



September 11, 2018

Reference No. 11115752

Mr. Andrew Booth
Engineering Services
City Service Centre
9505-112
Grande Prairie, Alberta
T8V 6H8

Dear Mr. Booth:

**Re: 2018 Arterial Traffic Noise Survey
City of Grande Prairie
Grande Prairie, Alberta**

1. Introduction

GHD limited (GHD) was retained by the City of Grande Prairie (City) to perform a Traffic Noise Survey (Survey) encompassing 21 residential locations in June 2018. The survey was required for the City's ongoing traffic monitoring program for use in city planning and traffic noise mitigation planning for residential areas.

2. Criteria

The City has previously identified traffic noise mitigation as an area of special concern with respect to transportation projects, with the following proposed limits in the City's 2002 Transportation Master Plan:

- For new residential areas, noise reduction be provided for traffic noise over 60 dBA for an existing or new road, within 1 year of completion of development in the area of the roadway, at the developer's responsibility.
- For existing residential areas, noise reduction for noise levels over 65 dBA for a new or modified roadway, within 10 years of construction, at the City's responsibility.

3. Methodology

A total of six sound level meters were used to measure the sound levels at the 21 identified monitoring locations; site observations are provided in Attachment A. A summary of the measurement locations is provided in Figure 1, and a summary of the sound level meters used is provided in Table 1. At all monitoring locations the sound level meters were placed at least 3 m from any façade and at an approximate height of 1.5 m above grade. The sound level meters were configured to measure the one-minute energy-equivalent sound level, L_{EQ} , and the 24-hour L_{EQ} was calculated from these values. Weather data from Environment Canada's "Grande Prairie A" meteorological station was reviewed, to



confirm suitable weather conditions during the measurement period. Typical weather observed during the measurement period consisted of low wind (less than 20 km/hr.), clear conditions, no precipitation, and temperatures between 14-31 degrees Celsius.

All sound level meters were within their annual calibration, as shown in Attachment B, and were field calibrated prior to and following the measurement period.

Table 1: Sound Level Meter Locations

Make	Model	Serial Number	Measurement Location
Larson Davis	LxT	4987	1, 4, 5, 6
Larson Davis	LxT	4880	2, 3, 7, 11
Larson Davis	LxT	4877	8, 9, 10, 21
Larson Davis	LxT	4527	12, 13, 20
Larson Davis	LxT	5558	14, 15, 16
Larson Davis	LxT	4864	17, 18, 19

Ambient noise will fluctuate during a typical 24-hour period due to normal patterns of human activity, natural sounds, and fluctuations in traffic volumes and traffic composition. GHD set-up long-term sound level monitors and data logging systems at the selected receiver locations to evaluate the noise impact over the minimum required 24-hour time period to capture the flux in environment and human influence on background noise. Measurements were only taken during Monday through Friday and excluded holidays and weekends, as these periods typically experience lower than normal traffic volumes. Therefore, it is expected that the measurement periods are representative of the worst-case traffic volumes.

4. Results

The L_{EQ} sound level results from the Survey are summarized in Table 2 below. These are provided as the 24-hour average L_{EQ} , 16-hour daytime L_{EQ} , and 8-hour nighttime L_{EQ} . Table 2 also provides the morning (AM) Peak, nighttime (PM) Peak, and daily maximum 1-hour L_{EQ} . For the purpose of this assessment, AM peak was defined as approximately 07:00 to 09:00 and the PM peak was defined as approximately 16:00 to 18:00. Note that while results are provided to two decimal points for comparison purposes, measurement accuracy is ± 1 dBA.

Table 2: Sound Level Results Summary

Location	Address	L_{EQ} [24 hr]	Day L_{EQ} [16 hr]	Night L_{EQ} [8 hr]	L_{EQ} [1 hr]		
					AM Peak	PM Peak	Maximum
1	9354 131 Ave	52.38	53.28	49.48	56.11	55.10	56.11
2	10202 114A Ave	56.06	57.23	51.35	56.66	59.16	60.04
3	9715 117 Ave	60.67	61.59	57.67	61.36	63.35	63.35



Table 2: Sound Level Results Summary

Location	Address	LEQ [24 hr]	Day LEQ [16 hr]	Night LEQ [8 hr]	LEQ [1 hr]		
					AM Peak	PM Peak	Maximum
4	9401 117 Ave	59.24	60.22	55.90	61.24	61.75	61.75
5	9214 115 Ave	59.87	60.99	55.60	60.74	61.52	63.68
6	9113 117 Ave	51.42	52.41	47.98	52.36	54.23	55.76
7	9805 111 Ave	57.89	58.68	55.49	58.36	59.97	60.57
8	10901 92A St	56.42	57.51	52.00	58.24	58.59	58.59
9	10415 92A St	57.50	58.51	53.63	60.19	59.51	60.19
10	9029 101 Ave	56.07	57.16	52.09	56.55	59.64	59.64
11	9609 92A St	61.36	62.55	56.57	62.72	63.49	64.70
12	9654 83 Ave	57.91	59.01	53.30	59.98	58.86	63.03
13	7923 94 St	54.51	55.50	51.09	54.77	58.39	58.39
14	25 Pinnacle Key	58.81	59.55	56.66	60.07	59.99	63.00
15	11533 69A Ave	52.38	53.18	49.93	54.91	56.10	56.10
16	6705 109 St	58.79	59.58	56.19	60.29	60.74	60.77
17	9925 69 Ave	57.41	58.75	50.17	68.17	54.99	68.17
18	9437 69 Ave	56.12	57.33	50.54	56.82	55.76	66.32
19	9337 69 Ave	54.21	54.45	53.62	54.61	54.20	59.15
20	6713 90A St	64.63	64.96	63.79	65.89	66.96	69.53
21	6345 93 St	49.37	50.37	45.91	48.52	49.14	55.33

It is GHD's understanding that the monitoring locations are all within existing residential areas, such that the City's 65 dBA limit applies. As shown in Table 2, the measured road noise is below 65 dBA at all measurement locations.

Full details of the measurement results are provided graphically in Attachment C. No filters have been applied. A comparison to previous sound level surveys and traffic counts is provided in Attachment D.



5. Conclusion

Based on the results of the survey, the evaluated roads within the study area meet the City's sound level limits. We trust this is sufficient for the City's current purpose.

Should you have any questions, please do not hesitate to contact us.

Sincerely,

GHD

Prepared by:

Reviewed by:

A handwritten signature in black ink, appearing to read 'Sean Williams', written over two lines.

Sean Williams, P.Eng.

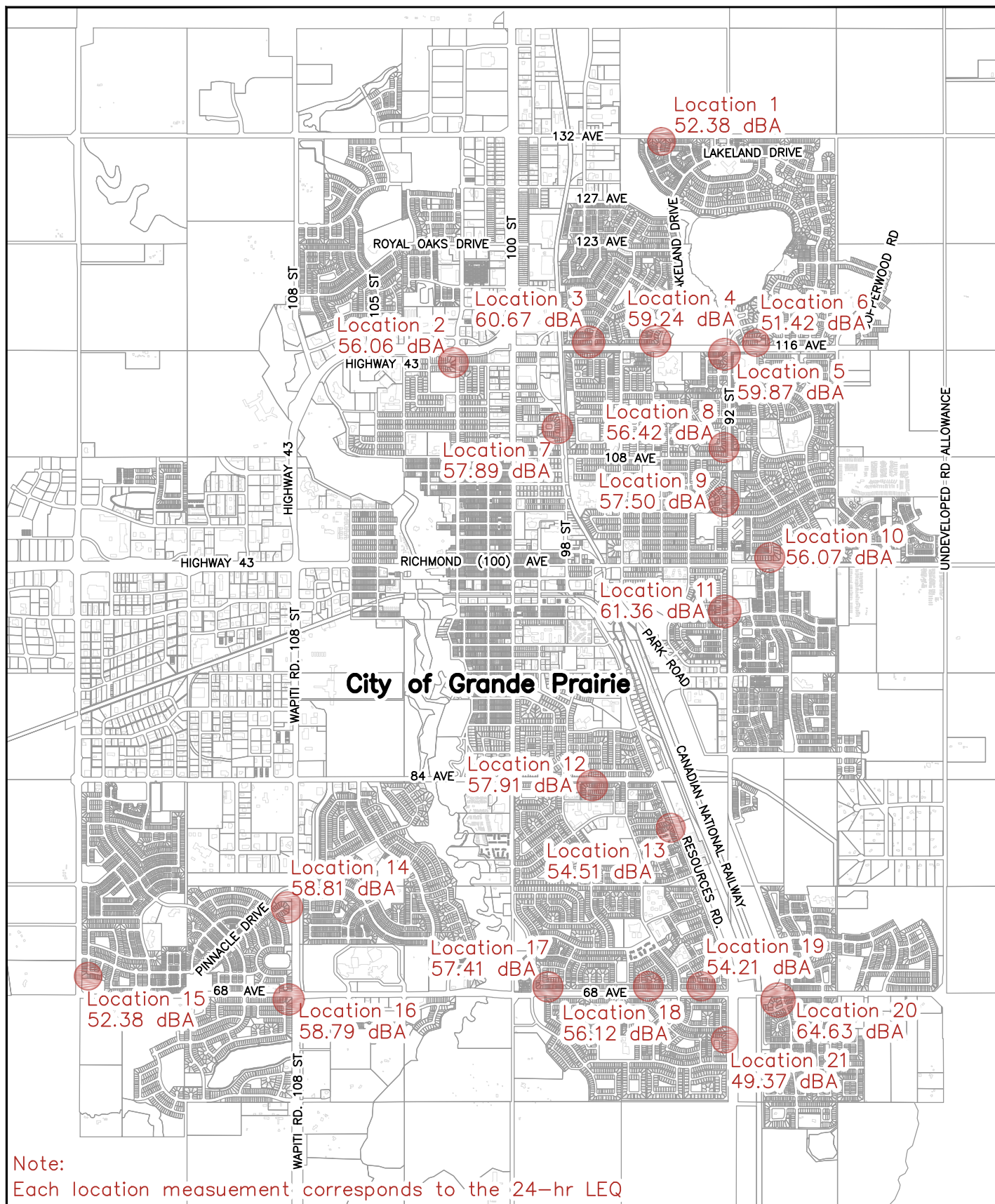
SW/jm/1

Encl.

A handwritten signature in black ink, appearing to read 'Michael Masschaele', written in a cursive style.

Michael Masschaele, BES

Figures



0 400 800 1,200m



City of Grande Prairie
GRANDE PRAIRIE, ALBERTA
2018 ARTERIAL TRAFFIC NOISE SURVEY

1115752-00

Aug 7, 2018

RECEIVER LOCATION PLAN

figure no.1

Attachments

Attachment A

Field Observations

Table A1: Site Observations

Location	Address	Comments
1	9354 131 Avenue	Road noise from 132 Avenue audible. High fence in backyard blocking line of sight.
2	10202 114A Avenue	Road noise from 116 Avenue audible. Trees and high fence blocking line of sight.
3	9715 117 Avenue	Road noise from 116 Avenue audible.
4	9401 117 Avenue	Road noise from 116 Avenue audible. Construction activities occurring on 117 Avenue (in front of house).
5	9214 115 Avenue	Road noise from 116 Avenue and 92 Street audible.
6	9113 117 Avenue	Road noise from 116 Avenue audible. Trees blocking line of sight.
7	9805 111 Avenue	Road noise from 98 Street audible.
8	10901 92A Street	Road noise from 92 Street dominant. Noise from 108 Avenue audible.
9	10415 92A Street	Road noise from 92 Street audible. Trees blocking line of sight.
10	9029 101 Avenue	Road noise from 100 Avenue dominant. Noise from 92 Street audible.
11	9609 92A Street	Road noise from 92 Street audible.
12	9654 83 Avenue	Road noise from 84 Avenue audible.
13	7923 94 Street	Road noise from Resources Road audible.
14	25 Pinnacle Key	Road noise from 108 Street audible.
15	11533 69A Avenue	Road noise from 116 Street audible. Large backyard
16	6705 109 Street	Road noise from 108 Street and 68 Avenue audible. Elevated fence blocking line of sight.
17	9925 69 Avenue	Road noise from 68 Avenue dominant. Noise from 100 Street audible.
18	9437 69 Avenue	Road noise from 68 Avenue audible. City working conducting lawn-mowing activities prior to takedown.
19	9337 69 Avenue	Road noise from 68 Avenue dominant. Noise from Resources Road audible.
20	6713 90A Street	Road noise from 68 Avenue dominant. Noise from 90 Street audible.
21	6345 93 Street	Road noise from Resources Road audible.

Attachment B

Calibration Certificates

Certificate of Calibration and Conformance

This document certifies that the instrument referenced below meets published specifications per Procedure PRD-P263; ANSI S1.4-1983 (R 2006) Type 1; S1.4A-1985; S1.43-1997 Type 1; S1.11-2004 Octave Band Class 0; S1.25-1991; IEC 61672-2002 Class 1; 60651-2001 Type 1; 60804-2000 Type 1; 61260-2001 Class 0; 61252-2002.

Manufacturer:	Larson Davis	Temperature:	78.2	°F
Model Number:	LxT1		25.67	°C
Serial Number:	4987	Rel. Humidity:	40.4	%
Customer:	TMS Rental	Pressure:	998.6	mbars
Description:	Sound Level Meter		998.6	hPa

Note: As Found/As Left: In Tolerance

Upon receipt for testing, this instrument was found to be:

Within the stated tolerance of the manufacturer's specification.

Calibration Date: 5/24/2018

Calibration Due: _____

Calibration Standards Used:

Manufacturer	Model	Serial Number	Cal Due
Stanford Research Systems	DS360	123270	5/7/2019

This Certificate attests that this instrument has been calibrated under the stated conditions with Measurement and Test Equipment (M&TE) Standards traceable to the National Institute of Standards and Technology (NIST). All of the Measurement Standards have been calibrated to their manufacturers' specified accuracy / uncertainty. Evidence of traceability and accuracy is on file at The Modal Shop and/or Larson Davis Corporate Headquarters. An acceptable accuracy ratio between the Standard(s) and the item calibrated has been maintained. This instrument meets or exceeds the manufacturer's published specification unless noted.

The results documented in this certificate relate only to the item(s) calibrated or tested. Calibration interval assignment and adjustment are the responsibility of the end user. This certificate may not be reproduced, except in full, without the written approval of The Modal Shop.

Technician: Adam Magee

Signature: _____



3149 East Kemper Road
Cincinnati, OH. 45241
Phone: (513) 351-9919
(800) 860-4867
www.modalshop.com

Certificate of Calibration and Conformance

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Manufacturer:	Larson Davis	Temperature:	70.5	°F
Model Number:	LxT1-SE		21.39	°C
Serial Number:	4880	Rel. Humidity:	50.8	%
Customer:	TMS Rental	Pressure:	993.1	mbars
Description:	Sound Level Meter		993.1	hPa
Note:	As Found/As Left: In Tolerance			

Upon receipt for testing, this instrument was found to be:

Within the stated tolerance of the manufacturer's specification.

Calibration Date: 10/11/2017

Calibration Due:

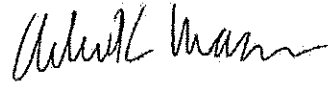
Calibration Standards Used:

Manufacturer	Model	Serial Number	Cal Due
Stanford Research Systems	DS360	123270	4/25/2018

This Certificate attests that this instrument has been calibrated under the stated conditions with Measurement and Test Equipment (M&TE) Standards traceable to the National Institute of Standards and Technology (NIST). All of the Measurement Standards have been calibrated to their manufacturers' specified accuracy / uncertainty. Evidence of traceability and accuracy is on file at The Modal Shop and/or Larson Davis Corporate Headquarters. An acceptable accuracy ratio between the Standard(s) and the item calibrated has been maintained. This instrument meets or exceeds the manufacturer's published specification unless noted.

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Technician: Adam Magee

Signature: 



THE MODAL SHOP

A PCB GROUP CO.

