Floatel Noise Monitoring Survey - 5 (May 14 – May 17, 2025)

Woodfibre LNG Project

July 31, 2025

123221624EN-RPT0059

Woodfibre LNG

Preamble

The Woodfibre Liquefied Natural Gas Project (the Project) is a liquefied natural gas export facility being constructed on the former Woodfibre Pulp and Paper Mill site in Átl'ka7tsem (Howe Sound), approximately seven kilometres south of Sḵwx̱wú7mesh (Squamish). The Project is on the historical location of a Sḵwx̱wú7mesh Úxwumixw (Squamish Nation) village known as Swiẏát. Swiẏát and Átl'ḵ'a7tsem (Howe Sound) are tied to the cultural well-being of Sḵwx̱wú7mesh Úxwumixw (Squamish Nation) members, their ancestors, and their descendants, and to other Indigenous groups as defined in the Project's Environmental Assessment Certificates. The Project is also operating within the traditional, ancestral, and unceded territory of the səlilwətaɬ (Tsleil-Waututh) Nation, and to other Indigenous groups as defined in the Project's Environmental Assessment Certificates. Woodfibre LNG General Partner Inc. recognizes the importance of these areas to the Sḵwx̱wú7mesh stélmexw (Squamish People), and other Indigenous groups. Woodfibre LNG General Partner Inc., as general partner on behalf of Woodfibre LNG Limited Partnership (Woodfibre LNG) seeks to construct and operate the Project in a manner that is respectful of Indigenous values. This Floatel Noise Monitoring and Mitigation Plan is primarily written in English with important place names, phrases, and passages provided in Sḵwx̱wú7mesh sníchim (the Squamish language).

Temíxwiẏiḵw chet wa naantem chet ti temíxw Swiẏát
Chet wa sméṅhemswit kwis ns7éyx̱nitas chet ti temíxw
We7ú chet kwis t'íchimwit iy íẇas chet eḵ' I tti.

Our ancient ancestors named this place Swiẏát
We, as their descendants safeguard these lands
We will continue to swim and fish in these clear waters.

Limitations and Sign-off

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Squamish-English Translations

Squamish	English
Átl'ka7tsem	Howe Sound
ínexwantas	monitoring
Skwxwú7mesh	Squamish
Skwxwú7mesh sníchim	Squamish Language
Skwxwú7mesh stélmexw	Squamish people
Skwxwú7mesh Úxwumixw	Squamish Nation
Swiỷát	Historic Squamish Nation village located at Woodfibre Site

Abbreviations

ANSI	American National Standards Institute
BC	British Columbia
BC ER	British Columbia Energy Regulator
dB	Decibel level
dBA	A-weighted decibel level
EAC	Environmental Assessment Certificate
FNMMP	Floatel Noise Monitoring and Mitigation Plan
HVAC	Heating, ventilation, and air-conditioning
Hz	Hertz
L_{Amax}	Maximum A-weighted equivalent sound level
L_d	Daytime equivalent sound level
L_{eq}	Energy equivalent sound level
L_n	Nighttime equivalent sound level
LNG	Liquified natural gas
MOE	Ministry of Environment and Climate Change Strategy
MOF	Material Offloading Facility
MOH	Ministry of Health
the Project	Woodfibre Liquefied Natural Gas Project
SPL	Sound pressure level
VCH	Vancouver Coastal Health
WHO	World Health Organization
Woodfibre LNG	Woodfibre LNG General Partner Inc.

Glossary

Adaptive Management	A systematic process for continually improving management policies and practices by learning from the outcomes of operational programs.
Bands (octave, 1/3 octave)	A series of electronic filters separate sound into discrete frequency bands, making it possible to know how sound energy is distributed as a function of frequency. Each octave band has a centre frequency that is double the centre frequency of the octave band preceding it.
daytime	The hours from 07:00 to 22:00.
dB - Decibel	A logarithmic unit associated with sound pressure levels and sound power levels.
dBA - decibel, A-weighted	A logarithmic unit where the recorded sound has been filtered using the A frequency weighting scale. A-weighting somewhat mimics the response of the human ear to sounds at different frequencies. A weighted sound pressure levels are denoted by the suffix 'A' (i.e., dBA), and the term pressure is normally omitted from the description (i.e., sound level or noise level).
energy equivalent sound level (L_{eq})	An energy-average sound level taken over a specified period of time. It represents the average sound pressure encountered for the period. The time period is often added as a suffix to the label (e.g., $L_{eq}(24)$ for the 24-hour equivalent sound level). L_{eq} is usually A-weighted. A L_{eq} value expressed in dBA is a good, single value descriptor of the annoyance of noise.
frequency	Number of cycles per unit of time. In acoustics frequency is expressed in hertz (Hz), i.e., cycles per second.
floatel	The marine-based work camp, associated facilities and mooring infrastructure dedicated to house approximately 650 Workers during the Construction of the Project.
hertz (Hz)	Unit of measurement of frequency, numerically equal to cycles per second.
L_d	Daytime sound level, an equivalent continuous sound level taken over 15 hours from 07:00 to 22:00.
L_{Amax}	The maximum value of the A-weighted sound pressure level during a measurement duration.

L_n	Nighttime sound level, an equivalent continuous sound level taken over 9 hours from 22:00 to 07:00.
nighttime	The hours from 22:00 to 07:00.
noise	Unwanted sound.
noise level	Same as sound level, except applied to unwanted sounds.
sound	A dynamic (fluctuating) pressure.
sound pressure level (SPL)	The logarithmic ratio of the root mean square (RMS) sound pressure to the sound pressure at the threshold of hearing. The sound pressure level is defined by the equation below where P is the RMS pressure due to a sound and P_0 is the reference pressure. P_0 is usually taken as 2.0×10^{-5} Pascals. SPL (dB) = 20 log (P_{RMS}/P_0)

1.0 INTRODUCTION

1.1 OVERVIEW

Woodfibre LNG General Partner Inc. (Woodfibre LNG) is constructing the Woodfibre Liquefied Natural Gas Project (the Project), which is located on the former Woodfibre Pulp Mill site approximately seven kilometres (km) southwest of Sḵwx̱wú7mesh (Squamish), British Columbia (BC).

Woodfibre LNG received an amendment to the Environmental Assessment Certificate (EAC) #E15-02 (Amendment #3) on November 1, 2023, approving the use of temporary accommodations for off-duty construction workers in a self-contained floating housing facility (floatel). The Amendment #3 includes conditions related to air quality and noise monitoring for the floatel occupants.

The floatel was mobilized and moored at the Project site on June 21, 2024, and will be continuously operating for approximately three years during the construction of the Project. The floatel will provide accommodation for approximately 650 persons at peak construction. In addition to the accommodation spaces, the floatel also includes a variety of ancillary service facilities such as medical, food and beverage, laundry, recreational and leisure, and office spaces. Figure 1 in Appendix A shows the site plan and location of the floatel.

1.2 FLOATEL NOISE MONITORING AND MITIGATION PLAN

Amendment #3 includes conditions regarding noise management for the floatel. Condition 30 of Amendment #3 states that:

> *30.1 The Holder must retain a Qualified Professional(s) to develop the following monitoring and mitigation plans, in consultation with MOE[1], MOH[2], BC Energy Regulator, VCH[3] and Aboriginal Groups:*
>
> *b) Noise Monitoring and Mitigation Plan.*

In accordance with the requirements of Condition 30, the Noise Monitoring and Mitigation Plan (the FNMMP) has been developed on July 17, 2024 (Rev.4) by the Stantec Qualified Professional and reviewed by the regulatory agencies. The FNMMP specifically includes the Noise Monitoring Plan, Noise Mitigation Plan and Adaptive Management Plan.

The FNMMP provides general guidance about how to assess workers' sleep disturbance due to Project related construction noise within the floatel cabins. The general guidance includes the monitoring method, sleep disturbance noise threshold, data analysis procedures, and reporting requirements.

1 MOE: Ministry of Environment and Climate Change Strategy
2 MOH: Ministry of Health
3 VCH: Vancouver Coastal Health

1.3 OBJECTIVE

In accordance with the FNMMP, a series of quarterly noise monitoring programs will be conducted or initiated following changes in construction activities.

