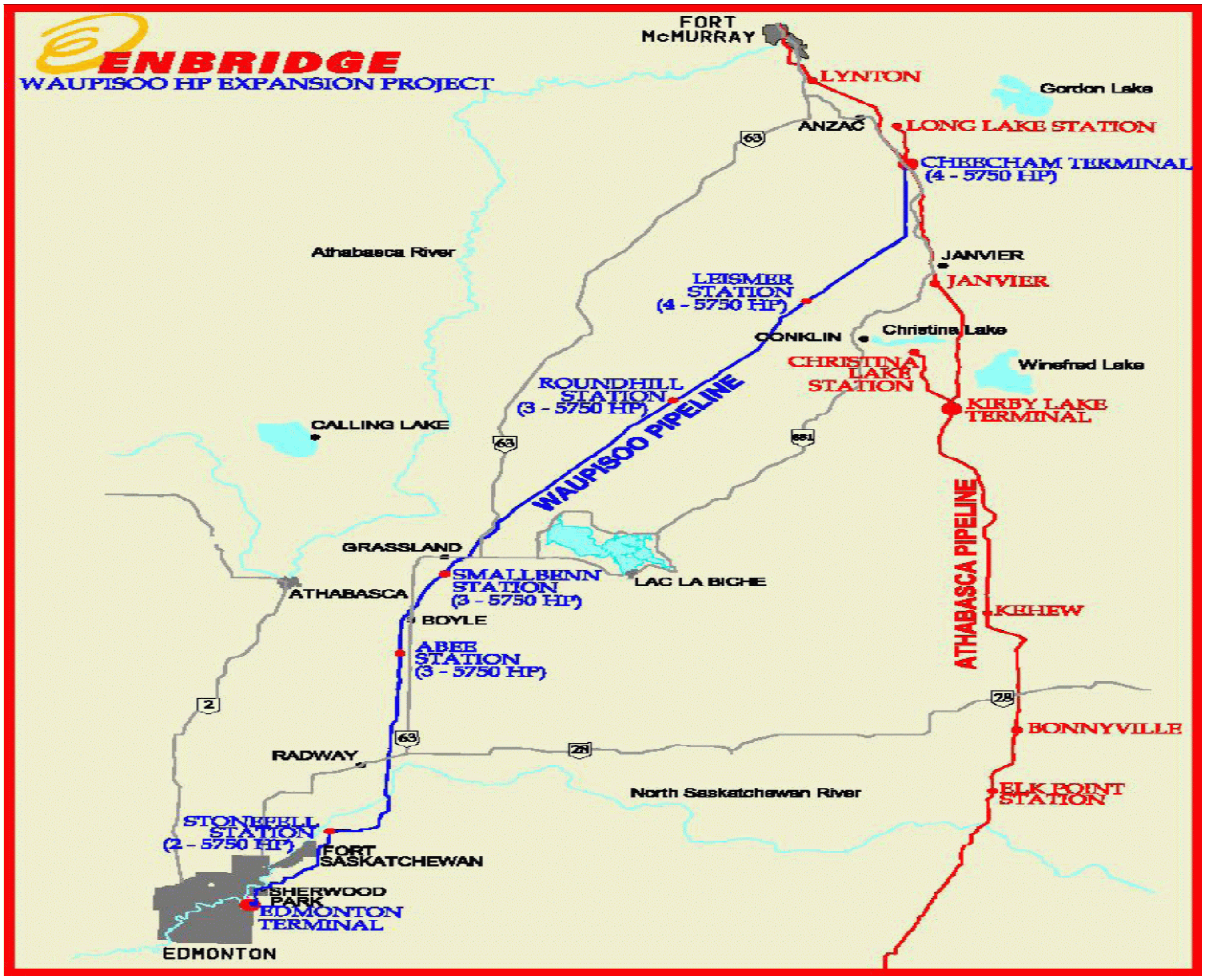


Figure 1. Project Study Area

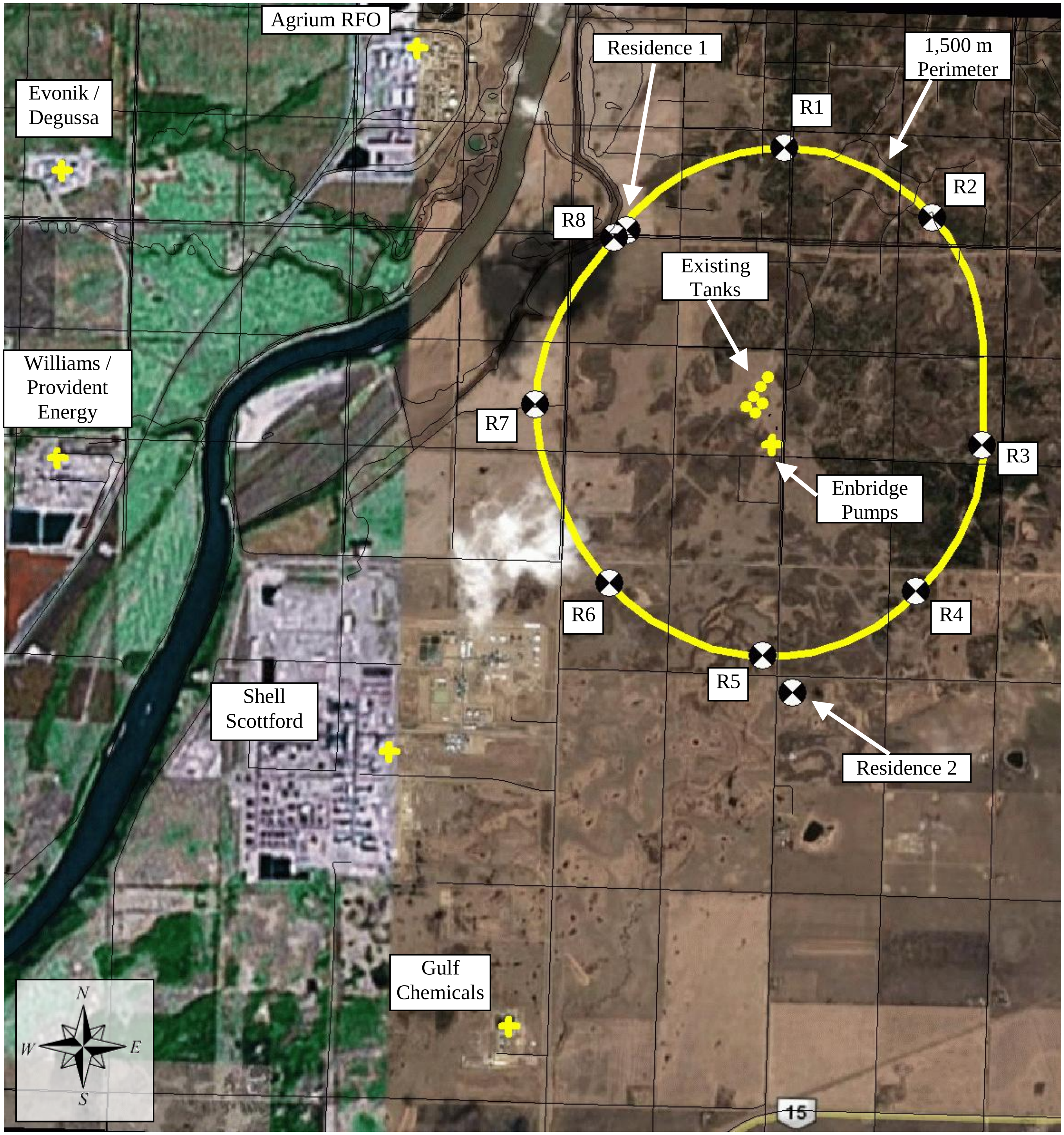


Figure 2. Stonefell Pump Station Study Area

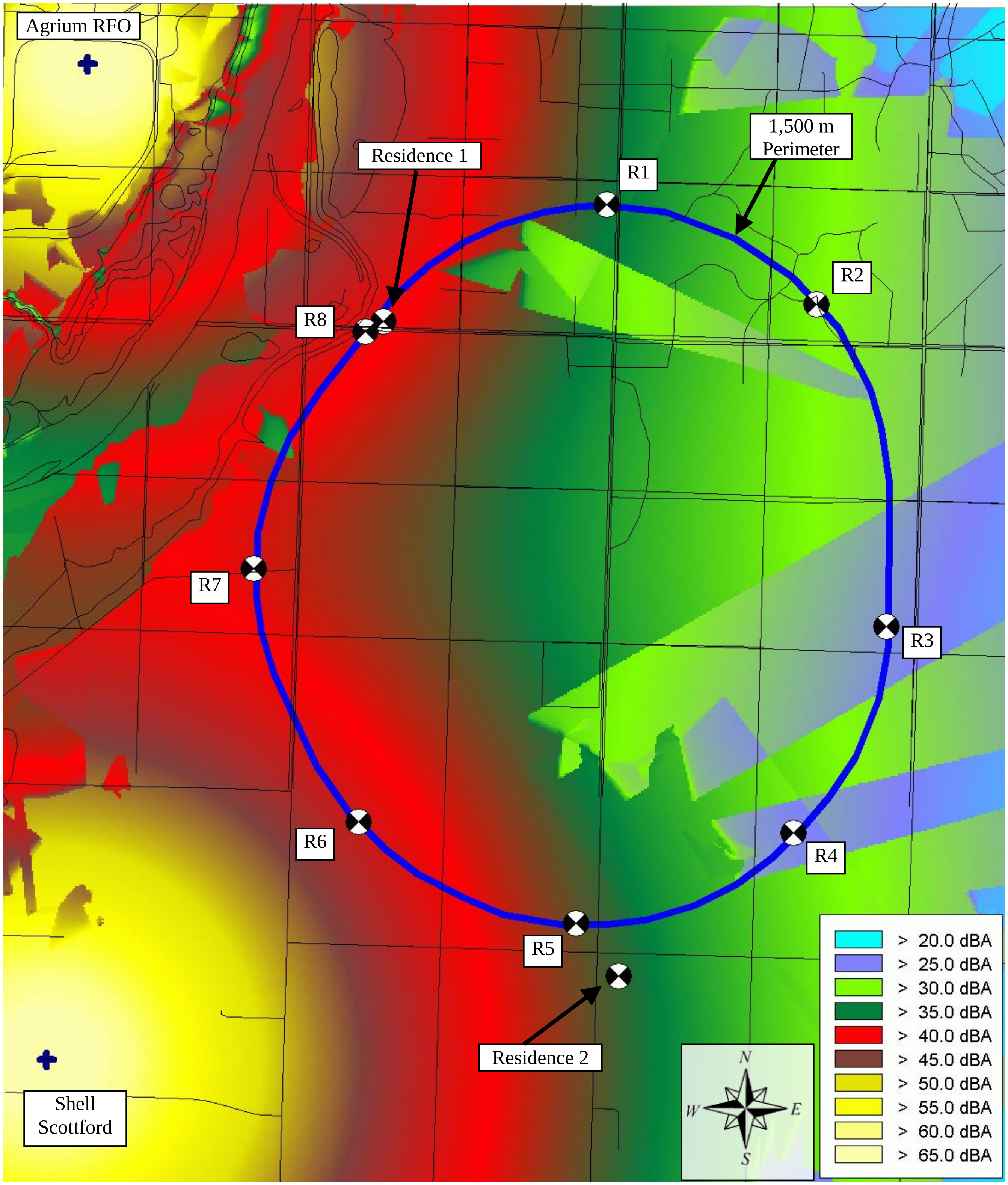


Figure 3. Baseline Case Modeled Night-time Noise Levels

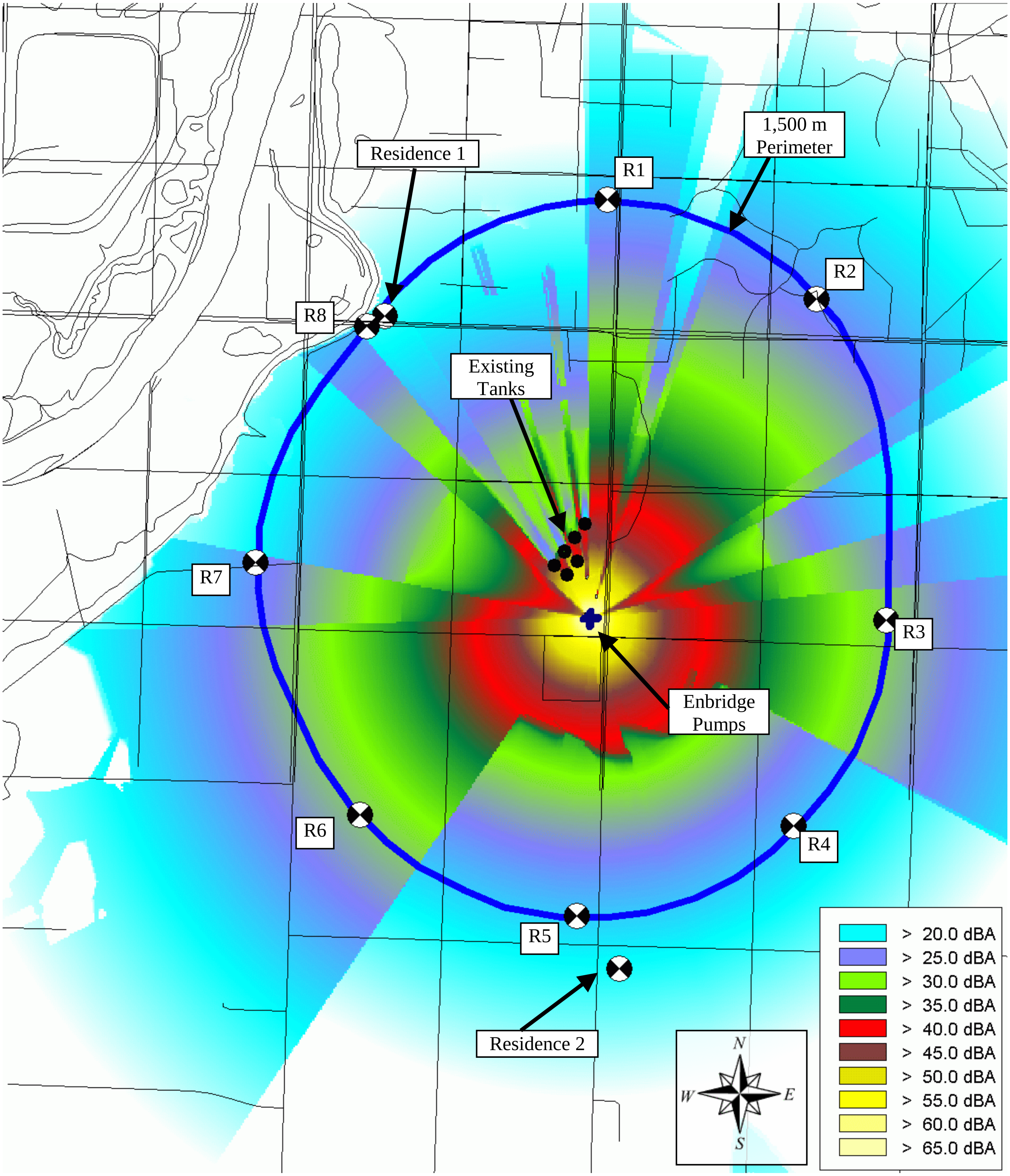


Figure 4. Application Case Modeled Night-time Noise Levels (Without ASL)

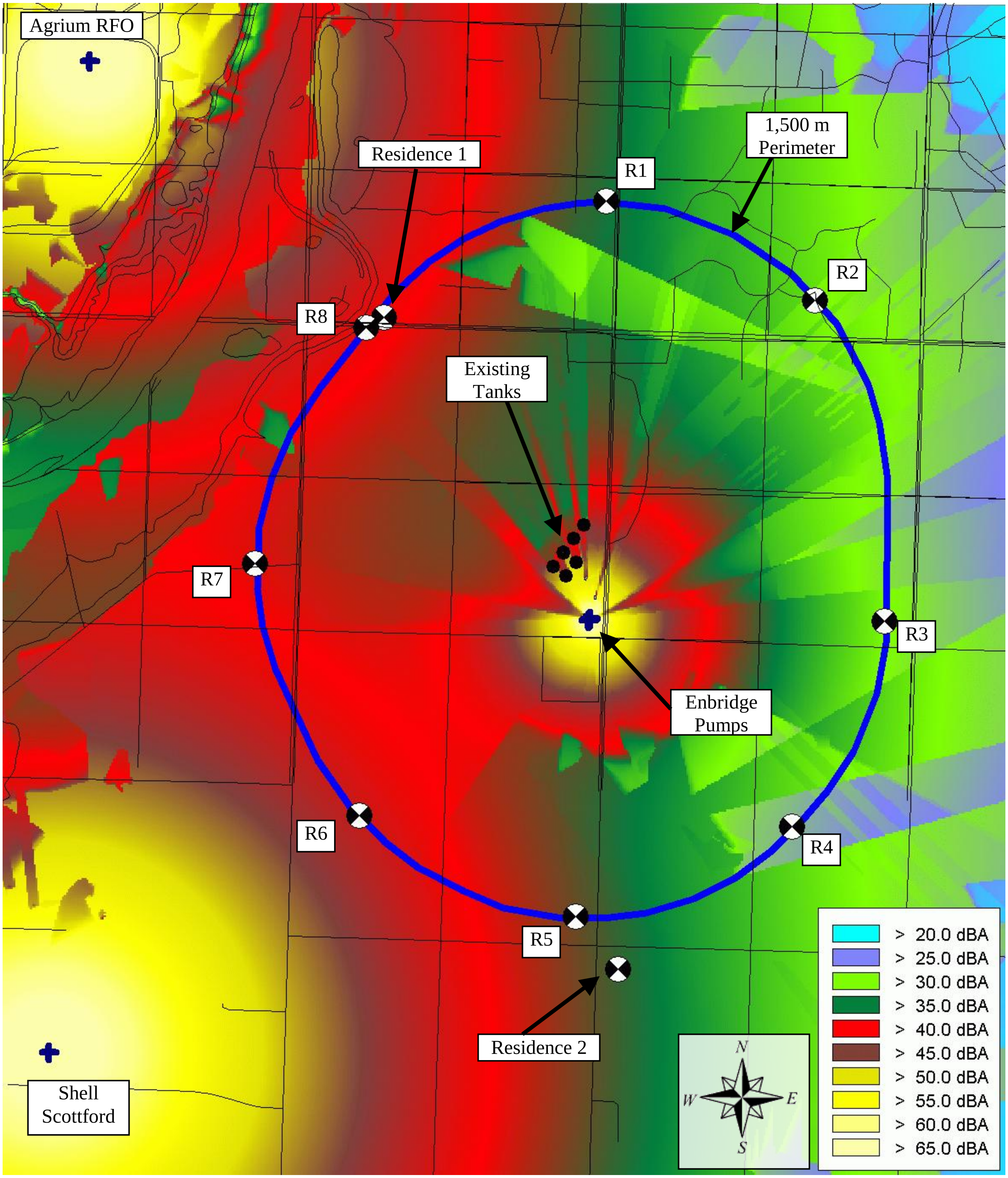


Figure 5. Cumulative Case Modeled Night-time Noise Levels

Appendix I

NOISE MODELING PARAMETERS

Noise Source Octave Band Sound Power Levels (Re 10^{-12} Watts, un-mitigated)

Description	31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz		dBA
Baseline Case Equipment											
Shell Scotford	100.0	130.0	121.0	122.0	124.0	126.0	124.0	120.0	110.0		130.0
Gulf Chemicals	73.0	90.0	104.0	105.0	107.0	109.0	107.0	103.0	93.0		113.0
Agrium RFO	100.0	110.0	120.0	118.0	121.0	124.0	119.0	115.0	109.0		126.8
Williams / Provident Energy	80.0	91.0	99.0	102.0	106.0	112.0	110.0	105.0	93.0		116.0
Evonik / Degussa	60.0	69.0	87.0	100.0	103.0	106.0	101.0	97.0	91.0		108.7
Application Case Equipment											
Shell Scotford	100.0	130.0	121.0	122.0	124.0	126.0	124.0	120.0	110.0		130.0
Gulf Chemicals	73.0	90.0	104.0	105.0	107.0	109.0	107.0	103.0	93.0		113.0
Agrium RFO	100.0	110.0	120.0	118.0	121.0	124.0	119.0	115.0	109.0		126.8
Williams / Provident Energy	80.0	91.0	99.0	102.0	106.0	112.0	110.0	105.0	93.0		116.0
Evonik / Degussa	60.0	69.0	87.0	100.0	103.0	106.0	101.0	97.0	91.0		108.7
Enbridge 5,750 HP Pump (each, x2)	98.0	99.0	100.0	102.0	102.0	105.0	102.0	98.0	92.0		109.0

Building Dimensions

Building	Length (m)	Width (m)	Height (m)
EB	5.5	7.0	6.2
VFD Buildings (x3)	3.5	7.2	6.2
Utility Building	6.5	17.5	5.28

Tank Dimensions (Existing)

Tank	Diameter (m)	Height (m)
Crude Tank 301-TK-1	45.8	15.8
Crude Tank 301-TK-2	45.8	15.8
Diluent Tank 301-TK-3	45.8	15.8
Diluent Tank 301-TK-4	45.8	15.8
OCO Tank 301-TK-5	45.8	15.8
AG/YGO Tank 301-TK-6	45.8	15.8

Appendix II

THE ASSESSMENT OF ENVIRONMENTAL NOISE (GENERAL)

Sound Pressure Level

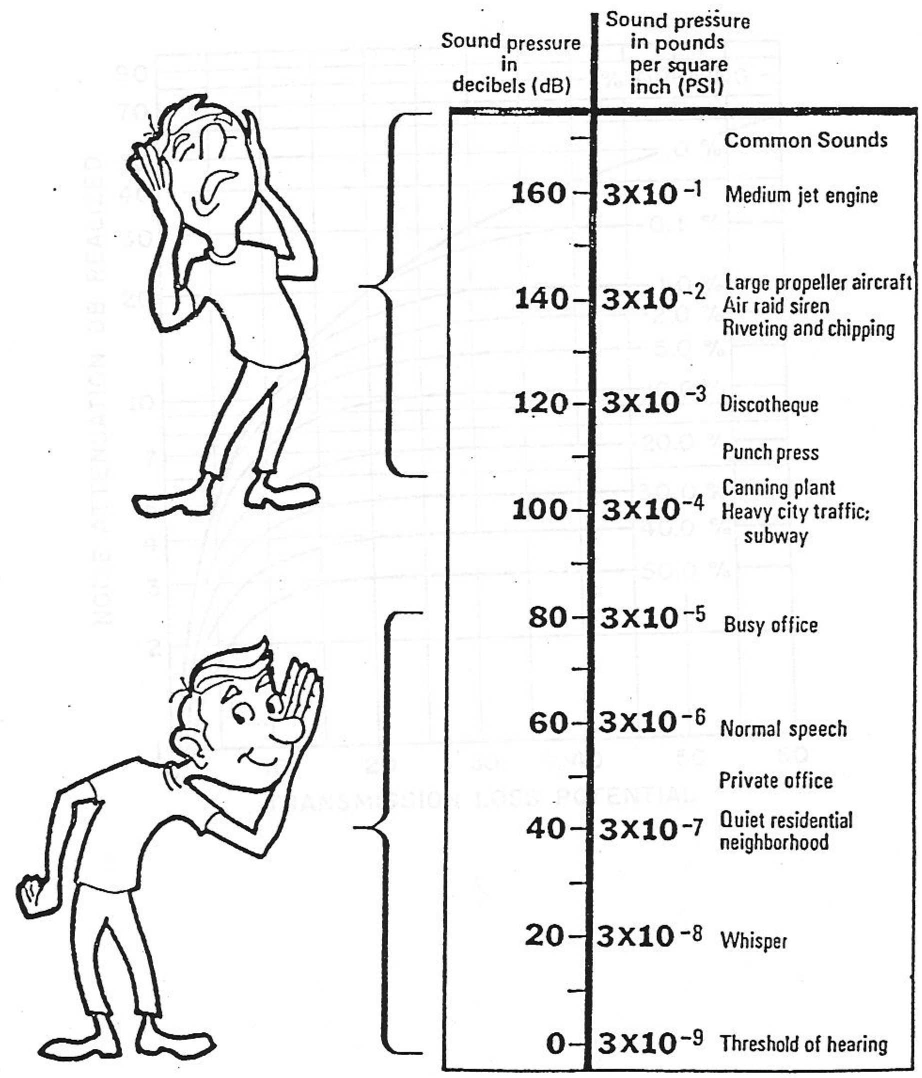
Sound pressure is initially measured in Pascal's (Pa). Humans can hear several orders of magnitude in sound pressure levels, so a more convenient scale is used. This scale is known as the decibel (dB) scale, named after Alexander Graham Bell (telephone guy). It is a base 10 logarithmic scale. When we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

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

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

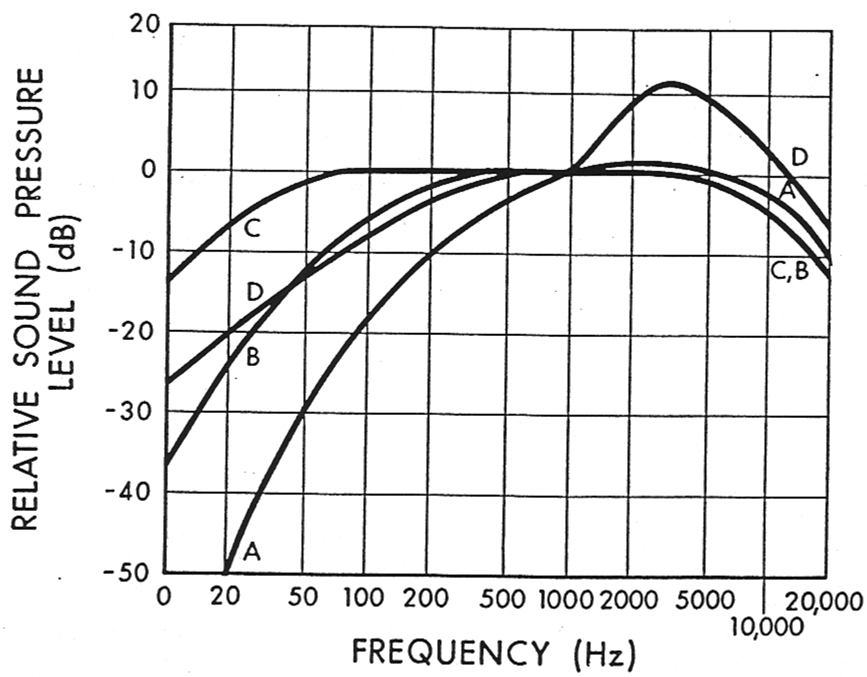
The range of frequencies audible to the human ear ranges from approximately 20 Hz to 20 kHz. Within this range, the human ear does not hear equally at all frequencies. It is not very sensitive to low frequency sounds, is very sensitive to mid frequency sounds and is slightly less sensitive to high frequency 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:

Lower Band Limit	Whole Octave Center Frequency	Upper Band Limit
11	**16**	22
22	**31.5**	44
44	**63**	88
88	**125**	177
177	**250**	355
355	**500**	710
710	**1000**	1420
1420	**2000**	2840
2840	**4000**	5680
5680	**8000**	11360
11360	**16000**	22720

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

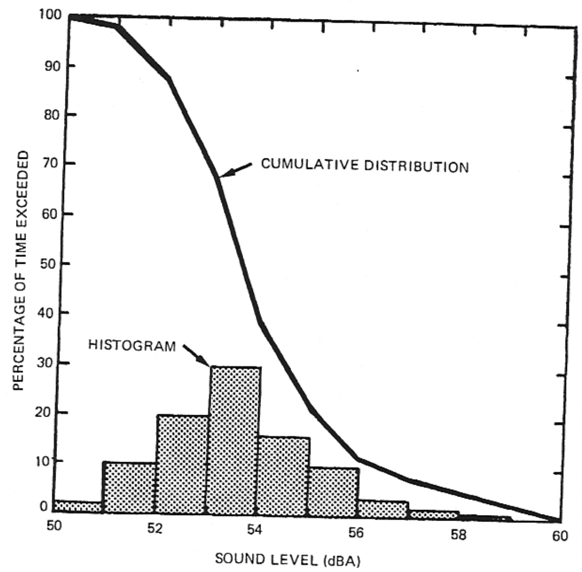


Figure 16.6 Statistically processed community noise showing histogram and cumulative distribution of A weighted sound levels.

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 34 dB at 400m.
- A line source measuring 50 dB at 100m will be 40 dB at 1000m.

Atmospheric Absorption

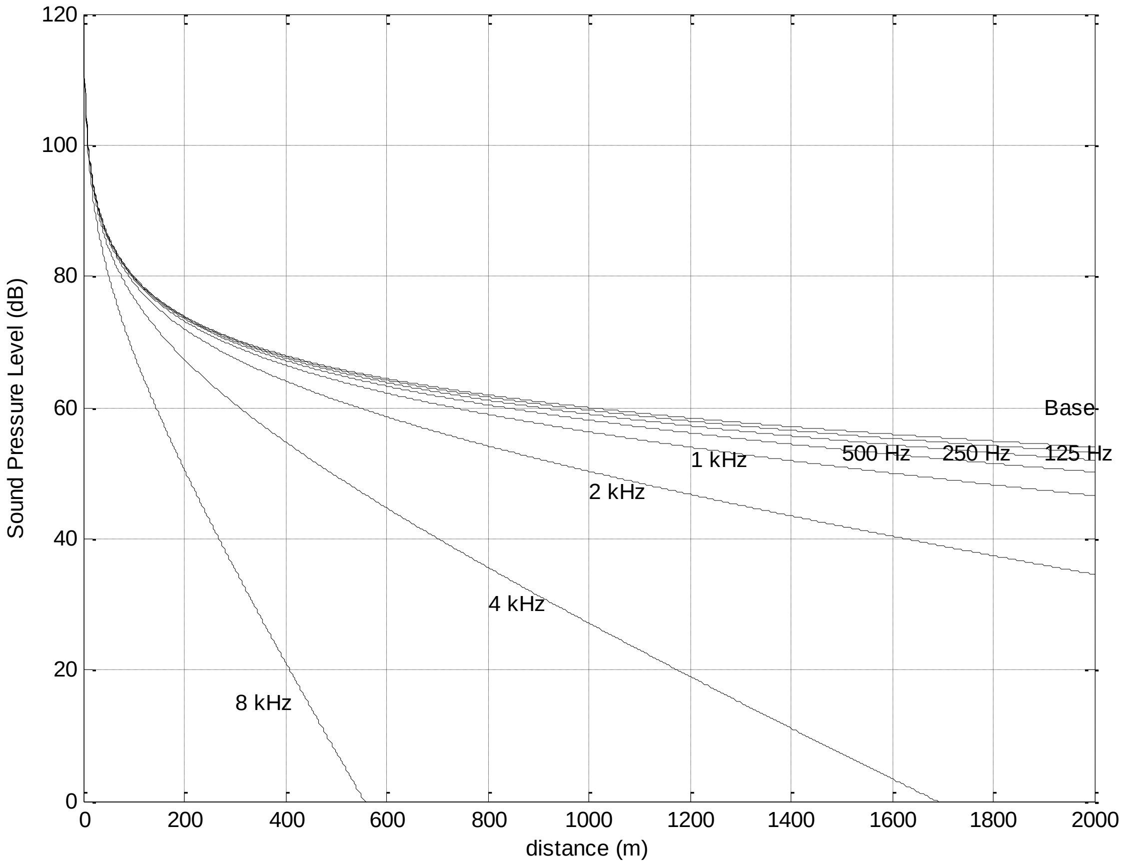
As sound transmits through a medium, there is an attenuation (or dissipation of acoustic energy) which can be attributed to three mechanisms:

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 ^{o}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 increases
- As Relative Humidity increases, absorption decreases
- 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^{o}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

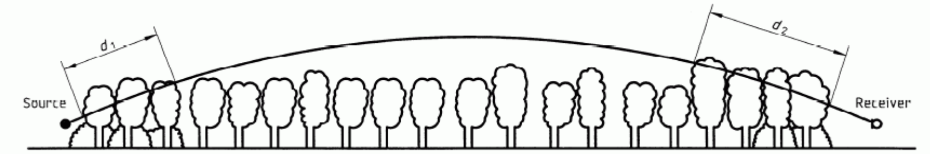
- Can be an effective absorber due to large area covered
- Only effective at low height above ground. Does not affect sound transmitted direct from source to receiver if there is line of sight.
- Typically less absorption than atmospheric absorption when there is line of sight.
- Approximate rule of 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
$10 \leq d_f \leq 20$	Attenuation, dB: 0	0	1	1	1	1	2	3
$20 \leq d_f \leq 200$	Attenuation, dB/m: 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 much 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 Directive 038 (January, 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 Directive 038 (January, 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

PERMISSIBLE SOUND LEVEL DETERMINATION

Permissible Sound Levels at Resident 1

Basic Sound Level

Proximity to Transportation	Dwelling Density (Per Quarter Section of Land): 1 - 8 Dwellings	9 - 160 Dwellings	> 160 Dwellings	Night-Time	Day-Time
Category 1	40	43	46	40	40
Category 2	45	48	51		
Category 3	50	53	56		
			Basic Sound Level (dBA)	40	40

Time of Day Adjustment

Time of Day	Adjustment (dBA)	Night-Time	Day-Time
Night-time adjustment for hours 22:00 - 07:00	0	0	n/a
Day-time adjustment for hours 07:00 - 22:00	+10	n/a	+10
	Time of day adjustment (dBA)	0	+ 10

Class A Adjustments

Class	Reason for Adjustment	Adjustment (dBA)	Night-Time	Day-Time
A1	Seasonal Adjustment (Winter)	0 to +5	0	0
A2	Ambient Monitoring Adjustment	-10 to +10	5*	5*
Sum of A1 and A2 cannot exceed maximum of 10 dBA Leq				
		Class A Adjustment (dBA)	5	5

Class B Adjustments

Class	Duration of Activity	Adjustment (dBA)	Night-Time	Day-Time
B1	≤ 1 Day	+ 15	0	0
B2	≤ 7 Days	+ 10	0	0
B3	≤ 60 Days	+ 5	0	0
B4	> 60 Days	0	0	0
Can only apply one of B1, B2, B3, or B4				
		Class B Adjustment (dBA)	0	0

	Night-Time	Day-Time
Total Permissible Sound Level (PSL) [dBA]	45	55

*Note: Ambient monitoring adjustment is based on historical information provided by ERCB

Permissible Sound Levels at Resident 2

Basic Sound Level

Proximity to Transportation	Dwelling Density (Per Quarter Section of Land): 1 - 8 Dwellings	9 - 160 Dwellings	> 160 Dwellings	Night-Time	Day-Time
Category 1	40	43	46	40	40
Category 2	45	48	51		
Category 3	50	53	56		
			Basic Sound Level (dBA)	40	40

Time of Day Adjustment

Time of Day	Adjustment (dBA)	Night-Time	Day-Time
Night-time adjustment for hours 22:00 - 07:00	0	0	n/a
Day-time adjustment for hours 07:00 - 22:00	+10	n/a	+10
	Time of day adjustment (dBA)	0	+ 10

Class A Adjustments

Class	Reason for Adjustment	Adjustment (dBA)	Night-Time	Day-Time
A1	Seasonal Adjustment (Winter)	0 to +5	0	0
A2	Ambient Monitoring Adjustment	-10 to +10	7*	7*
Sum of A1 and A2 cannot exceed maximum of 10 dBA Leq				
		Class A Adjustment (dBA)	7	7

Class B Adjustments

Class	Duration of Activity	Adjustment (dBA)	Night-Time	Day-Time
B1	≤ 1 Day	+ 15	0	0
B2	≤ 7 Days	+ 10	0	0
B3	≤ 60 Days	+ 5	0	0
B4	> 60 Days	0	0	0
Can only apply one of B1, B2, B3, or B4				
		Class B Adjustment (dBA)	0	0

	Night-Time	Day-Time
Total Permissible Sound Level (PSL) [dBA]	47	57

*Note: Ambient monitoring adjustment is based on historical information provided by ERCB

Permissible Sound Levels at Residents and 1,500 m Receptors for Application Case

Basic Sound Level

	Dwelling Density (Per Quarter Section of Land)			Night-Time	Day-Time
Proximity to Transportation	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		
Basic Sound Level (dBA)				40	40

Time of Day Adjustment

Time of Day	Adjustment (dBA)	Night-Time	Day-Time
Night-time adjustment for hours 22:00 - 07:00	0	0	n/a
Day-time adjustment for hours 07:00 - 22:00	+10	n/a	+10
Time of day adjustment (dBA)		0	+ 10

Class A Adjustments

Class	Reason for Adjustment	Adjustment (dBA)	Night-Time	Day-Time
A1	Seasonal Adjustment (Winter)	0 to +5	0	0
A2	Ambient Monitoring Adjustment	-10 to +10	0	0
Sum of A1 and A2 cannot exceed maximum of 10 dBA Leq				
Class A Adjustment (dBA)			0	0

Class B Adjustments

Class	Duration of Activity	Adjustment (dBA)	Night-Time	Day-Time
B1	≤ 1 Day	+ 15	0	0
B2	≤ 7 Days	+ 10	0	0
B3	≤ 60 Days	+ 5	0	0
B4	> 60 Days	0	0	0
Can only apply one of B1, B2, B3, or B4				
Class B Adjustment (dBA)			0	0

	Night-Time	Day-Time
Total Permissible Sound Level (PSL) [dBA]	40	50

Appendix V

NOISE IMPACT ASSESSMENT

Licensee: **Enbridge Pipelines (Athabasca) Inc.**

Facility name: **Waupisoo Capacity Expansion, Stonefell Station** Type: **Pump Station**

Legal location: **SE-09-56-21-W4M**

Contact: **Michael Wilfley, Enbridge** Telephone: **(780) 392-4117**

1. Permissible Sound Level (PSL) Determination (*Directive 038,* Section 2.1)

(Note that the PSL for a pre-1988 facility undergoing modifications may be the sound pressure level (SPL) that currently exists at the residence if no complaint exists and the current SPL exceeds the calculated PSL from Section 2.1.)

Complete the following for the nearest or most impacted residence(s):

Distance from facility	Direction from facility	BSL (dBA)	Daytime adjustment (dBA)	Class A adjustment (dBA)	Class B adjustment (dBA)	Nighttime PSL (dBA)	Daytime PSL(dBA)
1,500 m Baseline and Cumulative Case	**Northwest**	**40**	**10**	**5**	**0**	**45**	**55**
1,800 m Baseline and Cumulative Case	**Southeast**	**40**	**10**	**7**	**0**	**47**	**57**
Application Case	**All Directions**	**40**	**10**	**0**	**0**	**40**	**50**

2. Sound Source Identification

For the new and existing equipment, identify major sources of noise from the facility, their associated sound power level (PWL) or sound pressure level (SPL), the distance (far or free field) at which it was calculated or measured, and whether the sound data are from vendors, field measurement, theoretical estimates, etc.

New Equipment	Predicted X PWL (dBA) X SPL (dBA) OR Measured X PWL (dBA) X SPL (dBA)	Data source	Distance calculated or measured (m)
Listed in Appendix I		**Measurements / Calculations**	

Existing Equipment/Facility	Predicted X PWL (dBA) X SPL (dBA) OR Measured X PWL (dBA) X SPL (dBA)	Data source	Distance calculated or measured (m)
Listed in Appendix I		**Measurements / Calculations**	

3. Operating Conditions

When using manufacturer's data for expected performance, it may be necessary to modify the data to account for actual operating conditions (for example, indicate conditions such as operating with window/doors open or closed). Describe any considerations and assumptions used in conducting engineering estimates:

Equipment assumed to be operating at all times at maximum capacity

4. Modelling Parameters

If modelling was conducted, identify the parameters used (see Section 3.5.1):

Ground absorption 0.5, Temperature 10^{0}C, Relative Humitidy 70%, all receptors downwind, Following ISO 9613

5. Predicted Sound Level/Compliance Determination

Identify the predicted overall (cumulative) sound level at the nearest of most impacted residence. Typically, only the nighttime sound level is necessary, as levels do not often change from daytime to nighttime. However, if there are differences between day and night operations, both levels must be calculated.

Predicted sound level to the nearest or most impacted residence from new facility (including any existing facilities):

Baseline Case

Modeled L_{eq}-Night = **43.6 dBA,** ASL = **N/A**, Overall L_{eq}-Night = **43.6 dBA,** PSL-Night: **45 dBA**

Application Case

Modeled L_{eq}-Night = **31.2 dBA,** ASL = **35.0 dBA**, Overall L_{eq}-Night = **36.5 dBA,** PSL-Night: **40 dBA**

Cumulative Case

Modeled L_{eq}-Night = **43.6 dBA,** ASL = **N/A**, Overall L_{eq}-Night = **43.6 dBA,** PSL-Night: **45 dBA**

Is the predicted sound level less than the permissible sound level? **YES** If **YES**, go to number 7

6. Compliance Determination/Attenuation Measures

(a) If 5 is **NO**, identify the noise attenuation measures the licensee is committing to:

Predicted sound level to the nearest or most impacted residence from the facility (**with** noise attenuation measures):

N/A

Is the predicted sound level less than the permissible sound level? **YES** If **YES**, go to number 7

(b) If 6 (a) is **NO** or the licensee is not committing to any noise attenuation measures, the facility is not in compliance. If further attenuation measures are not practical, provide the reasons why the measures proposed to reduce the impacts are not practical.

Note: If 6 (a) is NO, the Noise Impact Assessment must be included with the application filed as non-routine.

7. Explain what measures have been taken to address construction noise.

Advising nearby residents of significant noise sources and appropriately scheduling
Mufflers on all internal combustion engines
Taking advantage of acoustical screening
Limiting vehicle access during night-time

8. Analyst's Name : **Steven Bilawchuk, M.Sc., P.Eng.**

Company: **ACI Acoustical Consultants Inc.**

Title: **Director**

Telephone: **(780) 414-6373** Date: **March 29, 2010**

Evonik Degussa 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 2010-002 issued 3-Sep-10, revised 5-Mar-13 (attached), including the Procedure/Practice/Standard reference.	Yes. This is part of our Management of Change Check in the Process Hazards Analysis section in C or our site Process Manual.
Attach results of any monitoring/assessments (fenceline outward) completed in 2012.	None
Disclose any improvements/corrective actions implemented in 2012 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.	None
Disclose any improvements/projects that are planned for 2013 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.	None
Provide a Noise Complaint summary for all noise complaints received in 2012 including any actions taken to address them.	None to report

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.

Keyera Corp. – Fort Saskatchewan Site

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-13 (attached), including the Procedure/Practice/Standard reference.	Confirmed. The site has a noise management plan based on the NCIA standard. The document is called KFS Site Noise Management Plan.
Attach results of any monitoring/assessments (fenceline outward) completed in 2012.	In 2012 we planned to update the on-site measurements which were used to develop the 2011 computer model that predicted sound levels at a number of the closest residential dwellings. This work was deferred to 2013 as drilling activity was taking place on site during the contractor's available times. Offsite monitoring at a nearby residence was completed during this drilling in 2012, as it had been in 2008 and 2010 during similar operations.
Disclose any improvements/corrective actions implemented in 2012 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.	A product injection pump project was described in the 2011 report and involved a Noise Impact Assessment that resulted in several modifications to the proposed pump installation, including an acoustically treated building and low noise valves. These were to have been implemented in 2012 and equipment delivery delays pushed the work into 2013.
Disclose any improvements/projects that are planned for 2013 that would impact the noise level output for your site (either up or down); including any updates to your site noise model.	The injection pump project described above will be completed in 2013. Once these units are operational it is expected that further on-site monitoring will be done to refine the computer noise model.
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 deethanizer system at the site. The design and regulatory components will be done in 2013 and equipment commissioning will occur in 2014.
Provide a Noise Complaint summary for all noise complaints received in 2012 including any actions taken to address them.	There were no noise complaints received in 2012.

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.

ACOUSTICAL CONSULTANTS CORP.
Canadian Member of the HFP Engineering Group

ENVIRONMENTAL NOISE ASSESSMENT

Keyera Energy
Fort Saskatchewan Site
5D Cavern Drilling Rig

Prepared For:

Mr. Greg Johansen
Environmental/Regulatory Coordinator,
Excelsior Engineering Ltd.

Prepared By:

Mr. Nigel Maybee, M.A.Sc.
and
Mr. Matt Gaskell, C.E.T.
HFP Acoustical Consultants Corp.

