Kami Mining Project

Champion Kami Partner Inc.

Wabush, NL

Annex 1: Atmospheric Baseline Reports

Environmental Impact Statement

July 2025

1155 René-Lévesque Blvd. West, 33rd Floor
Montréal, Québec H3B 3X7 CANADA
T +1 514 316-4858
championiron.com

REPORT

Ambient Air Quality Baseline Report

Kami Iron Ore Mine Project

Submitted to:

Champion Iron
1155 René-Lévesque Blvd. West
Suite 3300
Montréal, QC H3B 3X7

Submitted by:

WSP Canada Inc.
25 York St.
Suite 700
Toronto, ON M5J 2V5

1-416-487-5256

CA0003092.5894

May 2025

Distribution List

Champion Iron Mines Ltd.

Study Limitations

WSP Canada Inc. (WSP) has prepared this document in a manner consistent with that level of care and skill ordinarily exercised by members of the engineering and science professions currently practising under similar conditions in the jurisdiction in which the services are provided, subject to the time limits and physical constraints applicable to this document. No warranty, express or implied, is made.

This document, including all text, data, tables, plans, figures, drawings and other documents contained herein, has been prepared by WSP for the sole benefit of Champion Iron Mines. It represents WSP's professional judgement based on the knowledge and information available at the time of completion. WSP is not responsible for any unauthorized use or modification of this document. All third parties relying on this document do so at their own risk.

The factual data, interpretations, suggestions, recommendations and opinions expressed in this document pertain to the specific project, site conditions, design objective, development and purpose described to WSP by Champion Iron Mines and are not applicable to any other project or site location. In order to properly understand the factual data, interpretations, suggestions, recommendations and opinions expressed in this document, reference must be made to the entire document.

This document, including all text, data, tables, plans, figures, drawings and other documents contained herein, as well as all electronic media prepared by WSP are considered its professional work product and shall remain the copyright property of WSP. Champion Iron Mines may make copies of the document in such quantities as are reasonably necessary for those parties conducting business specifically related to the subject of this document or in support of or in response to regulatory inquiries and proceedings. Electronic media is susceptible to unauthorized modification, deterioration and incompatibility and therefore no party can rely solely on the electronic media versions of this document.

Executive Summary

The Kamistiatusset (Kami) Iron Ore Mine Project (the Project) is a proposed iron ore mine in Newfoundland and Labrador. The Project site is located entirely in Labrador, approximately seven kilometres from the Town of Wabush, 10 kilometres from the Town of Labrador City, and five kilometres east of Ville de Fermont, Québec. The future mine operation is expected to produce eight million tonnes of iron ore concentrate annually, which will be transported by rail to the Pointe Noire port terminal in Ville de Sept-Îles, Québec, for international shipping.

To support the Project Registration and effects assessment from the revised Project design changes, Champion retained WSP Canada Inc. (WSP) to assess the baseline ambient air quality at the communities surrounding the Project. An earlier baseline data collection program was completed between 2011 and 2012 for the Kami Project; however, the data is more than 10 years old, so it was determined that additional data would be required to describe the current background concentrations for particulate matter (PM) in the nearby communities.

The air quality baseline monitoring program focussed on particulates because potential dust generated from the Project has been raised as a concern from nearby communities. The air quality monitoring stations for PM were deployed within three communities within the vicinity of the Project area from July 26 to September 17, 2023. Overall, there were no exceedances of the Newfoundland and Labrador Air Quality (NL AAQ) standards for TPM, PM_{10} and $PM_{2.5}$ measured during the program sampling period.

Measured SO_2 and NO_2 concentrations were obtained from the Department of Environment and Climate Change for the Province of Newfoundland and Labrador (Department) for the period of June through August 2023, which overlapped with the period that the particulate monitors were deployed. Following a review of the data from these stations, the Labrador City (Firehall) station operated by the Iron Ore Company of Canada, was selected as the most representative location to summarize the baseline conditions for the Kami Project. The maximum measured rolling average and maximum measured daily averages were below the NL AAQ standards.

Table of Contents

TABLES

FIGURES

Acronyms and Abbreviations

Acronym or Abbreviation	Description
AAQC	NL Ambient Air Quality
CAAQS	Canadian Ambient Air Quality Standards
AAQBA	Ambient Air Quality Baseline Assessment
AAMP	Ambient Air Monitoring Program
CAC COC	Compounds of Concern
CCME	Canadian Council of Ministers of the Environment
the Department	Department of Environment and Climate Change for the Province of Newfoundland and Labrador
EA	Environmental Assessment
ECCC	Environment and Climate Change Canada
IAAC	Impact Assessment Agency of Canada
NAPS	National Air Pollutant Surveillance
AQHI	Air Quality Health Index
NAAQO	National Ambient Air Quality Objectives
NO_X	Oxides of Nitrogen
NO_2	Nitrogen Dioxide
NO	Nitric Oxide
N_2O	Nitrous Oxide
TPM	Total Particulate Matter
PM	Particulate Matter
$PM_{2.5}$	Particulate Matter less than 2.5 micrometres in diameter
PM_{10}	Particulate Matter less than 10 micrometres in diameter
SO_2	Sulphur Dioxide
US EPA	United States Environmental Protection Agency

Units Of Measure

Unit	Description
ACFM	Cubic Feet Per Minute at Actual Conditions
LPM	Litres Per Minute
ppb	parts per billion
µm	Micrometres
µg/m^3	Microgram per Cubic Metre

1.0 INTRODUCTION

The Kamistiatusset (Kami) Iron Ore Mine Project (the Project) is a proposed iron ore mine in Newfoundland and Labrador. The Project site is located approximately seven kilometres southwest of the Town of Wabush, ten kilometres south of the Town of Labrador City, and five kilometres northeast of Ville de Fermont, Québec (Figure 1-1).

The Project was originally proposed by the Alderon Iron Ore Corporation (Alderon) and underwent a provincial and federal environmental impact assessment from 2011 to 2013, including a comprehensive baseline program that was completed in 2011 and 2012. The Project was released from the provincial and federal EA process in 2014. In 2021, Champion Iron Limited (through its subsidiary 12364042 Canada Inc, herein referred to as Champion) completed the acquisition of the Project from Alderon.

Champion is proposing several improvements to the Project design proposed by Alderon through the previous Environmental Impact Statement (EIS). These proposed improvements include optimizations to the Project's water management strategy and modernization of the proposed ore handling, conveyance, and processing. Champion's objective for the Kami Project is to produce high purity (>67.5%) iron concentrate, which can be used as direct reduction pellet feed for electric arc furnaces in the green steel supply chain.

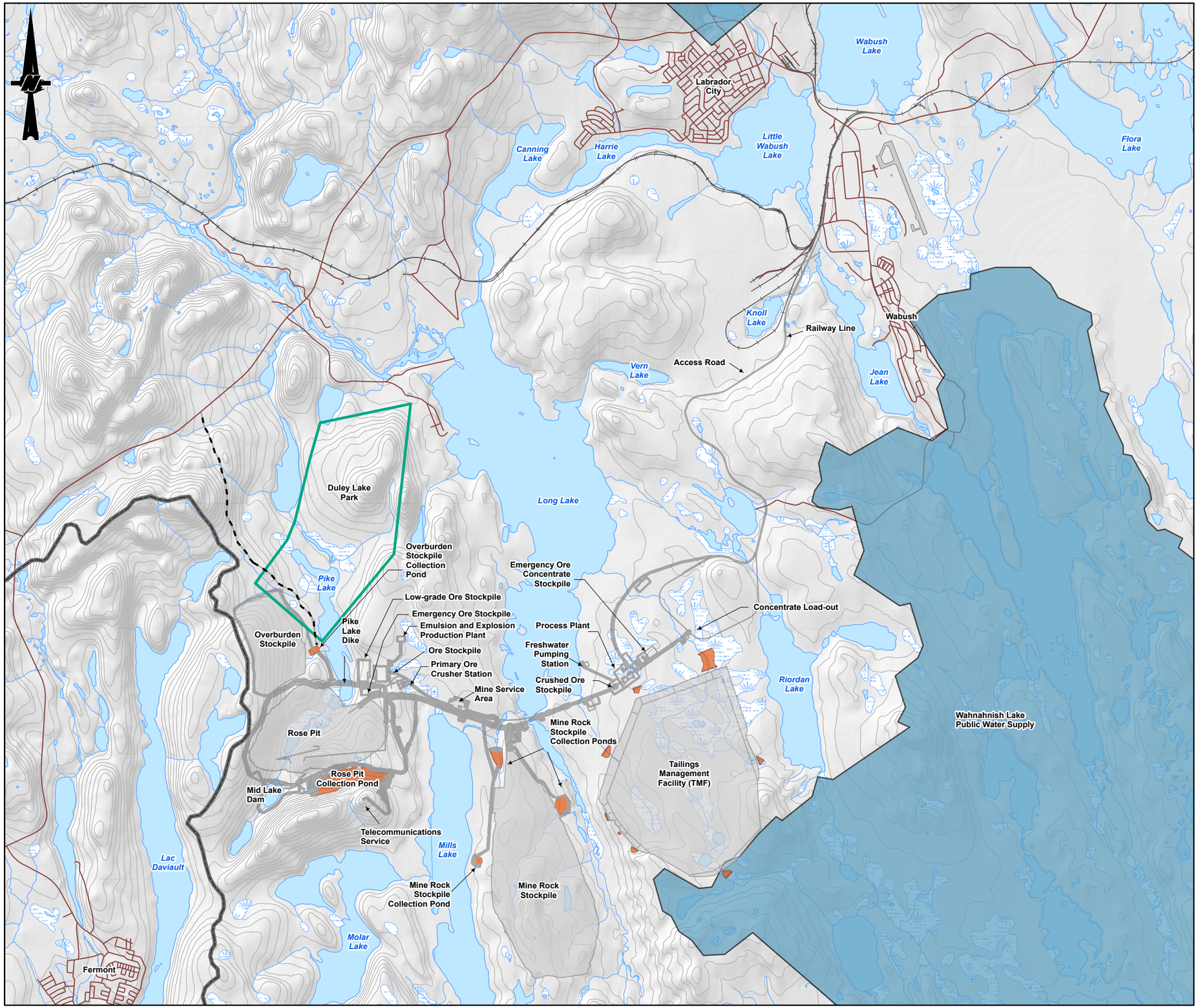
Champion submitted a Project Registration document to the NL Department of Environment and Climate Change (the Department) in April 2024 to restart the EA process for the Project. On June 13, 2024, the Minister issued a Decision Letter to Champion concluding that an EIS would be required for the Project. EIS Guidelines were issued for the Project on December 19, 2024, that includes requirements for baseline studies.

To support the EIS process, Champion has commissioned the services of WSP Canada Inc. (WSP) to complete a comprehensive baseline field program that documents the existing natural and socio-economic environments in the anticipated area of the Project, and this air quality baseline report represents a component of the comprehensive baseline program. The air quality baseline study was undertaken to provide context from which effects to air quality could be evaluated and inform the development of mitigation measures and follow-up effect monitoring programs in the EIS. Champion is planning to submit the EIS to the Newfoundland and Labrador Environmental Assessment Division of the Department of Environment and Climate Change in 2025.

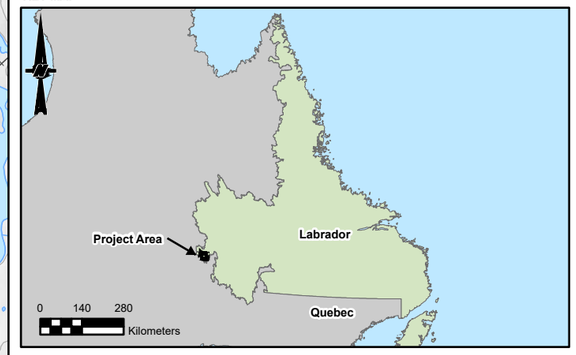
1.1 Overview of the Proposed Kami Project

Figure 1-1 outlines some of the main activities of the Project site including:

- Open pit (Rose Pit);
- Mine rock stockpile;
- Ore stockpiles (operational and reserve);
- Tailings management facility;
- Overburden stockpile;
- Processing infrastructure including crushing and concentrating;
- Ancillary infrastructure to support the mine and process plant.



KEY MAP



SCALE 1:20,000,000

Legend

PROJECT DATA

- Proposed Project Infrastructure
- Proposed Sediment Pond
- Potential Access Road

BASEMAP INFORMATION

- Road
- Railway
- Watercourse
- Contour
- Duley Lake Park
- Bog/Wetland
- Waterbody
- Labrador/Quebec Boundary
- Public Water Supply

0 1,000 2,000 4,000

1:71,000 METRES

NOTE(S)

1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)

1. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - ONTARIO
2. IMAGERY CREDITS:
3. COORDINATE SYSTEM: NAD 1983 UTM ZONE 19N

CLIENT

CHAMPION IRON MINES LTD.

PROJECT

KAMI IRON ORE MINE PROJECT (KAMI PROJECT)
WABUSH, NL

TITLE

PROJECT LOCATION AND SITE LAYOUT

CONSULTANT

wsp

YYYY-MM-DD	2025-02-27
DESIGNED	----
PREPARED	GM
REVIEWED	AF
APPROVED	--

PROJECT NO.	CONTROL	REV.	FIGURE
CA0038713.5261	0001	B	1-1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

25mm

PATH: S:\Clients\Champion_Iron_Ore_Mines\Kami Iron Ore\99_PROJ\CA0038713.5261_EIS\40_PROD\0002_General\CA0038713_5261_0002_V.X.aprx PRINTED ON: AT: 1:57:20 PM

1.2 Contaminants of Concern

As part of the main activities of the mining operations, it is expected that the following Contaminants of Concern (COC) will be PM emissions (dust) generated during mechanical disturbance of rock and soil materials, blasting and crushing, and wind erosion over stockpiles during development of the Project. Suspended dust (i.e., airborne PM) is expected from vehicular traffic volumes on haul roads. Airborne PM is often split into three categories based on particle size:

- Total particulate matter (TPM) – this category includes the largest particle size, airborne particles with an aerodynamic diameter less than 100 micrometres (µm).
- PM_{10} – a portion of the TPM with aerodynamic diameters of 10 µm or less is referred to as PM_{10}. The PM_{10}-sized particles are small enough to be inhaled into the upper respiratory tract (inhalable particulate).
- $PM_{2.5}$ – a portion of PM_{10} with an aerodynamic diameter of 2.5 µm or less is referred to as $PM_{2.5}$. This fine PM is small enough to be drawn into the lungs and are sometimes described as the respirable fraction of airborne particles (respirable particulate).

There will also be stationary and mobile fuel combustion sources associated with the Project, such as explosive detonation, haul trucks, material handling equipment, and power generation equipment which will produce airborne gaseous emissions. Carbon monoxide (CO) is an intermediate combustion product that forms when there is an incomplete reaction of CO to carbon dioxide (CO_2). Nitrogen dioxide (NO_2) emissions occur mainly from high-temperature combustion processes. Although most of the NO_X emissions are in the form of Nitric oxide (NO), NO will rapidly oxidize in the presence of ozone to form NO_2. Sulphur dioxide (SO_2) is formed when sulphur is present in fuel mixtures, which reacts with oxygen during the combustion process.

1.3 Regulatory Criteria and Guidelines

The AAQBA will be limited to the Project-related COC, which include nitrogen oxides (NOx as nitrogen dioxide, NO_2), SO_2, CO, TPM, PM_{10}, and $PM_{2.5}$. The predicted ground level concentrations from the Project will be determined through dispersion modelling, and compared to the relevant air quality limits and objectives. The Government of Newfoundland and Labrador lists the ambient air quality standards in Table I of Schedule A of the *Air Pollution Control Regulations, 2022* (O.C. 2022-072), under the *Environmental Protection Act*. For provincial permitting, facilities are expected to demonstrate compliance with the standards at the facility's administrative boundary.

The Government of Canada has set the Canadian Ambient Air Quality Standards (CAAQS), which are non-regulatory limits that can be used to facilitate air quality management on a regional scale and provide goals for ambient air quality that protect public health, the environment, or aesthetic properties of the environment. Table 1-1 provides a summary of the standards, applicable to the COC emissions from the Project.

Table 1-1: Standards Applicable to the Compounds of Concern Emissions for the Project

Pollutant	Averaging Period	Newfoundland and Labrador Ambient Air Quality Standards[a]	Canadian Ambient Air Quality Standards[b]
NO_2	1 hour	213 ppb	60 ppb 42 ppb[c,d] (2025)
	24 hour	106 ppb	—
	Annual	53 ppb	17 ppb 12 ppb[e,d] (2025)
SO_2	1 hour	344 ppb	70 ppb 65 ppb[f,d] (2025)
	3 hour	229 ppb	—
	24 hour	115 ppb	—
	Annual	23 ppb	5.0 ppb 4.0 ppb[g,d] (2025)
CO	1 hour	30,582 ppb	—
	8 hour	13,107 ppb	—
TPM	24 hour	120 µg/m³	—
	Annual	60 µg/m³	—
PM_{10}	24 hour	50 µg/m³	—
$PM_{2.5}$	24 hour	25 µg/m³	27 µg/m³[h]
	Annual	8.8 µg/m³	8.8 µg/m³[i]

Notes:

(a) Government of Newfoundland and Labrador (O.C. 2022-072)

(b) CAAQS published in the Canada Gazette Volume 147, No. 21 – May 25, 2013.

(c) The 3-year average of the annual 98th percentile of the daily maximum 1-hour average concentrations of NO_2.

(d) The Canadian Ambient Air Quality Standard (CAAQS) is effective from 2025.

(e) The average over a single calendar year of all 1-hour average concentrations of NO_2.

(f) The 3-year average of the annual 99th percentile of the SO_2 daily maximum 1-hour average concentrations.

(g) The average over a single calendar year of all 1-hour average concentrations of SO_2.

(h) The 3-year average of the annual 98th percentile of the daily 24-hour average concentrations of $PM_{2.5}$.

(i) The 3-year average of the annual average of the daily 24-hour average concentrations of $PM_{2.5}$.

2.0 RATIONALE AND OBJECTIVES

The objectives of the AAQBA are to quantify the background air quality in the Project area and nearby communities. A baseline data collection program was completed between 2011 and 2012 for the Kami Project; however, since the data is more than 10 years old, it was determined that additional data would be required to describe the current background concentrations for PM (TPM, PM_{10} and $PM_{2.5}$) in the nearby communities. The baseline monitoring program focused on particulates because potential dust generated from the Project has been raised as a concern from nearby communities.

Local industries also operate ambient air quality monitoring stations within the vicinity of the Project. The Iron Ore Company of Canada operates three monitoring stations in Labrador City and Tacora Resources Inc. operates two stations in Wabush, NL. These stations are intended to monitor local effects from the respective mine sites. The Iron Ore Company of Canada station located on Hudson Drive in Labrador City, is considered a National Air Pollution Surveillance (NAPS) equivalent station for the purpose of generating hourly readings for the Air Quality Health Index (AQHI). The annual monitoring results from these stations are summarized in the Annual Ambient Air Monitoring Reports published by the Department.

The results from the AAQBA data characterization will be used to support the assessment of Project related effects from the Construction, Operations, and Closure phases of the Project.

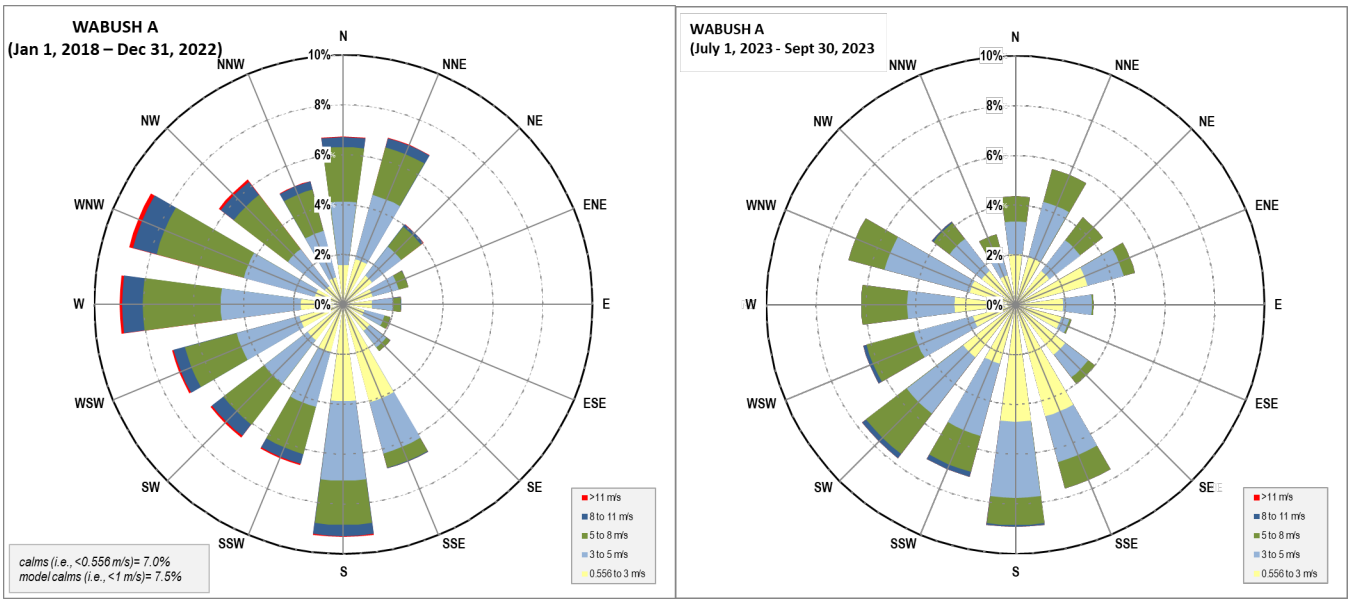
3.0 STUDY AREA

3.1 Local Meteorology

Wind data measured at the NAV Canada weather station at the Wabush Airport (Climate ID: 8504176) was used to describe the prevailing winds for the Project area. The weather station is located approximately 12 km northeast of the Project.

Figure 3-1 shows the five-year (2018 to 2022) wind rose for the Wabush Airport outlining the wind speed in metres/second (m/s) and wind direction frequency. A second wind rose showing the July to September 2023 wind patterns is included as the summer conditions are generally associated with higher fugitive dust emissions and this period overlapped with the AAQBA period. The wind roses show limited variability between the annual (2018 to 2022) and July to September (2023) periods with the prevailing winds generally blowing from the south and west.

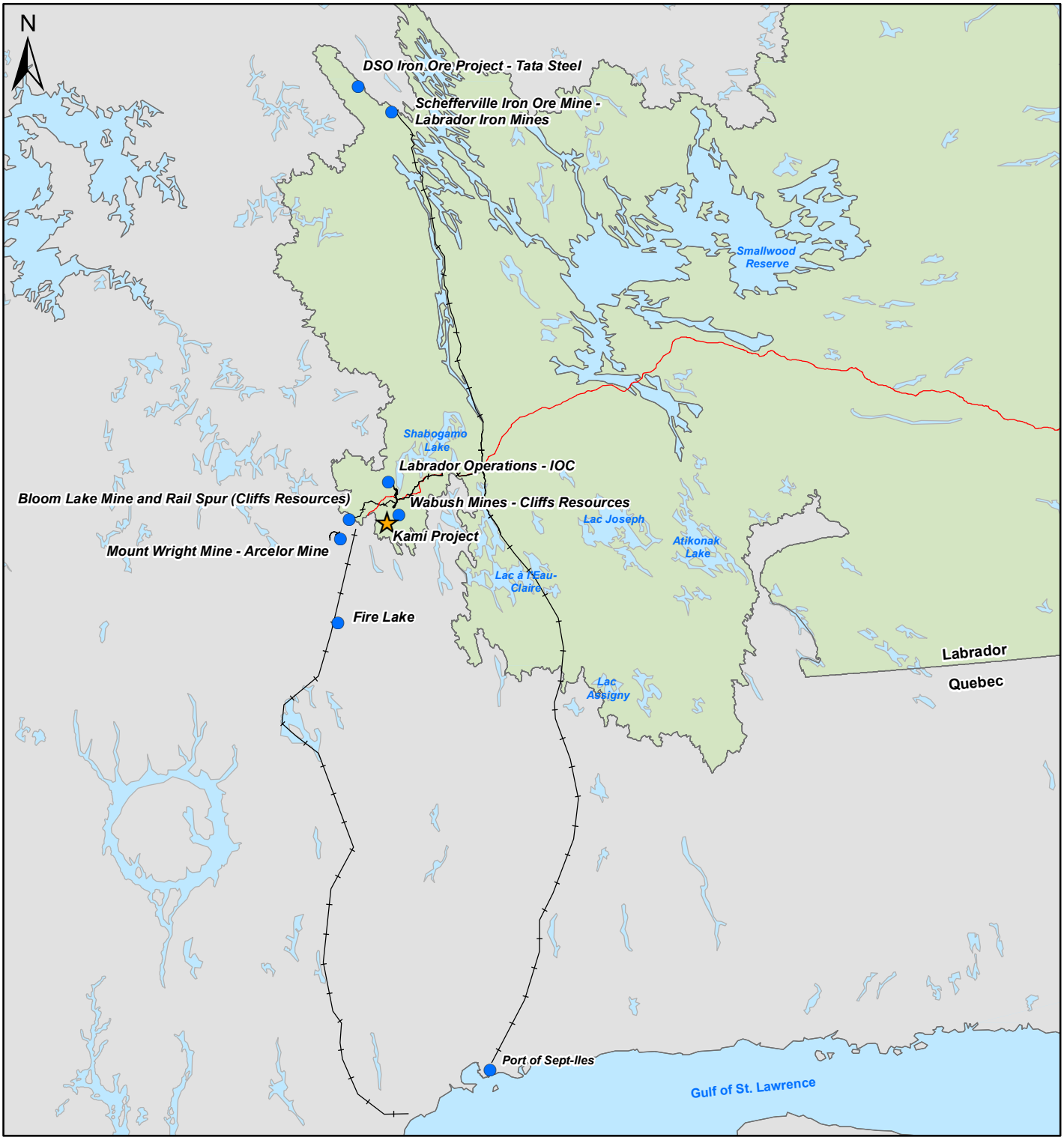
Figure 3-1: Wind Roses for the Wabush Airport



3.2 Existing Ambient Air Quality

Ambient air quality at the Project is influenced by natural and anthropogenic sources at the local and regional scales. Natural sources include, but are not limited to, pollen from vegetation during spring and summer months and air pollutants associated with forest fires. Anthropogenic sources include road traffic, construction, building heating, wind-blown particulate from exposed area sources, mining, power generation activities, and contributions from transboundary or long-range transport of air contaminants.

Figure 3-2 shows other mining projects that are located within the vicinity of the Kami Project. With respect to the Project, the main sources of air emission during construction and operations would include fugitive dusts and COC from fuel combustion.



LEGEND

- Kami Project Site
- Other Project Locations
- Railway
- Existing Road

0 28,500 57,000 114,000

1:2,975,000 METRES

NOTE(S)

1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)

1. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - ONTARIO
2. COORDINATE SYSTEM: NAD 1983 UTM ZONE 19N

CLIENT
CHAMPION IRON MINES

PROJECT
KAMI IRON ORE PROJECT
WABUSH, NL

TITLE
OTHER MINING PROJECTS IN THE VICINITY OF THE KAMI PROJECT

CONSULTANT

wsp

YYYY-MM-DD	2023-12-08
DESIGNED	----
PREPARED	JA
REVIEWED	JT
APPROVED	----

PROJECT NO.	CONTROL	REV.	FIGURE
TE23930010	0001	A	3-2

3.3 Ambient Air Quality Monitoring Program

The main activities for the Project, as described in Section 1, are located in Western Labrador approximately seven kilometres from the Town of Wabush, 10 kilometres from the Town of Labrador City, and five kilometres east of Ville de Fermont, Québec. There are a number of cabins located around the lakes adjacent to the Project area, particularly Long Lake, Riordan Lake, and Mills Lake. Duley Lake Provincial Park and the Duley Lake Provincial Nature Reserve are located north of the Project near Long Lake. Three ambient air quality monitoring station locations were selected to maintain consistency with the air quality monitoring program completed in 2011 and 2012 for the Kami Project since the rationale for the initial site selection is still sound.

Fermont was selected as an air quality monitoring station location because of the proximity of the community to the proposed Project. Although the predominant winds for the region are not from the East, as shown on Figure 3-1, the community has raised concerns about potential dust impacts from the Project. In addition, background air quality data is not readily available for the community of Fermont. The air quality station was selected based on discussions held between WSP field staff and community members. The ski club was chosen because there was continuous power available, and the location was readily accessible and secure.

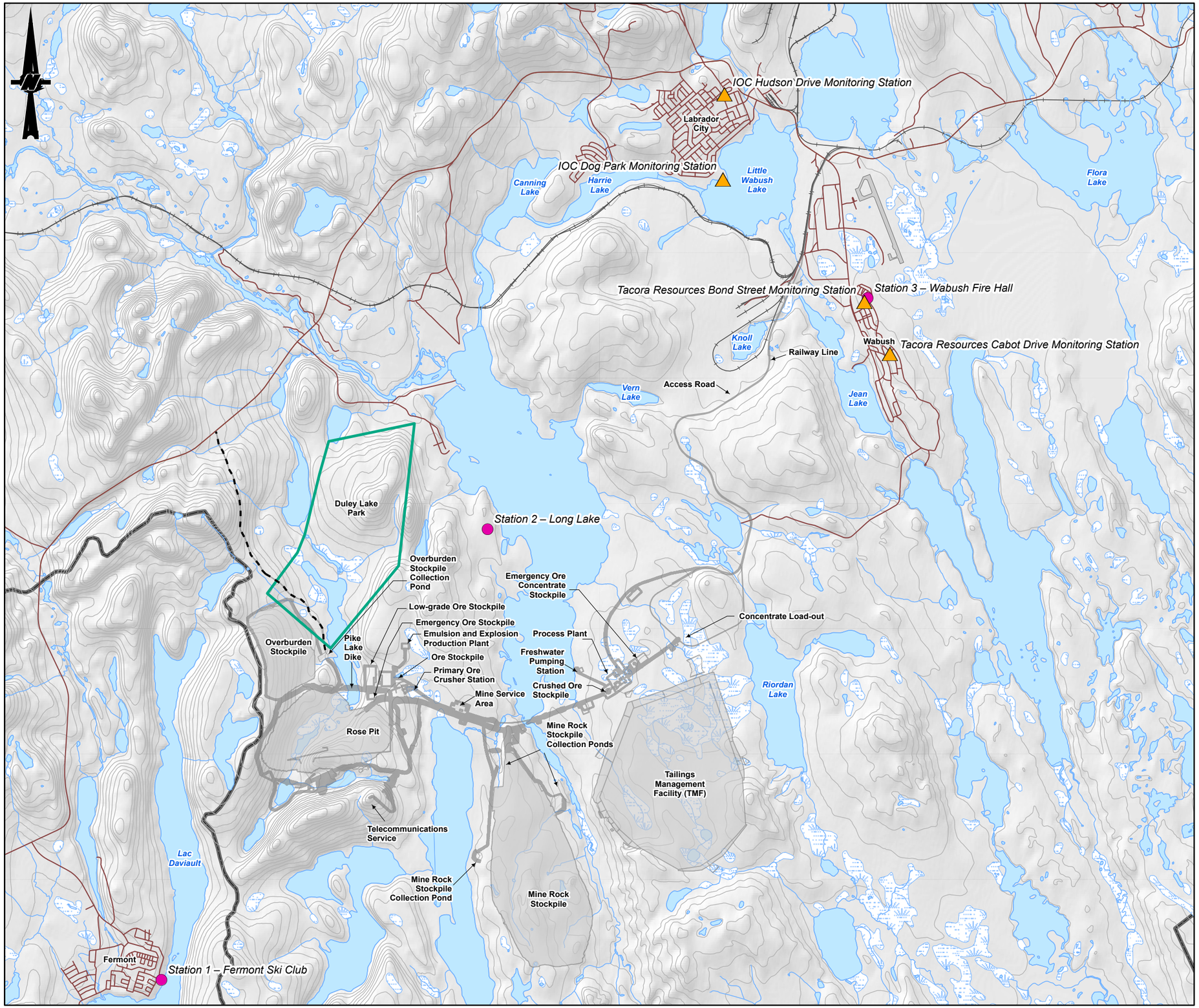
The station near Long Lake was moved further south from the location selected for the 2011 and 2012 monitoring program, because the previous station location had been repurposed as a campground. As noted in the previous baseline report, the Long Lake site presented a challenge (Stassinu Stantec 2012). The air quality monitoring station was located away from the main unpaved road, which made the accessibility challenging. The site also did not have a continuous power supply, so the monitoring station was set up using a power system with 12V batteries, which maintain their charge through solar panels.

The Wabush monitoring station location was selected because it is in the predominant downwind direction from the Project. Discussions were held with local community members to identify an ideal station siting. The fire hall provided a secure and easily accessible monitoring location and a continuous power source.

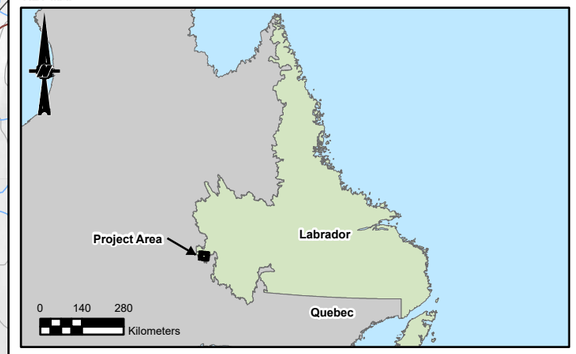
Table 3-1 provides a summary of the monitor locations from the 2011 to 2012 and the 2023 baseline sampling programs. The locations of the ambient air quality monitors from the 2023 baseline sampling program are shown on Figure 3-3.

Table 3-1: Ambient Air Quality Monitoring Programs

Station Location	2011-2012 Baseline Air Quality Sampling Program			2023 Baseline Air Quality Sampling Program		
	Easting (m)	Northing (m)	Description	Easting (m)	Northing (m)	Description
Fermont, Québec	629449	5851022	Residential property	629479	5851009	Ski club
Long Lake, Labrador	634479	5862308	Recreational area near Duley Lake	635823	5859779	Remote area adjacent to Long Lake
Wabush, Labrador	643272	5863149	Residential property	643215	5864276	Fire hall



KEY MAP



SCALE 1:20,000,000

LEGEND

- Baseline Air Quality Monitoring Stations
- Air Quality Monitoring Stations

PROJECT INFRASTRUCTURE

- Proposed Infrastructure Footprint
- Potential Access Road

BASEMAP INFORMATION

- Road
- Railway
- Watercourse
- Contour
- Duley Lake Park
- Bog/Wetland
- Waterbody
- Labrador/Quebec Boundary

0 1,000 2,000 4,000

1:75,000 METRES

NOTE(S)

1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)

1. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - NEWFOUNDLAND AND LABRADOR
2. IMAGERY CREDITS:
3. COORDINATE SYSTEM: NAD 1983 UTM ZONE 19N

CLIENT

CHAMPION IRON MINES LTD.

PROJECT

KAMI IRON ORE MINE PROJECT (KAMI PROJECT)
WABUSH, NL

TITLE

SAMPLE LOCATIONS

CONSULTANT

wsp

YYYY-MM-DD	2025-03-11
DESIGNED	----
PREPARED	GM
REVIEWED	MG
APPROVED	JMC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0038713.5261	0001	B	Figure 3-3

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

0 25mm

PATH: S:\Clients\Champion_Iron_Ore_Mines\Kami Iron Ore\99_PROJ\CA0038713.5261_EIS\40_PROD\0007_Atmospheric\CA0038713_5261_0007_0000.aprx PRINTED ON: AT: 10/1/28 AM

4.0 METHODS

4.1 Particulate Monitoring Equipment

An Aeroqual Particle Profiler “near-reference”, demonstrating good precision and accuracy in the field when calibrated against reference methods, was used to collect real-time continuous TPM, PM_{10} and $PM_{2.5}$ data for the AAQBA. The specifications of the unit are outlined in Table 4-1.

Aeroqual Dust Sentry Profiler’s (DS pro) were used at monitoring locations 1 (Fermont Ski Club), 2 (Long Lake) and 3 (Wabush Fire Hall). The DS Pro units collected PM data continuously and offered two-way remote connectivity, which was considered an asset when selecting the air quality monitoring station locations due to the relatively remote nature of the Project. The units were fitted with an inlet heater to help mitigate bias associated with high relative humidity (RH). The manufacturer has tested the units down to -40°C and concluded that the units operated adequately down to -40°C, albeit for short periods.

Table 4-1: Specification of the Aeroqual DS Pro Unit

Particle Module	Sizes	Range	Resolution	Lower Detectable Limit (2s)	Accuracy
DS Profiler (Optical Particle Counter)	$PM_{2.5}$, PM_{10}, and TPM	$PM_{2.5}$ 2000 µg/m^3 PM_{10} 5000 µg/m^3 TSP 5000 µg/m^3	0.1 µg/m3	<1 µg/m3	+/- (5 µg/m^3 +15% of reading)

4.2 Data Collection

Total Particulate Matter (TPM), PM_{10} and $PM_{2.5}$ monitoring was recorded on 1-min average concentrations utilizing internally measured flow rate, ambient temperature, ambient pressure, and relative humidity data. These data were averaged to obtain 1-hour averages, rolling 24-hour average or daily average (midnight to midnight) concentrations for comparison to the applicable regulatory criteria.

The DS pro monitors utilize a forward laser light scatter nephelometer system to measure ambient particulate levels. This methodology is sensitive to ambient fog, which results in the measurements over-stating ambient PM concentrations during these conditions.

Instrumentation issues arose during the baseline monitoring period for the air quality monitoring station at Long Lake (Station 2). During the baseline program, the DS Pro unit stopped operating due to a lack of electrical power. The station was supported by battery/solar panel system and during the period of August 1 to September 19, 2023, there was not enough solar input to supply charge to the batteries. Consequentially no air quality data was collected during this sampling period at Station 2.

4.3 Quality Assurance/Quality Control Procedures

The AAQBA was carried out in accordance with defined quality assurance/quality control (QA/QC) protocols to ensure that the basic elements outlined in the ambient air quality monitoring guidance documentation were adhered to. These procedures included:

- Strategic site selection to minimize interferences and obstacles that may affect airflow;
- Sampling system requirements;
- Site and analyzer operation;

- Frequency of sampler flow checks and equipment calibrations;
- Performance and system audits;
- Data validation, editing, and reporting;
- Documentation of field notes; and
- Personnel training.

Field staff were appropriately trained with the deployment, installation and operation of the air monitoring equipment, including safe transport of the equipment.

Data validation for the continuous monitors was included in the routine data QA/QC checks and regular monitoring of concentrations and investigations into suspect data was undertaken as applicable. The DS Pro, demonstrated good precision and accuracy in the field, and was calibrated by the manufacturer against reference methods prior to field deployment.

5.0 STUDY RESULTS

The ambient air quality monitoring stations for PM measurements, were deployed within the vicinity of the Project area, as described in Section 3.3, from July 26 to September 17, 2023, to establish baseline levels for local air quality. This monitoring period was prior to the commencement of any construction activities associated with the Kami Project. WSP did not undertake monitoring for SO_2 and NO_2, since concentrations are measured at the ambient air quality monitoring stations in Labrador and Wabush. The 2023 monitoring data for June through August was provided by the Department and the 2022 monitoring results were summarized in the Annual Ambient Air Monitoring Reports prepared by the Department. Measured SO_2 and NO_2 data were not yet available for the month of September 2023, when the data analysis was completed. The ambient air quality monitoring stations located in the vicinity of the Kami Project do not monitor for CO; therefore, baseline CO concentrations are not included in the summary below.

During the baseline sampling period, the Department noted that forest fires across the province of Newfoundland and Labrador impaired the ambient air quality in the region. The prevailing winds during this time, for the most part, did not bring significant smoke from the fires in the direction of the air quality monitoring stations and elevated COC levels were not obvious in the collected data; however, it is recognized that COC levels in the area may have been elevated during this time.

Sections 5.1 to 5.3 provide a summary of tabulated concentrations of TPM, PM_{10}, $PM_{2.5}$, SO_2 and NO_2 which will form the baseline air quality for the assessment of Project effects.

5.1 Particulate Matter

5.1.1 Monitoring Results

Ambient TPM, PM_{10} and $PM_{2.5}$ concentrations were measured continuously for the July 26 to September 17, 2023 sampling period at the Fermont, QC and Wabush, NL stations. A summary of measured maximum, and daily average for the particulate measurements over the monitoring period is presented in Table 5-1.

The maximum measured rolling 24-hour average PM_{10} concentrations at the Fermont and Wabush stations is 25 µg/m3. The maximum measured daily average of $PM_{2.5}$ was measured in September 2023 at the Fermont and Wabush stations. The daily maximum concentration of TPM was 27 µg/m3 and 28 µg/m3 for Fermont and Wabush,

respectively. The measured particulate concentrations during the sampling period are below their respective 24-hour Newfoundland and Labrador ambient air quality (NL AAQ) standards. Figure 5-1, Figure 5-2 and Figure 5-3 present the average 24-hour concentrations for particulates measured during the sampling period.

Table 5-1: Summary of Ambient PM Monitoring Data

Year	Month	Sample Location	# Valid Days	% Valid Days	24 Hour Average (µg/m³)			Daily Maximum (µg/m³)			Regulatory Exceedances (%)		
					$PM_{2.5}$	PM_{10}	TPM	$PM_{2.5}$	PM_{10}	TPM	$PM_{2.5}$ (>25)	PM_{10} (>50)	TPM (>120)
2023	July	Fermont	3	10%	2	2	3	2	2	3	0%	0%	0%
	August		31	100%	5	5	7	11	12	13	0%	0%	0%
	September		19	100%	16	17	18	23	25	27	0%	0%	0%
2023	July	Wabush	4	13%	4	6	8	5	7	10	0%	0%	0%
	August		31	100%	6	7	10	16	18	20	0%	0%	0%
	September		18	95%	18	20	22	23	25	28	0%	0%	0%

Figure 5-1: Average $PM_{2.5}$ 24-Hour Concentration During the 2023 Monitoring Program

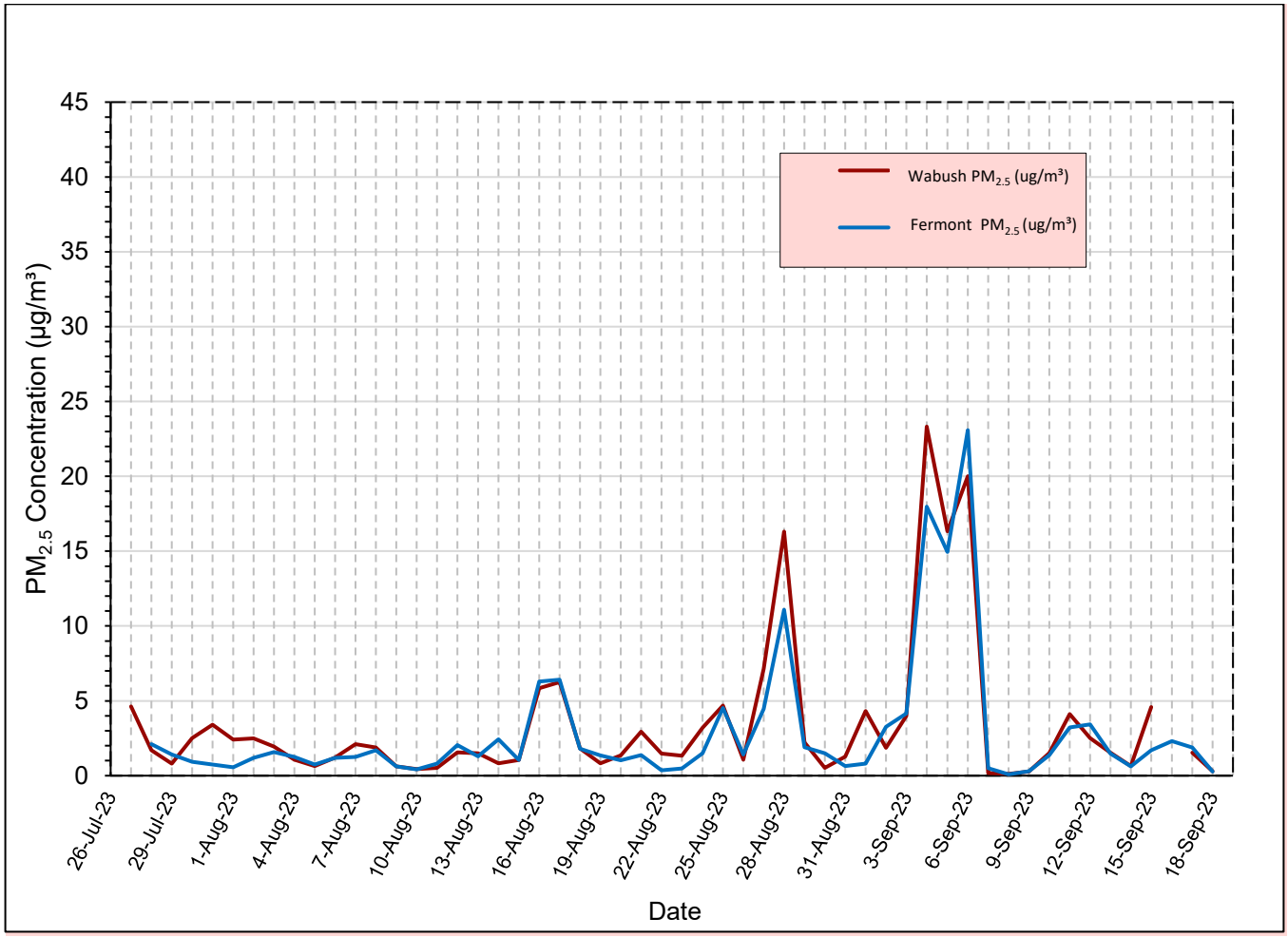


Figure 5-2: Average PM_{10} 24-Hour Concentration During the 2023 Monitoring Program

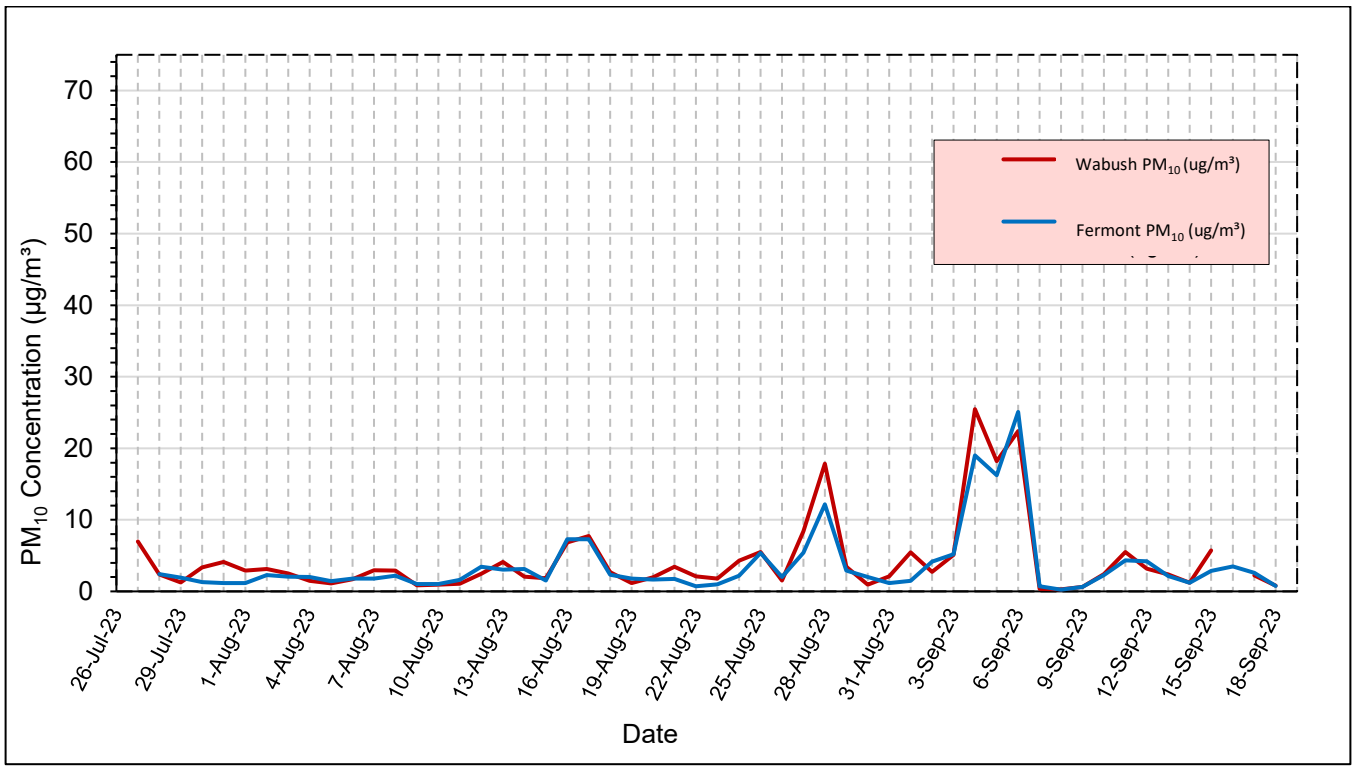
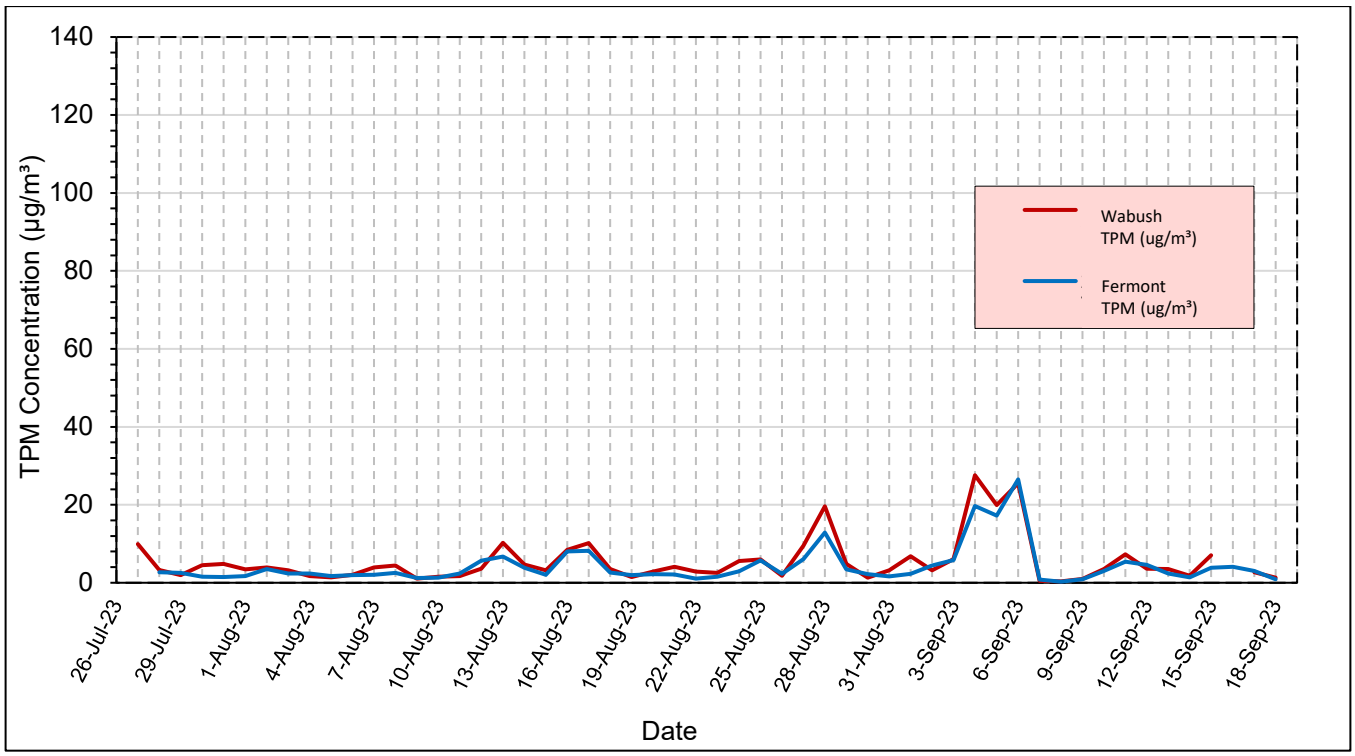


Figure 5-3: Average TPM 24-Hour Concentration During the 2023 Monitoring Program



5.2 Sulphur Dioxide

5.2.1 Ambient Monitoring Data

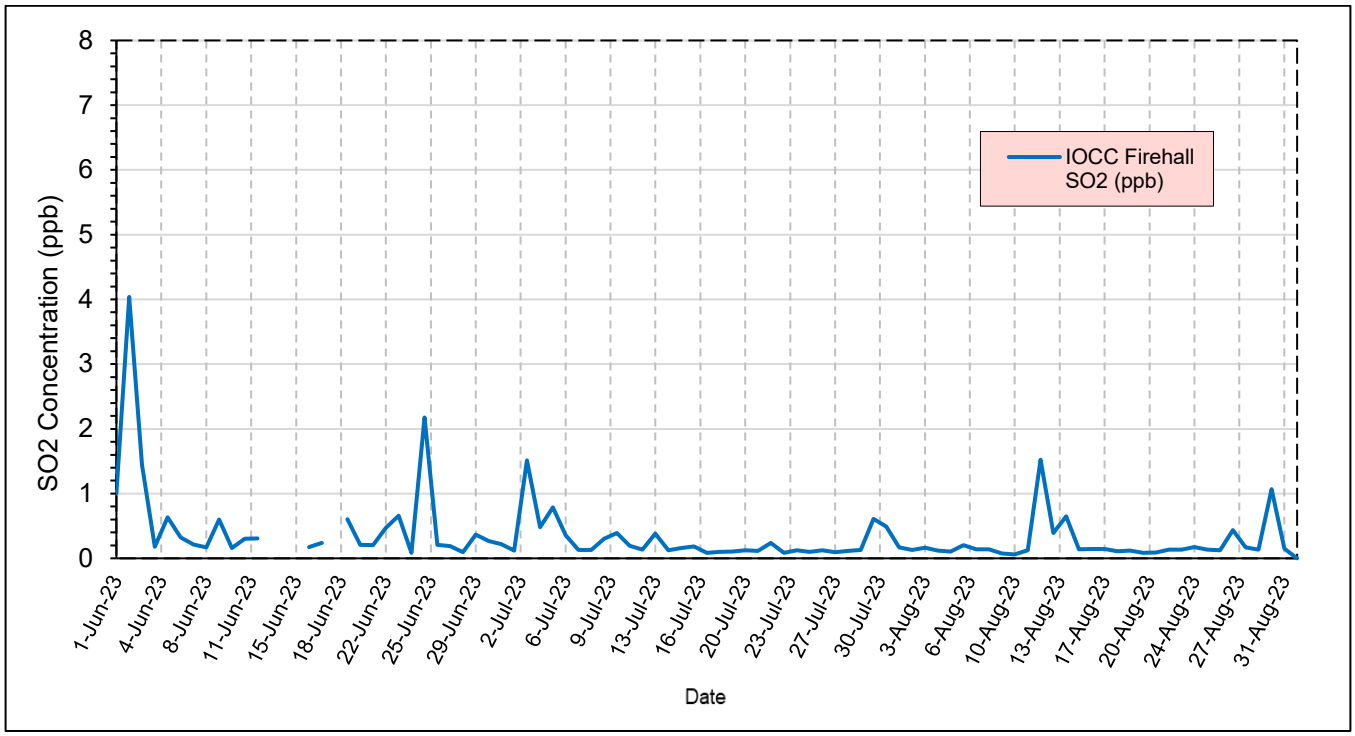
Ambient SO_2 concentrations were measured continuously at the monitoring networks operated by the Iron Ore Company of Canada and Tacora Resources Inc. Data from these motioning stations were provided by the Department for the sampling duration of approximately 90 days (June through August 2023) which overlapped with the period the particulate monitors were deployed. Following a review of the data from these stations, the station operated by the Iron Ore Company of Canada located at Hudson Drive (Firehall) in Labrador City, was selected as the most representative location. A summary of measured maximum, and daily average for the SO_2 measurements over the 90-day period is presented in Table 5-2.