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Manufacturer:	<u>Larson Davis</u>	Temperature:	<u>76.9</u>	°F
Model Number:	<u>LxT1-SE</u>		<u>24.94</u>	°C
Serial Number:	<u>4877</u>	Rel. Humidity:	<u>21.5</u>	%
Customer:	<u>TMS Rental</u>	Pressure:	<u>989.4</u>	mbars
Description:	<u>Sound Level Meter</u>		<u>989.4</u>	hPa
Note:	<u>As Found/As Left: In Tolerance</u>			

Upon receipt for testing, this instrument was found to be:

Within the stated tolerance of the manufacturer's specification.

Calibration Date: 3/15/2018

Calibration Due: _____

Calibration Standards Used:

Manufacturer	Model	Serial Number	Cal Due
Stanford Research Systems	DS360	123270	4/25/2018

This Certificate attests that this instrument has been calibrated under the stated conditions with Measurement and Test Equipment (M&TE) Standards traceable to the National Institute of Standards and Technology (NIST). All of the Measurement Standards have been calibrated to their manufacturers' specified accuracy / uncertainty. Evidence of traceability and accuracy is on file at The Modal Shop and/or Larson Davis Corporate Headquarters. An acceptable accuracy ratio between the Standard(s) and the item calibrated has been maintained. This instrument meets or exceeds the manufacturer's published specification unless noted.

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Technician: Adam Magee

Signature: _____



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Manufacturer:	Larson Davis	Temperature:	76.3	°F
Model Number:	LxT1-SE		24.61	°C
Serial Number:	4527	Rel. Humidity:	21.3	%
Customer:	TMS Rental	Pressure:	1016.2	mbars
Description:	Sound Level Meter		1016.2	hPa
Note:	As Found/As Left: In Tolerance			

Upon receipt for testing, this instrument was found to be:

Within the stated tolerance of the manufacturer's specification.

Calibration Date: 2/12/2018

Calibration Due: _____

Calibration Standards Used:

Manufacturer	Model	Serial Number	Cal Due
Stanford Research Systems	DS360	123270	4/25/2018

This Certificate attests that this instrument has been calibrated under the stated conditions with Measurement and Test Equipment (M&TE) Standards traceable to the National Institute of Standards and Technology (NIST). All of the Measurement Standards have been calibrated to their manufacturers' specified accuracy / uncertainty. Evidence of traceability and accuracy is on file at The Modal Shop and/or Larson Davis Corporate Headquarters. An acceptable accuracy ratio between the Standard(s) and the item calibrated has been maintained. This instrument meets or exceeds the manufacturer's published specification unless noted.

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Technician: Adam Magee

Signature: _____



3149 East Kemper Road
Cincinnati, OH. 45241
Phone: (513) 351-9919
(800) 860-4867
www.modalshop.com

Calibration Certificate

Certificate Number 2018002399

Customer:

The Modal Shop
3149 East Kemper Road
Cincinnati, OH 45241, United States

Model Number LxT1
Serial Number 0005558
Test Results Pass
Initial Condition As Manufactured
Description SoundTrack LxT Class 1
Class 1 Sound Level Meter
Firmware Revision: 2.302

Procedure Number D0001.8384
Technician Ron Harris
Calibration Date 6 Mar 2018
Calibration Due
Temperature 23.26 °C ± 0.25 °C
Humidity 51.5 %RH ± 2.0 %RH
Static Pressure 87.2 kPa ± 0.13 kPa

Evaluation Method Tested with: Data reported in dB re 20 µPa.

Larson Davis PRMLxT1, S/N 046842
PCB 377B02, S/N 302842
Larson Davis CAL200, S/N 9079
Larson Davis CAL291, S/N 0203

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

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

Issuing lab certifies that the instrument described above meets or exceeds all specifications as stated in the referenced procedure (unless otherwise noted). It has been calibrated using measurement standards traceable to the International System of Units (SI) through the National Institute of Standards and Technology (NIST), or other national measurement institutes, and meets the requirements of ISO/IEC 17025:2005.

Test points marked with a ‡ in the uncertainties column do not fall within this laboratory's scope of accreditation.

The quality system is registered to ISO 9001:2008.

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

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

This report may not be reproduced, except in full, unless permission for the publication of an approved abstract is obtained in writing from the organization issuing this report.

Correction data from Larson Davis LxT Manual for SoundTrack LxT & SoundExpert LxT, I770.01 Rev J Supporting Firmware Version 2.301, 2015-04-30

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



Certificate Number 2018002399

For 1/4" microphones, the Larson Davis ADP024 1/4" to 1/2" adaptor is used with the calibrators and the Larson Davis ADP043 1/4" to 1/2" adaptor is used with the preamplifier.

Calibration Check Frequency: 1000 Hz; Reference Sound Pressure Level: 114 dB re 20 µPa

Periodic tests were performed in accordance with procedures from IEC 61672-3:2013 / ANSI/ASA S1.4-2014/Part3.

Pattern approval for IEC 61672-1:2013 / ANSI/ASA S1.4-2014/Part 1 successfully completed by Physikalisch-Technische Bundesanstalt (PTB) on 2007-10-09 reference number PTB-1.72-4034218.

The sound level meter submitted for testing successfully completed the periodic tests of IEC 61672-3:2013 / ANSI/ASA S1.4-2014/Part 3, for the environmental conditions under which the tests were performed. As evidence was publicly available, from an independent testing organization responsible for approving the results of pattern-evaluation tests performed in accordance with IEC 61672-2:2013 / ANSI/ASA S1.4-2014/Part 2, to demonstrate that the model of sound level meter fully conformed to the class 1 specifications in IEC 61672-1:2013 / ANSI/ASA S1.4-2014/Part 1; the sound level meter submitted for testing conforms to the class 1 specifications in IEC 61672-1:2013 / ANSI/ASA S1.4-2014/Part 1.

Standards Used			
Description	Cal Date	Cal Due	Cal Standard
SRS DS360 Ultra Low Distortion Generator	2017-06-23	2018-06-23	006311
Hart Scientific 2626-S Humidity/Temperature Sensor	2017-06-11	2018-06-11	006943
Larson Davis CAL200 Acoustic Calibrator	2017-07-25	2018-07-25	007027
Larson Davis Model 831	2018-02-28	2019-02-28	007182
PCB 377A13 1/2 inch Prepolarized Pressure Microphone	2017-03-08	2018-03-08	007185
Larson Davis CAL291 Residual Intensity Calibrator	2017-09-19	2018-09-19	007287

Acoustic Calibration

Measured according to IEC 61672-3:2013 10 and ANSI S1.4-2014 Part 3: 10

Measurement	Test Result [dB]	Lower Limit [dB]	Upper Limit [dB]	Expanded Uncertainty [dB]	Result
1000 Hz	114.00	113.80	114.20	0.14	Pass

Acoustic Signal Tests, C-weighting

Measured according to IEC 61672-3:2013 12 and ANSI S1.4-2014 Part 3: 12 using a comparison coupler with Unit Under Test (UUT) and reference SLM using slow time-weighted sound level for compliance to IEC 61672-1:2013 5.5; ANSI S1.4-2014 Part 1: 5.5

Frequency [Hz]	Test Result [dB]	Expected [dB]	Lower Limit [dB]	Upper Limit [dB]	Expanded Uncertainty [dB]	Result
125	-0.17	-0.20	-1.20	0.80	0.23	Pass
1000	0.12	0.00	-0.70	0.70	0.23	Pass
8000	-3.67	-3.00	-5.50	-1.50	0.32	Pass

-- End of measurement results--

Self-generated Noise

Measured according to IEC 61672-3:2013 11.1 and ANSI S1.4-2014 Part 3: 11.1

Measurement	Test Result [dB]
A-weighted	40.61

-- End of measurement results--

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



-- End of Report--

Signatory: Ron Harris

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



 **LARSON DAVIS**
A PCB PIEZOTRONICS DIV.

Calibration Certificate

Certificate Number 2018002390

Customer:

The Modal Shop
3149 East Kemper Road
Cincinnati, OH 45241, United States

Model Number LxT1
Serial Number 0005558
Test Results Pass
Initial Condition As Manufactured
Description SoundTrack LxT Class 1
Class 1 Sound Level Meter
Firmware Revision: 2.302

Procedure Number D0001.8378
Technician Ron Harris
Calibration Date 6 Mar 2018
Calibration Due
Temperature 23.46 °C ± 0.25 °C
Humidity 49.8 %RH ± 2.0 %RH
Static Pressure 87.32 kPa ± 0.13 kPa

Evaluation Method Tested electrically using Larson Davis PRMLxT1 S/N 046842 and a 12.0 pF capacitor to simulate microphone capacitance. Data reported in dB re 20 µPa assuming a microphone sensitivity of 50.0 mV/Pa.

Compliance Standards Compliant to Manufacturer Specifications and the following standards when combined with Calibration Certificate from procedure D0001.8384:

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

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

The quality system is registered to ISO 9001:2008.

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

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

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Correction data from Larson Davis LxT Manual for SoundTrack LxT & SoundExpert Lxt, I770.01 Rev J Supporting Firmware Version 2.301, 2015-04-30

Calibration Check Frequency: 1000 Hz; Reference Sound Pressure Level: 114 dB re 20 µPa

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



LARSON DAVIS
A PCB PIEZOTRONICS DIV.

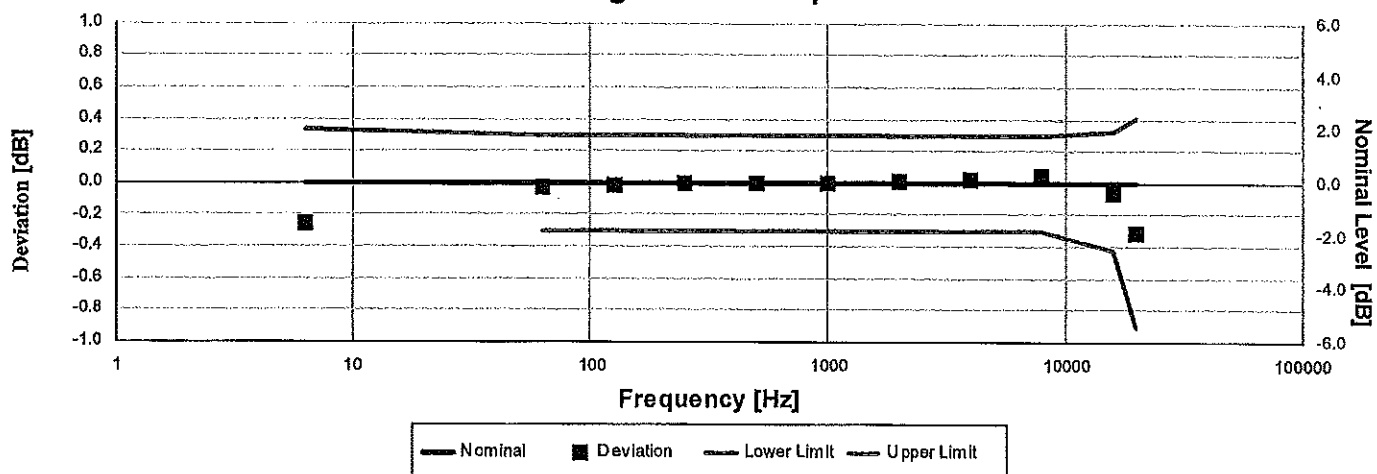
Description	Standards Used		
	Cal Date	Cal Due	Cal Standard
SRS DS360 Ultra Low Distortion Generator	2017-06-23	2018-06-23	006311
Hart Scientific 2626-S Humidity/Temperature Sensor	2017-06-11	2018-06-11	006943

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



LARSON DAVIS
 A PCB PIEZOTRONICS DIV.

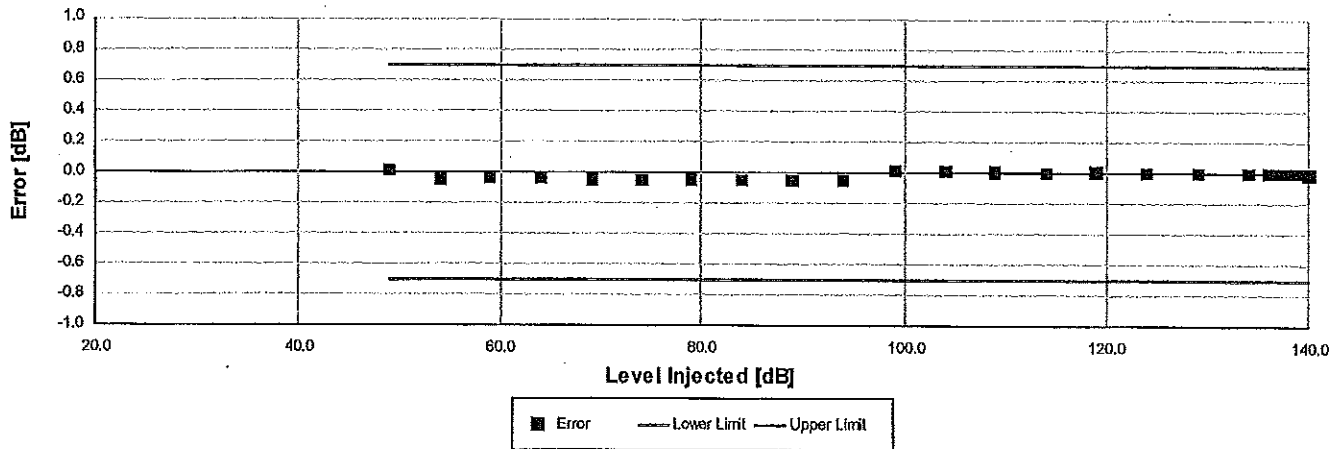
Z-weight Filter Response



Electrical signal test of frequency weighting performed according to IEC 61672-3:2013 13 and ANSI S1.4-2014 Part 3: 13 for compliance to IEC 61672-1:2013 5.5; IEC 60651:2001 6.1 and 9.2.2; IEC 60804:2000 5; ANSI S1.4:1983 (R2006) 5.1 and 8.2.1; ANSI S1.4-2014 Part 1: 5.5

Frequency [Hz]	Test Result [dB]	Deviation [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
6.31	-0.25	-0.25	-1.11	0.33	0.10	Pass
63.10	-0.03	-0.03	-0.30	0.30	0.09	Pass
125.89	-0.02	-0.02	-0.30	0.30	0.09	Pass
251.19	0.00	0.00	-0.30	0.30	0.09	Pass
501.19	0.00	0.00	-0.30	0.30	0.09	Pass
1,000.00	0.00	0.00	-0.30	0.30	0.09	Pass
1,995.26	0.01	0.01	-0.30	0.30	0.09	Pass
3,981.07	0.02	0.02	-0.30	0.30	0.09	Pass
7,943.28	0.04	0.04	-0.30	0.30	0.09	Pass
15,848.93	-0.06	-0.06	-0.42	0.32	0.09	Pass
19,952.62	-0.31	-0.31	-0.91	0.41	0.09	Pass

-- End of measurement results--

A-weighted Broadband Log Linearity: 8,000.00 Hz

Broadband level linearity performed according to IEC 61672-3:2013 16 and ANSI S1.4-2014 Part 3: 16 for compliance to IEC 61672-1:2013 5.6, IEC 60804:2000 6.2, IEC 61252:2002 8, ANSI S1.4 (R2006) 6.9, ANSI S1.4-2014 Part 1: 5.6, ANSI S1.43 (R2007) 6.2

Level [dB]	Error [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
49.00	0.01	-0.70	0.70	0.09	Pass
54.00	-0.04	-0.70	0.70	0.09	Pass
59.00	-0.04	-0.70	0.70	0.09	Pass
64.00	-0.04	-0.70	0.70	0.09	Pass
69.00	-0.04	-0.70	0.70	0.09	Pass
74.00	-0.05	-0.70	0.70	0.09	Pass
79.00	-0.04	-0.70	0.70	0.09	Pass
84.00	-0.05	-0.70	0.70	0.09	Pass
89.00	-0.05	-0.70	0.70	0.09	Pass
94.00	-0.05	-0.70	0.70	0.09	Pass
99.00	0.01	-0.70	0.70	0.09	Pass
104.00	0.01	-0.70	0.70	0.09	Pass
109.00	0.00	-0.70	0.70	0.09	Pass
114.00	0.00	-0.70	0.70	0.09	Pass
119.00	0.00	-0.70	0.70	0.09	Pass
124.00	0.00	-0.70	0.70	0.09	Pass
129.00	0.00	-0.70	0.70	0.09	Pass
134.00	0.00	-0.70	0.70	0.09	Pass
136.00	0.00	-0.70	0.70	0.09	Pass
137.00	0.00	-0.70	0.70	0.09	Pass
138.00	0.00	-0.70	0.70	0.09	Pass
139.00	-0.01	-0.70	0.70	0.09	Pass
140.00	-0.01	-0.70	0.70	0.09	Pass

