TABLE OF CONTENTS
SECTION 6

PAGE

LIST OF TABLES

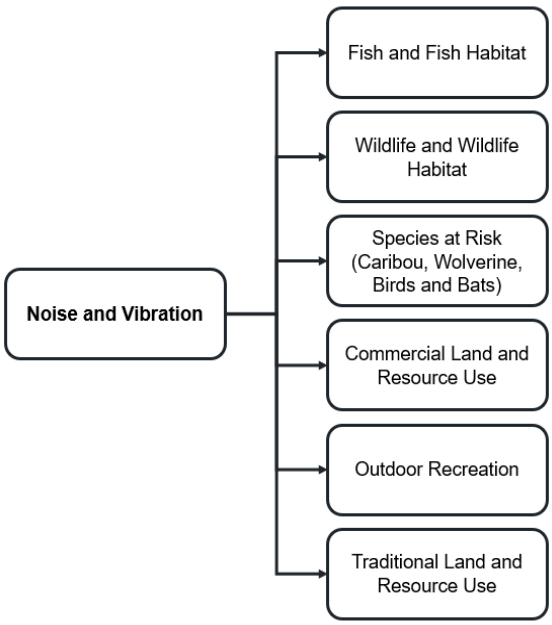
LIST OF FIGURES

6.3 Noise and Vibration

Noise is selected as a valued component (VC) since excessive noise can be disrupting to local land users, including Indigenous harvesters, and sensitive wildlife species, and it has the potential to affect human health and well-being. Potential vibration from short duration Project activities, such as blasting, may also affect local land users, including Indigenous harvesters, and disturb fish when they occur in close proximity to fish habitat.

In the absence of mitigation, the assessment of potential changes in noise and vibration are directly linked to other VCs, and is informed by the following sections:

- **Fish and fish habitat (Section 6.10):** The assessment of the potential effects on fish and fish habitat includes changes in fish communities during construction and operation of the Project that may be affected by changes in instantaneous pressure and peak particle velocity (PPV) resulting from blasting near the adjacent waterbodies.
- **Wildlife and wildlife habitat (Section 6.12) and Species at Risk (Section 6.13, Section 6.14, Section 6.15 and Section 6.16):** The assessment of the potential effects on wildlife, including species at risk, includes indirect changes to habitat during construction, operation and closure of the Project that may be affected by changes in sensory disturbances to wildlife and species at risk species in the adjacent habitat.



- **Commercial land and resource use (Section 6.17):** The assessment of the potential effects on commercial land and resource use includes changes in the experience of trapping during construction and operation of the Project that may be affected by changes in sensory disturbances to commercial operations that use the local lands and resources.
- **Outdoor recreation (Section 6.18):** The assessment of the potential effects on outdoor recreation includes changes in the experience associated with recreational hunting, fishing and the use of recreational areas during construction and operation of the Project that may be affected by changes in sensory disturbances to recreational users and tourists.
- **Traditional Land and Resource Use (Section 6.21):** The assessment of the potential effects on traditional land and resource use includes changes in the experience associated with harvesting fish, wildlife and plants, and the experience associated with the use of cultural and spiritual areas during construction and operation of the Project, that may be affected by changes in sensory disturbances for Indigenous people who may be traditionally using lands and resources.

The assessment of the potential changes to noise and vibration from the Project are compared to relevant provincial and federal criteria (Section 6.3.1.4). The noise and vibration technical support documentation is included in Appendix H, which includes the baseline sound and vibration results (Appendix H-1 and Appendix H-2) as well as the results of predictive noise and vibration modelling (Appendix H-3 and Appendix H-4, respectively).

6.3.1 Assessment Approach

The approach to the assessment of potential changes to noise and vibration includes a description of the relevant regulatory and policy setting, a description of the input obtained through consultation specific to this VC, the identification of criteria and indicators along with the associated rationale, a description of the spatial and temporal boundaries used for this VC, and a description of the attributes used to determine the significance of any residual, adverse effects. The assessment of potential effects is supported by a description of the existing conditions for the VC (Section 6.3.2), the identification and description of applicable pathways of potential effects on the VC (Section 6.3.3) and a description of applicable mitigation measures for the VC (Section 6.3.4). An outline of the analytical method conducted for the assessment and the key assumptions and/or conservative approach is found in Section 6.3.5. With the application of mitigation measures to the potential effects on the VC, the residual effects are then characterized in Section 6.3.6 and the significance of the residual effects is determined in Section 6.3.7.