HFP File 12-1897-03

September 25, 2012

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Table of Contents

EXECUTIVE SUMMARY

A comprehensive 24-hour noise monitoring survey was conducted at two residential locations near Keyera Energy's Fort Saskatchewan site to determine the noise impact of temporary drilling activity for the 5D Cavern Project. The survey was conducted at the Lamoureux residence (700 m northwest of the drilling site) and at the Dudzic residence (1,300 m west of the drilling site) on August 15-16, 2012. The comprehensive and isolated sound levels measured during the survey are presented below.

Residence	Comprehensive Sound Level		Isolated Sound Level
	Daytime (dBA L_{eq})	**Nighttime (dBA L_{eq})**	**Nighttime (dBA L_{eq})**
Dudzic (R1)	59.5	48.8	47.6
Lamoureux (R4)	53.5	52.2	48.7

The isolated nighttime sound level values are representative of the cumulative industrial noise contributions at the residences, inclusive of drilling operations.

A noise survey of the drilling rig site was also performed on August 15, 2012 and the results of that survey were used to prepare a computer noise model of the drilling rig facility. The computer model was used to calculate predicted noise contributions of drilling operations at the two residences. These calculations were performed for outdoor sound propagation conditions consistent with those that were present during the noise monitoring survey. The calculated drilling rig sound levels at the receptors are 43.7 dBA (Lamoureux) and 35.7 dBA (Dudzic).

The existing industrial sound levels at these receptors without noise contributions from the drilling rig are 46.0 dBA L_{eq} (Lamoureux) and 44.2 dBA L_{eq} (Dudzic). The cumulative predicted industrial sound levels with drilling rig noise contributions are 48.0 dBA L_{eq} (Lamoureux) and 44.8 dBA L_{eq} (Dudzic). The cumulative sound levels predicted from the noise modeling results infer that the 5D Cavern drilling activities caused an incremental increase of 0.6 to 2.0 dBA L_{eq} in overall industrial noise at the residences.

The 5D Cavern drilling operation is a temporary activity as defined by Directive 038 and Permissible Sound Levels for temporary activities with durations no greater than 60 days are allowed a Class B3 adjustment of +5 dBA $L_{eq.}$ The predicted incremental increase in cumulative industrial noise at the closest residences caused by temporary drilling for the 5D Cavern is less than +5 dBA L_{eq}. Consequently, the noise impact of the 5D Cavern drilling operation is shown to be in compliance with Directive 038.

PURPOSE

Keyera Energy operated a temporary drilling rig at the Keyera Fort Saskatchewan site during the summer of 2012 as part of the 5D Cavern Project. The drilling rig site is near the northwest fence of the Keyera plant site. The closest residences are located on the northwest side of the nearby North Saskatchewan River, approximately 700 m northwest and 1,300 m west of the rig site.

A comprehensive 24-hour noise monitoring survey was performed at these residences to determine the noise impact of the temporary drilling operations. A noise survey of the drilling rig site was also performed and used to model the drilling rig noise contributions at the residences.

This report documents the results of both surveys, as well as the results of noise modeling calculations performed to identify the incremental increase in cumulative industrial noise at the residences associated with the temporary drilling activity.

MEASUREMENTS CONDUCTED

MEASUREMENT METHODOLOGY

The ERCB Directive 038: Noise Control (ERCB Directive) is a receptor oriented noise regulation that may require that a continuous noise monitoring survey be conducted in the yard of the nearest, the most impacted, or a complainant's residence. The measurement methods to be followed are outlined in Directive 038 and were adhered to during this noise monitoring survey.

MONITORING LOCATIONS

Mr. Matt Gaskell, C.E.T. of HFP Acoustical Consultants Corp. performed simultaneous 24-hour noise monitoring surveys at the Dudzic residence (R1) and the Lamoureux residence (R4). The locations of these dwellings, the 5D Cavern drilling rig and the Keyera Fort Saskatchewan site are shown in Map 1.

The Dudzic residence is approximately 1,300 m west of the drilling rig site. There is a wide river valley between this residence and the facility, along with several stands of trees and a large field. The microphone (shown in Photo 1) was positioned approximately 15 meters east of the southeast corner of the house. This position was chosen as it was the least affected by trees in the area.

The Lamoureux residence is located approximately 700 m northwest of rig site. The river valley, several stands of trees, and a large field also lie between this residence and the facility. The microphone (shown in Photo 2, within the red circle) was positioned approximately 16 meters south-southwest of the southwest corner of the house. This position was chosen as it was least affected by trees and other buildings on the property.

The microphone at each residence was mounted to a tripod that elevated it to an approximate height of 1.5 m above the ground.

DURATION OF MONITORING

Simultaneous, continuous sound measurements were conducted for one 24-hour period at both locations. Monitoring commenced at 12:00 hours on Wednesday, August 15, 2012 and was completed at 12:00 hours on Thursday August 16, 2012.

Map 1
Keyera Energy
Ft. Saskatchewan Site
Area Map

Google Earth Pro

feet 4000
km 1

HFP File 12-1897-03

Photo 1: Looking northwest at the Dudzic residence towards the microphone

Photo 2: Looking northeast at the Lamoureux residence and microphone

MEASUREMENT INSTRUMENTATION

The sound measurement instrumentation used for the survey was as follows:

- Larson Davis 824 Environmental Sound Level Meter (2)
- Larson Davis PRM902 preamplifier (2)
- Modal Shop 40AE microphone (2)
- Brüel & Kjær UA0237 windscreen (2)
- Marantz Digital MP3 Player/Recorder (2)
- Larson Davis CAL200 calibrator SN 6861 (calibration date April 2012)

The sound measurement systems were calibrated at the beginning of the survey and checked at the end. The pre-survey and post-survey calibrations are summarized in Appendix A.

The Larson Davis 824 system is rated as a Type 1 measurement system in reference to ANSI S1.4.1983 Standards and fulfills the instrumentation requirements of the ERCB Directive.

L_{EQ} SOUND LEVEL DESCRIPTOR

Environmental sound level measurements have to contend with noise sources which constantly vary over time. For these measurements there is a steady-state background sound level from the surrounding industrial facilities that is slowly varying over time because of changes in sound propagation efficiencies due to varying atmospheric and/or terrain cover conditions. There are also short-term continuously varying higher level noises. The most common of these are the sounds associated with birds, wind, local traffic, train activity, farm equipment, residential activities, and the surrounding rural area. Therefore when undertaking sound measurements, it is a complex task to describe the sound level at a receptor point as it continuously varies over time. This has led to the development of single number noise descriptors. This allows noise monitoring to be undertaken of a constantly varying noise environment over an extended time period, with the results described as a single number.

The single number descriptor commonly used for environmental noise measurements and the descriptor required by the ERCB Directive is the energy equivalent sound level (L_{eq}). The L_{eq} value is the sound energy average over the entire measurement time period. It is defined as a calculated sound level over the measured time period that has the same acoustic energy as the actual fluctuating sound levels that occurred during the same period. The sound level measuring instrumentation used by HFP for this study records continuous 1-minute A-weighted L_{eq} sound levels. These 1-minute L_{eq} values are then used to calculate hourly, daytime and nighttime dBA L_{eq} values as required by the ERCB Directive.

The L_{eq} values are based on a measurement of the A-weighted sound levels expressed in units of dBA. The dBA value accounts for the frequency content of the measured sound, and assesses it with a frequency response similar to that of the human ear.

EFFECTS OF METEOROLOGICAL AND TERRAIN CONDITIONS

The effects of wind gradients on outdoor sound propagation can cause variations in the sound level of a distant facility. Similar effects are caused by temperature gradients in the atmosphere. The sound level variations caused by wind and temperature gradients are most pronounced for large source/receptor distances. Sound from a distant facility which propagates in a downwind direction (and/or during atmospheric inversion conditions) results in higher sound levels at a receptor than for calm conditions and a neutral atmosphere. This effect is caused by the downward refraction (or bending) of sound rays as they propagate through the atmosphere. Conversely, sound propagating in an upwind direction (and/or during lapse conditions in the atmosphere) is refracted upwards, which results in lower sound levels at the receptor. Sound propagating in a crosswind direction does not exhibit refraction effects and is essentially the same as sound propagation during calm conditions and a neutral atmosphere. The maximum acceptable hourly average wind speed for noise monitoring according to typical standards is about 15 km/hr. However from HFP's experience, usually wind speeds less than this are required to conduct a meaningful noise monitoring survey.

The sound monitoring survey was conducted during the middle of summer under mostly clear conditions for the entire 24-hour period. The winds were generally light at ground-level, coming from the south-southwest for most of the survey.

The types of vegetation, ground cover conditions and differing terrain conditions, (i.e., tall grass, snow cover, wet ground, ploughed earth, or rocky ground) can affect the amount of sound absorption that occurs as sound waves pass over the ground. For example, moist soil or soft fresh snow are highly sound absorptive, as opposed to hard-packed ground or crusty snow which are highly sound reflective.

The land between the drilling rig site and the dwellings is fields and wooded areas, with an adjacent wide river valley. The river valley comprises from ½ to ⅔ of the total distance between the drilling rig site and the dwellings. The effect of this terrain and ground cover is an absorptive ground surface over part of the distance to the dwellings, coupled with slight ground effects over the river valley.

METEOROLOGICAL CONDITIONS

A Krestrel 4500 weather monitor was used to collect meteorological data at the Lamoureux residence during the survey period. The weather monitor was mounted at height of about 1.5 m above the ground. (It appears on the foreground tripod in Photo 2.) The weather monitor was programmed to log meteorological data averaged over five minute intervals. Appendix B contains figures which summarize the meteorological data collected during the survey.

Observations of weather and ground conditions made by the consultant during the noise monitoring survey were as follows:

Date and Time	Meteorological Parameter					
	Temperature (℃)	Relative Humidity (%)	Wind Speed (km/h)	Wind Direction	Cloud Cover	Ground Conditions
Aug 15, 2012						
12:20	14	62	4-6	SW	Mostly Clear	Damp
18:30	22	43	0-1	WNW	Clear	Dry
23:35	9	100	0-1	SSW	Clear	Wet
Aug 16, 2012						
07:45	10	100	0-1	SSW	Clear	Wet
12:20	24	48	0-1	SSW	Clear	Damp

The meteorological conditions during the survey were in accordance with the requirements of the ERCB Directive for comprehensive noise monitoring.

OPERATING CONDITIONS

The 5D Cavern drilling rig was operating normally over the complete noise survey period. The Keyera Fort Saskatchewan site and other industrial facilities in the area also appeared to be operating normally.

RESULTS OF MEASUREMENTS

CONTINUOUS NOISE MONITORING DATA PRESENTATION

The noise monitoring results are presented in a series of figures and tables. The 1-minute L_{min}, L_{eq} and L_{max} values recorded during the daytime (07:00 - 22:00) and nighttime (22:00 - 07:00) for the Dudzic and Lamoureux residences, are presented in Figures 1a and 2a, respectively. These figures illustrate the short term variations in sound levels measured over the 24-hour period at the residences. These figures should also be referred to when assessing the sound level that may be attributed to a specific occurrence or event.

One-hour L_{eq} sound levels were calculated from the 1-minute values. For the Dudzic residence, they are presented graphically in Figure 1b and numerically in Table 1. For the Lamoureux residence, they are presented in Figure 2b and numerically in Table 2. The calculated daytime (07:00 - 22:00) and nighttime (22:00 - 07:00) L_{eq} values are presented at the bottom of the tables.

The hourly L_{eq} values and the longer term L_{eq} values are of more use when describing the sound environment as a single number. It should be understood that the actual sound level may vary considerably over the time period that the L_{eq} value represents.

The L_{eq} values are representative of the average sound level of all noise sources affecting the measurement location.

ASSESSMENT OF NOISE MONITORING RESULTS

Often the monitored daytime and nighttime L_{eq} values (i.e. the Comprehensive Sound Levels) are representative of the industrial noise contributions at a receptor. However when the monitored sound levels include noise from non-industrial sources, the sound data record may not be representative of the industrial noise contributions. In such cases, an appropriate "isolation analysis technique" may be used to remove loud events or time periods from the data record that are not representative of industrial noise contributions at the receptor. This assessment technique is deemed acceptable to the ERCB. Examples of sounds that may be isolated in a comprehensive survey are birds, local traffic, train activity, animals, resident activities and consultant activity at the monitor.

Isolation analysis was performed on the nighttime data for both monitors to eliminate some noise spikes caused by local traffic, dogs barking, and train activity. The isolated nighttime data for the Dudzic residence are presented graphically in Figures 1c and 1d, and numerically in Table 1. For the Lamoureux residence, these data are presented in Figures 2c and 2, ,and in Table 2.

Figure 1a
Keyera Energy, Ft. Saskatchewan
5D Cavern Drilling
Monitored One-Minute Leq Sound Values
Dudzic Residence, August 15-16, 2012

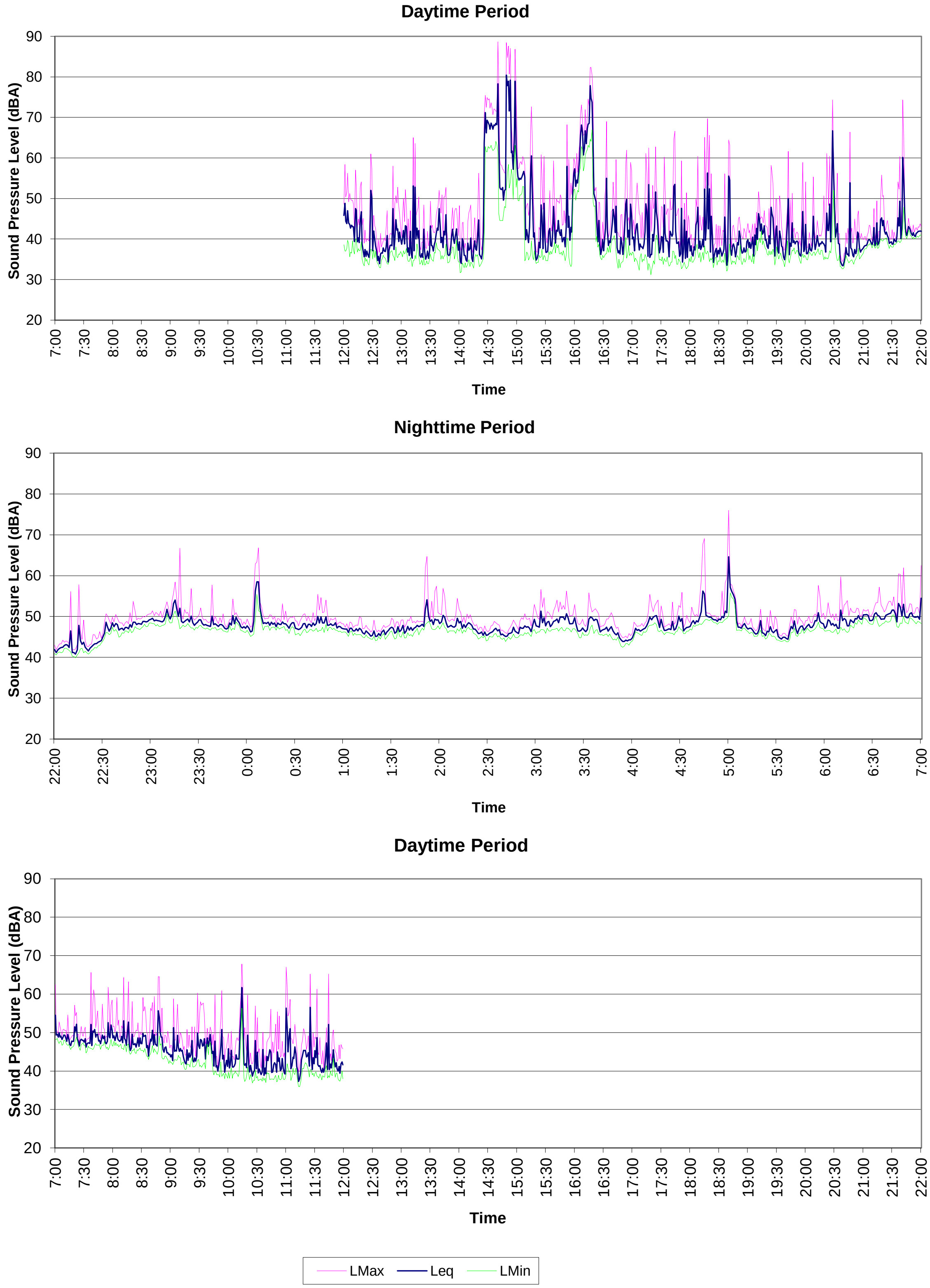
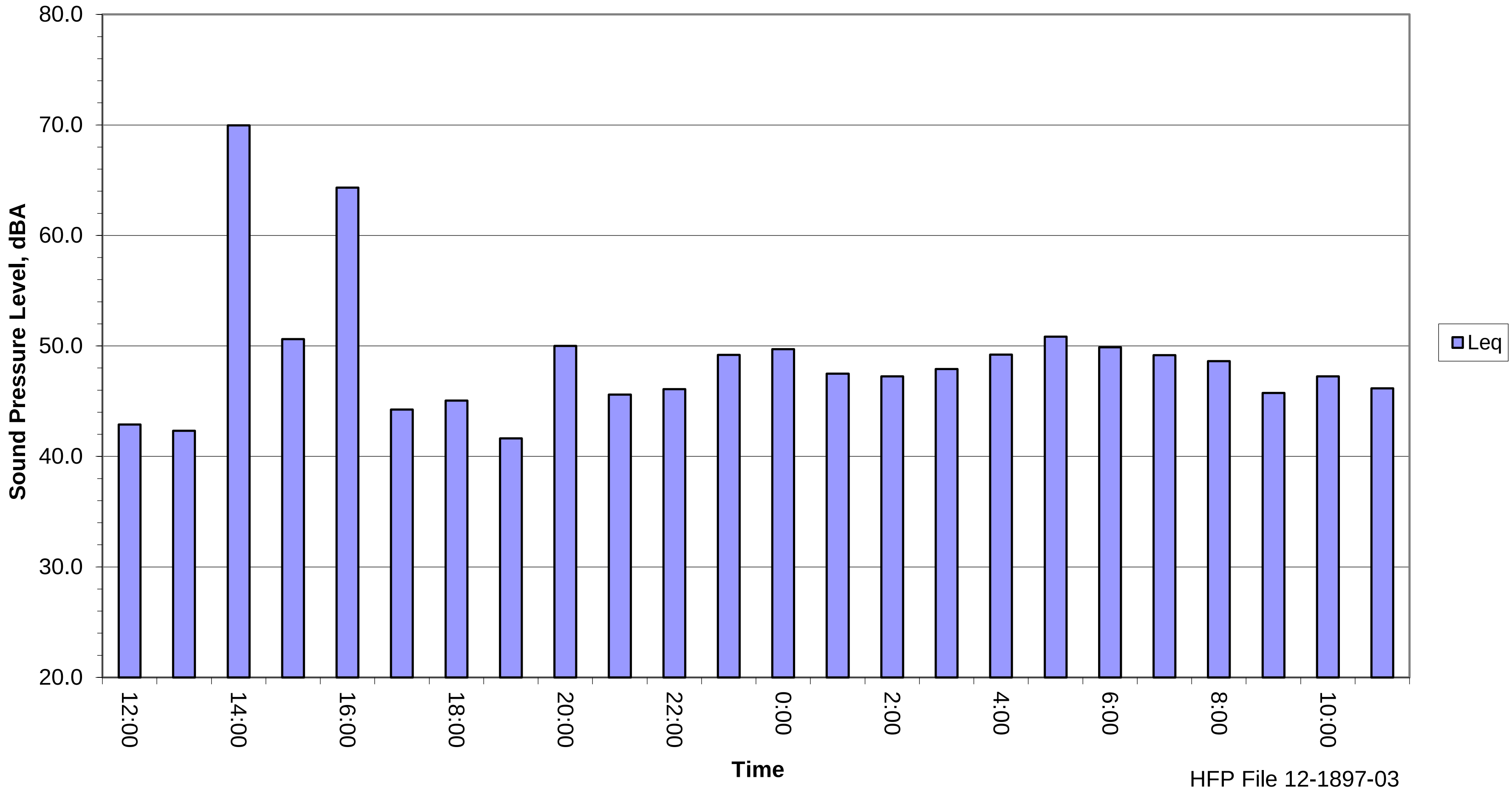


Figure 1b

Keyera Energy, Ft. Saskatchewan
5D Cavern Drilling
One-Hour Measured Values
Dudzic Residence, August 15-16, 2012



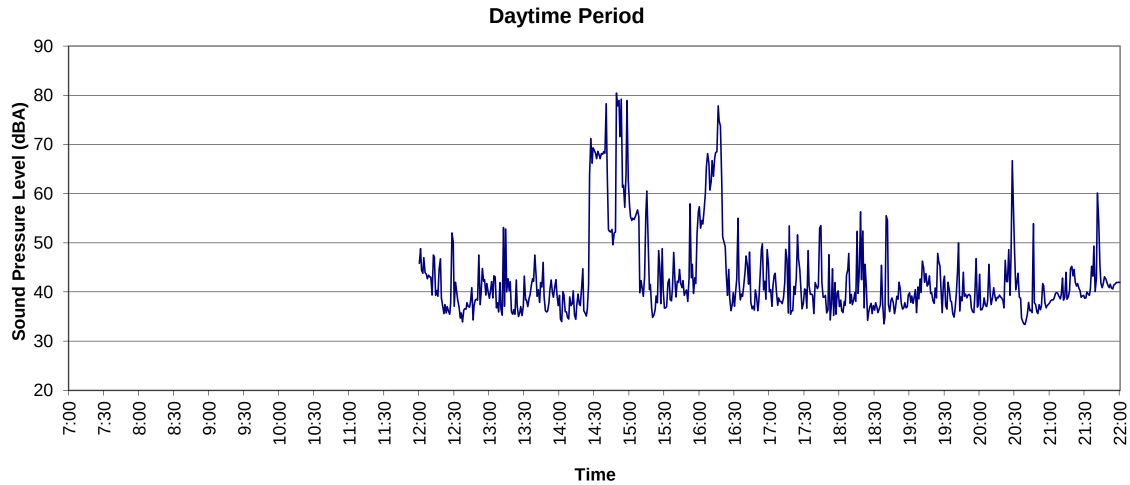
HFP File 12-1897-03

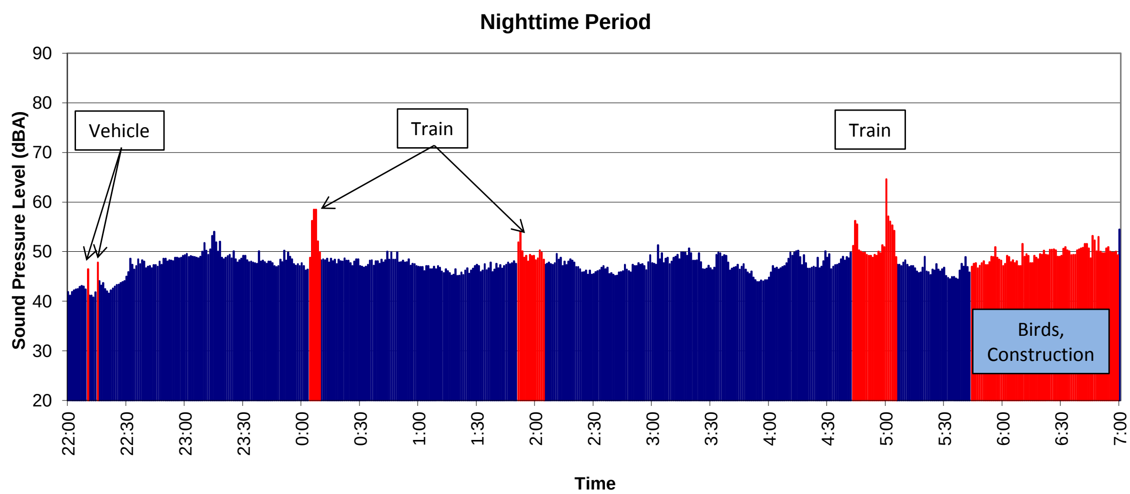
Table 1
Keyera Energy, Ft. Saskatchewan
5D Cavern Drilling
Monitored Hourly Leq Sound Levels
Dudzic Residence, August 15-16, 2012

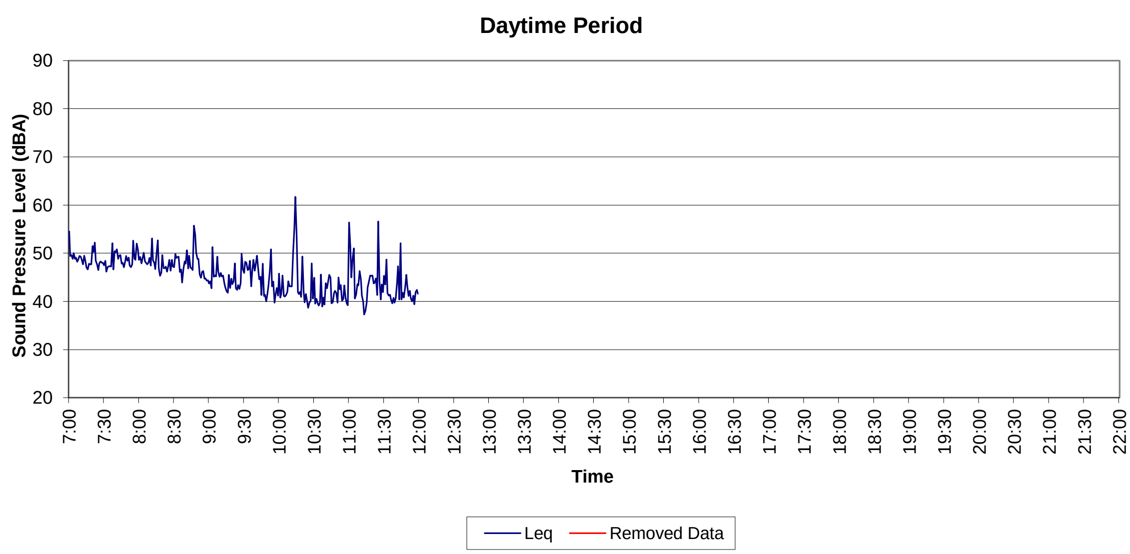
Time Start Hour	Measured Sound Level (dBA Leq)	Measured Sound Level (dBC Leq)	Isolated Sound Level (dBA Leq)	Isolated Sound Level (dBC Leq)	Valid # of Minutes
12:00	42.9	57.8			60
13:00	42.3	58.8			60
14:00	70.0	77.7			60
15:00	50.6	60.8			60
16:00	64.3	70.7			60
17:00	44.2	60.3			60
18:00	45.1	61.2			60
19:00	41.6	60.1			60
20:00	50.0	61.7			60
21:00	45.6	59.7			60
22:00	46.1	64.0	46.0	64.1	58
23:00	49.2	65.7			60
0:00	49.7	66.7	48.0	66.7	54
1:00	47.5	68.8	46.7	68.3	51
2:00	47.2	70.3	47.0	70.2	55
3:00	47.9	69.1			60
4:00	49.2	69.9	48.1	69.6	43
5:00	50.8	66.1	46.6	65.5	38
6:00	49.9	63.8			0
7:00	49.2	66.1			60
8:00	48.6	67.0			60
9:00	45.7	63.3			60
10:00	47.3	63.4			60
11:00	46.2	61.5			60
15 hour daytime Leq:	59.5	68.0			
9 hour nighttime Leq:	48.8	67.7			
7.0 hour isolated nighttime Leq:			47.6	67.9	

HFP File 12-1897-03

Figure 1c
Keyera Energy, Ft. Saskatchewan
5D Cavern Drilling
Isolated One-Minute Leq Sound Values
Dudzic Residence, August 15-16, 2012

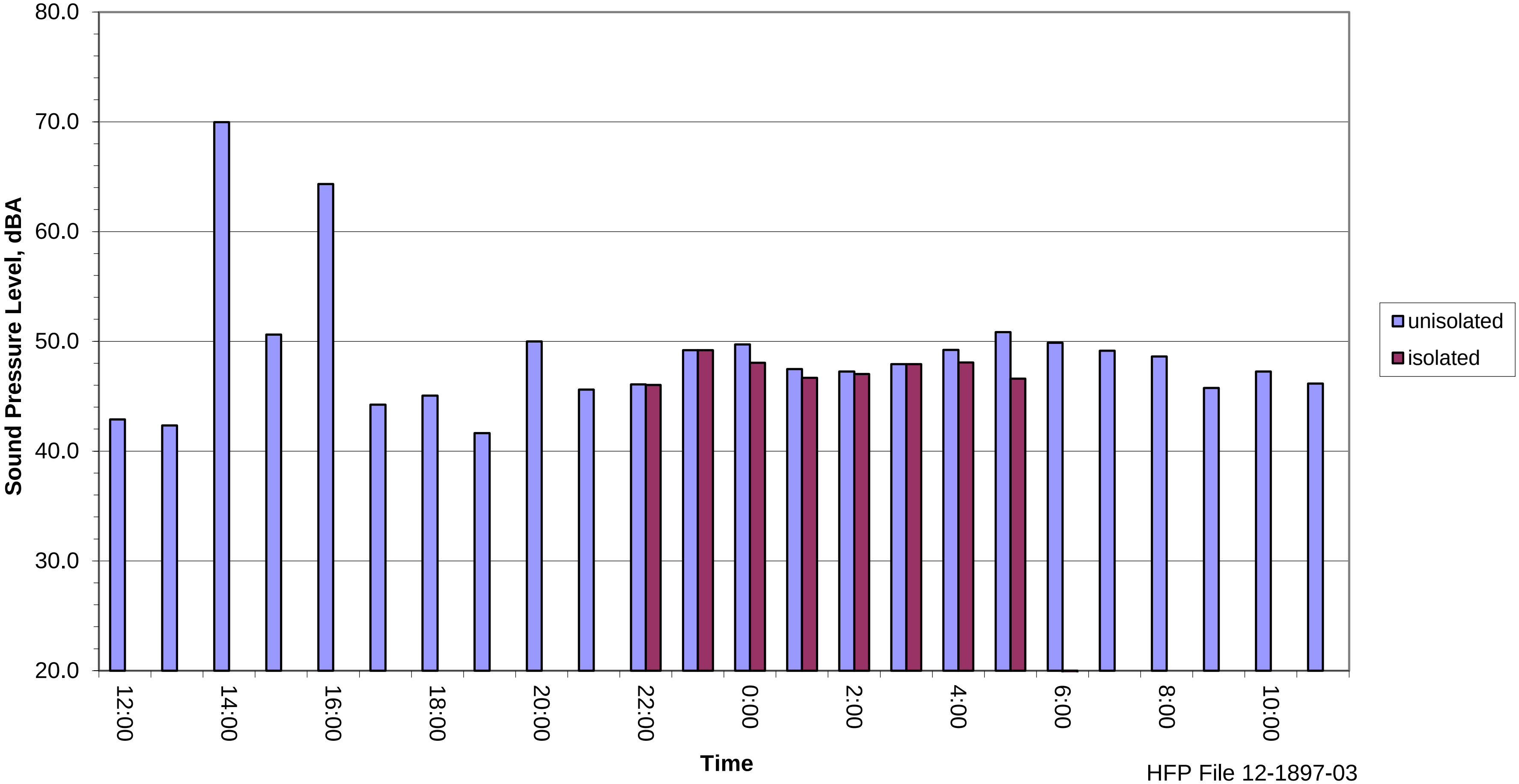






HFP File 12-1897-03

Figure 1d
Keyera Energy, Ft. Saskatchewan
5D Cavern Drilling
One-Hour Isolated Values
Dudzic Residence, August 15-16, 2012



HFP File 12-1897-03

Figure 2a
Keyera Energy, Ft. Saskatchewan
5D Cavern Drilling
Monitored One-Minute Leq Sound Values
Lamoureux Residence, August 15-16, 2012

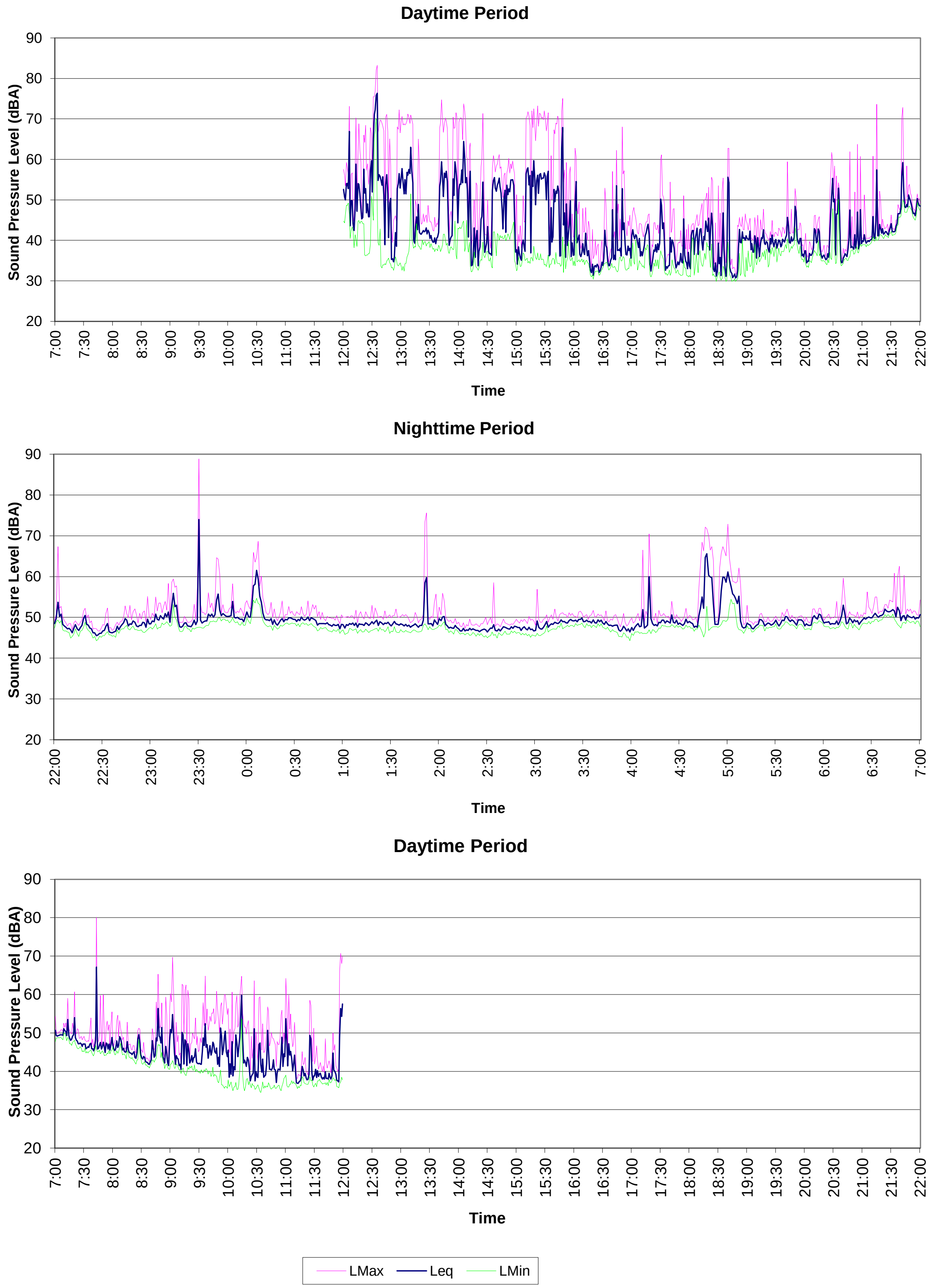
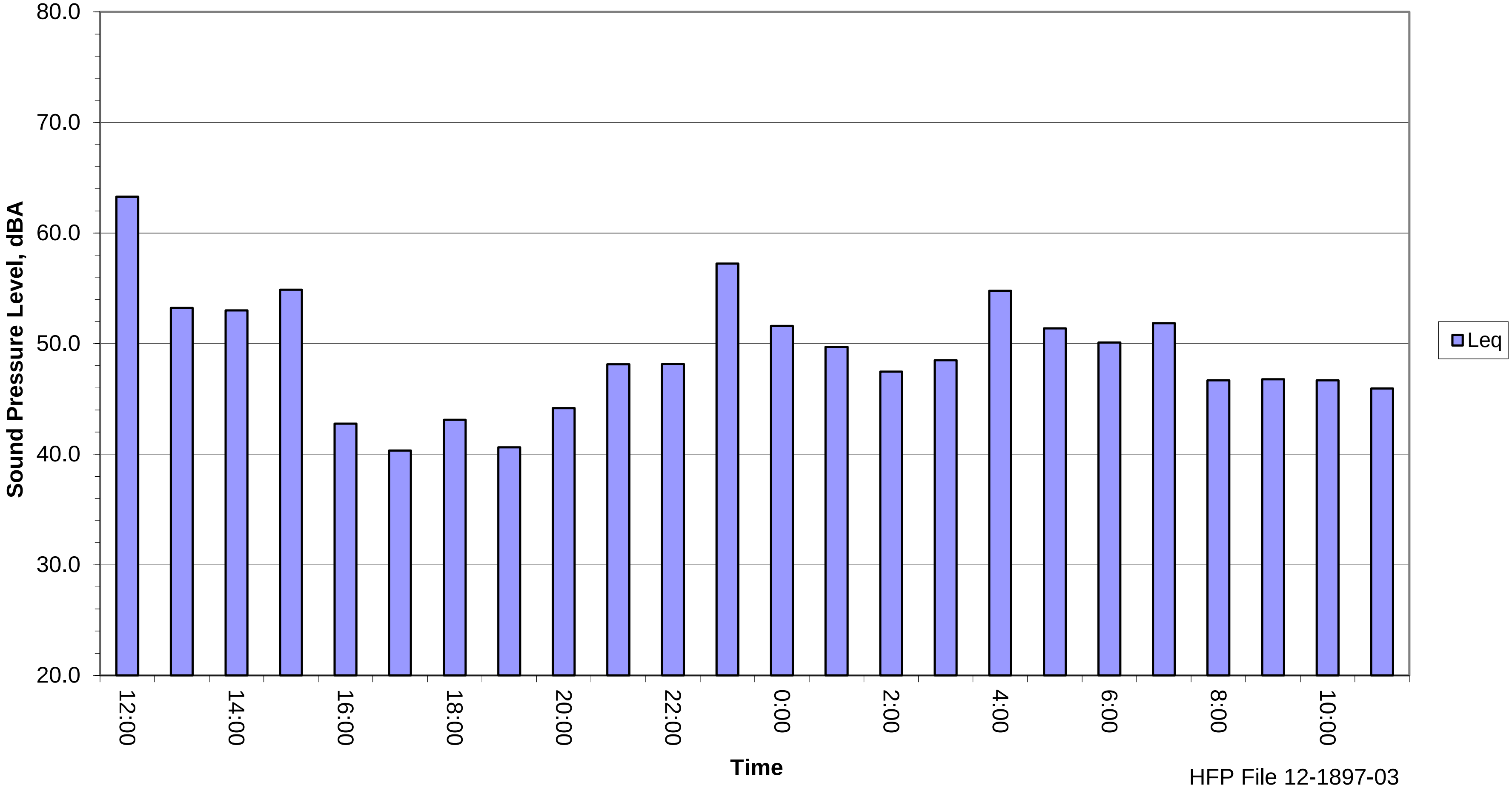


Figure 2b

Keyera Energy, Ft. Saskatchewan
5D Cavern Drilling
One-Hour Measured Values

Lamoureux Residence, August 15-16, 2012



HFP File 12-1897-03

Table 2
Keyera Energy, Ft. Saskatchewan
5D Cavern Drilling
Monitored Hourly Leq Sound Levels
Lamoureux Residence, August 15-16, 2012

Time Start Hour	Measured Sound Level (dBA Leq)	Measured Sound Level (dBC Leq)	Isolated Sound Level (dBA Leq)	Isolated Sound Level (dBC Leq)	Valid # of Minutes
12:00	63.3	74.3			60
13:00	53.2	60.9			60
14:00	53.0	60.6			60
15:00	54.9	64.4			60
16:00	42.8	57.4			60
17:00	40.3	57.3			60
18:00	43.1	59.0			60
19:00	40.6	59.2			60
20:00	44.2	60.7			60
21:00	48.1	60.5			60
22:00	48.2	61.6	47.9	61.5	53
23:00	57.2	65.4	50.1	63.9	55
0:00	51.6	65.8	49.2	63.8	52
1:00	49.7	64.1	48.3	64.0	58
2:00	47.5	64.4			60
3:00	48.5	63.7			60
4:00	54.8	64.9	48.5	63.7	43
5:00	51.4	65.2	48.9	64.0	51
6:00	50.1	65.1	49.0	63.8	25
7:00	51.8	64.3			60
8:00	46.7	64.4			60
9:00	46.8	62.0			60
10:00	46.7	62.1			60
11:00	45.9	60.2			60
15 hour daytime Leq:	53.5	65.0			
9 hour nighttime Leq:	52.2	64.6			
7.6 hour isolated nighttime Leq:			48.7	63.7	

HFP File 12-1897-03

Figure 2c
Keyera Energy, Ft. Saskatchewan
5D Cavern Drilling
Isolated One-Minute Leq Sound Values
Lamoureux Residence, August 15-16, 2012

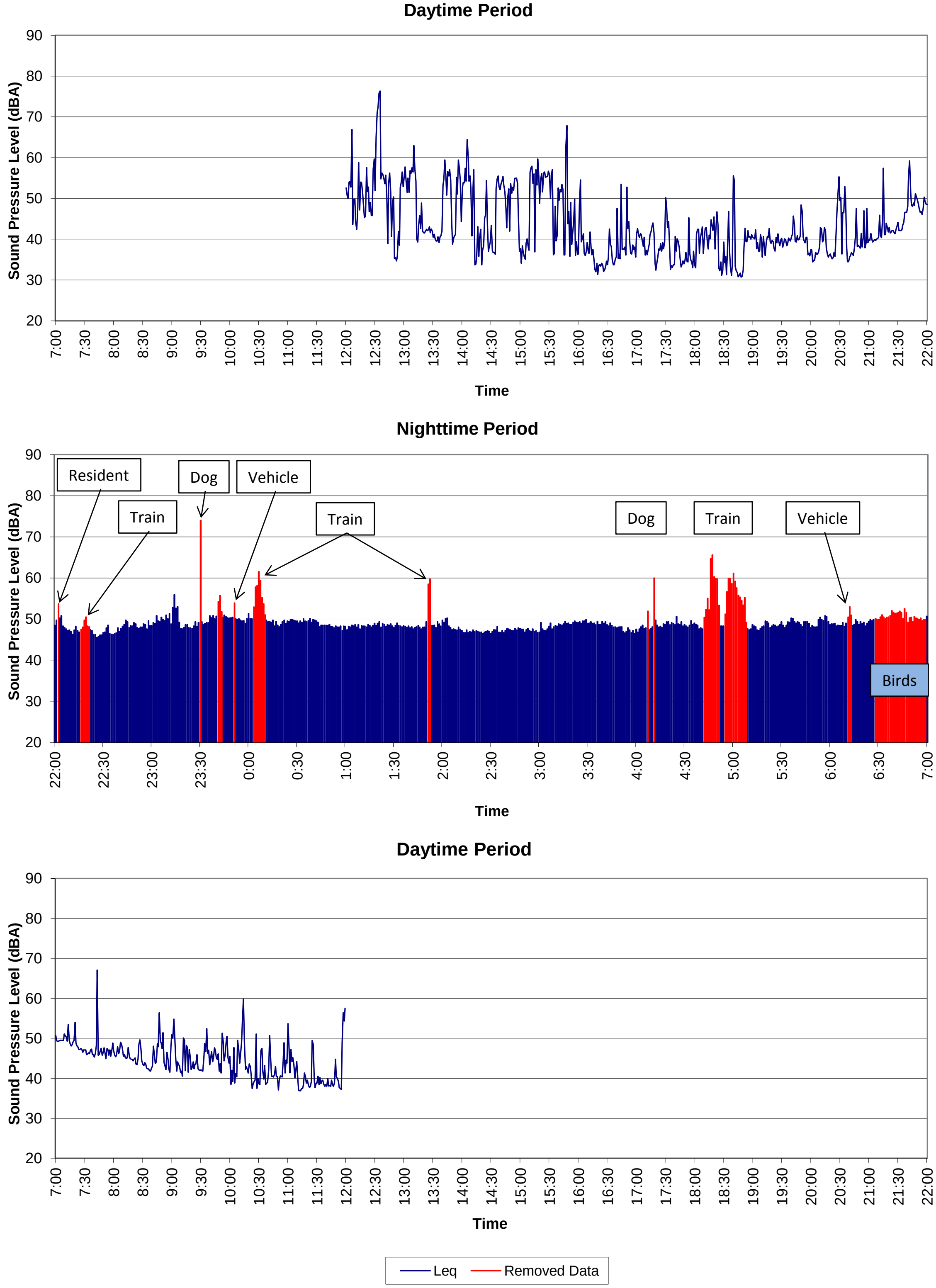


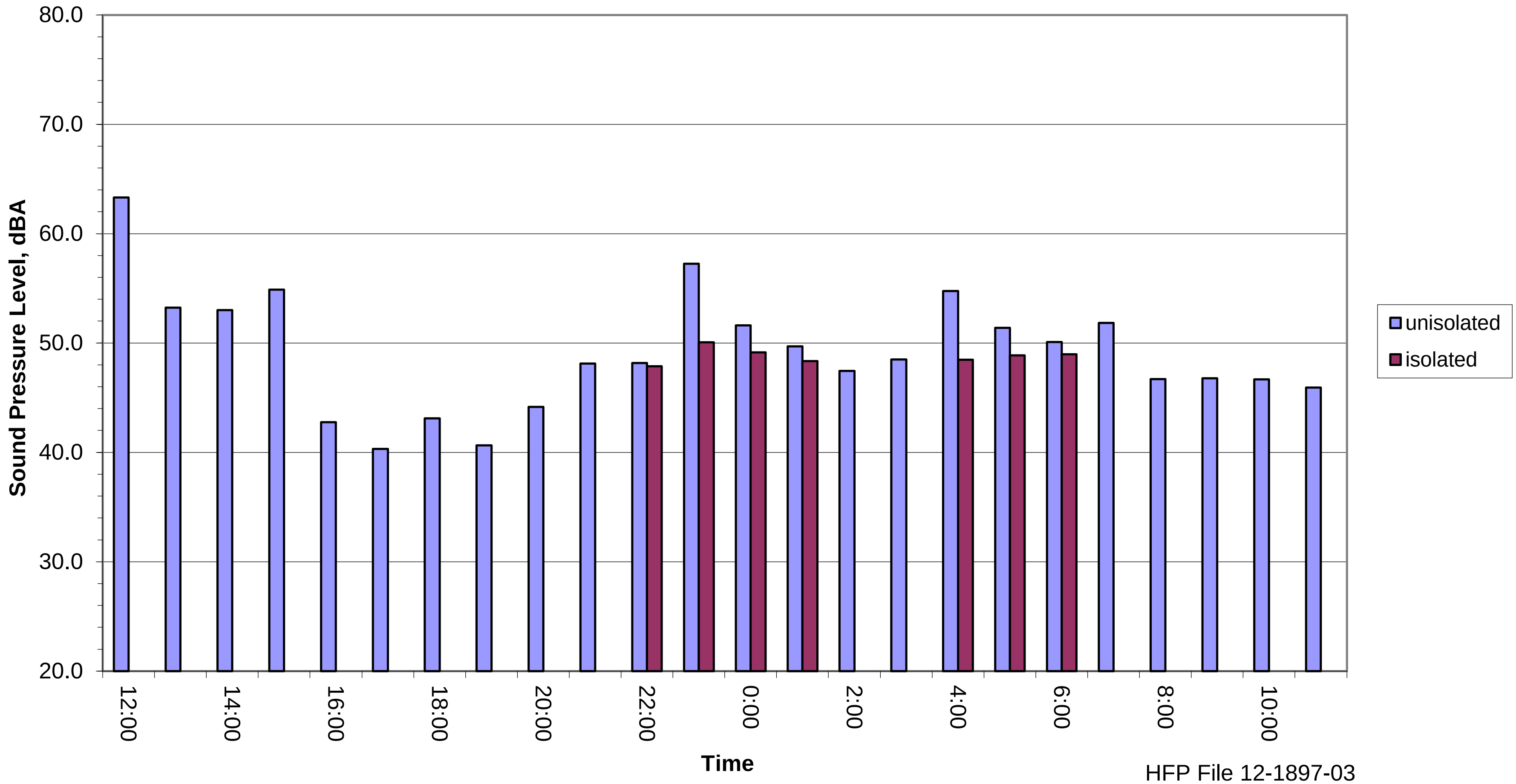
Figure 2d

Keyera Energy, Ft. Saskatchewan

5D Cavern Drilling

One-Hour Isolated Values

Lamoureux Residence, August 15-16, 2012



HFP File 12-1897-03

DISCUSSION OF MONITORING RESULTS

Dudzic Residence (R1)

Daytime

The results of the survey indicate a comprehensive daytime sound level of 59.5 dBA L_{eq}. During the daytime, there were prolonged periods of lawn mowing close to the microphone. At other times the main audible sources were industrial noise to the south-southwest, train horns, and some construction and reverse beeper noise on the road to the south. Local traffic, birds chirping, resident activities and leaves rustling in the trees were also audible during the day. Noise from the 5D Cavern drilling rig was not discernible at any time during the daytime periods.