Five noise monitoring surveys have been conducted on the floatel since July 2024 and four summary reports have been submitted. All reports are listed in References section:

- The initial noise monitoring program was conducted from July 10 to July 14, 2024, to measure sound levels in the cabins. The results were presented in a report “Floatel Noise Monitoring Survey - 1 (July 10 - 14, 2024) – Woodfibre LNG Project” (Stantec 2024a).
- A second subsequent noise monitoring survey was conducted from September 4 to September 7, 2024; and the results were presented in a report “Floatel Noise Monitoring Survey - 2 (September 4 – 7, 2024) – Woodfibre LNG Project” (Stantec 2024b).
- A third subsequent noise monitoring survey was conducted from October 8 to October 11, 2024; and the results were presented in a report “Floatel Noise Monitoring Survey - 3 (October 8 – 11, 2024) – Woodfibre LNG Project” (Stantec 2024c).
- The fourth subsequent noise monitoring survey was conducted from January 31 to February 2, 2025; the results were presented in a report “Floatel Noise Monitoring Survey - 4 (January 31 – February 2, 2025) – Woodfibre LNG Project” (Stantec 2024d).
- The fifth subsequent noise monitoring survey was conducted from May 14 to May 17, 2025.

During this fifth noise monitoring period, shore grid power continued to supply electricity to the floatel. Continuous construction activities were observed during the dayshift and nightshift.

The objectives of the noise monitoring programs include the following:

- Measure sound levels at the selected cabins.
- Analyze data gathered and evaluate noise effects on the floatel cabins from construction activities.
- Compare the measured sound levels with applicable sleep disturbance thresholds and assess compliance for sleep disturbance effect for sleeping quarter occupants.
- Conduct interviews about noise with occupants.
- Recommend mitigation or adaptive management plan if required.

1.4 ENVIRONMENTAL NOISE DESCRIPTORS

All noise descriptors in this assessment are based on the A-weighted decibel (dBA) scale. The dBA unit is based on relative loudness of sound at different frequencies and is meant to reflect the human ear’s response to noise.

Environmental noise typically varies over time. To account for this variation, single number descriptors are used. It is defined as the steady, continuous sound level over a specified time that has the same acoustic energy as the actual varying sound levels over the specified time. The noise descriptors energy equivalent sound level (L_{eq}), daytime equivalent A-weighted sound level (L_d), nighttime equivalent A-weighted sound level (L_n), and maximum A-weighted sound level (L_{Amax}) are commonly used to quantify noise effects for activities of a project. The following provides a general description for these descriptors:

- L_{eq} represents the energy-average sound pressure encountered for the period.
- L_d is the 15-hour energy equivalent A-weighted sound level during the daytime period from 07:00 to 22:00.
- L_n is a 9-hour energy equivalent A-weighted sound level during the nighttime period from 22:00 to 07:00.
- L_{Amax} is the maximum A-weighted sound level recorded over the measurement duration.

The Glossary section provides additional details for these descriptors.

2.0 CABIN SOUND LEVEL TARGETS

Construction noise may cause sleep disturbance for the floatel occupants during the Project construction phase. This section focuses on the sleep disturbance threshold recommendations by Health Canada, as well as room sound level criteria from international standards (i.e., American National Standards Institute [ANSI]).

2.1 HEALTH CANADA SLEEP DISTURBANCE THRESHOLD

Noise may cause sleep disturbance for people and there is clear evidence that ongoing sleep disturbance is associated with a wide variety of health effects, such as cardiovascular effects, mental health and hearing impairment. Health Canada's Guidance for Evaluating Human Health Effects in Impact Assessment: NOISE, 2023 (Health Canada Noise Guidance) references the guidelines and recommendations of the World Health Organization (WHO) for community noise (WHO 1999) and Night Noise Guidelines for Europe regarding sleep disturbance (WHO 2009). The WHO 1999 guideline recommends a threshold for sleep disturbance as being an indoor sound level of no more than 30 dBA L_{eq} for continuous noise during the sleep period. Additionally, for individual noise events, Health Canada refers to WHO's recommendations that indoor sound levels should not exceed 45 dBA L_{Amax} more than 10 to 15 times per night to provide for a good sleep environment (WHO 1999). Health Canada recommends that an outdoor-to-indoor transmission loss with windows at least partially open is 15 dBA and fully closed windows are assumed to reduce outdoor sound levels by approximately 27 dBA (Health Canada 2023).

The Project construction activities may be scheduled 24 hours per day, meaning that the floatel occupants could be off-duty and sleeping during both daytime and nighttime while construction is ongoing. To assess potential sleep disturbances, the recommended indoor noise thresholds for the floatel are:

- 30 dBA (L_{eq}) for continuous noise level during sleep periods.
- Maximum 15 times of occurrence of L_{Amax} > 45 dBA during both daytime (07:00 to 22:00) and nighttime (22:00 to 07:00).

Although the Heath Canada sleep disturbance threshold of 30 dBA is used in this assessment, it is better suited for private residential bedrooms with very low background noise. However, in spaces with higher occupant density, such as apartment buildings and hotel or motel rooms, background noise from central heating, ventilation and air-conditioning (HVAC) systems, as well as local people activities, a sound level of 30 dBA may not be feasible.

Therefore, in addition to Health Canada's thresholds, the ANSI S12.2 standard for hotel and motel room sound level criteria is used as an achievable target for evaluating interior noise on the floatel.

3.0 ANSI S12.2 SOUND LEVEL CRITERIA FOR ROOM

The ANSI S12.2-2019 (Reaffirmed in 2023) Criteria for Evaluating Room Noise is commonly used as a reference guide for assessment of sound level criteria for occupants in various interior environments. The ANSI standard specifies sound level criteria when evaluating the room noise by using the survey method that employs the A-weighted sound level. Table 2.1 lists the A-weighted sound level criteria for individual rooms or suite in hotels and motels, based on ANSI sound level criteria for room of various uses (ANSI S12.2).

Table 2.1 A-weighted Sound Level Criteria for Rooms – Hotels and Motels

Occupancy	A-weighted Sound Level dBA
Hotels/motels	
Individual rooms or suites	39-44
Meeting/banquet rooms	35-44
Service support areas	48-57
Source: Table C.1 of ANSI S12.2	

As the floatel worker accommodation is similar to the hotel/motel classification, the A-weighted sound level criteria of 39 to 44 dBA for individual rooms or suites are also included in the floatel noise evaluation, and 44 dBA will be set as the achievable target for the sleep disturbance thresholds.

4.0 NOISE MONITORING PROGRAM

In accordance with the FNMMP, Stantec Qualified Professionals conducted this noise monitoring program on the floatel from May 14 to May 17, 2025. The following sections outline the monitoring program details, including cabin locations, measurement instrumentation, measurement setup, Project construction activities occurring during the measurement period, and data analysis methods.

4.1 CABIN LOCATIONS

The sound level meters were set up inside the representative cabins on different decks of the floatel. A representative cabin is an unoccupied cabin that is available for occupancy and is selected based on the highest potential noise impact. Key factors in cabin selection included proximity to construction activities, line of sight to noise sources, and availability during the survey period.

Six cabins were selected for the fourth noise monitoring survey: Cabin 2010, Cabin 5630, Cabin 6004, Cabin 7028, Cabin 9436 and Cabin 0104. Each cabin is located on a different deck, indicated by the first digit of the cabin number (e.g., Cabin 5630 on Deck 5 and Cabin 0104 on Deck 10).

Construction activities within the Project area were the major noise sources onsite and were the focus of the fifth noise monitoring survey. Cabin 6004 and Cabin 7028 were selected because they are located at the stern of the floatel which is closest to and in line of sight with the northeastern construction site. The floatel is berthed starboard to shore, Cabin 5630, Cabin 9436 and Cabin 0104 are located at the starboard side of the floatel and facing the southwestern construction site. They were selected to evaluate noise effects from construction activities on the southwest. The rationale for the cabin selections is also presented in Table 3.1.

Table 3.1 summarizes the selected cabins, general descriptions, and field observations. Figure 2 through Figure 4 illustrate these cabin locations on each deck of the floatel.