The maximum measured rolling average and maximum measured daily average for SO_2 concentration are below the 1-hour, 3-hour and 24-hour NL AAQ standards. Figure 5-4 shows the average 24-hour concentration of SO_2 measured between June 2023 and August 2023.

Table 5-2: Summary of Ambient SO2 Monitoring Data - Labrador City (IOCC Firehall)

Year	Month	# Valid Days	%Valid Days	24 Hour Average	Maximum (ppb)			Regulatory Exceedances (%)		
				SO_2 (ppb)	1-Hour	3-Hour	24-Hour	1-Hour (>344)	3-Hour (>229)	24-Hour (>115)
2023	June	26	87%	0.59	21.88	14.52	4.04	0%	0%	0%
	July	31	100%	0.27	9.29	6.28	1.51	0%	0%	0%
	August	31	100%	0.24	8.71	6.65	1.52	0%	0%	0%

Figure 5-4: - Average SO_2 24-Hour Concentration from June 2023 to August 2023



5.2.2 Annual Monitoring Report

The maximum one-hour, three-hour and 24-hour concentrations of SO_2 measured between June and August 2022 are 32.8, 20.8, and 5.9 ppb, respectively (Ministry 2023). These were measured at the Hudson Drive station located in Labrador City. The 2022 concentrations are slightly higher than the 2023 concentrations shown in Table 5-2.

5.3 Nitrogen Oxide Measurements

5.3.1 Ambient Monitoring Data

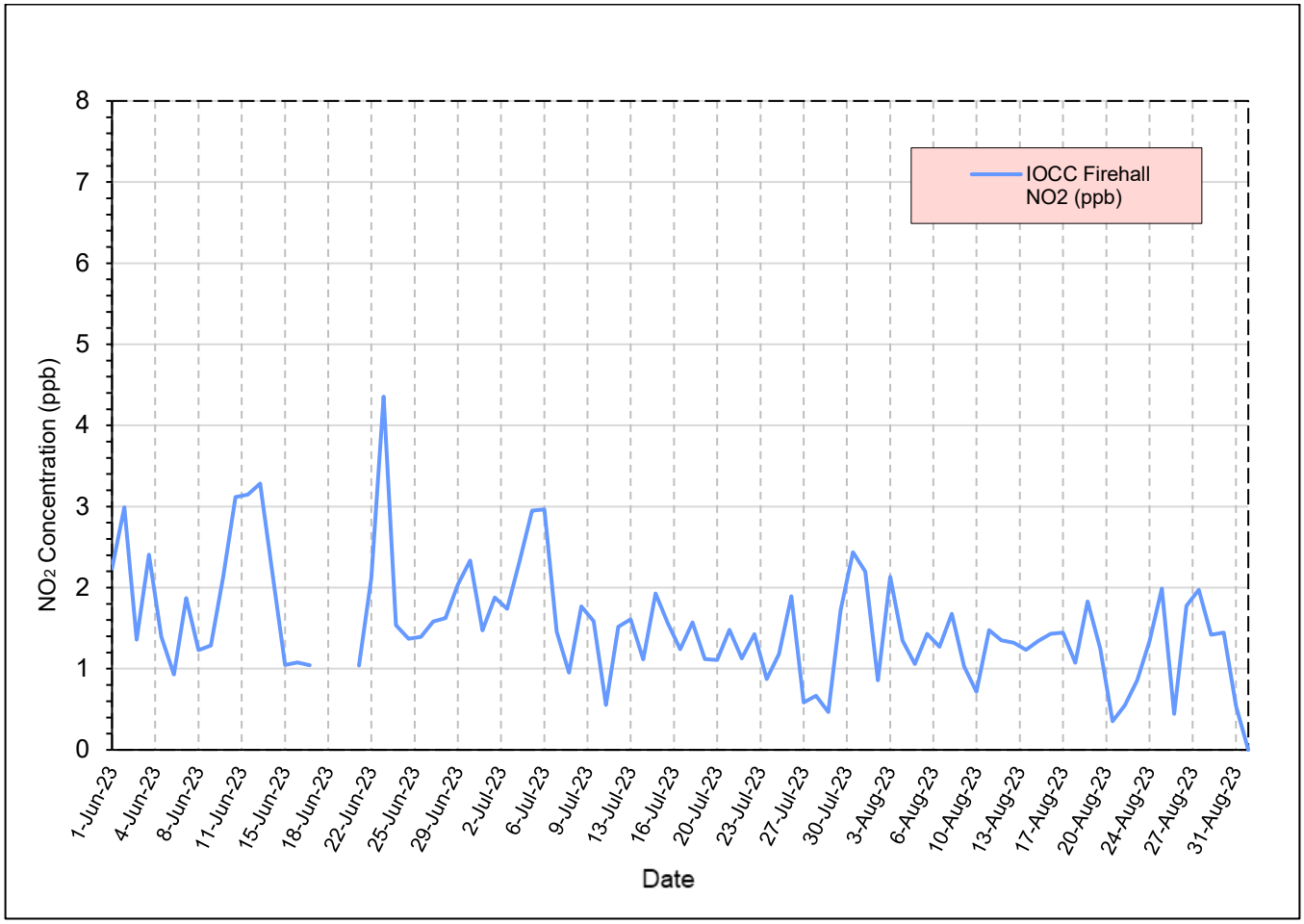
Ambient NO_2 concentrations were measured continuously at the monitoring networks operated by the Iron Ore Company of Canada and Tacora Resources. Data from these motioning stations was provided by the Department for the sampling duration of approximately 90 days (June 2023 through August 2023) which overlapped with the period the particulate monitors were deployed. Following a review of the data from these stations, the station operated by the Iron Ore Company of Canada located at Hudson Drive (Firehall) in Labrador City, was selected as the most representative location. A summary of measured maximum concentrations and daily average concentrations for NO_2 over the monitoring period is presented in Table 5-3. Figure 5-5 shows the average 24-hour concentration of NO_2 measured between June and August 2023 at the Iron Ore Company of Canada ambient air quality monitoring station located at the Firehall.

The maximum measured rolling average and maximum measured daily average for NO_2 concentration are below the one-hour and 24-hour NL AAQ standards.

Table 5-3: Summary of Ambient NO2 Monitoring Data - Labrador City (IOCC Firehall)

Year	Month	# Valid Days	%Valid Days	24 Hour Average	Maximum		Regulatory Exceedances (%)	
				NO_2 (ppb)	1-Hour	24-Hour	1-Hour (>213)	24-Hour (>106)
2023	June	28	93%	1.92	14.04	4.36	0%	0%
	July	31	100%	1.49	11.95	2.96	0%	0%
	August	31	100%	1.30	15.56	2.20	0%	0%

Figure 5-5: Average NO_2 24-Hour Concentration June 2023 to August 2023



5.3.2 Ambient Monitoring Report

The maximum one-hour and 24-hour concentrations of NO_2, measured between June and August 2022, are 19.4 and 6.3 ppb, respectively (Ministry 2023). These were measured at the Hudson Drive station located in Labrador City. The 2022 concentrations are slightly higher than the 2023 concentrations shown in Table 5-3.

6.0 KEY FINDINGS AND RECOMMENDATIONS

An ambient air monitoring and sampling program was undertaken within the vicinity of the proposed Project site. The prime objectives of the program are to provide updated information of the environmental conditions of the proposed site and to quantify the air quality in the Project area prior to commencement of the Project. The results of the monitoring program are expected to feed into the air quality assessment for the EIS.

The baseline monitoring program focussed on particulates because potential dust generated from the Project has been raised as a concern from nearby communities. The air quality monitoring stations for PM were deployed within three communities within the vicinity of the Project area in from July 26 to September 18, 2023. Overall, there were no exceedances of the TPM, PM_{10} and $PM_{2.5}$ measured during the sampling period.

Measured SO_2 and NO_2 concentrations were obtained from the Department for the period of June through August 2023 which overlapped with the period that the PM monitors were deployed. Following a review of the data from these stations, the station operated by the Iron Ore Company of Canada located at Hudson Drive (Firehall) in Labrador City, was selected as the most representative location. The maximum measured rolling average and maximum measured daily averages were below the NL AAQ standards. These results were compared to the maximum measured concentrations in June through August 2022 in the 2022 Annual Ambient Air Monitoring Reports published by the Department. It was found that the 2022 measured concentrations are slightly higher than then 2023 values.

The stations operated by local industry in the vicinity of the Kami Project do not monitor for CO; therefore, baseline monitoring data for CO concentrations was not included in the report.

In 2023, there was a limited window to complete the ambient air monitoring and sampling program to meet the Project schedule. Ideally, the air quality baseline study should consider seasonal variability of COC concentrations. WSP recommends that additional ambient air quality baseline data is collected in 2024 to account for seasonal variability. If additional data is obtained, the baseline report will be updated. It is also recommended that future monitoring in the Project area considers a sampling location near Long Lake where a dedicated electrical power source is available.

To better focus the EIS, the Proponent shall identify the key issues related to the Project. The issues shall be revised and adjusted in relation to the information acquired in the field and during consultations held by the Proponent in the preparation of the EIS.

From EIS Guidelines

The following factors shall be included in the selection of key issues:

- Air quality

The EIS shall describe the relevant components of the atmospheric environment within the study area of the VECs, including, but not limited to, the following:

- Ambient air quality, including dust and particulate matter

Baseline Studies shall be prepared for at least the following components of the existing environment:

- Atmospheric Environment: Air Quality

Atmospheric environment is defined as air quality and the acoustic and visual environments (e.g., noise, vibrations, light) within the vicinity of the Project. The atmospheric environment has been selected for a baseline study to understand the effects of the Project on human health and safety, ecological health and aesthetics, and potentially sensitive human and wildlife receptors.

The baseline study of the atmospheric environment shall be focused on, at a minimum, the following components:

- Air quality
- Dust
  - The EIS shall assess the predicted ambient air quality conditions resulting from air emission sources, and including particulates (e.g., diesel generators, heavy equipment, etc.) in the vicinity of the mine. The study shall compare the predicted air quality to acceptable standards and shall consider the effects of air quality on nearby human and animal receptors, including habitat quality.
  - The effects of dust from the Project, may have an adverse effect on the receiving environment, including humans, wildlife and waterbodies. The EIS shall assess the fugitive / lift-off dust sources in the vicinity of the mine, including roads, laydown areas, stockpiles, etc. The baseline study shall compare the observed dust levels to acceptable standards and shall consider the effects of air quality on humans, wildlife and their migration routes, and waterbodies. The discussion shall include any impacts of the Project to local residents (e.g., dust on clothes hanging on clotheslines, protected drinking water supplies, etc.).

Signature Page

WSP Canada Inc.

Julia Trautmann, M.Sc.
Senior Air Quality Scientist

Roy Sabino, P.Eng.
Lead Senior Air Quality Engineer

JAT/RS/tt

https://wsponlinecan.sharepoint.com/sites/ca-kamieaca00030925894/technical disciplines/07_air quality/01_baseline/kami iron ore baseline air quality reporting_revb.docx

7.0 REFERENCES

Environment Canada. 2024. Historical Climate Normals. https://climate.weather.gc.ca/historical_data/search_historic_data_e.html

Newfoundland and Labrador Department of Environment and Climate Change (Department). 2023. 2022 Ambient Air Monitoring Report. Stassinu Stantec Limited Partnership (Stassinu Stantec). 2012. Air Quality Monitoring Baseline Study Kami Iron Ore Mine and Rail Infrastructure.

wsp.com

REPORT

Baseline Noise Program

Kami Mine Iron Ore Project

Submitted to:

Champion Iron Mines Ltd.

1155 René-Lévesque Blvd. West
Suite 3300
Montréal, QC H3B 3X7

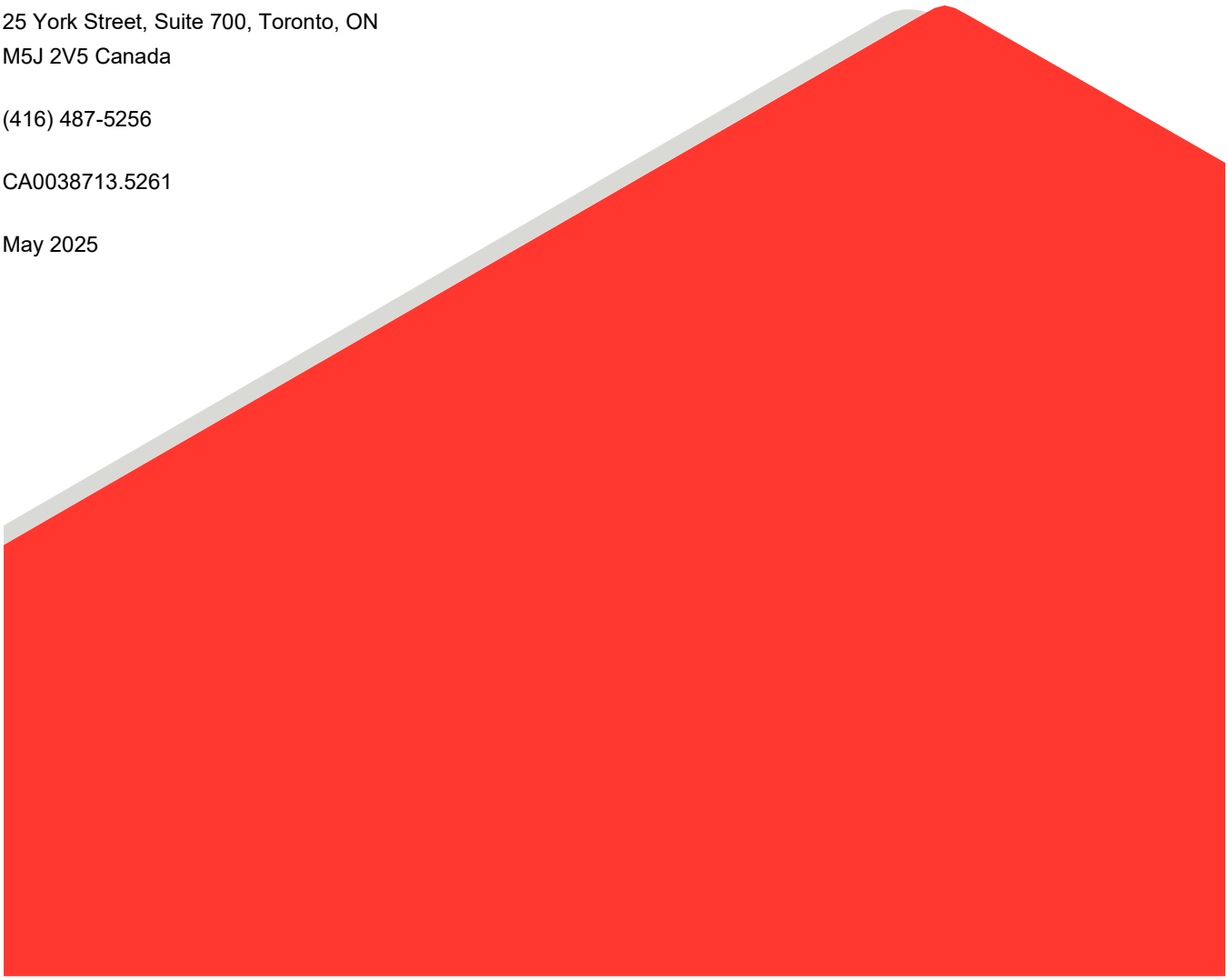
Submitted by:

WSP Canada Inc.
25 York Street, Suite 700, Toronto, ON
M5J 2V5 Canada

(416) 487-5256

CA0038713.5261

May 2025



Distribution List

Electronic Copy: Champion Iron Ore Mines Ltd.

Electronic Copy: WSP Canada Inc.

Study Limitations

WSP Canada Inc. (WSP) has prepared this document in a manner consistent with that level of care and skill ordinarily exercised by members of the engineering and science professions currently practising under similar conditions in the jurisdiction in which the services are provided, subject to the time limits and physical constraints applicable to this document. No warranty, express or implied, is made.

This document, including all text, data, tables, plans, figures, drawings and other documents contained herein, has been prepared by WSP for the sole benefit of Champion Iron Mines. It represents WSP's professional judgement based on the knowledge and information available at the time of completion. WSP is not responsible for any unauthorized use or modification of this document. All third parties relying on this document do so at their own risk.

The factual data, interpretations, suggestions, recommendations and opinions expressed in this document pertain to the specific project, site conditions, design objective, development and purpose described to WSP by Champion Iron Mines and are not applicable to any other project or site location. In order to properly understand the factual data, interpretations, suggestions, recommendations and opinions expressed in this document, reference must be made to the entire document.

This document, including all text, data, tables, plans, figures, drawings and other documents contained herein, as well as all electronic media prepared by WSP are considered its professional work product and shall remain the copyright property of WSP. Champion Iron Mines may make copies of the document in such quantities as are reasonably necessary for those parties conducting business specifically related to the subject of this document or in support of or in response to regulatory inquiries and proceedings. Electronic media is susceptible to unauthorized modification, deterioration and incompatibility and therefore no party can rely solely on the electronic media versions of this document.

Table of Contents

TABLES

FIGURES

APPENDICES

1.0 INTRODUCTION

The Kamistiatusset (Kami) Iron Ore Mine Project (the Project) is a proposed iron ore mine in Newfoundland and Labrador. The Project site is located entirely in Labrador, approximately seven kilometres southwest from the Town of Wabush, 10 kilometres southwest from the Town of Labrador City, and five kilometres east of Ville de Fermont, Québec.

The future mine operation is expected to produce a maximum of approximately 8.6 million tonnes of iron ore concentrate annually over a 26-year mine life, which will be transported by rail to the Pointe Noire port terminal in Ville de Sept-Îles, Québec, for international shipping. The Project was originally proposed by the Alderon Iron Ore Corporation (Alderon) and underwent a provincial and federal environmental impact assessment from 2011 to 2013. The Project was released from the process in 2014. Alderon updated the Feasibility Study in 2018, however, the Project was never undertaken by Alderon. In 2021, Champion Iron Mines Ltd. (Champion) completed the acquisition of the Project from Alderon. Champion is in the process of updating the feasibility study for the Project by preparing an Environmental Impact Statement (EIS) and submitted an updated Project Registration to the Newfoundland and Labrador Environmental Assessment Division of the Ministry of the Environment and Climate Change in 2024.

Champion is proposing several changes to the Project design initially proposed by Alderon through the previous Environmental Impact Statement (EIS). These proposed changes include optimizations to the Project's water management strategy and modernization of the proposed ore handling, conveyance and processing. Champion's objective for the Kami Project is produce high purity (>67.5%) iron concentrate, which can be used as direct reduction pellet feed for electric arc furnaces in the green steel supply chain.

To support the assessment of effects from the revised Project design changes, Champion has commissioned the services of WSP Canada Inc. to complete a baseline field program to collect baseline noise data characterizing the acoustic environment within the vicinity of the Project.

1.1 Description of Technical Terms

An introduction to key concepts used in the assessment of noise is provided below.

- "Noise", "sound", "airborne noise" or "noise levels" refers to the levels that can be perceived or measured at a point of reception. While noise is defined as unwanted sound, the terms noise and sound are often used interchangeably;
- A "receptor" or "Point of Reception (POR)" is any location on a noise sensitive land use where noise from a source is received;
- The "level" of a noise is expressed on a logarithmic scale, in units called decibels (dB). Since the scale is logarithmic, combining two similar noise levels will be three decibels (3 dB) higher than the noise levels on their own;
- "Sound pressure level" is the physical quantity that is measured in the environment that describes sound waves quantitatively. It is a ratio of the absolute measured pressure relative to a reference (i.e., 20 micro pascals [µPa]). This ratio of pressures is converted to a decibel scale;
- Noise emissions and noise levels have an associated frequency. The human ear does not respond to all frequencies in the same way. Mid-range frequencies are most readily detected by the human ear, while the human ear is generally less sensitive to low and high frequencies. Environmental noise levels used in this

assessment are presented as “A-weighted decibels” (or dBA), which incorporates the typical frequency response of the human ear;

- The “percentile noise level”, designated “Ln”, is the noise level exceeded “n”% of a specified time period and is measured in dBA. The L90, for instance, is the noise level exceeded 90% of the time;
- Outdoor noise is usually expressed as an “equivalent noise level” (Leq, T), which is a logarithmic average (i.e., energy average) of the measured or predicted noise levels over a given period of time (T). An equivalent noise level measured or predicted over a one-hour period would be referred to as Leq,1h; and
- Environmental noise levels vary throughout the day and it is therefore important to distinguish between the times of day (i.e., daytime / evening / nighttime). For the purposes of this assessment, the 24-hour period that represents a day is divided into either two or three periods for which noise is evaluated, depending on the guidance document. In accordance with the Quebec Noise Guideline, when utilizing the exclusionary level limits, the “daytime” noise levels occur for the period from 7 a.m. to 7 p.m., and the “nighttime” noise levels occur for the period from 7 p.m. to 7 a.m. when utilizing measurements to establish the existing noise levels and effectively the respective limits. In accordance with Health Canada Guideline, the “daytime” noise levels occur for the period from 7 a.m. to 10 p.m and the “nighttime” noise levels occur for the period from 10 p.m. to 7 a.m.

2.0 RATIONALE AND OBJECTIVE

The objective of the noise baseline program was to establish the existing conditions for noise where human activity is expected to occur within the vicinity of the Project. According to the EIS Guidelines for the Project (EIS Guidelines), which were finalized on December 19, 2024, the EIS shall describe the existing environment prior to the implementation of the Project, including ambient noise levels.

A baseline data collection program was completed between 2011 and 2012 for the Kami Project; however, since the data are more than 10 years old, it was determined that additional data would be required to describe the existing ambient noise levels within the study area, to validate whether existing ambient noise levels have changed when compared to those measured in 2011 and 2012. The 2024 baseline field program focused on supporting the desktop review of identifying potential Points of Reception (PORs), as further discussed in Section 5.2.1, located within the identified study area and collecting existing noise data to characterize the existing ambient noise levels based on the existing noise sources present at the time of the noise baseline program. The results from the noise field program will be used to support the assessment of Project related effects from the Construction, Operations, and Closure phases of the Project. The assessment of the Project on wildlife, socioeconomics, and human health, as related to sensory disturbance from noise was not part of the scope of work for the noise baseline program.

3.0 INFORMATION SOURCES AND APPLICABLE GUIDANCE

The Province of Newfoundland and Labrador does not have regulations or guidelines for the assessment of environmental noise from industrial and/or mining facilities. The Project is located in the Labrador West Region, which consists of the Town of Labrador City and the Town of Wabush. Noise regulations do exist within the Town of Labrador City and Town of Wabush, however federal guidance discussed below addresses the sound level limit requirements within these towns. Other aspects of these regulations considered applicable to the Project were applied. In addition, the EIS Guidelines did not specify any regulations or guidelines for the assessment of environmental noise.

Federal guidance for noise is considered applicable for mining projects, in particular Health Canada's *Guidance for Evaluating Human Health Effects in Impact Assessment: Noise* dated December 2023 (Health Canada Noise Guideline). Therefore, the Health Canada Noise Guideline was considered to support the assessment of environmental noise due to the Project. Noise assessments for industrial facilities in the Province of Québec often utilize *Ministère du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques (MDDELCC) Note d'instructions sur le bruit 98-01* (Québec Noise Guideline). As the study area described in Section 4.0 extends into the Province of Québec, the Québec Noise Guideline was also considered in the assessment of environmental noise due to the Project.

The Health Canada Noise Guideline and Québec Noise Guideline were utilized to support the scope and execution of the noise baseline field program in the following ways:

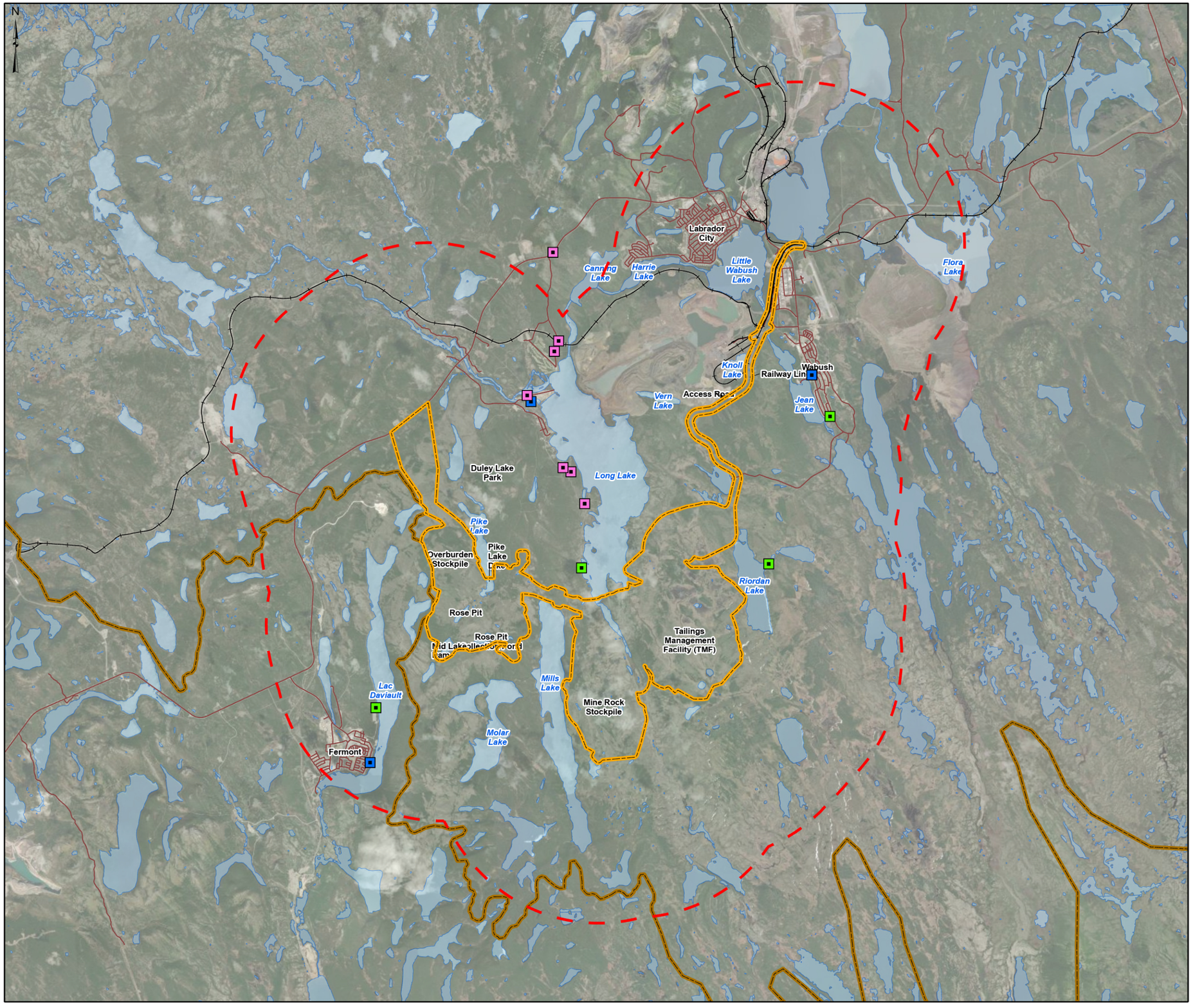
- **POR identification:** PORs were identified in general accordance with both the Health Canada Noise Guideline and the Québec Noise Guideline.
- **Noise level measurements**: Noise levels were measured in general accordance with the Health Canada Noise Guideline and the Québec Noise Guideline.

Additional information reviewed to inform the description of existing conditions for noise included:

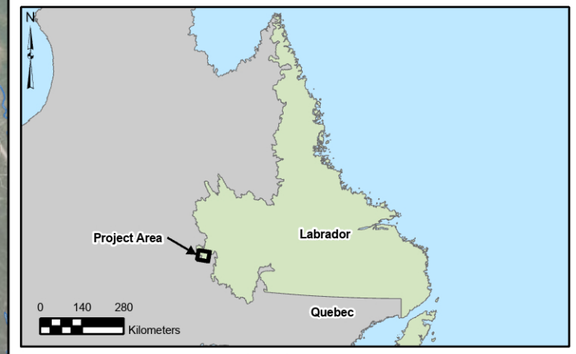
- **Imagery and property ownership information**: Imagery obtained from ESRI (ESRI, Maxar, Earthstar Geographics, and the GIS User Community) and publicly ownership information were used to identify PORs.
- **Previous Noise Assessment**: The previous noise assessment prepared in support of the Alderon Environmental Impact Statement (EIS) (Alderon 2012) was also reviewed.

4.0 STUDY AREA

The baseline study area for the noise baseline program was limited to the noise Local Study Area (LSA), defined as a 5 km buffer around the proposed Project site study area where human activity is expected to occur. The 5 km setback to define the baseline study area is based on professional judgement and WSP's past experiences on mining projects. The LSA is presented in Figure 4-1.



KEY MAP



SCALE 1:20,000,000

LEGEND

- Long Term Monitoring Location
- Short Term Monitoring Location
- Previous Baseline Program Monitoring Locations
- Existing Railway
- Existing Road
- Waterbody
- Labrador/Quebec Boundary
- Site Study Area (SSA)
- Acoustic Baseline Local Study Area (LSA)

0 2.5 5
1:120,000 KILOMETRES

NOTE(S)
1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)
1. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - ONTARIO
2. IMAGERY CREDITS: WORLD IMAGERY: EARTHSTAR GEOGRAPHICS
3. COORDINATE SYSTEM: NAD 1983 UTM ZONE 19N

CLIENT
CHAMPION IRON MINES LTD.

PROJECT
KAMI IRON ORE MINE PROJECT (KAMI PROJECT)
WABUSH, NL

TITLE
ACOUSTIC BASELINE LOCAL STUDY AREA AND NOISE MONITORING LOCATIONS

YYYY-MM-DD	2025-03-06
DESIGNED	----
PREPARED	MS
REVIEWED	----
APPROVED	----

PROJECT NO.	CONTROL	REV.	FIGURE
CA0038713.5261	0008	B	4-1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

0 25mm

PATH: S:\Clients\Champion_Iron_Ore_Mines\Kami Iron Ore\9g_PRO\CA0038713.5261_EIS\40_PRO\0008_Noise_Light\CA0038713-5216-0008-RN-0000.aprx PRINTED ON: AT: 1:33:23 PM

5.0 METHODS

5.1 Review of Existing Information

Table 5-2 summarize the results of the previous baseline program, as presented in Table 14.18 and Table 14.20 in the previous EIS. No indication is made in the previous EIS that data exclusions or abnormalities (i.e., inclement weather or other outliers) were applied to the baseline monitoring results.

Table 5-1: Day, Night, Day Night Average Sound Levels (Ld, Ln and Ldn) for each Monitoring Site during the Summer 2011 Baseline Program

Site Description	UTM Easting (m)	UTM Northing (m)	Average Day Sound Levels (L_d)	Average Night Sound Levels (L_n)	Average Day Night Sound Levels (L_{dn})
Residential Property in Fermont, Québec (Site 1)	629449	5851022	43.4	39.6	46.9
Recreational Area Near Duley Lake (Site 2)	634479	5862308	42.0	39.7	46.7
Residential Property in Wabush, Labrador (Site 3)	643272	5863149	53.1	42.5	52.9

Ld = average day sound levels, Ln = average night sound levels, Ldn = average day night sound levels.

Table 5-2: Day, Night, Day Night Average Sound Levels (Ld, Ln and Ldn) for each Monitoring Site during the Winter 2012 Baseline Program

Site Description	UTM Easting (m)	UTM Northing (m)	Average Day Sound Levels (L_d)		Average Night Sound Levels (L_n)		Average Day Night Sound Levels (L_{dn})	
			Weekday	Weekend	Weekday	Weekend	Weekday	Weekend
Residential Property in Fermont, Québec (Site 1)	629449	5851022	40.8	46.5	34.6	38.6	42.6	47.4
Recreational Area Near Duley Lake (Site 2)	634479	5862308	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]
Residual Residential Property in Wabush, Labrador (Site 3)	643272	5863149	46.4	43.8	37.5	32.7	46.8	43.4
Residential Property in Wabush, Labrador(Site 4)	643263	5863138	45.1[1]	N/A[1]	35.4	N/A [1]	45.2[1]	N/A[1]

N/A = no measurement available. Ld = average day sound levels, Ln = average night sound levels, Ldn = average day night sound levels.

[1] The above table presents data from Table 14.20 of the previous EIS. In the EIS, it is noted that Site 2 was not measured in the winter 2012 and instead Site 4 was measured to reflect noise levels in Wabush. However, there is a discrepancy in Table 14.20 that summarizes the results for Site 2, instead of Site 4. It has been interpreted that the results summarized for Site 2 in Table 14.20 are for Site 3, and the results for Site 3 are for Site 4.

5.2 Field Program Approach

The following approach was taken to develop the noise baseline program:

1) Identify potential PORs – a layout of potential sensitive receptors were identified in the vicinity of the Project within the LSA to help inform potential measurement locations.

2) Identify measurement locations – locations for measurements were identified in the vicinity of representative potential sensitive receptor locations. Where locations were identified on private property, property owners were contacted to permit access to the measurement location.

3) Confirm applicable noise metrics and equipment – confirmation of noise metrics and respective equipment to align with applicable guidelines; and

4) Scheduling – confirmation of the estimated time of deployment and duration.

Additional details on each component of the noise baseline program is described in the following sections.

5.2.1 Potential Points of Reception Layout

A potential POR refers to any location on a noise sensitive land use where human activity is expected and noise from a source is received. As noted in Section 3.0, potential PORs were identified in general accordance with the Health Canada Noise Guideline and Québec Noise Guideline. For the purposes of this assessment, a potential POR for either guideline was considered an existing sensitive land use with human activity, including dwellings, campsites or campgrounds, sensitive institutional uses (e.g., educational, nursery, hospital, healthcare, community centre, place of worship, or detention centre), or sensitive commercial uses (e.g., hotel or motel).

The desktop level analysis considered orthoimagery, publicly readily available imagery and publicly available ownership information. The potential noise sensitive land uses identified within the LSA were permanent cabins, recreational cabins, recreational vehicle (RV) campsites and low-density residential dwellings. The desktop level analysis of the potential PORs was supplemented with site observations from the noise baseline program.

At the time of carrying out the noise baseline program, human health and traditional knowledge receptor locations were not readily available and therefore not considered for the purposes of the baseline assessment. Potential PORs identified for the baseline program are presented in Figure 4-1.

5.2.2 Long-Term Monitoring and Short-Term Measurement Locations

The measurement locations consisted of both unattended long-term continuous monitoring (long-term monitoring) and attended short-term spot-check measurements (short-term measurements) carried out in the vicinity of potential PORs identified in Section 5.2.1. The short-term measurements were completed during the daytime period only to supplement the long-term monitoring to characterize existing noise levels within larger spatial extent to provide more context related to the typical noise sources present in the area and document noise sources contributing to the acoustical environment. For the purposes of the noise baseline program, ‘long-term’ is defined as approximately 24 hours in duration that includes both weekend and weekday periods when applicable, while ‘short-term’ is approximately 5 to 20 minutes in duration (assuming constant noise levels), during periods of favourable weather. A program of this duration is considered adequate for locations in rural and/or remote areas where day-to-day variability is expected to be minimal due to limited human activity. Figure 4-1 presents the long-term monitoring and short-term measurements locations, and the following sections provide further details on the individual measurement locations.

5.2.2.1 Long-Term Monitoring Locations

Long-term monitoring locations were identified based on the potential POR layout developed and the ability and permission to access the different locations. Four locations were selected in each general cardinal direction within the LSA, in line of sight to the Project. Table 5-3 summarizes the location identifiers and the coordinates of the selected long-term monitoring locations. Each long-term monitoring location is further described in the following sections.

Table 5-3: Long-Term Monitoring Locations

Long-Term Monitoring Location	Coordinates (UTM NAD 83 Zone 17U)		Rationale
	Easting (m)	Northing (m)	
ML1: Fermont Campsite	629639	5852708	Monitoring location is on the grounds of the Camping de Fermont site (Fermont Campsite) located approximately 5.0 km southwest of future Rose Pit. This location is considered representative of the northern area of the Fermont community. This monitoring location is slightly quieter rural area than Site 1 from the previous baseline program.
ML2: Duley Lake	636072	5857116	Monitoring location is near an existing cabin, approximately 4.5 km north of the Project. This location is considered representative of the potential PORs located along the western shore of Duley Lake and is a quieter, more remote area than the Site 2 monitoring location from the previous baseline program.
ML3: Riordan Lake	641931	5857274	Monitoring location is near an existing cabin, approximately 500 m from proposed Project railway line. This location is considered representative of potential PORs along northern shore of Riordan Lake.
ML4: Wabush	643846	5861876	Monitoring location is on the eastern edge of the Wabush, approximately 500 m from the proposed railway corridor. This location is considered representative of the potential PORs located on the southern outskirts of Wabush. This station is located in a slightly more rural and less residential area than Site 3 and 4 monitoring locations from the previous baseline program.

5.2.2.1.1 ML1 – Fermont Campsite

The monitoring location ML1 was located approximately 5.0 km south of the center of Project's proposed Rose Pit and approximately 2.4 km east of Highway 389. The monitoring location was associated with the Fermont Campsite. The monitoring equipment was deployed at the northeast edge of the site and the surrounding area was covered with open vegetation typical of a northern forest with mixed vegetation comprising of coniferous and deciduous trees, with the ground covered by grasses and shrubs. The noise sources encountered at this location during the deployment of the monitoring equipment included natural sources like birds, wind in vegetation, wildlife, insects, some camp activities and noise from the industrial area located approximately 1.3 km east of the monitoring location. Figure 5-1 presents photographs of the noise monitoring equipment deployed at ML1.

Figure 5-1: Photographs of Noise Monitoring Equipment and Surrounding Environment of Site ML1 – Fermont Campsite

5.2.2.1.2 ML2 – Duley Lake

The monitoring location ML2 was located approximately 4.5 km from the centre of the Project's proposed Rose Pit and approximately 7.1 km east of Highway 500 and approximately 5.0 km south of Tacora's Scully Mine. The surrounding area was covered by vegetation typical of a northern forest with mixed vegetation comprising coniferous and deciduous trees, with the ground covered by grasses and shrubs. The noise sources encountered at this location during the deployment of the monitoring equipment included nature-based sources such as wind-induced noise in vegetation, wildlife, insects, waves on the lake and barely perceptible noise from the operations of the Tacora Scully Mine to the north. Figure 5-2 presents photographs of the noise monitoring equipment deployed at ML2.

Figure 5-2: Photographs of Noise Monitoring Equipment and Surrounding Environment of Site ML2 – Duley Lake

5.2.2.1.3 ML3 – Riordan Lake

The monitoring location ML3 was located approximately 3.5 km east of the centre of the Project's proposed tailings management facility, approximately 1.4 km south of the proposed railway track and approximately 2.4 km from the Project's proposed train loading facility. The surrounding area was covered by vegetation typical of a northern forest with mixed vegetation comprising coniferous and deciduous trees, with the ground covered by grasses and shrubs. The noise sources encountered at this location during the deployment of the monitoring equipment included nature-based sources such as wind-induced noise in vegetation, and wind-induced noise due to waves on a nearby lake, wildlife, and insects. In absence of residents of nearby cabins, no anthropogenic noises were heard. Figure 5-3 presents photographs of the noise monitoring equipment deployed at ML3.

Figure 5-3: Photographs of Noise Monitoring Equipment and Surrounding Environment of Site ML3 – Riordan Lake

5.2.2.1.4 ML4 – Wabush

The monitoring location ML4 was located approximately 1.6 km southeast from the Highway 503, and 3.2 km west of an existing Tacora Scully Mine operation. This location was approximately 500 m north of the Project's proposed railway corridor. The surrounding area was covered by vegetation typical of a northern forest with mixed vegetation comprising coniferous and deciduous trees, with the ground covered by grasses and shrubs. The southern edge of the town of Wabush is situated approximately 70 m north of this monitoring location. The noise monitoring equipment was deployed in the area adjacent to the Wabush snow dump which appears it may be used by local residents as a meeting place which may result in periodic increases in the local noise level. The noise sources encountered at this location were nature-based sources including wind-induced noise in vegetation, animals and birds and occasional traffic within the area of the snow dump and due to a road to the north. In addition, barely perceivable noise from the haul trucks operating at Tacora Scully Mine was heard during the periods of lulls in local noise level. Figure 5-4 presents photographs of the noise monitoring equipment deployed at ML4.

Figure 5-4: Photographs of Noise Monitoring Equipment and Surrounding Environment of Site ML4 – Riordan Lake

5.2.2.2 Short-Term Measurements

Table 5-4 summarizes the locations and coordinates of the short-term measurement locations. These short-term measurement locations were used to collect data to supplement the long-term monitoring data collected from the Program. Short-term measurement locations are presented in Figure 4-1.

Table 5-4: Short-Term Measurement Locations

Short-term Measurement Location	Coordinates (UTM NAD 83 Zone 17 U)		Description
	Easting (m)	Northing (m)	
MS1	640758	5859911	Elephant Head Lake
MS2	642961	5864223	Infront of accommodations in Wabush
MS3	642989	5864224	Infront of accommodations in Wabush
MS4	634365	5862460	Near entry to Duley Park (camp site)
MS5	635734	5860099	Along road to south areas of the Duley Lake
MS6	636162	5859105	Along road to south areas of the Duley Lake
MS7	635158	5866915	Labrador City view point
MS8	635210	5863840	Along road to Tamarack Golf Club (existing mine noise)
MS9	635347	5864160	Along road to Tamarack Golf Club (existing mine noise)
MS10	635491	5860227	Along road to south areas of the Duley Lake

5.2.3 Equipment and Noise Metrics

The noise baseline program included long-term (ranging from approximately 72 to 96 hours) monitoring and short-term (up to 5 minutes) measurements of existing ambient noise levels in the vicinity of the Project.

The long-term monitoring and short-term measurements were completed using Type 1 Larson Davis 831 and/or Brüel&Kjær 2250 integrating Sound Level Meters (SLMs), with an outdoor environmental kit. The microphone of the SLM was equipped with a windscreen and installed on a tripod with the microphone height set to approximately 1.5 m above the ground. The SLMs were calibrated prior to and upon completion of the measurement using a Larson-Davis and Brüel&Kjær acoustic calibrator set to generate a 94 dBA at 1,000 Hz tone (B&K 2250), and a 114 dBA (LD 831) at 1,000 Hz tone. An equipment summary and respective calibration certificates are provided in Appendix A.

At each long-term monitoring location, the SLM was set to collect A-weighted equivalent sound level (L_{eq}) at 1 min and 1-hour intervals. Continuous audio recording of sound present in the area was collected at each long-term monitoring location for further analysis. In addition, octave band data and statistical data (i.e., L_n%) describing the percentage of time the noise level exceeded a certain value (e.g., L_n90) were collected. At each of the short-term measurement locations, a similar SLM as the one used for long-term monitoring was used and similar noise metrics were collected.

The long-term monitoring data were analyzed and screened to remove data identified as not being representative of typical conditions and collected during periods considered to be inclement weather conditions. For the purposes of the baseline noise program, inclement weather conditions were identified in general accordance with the Health Canada Guideline, Quebec Noise Guideline and other noise guidelines from other provinces (e.g. Nova Scotia and Ontario). Inclement weather conditions for the purposes of the baseline noise program include

periods of precipitation, wind speeds exceeding 18 km/hr, humidity exceeding 90% and temperatures less than -10 C. Note, the Health Canada Guideline states noise is not to be measured when wind speeds exceed 14 km/hr (3.9 m/s) unless these effects can be shown to be negligible. Analysis was carried out and it was determined that the change in noise levels when including wind speeds between 14 km/hr (3.9 m/s) and 18 km/hr (5 m/s) in the analysis within 3 dB (i.e., change typically considered just perceivable), therefore allocating more noise data to be included within the analysis. In other noise guidelines, wind speeds not exceeding 18 km/hr (5 m/s) is typical criteria/parameter when describing preferred weather conditions for noise measurements.

In addition, the data considered as not representative of the local acoustical environment (e.g., animals, humans, and vehicles in the vicinity of the SLM) were also removed from analysis. Local weather (i.e., wind speed and direction, air temperature, humidity and pressure) required for analysis was obtained from the nearby meteorological station (Wabush A station) located within the LSA at Wabush Airport, Newfoundland and Labrador operated by *Environment and Climate Change Canada – Meteorological Service of Canada* with Climate ID 8504177.

5.2.4 Program Scheduling

The baseline noise program was scheduled when weather conditions were expected to be favourable, based on available short-term weather forecast for the local study area. However, due to uncertainty of actual weather, periods of inclement conditions are possible. A total ranging approximately between 72 to 96 hours (i.e., 3 to 4 days) of noise data were collected at each long-term noise monitoring location. A program of this duration is considered adequate for locations in rural and/or remote areas where day-to-day variability is expected to be minimal due to limited human activity.

6.0 RESULTS

The baseline field program was carried out between August 29 and September 3, 2024. Weather conditions at Wabush Airport were predominantly clear to overcast, with temperatures ranging from 5°C to 24°C. Winds were predominantly from the west, with wind speeds ranging from 5 km/h to 34 km/h. Weather data are available in Appendix B.

The collected 1-hour L_{eq} noise data are summarized in Appendix C. The analyzed data were used to determine the daytime ($L_{eq, Day}$) and nighttime $L_{eq, Night}$) noise levels. If present, periods of inclement weather as identified in Section 5.2.3 (i.e., precipitation, relative humidity exceeding 90% and wind speeds exceeding 18 km/hr), that have the potential to affect ambient noise levels were identified. Noise data (1-hour L_{eq}) collected during the inclement weather conditions, resulting in approximately 24 hours of valid data analyzed at each long-term monitoring location, were excluded in the results presented below in Sections 6.1.1 to 6.1.4.

Noise data collected when WSP personnel were in the vicinity of the long-term monitoring equipment during deployment and retrieval were excluded. In addition, as noted above in Section 5.2.2, the sources of noise at different long-term monitoring locations varied but included mostly nature-based sources including wind-induced noise due to vegetation, wildlife, and insects and anthropogenic sources (nearby traffic and nearby human activity), however the latter was limited to areas with human presence (e.g., Wabush, entry to Duley Lake Camp). A review of the audio recordings collected at various times during the baseline noise program were carried out and elevated noise data which may be non-representative of the existing noise environment (e.g., vehicles nearby) were omitted from the analysis.

6.1 Long-Term Monitoring

6.1.1 ML1 – Fermont Campsite

Table 6-1 summarizes the average daytime and nighttime L_{eq} sound levels collected at ML1 for the duration of the noise baseline program. Figure 6-1 presents the 1-hour L_{eq} and 1-hour L90 sound levels measured at ML Fermont Campsite. The results collected at ML1 are quieter than the conditions measured at the Residential Property in Fermont, Québec (Site 1) in the previous baseline program. The Fermont Campsite is located further north of the town of Fermont, where noise measurements were previously taken, with less anthropogenic activity. Inclement weather conditions did result in a large portion of the noise data collected at this location to be excluded; however approximately 27 hours of valid data was collected which is considered typically adequate for locations in rural and/or remote areas where day-to-day variability is expected to be minimal due to limited human activity.

Table 6-1: Calculated Average Daytime and Nighttime L_{eq} and Measured Minimum and Maximum $L_{eq1\text{-}hour}$ Sound Level at ML1 Fermont Campsite

Location	Total Hours of Collected Data / Hours of Valid Data[(1)]	Daytime L_{eq} Sound Level [dBA] (07:00 to 22:00)			Nighttime L_{eq} Sound Level [dBA] (22:00 to 07:00)		
		Average	Maximum	Minimum	Average	Maximum	Minimum
ML1 Fermont Campsite	97/27	37	44	32	35	40	27

[1] Removed localized event, precipitation, humidity greater than 90% and winds greater than 18 km/hr (5 m/s)

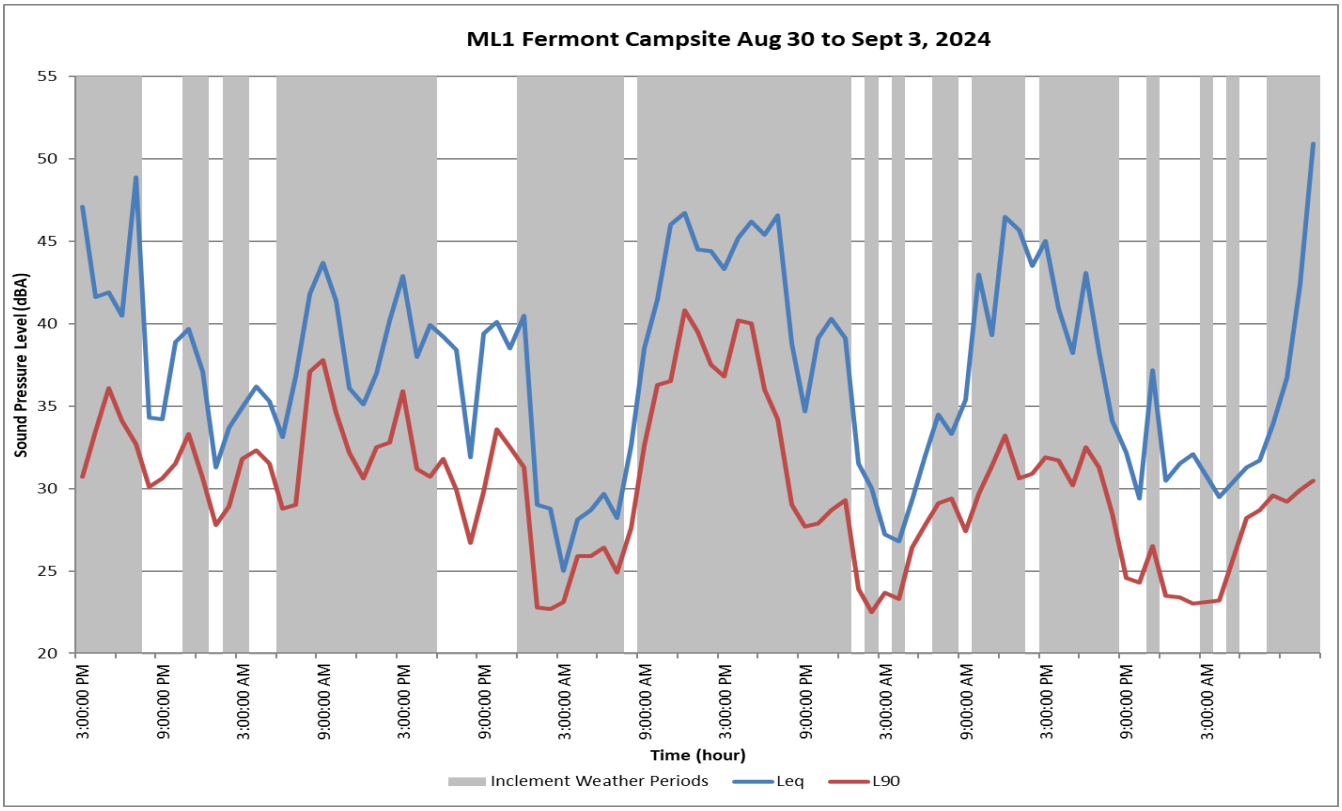


Figure 6-1: $L_{eq\ -\ 1\ hour}$ and $L_{90\ -\ 1\ hour}$ Noise Levels Monitored at ML1 Fermont Campsite

6.1.2 ML2 – Duley Lake

Table 6-2 summarizes the average daytime and nighttime L_{eq} sound levels collected at ML2 for the duration of the noise baseline program. Figure 6-2 presents the 1-hour L_{eq} and 1-hour L_{90} sound levels measured at ML2. The results collected at ML2 are representative of a quiet rural area that is located at the southern tip of Duley Lake where it is expected that infrequent anthropogenic noise occurs. The results collected at ML2 indicate lower average level (i.e., perceived as quieter) than the conditions measured for Duley Lake (Site 2) in the previous baseline program. The Duley Lake ML2 monitor is located further south on Duley Lake's western shoreline, which has a lighter density of cabins and buildings, and in turn, anthropogenic activity, then where the noise measurements were previously taken. Inclement weather conditions did result in a large portion of the noise data collected at this location to be excluded; however up to 26 hours of valid data was collected which is considered typically adequate for locations in rural and/or remote areas where day-to-day variability is expected to be minimal due to limited human activity.

