APPENDIX 7.6B

Noise Assessment

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Project No. 1535751

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7.6B1.0 INTRODUCTION

This appendix presents the noise assessment for the Phase 1 New Transmission Line to Pickle Lake Project (the Project) and includes an assessment of potential health effects associated with noise levels potentially generated by the Project. Specifically, the noise assessment uses the percent highly annoyed (%HA) level put forward by Health Canada (2016) to assess the potential for health effects from noise.

According to Health Canada (2016), community reactions to project-related noise represent potential indicators of adverse health. Specifically, long-term exposure to noise could potentially increase one's risk of developing health effects. Excessive noise from a magnitude and frequency perspective can result in annoyance. Annoyance due to noise can be linked to the ability to have a conversation, enjoy certain leisure activities, get a good night's sleep, and do work that requires thought and concentration (Health Canada 2005). However, perception of noise, including perception of whether noise is an annoyance, is subjective.

Health Canada uses annoyance, and specifically %HA, as an indicator of noise-induced health effects. The calculated %HA provides information on how an average community responds to a noise level. Health Canada considers the change in %HA as an appropriate indicator of noise-induced effects for project operational noise and for long-term construction noise exposure. Health Canada indicates that the change in %HA per representative receptor (i.e., a group of residences in similar geographic proximity to the noise source) be evaluated rather than the average increase in %HA for all receptors which could underestimate the project-related impact on community annoyance. Health Canada suggests that impact management measures be considered if the predicted change in %HA at a specific receptor is greater than 6.5% between baseline and project noise environments.

7.6B2.0 METHODS

Health Canada (2016) has published a national guideline document for evaluating health impacts of noise. The guideline considers the following:

- characteristics of the noise level;
- construction noise impacts based on increased levels of annoyance in the population;
- operational noise impacts based on increased levels of annoyance in the population;
- impact on special land uses such as schools, hospitals and seniors' residences; and
- sleep disturbance impacts.

The Health Canada guideline addresses increases in predicted noise levels over the existing conditions for the daytime (Ld) and nighttime (Ln) equivalent noise levels, as well as a 24-hour (whole day) equivalent noise level descriptor (Leq24). In addition, impulsive and tonal characteristics of source noise are accounted for because they can increase potential effects. The following measure was included in the Health Canada guideline (2016):

The percentage of the exposed population that could be "highly annoyed" by increased noise levels caused by the Project (% HA), is described by the following formula (Equation 1):

$$HA = \frac{100}{1 + \exp[10.4 - 1.32 \times \log(10^{0.1 \times L_{eq24}} + 3.375 \times 10^{0.1 \times L_n})]} \quad \textbf{Equation 1}$$

Where:

- Leq24 = the 24-hour equivalent noise level calculated according to International Organization for Standardization 1996-1:05 (ISO 2003); and
- Ln = the nighttime average sound level according to ISO1996-1:05 (ISO 2003).

Health Canada adopted the approach from guidance on construction noise from the Alberta Energy and Utilities Board (AEUB 2007). Health Canada considers a change in %HA of more than 6.5% to have the potential for adverse effects on human health (Health Canada 2010, 2016).

Taking into consideration impact management measures and using a number of conservative assumptions, noise levels were predicted for construction stage activities and operation and maintenance stage activities by the noise discipline (Section 5.5 of the Draft Environmental Assessment [EA] Report). For construction stage activities, four modelling scenarios were considered:

- construction of the transmission line;
- construction of the transformer station and connection facility;
- construction of a construction camp; and
- construction of an access road.

Noise levels were predicted at 50 metre (m) increments from the transmission line alignment right-of-way (ROW), transformer station, connection facility, construction camp, and access road. The %HA levels were then calculated from the noise levels and provided to the human health discipline. The change in %HA levels are compared to the Health Canada criterion of 6.5% to assess the potential for health effects (i.e., annoyance) from noise associated with construction activities.

For operation and maintenance stage activities, three scenarios were considered:

- operation and maintenance of the ROW, fencing, transmission line, conductors, tower foundations, and permanent access roads;
- operation and maintenance of the transformer station and connection facility; and
- electricity transmission.

The greatest effects to noise during the operation and maintenance stage are expected to occur during the operation of the transformer station and connection facility as they will operate continuously over the life of the Project. Therefore, noise levels associated with operation and maintenance of the transformer station and connection facility were predicted by the noise discipline. Noise levels were predicted at PORs identified in the vicinity (within 3,000 m) of the transformer station and connection facility. The %HA levels were then calculated from the noise levels and provided to the human health discipline. The change in %HA levels are compared to the Health Canada criterion of 6.5% to assess the potential for health effects (i.e., annoyance) from noise associated with operation and maintenance stage activities.