Table 3.1 Selected Cabins, Descriptions, and Observations

Cabin	Deck	Description and Observations during Monitoring Period	Reference Figures
2010	2	• Deck 2 is under the ship water line. • The 86 cabins on Deck 2 are mainly occupied by the crew members, there are a few construction workers also living on Deck 2 due to full occupancy. • Some cabins are adjacent to the floatel operating facilities, including Engine Stores (engine room) and workshop. • Shore grid power provided power to the floatel during the survey period. Noise levels due to the Engine Store were reduced along the corridors. • Cabin 2010 is adjacent to the floatel operating facility, high noise emissions through the ceiling plenum to the room were measured. • Cabin ceiling ventilation was continuously operating.	Figure 2 Figure 5
5630	5	• Total of 219 cabins, the second highest numbers of cabins per deck after Deck 6. • Cabins are occupied by the construction workers. • There are Vent Stores (i.e., ventilation rooms) and Service Workshop located at the stern of Deck 5. • Cabin 5630 was selected as it is located at the starboard side of the floatel and facing the southwestern construction site. • Cabin ceiling ventilation was continuously operating.	Figure 2 Figure 6
6004	6	• Total of 248 cabins, highest number of cabins per deck among all decks. • Cabins occupied by the construction workers. • Cabin 6004 was selected as it is located at the stern of the floatel and the cabin wall is facing the northeastern construction site. • Cabin ceiling ventilation was continuously operating.	Figure 3 Figure 7
7028	7	• Total of 58 cabins on Deck 7. • Ancillary service facilities on Deck 7 including Reception, Gym, Games Lounge, and other facility rooms. • Cabins are occupied by the construction workers. • Cabin 7028 it is located at the stern of the floatel and the cabin wall is facing the northeastern construction site. • Cabin ceiling ventilation was continuously operating.	Figure 3 Figure 8
9436	9	• Total of 88 cabins on Deck 9. • There is an outdoor area at the stern and a smoking area on the starboard side of Deck 9. • Cabins are occupied by the construction workers. • Some cabins are located underneath several Fan Rooms (rooms with ventilation fans) on Deck 10, e.g., Cabins 9420 to 9436. • Higher noise from Fan Rooms ventilation openings was observed at the smoke area. • Cabin 9436 is located at the starboard side of the floatel and facing the southwestern construction site. • Cabin ceiling ventilation was continuously operating.	Figure 4 Figure 9

Cabin	Deck	Description and Observations during Monitoring Period	Reference Figures
0104	10	• Total of 17 cabins with office areas on Deck 10. • Cabins are occupied by crew members and construction workers. • There are several Fan Rooms on Deck 10. • Cabin 0104 is located at the starboard side of the floatel and facing the southwestern construction site. • Cabin ceiling ventilation was continuously operating.	Figure 4 Figure 10

4.2 MEASUREMENT INSTRUMENTATION

Noise monitoring was conducted with two Brüel & Kjær Model 2250 sound level meters fitted with Brüel & Kjær 4189 type microphones. The sound level meters meet the ANSI S1.4-2006 Type 1 and IEC 61672-1 Class 1 specifications. The sound level meters were field calibrated before and after each measurement period and have valid laboratory certificates. Laboratory certificates are considered valid within two-year period after last recalibration for the sound level meters and within one year period for the calibrator.

Table 3.2 summarizes details of the measurement instrumentation. Corresponding calibration certificates of sound level meters and calibrator are attached in Appendix C.

Table 3.2 Details of Measurement Instrumentation

Item	Description
Sound Level Meter	Brüel & Kjær Model 2250 s/n 2818093 Brüel & Kjær Model 2250 s/n 2809183
Microphone	Brüel & Kjær Model 4189 s/n 2799496 Brüel & Kjær Model 4189 s/n 2799510
Calibrator	Brüel & Kjær Model 4231 s/n 3009303
Bandwidth	1/3 Octave Band
Frequency Range	6.3 Hz – 20 kHz
Frequency Weightings	Z (Linear), A & C
Calibration Level	94 dB at 1 kHz

4.3 MEASUREMENT SETUP

Dayshift workers sleep during nighttime and nightshift workers sleep during daytime on the floatel. Therefore, continuous sound levels over 24 hours (i.e., over one daytime and one nighttime periods) were measured at the cabins.

Two sound level meters (Brüel & Kjær Model 2250), one per room, were deployed for continuous noise monitoring. The sound level meters were set to 1-minute logging intervals measuring L_{Amax} and L_{eq} sound levels in one-third octave band L_{eq} sound levels from 6.3 Hz to 20 kHz frequency range.

Sound level meters also recorded the continuous digital audio signal simultaneously for further data analysis and post-processing to remove (isolate) extraneous noise events from the dataset.

The microphones were set up at bed height (i.e., 1 metre above the room floor) at each cabin. Figure 5 through Figure 10 in Appendix A illustrate the sound level meter setup at each cabin.

The monitoring procedures are described as below:

- Two sound level meters were setup at Cabin 7028 and Cabin 0104 to collect continuous noise data over 24 hours from May 14 to May 15.
- Two sound level meters were switched Cabin 5630 and Cabin 6004 to collect continuous noise data over 24 hours from May 15 to May 16.
- Then two sound level meters were switched to Cabin 2010, Cabin 9436 to collect continuous noise data over 24 hours from May 16 to May 17.

Table 3.3 summarizes the measurement duration at each cabin during the noise monitoring period.

Table 3.3 Noise Monitoring Duration at Cabins

Cabin	Measurement Start		Measurement End		Measurement Duration (hrs mm))
	Date (mm/dd/yy yy)	Time (hh:mm)	Date (mm/dd/yy yy)	Time (hh:mm)	
2010	05/16/2025	18:38	05/17/2025	18:38	24 hrs
5630	05/15/2025	18:17	05/16/2025	18:33	24 hrs 16 mins
6004	05/15/2025	18:32	05/16/2025	18:19	23 hrs 47 mins
7028	05/14/2025	16:03	05/15/2025	18:08	26 hrs 5 mins
9436	05/16/2025	18:29	05/17/2025	18:31	24 hrs 2 mins
0104	05/14/2025	15:44	05/15/2025	18:23	26 hrs 39 mins

4.4 PROJECT CONSTRUCTION ACTIVITIES

There were Project dayshift construction activities during the noise monitoring period from May 14 to May 17. The dayshift was from 07:00 to 17:00. There were no nighttime construction activities during the noise monitoring period. Figure 12 illustrates the construction areas onsite with Area ID #.

Major construction activities during the noise monitoring period included the following:

- Area 1200: Excavator began digging the trench; built an access ramp for nightshift.
- Area 1200: Excavator continued hammering, digging, and loading material from the trench to 4200 and 4100 Areas.
- Area 4200: Rock trucks hauled material and stockpiles in the 4200 Area.
- Area 4100: Rock trucks continued hauling materials to the 4100 Area stockpile.

4.5 DATA ISOLATION ANALYSIS

The FNMMP prescribes that measured noise data that are not representative of the existing acoustic environment, non-anthropogenic sound, or non-representative weather conditions can be isolated from the data set prior to the calculation of any average values.

Weather during this monitoring period was generally representative most time, there was no high wind; there were some periods with light rain, however, the rain was light and had no influences on the noise measurements inside the cabins. Therefore, isolation was not applied for weather conditions.

Noise events isolated from the data set included:

- Qualified Professional activities (e.g., equipment setup and disassembly, daily regular checkups).
- Door knocking or opening at the monitored cabin.
- Floatel power shutdown period. During the noise monitoring periods, the floatel scheduled power shutdowns for operation maintenance purposes. During power shutdowns, all operational equipment on the floatel was off and the background noise was not representative of the normal floatel acoustical environments. These periods include:
    1. May 15: 14:12 – 15:50
    2. May 17: 8:20 – 8:46

These noise events were identified using audio recordings and also based on the Qualified Professional's field notes and then removed from the valid measurement data. Noise from local anthropogenic activities from neighbor occupants (e.g., toilet flushing, foot traffic and conversation in the corridor) and crew member activities nearby (e.g., regular operations, cleaning and maintenance activities) was considered to be part of the existing acoustic environment and was not isolated.

After the data isolation, L_{eq}, L_d, L_n, and L_{Amax} values were determined for the different measurement periods. Once the data isolation analysis was completed, the resulting valid noise data set (i.e., with invalid data removed) was logarithmically averaged over the corresponding time periods using the following formula:

$$L_{Aeq}(isolated, ave) = 10lg_{10}\left[\frac{1}{N_V}\sum_{i=1}^{N_V} 10^{(0.1L_{A,eq})}\right] dBA$$

where N_V = number of valid 1-minute logging periods in the measurement data set.

5.0 MEASUREMENT RESULTS

This section summarizes the analysis results. The L_d, L_n, the occurrence of L_{Amax} higher than 45 dBA (i.e., Health Canada threshold) are analyzed and presented in tables herein. In total, there are more than 8,700 minutes logged measurement values at six cabins during the monitoring period.