Nighttime

The results of the survey indicate a comprehensive nighttime sound level of 48.8 dBA L_{eq}. Some of the acoustical energy is contained in spikes caused by local traffic and train activity, as well as in an extended period of early morning bird sounds. These periods were isolated, as shown in Figure 1c, resulting in a 7.0 hour isolated nighttime sound level of 47.6 dBA L_{eq}. The remaining nighttime sound level is noise from industrial facilities to the south of the Dudzic residence. None of the industrial noise seemed to be coming from the direction of the 5D Cavern drilling rig.

Lamoureux Residence (R4)

Daytime

During much of the day, the sound level was approximately 40 dBA L_{eq}. However as a result of lawn mowing on the property, the comprehensive 15-hour daytime sound level was 53.5 dBA L_{eq}. During the rest of the daytime period, the main audible sources at the Lamoureux residence were industrial noise to the west and south, train horns, and reverse beeper noise. Local traffic, birds chirping, resident activities and leaves rustling in the trees also contributed to the daytime sound level. The 5D Cavern drilling rig, in combination with noise from the other industrial facilities, was audible and noticeable during most of the daytime period.

Nighttime

The comprehensive nighttime sound level at the Lamoureux residence was 52.2 dBA L_{eq}. This includes some noise contributions from train activity, dogs barking and early morning bird activity. These intervals were isolated, as shown in Figure 2c, resulting in a 7.6 hour isolated nighttime sound level of 48.7 dBA L_{eq}. The isolated nighttime sound level is a combination of noise from both the 5D Cavern drilling rig to the southeast and noise from industrial facilities to the south. At approximately 23:30, HFP staff observed that generator noise from the rig site was clearly audible, ramping up and down as the load on them fluctuated.

A summary of the daytime, nighttime and isolated nighttime sound levels measured during the surveys is presented in Table 3.

Table 3

Summary of Monitored Sound Levels (August 15 – 16, 2012)

Residence	Comprehensive Sound Level		Isolated Sound Level
	Daytime (dBA L_{eq})	Nighttime (dBA L_{eq})	Nighttime (dBA L_{eq})
Dudzic (R1)	59.5	48.8	47.6
Lamoureux (R4)	53.5	52.2	48.7

PREDICTED INDUSTRIAL NOISE CONTRIBUTIONS AT THE MONITOR LOCATIONS

Measurements of the noise produced by the 5D Cavern drilling rig were performed by Mr. Matt Gaskell on August 15, 2012. The survey included short-term measurements at several locations around drilling rig site, at distances ranging from 40 m and 315 m from the derrick. Figure 3 shows an area map of the north end of the Keyera site, which identifies the 5D Cavern drilling rig and the measurement locations used for the rig noise survey. Table 4 lists the octave band sound pressure levels measured at each of these locations. Drilling rig noise was the dominant sound at most of the spot measurement locations, except for M11 which was heavily contaminated by noise from a nearby furnace on the Keyera plant site.

The main noise sources for the drilling rig are a main generator located on the west side of the rig site and secondary generator located on the north side of the site. The noise survey results were used to calculate octave band sound power levels for these two sources, which are listed in Table 5.

A noise model of the 5D Cavern drilling rig was prepared using SoundPLAN Version 7.1, a computer noise modeling software package developed by Braunstein + Berndt GmbH, Germany. The computer noise model for the Keyera Fort Saskatchewan plant site has also been developed using this software package. The purpose of noise modeling is to calculate predicted sound level contributions of industrial facilities at the nearby residential receptors. In this case, noise modeling was performed to calculate the predicted noise contribution of the 5D Cavern drilling rig at the two noise monitoring locations.

The drilling rig noise model calculations utilize the ISO 9613-1 calculation method for absorption of sound by the atmosphere and the CONCAWE calculation method for outdoor sound propagation from industrial facilities. These calculation methods account for the following outdoor sound propagation effects:

- Geometric spreading
- Ground attenuation
- Atmospheric absorption
- Barrier attenuation
- Moderate wind or temperature gradient

Meteorological parameters and ground attenuation values typical of summer seasonal conditions are normally used in noise model calculations. Calculations are typically made for downwind sound propagation from facilities, although the CONCAWE method also allows for calculations under calm and atmospheric inversion conditions. Downwind (and atmospheric inversion) conditions produce downward refraction of air-borne sound, resulting in enhanced sound propagation between the source and receptor. A summary of the modeling parameters for the 5D Cavern drilling rig noise predictions is presented in Appendix C. These noise modeling calculations also take into account the topography of the study area, which was imported into the modeling software as digital elevation data.

Weather conditions during the noise monitoring survey were mostly calm during the nighttime period and predicted noise contributions at the Dudzic and Lamoureux residences have been calculated for calm conditions and a neutral atmosphere.

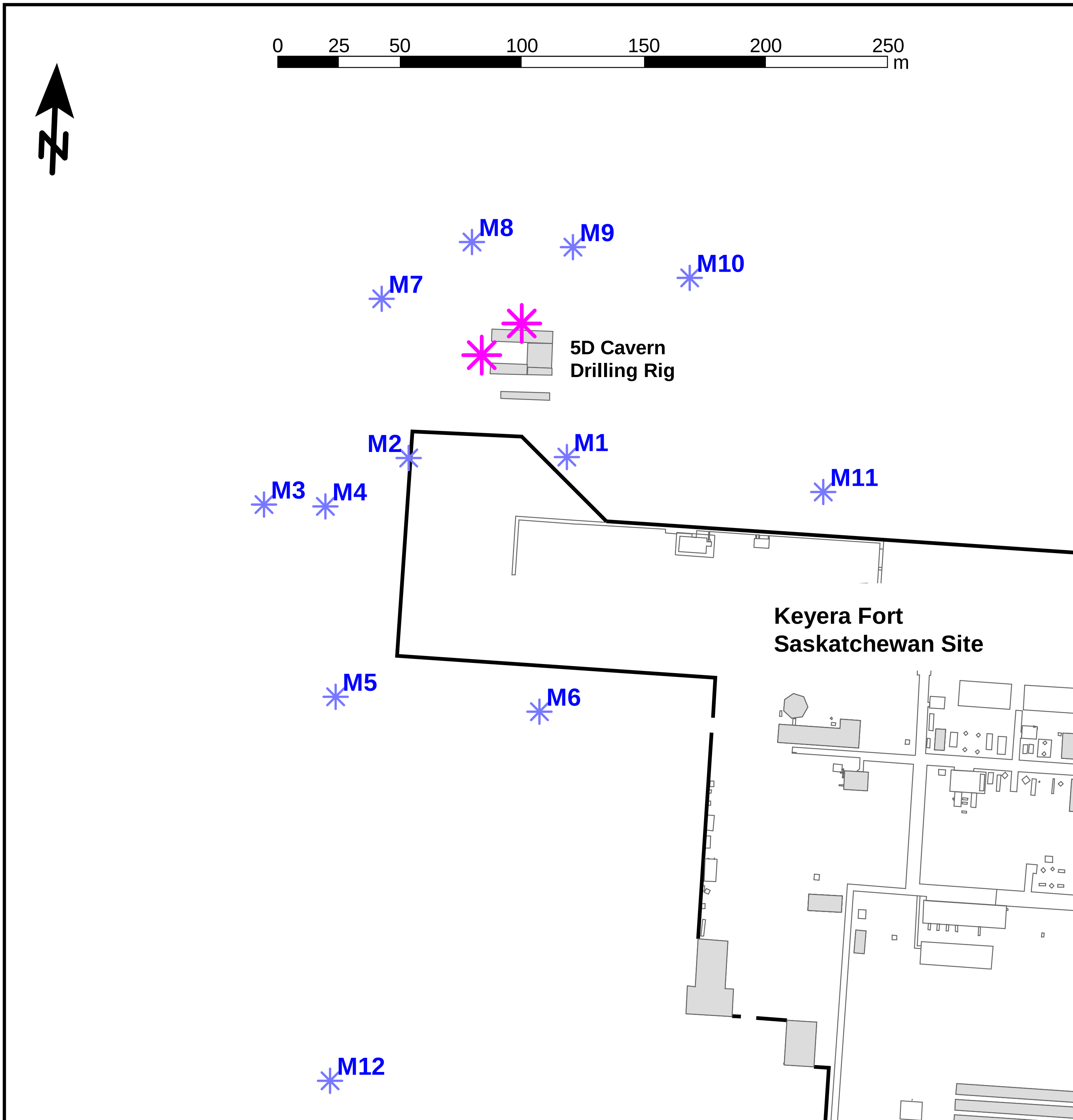


Figure 3

Drilling Rig Noise Measurement Locations

Keyera Energy
5D Cavern Drilling Rig

Legend

Rig noise source
Keyera site fence line
Spot measurement location

9/24/2012

HFP ACOUSTICAL CONSULTANTS

Table 4

5D Cavern Drilling Rig Sound Pressure Level Data

Measurement Location	Distance from Rig (m)	Direction from Rig	Octave Band Sound Pressure Level (dB)									Overall (dBA)
			31.5	63	125	250	500	1000	2000	4000	8000	
M1	42	south	70.8	73.1	70.4	63.2	60.7	55.5	51.0	46.5	36.2	62.0
M2	67	southwest	72.4	75.8	77.2	69.7	71.5	68.7	65.6	59.9	46.4	73.5
M3	133	southwest	69.2	70.8	70.8	60.5	62.4	60.8	58.3	51.5	36.6	65.4
M4	115	southwest	66.8	69.8	70.9	65.4	58.9	54.5	51.9	45.1	33.3	61.8
M5	172	southwest	65.2	65.9	65.2	60.5	53.3	47.5	43.1	37.5	24.9	55.9
M6	150	south	68.7	69.2	65.6	58.9	58.2	52.0	50.1	46.9	32.5	59.0
M7	75	northwest	71.8	75.5	75.9	70.2	68.9	69.4	66.7	61.4	49.8	73.5
M8	54	north	78.5	78.8	78.1	71.7	69.7	71.0	69.1	61.3	51.1	75.2
M9	39	north	77.2	73.1	69.1	68.1	65.1	63.7	59.0	52.5	41.8	68.0
M10	68	northeast	74.6	72.7	69.8	65.0	57.9	57.3	53.1	52.3	38.5	63.0
M11*	128	southeast	73.2	74.8	72.1	64.8	61.3	59.8	56.7	59.8	48.6	66.3
M12	315	south	64.3	67.4	57.2	53.2	44.6	41.6	37.1	28.8	16.1	48.9

* Audible noise at M11 dominated by noise from a large furnace located approximately 50 m south on the Keyera plant site.

Table 5

5D Cavern Drilling Rig Sound Power Level Data

Noise Source Description	Octave Band Sound Power Level (dB)									Overall (dBA)
	31.5	63	125	250	500	1000	2000	4000	8000	
Main generator	116.2	118.2	118.6	112.0	111.7	111.1	108.6	102.4	90.8	115.5
Secondary generator	100.2	102.2	102.6	96.0	95.7	95.1	92.6	86.4	74.8	99.5

Prior to calculating drilling rig sound levels at the receptors, the noise model was validated by calculating predicted sound levels at the rig measurement locations. Table 6 compares the measured and predicted sound levels for rig noise at each of the spot measurement locations.

Table 6

5D Cavern Drilling Rig Model Validation Data

Measurement Location	Sound Level (dBA)	
	Measured	Predicted
M1	62.0	59.8
M2	73.5	73.4
M3	65.4	65.9
M4	61.8	67.9
M5	55.9	61.8
M6	59.0	62.1
M7	73.5	74.0
M8	75.2	74.2
M9	68.0	67.0
M10	63.0	63.7
M11	66.3	61.7
M12	48.9	52.7

Agreement between the measured and predicted values is within about ±2 dB for all locations within 100 m of the drilling rig (Locations M1, M2, M7, M8, M9 and M10). The margins between measured and predicted values are larger for measurement locations at greater distances, with predicted sound levels higher than the measured values at most of the more distant locations.[1] All these more distant locations are located south of the drilling rig site, and it appears that upwind sound propagation and moderate variations in generator noise emissions at the time of the measurements may contribute to the differences between the measured and predicted values for these locations.

The predicted drilling rig noise contributions at the two noise monitor locations for calm/neutral conditions are 35.7 dBA (Dudzic) and 43.7 dBA (Lamoureux).

The predicted noise contributions of the existing Keyera plant site and other surrounding industrial facilities at these receptors were determined by noise modeling as part of the noise impact assessment of the $C2^+$ Storage Addition Project for the Keyera Fort Saskatchewan site.[2] A summary of the existing industrial facility noise contributions at these receptors for three outdoor sound propagation conditions is presented in Table 7. These conditions range from a calm/neutral atmosphere, through a calm/moderate inversion to downwind conditions with a wind speed of 7.5 km/h.

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1 except M11 which is dominated by furnace noise from the Keyera plant site.

2 HFP Acoustical Consultants, 2012. *Keyera Energy Fort Saskatchewan Site $C2^+$ Storage Addition Project – Noise Impact Assessment Rev.1.* HFP File 11-2043-2. April 30, 2012. Calgary, Alberta.

Table 7
Existing Facility Sound Levels at Receptors

Residence	Facility Noise Contributions (dBA L_{eq})		
	Calm/neutral	Calm/moderate inversion	Downwind*
Dudzic (R1)	44.2	48.4	48.5
Lamoureux (R4)	46.0	50.1	50.3

* Wind speed: 7.5 km/h.

The calm/neutral values in Table 7 represent the closest match to the outdoor sound propagation conditions that occurred during the August 15 – 16, 2012 noise monitoring survey, particularly during the nighttime period. In Table 8, these values are combined with the predicted drilling rig sound levels to calculate the cumulative industrial sound level contribution at the two receptors.

Table 8
Cumulative Facility Sound Levels at Receptors – Calm/Neutral Conditions

Residence	Sound Level Contribution (dBA L_{eq})			Isolated Sound Level Nighttime (dBA L_{eq})
	Existing Facilities	5D Cavern Drilling Rig	Total (existing and rig)	
Dudzic (R1)	44.2	35.7	44.8	47.6
Lamoureux (R4)	46.0	43.7	48.0	48.7

The last column in Table 8 lists the isolated sound levels for nighttime period of the August 15 – 16, 2012 survey. Comparison of the measured and predicted sound levels for cumulative facility noise show good agreement for the most impacted residence (Lamoureux); to within 1 dB. Agreement for the Dudzic residence is within 3 dB.

At both residences the measured values are higher than the predicted values. It is worth noting that the predicted facility noise contributions would be higher both residences for different outdoor sound propagation conditions (e.g., downwind or inversion), and that the modeled calm/neutral condition may slightly underestimate the actual nighttime condition during the survey.

The noise prediction results in Table 8 are also supported by observations made during the noise monitoring survey. Drilling rig noise was clearly audible at the Lamoureux residence and the predicted drilling rig noise contribution at this receptor is within about 2 dB of the noise contribution of the existing facilities. Drilling rig noise was not discernible at the Dudzic residence and the predicted drilling rig noise contribution at the Dudzic residence is 8 to 9 dB lower than the noise contribution of the existing facilities.

SUMMARY

Keyera Energy conducted temporary drilling operations at the Keyera Fort Saskatchewan site during the summer of 2012 as part of the 5D Cavern Project. A comprehensive 24-hour noise monitoring survey was performed at two of the closest residences to the drilling rig site on August 15 -16, 2012 while drilling operations were underway.

During the survey, drilling operation noise was audible at the closest residence (Lamoureux), along with industrial noise from other existing facilities in the Fort Saskatchewan area. The isolated nighttime sound level measured at this receptor (48.7 dBA L_{eq}) is representative of the cumulative industrial noise contributions during the drilling activities. Drilling operation noise was not discernible at the Dudzic residence, although industrial noise from other existing facilities was audible. The isolated nighttime sound level measured at the Dudzic residence was 47.6 dBA L_{eq}.

A noise survey of the drilling rig site was also performed on August 15, 2012 and the results of that survey were used to prepare a computer noise model of the drilling rig facility. The computer model was used to calculate predicted noise contributions of drilling operations at the two residences. These calculations were performed for outdoor sound propagation conditions consistent with those that were present during the noise monitoring survey. The calculated drilling rig sound levels at the receptors are 43.7 dBA (Lamoureux) and 35.7 dBA (Dudzic).

The predicted industrial sound levels at these receptors without noise contributions from the drilling rig are 46.0 dBA L_{eq} (Lamoureux) and 44.2 dBA L_{eq} (Dudzic). The cumulative predicted industrial sound levels with drilling rig noise contributions are 48.0 dBA L_{eq} (Lamoureux) and 44.8 dBA L_{eq} (Dudzic). These cumulative sound level results infer that the 5D Cavern drilling activities caused an incremental increase in overall industrial noise at the residences of 0.6 to 2.0 dBA L_{eq}.

The 5D Cavern drilling operation is a temporary activity as defined by Directive 038 and Permissible Sound Levels for temporary activities with durations no greater than 60 days are allowed a Class B3 adjustment of +5 dBA $L_{eq.}$ The predicted incremental increase in cumulative industrial noise at the closest residences associated with temporary drilling for the 5D Cavern is less than +5 dBA L_{eq}. Consequently, the noise impact of the 5D Cavern drilling operation is shown to be in compliance with Directive 038.

APPENDIX A

RECORD OF CALIBRATION RESULTS

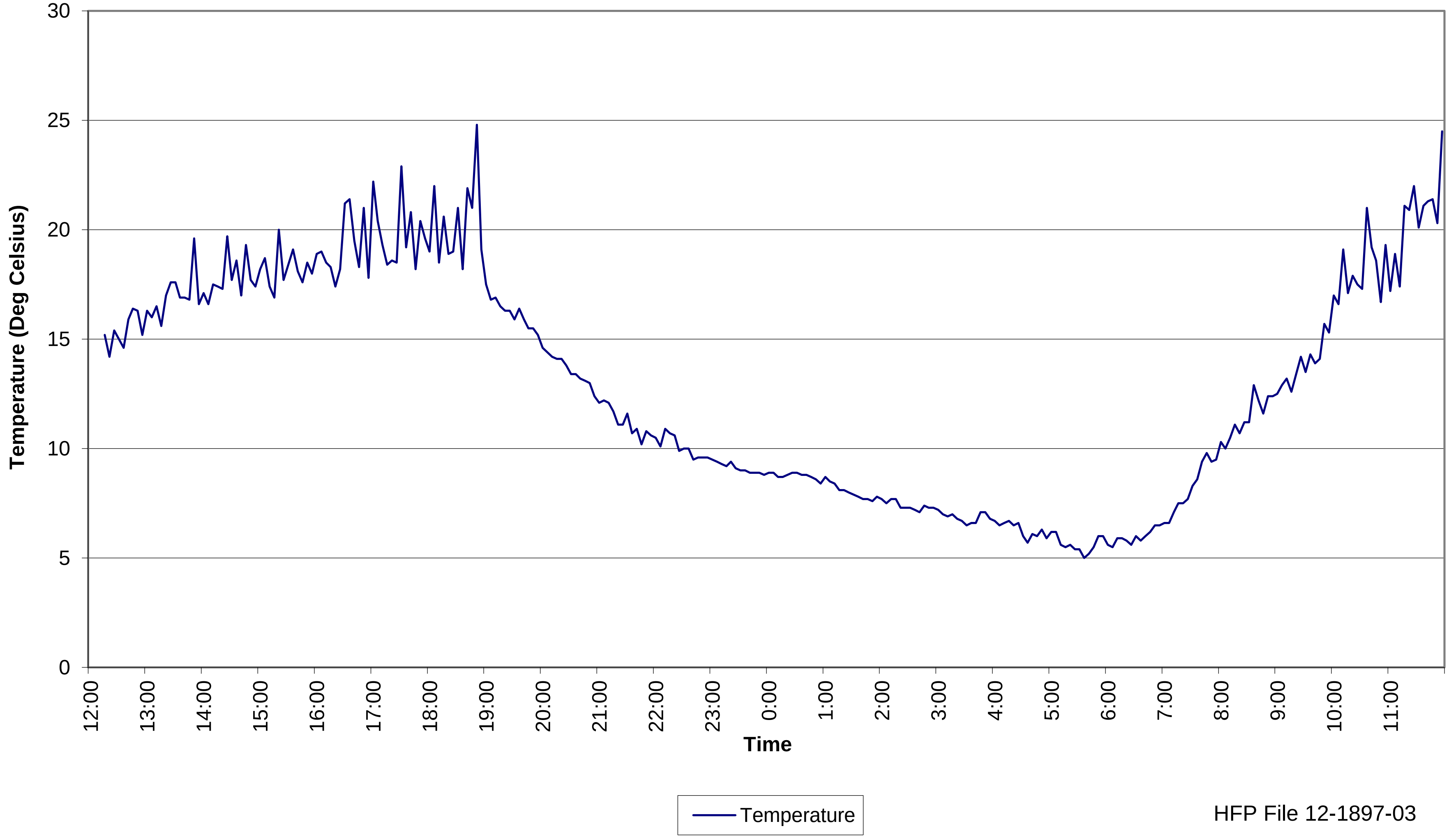
HFP File: 1897-03

Equipment Model	Equipment Serial No.	Calibrator Model	Calibrator Serial No.	Calibration Level (dBA)	Date DD/MM/YY	Time	Calibrated By (Initials)	Notes
Larson Davis 824	A0301	Larson Davis CAL200	6861	93.9	15/08/12	11:09	MG	Pre-calibration
Larson Davis 824	A0301	Larson Davis CAL200	6861	94.1	16/08/12	12:15	MG	Post-calibration
Larson Davis 824	A0298	Larson Davis CAL200	6861	94.0	15/08/12	11:27	MG	Pre-calibration
Larson Davis 824	A0298	Larson Davis CAL200	6861	94.2	16/08/12	12:03	MG	Post-calibration

HFP ACOUSTICAL CONSULTANTS

Figure B-1

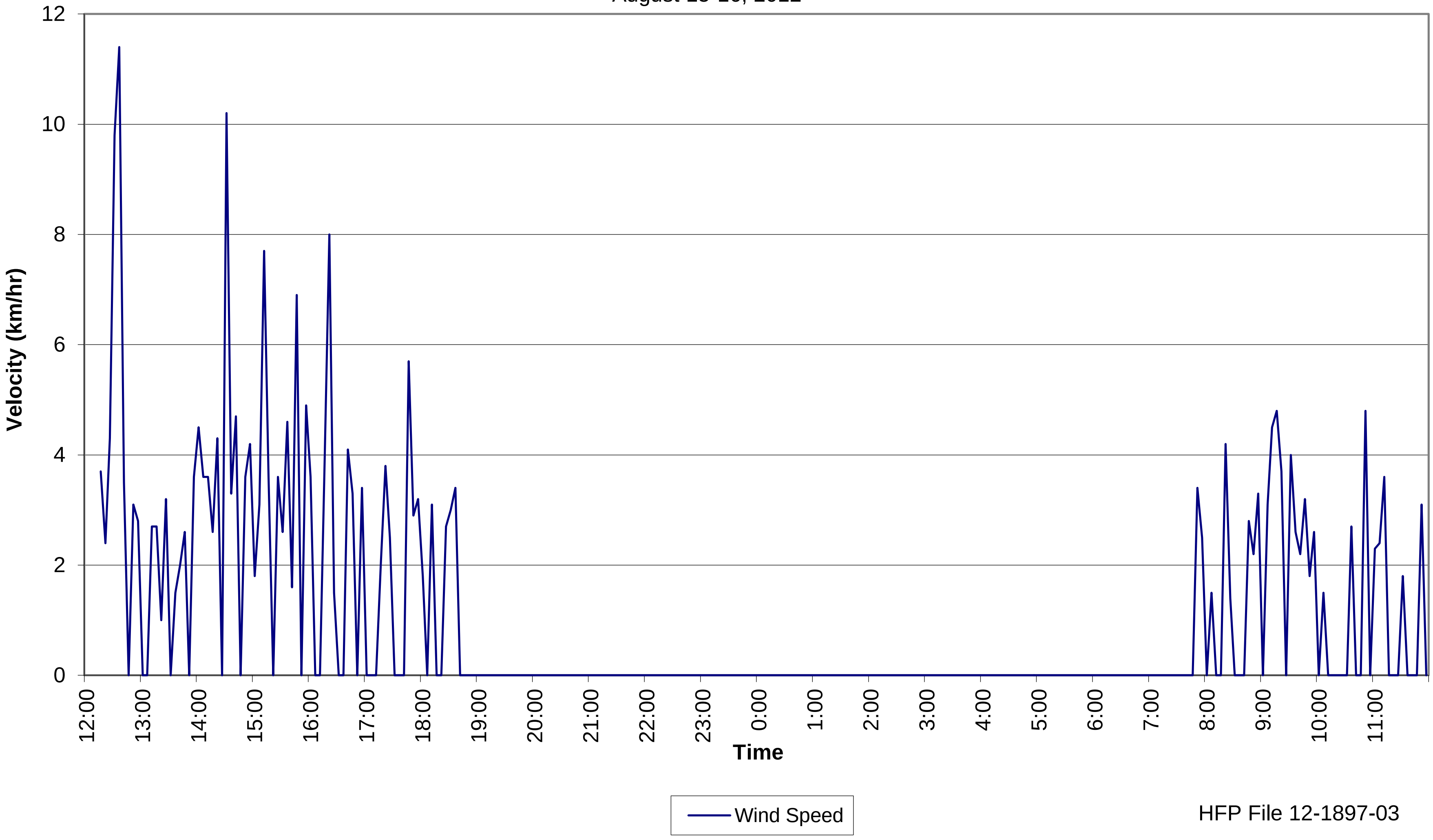
Lamoureux Residence, Ft. Saskatchewan
Keyera Energy 5D Cavern Drilling
Temperature 5-Minute Average
August 15-16, 2012



HFP File 12-1897-03

Figure B-2

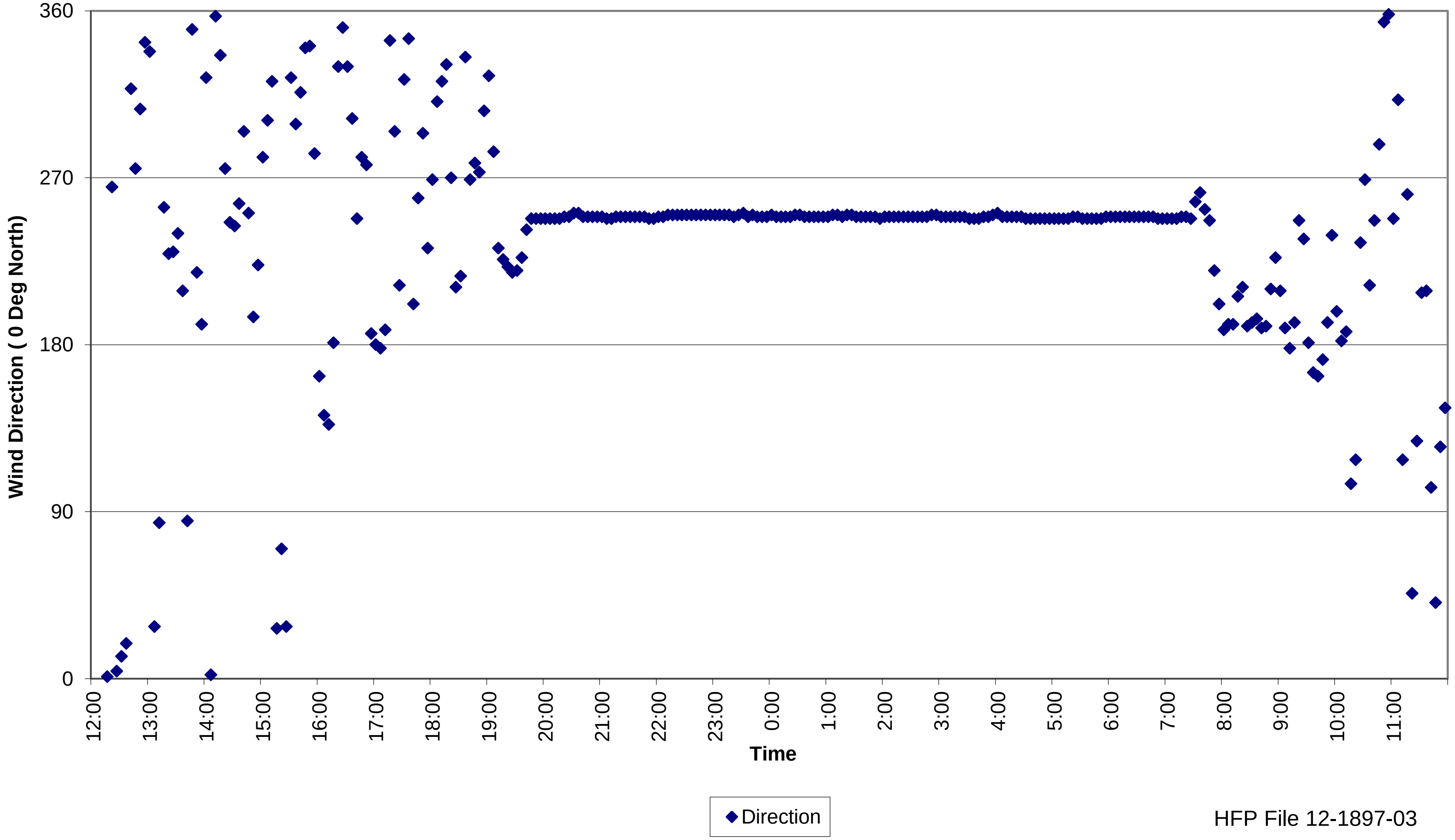
Lamoureux Residence, Ft. Saskatchewan
Keyera Energy 5D Cavern Drilling
Wind Speed 5-Minute Average
August 15-16, 2012



HFP File 12-1897-03

Figure B-3

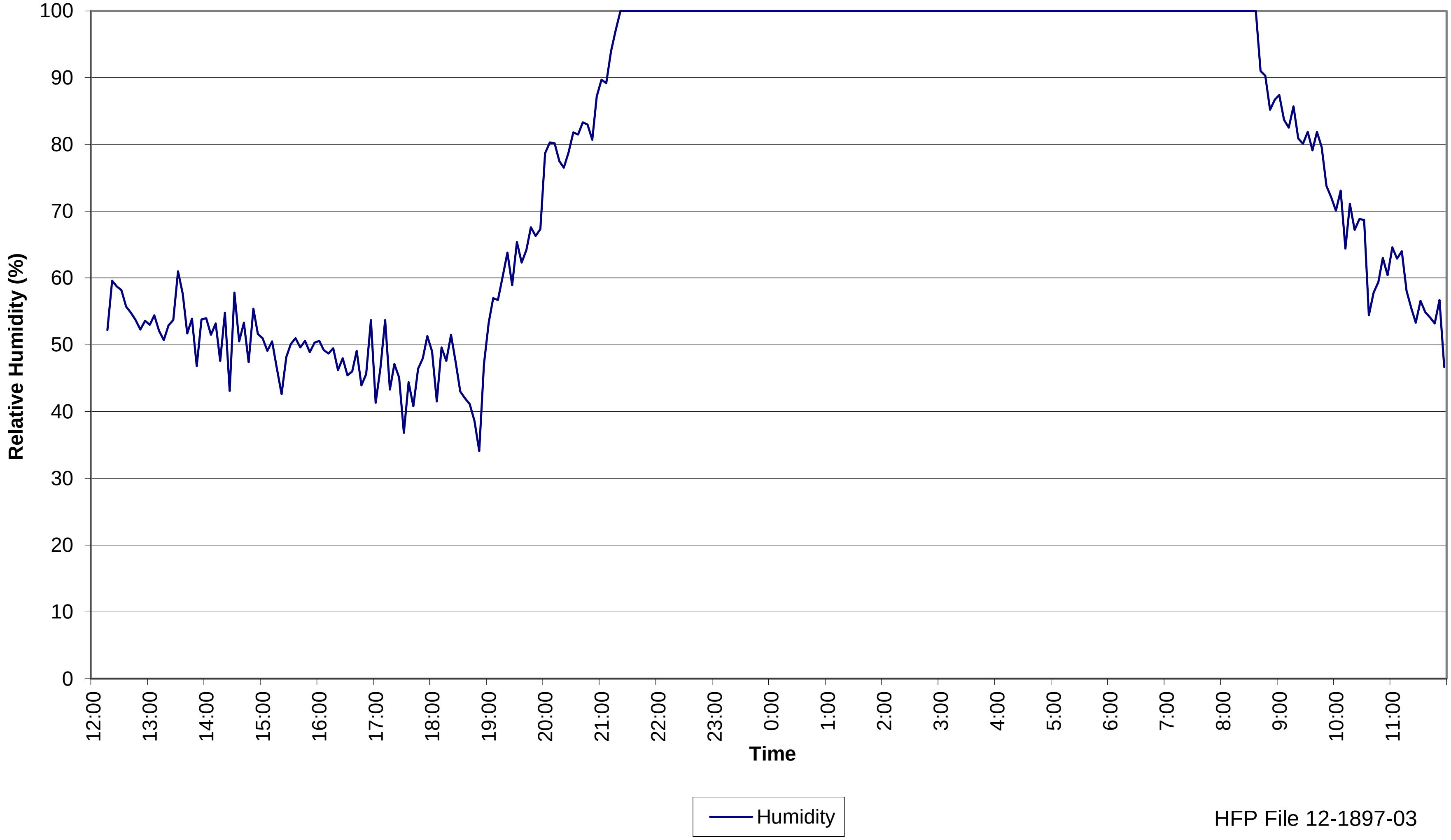
Lamoureux Residence, Ft. Saskatchewan
Keyera Energy 5D Cavern Drilling
Wind Direction 5-Minute Average
August 15-16, 2012



HFP File 12-1897-03

Figure B-4

Lamoureux Residence, Ft. Saskatchewan
Keyera Energy 5D Cavern Drilling
Humidity 5-Minute Average
August 15-16, 2012



HFP File 12-1897-03

APPENDIX C
NOISE MODELING PARAMETERS

Facility

Keyera Energy – 5D Cavern Drilling Rig

Noise Modeling Software

SoundPLAN 7.1

Standards

ISO 9613-1, Acoustics – Attenuation of sound during propagation outdoors - Part 1: *Calculation of the absorption of sound by the atmosphere.*

CONCAWE Report No.4/81, *The propagation of noise from petroleum and petrochemical complexes to neighbouring communities.*

Source Characteristics

Main Generator:	omnidirectional, point source; 3.5 m above grade.
Secondary Generator:	omnidirectional, point source; 2.0 m above grade.

Ground Absorption Conditions

Off-site:	Rough fields; G = 1.0
Facility site:	Hard packed ground; G = 0.1
	($G_{hard\ ground}$ = 0; $G_{porous\ ground}$ = 1)

Meteorological Parameters

Temperature:	10^{o}C
Relative humidity:	70%
Wind:	calm
Pasquil Stability Category:	D

Terrain Parameters

River valley; digital elevation data

Reflection Parameters

Rig buildings:	1 dBA reflection loss

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** **5-Mar-13**	**Rev.** **1**

North West Redwater Partnership – Sturgeon Refinery (Approvals held by North West Upgrading 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 2010-002 issued 3-Sep-10, revised 5-Mar-13 (attached), including the Procedure/Practice/Standard reference.	As the North West Redwater Partnership (NWR) project has just completed the Engineering Design Specification phase of its engineering, with detailed design and procurement just getting underway, NWR is pleased to confirm compliance with its approval conditions relative to noise management. NWR has engaged to 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 2012.	As the NWR facility is neither operating nor under construction to this date (March 2013), no noise monitoring has been conducted since baseline work was completed in 2008. No updates have been issued to the site noise model submitted to the ERCB for review mid-2008.
Disclose any improvements/corrective actions implemented in 2012 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.	No updates have been issued to the site noise model submitted to the ERCB for review mid-2008. NWRs acoustical consultant has been engaged to ensure engineering and procurement just advancing into the detailed stages (pre-construction) are in accordance with the 2008 site noise model.
Disclose any improvements/projects that are planned for 2013 that would impact the noise level output for your site (either up or down); including any updates to your site noise model.	NWR is advancing detailed engineering and procurement (pre-construction) to ensure compliance with the 2008 site noise model.
Disclose any audit/self-assessment evaluation (qualitative evaluation only, with senior site leader sign-off) completed for your site noise	As no significant procurement or construction has been completed since the 2008 site noise model report (accepted by NWRs VP

management plan.	Regulatory Affairs – Doug Bertsch, and reviewed and accepted by ERCB per letter dated July 23, 2008), and no update has been issued to the site noise model since that report, no audit nor qualitative evaluation has been conducted.
Provide a Noise Complaint summary for all noise complaints received in 2012 including any actions taken to address them.	As construction of the NWR project was not active and the site remained essentially undeveloped during 2012, no noise complaints have been received to date.

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.

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 5-Mar-13 / Rev. 1

Pembina NGL Corporation

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 2010-002 issued 3-Sep-10, revised 5-Mar-13 (attached), including the Procedure/Practice/Standard reference.	The Site Continues to mange noise in accordance with the Noise Management Plan developed by Provident and adopted by Pembina.
Attach results of any monitoring/assessments (fenceline outward) completed in 2012.	- Initiated construction on the ROF De-ethanizer Project in August 2012 (approved NIA). - Prepared an NIA in 2012 for the proposed ROF Debottleneck Project, using information from NCIA. The NIA will be submitted to the ERCB with the application to amend Pembina's ERCB approval for the ROF Debottleneck Project. The NIA is too large to send as an attachment in email; however, it is available to share with NCIA on request. - Williams and Pembina have committed to doing a follow-up assessment of operational noise once the ROF De-ethanizer Project is in-service. As well, both companies have committed to doing a follow-up assessment of operational noise once the ROF debottleneck and RFS 2 are complete.
Disclose any improvements/corrective actions implemented in 2012 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.	For the ROF Debottleneck Project (assessed in the NIA), mitigation measures are outlined in Section 7.0 of the NIA. Construction noise will be mitigated by: - Noisy construction activities (i.e., piling) will be scheduled within the daytime hours of 0700 to 2200. - Nearby residents will be notified in advance of substantial noise-causing

	activities where possible. - Noise mitigation measures installed on construction equipment (e.g., mufflers) will be kept in good - working condition. - Screening effects of barriers around construction equipment will be used where practical. - Construction vehicles will follow posted speed limits. - Construction equipment not in use will be turned off where practical. During operations, some of the new equipment that will make noise will be contained in two existing buildings and four new buildings. Doors and windows will be weather-stripped and doors will remain closed during normal operations. The specific equipment that will be added is outlined in Section 7.2 of the NIA.
Disclose any improvements/projects that are planned for 2013 that would impact the noise level output for your site (either up or down); including any updates to your site noise model.	Pembina and Williams continue to plan on several medium to very large projects at the Redwater facility. As part of the NMP noise is considered upfront during engineering of all projects at the site. An NIA is required for many of these projects.
Disclose any audit/self-assessment evaluation (qualitative evaluation only, with senior site leader sign-off) completed for your site noise management plan.	See NIA above, all aspects of these projects, including noise, are signed off by senior management.
Provide a Noise Complaint summary for all noise complaints received in 2012 including any actions taken to address them.	No noise complaints in 2012.

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.