Table 6-2: Calculated Average Daytime and Nighttime L_{eq} and Measured Minimum and Maximum $L_{eq1\text{-}hour}$ Sound Level at ML2 Duley Lake

Location	Total Hours of Collected Data/Hours of Valid Data [1]	Daytime L_{eq} Sound Level [dBA] (07:00 to 22:00)			Nighttime L_{eq} Sound Level [dBA] (22:00 to 07:00)		
		Average	Maximum	Minimum	Average	Maximum	Minimum
ML2 Duley Lake	81/26	32	37	23	25	28	22

[1] Removed localized event, precipitation, humidity greater than 90% and winds greater than 18 km/hr (5 m/s)

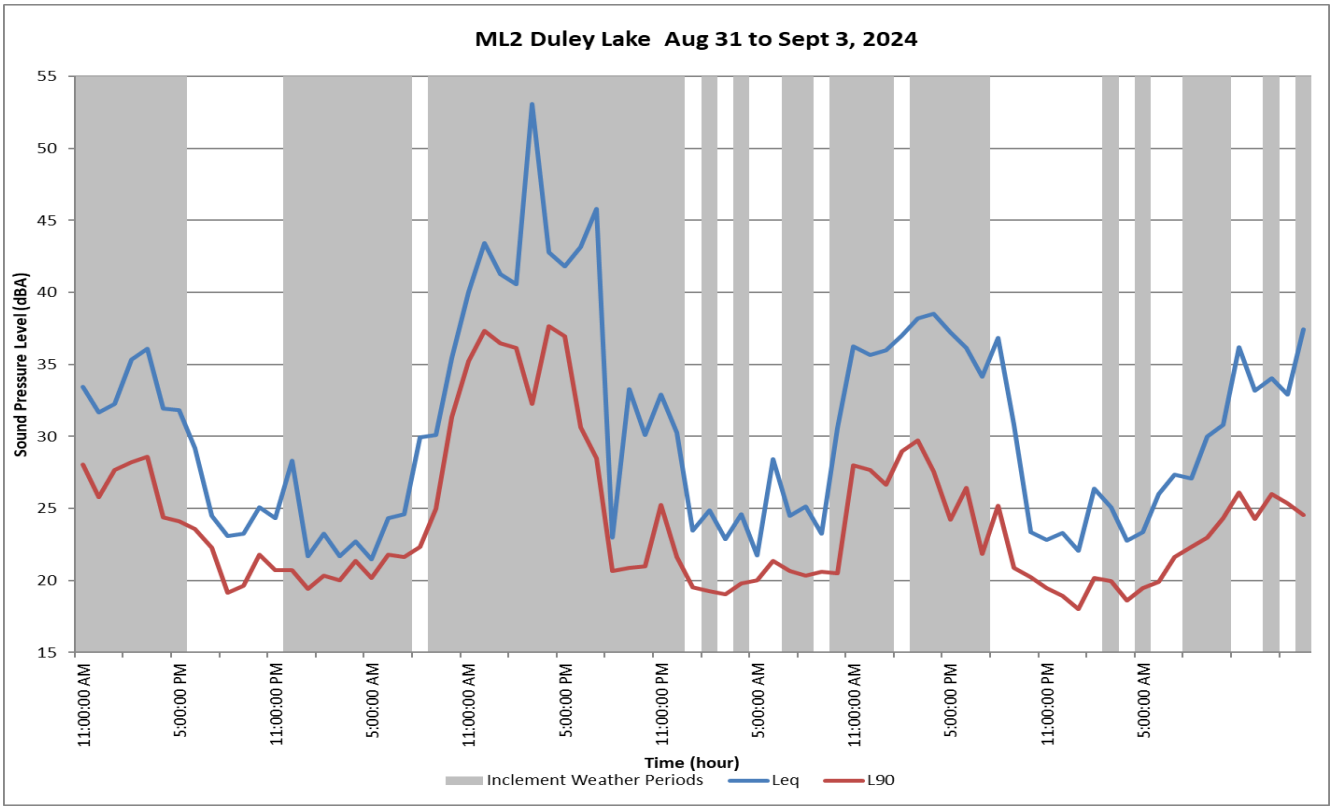


Figure 6-2: Leq - 1 hour and L90 – 1 hour Noise Levels Monitored at ML Duley Lake

6.1.3 ML3 – Riordan Lake

Table 6-3 summarizes the average daytime and nighttime L_{eq} sound levels collected at ML3 for the duration of the noise baseline program. Table 6-3 presents the 1-hour L_{eq} and 1-hour L_{90} sound levels measured at ML3. The results collected at ML3 are representative of a quiet rural area without much existing anthropogenic noise. The location of ML3 is not comparable to any of the monitoring stations from the 2011 baseline study that supported the previous EIS, as no measurements were taken in the Riordan Lake area. Inclement weather conditions did result in a large portion of the noise data collected at this location to be excluded; however up to 23 hours of valid data was collected which is considered typically adequate for locations in rural and/or remote areas where day-to-day variability is expected to be minimal due to limited human activity.

Table 6-3: Calculated Average Daytime and Nighttime L_{eq} and Measured Minimum and Maximum $L_{eq1\text{-hour}}$ Sound Level at ML3 Riordan Lake

Location	Total Hours of Collected Data/Hours of Valid Data[1]	Daytime L_{eq} Sound Level [dBA] (07:00 to 22:00)			Nighttime L_{eq} Sound Level [dBA] (22:00 to 07:00)		
		Average	Maximum	Minimum	Average	Maximum	Minimum
ML3 Riordan Lake	94/23	38	43	23	37	40	25

[1] Removed localized event, precipitation, humidity greater than 90% and winds greater than 18 km/hr (5 m/s)

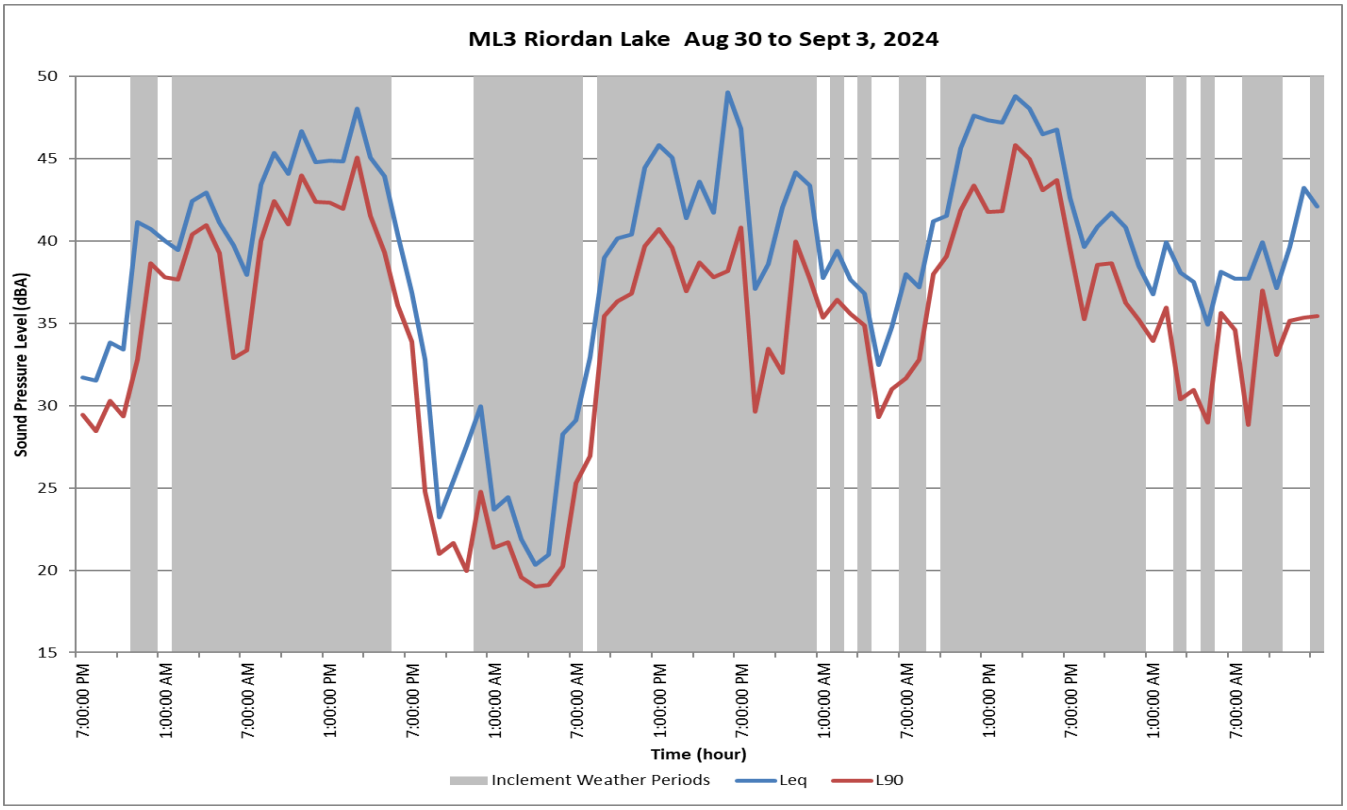


Figure 6-3: $L_{eq\ -\ 1\ hour}$ and $L_{90\ –\ 1\ hour}$ Noise Levels Monitored at ML Riordan Lake

6.1.4 ML4 – Wabush

Table 6-4 summarizes the average daytime and nighttime L_{eq} sound levels collected at ML4 for the duration of the noise baseline program. Table 6-4 presents the 1-hour L_{eq} and 1-hour L_{90} sound levels measured at ML4. The results collected at ML4 are representative of a quiet suburban residential area. The results collected at ML4 indicate lower average level (i.e., perceived as quieter) than the conditions measured for Wabush (Site 3 and 4) during the daytime, however similar to the nighttime levels when compared to those measured in the 2011 baseline program. Inclement weather conditions did result in a large portion of the noise data collected at this location to be excluded; however up to 21 hours of valid data was collected which is considered typically adequate for locations in rural and/or remote areas where day-to-day variability is expected to be minimal due to limited human activity.

Table 6-4: Calculated Average Daytime and Nighttime L_{eq} and Measured Minimum and Maximum $L_{eq1\text{-hour}}$ Sound Level at ML4 Wabush

Location	Total Hours of Collected Data/Hours of Valid Data[1]	Daytime L_{eq} Sound Level [dBA] (07:00 to 22:00)			Nighttime L_{eq} Sound Level [dBA] (22:00 to 07:00)		
		Average	Maximum	Minimum	Average	Maximum	Minimum
ML4 Wabush	97/21	39	45	30	36	40	31

[1] Removed localized event, precipitation, humidity greater than 90% and winds greater than 18 km/hr (5 m/s)

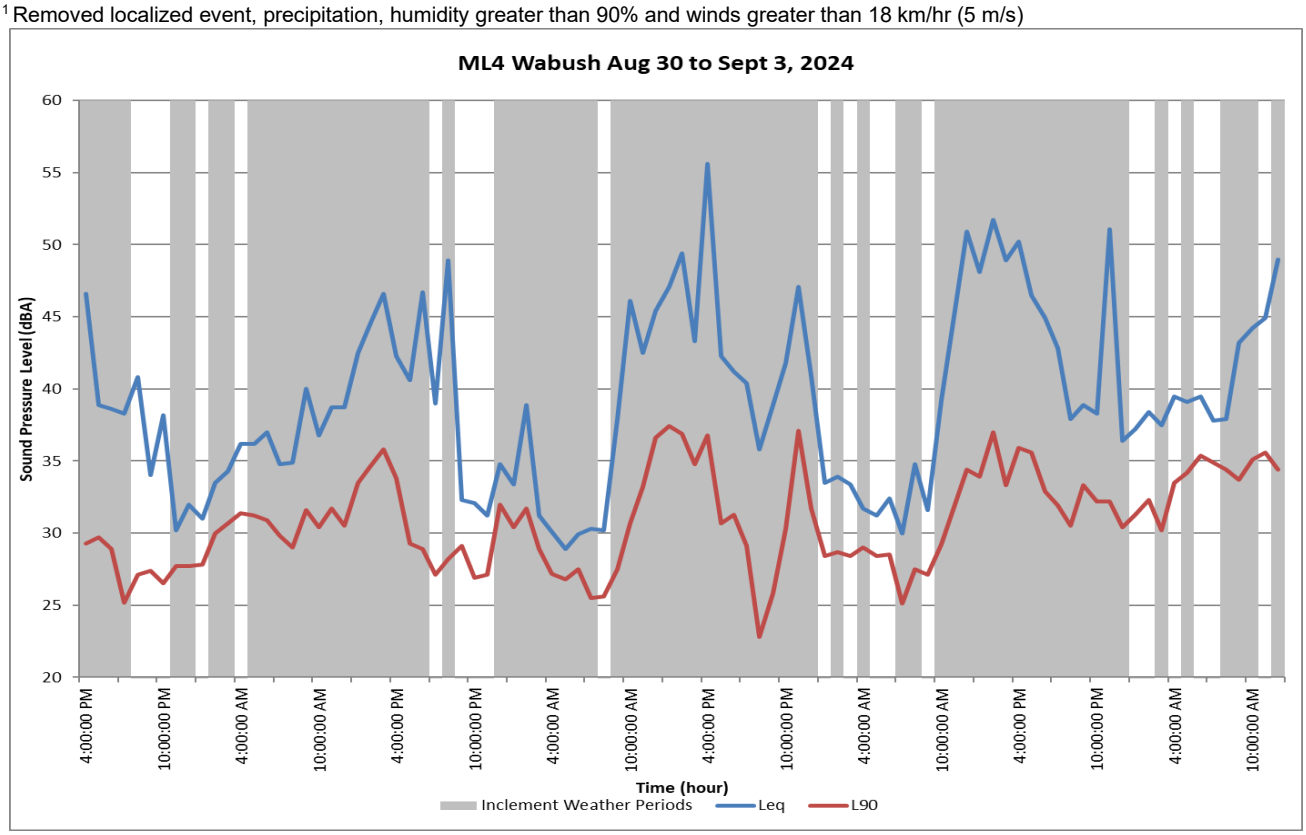


Figure 6-4: $L_{eq\ -\ 1\ hour}$ and $L_{90\ -\ 1\ hour}$ Noise Levels Monitored at ML Wabush

6.2 Short-Term Noise Measurements

Table 6-5 summarizes the results of the short-term noise measurements collected during the noise baseline program. The short-term measurements combine the contributions of existing noise levels associated with natural and anthropogenic noise sources and reflects all events that occurred during the measurement. The short-term measurements provide additional context for the long-term monitoring. Generally, the short-term measurements resulted in higher measured sound levels than the average long-term measurements.

Table 6-5: Short-Term Measurement Results

Location	Measured L_{eq} and (Measured L_{90}) Sound Level [dBA]			
MS1	51 (45)			
MS2	39 (38)	49 (45)	52 (45)	51(46)
MS3	47 (41)	48 (39)	43 (37)	
MS4	53 (36)		50 (36)	
MS5	41 (37)			
MS6	47 (38)			
MS7	55 (39)			
MS8	50 (43)			
MS9	49 (41)			
MS10	50 (32)			

7.0 SUMMARY

The objective of the noise baseline program was to establish the existing conditions for noise where human activity is expected to occur within the vicinity of the Project. The results from the noise baseline program will be used to support the assessment of Project related effects from the Construction, Operations, and Closure phases of the Project. The assessment of the Project on wildlife, socioeconomics, and human health, as related to sensory disturbance from noise was not part of the scope of work for the noise baseline program but will be presented in the EIS.

The results of the noise baseline program indicate that the existing noise levels within the Project area are primarily dominated by nature-based ambient sources including wind-induced noise due to vegetation, wildlife, and insects, and to a lesser degree by anthropogenic sources (such as local industry activity and traffic along Highway 389/500/503).

Table 7-1 summarizes the average day and night sound levels between the previous baseline data collection program completed between 2011 and 2012 and 2024 programs. Overall, sound levels were measured to be slightly lower than levels measured in 2011 and 2012. Upon a comparison of the two sets of programs, in general differences included length of monitoring program, monitoring locations and the uncertainty whether the previous program followed a similar criterion applied to the collected data to what was applied in the 2024 program. Based on review of 2011 and 2012 data and collected data in 2024, from the perspective of existing noise levels the area in the vicinity of the Project can be considered as rural within the towns of Wabush and Fermont to remote in the Duley Lake and Riordan Lake areas. Overall, when considering the data collected, sufficient data exists to support the characterization of existing sound levels and assessment of anticipated effects to the acoustic environment from the Project in the EIS.

Table 7-1: Summary of Previous and Current Baseline Noise Monitoring Results

Monitor Location	Monitoring Station	Average Day Sound Levels (L_d)	Average Night Sound Levels (L_n)
Fermont	Site 1 – 2011 Summer Program	43	40
	Site 1 – 2012 Winter Program[1]	41/47	35/39
	ML1 – Fermont Campsite 2024 Summer Program	37	35
Duley Lake	Site 2 – 2011 Summer Program	42	40
	ML2 – Duley Lake 2024 Summer Program	32	25
Riordan Lake	ML3 – Riordan Lake 2024 Summer Program	38	37
Wabush	Site 3 – 2011 Summer Program	53	43
	Site 3 – 2011 Winter Program[1,2]	46/44	38/33
	Site 4 – 2012 Winter Program[1,2]	45	35
	ML4 – Wabush 2024 Summer Program	39	36

[1]The Winter 2012 baseline program summarized measurements on the weekday and weekend and have been presented respectively.

[2] The above table presents data from Table 14.18 and Table 14.20 of the previous EIS. In the EIS, it is noted that Site 2 was not measured in the winter of 2012 and instead Site 4 was measured to reflect noise levels in Wabush. However, there is a discrepancy in Table 14.20 that summarizes the results for Site 2, instead of Site 4. It has been interpreted that the results summarized for Site 2 in Table 14.20 are for Site 3, and the results for Site 3 are for Site 4.

Signature Page

WSP Canada Inc.

Tomasz Nowak M.Sc., M.Eng.
Acoustics, Noise and Vibration Specialist

Stefan Cicak P.Eng.
Senior Acoustics, Noise and Vibration Engineer

TN/SC

https://wsponlinecan.sharepoint.com/sites/ca-kamieaca00030925894/technical disciplines/09_noise, vibration and light/03 noise/01 baseline/05 report/ca0038713_5261-r-rev1-kami_noise_baseline.docx

8.0 REFERENCES

Alderon. 2012. Kami Iron Ore Mine & Rail Infrastructure Environmental Impact Statement, Vol. 1 & Vol. 2.

Health Canada. 2023. Guidance for Evaluating Human Health Effects in Impact Assessment: Noise.

APPENDIX A

Equipment Calibration Certificates

HBK
HOTTINGER BRÜEL & KJÆR

Calibration Certificate Number 1568.01

The Hottinger Bruel & Kjaer Calibration Laboratory
3079 Premiere Parkway Suite 120
Duluth, GA 30097
Telephone: 770/209-6907
Fax: 770/447-4033
Web site address: http://www.hbkworld.com

CERTIFICATE OF CALIBRATION

Certificate No: CAS-638142-F7C8P0-101

CALIBRATION OF:

Sound Level Meter:	Brüel & Kjær	2250	Serial No: 3009811
Microphone:	Brüel & Kjær	4189	Serial No: 3130516
Preamplifier:	Brüel & Kjær	ZC-0032	Serial No: 26863
Software version:	BZ7222 Version 4.7.7		

CLIENT:

WSP Canada Inc.
120, 8610 36th Street NE
Calgary, AB, T3J 2E1

CALIBRATION CONDITIONS:

Preconditioning:	4 hours at 23 ± 3 °C
Environment conditions	See actual values in Environmental Condition sections

SPECIFICATIONS:

This document certifies that the instrument as listed under "Model/Serial Number" has been calibrated and unless otherwise indicated under "Final Data", meets acceptance criteria as prescribed by the referenced Procedure. The reported expanded uncertainty is based on the standard uncertainty multiplied by a coverage factor $k = 2$ providing a level of confidence of approximately 95%. Statements of compliance, where applicable, are based on calibration results falling within specified criteria with no reduction by the uncertainty of the measurement. The calibration of the listed instrumentation, was accomplished using a test system which conforms with the requirements of ISO/IEC 17025, ANSI/NCSL Z540-1, and ISO 10012-1. For "as received" and/or "final" data, see the attached page(s). Items marked with one asterisk (*) are not covered by the scope of the current A2LA accreditation This Certificate and attached data pages shall not be reproduced, except in full, without the written approval of the Hottinger Brüel & Kjær Calibration Laboratory-Duluth, GA. Results relate only to the items tested. This instrument has been calibrated using Measurement Standards with values traceable to the National Institute of Standards and Technology, National Measurement Institutes or derived from natural physical constants.

PROCEDURE:

Hottinger Brüel & Kjær Model 3630 Sound Level Meter Calibration System Software 7763 Version 8.6 - DB: 8.60 Test Collection 2250-4189.

RESULTS:

As Received Condition	As Received Data	Final Data
_X_ Received in good condition	___ Within acceptance criteria	_X_ Within acceptance criteria
___ Damaged - See attached report	___ Outside acceptance criteria	___ Limited test - See attached details
	_X_ Inoperative	
	___ Data not taken	

Date of Calibration: 05 May. 2023

Certificate issued: 05 May. 2023

John Avitabile
Calibration Technician

Kyle Chancey
Quality Representative

Summary

Preliminary inspection	**Passed**
Environmental conditions, Prior to calibration	**Passed**
Reference information	**Passed**
Indication at the calibration check frequency	**Passed**
Acoustical signal tests of a frequency weighting, C weighting	**Passed**
Self-generated noise, Microphone installed	**Passed**
Self-generated noise, Electrical	**Passed**
Electrical signal tests of frequency weightings, A weighting	**Passed**
Electrical signal tests of frequency weightings, C weighting	**Passed**
Electrical signal tests of frequency weightings, Z weighting	**Passed**
Frequency and time weightings at 1 kHz	**Passed**
Long-term stability, Reference	**Passed**
Level linearity on the reference level range, Upper	**Passed**
Level linearity on the reference level range, Lower	**Passed**
Toneburst response, Time-weighting Fast	**Passed**
Toneburst response, Time-weighting Slow	**Passed**
Toneburst response, LAE	**Passed**
C-weighted peak sound level, 8 kHz	**Passed**
C-weighted peak sound level, 500 Hz	**Passed**
Overload indication	**Passed**
Long-term stability, 1. relative	**Passed**
High-level stability	**Passed**
Long-term stability, 2. relative	**Passed**
Environmental conditions, Following calibration	**Passed**

The sound level meter submitted for testing successfully completed the periodic tests of IEC 61672-3:2013, for the environmental conditions under which the tests were performed.
However, no general statement or conclusion can be made about conformance of the sound level meter to the full specifications of IEC 61672-1:2013 because (a) evidence was not publicly available, from an independent testing organization responsible for pattern approvals, to demonstrate that the model of sound level meter fully conformed to the class 1 specifications in IEC 61672-1:2013 or correction data for acoustical test of frequency weighting were not provided in the Instruction Manual and (b) because the periodic tests of IEC 61672-3:2013 cover only a limited subset of the specifications in IEC 61672-1:2013.

Conformance to a performance specification is demonstrated when the following criteria are both satisfied: (a) a measured deviation from a design goal does not exceed the applicable acceptance limit and (b) the corresponding uncertainty of measurement does not exceed the corresponding maximum-permitted uncertainty of measurement given in IEC 61672-1:2013 for the same coverage probability of 95 %.

Instruments

Category:	Type:	Manufacturer:	Serial No.:	Next Calibration Date:	Traceable to:
Voltmeter	DMM34970A	Keysight / Agilent	MY44076819	28 Sep. 2023	484663
Generator	Pulse Generator	Brüel & Kjær	2626307	01 Aug. 2023	CAS-607189-S2Z0M2-111
Calibrator	4226	Brüel & Kjær	2141946	30 Jan. 2024	CAS-617757-N8Z8Y7-710
AmplifierDivider	3111 Output Module	Brüel & Kjær	2973326	01 Aug. 2023	CAS-607189-S2Z0M2-111
Adaptor	WA0302B, 15 pF	Brüel & Kjær	2411605	30 Dec. 2023	475064

Preliminary inspection

Visually inspect instrument, and operate all relevant controls. (clause 5)

	Result
Visual inspection	OK

Environmental conditions, Prior to calibration

Actual environmental conditions prior to calibration. (clause 7)

	Expected	Accept - Limit	Accept + Limit	Measured [Deg / kPa / %RH]
Air temperature	23.00	-3.00	3.00	23.00
Air pressure	101.30	-21.30	3.70	98.00
Relative humidity	50.00	-25.00	20.00	32.00

Reference information

Information about reference range, level and channel. (clause 22.h + 22.m)

	Value [dB SPL]
Reference sound pressure level	94
Reference level range	140
Channel number	1

Indication at the calibration check frequency

Measure and adjust sound level meter using the supplied calibrator. (clause 10 + 22.m)

	Expected	Measured	Uncertainty
	[dB SPL / Hz]	[dB SPL / Hz]	[dB]
Calibration check frequency (in-house calibrator)	1000.00	1000.00	1.00
Initial indication (in-house calibrator)	94.01	93.73	0.20
Adjusted indication (in-house calibrator)	94.01	94.01	0.20

Acoustical signal tests of a frequency weighting, C weighting

Frequency weightings measured acoustically with a calibrated multi-frequency sound calibrator. Averaging time is 10 seconds, and the result is the average of 2 measurements. (clause 12)

	Coupler Pressure Lc	Mic. Correction C4226	Body Influence	Expected	Measured	Accept - Limit	Accept + Limit	Deviation	Uncertainty
	[dB SPL]	[dB]	[dB]	[dB SPL]	[dB SPL]	[dB]	[dB]	[dB]	[dB]
1000Hz, Ref. (1st)	94.04	0.10	-0.07	94.01	94.01	-0.7	0.7	0.00	0.25
1000Hz, Ref. (2nd)	94.04	0.10	-0.07	94.01	94.01	-0.7	0.7	0.00	0.25
1000Hz, Ref. (Average)	94.04	0.10	-0.07	94.01	94.01	-0.7	0.7	0.00	0.25
125.89Hz (1st)	94.02	0.00	0.00	93.89	93.94	-1.0	1.0	0.05	0.25
125.89Hz (2nd)	94.02	0.00	0.00	93.89	93.94	-1.0	1.0	0.05	0.25
125.89Hz (Average)	94.02	0.00	0.00	93.89	93.94	-1.0	1.0	0.05	0.25
7943.3Hz (1st)	93.98	2.80	-0.08	88.33	86.81	-2.5	1.5	-1.52	0.52
7943.3Hz (2nd)	93.98	2.80	-0.08	88.33	86.81	-2.5	1.5	-1.52	0.52
7943.3Hz (Average)	93.98	2.80	-0.08	88.33	86.81	-2.5	1.5	-1.52	0.52

Self-generated noise, Microphone installed

Self-generated noise measured with microphone submitted for periodic testing. Averaging time is 30 seconds. An anechoic chamber is used to isolate environmental noise.
The level of self-generated noise is reported for information only and is not used to assess conformance to a requirement. (clause 11.1)

	Max	Measured	Uncertainty
	[dB SPL]	[dB SPL]	[dB]
A weighted	17.70	16.18	0.50

Self-generated noise, Electrical

Self-generated noise measured in most sensitive range, with electrical substitution for microphone, according to manufactures specifications.
The level of self-generated noise is reported for information only and is not used to assess conformance to a requirement. (clause 11.2)

	Max	Measured	Uncertainty
	[dB SPL]	[dB SPL]	[dB]
A weighted	13.60	11.73	0.30
C weighted	14.30	11.94	0.30
Z weighted	19.40	16.79	0.30

Electrical signal tests of frequency weightings, A weighting

Frequency response measured with electrical signal relative to level at 1 kHz in reference range. (clause 13)
Electrical and acoustical response and body influence corrections are adjusted with the respective correction values at the reference frequency, in accordance with clause 13.6

	Input Level	Expected	Measured	Response Corr.	Body Influence	Corr. Measured	Accept - Limit	Accept + Limit	Deviation	Uncertainty
	[dBV]	[dB SPL]	[dB SPL]	[dB]	[dB]	[dB SPL]	[dB]	[dB]	[dB]	[dB]
1000Hz, Ref.	-23.45	95.00	95.00	0.00	0.00	95.00	-0.5	0.5	0.00	0.12
63.096Hz	2.75	95.00	95.06	0.00	0.07	95.13	-1.0	1.0	0.13	0.12
125.89Hz	-7.35	95.00	95.03	0.00	0.07	95.10	-1.0	1.0	0.10	0.12
251.19Hz	-14.85	95.00	94.98	0.00	0.14	95.12	-1.0	1.0	0.12	0.12
501.19Hz	-20.25	95.00	94.97	0.00	0.29	95.26	-1.0	1.0	0.26	0.12
1995.3Hz	-24.65	95.00	95.01	-0.01	-0.02	94.98	-1.0	1.0	-0.02	0.12
3981.1Hz	-24.45	95.00	94.99	-0.02	-0.02	94.95	-1.0	1.0	-0.05	0.12
7943.3Hz	-22.35	95.00	95.00	0.00	-0.01	94.99	-2.5	1.5	-0.01	0.12
15849Hz	-16.85	95.00	94.10	0.87	0.18	95.15	-16.0	2.5	0.15	0.12

Electrical signal tests of frequency weightings, C weighting

Frequency response measured with electrical signal relative to level at 1 kHz in reference range. (clause 13)
Electrical and acoustical response and body influence corrections are adjusted with the respective correction values at the reference frequency, in accordance with clause 13.6

	Input Level	Expected	Measured	Response Corr.	Body Influence	Corr. Measured	Accept - Limit	Accept + Limit	Deviation	Uncertainty
	[dBV]	[dB SPL]	[dB SPL]	[dB]	[dB]	[dB SPL]	[dB]	[dB]	[dB]	[dB]
1000Hz, Ref.	-23.45	95.00	95.00	0.00	0.00	95.00	-0.5	0.5	0.00	0.12
63.096Hz	-22.65	95.00	95.02	0.00	0.07	95.09	-1.0	1.0	0.09	0.12
125.89Hz	-23.25	95.00	95.04	0.00	0.07	95.11	-1.0	1.0	0.11	0.12
251.19Hz	-23.45	95.00	95.00	0.00	0.14	95.14	-1.0	1.0	0.14	0.12
501.19Hz	-23.45	95.00	95.03	0.00	0.29	95.32	-1.0	1.0	0.32	0.12
1995.3Hz	-23.25	95.00	95.04	-0.01	-0.02	95.01	-1.0	1.0	0.01	0.12
3981.1Hz	-22.65	95.00	95.00	-0.02	-0.02	94.96	-1.0	1.0	-0.04	0.12
7943.3Hz	-20.45	95.00	95.00	0.00	-0.01	94.99	-2.5	1.5	-0.01	0.12
15849Hz	-14.95	95.00	94.07	0.87	0.18	95.12	-16.0	2.5	0.12	0.12

Electrical signal tests of frequency weightings, Z weighting

Frequency response measured with electrical signal relative to level at 1 kHz in reference range. (clause 13)
Electrical and acoustical response and body influence corrections are adjusted with the respective correction values at the reference frequency, in accordance with clause 13.6

	Input Level	Expected	Measured	Response Corr.	Body Influence	Corr. Measured	Accept - Limit	Accept + Limit	Deviation	Uncertainty
	[dBV]	[dB SPL]	[dB SPL]	[dB]	[dB]	[dB SPL]	[dB]	[dB]	[dB]	[dB]
1000Hz, Ref.	-23.45	95.00	95.00	0.00	0.00	95.00	-0.5	0.5	0.00	0.12
63.096Hz	-23.45	95.00	95.03	0.00	0.07	95.10	-1.0	1.0	0.10	0.12
125.89Hz	-23.45	95.00	95.01	0.00	0.07	95.08	-1.0	1.0	0.08	0.12
251.19Hz	-23.45	95.00	95.00	0.00	0.14	95.14	-1.0	1.0	0.14	0.12
501.19Hz	-23.45	95.00	95.00	0.00	0.29	95.29	-1.0	1.0	0.29	0.12
1995.3Hz	-23.45	95.00	95.01	-0.01	-0.02	94.98	-1.0	1.0	-0.02	0.12
3981.1Hz	-23.45	95.00	95.02	-0.02	-0.02	94.98	-1.0	1.0	-0.02	0.12
7943.3Hz	-23.45	95.00	95.00	0.00	-0.01	94.99	-2.5	1.5	-0.01	0.12
15849Hz	-23.45	95.00	94.12	0.87	0.18	95.17	-16.0	2.5	0.17	0.12

Frequency and time weightings at 1 kHz

Frequency and time weighting measured at 1 kHz with electrical signal in reference range. Measured relative to A-weighted and Fast response. (clause 14)

	Expected	Measured	Accept - Limit	Accept + Limit	Deviation	Uncertainty
	[dB SPL]	[dB SPL]	[dB]	[dB]	[dB]	[dB]
LAF, Ref.	94.00	94.00	-0.5	0.5	0.00	0.12
LCF	94.00	94.00	-0.2	0.2	0.00	0.12
LZF	94.00	94.00	-0.2	0.2	0.00	0.12
LAS	94.00	93.95	-0.1	0.1	-0.05	0.12
LAeq	94.00	93.99	-0.1	0.1	-0.01	0.12

Long-term stability, Reference

Long-term stability over 25 to 35 minutes, with steady 1kHz signal at reference level. (clause 15)
Adjusting to reference level indication.

	Measured	Accept - Limit	Accept + Limit	Deviation	Timestamp	Uncertainty
	[dB SPL]	[dB]	[dB]	[dB]		[dB]
Reference	94.00	-0.5	0.5	0.00	2023-05-05 07:16:48	0.10

Level linearity on the reference level range, Upper

Level linearity in reference range, measured at 8 kHz until overload. (clause 16)

	Expected	Measured	Accept - Limit	Accept + Limit	Deviation	Uncertainty
	[dB SPL]	[dB SPL]	[dB]	[dB]	[dB]	[dB]
94 dB	94.00	94.00	-0.2	0.2	0.00	0.13
99 dB	99.00	99.00	-0.8	0.8	0.00	0.13
104 dB	104.00	104.01	-0.8	0.8	0.01	0.13
109 dB	109.00	109.01	-0.8	0.8	0.01	0.13
114 dB	114.00	114.02	-0.8	0.8	0.02	0.13
119 dB	119.00	119.03	-0.8	0.8	0.03	0.13
124 dB	124.00	124.02	-0.8	0.8	0.02	0.13
129 dB	129.00	129.03	-0.8	0.8	0.03	0.13
134 dB	134.00	134.03	-0.8	0.8	0.03	0.13
135 dB	135.00	135.03	-0.8	0.8	0.03	0.13
136 dB	136.00	136.02	-0.8	0.8	0.02	0.13
137 dB	137.00	137.03	-0.8	0.8	0.03	0.13
138 dB	138.00	138.02	-0.8	0.8	0.02	0.13

Level linearity on the reference level range, Lower

Level linearity in reference range, measured at 8 kHz down to lower limit, or until underrange. (clause 16)

	Expected	Measured	Accept - Limit	Accept + Limit	Deviation	Uncertainty
	[dB SPL]	[dB SPL]	[dB]	[dB]	[dB]	[dB]
94 dB	94.00	94.00	-0.2	0.2	0.00	0.13
89 dB	89.00	89.00	-0.8	0.8	0.00	0.13
84 dB	84.00	84.00	-0.8	0.8	0.00	0.13
79 dB	79.00	79.00	-0.8	0.8	0.00	0.13
74 dB	74.00	74.00	-0.8	0.8	0.00	0.13
69 dB	69.00	69.00	-0.8	0.8	0.00	0.13
64 dB	64.00	63.99	-0.8	0.8	-0.01	0.13
59 dB	59.00	59.00	-0.8	0.8	0.00	0.13
54 dB	54.00	54.00	-0.8	0.8	0.00	0.13
49 dB	49.00	49.00	-0.8	0.8	0.00	0.13
44 dB	44.00	44.02	-0.8	0.8	0.02	0.13
39 dB	39.00	39.03	-0.8	0.8	0.03	0.24
34 dB	34.00	34.08	-0.8	0.8	0.08	0.24
30 dB	30.00	30.17	-0.8	0.8	0.17	0.24
29 dB	29.00	29.20	-0.8	0.8	0.20	0.24
28 dB	28.00	28.28	-0.8	0.8	0.28	0.24
27 dB	27.00	27.30	-0.8	0.8	0.30	0.24
26 dB	26.00	26.42	-0.8	0.8	0.42	0.24
25 dB	25.00	25.50	-0.8	0.8	0.50	0.24
24 dB	24.00	24.57	-0.8	0.8	0.57	0.24

Toneburst response, Time-weighting Fast

Response to 4 kHz toneburst measured in reference range, relative to continuous signal. (clause 18)

	Expected	Measured	Accept - Limit	Accept + Limit	Deviation	Uncertainty
	[dB SPL]	[dB SPL]	[dB]	[dB]	[dB]	[dB]
Continuous, Ref.	137.00	137.00	-0.5	0.5	0.00	0.12
200 ms Burst	136.00	135.99	-0.5	0.5	-0.01	0.12
2 ms Burst	119.00	118.92	-1.5	1.0	-0.08	0.12
0.25 ms Burst	110.00	109.83	-3.0	1.0	-0.17	0.12

Toneburst response, Time-weighting Slow

Response to 4 kHz toneburst measured in reference range, relative to continuous signal. (clause 18)

	Expected	Measured	Accept - Limit	Accept + Limit	Deviation	Uncertainty
	[dB SPL]	[dB SPL]	[dB]	[dB]	[dB]	[dB]
Continuous, Ref.	137.00	137.00	-0.5	0.5	0.00	0.12
200 ms Burst	129.60	129.61	-0.5	0.5	0.01	0.12
2 ms Burst	110.00	110.00	-3.0	1.0	0.00	0.12

Toneburst response, LAE

Response to 4 kHz toneburst measured in reference range, relative to continuous signal. (clause 18)

	Expected	Measured	Accept - Limit	Accept + Limit	Deviation	Uncertainty
	[dB SPL]	[dB SPL]	[dB]	[dB]	[dB]	[dB]
Continuous, Ref.	137.00	137.00	-0.5	0.5	0.00	0.12
200 ms Burst	130.00	129.99	-0.5	0.5	-0.01	0.12
2 ms Burst	110.00	109.96	-1.5	1.0	-0.04	0.12
0.25 ms Burst	101.00	100.85	-3.0	1.0	-0.15	0.12

C-weighted peak sound level, 8 kHz

Peak-response to a 8 kHz single-cycle sine measured in least-sensitive range, relative to continuous signal. (clause 19)

	Expected	Measured	Accept - Limit	Accept + Limit	Deviation	Uncertainty
	[dB SPL]	[dB SPL]	[dB]	[dB]	[dB]	[dB]
Continuous, Ref.	132.00	132.00	-0.5	0.5	0.00	0.09
Single Sine	135.40	135.49	-2.0	2.0	0.09	0.20

C-weighted peak sound level, 500 Hz

Peak-response to a 500 Hz half-cycle sine measured in least-sensitive range, relative to continuous signal. (clause 19)

	Expected	Measured	Accept - Limit	Accept + Limit	Deviation	Uncertainty
	[dB SPL]	[dB SPL]	[dB]	[dB]	[dB]	[dB]
Continuous, Ref.	135.00	135.00	-0.5	0.5	0.00	0.09
Half-sine, Positive	137.40	137.13	-1.0	1.0	-0.27	0.12
Half-sine, Negative	137.40	137.13	-1.0	1.0	-0.27	0.12

Overload indication

Overload indication in the least sensitive range determined with a 4 kHz positive/negative half-cycle signal. (clause 20)

	Measured / Input Level	Accept - Limit	Accept + Limit	Deviation	Uncertainty
	[dB SPL]	[dB]	[dB]	[dB]	[dB]
Continuous	140.00	-0.5	0.5	0.00	0.20
Half-sine, Positive	140.20	-10.0	10.0	0.20	0.20
Half-sine, Negative	140.40	-10.0	10.0	0.40	0.20
Difference	140.40	-1.5	1.5	0.20	0.24

Long-term stability, 1. relative

Long-term stability over 25 to 35 minutes, with steady 1kHz signal at reference level. (clause 15)
Relative to prior adjustment to reference level indication.

	Measured	Accept - Limit	Accept + Limit	Deviation	Timestamp	Uncertainty
	[dB SPL / Min]	[dB / Min]	[dB / Min]	[dB / Min]		[dB]
Measurement	94.00	-0.1	0.1	0.00	2023-05-05 07:33:36	0.10
Time passed	16.48	0.0	35.0	16.48		0.00

High-level stability

High-level stability over 5 minutes, with steady 1kHz signal, 1dB below upper boundary. (clause 21)

	Measured	Accept - Limit	Accept + Limit	Deviation	Uncertainty
	[dB SPL]	[dB]	[dB]	[dB]	[dB]
High-level, Ref.	139.00	-0.5	0.5	0.00	0.10
High-level, after 5min	139.00	-0.1	0.1	0.00	0.10

Long-term stability, 2. relative

Long-term stability over 25 to 35 minutes, with steady 1kHz signal at reference level. (clause 15)
Relative to prior adjustment to reference level indication.

	Measured	Accept - Limit	Accept + Limit	Deviation	Timestamp	Uncertainty
	[dB SPL/ Min]	[dB / Min]	[dB / Min]	[dB / Min]		[dB]
Wait	25.00	25.0	120.0	25.00		0.00
Measurement	94.00	-0.1	0.1	0.00	2023-05-05 07:42:34	0.10

Environmental conditions, Following calibration

Actual environmental conditions following calibration. (clause 7)

	Expected	Accept - Limit	Accept + Limit	Measured
				[Deg / kPa / %RH]
Air temperature	23.00	-3.00	3.00	23.00
Air pressure	101.30	-21.30	3.70	98.00
Relative humidity	50.00	-25.00	20.00	32.00

HBK HOTTINGER BRÜEL & KJÆR
The Hottinger Brüel & Kjær Inc. Calibration Laboratory
3079 Premiere Parkway Suite 120
Duluth, GA 30097
Telephone: 770-209-6907
Fax: 770-447-4033
Web site address: http://www.hbkworld.com

A2LA ACCREDITED

Calibration Certificate # 1568.01

CERTIFICATE OF CALIBRATION

No.: CAS-675082-W4J9Y4-702

CALIBRATION OF:

Calibrator:	Brüel & Kjær	Type	4231	Serial No.:	3020498
		IEC Class:	1		

CUSTOMER:

WSP Canada Inc
120, 8610 36th Street NE
Calgary, AB T3J 2E1
Canada

CALIBRATION CONDITIONS:

Environment conditions:	Air temperature:	23.3	°C
	Air pressure:	97.05	kPa
	Relative Humidity:	26.6	%RH

SPECIFICATIONS:

This document certifies that the acoustic calibrator as listed under "Type" has been calibrated and unless otherwise indicated under "Final Data", meets acceptance criteria as prescribed by the referenced Procedure. Hottinger Bruel & Kjaer Inc. utilizes a simple acceptance decision rule as defined by ILAC G8 with measurement uncertainty value which will not exceed 50% of the tolerance. The calibration of the listed transducer was accomplished using a test system which conforms to the requirements of ISO/IEC 17025, ANSI/NCSL Z540-1, and guidelines of ISO 10012-1. For "as received" and "final" data, see the attached page(s). Items marked with one asterisk (*) are not covered by the scope of the current A2LA accreditation. This Certificate and attached data pages shall not be reproduced, except in full, without written approval of the Hottinger Brüel & Kjær Inc. Calibration Laboratory-Duluth, GA. Results relate only to the items tested. The transducer has been calibrated using Measurement Standards with values traceable to the National Institute of Standards and Technology, National Measurement Institutes or derived from natural physical constants. The acoustic calibrator has been calibrated in accordance with the requirements as specified in IEC60942.

PROCEDURE:

The measurements have been performed with the assistance of Hottinger Brüel & Kjær Inc. acoustic calibrator calibration application
Software version 2.3.4 Type 7794 using calibration procedure 4231 Complete

RESULTS:

- [X] "As Received" Data: Within Acceptance Criteria
- [ ] "As Received" Data: Outside Acceptance Criteria
- [X] "Final" Data : Within Acceptance Criteria
- [ ] "Final" Data : Outside Acceptance Criteria

The reported expanded uncertainty is based on the standard uncertainty multiplied by a coverage factor $k = 2$, providing a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with EA-4/02from elements originating from the standards, calibration method, effect of environmental conditions and any short time contribution from the calibrator under calibration.

Date of Calibration: February 6, 2024

Certificate issued: February 6, 2024

Can Phan
Calibration Technician

Meshaun Hobbs
Quality Representative

Sound Pressure Levels

All stated values are valid at environmental reference conditions

Nominal Level [dB]	Accept Limit Lower [dB]	Accept Limit Upper [dB]	Measured Level [dB]	Measurement Uncertainty [dB]
94	93.80	94.20	93.98	0.12
114	113.80	114.20	113.97	0.12

Frequency

Nominal Frequency [Hz]	Accept Limit Lower [Hz]	Accept Limit Upper [Hz]	Measured Frequency [Hz]	Measurement Uncertainty [Hz]
1000	999.00	1001.00	1000.04	0.10

Total Distortion*

Distortion mode: [X] **TD*** [ ] **THD***

Calibration Level [dB]*	Accept Limit [%]*	Measured Distortion [%]*	Measurement Uncertainty [%]*
94	1.00	0.36	0.13
114	1.00	0.11	0.13

Environmental Reference Conditions:

Pressure: 101.3 kPa, Temperature: 23 °C, Relative Humidity: 50%

Instrument List

Type	Description	Serial no	Cal. date	Due date	Calibrated by	Trace number
3560	PULSE Analyzer	2723320	2023-10-19	2024-10-18	GK	CAS-664166-V3L2K7-801
9545	Transfer Microphone	3	2023-10-31	2024-10-30	MH	CAS-664166-V3L2K7-403
4228	Reference Sound Source	1618502	2023-04-19	2025-04-30	WS	CAS-632564-L2S0L9-708

During the calibration the calibrator has been loaded by the load volume of the Transfer Microphone. The load volumes for a number of different types of Transfer Microphones are listed in the table below.
For Brüel & Kjær Pistonphones types 4220 and 4228 the result of the SPL calibration has been corrected to be valid for a load volume of 1333 mm^3 . For all other types the result is valid with the actual load volume.

Transfer Microphone Type	Fulfils standard IEC 61094-1 LS	Fulfils standard IEC 61094-4 WS	Load Volume 1" (1/2" mic including DP-0776)	Load Volume 1/2"
4180	yes	yes	1126 mm^3	43 mm^3
4192	-	yes	1273 mm^3	190 mm^3
9545	-	-	1333 mm^3	-

Condition "As Received": Good

The Hottinger Bruel & Kjaer Calibration Laboratory
3079 Premiere Parkway Suite 120
Duluth, GA 30097
Telephone: 770/209-6907
Fax: 770/447-4033
Web site address: http://www.hbkworld.com

Calibration Certificate Number 1568.01

CERTIFICATE OF CALIBRATION

Certificate No: CAS-595151-Y5R6N5-101

CALIBRATION OF:

Sound Level Meter:	Brüel & Kjær	2250	Serial No: 2717770
Microphone:	Brüel & Kjær	4966	Serial No: 3336465
Preamplifier:	Brüel & Kjær	ZC-0032	Serial No: 15448
Software version:	BZ7222 Version 4.7.6		

CLIENT:

Golder Associates
120, 8610 36th Street NE
Calgary, AB T3J 2E1

CALIBRATION CONDITIONS:

Preconditioning:	4 hours at 23 ± 3 °C
Environment conditions	See actual values in Environmental Condition sections

SPECIFICATIONS:

This document certifies that the instrument as listed under "Model/Serial Number" has been calibrated and unless otherwise indicated under "Final Data", meets acceptance criteria as prescribed by the referenced Procedure. The reported expanded uncertainty is based on the standard uncertainty multiplied by a coverage factor $k = 2$ providing a level of confidence of approximately 95%. Statements of compliance, where applicable, are based on calibration results falling within specified criteria with no reduction by the uncertainty of the measurement. The calibration of the listed instrumentation, was accomplished using a test system which conforms with the requirements of ISO/IEC 17025, ANSI/NCSL Z540-1, and ISO 10012-1. For "as received" and/or "final" data, see the attached page(s). Items marked with one asterisk (*) are not covered by the scope of the current A2LA accreditation This Certificate and attached data pages shall not be reproduced, except in full, without the written approval of the Hottinger Brüel & Kjær Calibration Laboratory-Duluth, GA. Results relate only to the items tested. This instrument has been calibrated using Measurement Standards with values traceable to the National Institute of Standards and Technology, National Measurement Institutes or derived from natural physical constants.

PROCEDURE:

Hottinger Brüel & Kjær Model 3630 Sound Level Meter Calibration System Software 7763 Version 8.3 - DB: 8.30 Test Collection 2250-4966.

RESULTS:

As Received Condition	As Received Data	Final Data
_X_ Received in good condition	_X_ Within acceptance criteria	_X_ Within acceptance criteria
___ Damaged - See attached report	___ Outside acceptance criteria	___ Limited test - See attached details
	___ Inoperative	
	___ Data not taken	

Date of Calibration: 08 November 2022

Certificate issued: 08 November 2022

John Avitabile

Calibration Technician

Grant Kennedy

Quality Representative

Summary

Preliminary inspection	**Passed**
Environmental conditions, Prior to calibration	**Passed**
Reference information	**Passed**
Indication at the calibration check frequency	**Passed**
Acoustical signal tests of a frequency weighting, C weighting	**Passed**
Self-generated noise, Microphone installed	**Passed**
Self-generated noise, Electrical	**Passed**
Electrical signal tests of frequency weightings, A weighting	**Passed**
Electrical signal tests of frequency weightings, C weighting	**Passed**
Electrical signal tests of frequency weightings, Z weighting	**Passed**
Frequency and time weightings at 1 kHz	**Passed**
Long-term stability, Reference	**Passed**
Level linearity on the reference level range, Upper	**Passed**
Level linearity on the reference level range, Lower	**Passed**
Toneburst response, Time-weighting Fast	**Passed**
Toneburst response, Time-weighting Slow	**Passed**
Toneburst response, LAE	**Passed**
C-weighted peak sound level, 8 kHz	**Passed**
C-weighted peak sound level, 500 Hz	**Passed**
Overload indication	**Passed**
Long-term stability, 1. relative	**Passed**
High-level stability	**Passed**
Long-term stability, 2. relative	**Passed**
Environmental conditions, Following calibration	**Passed**

The sound level meter submitted for testing successfully completed the periodic tests of IEC 61672-3:2013, for the environmental conditions under which the tests were performed.
However, no general statement or conclusion can be made about conformance of the sound level meter to the full specifications of IEC 61672-1:2013 because (a) evidence was not publicly available, from an independent testing organization responsible for pattern approvals, to demonstrate that the model of sound level meter fully conformed to the class 1 specifications in IEC 61672-1:2013 or correction data for acoustical test of frequency weighting were not provided in the Instruction Manual and (b) because the periodic tests of IEC 61672-3:2013 cover only a limited subset of the specifications in IEC 61672-1:2013.