7.6B3.0 RESULTS AND DISCUSSION

7.6B3.1 Construction Activities

For construction activities, the change in %HA levels at increasing distances from the transmission line alignment ROW, transformer station/connection facility, construction camp, and access road are provided in Table 7.6B-1.

Table 7.6B-1: Change in Percent Highly Annoyed at Increasing Distance from the Transmission Line Alignment Right-of-Way, Transformer Station/Connection Facility, Construction Camp, and Access Road during Construction

Receptor Distance (m)	Change in Percent Highly Annoyed (%)			
	Transmission Line Alignment ROW	Transformer Station/ Connection Facility	Construction Camp	Access Road
10	**85.1**	**84.8**	**81.9**	**82.2**
50	**50.8**	**51.2**	**44.9**	**45.3**
100	**29.8**	**31.0**	**25.6**	**25.9**
150	**19.3**	**20.7**	**16.5**	**16.7**
200	**13.6**	**14.9**	**11.5**	**11.7**
250	**10.2**	**11.4**	**8.6**	**8.8**
300	**7.9**	**9.2**	**6.9**	**7.0**
350	6.3	**7.4**	5.5	5.6
400	5.1	6.1	4.5	4.5
450	4.2	5.1	3.7	3.7
500	3.5	4.3	3.1	3.1
550	2.9	3.6	2.5	2.6
600	2.5	3.1	2.2	2.2
650	2.2	2.7	1.8	1.9
700	1.9	2.3	1.6	1.6
750	1.6	2.0	1.4	1.4
800	1.4	1.8	1.2	1.2
850	1.3	1.5	1.0	1.1
900	1.1	1.3	0.9	0.9

Table 7.6B-1: Change in Percent Highly Annoyed at Increasing Distance from the Transmission Line Alignment Right-of-Way, Transformer Station/Connection Facility, Construction Camp, and Access Road during Construction

Receptor Distance (m)	Change in Percent Highly Annoyed (%)			
	Transmission Line Alignment ROW	Transformer Station/ Connection Facility	Construction Camp	Access Road
950	1.0	1.2	0.8	0.8
1,000	0.9	1.1	0.7	0.7
1,050	0.8	0.9	0.6	0.6
1,100	0.7	0.9	0.6	0.6
1,150	0.6	0.8	0.5	0.5
1,200	0.6	0.7	0.4	0.5
1,250	0.5	0.6	0.4	0.4
1,300	0.5	0.6	0.4	0.4
1,350	0.4	0.5	0.3	0.3
1,400	0.4	0.5	0.3	0.3
1,450	0.4	0.4	0.3	0.3
1,500	0.3	0.4	0.2	0.3

Note: **Bold** + shaded text indicates the change in percent highly annoyed greater than the Health Canada criterion of 6.5%.
m = metres; ROW = right-of-way; % = percent.

For the transmission line alignment ROW and access road, the change in %HA was greater than the Health Canada criterion of 6.5% at a distance of up to 300 m from these Project components, and ranged from 85.1 to 7.9% and from 82.2 to 7.0%, respectively. The exceedances within 300 m of these Project components are discussed further below with respect to the three corridors.

- **Preliminary Proposed Corridor –** A portion of the residential area in Central Patricia is located near the transmission line alignment ROW. The closest human receptor location to the transmission line alignment ROW was a church rectory located approximately 175 m from the ROW. The change in %HA at 175 m from the transmission line alignment ROW is between 19.3% (at 150 m) and 13.6% (at 200 m) and greater than the Health Canada criterion of 6.5% (Table 7.6B-1).
- **Corridor Alternative Around Mishkeegogamang –** A residential area in Central Patricia and a residential area in Silver Dollar are located near the transmission line alignment ROW (at 175 and 152 m from the ROW, respectively). As discussed previously, the closest human receptor location for Central Patricia was a church rectory located approximately 175 m from the transmission line alignment ROW. The change in %HA at 175 m from the transmission line alignment ROW is between 19.3% (at 150 m) and 13.6% (at 200 m) and greater than the Health Canada criterion of 6.5% (Table 7.6B-1). The change in %HA at 152 m from the transmission line alignment ROW for the residential area in Silver Dollar is 19.3% (at 150 m) and greater than the Health Canada criterion of 6.5%.