-- End of measurement results--

Peak Rise Time

Peak rise time performed according to IEC 60651:2001 9.4.4 and ANSI S1.4:1983 (R2006) 8.4.4

Amplitude [dB]	Duration [µs]		Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
137.85	40	Negative Pulse	138.51	137.02	139.02	0.09	Pass
		Positive Pulse	138.49	137.01	139.01	0.09	Pass
	30	Negative Pulse	137.58	137.02	139.02	0.09	Pass
		Positive Pulse	137.58	137.01	139.01	0.09	Pass

-- End of measurement results--

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716-684-0001



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Positive Pulse Crest Factor

200 μ s pulse tests at 2.0, 12.0, 22.0, 32.0 dB below Overload Limit

Crest Factor measured according to IEC 60651:2001 9.4.2 and ANSI S1.4:1983 (R2006) 8.4.2

Amplitude [dB]	Crest Factor	Test Result [dB]	Limits [dB]	Expanded Uncertainty [dB]	Result
136.85	3	OVL	± 0.50	0.09	Pass
	5	OVL	± 1.00	0.09	Pass
	10	OVL	± 1.50	0.09	Pass
126.85	3	-0.12	± 0.50	0.09	Pass
	5	-0.12	± 1.00	0.11	Pass
	10	OVL	± 1.50	0.09	Pass
116.85	3	-0.11	± 0.50	0.09	Pass
	5	-0.13	± 1.00	0.09	Pass
	10	-0.17	± 1.50	0.09	Pass
106.85	3	-0.13	± 0.50	0.09	Pass
	5	-0.14	± 1.00	0.09	Pass
	10	-0.15	± 1.50	0.09	Pass

-- End of measurement results--

Negative Pulse Crest Factor

200 μ s pulse tests at 2.0, 12.0, 22.0, 32.0 dB below Overload Limit

Crest Factor measured according to IEC 60651:2001 9.4.2 and ANSI S1.4:1983 (R2006) 8.4.2

Amplitude [dB]	Crest Factor	Test Result [dB]	Limits [dB]	Expanded Uncertainty [dB]	Result
136.85	3	OVL	± 0.50	0.09	Pass
	5	OVL	± 1.00	0.09	Pass
	10	OVL	± 1.50	0.09	Pass
126.85	3	-0.12	± 0.50	0.09	Pass
	5	-0.12	± 1.00	0.09	Pass
	10	OVL	± 1.50	0.09	Pass
116.85	3	-0.11	± 0.50	0.09	Pass
	5	-0.11	± 1.00	0.09	Pass
	10	-0.15	± 1.50	0.09	Pass
106.85	3	-0.12	± 0.50	0.09	Pass
	5	-0.12	± 1.00	0.09	Pass
	10	-0.24	± 1.50	0.09	Pass

-- End of measurement results--

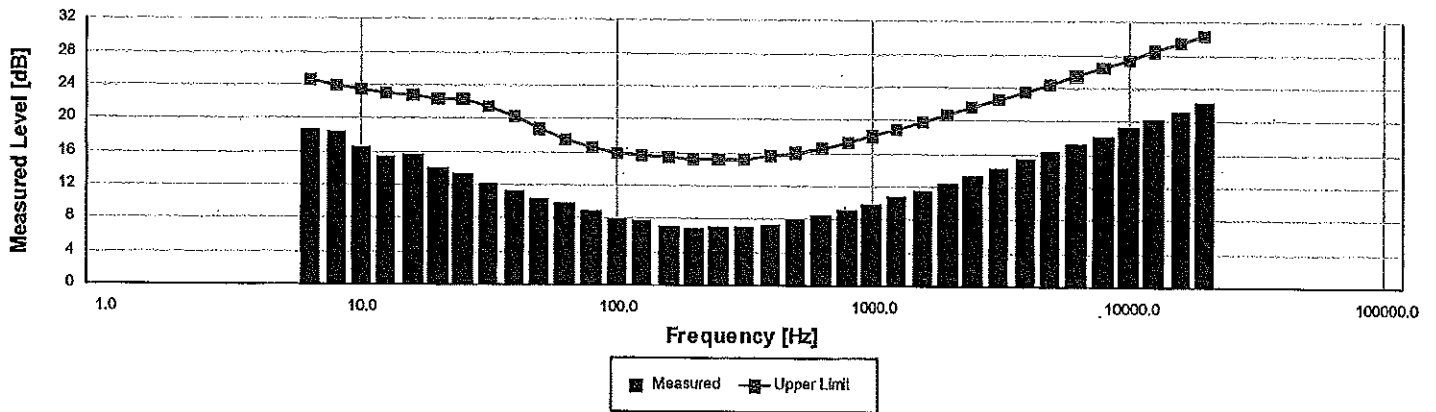
Gain

Gain measured according to IEC 61672-3:2013 17.3 and 17.4 and ANSI S1.4-2014 Part 3: 17.3 and 17.4

Measurement	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
0 dB Gain	93.96	93.91	94.11	0.09	Pass
0 dB Gain, Linearity	41.13	40.31	41.71	0.09	Pass
OBA Low Range	94.01	93.91	94.11	0.09	Pass
OBA Normal Range	94.01	93.20	94.80	0.09	Pass

-- End of measurement results--

1/3-Octave Self-Generated Noise



The SLM is set to low range.

Frequency [Hz]	Test Result [dB]	Upper limit [dB]	Result
6.30	18.76	24.60	Pass
8.00	18.42	24.00	Pass
10.00	16.61	23.50	Pass
12.50	15.47	23.00	Pass
16.00	15.58	22.90	Pass
20.00	13.97	22.40	Pass
25.00	13.37	22.30	Pass
31.50	12.15	21.50	Pass
40.00	11.27	20.20	Pass
50.00	10.31	18.80	Pass
63.00	9.81	17.60	Pass
80.00	8.89	16.60	Pass
100.00	8.03	15.90	Pass
125.00	7.86	15.70	Pass
160.00	7.13	15.50	Pass
200.00	6.79	15.20	Pass
250.00	7.04	15.20	Pass
315.00	7.12	15.20	Pass
400.00	7.34	15.70	Pass
500.00	8.04	16.00	Pass
630.00	8.53	16.60	Pass
800.00	9.19	17.30	Pass
1,000.00	9.97	18.10	Pass
1,250.00	10.83	18.90	Pass
1,600.00	11.61	19.80	Pass
2,000.00	12.50	20.80	Pass
2,500.00	13.43	21.70	Pass
3,150.00	14.33	22.60	Pass
4,000.00	15.36	23.50	Pass
5,000.00	16.32	24.50	Pass
6,300.00	17.34	25.50	Pass
8,000.00	18.29	26.50	Pass
10,000.00	19.26	27.40	Pass
12,500.00	20.28	28.50	Pass
16,000.00	21.28	29.50	Pass
20,000.00	22.30	30.40	Pass

-- End of measurement results--

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 Provo, UT 84601, United States
 716-684-0001



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Broadband Noise Floor

Self-generated noise measured according to IEC 61672-3:2013 11.2 and ANSI S1.4-2014 Part 3: 11.2

Measurement	Test Result [dB]	Upper Limit [dB]	Result
A-weight Noise Floor	26.80	36.00	Pass
C-weight Noise Floor	26.36	35.00	Pass
Z-weight Noise Floor	33.59	39.00	Pass

-- End of measurement results--

Total Harmonic Distortion

Measured using 1/3-Octave filters

Measurement	Test Result [dB]	Lower Limit [dB]	Upper Limit [dB]	Expanded Uncertainty [dB]	Result
10 Hz Signal	135.45	135.05	136.65	0.09	Pass
THD	-67.67		-58.00	0.01	Pass
THD+N	-63.23		-58.00	0.01	Pass

-- End of measurement results--

-- End of Report--

Signatory: Ron Harris

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



Certificate of Calibration and Conformance

This document certifies that the instrument referenced below meets published specifications per Procedure PRD-P263; ANSI S1.4-1983 (R 2006) Type 1; S1.4A-1985; S1.43-1997 Type 1; S1.11-2004 Octave Band Class 0; S1.25-1991; IEC 61672-2002 Class 1; 60651-2001 Type 1; 60804-2000 Type 1; 61260-2001 Class 0; 61252-2002.

Manufacturer:	Larson Davis	Temperature:	70.5	°F
Model Number:	LxT1-SE		21.39	°C
Serial Number:	4864	Rel. Humidity:	50.8	%
Customer:	TMS Rental	Pressure:	993.1	mbars
Description:	Sound Level Meter		993.1	hPa

Note: As Found/As Left: In Tolerance

Upon receipt for testing, this instrument was found to be:

Within the stated tolerance of the manufacturer's specification.

Calibration Date: 10/11/2017

Calibration Due: _____

Calibration Standards Used:

Manufacturer	Model	Serial Number	Cal Due
Stanford Research Systems	DS360	123270	4/25/2018

This Certificate attests that this instrument has been calibrated under the stated conditions with Measurement and Test Equipment (M&TE) Standards traceable to the National Institute of Standards and Technology (NIST). All of the Measurement Standards have been calibrated to their manufacturers' specified accuracy / uncertainty. Evidence of traceability and accuracy is on file at The Modal Shop and/or Larson Davis Corporate Headquarters. An acceptable accuracy ratio between the Standard(s) and the item calibrated has been maintained. This instrument meets or exceeds the manufacturer's published specification unless noted.

The results documented in this certificate relate only to the item(s) calibrated or tested. Calibration interval assignment and adjustment are the responsibility of the end user. This certificate may not be reproduced, except in full, without the written approval of The Modal Shop.

Technician: Adam Magee

Signature: _____



3149 East Kemper Road
Cincinnati, OH. 45241
Phone: (513) 351-9919
(800) 860-4867
www.modalshop.com

Attachment C Monitoring Results

Figure C1: Location 1 Monitoring Results
9354 131 Avenue, Grande Prairie, AB
June 18-19, 2018

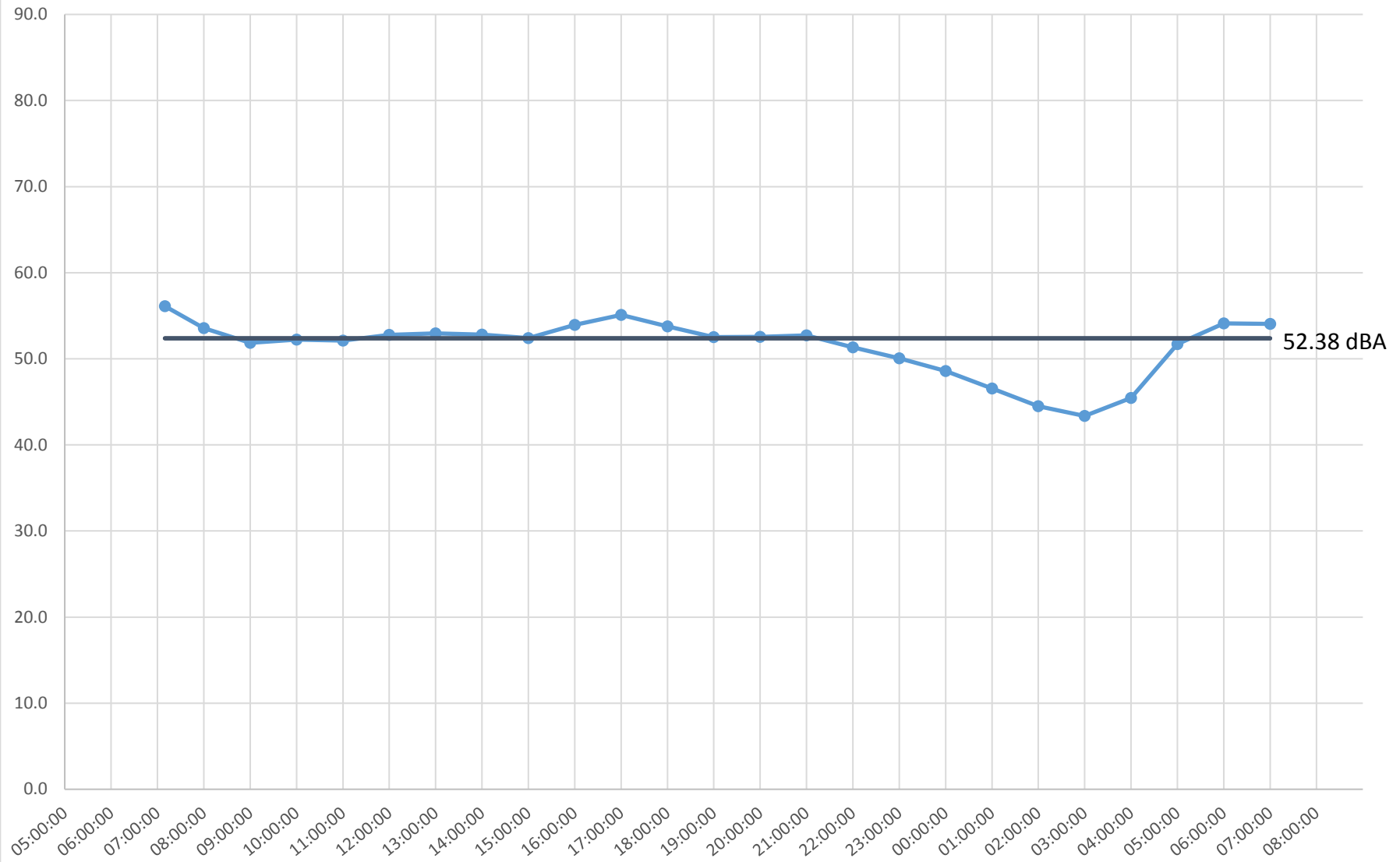


Figure C2: Location 2 Monitoring Results
10202 114A Street, Grande Prairie, AB
June 19-20, 2018

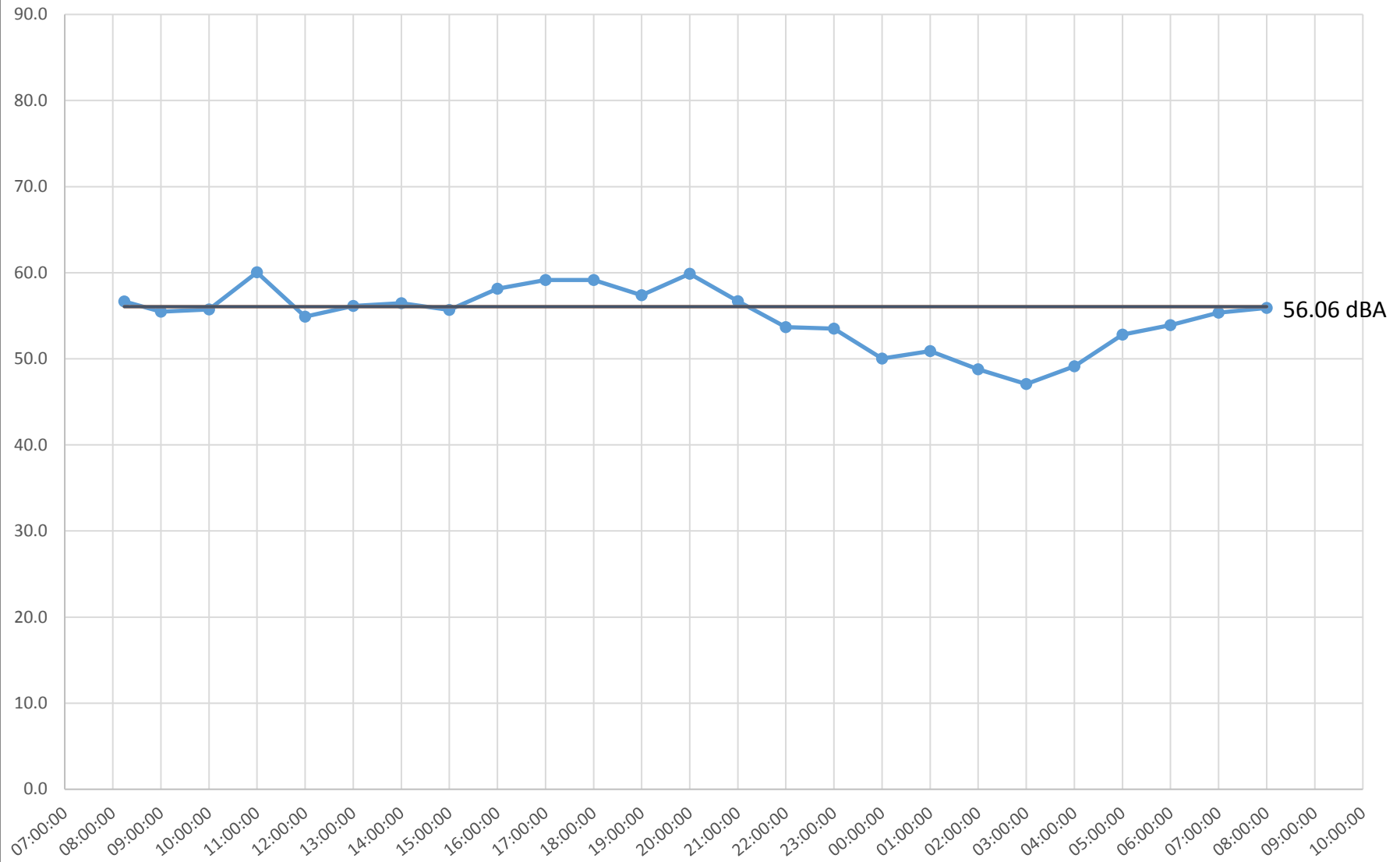


Figure C3: Location 3 Monitoring Results
9715 117 Avenue, Grande Prairie, AB
June 18-19, 2018