Conformance to a performance specification is demonstrated when the following criteria are both satisfied: (a) a measured deviation from a design goal does not exceed the applicable acceptance limit and (b) the corresponding uncertainty of measurement does not exceed the corresponding maximum-permitted uncertainty of measurement given in IEC 61672-1:2013 for the same coverage probability of 95 %.

Instruments

Category:	Type:	Manufacturer:	Serial No.:	Next Calibration Date:	Traceable to:
Voltmeter	DMM34970A	Keysight / Agilent	MY44002586	06 April 2023	478486
Generator	Pulse Generator	Brüel & Kjær	2626307	14 December 2022	CAS-589455-K8M7C7-101
Calibrator	4226	Brüel & Kjær	2141946	31 January 2023	CAS-549140-C2T2B0-901
AmplifierDivider	3111 Output Module	Brüel & Kjær	2973326	14 December 2022	CAS-589455-K8M7C7-101
Adaptor	WA0302B, 15 pF	Brüel & Kjær	2409010	26 February 2023	464819

Preliminary inspection

Visually inspect instrument, and operate all relevant controls. (clause 5)

	Result
Visual inspection	OK

Environmental conditions, Prior to calibration

Actual environmental conditions prior to calibration. (clause 7)

	Expected	Accept - Limit	Accept + Limit	Measured [Deg / kPa / %RH]
Air temperature	23.00	-3.00	3.00	24.00
Air pressure	101.30	-21.30	3.70	99.00
Relative humidity	50.00	-25.00	20.00	44.00

Reference information

Information about reference range, level and channel. (clause 22.h + 22.m)

	Value [dB SPL]
Reference sound pressure level	94
Reference level range	140
Channel number	1

Indication at the calibration check frequency

Measure and adjust sound level meter using the supplied calibrator. (clause 10 + 22.m)

	Expected	Measured	Uncertainty
	[dB SPL / Hz]	[dB SPL / Hz]	[dB]
Calibration check frequency (in-house calibrator)	1000.00	1000.00	1.00
Initial indication (in-house calibrator)	94.08	94.03	0.20
Adjusted indication (in-house calibrator)	94.08	94.10	0.20

Acoustical signal tests of a frequency weighting, C weighting

Frequency weightings measured acoustically with a calibrated multi-frequency sound calibrator. Averaging time is 10 seconds, and the result is the average of 2 measurements. (clause 12)

	Coupler Pressure Lc	Mic. Correction C4226	Body Influence	Expected	Measured	Accept - Limit	Accept + Limit	Deviation	Uncertainty
	[dB SPL]	[dB]	[dB]	[dB SPL]	[dB SPL]	[dB]	[dB]	[dB]	[dB]
1000Hz, Ref. (1st)	94.07	0.06	-0.07	94.08	94.10	-0.7	0.7	0.02	0.33
1000Hz, Ref. (2nd)	94.07	0.06	-0.07	94.08	94.10	-0.7	0.7	0.02	0.33
1000Hz, Ref. (Average)	94.07	0.06	-0.07	94.08	94.10	-0.7	0.7	0.02	0.33
125.89Hz (1st)	94.04	0.00	0.00	93.93	94.03	-1.0	1.0	0.10	0.31
125.89Hz (2nd)	94.04	0.00	0.00	93.93	94.03	-1.0	1.0	0.10	0.31
125.89Hz (Average)	94.04	0.00	0.00	93.93	94.03	-1.0	1.0	0.10	0.31
7943.3Hz (1st)	92.98	2.88	-0.08	87.27	87.30	-2.5	1.5	0.03	0.56
7943.3Hz (2nd)	92.98	2.88	-0.08	87.27	87.30	-2.5	1.5	0.03	0.56
7943.3Hz (Average)	92.98	2.88	-0.08	87.27	87.30	-2.5	1.5	0.03	0.56

Self-generated noise, Microphone installed

Self-generated noise measured with microphone submitted for periodic testing. Averaging time is 30 seconds. An anechoic chamber is used to isolate environmental noise.
The level of self-generated noise is reported for information only and is not used to assess conformance to a requirement. (clause 11.1)

	Max	Measured	Uncertainty
	[dB SPL]	[dB SPL]	[dB]
A weighted	17.80	16.18	0.50

Self-generated noise, Electrical

Self-generated noise measured in most sensitive range, with electrical substitution for microphone, according to manufactures specifications.
The level of self-generated noise is reported for information only and is not used to assess conformance to a requirement. (clause 11.2)

	Max	Measured	Uncertainty
	[dB SPL]	[dB SPL]	[dB]
A weighted	13.60	12.37	0.30
C weighted	14.30	12.51	0.30
Z weighted	19.40	17.59	0.30

Electrical signal tests of frequency weightings, A weighting

Frequency response measured with electrical signal relative to level at 1 kHz in reference range. (clause 13)
Electrical and acoustical response and body influence corrections are adjusted with the respective correction values at the reference frequency, in accordance with clause 13.6

	Input Level	Expected	Measured	Response Corr.	Body Influence	Corr. Measured	Accept - Limit	Accept + Limit	Deviation	Uncertainty
	[dBV]	[dB SPL]	[dB SPL]	[dB]	[dB]	[dB SPL]	[dB]	[dB]	[dB]	[dB]
1000Hz, Ref.	-24.33	95.00	95.00	0.00	0.00	95.00	-0.5	0.5	0.00	0.12
63.096Hz	1.87	95.00	95.05	0.01	0.07	95.13	-1.0	1.0	0.13	0.12
125.89Hz	-8.23	95.00	95.02	0.01	0.07	95.10	-1.0	1.0	0.10	0.12
251.19Hz	-15.73	95.00	94.97	0.01	0.14	95.12	-1.0	1.0	0.12	0.12
501.19Hz	-21.13	95.00	94.97	0.01	0.29	95.27	-1.0	1.0	0.27	0.12
1995.3Hz	-25.53	95.00	95.00	-0.03	-0.02	94.95	-1.0	1.0	-0.05	0.12
3981.1Hz	-25.33	95.00	94.99	-0.08	-0.02	94.89	-1.0	1.0	-0.11	0.12
7943.3Hz	-23.23	95.00	95.00	0.18	-0.01	95.17	-2.5	1.5	0.17	0.12
15849Hz	-17.73	95.00	94.10	0.68	0.18	94.96	-16.0	2.5	-0.04	0.12

Electrical signal tests of frequency weightings, C weighting

Frequency response measured with electrical signal relative to level at 1 kHz in reference range. (clause 13)
Electrical and acoustical response and body influence corrections are adjusted with the respective correction values at the reference frequency, in accordance with clause 13.6

	Input Level	Expected	Measured	Response Corr.	Body Influence	Corr. Measured	Accept - Limit	Accept + Limit	Deviation	Uncertainty
	[dBV]	[dB SPL]	[dB SPL]	[dB]	[dB]	[dB SPL]	[dB]	[dB]	[dB]	[dB]
1000Hz, Ref.	-24.33	95.00	95.00	0.00	0.00	95.00	-0.5	0.5	0.00	0.12
63.096Hz	-23.53	95.00	95.01	0.01	0.07	95.09	-1.0	1.0	0.09	0.12
125.89Hz	-24.13	95.00	95.04	0.01	0.07	95.12	-1.0	1.0	0.12	0.12
251.19Hz	-24.33	95.00	95.00	0.01	0.14	95.15	-1.0	1.0	0.15	0.12
501.19Hz	-24.33	95.00	95.03	0.01	0.29	95.33	-1.0	1.0	0.33	0.12
1995.3Hz	-24.13	95.00	95.04	-0.03	-0.02	94.99	-1.0	1.0	-0.01	0.12
3981.1Hz	-23.53	95.00	95.00	-0.08	-0.02	94.90	-1.0	1.0	-0.10	0.12
7943.3Hz	-21.33	95.00	95.00	0.18	-0.01	95.17	-2.5	1.5	0.17	0.12
15849Hz	-15.83	95.00	94.07	0.68	0.18	94.93	-16.0	2.5	-0.07	0.12

Electrical signal tests of frequency weightings, Z weighting

Frequency response measured with electrical signal relative to level at 1 kHz in reference range. (clause 13)
Electrical and acoustical response and body influence corrections are adjusted with the respective correction values at the reference frequency, in accordance with clause 13.6

	Input Level	Expected	Measured	Response Corr.	Body Influence	Corr. Measured	Accept - Limit	Accept + Limit	Deviation	Uncertainty
	[dBV]	[dB SPL]	[dB SPL]	[dB]	[dB]	[dB SPL]	[dB]	[dB]	[dB]	[dB]
1000Hz, Ref.	-24.33	95.00	95.00	0.00	0.00	95.00	-0.5	0.5	0.00	0.12
63.096Hz	-24.33	95.00	95.03	0.01	0.07	95.11	-1.0	1.0	0.11	0.12
125.89Hz	-24.33	95.00	95.01	0.01	0.07	95.09	-1.0	1.0	0.09	0.12
251.19Hz	-24.33	95.00	95.00	0.01	0.14	95.15	-1.0	1.0	0.15	0.12
501.19Hz	-24.33	95.00	95.00	0.01	0.29	95.30	-1.0	1.0	0.30	0.12
1995.3Hz	-24.33	95.00	95.01	-0.03	-0.02	94.96	-1.0	1.0	-0.04	0.12
3981.1Hz	-24.33	95.00	95.02	-0.08	-0.02	94.92	-1.0	1.0	-0.08	0.12
7943.3Hz	-24.33	95.00	95.00	0.18	-0.01	95.17	-2.5	1.5	0.17	0.12
15849Hz	-24.33	95.00	94.13	0.68	0.18	94.99	-16.0	2.5	-0.01	0.12

Frequency and time weightings at 1 kHz

Frequency and time weighting measured at 1 kHz with electrical signal in reference range. Measured relative to A-weighted and Fast response. (clause 14)

	Expected	Measured	Accept - Limit	Accept + Limit	Deviation	Uncertainty
	[dB SPL]	[dB SPL]	[dB]	[dB]	[dB]	[dB]
LAF, Ref.	94.00	94.00	-0.5	0.5	0.00	0.12
LCF	94.00	94.00	-0.2	0.2	0.00	0.12
LZF	94.00	94.00	-0.2	0.2	0.00	0.12
LAS	94.00	93.95	-0.1	0.1	-0.05	0.12
LAeq	94.00	93.99	-0.1	0.1	-0.01	0.12

Long-term stability, Reference

Long-term stability over 25 to 35 minutes, with steady 1kHz signal at reference level. (clause 15)
Adjusting to reference level indication.

	Measured	Accept - Limit	Accept + Limit	Deviation	Timestamp	Uncertainty
	[dB SPL]	[dB]	[dB]	[dB]		[dB]
Reference	94.00	-0.5	0.5	0.00	2022-11-08 10:51:15	0.10

Level linearity on the reference level range, Upper

Level linearity in reference range, measured at 8 kHz until overload. (clause 16)

	Expected	Measured	Accept - Limit	Accept + Limit	Deviation	Uncertainty
	[dB SPL]	[dB SPL]	[dB]	[dB]	[dB]	[dB]
94 dB	94.00	94.00	-0.5	0.5	0.00	0.13
99 dB	99.00	99.00	-0.8	0.8	0.00	0.13
104 dB	104.00	104.00	-0.8	0.8	0.00	0.13
109 dB	109.00	109.01	-0.8	0.8	0.01	0.13
114 dB	114.00	114.02	-0.8	0.8	0.02	0.13
119 dB	119.00	119.02	-0.8	0.8	0.02	0.13
124 dB	124.00	124.02	-0.8	0.8	0.02	0.13
129 dB	129.00	129.02	-0.8	0.8	0.02	0.13
134 dB	134.00	134.02	-0.8	0.8	0.02	0.13
135 dB	135.00	135.02	-0.8	0.8	0.02	0.13
136 dB	136.00	136.02	-0.8	0.8	0.02	0.13
137 dB	137.00	137.02	-0.8	0.8	0.02	0.13
138 dB	138.00	138.02	-0.8	0.8	0.02	0.13
139 dB	139.00	139.02	-0.8	0.8	0.02	0.13

Level linearity on the reference level range, Lower

Level linearity in reference range, measured at 8 kHz down to lower limit, or until underrange. (clause 16)

	Expected	Measured	Accept - Limit	Accept + Limit	Deviation	Uncertainty
	[dB SPL]	[dB SPL]	[dB]	[dB]	[dB]	[dB]
94 dB	94.00	94.00	-0.5	0.5	0.00	0.13
89 dB	89.00	89.00	-0.8	0.8	0.00	0.13
84 dB	84.00	84.00	-0.8	0.8	0.00	0.13
79 dB	79.00	79.00	-0.8	0.8	0.00	0.13
74 dB	74.00	73.99	-0.8	0.8	-0.01	0.13
69 dB	69.00	68.99	-0.8	0.8	-0.01	0.13
64 dB	64.00	63.99	-0.8	0.8	-0.01	0.13
59 dB	59.00	58.99	-0.8	0.8	-0.01	0.13
54 dB	54.00	53.99	-0.8	0.8	-0.01	0.13
49 dB	49.00	49.00	-0.8	0.8	0.00	0.13
44 dB	44.00	44.01	-0.8	0.8	0.01	0.13
39 dB	39.00	39.03	-0.8	0.8	0.03	0.24
34 dB	34.00	34.08	-0.8	0.8	0.08	0.24
30 dB	30.00	30.16	-0.8	0.8	0.16	0.24
29 dB	29.00	29.22	-0.8	0.8	0.22	0.24
28 dB	28.00	28.27	-0.8	0.8	0.27	0.24
27 dB	27.00	27.32	-0.8	0.8	0.32	0.24
26 dB	26.00	26.40	-0.8	0.8	0.40	0.24
25 dB	25.00	25.48	-0.8	0.8	0.48	0.24
24 dB	24.00	24.63	-0.8	0.8	0.63	0.24

Toneburst response, Time-weighting Fast

Response to 4 kHz toneburst measured in reference range, relative to continuous signal. (clause 18)

	Expected	Measured	Accept - Limit	Accept + Limit	Deviation	Uncertainty	
	[dB SPL]	[dB SPL]	[dB]	[dB]	[dB]	[dB]	
Continuous, Ref.	137.00	137.00	-0.5	0.5	0.00	0.12	*
200 ms Burst	136.00	136.00	-0.5	0.5	0.00	0.12	*
2 ms Burst	119.00	118.92	-1.5	1.0	-0.08	0.12	*
0.25 ms Burst	110.00	109.86	-3.0	1.0	-0.14	0.12	*

Toneburst response, Time-weighting Slow

Response to 4 kHz toneburst measured in reference range, relative to continuous signal. (clause 18)

	Expected	Measured	Accept - Limit	Accept + Limit	Deviation	Uncertainty	
	[dB SPL]	[dB SPL]	[dB]	[dB]	[dB]	[dB]	
Continuous, Ref.	137.00	137.00	-0.5	0.5	0.00	0.12	*
200 ms Burst	129.60	129.60	-0.5	0.5	0.00	0.12	*
2 ms Burst	110.00	109.99	-3.0	1.0	-0.01	0.12	*

Toneburst response, LAE

Response to 4 kHz toneburst measured in reference range, relative to continuous signal. (clause 18)

	Expected	Measured	Accept - Limit	Accept + Limit	Deviation	Uncertainty	
	[dB SPL]	[dB SPL]	[dB]	[dB]	[dB]	[dB]	
Continuous, Ref.	137.00	137.00	-0.5	0.5	0.00	0.12	*
200 ms Burst	130.00	129.99	-0.5	0.5	-0.01	0.12	*
2 ms Burst	110.00	109.96	-1.5	1.0	-0.04	0.12	*
0.25 ms Burst	101.00	100.85	-3.0	1.0	-0.15	0.12	*

C-weighted peak sound level, 8 kHz

Peak-response to a 8 kHz single-cycle sine measured in least-sensitive range, relative to continuous signal. (clause 19)

	Expected	Measured	Accept - Limit	Accept + Limit	Deviation	Uncertainty
	[dB SPL]	[dB SPL]	[dB]	[dB]	[dB]	[dB]
Continuous, Ref.	132.00	132.00	-0.5	0.5	0.00	0.09
Single Sine	135.40	135.44	-2.0	2.0	0.04	0.20

C-weighted peak sound level, 500 Hz

Peak-response to a 500 Hz half-cycle sine measured in least-sensitive range, relative to continuous signal. (clause 19)

	Expected	Measured	Accept - Limit	Accept + Limit	Deviation	Uncertainty
	[dB SPL]	[dB SPL]	[dB]	[dB]	[dB]	[dB]
Continuous, Ref.	135.00	135.00	-0.5	0.5	0.00	0.09
Half-sine, Positive	137.40	137.12	-1.0	1.0	-0.28	0.12
Half-sine, Negative	137.40	137.12	-1.0	1.0	-0.28	0.12

Overload indication

Overload indication in the least sensitive range determined with a 4 kHz positive/negative half-cycle signal. (clause 20)

	Measured / Input Level	Accept - Limit	Accept + Limit	Deviation	Uncertainty
	[dB SPL]	[dB]	[dB]	[dB]	[dB]
Continuous	140.00	-0.5	0.5	0.00	0.20
Half-sine, Positive	141.10	-10.0	10.0	1.10	0.20
Half-sine, Negative	141.40	-10.0	10.0	1.40	0.20
Difference	141.40	-1.5	1.5	0.30	0.24

Long-term stability, 1. relative

Long-term stability over 25 to 35 minutes, with steady 1kHz signal at reference level. (clause 15)
Relative to prior adjustment to reference level indication.

	Measured	Accept - Limit	Accept + Limit	Deviation	Timestamp	Uncertainty
	[dB SPL / Min]	[dB / Min]	[dB / Min]	[dB / Min]		[dB]
Measurement	94.00	-0.1	0.1	0.00	2022-11-08 11:08:21	0.10
Time passed	17.06	0.0	35.0	17.06		0.00

High-level stability

High-level stability over 5 minutes, with steady 1kHz signal, 1dB below upper boundary. (clause 21)

	Measured	Accept - Limit	Accept + Limit	Deviation	Uncertainty
	[dB SPL]	[dB]	[dB]	[dB]	[dB]
High-level, Ref.	139.00	-0.5	0.5	0.00	0.10
High-level, after 5min	139.00	-0.1	0.1	0.00	0.10

Long-term stability, 2. relative

Long-term stability over 25 to 35 minutes, with steady 1kHz signal at reference level. (clause 15)
Relative to prior adjustment to reference level indication.

	Measured	Accept - Limit	Accept + Limit	Deviation	Timestamp	Uncertainty
	[dB SPL/ Min]	[dB / Min]	[dB / Min]	[dB / Min]		[dB]
Wait	25.00	25.0	120.0	25.00		0.00
Measurement	94.00	-0.1	0.1	0.00	2022-11-08 11:16:46	0.10

Environmental conditions, Following calibration

Actual environmental conditions following calibration. (clause 7)

	Expected	Accept - Limit	Accept + Limit	Measured [Deg / kPa / %RH]
Air temperature	23.00	-3.00	3.00	24.00
Air pressure	101.30	-21.30	3.70	99.00
Relative humidity	50.00	-25.00	20.00	44.00

Calibration Certificate

Certificate Number 2023017485
Customer:
WSP Canada Inc

Model Number	831	***Procedure Number***	D0001.8378		
Serial Number	0001702	***Technician***	Jacob Cannon		
Test Results	**Pass**	***Calibration Date***	28 Dec 2023		
Initial Condition	AS RECEIVED same as shipped	***Calibration Due***	28 Dec 2024		
Description	Larson Davis Model 831 Class 1 Sound Level Meter Firmware Revision: 2.403	***Temperature***	23.4	°C	± 0.25 °C
		Humidity	51.6	%RH	± 2.0 %RH
		Static Pressure	86.97	kPa	± 0.13 kPa

Evaluation Method Tested electrically using Larson Davis PRM831 S/N 019106 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 S1.25 (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 17025:2017. **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 9001:2015.

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.

Correction data from Larson Davis Model 831 Sound Level Meter Manual, I831.01 Rev S, 2019-09-10

Calibration Check Frequency: 1000 Hz; Reference Sound Pressure Level: 114 dB re 20 µPa; Reference Range: 0 dB gain

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

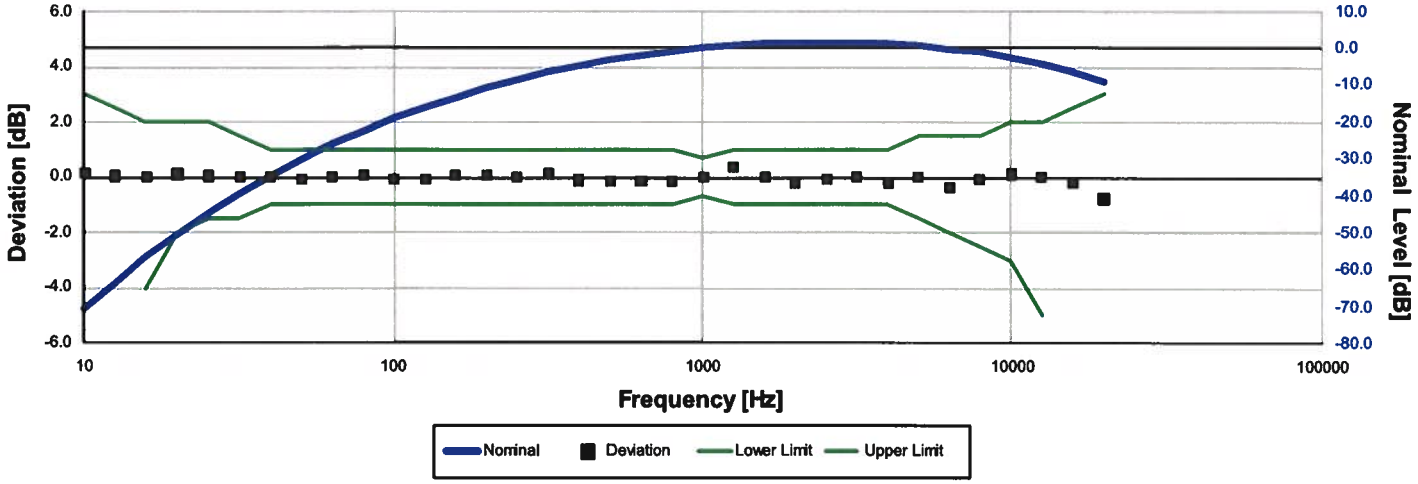
Pattern approval for IEC 61672-1:2013 / ANSI/ASA S1.4-2014/Part 1 successfully completed by Physikalisch-Technische Bundesanstalt (PTB) on 2016-02-24 certificate number DE-15-M-PTB-0056.

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 1specifications in IEC 61672-1:2013 / ANSI/ASA S1.4-2014/Part 1.

Standards Used

Description	Cal Date	Cal Due	Cal Standard
Hart Scientific 2626-S Humidity/Temperature Sensor	2023-02-20	2024-08-20	006946
SRS DS360 Ultra Low Distortion Generator	2023-03-31	2024-03-31	007174

A-weight Filter Response

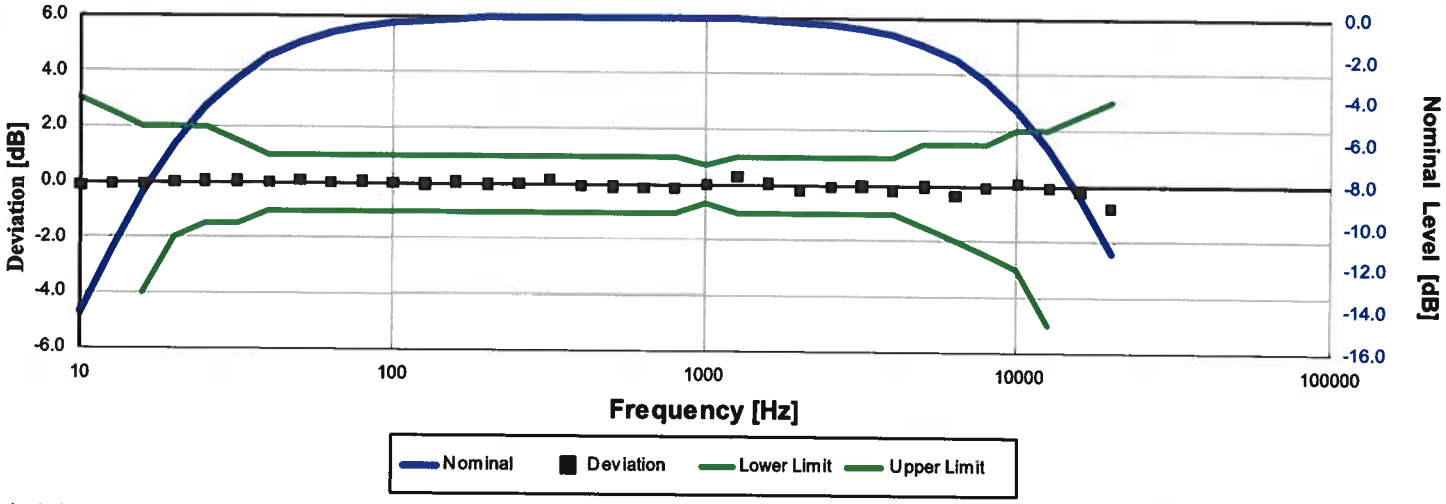


Electrical signal test of frequency weighting performed according to IEC 61672-3:2013 13 and ANSI S1.4-2014 Part 3: 13 for compliance to IEC 61672-1:2013 5.5; IEC 60651:2001 6.1 and 9.2.2; IEC 60804:2000 5; ANSI S1.4:1983 (R2006) 5.1 and 8.2.1; ANSI S1.4-2014 Part 1: 5.5

Frequency [Hz]	Test Result [dB]	Deviation [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
10.00	-70.26	0.14	-inf	3.00	0.25	Pass
12.59	-63.35	0.05	-inf	2.50	0.25	Pass
15.85	-56.69	0.01	-4.00	2.00	0.25	Pass
19.95	-50.38	0.12	-2.00	2.00	0.25	Pass
25.12	-44.66	0.04	-1.50	2.00	0.25	Pass
31.62	-39.38	0.02	-1.50	1.50	0.25	Pass
39.81	-34.59	0.01	-1.00	1.00	0.25	Pass
50.12	-30.25	-0.05	-1.00	1.00	0.25	Pass
63.10	-26.18	0.02	-1.00	1.00	0.25	Pass
79.43	-22.45	0.05	-1.00	1.00	0.25	Pass
100.00	-19.15	-0.05	-1.00	1.00	0.25	Pass
125.89	-16.14	-0.04	-1.00	1.00	0.25	Pass
158.49	-13.31	0.09	-1.00	1.00	0.25	Pass
199.53	-10.85	0.06	-1.00	1.00	0.25	Pass
251.19	-8.61	-0.01	-1.00	1.00	0.25	Pass
316.23	-6.47	0.13	-1.00	1.00	0.25	Pass
398.11	-4.90	-0.10	-1.00	1.00	0.25	Pass
501.19	-3.35	-0.15	-1.00	1.00	0.25	Pass
630.96	-2.06	-0.16	-1.00	1.00	0.25	Pass
794.33	-0.95	-0.15	-1.00	1.00	0.25	Pass
1,000.00	0.00	0.00	-0.70	0.70	0.25	Pass
1,258.93	0.95	0.35	-1.00	1.00	0.25	Pass
1,584.89	1.02	0.02	-1.00	1.00	0.25	Pass
1,995.26	0.96	-0.24	-1.00	1.00	0.25	Pass
2,511.89	1.23	-0.07	-1.00	1.00	0.25	Pass
3,162.28	1.19	-0.01	-1.00	1.00	0.25	Pass
3,981.07	0.80	-0.20	-1.00	1.00	0.25	Pass
5,011.87	0.52	0.02	-1.50	1.50	0.25	Pass
6,309.57	-0.47	-0.37	-2.00	1.50	0.25	Pass
7,943.28	-1.18	-0.08	-2.50	1.50	0.25	Pass
10,000.00	-2.39	0.11	-3.00	2.00	0.25	Pass
12,589.25	-4.31	-0.01	-5.00	2.00	0.25	Pass
15,848.93	-6.79	-0.19	-16.00	2.50	0.25	Pass
19,952.62	-10.06	-0.76	-inf	3.00	0.25	Pass

– End of measurement results–

C-weight Filter Response

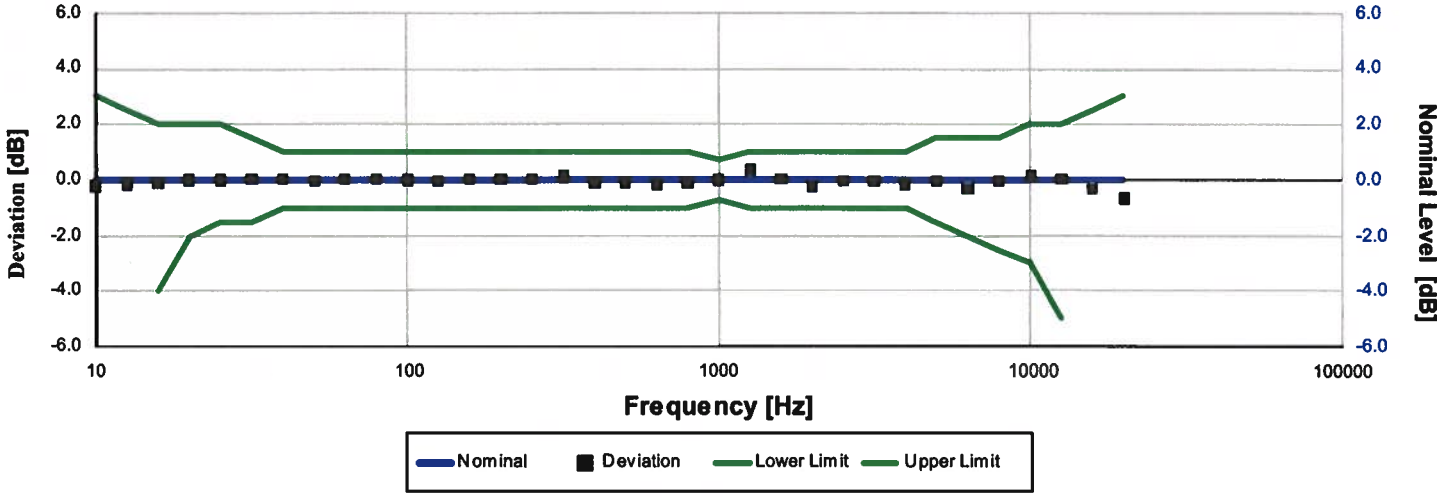


Electrical signal test of frequency weighting performed according to IEC 61672-3:2013 13 and ANSI S1.4-2014 Part 3: 13 for compliance to IEC 61672-1:2013 5.5; IEC 60651:2001 6.1 and 9.2.2; IEC 60804:2000 5; ANSI S1.4:1983 (R2006) 5.1 and 8.2.1; ANSI S1.4-2014 Part 1: 5.5

Frequency [Hz]	Test Result [dB]	Deviation [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
10.00	-14.43	-0.13	-inf	3.00	0.25	Pass
12.59	-11.28	-0.08	-inf	2.50	0.25	Pass
15.85	-8.54	-0.04	-4.00	2.00	0.25	Pass
19.95	-6.17	0.03	-2.00	2.00	0.25	Pass
25.12	-4.36	0.04	-1.50	2.00	0.25	Pass
31.62	-2.94	0.06	-1.50	1.50	0.25	Pass
39.81	-1.96	0.04	-1.00	1.00	0.25	Pass
50.12	-1.23	0.07	-1.00	1.00	0.25	Pass
63.10	-0.80	0.00	-1.00	1.00	0.25	Pass
79.43	-0.45	0.05	-1.00	1.00	0.25	Pass
100.00	-0.28	0.02	-1.00	1.00	0.25	Pass
125.89	-0.21	-0.01	-1.00	1.00	0.25	Pass
158.49	-0.05	0.05	-1.00	1.00	0.25	Pass
199.53	-0.01	-0.01	-1.00	1.00	0.25	Pass
251.19	0.04	0.04	-1.00	1.00	0.25	Pass
316.23	0.16	0.16	-1.00	1.00	0.25	Pass
398.11	-0.06	-0.06	-1.00	1.00	0.25	Pass
501.19	-0.09	-0.09	-1.00	1.00	0.25	Pass
630.96	-0.13	-0.13	-1.00	1.00	0.25	Pass
794.33	-0.11	-0.11	-1.00	1.00	0.25	Pass
1,000.00	0.00	0.00	-0.70	0.70	0.25	Pass
1,258.93	0.33	0.33	-1.00	1.00	0.25	Pass
1,584.89	-0.05	0.05	-1.00	1.00	0.25	Pass
1,995.26	-0.41	-0.21	-1.00	1.00	0.25	Pass
2,511.89	-0.35	-0.04	-1.00	1.00	0.25	Pass
3,162.28	-0.52	-0.02	-1.00	1.00	0.25	Pass
3,981.07	-0.99	-0.19	-1.00	1.00	0.25	Pass
5,011.87	-1.32	-0.02	-1.50	1.50	0.25	Pass
6,309.57	-2.35	-0.35	-2.00	1.50	0.25	Pass
7,943.28	-3.08	-0.08	-2.50	1.50	0.25	Pass
10,000.00	-4.30	0.10	-3.00	2.00	0.25	Pass
12,589.25	-6.23	-0.03	-5.00	2.00	0.25	Pass
15,848.93	-8.72	-0.22	-16.00	2.50	0.25	Pass
19,952.62	-11.99	-0.79	-inf	3.00	0.25	Pass

-- End of measurement results--

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
10.00	-0.22	-0.22	-inf	3.00	0.25	Pass
12.59	-0.14	-0.14	-inf	2.50	0.25	Pass
15.85	-0.10	-0.10	-4.00	2.00	0.25	Pass
19.95	-0.01	-0.01	-2.00	2.00	0.25	Pass
25.12	-0.01	-0.01	-1.50	2.00	0.25	Pass
31.62	0.01	0.01	-1.50	1.50	0.25	Pass
39.81	0.01	0.01	-1.00	1.00	0.25	Pass
50.12	-0.04	-0.04	-1.00	1.00	0.25	Pass
63.10	0.01	0.01	-1.00	1.00	0.25	Pass
79.43	0.05	0.05	-1.00	1.00	0.25	Pass
100.00	-0.01	-0.01	-1.00	1.00	0.25	Pass
125.89	-0.05	-0.05	-1.00	1.00	0.25	Pass
158.49	0.04	0.04	-1.00	1.00	0.25	Pass
199.53	0.02	0.02	-1.00	1.00	0.25	Pass
251.19	0.03	0.03	-1.00	1.00	0.25	Pass
316.23	0.14	0.14	-1.00	1.00	0.25	Pass
398.11	-0.09	-0.09	-1.00	1.00	0.25	Pass
501.19	-0.12	-0.12	-1.00	1.00	0.25	Pass
630.96	-0.16	-0.16	-1.00	1.00	0.25	Pass
794.33	-0.13	-0.13	-1.00	1.00	0.25	Pass
1,000.00	0.00	0.00	-0.70	0.70	0.25	Pass
1,258.93	0.36	0.36	-1.00	1.00	0.25	Pass
1,584.89	0.04	0.04	-1.00	1.00	0.25	Pass
1,995.26	-0.24	-0.24	-1.00	1.00	0.25	Pass
2,511.89	-0.06	-0.06	-1.00	1.00	0.25	Pass
3,162.28	-0.03	-0.03	-1.00	1.00	0.25	Pass
3,981.07	-0.19	-0.19	-1.00	1.00	0.25	Pass
5,011.87	-0.04	-0.04	-1.50	1.50	0.25	Pass
6,309.57	-0.35	-0.35	-2.00	1.50	0.25	Pass
7,943.28	-0.05	-0.04	-2.50	1.50	0.25	Pass
10,000.00	0.16	0.16	-3.00	2.00	0.25	Pass
12,589.25	0.01	0.01	-5.00	2.00	0.25	Pass
15,848.93	-0.33	-0.33	-16.00	2.50	0.25	Pass
19,952.62	-0.66	-0.65	-inf	3.00	0.25	Pass

-- End of measurement results--

High Level Stability

Electrical signal test of high level stability performed according to IEC 61672-3:2013 21 and ANSI S1.4-2014 Part 3: 21 for compliance to IEC 61672-1:2013 5.15 and ANSI S1.4-2014 Part 1: 5.15

Measurement	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
High Level Stability	0.00	-0.10	0.10	0.01 ‡	Pass

-- End of measurement results--

Long-Term Stability

Electrical signal test of long term stability performed according to IEC 61672-3:2013 15 and ANSI S1.4-2014 Part 3: 15 for compliance to ISC 61672-1:2013 5.14 and ANSI S1.4-2014 Part 1: 5.14

Test Duration [min]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
34	0.00	-0.10	0.10	0.01 ‡	Pass

-- End of measurement results--

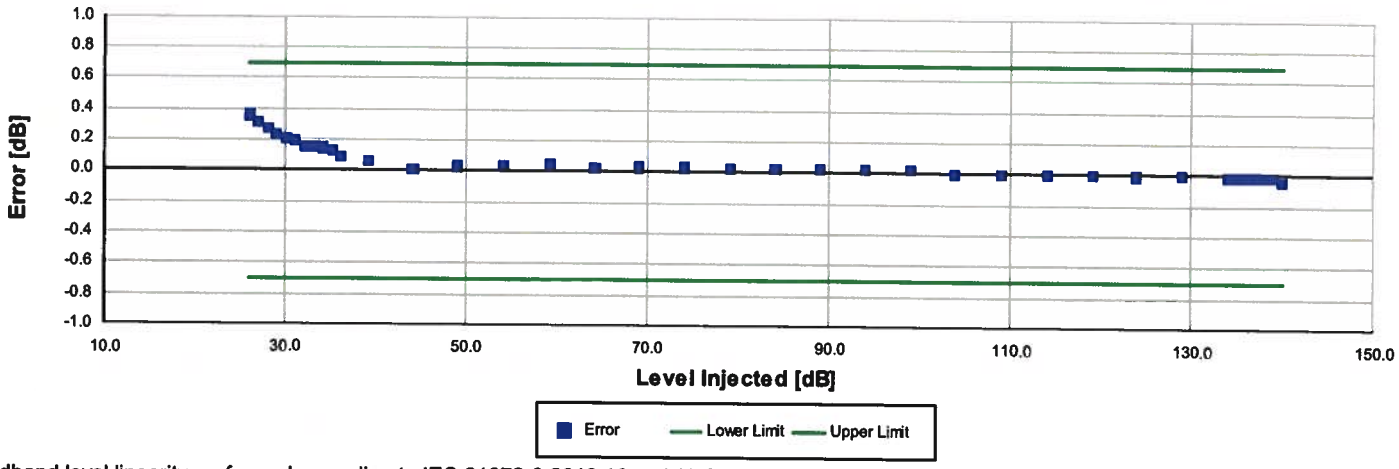
1 kHz Reference Levels

Frequency weightings and time weightings at 1 kHz (reference is A weighted Fast) performed according to IEC 61672-3:2013 14 and ANSI S1.4-2014 Part 3: 14 for compliance to IEC 61672-1:2013 5.5.9 and 5.8.3 and ANSI S1.4-2014 Part 1: 5.5.9 and 5.8.3

Measurement	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
C weight	114.00	113.80	114.20	0.15	Pass
Z weight	113.99	113.80	114.20	0.15	Pass
Slow	114.00	113.90	114.10	0.15	Pass
Impulse	114.00	113.90	114.10	0.15	Pass

-- End of measurement results--

A-weighted 0 dB Gain Broadband Log Linearity: 8,000.00 Hz



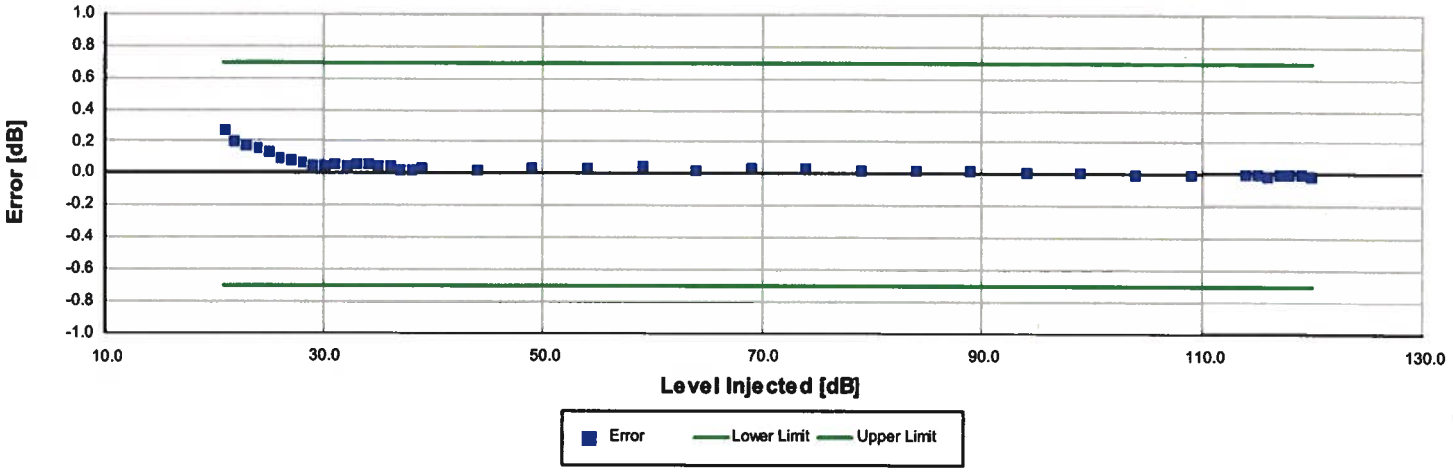
Broadband level linearity performed according to IEC 61672-3:2013 16 and ANSI S1.4-2014 Part 3: 16 for compliance to IEC 61672-1:2013 5.6, IEC 60804:2000 6.2, IEC 61252:2002 8, ANSI S1.4 (R2006) 6.9, ANSI S1.4-2014 Part 1: 5.6, ANSI S1.43 (R2007) 6.2

Level [dB]	Error [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
26.00	0.36	-0.70	0.70	0.16	Pass
27.00	0.31	-0.70	0.70	0.16	Pass
28.00	0.28	-0.70	0.70	0.16	Pass
29.00	0.23	-0.70	0.70	0.16	Pass
30.00	0.20	-0.70	0.70	0.16	Pass
31.00	0.20	-0.70	0.70	0.16	Pass
32.00	0.15	-0.70	0.70	0.16	Pass
33.00	0.15	-0.70	0.70	0.16	Pass
34.00	0.15	-0.70	0.70	0.16	Pass
35.00	0.13	-0.70	0.70	0.16	Pass
36.00	0.09	-0.70	0.70	0.16	Pass
39.00	0.06	-0.70	0.70	0.16	Pass
44.00	0.01	-0.70	0.70	0.16	Pass
49.00	0.03	-0.70	0.70	0.16	Pass
54.00	0.03	-0.70	0.70	0.16	Pass
59.00	0.04	-0.70	0.70	0.16	Pass
64.00	0.02	-0.70	0.70	0.16	Pass
69.00	0.03	-0.70	0.70	0.16	Pass
74.00	0.03	-0.70	0.70	0.16	Pass
79.00	0.03	-0.70	0.70	0.16	Pass
84.00	0.02	-0.70	0.70	0.16	Pass
89.00	0.03	-0.70	0.70	0.16	Pass
94.00	0.02	-0.70	0.70	0.16	Pass
99.00	0.02	-0.70	0.70	0.16	Pass
104.00	0.00	-0.70	0.70	0.15	Pass
109.00	0.00	-0.70	0.70	0.15	Pass
114.00	0.00	-0.70	0.70	0.15	Pass
119.00	0.00	-0.70	0.70	0.15	Pass
124.00	-0.01	-0.70	0.70	0.15	Pass
129.00	0.00	-0.70	0.70	0.15	Pass
134.00	-0.01	-0.70	0.70	0.15	Pass
135.00	-0.02	-0.70	0.70	0.15	Pass
136.00	-0.01	-0.70	0.70	0.15	Pass
137.00	-0.01	-0.70	0.70	0.15	Pass
138.00	-0.01	-0.70	0.70	0.15	Pass
139.00	-0.01	-0.70	0.70	0.15	Pass

Level [dB]	Error [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
140.00	-0.04	-0.70	0.70	0.15	Pass

-- End of measurement results--

A-weighted 20 dB Gain 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
21.00	0.28	-0.70	0.70	0.16	Pass
22.00	0.20	-0.70	0.70	0.16	Pass
23.00	0.18	-0.70	0.70	0.16	Pass
24.00	0.16	-0.70	0.70	0.16	Pass
25.00	0.13	-0.70	0.70	0.16	Pass
26.00	0.10	-0.70	0.70	0.16	Pass
27.00	0.08	-0.70	0.70	0.16	Pass
28.00	0.08	-0.70	0.70	0.16	Pass
29.00	0.05	-0.70	0.70	0.16	Pass
30.00	0.05	-0.70	0.70	0.16	Pass
31.00	0.06	-0.70	0.70	0.16	Pass
32.00	0.05	-0.70	0.70	0.16	Pass
33.00	0.06	-0.70	0.70	0.16	Pass
34.00	0.07	-0.70	0.70	0.16	Pass
35.00	0.05	-0.70	0.70	0.16	Pass
36.00	0.05	-0.70	0.70	0.16	Pass
37.00	0.03	-0.70	0.70	0.16	Pass
38.00	0.02	-0.70	0.70	0.16	Pass
39.00	0.03	-0.70	0.70	0.16	Pass
44.00	0.03	-0.70	0.70	0.16	Pass
49.00	0.03	-0.70	0.70	0.16	Pass
54.00	0.04	-0.70	0.70	0.16	Pass
59.00	0.05	-0.70	0.70	0.16	Pass
64.00	0.03	-0.70	0.70	0.16	Pass
69.00	0.03	-0.70	0.70	0.16	Pass
74.00	0.03	-0.70	0.70	0.16	Pass
79.00	0.03	-0.70	0.70	0.16	Pass
84.00	0.02	-0.70	0.70	0.16	Pass
89.00	0.02	-0.70	0.70	0.16	Pass
94.00	0.01	-0.70	0.70	0.16	Pass
99.00	0.02	-0.70	0.70	0.16	Pass
104.00	-0.01	-0.70	0.70	0.15	Pass
109.00	0.00	-0.70	0.70	0.15	Pass
114.00	0.00	-0.70	0.70	0.15	Pass
115.00	0.00	-0.70	0.70	0.15	Pass
116.00	-0.02	-0.70	0.70	0.15	Pass

Level [dB]	Error [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
117.00	0.00	-0.70	0.70	0.15	Pass
118.00	0.00	-0.70	0.70	0.15	Pass
119.00	0.00	-0.70	0.70	0.15	Pass
120.00	-0.02	-0.70	0.70	0.15	Pass

-- End of measurement results--

Slow Detector

Toneburst response performed according to IEC 61672-3:2013 18 and ANSI S1.4-2014 Part 3: 18 for compliance to IEC 61672-1:2013 5.9, IEC 60651:2001 9.4.2, ANSI S1.4:1983 (R2006) 8.4.2 and ANSI S1.4-2014 Part 1: 5.9

Amplitude [dB]	Duration [ms]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
137.00	200	-7.55	-7.92	-6.92	0.15	Pass
	2	-27.16	-29.99	-25.99	0.15	Pass

-- End of measurement results--

Fast Detector

Toneburst response performed according to IEC 61672-3:2013 18 and ANSI S1.4-2014 Part 3: 18 for compliance to IEC 61672-1:2013 5.9, IEC 60651:2001 9.4.2, ANSI S1.4:1983 (R2006) 8.4.2 and ANSI S1.4-2014 Part 1: 5.9

Amplitude [dB]	Duration [ms]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
137.00	200.00	-1.07	-1.48	-0.48	0.15	Pass
	2.00	-18.36	-19.49	-16.99	0.15	Pass
	0.25	-27.31	-29.99	-25.99	0.15	Pass

-- End of measurement results--

Sound Exposure Level

Toneburst response performed according to IEC 61672-3:2013 18 and ANSI S1.4-2014 Part 3: 18 for compliance to IEC 61672-1:2013 5.9, IEC 60651:2001 9.4.2, ANSI S1.4:1983 (R2006) 8.4.2 and ANSI S1.4-2014 Part 1: 5.9

Amplitude [dB]	Duration [ms]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
137.00	200.00	-7.02	-7.49	-6.49	0.15	Pass
	2.00	-27.04	-28.49	-25.99	0.15	Pass
	0.25	-36.15	-39.02	-35.02	0.15	Pass

-- End of measurement results--

Peak C-weight

C-weighted peak sound level performed according to IEC 61672-3:2013 19 and ANSI S1.4-2014 Part 3: 19 for compliance to IEC 61672-1:2013 5.13 and ANSI S1.4-2014 Part 1: 5.13

Level [dB]	Frequency [Hz]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
135.00	31.50	138.20	135.50	139.50	0.15	Pass
135.00	500.00	138.56	137.50	139.50	0.15	Pass
135.00	8,000.00	137.76	136.40	140.40	0.15	Pass
135.00, Negative	500.00	137.08	136.40	138.40	0.15	Pass
135.00, Positive	500.00	137.17	136.40	138.40	0.15	Pass

-- End of measurement results--

Peak Z-weight

Z-weighted peak sound level 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
136.00	100	Negative Pulse	136.14	133.87	137.87	0.15	Pass
	100	Positive Pulse	136.25	134.01	138.01	0.15	Pass
126.00	100	Negative Pulse	125.98	123.88	127.88	0.15	Pass
	100	Positive Pulse	126.35	124.01	128.01	0.15	Pass
116.00	100	Negative Pulse	116.09	113.88	117.88	0.15	Pass
	100	Positive Pulse	116.35	114.00	118.00	0.15	Pass
106.00	100	Negative Pulse	106.12	103.84	107.84	0.15	Pass
	100	Positive Pulse	106.37	104.02	108.02	0.15	Pass

-- End of measurement results--

Overload Detector

Overload indication performed according to IEC 61672-3:2013 20 and ANSI S1.4-2014 Part 3: 20 for compliance to IEC 61672-1:2013 5.11, IEC 60804:2000 9.3.5, IEC 61252:2002 11, ANSI S1.4 (R2006) 5.8, and ANSI S1.4-2014 Part 1: 5.11, ANSI S1.25 (R2007) 7.6, ANSI S1.43 (R2007) 7

Measurement	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
Positive	141.10	140.00	142.00	0.15	Pass
Negative	141.20	140.00	142.00	0.15	Pass
Difference	-0.10	-1.50	1.50	0.16	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
139.00	40	Negative Pulse	135.87	134.39	136.39	0.15	Pass
		Positive Pulse	136.00	134.52	136.52	0.15	Pass
	30	Negative Pulse	134.87	134.39	136.39	0.15	Pass
		Positive Pulse	135.07	134.52	136.52	0.15	Pass

-- End of measurement results--

Positive Pulse Crest Factor

200 µs 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
138.00	3	OVLD	± 0.50	0.15 ‡	Pass
	5	OVLD	± 1.00	0.15 ‡	Pass
	10	OVLD	± 1.50	0.15 ‡	Pass
128.00	3	-0.11	± 0.50	0.15 ‡	Pass
	5	-0.11	± 1.00	0.15 ‡	Pass
	10	OVLD	± 1.50	0.15 ‡	Pass
118.00	3	-0.13	± 0.50	0.16 ‡	Pass
	5	-0.10	± 1.00	0.15 ‡	Pass
	10	-0.26	± 1.50	0.15 ‡	Pass
108.00	3	-0.12	± 0.50	0.18 ‡	Pass
	5	-0.09	± 1.00	0.15 ‡	Pass
	10	-0.24	± 1.50	0.15 ‡	Pass

-- End of measurement results--

Negative Pulse Crest Factor

200 µs 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
138.00	3	OVLD	± 0.50	0.15 ‡	Pass
	5	OVLD	± 1.00	0.15 ‡	Pass
	10	OVLD	± 1.50	0.15 ‡	Pass
128.00	3	-0.13	± 0.50	0.15 ‡	Pass
	5	-0.11	± 1.00	0.15 ‡	Pass
	10	OVLD	± 1.50	0.15 ‡	Pass
118.00	3	-0.14	± 0.50	0.15 ‡	Pass
	5	-0.13	± 1.00	0.15 ‡	Pass
	10	-0.28	± 1.50	0.15 ‡	Pass
108.00	3	-0.13	± 0.50	0.15 ‡	Pass
	5	-0.12	± 1.00	0.15 ‡	Pass
	10	-0.26	± 1.50	0.15 ‡	Pass

-- End of measurement results--

Tone Burst

2kHz tone burst tests at 2.0, 12.0, 22.0, 32.0 dB below Overload Limit

Tone burst response 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
138.00	3	OVLD	± 0.50	0.15	Pass
	5	OVLD	± 1.00	0.15	Pass
128.00	3	-0.06	± 0.50	0.17	Pass
	5	-0.01	± 1.00	0.15	Pass
118.00	3	-0.08	± 0.50	0.15	Pass
	5	-0.05	± 1.00	0.15	Pass
108.00	3	-0.05	± 0.50	0.15	Pass
	5	-0.04	± 1.00	0.15	Pass

-- End of measurement results--

Impulse Detector - Repeat

Impulse Detector measured according to IEC 60651:2001 9.4.3 and ANSI S1.4:1983 (R2006) 8.4.3

Amplitude [dB]	Repitition Rate [Hz]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
140	100.00	-2.86	-3.71	-1.71	0.15	Pass
	20.00	-7.56	-9.57	-5.57	0.15	Pass
	2.00	-8.74	-10.76	-6.76	0.15	Pass
Step	2.00	5.00	4.00	6.00	0.16	Pass

-- End of measurement results--

Impulse Detector - Single

Impulse Detector measured according to IEC 60651:2001 9.4.3 and ANSI S1.4:1983 (R2006) 8.4.3

Amplitude [dB]	Duration [ms]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
140	20.00	-3.63	-5.11	-2.11	0.15	Pass
	5.00	-8.73	-10.76	-6.76	0.16	Pass
	2.00	-12.70	-14.55	-10.55	0.16	Pass
Step	2.00	9.99	9.00	11.00	0.16	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	94.04	93.90	94.10	0.15	Pass
0 dB Gain, Linearity	29.15	28.30	29.70	0.16	Pass
20 dB Gain	94.02	93.90	94.10	0.15	Pass
20 dB Gain, Linearity	24.15	23.30	24.70	0.16	Pass
OBA Low Range	94.01	93.90	94.10	0.15	Pass
OBA Normal Range	94.00	93.20	94.80	0.15	Pass

-- End of measurement results--

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	7.14	15.00	Pass
C-weight Noise Floor	12.10	17.30	Pass
Z-weight Noise Floor	20.92	24.50	Pass

-- End of measurement results--

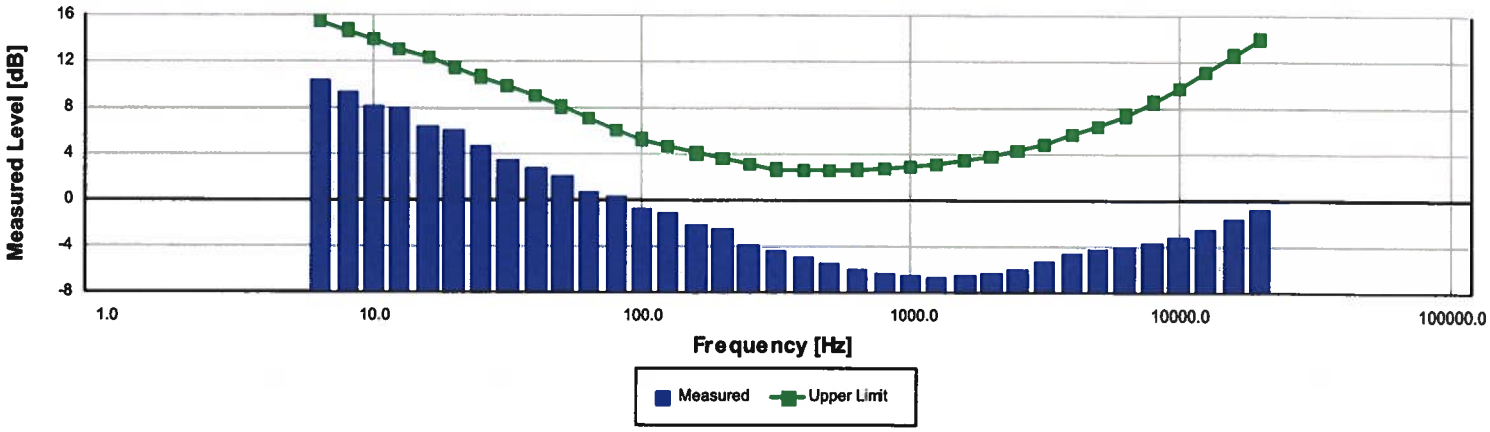
Total Harmonic Distortion

Measured using 1/3-Octave filters

Measurement	Test Result [dB]	Lower Limit [dB]	Upper Limit [dB]	Expanded Uncertainty [dB]	Result
10 Hz Signal	137.56	137.20	138.80	0.15	Pass
THD	-71.37		-60.00	0.01 ‡	Pass
THD+N	-64.95		-60.00	0.01 ‡	Pass

-- End of measurement results--

1/3-Octave Self-Generated Noise



The SLM is set to low range and 20 dB gain.