6.3.1.1 Regulatory and Policy Setting

The effects assessment for noise and vibration has been prepared in accordance with the requirements of the federal Environmental Impact Statement (EIS) Guidelines (Appendix B-1) and the provincially approved Amended Terms of Reference (ToR; Appendix B-3). Concordance tables, indicating where EIS Guidelines and ToR requirements have been addressed, are provided in Appendix B-2 and B-5, respectively.

As the Project is located in Ontario, it will need to meet applicable federal and provincial legislation and regulatory requirements; further information regarding anticipated approval requirements is provided in Section 11. Government policies, objectives, standards and guidelines most relevant to the VC are summarized below.

Federal Policies and Guidelines

The federal EIS Guidelines provide reference to Health Canada's *Guidance for Evaluating Human Health Impacts in Environmental Assessment Noise* (Health Canada Noise Guideline; Health Canada 2017). The Health Canada Noise Guideline provides guidance on predicting health risks related to levels and/or types of noise predicted in federal environmental assessments of proposed major resource and infrastructure projects (such as mines, dikes, pipelines and other projects). In the context of an environmental assessment, the Health Canada Noise Guideline considers the noise levels associated with sleep disturbance, interference with communications, noise complaints and a high level of annoyance—these were considered in this assessment.

The Health Canada Noise Guideline also provides guideline limits for blasting air-overpressure—they are based on the World Health Organization recommendations for hearing loss protection. The Health Canada Noise Guideline considers that while hearing loss impacts are not typically considered in the context of a federal environmental assessment because project-related sound levels rarely reach these high levels at potential receptor locations, noise-induced hearing loss may be a concern when project activities involve impulsive noise emissions such as from blasting. As such, Health Canada suggests that the World Health Organization recommendation be followed to avoid hearing loss resulting from impulsive noise exposure.

The vibration assessment considers the Fisheries and Oceans Canada (DFO) *Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters* (Wright and Hopky 1998) and subsequent work by DFO (Cott and Hanna 2005), which provide guideline limits for blasting water-overpressure and ground-borne vibration when in proximity to Canadian fisheries waters.

Provincial Policies and Guidelines

The provincially approved Amended ToR states that the Project will comply with noise limits provided in the following Ministry of the Environment, Conservation and Parks (MECP) publications:

- *Environmental Noise Guideline NPC-300, Noise Assessment Criteria for Stationary Sources and for Land Use Planning (NPC-300; MECP 2013)*;
- *NPC-115, Construction Equipment (NPC-115; MECP 1978a)*: and
- *NPC-118, Motorized Conveyances (NPC-118; MECP 1978b)*.

The NPC-300 guideline establishes four classes of acoustical environments, based on the ambient background sound environments, and also establishes class-specific sound level limit criteria for the provincial environmental permitting process. These sound level limits were considered at representative points of reception (PORs) identified for the Project.

The MECP's NPC-115 and NPC-118 set out maximum noise-emission ratings for certain construction equipment and motorized conveyances, respectively, for use in residential areas and quiet zones. They do not provide receptor-based criteria or guidance on carrying out noise assessments. The noise emissions developed for Project construction equipment (see Appendix H-3) satisfied the emission ratings provided in NPC-115, and all motorized conveyances considered for the Project satisfied the emission ratings provided in NPC-118. These guidance documents were not considered further.

The noise assessment for the Project also considered the MECP's noise guidance document, *Protocol for the Measurement and Prediction of Audible Noise from HV Transmission Lines, Publication NPC-360* (MECP 2011a), which outlines the methods and criteria for assessing operational noise from transmission lines. This document was not identified in the provincially approved Amended ToR; however, based on comments received from the MECP, an assessment of the transmission line was completed and NPC-360 was applied.

The provincially approved Amended ToR states that noise screening should be prepared in accordance with the following:

- *Primary Noise Screening Method Guide* (MECP 2017a); and
- *Secondary Noise Screening Method* (MECP 2017b).

These documents provide guidance on carrying out a preliminary assessment when a detailed assessment is not required. As a detailed assessment was completed (i.e., noise modelling report in Appendix H-3), these screening method documents were not applicable.