	NCIA Standards and Guidelines	Document Number **2010-002**
Noise Management Plan Reporting Requirements as per Section 5.4 of this Standard		**Rev. Date** 5-Mar-13 / **Rev.** 1

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 2010-002 issued 3-Sep-10, revised 5-Mar-13 (attached), including the Procedure/Practice/Standard reference.	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 2012.	None were completed in 2012.
Disclose any improvements/corrective actions implemented in 2012 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.	No improvements were implemented in 2012.
Disclose any improvements/projects that are planned for 2013 that would impact the noise level output for your site (either up or down); including any updates to your site noise model.	In 2013, the site will begin construction on 2 new brine ponds. The ponds are slated for completion in 2014 and 2015. Once the ponds have been put into service we will conduct an update to our fence line noise model.
Disclose any audit/self-assessment evaluation (qualitative evaluation only, with senior site leader sign-off) completed for your site noise management plan.	None were completed in 2012.
Provide a Noise Complaint summary for all noise complaints received in 2012 including any actions taken to address them.	One noise complaint was received from a resident in the Fort Augustus Park. The resident complained about a loud bang sound that occurred on October 1, 2012 at around 2:00 pm. Investigated activities at site to see if noise came from our facility. It was determined by operations that the sound did not originate from our site. Phone resident back to inform them of this. Told them to call the update line to see what other activities were occurring in the area.

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.

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 5-Mar-13	Rev. 1

<u>Shell Scotford Manufacturing (Refinery and Chemicals Plants)</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 2010-002 issued 3-Sep-10, revised 5-Mar-13 (attached), including the Procedure/Practice/Standard reference.	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 2012.	A survey was completed in July 2013 around the entire Scotford Site. The RNMP Model validation report conducted in September 2012 indicated identified an anomalous reading south of the Site. The July 2012 monitoring results at a near approximate site did not compare well. Accordingly additional investigation of these results will take place in 2013.
Disclose any improvements/corrective actions implemented in 2012 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.	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 planned for 2013 that would impact the noise level output for your site (either up or down); including any updates to your site noise model.	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.	2013 Awareness Orientation continued at operational, project, C&P, HSSE levels. A NMP pointer reference will become a useful auditing tool as well. Internal management system audit to include noise management in 2013.
Provide a Noise Complaint summary for all noise complaints received in 2012 including any actions taken to address them.	No complaints received regarding noise in 2012.

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.

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** 5-Mar-13	**Rev.** 1

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 2010-002 issued 3-Sep-10, revised 5-Mar-13 (attached), including the Procedure/Practice/Standard reference.	• Attached is the Shell Scotford Upgrader Site Noise Management Plan (SUG.HSSE.ENV.AIR.NOIS.M.002 revised June 16, 2012).
Attach results of any monitoring/assessments (fenceline outward) completed in 2012.	• Attached is the Shell Scotford 2012 Environmental Noise Assessment completed by HFP Acoustical Consultants on July 5-6, 2012.
Disclose any improvements/corrective actions implemented in 2012 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.	• A project to create an updated model for the Upgrader (incl. Expansion) was started in 2012 and is approximately 90% complete. Measurements will be completed in 2013 and model will be completed by Q4 2013.
Disclose any improvements/projects that are planned for 2013 that would impact the noise level output for your site (either up or down); including any updates to your site noise model.	• A project to create an updated model for the Upgrader (incl. Expansion) was started in 2012 and is approximately 90% complete. Measurements will be completed in 2013 and model will be completed by Q4 2013.
Disclose any audit/self-assessment evaluation (qualitative evaluation only, with senior site leader sign-off) completed for your site noise management plan.	• No audit/self-assessment completed. Site NMP requirement is every 3 years with the next one being due in 2015.
Provide a Noise Complaint summary for all noise complaints received in 2012 including any actions taken to address them.	• No noise complaints received.

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.

ACOUSTICAL CONSULTANTS CORP.
Canadian Member of the HFP Engineering Group

2012 ENVIRONMENTAL NOISE ASSESSMENT

SHELL CANADA LIMITED
SCOTFORD COMPLEX

Prepared For:

Mr. Maurice Ouellet
Shell Canada Limited

Prepared By:

HFP Acoustical Consultants Corp.

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Richard Wright, P.Eng.

HFP File: 12-1197-35
October 2, 2012

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EXECUTIVE SUMMARY

Shell Canada Limited (Shell) is a member of the Northeast Capital Industrial Association (NCIA). NCIA is an industry association representing most of the industrial companies operating in the Heartland Region of Alberta. NCIA has developed a Regional Noise Management Plan (RNMP) which addresses noise control expectations and offers a management system for existing industrial noise sources. Each member company is responsible for a Site Noise Management Plan. As part of Shell's Site Noise Management Plan for the Scotford Complex, annual noise monitoring surveys will be completed at several off-site locations around the Scotford Complex. This report presents the results of the 2012 noise monitoring surveys.

24-hour environmental sound monitoring surveys were conducted at four locations around the Scotford Complex. In addition, another four locations were monitored for a shorter time period encompassing the entire nighttime period. The surveys were conducted on July 5-6, 2012. The monitored daytime and nighttime sound levels are presented below. As well, HFP completed isolation analysis to determine a representative Scotford Complex sound level at each monitoring location.

The representative sound level includes steady plant operations and does not include short-term events such as train horns, off-site rail or road traffic or natural sounds such as birds chirping.

Location	Duration	July 5-6, 2012		
		Monitored Sound Level		Isolated Sound Level
		Daytime (dBA L_{eq})	Nighttime (dBA L_{eq})	Nighttime (dBA L_{eq})
Location 01	24-hours	47.6	46.9	40.9
Location 02	24-hours	57.3	54.6	53.5
Location 03	24-hours	50.5	53.9	51.8
Location 04	24-hours	57.1	56.2	54.7
Location 05	22-hours	57.8	58.9	56.6
Location 06	21-hours	63.5	60.8	54.9
Location 07	21-hours	58.1	57.9	56.7
Location 08	17-hours	62.5	58.2	46.0

The Scotford Complex was audible at all monitoring locations, with the Scotford Complex being the dominant audible industrial contributor at most locations. Other audible sounds included local road and rail traffic, train whistles, birds chirping, and frogs croaking.

As additional annual surveys are completed, Shell will be able to confirm the effectiveness of its Site Noise Management Plan and track any changes in sound level over time.

PURPOSE

Shell Canada Limited (Shell) is a member of the Northeast Capital Industrial Association (NCIA). NCIA is an industry association representing most of the industrial companies operating in the Heartland Region of Alberta. NCIA has developed a Regional Noise Management Plan (RNMP) which addresses noise control expectations and offers a management system for existing industrial noise sources. Each member company is responsible for a Site Noise Management Plan. As part of Shell's Site Noise Management Plan for the Scotford Complex, annual noise monitoring surveys will be completed at several off-site locations around the Scotford Complex. This report presents the results of the 2012 noise monitoring surveys.

MEASUREMENTS CONDUCTED

MEASUREMENT METHODOLOGY

The Energy Resources Conservation Board (ERCB) Directive 038: Noise Control is a receptor-oriented noise regulation that allows the use of RNMP for specific industrial areas. The ERCB has approved the use of a RNMP for the Heartland industrial area. The measurement methods for a continuous noise monitoring survey are outlined in the ERCB Directive and were adhered to during this noise monitoring survey.

MONITORING LOCATIONS

Mr. Richard Wright, P.Eng., of HFP Acoustical Consultants Corp. conducted the sound monitoring surveys at eight locations. The locations were chosen to represent locations around the Scotford Complex in all directions and which could be used to track changes in sound levels over time. No locations were at residences, as the RNMP does not set permissible sound levels, which are measured at residential locations.

Table A presents a summary of the monitoring locations chosen by HFP and Shell for the annual sound monitoring.

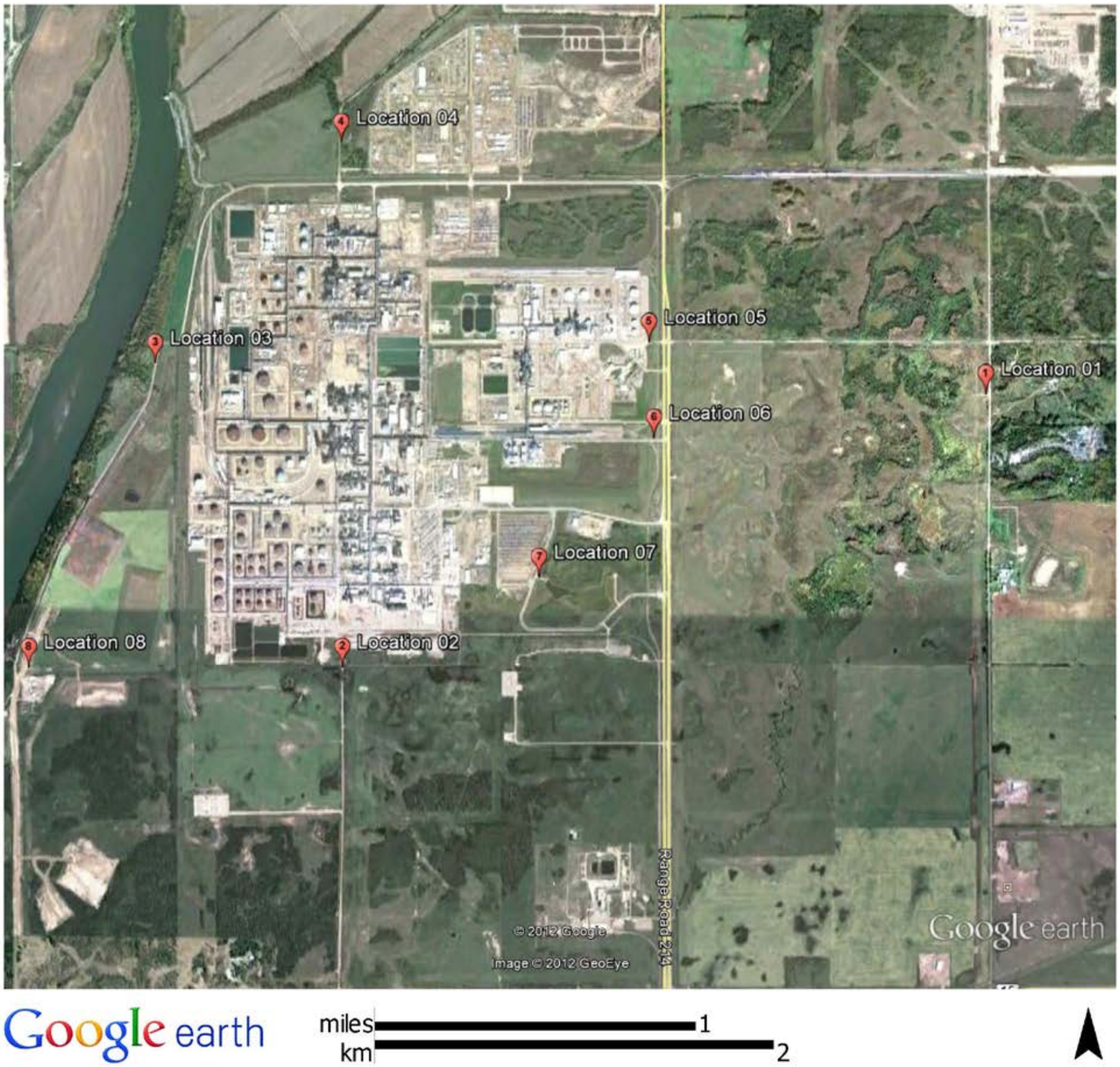
TABLE A
SHELL SCOTFORD COMPLEX MONITORING LOCATIONS

Identifier	Easting	Northing	Description	Direction from Scotford Complex
Location 01	364978	5963350	15m west of Range Road 213, inside gate to air monitoring trailer.	East
Location 02	361704	5962084	2m south of Shell gate at north end of Range Road 215.	South
Location 03	360806	5963637	3m west of old Range Road 220, at a now unused driveway.	West
Location 04	361780	5964711	6m east of Range Road 215, at a now unused driveway. This location corresponds to Location #5 for the NCIA validation measurements.	North
Location 05	363295	5963661	2m east of Shell gate, west of intersection of Range Road 214 & Township Road 560.	East
Location 06	363304	5963181	8m north of Air Liquide entrance, 20m west of rail tracks.	East
Location 07	362706	5962503	12m east of edge of loop road for Refinery, towards south end of main parking lot for Refinery.	East
Location 08	360133	5962133	15m east of new Range Road 220, 45m NNE of NW corner of Master Blasters property.	WSW

The microphones at all locations were mounted on tripods that elevated them to an approximate height of 1.2 metres.

Map A illustrates the locations of the eight monitoring locations relative to the Scotford Complex.

MAP A – MONITORING LOCATIONS RELATIVE TO SHELL SCOTFORD COMPLEX



DURATION OF MONITORING

Continuous sound measurements were conducted for 24 hours at four locations and for 17-22 hours at four additional locations. A full 9-hour nighttime period was collected at all 8 locations. Monitoring commenced between 09:00 and 16:00 hours on Thursday, July 5, 2012 and was completed at 09:00 hours on Friday, July 6, 2012.

MEASUREMENT INSTRUMENTATION

The sound measurement instrumentation used to conduct the continuous noise monitoring survey was as follows:

- Larson Davis 824 Environmental Sound Level Meter (8)
- Larson Davis PRM902 preamplifier (8)
- Modal Shop 40AE microphone (6)
- PCB 377B02 microphone (1)
- CRL 224 microphone (1)
- Brüel & Kjær UA0237 windscreen (8)
- Marantz Professional PMD 620 MP3 recorder (8)
- Larson David LD200 calibrator (calibration date April 2012)

The sound measurement system was calibrated at the beginning of the noise monitoring survey and then checked again at the end. The pre-survey and post-survey calibrations are summarized in Appendix A.

The Larson Davis 824 system is rated as a Type 1 measurement system in reference to ANSI S1.4.1983 Standards and fulfills the instrumentation requirements of ERCB Directive 038.

LEQ SOUND LEVEL DESCRIPTOR

Environmental sound level measurements have to contend with noise sources which constantly vary over time. For these measurements there is a steady-state background sound level that is slowly varying over time because of changes in sound propagation efficiencies due to varying atmospheric and/or terrain cover conditions. There are also short-term continuously varying higher level noises. The most common of these are the sounds associated with local road or rail traffic, train whistles, birds chirping and surrounding rural area. Therefore when undertaking sound measurements, it is a complex task to describe the sound level at a receptor point as it continuously varies over time. This has led to the development of single number noise descriptors. This allows noise monitoring to be undertaken of a constantly varying noise environment over an extended time period, with the results described as a single number.

The single number descriptor commonly used for environmental noise measurements and the descriptor required by Directive 038 is the energy equivalent sound level (L_{eq}). The L_{eq} value is the sound energy average over the entire measurement time period. It is defined as a calculated sound level over the measured time period that has the same acoustic energy as the actual fluctuating sound levels that occurred during the same period. The sound level measuring instrumentation used by HFP for this study records continuous 1 minute A-weighted L_{eq} sound levels. These 1 minute L_{eq} values are then used to calculate hourly, daytime and nighttime dBA L_{eq} values as required by Directive 038.

The L_{eq} values are based on a measurement of the A-weighted sound levels expressed in units of dBA. The dBA value accounts for the frequency content of the measured sound, and assesses it with a frequency response similar to that of the human ear.

METEOROLOGICAL CONDITIONS

Meteorological and ground conditions noted during the noise monitoring survey are as follows:

Date and Time	Meteorological Parameter					
	Temperature (°C)	**Relative Humidity (%)**	**Wind Speed (km/h)**	**Wind Direction**	**Cloud Cover**	**Ground Conditions**
July 5, 2012						
09:10	+15	70	5	WSW	Clear	Moist
15:20	+21	52	5-10	West	Partly Cloudy	Moist
22:15	+15	77	2-3	WSW	Partly Cloudy	Moist
July 6, 2012						
07:00	+12	95	8-10	WSW	Clear	Dew
09:00	+16	77	5-6	West	Clear	Moist

The meteorological conditions were in accordance with the requirements of Directive 038, with winds generally below 10 kilometres per hour during the entire survey. HFP also set up a portable meteorological station at Location 04 to measure 5-minute averaged values of temperature, wind speed, wind direction and relative humidity. That data is presented graphically in Appendix B.

EFFECTS OF METEOROLOGICAL AND TERRAIN CONDITIONS

Various meteorological and seasonal conditions can affect the sound propagation efficiency between noise sources and a receptor. If the receptor is located upwind from a distant noise source, a wind gradient could cause greater than normal sound attenuation to occur. This would result in lower sound levels at the receptor than would normally occur with no wind. However, if the receptor is downwind of a distant noise source, the opposite effect would occur, resulting in higher sound levels than normal at the receptor. Crosswinds do not significantly affect sound propagation efficiency in either respect. The maximum acceptable hourly average wind speed for noise monitoring in accordance with Directive 038 is 15 kilometres per hour. However, from HFP's experience, usually wind speeds less than this are required to conduct a meaningful noise monitoring survey.

The sound monitoring survey was conducted during the summer under clear to partly cloudy conditions. The winds were westerly for the entire survey.

Also the types of vegetation, ground cover conditions and differing terrain conditions, (i.e., tall grass, snow cover, wet ground, ploughed earth, or rocky ground) can affect the amount of sound absorption that occurs as sound waves pass over the ground. For example, moist soil or soft fresh snow is highly sound absorptive, as opposed to hard-packed ground or crusty snow which are highly sound reflective.

Locations 02, 05, 06 and 07 are located near the edge of the developed site, so any land between the noise sources and the monitoring locations would generally be considered hard and reflective. Locations 01, 03, 04 and 08 have some open fields between the noise sources and the monitoring locations. Location 01 also has some patches of trees in the fields.

OPERATING CONDITIONS

Shell staff have provided operating conditions for the Scotford Complex, which are provided in Appendix C.

Most units at the Scotford Complex were operating near or above capacity during the sound survey.

RESULTS OF MEASUREMENTS

CONTINUOUS NOISE MONITORING DATA PRESENTATION

The 1-minute L_{min}, L_{eq} and L_{max} values recorded during the survey at each location are presented in Figures 1a to 8a, where the figure number corresponds to the location identifier. These figures illustrate the short-term variations in sound levels measured over the survey period at each location. These figures should also be referred to when assessing the sound level that may be attributed to a specific occurrence or event.

The 1-hour L_{eq} sound levels were calculated from the 1-minute values and are presented graphically in Figures 1b to 8b and numerically in Tables 1 to 8. The calculated daytime (07:00-22:00) and nighttime (22:00 - 07:00) L_{eq} values are presented at the bottom of each table. The C-weighted (dBC) hourly, daytime and nighttime L_{eq} values are also presented in the tables. The difference between the dBC and dBA values is sometimes used to determine if there are significant low-frequency components.

The hourly L_{eq} values and the longer-term L_{eq} values are of more use when describing the sound environment as a single number. It should be understood that the actual sound level may vary considerably over the time period that the L_{eq} value represents.

ASSESSMENT OF NOISE MONITORING RESULTS

Sometimes the monitored daytime and nighttime L_{eq} values can be assumed to be representative of the typical sound contribution from the industrial facilities. However, when the monitored sound levels contain noises not due to the industrial facilities, the monitored values are not representative of the typical industrial contributions. In such cases, an appropriate "isolation analysis technique" may be used to determine the facility's contribution to the overall noise environment. This assessment technique is deemed acceptable to the ERCB. Examples of noise that may be isolated in a noise survey are invalid data due to weather (extraneous wind or rain-generated noise), animals, birds, community or transportation related noises. Isolation analysis was performed on the nighttime monitoring data to determine a representative Scotford Complex contribution.

After careful consideration, HFP determined the most appropriate method of determining the representative Scotford Complex contribution was to use the nighttime L_{min} values. HFP believes the L_{min} values most closely represent the steady industrial contributions at each monitoring location.

The isolated 1-minute L_{eq} values are presented in Figures 1c to 8c and the isolated 1-hour L_{eq} values are presented in Figures 1d to 8d. The isolated nighttime L_{eq} values are shown in Tables 1 to 8.

Location 01

This location is the farthest from the Scotford Complex and therefore has the lowest sound contributions from the Scotford Complex. The main audible sounds at this location are birds chirping, leaf noise when the wind increases and local traffic. The Scotford Complex was generally audible. Train horns were sometimes heard during the checks on the equipment.

Figure 1a shows a steady sound level in the low 40's (dBA) which is due to the Scotford Complex. There is increased bird activity after 03:45, causing that period to be not representative of the Scotford Complex contribution. The isolated nighttime sound level is 40.9 dBA L_{eq}.

Location 02

This location is at the south edge of the Scotford Complex. The main audible sounds at this location are the Scotford Complex and birds chirping. During the daytime, there were crews working inside the Shell gate northwest of the microphone. As well, there was a pipeline construction crew working most of the day to the south along Range Road 215. However, the pipeline crew's activities were not audible over the closer activities to the northwest and the noise from the Scotford Complex. During the nighttime period, there were a few spikes due to birds chirping or back-up beepers from within the Scotford Complex. Some frogs croaking were also audible.

Figure 2a shows a steady sound level above 50 dBA for the entire nighttime period, which is due to the Scotford Complex. The isolated nighttime sound level is 53.5 dBA L_{eq}.

Location 03

This location is west of the Scotford Complex. The main audible sounds at this location are birds chirping, local traffic and the Scotford Complex. Other intermittent sounds included train horns, train movements and industrial activity to the northwest across the North Saskatchewan River.

Figure 3a shows the nighttime sound level generally varied between 50 and 60 dBA, with the Scotford Complex being the main contributor. The isolated nighttime sound level is 51.8 dBA L_{eq}.

Location 04

This location is north of the Scotford Complex. The main audible sound at this location is the Scotford Complex. Water running through a culvert near the microphone was also audible, being more audible during the afternoon on July 5, 2012. Other intermittent sounds included birds chirping, frogs croaking, train horns, train movements and local traffic.

Figure 4a shows a steady sound level close to 55 dBA for most of the 24-hour monitoring period, which is generally due to the Scotford Complex contribution. The isolated nighttime sound level is 54.7 dBA L_{eq}.

Location 05

This location is along the east edge of the Scotford Complex. The main audible sounds at this location are the Scotford Complex and local traffic. This location is partially shielded from traffic on Range Road 214 by earth berms located both north and south along Range Road 214. Other intermittent sounds included train horns, train movements, activities inside the Scotford Complex and gopher squeaks. Frogs croaking became more audible during the nighttime period.

Figure 5a shows a steady nighttime sound level between 55 and 60 dBA, with the Scotford Complex being the main contributor. There are two train movements between 03:30 and 05:00 which include train horns. These events were isolated from the calculation of the isolated nighttime sound level, as these are not part of the steady Scotford Complex contributions. The isolated nighttime sound level is 56.6 dBA L_{eq}.

Location 06

This location is also along the east edge of the Scotford Complex. The main audible sounds at this location are the Scotford Complex and local traffic. There was a rail construction crew working on the rail lines west of this location during the daytime, which creates many of the daytime noise spikes. Other intermittent sounds included train horns, train movements and gopher squeaks. Frogs croaking were also audible during the nighttime period.

Figure 6a shows a steady nighttime sound level between 50 and 60 dBA, with the Scotford Complex being audible. Similar to Location 05, there are two train movements between 03:30 and 05:00 which include train horns. As with Location 05, these events were isolated from the calculation of the isolated nighttime sound level. The isolated nighttime sound level is 54.9 dBA L_{eq}.

Location 07

This location is also along the east edge of the Scotford Complex. The main audible sounds at this location are the Scotford Complex and local traffic. Other intermittent sounds included birds chirping, some leaf rustle and train horns. Frogs croaking became audible during the nighttime period.

Figure 7a shows the nighttime sound levels varied between 50 and 60 dBA, with the Scotford Complex being audible. The isolated nighttime sound level is 56.7 dBA L_{eq}.

Location 08

This location is west-southwest of the Scotford Complex. This location is immediately north of the Master Blasters Industrial Media Blasting and Coating Shop. During the daytime and a portion of the nighttime period, the dominant sound contribution was from the Master Blasters shop, making the Scotford Complex contribution not audible. As well, there was a truck-mounted generator working on a pipeline excavation project during the daytime, just east of this microphone location. Therefore, the daytime sound levels are dominated by contributions from the Master Blasters operation and the truck-mounted generator. Other intermittent sounds audible included local traffic and birds chirping.

Figure 8a shows the steady sound level due to the Master Blasters operation until approximately 02:00, gradually decreasing until about 02:30. Then the sound level fluctuated between 40 and 50 dBA until just after 04:00, when traffic on Range Road 220 and bird activity increased for the remainder of the nighttime period. Between 02:30 and 04:00, the Scotford Complex was audible, along with frogs croaking. The time period between 02:25 and 07:00, when Master Blasters was not operating, provides the only time period when the Scotford Complex was audible. The isolated nighttime sound level is 46.0 dBA L_{eq}.

SUMMARY OF THE SOUND MONITORING RESULTS

Table 9 presents a summary of the monitored daytime and nighttime sound levels and the isolated nighttime sound levels.

TABLE 9
SHELL CANADA LIMITED
SCOTFORD COMPLEX
SUMMARY OF MONITORED AND ISOLATED SOUND LEVELS

Location	Duration	July 5-6, 2012		
		Monitored Sound Level		Isolated Sound Level
		Daytime (dBA L_{eq})	Nighttime (dBA L_{eq})	Nighttime (dBA L_{eq})
Location 01	24-hours	47.6	46.9	40.9
Location 02	24-hours	57.3	54.6	53.5
Location 03	24-hours	50.5	53.9	51.8
Location 04	24-hours	57.1	56.2	54.7
Location 05	22-hours	57.8	58.9	56.6
Location 06	21-hours	63.5	60.8	54.9
Location 07	21-hours	58.1	57.9	56.7
Location 08	17-hours	62.5	58.2	46.0

COMPARISON OF 2012 SOUND LEVELS TO PREVIOUS SOUND SURVEYS

Shell intends to conduct annual sound surveys at these locations as part of its Site Noise Management Plan. As this is the first year of data collection, there are no previous sound surveys this data can be compared to. In reports for future annual sound surveys, the results can be compared to see if any trends are apparent.

LOW FREQUENCY NOISE

The ERCB updated its Noise Control Directive (Directive 038) in February 2007 to include a section on low frequency noise (LFN). Section 4.1.1 of Directive 038 indicates:

> "due to the complexity of determining LFN, this is a specialized investigation. The procedure outlined below and in Appendix 6 should only be done in specific response to an LFN complaint identified through the complaint investigation process and as a second-stage investigation."

HFP believes it is worthwhile to discuss the LFN analysis, even though it is clearly aimed at a LFN complaint situation arising at a residence. As none of the monitoring locations are residences, the purpose of the analysis is to provide (over time) a comparison to previous survey results and see if any trends become apparent.

The test for low frequency noise consists of two parts. The first part is to determine the difference between the C-weighted isolated sound level (dBC) and the A-weighted isolated sound level (dBA). The C-weighted sound level does not remove as much low frequency energy and therefore a large difference between the C-weighted sound level and the A-weighted sound level may be an indicator of the presence of significant low frequency energy. If the "dBC – dBA" difference is greater than 20 dB, then the second part of the test should be conducted. The second part of the low frequency noise test is to determine if there is a clear tonal component below 250 Hz. The directive provides specific direction on what qualifies as a clear tonal component.

Table 10 shows Locations 01, 02 and 08 have "dBC-dBA" differences over 20 dB for the isolated nighttime period. Upon further analysis, Location 01 and 02 have low frequency tones at 50 Hz. Location 08 does not have any low frequency tones. This information is summarized in Table 10.

TABLE 10
SHELL CANADA LIMITED
SCOTFORD COMPLEX
SUMMARY OF LOW FREQUENCY NOISE ANALYSIS
JULY 2012 DATA

Location	Isolated dBC - dBA Difference	Clear Tonal Component Below 250 Hz?*	Frequency of Tonal Component (Hz)
Location 01	24.4	Yes	50
Location 02	21.0	Yes	50
Location 03	17.2	N/A	N/A
Location 04	16.1	N/A	N/A
Location 05	17.2	N/A	N/A
Location 06	18.5	N/A	N/A
Location 07	17.7	N/A	N/A
Location 08	23.0	No	N/A

* Determination of tonal component below 250 Hz only needs to be completed if the dBC - dBA difference is > 20 dB

Table 1
Shell Canada Limited
Scotford Complex
Monitored Hourly Leq Sound Levels
Location 01, July 5-6, 2012

Time Start Hour	Measured Sound Level (dBA Leq)	Measured Sound Level (dBC Leq)	Isolated Sound Level (dBA Leq)	Isolated Sound Level (dBC Leq)	Valid # of Minutes
9:00	45.0	59.9			
10:00	46.8	60.0			
11:00	45.4	60.1			
12:00	43.9	59.0			
13:00	44.4	60.9			
14:00	47.2	63.1			
15:00	50.3	63.6			
16:00	44.5	64.2			
17:00	52.2	63.4			
18:00	48.8	66.6			
19:00	46.3	63.5			
20:00	43.3	62.5			
21:00	47.9	60.3			
22:00	43.5	62.0	39.3	62.0	60
23:00	43.6	63.6	40.3	63.6	60
0:00	43.7	66.1	42.5	66.1	60
1:00	42.5	66.8	41.2	66.8	60
2:00	42.3	66.2	41.1	66.2	60
3:00	42.2	65.4	40.3	65.6	46
4:00	47.7	65.2			0
5:00	48.6	65.3			0
6:00	52.8	65.3			0
7:00	49.6	64.9			
8:00	47.5	62.6			
15 hour daytime Leq:	47.6	62.8			
9 hour nighttime Leq:	46.9	65.3			
5.8 hour isolated nighttime Leq:			40.9	65.3	

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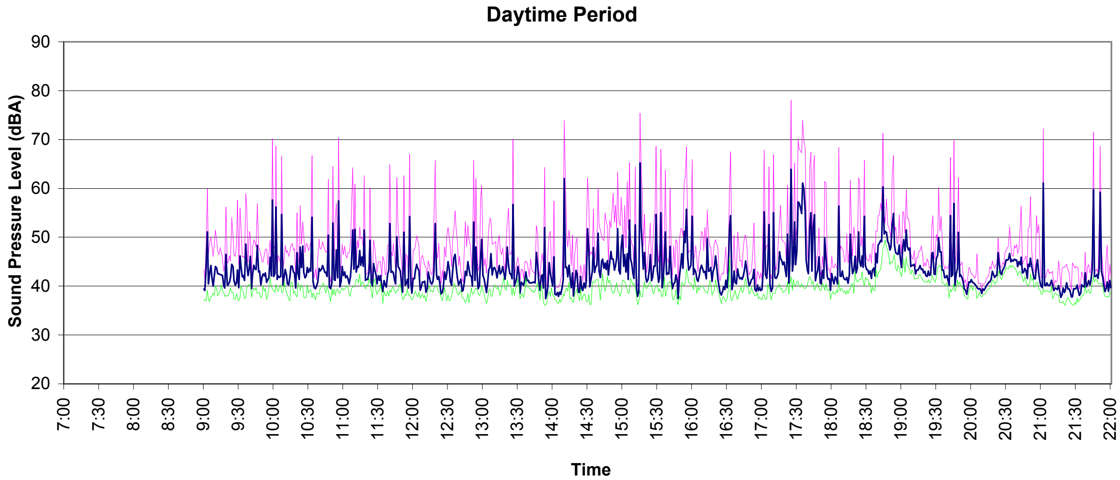
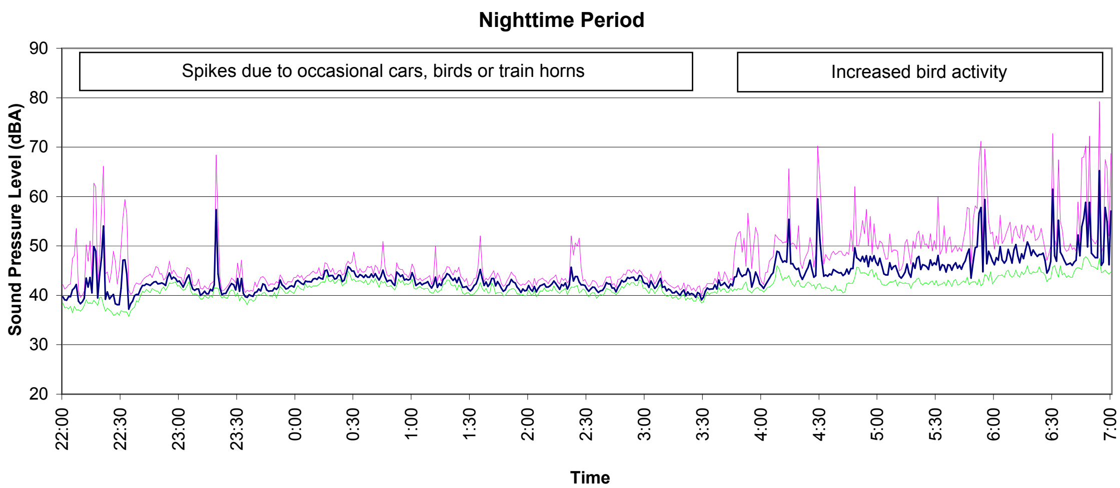
Figure 1a
Shell Canada Limited
Scotford Complex
Monitored One-Minute Leq Sound Values
Location 01, July 5-6, 2012





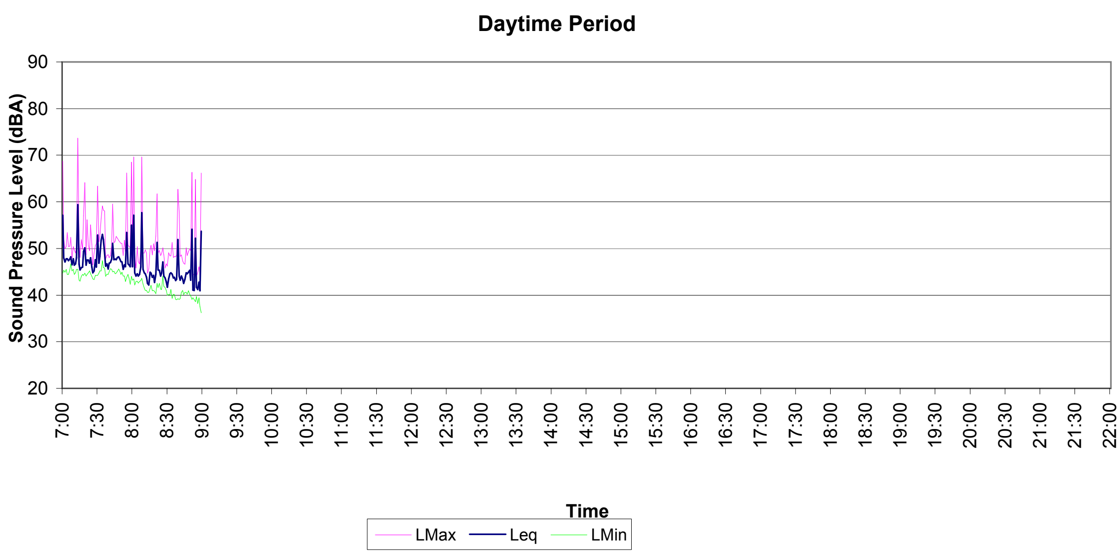


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Figure 1b
Shell Canada Limited
Scotford Complex
One-Hour Measured Values
Location 01, July 5-6, 2012

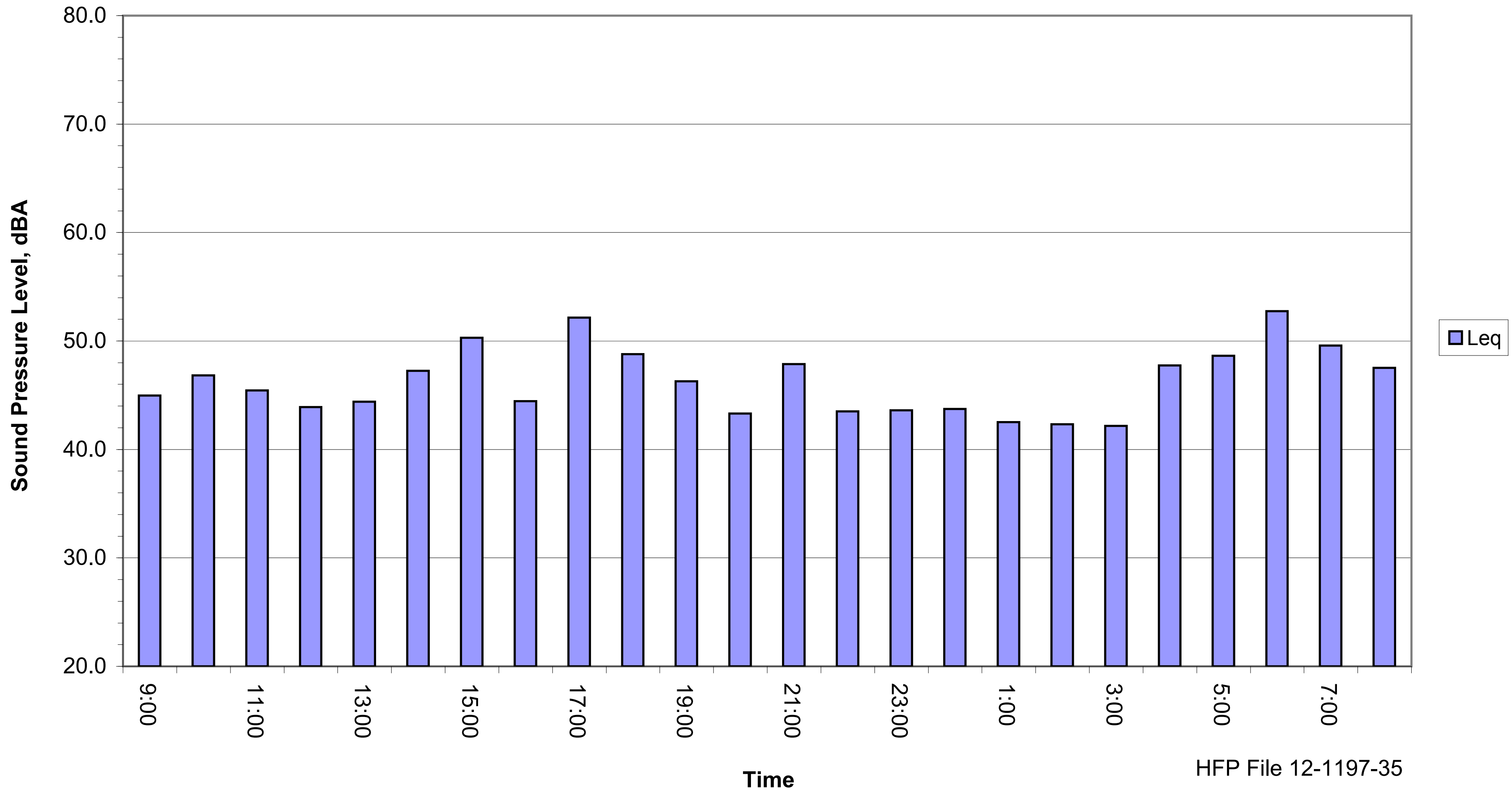
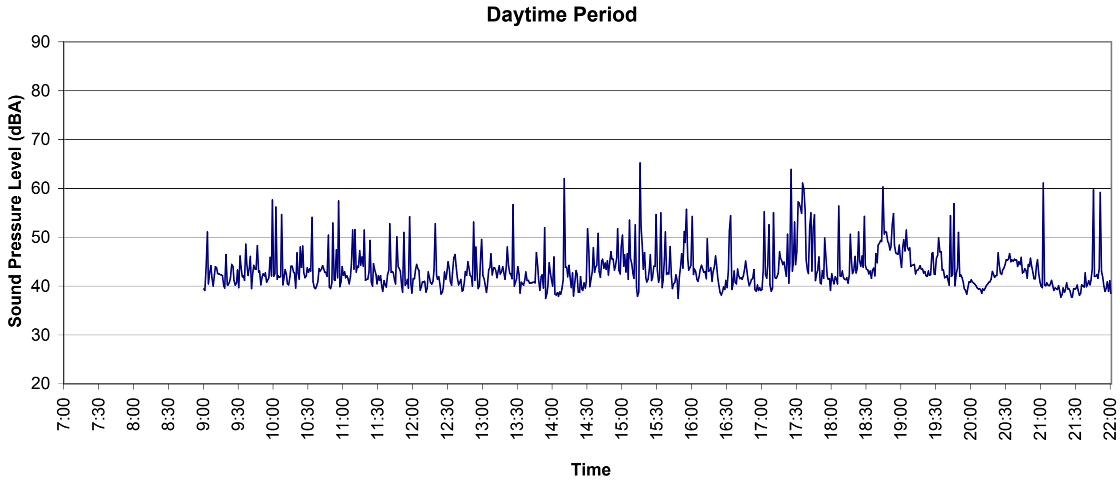
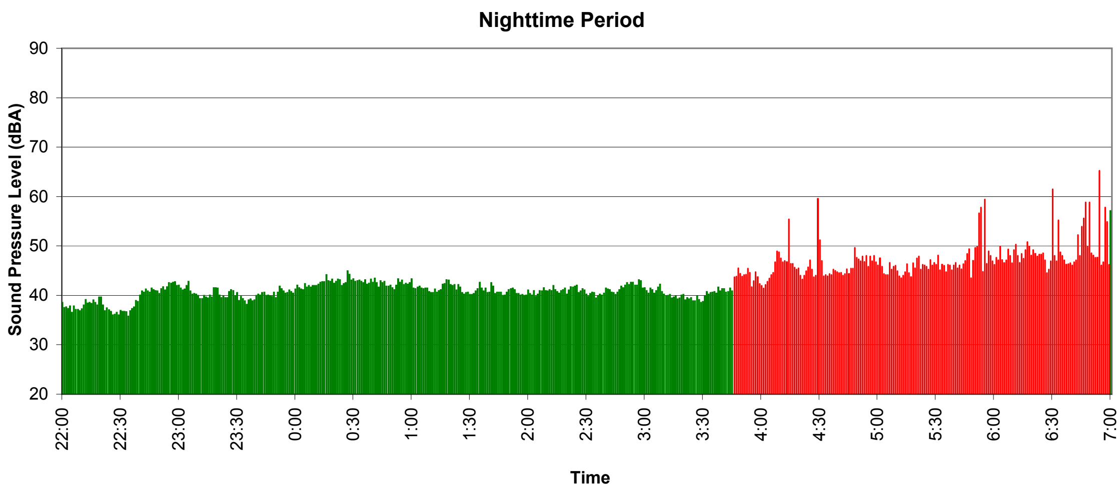


Figure 1c
Shell Canada Limited
Scotford Complex
Isolated One-Minute Leq Sound Values
Location 01, July 5-6, 2012





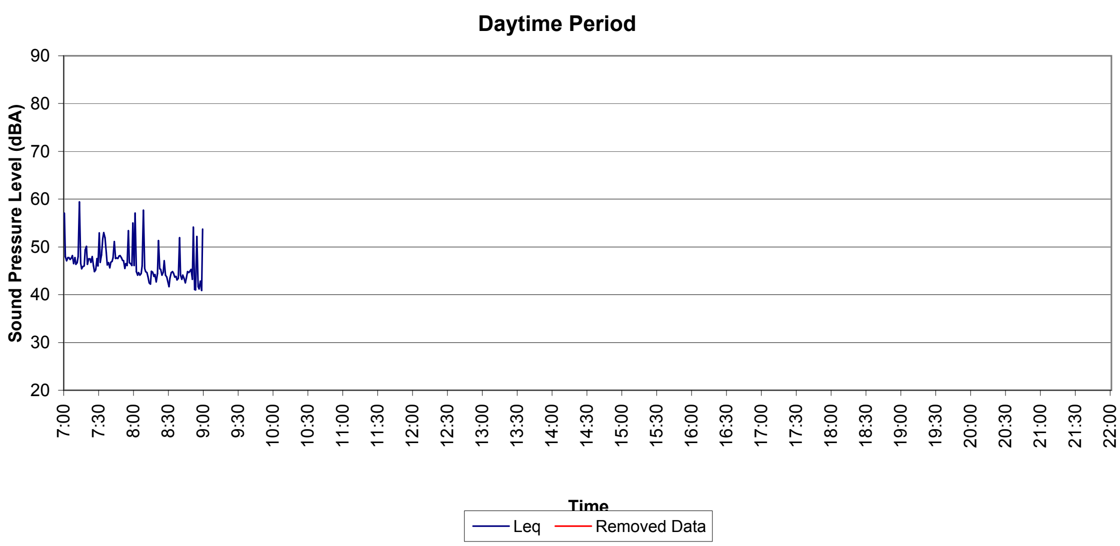


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Figure 1d
Shell Canada Limited
Scotford Complex
One-Hour Isolated Values
Location 01, July 5-6, 2012