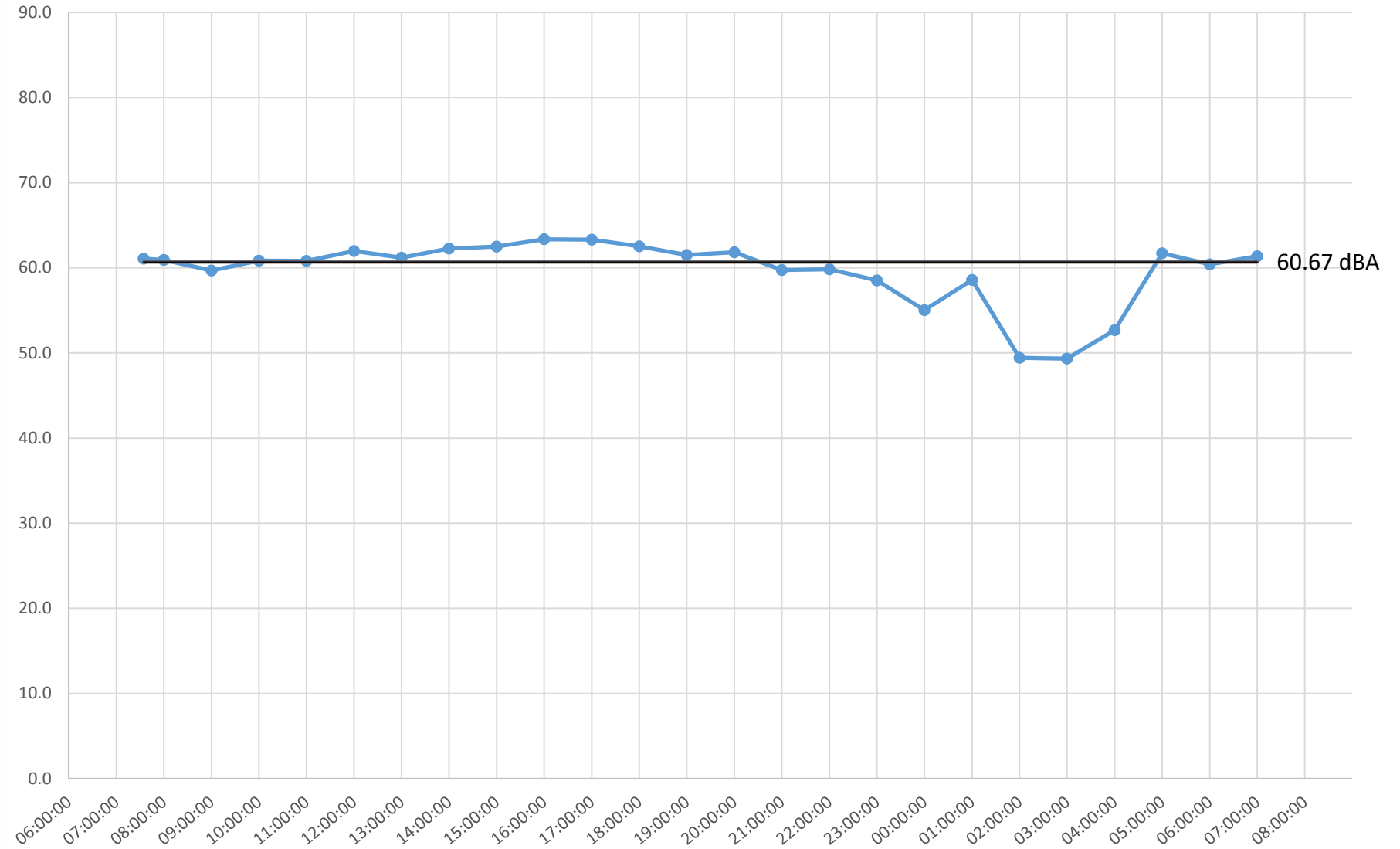


Figure C4: Location 4 Monitoring Results
9401 117 Avenue, Grande Prairie, AB
June 19-20, 2018

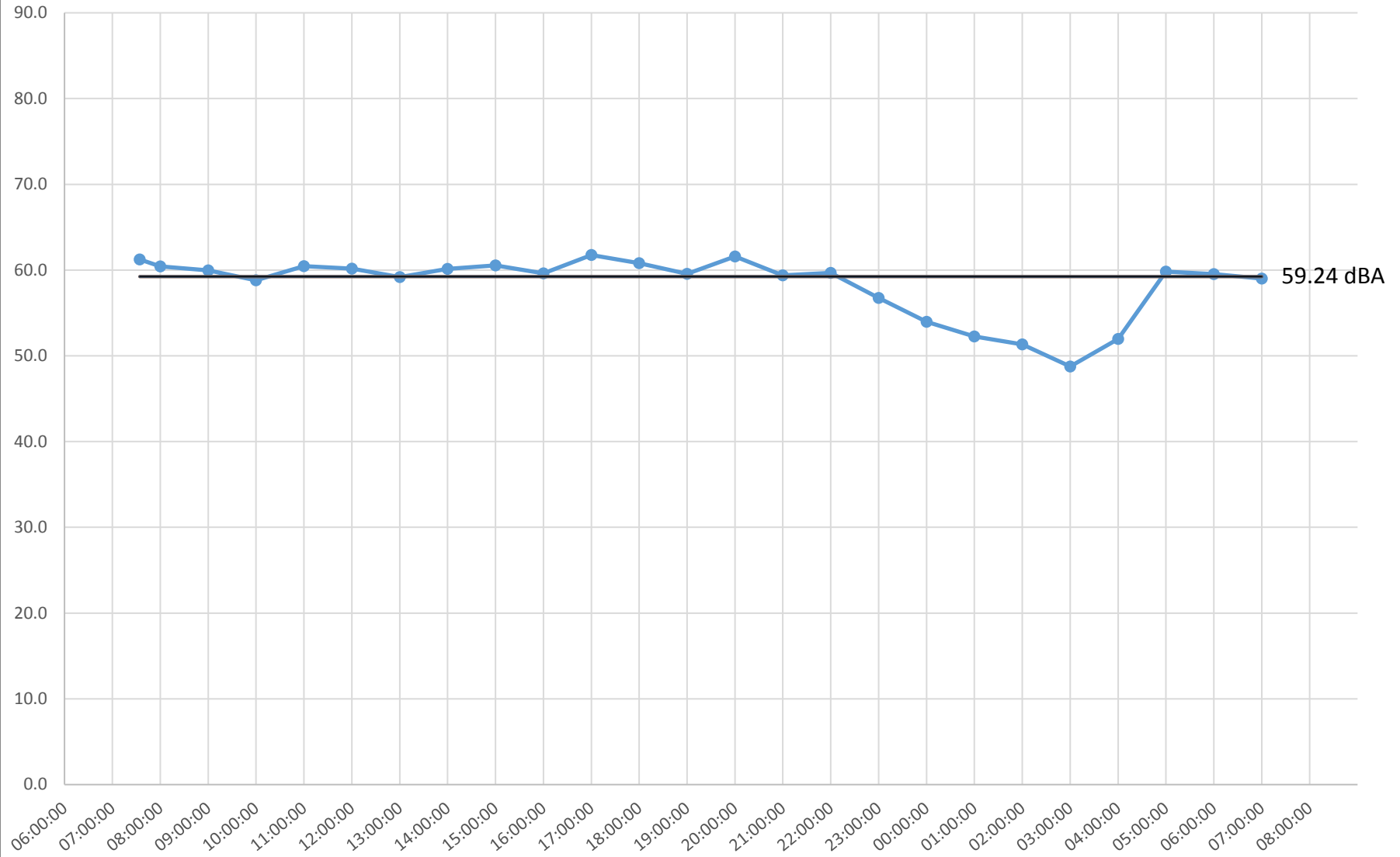


Figure C5: Location 5 Monitoring Results
9214 115 Avenue, Grande Prairie, AB
June 20-21, 2018

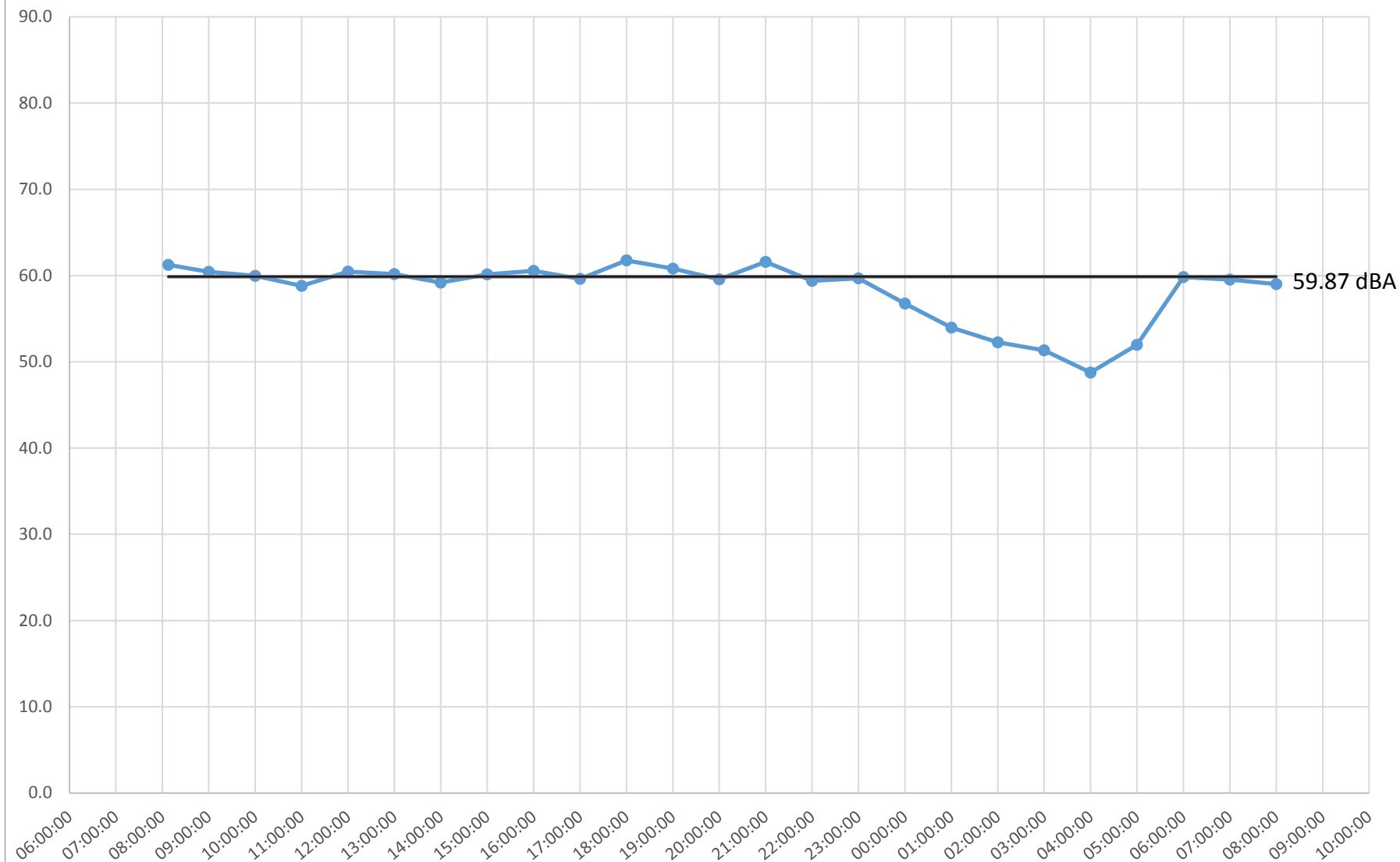


Figure C6: Location 6 Monitoring Results
9113 117 Avenue, Grande Prairie, AB
June 21-22, 2018

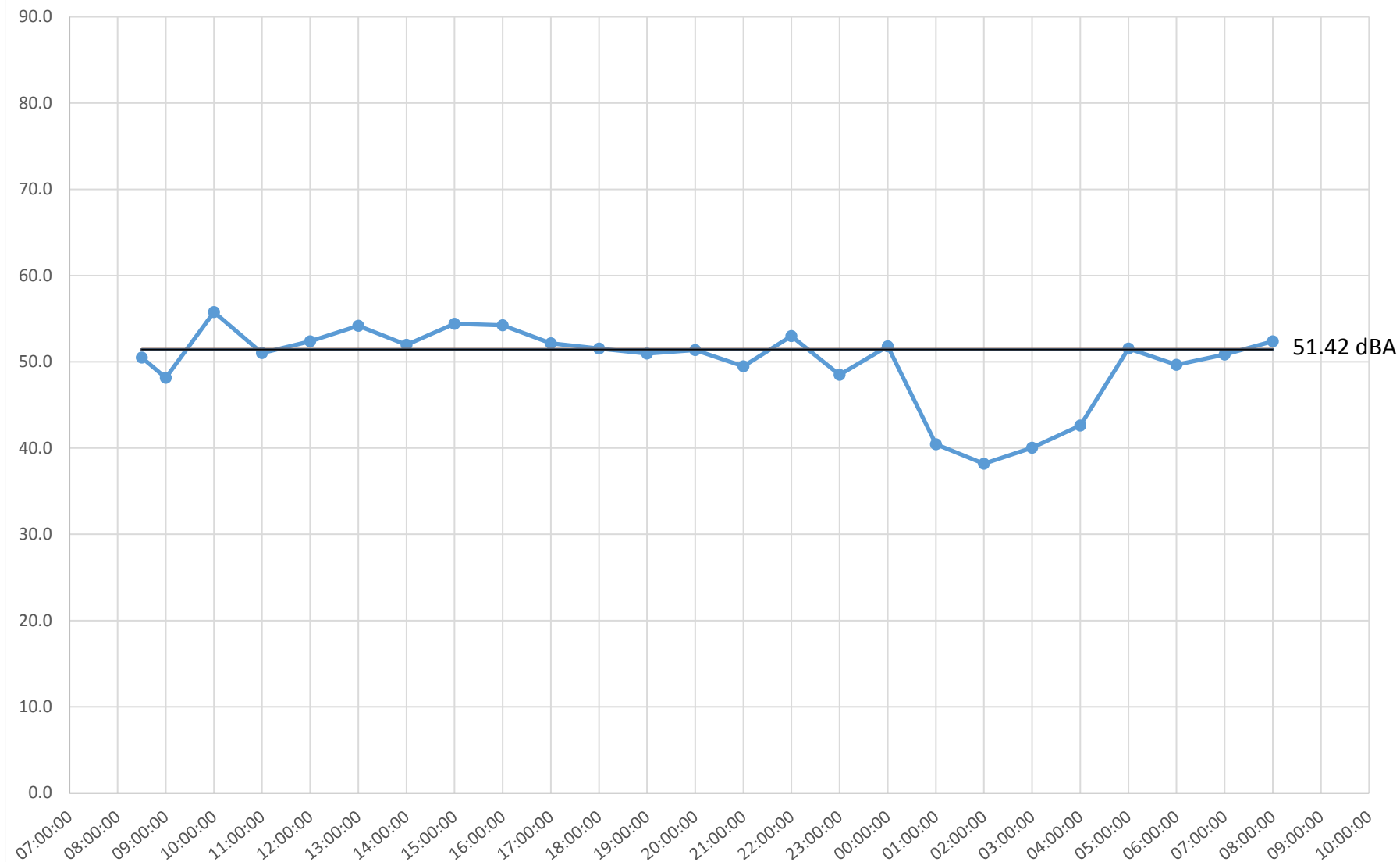


Figure C7: Location 7 Monitoring Results
9805 111 Avenue, Grande Prairie, AB
June 20-21, 2018