The provincially approved Amended ToR also states that noise reports will be prepared in accordance with the following:

- NPC-233, Information to be Submitted for Approval of Stationary Source of Sound (NPC-233; MECP 2016); and
- Basic Comprehensive Certificates of Approval (Air), User Guide, Appendix A – Supporting Information for an Acoustic Assessment Report or Vibration Assessment Report Required by a Basic

Comprehensive CofA prepared by the Environmental Assessment and Approvals Branch, Version 2.1, April 2011 (MECP 2011b).

The noise modelling report (Appendix H-3) was prepared in accordance with these documents.

The provincially approved Amended ToR states that the Project will comply with vibration limits provided in the following MECP publications:

- NPC-207, Impulse Vibration in Residential Buildings (NPC-207; MECP 1983).; and
- NPC-119, Model Municipal Noise Control By-law for Blasting in Mines and Quarries (NPC-119; MECP 1982).

The NPC-207 guideline provides limits for impulse vibration within residential buildings resulting from the operation of stationary sources of vibration, including, but not limited to, stamping presses and forging hammers. The NPC-300 guideline provides the most recent definition of stationary sources by the MECP and generally identifies stationary sources as those activities and equipment that are expected to operate long term and, therefore, are more permanent in nature. Temporary construction activities are not considered to be a stationary source, according to NPC-300. In addition, NPC-119 provides guidance for blasting activities. Based on the Project information, no activities or equipment are expected to result in impulsive vibrations due to stationary sources during the operation phase of the Project. As a result, NPC-207 was not further assessed for the Project.

The NPC-119 guideline provides limits for blasting air-borne overpressure and ground-borne vibration from open pit blasts. These limits are applicable at sensitive land uses, in particular at residential dwellings, and were considered for the Project.

6.3.1.2 Influence of Consultation with Indigenous Communities, Government and the Public

Consultation has been ongoing for several years, prior to and throughout the environmental assessment process, and will continue with Indigenous communities, government agencies and the public through the life of the Project. Section 2 provides more detail on the consultation process. The Record of Consultation (Appendix D) includes detailed comments received, and responses provided, during the development of the final EIS/Environmental Assessment (EA).

Feedback received through consultation has been addressed through direct responses (in writing and follow-up meetings) and incorporated into the final EIS/EA, as appropriate. The key comments that influenced the assessment for noise and vibration between the draft and final EIS/EA are provided below.

Baseline Sound Conditions

Cat Lake First Nation, Lac Seul First Nation and Slate Falls Nation requested further information on the baseline sound reports (Appendices H-1 and H-2), including a summary of the applicable regulations and criteria for the Project. The baseline sound reports have been updated to include a summary of the applicable guidelines. Further, the applicable noise and vibration criteria are described in detail in the Noise Modelling Report (Appendix H-3, Section 2) and Blasting Assessment Report (Appendix H-4, Section 2).

Cat Lake First Nation, Lac Seul First Nation and Slate Falls Nation requested a description of the existing environmental conditions for each noise monitoring location, including details of the meteorological station and further discussion on the presentation and results of the monitoring programs. A description of the monitoring locations has been added to baseline noise reports (Section 3 of both Appendices H-1 and H-2); the further discussion on the presentation and results of the monitoring programs has also been added.

The MECP requested that the minimum hourly noise levels be provided for each period of evaluation and that arithmetic averages should not be considered. Further, the MECP noted that the applicable periods of evaluation are daytime (07:00 to 19:00), evening (19:00 to 23:00) and nighttime (23:00 to 07:00). The baseline sound reports (Appendices H-1 and H-2, Section 5.1) have been updated accordingly and present the minimum one-hour noise levels for each period of evaluation and consider logarithmic averages when considering average noise levels over a period of time.

Blasting Thresholds and Criteria

DFO and the Impact Assessment Agency of Canada (IAAC) recommended the use of 50 kilopascals (kPa) as the threshold for instantaneous pressure changes on fish in the assessment of blasting impacts based on guidance provided in Cott and Hanna (2005). The Blasting Assessment Report (Appendix H-4, Section 2) has been updated to include the 50 kPa threshold in the assessment and it provides revised results on that basis.

IAAC requested that the blasting criteria from the Health Canada Noise Guideline be considered in the blasting assessment. The criteria from the Health Canada Noise Guideline are used in the updated Blasting Assessment Report (Appendix H-4, Section 2).