- **Corridor Alternative Through Mishkeegogamang –** A residential area in Central Patricia and a residential area in Silver Dollar are located near the transmission line alignment ROW (at 175 and 152 m from the ROW, respectively). As well, the Mishkeegogamang First Nation Reserve is located approximately 100 m from the transmission line alignment ROW. As discussed previously, the closest human receptor location for Central Patricia was a church rectory located approximately 175 m from the transmission line alignment ROW. The change in %HA at 175 m from the transmission line alignment ROW is between 19.3% (at 150 m) and 13.6% (at 200 m) and greater than the Health Canada criterion of 6.5% (Table 7.6B-1). The change in %HA at 152 m from the transmission line alignment ROW for the residential area in Silver Dollar is 19.3% (at 150 m) and greater than the Health Canada criterion of 6.5%. The change in %HA at 100 m from the transmission line alignment ROW and the Mishkeegogamang First Nation Reserve is 29.8% (at 100 m) and greater than the Health Canada criterion of 6.5%.

Although exceedances of the Health Canada criterion of 6.5% have been predicted within 300 m of the transmission line alignment ROW and access roads, Project-related changes in noise levels for these components are not expected to result in health effects (i.e., annoyance) to human receptors along the transmission line alignment ROW and access roads for the following reasons:

- The health assessment relies on predicted noise levels and calculated %HA levels provided by the noise discipline. A number of conservative assumptions were used in the noise modelling such that predicted levels have likely been overestimated. For a summary of the conservative assumptions used in the noise modelling, refer to Section 5.5 of the Draft EA Report.
- It is not expected that receptors within 300 m of the transmission line alignment ROW and access roads will be subjected to the predicted noise levels for the entire duration of the Project construction stage. While the Project construction stage is two years, the length of time spent at each location along the ROW and access roads will be substantially less than two years and likely less than one year. The Health Canada criterion of 6.5% is applicable to receptors exposed to long-term project noise (i.e., more than one year) (Health Canada 2016).
- Construction noise will be temporary in nature, occur only during specific activities and be localized to the area under construction along the transmission line alignment ROW or access roads.
- There is no potential for a change in noise levels during the nighttime period as Project construction will typically occur during one 10-hour shift per day, generally within the daytime period (i.e., 07:00 to 19:00).
- The impact management measures identified in Section 5.5 of the Draft EA Report will be implemented at a minimum during construction activities.
- An engagement program will be in place to notify residences of upcoming work.

As indicated in Section 5.5 of the Draft EA Report, once the preferred corridor is selected, potential sensitive human receptors within the Project footprint will be confirmed and avoided through detailed design, if required. Potential receptors located outside of the Project footprint, but within 100 m of the Project footprint will be verified with respect to their presence and use. Any confirmed receptors determined to be of use outside of, but within 100 m of the Project footprint will be avoided as a receptor as part of the Project detailed design.

For the construction camp, the change in %HA was greater than the Health Canada criterion of 6.5% at a distance of up to 300 m from this Project component, and ranged from 81.9 to 6.9%. However, it is assumed that worker health will be protected through compliance with appropriate workplace practices following requirements defined in the Ontario *Occupational Health and Safety Act* and other applicable regulatory instruments. Therefore, Project-related changes in noise levels for the construction camp were not considered further for evaluation.

For the transformer station/connection facility, the change in %HA was greater than the Health Canada criterion of 6.5% at a distance of up to 350 m from these Project components, and ranged from 84.8 to 7.4%. These exceedances are discussed further below with respect to potential human receptor locations within the modelled distances of the transformer station/connection facility.

The transformer station is proposed to be located in the town of Central Patricia. for the preliminary proposed corridor, corridor alternative through Mishkeegogamang and corridor alternative around Mishkeegogamang. The closest human receptor location to the transformer station footprint for all three corridors is a church rectory located approximately 175 m from the transformer station footprint. The change in %HA at 175 m from the transformer station footprint is between 20.7% (at 150 m) and 14.9% (at 200 m) and greater than the Health Canada criterion of 6.5% (Table 7.6B-1). Given that the location of the transformer station/connection facility is stationary and construction activities are not transient when compared to the construction of the transmission line alignment ROW and access road, there is potential for health effects (i.e., annoyance) to human receptors in proximity during construction of the transformer station/connection facility. As noted in Section 7.6B1.0 of this appendix, health effects related to noise are in terms of annoyance and by extension have a potential to negatively impact human health. With that said, although a potential for health effects (i.e., annoyance) has been identified to human receptors near the transformer station, it is important to note the following points for context:

- The noise assessment relies on predicted noise levels and calculated %HA levels provided by the noise discipline. A number of conservative assumptions were used in the noise modelling such that predicted levels have likely been overestimated. For a summary of the conservative assumptions used in the noise modelling, refer to Section 5.5 of the Draft EA Report.
- There is no potential for a change in noise levels during the nighttime period as Project construction will typically occur during one 10-hour shift per day, generally within the daytime period (i.e., 07:00 to 19:00).
- The impact management measures identified in Section 5.5 of the Draft EA Report will be implemented at a minimum during construction activities.
- An engagement program will be in place to notify residences of upcoming work.
- The Health Canada %HA criterion is applicable at the community level; however, in this assessment %HA has been conservatively used to assess the potential for health effects (i.e., annoyance) at an individual human receptor location (i.e., church rectory).