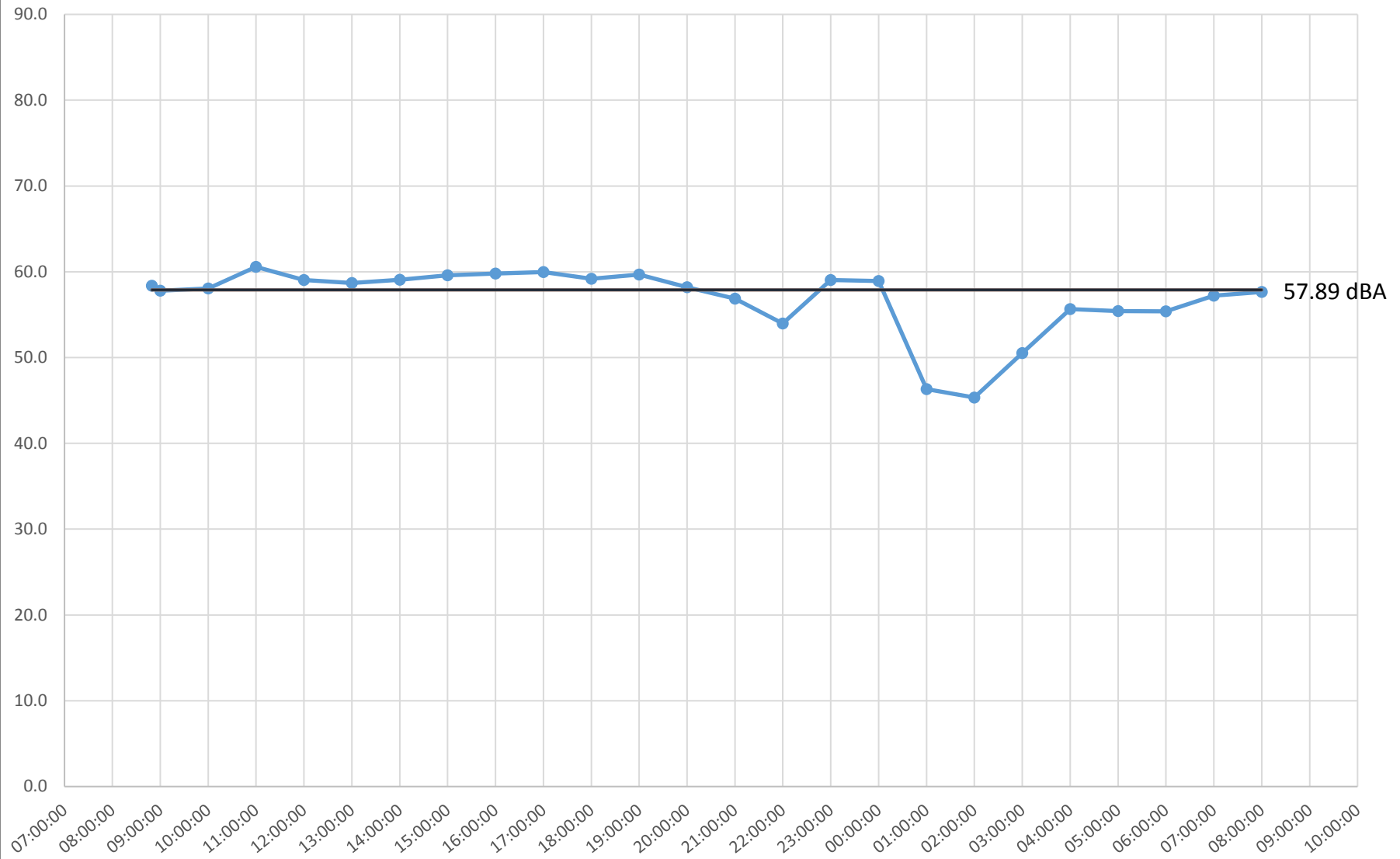


Figure C8: Location 8 Monitoring Results
10901 92A Street, Grande Prairie, AB
June 18-19, 2018

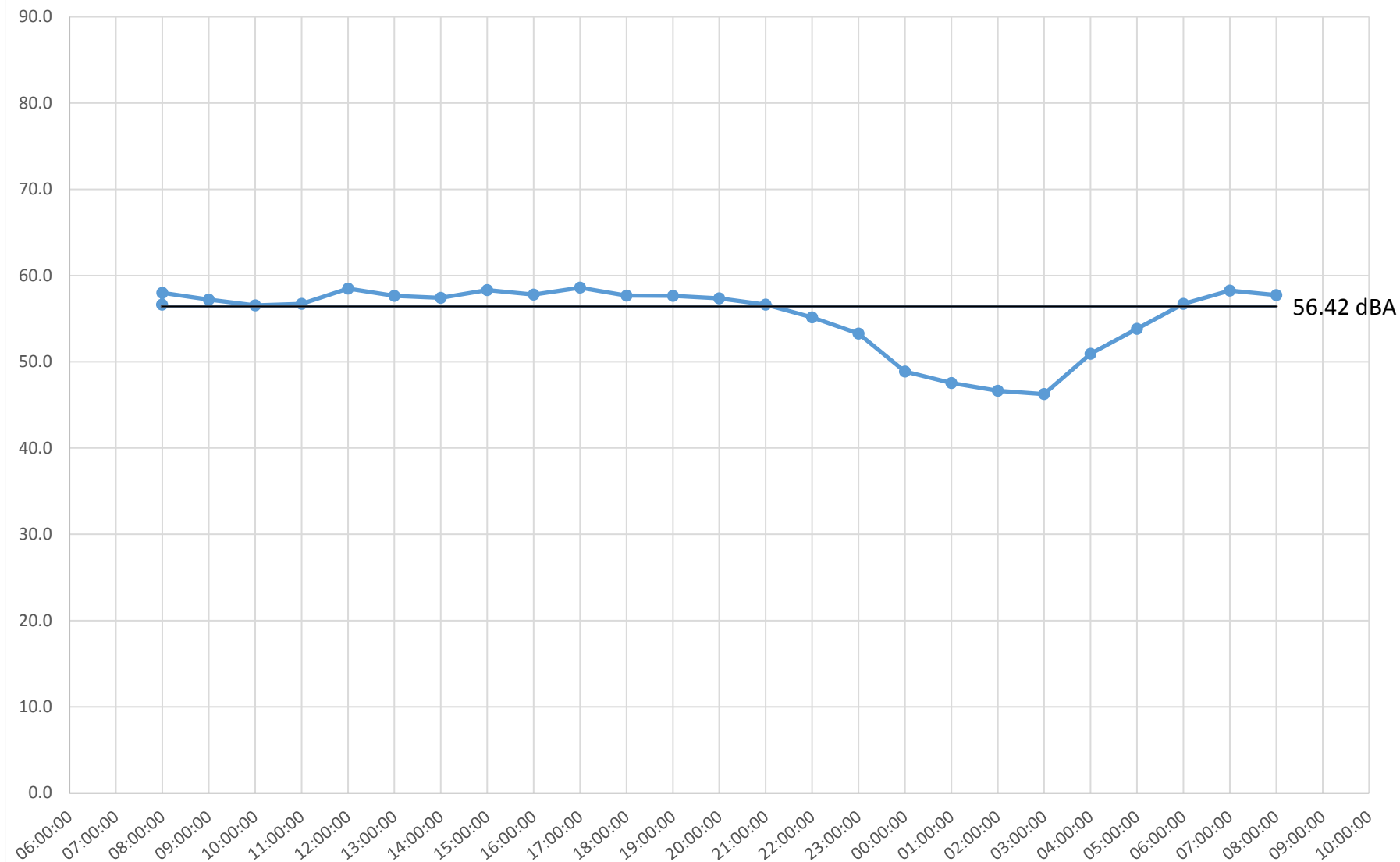


Figure C9: Location 9 Monitoring Results
10415 92A Street, Grande Prairie, AB
June 19-20, 2018

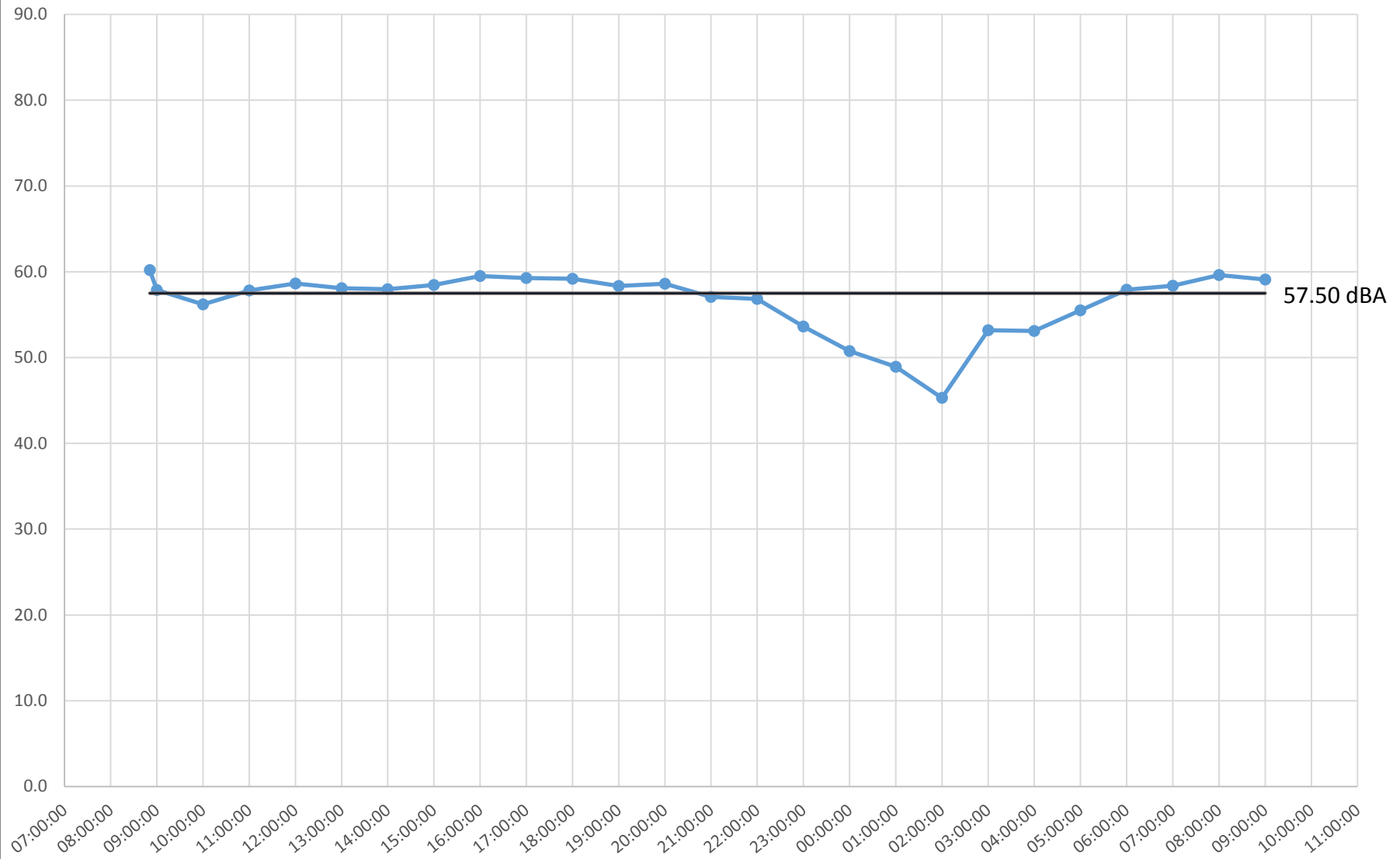


Figure C10: Location 10 Monitoring Results
9029 101 Avenue, Grande Prairie, AB
June 20-21, 2018

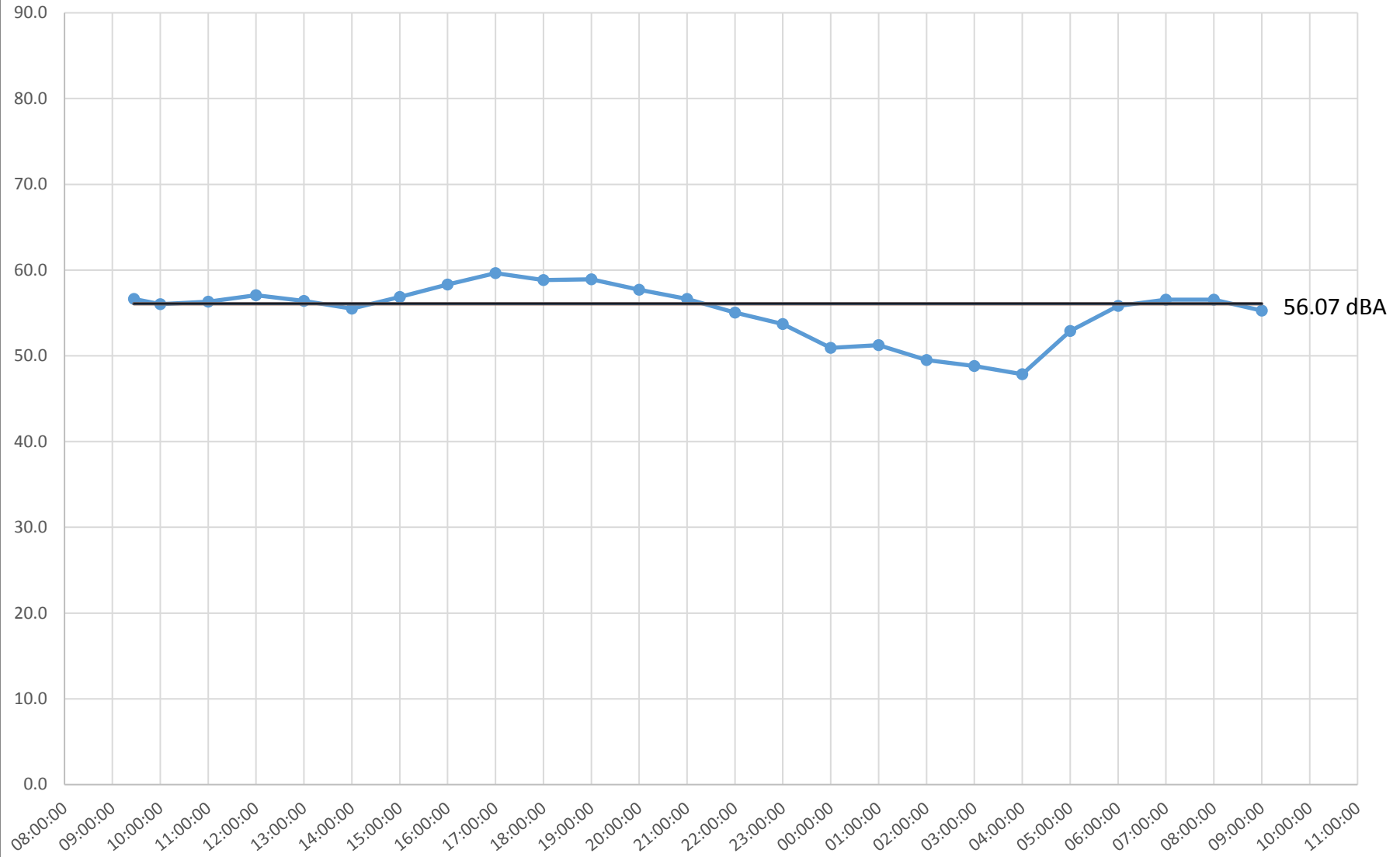


Figure C11: Location 11 Monitoring Results
9609 92A Street, Grande Prairie, AB
June 21-22 2018