Frequency [Hz]	Test Result [dB]	Upper limit [dB]	Result
6.30	10.47	15.50	Pass
8.00	9.42	14.70	Pass
10.00	8.10	13.90	Pass
12.50	7.99	13.10	Pass
16.00	6.41	12.30	Pass
20.00	6.17	11.50	Pass
25.00	4.69	10.70	Pass
31.50	3.54	9.90	Pass
40.00	2.86	9.10	Pass
50.00	2.13	8.10	Pass
63.00	0.77	7.10	Pass
80.00	0.28	6.10	Pass
100.00	-0.75	5.30	Pass
125.00	-0.99	4.70	Pass
160.00	-2.00	4.10	Pass
200.00	-2.50	3.60	Pass
250.00	-3.75	3.10	Pass
315.00	-4.30	2.70	Pass
400.00	-4.90	2.60	Pass
500.00	-5.35	2.60	Pass
630.00	-5.86	2.70	Pass
800.00	-6.18	2.80	Pass
1,000.00	-6.39	3.00	Pass
1,250.00	-6.60	3.20	Pass
1,600.00	-6.48	3.50	Pass
2,000.00	-6.20	3.80	Pass
2,500.00	-5.83	4.30	Pass
3,150.00	-5.24	4.90	Pass
4,000.00	-4.55	5.70	Pass
5,000.00	-4.13	6.40	Pass
6,300.00	-3.94	7.40	Pass
8,000.00	-3.63	8.60	Pass
10,000.00	-3.11	9.80	Pass
12,500.00	-2.42	11.20	Pass
16,000.00	-1.61	12.60	Pass
20,000.00	-0.72	14.00	Pass

-- End of measurement results--

-- End of Report--

Signatory: *Jacob Cannon*

LARSON DAVIS – A PCB DIVISION
1681 West 820 North
Provo, UT 84601, United States
716-684-0001

ACCREDITED
CERT #3622.01

LARSON DAVIS
A PCB DIVISION

Calibration Certificate

Certificate Number 2024000451

Customer:
WSP Canada Inc

Model Number	CAL200	***Procedure Number***	D0001.8386		
Serial Number	18470	***Technician***	Scott Montgomery		
Test Results	**Pass**	***Calibration Date***	9 Jan 2024		
Initial Condition	AS RECEIVED same as shipped	***Calibration Due***	9 Jan 2025		
		Temperature	22	°C	± 0.3 °C
Description	Larson Davis CAL200 Acoustic Calibrator	***Humidity***	31	%RH	± 3 %RH
		Static Pressure	100.8	kPa	± 1 kPa

Evaluation Method The data is aquired by the insert voltage calibration method using the reference microphone's open circuit sensitivity. Data reported in dB re 20 µPa.

Compliance Standards Compliant to Manufacturer Specifications per D0001.8190 and the following standards:
IEC 60942:2017 ANSI S1.40-2006

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 SI through the National Institute of Standards and Technology (NIST), or other national measurement institutes, and meets the requirements of ISO/IEC 17025:2017.
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 9001:2015.

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.

Standards Used

Description	Cal Date	Cal Due	Cal Standard
Agilent 34401A DMM	06/21/2023	06/21/2024	001021
Larson Davis Model 2900 Real Time Analyzer	03/31/2023	03/31/2024	001051
Microphone Calibration System	02/22/2023	02/22/2024	005446
1/2" Preamplifier	08/16/2023	08/16/2024	006506
Larson Davis 1/2" Preamplifier 7-pin LEMO	08/04/2023	08/04/2024	006507
1/2 inch Microphone - RI - 200V	04/11/2023	04/11/2024	006511
Pressure Sensor	04/21/2023	04/21/2024	007826

Output Level

Nominal Level [dB]	Pressure [kPa]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
94	100.8	94.03	93.80	94.20	0.14	Pass
114	101.1	114.03	113.80	114.20	0.14	Pass

-- End of measurement results--

Frequency

Nominal Level [dB]	Pressure [kPa]	Test Result [Hz]	Lower limit [Hz]	Upper limit [Hz]	Expanded Uncertainty [Hz]	Result
94	100.8	1,000.34	993.00	1,007.00	0.20	Pass
114	101.1	1,000.33	993.00	1,007.00	0.20	Pass

-- End of measurement results--

Total Harmonic Distortion + Noise (THD+N)

Nominal Level [dB]	Pressure [kPa]	Test Result [%]	Lower limit [%]	Upper limit [%]	Expanded Uncertainty [%]	Result
94	100.8	0.58	0.00	2.00	0.25 ‡	Pass
114	101.1	0.59	0.00	2.00	0.25 ‡	Pass

-- End of measurement results--

Level Change Over Pressure

Tested at: 114 dB, 22 °C, 34 %RH

Nominal Pressure [kPa]	Pressure [kPa]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
108.0	108.0	-0.04	-0.25	0.25	0.04 ‡	Pass
101.3	101.2	0.00	-0.25	0.25	0.04 ‡	Pass
92.0	92.0	0.03	-0.25	0.25	0.04 ‡	Pass
83.0	82.9	0.04	-0.25	0.25	0.04 ‡	Pass
74.0	74.0	0.01	-0.25	0.25	0.04 ‡	Pass
65.0	64.9	-0.06	-0.25	0.25	0.04 ‡	Pass

-- End of measurement results--

Frequency Change Over Pressure

Tested at: 114 dB, 22 °C, 34 %RH

Nominal Pressure [kPa]	Pressure [kPa]	Test Result [Hz]	Lower limit [Hz]	Upper limit [Hz]	Expanded Uncertainty [Hz]	Result
108.0	108.0	0.00	-7.00	7.00	0.20 ‡	Pass
101.3	101.2	0.00	-7.00	7.00	0.20 ‡	Pass
92.0	92.0	0.00	-7.00	7.00	0.20 ‡	Pass
83.0	82.9	-0.01	-7.00	7.00	0.20 ‡	Pass
74.0	74.0	-0.01	-7.00	7.00	0.20 ‡	Pass
65.0	64.9	-0.01	-7.00	7.00	0.20 ‡	Pass

-- End of measurement results--

Total Harmonic Distortion + Noise (THD+N) Over Pressure

Tested at: 114 dB, 22 °C, 34 %RH

Nominal Pressure [kPa]	Pressure [kPa]	Test Result [%]	Lower limit [%]	Upper limit [%]	Expanded Uncertainty [%]	Result
108.0	108.0	0.59	0.00	2.00	0.25 ‡	Pass
101.3	101.2	0.59	0.00	2.00	0.25 ‡	Pass
92.0	92.0	0.58	0.00	2.00	0.25 ‡	Pass
83.0	82.9	0.60	0.00	2.00	0.25 ‡	Pass
74.0	74.0	0.62	0.00	2.00	0.25 ‡	Pass
65.0	64.9	0.64	0.00	2.00	0.25 ‡	Pass

-- End of measurement results--

Signatory: *Scott Montgomery*

LARSON DAVIS – A PCB DIVISION
1681 West 820 North
Provo, UT 84601, United States
716-684-0001

ACCREDITED CERT #3622.01

LARSON DAVIS A PCB DIVISION

Calibration Certificate

Certificate Number 2023016939
Customer:
WSP Canada Inc

,

Model Number	831	***Procedure Number***	D0001.8378		
Serial Number	0001158	***Technician***	Jacob Cannon		
Test Results	**Pass**	***Calibration Date***	18 Dec 2023		
Initial Condition	Inoperable	***Calibration Due***			
		Temperature	23.33	°C	± 0.25 °C
Description	Larson Davis Model 831 Class 1 Sound Level Meter Firmware Revision: 2.403	***Humidity***	53.4	%RH	± 2.0 %RH
		Static Pressure	86.5	kPa	± 0.13 kPa

Evaluation Method Tested electrically using Larson Davis PRM831 S/N 0403 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 S1.25 (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 17025:2017. **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 9001:2015.

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.

Correction data from Larson Davis Model 831 Sound Level Meter Manual, I831.01 Rev S, 2019-09-10

Calibration Check Frequency: 1000 Hz; Reference Sound Pressure Level: 114 dB re 20 µPa; Reference Range: 0 dB gain

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

LARSON DAVIS – A PCB DIVISION
1681 West 820 North
Provo, UT 84601, United States
716-684-0001

ACCREDITED CERT #3622.01

LARSON DAVIS
A PCB DIVISION

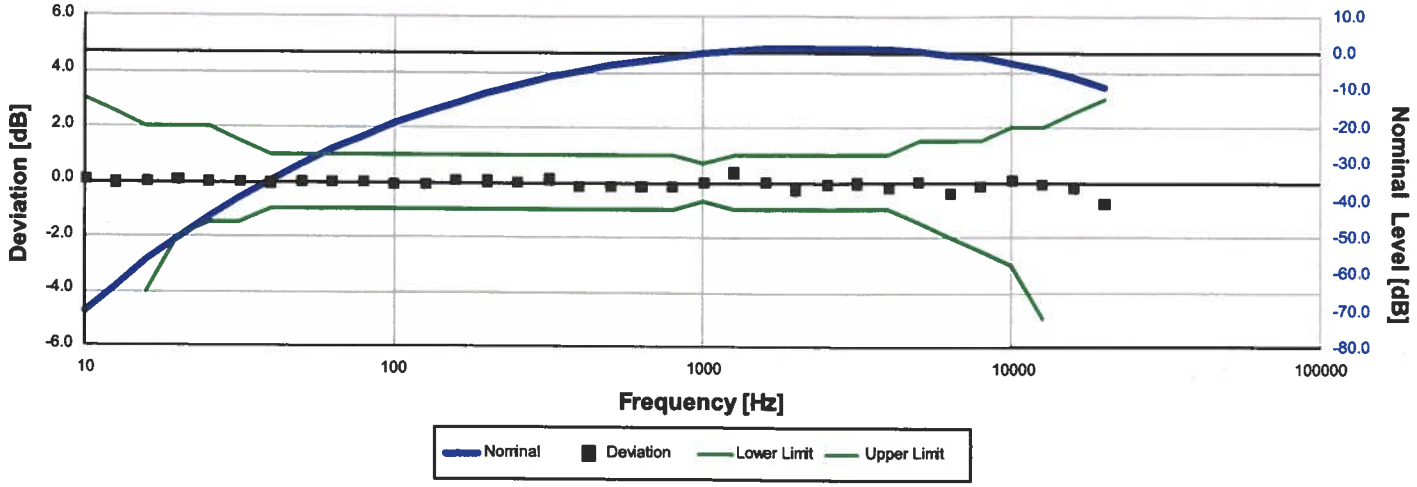
Pattern approval for IEC 61672-1:2013 / ANSI/ASA S1.4-2014/Part 1 successfully completed by Physikalisch-Technische Bundesanstalt (PTB) on 2016-02-24 certificate number DE-15-M-PTB-0056.

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 1specifications in IEC 61672-1:2013 / ANSI/ASA S1.4-2014/Part 1.

Standards Used

Description	Cal Date	Cal Due	Cal Standard
Hart Scientific 2626-S Humidity/Temperature Sensor	2023-02-20	2024-08-20	006946
SRS DS360 Ultra Low Distortion Generator	2022-12-29	2023-12-29	007118

A-weight Filter Response

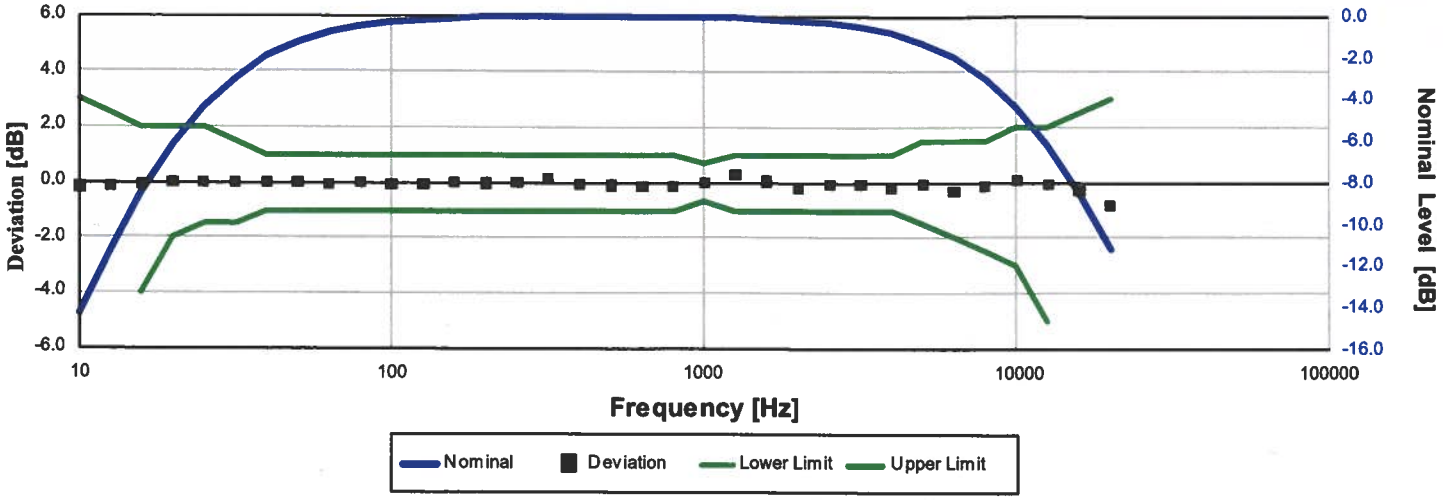


Electrical signal test of frequency weighting performed according to IEC 61672-3:2013 13 and ANSI S1.4-2014 Part 3: 13 for compliance to IEC 61672-1:2013 5.5; IEC 60651:2001 6.1 and 9.2.2; IEC 60804:2000 5; ANSI S1.4:1983 (R2006) 5.1 and 8.2.1; ANSI S1.4-2014 Part 1: 5.5

Frequency [Hz]	Test Result [dB]	Deviation [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
10.00	-70.34	0.06	-inf	3.00	0.25	Pass
12.59	-63.44	-0.04	-inf	2.50	0.25	Pass
15.85	-56.71	-0.01	-4.00	2.00	0.25	Pass
19.95	-50.42	0.08	-2.00	2.00	0.25	Pass
25.12	-44.69	0.01	-1.50	2.00	0.25	Pass
31.62	-39.41	-0.01	-1.50	1.50	0.25	Pass
39.81	-34.63	-0.03	-1.00	1.00	0.25	Pass
50.12	-30.20	0.00	-1.00	1.00	0.25	Pass
63.10	-26.21	-0.01	-1.00	1.00	0.25	Pass
79.43	-22.47	0.03	-1.00	1.00	0.25	Pass
100.00	-19.18	-0.08	-1.00	1.00	0.25	Pass
125.89	-16.16	-0.06	-1.00	1.00	0.25	Pass
158.49	-13.33	0.07	-1.00	1.00	0.25	Pass
199.53	-10.86	0.04	-1.00	1.00	0.25	Pass
251.19	-8.60	0.00	-1.00	1.00	0.25	Pass
316.23	-6.48	0.12	-1.00	1.00	0.25	Pass
398.11	-4.91	-0.11	-1.00	1.00	0.25	Pass
501.19	-3.35	-0.15	-1.00	1.00	0.25	Pass
630.96	-2.06	-0.16	-1.00	1.00	0.25	Pass
794.33	-0.95	-0.15	-1.00	1.00	0.25	Pass
1,000.00	0.00	0.00	-0.70	0.70	0.25	Pass
1,258.93	0.94	0.33	-1.00	1.00	0.25	Pass
1,584.89	1.00	0.00	-1.00	1.00	0.25	Pass
1,995.26	0.94	-0.26	-1.00	1.00	0.25	Pass
2,511.89	1.21	-0.09	-1.00	1.00	0.25	Pass
3,162.28	1.17	-0.03	-1.00	1.00	0.25	Pass
3,981.07	0.78	-0.22	-1.00	1.00	0.25	Pass
5,011.87	0.49	-0.01	-1.50	1.50	0.25	Pass
6,309.57	-0.51	-0.41	-2.00	1.50	0.25	Pass
7,943.28	-1.23	-0.13	-2.50	1.50	0.25	Pass
10,000.00	-2.44	0.06	-3.00	2.00	0.25	Pass
12,589.25	-4.34	-0.04	-5.00	2.00	0.25	Pass
15,848.93	-6.83	-0.23	-16.00	2.50	0.25	Pass
19,952.62	-10.11	-0.81	-inf	3.00	0.25	Pass

– End of measurement results–

C-weight Filter Response

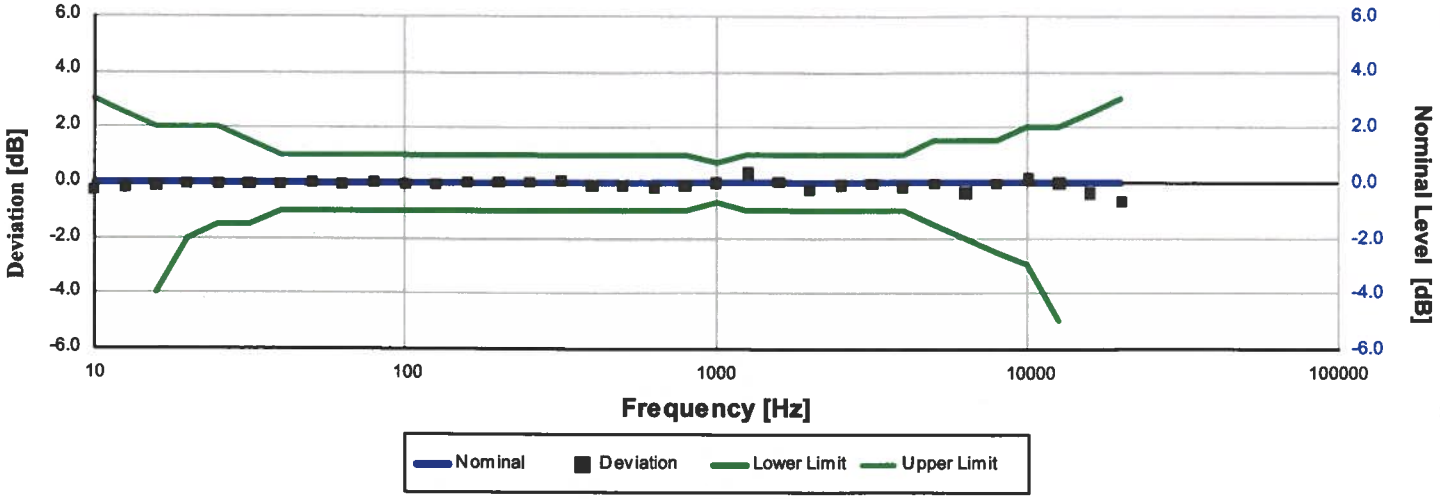


Electrical signal test of frequency weighting performed according to IEC 61672-3:2013 13 and ANSI S1.4-2014 Part 3: 13 for compliance to IEC 61672-1:2013 5.5; IEC 60651:2001 6.1 and 9.2.2; IEC 60804:2000 5; ANSI S1.4:1983 (R2006) 5.1 and 8.2.1; ANSI S1.4-2014 Part 1: 5.5

Frequency [Hz]	Test Result [dB]	Deviation [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
10.00	-14.48	-0.17	-inf	3.00	0.25	Pass
12.59	-11.33	-0.13	-inf	2.50	0.25	Pass
15.85	-8.57	-0.07	-4.00	2.00	0.25	Pass
19.95	-6.21	-0.01	-2.00	2.00	0.25	Pass
25.12	-4.40	0.00	-1.50	2.00	0.25	Pass
31.62	-2.98	0.02	-1.50	1.50	0.25	Pass
39.81	-2.01	-0.01	-1.00	1.00	0.25	Pass
50.12	-1.28	0.02	-1.00	1.00	0.25	Pass
63.10	-0.85	-0.05	-1.00	1.00	0.25	Pass
79.43	-0.50	0.00	-1.00	1.00	0.25	Pass
100.00	-0.36	-0.06	-1.00	1.00	0.25	Pass
125.89	-0.23	-0.03	-1.00	1.00	0.25	Pass
158.49	-0.06	0.04	-1.00	1.00	0.25	Pass
199.53	-0.02	-0.02	-1.00	1.00	0.25	Pass
251.19	0.02	0.02	-1.00	1.00	0.25	Pass
316.23	0.14	0.14	-1.00	1.00	0.25	Pass
398.11	-0.08	-0.08	-1.00	1.00	0.25	Pass
501.19	-0.09	-0.09	-1.00	1.00	0.25	Pass
630.96	-0.14	-0.13	-1.00	1.00	0.25	Pass
794.33	-0.11	-0.11	-1.00	1.00	0.25	Pass
1,000.00	0.00	0.00	-0.70	0.70	0.25	Pass
1,258.93	0.31	0.31	-1.00	1.00	0.25	Pass
1,584.89	-0.06	0.04	-1.00	1.00	0.25	Pass
1,995.26	-0.42	-0.22	-1.00	1.00	0.25	Pass
2,511.89	-0.36	-0.06	-1.00	1.00	0.25	Pass
3,162.28	-0.53	-0.03	-1.00	1.00	0.25	Pass
3,981.07	-1.01	-0.21	-1.00	1.00	0.25	Pass
5,011.87	-1.34	-0.04	-1.50	1.50	0.25	Pass
6,309.57	-2.37	-0.37	-2.00	1.50	0.25	Pass
7,943.28	-3.11	-0.11	-2.50	1.50	0.25	Pass
10,000.00	-4.34	0.07	-3.00	2.00	0.25	Pass
12,589.25	-6.27	-0.07	-5.00	2.00	0.25	Pass
15,848.93	-8.77	-0.26	-16.00	2.50	0.25	Pass
19,952.62	-12.06	-0.86	-inf	3.00	0.25	Pass

-- End of measurement results--

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
10.00	-0.27	-0.27	-inf	3.00	0.25	Pass
12.59	-0.17	-0.17	-inf	2.50	0.25	Pass
15.85	-0.14	-0.14	-4.00	2.00	0.25	Pass
19.95	-0.04	-0.04	-2.00	2.00	0.25	Pass
25.12	-0.05	-0.05	-1.50	2.00	0.25	Pass
31.62	-0.02	-0.02	-1.50	1.50	0.25	Pass
39.81	-0.03	-0.03	-1.00	1.00	0.25	Pass
50.12	0.02	0.02	-1.00	1.00	0.25	Pass
63.10	-0.03	-0.03	-1.00	1.00	0.25	Pass
79.43	0.01	0.01	-1.00	1.00	0.25	Pass
100.00	-0.06	-0.06	-1.00	1.00	0.25	Pass
125.89	-0.07	-0.07	-1.00	1.00	0.25	Pass
158.49	0.02	0.02	-1.00	1.00	0.25	Pass
199.53	0.01	0.01	-1.00	1.00	0.25	Pass
251.19	0.02	0.02	-1.00	1.00	0.25	Pass
316.23	0.13	0.13	-1.00	1.00	0.25	Pass
398.11	-0.11	-0.10	-1.00	1.00	0.25	Pass
501.19	-0.12	-0.12	-1.00	1.00	0.25	Pass
630.96	-0.16	-0.16	-1.00	1.00	0.25	Pass
794.33	-0.13	-0.13	-1.00	1.00	0.25	Pass
1,000.00	0.00	0.00	-0.70	0.70	0.25	Pass
1,258.93	0.35	0.35	-1.00	1.00	0.25	Pass
1,584.89	0.02	0.02	-1.00	1.00	0.25	Pass
1,995.26	-0.26	-0.26	-1.00	1.00	0.25	Pass
2,511.89	-0.07	-0.07	-1.00	1.00	0.25	Pass
3,162.28	-0.04	-0.04	-1.00	1.00	0.25	Pass
3,981.07	-0.20	-0.20	-1.00	1.00	0.25	Pass
5,011.87	-0.06	-0.06	-1.50	1.50	0.25	Pass
6,309.57	-0.37	-0.37	-2.00	1.50	0.25	Pass
7,943.28	-0.07	-0.07	-2.50	1.50	0.25	Pass
10,000.00	0.14	0.14	-3.00	2.00	0.25	Pass
12,589.25	-0.02	-0.01	-5.00	2.00	0.25	Pass
15,848.93	-0.36	-0.36	-16.00	2.50	0.25	Pass
19,952.62	-0.70	-0.70	-inf	3.00	0.25	Pass

– End of measurement results–

High Level Stability

Electrical signal test of high level stability performed according to IEC 61672-3:2013 21 and ANSI S1.4-2014 Part 3: 21 for compliance to IEC 61672-1:2013 5.15 and ANSI S1.4-2014 Part 1: 5.15

Measurement	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
High Level Stability	0.00	-0.10	0.10	0.01 ‡	Pass

-- End of measurement results--

Long-Term Stability

Electrical signal test of long term stability performed according to IEC 61672-3:2013 15 and ANSI S1.4-2014 Part 3: 15 for compliance to ISC 61672-1:2013 5.14 and ANSI S1.4-2014 Part 1: 5.14

Test Duration [min]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
25	0.00	-0.10	0.10	0.01 ‡	Pass

-- End of measurement results--

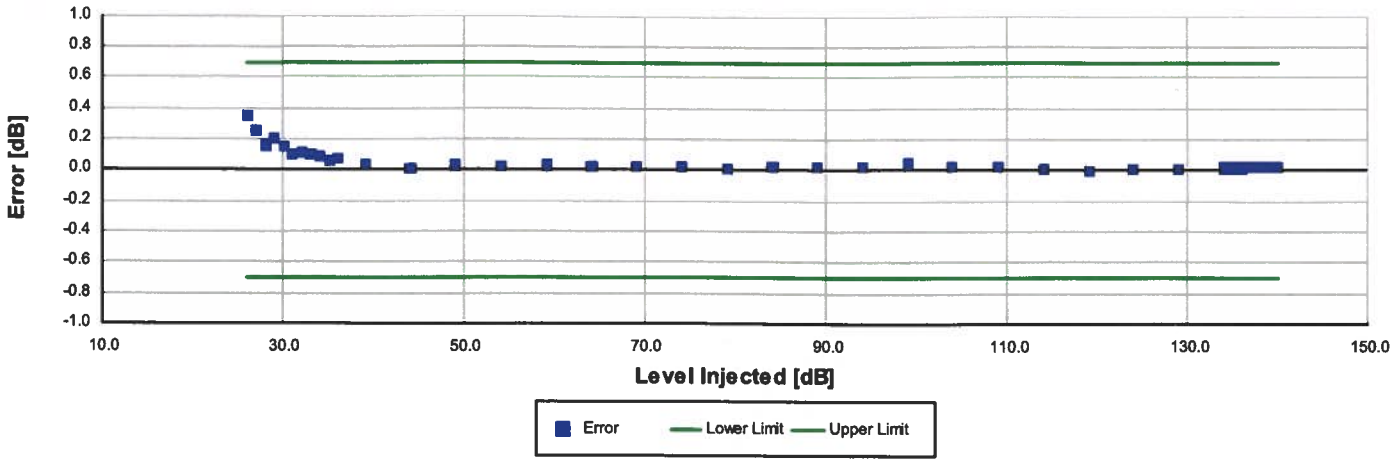
1 kHz Reference Levels

Frequency weightings and time weightings at 1 kHz (reference is A weighted Fast) performed according to IEC 61672-3:2013 14 and ANSI S1.4-2014 Part 3: 14 for compliance to IEC 61672-1:2013 5.5.9 and 5.8.3 and ANSI S1.4-2014 Part 1: 5.5.9 and 5.8.3

Measurement	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
C weight	114.00	113.80	114.20	0.15	Pass
Z weight	113.99	113.80	114.20	0.15	Pass
Slow	114.00	113.90	114.10	0.15	Pass
Impulse	114.00	113.90	114.10	0.15	Pass

-- End of measurement results--

A-weighted 0 dB Gain Broadband Log Linearity: 8,000.00 Hz



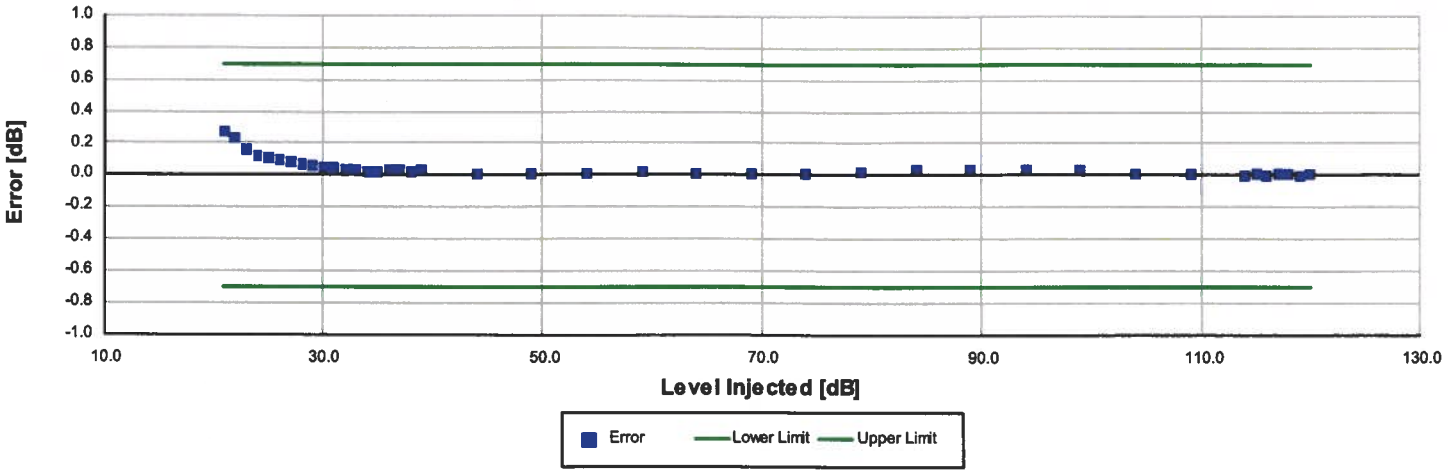
Broadband level linearity performed according to IEC 61672-3:2013 16 and ANSI S1.4-2014 Part 3: 16 for compliance to IEC 61672-1:2013 5.6, IEC 60804:2000 6.2, IEC 61252:2002 8, ANSI S1.4 (R2006) 6.9, ANSI S1.4-2014 Part 1: 5.6, ANSI S1.43 (R2007) 6.2

Level [dB]	Error [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
26.00	0.35	-0.70	0.70	0.16	Pass
27.00	0.26	-0.70	0.70	0.16	Pass
28.00	0.16	-0.70	0.70	0.16	Pass
29.00	0.21	-0.70	0.70	0.16	Pass
30.00	0.16	-0.70	0.70	0.16	Pass
31.00	0.10	-0.70	0.70	0.16	Pass
32.00	0.12	-0.70	0.70	0.16	Pass
33.00	0.10	-0.70	0.70	0.16	Pass
34.00	0.09	-0.70	0.70	0.16	Pass
35.00	0.06	-0.70	0.70	0.16	Pass
36.00	0.07	-0.70	0.70	0.16	Pass
39.00	0.04	-0.70	0.70	0.16	Pass
44.00	0.01	-0.70	0.70	0.16	Pass
49.00	0.03	-0.70	0.70	0.16	Pass
54.00	0.02	-0.70	0.70	0.16	Pass
59.00	0.03	-0.70	0.70	0.16	Pass
64.00	0.03	-0.70	0.70	0.16	Pass
69.00	0.03	-0.70	0.70	0.16	Pass
74.00	0.03	-0.70	0.70	0.16	Pass
79.00	0.02	-0.70	0.70	0.16	Pass
84.00	0.02	-0.70	0.70	0.16	Pass
89.00	0.02	-0.70	0.70	0.16	Pass
94.00	0.03	-0.70	0.70	0.16	Pass
99.00	0.05	-0.70	0.70	0.16	Pass
104.00	0.03	-0.70	0.70	0.15	Pass
109.00	0.03	-0.70	0.70	0.15	Pass
114.00	0.01	-0.70	0.70	0.15	Pass
119.00	0.00	-0.70	0.70	0.15	Pass
124.00	0.01	-0.70	0.70	0.15	Pass
129.00	0.01	-0.70	0.70	0.15	Pass
134.00	0.02	-0.70	0.70	0.15	Pass
135.00	0.02	-0.70	0.70	0.15	Pass
136.00	0.02	-0.70	0.70	0.15	Pass
137.00	0.02	-0.70	0.70	0.15	Pass
138.00	0.02	-0.70	0.70	0.15	Pass
139.00	0.02	-0.70	0.70	0.15	Pass

Level [dB]	Error [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
140.00	0.02	-0.70	0.70	0.15	Pass

-- End of measurement results--

A-weighted 20 dB Gain 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
21.00	0.28	-0.70	0.70	0.16	Pass
22.00	0.24	-0.70	0.70	0.16	Pass
23.00	0.16	-0.70	0.70	0.16	Pass
24.00	0.13	-0.70	0.70	0.16	Pass
25.00	0.11	-0.70	0.70	0.16	Pass
26.00	0.10	-0.70	0.70	0.16	Pass
27.00	0.08	-0.70	0.70	0.16	Pass
28.00	0.07	-0.70	0.70	0.16	Pass
29.00	0.06	-0.70	0.70	0.16	Pass
30.00	0.05	-0.70	0.70	0.16	Pass
31.00	0.05	-0.70	0.70	0.16	Pass
32.00	0.04	-0.70	0.70	0.16	Pass
33.00	0.03	-0.70	0.70	0.16	Pass
34.00	0.03	-0.70	0.70	0.16	Pass
35.00	0.02	-0.70	0.70	0.16	Pass
36.00	0.04	-0.70	0.70	0.16	Pass
37.00	0.03	-0.70	0.70	0.16	Pass
38.00	0.03	-0.70	0.70	0.16	Pass
39.00	0.03	-0.70	0.70	0.16	Pass
44.00	0.02	-0.70	0.70	0.16	Pass
49.00	0.01	-0.70	0.70	0.16	Pass
54.00	0.01	-0.70	0.70	0.16	Pass
59.00	0.02	-0.70	0.70	0.16	Pass
64.00	0.01	-0.70	0.70	0.16	Pass
69.00	0.01	-0.70	0.70	0.16	Pass
74.00	0.02	-0.70	0.70	0.16	Pass
79.00	0.03	-0.70	0.70	0.16	Pass
84.00	0.04	-0.70	0.70	0.16	Pass
89.00	0.04	-0.70	0.70	0.16	Pass
94.00	0.04	-0.70	0.70	0.16	Pass
99.00	0.03	-0.70	0.70	0.16	Pass
104.00	0.01	-0.70	0.70	0.15	Pass
109.00	0.01	-0.70	0.70	0.15	Pass
114.00	0.00	-0.70	0.70	0.15	Pass
115.00	0.01	-0.70	0.70	0.15	Pass
116.00	0.00	-0.70	0.70	0.15	Pass

Level [dB]	Error [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
117.00	0.01	-0.70	0.70	0.15	Pass
118.00	0.01	-0.70	0.70	0.15	Pass
119.00	0.00	-0.70	0.70	0.15	Pass
120.00	0.01	-0.70	0.70	0.15	Pass

-- End of measurement results--

Slow Detector

Toneburst response performed according to IEC 61672-3:2013 18 and ANSI S1.4-2014 Part 3: 18 for compliance to IEC 61672-1:2013 5.9, IEC 60651:2001 9.4.2, ANSI S1.4:1983 (R2006) 8.4.2 and ANSI S1.4-2014 Part 1: 5.9

Amplitude [dB]	Duration [ms]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
137.00	200	-7.55	-7.92	-6.92	0.15	Pass
	2	-27.15	-29.99	-25.99	0.15	Pass

-- End of measurement results--

Fast Detector

Toneburst response performed according to IEC 61672-3:2013 18 and ANSI S1.4-2014 Part 3: 18 for compliance to IEC 61672-1:2013 5.9, IEC 60651:2001 9.4.2, ANSI S1.4:1983 (R2006) 8.4.2 and ANSI S1.4-2014 Part 1: 5.9

Amplitude [dB]	Duration [ms]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
137.00	200.00	-1.05	-1.48	-0.48	0.15	Pass
	2.00	-18.43	-19.49	-16.99	0.15	Pass
	0.25	-27.39	-29.99	-25.99	0.15	Pass

-- End of measurement results--

Sound Exposure Level

Toneburst response performed according to IEC 61672-3:2013 18 and ANSI S1.4-2014 Part 3: 18 for compliance to IEC 61672-1:2013 5.9, IEC 60651:2001 9.4.2, ANSI S1.4:1983 (R2006) 8.4.2 and ANSI S1.4-2014 Part 1: 5.9

Amplitude [dB]	Duration [ms]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
137.00	200.00	-7.00	-7.49	-6.49	0.15	Pass
	2.00	-27.02	-28.49	-25.99	0.15	Pass
	0.25	-36.13	-39.02	-35.02	0.15	Pass

-- End of measurement results--

Peak C-weight

C-weighted peak sound level performed according to IEC 61672-3:2013 19 and ANSI S1.4-2014 Part 3: 19 for compliance to IEC 61672-1:2013 5.13 and ANSI S1.4-2014 Part 1: 5.13

Level [dB]	Frequency [Hz]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
135.00	31.50	138.23	135.50	139.50	0.15	Pass
135.00	500.00	138.57	137.50	139.50	0.15	Pass
135.00	8,000.00	137.77	136.40	140.40	0.15	Pass
135.00, Negative	500.00	137.17	136.40	138.40	0.15	Pass
135.00, Positive	500.00	137.17	136.40	138.40	0.15	Pass

-- End of measurement results--

Peak Z-weight

Z-weighted peak sound level 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
136.00	100	Negative Pulse	136.36	134.00	138.00	0.15	Pass
	100	Positive Pulse	136.36	134.01	138.01	0.15	Pass
126.00	100	Negative Pulse	126.35	124.00	128.00	0.15	Pass
	100	Positive Pulse	126.35	124.00	128.00	0.15	Pass
116.00	100	Negative Pulse	116.35	114.01	118.01	0.15	Pass
	100	Positive Pulse	116.35	114.00	118.00	0.15	Pass
106.00	100	Negative Pulse	106.34	103.99	107.99	0.15	Pass
	100	Positive Pulse	106.35	104.00	108.00	0.15	Pass

-- End of measurement results--

Overload Detector

Overload indication performed according to IEC 61672-3:2013 20 and ANSI S1.4-2014 Part 3: 20 for compliance to IEC 61672-1:2013 5.11, IEC 60804:2000 9.3.5, IEC 61252:2002 11, ANSI S1.4 (R2006) 5.8, and ANSI S1.4-2014 Part 1: 5.11, ANSI S1.25 (R2007) 7.6, ANSI S1.43 (R2007) 7

Measurement	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
Positive	140.80	140.00	142.00	0.15	Pass
Negative	140.80	140.00	142.00	0.15	Pass
Difference	0.00	-1.50	1.50	0.16	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
139.00	40	Negative Pulse	135.95	134.47	136.47	0.15	Pass
		Positive Pulse	135.96	134.46	136.46	0.15	Pass
	30	Negative Pulse	135.03	134.47	136.47	0.15	Pass
		Positive Pulse	135.01	134.46	136.46	0.15	Pass

-- End of measurement results--

Positive Pulse Crest Factor

200 µs 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
138.00	3	OVLD	± 0.50	0.15 ‡	Pass
	5	OVLD	± 1.00	0.15 ‡	Pass
	10	OVLD	± 1.50	0.15 ‡	Pass
128.00	3	-0.13	± 0.50	0.15 ‡	Pass
	5	-0.13	± 1.00	0.15 ‡	Pass
	10	OVLD	± 1.50	0.15 ‡	Pass
118.00	3	-0.13	± 0.50	0.16 ‡	Pass
	5	-0.14	± 1.00	0.15 ‡	Pass
	10	-0.25	± 1.50	0.15 ‡	Pass
108.00	3	-0.15	± 0.50	0.18 ‡	Pass
	5	-0.12	± 1.00	0.15 ‡	Pass
	10	-0.08	± 1.50	0.15 ‡	Pass

-- End of measurement results--

Negative Pulse Crest Factor

200 µs 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
138.00	3	OVLD	± 0.50	0.15 ‡	Pass
	5	OVLD	± 1.00	0.15 ‡	Pass
	10	OVLD	± 1.50	0.15 ‡	Pass
128.00	3	-0.14	± 0.50	0.15 ‡	Pass
	5	-0.14	± 1.00	0.15 ‡	Pass
	10	OVLD	± 1.50	0.15 ‡	Pass
118.00	3	-0.14	± 0.50	0.15 ‡	Pass
	5	-0.12	± 1.00	0.15 ‡	Pass
	10	-0.17	± 1.50	0.15 ‡	Pass
108.00	3	-0.15	± 0.50	0.15 ‡	Pass
	5	-0.13	± 1.00	0.15 ‡	Pass
	10	-0.09	± 1.50	0.15 ‡	Pass

-- End of measurement results--

Tone Burst

2kHz tone burst tests at 2.0, 12.0, 22.0, 32.0 dB below Overload Limit

Tone burst response 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
138.00	3	OVLD	± 0.50	0.15	Pass
	5	OVLD	± 1.00	0.15	Pass
128.00	3	-0.07	± 0.50	0.17	Pass
	5	-0.03	± 1.00	0.15	Pass
118.00	3	-0.05	± 0.50	0.15	Pass
	5	0.02	± 1.00	0.15	Pass
108.00	3	-0.06	± 0.50	0.15	Pass
	5	-0.03	± 1.00	0.15	Pass

-- End of measurement results--

Impulse Detector - Repeat

Impulse Detector measured according to IEC 60651:2001 9.4.3 and ANSI S1.4:1983 (R2006) 8.4.3

Amplitude [dB]	Repitition Rate [Hz]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
140	100.00	-2.84	-3.71	-1.71	0.15	Pass
	20.00	-7.71	-9.57	-5.57	0.15	Pass
	2.00	-8.69	-10.76	-6.76	0.15	Pass
Step	2.00	5.19	4.00	6.00	0.16	Pass

-- End of measurement results--

Impulse Detector - Single

Impulse Detector measured according to IEC 60651:2001 9.4.3 and ANSI S1.4:1983 (R2006) 8.4.3

Amplitude [dB]	Duration [ms]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
140	20.00	-3.75	-5.11	-2.11	0.15	Pass
	5.00	-8.79	-10.76	-6.76	0.16	Pass
	2.00	-12.78	-14.55	-10.55	0.16	Pass
Step	2.00	9.94	9.00	11.00	0.16	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	94.01	93.92	94.12	0.15	Pass
0 dB Gain, Linearity	29.15	28.32	29.72	0.16	Pass
20 dB Gain	94.03	93.92	94.12	0.15	Pass
20 dB Gain, Linearity	24.03	23.32	24.72	0.16	Pass
OBA Low Range	94.02	93.92	94.12	0.15	Pass
OBA Normal Range	94.02	93.20	94.80	0.15	Pass

-- End of measurement results--

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	6.39	15.00	Pass
C-weight Noise Floor	11.81	17.30	Pass
Z-weight Noise Floor	21.24	24.50	Pass

-- End of measurement results--

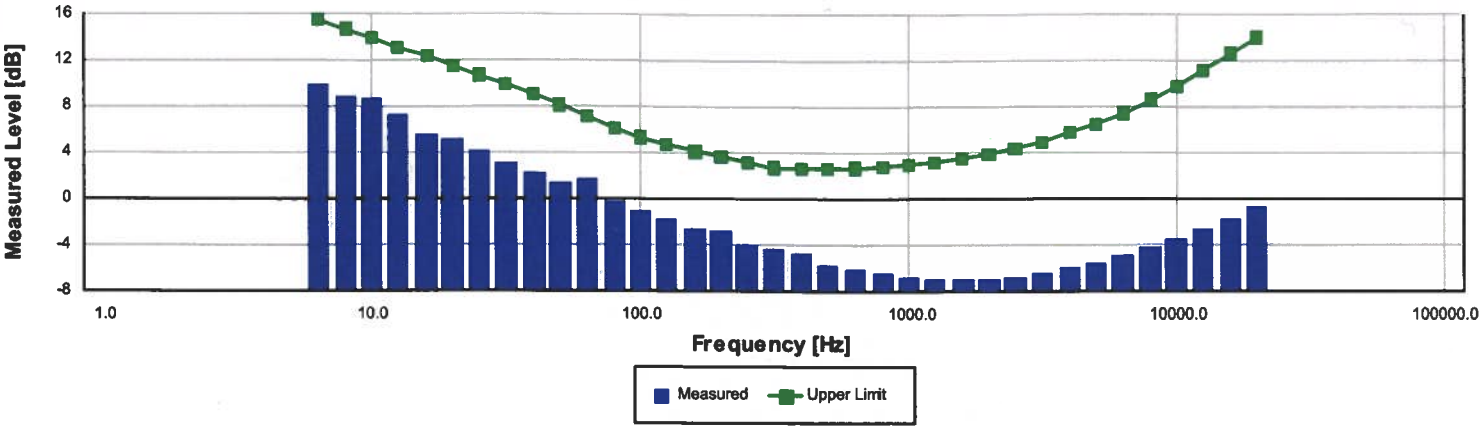
Total Harmonic Distortion

Measured using 1/3-Octave filters

Measurement	Test Result [dB]	Lower Limit [dB]	Upper Limit [dB]	Expanded Uncertainty [dB]	Result
10 Hz Signal	137.49	137.20	138.80	0.15	Pass
THD	-73.25		-60.00	0.01 ‡	Pass
THD+N	-66.20		-60.00	0.01 ‡	Pass

-- End of measurement results--

1/3-Octave Self-Generated Noise



The SLM is set to low range and 20 dB gain.

Frequency [Hz]	Test Result [dB]	Upper limit [dB]	Result
6.30	9.96	15.50	Pass
8.00	8.91	14.70	Pass
10.00	8.68	13.90	Pass
12.50	7.40	13.10	Pass
16.00	5.65	12.30	Pass
20.00	5.25	11.50	Pass
25.00	4.17	10.70	Pass
31.50	3.21	9.90	Pass
40.00	2.26	9.10	Pass
50.00	1.46	8.10	Pass
63.00	1.69	7.10	Pass
80.00	-0.13	6.10	Pass
100.00	-1.03	5.30	Pass
125.00	-1.77	4.70	Pass
160.00	-2.65	4.10	Pass
200.00	-2.71	3.60	Pass
250.00	-4.07	3.10	Pass
315.00	-4.42	2.70	Pass
400.00	-4.71	2.60	Pass
500.00	-5.68	2.60	Pass
630.00	-6.08	2.70	Pass
800.00	-6.45	2.80	Pass
1,000.00	-6.77	3.00	Pass
1,250.00	-6.89	3.20	Pass
1,600.00	-6.95	3.50	Pass
2,000.00	-6.91	3.80	Pass
2,500.00	-6.72	4.30	Pass
3,150.00	-6.41	4.90	Pass
4,000.00	-5.98	5.70	Pass
5,000.00	-5.52	6.40	Pass
6,300.00	-4.91	7.40	Pass
8,000.00	-4.20	8.60	Pass
10,000.00	-3.46	9.80	Pass
12,500.00	-2.63	11.20	Pass
16,000.00	-1.72	12.60	Pass
20,000.00	-0.64	14.00	Pass

– End of measurement results–

– End of Report–

Signatory: Jacob Cannon

LARSON DAVIS – A PCB DIVISION
1681 West 820 North
Provo, UT 84601, United States
716-684-0001

ACCREDITED
CERT #3622.01

LARSON DAVIS
A PCB DIVISION

Calibration Certificate

Certificate Number 2023016967
Customer:
WSP Canada Inc

,

Model Number	831		***Procedure Number***	D0001.8384	
Serial Number	0001158		***Technician***	Jacob Cannon	
Test Results	**Pass**		***Calibration Date***	18 Dec 2023	
Initial Condition	Inoperable		***Calibration Due***		
			Temperature	23.51 °C	± 0.25 °C
Description	Larson Davis Model 831 Class 1 Sound Level Meter Firmware Revision: 2.403		***Humidity***	51.9 %RH	± 2.0 %RH
			Static Pressure	86.41 kPa	± 0.13 kPa

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

Larson Davis PRM831. S/N 0403
Larson Davis CAL291. S/N 0108
Larson Davis CAL200. S/N 9079
PCB 377B02. S/N 333855

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 17025:2017.
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 9001:2015.