As noted in Section 5.5 of the Draft EA Report, once the preferred corridor is selected, potential sensitive human receptor locations within the Project footprint will be confirmed and avoided through detailed design, if required. Potential sensitive human receptor locations outside of the Project footprint, but within 100 m of the Project footprint will be verified with respect to their presence and use. Any confirmed receptor locations determined to be of use outside of, but within 100 m of the Project footprint will be avoided through detailed design.

7.6B3.2 Operation and Maintenance Stage Activities

For operation and maintenance stage activities, the change in %HA levels at receptors within 3 km of the transformer station and connection facilities are provided in Table 7.6B-2.

Table 7.6B-2: Change in Percent Highly Annoyed at Receptors in the Vicinity of the Transformer Station and Connection Facilities during Operation and Maintenance

Station/ Facility	POR	Direction from Station/ Facility	Approximate Distance from Station/Facility (m)	Baseline %HA	Baseline + Operations %HA	Change in %HA
Transformer Station – Pickle Lake (TSPL)	TSPL POR01	North	500	6.2	7.4	1.2
	n/a	East	n/a	n/a	n/a	n/a
	n/a	South	n/a	n/a	n/a	n/a
	TSPL POR02	West	175	6.2	8.7	2.5
Connection Facility – Dinorwic (CFD)	CFD POR01	North	650	4.1	5.2	1.0
	CFD POR02	East	1380	4.1	4.2	0.0
	CFD POR03	South	1960	4.1	4.2	0.0
	CFD POR04	West	1200	4.1	4.2	0.0
Connection Facility – Ignace (CFI)	CFI POR01	North	2300	4.1	4.2	0.0
	n/a	East	n/a	n/a	n/a	n/a
	CFI POR02	South	1800	4.1	4.2	0.0
	CFI POR03	West	1660	4.1	4.2	0.0

Note: n/a = indicates not applicable, as there are no PORs within 3,000 m of the station/facility boundary in the specific direction.
POR = point of reception; m = metre; %HA = percent highly annoyed.

The change in %HA was less than the Health Canada criterion of 6.5% for all receptors in the vicinity of the transformer station and connection facilities; therefore, Project-related changes in noise levels for operation and maintenance stage activities are not expected to result in a human health effect (i.e., annoyance).

7.6B4.0 SUMMARY AND CONCLUSIONS

The following summary and conclusions are provided with respect to noise levels potentially generated by the Project:

- For construction stage activities related to the transmission line alignment ROW and access roads, the change in %HA was greater than the Health Canada criterion of 6.5% at distances of up to 300 m from these Project components. However, although exceedances were noted, construction noise is expected to be temporary in nature, occur only during specific activities and be localized to the area under construction along the transmission line alignment ROW or access roads. In addition, the %HA criterion is applicable to long-term project noise (i.e., more than one year) and construction activities related to the transmission line alignment ROW and access roads at any one location are expected to take less than one year. Overall, health effects (i.e., annoyance) from exposure to construction noise are not expected to human receptors along the transmission line alignment ROW or access roads.

- For construction stage activities related to the construction camp, the change in %HA was greater than the Health Canada criterion of 6.5% at a distance of up to 300 m from this Project component. However, it is assumed that worker health will be protected through compliance with appropriate workplace practices following requirements defined in the Ontario *Occupational Health and Safety Act* and other applicable regulatory instruments. Therefore, noise from construction activities related to the construction camp have not been considered for further evaluation.
- For construction stage activities related to the transformer station/connection facility, the change in %HA was greater than the Health Canada criterion of 6.5% at a distance of up to 350 m from this Project component. A portion of the residential area in Central Patricia is located within the proposed transformer station footprint, as well as outside of the transformer station footprint for the preliminary proposed corridor, corridor alternative through Mishkeegogamang, and corridor alternative through Mishkeegogamang. The closest human receptor location to the transformer station footprint for all three corridors was a church rectory located approximately 175 m from the transformer station footprint and outside of the Project area. The change in %HA at this location is greater than Health Canada criterion of 6.5%. Given that the location of the transformer station is stationary and construction activities are not transient when compared to the construction of the transmission line alignment ROW and access roads, there is potential for health effects (i.e., annoyance) to human receptors in proximity during construction of the transformer station/connection facility.
- For operation and maintenance stage activities, the change in %HA was less than the Health Canada criterion of 6.5% for all receptors in the vicinity of the transformer station and connection facilities; therefore, Project-related changes in noise levels are not expected to result in a health effect (i.e., annoyance).

7.6B5.0 REFERENCES

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