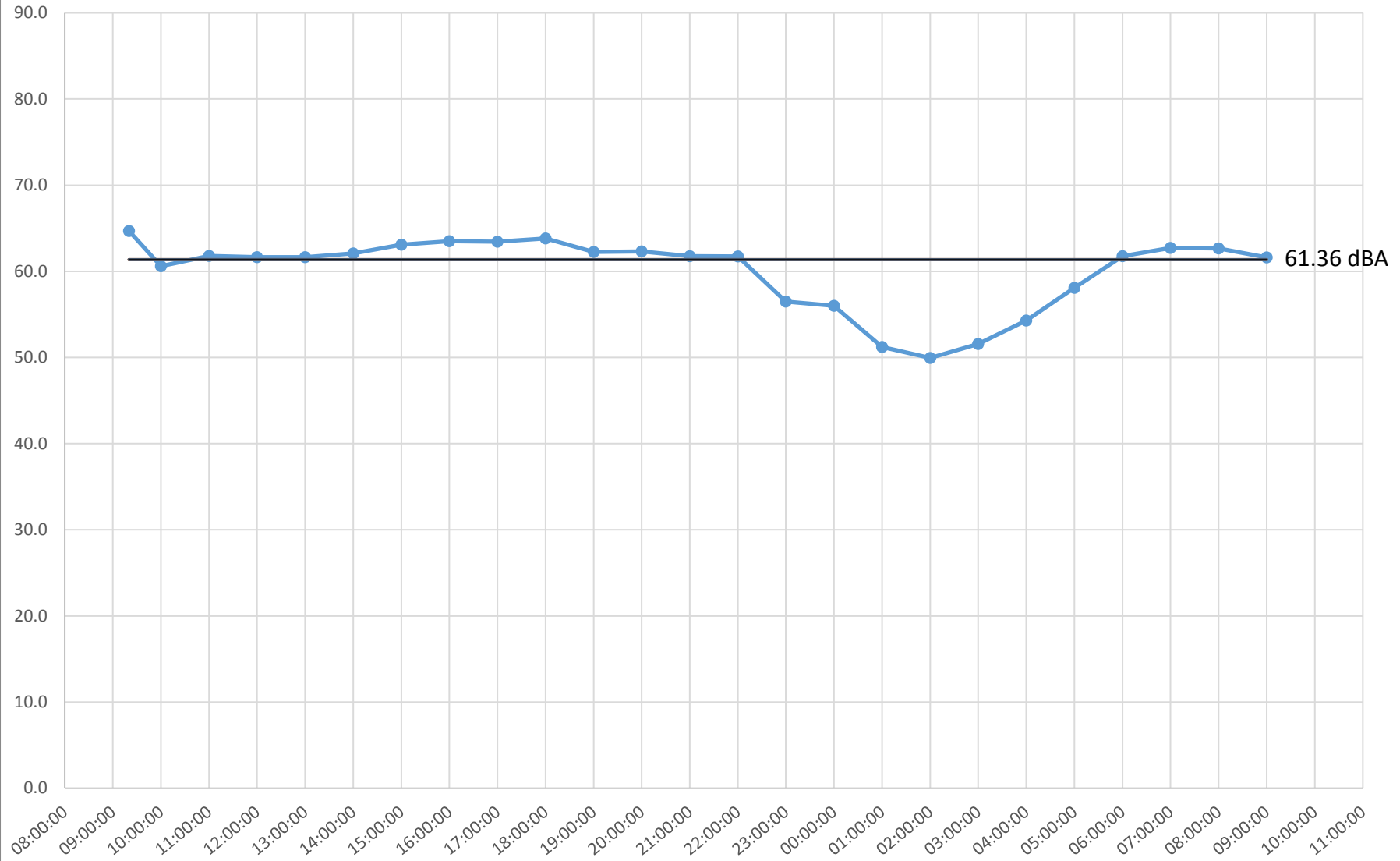


Figure C12: Location 12 Monitoring Results
9654 83 Avenue, Grande Prairie, AB
June 18-19 2018

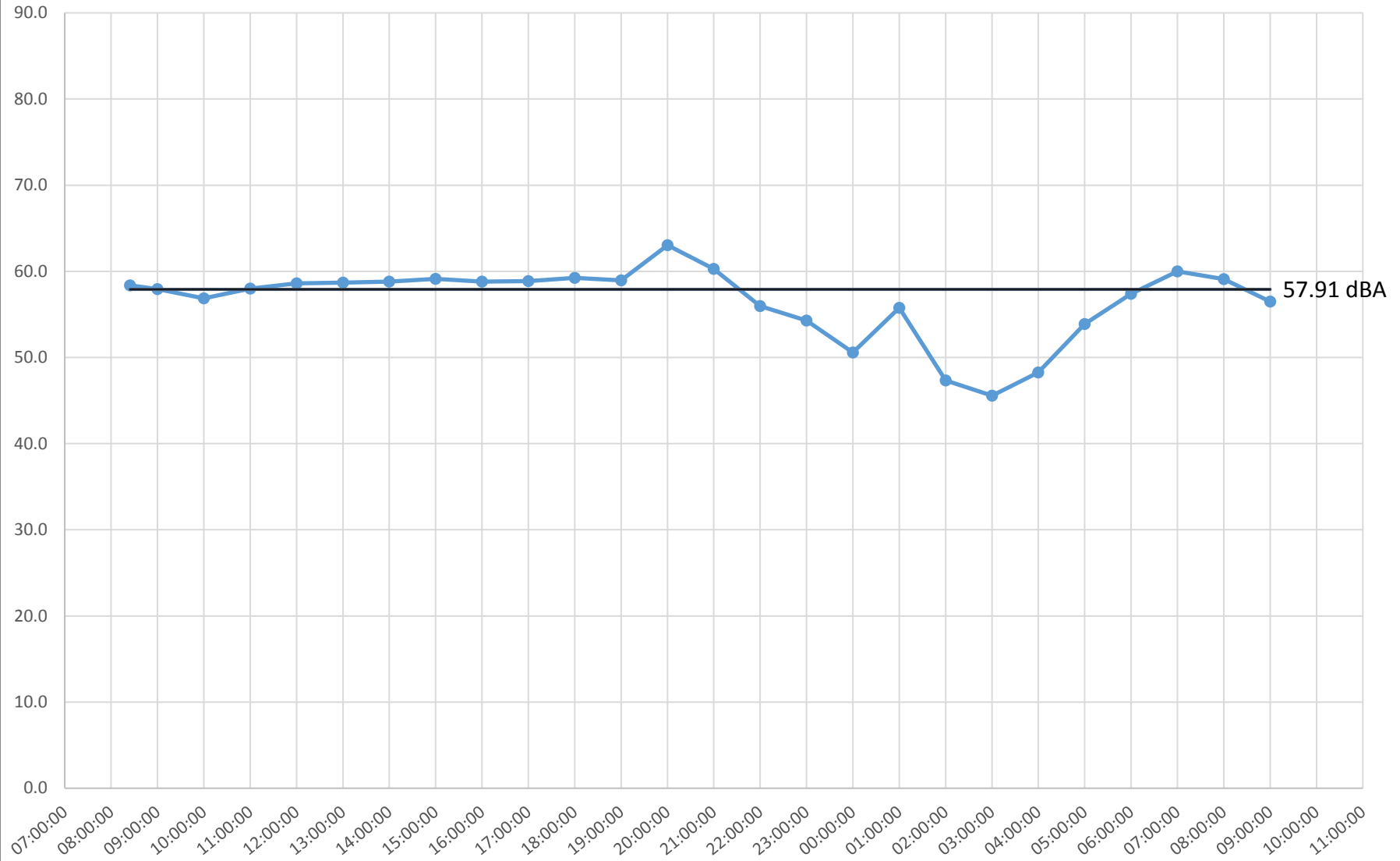


Figure C13: Location 13 Monitoring Results
7923 94 Street, Grande Prairie, AB
June 19-20 2018

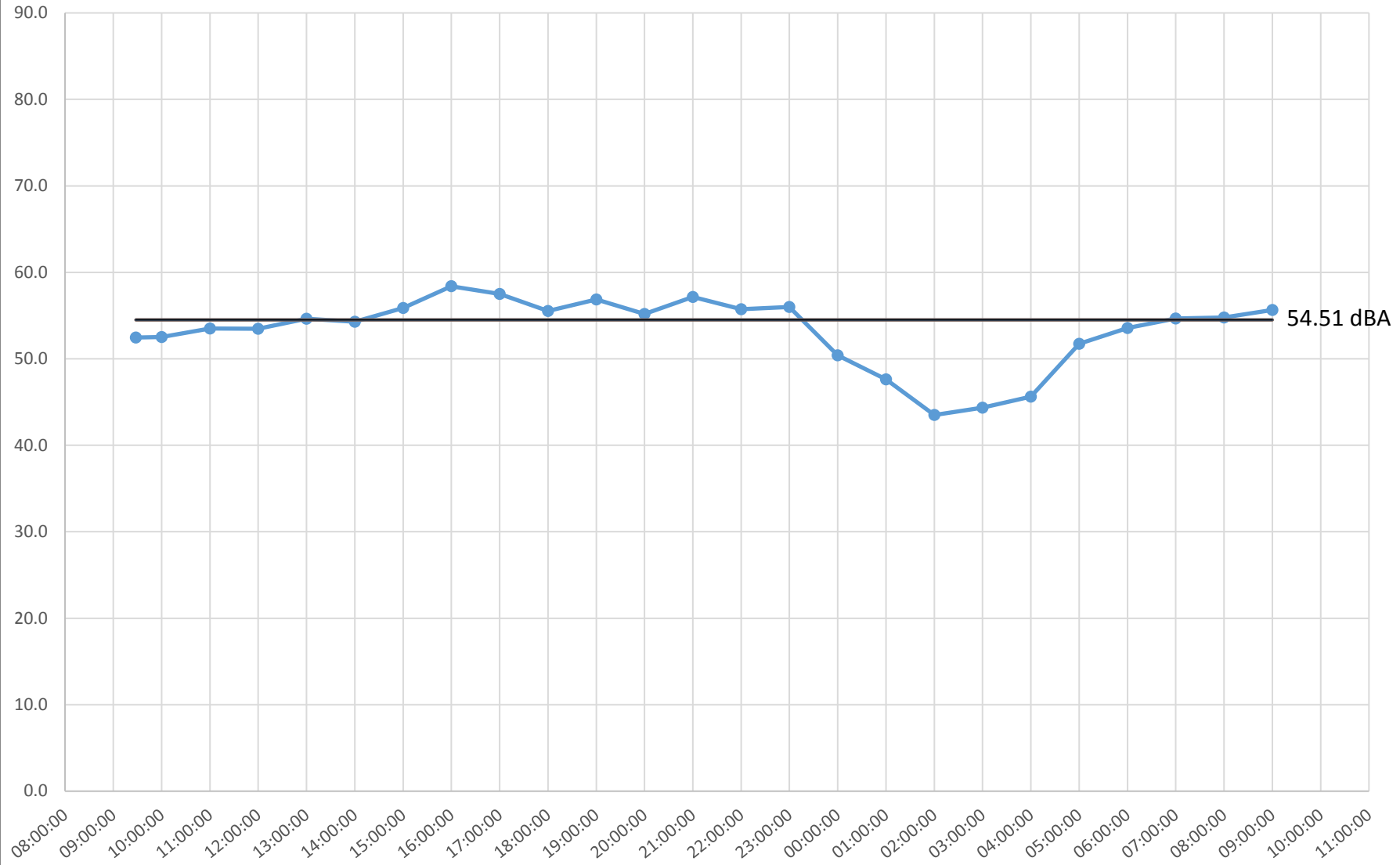


Figure C14: Location 14 Monitoring Results
25 Pinnacle Key, Grande Prairie, AB
June 19-20 2018

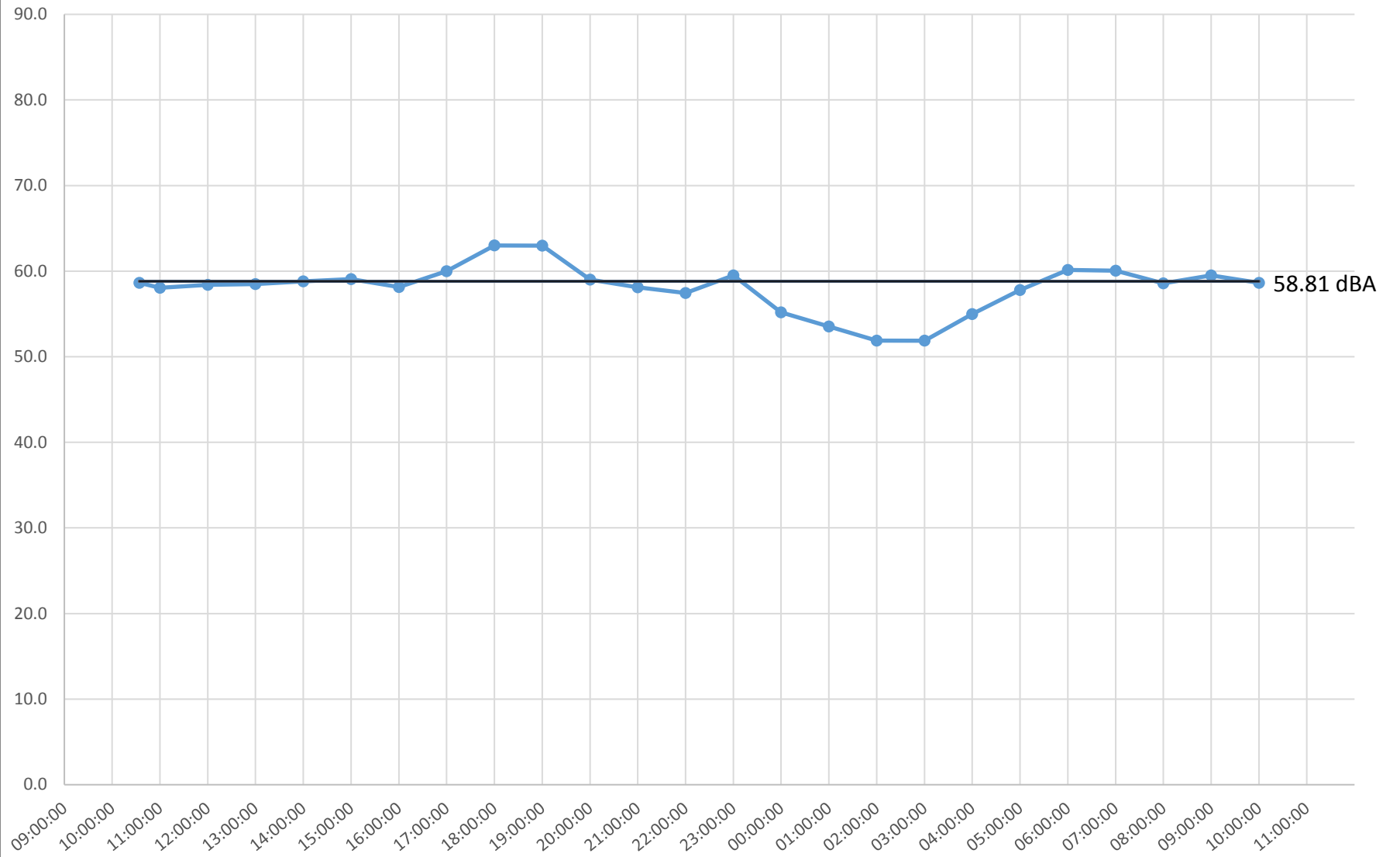


Figure C15: Location 15 Monitoring Results
11533 69A Avenue, Grande Prairie, AB
June 20-21 2018