5.1 MEASUREMENT RESULTS AT CABINS

Table 4.1 provides an overall summary of the noise monitoring results at each noise monitoring cabin.

Table 4.1 Summary of Measurement Results

Cabin	Deck	Overall Average Daytime L_d, dBA	Overall Average Nighttime L_n, dBA	Number of Highest Occurrence of L_{Amax} > 45 dBA	
				Daytime	Nighttime
2010	2	45.7	46.2	670	540
5630	5	37.2	36.9	25	9
6004	6	41.3	41.2	46	21
7028	7	33.6	33.4	11	4
9436	9	35.2	35.7	23	5
0104	10	38.5	39.2	115	25

The overall average daytime L_d sound levels are the logarithmic average of two daytime measurement results at each cabin. Details of daily measurement results at each cabin are described in the following sections. The daily results are compared to the Health Canada sleep disturbance thresholds and ANSI room sound level criteria of 39 to 44 dBA.

5.1.1 Cabin 2010

Table 4.2 summarizes the daily L_d and L_n sound levels, and quantities of occurrence with L_{Amax} > 45 dBA at Cabin 2010.

Table 4.2 Summary of Daily L_d and L_n at Cabin 2010

Date (mm/dd/yyyy)	Average Daytime L_d, dBA	Average Nighttime L_n, dBA	Daytime Quantity of L_{Amax}> 45 dBA	Nighttime Quantity of L_{Amax} > 45 dBA	Health Canada		ANSI S12.2
					L_{eq}, dBA	Qty. of L_{Amax} > 45 dBA	L_{eq}, dBA
05/16/2025[1]	46.1	46.2	199	540	30	15	39 to 44
05/17/2025	45.2	-[2]	670	-[2]	30	15	39 to 44

Notes:
[1] The measurements started at 18:38.
[2] "-" indicates no data was measured. The survey ended at 18:38.

Monitoring results for Cabin 2010 are summarized as follows:

- L_d and L_n are higher than the Health Canada noise threshold of 30 dBA.
- L_d and L_n are higher than recommended ANSI S12.2 room sound level criteria limit of 44 dBA.
- Quantities of occurrence with L_{Amax} > 45 dBA are more than 15 times during both daytime and nighttime periods. See Section 6.0 for further detail of discussion.

5.1.2 Cabin 5630

Table 4.3 summarizes the daily L_d and L_n sound levels, and quantities of occurrence with L_{Amax} > 45 dBA at Cabin 5630.

Table 4.3 Summary of Daily L_d and L_n at Cabin 5630

Date (mm/dd/yyyy)	Average Daytime L_d, dBA	Average Nighttime L_n, dBA	Daytime Quantity of L_{Amax}> 45 dBA	Nighttime Quantity of L_{Amax} > 45 dBA	Health Canada		ANSI S12.2
					L_{eq}, dBA	Qty. of L_{Amax} > 45 dBA	L_{eq}, dBA
05/15/2025[1]	37.2	36.9	25	9	30	15	39 to 44
05/16/2025	37.1	-[2]	8	-[2]	30	15	39 to 44

Notes:

[1] The measurements started at 18:17.

[2] "-" indicates no data was measured. The survey ended at 18:33.

Monitoring results for Cabin 5632 are summarized as follows:

- L_d and L_n are higher than the Health Canada noise threshold of 30 dBA.
- L_d and L_n are lower than recommended ANSI S12.2 room sound level criteria limit of 44 dBA.
- Quantities of occurrence with L_{Amax} > 45 dBA are more than 15 times during the daytime period of May 15.
- Quantities of occurrence with L_{Amax} > 45 dBA are less than 15 times during the nighttime period of May 15 and daytime period of May 16.

5.1.3 Cabin 6004

Table 4.4 summarizes the daily L_d and L_n sound levels, and quantities of occurrence with L_{Amax} > 45 dBA at Cabin 6004.

Table 4.4 Summary of Daily L_d and L_n at Cabin 6004

Date (mm/dd/yyyy)	Average Daytime L_d, dBA	Average Nighttime L_n, dBA	Daytime Quantity of L_{Amax}> 45 dBA	Nighttime Quantity of L_{Amax} > 45 dBA	Health Canada		ANSI S12.2
					L_{eq}, dBA	Qty. of L_{Amax} > 45 dBA	L_{eq}, dBA
05/15/2025[1]	41.3	41.2	6	21	30	15	39 to 44
05/16/2025	41.2	-[2]	46	-[2]	30	15	39 to 44

Notes:

[1] The measurements started at 18:32.

[2] "-" indicates no data was measured. The survey ended at 18:19.

Monitoring results for Cabin 6004 are summarized as follows:

- L_d and L_n sound levels are higher than the Health Canada noise threshold of 30 dBA.
- L_d and L_n sound levels are lower than the ANSI S12.2 room sound level criteria limit of 44 dBA.
- Quantities of occurrence with L_{Amax} > 45 dBA are less than 15 times during daytime period of May 15.
- Quantities of occurrence with L_{Amax} > 45 dBA are more than 15 times during night period of May 15 and daytime period of May 16.

5.1.4 Cabin 7028

Table 4.5 summarizes the daily L_d and L_n sound levels, and quantities of occurrence with L_{Amax} > 45 dBA at Cabin 7028.

Table 4.5 Summary of Daily L_d and L_n at Cabin 7028

Date (mm/dd/yyyy)	Average Daytime L_d, dBA	Average Nighttime L_n, dBA	Daytime Quantity of L_{Amax}> 45 dBA	Nighttime Quantity of L_{Amax} > 45 dBA	Health Canada		ANSI S12.2
					L_{eq}, dBA	Qty. of L_{Amax} > 45 dBA	L_{eq}, dBA
05/14/2025[1]	33.4	33.4	9	4	30	15	39-44
05/15/2025	33.7	-[2]	11	-[2]	30	15	39-44

Notes:

[1] The measurements started at 16:03.

[2] "-" indicates no data was measured. The survey ended at 18:08.

Monitoring results for Cabin 7028 are summarized as follows:

- L_d and L_n sound levels are higher than the Health Canada noise threshold of 30 dBA.
- L_d and L_n sound levels are lower than the ANSI S12.2 room sound level criteria limit of 44 dBA.
- Quantities of occurrence with L_{Amax} > 45 dBA are less than 15 times during both daytime and nighttime periods.

5.1.5 Cabin 9436

Table 4.6 summarizes the daily L_d and L_n sound levels, and quantities of occurrence with L_{Amax} > 45 dBA at Cabin 9436.

Table 4.6 Summary of Daily L_d and L_n at Cabin 9436

Date (mm/dd/yyyy)	Average Daytime L_d, dBA	Average Nighttime L_n, dBA	Daytime Quantity of L_{Amax}> 45 dBA	Nighttime Quantity of L_{Amax} > 45 dBA	Health Canada		ANSI S12.2
					L_{eq}, dBA	Qty. of L_{Amax} > 45 dBA	L_{eq}, dBA
05/16/2025[1]	35.4	35.7	5	5	30	15	39 to 44
05/17/2025	34.7	-[2]	23	-[2]	30	15	39 to 44

Notes:

[1] The measurements started at 18:29.

[2] "-" indicates no data was measured. The survey ended at 18:31.

Monitoring results for Cabin 9436 are summarized as follows:

- L_d and L_n sound levels are higher than the Health Canada noise threshold of 30 dBA.
- L_d and L_n sound levels are lower than the ANSI S12.2 room sound level criteria limit of 44 dBA.
- Quantities of occurrence with L_{Amax} > 45 dBA are less than 15 times during the daytime and nighttime periods of May 16.
- Quantities of occurrence with L_{Amax} > 45 dBA are more than 15 times during the daytime period of May 17.

5.1.6 Cabin 0104

Table 4.7 summarizes the daily L_d and L_n sound levels, and quantities of occurrence with L_{Amax} > 45 dBA at Cabin 0104.

Table 4.7 Summary of Daily L_d and L_n at Cabin 0104

Date (mm/dd/yyyy)	Average Daytime L_d, dBA	Average Nighttime L_n, dBA	Daytime Quantity of L_{Amax}> 45 dBA	Nighttime Quantity of L_{Amax} > 45 dBA	Health Canada		ANSI S12.2
					L_{eq}, dBA	Qty. of L_{Amax} > 45 dBA	L_{eq}, dBA
05/14/2025[1]	38.7	39.2	59	25	30	15	39 to 44
05/15/2025	38.3	-[2]	115	-[2]	30	15	39 to 44

Note:

[1] The measurements started at 15:44.