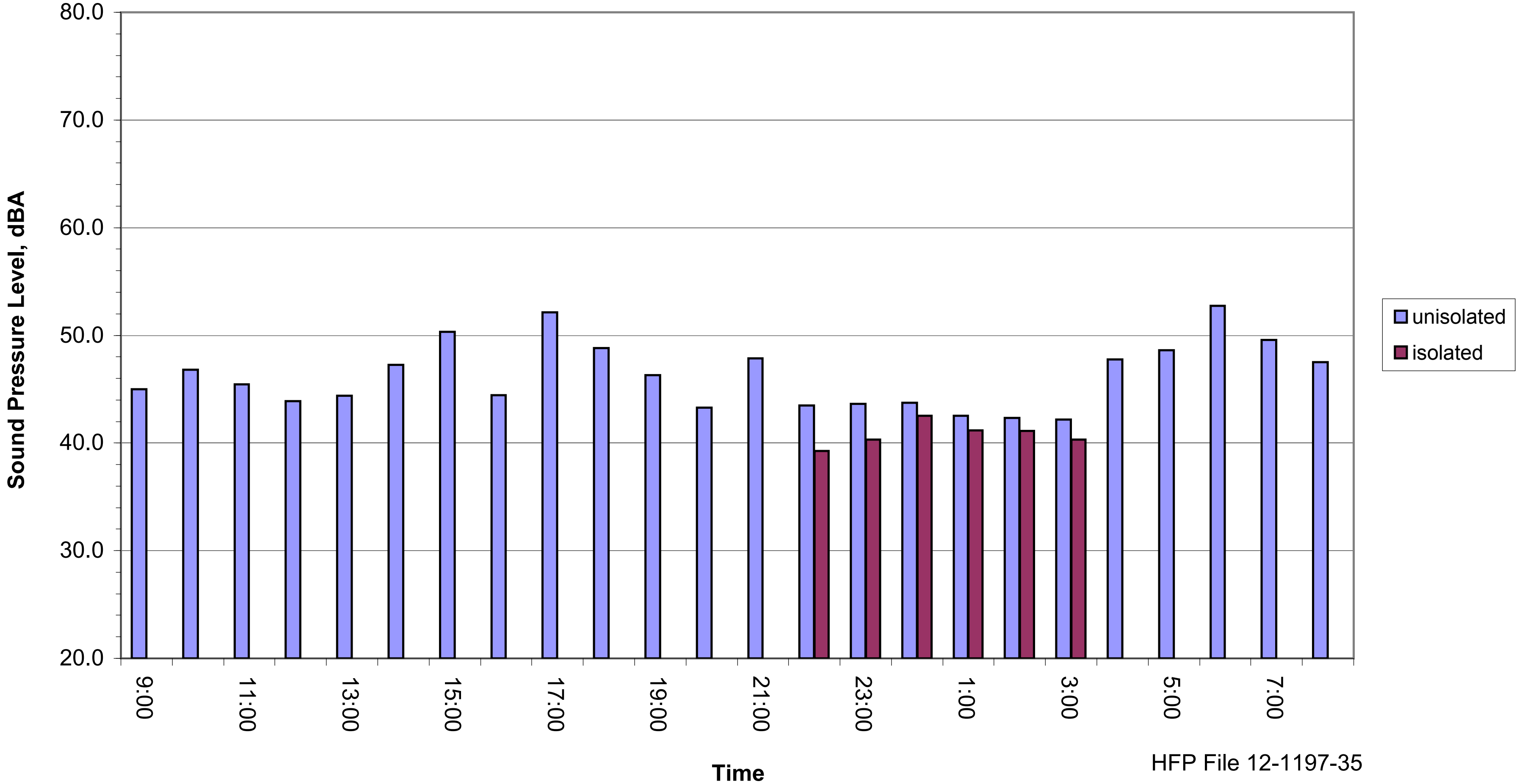

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Table 2
Shell Canada Limited
Scotford Complex
Monitored Hourly Leq Sound Levels
Location 02, July 5-6, 2012

Time Start Hour	Measured Sound Level (dBA Leq)	Measured Sound Level (dBC Leq)	Isolated Sound Level (dBA Leq)	Isolated Sound Level (dBC Leq)	Valid # of Minutes
9:00	53.3	74.2			
10:00	53.5	73.6			
11:00	54.8	73.9			
12:00	53.8	74.1			
13:00	58.0	76.3			
14:00	59.4	78.6			
15:00	61.3	80.7			
16:00	62.0	80.2			
17:00	59.8	79.6			
18:00	59.0	79.6			
19:00	52.3	73.9			
20:00	51.6	71.9			
21:00	51.4	71.9			
22:00	51.5	72.4	50.4	72.4	60
23:00	53.5	73.4	51.9	73.4	60
0:00	54.1	74.3	53.3	74.3	60
1:00	55.5	74.6	54.9	74.6	60
2:00	55.4	75.6	54.6	75.6	60
3:00	55.5	74.2	54.9	74.2	60
4:00	55.1	75.0	53.5	75.0	60
5:00	54.9	75.3	53.7	75.3	60
6:00	54.4	75.4	52.7	75.4	60
7:00	52.7	74.2			
8:00	54.0	74.4			
15 hour daytime Leq:	57.3	76.8			
9 hour nighttime Leq:	54.6	74.6			
9.0 hour isolated nighttime Leq:			53.5	74.6	

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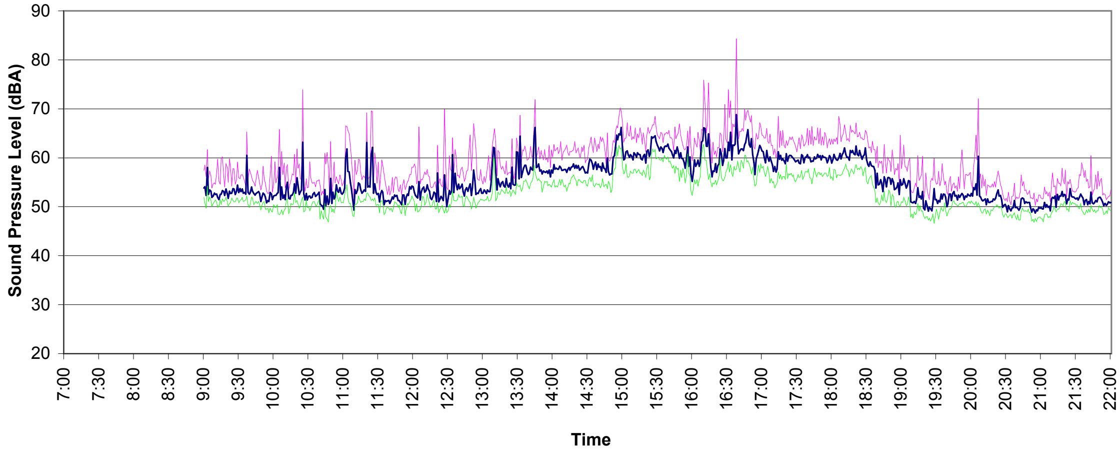
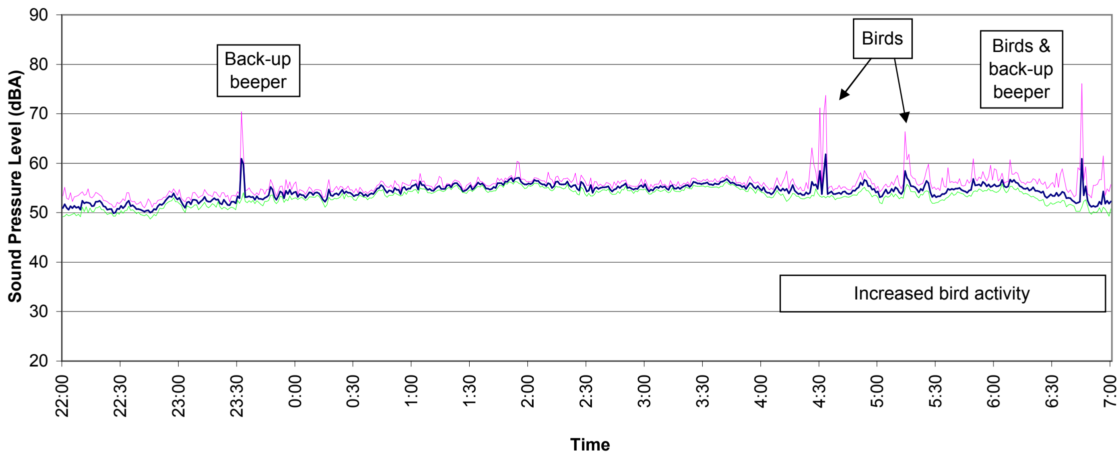
Figure 2a
Shell Canada Limited
Scotford Complex
Monitored One-Minute Leq Sound Values
Location 02, July 5-6, 2012

Daytime Period



Nighttime Period



Daytime Period

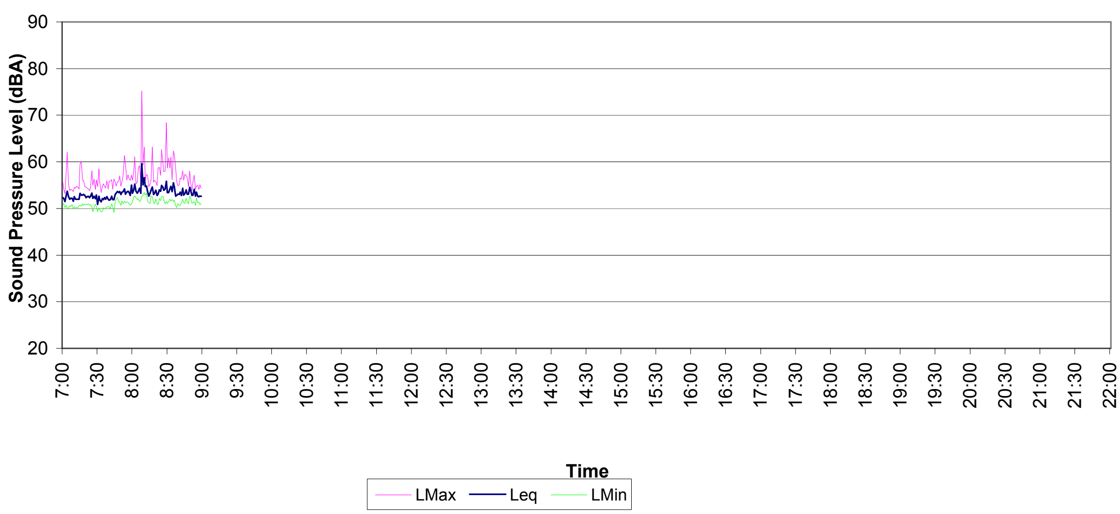


Figure 2b
Shell Canada Limited
Scotford Complex
One-Hour Measured Values
Location 02, July 5-6, 2012

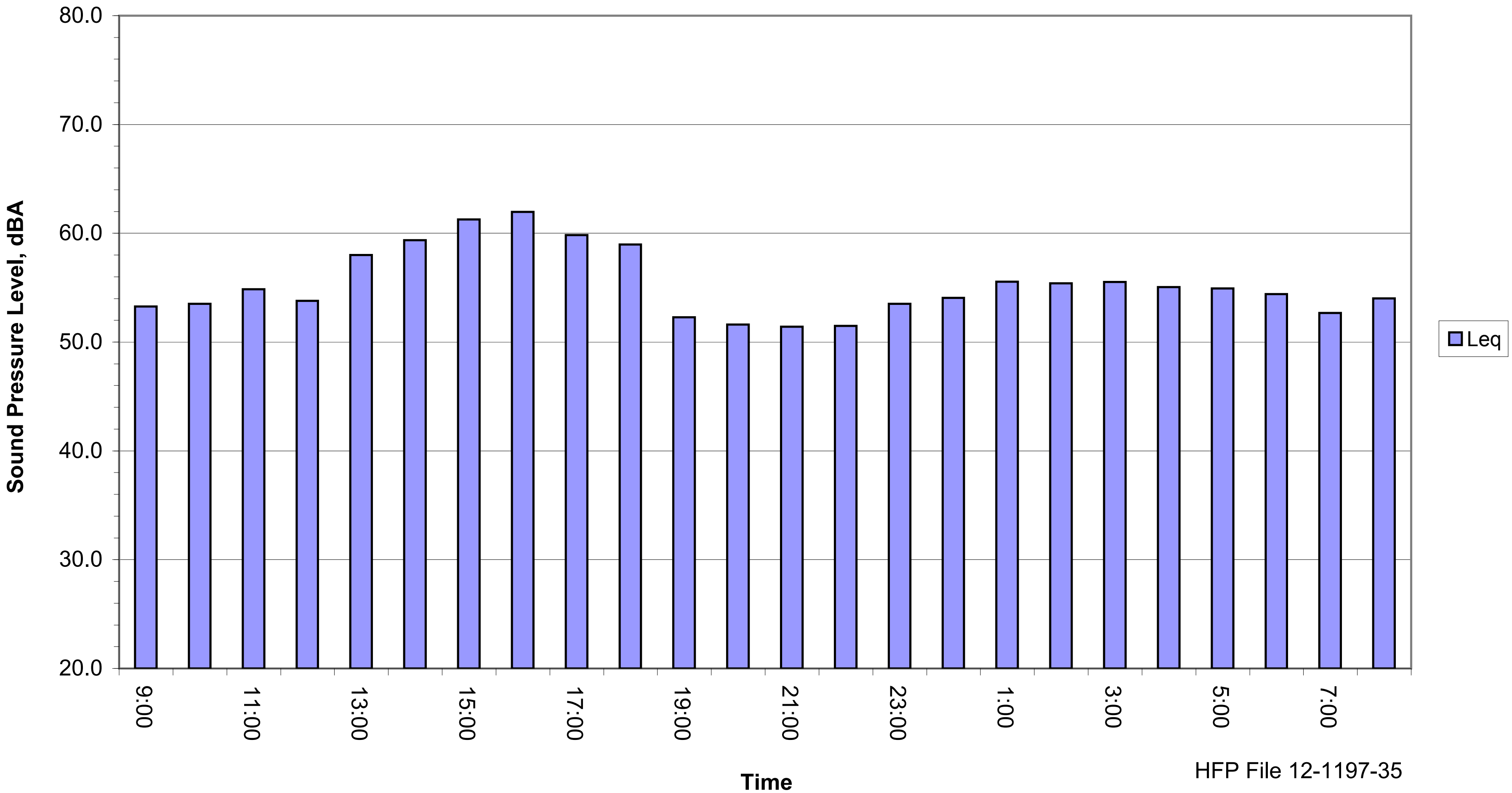


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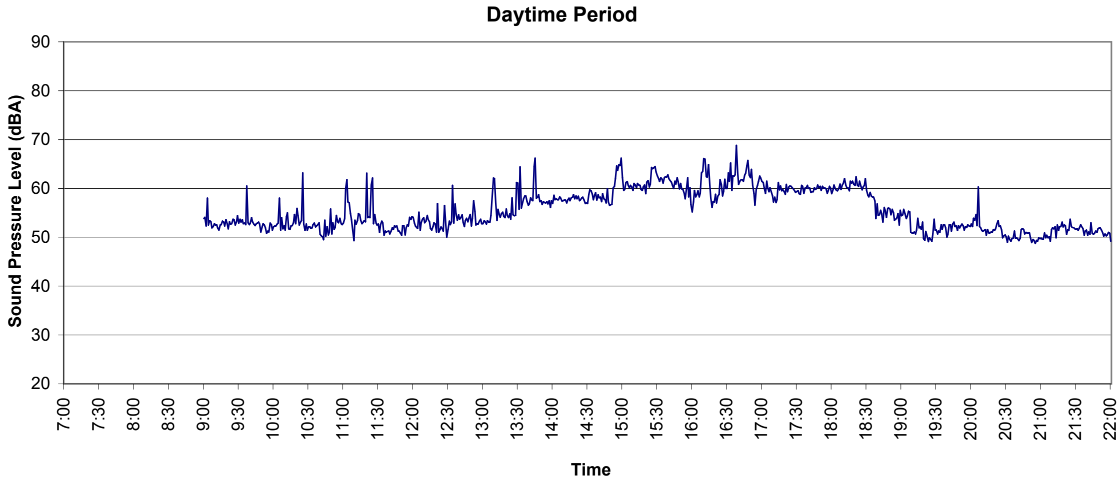
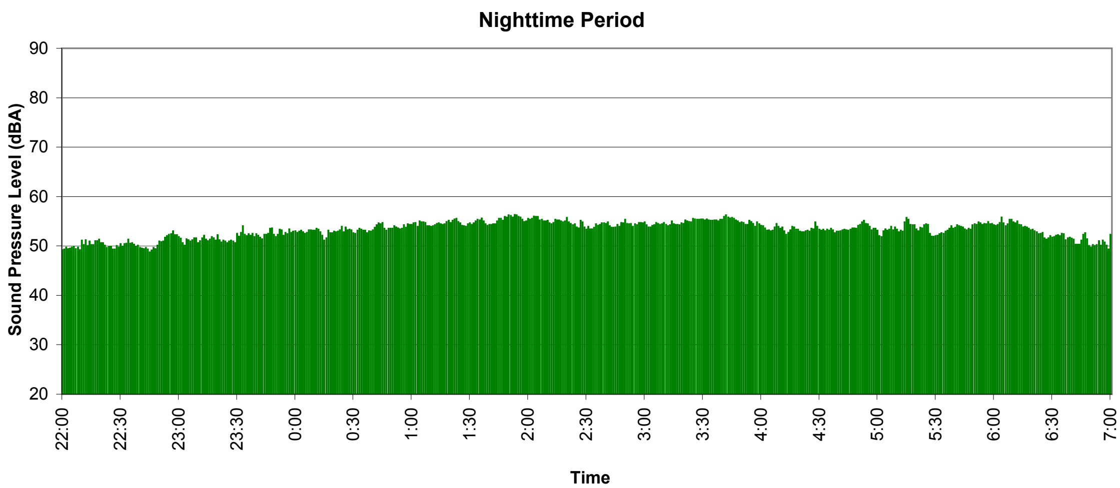
Figure 2c
Shell Canada Limited
Scotford Complex
Isolated One-Minute Leq Sound Values
Location 02, July 5-6, 2012





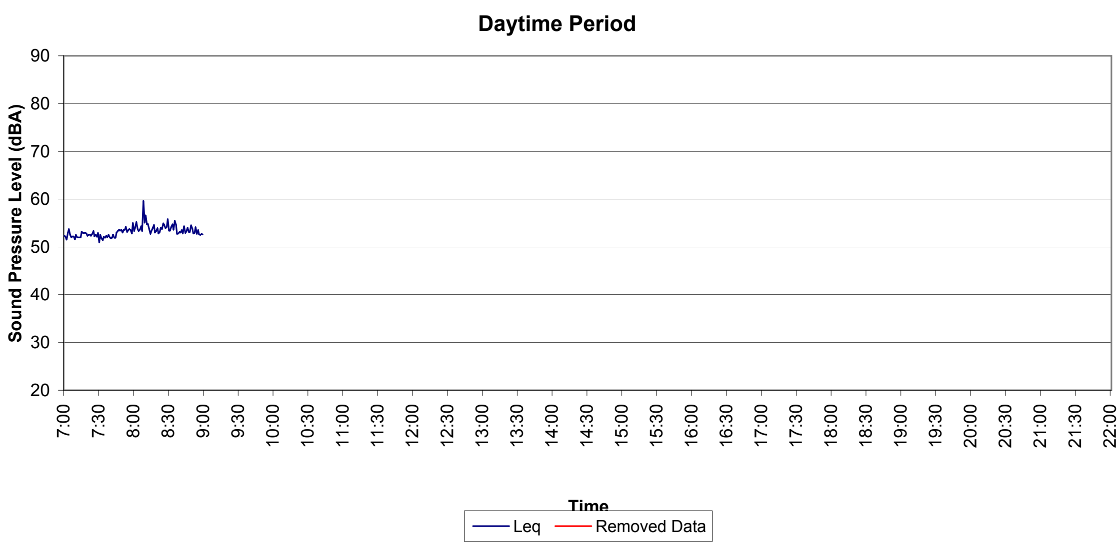


Figure 2d
Shell Canada Limited
Scotford Complex
One-Hour Isolated Values
Location 02, July 5-6, 2012

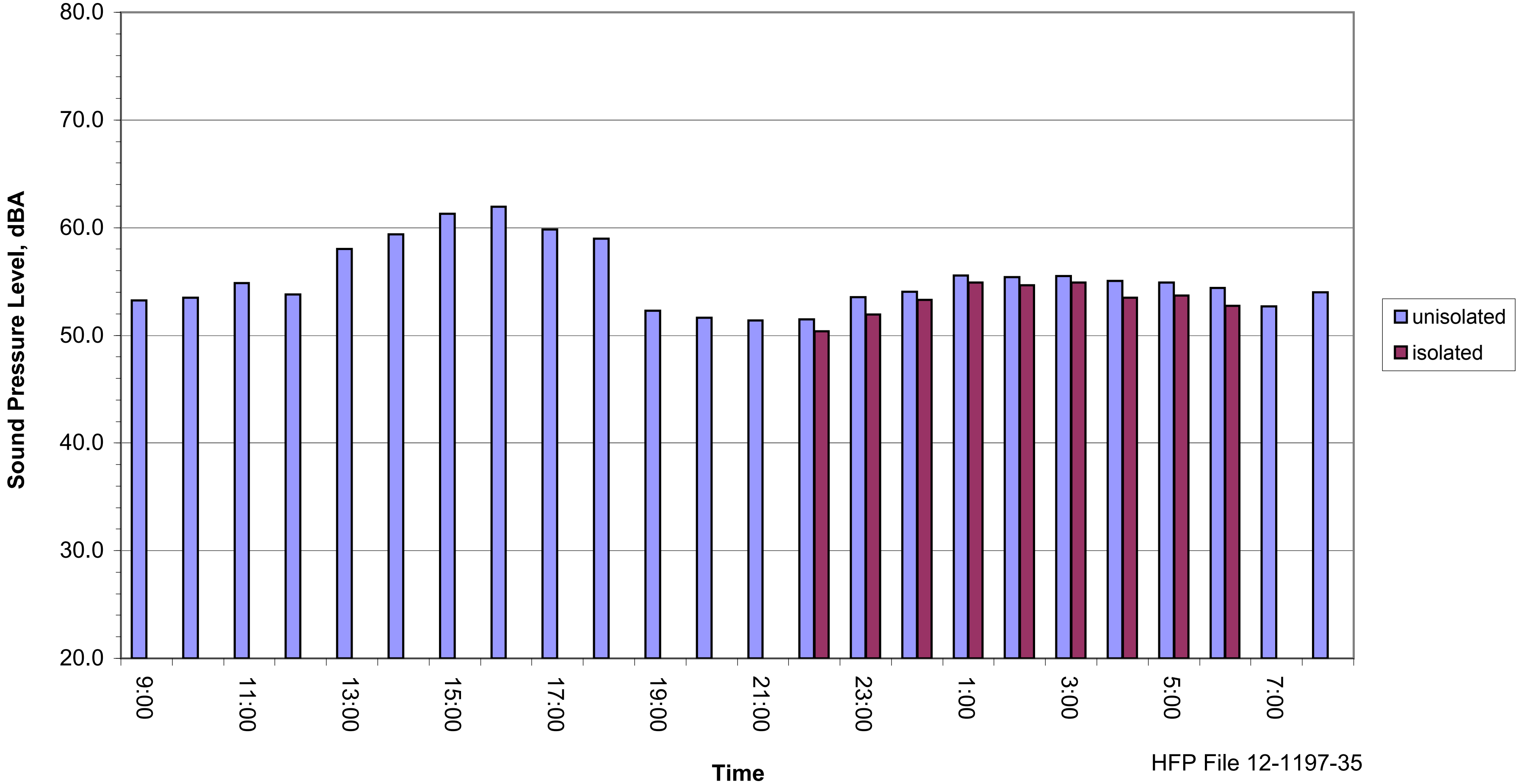


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Table 3
Shell Canada Limited
Scotford Complex
Monitored Hourly Leq Sound Levels
Location 03, July 5-6, 2012

Time Start Hour	Measured Sound Level (dBA Leq)	Measured Sound Level (dBC Leq)	Isolated Sound Level (dBA Leq)	Isolated Sound Level (dBC Leq)	Valid # of Minutes
9:00	47.7	69.0			
10:00	49.0	69.8			
11:00	48.2	68.2			
12:00	47.9	68.4			
13:00	48.3	68.7			
14:00	49.3	70.8			
15:00	52.1	72.6			
16:00	53.1	72.4			
17:00	51.7	72.6			
18:00	53.5	73.6			
19:00	52.1	71.5			
20:00	46.6	68.8			
21:00	50.1	69.6			
22:00	50.8	69.7	49.1	69.7	60
23:00	53.1	69.2	51.3	69.2	60
0:00	50.0	67.3	48.7	67.3	60
1:00	55.5	69.5	53.8	69.5	60
2:00	55.1	68.8	53.5	68.8	60
3:00	54.0	69.4	52.2	69.4	60
4:00	56.6	71.2	51.2	70.3	1
5:00	53.5	68.8			0
6:00	52.2	69.3			0
7:00	51.4	69.2			
8:00	47.7	69.1			
15 hour daytime Leq:	50.5	70.7			
9 hour nighttime Leq:	53.9	69.4			
6.0 hour isolated nighttime Leq:			51.8	69.0	

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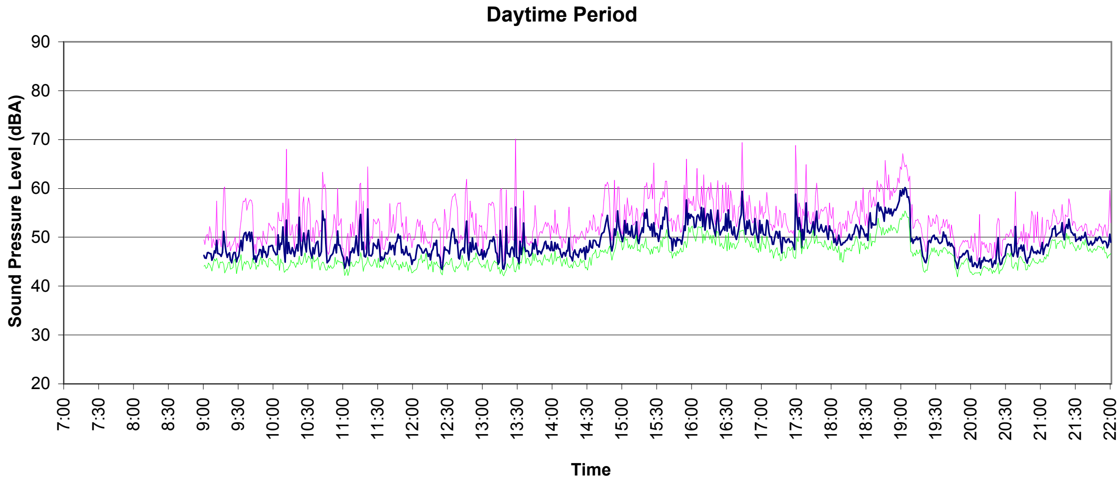
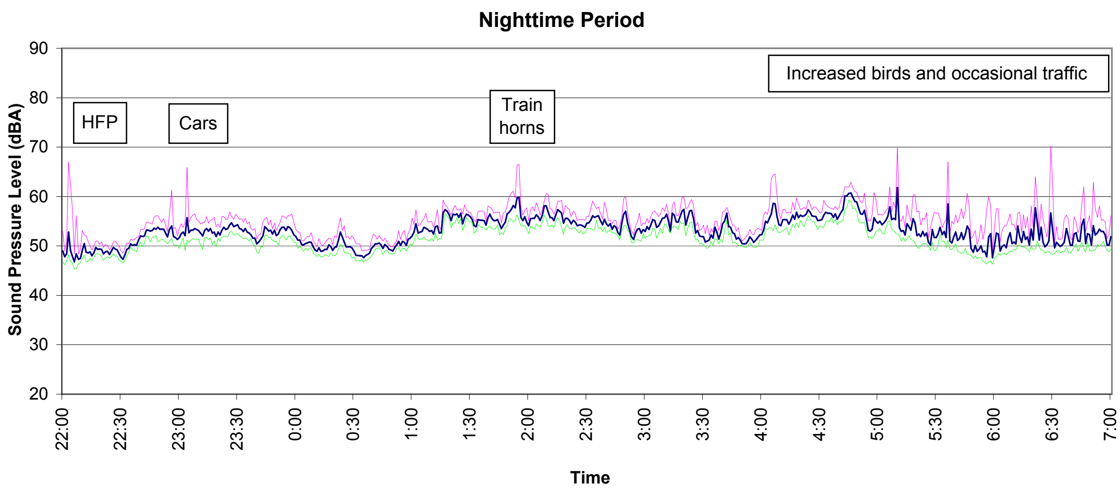
Figure 3a
Shell Canada Limited
Scotford Complex
Monitored One-Minute Leq Sound Values
Location 03, July 5-6, 2012





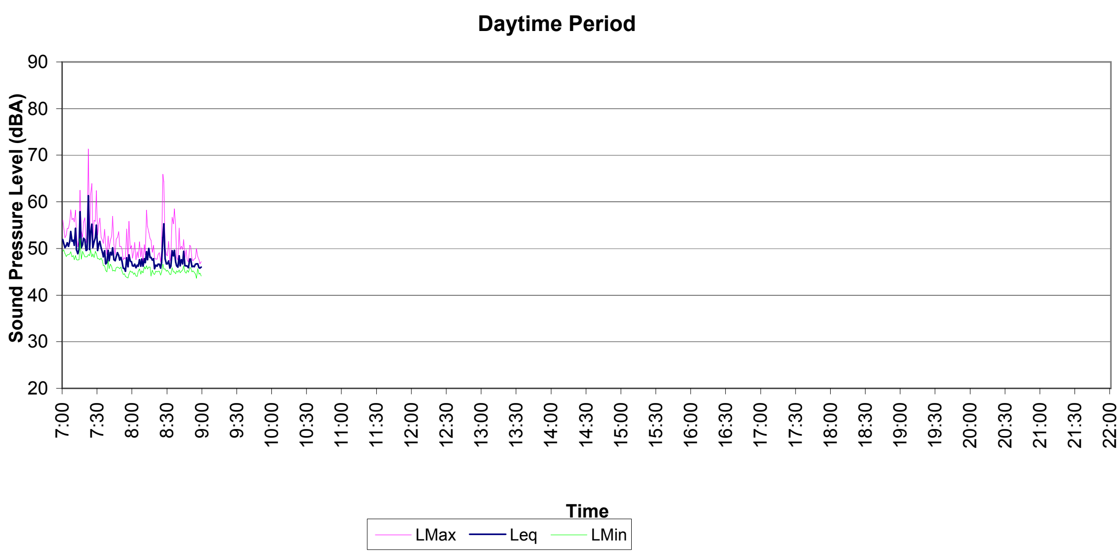


Figure 3b
Shell Canada Limited
Scotford Complex
One-Hour Measured Values
Location 03, July 5-6, 2012

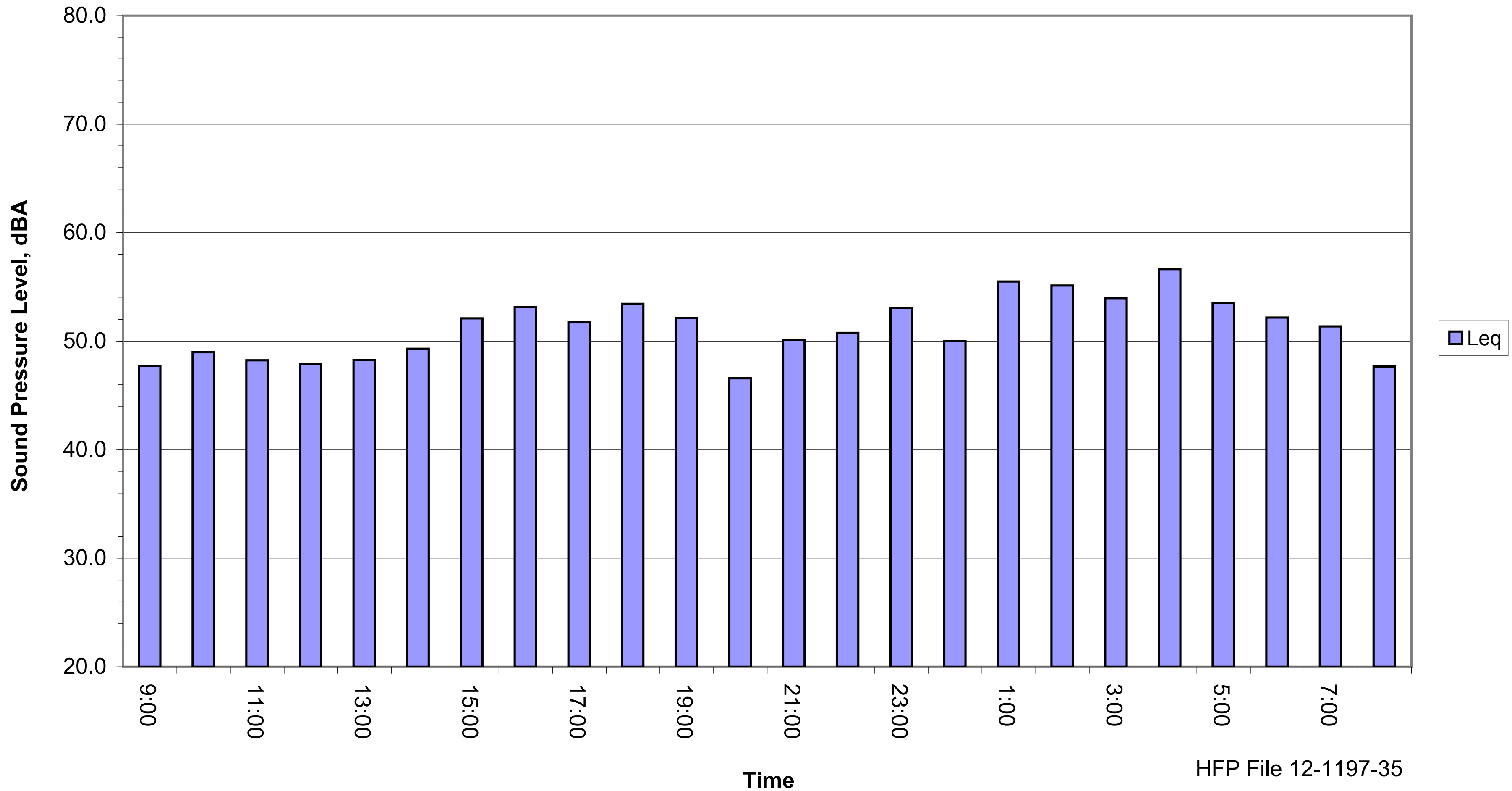


Figure 3c
Shell Canada Limited
Scotford Complex
Isolated One-Minute Leq Sound Values
Location 03, July 5-6, 2012

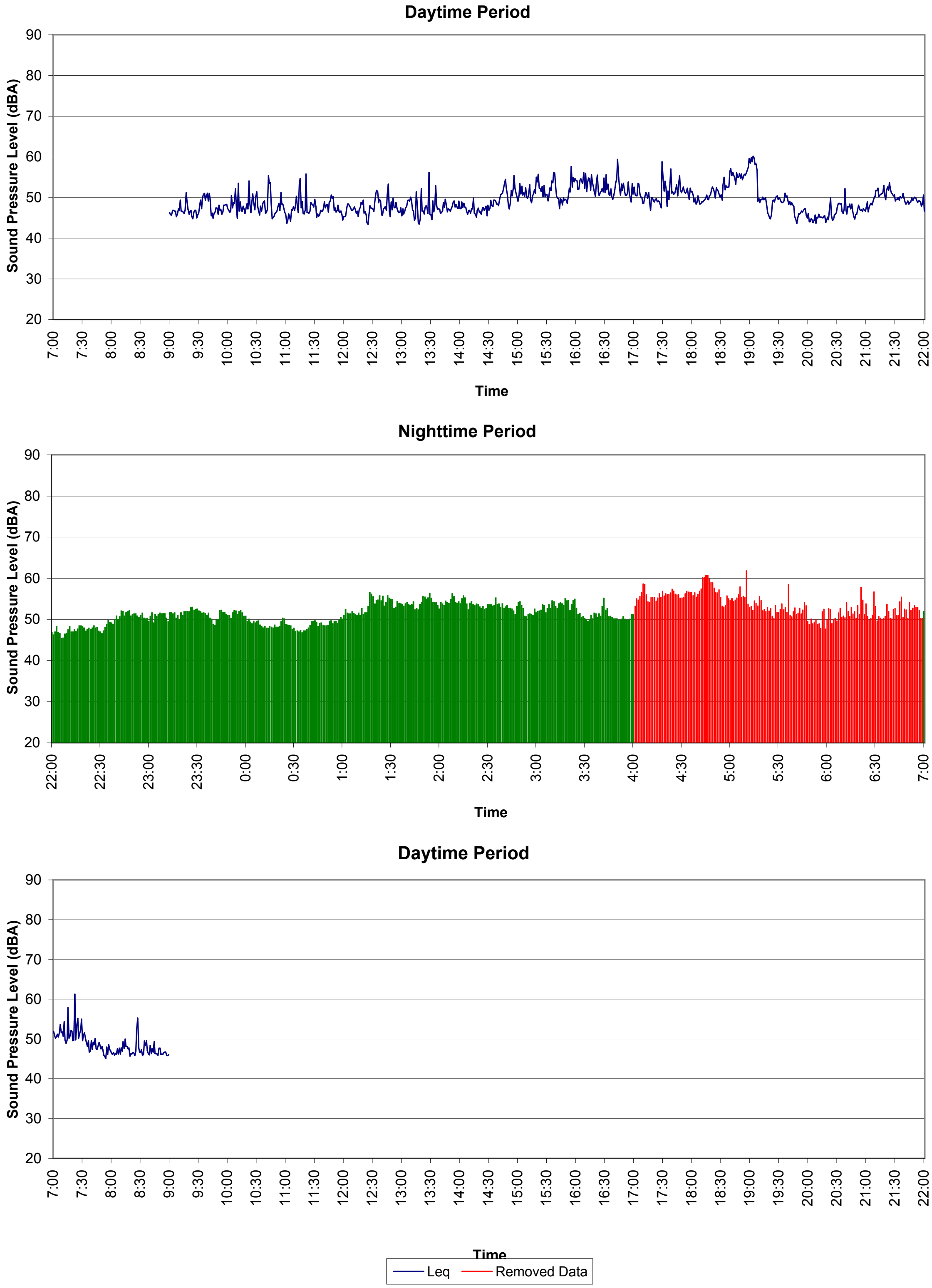


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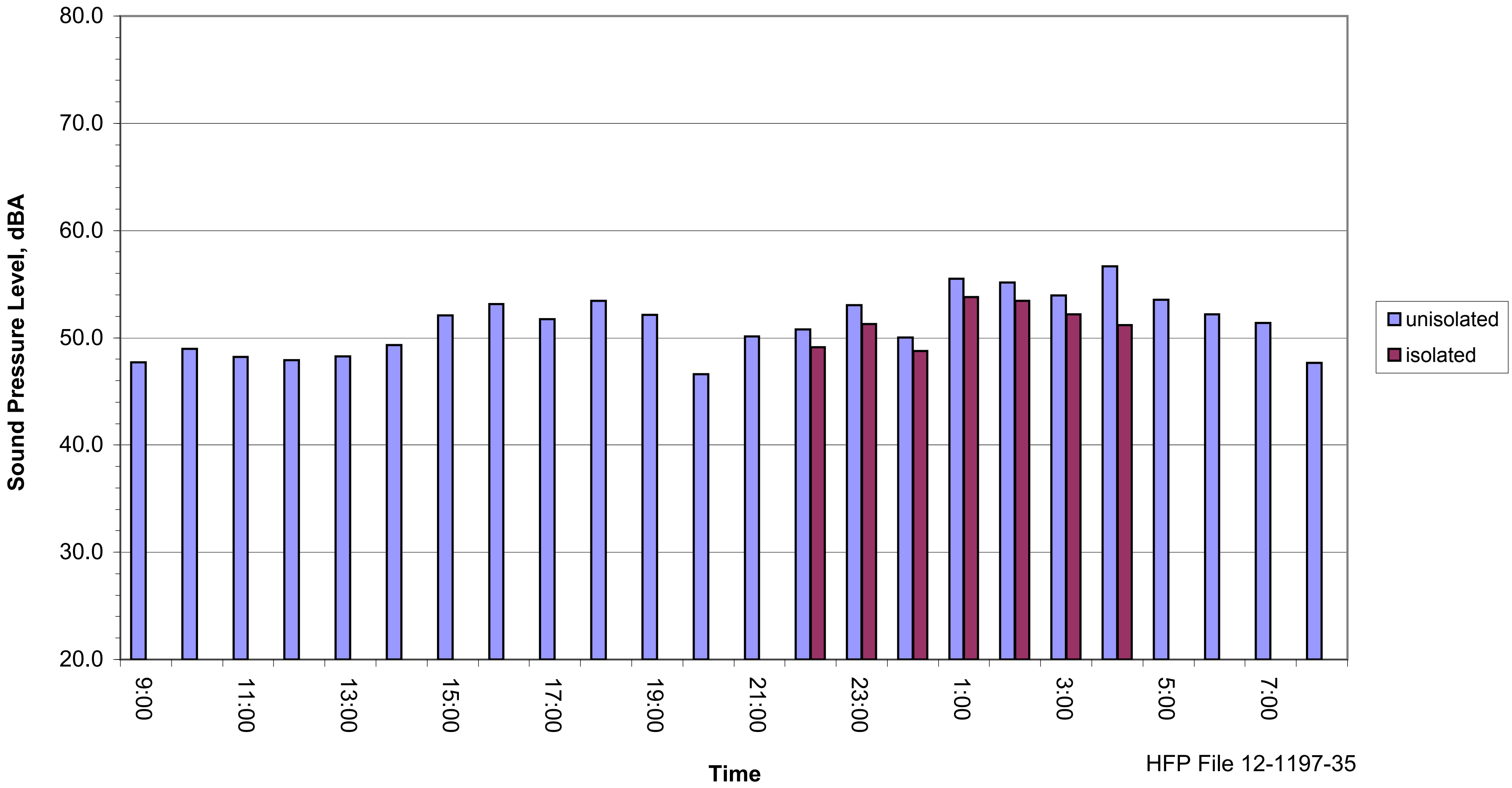
Figure 3d
Shell Canada Limited
Scotford Complex
One-Hour Isolated Values
Location 03, July 5-6, 2012



HFP File 12-1197-35

Table 4
Shell Canada Limited
Scotford Complex
Monitored Hourly Leq Sound Levels
Location 04, July 5-6, 2012

Time Start Hour	Measured Sound Level (dBA Leq)	Measured Sound Level (dBC Leq)	Isolated Sound Level (dBA Leq)	Isolated Sound Level (dBC Leq)	Valid # of Minutes
9:00	55.0	70.7			
10:00	64.0	73.0			
11:00	54.7	70.5			
12:00	55.3	70.2			
13:00	55.9	69.5			
14:00	56.0	69.5			
15:00	57.3	70.9			
16:00	56.6	70.1			
17:00	56.2	69.9			
18:00	56.7	72.6			
19:00	56.4	72.1			
20:00	54.3	70.4			
21:00	55.5	71.4			
22:00	56.1	71.2	54.6	71.2	60
23:00	56.3	70.4	54.8	70.4	60
0:00	56.5	70.5	55.1	70.5	60
1:00	56.1	70.8	55.0	70.8	60
2:00	56.0	70.8	54.9	70.8	60
3:00	55.8	70.9	54.7	70.9	60
4:00	57.4	71.8	55.1	71.8	60
5:00	55.6	70.3	54.0	70.3	60
6:00	55.2	70.0	53.8	70.0	60
7:00	54.6	70.3			
8:00	53.6	69.9			
15 hour daytime Leq:	57.1	70.9			
9 hour nighttime Leq:	56.2	70.8			
9.0 hour isolated nighttime Leq:			54.7	70.8	