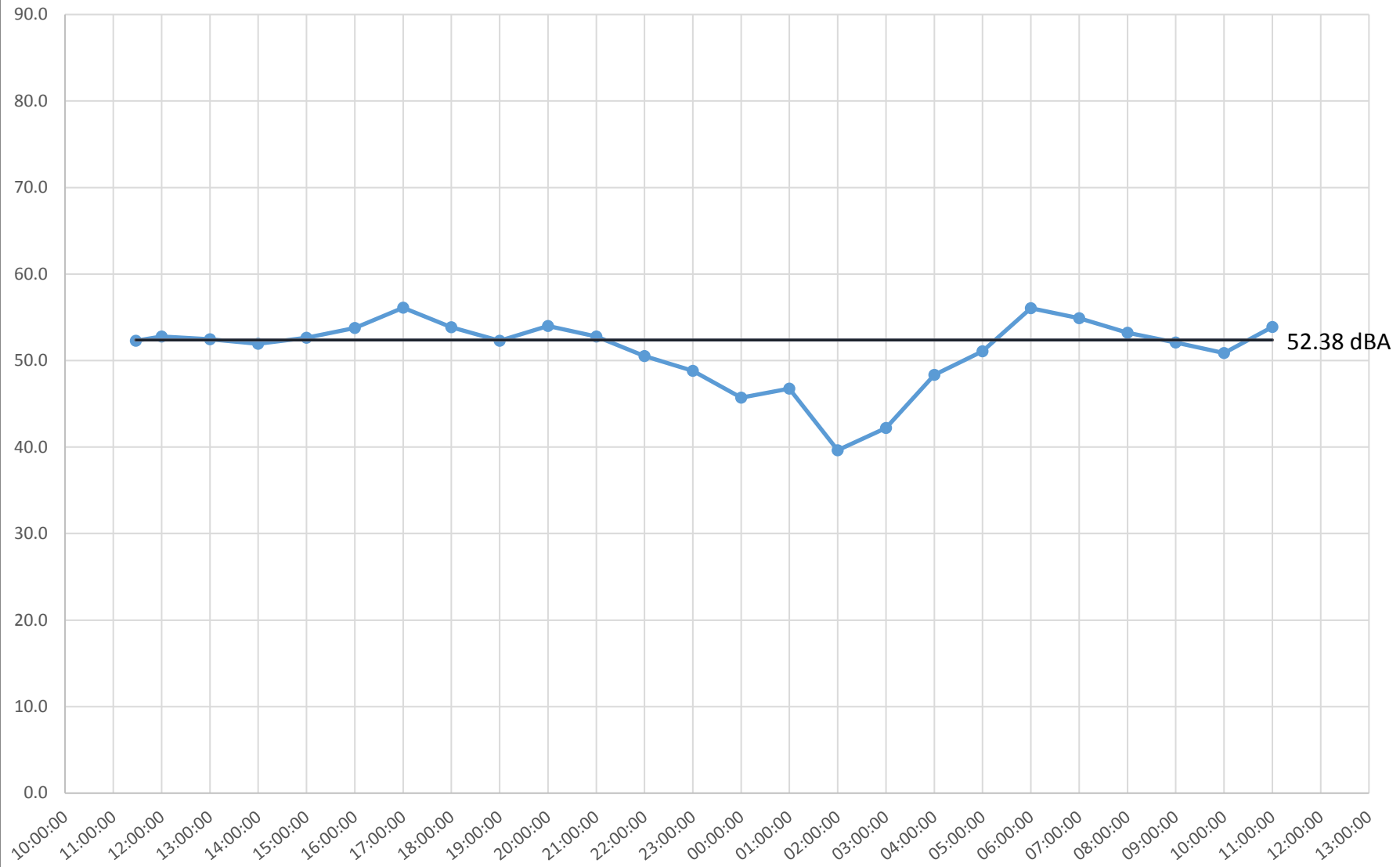


Figure C16: Location 16 Monitoring Results
6705 109 Street, Grande Prairie, AB
June 18-19 2018

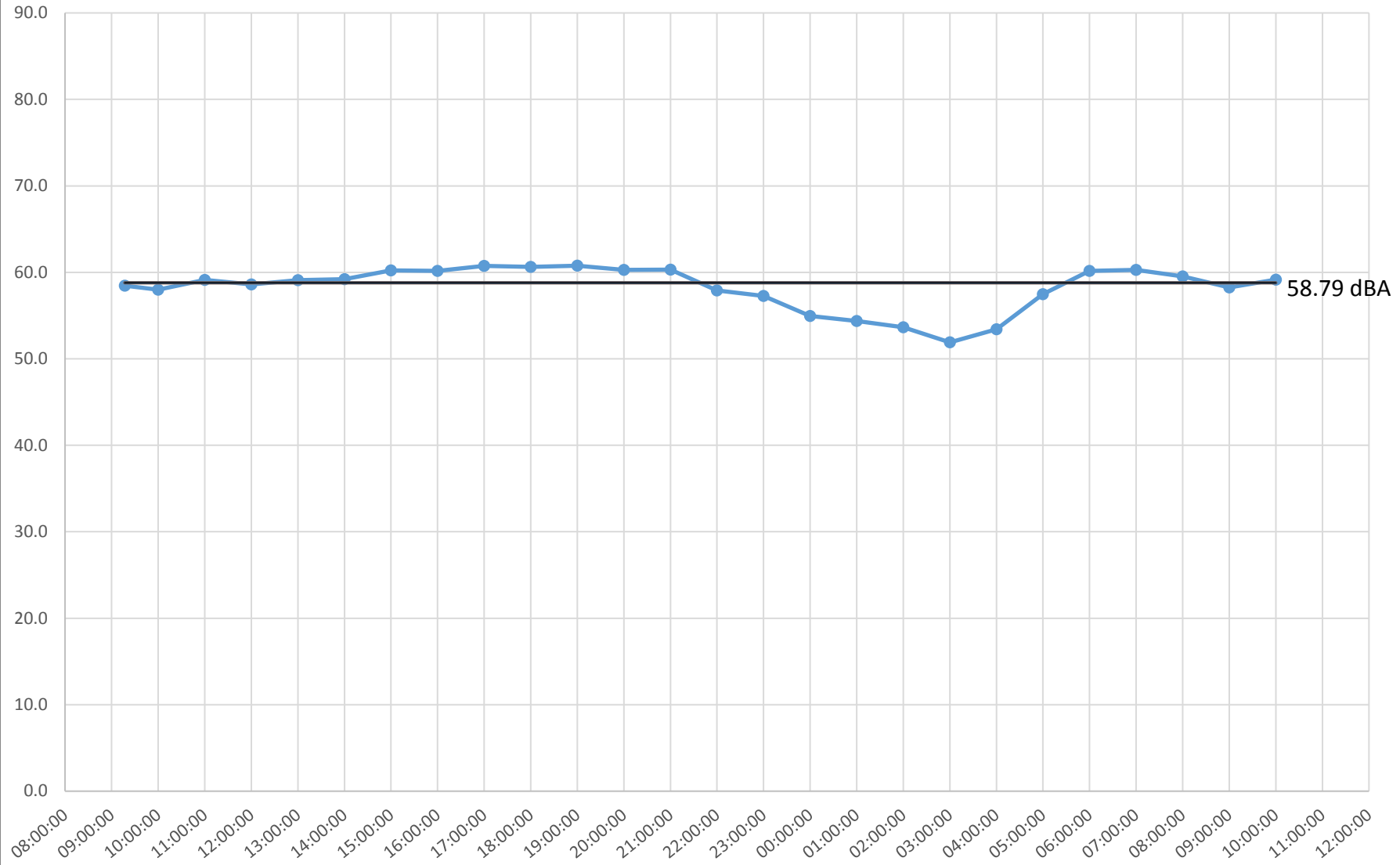


Figure C17: Location 17 Monitoring Results
9925 69 Avenue, Grande Prairie, AB
June 19-20 2018

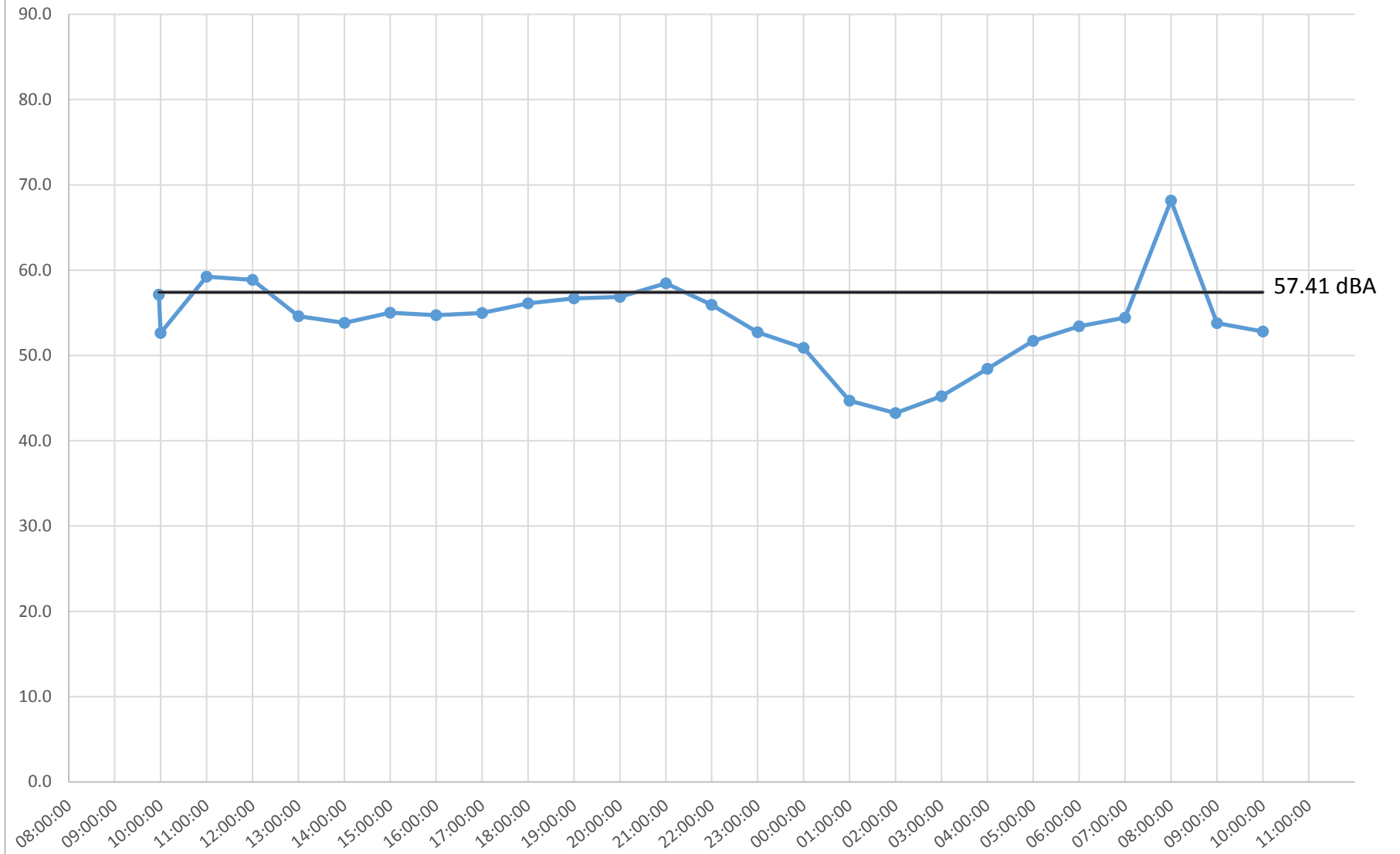


Figure C18: Location 18 Monitoring Results
9437 69 Avenue, Grande Prairie, AB
June 20-21 2018

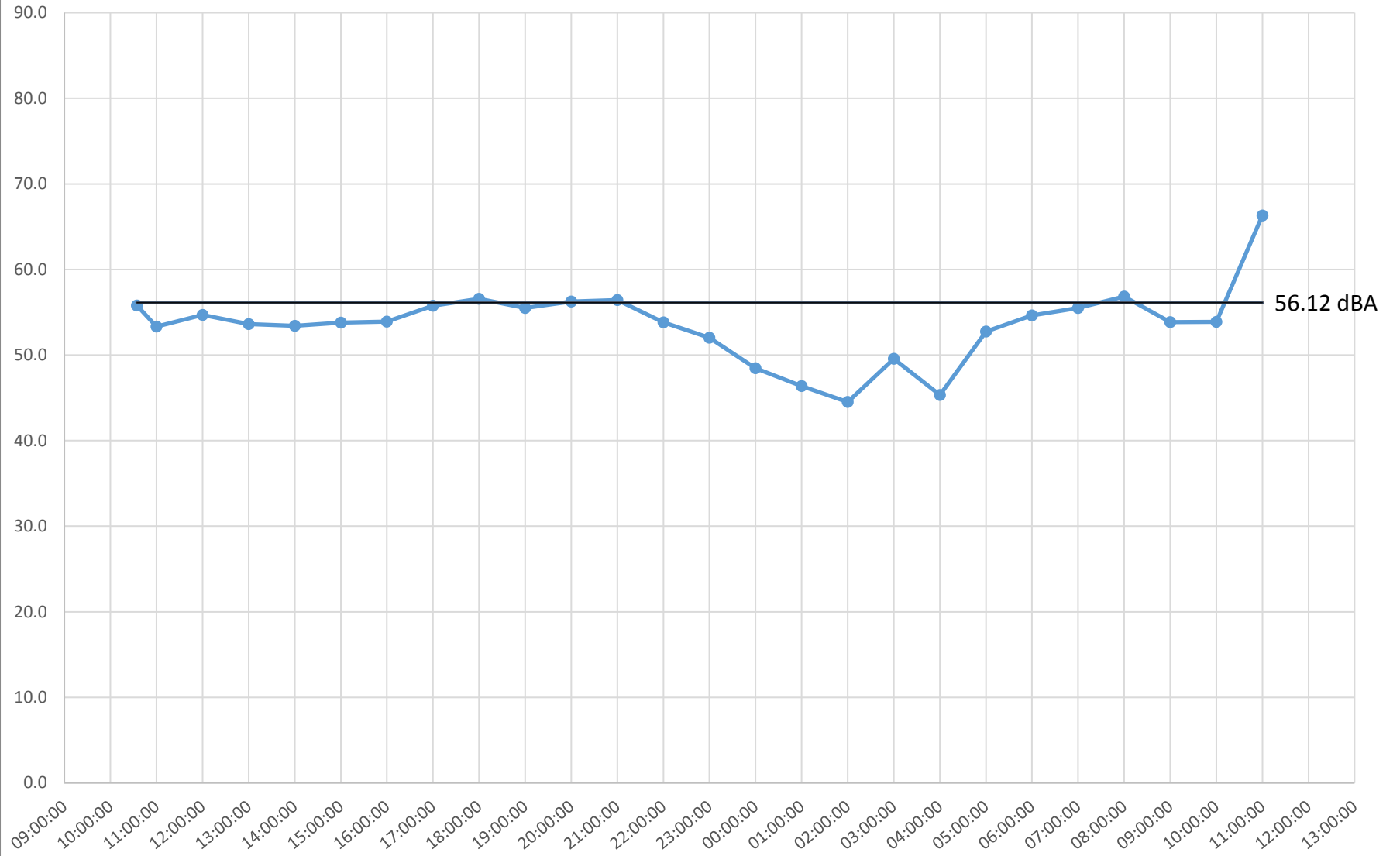


Figure C19: Location 19 Monitoring Results
9337 69 Avenue, Grande Prairie, AB
June 18-19 2018