[2] "-" indicates no data was measured. The survey ended at 18:23.

Monitoring results for Cabin 0104 are summarized as follows:

- L_d and L_n sound levels are higher than the Health Canada noise threshold of 30 dBA.
- The L_d and L_n sound levels are lower than the ANSI S12.2 room sound level criteria limit of 44 dBA.
- Quantities of occurrence with L_{Amax} > 45 dBA are more than 15 times during both daytime and nighttime periods.

6.0 NOISE INTERVIEWS

During the noise monitoring period on the floatel, the Qualified Professionals interviewed various cabin occupants. The purpose of the interview is to obtain an understanding of the noise effects of interest to the occupants; and perform an investigation if there are any potential noise issues identified on the floatel and inform the floatel management for further mitigation plans.

Thirty occupants were randomly selected for the interviews, which represents about 5% of the total occupants at the time. There were approximately 514 total construction worker occupants during the fourth noise monitoring survey. The quantity of the floatel occupants is close to the full capacity.

Four questions were asked regarding noise issues:

1. General evaluation for your sleeping quality at the floatel.
2. How long have you stayed at the floatel?
3. Can you hear outside construction noise?
4. Any noise concern/complaints.

Details of the interviews, including interviewee ID #, interview date, cabin location, and work shift; and answers for the questions are included in Appendix B.

Feedback for the questions from the interviewees is summarized as below:

- No interviewees have noise concerns or complaints regarding construction noise.
- Most interviewees don’t have sleep disturbance issues during the stay on the floatel, including sleeping during the daytime period. Only one interviewee mentioned the cabin was too loud when stayed on Deck 2.
- Only one interviewee reported that he barely perceived construction hammer noise inside the cabins previously.
- Occasional perceptible noise events raised by several interviewees living on Deck 6, the events are due to activities in the Gym on Deck 7, such as weights dropping on the floor.

7.0 DISCUSSION

Table 7.1 summarizes the measurement results when compared to the Health Canada noise threshold and ANSI S12.2 room sound level criteria.

Table 7.1 Summary of Results

Cabin	Deck	Meet Health Canda Indoor L_{eq} Threshold of 30 dBA		Meet Health Canada L_{Amax} > 45 dBA Occurrence Less Than 15 Times		Meet ANSI S12.2 Room Sound Level Criteria of 39 to 44 dBA	
		Daytime	Nighttime	Daytime	Nighttime	Daytime	Nighttime
2010	2	No	No	No	No	No	No
5630	5	No	No	Yes/No[1]	Yes	Yes	Yes
6004	6	No	No	Yes/No[2]	No	Yes	Yes
7028	7	No	No	Yes	Yes	Yes	Yes
9436	9	No	No	Yes/No[3]	Yes	Yes	Yes
0104	10	No	No	No	No	Yes	Yes

Notes:

[1] Meet threshold on May 16 but exceed threshold on May 15.

[2] Meet threshold on May 15 but exceed threshold on May 16.

[3] Meet threshold on May 16 but exceed threshold on May 17.

Sound levels at all measured cabins are above the Health Canada sleep disturbance threshold of 30 dBA.

Cabin 2010 has the highest daytime and nighttime sound levels. The cabin is adjacent to the Engine Stores (engine rooms), intrusive noise emitted from the auxiliary equipment operations was transmitted to the cabin through the partition walls and ceiling plenum and contributes to the high noise levels inside the cabin.

Cabin 2010 has the highest occurrence results and exceeds the threshold during both daytime and nighttime, due to its proximity to the Engine Stores with local operating noise on Deck 2. Cabin 7028 meets the 45 dBA L_{Amax} or above occurrence less than 15 times threshold during both daytime and nighttime. Cabins 2010 and 0104 exceed the threshold during both daytime and nighttime. Continuous L_{Amax} more than 45 dBA noise levels were measured during daytime and nighttime. See Section 7.0 for additional mitigation discussion regarding cabin allocation on Deck 2 following the noise survey.

Cabins 5630, 6004, and 9436 meet the threshold during one daytime period but exceed the threshold during another daytime period. During the nighttime periods, Cabins 5630 and 9436 meet the threshold during nighttime while Cabin 6004 exceeds the threshold.

Table 6.2 compares the results from the three most recent surveys (i.e., October 2024, January to February 2025, and May 2025).

Table 6.2 Comparisons of Third, Fourth and Fifth Survey Results

Cabin #			Daytime Highest L_d, dBA			Nighttime Highest L_n, dBA			Number of Highest Occurrence of L_{Amax} > 45 dBA					
									Daytime			Nighttime		
3rd	4th	5th	3rd	4th	5th	3rd	4th	5th	3rd	4th	5th	3rd	4th	5th
2002	2027	2010	52.8	41.1	46.1	52.3	41.2	46.2	554	35	670	540	29	540
5004	5632	5630	38.7	38.7	37.2	38.5	38.6	36.9	23	18	25	10	9	9
6004	6708	6004	40.5	41.3	41.3	40.3	41.4	41.2	72	13	46	18	12	21
7027	7024	7028	28.6	33.7	33.7	28.6	32.9	33.4	0	14	11	8	10	4
9412	9436	9436	30.2	37.3	35.4	29.6	37.5	35.7	0	16	23	8	9	5
0106	0103	0104	38.5	34.9	38.7	38.6	34.8	39.2	48	44	115	14	10	25

During the third and fifth noise monitoring surveys, Cabin 2002 and Cabin 2010 had the highest daytime and nighttime sound levels. Both Cabin 2002 and Cabin 2010 are located at the first row of cabins on Deck 2 and are adjacent to the Engine Stores (engine rooms), intrusive noise emitted from the auxiliary equipment operations was transmitted to these cabins through the partition walls and ceiling plenum and contributed the high interior sound levels. In terms of meeting the 45 dBA L_{Amax} or above occurrence less than 15 times, Cabin 2002 and Cabin 2010 had the highest occurrence results

Cabin 2027 was purposely selected during the fourth survey to measure the cabin located further away from the Engine Stores and compare the results with Cabin 2002 and Cabin 2010. The sound levels inside Cabin 2002 and Cabin 2010 are much higher than Cabin 2027. Cabin 2027 is located at the fourth row and further away from the Engine Stores (see Figure 1Figure 2), intrusive noise through the cabin ceiling plenum is reduced further along the transmission path. The occurrence of meeting the 45 dBA L_{Amax} or above at Cabin 2027 reduced significantly.

Cabin 6004 was selected in the third and fifth surveys, as well as Cabin 6708 in the fourth survey, interior L_d and L_n sound levels were in a similar range of 40 to 41 dBA for both sets of measurements. Cabin 9436 was selected in the fourth and fifth surveys, interior L_d and L_n sound levels in the fifth survey were lower than the fourth survey but in a comparable range between 35 to 37 dBA for both sets of measurements.

Cabin 5004, Cabin 5632 and Cabin 5630 were selected in the third, fourth and fifth surveys, respectively. The interior L_d and L_n sound levels measured in three surveys were in similar range of 37 to 38 dBA for cabins on Deck 5.

The ceiling ventilations in Cabin 7027 and Cabin 9412 were not in operation during the third survey, and the ceiling ventilations in Cabin 7024, Cabin 7028, and Cabin 9436 were in normal operation. The interior sound levels in Cabin 7024, Cabin 7028 and Cabin 9436 with ceiling ventilations are higher than Cabin 7027 and Cabin 9412 without ceiling ventilations.

All cabins do not have the option to open the window. The ceiling ventilation is essential to keep the cabins in comfortable warm or cool air flow for the occupants, similar to any hotel rooms. Turning off ventilation will affect the air circulation and temperature for cabin occupants. Therefore, the measurement results are compared to the ANSI S12.2 room sound level criteria for hotel/motel rooms. In all surveys, most cabins are within the ANSI S12.2 room sound level criteria range of 39 dBA to 44 dBA, except Cabin 2002 and Cabin 2010 during the third and fifth surveys, respectively.