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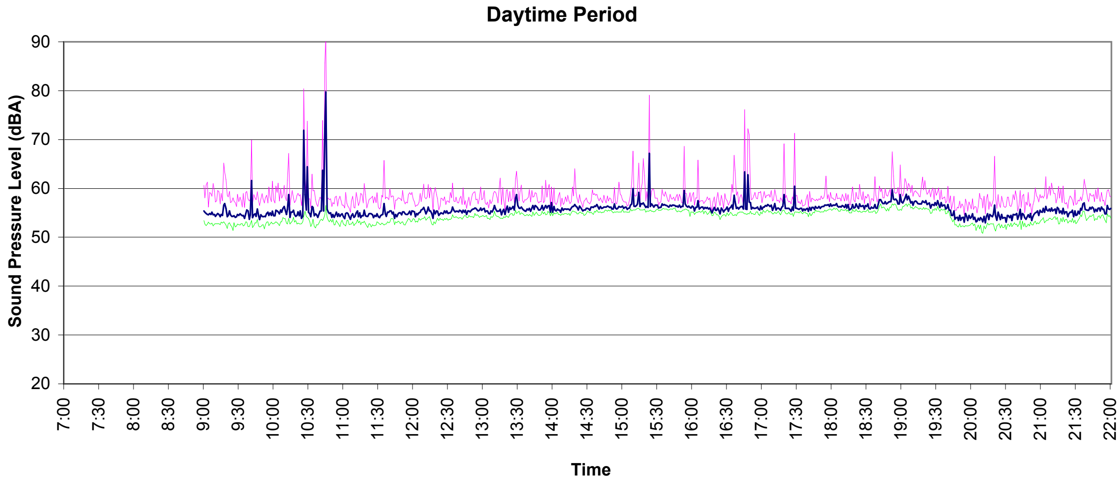
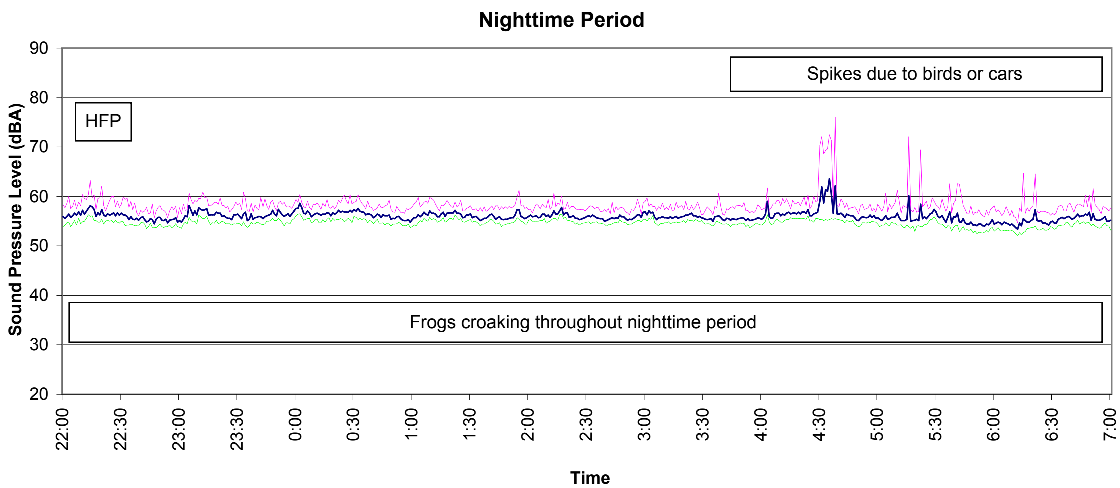
Figure 4a
Shell Canada Limited
Scotford Complex
Monitored One-Minute Leq Sound Values
Location 04, July 5-6, 2012





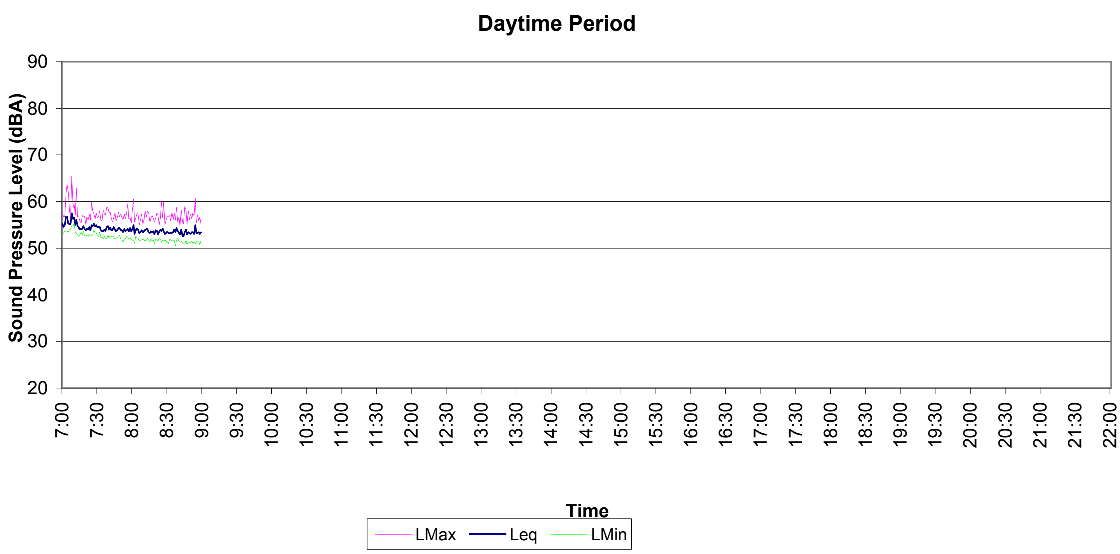


Figure 4b
Shell Canada Limited
Scotford Complex
One-Hour Measured Values
Location 04, July 5-6, 2012

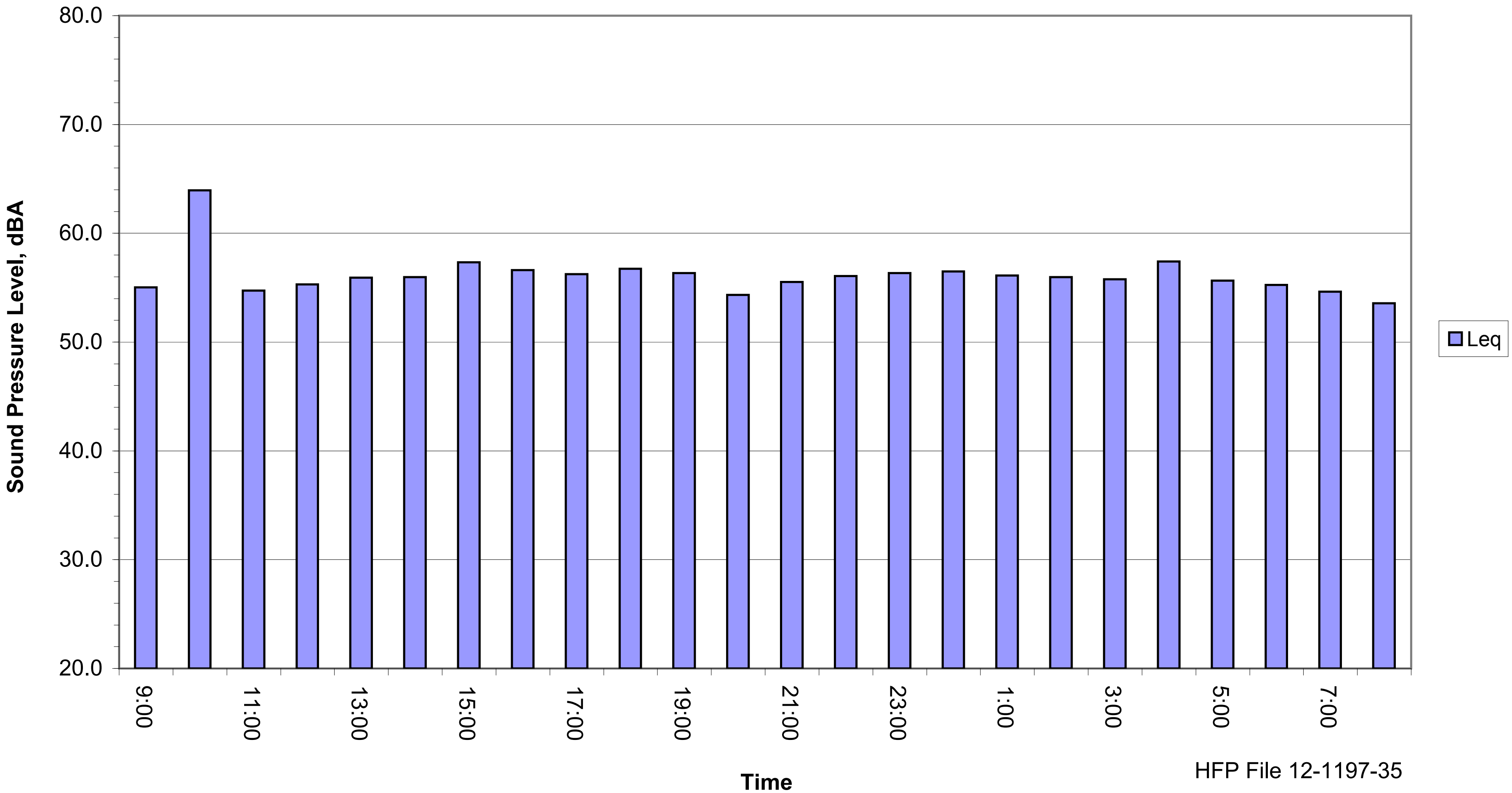
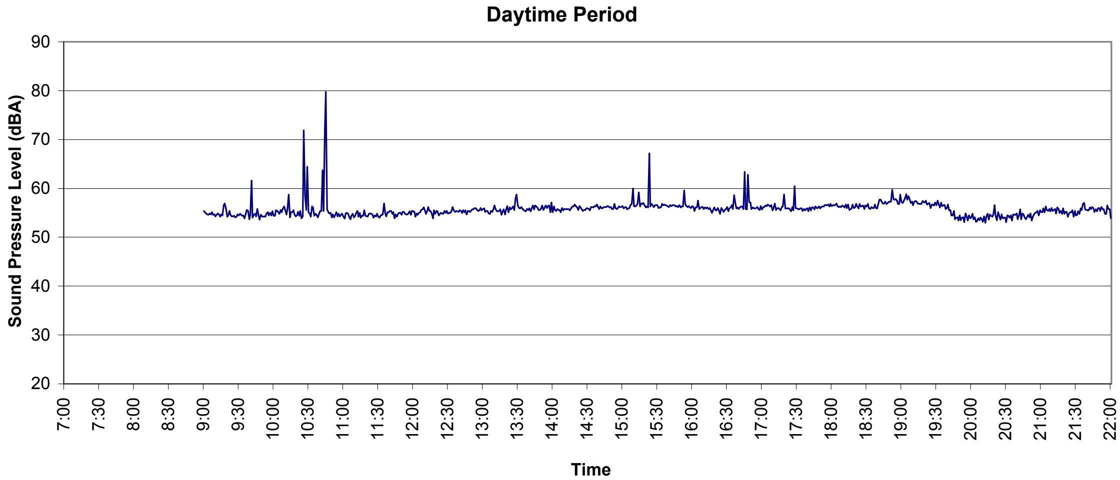
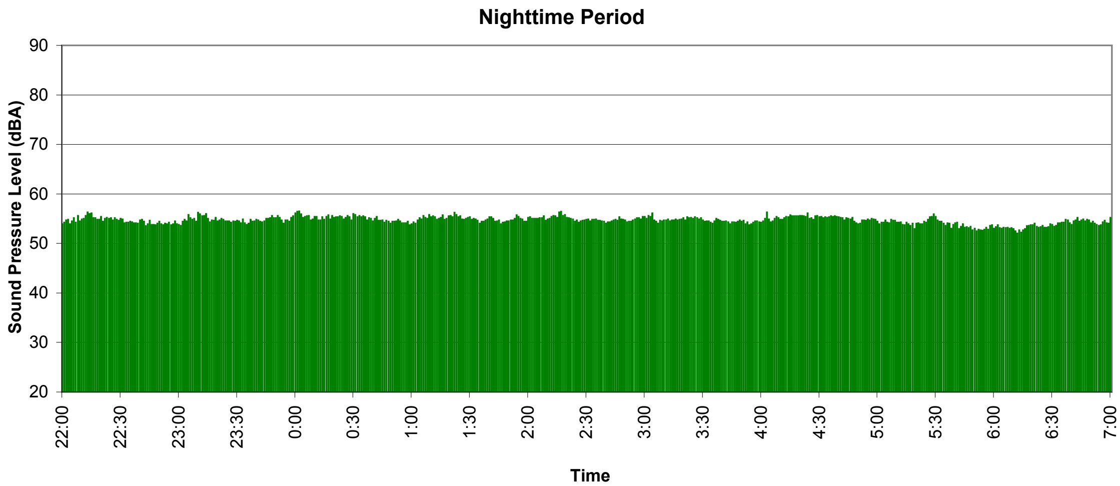


Figure 4c
Shell Canada Limited
Scotford Complex
Isolated One-Minute Leq Sound Values
Location 04, July 5-6, 2012





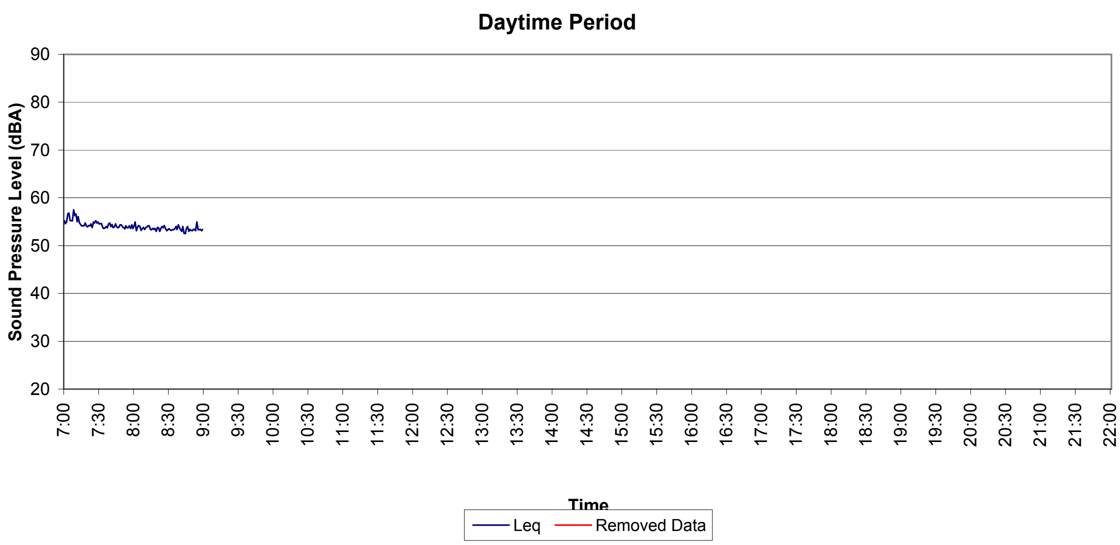


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Figure 4d
Shell Canada Limited
Scotford Complex
One-Hour Isolated Values
Location 04, July 5-6, 2012

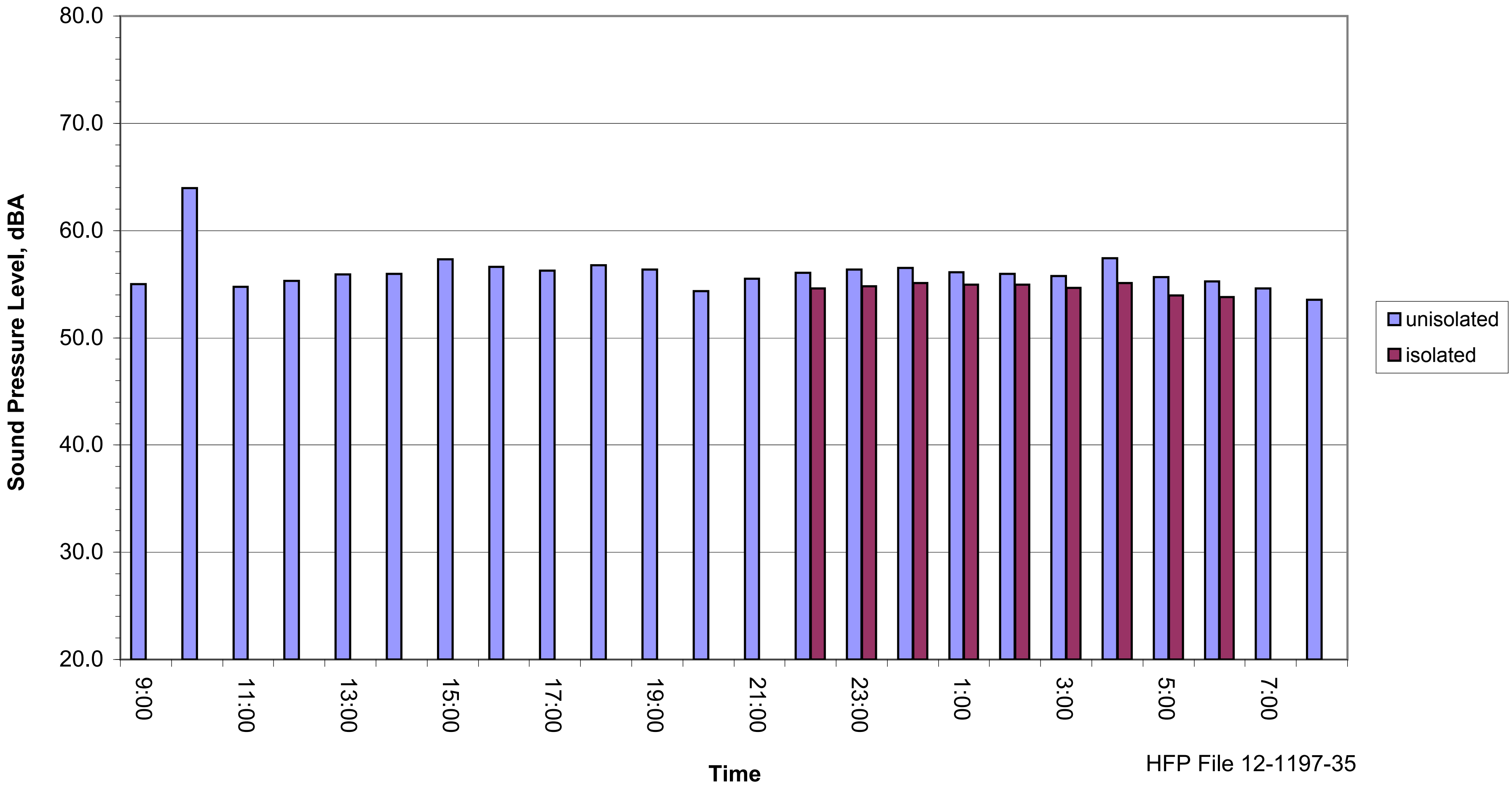

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Table 5
Shell Canada Limited
Scotford Complex
Monitored Hourly Leq Sound Levels
Location 05, July 5-6, 2012

Time Start Hour	Measured Sound Level (dBA Leq)	Measured Sound Level (dBC Leq)	Isolated Sound Level (dBA Leq)	Isolated Sound Level (dBC Leq)	Valid # of Minutes
11:00	62.2	78.6			
12:00	54.6	71.5			
13:00	54.0	71.3			
14:00	57.1	76.6			
15:00	64.0	78.5			
16:00	56.9	73.0			
17:00	54.6	73.0			
18:00	53.9	73.6			
19:00	54.5	72.0			
20:00	54.5	71.7			
21:00	54.6	71.6			
22:00	55.8	73.4	54.9	73.4	60
23:00	56.3	73.6	55.4	73.6	60
0:00	56.9	73.4	56.1	73.4	60
1:00	57.9	73.8	57.2	73.8	60
2:00	57.9	73.6	57.1	73.6	60
3:00	61.9	75.9	57.4	73.3	52
4:00	61.7	76.0	56.5	75.6	55
5:00	58.1	73.2	56.5	73.2	60
6:00	59.1	73.8	57.3	73.8	60
7:00	55.9	71.5			
8:00	54.5	72.0			
13 hour daytime Leq:	57.8	74.3			
9 hour nighttime Leq:	58.9	74.2			
8.8 hour isolated nighttime Leq:			56.6	73.8	

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Figure 5a
Shell Canada Limited
Scotford Complex
Monitored One-Minute Leq Sound Values
Location 05, July 5-6, 2012

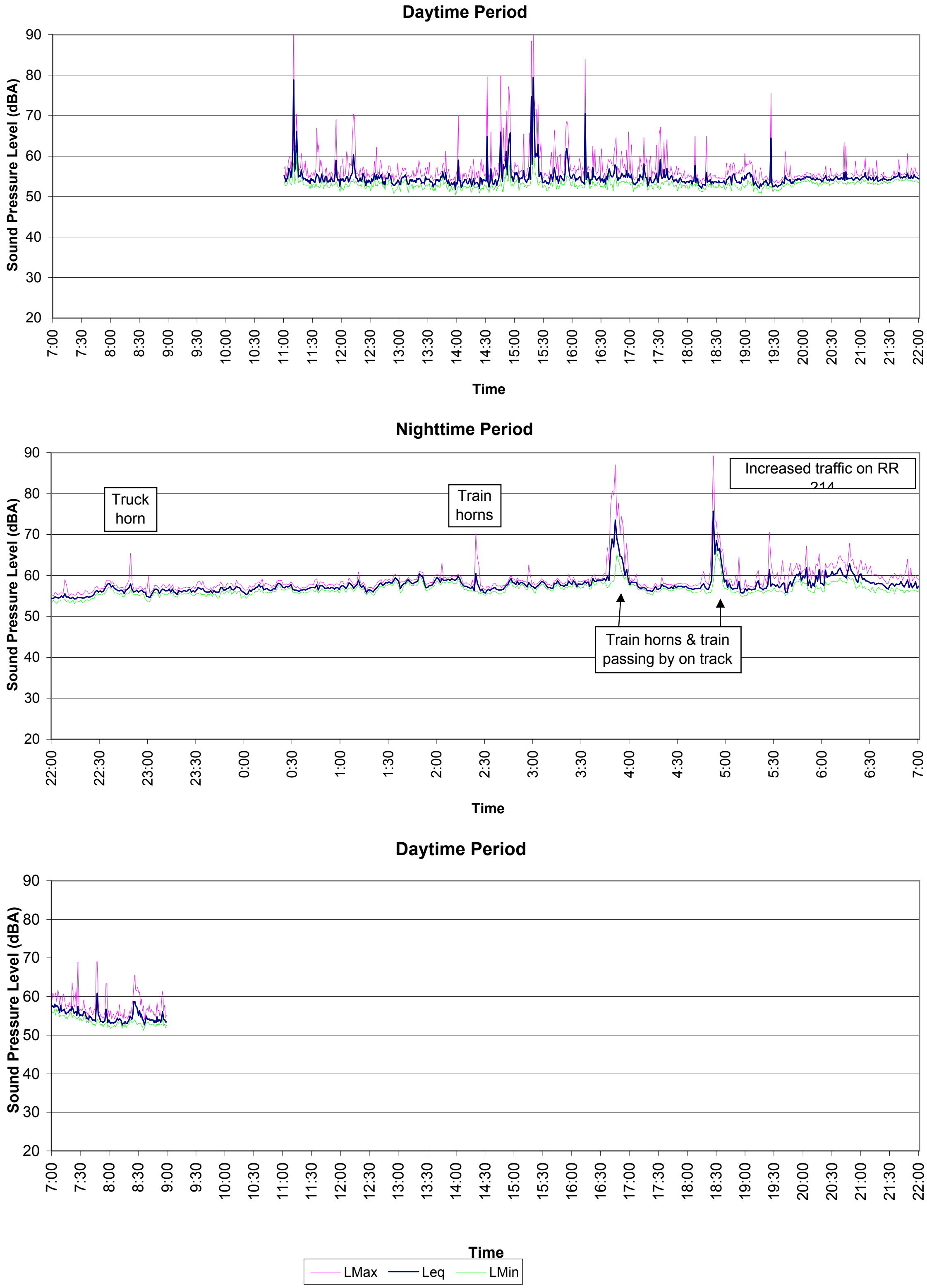

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Figure 5b
Shell Canada Limited
Scotford Complex
One-Hour Measured Values
Location 05, July 5-6, 2012

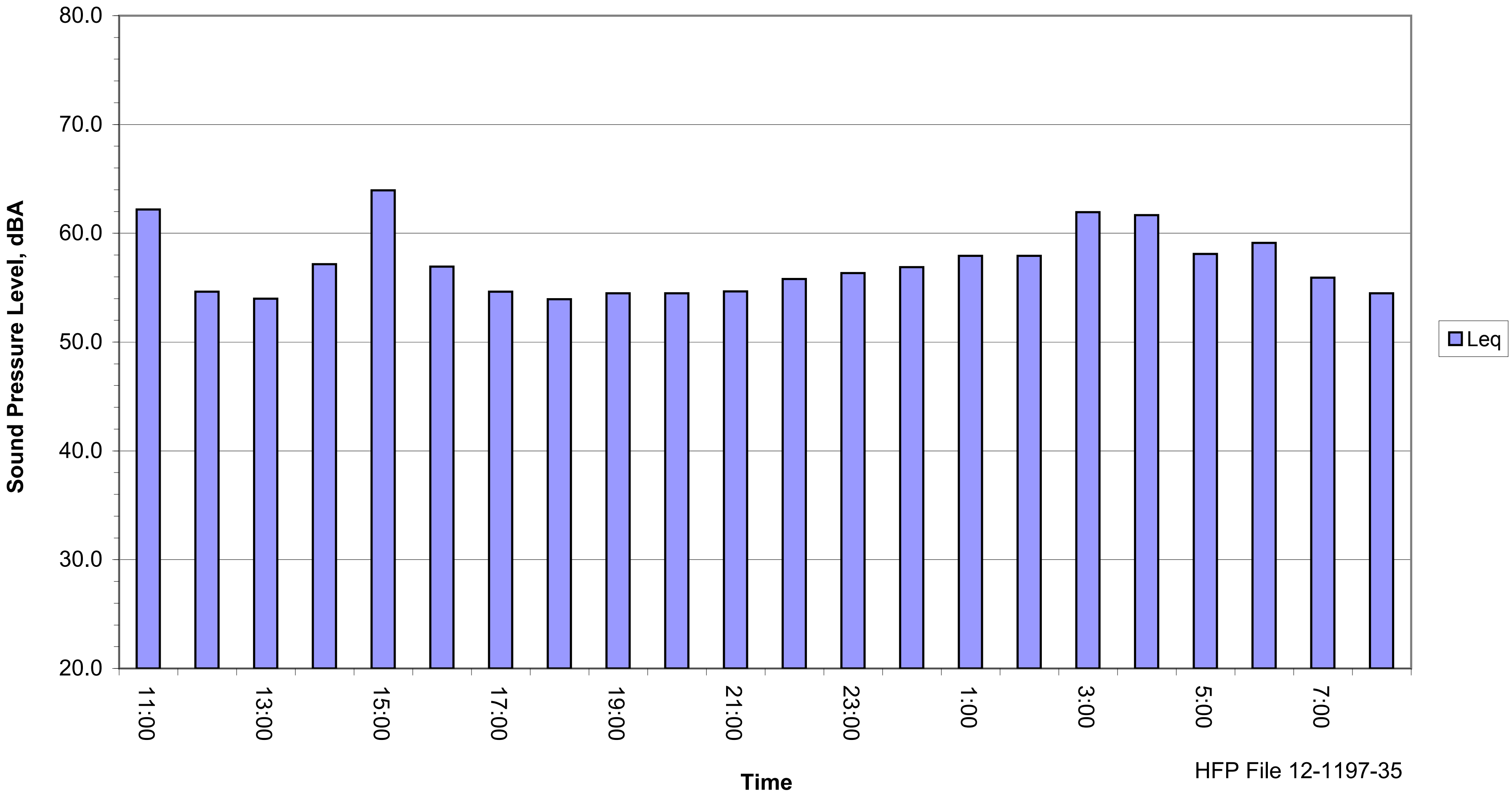

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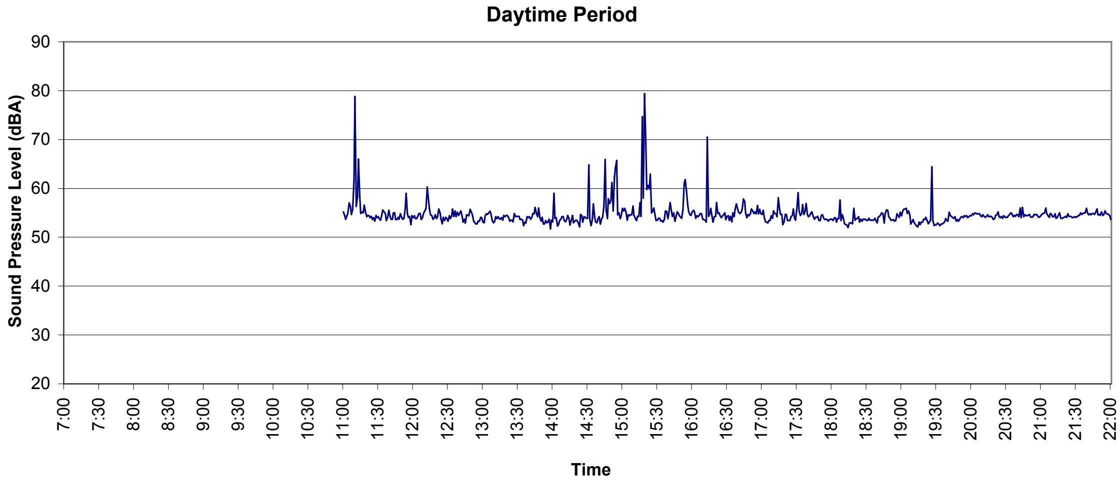
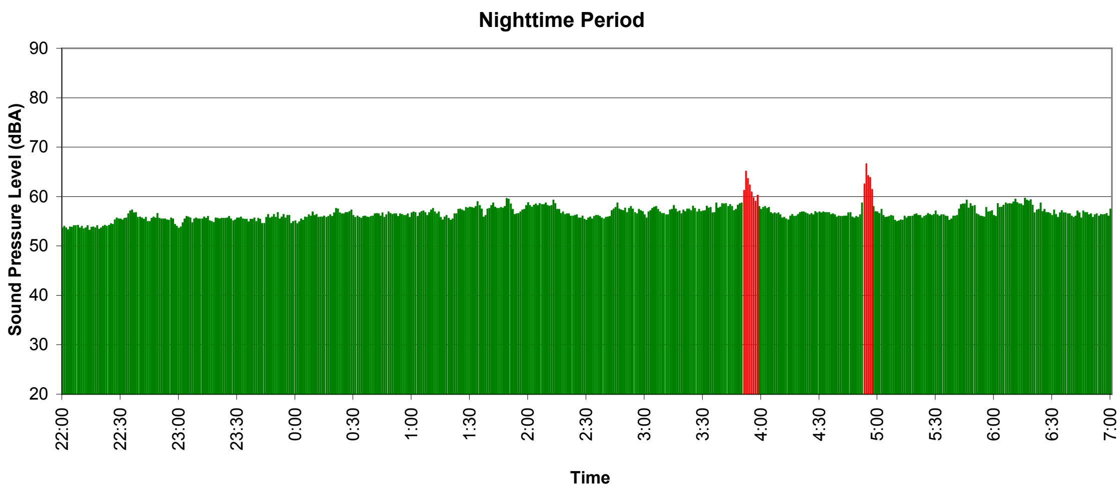
Figure 5c
Shell Canada Limited
Scotford Complex
Isolated One-Minute Leq Sound Values
Location 05, July 5-6, 2012





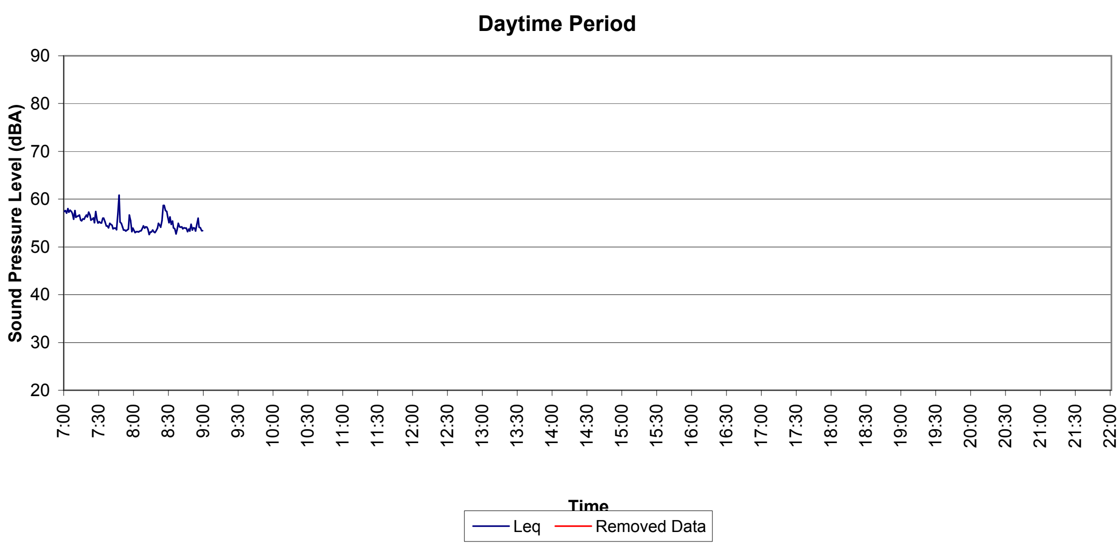


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Figure 5d
Shell Canada Limited
Scotford Complex
One-Hour Isolated Values
Location 05, July 5-6, 2012

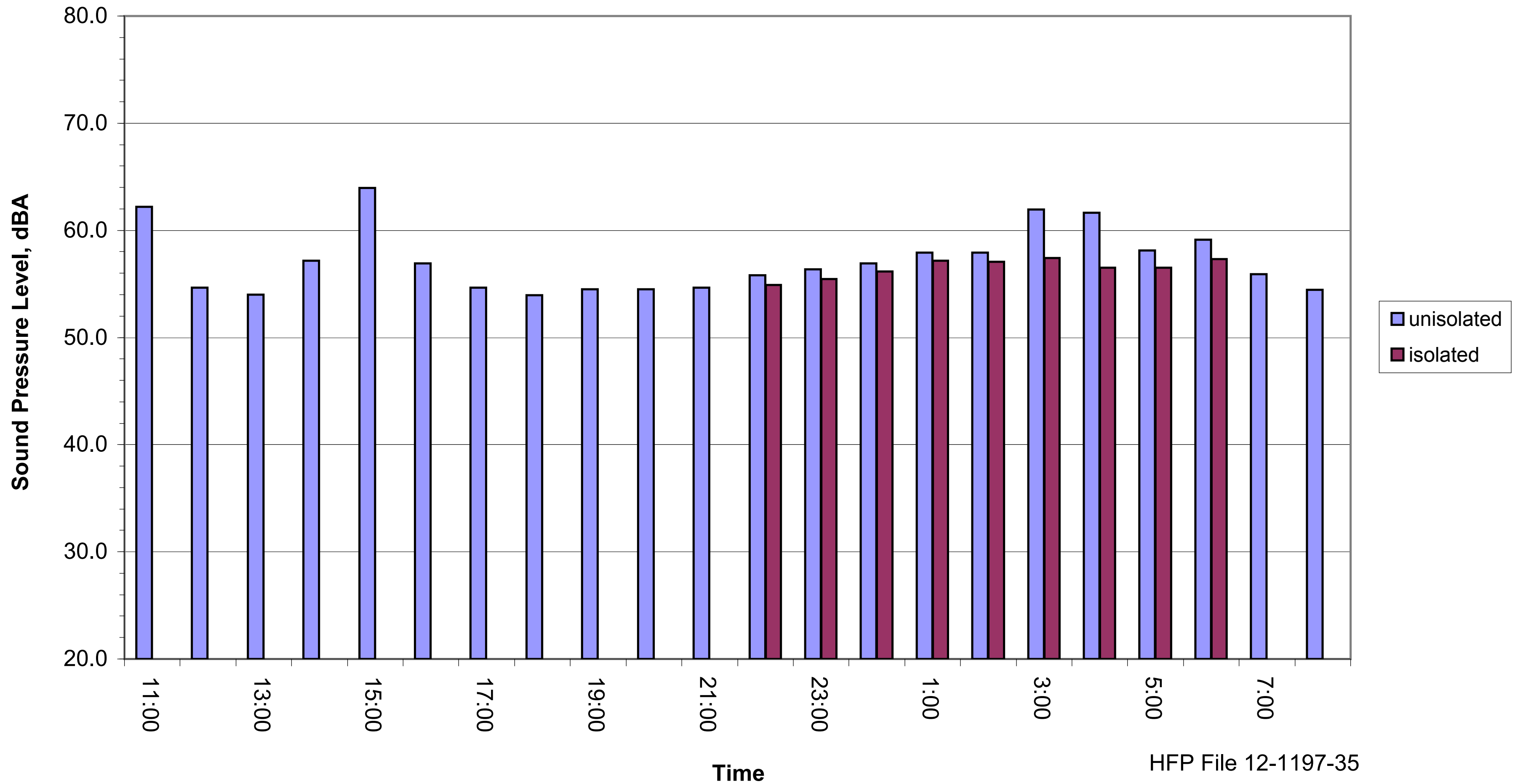

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Table 6
Shell Canada Limited
Scotford Complex
Monitored Hourly Leq Sound Levels
Location 06, July 5-6, 2012

Time Start Hour	Measured Sound Level (dBA Leq)	Measured Sound Level (dBC Leq)	Isolated Sound Level (dBA Leq)	Isolated Sound Level (dBC Leq)	Valid # of Minutes
12:00	65.1	81.4			
13:00	55.1	71.4			
14:00	62.0	73.6			
15:00	71.1	81.6			
16:00	59.5	74.6			
17:00	58.3	74.5			
18:00	58.5	74.5			
19:00	54.5	71.7			
20:00	53.7	71.2			
21:00	54.4	69.7			
22:00	56.0	71.1	51.3	71.1	60
23:00	55.2	71.6	52.6	71.6	60
0:00	57.0	73.5	55.1	73.5	60
1:00	57.0	73.7	54.7	73.7	60
2:00	56.6	73.4	55.2	73.4	60
3:00	67.2	77.3	55.3	73.2	55
4:00	61.8	76.4	54.9	75.4	56
5:00	58.6	73.6	55.7	73.6	60
6:00	60.8	73.7	56.7	73.7	60
7:00	65.7	78.2			
8:00	62.8	77.5			
12 hour daytime Leq:	63.5	76.7			
9 hour nighttime Leq:	60.8	74.2			
8.9 hour isolated nighttime Leq:			54.9	73.4	

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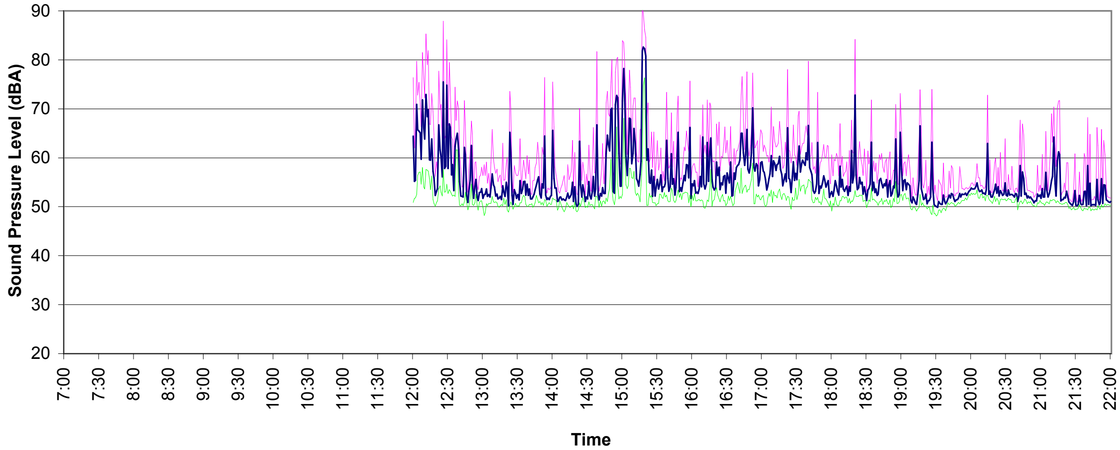
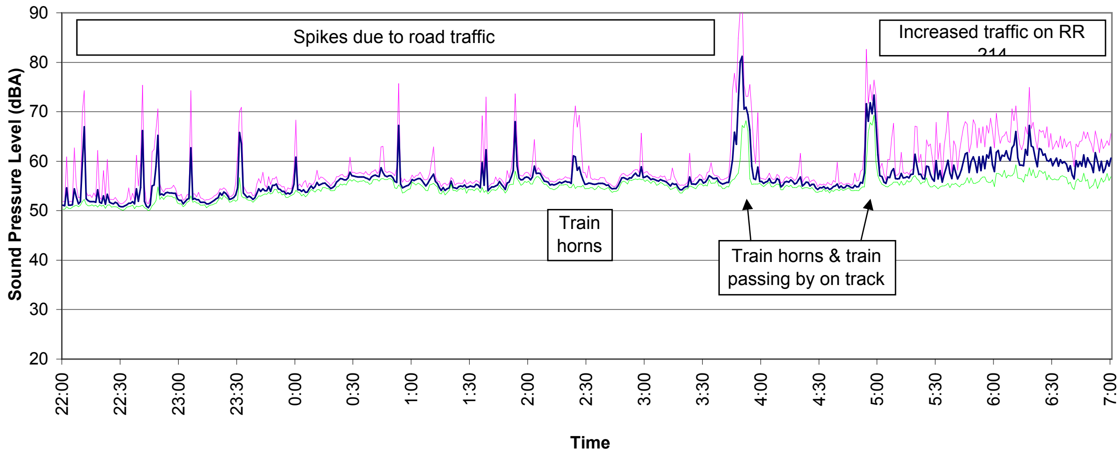
Figure 6a
Shell Canada Limited
Scotford Complex
Monitored One-Minute Leq Sound Values
Location 06, July 5-6, 2012

Daytime Period



Nighttime Period



Daytime Period

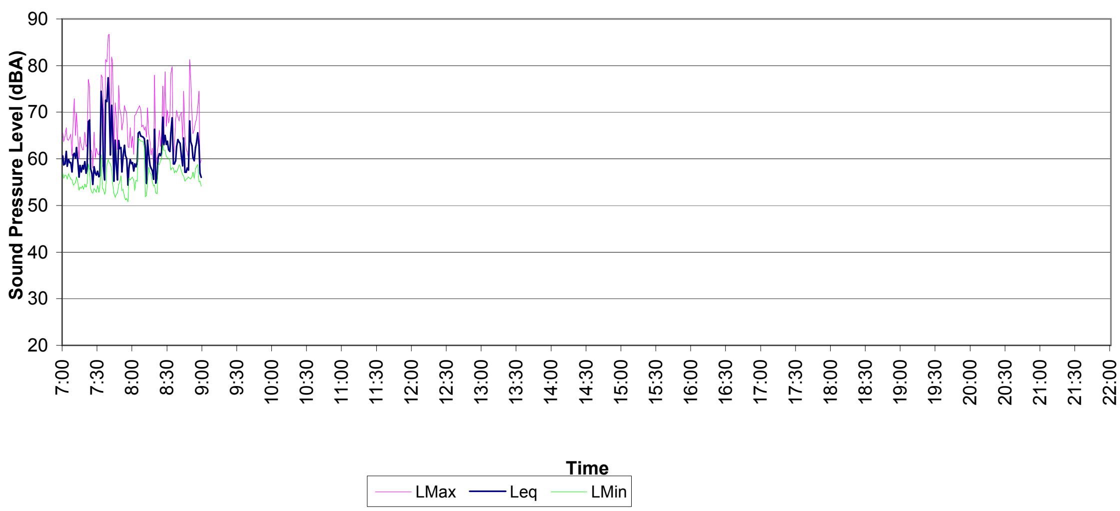


Figure 6b
Shell Canada Limited
Scotford Complex
One-Hour Measured Values
Location 06, July 5-6, 2012