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.

Correction data from Larson Davis Model 831 Sound Level Meter Manual, I831.01 Rev S, 2019-09-10

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.

LARSON DAVIS – A PCB DIVISION
1681 West 820 North
Provo, UT 84601, United States
716-684-0001

ACCREDITED CERT #3622.01

LARSON DAVIS
A PCB DIVISION

Calibration Check Frequency: 1000 Hz; Reference Sound Pressure Level: 114 dB re 20 µPa; Reference Range: 0 dB gain

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 2016-02-24 certificate number DE-15-M-PTB-0056.

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 1specifications in IEC 61672-1:2013 / ANSI/ASA S1.4-2014/Part 1.

Standards Used

Description	Cal Date	Cal Due	Cal Standard
Larson Davis CAL291 Residual Intensity Calibrator	2023-09-12	2024-09-12	001250
Hart Scientific 2626-S Humidity/Temperature Sensor	2023-02-20	2024-08-20	006946
Larson Davis CAL200 Acoustic Calibrator	2023-07-17	2024-07-17	007027
Larson Davis Model 831	2023-02-22	2024-02-22	007182
PCB 377A13 1/2 inch Prepolarized Pressure Microphone	2023-03-06	2024-03-06	007185
SRS DS360 Ultra Low Distortion Generator	2023-03-30	2024-03-30	007635
Larson Davis 1/2" Preamplifier for Model 831 Type 1	2023-09-28	2024-09-28	PCB0004783

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

As Received Level: 113.26
Adjusted Level: 114.00

-- End of measurement results--

Loaded Circuit Sensitivity

Measurement	Test Result [dB re 1 V / Pa]	Lower Limit [dB re 1 V / Pa]	Upper Limit [dB re 1 V / Pa]	Expanded Uncertainty [dB]	Result
1000 Hz	-26.76	-27.84	-24.74	0.14	Pass

-- End of measurement results--

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	-0.21	-0.20	-1.20	0.80	0.23	Pass
1000	0.14	0.00	-0.70	0.70	0.23	Pass
8000	-2.37	-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, 20 dB gain	40.62

-- End of measurement results--

-- End of Report--

Signatory: Jacob Cannon

LARSON DAVIS – A PCB DIVISION
1681 West 820 North
Provo, UT 84601, United States
716-684-0001

ACCREDITED CERT #3622.01

LARSON DAVIS A PCB DIVISION

Calibration Certificate

Certificate Number 2023017498
Customer:
WSP Canada Inc

,

Model Number	831		***Procedure Number***	D0001.8384	
Serial Number	0001669		***Technician***	Jacob Cannon	
Test Results	**Pass**		***Calibration Date***	28 Dec 2023	
Initial Condition	AS RECEIVED same as shipped		***Calibration Due***	28 Dec 2024	
Description	Larson Davis Model 831 Class 1 Sound Level Meter Firmware Revision: 2.403		***Temperature***	23.62 °C	± 0.25 °C
			Humidity	51.8 %RH	± 2.0 %RH
			Static Pressure	86.9 kPa	± 0.13 kPa

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

Larson Davis CAL200. S/N 9079
Larson Davis PRM831. S/N 019104
Larson Davis CAL291. S/N 0108
PCB 377B20. S/N 112206

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 17025:2017.
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 9001:2015.

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.

Correction data from Larson Davis Model 831 Sound Level Meter Manual, I831.01 Rev S, 2019-09-10

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; Reference Range: 0 dB gain

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 2016-02-24 certificate number DE-15-M-PTB-0056.

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 1specifications in IEC 61672-1:2013 / ANSI/ASA S1.4-2014/Part 1.

Standards Used

Description	Cal Date	Cal Due	Cal Standard
Larson Davis CAL291 Residual Intensity Calibrator	2023-09-12	2024-09-12	001250
Hart Scientific 2626-S Humidity/Temperature Sensor	2023-02-20	2024-08-20	006946
Larson Davis CAL200 Acoustic Calibrator	2023-07-17	2024-07-17	007027
Larson Davis Model 831	2023-02-22	2024-02-22	007182
PCB 377A13 1/2 inch Prepolarized Pressure Microphone	2023-03-06	2024-03-06	007185
SRS DS360 Ultra Low Distortion Generator	2023-03-30	2024-03-30	007635
Larson Davis 1/2" Preamplifier for Model 831 Type 1	2023-09-28	2024-09-28	PCB0004783

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	114.01	113.80	114.20	0.14	Pass

Adjusted Level: 114.01
As Received Level: 114.58

-- End of measurement results--

Loaded Circuit Sensitivity

Measurement	Test Result [dB re 1 V / Pa]	Lower Limit [dB re 1 V / Pa]	Upper Limit [dB re 1 V / Pa]	Expanded Uncertainty [dB]	Result
1000 Hz	-25.64	-27.82	-24.69	0.14	Pass

-- End of measurement results--

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	-0.10	-0.20	-1.20	0.80	0.23	Pass
1000	0.06	0.00	-0.70	0.70	0.23	Pass
8000	-3.20	-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, 20 dB gain	40.61

-- End of measurement results--

-- End of Report--

Signatory: *Jacob Cannon*

Calibration Certificate

Certificate Number 2023017484
Customer:
WSP Canada Inc

,

Model Number	831	***Procedure Number***	D0001.8378		
Serial Number	0001669	***Technician***	Jacob Cannon		
Test Results	**Pass**	***Calibration Date***	28 Dec 2023		
Initial Condition	AS RECEIVED same as shipped	***Calibration Due***	28 Dec 2024		
Description	Larson Davis Model 831 Class 1 Sound Level Meter Firmware Revision: 2.403	***Temperature***	23.44	°C	± 0.25 °C
		Humidity	52	%RH	± 2.0 %RH
		Static Pressure	86.97	kPa	± 0.13 kPa

Evaluation Method Tested electrically using Larson Davis PRM831 S/N 019104 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 S1.25 (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 17025:2017. **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 9001:2015.

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.

Correction data from Larson Davis Model 831 Sound Level Meter Manual, I831.01 Rev S, 2019-09-10

Calibration Check Frequency: 1000 Hz; Reference Sound Pressure Level: 114 dB re 20 µPa; Reference Range: 0 dB gain

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

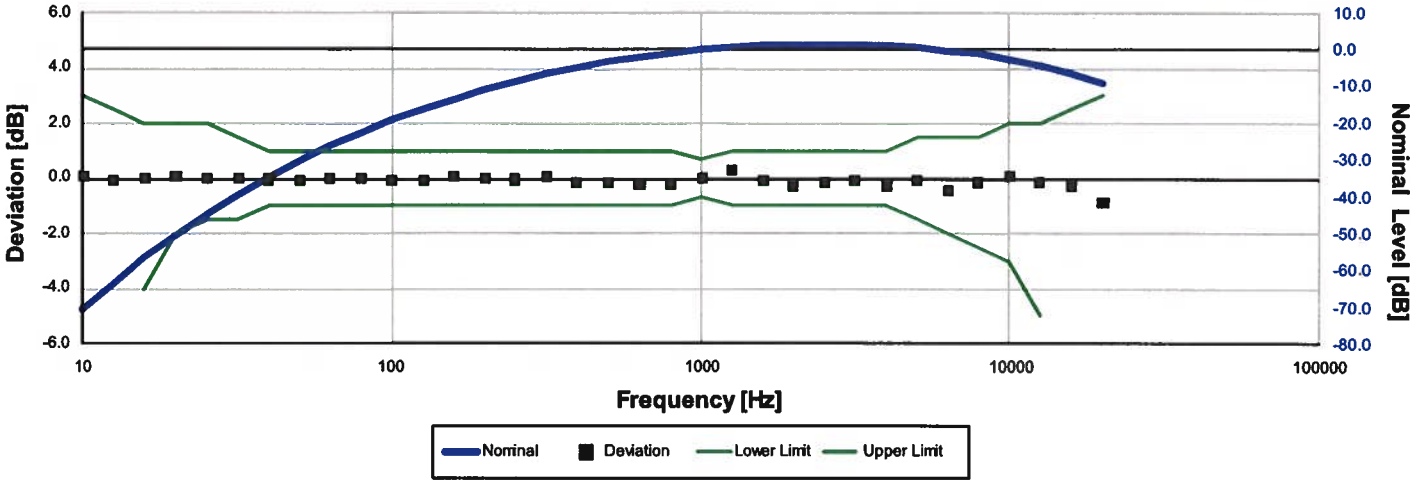
Pattern approval for IEC 61672-1:2013 / ANSI/ASA S1.4-2014/Part 1 successfully completed by Physikalisch-Technische Bundesanstalt (PTB) on 2016-02-24 certificate number DE-15-M-PTB-0056.

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 1specifications in IEC 61672-1:2013 / ANSI/ASA S1.4-2014/Part 1.

Standards Used

Description	Cal Date	Cal Due	Cal Standard
Hart Scientific 2626-S Humidity/Temperature Sensor	2023-02-20	2024-08-20	006946
SRS DS360 Ultra Low Distortion Generator	2023-08-25	2024-08-25	007167

A-weight Filter Response

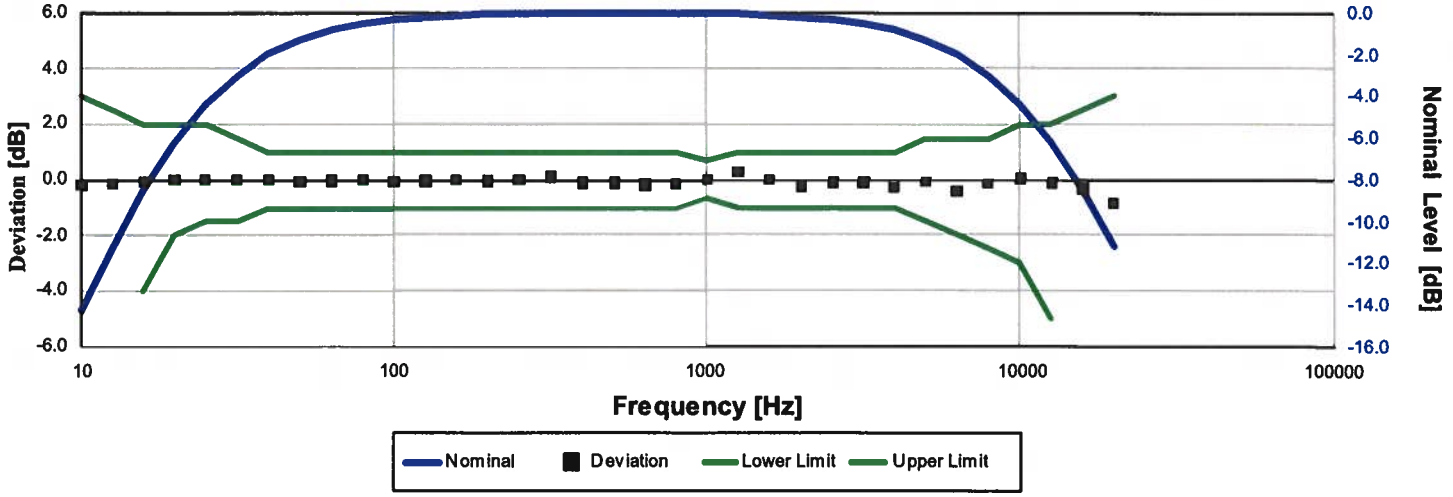


Electrical signal test of frequency weighting performed according to IEC 61672-3:2013 13 and ANSI S1.4-2014 Part 3: 13 for compliance to IEC 61672-1:2013 5.5; IEC 60651:2001 6.1 and 9.2.2; IEC 60804:2000 5; ANSI S1.4:1983 (R2006) 5.1 and 8.2.1; ANSI S1.4-2014 Part 1: 5.5

Frequency [Hz]	Test Result [dB]	Deviation [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
10.00	-70.34	0.06	-inf	3.00	0.25	Pass
12.59	-63.44	-0.04	-inf	2.50	0.25	Pass
15.85	-56.71	-0.01	-4.00	2.00	0.25	Pass
19.95	-50.42	0.08	-2.00	2.00	0.25	Pass
25.12	-44.71	-0.01	-1.50	2.00	0.25	Pass
31.62	-39.42	-0.02	-1.50	1.50	0.25	Pass
39.81	-34.63	-0.03	-1.00	1.00	0.25	Pass
50.12	-30.28	-0.08	-1.00	1.00	0.25	Pass
63.10	-26.21	-0.01	-1.00	1.00	0.25	Pass
79.43	-22.49	0.01	-1.00	1.00	0.25	Pass
100.00	-19.18	-0.08	-1.00	1.00	0.25	Pass
125.89	-16.15	-0.05	-1.00	1.00	0.25	Pass
158.49	-13.35	0.05	-1.00	1.00	0.25	Pass
199.53	-10.91	-0.01	-1.00	1.00	0.25	Pass
251.19	-8.63	-0.03	-1.00	1.00	0.25	Pass
316.23	-6.50	0.10	-1.00	1.00	0.25	Pass
398.11	-4.95	-0.15	-1.00	1.00	0.25	Pass
501.19	-3.37	-0.17	-1.00	1.00	0.25	Pass
630.96	-2.09	-0.19	-1.00	1.00	0.25	Pass
794.33	-0.99	-0.19	-1.00	1.00	0.25	Pass
1,000.00	0.00	0.00	-0.70	0.70	0.25	Pass
1,258.93	0.88	0.28	-1.00	1.00	0.25	Pass
1,584.89	0.96	-0.04	-1.00	1.00	0.25	Pass
1,995.26	0.93	-0.27	-1.00	1.00	0.25	Pass
2,511.89	1.19	-0.11	-1.00	1.00	0.25	Pass
3,162.28	1.15	-0.05	-1.00	1.00	0.25	Pass
3,981.07	0.74	-0.27	-1.00	1.00	0.25	Pass
5,011.87	0.46	-0.04	-1.50	1.50	0.25	Pass
6,309.57	-0.52	-0.42	-2.00	1.50	0.25	Pass
7,943.28	-1.24	-0.14	-2.50	1.50	0.25	Pass
10,000.00	-2.44	0.06	-3.00	2.00	0.25	Pass
12,589.25	-4.41	-0.11	-5.00	2.00	0.25	Pass
15,848.93	-6.90	-0.30	-16.00	2.50	0.25	Pass
19,952.62	-10.17	-0.87	-inf	3.00	0.25	Pass

-- End of measurement results--

C-weight Filter Response

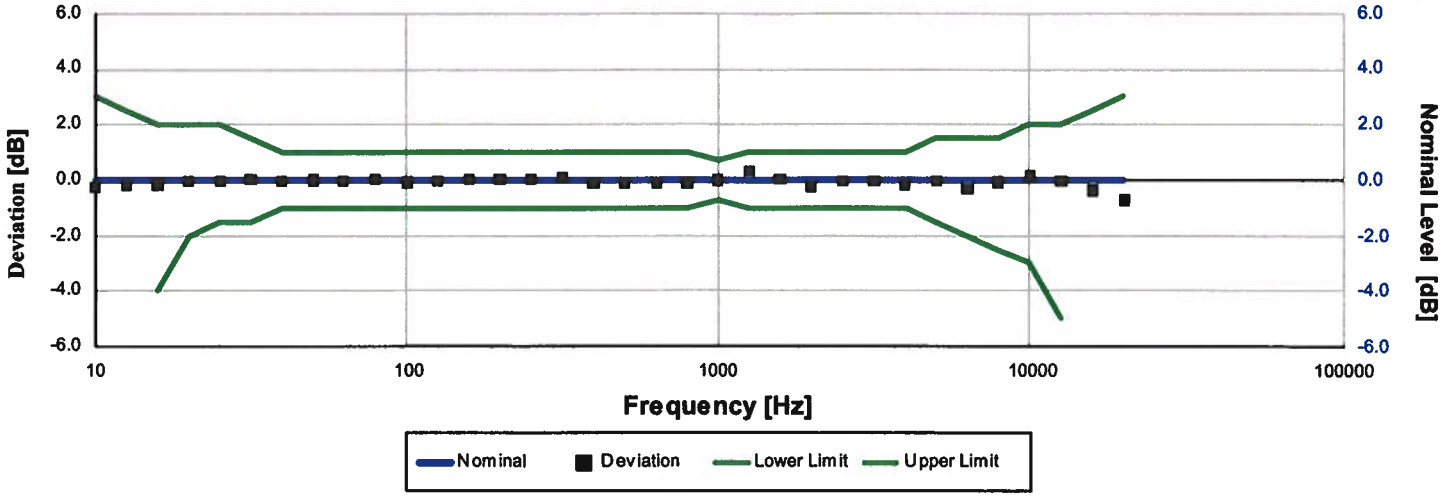


Electrical signal test of frequency weighting performed according to IEC 61672-3:2013 13 and ANSI S1.4-2014 Part 3: 13 for compliance to IEC 61672-1:2013 5.5; IEC 60651:2001 6.1 and 9.2.2; IEC 60804:2000 5; ANSI S1.4:1983 (R2006) 5.1 and 8.2.1; ANSI S1.4-2014 Part 1: 5.5

Frequency [Hz]	Test Result [dB]	Deviation [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
10.00	-14.50	-0.20	-inf	3.00	0.25	Pass
12.59	-11.32	-0.12	-inf	2.50	0.25	Pass
15.85	-8.57	-0.07	-4.00	2.00	0.25	Pass
19.95	-6.21	-0.01	-2.00	2.00	0.25	Pass
25.12	-4.39	0.01	-1.50	2.00	0.25	Pass
31.62	-3.01	-0.01	-1.50	1.50	0.25	Pass
39.81	-2.00	0.01	-1.00	1.00	0.25	Pass
50.12	-1.36	-0.06	-1.00	1.00	0.25	Pass
63.10	-0.82	-0.02	-1.00	1.00	0.25	Pass
79.43	-0.50	0.01	-1.00	1.00	0.25	Pass
100.00	-0.34	-0.04	-1.00	1.00	0.25	Pass
125.89	-0.23	-0.03	-1.00	1.00	0.25	Pass
158.49	-0.07	0.03	-1.00	1.00	0.25	Pass
199.53	-0.02	-0.02	-1.00	1.00	0.25	Pass
251.19	0.00	0.00	-1.00	1.00	0.25	Pass
316.23	0.13	0.13	-1.00	1.00	0.25	Pass
398.11	-0.09	-0.09	-1.00	1.00	0.25	Pass
501.19	-0.09	-0.09	-1.00	1.00	0.25	Pass
630.96	-0.18	-0.18	-1.00	1.00	0.25	Pass
794.33	-0.15	-0.14	-1.00	1.00	0.25	Pass
1,000.00	0.00	0.00	-0.70	0.70	0.25	Pass
1,258.93	0.28	0.28	-1.00	1.00	0.25	Pass
1,584.89	-0.11	-0.01	-1.00	1.00	0.25	Pass
1,995.26	-0.45	-0.25	-1.00	1.00	0.25	Pass
2,511.89	-0.40	-0.10	-1.00	1.00	0.25	Pass
3,162.28	-0.59	-0.09	-1.00	1.00	0.25	Pass
3,981.07	-1.05	-0.25	-1.00	1.00	0.25	Pass
5,011.87	-1.35	-0.05	-1.50	1.50	0.25	Pass
6,309.57	-2.40	-0.40	-2.00	1.50	0.25	Pass
7,943.28	-3.15	-0.15	-2.50	1.50	0.25	Pass
10,000.00	-4.35	0.05	-3.00	2.00	0.25	Pass
12,589.25	-6.29	-0.09	-5.00	2.00	0.25	Pass
15,848.93	-8.81	-0.31	-16.00	2.50	0.25	Pass
19,952.62	-12.07	-0.87	-inf	3.00	0.25	Pass

-- End of measurement results--

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
10.00	-0.24	-0.24	-inf	3.00	0.25	Pass
12.59	-0.17	-0.17	-inf	2.50	0.25	Pass
15.85	-0.16	-0.16	-4.00	2.00	0.25	Pass
19.95	-0.03	-0.03	-2.00	2.00	0.25	Pass
25.12	-0.05	-0.05	-1.50	2.00	0.25	Pass
31.62	0.01	0.01	-1.50	1.50	0.25	Pass
39.81	-0.02	-0.02	-1.00	1.00	0.25	Pass
50.12	-0.01	-0.01	-1.00	1.00	0.25	Pass
63.10	-0.02	-0.02	-1.00	1.00	0.25	Pass
79.43	0.02	0.02	-1.00	1.00	0.25	Pass
100.00	-0.07	-0.07	-1.00	1.00	0.25	Pass
125.89	-0.05	-0.05	-1.00	1.00	0.25	Pass
158.49	0.03	0.03	-1.00	1.00	0.25	Pass
199.53	0.03	0.03	-1.00	1.00	0.25	Pass
251.19	0.02	0.02	-1.00	1.00	0.25	Pass
316.23	0.10	0.10	-1.00	1.00	0.25	Pass
398.11	-0.11	-0.11	-1.00	1.00	0.25	Pass
501.19	-0.11	-0.11	-1.00	1.00	0.25	Pass
630.96	-0.14	-0.14	-1.00	1.00	0.25	Pass
794.33	-0.11	-0.11	-1.00	1.00	0.25	Pass
1,000.00	0.00	0.00	-0.70	0.70	0.25	Pass
1,258.93	0.32	0.32	-1.00	1.00	0.25	Pass
1,584.89	0.02	0.01	-1.00	1.00	0.25	Pass
1,995.26	-0.26	-0.26	-1.00	1.00	0.25	Pass
2,511.89	-0.07	-0.06	-1.00	1.00	0.25	Pass
3,162.28	-0.03	-0.03	-1.00	1.00	0.25	Pass
3,981.07	-0.21	-0.21	-1.00	1.00	0.25	Pass
5,011.87	-0.05	-0.04	-1.50	1.50	0.25	Pass
6,309.57	-0.35	-0.35	-2.00	1.50	0.25	Pass
7,943.28	-0.08	-0.08	-2.50	1.50	0.25	Pass
10,000.00	0.13	0.13	-3.00	2.00	0.25	Pass
12,589.25	-0.04	-0.04	-5.00	2.00	0.25	Pass
15,848.93	-0.37	-0.37	-16.00	2.50	0.25	Pass
19,952.62	-0.73	-0.73	-inf	3.00	0.25	Pass

-- End of measurement results--

High Level Stability

Electrical signal test of high level stability performed according to IEC 61672-3:2013 21 and ANSI S1.4-2014 Part 3: 21 for compliance to IEC 61672-1:2013 5.15 and ANSI S1.4-2014 Part 1: 5.15

Measurement	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
High Level Stability	0.01	-0.10	0.10	0.01 ‡	Pass

-- End of measurement results--

Long-Term Stability

Electrical signal test of long term stability performed according to IEC 61672-3:2013 15 and ANSI S1.4-2014 Part 3: 15 for compliance to ISC 61672-1:2013 5.14 and ANSI S1.4-2014 Part 1: 5.14

Test Duration [min]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
34	0.01	-0.10	0.10	0.01 ‡	Pass

-- End of measurement results--

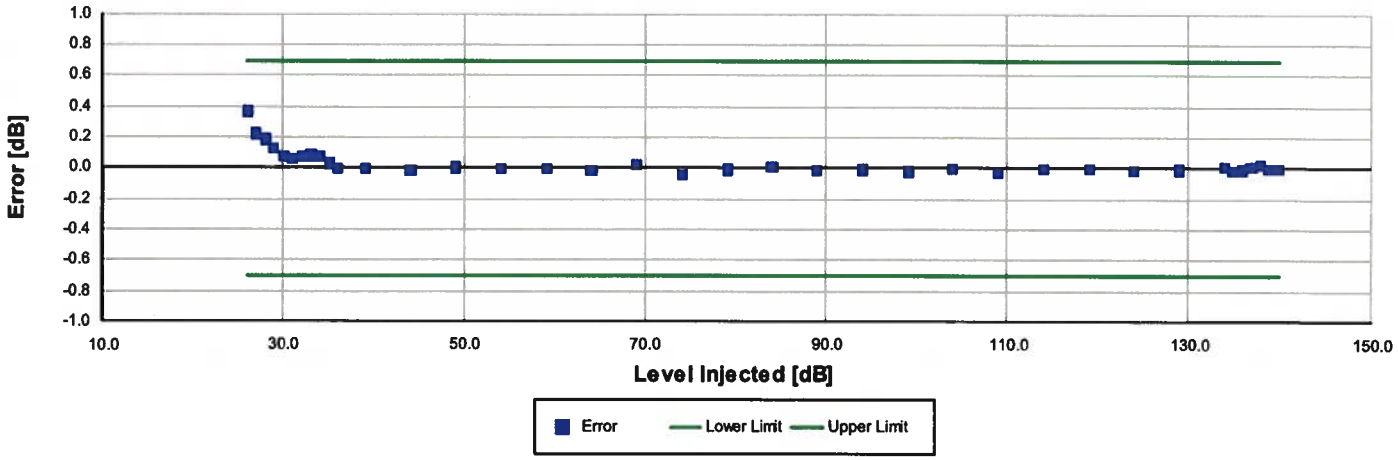
1 kHz Reference Levels

Frequency weightings and time weightings at 1 kHz (reference is A weighted Fast) performed according to IEC 61672-3:2013 14 and ANSI S1.4-2014 Part 3: 14 for compliance to IEC 61672-1:2013 5.5.9 and 5.8.3 and ANSI S1.4-2014 Part 1: 5.5.9 and 5.8.3

Measurement	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
C weight	114.02	113.82	114.22	0.15	Pass
Z weight	114.01	113.82	114.22	0.15	Pass
Slow	114.02	113.92	114.12	0.15	Pass
Impulse	114.02	113.92	114.12	0.15	Pass

-- End of measurement results--

A-weighted 0 dB Gain Broadband Log Linearity: 8,000.00 Hz



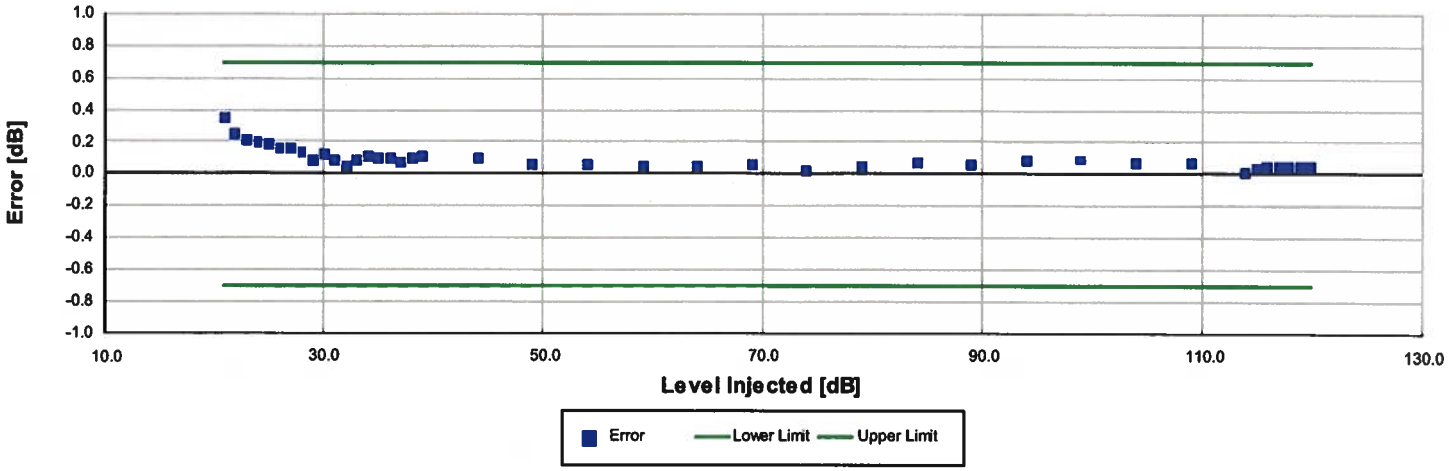
Broadband level linearity performed according to IEC 61672-3:2013 16 and ANSI S1.4-2014 Part 3: 16 for compliance to IEC 61672-1:2013 5.6, IEC 60804:2000 6.2, IEC 61252:2002 8, ANSI S1.4 (R2006) 6.9, ANSI S1.4-2014 Part 1: 5.6, ANSI S1.43 (R2007) 6.2

Level [dB]	Error [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
26.00	0.37	-0.70	0.70	0.16	Pass
27.00	0.23	-0.70	0.70	0.16	Pass
28.00	0.19	-0.70	0.70	0.16	Pass
29.00	0.12	-0.70	0.70	0.16	Pass
30.00	0.08	-0.70	0.70	0.16	Pass
31.00	0.07	-0.70	0.70	0.16	Pass
32.00	0.08	-0.70	0.70	0.16	Pass
33.00	0.08	-0.70	0.70	0.16	Pass
34.00	0.08	-0.70	0.70	0.16	Pass
35.00	0.03	-0.70	0.70	0.16	Pass
36.00	0.00	-0.70	0.70	0.16	Pass
39.00	0.00	-0.70	0.70	0.16	Pass
44.00	-0.02	-0.70	0.70	0.16	Pass
49.00	0.01	-0.70	0.70	0.16	Pass
54.00	0.00	-0.70	0.70	0.16	Pass
59.00	0.00	-0.70	0.70	0.16	Pass
64.00	-0.02	-0.70	0.70	0.16	Pass
69.00	0.02	-0.70	0.70	0.16	Pass
74.00	-0.04	-0.70	0.70	0.16	Pass
79.00	-0.01	-0.70	0.70	0.16	Pass
84.00	0.01	-0.70	0.70	0.16	Pass
89.00	-0.02	-0.70	0.70	0.16	Pass
94.00	-0.01	-0.70	0.70	0.16	Pass
99.00	-0.02	-0.70	0.70	0.16	Pass
104.00	0.00	-0.70	0.70	0.15	Pass
109.00	-0.03	-0.70	0.70	0.15	Pass
114.00	0.00	-0.70	0.70	0.15	Pass
119.00	0.00	-0.70	0.70	0.15	Pass
124.00	-0.01	-0.70	0.70	0.15	Pass
129.00	-0.01	-0.70	0.70	0.15	Pass
134.00	0.01	-0.70	0.70	0.15	Pass
135.00	-0.01	-0.70	0.70	0.15	Pass
136.00	-0.01	-0.70	0.70	0.15	Pass
137.00	0.01	-0.70	0.70	0.15	Pass
138.00	0.02	-0.70	0.70	0.15	Pass
139.00	0.00	-0.70	0.70	0.15	Pass

Level [dB]	Error [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
140.00	0.00	-0.70	0.70	0.15	Pass

-- End of measurement results--

A-weighted 20 dB Gain 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
21.00	0.35	-0.70	0.70	0.16	Pass
22.00	0.25	-0.70	0.70	0.16	Pass
23.00	0.21	-0.70	0.70	0.16	Pass
24.00	0.20	-0.70	0.70	0.16	Pass
25.00	0.19	-0.70	0.70	0.16	Pass
26.00	0.17	-0.70	0.70	0.16	Pass
27.00	0.17	-0.70	0.70	0.16	Pass
28.00	0.14	-0.70	0.70	0.16	Pass
29.00	0.09	-0.70	0.70	0.16	Pass
30.00	0.13	-0.70	0.70	0.16	Pass
31.00	0.08	-0.70	0.70	0.16	Pass
32.00	0.05	-0.70	0.70	0.16	Pass
33.00	0.09	-0.70	0.70	0.16	Pass
34.00	0.11	-0.70	0.70	0.16	Pass
35.00	0.10	-0.70	0.70	0.16	Pass
36.00	0.10	-0.70	0.70	0.16	Pass
37.00	0.08	-0.70	0.70	0.16	Pass
38.00	0.10	-0.70	0.70	0.16	Pass
39.00	0.11	-0.70	0.70	0.16	Pass
44.00	0.10	-0.70	0.70	0.16	Pass
49.00	0.06	-0.70	0.70	0.16	Pass
54.00	0.06	-0.70	0.70	0.16	Pass
59.00	0.05	-0.70	0.70	0.16	Pass
64.00	0.04	-0.70	0.70	0.16	Pass
69.00	0.06	-0.70	0.70	0.16	Pass
74.00	0.02	-0.70	0.70	0.16	Pass
79.00	0.05	-0.70	0.70	0.16	Pass
84.00	0.08	-0.70	0.70	0.16	Pass
89.00	0.06	-0.70	0.70	0.16	Pass
94.00	0.09	-0.70	0.70	0.16	Pass
99.00	0.09	-0.70	0.70	0.16	Pass
104.00	0.07	-0.70	0.70	0.15	Pass
109.00	0.07	-0.70	0.70	0.15	Pass
114.00	0.01	-0.70	0.70	0.15	Pass
115.00	0.04	-0.70	0.70	0.15	Pass
116.00	0.04	-0.70	0.70	0.15	Pass

Level [dB]	Error [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
117.00	0.05	-0.70	0.70	0.15	Pass
118.00	0.05	-0.70	0.70	0.15	Pass
119.00	0.05	-0.70	0.70	0.15	Pass
120.00	0.05	-0.70	0.70	0.15	Pass

-- End of measurement results--

Slow Detector

Toneburst response performed according to IEC 61672-3:2013 18 and ANSI S1.4-2014 Part 3: 18 for compliance to IEC 61672-1:2013 5.9, IEC 60651:2001 9.4.2, ANSI S1.4:1983 (R2006) 8.4.2 and ANSI S1.4-2014 Part 1: 5.9

Amplitude [dB]	Duration [ms]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
137.00	200	-7.55	-7.92	-6.92	0.15	Pass
	2	-27.18	-29.99	-25.99	0.15	Pass

-- End of measurement results--

Fast Detector

Toneburst response performed according to IEC 61672-3:2013 18 and ANSI S1.4-2014 Part 3: 18 for compliance to IEC 61672-1:2013 5.9, IEC 60651:2001 9.4.2, ANSI S1.4:1983 (R2006) 8.4.2 and ANSI S1.4-2014 Part 1: 5.9

Amplitude [dB]	Duration [ms]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
137.00	200.00	-1.10	-1.48	-0.48	0.15	Pass
	2.00	-18.22	-19.49	-16.99	0.15	Pass
	0.25	-27.34	-29.99	-25.99	0.15	Pass

-- End of measurement results--

Sound Exposure Level

Toneburst response performed according to IEC 61672-3:2013 18 and ANSI S1.4-2014 Part 3: 18 for compliance to IEC 61672-1:2013 5.9, IEC 60651:2001 9.4.2, ANSI S1.4:1983 (R2006) 8.4.2 and ANSI S1.4-2014 Part 1: 5.9

Amplitude [dB]	Duration [ms]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
137.00	200.00	-6.99	-7.49	-6.49	0.15	Pass
	2.00	-27.01	-28.49	-25.99	0.15	Pass
	0.25	-36.13	-39.02	-35.02	0.15	Pass

-- End of measurement results--

Peak C-weight

C-weighted peak sound level performed according to IEC 61672-3:2013 19 and ANSI S1.4-2014 Part 3: 19 for compliance to IEC 61672-1:2013 5.13 and ANSI S1.4-2014 Part 1: 5.13

Level [dB]	Frequency [Hz]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
135.00	31.50	138.20	135.50	139.50	0.15	Pass
135.00	500.00	138.53	137.50	139.50	0.15	Pass
135.00	8,000.00	137.61	136.40	140.40	0.15	Pass
135.00, Negative	500.00	137.23	136.40	138.40	0.15	Pass
135.00, Positive	500.00	137.14	136.40	138.40	0.15	Pass

-- End of measurement results--

Peak Z-weight

Z-weighted peak sound level 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
136.00	100	Negative Pulse	136.42	134.09	138.09	0.15	Pass
	100	Positive Pulse	136.32	134.00	138.00	0.15	Pass
126.00	100	Negative Pulse	126.40	124.07	128.07	0.15	Pass
	100	Positive Pulse	126.33	124.00	128.00	0.15	Pass
116.00	100	Negative Pulse	116.41	114.06	118.06	0.15	Pass
	100	Positive Pulse	116.34	114.01	118.01	0.15	Pass
106.00	100	Negative Pulse	106.39	104.05	108.05	0.15	Pass
	100	Positive Pulse	106.34	104.01	108.01	0.15	Pass

-- End of measurement results--

Overload Detector

Overload indication performed according to IEC 61672-3:2013 20 and ANSI S1.4-2014 Part 3: 20 for compliance to IEC 61672-1:2013 5.11, IEC 60804:2000 9.3.5, IEC 61252:2002 11, ANSI S1.4 (R2006) 5.8, and ANSI S1.4-2014 Part 1: 5.11, ANSI S1.25 (R2007) 7.6, ANSI S1.43 (R2007) 7

Measurement	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
Positive	141.10	140.00	142.00	0.15	Pass
Negative	141.10	140.00	142.00	0.15	Pass
Difference	0.00	-1.50	1.50	0.16	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
139.00	40	Negative Pulse	135.94	134.56	136.56	0.15	Pass
		Positive Pulse	135.94	134.44	136.44	0.15	Pass
	30	Negative Pulse	135.10	134.56	136.56	0.15	Pass
		Positive Pulse	134.99	134.44	136.44	0.15	Pass

-- End of measurement results--

Positive Pulse Crest Factor

200 µs 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
138.00	3	OVLD	± 0.50	0.15 ‡	Pass
	5	OVLD	± 1.00	0.15 ‡	Pass
	10	OVLD	± 1.50	0.15 ‡	Pass
128.00	3	-0.11	± 0.50	0.15 ‡	Pass
	5	-0.11	± 1.00	0.15 ‡	Pass
	10	OVLD	± 1.50	0.15 ‡	Pass
118.00	3	-0.11	± 0.50	0.16 ‡	Pass
	5	-0.09	± 1.00	0.15 ‡	Pass
	10	-0.21	± 1.50	0.15 ‡	Pass
108.00	3	-0.13	± 0.50	0.18 ‡	Pass
	5	-0.11	± 1.00	0.15 ‡	Pass
	10	-0.15	± 1.50	0.15 ‡	Pass

-- End of measurement results--

Negative Pulse Crest Factor

200 µs 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
138.00	3	OVLD	± 0.50	0.15 ‡	Pass
	5	OVLD	± 1.00	0.15 ‡	Pass
	10	OVLD	± 1.50	0.15 ‡	Pass
128.00	3	-0.01	± 0.50	0.15 ‡	Pass
	5	0.00	± 1.00	0.15 ‡	Pass
	10	OVLD	± 1.50	0.15 ‡	Pass
118.00	3	-0.01	± 0.50	0.15 ‡	Pass
	5	-0.01	± 1.00	0.15 ‡	Pass
	10	-0.14	± 1.50	0.15 ‡	Pass
108.00	3	-0.03	± 0.50	0.15 ‡	Pass
	5	-0.02	± 1.00	0.15 ‡	Pass
	10	-0.08	± 1.50	0.15 ‡	Pass

-- End of measurement results--

Tone Burst

2kHz tone burst tests at 2.0, 12.0, 22.0, 32.0 dB below Overload Limit

Tone burst response 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
138.00	3	OVLD	± 0.50	0.15	Pass
	5	OVLD	± 1.00	0.15	Pass
128.00	3	-0.06	± 0.50	0.17	Pass
	5	0.00	± 1.00	0.15	Pass
118.00	3	-0.06	± 0.50	0.15	Pass
	5	0.01	± 1.00	0.15	Pass
108.00	3	-0.07	± 0.50	0.15	Pass
	5	-0.02	± 1.00	0.15	Pass

-- End of measurement results--

Impulse Detector - Repeat

Impulse Detector measured according to IEC 60651:2001 9.4.3 and ANSI S1.4:1983 (R2006) 8.4.3

Amplitude [dB]	Repitition Rate [Hz]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
140	100.00	-2.80	-3.71	-1.71	0.15	Pass
	20.00	-7.66	-9.57	-5.57	0.15	Pass
	2.00	-8.83	-10.76	-6.76	0.15	Pass
Step	2.00	4.95	4.00	6.00	0.16	Pass

-- End of measurement results--

Impulse Detector - Single

Impulse Detector measured according to IEC 60651:2001 9.4.3 and ANSI S1.4:1983 (R2006) 8.4.3

Amplitude [dB]	Duration [ms]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
140	20.00	-3.69	-5.11	-2.11	0.15	Pass
	5.00	-8.90	-10.76	-6.76	0.16	Pass
	2.00	-12.73	-14.55	-10.55	0.16	Pass
Step	2.00	10.01	9.00	11.00	0.16	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	94.02	93.91	94.11	0.15	Pass
0 dB Gain, Linearity	29.19	28.31	29.71	0.16	Pass
20 dB Gain	94.03	93.91	94.11	0.15	Pass
20 dB Gain, Linearity	24.13	23.31	24.71	0.16	Pass
OBA Low Range	94.02	93.91	94.11	0.15	Pass
OBA Normal Range	94.01	93.20	94.80	0.15	Pass

-- End of measurement results--

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	7.72	15.00	Pass
C-weight Noise Floor	12.57	17.30	Pass
Z-weight Noise Floor	21.37	24.50	Pass

-- End of measurement results--

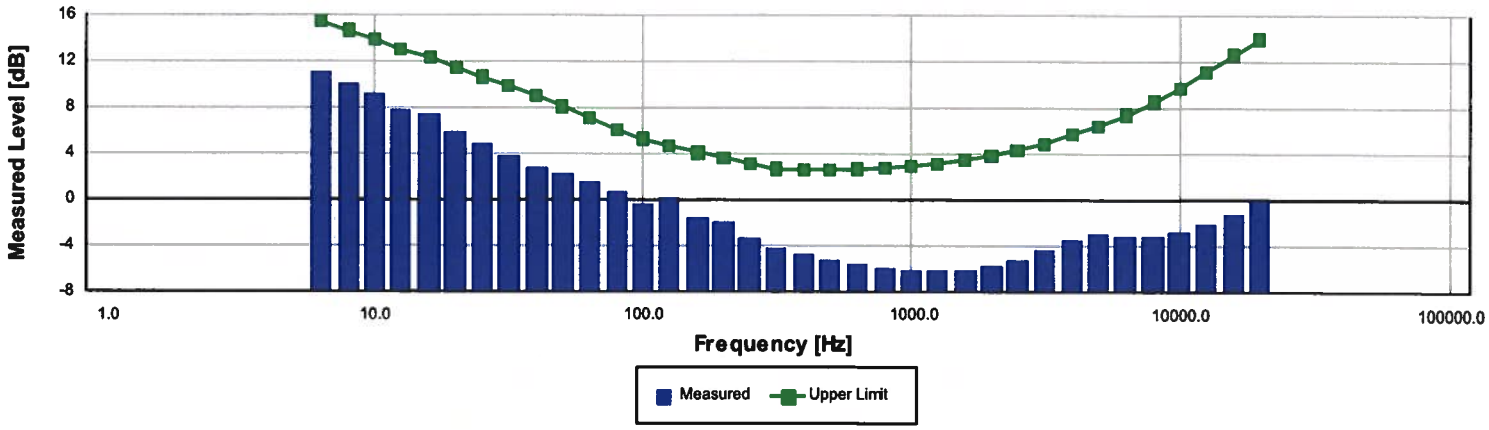
Total Harmonic Distortion

Measured using 1/3-Octave filters

Measurement	Test Result [dB]	Lower Limit [dB]	Upper Limit [dB]	Expanded Uncertainty [dB]	Result
10 Hz Signal	137.53	137.20	138.80	0.15	Pass
THD	-69.43		-60.00	0.01 ‡	Pass
THD+N	-64.39		-60.00	0.01 ‡	Pass

-- End of measurement results--

1/3-Octave Self-Generated Noise



The SLM is set to low range and 20 dB gain.

Frequency [Hz]	Test Result [dB]	Upper limit [dB]	Result
6.30	11.17	15.50	Pass
8.00	10.03	14.70	Pass
10.00	9.16	13.90	Pass
12.50	7.85	13.10	Pass
16.00	7.45	12.30	Pass
20.00	5.95	11.50	Pass
25.00	4.94	10.70	Pass
31.50	3.84	9.90	Pass
40.00	2.73	9.10	Pass
50.00	2.25	8.10	Pass
63.00	1.50	7.10	Pass
80.00	0.69	6.10	Pass
100.00	-0.38	5.30	Pass
125.00	0.24	4.70	Pass
160.00	-1.57	4.10	Pass
200.00	-1.83	3.60	Pass
250.00	-3.26	3.10	Pass
315.00	-4.10	2.70	Pass
400.00	-4.60	2.60	Pass
500.00	-5.14	2.60	Pass
630.00	-5.58	2.70	Pass
800.00	-5.93	2.80	Pass
1,000.00	-6.10	3.00	Pass
1,250.00	-6.15	3.20	Pass
1,600.00	-6.01	3.50	Pass
2,000.00	-5.70	3.80	Pass
2,500.00	-5.16	4.30	Pass
3,150.00	-4.32	4.90	Pass
4,000.00	-3.41	5.70	Pass
5,000.00	-2.99	6.40	Pass
6,300.00	-3.07	7.40	Pass
8,000.00	-3.11	8.60	Pass
10,000.00	-2.69	9.80	Pass
12,500.00	-2.03	11.20	Pass
16,000.00	-1.15	12.60	Pass
20,000.00	-0.07	14.00	Pass

-- End of measurement results--

-- End of Report--

Signatory: *Jacob Cannon*

LARSON DAVIS – A PCB DIVISION
1681 West 820 North
Provo, UT 84601, United States
716-684-0001

ACCREDITED CERT #3622.01

LARSON DAVIS A PCB DIVISION

Calibration Certificate

Certificate Number 2023017499
Customer:
WSP Canada Inc

,

Model Number	831	***Procedure Number***	D0001.8384		
Serial Number	0001702	***Technician***	Jacob Cannon		
Test Results	**Pass**	***Calibration Date***	28 Dec 2023		
Initial Condition	AS RECEIVED same as shipped	***Calibration Due***	28 Dec 2024		
Description	Larson Davis Model 831 Class 1 Sound Level Meter Firmware Revision: 2.403	***Temperature***	23.57	°C	± 0.25 °C
		Humidity	50.6	%RH	± 2.0 %RH
		Static Pressure	86.9	kPa	± 0.13 kPa

Evaluation Method ***Tested with:***

PCB 377B20. S/N 115034
Larson Davis CAL291. S/N 0108
Larson Davis PRM831. S/N 019106
Larson Davis CAL200. S/N 9079

Data reported in dB re 20 µPa.

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 17025:2017.
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 9001:2015.

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.

Correction data from Larson Davis Model 831 Sound Level Meter Manual, I831.01 Rev S, 2019-09-10

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.

LARSON DAVIS – A PCB DIVISION
1681 West 820 North
Provo, UT 84601, United States
716-684-0001

ACCREDITED CERT #3622.01

LARSON DAVIS
A PCB DIVISION

Calibration Check Frequency: 1000 Hz; Reference Sound Pressure Level: 114 dB re 20 µPa; Reference Range: 0 dB gain

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 2016-02-24 certificate number DE-15-M-PTB-0056.

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 1specifications in IEC 61672-1:2013 / ANSI/ASA S1.4-2014/Part 1.