Regarding the threshold of the 45 dBA L_{Amax} or above occurrence less than 15 times, cabins on Deck 5 (Cabin 5004, Cabin 5632, and Cabin 5630), Deck 7 (Deck 7027, Cabin 7024, and Cabin 7028), and Deck 9 (Deck 9412 and Cabin 9436) meet the threshold during the nighttime periods, and cabins on Deck 7 also meet the threshold during the daytime periods.

On all decks, noise from the construction activities does not affect the floatel interior acoustic environment.

The interview results also indicate no sleep disturbance issues and no noise concerns or complaints due to construction noise during the noise monitoring survey periods.

8.0 MITIGATION MEASURES

To prevent future noise concerns or complaints, potential noise mitigation measures and management controls that have been implemented or may be considered are summarized below:

- Shore grid power supply continues to provide power to the floatel. The power generation engines inside the Engine Stores will be used only in emergency situations. In accordance with the results of the third noise monitoring survey, the sound levels at corridors on Deck 2 have been reduced at different locations (Stance 2024c).
- As discussed in Section 6, cabins adjacent to the Engine Stores at Deck 2 have high interior sound levels. However, sound levels in the cabins further away from the Engine Stores meet the ANSI S12.2 room sound level criteria. Workers' cabin allocation at nine cabins in the first row of Deck 2 should be reduced where possible. These cabin locations are illustrated in Figure 11. Where reducing occupancy of these cabins is not possible, hearing protection (e.g., earplugs) will be offered to occupants to facilitate undisturbed sleep. Woodfibre LNG is currently assessing other potential mitigation measures for the cabins adjacent to the Engine Stores.
- For activities in the Gym, the floatel management has posted additional signage, and the receptionist also does regular patrolling to remind users that dropping the weights (e.g., deadlifts) should be minimized or avoided.
- The floatel management keeps seeking solutions to reduce noise and vibration from weight dropping (e.g., rubber mats on the gym floor to dampen the impact).
- Should the floatel management receive noise complaints, administration controls can be implemented to select or change specific cabins or decks for the workers who need alternative cabins.
- Maintain the Communication Protocol and Complaint Response Procedure to address and manage any future noise concerns or complaints by the floatel occupants.

9.0 CONCLUSIONS

The fifth noise monitoring survey was conducted on the floatel from May 14 to May 17, 2025 to fulfill the requirements of Condition 30 of EAC. Continuous sound levels over 24 hours were collected at six selected cabins. Measured noise data were analyzed and compared with the Health Canada sleep disturbance thresholds, as well as ANSI S12.2 room sound level criteria and assess the compliance. Interviews with occupants for noise concerns were performed. Mitigation and an adaptive management plan were recommended.

The measurement results of the fifth noise monitoring survey are above the Health Canada thresholds. The measurement results meet the ANSI S12.2 room sound level criteria for hotel and motel rooms at most cabins, except Cabin 2010. There was no sleep disturbance issues and noise concerns or complaints due to construction noise received from the floatel occupants. Noise from the Project construction activities does not affect the floatel interior acoustic environment. In addition, the Communication Protocol and Complaint Response Procedure will be maintained to address and manage any noise concerns or complaints from the floatel occupants.

10.0 REFERENCES

ANSI (American National Standard) 2005. ANSI S12.9 – 2005/Part 4, Quantities and Procedures for Description and Measurement of Environmental Sound – Part 4: Noise Assessment and Prediction of Long-term Community Response. New York, 2005.

ANSI (American National Standard) 2023. ANSI S12.2 – 2019 (Reaffirmed in 2023), Criteria for Evaluating Room Noise. New York, 2023.

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District of Squamish 2014. Noise Regulation Bylaw No.2312. Available at: https://squamish.ca/our-services/bylaws-and-enforcement/noise-bylaw/.

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Stantec 2022. Construction Phase Noise Assessment Technical Report – Woodfibre LNG. September 2022.

Stantec 2024. Floatel Noise Monitoring and Mitigation Plan – Woodfibre LNG Project. April 2024.

Stantec 2024a. Floatel Noise Monitoring Survey - 1 (July 10 -14, 2024) – Woodfibre LNG Project. 123222160EN-RPT0052 Revision 1, September 16, 2024.

Stantec 2024b. Floatel Noise Monitoring Survey - 2 (September 4 - 7, 2024) – Woodfibre LNG Project. 123222160EN-RPT0053 Revision 1, November 2024.

Stantec 2024c. Floatel Noise Monitoring Survey - 3 (October 8 - 11, 2024) – Woodfibre LNG Project. 123222160EN-RPT0054, November 2024.

Stantec 2024d. Floatel Noise Monitoring Survey - 4 (January 31 - February 2, 2025) – Woodfibre LNG Project. 123222160EN-RPT0059, March 2025.

Woodfibre LNG 2015. Woodfibre LNG Project Application for an Environmental Assessment Certificate.

Woodfibre LNG 2023. Application for a Temporary Use Permit for the District of Squamish – Floatel. August 2023.

APPENDIX A FIGURES

Figure 1 Site Plan with Floatel Location

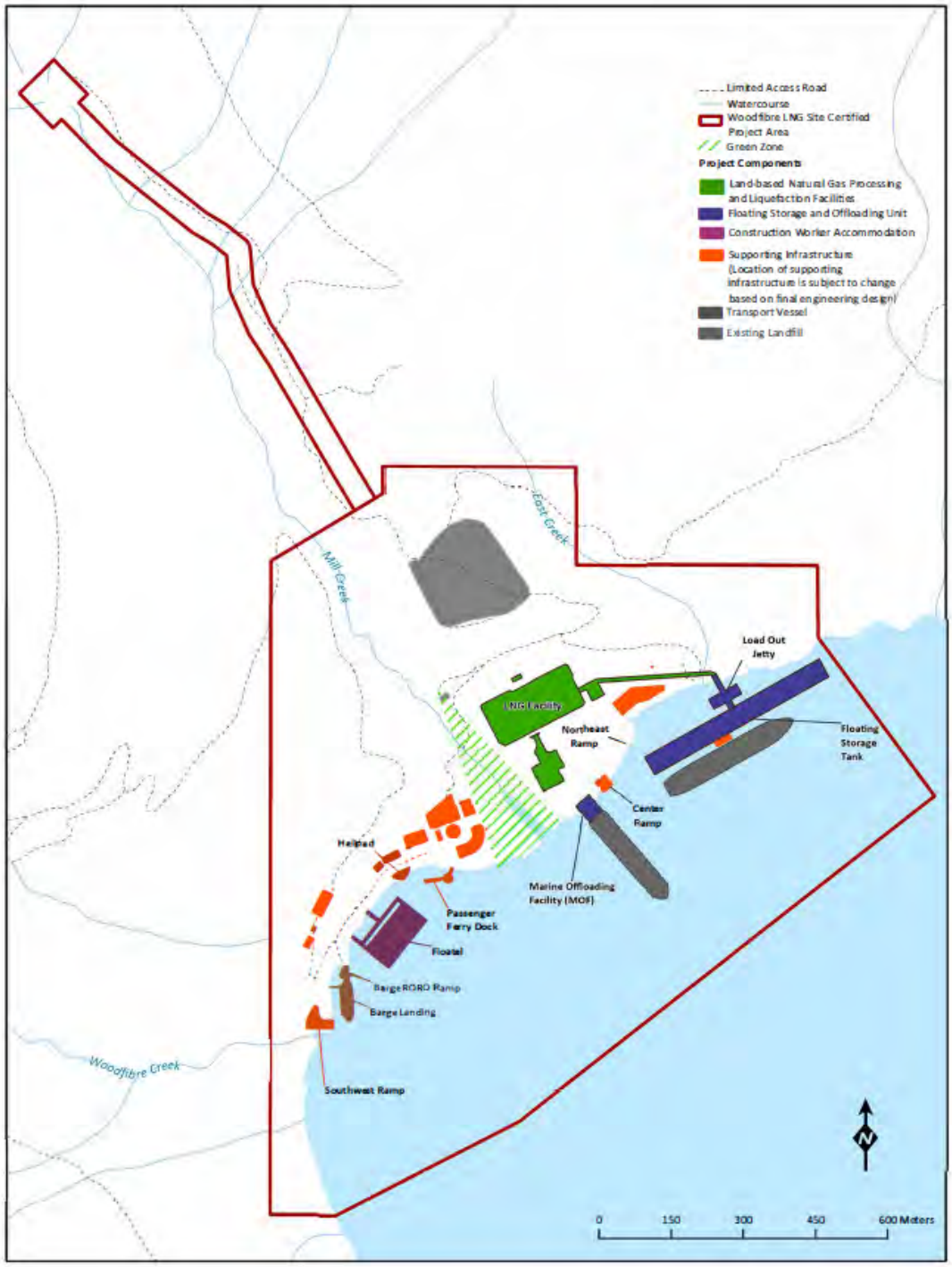


Figure 2 Measurement Location at Cabin 2010 and Cabin 5630 (Deck 2 and Deck 5)