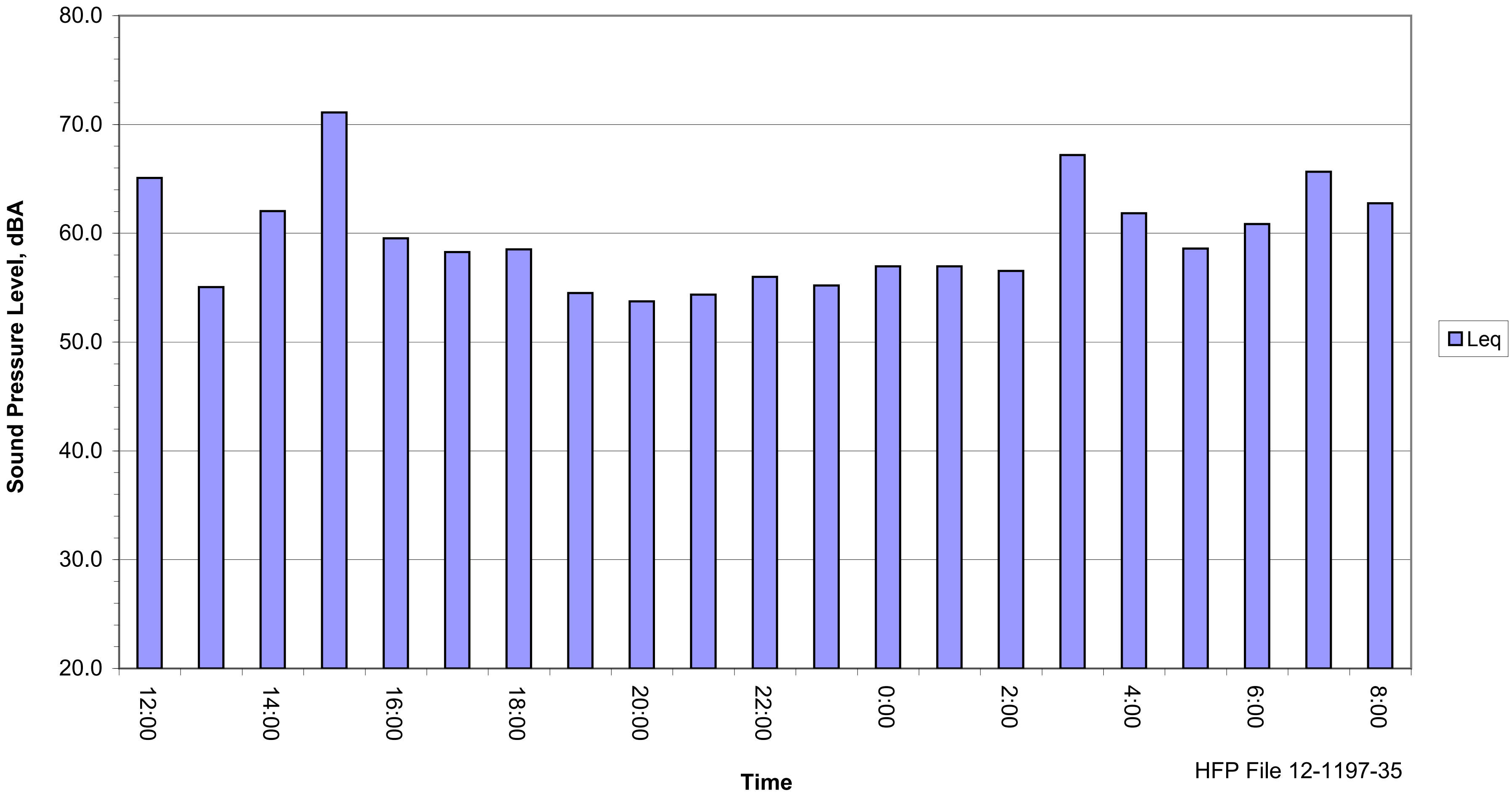


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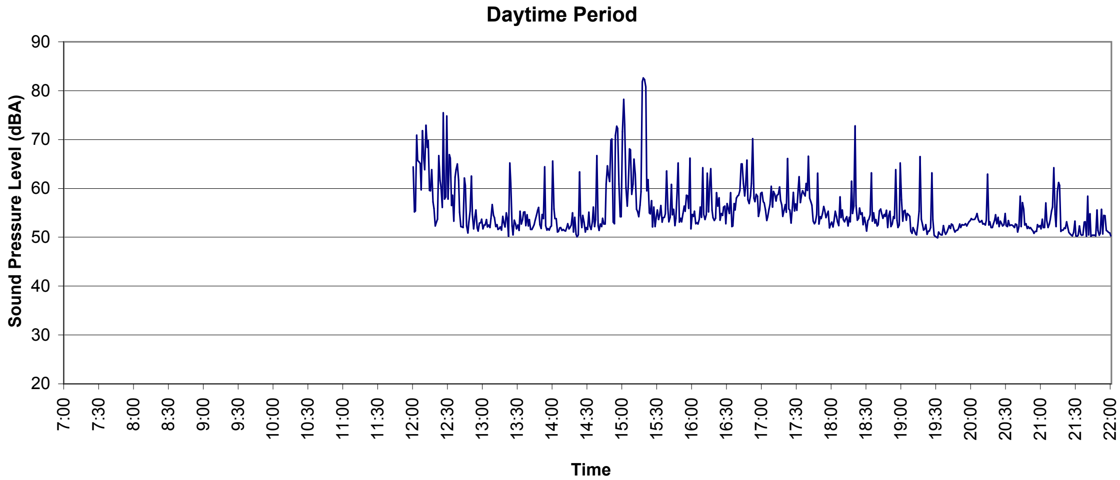
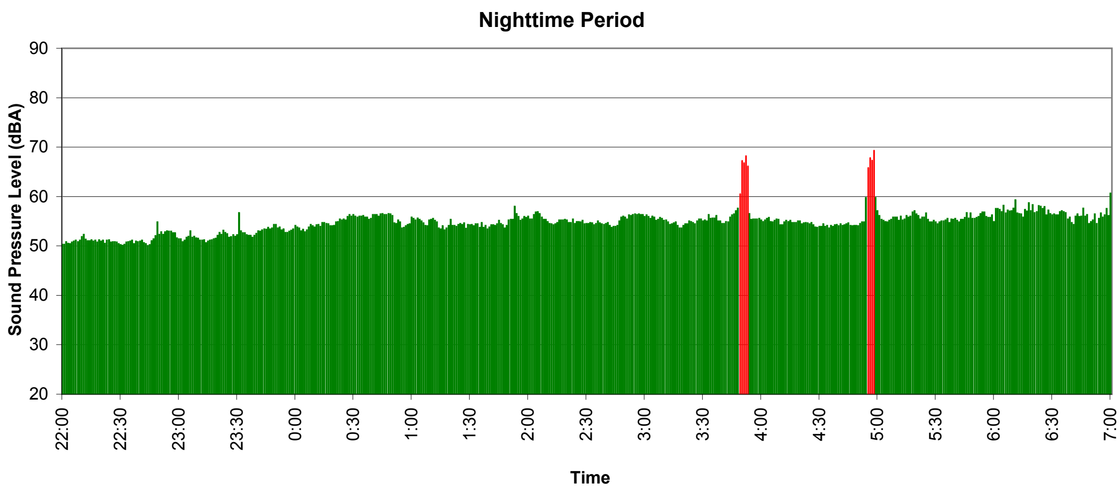
Figure 6c
Shell Canada Limited
Scotford Complex
Isolated One-Minute Leq Sound Values
Location 06, July 5-6, 2012





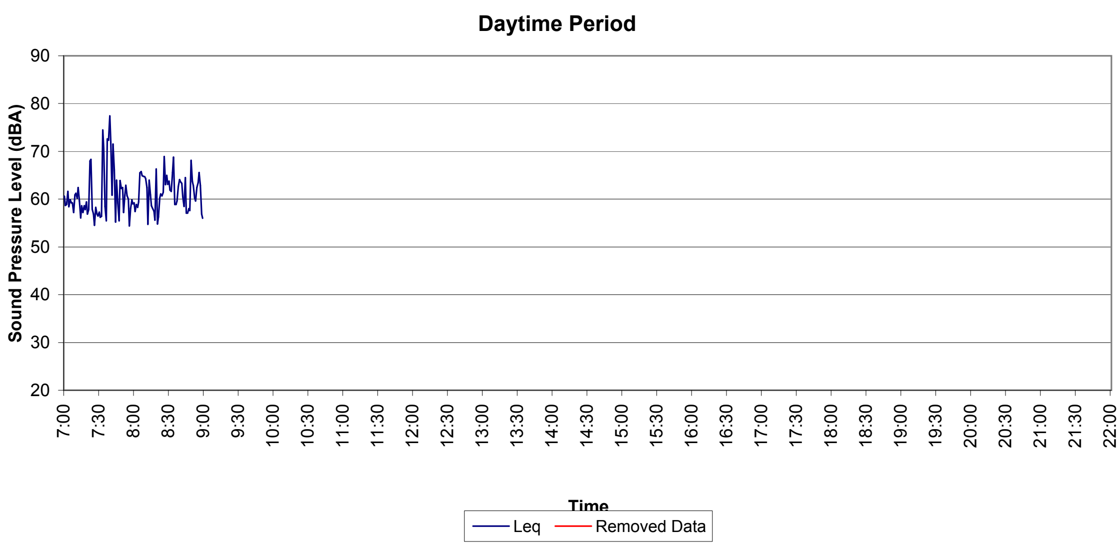


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Figure 6d
Shell Canada Limited
Scotford Complex
One-Hour Isolated Values
Location 06, July 5-6, 2012

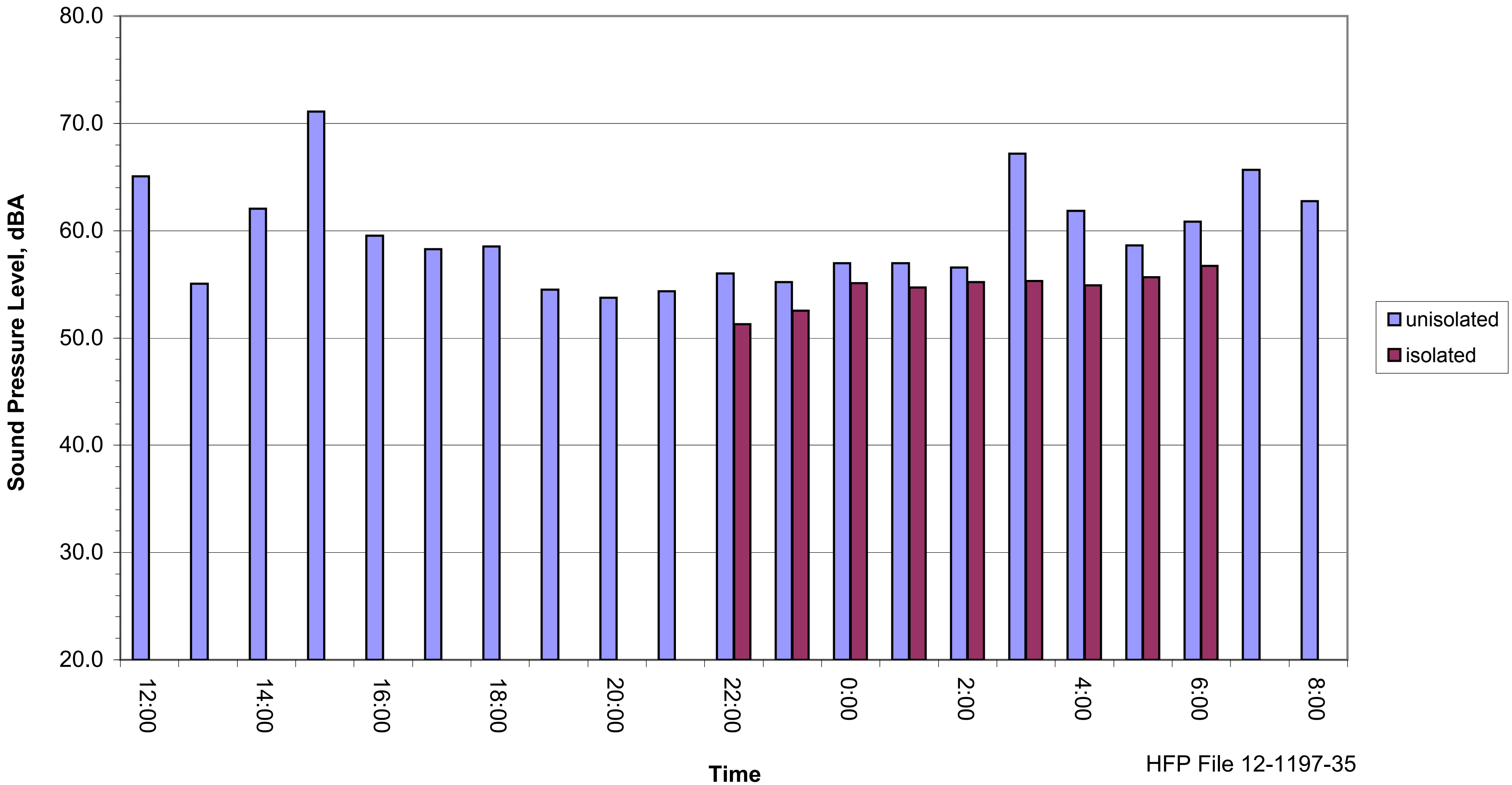

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Table 7
Shell Canada Limited
Scotford Complex
Monitored Hourly Leq Sound Levels
Location 07, July 5-6, 2012

Time Start Hour	Measured Sound Level (dBA Leq)	Measured Sound Level (dBC Leq)	Isolated Sound Level (dBA Leq)	Isolated Sound Level (dBC Leq)	Valid # of Minutes
12:00	55.7	73.1			
13:00	56.4	74.8			
14:00	58.6	76.6			
15:00	59.8	78.3			
16:00	61.6	77.6			
17:00	60.9	78.6			
18:00	58.1	78.1			
19:00	54.7	73.4			
20:00	53.8	72.1			
21:00	53.2	72.3			
22:00	54.1	72.7	52.6	72.7	60
23:00	56.1	73.6	55.1	73.6	60
0:00	58.1	74.7	57.5	74.7	60
1:00	56.7	73.3	55.6	73.3	60
2:00	59.0	75.8	58.0	75.8	60
3:00	58.6	75.2	57.6	75.2	60
4:00	58.2	74.5	57.2	74.5	60
5:00	58.9	74.4	57.1	74.4	60
6:00	58.9	74.7	57.4	74.7	60
7:00	57.3	75.5			
8:00	57.6	74.8			
12 hour daytime Leq:	58.1	76.1			
9 hour nighttime Leq:	57.9	74.4			
9.0 hour isolated nighttime Leq:			56.7	74.4	

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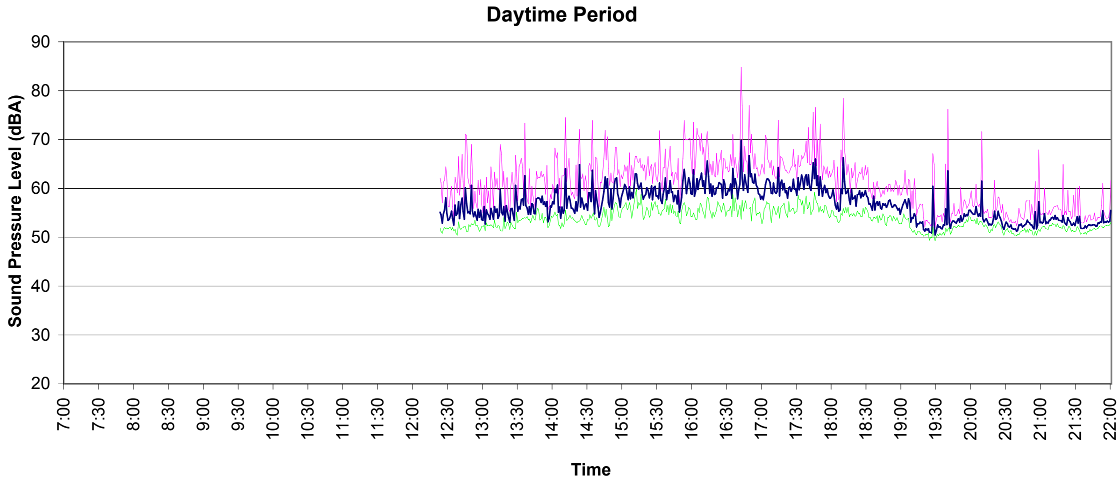
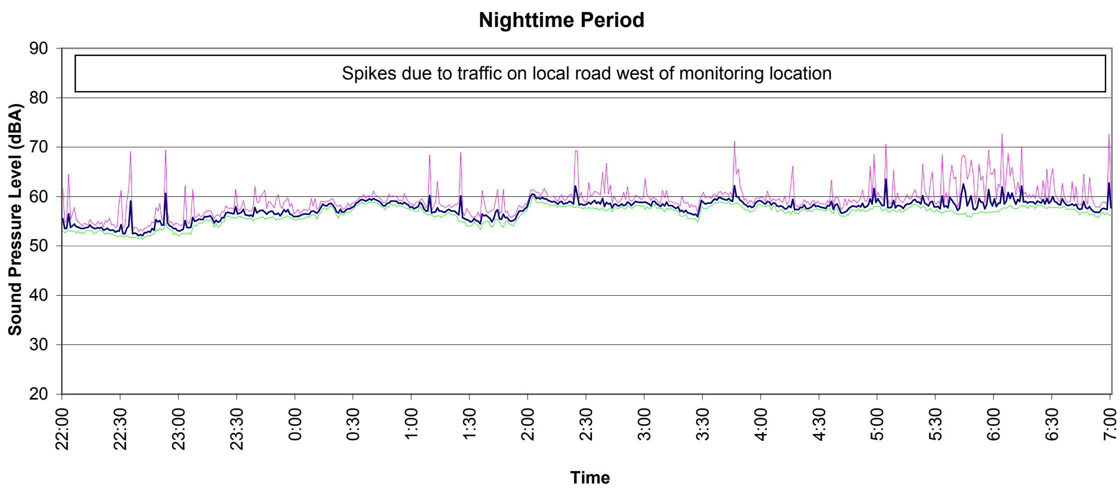
Figure 7a
Shell Canada Limited
Scotford Complex
Monitored One-Minute Leq Sound Values
Location 07, July 5-6, 2012





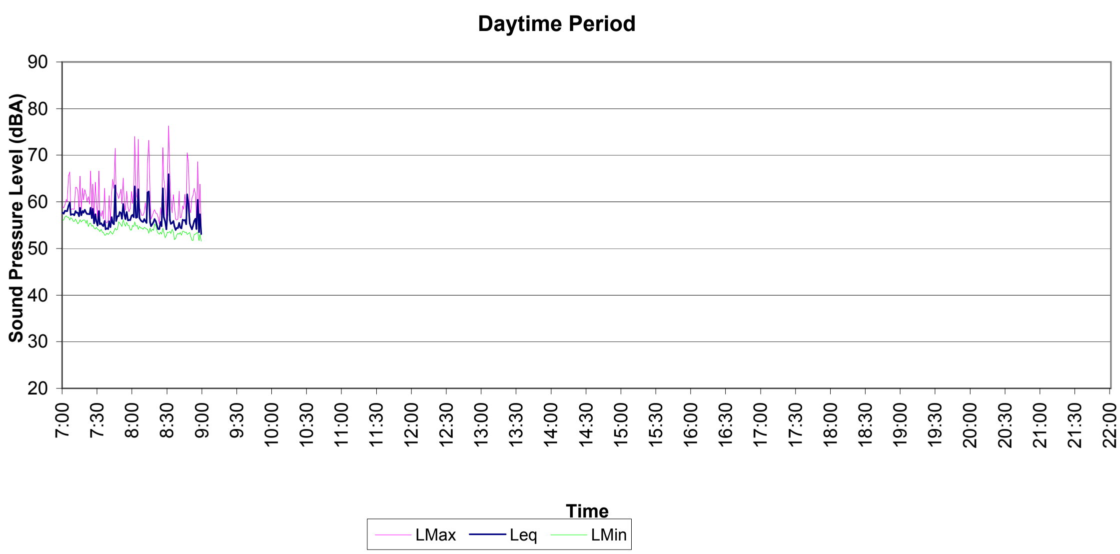


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Figure 7b
Shell Canada Limited
Scotford Complex
One-Hour Measured Values
Location 07, July 5-6, 2012

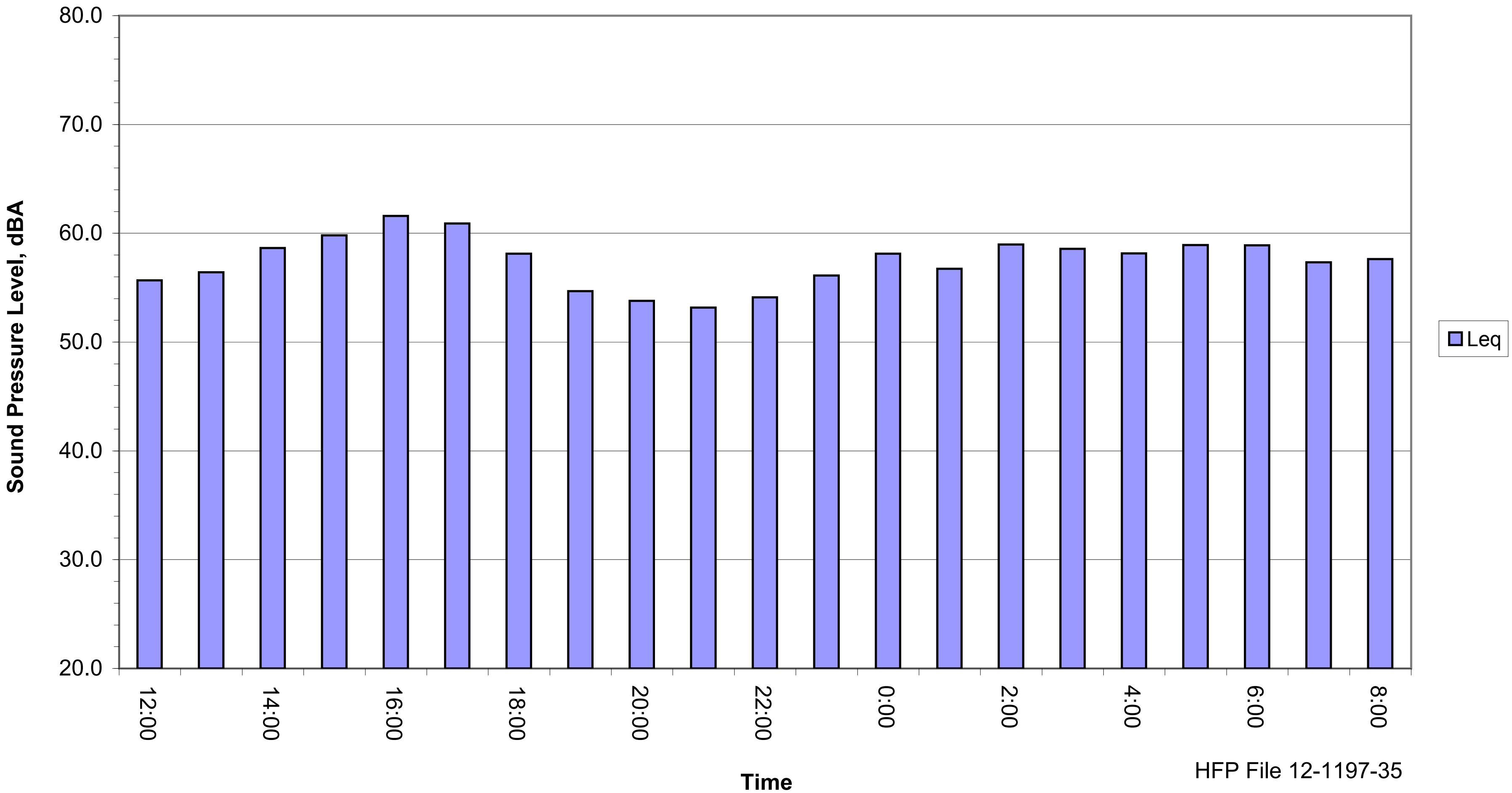

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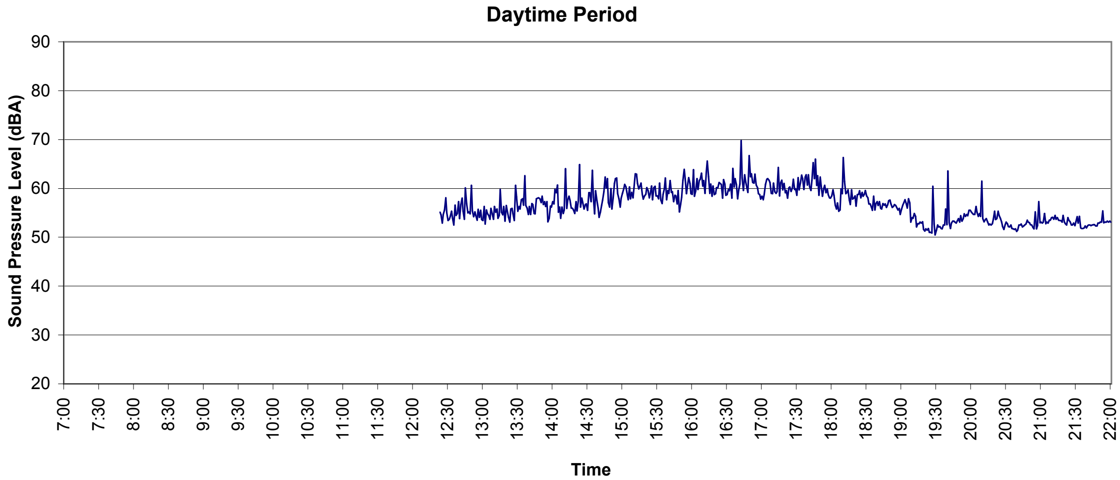
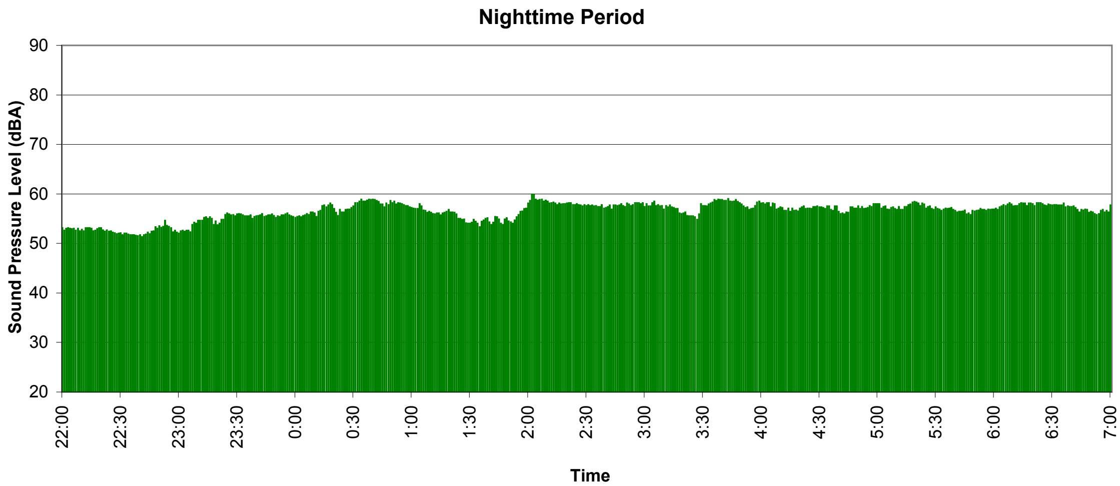
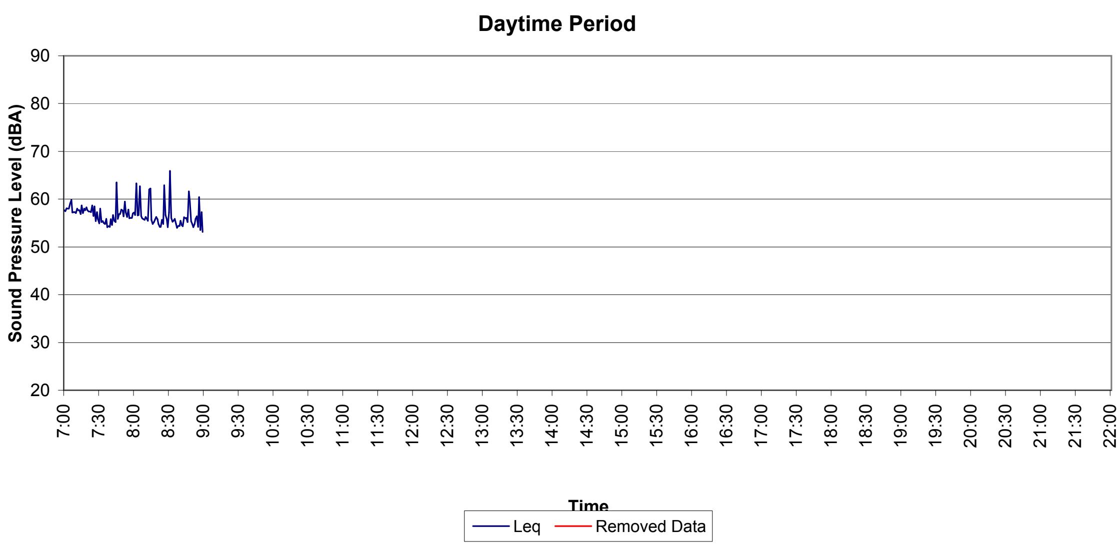
Figure 7c
Shell Canada Limited
Scotford Complex
Isolated One-Minute Leq Sound Values
Location 07, July 5-6, 2012







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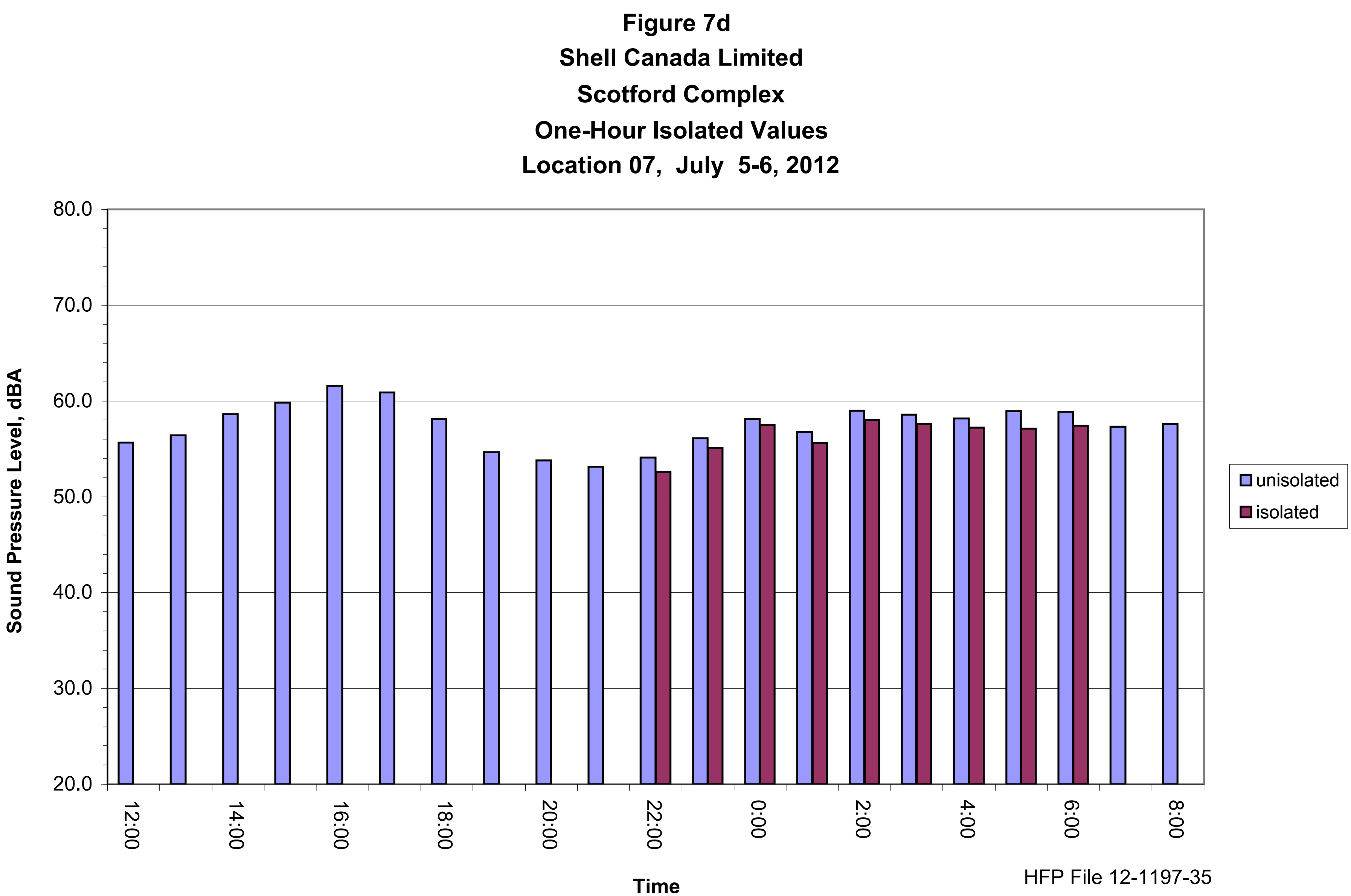
Figure 7d
Shell Canada Limited
Scotford Complex
One-Hour Isolated Values
Location 07, July 5-6, 2012
Sound Pressure Level, dBA
80.0
70.0
60.0
50.0
40.0
30.0
20.0
12:00
14:00
16:00
18:00
20:00
22:00
0:00
2:00
4:00
6:00
8:00
Time
unisolated
isolated
HFP File 12-1197-35

Table 8
Shell Canada Limited
Scotford Complex
Monitored Hourly Leq Sound Levels
Location 08, July 5-6, 2012

Time Start Hour	Measured Sound Level (dBA Leq)	Measured Sound Level (dBC Leq)	Isolated Sound Level (dBA Leq)	Isolated Sound Level (dBC Leq)	Valid # of Minutes
16:00	68.2	79.7			
17:00	62.4	77.6			
18:00	60.3	77.7			
19:00	59.5	77.2			
20:00	59.7	77.1			
21:00	59.7	77.0			
22:00	58.6	76.7			0
23:00	58.9	76.6			0
0:00	59.1	76.9			0
1:00	60.2	77.7			0
2:00	55.2	69.9	46.2	69.4	35
3:00	47.5	67.9	46.0	67.9	60
4:00	50.8	67.8	45.0	67.8	60
5:00	61.2	70.6	44.3	70.6	60
6:00	58.9	69.0	47.8	69.0	60
7:00	60.6	73.0			
8:00	64.8	77.8			
8 hour daytime Leq:	62.5	77.3			
9 hour nighttime Leq:	58.2	74.3			
4.6 hour isolated nighttime Leq:			46.0	69.0	

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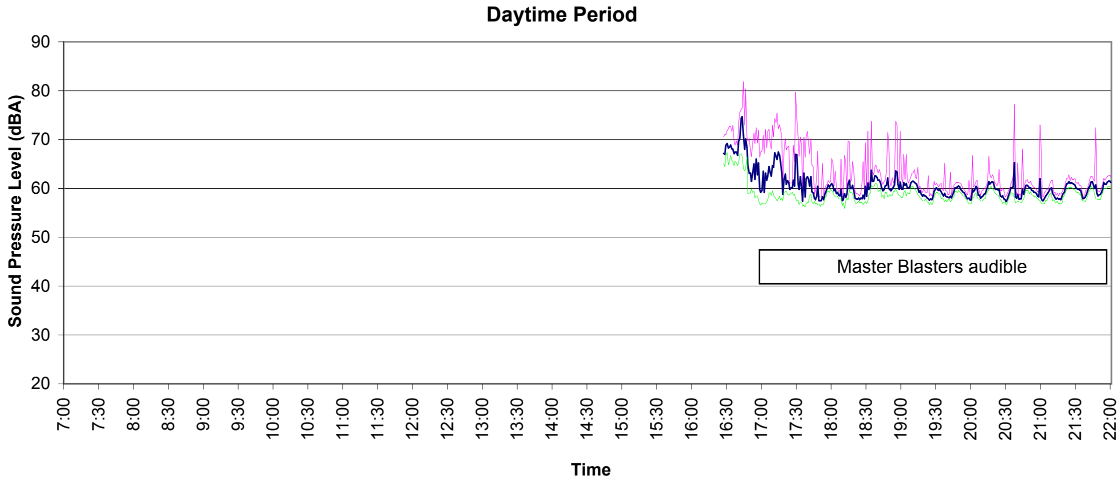
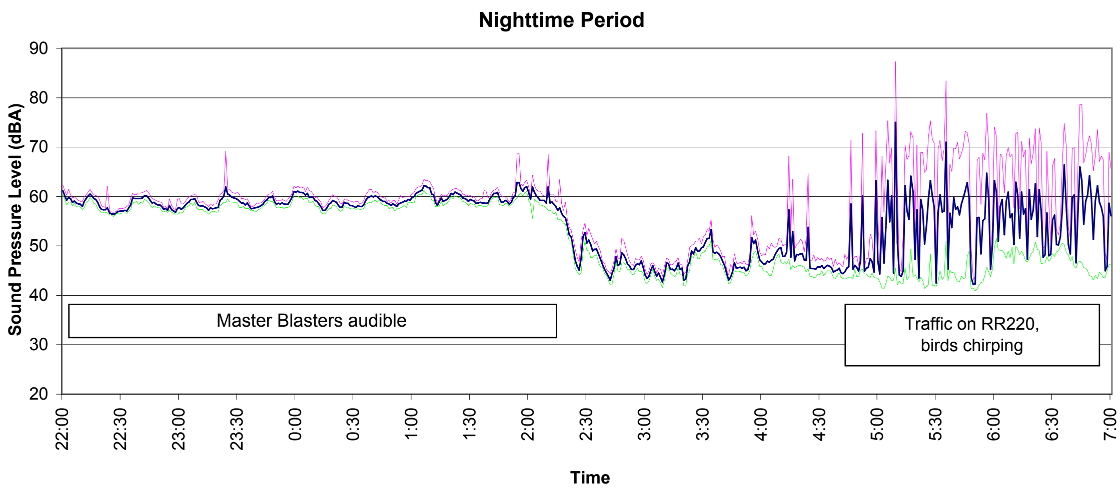
Figure 8a
Shell Canada Limited
Scotford Complex
Monitored One-Minute Leq Sound Values
Location 08, July 5-6, 2012





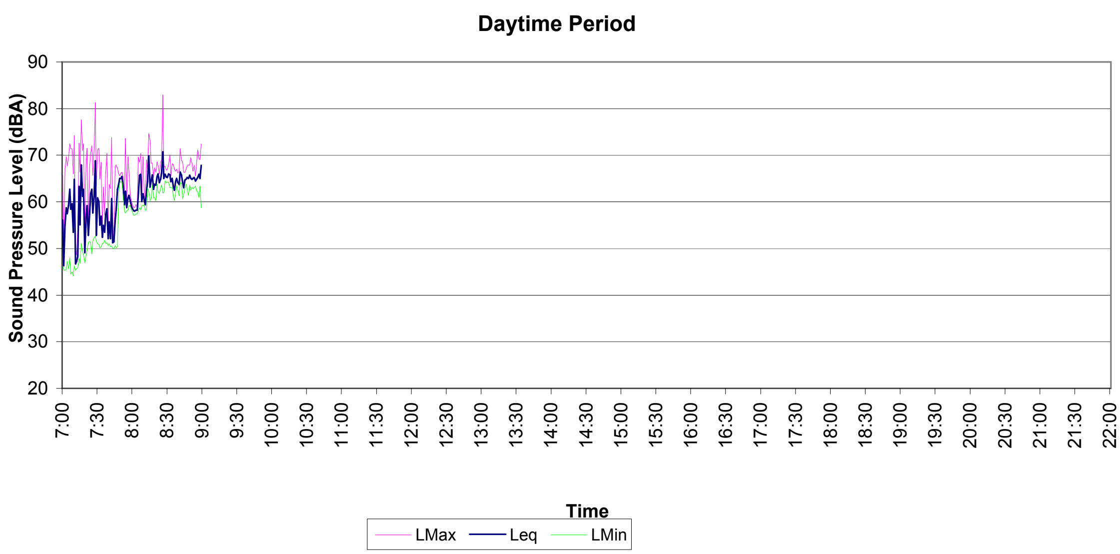


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Figure 8b
Shell Canada Limited
Scotford Complex
One-Hour Measured Values
Location 08, July 5-6, 2012