Standards Used

Description	Cal Date	Cal Due	Cal Standard
Larson Davis CAL291 Residual Intensity Calibrator	2023-09-12	2024-09-12	001250
Hart Scientific 2626-S Humidity/Temperature Sensor	2023-02-20	2024-08-20	006946
Larson Davis CAL200 Acoustic Calibrator	2023-07-17	2024-07-17	007027
Larson Davis Model 831	2023-02-22	2024-02-22	007182
PCB 377A13 1/2 inch Prepolarized Pressure Microphone	2023-03-06	2024-03-06	007185
SRS DS360 Ultra Low Distortion Generator	2023-03-30	2024-03-30	007635
Larson Davis 1/2" Preamplifier for Model 831 Type 1	2023-09-28	2024-09-28	PCB0004783

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	114.01	113.80	114.20	0.14	Pass

As Received Level: 114.42
Adjusted Level: 114.01

-- End of measurement results--

Loaded Circuit Sensitivity

Measurement	Test Result [dB re 1 V / Pa]	Lower Limit [dB re 1 V / Pa]	Upper Limit [dB re 1 V / Pa]	Expanded Uncertainty [dB]	Result
1000 Hz	-24.98	-27.82	-24.69	0.14	Pass

-- End of measurement results--

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	-0.10	-0.20	-1.20	0.80	0.23	Pass
1000	0.09	0.00	-0.70	0.70	0.23	Pass
8000	-2.71	-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, 20 dB gain	40.58

-- End of measurement results--

-- End of Report--

Signatory: Jacob Cannon

LARSON DAVIS – A PCB DIVISION
1681 West 820 North
Provo, UT 84601, United States
716-684-0001

ACCREDITED CERT #3622.01

LARSON DAVIS A PCB DIVISION

APPENDIX B

Weather Data

Longitude (x)	Latitude (y)	Station Name	Climate ID	Date/Time (LST)	Year	Month	Day	Time (LST)	Temp (°C)	Dew Point Temp (°C)	Relative Humidity (%)	Wind Dir (10s degree)	Wind Speed (km/h)	Visibility (km)	Station Pressure (kPa)	Weather
-66.86	52.92	WABUSH A	8504177	2024-08-28 0:00	2024	8	28	0:00	10.5	5.9	73	29	24	16.1	94	NA
-66.86	52.92	WABUSH A	8504177	2024-08-28 1:00	2024	8	28	1:00	10.1	6.1	76	30	22	16.1	93.99	NA
-66.86	52.92	WABUSH A	8504177	2024-08-28 2:00	2024	8	28	2:00	9.5	6.6	82	31	15	16.1	94	NA
-66.86	52.92	WABUSH A	8504177	2024-08-28 3:00	2024	8	28	3:00	9.1	5.2	77	30	21	16.1	93.96	NA
-66.86	52.92	WABUSH A	8504177	2024-08-28 4:00	2024	8	28	4:00	7.8	6.1	89	29	17	16.1	93.99	NA
-66.86	52.92	WABUSH A	8504177	2024-08-28 5:00	2024	8	28	5:00	7.3	5.2	86	30	15	16.1	94.03	NA
-66.86	52.92	WABUSH A	8504177	2024-08-28 6:00	2024	8	28	6:00	7.7	4.7	81	29	18	16.1	94.09	NA
-66.86	52.92	WABUSH A	8504177	2024-08-28 7:00	2024	8	28	7:00	7.7	5.4	85	29	18	16.1	94.12	NA
-66.86	52.92	WABUSH A	8504177	2024-08-28 8:00	2024	8	28	8:00	8.7	5.1	78	31	21	16.1	94.15	NA
-66.86	52.92	WABUSH A	8504177	2024-08-28 9:00	2024	8	28	9:00	8.9	5.8	81	31	21	16.1	94.19	NA
-66.86	52.92	WABUSH A	8504177	2024-08-28 10:00	2024	8	28	10:00	9.7	6	78	29	24	16.1	94.23	NA
-66.86	52.92	WABUSH A	8504177	2024-08-28 11:00	2024	8	28	11:00	10.2	6.4	77	33	17	16.1	94.29	NA
-66.86	52.92	WABUSH A	8504177	2024-08-28 12:00	2024	8	28	12:00	10.9	6.5	74	32	18	16.1	94.36	NA
-66.86	52.92	WABUSH A	8504177	2024-08-28 13:00	2024	8	28	13:00	10	7.1	82	32	24	11.3	94.42	Rain
-66.86	52.92	WABUSH A	8504177	2024-08-28 14:00	2024	8	28	14:00	10.9	3.7	61	33	35	16.1	94.5	NA
-66.86	52.92	WABUSH A	8504177	2024-08-28 15:00	2024	8	28	15:00	10	2.7	60	33	39	16.1	94.58	NA
-66.86	52.92	WABUSH A	8504177	2024-08-28 16:00	2024	8	28	16:00	8.5	5.3	80	32	30	14.5	94.69	Rain
-66.86	52.92	WABUSH A	8504177	2024-08-28 17:00	2024	8	28	17:00	8.6	5.4	80	34	24	16.1	94.79	Rain
-66.86	52.92	WABUSH A	8504177	2024-08-28 18:00	2024	8	28	18:00	10	5.2	72	34	24	16.1	94.87	NA
-66.86	52.92	WABUSH A	8504177	2024-08-28 19:00	2024	8	28	19:00	8.8	6.1	83	32	24	12.9	94.96	Rain
-66.86	52.92	WABUSH A	8504177	2024-08-28 20:00	2024	8	28	20:00	8.6	4.6	76	34	18	16.1	95.08	NA
-66.86	52.92	WABUSH A	8504177	2024-08-28 21:00	2024	8	28	21:00	8.1	5.1	81	33	17	16.1	95.19	NA
-66.86	52.92	WABUSH A	8504177	2024-08-28 22:00	2024	8	28	22:00	8	5.6	85	33	18	16.1	95.27	NA
-66.86	52.92	WABUSH A	8504177	2024-08-28 23:00	2024	8	28	23:00	7.7	5.2	84	34	15	16.1	95.32	NA
-66.86	52.92	WABUSH A	8504177	2024-08-29 0:00	2024	8	29	0:00	7.5	4.7	82	33	15	16.1	95.38	NA
-66.86	52.92	WABUSH A	8504177	2024-08-29 1:00	2024	8	29	1:00	8	4.3	78	35	15	16.1	95.41	NA
-66.86	52.92	WABUSH A	8504177	2024-08-29 2:00	2024	8	29	2:00	7.5	3.2	74	34	15	16.1	95.47	NA
-66.86	52.92	WABUSH A	8504177	2024-08-29 3:00	2024	8	29	3:00	6.8	2.3	73	35	11	16.1	95.53	NA
-66.86	52.92	WABUSH A	8504177	2024-08-29 4:00	2024	8	29	4:00	6.3	2.4	76	31	13	16.1	95.56	NA
-66.86	52.92	WABUSH A	8504177	2024-08-29 5:00	2024	8	29	5:00	4.8	3	88	27	17	16.1	95.65	NA
-66.86	52.92	WABUSH A	8504177	2024-08-29 6:00	2024	8	29	6:00	5	2.5	84	29	11	16.1	95.75	NA
-66.86	52.92	WABUSH A	8504177	2024-08-29 7:00	2024	8	29	7:00	6.9	3.3	78	28	8	16.1	95.84	NA
-66.86	52.92	WABUSH A	8504177	2024-08-29 8:00	2024	8	29	8:00	9.2	3.5	68	34	11	16.1	95.91	NA
-66.86	52.92	WABUSH A	8504177	2024-08-29 9:00	2024	8	29	9:00	11.2	4	61	35	18	16.1	95.95	NA

Longitude (x)	Latitude (y)	Station Name	Climate ID	Date/Time (LST)	Year	Month	Day	Time (LST)	Temp (°C)	Dew Point Temp (°C)	Relative Humidity (%)	Wind Dir (10s degree)	Wind Speed (km/h)	Visibility (km)	Station Pressure (kPa)	Weather
-66.86	52.92	WABUSH A	8504177	2024-08-29 10:00	2024	8	29	10:00	12.9	4.8	58	34	15	16.1	95.97	NA
-66.86	52.92	WABUSH A	8504177	2024-08-29 11:00	2024	8	29	11:00	14.4	5.4	54	35	9	16.1	95.98	NA
-66.86	52.92	WABUSH A	8504177	2024-08-29 12:00	2024	8	29	12:00	16.1	4.9	47	35	17	16.1	95.97	NA
-66.86	52.92	WABUSH A	8504177	2024-08-29 13:00	2024	8	29	13:00	16.6	4.5	44	34	18	16.1	95.95	NA
-66.86	52.92	WABUSH A	8504177	2024-08-29 14:00	2024	8	29	14:00	17.3	3.9	41	33	17	16.1	95.93	NA
-66.86	52.92	WABUSH A	8504177	2024-08-29 15:00	2024	8	29	15:00	18.4	4.1	38	34	15	16.1	95.91	NA
-66.86	52.92	WABUSH A	8504177	2024-08-29 16:00	2024	8	29	16:00	18.4	3.8	38	28	11	16.1	95.88	NA
-66.86	52.92	WABUSH A	8504177	2024-08-29 17:00	2024	8	29	17:00	17.6	4.1	40	27	17	16.1	95.88	NA
-66.86	52.92	WABUSH A	8504177	2024-08-29 18:00	2024	8	29	18:00	16.2	3.8	43	30	13	16.1	95.9	NA
-66.86	52.92	WABUSH A	8504177	2024-08-29 19:00	2024	8	29	19:00	14.3	4.1	50	29	9	16.1	95.89	NA
-66.86	52.92	WABUSH A	8504177	2024-08-29 20:00	2024	8	29	20:00	12.4	4.4	58	28	8	16.1	95.91	NA
-66.86	52.92	WABUSH A	8504177	2024-08-29 21:00	2024	8	29	21:00	11.6	4.9	63	24	9	16.1	95.91	NA
-66.86	52.92	WABUSH A	8504177	2024-08-29 22:00	2024	8	29	22:00	6.6	3.9	83	19	8	16.1	95.89	NA
-66.86	52.92	WABUSH A	8504177	2024-08-29 23:00	2024	8	29	23:00	5.9	4.2	89	18	5	16.1	95.88	NA
-66.86	52.92	WABUSH A	8504177	2024-08-30 0:00	2024	8	30	0:00	5	3.6	90	17	11	16.1	95.86	NA
-66.86	52.92	WABUSH A	8504177	2024-08-30 1:00	2024	8	30	1:00	4.1	2.9	92	16	5	16.1	95.83	NA
-66.86	52.92	WABUSH A	8504177	2024-08-30 2:00	2024	8	30	2:00	4.4	3.7	95	13	5	16.1	95.79	NA
-66.86	52.92	WABUSH A	8504177	2024-08-30 3:00	2024	8	30	3:00	4.8	4.1	95	15	11	16.1	95.78	NA
-66.86	52.92	WABUSH A	8504177	2024-08-30 4:00	2024	8	30	4:00	5.1	4	93	16	13	16.1	95.77	NA
-66.86	52.92	WABUSH A	8504177	2024-08-30 5:00	2024	8	30	5:00	4.7	3.1	89	17	9	16.1	95.78	NA
-66.86	52.92	WABUSH A	8504177	2024-08-30 6:00	2024	8	30	6:00	3.7	2.3	90	19	8	16.1	95.82	NA
-66.86	52.92	WABUSH A	8504177	2024-08-30 7:00	2024	8	30	7:00	8.4	5	79	18	8	16.1	95.86	NA
-66.86	52.92	WABUSH A	8504177	2024-08-30 8:00	2024	8	30	8:00	12.2	4.7	60		4	16.1	95.82	NA
-66.86	52.92	WABUSH A	8504177	2024-08-30 9:00	2024	8	30	9:00	15.3	5.2	51	26	11	16.1	95.77	NA
-66.86	52.92	WABUSH A	8504177	2024-08-30 10:00	2024	8	30	10:00	16.7	5	46	28	17	16.1	95.74	NA
-66.86	52.92	WABUSH A	8504177	2024-08-30 11:00	2024	8	30	11:00	18.6	4.3	39	27	11	16.1	95.65	NA
-66.86	52.92	WABUSH A	8504177	2024-08-30 12:00	2024	8	30	12:00	20.2	3.3	33	23	15	16.1	95.57	NA
-66.86	52.92	WABUSH A	8504177	2024-08-30 13:00	2024	8	30	13:00	21.5	3.5	30	25	21	16.1	95.48	NA
-66.86	52.92	WABUSH A	8504177	2024-08-30 14:00	2024	8	30	14:00	22.6	4.9	31	27	18	16.1	95.38	NA
-66.86	52.92	WABUSH A	8504177	2024-08-30 15:00	2024	8	30	15:00	23.8	3.9	27	23	18	16.1	95.28	NA
-66.86	52.92	WABUSH A	8504177	2024-08-30 16:00	2024	8	30	16:00	24.1	2.7	24	24	26	16.1	95.19	NA
-66.86	52.92	WABUSH A	8504177	2024-08-30 17:00	2024	8	30	17:00	22.5	3.8	29	20	22	16.1	95.15	NA
-66.86	52.92	WABUSH A	8504177	2024-08-30 18:00	2024	8	30	18:00	22	3.6	30	21	22	16.1	95.1	NA
-66.86	52.92	WABUSH A	8504177	2024-08-30 19:00	2024	8	30	19:00	19.3	5.7	41	19	15	16.1	95.07	NA

Longitude (x)	Latitude (y)	Station Name	Climate ID	Date/Time (LST)	Year	Month	Day	Time (LST)	Temp (°C)	Dew Point Temp (°C)	Relative Humidity (%)	Wind Dir (10s degree)	Wind Speed (km/h)	Visibility (km)	Station Pressure (kPa)	Weather
-66.86	52.92	WABUSH A	8504177	2024-08-30 20:00	2024	8	30	20:00	18.1	5.1	42	19	17	16.1	95.03	NA
-66.86	52.92	WABUSH A	8504177	2024-08-30 21:00	2024	8	30	21:00	16.7	5.1	46	19	15	16.1	94.94	NA
-66.86	52.92	WABUSH A	8504177	2024-08-30 22:00	2024	8	30	22:00	14.8	5.7	54	17	11	16.1	94.86	NA
-66.86	52.92	WABUSH A	8504177	2024-08-30 23:00	2024	8	30	23:00	15.9	5.9	51	20	22	16.1	94.77	NA
-66.86	52.92	WABUSH A	8504177	2024-08-31 0:00	2024	8	31	0:00	15.9	6.4	53	20	24	16.1	94.7	NA
-66.86	52.92	WABUSH A	8504177	2024-08-31 1:00	2024	8	31	1:00	15.2	7.3	59	18	18	16.1	94.63	NA
-66.86	52.92	WABUSH A	8504177	2024-08-31 2:00	2024	8	31	2:00	15	7.6	61	20	24	16.1	94.52	NA
-66.86	52.92	WABUSH A	8504177	2024-08-31 3:00	2024	8	31	3:00	14.8	6.7	58	19	24	16.1	94.41	NA
-66.86	52.92	WABUSH A	8504177	2024-08-31 4:00	2024	8	31	4:00	14.5	6.7	59	19	18	16.1	94.35	NA
-66.86	52.92	WABUSH A	8504177	2024-08-31 5:00	2024	8	31	5:00	14.5	7.4	62	21	13	16.1	94.29	NA
-66.86	52.92	WABUSH A	8504177	2024-08-31 6:00	2024	8	31	6:00	13.6	9.8	78	21	21	16.1	94.22	Rain
-66.86	52.92	WABUSH A	8504177	2024-08-31 7:00	2024	8	31	7:00	13.8	11.2	84	21	24	11.3	94.19	Rain
-66.86	52.92	WABUSH A	8504177	2024-08-31 8:00	2024	8	31	8:00	13.8	13	95	20	24	9.7	94.15	Rain,Fog
-66.86	52.92	WABUSH A	8504177	2024-08-31 9:00	2024	8	31	9:00	14.2	13.4	95	21	24	9.7	94.1	Rain,Fog
-66.86	52.92	WABUSH A	8504177	2024-08-31 10:00	2024	8	31	10:00	14.5	13.7	95	21	24	9.7	94.08	Fog
-66.86	52.92	WABUSH A	8504177	2024-08-31 11:00	2024	8	31	11:00	16.2	14.3	88	21	28	16.1	94.04	NA
-66.86	52.92	WABUSH A	8504177	2024-08-31 12:00	2024	8	31	12:00	17.2	14.2	82	22	26	16.1	94.03	NA
-66.86	52.92	WABUSH A	8504177	2024-08-31 13:00	2024	8	31	13:00	18.4	13.8	74	22	28	16.1	94.01	NA
-66.86	52.92	WABUSH A	8504177	2024-08-31 14:00	2024	8	31	14:00	19	13.1	68	23	26	16.1	93.97	NA
-66.86	52.92	WABUSH A	8504177	2024-08-31 15:00	2024	8	31	15:00	19.5	12.6	64	23	32	16.1	93.96	NA
-66.86	52.92	WABUSH A	8504177	2024-08-31 16:00	2024	8	31	16:00	20.2	12.6	61	23	28	16.1	93.92	NA
-66.86	52.92	WABUSH A	8504177	2024-08-31 17:00	2024	8	31	17:00	19.6	12.7	64	22	22	16.1	93.93	NA
-66.86	52.92	WABUSH A	8504177	2024-08-31 18:00	2024	8	31	18:00	18.9	12.9	68	21	18	16.1	93.94	NA
-66.86	52.92	WABUSH A	8504177	2024-08-31 19:00	2024	8	31	19:00	17.8	13.6	76	23	13	16.1	93.94	Rain
-66.86	52.92	WABUSH A	8504177	2024-08-31 20:00	2024	8	31	20:00	17.2	10.9	66	25	15	16.1	94.01	NA
-66.86	52.92	WABUSH A	8504177	2024-08-31 21:00	2024	8	31	21:00	15.6	11	74	21	9	16.1	94.03	NA
-66.86	52.92	WABUSH A	8504177	2024-08-31 22:00	2024	8	31	22:00	15.7	10.7	72	22	9	16.1	94.06	NA
-66.86	52.92	WABUSH A	8504177	2024-08-31 23:00	2024	8	31	23:00	15.1	12.3	83	22	13	16.1	94.06	NA
-66.86	52.92	WABUSH A	8504177	2024-09-01 0:00	2024	9	1	0:00	14.2	12.7	91	21	11	16.1	94.04	NA
-66.86	52.92	WABUSH A	8504177	2024-09-01 1:00	2024	9	1	1:00	12.6	12.2	98	16	8	16.1	94.03	NA
-66.86	52.92	WABUSH A	8504177	2024-09-01 2:00	2024	9	1	2:00	12.1	11.8	98	17	9	16.1	94.03	NA
-66.86	52.92	WABUSH A	8504177	2024-09-01 3:00	2024	9	1	3:00	12.6	12.3	98	20	11	16.1	94	NA
-66.86	52.92	WABUSH A	8504177	2024-09-01 4:00	2024	9	1	4:00	12	11.7	98	16	5	16.1	94.01	NA
-66.86	52.92	WABUSH A	8504177	2024-09-01 5:00	2024	9	1	5:00	11.3	11.2	99	18	9	3.2	93.95	NA

Longitude (x)	Latitude (y)	Station Name	Climate ID	Date/Time (LST)	Year	Month	Day	Time (LST)	Temp (°C)	Dew Point Temp (°C)	Relative Humidity (%)	Wind Dir (10s degree)	Wind Speed (km/h)	Visibility (km)	Station Pressure (kPa)	Weather
-66.86	52.92	WABUSH A	8504177	2024-09-01 6:00	2024	9	1	6:00	11.6	11.5	99	18	11	16.1	93.95	NA
-66.86	52.92	WABUSH A	8504177	2024-09-01 7:00	2024	9	1	7:00	13.7	13.3	97	18	8	16.1	93.91	NA
-66.86	52.92	WABUSH A	8504177	2024-09-01 8:00	2024	9	1	8:00	15.4	13.3	87	17	18	16.1	93.86	NA
-66.86	52.92	WABUSH A	8504177	2024-09-01 9:00	2024	9	1	9:00	17	12.8	76	19	21	16.1	93.79	NA
-66.86	52.92	WABUSH A	8504177	2024-09-01 10:00	2024	9	1	10:00	17.7	12.6	72	19	28	16.1	93.7	NA
-66.86	52.92	WABUSH A	8504177	2024-09-01 11:00	2024	9	1	11:00	19.7	12.1	61	18	34	16.1	93.61	NA
-66.86	52.92	WABUSH A	8504177	2024-09-01 12:00	2024	9	1	12:00	20	11.4	57	19	30	16.1	93.49	NA
-66.86	52.92	WABUSH A	8504177	2024-09-01 13:00	2024	9	1	13:00	20.4	11.2	55	18	34	16.1	93.4	NA
-66.86	52.92	WABUSH A	8504177	2024-09-01 14:00	2024	9	1	14:00	19.6	11.1	58	19	34	16.1	93.36	NA
-66.86	52.92	WABUSH A	8504177	2024-09-01 15:00	2024	9	1	15:00	19.5	11.6	60	17	22	16.1	93.27	NA
-66.86	52.92	WABUSH A	8504177	2024-09-01 16:00	2024	9	1	16:00	19.6	11.5	59	17	24	16.1	93.16	NA
-66.86	52.92	WABUSH A	8504177	2024-09-01 17:00	2024	9	1	17:00	17.9	11.8	67	17	28	16.1	93.1	NA
-66.86	52.92	WABUSH A	8504177	2024-09-01 18:00	2024	9	1	18:00	14.9	13.6	92	19	21	16.1	93.1	NA
-66.86	52.92	WABUSH A	8504177	2024-09-01 19:00	2024	9	1	19:00	14.7	13.1	90	21	26	16.1	93.16	NA
-66.86	52.92	WABUSH A	8504177	2024-09-01 20:00	2024	9	1	20:00	13.9	12.6	92	22	11	16.1	93.18	NA
-66.86	52.92	WABUSH A	8504177	2024-09-01 21:00	2024	9	1	21:00	12.9	11.6	92	22	17	16.1	93.22	NA
-66.86	52.92	WABUSH A	8504177	2024-09-01 22:00	2024	9	1	22:00	11	9.9	93	28	32	11.3	93.34	NA
-66.86	52.92	WABUSH A	8504177	2024-09-01 23:00	2024	9	1	23:00	8.7	6.6	86	28	24	16.1	93.45	NA
-66.86	52.92	WABUSH A	8504177	2024-09-02 0:00	2024	9	2	0:00	7.8	5.5	85	29	22	16.1	93.55	NA
-66.86	52.92	WABUSH A	8504177	2024-09-02 1:00	2024	9	2	1:00	7.6	5.6	87	25	5	16.1	93.67	NA
-66.86	52.92	WABUSH A	8504177	2024-09-02 2:00	2024	9	2	2:00	7.5	5.7	88	26	21	16.1	93.71	NA
-66.86	52.92	WABUSH A	8504177	2024-09-02 3:00	2024	9	2	3:00	7.3	5.3	87	25	13	16.1	93.73	NA
-66.86	52.92	WABUSH A	8504177	2024-09-02 4:00	2024	9	2	4:00	7.1	4.6	84	24	21	16.1	93.75	NA
-66.86	52.92	WABUSH A	8504177	2024-09-02 5:00	2024	9	2	5:00	6.9	4.8	87	25	9	16.1	93.79	NA
-66.86	52.92	WABUSH A	8504177	2024-09-02 6:00	2024	9	2	6:00	7.2	5	86	23	15	16.1	93.84	NA
-66.86	52.92	WABUSH A	8504177	2024-09-02 7:00	2024	9	2	7:00	6.4	5.8	96	26	13	3.2	93.89	NA
-66.86	52.92	WABUSH A	8504177	2024-09-02 8:00	2024	9	2	8:00	7.1	5.1	87	26	21	16.1	93.93	NA
-66.86	52.92	WABUSH A	8504177	2024-09-02 9:00	2024	9	2	9:00	7.9	5.7	86	24	11	16.1	93.94	NA
-66.86	52.92	WABUSH A	8504177	2024-09-02 10:00	2024	9	2	10:00	8.6	4.6	76	26	24	16.1	93.94	NA
-66.86	52.92	WABUSH A	8504177	2024-09-02 11:00	2024	9	2	11:00	9.3	4.9	74	26	21	16.1	93.93	NA
-66.86	52.92	WABUSH A	8504177	2024-09-02 12:00	2024	9	2	12:00	10.8	4.1	63	23	34	16.1	93.89	NA
-66.86	52.92	WABUSH A	8504177	2024-09-02 13:00	2024	9	2	13:00	11.2	5.1	66	25	26	16.1	93.9	NA
-66.86	52.92	WABUSH A	8504177	2024-09-02 14:00	2024	9	2	14:00	11	5	66	26	18	16.1	93.88	NA
-66.86	52.92	WABUSH A	8504177	2024-09-02 15:00	2024	9	2	15:00	11.4	4.1	61	25	34	16.1	93.89	NA

Longitude (x)	Latitude (y)	Station Name	Climate ID	Date/Time (LST)	Year	Month	Day	Time (LST)	Temp (°C)	Dew Point Temp (°C)	Relative Humidity (%)	Wind Dir (10s degree)	Wind Speed (km/h)	Visibility (km)	Station Pressure (kPa)	Weather
-66.86	52.92	WABUSH A	8504177	2024-09-02 16:00	2024	9	2	16:00	10.7	4.2	64	26	22	16.1	93.96	NA
-66.86	52.92	WABUSH A	8504177	2024-09-02 17:00	2024	9	2	17:00	10.4	3.6	62	27	26	16.1	93.98	NA
-66.86	52.92	WABUSH A	8504177	2024-09-02 18:00	2024	9	2	18:00	8.4	4.3	75	28	22	16.1	94.03	NA
-66.86	52.92	WABUSH A	8504177	2024-09-02 19:00	2024	9	2	19:00	8.6	3.3	69	27	22	16.1	94.04	NA
-66.86	52.92	WABUSH A	8504177	2024-09-02 20:00	2024	9	2	20:00	8	3.3	72	26	17	16.1	94.1	NA
-66.86	52.92	WABUSH A	8504177	2024-09-02 21:00	2024	9	2	21:00	6.5	4	84	27	9	16.1	94.11	NA
-66.86	52.92	WABUSH A	8504177	2024-09-02 22:00	2024	9	2	22:00	6.8	3.4	79	28	17	16.1	94.12	NA
-66.86	52.92	WABUSH A	8504177	2024-09-02 23:00	2024	9	2	23:00	5.9	4.4	90	28	11	16.1	94.16	NA
-66.86	52.92	WABUSH A	8504177	2024-09-03 0:00	2024	9	3	0:00	6.3	3.5	82	27	15	16.1	94.16	NA
-66.86	52.92	WABUSH A	8504177	2024-09-03 1:00	2024	9	3	1:00	6.2	4	86	27	15	16.1	94.16	NA
-66.86	52.92	WABUSH A	8504177	2024-09-03 2:00	2024	9	3	2:00	6.1	3.4	83	28	18	16.1	94.18	NA
-66.86	52.92	WABUSH A	8504177	2024-09-03 3:00	2024	9	3	3:00	5.4	4.4	93	28	17	16.1	94.17	NA
-66.86	52.92	WABUSH A	8504177	2024-09-03 4:00	2024	9	3	4:00	5.5	3.5	87	27	17	16.1	94.2	NA
-66.86	52.92	WABUSH A	8504177	2024-09-03 5:00	2024	9	3	5:00	5.4	3.7	89	27	21	16.1	94.21	NA
-66.86	52.92	WABUSH A	8504177	2024-09-03 6:00	2024	9	3	6:00	5.5	4	90	27	15	16.1	94.24	NA
-66.86	52.92	WABUSH A	8504177	2024-09-03 7:00	2024	9	3	7:00	5.8	3.8	87	27	13	16.1	94.31	NA
-66.86	52.92	WABUSH A	8504177	2024-09-03 8:00	2024	9	3	8:00	6.1	3.8	85	28	21	16.1	94.33	NA
-66.86	52.92	WABUSH A	8504177	2024-09-03 9:00	2024	9	3	9:00	6.3	3.8	84	29	22	16.1	94.4	NA
-66.86	52.92	WABUSH A	8504177	2024-09-03 10:00	2024	9	3	10:00	8	4.3	77	29	24	16.1	94.45	NA
-66.86	52.92	WABUSH A	8504177	2024-09-03 11:00	2024	9	3	11:00	8.8	4.2	73	30	18	16.1	94.48	NA
-66.86	52.92	WABUSH A	8504177	2024-09-03 12:00	2024	9	3	12:00	9.7	5.1	73	28	13	16.1	94.52	NA
-66.86	52.92	WABUSH A	8504177	2024-09-03 13:00	2024	9	3	13:00	9.4	4.6	72	28	26	16.1	94.54	NA
-66.86	52.92	WABUSH A	8504177	2024-09-03 14:00	2024	9	3	14:00	9.3	5.2	76	29	18	16.1	94.59	NA
-66.86	52.92	WABUSH A	8504177	2024-09-03 15:00	2024	9	3	15:00	9.8	5.1	72	29	22	16.1	94.61	NA
-66.86	52.92	WABUSH A	8504177	2024-09-03 16:00	2024	9	3	16:00	9.8	5.6	75	29	32	11.3	94.68	NA
-66.86	52.92	WABUSH A	8504177	2024-09-03 17:00	2024	9	3	17:00	10.3	5.3	71	28	22	16.1	94.69	NA
-66.86	52.92	WABUSH A	8504177	2024-09-03 18:00	2024	9	3	18:00	8.8	5.3	79	29	21	16.1	94.74	NA
-66.86	52.92	WABUSH A	8504177	2024-09-03 19:00	2024	9	3	19:00	8.3	5.6	83	28	18	16.1	94.84	NA
-66.86	52.92	WABUSH A	8504177	2024-09-03 20:00	2024	9	3	20:00	7.6	5.3	85	28	13	16.1	94.92	NA
-66.86	52.92	WABUSH A	8504177	2024-09-03 21:00	2024	9	3	21:00	7.3	5	85	32	9	16.1	95.01	NA
-66.86	52.92	WABUSH A	8504177	2024-09-03 22:00	2024	9	3	22:00	7.4	4.7	83	28	8	16.1	95.08	NA
-66.86	52.92	WABUSH A	8504177	2024-09-03 23:00	2024	9	3	23:00	6.3	4.5	88	28	8	16.1	95.12	NA
-66.86	52.92	WABUSH A	8504177	2024-09-04 0:00	2024	9	4	0:00	6.4	5.2	92	29	13	16.1	95.18	NA
-66.86	52.92	WABUSH A	8504177	2024-09-04 1:00	2024	9	4	1:00	5.8	3.8	87	33	17	16.1	95.28	NA

Longitude (x)	Latitude (y)	Station Name	Climate ID	Date/Time (LST)	Year	Month	Day	Time (LST)	Temp (°C)	Dew Point Temp (°C)	Relative Humidity (%)	Wind Dir (10s degree)	Wind Speed (km/h)	Visibility (km)	Station Pressure (kPa)	Weather
-66.86	52.92	WABUSH A	8504177	2024-09-04 2:00	2024	9	4	2:00	4.6	3.3	91	28	13	16.1	95.34	NA
-66.86	52.92	WABUSH A	8504177	2024-09-04 3:00	2024	9	4	3:00	5.1	3.8	91	26	9	16.1	95.37	NA
-66.86	52.92	WABUSH A	8504177	2024-09-04 4:00	2024	9	4	4:00	5.3	4	91	27	9	16.1	95.42	NA
-66.86	52.92	WABUSH A	8504177	2024-09-04 5:00	2024	9	4	5:00	5.7	4.7	93	28	8	16.1	95.5	NA
-66.86	52.92	WABUSH A	8504177	2024-09-04 6:00	2024	9	4	6:00	5.6	4.4	92	25	8	16.1	95.53	NA
-66.86	52.92	WABUSH A	8504177	2024-09-04 7:00	2024	9	4	7:00	6.2	4.5	89	25	5	16.1	95.61	NA
-66.86	52.92	WABUSH A	8504177	2024-09-04 8:00	2024	9	4	8:00	7.3	4.1	80	26	9	16.1	95.67	NA
-66.86	52.92	WABUSH A	8504177	2024-09-04 9:00	2024	9	4	9:00	8.6	3.3	69	24	13	16.1	95.67	NA
-66.86	52.92	WABUSH A	8504177	2024-09-04 10:00	2024	9	4	10:00	10.6	3.4	61	25	18	16.1	95.66	NA
-66.86	52.92	WABUSH A	8504177	2024-09-04 11:00	2024	9	4	11:00	12.5	3.7	55	22	17	16.1	95.64	NA
-66.86	52.92	WABUSH A	8504177	2024-09-04 12:00	2024	9	4	12:00	13.8	3.7	50	23	18	16.1	95.56	NA
-66.86	52.92	WABUSH A	8504177	2024-09-04 13:00	2024	9	4	13:00	14.7	5.3	53	23	18	16.1	95.54	NA
-66.86	52.92	WABUSH A	8504177	2024-09-04 14:00	2024	9	4	14:00	14.7	6.5	58	20	15	16.1	95.48	NA
-66.86	52.92	WABUSH A	8504177	2024-09-04 15:00	2024	9	4	15:00	14.6	7.1	60	19	17	16.1	95.41	NA
-66.86	52.92	WABUSH A	8504177	2024-09-04 16:00	2024	9	4	16:00	17.4	8.1	54	21	26	16.1	95.34	NA
-66.86	52.92	WABUSH A	8504177	2024-09-04 17:00	2024	9	4	17:00	17.8	9.3	57	20	22	16.1	95.31	NA
-66.86	52.92	WABUSH A	8504177	2024-09-04 18:00	2024	9	4	18:00	17.1	9.7	61	21	22	16.1	95.29	NA
-66.86	52.92	WABUSH A	8504177	2024-09-04 19:00	2024	9	4	19:00	15.3	9.5	68	20	13	16.1	95.26	NA
-66.86	52.92	WABUSH A	8504177	2024-09-04 20:00	2024	9	4	20:00	14.3	10.2	76	19	15	16.1	95.24	NA
-66.86	52.92	WABUSH A	8504177	2024-09-04 21:00	2024	9	4	21:00	15.1	11	77	21	21	16.1	95.28	NA
-66.86	52.92	WABUSH A	8504177	2024-09-04 22:00	2024	9	4	22:00	15.1	11.2	78	20	17	16.1	95.18	NA
-66.86	52.92	WABUSH A	8504177	2024-09-04 23:00	2024	9	4	23:00	14.4	11.2	81	19	21	16.1	95.14	NA

APPENDIX C

Noise Data

ML 1: Fermont Campsite

Date	Time	Leq-1Hr	L(90)
2024-08-30 14:08	2:00 PM	62	44.6
2024-08-30 15:00	3:00 PM	47.1	30.7
2024-08-30 16:00	4:00 PM	41.6	33.5
2024-08-30 17:00	5:00 PM	41.9	36.1
2024-08-30 18:00	6:00 PM	40.5	34.1
2024-08-30 19:00	7:00 PM	48.9	32.7
2024-08-30 20:00	8:00 PM	34.3	30.1
2024-08-30 21:00	9:00 PM	34.2	30.6
2024-08-30 22:00	10:00 PM	38.9	31.5
2024-08-30 23:00	11:00 PM	39.7	33.3
2024-08-31 0:00	12:00 AM	37.1	30.6
2024-08-31 1:00	1:00 AM	31.3	27.8
2024-08-31 2:00	2:00 AM	33.7	28.9
2024-08-31 3:00	3:00 AM	34.9	31.8
2024-08-31 4:00	4:00 AM	36.2	32.3
2024-08-31 5:00	5:00 AM	35.3	31.5
2024-08-31 6:00	6:00 AM	33.1	28.8
2024-08-31 7:00	7:00 AM	36.8	29
2024-08-31 8:00	8:00 AM	41.8	37.1
2024-08-31 9:00	9:00 AM	43.7	37.8
2024-08-31 10:00	10:00 AM	41.4	34.6
2024-08-31 11:00	11:00 AM	36.1	32.2
2024-08-31 12:00	12:00 PM	35.1	30.6
2024-08-31 13:00	1:00 PM	37	32.5
2024-08-31 14:00	2:00 PM	40.2	32.8
2024-08-31 15:00	3:00 PM	42.9	35.9
2024-08-31 16:00	4:00 PM	38	31.2
2024-08-31 17:00	5:00 PM	39.9	30.7
2024-08-31 18:00	6:00 PM	39.2	31.8
2024-08-31 19:00	7:00 PM	38.4	29.9
2024-08-31 20:00	8:00 PM	31.9	26.7
2024-08-31 21:00	9:00 PM	39.4	29.8
2024-08-31 22:00	10:00 PM	40.1	33.6
2024-08-31 23:00	11:00 PM	38.5	32.5
2024-09-01 0:00	12:00 AM	40.5	31.3
2024-09-01 1:00	1:00 AM	29	22.8
2024-09-01 2:00	2:00 AM	28.8	22.7
2024-09-01 3:00	3:00 AM	25	23.1
2024-09-01 4:00	4:00 AM	28.1	25.9
2024-09-01 5:00	5:00 AM	28.7	25.9

Date	Time	Leq-1Hr	L(90)
2024-09-01 6:00	6:00 AM	29.7	26.4
2024-09-01 7:00	7:00 AM	28.2	24.9
2024-09-01 8:00	8:00 AM	32.6	27.6
2024-09-01 9:00	9:00 AM	38.5	32.6
2024-09-01 10:00	10:00 AM	41.5	36.3
2024-09-01 11:00	11:00 AM	46	36.5
2024-09-01 12:00	12:00 PM	46.7	40.8
2024-09-01 13:00	1:00 PM	44.5	39.5
2024-09-01 14:00	2:00 PM	44.4	37.5
2024-09-01 15:00	3:00 PM	43.3	36.8
2024-09-01 16:00	4:00 PM	45.2	40.2
2024-09-01 17:00	5:00 PM	46.2	40
2024-09-01 18:00	6:00 PM	45.4	36
2024-09-01 19:00	7:00 PM	46.6	34.2
2024-09-01 20:00	8:00 PM	38.8	29
2024-09-01 21:00	9:00 PM	34.7	27.7
2024-09-01 22:00	10:00 PM	39.1	27.9
2024-09-01 23:00	11:00 PM	40.3	28.7
2024-09-02 0:00	12:00 AM	39.1	29.3
2024-09-02 1:00	1:00 AM	31.5	23.9
2024-09-02 2:00	2:00 AM	30	22.5
2024-09-02 3:00	3:00 AM	27.2	23.7
2024-09-02 4:00	4:00 AM	26.8	23.3
2024-09-02 5:00	5:00 AM	29.3	26.4
2024-09-02 6:00	6:00 AM	32	27.8
2024-09-02 7:00	7:00 AM	34.5	29.1
2024-09-02 8:00	8:00 AM	33.3	29.4
2024-09-02 9:00	9:00 AM	35.4	27.4
2024-09-02 10:00	10:00 AM	43	29.7
2024-09-02 11:00	11:00 AM	39.3	31.4
2024-09-02 12:00	12:00 PM	46.5	33.2
2024-09-02 13:00	1:00 PM	45.7	30.6
2024-09-02 14:00	2:00 PM	43.5	30.9
2024-09-02 15:00	3:00 PM	45	31.9
2024-09-02 16:00	4:00 PM	40.9	31.7
2024-09-02 17:00	5:00 PM	38.2	30.2
2024-09-02 18:00	6:00 PM	43.1	32.5
2024-09-02 19:00	7:00 PM	38.3	31.3
2024-09-02 20:00	8:00 PM	34.1	28.5
2024-09-02 21:00	9:00 PM	32.2	24.6

Date	Time	Leq-1Hr	L(90)
2024-09-02 22:00	10:00 PM	29.4	24.3
2024-09-02 23:00	11:00 PM	37.2	26.5
2024-09-03 0:00	12:00 AM	30.5	23.5
2024-09-03 1:00	1:00 AM	31.5	23.4
2024-09-03 2:00	2:00 AM	32.1	23
2024-09-03 3:00	3:00 AM	-	-
2024-09-03 4:00	4:00 AM	29.5	23.2
2024-09-03 5:00	5:00 AM	-	-
2024-09-03 6:00	6:00 AM	31.3	28.2
2024-09-03 7:00	7:00 AM	31.7	28.7
2024-09-03 8:00	8:00 AM	33.9	29.6
2024-09-03 9:00	9:00 AM	36.7	29.2
2024-09-03 10:00	10:00 AM	42.4	29.9
2024-09-03 11:00	11:00 AM	50.9	30.5

ML2: Duley Lake

Date	Time	Leq-1Hr	L(90)
2024-08-31 10:45	10:45 AM	45.3	28.01
2024-08-31 11:00	11:00 AM	33.43	28.07
2024-08-31 12:00	12:00 PM	31.65	25.81
2024-08-31 13:00	1:00 PM	32.24	27.66
2024-08-31 14:00	2:00 PM	35.33	28.22
2024-08-31 15:00	3:00 PM	36.12	28.6
2024-08-31 16:00	4:00 PM	31.95	24.38
2024-08-31 17:00	5:00 PM	31.84	24.14
2024-08-31 18:00	6:00 PM	29.17	23.6
2024-08-31 19:00	7:00 PM	24.51	22.26
2024-08-31 20:00	8:00 PM	23.11	19.14
2024-08-31 21:00	9:00 PM	23.27	19.63
2024-08-31 22:00	10:00 PM	25.06	21.81
2024-08-31 23:00	11:00 PM	24.34	20.72
2024-09-01 0:00	12:00 AM	28.32	20.72
2024-09-01 1:00	1:00 AM	21.69	19.41
2024-09-01 2:00	2:00 AM	23.23	20.34
2024-09-01 3:00	3:00 AM	21.7	20.04
2024-09-01 4:00	4:00 AM	22.72	21.36
2024-09-01 5:00	5:00 AM	21.48	20.2
2024-09-01 6:00	6:00 AM	24.34	21.8
2024-09-01 7:00	7:00 AM	24.58	21.63
2024-09-01 8:00	8:00 AM	29.94	22.31
2024-09-01 9:00	9:00 AM	30.12	25
2024-09-01 10:00	10:00 AM	35.42	31.33
2024-09-01 11:00	11:00 AM	40.03	35.25
2024-09-01 12:00	12:00 PM	43.42	37.35
2024-09-01 13:00	1:00 PM	41.27	36.49
2024-09-01 14:00	2:00 PM	40.56	36.16
2024-09-01 15:00	3:00 PM	53.08	32.25
2024-09-01 16:00	4:00 PM	42.77	37.67
2024-09-01 17:00	5:00 PM	41.82	36.95
2024-09-01 18:00	6:00 PM	43.17	30.66
2024-09-01 19:00	7:00 PM	45.78	28.47
2024-09-01 20:00	8:00 PM	23	20.67
2024-09-01 21:00	9:00 PM	33.3	20.88
2024-09-01 22:00	10:00 PM	30.11	20.97
2024-09-01 23:00	11:00 PM	32.9	25.26
2024-09-02 0:00	12:00 AM	30.27	21.62
2024-09-02 1:00	1:00 AM	23.45	19.52
2024-09-02 2:00	2:00 AM	24.87	19.24

Date	Time	Leq-1Hr	L(90)
2024-09-02 3:00	3:00 AM	22.86	19.06
2024-09-02 4:00	4:00 AM	24.6	19.79
2024-09-02 5:00	5:00 AM	21.76	20.02
2024-09-02 6:00	6:00 AM	28.43	21.36
2024-09-02 7:00	7:00 AM	24.48	20.67
2024-09-02 8:00	8:00 AM	25.13	20.34
2024-09-02 9:00	9:00 AM	23.24	20.63
2024-09-02 10:00	10:00 AM	30.58	20.49
2024-09-02 11:00	11:00 AM	36.27	27.99
2024-09-02 12:00	12:00 PM	35.66	27.69
2024-09-02 13:00	1:00 PM	35.96	26.67
2024-09-02 14:00	2:00 PM	37.01	28.95
2024-09-02 15:00	3:00 PM	38.18	29.7
2024-09-02 16:00	4:00 PM	38.51	27.56
2024-09-02 17:00	5:00 PM	37.25	24.21
2024-09-02 18:00	6:00 PM	36.15	26.46
2024-09-02 19:00	7:00 PM	34.13	21.87
2024-09-02 20:00	8:00 PM	36.83	25.19
2024-09-02 21:00	9:00 PM	30.8	20.86
2024-09-02 22:00	10:00 PM	23.38	20.24
2024-09-02 23:00	11:00 PM	22.83	19.46
2024-09-03 0:00	12:00 AM	23.33	18.93
2024-09-03 1:00	1:00 AM	22.09	18.03
2024-09-03 2:00	2:00 AM	26.4	20.19
2024-09-03 3:00	3:00 AM	25.09	19.95
2024-09-03 4:00	4:00 AM	22.77	18.63
2024-09-03 5:00	5:00 AM	23.36	19.45
2024-09-03 6:00	6:00 AM	26	19.92
2024-09-03 7:00	7:00 AM	27.35	21.65
2024-09-03 8:00	8:00 AM	27.07	22.34
2024-09-03 9:00	9:00 AM	29.99	22.96
2024-09-03 10:00	10:00 AM	30.79	24.33
2024-09-03 11:00	11:00 AM	36.18	26.12
2024-09-03 12:00	12:00 PM	33.18	24.25
2024-09-03 13:00	1:00 PM	34.03	26.02
2024-09-03 14:00	2:00 PM	32.93	25.34
2024-09-03 15:00	3:00 PM	37.43	24.57

ML3: Riordan Lake

Date	Time	Leq-1Hr	L(90)
2024-08-30 18:45	6:00 PM	49.86	31.32
2024-08-30 19:00	7:00 PM	31.71	29.46
2024-08-30 20:00	8:00 PM	31.52	28.44
2024-08-30 21:00	9:00 PM	33.83	30.31
2024-08-30 22:00	10:00 PM	33.39	29.34
2024-08-30 23:00	11:00 PM	41.13	32.8
2024-08-31 0:00	12:00 AM	40.74	38.64
2024-08-31 1:00	1:00 AM	40.01	37.81
2024-08-31 2:00	2:00 AM	39.46	37.64
2024-08-31 3:00	3:00 AM	42.45	40.38
2024-08-31 4:00	4:00 AM	42.95	40.98
2024-08-31 5:00	5:00 AM	41.11	39.27
2024-08-31 6:00	6:00 AM	39.72	32.88
2024-08-31 7:00	7:00 AM	37.95	33.38
2024-08-31 8:00	8:00 AM	43.41	40
2024-08-31 9:00	9:00 AM	45.34	42.44
2024-08-31 10:00	10:00 AM	44.09	41
2024-08-31 11:00	11:00 AM	46.66	43.97
2024-08-31 12:00	12:00 PM	44.77	42.36
2024-08-31 13:00	1:00 PM	44.89	42.32
2024-08-31 14:00	2:00 PM	44.85	41.96
2024-08-31 15:00	3:00 PM	48.04	45.09
2024-08-31 16:00	4:00 PM	45.07	41.53
2024-08-31 17:00	5:00 PM	43.93	39.31
2024-08-31 18:00	6:00 PM	40.38	36.08
2024-08-31 19:00	7:00 PM	36.84	33.88
2024-08-31 20:00	8:00 PM	32.8	24.77
2024-08-31 21:00	9:00 PM	23.22	20.99
2024-08-31 22:00	10:00 PM	25.41	21.65
2024-08-31 23:00	11:00 PM	27.56	19.97
2024-09-01 0:00	12:00 AM	29.95	24.79
2024-09-01 1:00	1:00 AM	23.69	21.39
2024-09-01 2:00	2:00 AM	24.45	21.68
2024-09-01 3:00	3:00 AM	21.88	19.59
2024-09-01 4:00	4:00 AM	20.31	19.02

Date	Time	Leq-1Hr	L(90)
2024-09-01 5:00	5:00 AM	20.95	19.09
2024-09-01 6:00	6:00 AM	28.28	20.26
2024-09-01 7:00	7:00 AM	29.12	25.28
2024-09-01 8:00	8:00 AM	32.93	26.94
2024-09-01 9:00	9:00 AM	38.96	35.44
2024-09-01 10:00	10:00 AM	40.16	36.33
2024-09-01 11:00	11:00 AM	40.39	36.79
2024-09-01 12:00	12:00 PM	44.46	39.7
2024-09-01 13:00	1:00 PM	45.83	40.71
2024-09-01 14:00	2:00 PM	45.08	39.6
2024-09-01 15:00	3:00 PM	41.39	36.95
2024-09-01 16:00	4:00 PM	43.61	38.68
2024-09-01 17:00	5:00 PM	41.71	37.82
2024-09-01 18:00	6:00 PM	49.02	38.17
2024-09-01 19:00	7:00 PM	46.83	40.84
2024-09-01 20:00	8:00 PM	37.08	29.61
2024-09-01 21:00	9:00 PM	38.6	33.45
2024-09-01 22:00	10:00 PM	42.05	32.01
2024-09-01 23:00	11:00 PM	44.16	39.95
2024-09-02 0:00	12:00 AM	43.37	37.7
2024-09-02 1:00	1:00 AM	37.77	35.35
2024-09-02 2:00	2:00 AM	39.39	36.41
2024-09-02 3:00	3:00 AM	37.64	35.6
2024-09-02 4:00	4:00 AM	36.79	34.87
2024-09-02 5:00	5:00 AM	32.45	29.32
2024-09-02 6:00	6:00 AM	34.78	31
2024-09-02 7:00	7:00 AM	38	31.68
2024-09-02 8:00	8:00 AM	37.19	32.8
2024-09-02 9:00	9:00 AM	41.22	37.97
2024-09-02 10:00	10:00 AM	41.51	39.06
2024-09-02 11:00	11:00 AM	45.65	41.87
2024-09-02 12:00	12:00 PM	47.62	43.38
2024-09-02 13:00	1:00 PM	47.33	41.79
2024-09-02 14:00	2:00 PM	47.22	41.83
2024-09-02 15:00	3:00 PM	48.78	45.82

Date	Time	Leq-1Hr	L(90)
2024-09-02 16:00	4:00 PM	48.03	44.99
2024-09-02 17:00	5:00 PM	46.47	43.1
2024-09-02 18:00	6:00 PM	46.75	43.68
2024-09-02 19:00	7:00 PM	42.64	39.53
2024-09-02 20:00	8:00 PM	39.63	35.26
2024-09-02 21:00	9:00 PM	40.87	38.54
2024-09-02 22:00	10:00 PM	41.73	38.66
2024-09-02 23:00	11:00 PM	40.8	36.25
2024-09-03 0:00	12:00 AM	38.45	35.21
2024-09-03 1:00	1:00 AM	36.75	33.94
2024-09-03 2:00	2:00 AM	39.94	35.96
2024-09-03 3:00	3:00 AM	38.09	30.39
2024-09-03 4:00	4:00 AM	37.53	30.97
2024-09-03 5:00	5:00 AM	34.92	28.97
2024-09-03 6:00	6:00 AM	38.15	35.62
2024-09-03 7:00	7:00 AM	37.71	34.59
2024-09-03 8:00	8:00 AM	37.7	28.84
2024-09-03 9:00	9:00 AM	39.92	37.02
2024-09-03 10:00	10:00 AM	37.12	33.1
2024-09-03 11:00	11:00 AM	39.63	35.16
2024-09-03 12:00	12:00 PM	43.25	35.35
2024-09-03 13:00	1:00 PM	42.1	35.44

ML4: Wabush

Date	Time	Leq-1Hr	L(90)
2024-08-30 15:46	3:00 PM	54	29.2
2024-08-30 16:00	4:00:00 PM	46.6	29.3
2024-08-30 17:00	5:00:00 PM	38.9	29.7
2024-08-30 18:00	6:00:00 PM	38.6	28.9
2024-08-30 19:00	7:00:00 PM	38.3	25.2
2024-08-30 20:00	8:00:00 PM	40.8	27.1
2024-08-30 21:00	9:00:00 PM	34	27.4
2024-08-30 22:00	10:00:00 PM	38.2	26.5
2024-08-30 23:00	11:00:00 PM	30.2	27.7
2024-08-31 0:00	12:00:00 AM	32	27.7
2024-08-31 1:00	1:00:00 AM	31	27.8
2024-08-31 2:00	2:00:00 AM	33.5	30
2024-08-31 3:00	3:00:00 AM	34.3	30.7
2024-08-31 4:00	4:00:00 AM	36.2	31.4
2024-08-31 5:00	5:00:00 AM	36.2	31.2
2024-08-31 6:00	6:00:00 AM	37	30.9
2024-08-31 7:00	7:00:00 AM	34.8	29.8
2024-08-31 8:00	8:00:00 AM	34.9	29
2024-08-31 9:00	9:00:00 AM	40	31.6
2024-08-31 10:00	10:00:00 AM	36.8	30.4
2024-08-31 11:00	11:00:00 AM	38.7	31.7
2024-08-31 12:00	12:00:00 PM	38.7	30.5
2024-08-31 13:00	1:00:00 PM	42.5	33.5
2024-08-31 14:00	2:00:00 PM	44.6	34.7
2024-08-31 15:00	3:00:00 PM	46.6	35.8
2024-08-31 16:00	4:00:00 PM	42.3	33.8
2024-08-31 17:00	5:00:00 PM	40.6	29.3
2024-08-31 18:00	6:00:00 PM	46.7	28.9
2024-08-31 19:00	7:00:00 PM	39	27.1
2024-08-31 20:00	8:00:00 PM	48.9	28.2
2024-08-31 21:00	9:00:00 PM	32.3	29.1
2024-08-31 22:00	10:00:00 PM	32.1	26.9
2024-08-31 23:00	11:00:00 PM	31.2	27.1
2024-09-01 0:00	12:00:00 AM	34.8	32
2024-09-01 1:00	1:00:00 AM	33.4	30.4

Date	Time	Leq-1Hr	L(90)
2024-09-01 2:00	2:00:00 AM	38.9	31.7
2024-09-01 3:00	3:00:00 AM	31.2	28.9
2024-09-01 4:00	4:00:00 AM	30.1	27.2
2024-09-01 5:00	5:00:00 AM	28.9	26.8
2024-09-01 6:00	6:00:00 AM	29.9	27.5
2024-09-01 7:00	7:00:00 AM	30.3	25.5
2024-09-01 8:00	8:00:00 AM	30.2	25.6
2024-09-01 9:00	9:00:00 AM	37.9	27.5
2024-09-01 10:00	10:00:00 AM	46.1	30.7
2024-09-01 11:00	11:00:00 AM	42.5	33.2
2024-09-01 12:00	12:00:00 PM	45.4	36.6
2024-09-01 13:00	1:00:00 PM	47.1	37.4
2024-09-01 14:00	2:00:00 PM	49.4	36.9
2024-09-01 15:00	3:00:00 PM	43.3	34.8
2024-09-01 16:00	4:00:00 PM	55.6	36.8
2024-09-01 17:00	5:00:00 PM	42.3	30.7
2024-09-01 18:00	6:00:00 PM	41.2	31.3
2024-09-01 19:00	7:00:00 PM	40.4	29.1
2024-09-01 20:00	8:00:00 PM	35.8	22.8
2024-09-01 21:00	9:00:00 PM	38.9	25.8
2024-09-01 22:00	10:00:00 PM	41.8	30.3
2024-09-01 23:00	11:00:00 PM	47.1	37.1
2024-09-02 0:00	12:00:00 AM	40.9	31.7
2024-09-02 1:00	1:00:00 AM	33.5	28.4
2024-09-02 2:00	2:00:00 AM	33.9	28.7
2024-09-02 3:00	3:00:00 AM	33.4	28.4
2024-09-02 4:00	4:00:00 AM	31.7	29
2024-09-02 5:00	5:00:00 AM	31.2	28.4
2024-09-02 6:00	6:00:00 AM	32.4	28.5
2024-09-02 7:00	7:00:00 AM	30	25.1
2024-09-02 8:00	8:00:00 AM	34.8	27.5
2024-09-02 9:00	9:00:00 AM	31.6	27.1
2024-09-02 10:00	10:00:00 AM	39.2	29.2
2024-09-02 11:00	11:00:00 AM	-	-
2024-09-02 12:00	12:00:00 PM	50.9	34.4

Date	Time	Leq-1Hr	L(90)
2024-09-02 13:00	1:00:00 PM	48.1	33.9
2024-09-02 14:00	2:00:00 PM	51.7	37
2024-09-02 15:00	3:00:00 PM	48.9	33.3
2024-09-02 16:00	4:00:00 PM	50.2	35.9
2024-09-02 17:00	5:00:00 PM	46.5	35.6
2024-09-02 18:00	6:00:00 PM	44.9	32.9
2024-09-02 19:00	7:00:00 PM	42.8	31.9
2024-09-02 20:00	8:00:00 PM	37.9	30.5
2024-09-02 21:00	9:00:00 PM	38.9	33.3
2024-09-02 22:00	10:00:00 PM	38.3	32.2
2024-09-02 23:00	11:00:00 PM	51.1	32.2
2024-09-03 0:00	12:00:00 AM	36.4	30.4
2024-09-03 1:00	1:00:00 AM	37.2	31.3
2024-09-03 2:00	2:00:00 AM	38.4	32.3
2024-09-03 3:00	3:00:00 AM	37.5	30.2
2024-09-03 4:00	4:00:00 AM	39.5	33.5
2024-09-03 5:00	5:00:00 AM	39.1	34.2
2024-09-03 6:00	6:00:00 AM	39.5	35.4
2024-09-03 7:00	7:00:00 AM	37.8	34.9
2024-09-03 8:00	8:00:00 AM	37.9	34.4
2024-09-03 9:00	9:00:00 AM	43.2	33.7
2024-09-03 10:00	10:00:00 AM	44.2	35.1
2024-09-03 11:00	11:00:00 AM	44.9	35.6
2024-09-03 12:00	12:00:00 PM	49	34.4
2024-09-03 13:00	1:00:00 PM	50.9	32.9

wsp.com

REPORT

Kami Iron Ore Mine Light Baseline Report

Kami Iron Ore Mine Project

Submitted to:

Champion Iron
1155 René-Lévesque Blvd. West
Suite 3300
Montréal, QC H3B 3X7

Submitted by:

WSP Canada Inc.
25 York St.
Suite 700
Toronto, ON M5J 2V5

1-416-487-5256

CA0038713.5261

May 2025

Distribution List

1 electronic copy: Champion Iron

1 electronic copy: WSP Canada Inc.

Study Limitations

WSP Canada Inc. (WSP) has prepared this document in a manner consistent with that level of care and skill ordinarily exercised by members of the engineering and science professions currently practising under similar conditions in the jurisdiction in which the services are provided, subject to the time limits and physical constraints applicable to this document. No warranty, express or implied, is made.