Legend of Figure 2

Noise monitoring cabin

Quantity of cabins per deck (unless otherwise indicated, applies to all figures with cabins)

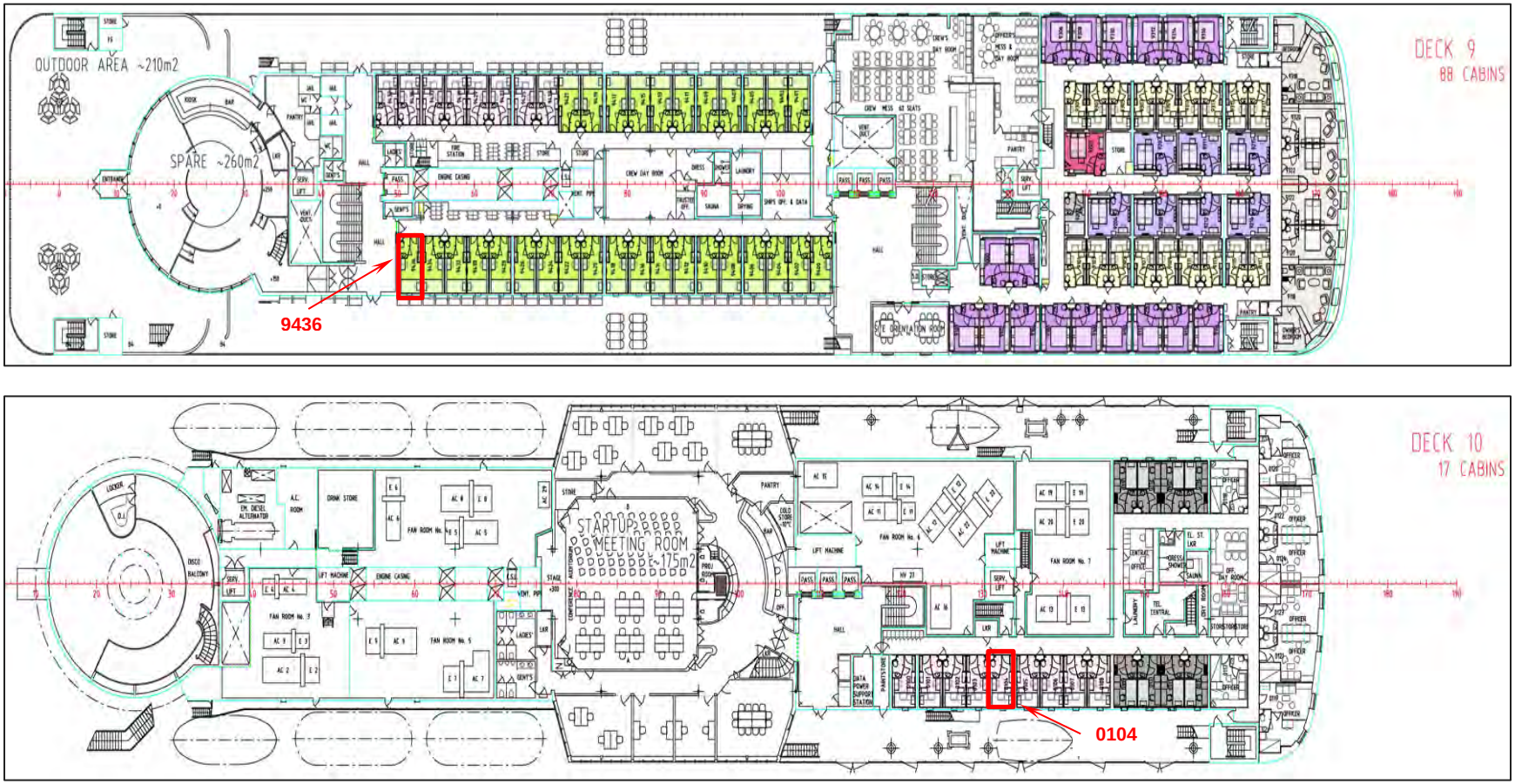
	TYPE 1A-1	TYPE 1A-2	TYPE 1A-3	TYPE 1B-1	TYPE 1B-2	TYPE 1B-3	TYPE 1B-4	TYPE 1B-5	TYPE 1B-6	TYPE 1B-7	TYPE 1B-8	TYPE 1C-1	TYPE 1C-2	TYPE 1D	TYPE 1E-1	TYPE 1E-2	TYPE 1F-1	TYPE 1F-2	TYPE 2A	TYPE 2B	TYPE 2C	TYPE 3A	TYPE 3B	TYPE 4A	TYPE 4B	QUANTITY OF CABINS PER DECK
DECK 10				9																				8		17
DECK 9	18			8								30				2		2	7	1	17	4	8		1	88
DECK 7	24											30														58
DECK 6	208												8		2		2		24	1					3	248
DECK 5	102	6	44		15	5	9	10	7	1	1			4					14						1	219
DECK 2	34																								52	86
CABINS PER TYPE	386	6	44	17	15	5	9	10	7	1	1	60	8	4	2	2	2	2	45	2	17	4	2	8	57	716

Figure 3 Measurement Location at Cabin 6708 and Cabin 7024 (Deck 6 and Deck 7)

Legend

Noise monitoring cabin

Figure 4 Measurement Location at Cabin 9436 and Cabin 0103 (Deck 9 and Deck 10)



Legend

Noise monitoring cabin

Figure 5 Sound Level Meter Setup at Cabin 2010

Figure 6 Sound Level Meter Setup at Cabin 5630

Figure 7 Sound Level Meter Setup at Cabin 6004

Figure 8 Sound Level Meter Setup at Cabin 7028

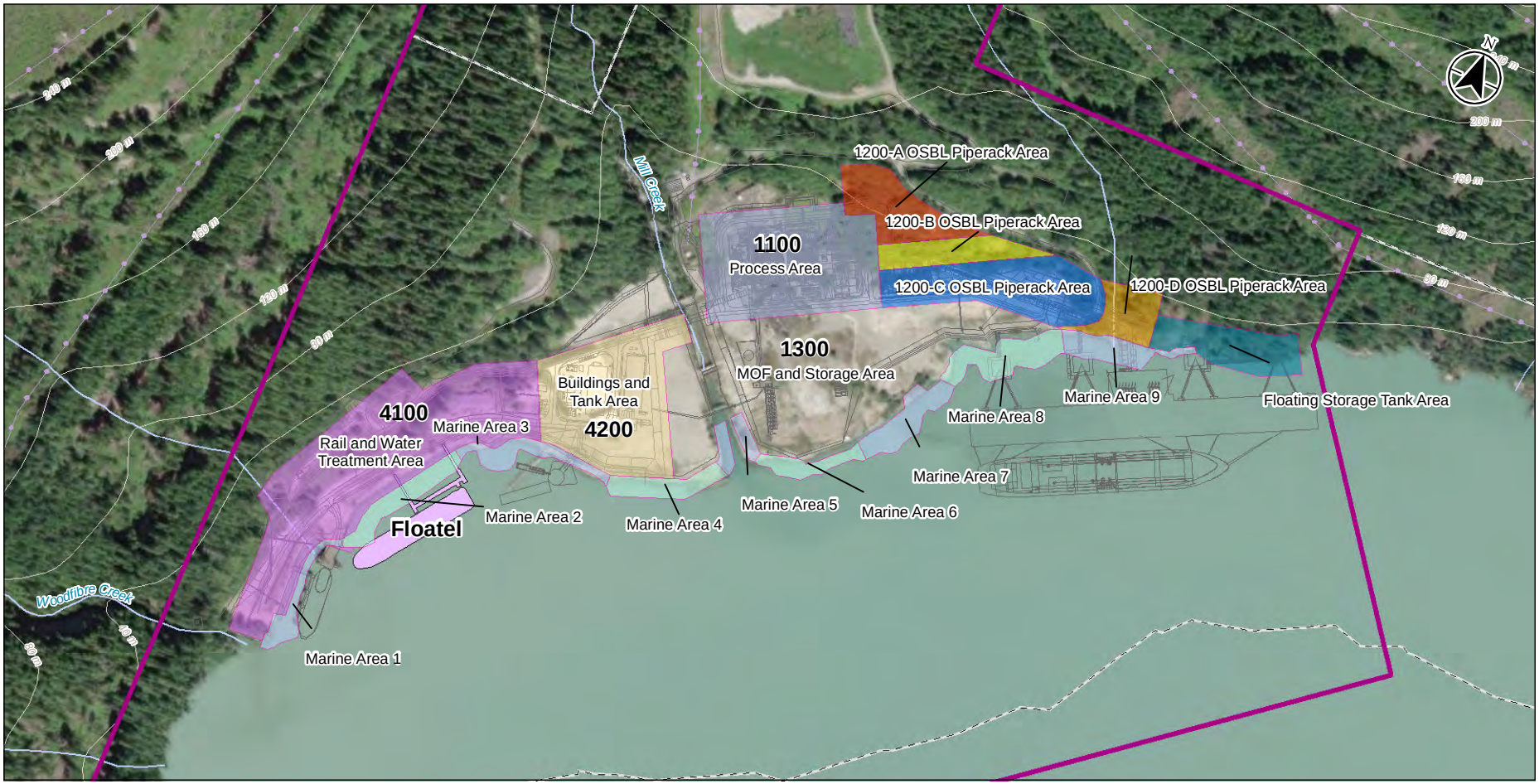
Figure 9 Sound Level Meter Setup at Cabin 9436