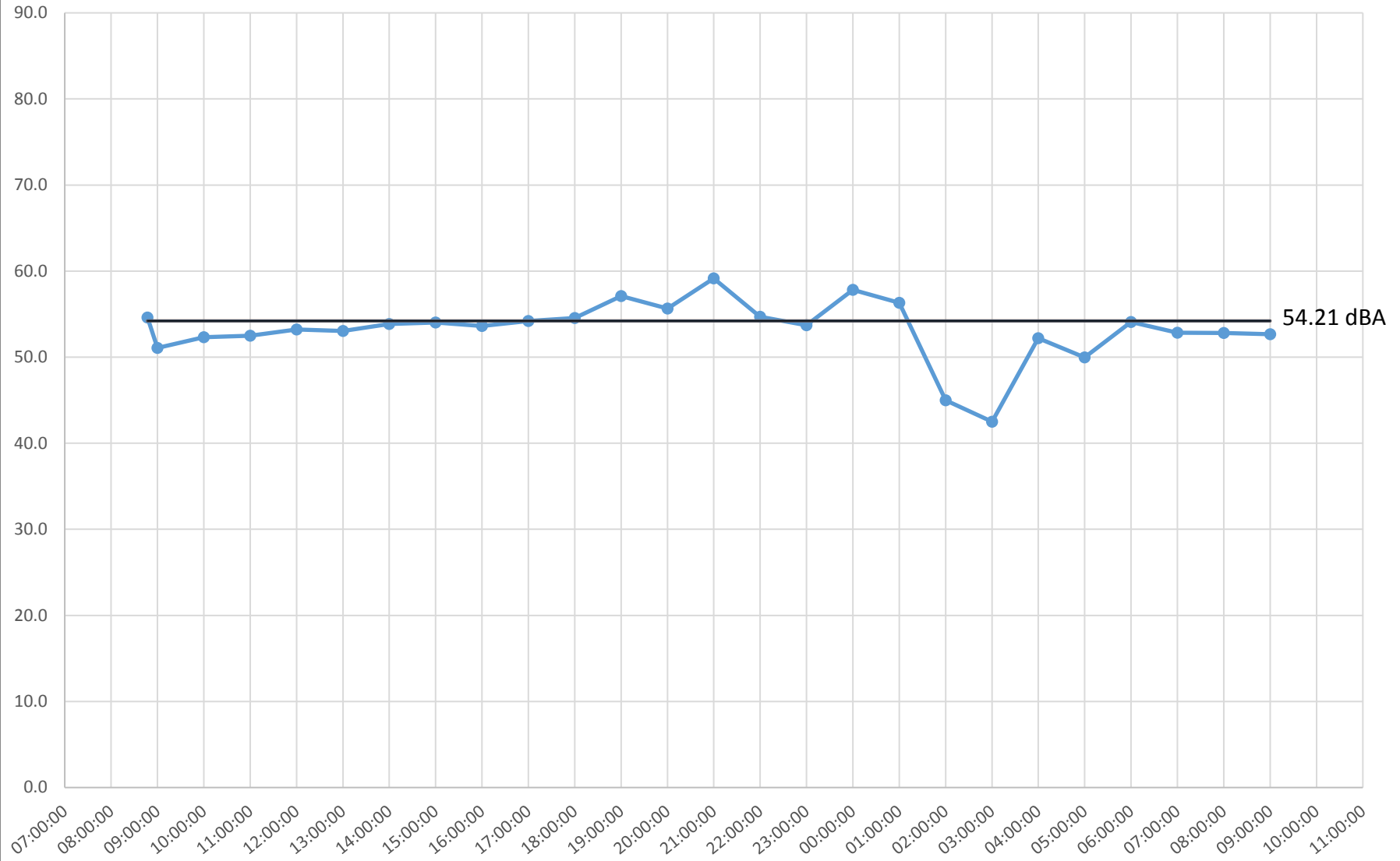


Figure C20: Location 20 Monitoring Results
6713 90A Street, Grande Prairie, AB
June 20-21 2018

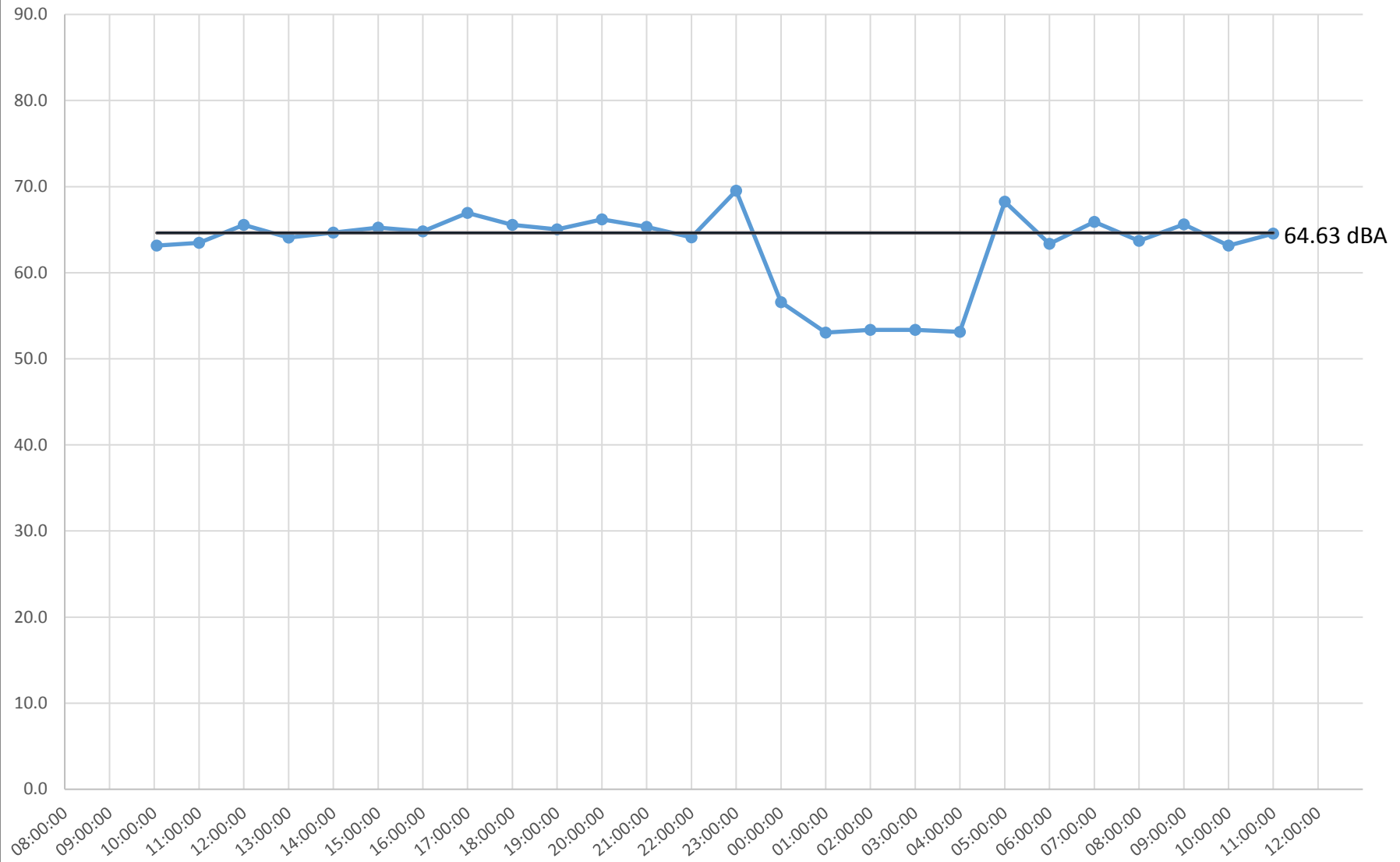
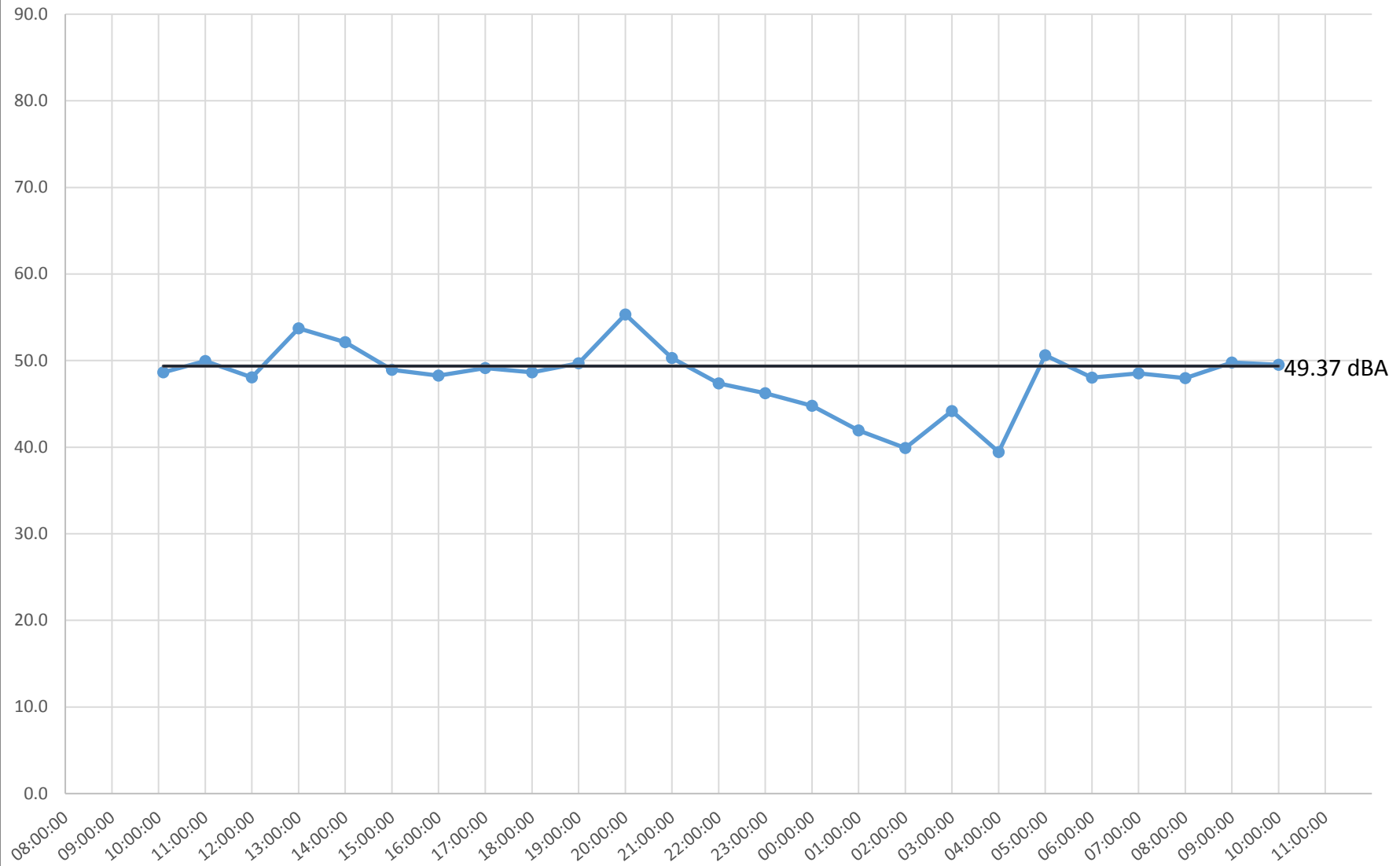


Figure C21: Location 21 Monitoring Results
6345 93 Street, Grande Prairie, AB
June 21-22 2018



Attachment D

Historical Sound Levels

Table D1: Comparison of Sound Level Results Leq (24), dBA

ADDRESS	2002	2003	2004	2005	2007	2008	2010	2012	2014	2016	2018	AADT	Intersection
116 Avenue													
10122 - 115 Ave				54.9									
9201 - 115 Ave									60.0				
9214 - 115 Ave										55.0	59.9	14041	116 Ave, 92 St (2016)
9715 - 117 Ave											60.7	18070	116 Ave, 97 St (2015)
9719 - 117 Ave	59.2		59.7	58.3						61.6			
9401 - 117 Ave					57.8		58.4				59.2	24903	116 Ave, Lakeland Drive (2011)
9113 - 117 Ave											51.4	14041	116 Ave, 92 St (2016)
9121 - 117 Ave						51.4	48.7						
9509 - 117 Ave									55.0				
98 Street													
9805 - 111 Ave				58.2							57.89	28739	108 Ave, 98 St (2009)
9804 - 104 Ave			65.5					57.3					
9808 - 104 Ave									60.0	53.6			
84 Avenue													
10013 - 85 Ave										60.8			
10015 - 85 Ave					62.0	61.5							
9824 - 83 Ave	57.2		55.8	54.0	56.0								
9559 - 85 Ave	54.7		56.6	58.0									
9654 - 83 Ave								57.4			57.91	12917	84 Ave, Poplar Dr (2017)
8320 - 114A St									61.0	61.1			
100 Street													
8202 - 99 A St				62.1		61.6							
8214 - 99 A St										55.3			
7922 - 99 A St			59.3										
7612 - 99 A St					57.2								
7310 - 99 A St	56.7					50.8		59.9					
7326 - 99 A St										54.5			
7214 - 99 A St			54.2	52.3									
8410 - 100 St									54.0				
Resources Road													
8223 - 94 St										61.9			
8219 - 94 St					60.0								
7923 - 94 St	54.1						54.2				54.5	20316	84 Ave, Resources Road (2016)
7031 - 93 St	48.8												
6345 - 93 St	54.8		48.8				51.1				49.4	13036	63 Ave, Resources Road (2014)
68 Avenue													
10954 - 67 Ave					48.8			63.7					
6705 - 109 St										57.9	58.79	27316	68 Ave, 108 St (2017)
11030 - 67 Ave									51.0				
9901 - 69 Ave	51.5	53.6	54.6	56.5									
9925 - 69 Ave									58.0		57.41	26007	68 Ave, 100 St (2015)
9437 - 69 Ave	54.8	55.4	56.7								56.12	15560	68 Ave, Poplar Dr (2016)
9329 - 69 Ave								56.5					
9337 - 69 Ave											54.21	15560	68 Ave, Poplar Dr (2016)
9341 - 69 Ave										54.0			
11533 69 A Ave											52.4	11028	68 Ave, 116 St (2015)
6902 - Poplar Dr					57.0								
9326 - 67 Ave			56.1					48.6					
9318 - 67 Ave				54.9		54.2							
9304 - 67 Ave					56.9								
6713 - 90 A St								63.5		64.5	64.63	23864	68 Ave, Resources Rd (2009)
6716 - 90 A St		60.2	62.1	61.6		62.1	60.5		58.0				
8575 - 69 Ave						47.9							

Table D1: Comparison of Sound Level Results Leq (24), dBA

ADDRESS	2002	2003	2004	2005	2007	2008	2010	2012	2014	2016	2018	AADT	Intersection
108 Street													
25 Pinnacle Key			54.1	57.8	53.6	55.7	56.1	50.1			58.8	27673	76 Ave, 108 St (2015)
29 Pinnacle Key										63.4			
7414 - 107A										55.8			
7406 - 107 A St			59.3	57.5		53.6		53					
92 Street													
9204 - 108 Ave					54.5		55.2	58.7					
9609 - 92 A St					56.3						61.36	25404	100 Ave, 92 St (2008)
9449 - 92 A St				55.0			58.4			60.1			
10415 - 92 A St											57.5	16436	108 Ave, 92 St (2015)
10427 - 92 A St								57.4					
10901 - 92 A St									58.0		56.4	16436	108 Ave, 92 St (2015)
7422 - 91 St							53.2						
7426 - 91 St										52.2			
7118 - 90 St									56.0				
102 Street													
11314 - 101 B St					48.5	53.6	54.5	58.4					
10202 - 114 A Ave						60.6	55.1	53.4			56.1		
10209 - 114 A Ave									52.0				
116 Street													
116 St / Pinnacle Dr								58.4					
7002 - 115B St										54.0		11028	68 Ave, 116 St (2015)
6934 - 115B St									56.0				
100 Avenue													
9029 - 101 Ave									56.0		56.07	37106	116 Ave, 102 St (2010)
132 Avenue													
9338 - 131 Ave									58.0				
9354 - 131 Ave											52.38	7902	132 Ave, 92 St (2017)
Other Sites													
13107 - 93 St					57.3								
9025 - 101 Ave		54.2	53.4	54.2		55.6		52.4					

Figure D1: Correlation Between Daily Traffic Volumes and Road Noise