This document, including all text, data, tables, plans, figures, drawings and other documents contained herein, has been prepared by WSP for the sole benefit of Champion Iron Mines. It represents WSP's professional judgement based on the knowledge and information available at the time of completion. WSP is not responsible for any unauthorized use or modification of this document. All third parties relying on this document do so at their own risk.

The factual data, interpretations, suggestions, recommendations and opinions expressed in this document pertain to the specific project, site conditions, design objective, development and purpose described to WSP by Champion Iron Mines and are not applicable to any other project or site location. In order to properly understand the factual data, interpretations, suggestions, recommendations and opinions expressed in this document, reference must be made to the entire document.

This document, including all text, data, tables, plans, figures, drawings and other documents contained herein, as well as all electronic media prepared by WSP are considered its professional work product and shall remain the copyright property of WSP. Champion Iron Mines may make copies of the document in such quantities as are reasonably necessary for those parties conducting business specifically related to the subject of this document or in support of or in response to regulatory inquiries and proceedings. Electronic media is susceptible to unauthorized modification, deterioration and incompatibility and therefore no party can rely solely on the electronic media versions of this document.

Executive Summary

The Kamistiatusset (Kami) Iron Ore Mine Project (the Project) is a proposed iron ore mine in Newfoundland and Labrador. The Project was originally proposed by the Alderon Iron Ore Corporation (Alderon) and underwent a provincial and federal environmental impact assessment from 2011 to 2013, including a comprehensive baseline program that was completed in 2011 and 2012. In 2021, Champion Iron Mines Ltd. (Champion) completed the acquisition of the Project from Alderon. Champion is proposing several changes to the Project design proposed by Alderon through the previous Environmental Impact Statement (EIS) and planning to submit a Project Registration to the Newfoundland and Labrador Environmental Assessment Division of the Ministry of the Environment and Climate Change in 2024.

The light baseline program is part of a comprehensive baseline field program that documents the existing natural and socio-economic environments in the anticipated area of the Project. This light baseline report describes existing light levels at representative locations that may be influenced by the Project and was prepared to support the Project Registration and assessment of effects from the revised Project design changes.

To assess the change in light due to the Project, it is necessary to characterize existing light conditions (i.e., levels of sky quality and light trespass). Sky quality and light trespass measurements were collected during two field surveys: a program during winter conditions (i.e., ground covered in snow, absence of leaves on trees) on the night of April 9, 2024, and a program during summer conditions on the nights of August 31, 2024 and September 1, 2024. The measurements were taken under various cloud conditions (i.e., clear skies and/or overcast), after astronomical twilight and while the moon was set so there was no impact on light levels from the sun or the moon.

A review of existing information was conducted to determine appropriate measurement locations for the light baseline program that were representative of sensitive receptors in the vicinity of the Project. Available information was collected from mapping of the area surrounding the Project. Based on an analysis of available information, 12 locations for the winter field program and 15 locations for the summer program were selected.

The light trespass measurements were carried out using a Solar Light PMA2100 photometer and a PMA2131 scotopic detector and a Unihedron Sky Quality Meter was used to gather information on existing sky glow levels. The measurements were made at each identified measurement location following standard practices as per the Illuminating Engineering Society of North America (IESNA) and Commission Internationale de l'Éclairage (CIE) guidelines (IESNA 2000; CIE 2017). The CIE light classification system consists of a set of illuminance zones, identified as E0 to E4, ranging from intrinsically dark landscapes to areas of high ambient brightness (CIE 2017; Narisada and Schreuder 2004). Each illuminance zone has associated limits for light trespass and sky quality.

Table ES-1 summarizes the measured average illuminance levels and sky quality at the identified measurement locations. The CIE zone classification light trespass limits were met at the measurement locations except for M06, M07, and M11, where commercial lighting dominated. The sky quality measured at measurement locations away from Fermont, Wabush and Labrador City met the sky quality limit for CIE zone classification E1 and E2. Locations in Fermont, Wabush and Labrador City were impacted by commercial lights and streetlights and met the sky quality limit for CIE zone classification E3, except for M06 and M07.

Table ES-1: Existing Light Trespass and Sky Quality at Measurement Locations

Location ID	Measurement Location Description	Key Light Sources	Illuminance (lux)			Sky Quality (mag/arcsec^2)			CIE Zone
			Winter	Summer Night 1	Summer Night 2	Winter	Summer Night 1	Summer Night 2	
M01	Residences, Fermont QC	Residential Lights	0.004	0.154	0.548	20.01	18.43	16.96	E3 – suburban centres
M02	Horizon-Blanc High School, Fermont QC	Internal/External School Lights	0.424	1.258	1.135	18.61	17.02	16.83	E3 – suburban centres
M03	Duley Lake Provincial Park Entrance, Labrador City NL	None	0.007	0.006	0.006	20.73	20.32	20.97	E1 – natural
M04	Duley Lake Provincial Park, Labrador City NL	None	0.007	0.014	0.005	20.72	19.96	20.81	E1 – natural
M05	Residences South of Duley Lake Provincial Park, Labrador City NL	None	0.003	0.010	0.008	20.31	20.17	20.66	E2 – rural
M06	Drake Ave and Avalon Dr Intersection, Labrador City NL	Commercial Lights	6.835	12.475	13.158	16.04	14.42	14.52	E3 – suburban centres
M07	Labrador Mall Parking Lot, Labrador City NL	Commercial/Streetlights	19.503	20.139	18.098	12.32	12.46	11.86	E3 – suburban centres
M08	Dog Park, Labrador City NL	Residential Lights	0.220	0.026	0.025	18.16	19.47	19.01	E3 – suburban centres
M09	Open Space near Jean Lake, Wabush NL	Streetlights	0.034	0.235	0.268	20.02	19.55	17.61	E3 – suburban centres
M10	Reid St and Whiteway Dr Intersection, Wabush NL	Streetlights	1.056	0.531	0.549	16.88	17.08	17.34	E3 – suburban centres
M11	1 Grenfell Dr, Wabush NL	Commercial Lights	2.744	1.441	1.898	15.68	16.49	15.27	E3 – suburban centres
M12	South End of Snow's Dr, Wabush NL	Streetlights	0.103	0.835	0.350	19.76	16.82	18.36	E3 – suburban centres
M13 (Summer Only)	Elephant Head Lake, Wabush NL	None	N/D	0.006	0.028	n/d	20.38	20.62	E1 – natural
M14 (Summer Only)	Riordan Lake, NL	None	N/D	0.005	0.028	n/d	20.08	20.25	E1 – natural
M15 (Summer Only)	Long Lake, NL	None	N/D	0.005	n/d	n/d	20.40	N/D	E1 – natural

CIE = Commission Internationale de l'Éclairage; lux = lumens per square metre; mag/arcsec^2 = magnitude per square arc second; N/D = no data collected.

Glossary and Units of Measure

Term	Definition
Astronomical twilight	The time when the centre of the sun is between 12° and 18° below the horizon. From the end of astronomical twilight in the evening to the beginning of astronomical twilight in the morning, the sky is dark enough for all astronomical observations (away from urban light pollution).
Candela	The luminous intensity of a lighting source measured in candelas (cd = lumen/steradian)
Illuminance	The total luminous flux incident on a surface per unit area (i.e., lumens per m^2). It is a measure of the intensity of the incident light, wavelength-weighted by the luminosity function to correlate with human brightness perception, and is the standard metric for lighting levels, measured in lux.
Lumen	The unit of luminous flux produced by a source.
Luminance	The perceived brightness of an object which has been illuminated by a source. The luminance of an object depends on its material characteristics and reflectance. It is measured in candelas per m^2.
Magnitude per square arc second (mag/arcsec^2)	A relative measure of the brightness of the sky. The natural background is 21.6, and the smaller the number the brighter the sky or celestial object. One magnitude level of difference corresponds to a factor of 2.5 change in brightness.
Zenith	An imaginary point directly “above” a particular location, on the imaginary celestial sphere. “Above” means in the vertical direction opposite to the apparent gravitational force at that location.

Units of Measure	Definition
%	percent
°	degree
±	plus or minus
lux	lumens per square metre
m	metre
m^2	square metre
mag/arcsec^2	magnitude per square arc second
km	kilometre
km^2	square kilometre

Table of Contents

TABLES

FIGURES

1.0 INTRODUCTION

The Kamistiatusset (Kami) Iron Ore Mine Project (the Project) is a proposed iron ore mine in Newfoundland and Labrador. The Project site is located approximately seven kilometres southwest of the Town of Wabush, ten kilometres south of the Town of Labrador City, and five kilometres northeast of Ville de Fermont, Québec (Figure 1-1).

The Project was originally proposed by the Alderon Iron Ore Corporation (Alderon) and underwent a provincial and federal environmental impact assessment from 2011 to 2013, including a comprehensive baseline program that was completed in 2011 and 2012. The Project was released from the provincial and federal EA process in 2014. In 2021, Champion Iron Limited (through its subsidiary 12364042 Canada Inc, herein referred to as Champion) completed the acquisition of the Project from Alderon.

Champion is proposing several improvements to the Project design proposed by Alderon through the previous Environmental Impact Statement (EIS). These proposed improvements include optimizations to the Project's water management strategy and modernization of the proposed ore handling, conveyance, and processing. Champion's objective for the Kami Project is to produce high purity (>67.5%) iron concentrate, which can be used as direct reduction pellet feed for electric arc furnaces in the green steel supply chain.

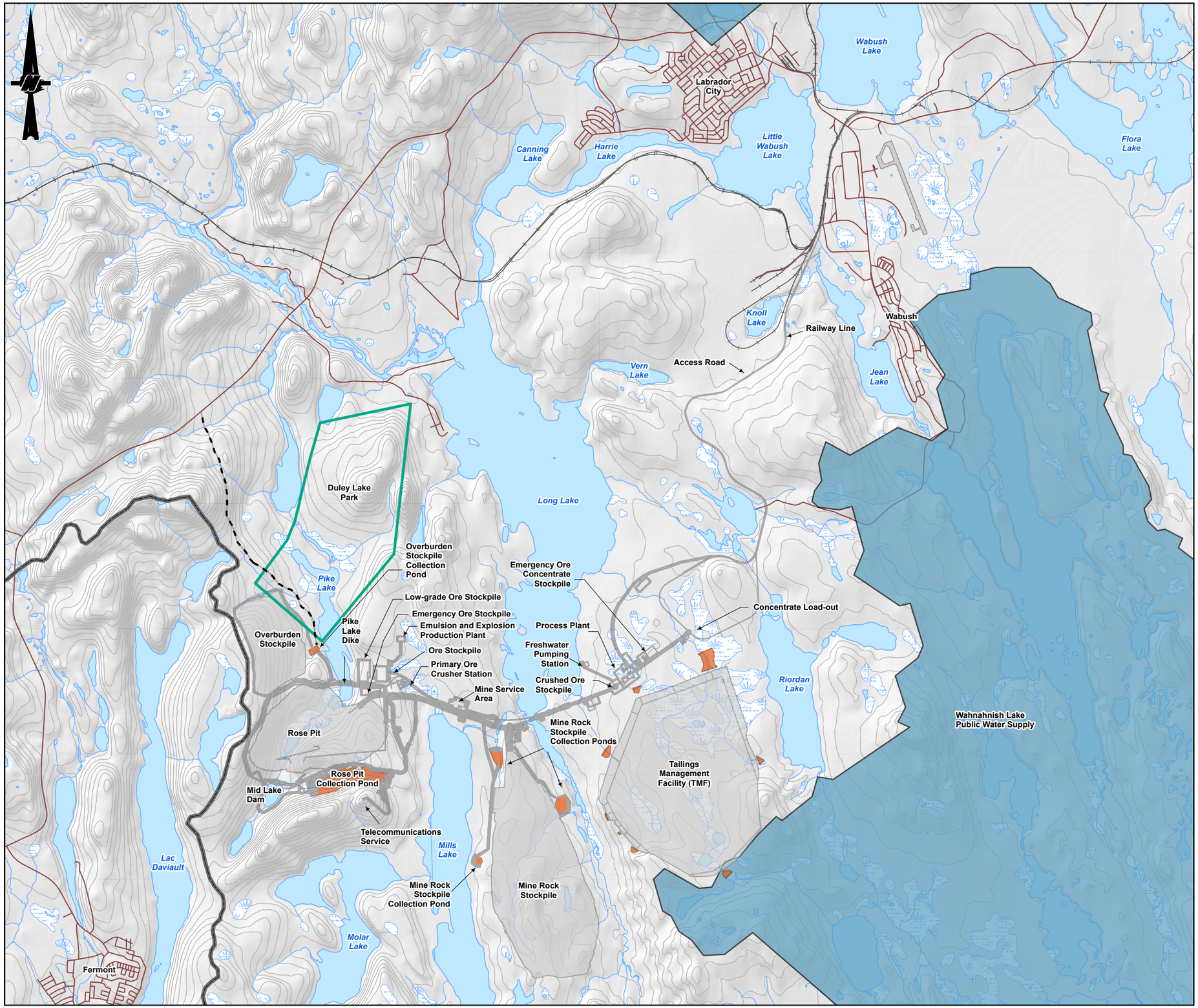
Champion submitted a Project Registration document to the NL Department of Environment and Climate Change (the Department) in April 2024 to restart the EA process for the Project. On June 13, 2024, the Minister issued a Decision Letter to Champion concluding that an EIS would be required for the Project. EIS Guidelines were issued for the Project on December 19, 2024, that includes requirements for baseline studies.

To support the EIS process, Champion has commissioned the services of WSP Canada Inc. (WSP) to complete a comprehensive baseline field program that documents the existing natural and socio-economic environments in the anticipated area of the Project, and this light baseline report represents a component of the comprehensive baseline program. The light baseline study was undertaken to provide context from which effects to light could be evaluated and inform the development of mitigation measures and follow-up effect monitoring programs in the EIS. Champion is planning to submit the EIS to the Newfoundland and Labrador Environmental Assessment Division of the Department of Environment and Climate Change in 2025.

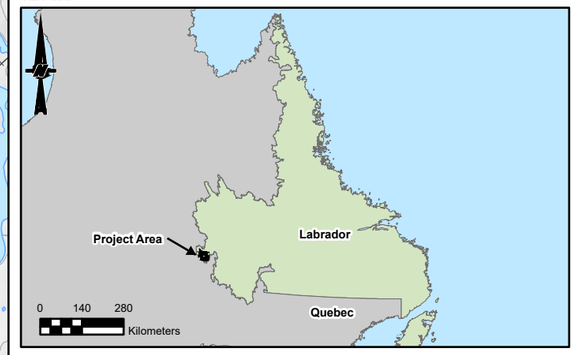
1.1 Overview of the Kami Iron Ore Mine

Figure 1-1 outlines some of the main components of the Project site including:

- Open Pit (Rose Pit);
- Mine rock stockpile;
- Ore stockpiles (operational and reserve);
- Tailings management facility (TMF);
- Overburden stockpile;
- Processing infrastructure including crushing and concentrating; and
- Ancillary infrastructure to support the mine and process plant.



KEY MAP



SCALE 1:20,000,000

Legend

PROJECT DATA

- Proposed Project Infrastructure
- Proposed Sediment Pond
- Potential Access Road

BASEMAP INFORMATION

- Road
- Railway
- Watercourse
- Contour
- Duley Lake Park
- Bog/Wetland
- Waterbody
- Labrador/Quebec Boundary
- Public Water Supply

0 1,000 2,000 4,000

1:71,000 METRES

NOTE(S)

1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)

1. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - ONTARIO
2. IMAGERY CREDITS:
3. COORDINATE SYSTEM: NAD 1983 UTM ZONE 19N

CLIENT

CHAMPION IRON MINES LTD.

PROJECT

KAMI IRON ORE MINE PROJECT (KAMI PROJECT)
WABUSH, NL

TITLE

PROJECT LOCATION AND SITE LAYOUT

CONSULTANT

wsp

YYYY-MM-DD	2025-02-27
DESIGNED	----
PREPARED	GM
REVIEWED	AF
APPROVED	--

PROJECT NO.	CONTROL	REV.	FIGURE
CA0038713.5261	0001	B	1-1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

25mm

PATH: S:\Clients\Champion_Iron_Ore_Mines\Kami Iron Ore\99_PROJ\CA0038713.5261_EIS\40_PROD\0002_General\CA0038713_5261_0002_V.X.aprx PRINTED ON: AT: 1:57:20 PM

2.0 RATIONALE AND OBJECTIVES

The purpose of the light baseline report is to describe existing conditions related to light in areas that may be affected by the Project. This information will contribute to the comprehensive baseline program which assesses the social and environmental management planning of the Project.

Existing conditions data requirements were identified using provincial and federal legislation, guidelines, and standards where applicable.

The objectives for the light baseline report were to:

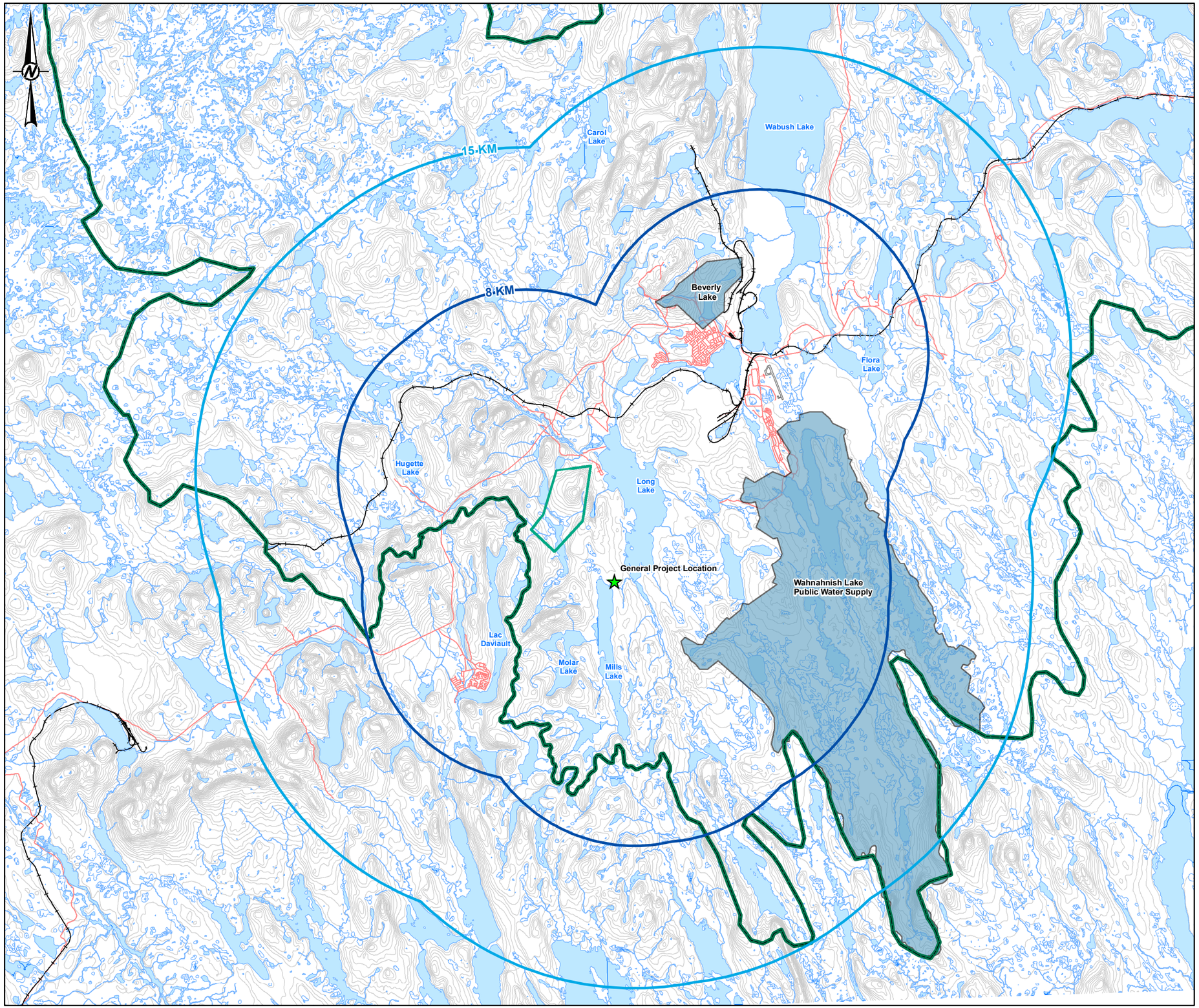
- Compile available existing information and prepare the light existing conditions report in support of the Project Registration and assessment of effects from the revised Project design changes.
- Implement field studies to collect up-to-date existing light conditions.
- Describe and summarize the existing information and data collected, with reference to relevant reports.
- Describe methods used to conduct light field programs to establish existing conditions related to summer and winter conditions.
- Present results describing nighttime light levels under existing conditions.

This light baseline report provides a description of the light resources known to be present, or that may be present, in areas where potential effects of the Project may occur (Section 3.0 provides a description of study areas). This report focuses on the presentation of available data and does not include predictive modelling or an assessment of effects of the Project. This information, along with a discussion of future trends associated with light (both with and without the proposed Project) will be presented in the EIS.

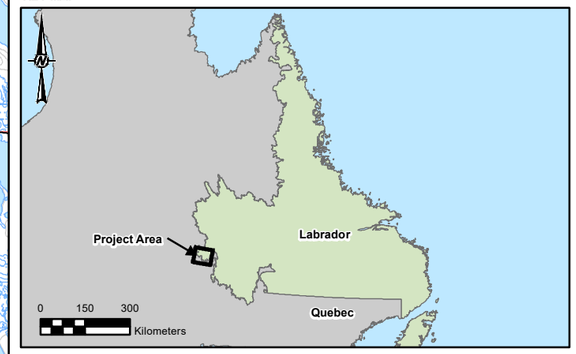
3.0 STUDY AREA

The work completed to prepare the light baseline report was focused spatially within the light local study area (LSA) and regional study area (RSA) defined for the Project. The light LSA is an 8 km buffer from the Site Assessment Area, which considers surrounding areas that might be impacted by the Project including all potential transmission line routes and corridors. The light RSA is defined as a 15 km area around the Site Assessment Area which was developed to provide context for assessment of potential Project effects and to provide an appropriate scale for cumulative effects assessment for light.

The study areas for the assessment of Project-related effects on light are shown in Figure 3-1.



KEY MAP



SCALE 1:20,000,000

LEGEND

PROJECT DATA

- General Project Location
- Local Study Area (8km)
- Regional Study Area

BASEMAP INFORMATION

- Duley Lake Park
- Existing Railway
- Existing Road
- River/Stream
- Contour
- Bog/Wetland
- Waterbody
- Public Water Supply
- Labrador/Quebec Boundary

0 1,950 3,900 7,800

1:189,615 METRES

NOTE(S)

1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)

1. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - ONTARIO
2. IMAGERY CREDITS:
3. COORDINATE SYSTEM: NAD 1983 UTM ZONE 19N

CLIENT

CHAMPION IRON MINES LTD.

PROJECT

KAMI IRON ORE MINE PROJECT (KAMI PROJECT)
WABUSH, NL

TITLE

BASELINE LIGHT STUDY AREAS

YYYY-MM-DD	2024-10-25
DESIGNED	----
PREPARED	JMA
REVIEWED	JT
APPROVED	JMC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0038713.5261	0001	B	Figure 3-1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

25mm

0

PATH: E:\Kami\Project_Figures\MXD\Light\TE23930010_LI_BaselineLtStudyAreasF2_October2024 v2.mxd PRINTED ON: 2024-10-25 AT: 3:05:11 PM

4.0 METHODS

4.1 Standards and Guidelines

Guidance to establish the existing conditions related to light was taken from the following documents:

- Commission Internationale de L'Éclairage (CIE) Guide on the Limitation of the Effects of Obtrusive Light from Outdoor Lighting Installations (CIE 2017)
- Illuminating Engineering Society of North America (IESNA) Light Trespass: Research, Results and Recommendations (IESNA 2000)
- Institution of Lighting Professionals (ILP) Guidance Note 01/20 Guidance note for the reduction of obtrusive light (ILP 2020)

4.2 Description of Technical Terms

The following are descriptions of key concepts and definitions used in the assessment of light:

- "*Light trespass*" refers to the effect of light or illuminance (measured in lumens per m^2 or "lux") that strays from its intended purpose onto neighbouring areas, illuminating areas where lighting may be undesirable – refer to Section 4.2.1 for additional information.
- "*Sky glow*" refers to stray light being scattered in the atmosphere due to a project, resulting in a brightening of the natural sky background level and reduction in star visibility – refer to Section 4.2.2 for additional information.

Additional information on technical terms is provided in the Glossary.

4.2.1 Light Trespass

Light trespass is the unintended direct illumination of nearby off-site locations by a light source. Illuminance has been selected as the indicator to represent the light trespass levels for this assessment. To put the illuminance levels into context, the illuminance levels associated with common sources are provided in Table 4-1.

Table 4-1: Summary of Illumination Levels Associated with Common Sources

Example Illuminance Source	Illuminance (lux)
Moonless overcast night sky[(a)]	0.0001
Moonless clear night sky with airglow[(a)]	0.002
Full moon on a clear night[(a)]	0.27
Family living room[(b)]	50
Hallway[(c)]	80
Office lighting[(d)]	320-500
Overcast day[(a)]	1,000
Full daylight (not direct sun)[(a)]	10,000-25,000

(a) Schlyter 2009.
(b) Australian Greenhouse Office 1998.
(c) Australian Greenhouse Office 2005.
(d) US Department of Labour 2010.
lux = lumens per square metre.

4.2.2 Sky Glow

Sky glow is the illumination of the night sky due to the scattering and reflection of light rays radiated in directions above the horizontal plane or reflected from the ground and buildings by aerosols present in the night sky. This results in a loss of contrast which reduces the number of visible stars and produces a visible glow in the direction of the light source. One metric used to characterize sky glow is the change in sky brightness compared to a natural dark sky (% brightness above natural dark sky background). Another closely related metric is sky quality: the brighter the sky, the lower its sky quality. Table 4-2 provides a list of reference sky quality and equivalent sky glow levels.

Table 4-2: Summary of Commonly Seen Sky Quality and Sky Glow in Percent Above Natural Dark Sky Background

Example	Sky Quality[(a)] (mag/arcsec^2)	Sky Glow[(b)] (% Brightness above Natural Dark Sky Background)
Standard natural background (zero sky glow)	21.6	0
Limit for astronomical site of international standing	21.5	10
Limit for dark sky site for most astronomers	21.2	40
Full moon night sky	18	3,000
Common densely populated area in North America	17	7,000
Clear sky 30 minutes after sunset	15	43,000
Heavily overcast sky	8	2.7×10^7
Clear daytime sky	3	2.7×10^9

Source: Narisada and Schreuder 2004.

(a) Sky quality is a measure of sky brightness – this field measurement is converted into units of luminance, from which sky glow is obtained.

(b) Sky glow defined as percent brightness above natural dark sky background.

mag/arcsec^2 = magnitude per square arc second.

4.3 Reference Limits

The quantification of changes to sky glow and light trespass are based on the CIE environmental lighting zones (CIE 2017), as described in Table 4-3. The CIE light classification system consists of a set of illuminance zones, identified as E0 to E4, ranging from intrinsically dark landscapes to areas of high ambient brightness (CIE 2017).

Table 4-3: Environmental Lighting Zones

Zone	Surrounding	Lighting Environment	Examples
E0	Protected	Intrinsically Dark	UNESCO Starlight Reserves, IDA Dark Sky Parks, major optical observatories
E1	Natural	Dark	Relatively uninhabited rural areas, National Parks, Areas of Outstanding Natural Beauty, IDA buffer zones
E2	Rural	Low district brightness	Sparsely inhabited rural areas, village or relatively dark outer suburban locations
E3	Suburban	Medium district brightness	Well inhabited rural and urban settlements, small town centres of suburban locations
E4	Urban	High district brightness	Town and city centres and other commercial areas

Source: CIE 2017; ILP 2020.

CIE = Commission Internationale de l'Éclairage; ILP = Institution of Lighting Professionals; UNESCO = United Nations Educational, Scientific and Cultural Organization; IDA = International Dark-Sky Association.

Limits for light trespass attributable to Project light sources may be determined based on the CIE environmental lighting zone for the area. The CIE lighting zone light trespass limits are provided in Table 4-4.

Table 4-4: Maximum Values of Vertical Illuminance

Environmental Zone	Recommended Light Trespass Limit (lux)
E0	0
E1	0.1
E2	1
E3	2
E4	5

Source: CIE 2017.

CIE = Commission Internationale de l'Éclairage; lux = lumens per square metre.

Sky glow limits have been established for each environmental lighting zone based on sky quality recommendations from the Institution of Lighting Professionals (ILP 2020). The sky glow limit in terms of sky glow and sky quality for each environmental lighting zone is defined in Table 4-5.

Table 4-5: Suggestions for the Limitations of Sky Glow

Environmental Zones	Sky Glow (% Brightness above Natural Dark Sky)	Sky Quality (mag/arcsec^2)
E0	<175%	20.5+
E1	175% to 337%	20 to 20.5
E2	337% to 43,553%	15 to 20
E3	>43,553%	<15
E4		

Source: ILP 2020.

< = less than; > = greater than; mag/arcsec^2 = magnitude per square arc second.

4.4 Review of Existing Information

Existing data were reviewed for the RSA and LSA. Light measurement data were obtained from the previous EIS (Alderon 2012), for which baseline sky quality measurements were carried out in Wabush, Labrador City, Duley Lake, and Fermont (Table 4-6).

As the baseline sky quality data were over 10 years old and the field program did not include the measurement of light trespass, baseline light field programs were carried out in 2024 to update the previous baseline and confirm current baseline conditions. Information was obtained from publicly available imagery (e.g., Google Earth) and from Champion to identify measurement locations for the field programs which were representative of sensitive receptors in the RSA and LSA (see Section 4.5). Measurement locations typically include permanent or seasonal residences, hotels/motels, hospitals, campgrounds, and areas of importance to Indigenous Peoples.

Table 4-6: Previous Environmental Impact Statement Sky Quality Measurements

Urban Area	UTM Easting (m)	UTM Northing (m)	Date	Time	Weather	Measured Sky Quality (mag/arcsec^2)
Fermont	629527	5851237	June 16	00:30	Clear	19.11 to 19.39
	628725	5851306	June 16	00:40	Clear	19.04 to 19.47
Duley Lake	633982	5862247	June 16	00:50	Clear	20.07 to 20.17
	634724	5862503	June 16	00:55	Clear	20.08 to 20.18
	634990	5861243	June 16	01:00	Clear	20.06 to 20.26
Labrador City	640781	5868070	June 17	00:45	Scattered Clouds	17.68 to 17.90
	639472	5868467	June 17	00:00	High Scattered Clouds	15.37 to 16.47
	640363	5866674	June 17	00:50	Scattered Clouds	18.45 to 18.77
Wabush	643205	5862975	June 17	00:20	Cloudy	19.08 to 19.24
	643509	5863591	June 17	00:30	High Scattered Clouds	19.14 to 19.24
	642889	5864015	June 17	00:15	Cloudy	18.36 to 18.56

Note: Easting and Northing were reversed in the previous EIS and are corrected in the Table 6.

4.5 Baseline Field Program

Existing light levels were collected through two field programs to quantify the existing conditions during different weather conditions and seasons (Table 4-7). The first field program, carried out under winter conditions (i.e., ground covered in snow, absence of leaves on trees), was undertaken between April 10 and 11, 2024 at 12 measurement locations. The second field program, carried out under summer conditions, was undertaken between August 31 and September 2, 2024. In addition to the 12 locations measured during the winter field program, 3 measurement locations were added to the summer field program, which were not considered accessible during the winter field program due to snow and nighttime road conditions. Both surveys were designed to align with guidance from the CIE (2017). Table 4-8 summarizes all measurement locations for both the winter and summer field programs, including their CIE zone based on the classification system provided in Table 4-3, and their locations are shown in Figure 4-1. Measurement locations in Fermont, Wabush and Labrador City were considered to be CIE zone E3 (suburban centres), while remote locations were considered to be CIE zone E1 (natural) and rural areas were considered to be CIE zone E2 (rural).

Table 4-7: Baseline Light Surveys Weather Conditions

Survey Type	Dates	Number of Locations Measured	Weather Conditions
Light survey during winter conditions	April 9 to 11, 2024	12	Clear skies, snow on ground
Light survey during summer conditions	August 31 to September 2, 2024	15	Clear skies and cloudy skies

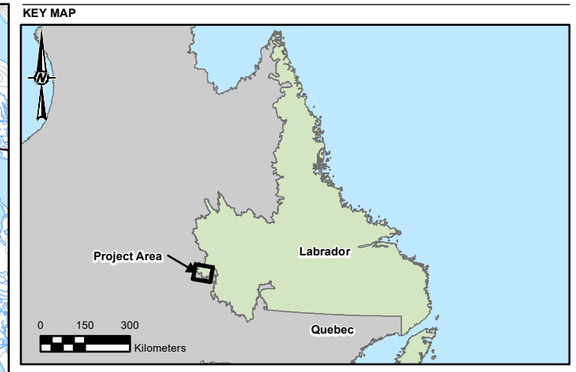
Table 4-8: Light Baseline Field Programs Measurement Locations

Location ID	Measurement Location Description	CIE Zone Classification	Universal Transverse Mercator Location (17N)	
			Easting (m)	Northing (m)
M01	Residences, Fermont QC	E3	1436047	5940949
M02	Horizon-Blanc High School, Fermont QC	E3	1435297	5940786
M03	Duley Lake Provincial Park Entrance, Labrador City NL	E1	1438681	5952571
M04	Duley Lake Provincial Park, Labrador City NL	E1	1439026	5952876
M05	Residences South of Duley Lake Provincial Park, Labrador City NL	E2	1439872	5951771
M06	Drake Ave and Avalon Dr Intersection, Labrador City NL	E3	1444411	5959614
M07	Labrador Mall Parking Lot, Labrador City NL	E3	1443122	5959797
M08	Dog Park, Labrador City NL	E3	1444279	5958110
M09	Open Space near Jean Lake, Wabush NL	E3	1447694	5954995
M10	Reid St and Whiteway Dr Intersection, Wabush NL	E3	1447889	5955518
M11	1 Grenfell Dr, Wabush NL	E3	1447262	5955784
M12	South End of Snow's Dr, Wabush NL	E3	1448426	5953851
M13 (Summer Only)	Elephant Head Lake, Wabush NL	E1	1445945	5951452
M14 (Summer Only)	Riordan Lake, NL	E1	1447912	5951455
M15 (Summer Only)	Long Lake, NL	E1	1440698	5951013

CIE = Commission Internationale de l'Éclairage; E1 = natural; E2 = rural; E3 = suburban.

15-KM
8-KM
Carol Lake
Wabush Lake
Beverly Lake
M07
M06
M08
Flora Lake
M11
M10
M09
M12
M03
M04
M05
Hugette Lake
Long Lake
M15S
M13S
M14S
General Project Location
Wahnahnish Lake Public Water Supply
Lac Daviault
M01
M02
Molar Lake
Mills Lake

KEY MAP



SCALE 1:20,000,000

LEGEND

PROJECT DATA

- General Project Location
- Summer Light Measurement Location
- Winter/Summer Light Measurement Location
- Local Study Area (8km)
- Regional Study Area (15km)

BASEMAP INFORMATION

- Duley Lake Park
- Existing Railway
- Existing Road
- River/Stream
- Contour
- Bog/Wetland
- Waterbody
- Public Water Supply
- Labrador/Quebec Boundary

0 1,950 3,900 7,800

1:189,615 METRES

NOTE(S)

1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)

1. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - ONTARIO
2. IMAGERY CREDITS:
3. COORDINATE SYSTEM: NAD 1983 UTM ZONE 19N

CLIENT

CHAMPION IRON MINES LTD.

PROJECT

KAMI IRON ORE MINE PROJECT (KAMI PROJECT)
WABUSH, NL

TITLE

BASELINE LIGHT MEASUREMENT LOCATIONS

Kami

YYYY-MM-DD	2024-10-25
DESIGNED	----
PREPARED	JMA
REVIEWED	JT
APPROVED	JMC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0038713.5261	0001	B	Figure 4-1

During the April 2024 winter field program, light measurements were taken during clear skies, after astronomical twilight and before the moon rise between 10:30 p.m. and 1:30 a.m. There was snow present on the ground.

During the August/September 2024 summer field program, light measurements at all 15 measurement locations were collected. On the night of August 31, 2024, skies were cloudy for the light measurements conducted at M03, M05, and M15, while skies were generally clear for the measurements at the rest of locations. On the night of September 1, 2024, skies were clear for the light measurements collected at M03, M04, M05, and M07 while skies were overcast for the measurements at the rest of the locations. All measurements were taken after astronomical twilight and before the moon rise, between 10:30 p.m. and 2:40 a.m.

The light trespass measurements were carried out using a Solar Light PMA2100 photometer and a PMA2131 scotopic detector. The scotopic detector has a precision of 0.001 lux (or 1 millilux, comparable to the light trespass of a moonless clear night sky). The measurements were made at each identified measurement location following best practices as per CIE guidelines (CIE 2017). At each location, measurements were taken on a vertical plane at a height of 1.5 m towards the Project footprint. This method follows the IESNA and CIE recommended approach (CIE 2017; IESNA 2000). To account for slight variations in the measurements, three readings with the same orientation were taken at each location and averaged. The measurement locations were selected to be representative of the light trespass that would be experienced by humans in the area.

A Unihedron Sky Quality Meter was used to collect data on existing sky glow levels, providing sky quality measurements in mag/arcsec^2. Sky quality is a measure of sky brightness, which is used to calculate sky glow. The sky quality measurements were taken at 45° from the zenith in the direction of the Project. To account for variability in the measurements, three readings were taken at each location, and averaged to obtain a more representative sky quality measurement. The Sky Quality Meter has a precision of ±0.10 mag/arcsec^2.

4.6 Quality Assurance/Quality Control

The light trespass and sky quality data collected were entered into field notebooks. The photometer was calibrated in accordance with the manufacturer's recommendations and CIE requirements. The data underwent a quality assurance/quality control process for consistency and accuracy. Field notes were reviewed prior to data entry to check for errors. GPS coordinates were crosschecked against field maps for accuracy.

At the end of each field day, GPS coordinates were downloaded to a laptop for safe storage. All field notebooks were scanned and uploaded to the file server. After each field program was complete, GPS coordinates and data from field notebooks were compiled and saved to WSP's secure network.

An independent internal reviewer checked calculations and analysis of the data for applicability, validity of assumptions, methodology, and arithmetic. Technical documents issued externally were reviewed and checked internally by a senior technical staff member with applicable light experience and expertise.

5.0 STUDY RESULTS

The following provides a qualitative description of the measurement locations:

- M01 was located in a residential neighborhood in Fermont, QC. Light levels were impacted by existing residential lighting and streetlights.
- M02 was located at Horizon-Blanc High School in Fermont, QC. Light levels were impacted by existing internal and external school lighting.
- M03 was located at the turnoff for Duley Lake Provincial Park in Labrador City, NL. There were no significant sources of light at this location.
- M04 was located at the entrance gate of Duley Lake Provincial Park in Labrador City, NL. There were entrance lights impacting the measurements for the first night in the summertime field program. Lights were off for the other measurement nights.
- M05 was located at the end of a road in a residential area south of Duley Lake Provincial Park, Labrador City, NL. There were no significant sources of light at this location.
- M06 was located at the intersection of Drake Ave and Avalon Dr in Labrador City, NL. Light levels were impacted by existing commercial lighting and streetlights.
- M07 was located in the parking lot of the Labrador Mall. Light levels were impacted by streetlights and commercial lights.
- M08 was located in a dog park in Labrador City, NL. Light levels were impacted by nearby residential lighting.
- M09 was located in an open space near Jean Lake, Wabush, NL. Light levels were impacted by streetlights.
- M10 was located at the intersection of Reid St and Whiteway Dr, Wabush, NL. Light levels were impacted by streetlights.
- M11 was located at 1 Grenfell Dr, Wabush NL, where the light levels were impacted by existing commercial lights.
- M12 was located in a residential community at the south end of Snow’s Dr, Wabush NL. Light levels were impacted by streetlights.
- M13 was located at the end of a road to Elephant Hear Lake, Wabushi, NL. There were no significant sources of light at this location.
- M14 was located along an unnamed road to Riordan Lake at the turnoff for Elephant Head Lake. Riordan Lake was not accessible to due to poor road conditions. There were no significant sources of light at this location.
- M15 was located near Long Lake, NL, where there were no significant sources of light.

5.1 Light Trespass

Table 5-1 summarizes the measured average illuminance levels at the identified measurement locations during the two field programs, as well as the applicable CIE zone classification and corresponding light trespass limit as per Table 4-4.

Table 5-1: Measured Illuminance Levels

Measurement Location ID	Illuminance (lux)			CIE Zone Classification	CIE Zone Light Trespass Limit (lux)
	Winter	Summer (Night 1)	Summer (Night 2)		
M01	0.004	0.154	0.548	E3	2
M02	0.424	1.258	1.135	E3	2
M03	0.007	0.006	0.006	E1	0.1
M04	0.007	0.014	0.005	E1	0.1
M05	0.003	0.010	0.008	E2	1
M06	6.835	12.475	13.158	E3	2
M07	19.503	20.139	18.098	E3	2
M08	0.220	0.026	0.025	E3	2
M09	0.034	0.235	0.268	E3	2
M10	1.056	0.531	0.549	E3	2
M11	2.744	1.441	1.898	E3	2
M12	0.103	0.835	0.350	E3	2
M13	N/D	0.006	0.028	E1	0.1
M14	N/D	0.005	0.028	E1	0.1
M15	N/D	0.005	N/D	E1	0.1

CIE = Commission Internationale de l'Éclairage; lux = lumens per square metre; N/D = no data collected.

The CIE zone classification light trespass limits were met at most measurement locations except for M06, M07, and M11, which were all associated with commercial land uses (e.g., mall, plaza). Locations were lit up by parking and commercial lights.

The illuminance levels measured at some locations varied between measurement nights because there were various lights that impacted the measurements that were on or off, depending on the night. At M04, road lights at the entrance gate of Duley Lake Provincial Park were only on during the first night of the summer field program but were off during the winter field program and the second night of the summer field program.

5.2 Sky Glow

Table 5-2 summarizes the measured average sky quality levels, the equivalent sky glow levels, and the applicable CIE zone classification and corresponding sky quality limit, as per Table 4-5, at the identified measurement locations during summer and winter conditions. Note that the two nights of the summertime measurements had varying amounts of cloud cover. Measurements taken when there was considerable cloud cover resulted in a decrease in sky quality and an increase in sky glow when compared to results measured under clear skies.

Table 5-2: Measured Sky Quality and Sky Glow Levels

Measurement Location ID	Sky Quality (mag/arcsec^2)			Sky Glow (% above Natural Dark Sky)			CIE Zone Classification	CIE Zone Sky Quality Limit (mag/arcsec^2)
	Winter[a]	Summer (Night 1)[b]	Summer (Night 2)[c]	Winter	Summer (Night 1)	Summer (Night 2)		
M01	20.01	18.43	16.96	333	1754	7056	E3	15
M02	18.61	17.02	16.83	1470	6713	8016	E3	15
M03	20.73	20.32	20.97	123	225	79	E1	20 to 20.5
M04	20.72	19.96	20.81	125	354	108	E1	20 to 20.5
M05	20.31	20.17	20.66	228	272	137	E2	15 to 20
M06	16.04	14.42	14.52	16701	74514	68032	E3	15
M07	12.32	12.46	11.86	513578	454215	786992	E3	15
M08	18.16	19.47	19.01	2270	611	990	E3	15
M09	20.02	19.55	17.61	330	559	3833	E3	15
M10	16.88	17.08	17.34	7627	6347	4974	E3	15
M11	15.68	16.49	15.27	23235	10967	33942	E3	15
M12	19.76	16.82	18.36	445	8066	1883	E3	15
M13	N/D	20.38	20.62	N/D	209	147	E1	20 to 20.5
M14	N/D	20.08	20.25	N/D	304	246	E1	20 to 20.5
M15	N/D	20.40	N/D	N/D	201	N/D	E1	20 to 20.5

(a) Light measurements were taken during clear skies.

(b) Skies were cloudy for the light measurements conducted at M03, M05, M15, while skies were generally clear for the measurements at the rest of locations.

(c) Skies were clear for the light measurements conducted at M03, M04, M05, and M07 while skies were overcast for the measurements at the rest of the locations.

CIE = Commission Internationale de l'Éclairage; mag/arcsec^2 = magnitude per square arc second; N/D = no data collected.

The sky quality measured at measurement locations away from Fermont, Wabush and Labrador City was close to that of a natural dark sky (21.6 mag/arcsec^2) and met the sky glow limit for CIE zone classification E1. Locations in Fermont, Wabush and Labrador City were impacted by commercial lights and streetlights and met the sky glow limit for CIE zone classification E3 at all measurement locations except for M06 and M07.

Comparing the baseline measurement locations identified in the previous EIS (Alderon 2012) and shown in Table 4-6 with measurement locations selected for the 2024 baseline field program, all previous assessment locations were similar to M01 to M11, except for M04 which was located by the Duley Lake Provincial Park entrance, whereas it was located in the centre of the park for the previous study. The sky quality measurement results from the 2024 baseline program were generally lower than those presented in the previous EIS, except for in Duley Lake Provincial Park. The lower sky quality indicates higher sky glow caused by reflection from the atmosphere of human-made lighting; it is expected the increase in sky glow is due to increasing human activities over the past decade. Comparing data under similar weather conditions (i.e., clear skies during summertime), the sky quality results collected at the Duley Lake Provincial Park are very similar in both assessments.

6.0 SUMMARY

To assess the change in light due to the Project, it is necessary to characterize baseline light conditions (i.e., measurements of sky quality and light trespass). Existing data were reviewed for the RSA and LSA. Light measurement data were obtained from the previous EIS (Alderon 2012), for which baseline sky quality measurements were carried out in Wabush, Labrador City, Duley Lake, and Fermont.

As the baseline sky quality data were over 10 years old and the field program did not include the measurement of light trespass, baseline light field programs were carried out in 2024 to update the previous baseline and confirm current baseline conditions. This section presents the results of the data collected in the field program under winter conditions in April 2024 and in the field program under summer conditions in August/September 2024 for the purpose of characterizing the existing light environment.

Available information was collected from mapping of the area surrounding the Project. Based on analysis of available information, 12 locations for the winter field program and 15 locations for the summer field program were selected as monitoring locations representative of sensitive locations in the vicinity of the Project.

Sky quality and light trespass measurements were undertaken during both clear and cloudy skies, after astronomical twilight and while the moon was set so there was no impact on light levels from the sun or the moon.

The light trespass measurements were carried out using a Solar Light PMA2100 photometer and a PMA2131 scotopic detector and a Unihedron Sky Quality Meter was used to gather information on existing sky glow levels. The measurements were made at each identified measurement location following best practices as per the IESNA and CIE guidelines (CIE 2017; IESNA 2000).

Table 6-1 summarizes the measured illuminance levels and sky quality at the measurement locations.

Measured illuminance levels met the applicable CIE zone light trespass limit at most measurement locations except for M06, M07, and M11, which were associated with commercial land uses and were lit up by parking and commercial lights. The sky quality measured at most locations met the applicable CIE zone sky quality limit except for M06 and M07. Light trespass and sky quality were generally impacted by street and commercial lighting and lighting from nearby residences. The sky quality measurement results from the 2024 baseline program were generally lower than those presented in the previous EIS, except for in Duley Lake Provincial Park. The lower sky quality indicates higher sky glow caused by reflection from the atmosphere of human-made lighting; it is expected the increase in sky glow is due to increasing human activities over the past decade. Comparing data under similar weather conditions (i.e., clear skies during summertime), the sky quality results collected at the Duley Lake Provincial Park are very similar in both assessments.

Potential effects to light conditions from the proposed Project will be further examined in the EIS, following the requirements of the Environmental Impact Statement Guidelines (Newfoundland and Labrador Environment and Climate Change, December 2024). The Guidelines outline the relevant EIS requirements for the assessment of effects to light, including but not limited to requirements for the baseline study, effects assessment, and environmental protection mitigation and plans. The baseline report addresses Section 4.3.1 (e) of the EIS Guidelines to document baseline conditions for ambient light conditions, including nighttime illumination levels during different weather conditions and seasons in the light study area. Sufficient data exists from the baseline study for assessment of effects to light from the Project in accordance with the EIS Guidelines.

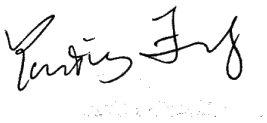
Table 6-1: Existing Light Trespass and Sky Quality at Measurement Locations

Measurement Location ID	Measurement Location Description	Key Light Sources	Illuminance (lux)			Sky Quality (mag/arcsec^2)			CIE Zone Classification
			Winter	Summer (Night 1)	Summer (Night 2)	Winter	Summer (Night 1)	Summer (Night 2)	
M01	Residences, Fermont QC	Residential Lights	0.004	0.154	0.548	20.01	18.43	16.96	E3 – suburban centres
M02	Horizon-Blanc High School, Fermont QC	Internal/External School Lights	0.424	1.258	1.135	18.61	17.02	16.83	E3 – suburban centres
M03	Duley Lake Provincial Park Entrance, Labrador City NL	None	0.007	0.006	0.006	20.73	20.32	20.97	E1 – natural
M04	Duley Lake Provincial Park, Labrador City NL	None	0.007	0.014	0.005	20.72	19.96	20.81	E1 – natural
M05	Residences South of Duley Lake Provincial Park, Labrador City NL	None	0.003	0.010	0.008	20.31	20.17	20.66	E2 – rural
M06	Drake Ave and Avalon Dr Intersection, Labrador City NL	Commercial Lights	6.835	12.475	13.158	16.04	14.42	14.52	E3 – suburban centres
M07	Labrador Mall Parking Lot, Labrador City NL	Commercial/Streetlights	19.503	20.139	18.098	12.32	12.46	11.86	E3 – suburban centres
M08	Dog Park, Labrador City NL	Residential Lights	0.220	0.026	0.025	18.16	19.47	19.01	E3 – suburban centres
M09	Open Space near Jean Lake, Wabush NL	Streetlights	0.034	0.235	0.268	20.02	19.55	17.61	E3 – suburban centres
M10	Reid St and Whiteway Dr Intersection, Wabush NL	Streetlights	1.056	0.531	0.549	16.88	17.08	17.34	E3 – suburban centres
M11	1 Grenfell Dr, Wabush NL	Commercial Lights	2.744	1.441	1.898	15.68	16.49	15.27	E3 – suburban centres
M12	South End of Snow's Dr, Wabush NL	Streetlights	0.103	0.835	0.350	19.76	16.82	18.36	E3 – suburban centres
M13 (Summer Only)	Elephant Head Lake, Wabush NL	None	N/D	0.006	0.028	n/d	20.38	20.62	E1 – natural
M14 (Summer Only)	Riordan Lake, NL	None	N/D	0.005	0.028	n/d	20.08	20.25	E1 – natural
M15 (Summer Only)	Long Lake, NL	None	N/D	0.005	n/d	n/d	20.40	N/D	E1 – natural

CIE = Commission Internationale de l'Éclairage; lux = lumens per square metre; mag/arcsec^2 = magnitude per square arc second; N/D = no data collected

Signature Page

WSP Canada Inc.



Yanqing Zeng, M.A.E.
Light Specialist

Shira Daltrop, M.A.Sc.
Noise and Light Consultant

YZ/SD/jlb

https://wsponlinecan.sharepoint.com/sites/ca-kamieaca00030925894/technical disciplines/09_noise, vibration and light/05 light/ca0038713.5261-r-revb kami light baseline_clean.docx

7.0 REFERENCES

Alderon (Alderon Iron Ore Corp). 2012. Kami Iron Ore Project Environmental Impact Statement. September 2012.

Australian Greenhouse Office. 1998. Chapter 7: Appliance Technologies and Scope for Emission Reduction. Strategic Study of Household Energy and Greenhouse Issues. June 1998.

Australian Greenhouse Office. 2005. Chapter 5: Assessing lighting savings, Working Energy Resource and training kit: Lighting. May 2005.

CIE (Commission Internationale de l'Eclairage). 2017. Technical Report: Guide on the Limitation of the Effects of Obtrusive Light from Outdoor Lighting Installations, 2nd Edition. CIE 150:2017, ISBN 978-3-902842-48-0. Vienna, Austria.

IESNA (Illuminating Engineering Society of North America). 2000. TM-11-2000, Light Trespass: Research, Results and Recommendations. New York: Illuminating Engineering Society of North America.

ILP (Institution of Lighting Professionals). 2020. Guidance Note 01/20 Guidance note for the reduction of obtrusive light. Available at https://www.brighton-hove.gov.uk/sites/default/files/2021-05/OD65%20ILP-Guidance%20Note%201%202020.pdf.

Narisada K, Schreuder D. 2004. Light Pollution Handbook. Springer. Dordrecht, The Netherlands.

Schlyter P. 2009. Radiometry and photometry in astronomy. Archived from the original on Dec 7, 2013.

US (United States) Department of Labor. 2010. Illumination. Regulations (Standards - 29 CFR). Occupational Safety and Health Administration.

wsp.com