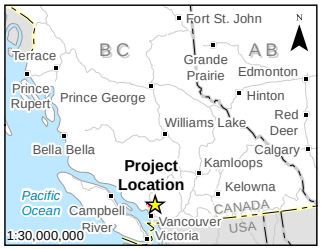
Figure 10 Sound Level Meter Setup at Cabin 0104

Figure 11 Cabins Not Preferable for Worker Accommodation on Deck 2

Legend

Cabins not preferable for worker accommodation





- Transmission Line
- Topographic Contour
- Watercourse
- Municipal Boundary
- Project Design Linework
- Floatel
- Certified Project Area

0 50 100 150 200 250 m

1:7,500 (at original document size of 8.5x11)

Notes
1. Coordinate System: NAD 1983 UTM Zone 10N
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Orthoimagery: ESRI World Imagery

Stantec

Project Location:
Woodfibre, British Columbia

Project Number: 123222160
Prepared by PKASIANCHUK on 20241004
Requested by ACALDERON on 20240822
Checked by YMA on 20240828

Client/Project/Report

Woodfibre LNG
Floatel Noise Monitoring Survey

Figure No.
12

Title
Construction Areas Onsite

APPENDIX B NOISE INTERVIEW RECORDS

Interviewer: Emma Xiong, EIT				Interview Questionnaire			
Interviewee Information							
ID # of Interviewee	Interview Date	Living Deck	Work Shift	1.General evaluation for your sleeping quality at Floatel	2.How long have you stayed?	3. Can you hear outside construction noise?	3. Any noise concerns/ complaints
#1	May 15	7	Day/Night	No noise issues/good sleep	10 months	No	No
#2	May 15	7	Night	No	2 months	No	Not for noise
#3	May 15	9	Day	Very good	11 months	No	No
#4	May 15	5	Day	Not bad (sometimes feel hot)	1 month	Not really	It’s OK, all good
#5	May 15	10	Day	Just OK	19 months	No	No
#6	May 15	7	Day	OK	1 month	No	No problem
#7	May 15	6	Day	Good	3 weeks	No	No
#8	May 15	5	Day	Very good	12 months	Not often	No
#9	May 15	6	Day	OK	8 months	No	No
#10	May 15	10	Night	Excellent	10 months	No	No issues
#11	May 15	5	Day	Not bad	15 months	Sometimes hammer noise	Not bother by construction rather than temperature
#12	May 15	7	Day	It’s good	9 months	No	Sometimes people sound
#13	May 15	6	Day	Good	2 weeks	No	No
#14	May 15	2	Day	It’s fine	1 week	No	People talking
#15	May 16	7	Night	OK	6 months	Not heard	People playing games at Deck 8
#16	May 16	7	Day	All right	5 months	No	No problem
#17	May 16	7	Day	OK	4 months	No	No
#18	May 16	6	Day	OK	1 week	No	No
#19	May 16	5	Day	OK, half/half for AC noise	18 months	Not heard	No
#20	May 16	6	Day	Just OK	10 months	No	Gym noise
#21	May 16	6	Day	Great	8 months	No inside room	No
#22	May 16	5	Day	Most time good	9 months	No	AC noise, neighbor flush toilet/gym noise
#23	May 17	6	Day	Not very good	22 months	Not at all from construction	Gym noise when under gym
#24	May 17	10	Day	It’s good	12 months	No	No
#25	May 17	10	Day	Good	8 months	No	People walking/talking
#26	May 17	7	Day	Not very good – AC too cold	6 months	No	AC sometimes loud
#27	May 17	5	Day	Great	6 months	No	No
#28	May 17	7	Day	OK	10 months	No	When security room nearby operating machine
#29	May 17	7	Day	OK	3 months	No	It’s OK
#30	May 17	5	Day	It’s OK	10 months	No	AC noise, but don’t affect sleep (Deck 2 was too loud when staying at Deck 2)

APPENDIX C INSTRUMENTATION CALIBRATION CERTIFICATION

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.: 424477-709

CALIBRATION OF:

Calibrator:	Brüel & Kjær	Type 4231 IEC Class: 1		Serial No.:	3009303

CUSTOMER:

Stantec Consulting Ltd.
325 25 Street SE - Unit 200
Calgary, AB T2A 7H8

CALIBRATION CONDITIONS:

Environment conditions:	Air temperature:	23.6	°C
	Air pressure:	98.63	kPa
	Relative Humidity:	49.5	%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: 9 April, 2025

Certificate issued: 9 April, 2025

Can Phan
Calibration Technician

Grant Kennedy
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	94.02	0.12
114	113.80	114.20	114.03	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	999.97	0.10

Total Distortion*

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

Calibration Level [dB]*	Accept Limit [%]*	Measured Distortion [%]*	Measurement Uncertainty [%]*
94	1.00	0.52	0.13
114	1.00	0.24	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	2024-10-16	2025-10-31	GK	401410-801
9545	Transfer Microphone	3	2024-10-18	2025-10-31	MH	401410-401
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

HBK
HOTTINGER BRÜEL & KJÆR

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

A2LA ACCREDITED
Calibration Certificate Number 1568.01

CERTIFICATE OF CALIBRATION

Certificate No: 409505- 802

CALIBRATION OF:

Sound Level Meter:	Brüel & Kjær	2250	Serial No: 2818093
Microphone:	Brüel & Kjær	4189	Serial No: 2799496
Preamplifier:	Brüel & Kjær	ZC-0032	Serial No: 16971
Software version:	BZ7222 Version 4.7.8		

CLIENT:

Stantec Consulting Ltd.
200 - 325 25th Street SE
Calgary, AB T2A 7H8

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	_X_ Within acceptance criteria	_X_ Within acceptance criteria

Date of Calibration: 28 Feb. 2025

Certificate issued: 28 Feb. 2025

Grant Kennedy

Calibration Technician

John Avitabile

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 %.

HBK
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Web site address: http://www.hbkworld.com

ACCREDITED
Calibration Certificate Number 1568.01

CERTIFICATE OF CALIBRATION

Certificate No: 424477-803

CALIBRATION OF:

Sound Level Meter:	Brüel & Kjær	2250	Serial No: 2809183
Microphone:	Brüel & Kjær	4189	Serial No: 2799510
Preamplifier:	Brüel & Kjær	ZC-0032	Serial No: 17456
Supplied Calibrator:	Brüel & Kjær	4231	Serial No: 3009303
Software version:	BZ7222 Version 4.7.7		

CLIENT:

Stantec Consulting Ltd.
325 25 Street SE
Unit 200
Calgary, AB T2A 7H8

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	_X_ Within acceptance criteria	_X_ Within acceptance criteria

Date of Calibration: 10 Apr. 2025

Certificate issued: 10 Apr. 2025

Grant Kennedy

Calibration Technician

Can Phan

Can Phan
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**
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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 %.