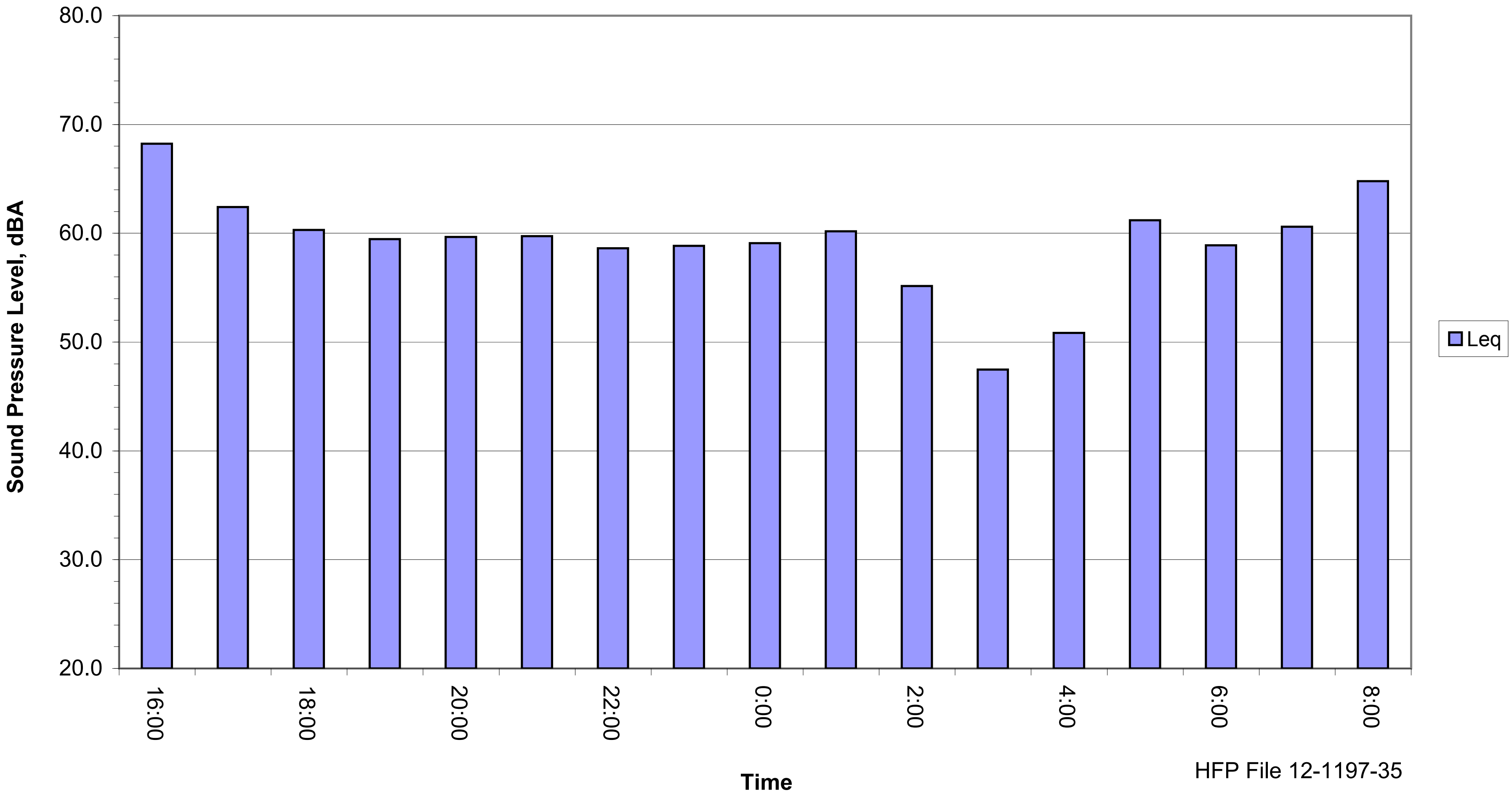

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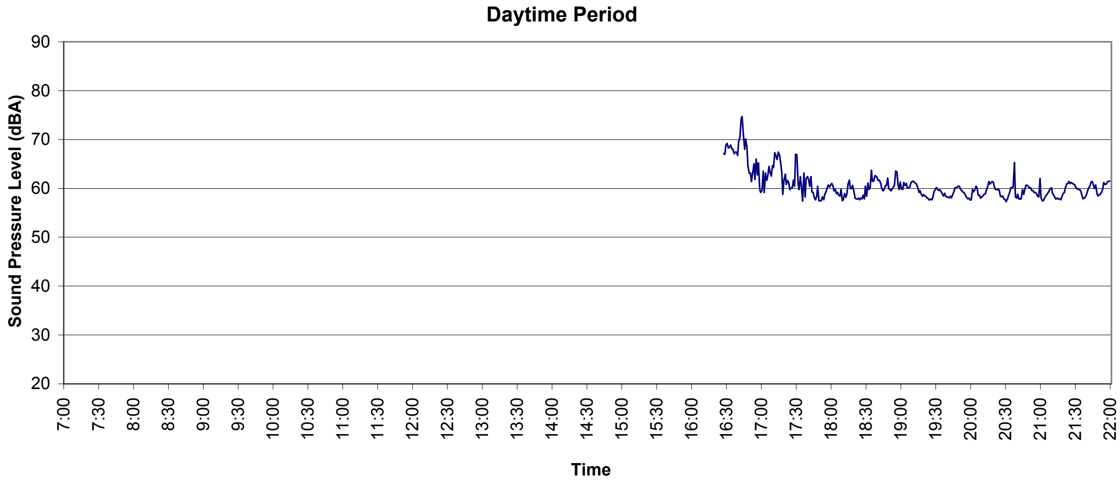
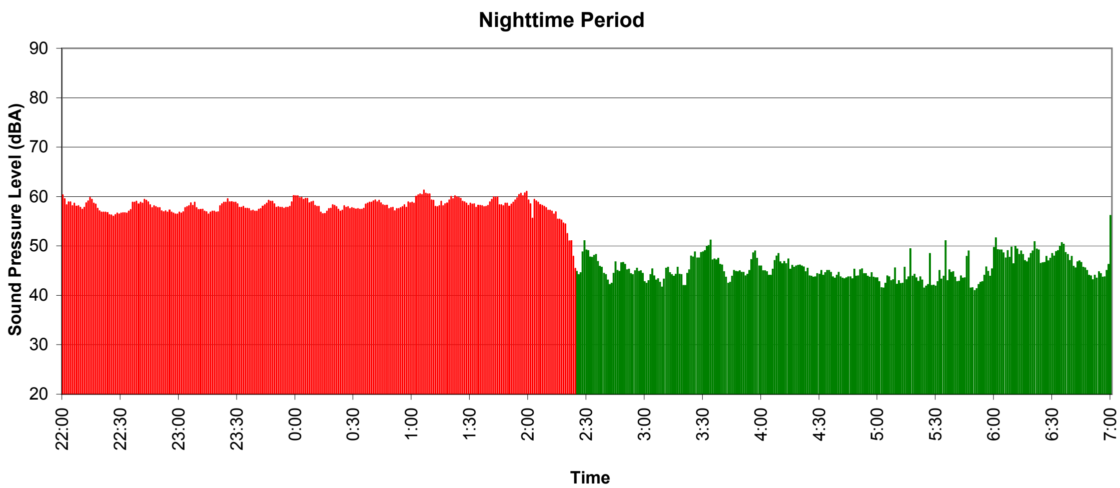
Figure 8c
Shell Canada Limited
Scotford Complex
Isolated One-Minute Leq Sound Values
Location 08, July 5-6, 2012





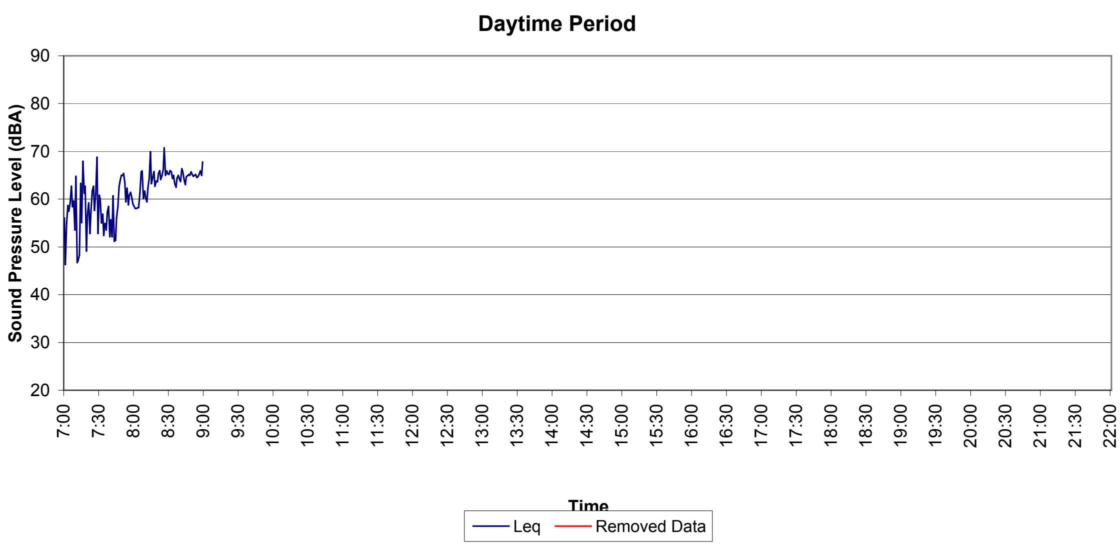
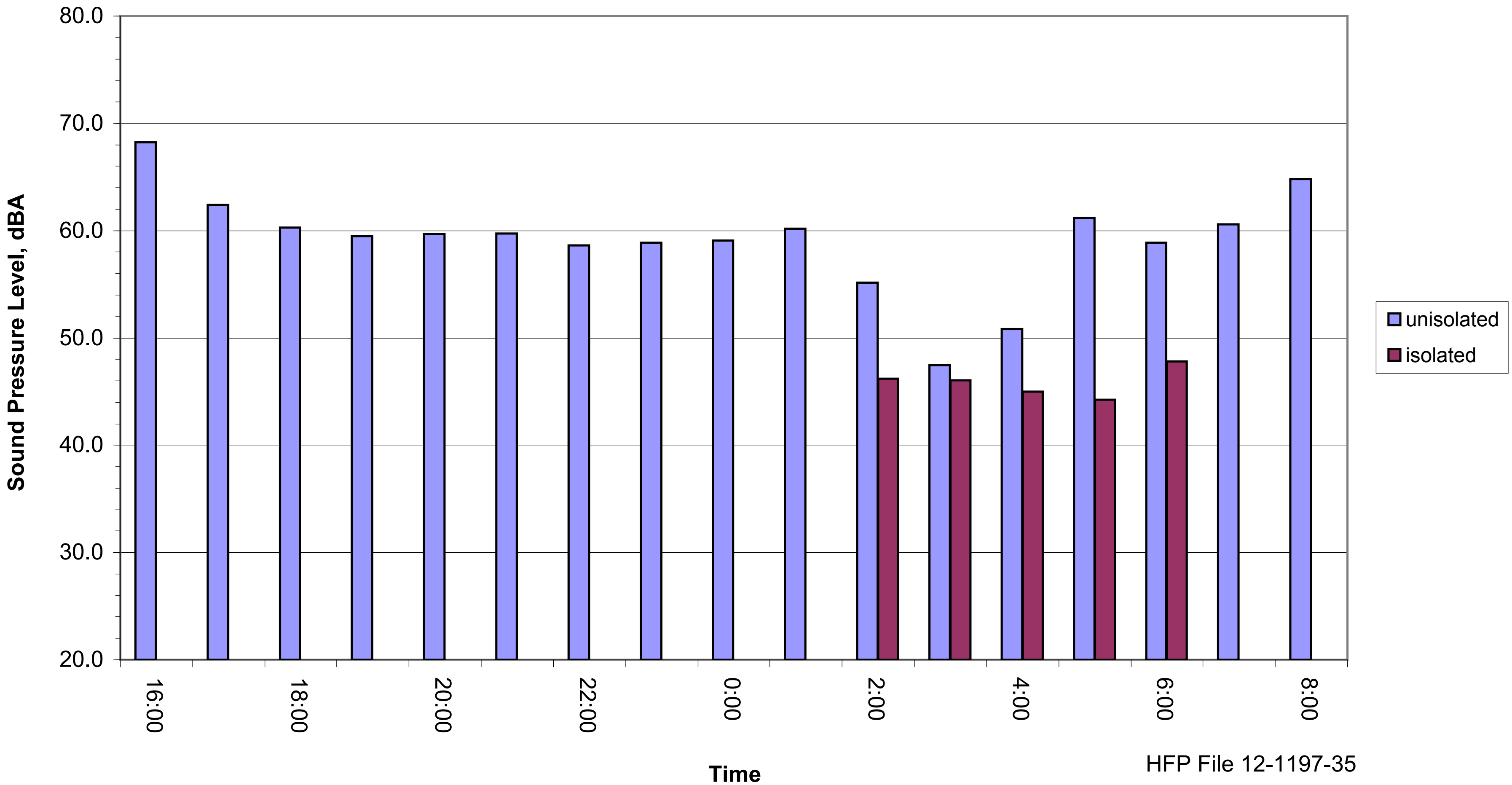


Figure 8d
Shell Canada Limited
Scotford Complex
One-Hour Isolated Values
Location 08, July 5-6, 2012



HFP File 12-1197-35

APPENDIX A
RECORD OF CALIBRATION RESULTS

HFP File: 12-1197-35

Equipment Model	Equipment Serial No.	Calibrator Model	Calibrator Serial No.	Calibration Level (dBA)	Date DD/MM/YY	Time	Calibrated By (Initials)	Notes
Larson Davis 824	A0298	Larson Davis LD 200	6861	93.9	05/07/12	12:19	RW	Pre-Calibration
Larson Davis 824	A0298	Larson Davis LD 200	6861	94.0	06/07/12	09:46	RW	Post-Calibration
Larson Davis 824	A0301	Larson Davis LD 200	6861	93.9	05/07/12	07:41	RW	Pre-Calibration
Larson Davis 824	A0301	Larson Davis LD 200	6861	94.1	06/07/12	10:04	RW	Post-Calibration
Larson Davis 824	A0342	Larson Davis LD 200	6861	94.0	05/07/12	16:21	RW	Pre-Calibration
Larson Davis 824	A0342	Larson Davis LD 200	6861	94.0	06/07/12	10:20	RW	Post-Calibration
Larson Davis 824	A0404	Larson Davis LD 200	6861	93.9	05/07/12	08:39	RW	Pre-Calibration
Larson Davis 824	A0404	Larson Davis LD 200	6861	93.8	06/07/12	10:38	RW	Post-Calibration
Larson Davis 824	A0412	Larson Davis LD 200	6861	94.0	05/07/12	10:53	RW	Pre-Calibration
Larson Davis 824	A0412	Larson Davis LD 200	6861	94.2	06/07/12	09:19	RW	Post-Calibration
Larson Davis 824	A0606	Larson Davis LD 200	6861	94.0	05/07/12	08:13	RW	Pre-Calibration
Larson Davis 824	A0606	Larson Davis LD 200	6861	94.1	06/07/12	10:28	RW	Post-Calibration

Equipment Model	Equipment Serial No.	Calibrator Model	Calibrator Serial No.	Calibration Level (dBA)	Date DD/MM/YY	Time	Calibrated By (Initials)	Notes
Larson Davis 824	A0970	Larson Davis LD 200	6861	93.9	05/07/12	07:05	RW	Pre-Calibration
Larson Davis 824	A0970	Larson Davis LD 200	6861	94.1	06/07/12	09:03	RW	Post-Calibration
Larson Davis 824	A1093	Larson Davis LD 200	6861	94.0	05/07/12	11:29	RW	Pre-Calibration
Larson Davis 824	A1093	Larson Davis LD 200	6861	93.8	06/07/12	09:37	RW	Post-Calibration

APPENDIX B
WEATHER DATA

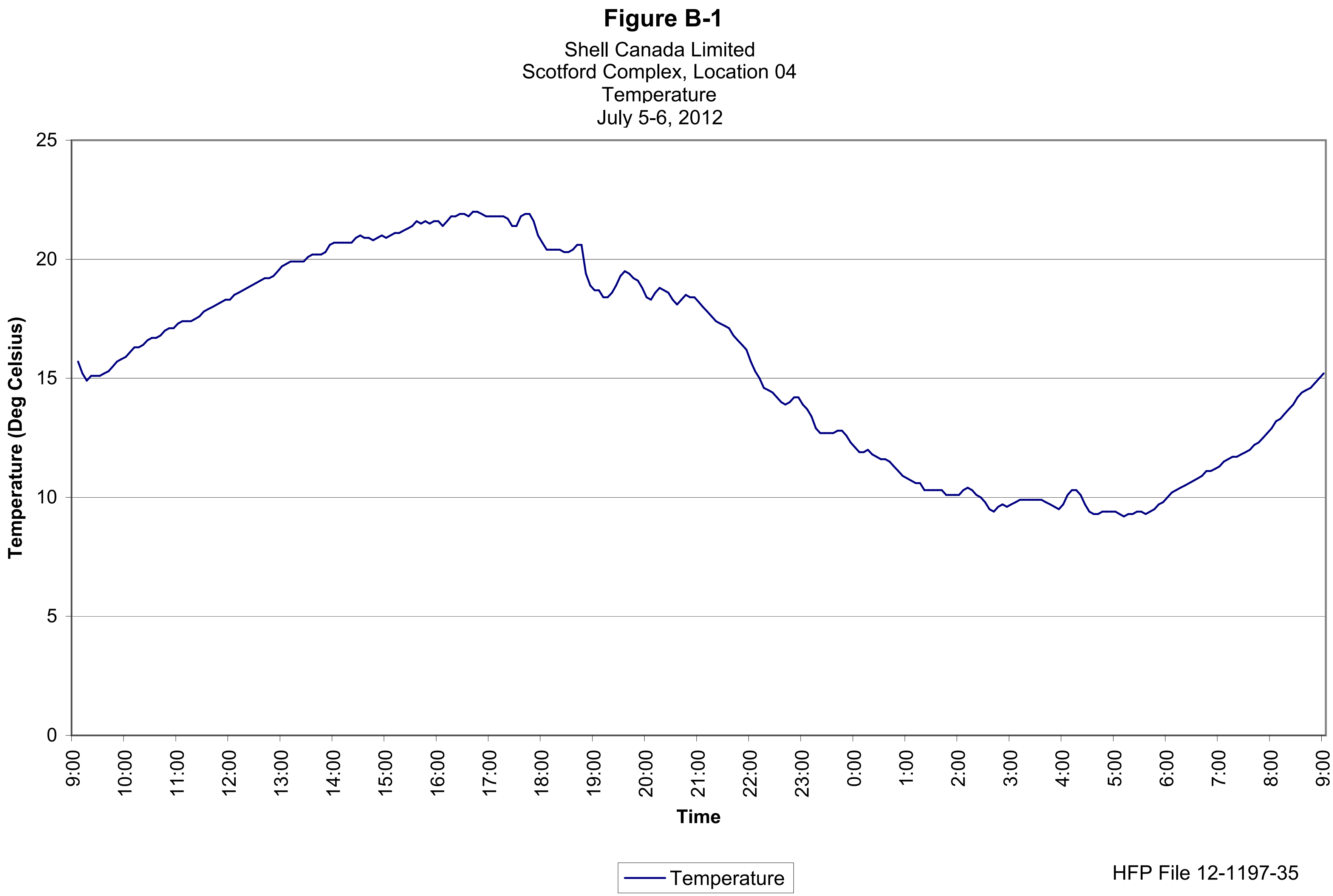
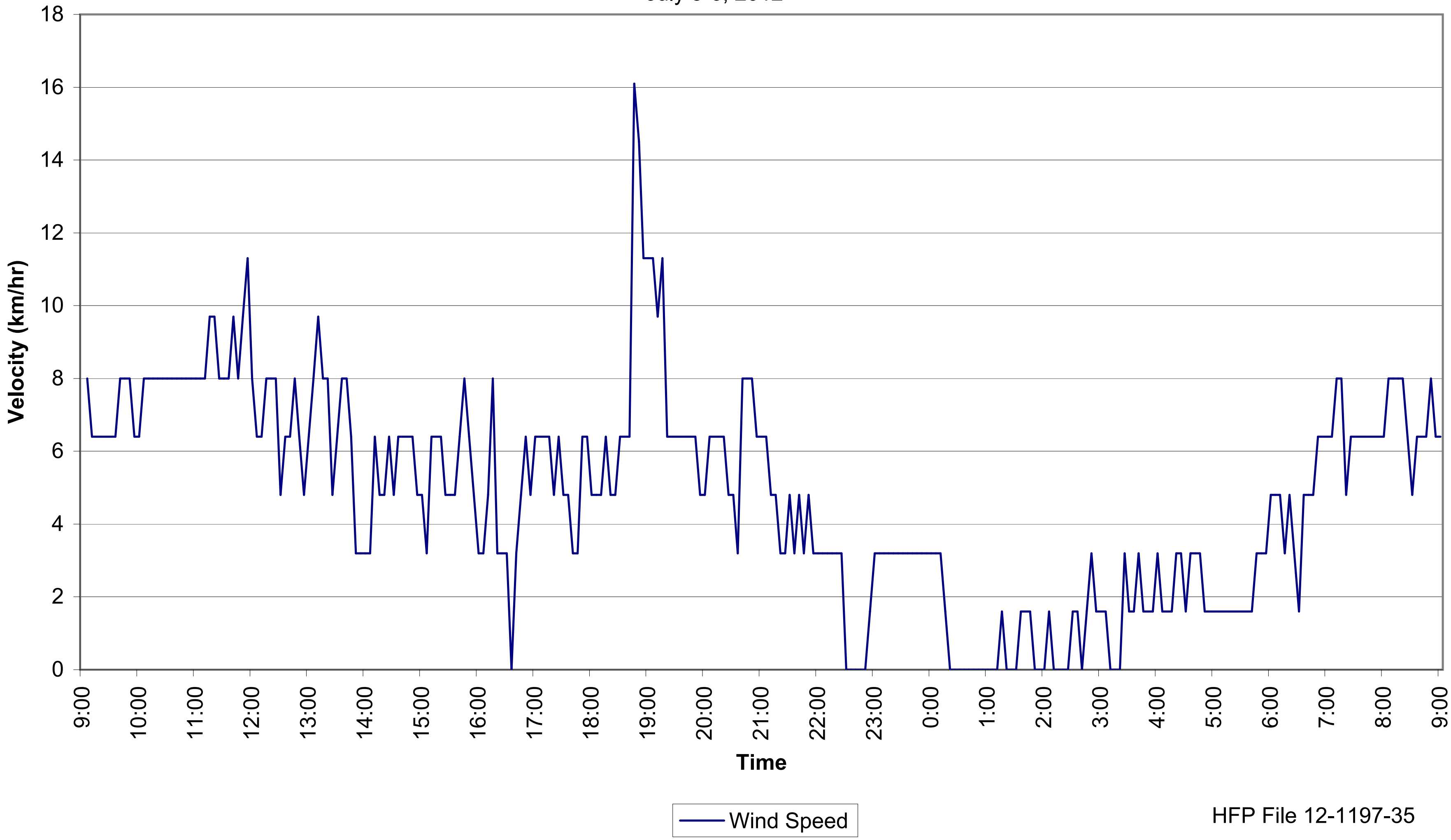


Figure B-1
Shell Canada Limited
Scotford Complex, Location 04
Temperature
July 5-6, 2012
Temperature (Deg Celsius)
0
5
10
15
20
25
9:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
0:00
1:00
2:00
3:00
4:00
5:00
6:00
7:00
8:00
9:00
Time
Temperature
HFP File 12-1197-35

Figure B-2

Shell Canada Limited
Scotford Complex, Location 04
Wind Speed
July 5-6, 2012



HFP File 12-1197-35

Figure B-3

Shell Canada Limited
Scotford Complex, Location 04
Wind Direction
July 5-6, 2012

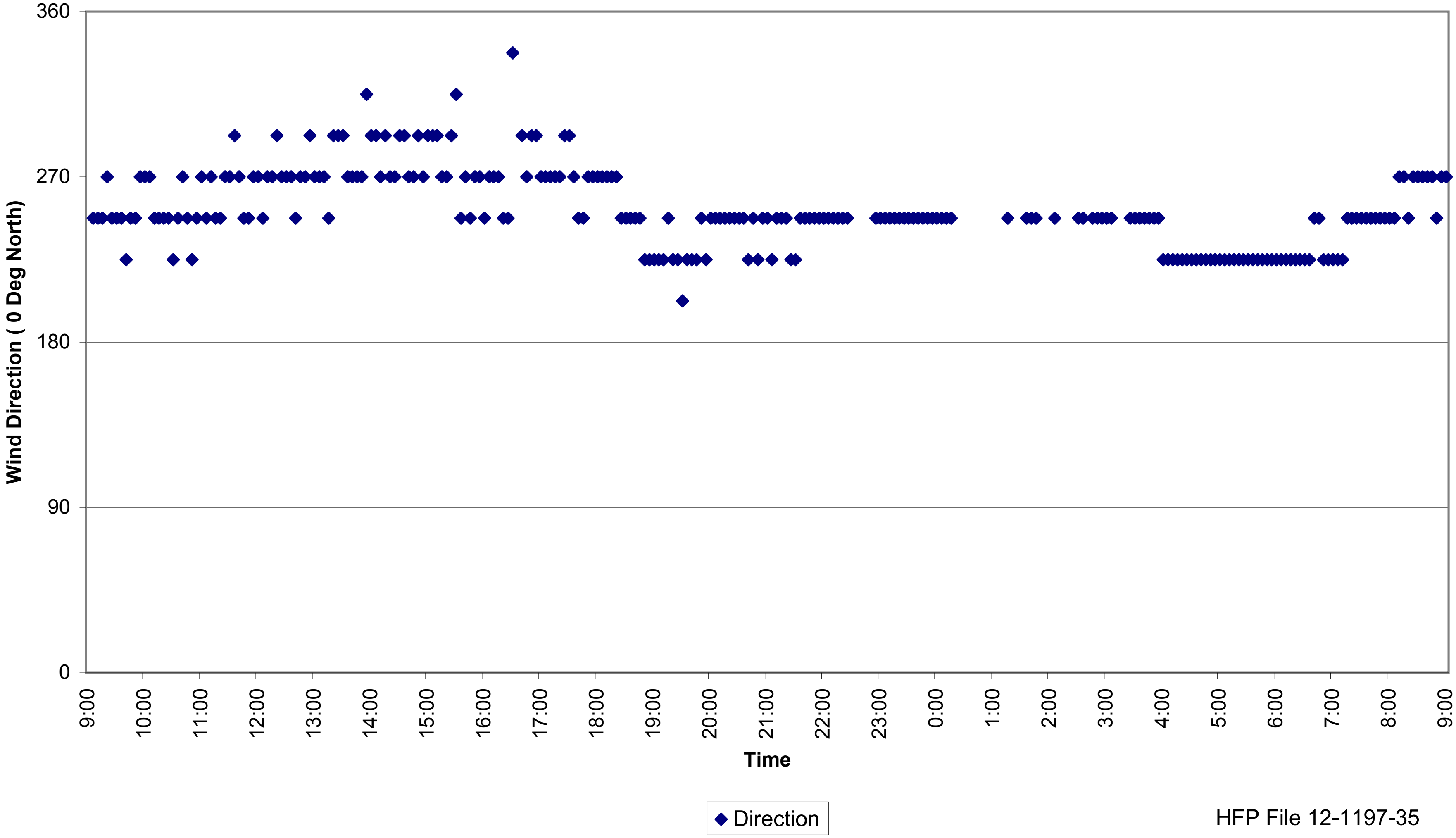


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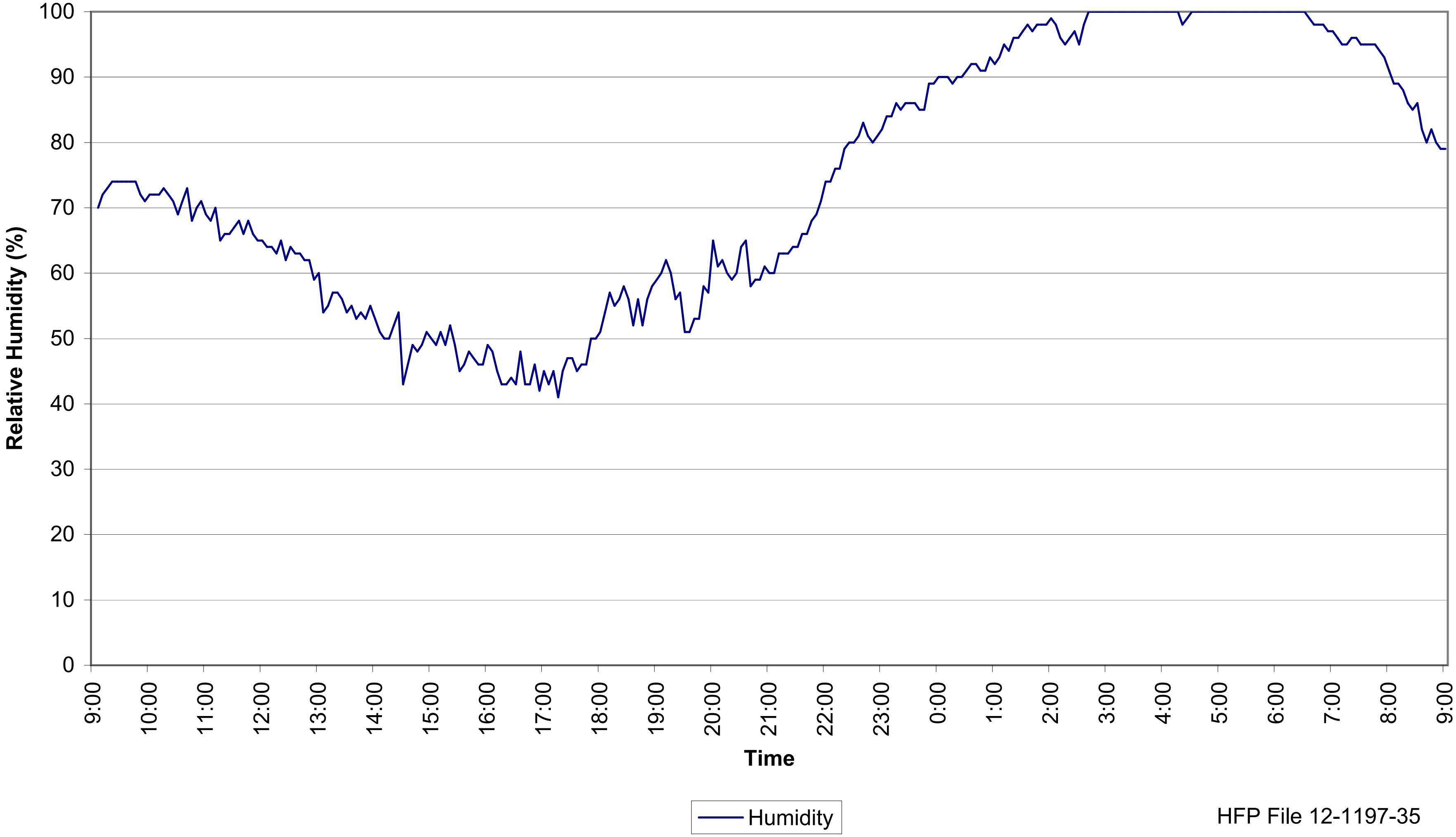
Figure B-4

Shell Canada Limited
Scotford Complex, Location 04
Humidity
July 5-6, 2012



HFP File 12-1197-35

APPENDIX C
SCOTFORD COMPLEX OPERATING CONDITIONS

Shell Scotford Upgrader Site Noise Management Plan

Document Review and Approval		
Reviewed By		
Doug Loree		
Kelly Wietzel		
Sean Michaelchuk		
Chris Calef		
Penny Salmon		
APPROVED BY	**DATE**	**SIGNATURE**

Version 1

16-June-2012

Scotford Upgrader	**Area: Noise Monitoring**	Document Number: SUG.HSSE.ENV.AIR.NOIS.M.002
	Title: Shell Scotford Upgrader Site Noise Management Plan	Rev No: 1 Date: Jun-16-12
Document Owner: Environment Manager	Document Focal: Noise Focal	

CONTENTS

Scotford Upgrader	**Area: Noise Monitoring**	Document Number: SUG.HSSE.ENV.AIR.NOIS.M.002
	Title: Shell Scotford Upgrader Site Noise Management Plan	Rev No: 1 Date: Jun-16-12

Document Owner: Environment Manager	Document Focal: Noise Focal

1 POLICY

Royal Dutch Shell's Commitment and Policy on Health, Security, Safety, the Environment and Social Performance demonstrates commitment for reducing environmental and social impacts resulting from our operations. For Shell Scotford Upgrader (Upgrader), noise is actively managed by instituting controls, and measures up front when designing or changing parts of the process that generate noise, and by also measuring and monitoring to ensure controls are effective. This Site Noise Management Plan is part of the Upgrader's ongoing commitment to the environment, our neighbours, and social performance. The Upgrader Leadership Team is committed to controlling noise and supports the contents of this Site Noise Management Plan.

2 NOISE MANAGEMENT PROGRAM

2.1 Goals and Objectives

2.1.1 Regulatory Compliance

Noise is regulated by the Alberta Energy and Resources Conservation Board (ERCB), Directive 038, "Noise Control Directive – User Guide" and applies to all facilities where the ERCB has issued a permit to operate. Section 5.1 of the Noise Control Directive states,

> "A facility is in compliance if a CSL (comprehensive sound level) survey conducted at representative conditions has results equal to or lower than the established PSL (permissible sound level), taking into consideration any LFN (low frequency noise). Alternatively, if the ERCB agrees that a CSL survey is not practical, a detailed Noise Management Plan (NMP) approved by the ERCB may be used."

The Industrial Heartland is considered an area where a CSL survey is not practical 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 mandated to participate in the Regional Noise Management Plan 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,
- performance effectiveness of noise control devices,
- methods of noise measurement,
- best practices programs, and
- continuous improvement programs

Compliance with D-38 is to be demonstrated through conformance with the RNMP on the basis of due diligence for noise control (taking all reasonable steps to reduce a given impact). Key expectations with respect to compliance are as follows:

1. Conformance with individual facility programs – implementing best practices in monitoring, abatement, self audit, annual reporting and other program details.
2. Complaint Resolution – partnership with regulator to determine adequate resources to manage complaints to a "workable resolution".
3. Readiness for potential management system (Site NMP) audit – similar to other regulated activities under current monitoring and enforcement rules.
4. Participation in development and maintenance of a Regional Noise Model – the model provides a baseline for industrial noise and allows for an empirical assessment of potential problem area and sources.
5. Tracking noise management initiatives and providing an annual status to NCIA to facilitate a comprehensive annual report to the ERCB.

Companies that do not demonstrate conformance with the plan would default to Permissible Sound Level (PSL) compliance under Directive 038.

2.1.2 Noise Control Objectives

Shell recognizes that it is not practical or possible to eliminate all sources of noise. However, it is expected that wherever possible, noise control practices and mitigation will be in place to minimize noise, for example, maintaining a noise standard when procuring new equipment or taking into consideration possible noise impacts when instituting plant process changes. It also includes how Shell operates including employing the use of silencers and mufflers, or simply keeping doors on buildings closed.

Shell takes a proactive approach for activities that could have an environmental impact such as noise. When planning work that could generate excessive noise, such as boiler blow downs or flaring for example, it is important to assess the community impact and communicate with stakeholders as required. It is also Shell's approach to avoid practices that create excessive noise during evening hours and weekends whenever possible.

If despite proactive measures a resident expresses concern that they are impacted by plant operation, Shell will immediately initiate a complaint protocol and work in collaboration with the resident to attain resolution.

2.1.3 Continuous Improvement and Best Practices

For Shell, continuous improvement from a noise perspective means to examine noise sources to discover and eliminate problems. Examination of noise sources is accomplished through Industrial Hygiene (IH) noise surveys, noise modelling, and offsite noise surveys. When any of these tools identifies a potential unacceptable noise level, mitigation plans are implemented.

Shell stays current by attending the bi-annual noise conference (hosted by the Alberta Acoustics & Noise Association) and having active representation on the NCIA Noise Best Practices Sub-committee. In the way Shell will be aware of the latest technology and advancements in the noise field and institute best practices accordingly.

2.1.4 Facility Communication Strategies

Where noise has been identified as a potential issue with the community, Shell will notify stakeholders in advance of the activity by utilizing the NRCAER line.

If a noise concern is received from a stakeholder, then SDP11021 Public Concern Response Practice is activated and followed. All relevant information is entered in SDF11021 Public Concern Form along with an incident report being entered into FIM (Fountain Incident Management).

2.2 Roles and Responsibilities

Department or Title	Roles
Community Affairs	• Notification to neighbours for planned activities. • Reactive communications to neighbours concern. • Monitor operations response to public concern.
Shift Supervisor or Designate	• Initiate investigation for public concern for operating units • Perform fence-line noise surveys. • If required follow-up with concern in off-hours (PA during normal hours).
Environment Dept	• Support to Operations for investigation of noise concern, conducting fence-line noise surveys & regulatory notifications. • Data analysis and external noise surveys. • Maintain site noise model.
Industrial Hygiene	• Primary support for onsite noise monitoring.
Security	• Initial contact for public concern.

2.3 Monitoring and Measuring

2.3.1 Fenceline Monitoring

When a public concern is received and the Public Concern Response Practice is activated, as stated in 2.1.4, or activities on site create the need to monitor noise levels, fenceline noise measurements are conducted.

Fenceline measurements are conducted as per SUG.HSSE.ENV.NOIS.P.001 Noise Sampling Practice and results are recorded on SUG.HSSE.ENV.NOIS.TO.001 Fenceline Noise Monitoring Form.

If the need arises for any other type of noise monitoring, a request can be submitted through SUG.HSSE.ENV.NOIS.TO.002 Request for Non-Routine Noise Sampling.

2.3.2 Industrial Hygiene (IH) Surveys

IH Surveys are done on a request basis, or at a minimum a unit noise survey is conducted every 4 years. All results and reports are stored in Livelink.

Shell is regulated under the Alberta OH&S Code and participates in the Hearing Conversation Program set forth in the code. IH is responsible to ensure that workers get noise dosimeter testing done every 2 years as part of this program.

2.3.3 Noise Modelling

A detailed noise model was developed for the Shell Scotford Upgrader in 2006 and can be viewed here 2006 Noise Model. The model identifies all noise sources within the base Upgrader.

The Upgrader Expansion started operations in June 2011. It is Shell's intent to update the original 2006 Model to include the Expansion facilities, and to identify any changes to the existing Base plant, by the end of 2013.

2.3.4 Routine Monitoring

There is currently no routine monitoring being done at the Shell Scotford Upgrader, due to the fact there has not been a residence complaint since 2004 and the results of the 2005 Noise Model demonstrated satisfactory offsite noise levels.

An offsite noise survey of the Shell facilities will be completed in 2012 to determine the offsite CSL's post Expansion project start up.

The results of this survey along with the information obtained from the upcoming model will determine what, if any, routine monitoring will be conducted.

2.4 Noise Control

Proactively ensuring mitigative measures and controls are considered in order to minimize the impact of noise when implementing facility design changes or purchasing new equipment is a key principle of noise control. When implementing a change at Shell Scotford, whether it's new equipment or a modification to existing equipment, the MOC (Management of Change) process must be followed. Shell's definition of a plant change can be found in MOC-C01 Definition of Plant Change.

The Management of Change Quality Assurance Manual describes the work process for all managed changes to plants within the Shell Scotford Upgrader. Any change that may increase noise as per SUG.CON.MOC.G.001 Environmental Guideline for Noise Producing Equipment.needs to be reviewed and signed off by by both the Environment department and Industrial Hygiene as per MOC-C03 Discipline Review Parties Matrix.

3 AUDIT/SELF ASSESSMENT

Noise is included in the scope of ongoing ISO 14001 audits and the HSSE MS internal audits under social performance. Audit findings are recorded in Fountain Assurance Management (FAM) with related action items assigned to individuals. Audit findings are reviewed by Upgrader Leadership Team.

An internal audit specific to the Site NMP against the NCIA Standards and Guidelines will be done every 3 years.

Audit results and findings will be included in the annual summary to NCIA to be included in the NCIA Annual Noise Report to ERCB.

4 REPORTING

All routine sampling results, non-routine sampling results, monitoring surveys, and modelling results are stored in Shell's Livelink system.

Shell has the responsibility to provide input into the Annual Regional Noise Management Plan report, which is submitted to the ERCB by NCIA. Information to be provided is as follows:

- Confirmation that site has implemented a best management practice to address environmental noise as per NCIA Noise Management Plan Standard 2010-001 issued 3-Sep-10.
- Procedure/Practice/Standard reference (i.e. SOP-AG-RW-200-002)
- Results of any monitoring/assessments (fenceline outward) completed in the reporting year.
- Improvements implemented for the reporting year.
- Changes that have resulted in increased noise levels on your site for the year reporting on.
- Noise Complaints received and follow up actions taken to address them.
- Planned improvements to noise management practice, noise abatement work or noise model work for the upcoming year.

sherritt

April 8, 2013

TO: NCIA

MEMORANDUM
H&S Department

Re: Sherritt/Corefco Noise Management Report

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, we will fall within the requirements of these regulations and strive for continuous improvement within our facility.

Sherritt International Noise Management Plan

A policy has been implemented for Noise Management (FSSMP001-021) on the Sherritt site. The noise management plan meets the requirements that are outlined by the NCIA.

Occupational Noise Studies

A plant wide occupational noise assessment was performed and compared to the 2007 noise levels in the operating units. Overall, the noise in the operating units decreased, on average, by 1 dBA

Environmental Noise Studies (fence line outward)

Previous Environmental noise studies have been conducted in 1997, 1999 and 2005 by third party consultants.

An update to the Environmental noise model was completed in October of 2011 to ensure compliance and assess changes in our operations. The model updated with fence line locations for future reference points and will be included in the Regional Noise Model.

This model showed a decrease in the noise production from the facility since 2005.

Improvements/corrective actions

An area building noise survey was conducted indicated that there was an over all reduction of 1 to 5 dBA for the operating units.

Noise Complaint's

There were no noise complaints for the 2012 year.

Planned Work

Continual updating of plant noise maps will continue as well as monitoring of new installations of equipment. 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

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** **5-Mar-13**	**Rev.** **1**

Sulzer Metco (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 2010-002 issued 3-Sep-10, revised 5-Mar-13 (attached), including the Procedure/Practice/Standard reference.	MSP2-3, *Occupational Health and Personal Safety*
Attach results of any monitoring/assessments (fenceline outward) completed in 2012.	None in 2012
Disclose any improvements/corrective actions implemented in 2012 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.	No improvements or corrective actions implemented
Disclose any improvements/projects that are planned for 2013 that would impact the noise level output for your site (either up or down); including any updates to your site noise model.	None planned 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 conducted in 2012
Provide a Noise Complaint summary for all noise complaints received in 2012 including any actions taken to address them.	No noise complaints received in 2012

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>NCIA Northeast Capital Industrial Association</td><td>NCIA Standards and Guidelines</td><td colspan="2">Document Number
2010-002</td></tr>
<tr><td colspan="2">Noise Management Plan Reporting Requirements as per Section 5.4 of this Standard</td><td>Rev. Date
5-Mar-13</td><td>Rev.
1</td></tr>
</table>

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 2010-002 issued 3-Sep-10, revised 5-Mar-13 (attached), including the Procedure/Practice/Standard reference.	Code of Practice (COP-323-7) Noise Exposure Management Plan included in the 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 2012.	Not applicable – noise monitoring conducted inside the plant from an industrial hygiene perspective
Disclose any improvements/corrective actions implemented in 2012 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.	Management of Change (MOC) program includes elements to identify potential changes/ impacts with respect to noise exposure. Noise monitoring was conducted following installation of new screening equipment – did not result in any changes to noise levels
Disclose any improvements/projects that are planned for 2013 that would impact the noise level output for your site (either up or down); including any updates to your site noise model.	Planning on removing process screening equipment in 2013 – should reduce noise levels from an industrial hygiene perspective.
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 industry hygiene perspective. Internal audits are conducted annually on the environmental components/programs of the Management System as per ISO14001.
Provide a Noise Complaint summary for all noise complaints received in 2012 including any actions taken to address them.	Did not receive any noise complaints in 2012

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.

Annual Noise Management Program Evaluation

	Yes	No
A. Training Requirements for Reducing Noise Exposure		
1. Has the annual PPE & Hygiene Requirements training been delivered to all UCI employees? *Delivered via January 2013 BEST Meetings*	☑	❑
2. Are hearing protection requirements included in the UCI Contractor Orientation?	☑	❑
3. Is hearing protection signage adequate and in proper locations?	☑	❑
4. Do workers know how to properly wear/insert hearing protection? *Discussed during annual PPE & Hygiene Requirements training*	☑	❑
B. Noise Exposure Monitoring		
1. Have periodic noise exposure assessments been conducted when:		
• New noise-generating equipment or work procedures introduced? *Screening room, etc. monitored in March 2013 – results similar to 2012*	☑	❑
• Old equipment perceived to be louder with time?	❑	❑ *N/A*
• Work practices/procedures changed? *No significant changes*	❑	❑ *N/A*
• Worker complaints regarding noise levels? *No complaints*	❑	❑ *N/A*
2. Has personal noise dosimetry monitoring been conducted minimum once/year?	☑	❑
3. Are any noise exposure limits exceeded as per OH&S Code *Limits exceeded in hearing Protection designated areas (Screening Room, etc.)*	☑	❑
4. Were noise exposure assessments conducted by a competent person with proper equipment? *Conducted by Umicore Industrial Hygienist*	☑	❑
5. Are all noise monitoring results documented? *Located electronically on shared management drive*	☑	❑
C. Audiometric Testing		
1. Have initial baseline audiometric tests been conducted for new employees within 6 months of start date? *New Operations Supervisor & Maintenance Coordinator*	☑	❑
2. Was the 12 month audiometric test for new employees conducted not more than 12 months following the initial baseline test? *Will be scheduled in 2014 for both individuals*	❑	❑ *N/A*
3. Has audiometric testing been conducted on all employees every 2 years (medical)? *Conducted for all employees in May 2012. Conducted on 7 operators in 2013 - ERT*	☑	❑

4. Have there been any abnormal audiograms or abnormal shifts for any employees? ❑ ☑
   Possibly for one individual – reported via WCB for past company
5. If there were any abnormal audiograms or abnormal shifts, was the employee advised accordingly as per OH&S Code? ☑ ❑

D. Noise Exposure Abatement Strategies

1. Have appropriate noise exposure abatement strategies as per COP-323-7 been considered when reducing noise levels and has this been documented via MOC's? ☑ ❑
   EHS Manager conducted EHS Assessments for all MOC's in UCNet
2. Are noise control measures adequate? ☑ ❑
3. Have potential noise impacts to external stakeholders been considered and evaluated whenever changes to work areas/equipment are made? *Via MOC's* ☑
   ❑
4. Have any external noise complaints been received? ❑ ☑
5. If external noise complaint(s) were received, have all necessary corrective actions been completed in a timely manner? ❑ ❑ *N/A*

E. Personal Hearing Protection (PPE)

1. Does hearing protection meet the requirements of CSA Standard Z94.2-02? ☑ ❑
2. Are workers wearing hearing protection as required? ☑ ❑

Wendy Lyka	*EHS Manager*	*08/21/2013*
Evaluation performed by	Title	Date

Comments & Actions
Need to locate historical noise assessments from Umicore Corporate EHS Group
Note: Environmental noise management assessed indirectly via ISO 14001 internal and external audits – noise is included as an environmental aspect for Umicore Canada - has a relatively low risk ranking