The Ministry of Citizenship and Multiculturalism requested clarification on how blasting noise was considered. The Blasting Assessment Report (Appendix H-4, Section 2) includes a description of how blasting noise was assessed for the EIS/EA, and it follows the method outlined by the Health Canada Noise Guideline (Health Canada 2017), as described in Section 6.3.5.

Potential Sources of Noise from Project Components

IAAC and Health Canada requested that all noise sources should be included in the noise modelling and noted that justification should be provided for the exclusion of noise sources. Further, MECP requested that the change in sound levels from offsite transport trucks along the mine access road to the existing public Wenasaga Road, the transmission line, the process plant and the aggregate locations be included in the noise modelling. Considering this feedback, additional sources of noise (including the transmission line, the process plant and the aggregate locations) from the Project that are expected to change sound levels at offsite PORs have been included in the Noise Modelling Report (Appendix H-3, Section 3).

The existing publicly accessible Wenasaga Road, from the E1C transmission line to the eastern end of Springpole Lake, was previously assessed through the provincial forest management planning process and, therefore, is not part of the Springpole Project EA process.

Traditional Land Use Activities

Cat Lake First Nation, Slate Falls Nation and the Northwestern Ontario Métis Community noted that sensory disturbances such as noise, particularly from the use of helicopters and the airstrip, may affect Indigenous land users in carrying out Traditional Land Use activities. There are currently helicopters and other aircraft being used to support the existing exploration camp, however the potential effect of noise from the Project has been acknowledged in the introduction to Section 6.3. The description of Traditional Land Use activities has factored into the selection of PORs, as described in Section 6.3.5 and the Noise Modelling Report (Appendix H-3, Section 4). The potential effect of helicopters and the airstrip has also been included in the Noise Modelling Report (Appendix H-3, Section 6.1). The effect on the experience associated with Traditional Land Use activities is further assessed in Section 6.21.

Environment and Climate Change Canada requested clarification as to whether the effects of changes in sound from the mine access road would be considered in the assessment of potential effects on Caribou.

The modelled changes in sound levels along the mine access road are used in the assessment of potential effects on Caribou, as described in Section 6.13.5.4 as well as the assessment of potential effects on wildlife (Section 6.12.5).

Noise Modelling

IAAC and Health Canada requested that further details on the applicable tonal adjustments in the noise model be provided in the final EIS/EA. The Noise Modelling Report (Appendix H-3) has considered applicable adjustments and indicates which noise sources were considered tonal (i.e., Tables A1-A through A1-D in Appendix H-3) where a 5 decibel (dB) tonal penalty was applied, and it describes the use of the 10 dB correction in the calculation of the percentage of highly annoyed people in quiet rural areas.

IAAC requested that sleep disturbance be assessed against the standards recommended by Health Canada. The Noise Modelling Report (Appendix H-3, Section 5.2) uses the most stringent sleep disturbance criteria (i.e., annual average nighttime noise level limit of 40 dBA).

The Ministry of Citizenship and Multiculturism requested clarification on how noise propagates over water. The Noise Modelling Report (Appendix H-3, Section 6.1) includes a ground absorption value of 0 for waterbodies, meaning a waterbody surface is a noise-reflecting surface.

Noise Complaint Response

IAAC requested further detail on the noise complaint response protocol identified in the draft EIS/EA. Section 6.3.4 outlines the mitigation measures, which include the development of a weekly blast schedule posted on the Project's website, a mechanism for recording complaints, and a mechanism for timely monitoring of and follow-up for complaints during the construction and operation phases. It is expected that the protocol will include a complaint submission function available through the Project's website.

Monitoring Programs

Cat Lake First Nation and Lac Seul First Nation requested that sound monitoring also include monitoring of vibration from blasting. A monitoring program for sound and vibration resulting from the Project will be implemented during the construction and operation phases (see Section 12.3 for details).

6.3.1.3 Spatial and Temporal Boundaries

The Project Development Area (PDA) is defined as the footprint of the Project, including the mine site area, mine site access road and the transmission line corridor, as well as a buffer to allow flexibility for design optimizations. The buffer includes approximately 250 metres (m) around the mine site area. The buffer for the transmission line is included within the 40 m wide corridor and within the 30 m wide corridor for the mine access road. Where the mine access road and transmission line are aligned, the buffer is included within a 60 m wide corridor.

The spatial boundaries used for the assessment of noise and vibration are shown in Figure 6.3-1 and defined as follows:

- **Local Study Area (LSA)**: The noise and vibration LSA includes the area in the vicinity of the Project where the noise and vibration effects of the Project are expected to occur. The LSA is defined as an area that extends approximately 3 kilometres (km) from the PDA.
- **Regional Study Area:** The Regional Study Area is defined as the area that extends approximately 6 km from the mine site area of the PDA and 3 km from the mine access road and transmission line portions of the PDA.

The temporal boundaries for the assessment of noise and vibration are defined as follows:

- **Construction phase:** Years -3 to -1, representing the construction period for the Project.
- **Operation phase:** Years 1 to 10, with the first year potentially representing a partial year as the Project transitions from construction into operation. Mining of the ore from the open pit will end in Year 10, at which time the pit will begin refilling with water.
- **Decommissioning and closure phase:**
    - Active closure: Years 11 to 15, when final decommissioning and the majority of active reclamation activities are carried out; and
    - Post-closure: Years 16+, corresponding to the post-closure monitoring period and when the filled open pit basin will be reconnected to Springpole Lake.

Effects on the noise and vibration VC are assessed for each Project phase (i.e., construction, operation and closure).

6.3.1.4 Criteria and Indicators

In undertaking the assessment of noise and vibration levels, the following criteria were used:

- Change in sound levels; and
- Change in vibration levels.

The specific criteria, measurable indicators and the rationale for the selection of criteria are described in Table 6.3-1.

6.3.1.5 Description of Residual Effect Attributes

The residual effects for noise and vibration are characterized by the following attributes:

- Magnitude;
- Geographic extent;
- Duration;
- Frequency; and
- Reversibility.

These attributes, along with the rankings, are further described in Table 6.3-2

In addition, the residual effects for noise and vibration are characterized according to the ecological and/or social context within which the VC is found. This is a qualitative measure of the sensitivity and/or resilience of the VC to potential change. The following ranking is applicable:

- **Level I:** The VC may or may not be sensitive but is capable of supporting the predicted change with typical mitigation measures.
- **Level II:** The VC is sensitive and requires special measures to support the predicted change.
- **Level III:** The VC is sensitive and unable to support the predicted change, even with special measures.

As noted in Section 6.1, a residual effect is defined as significant if both of the following criteria are satisfied:

- A Level II or III rating is attained for all of the attributes involving magnitude, extent, duration, frequency and reversibility; and
- A Level II or III rating is attained for ecological and/or social context.

Conversely, if a Level I rating is achieved for any of the attributes involving magnitude, extent, duration, frequency or reversibility—or, if a Level I rating is achieved for the ecological and/or social context—then the residual effect is considered to be not significant.

In the event there is a significant adverse effect, the likelihood of occurrence is further described.

6.3.2 Existing Conditions

A description of the baseline conditions, based on field investigations, is presented below to characterize the existing conditions for noise and vibration. The existing conditions are used to support the assessment of potential effects from the Project on noise and vibration.

Detailed baseline information on noise and vibration can be found in the technical support documentation; it includes the Sound and Vibration Baseline Report Leaves-off Program (Appendix H-1) and the Sound and Vibration Baseline Report Leaves-on Program (Appendix H-2).

6.3.2.1 Sound

Two baseline monitoring field programs, at two locations (SP1 and SP2), have been conducted for the Project to characterize the existing environmental sound conditions as outlined in Section 3. Summaries of the baseline sound levels obtained from when leaves are not on trees (leaves-off) and when leaves are present (leaves-on) are shown in Table 6.3-3.

Existing sound levels in the vicinity of the Project site reflect a rural sound environment and are generally characterized by sounds of nature and minimal road traffic. No audible anthropogenic activities were observed at the monitoring location during installation and removal of the equipment. Note that there is current use of helicopters and other aircraft associated with the exploration camp which may affect existing background sound levels. The data indicate that the existing offsite noise levels are reflective of a Class 3 rural acoustical environment, as per classifications under the NPC-300 guideline publication (MECP 2013): a rural area with background sound levels dominated by natural sounds with infrequent human activity.

The Project site and surrounding area are mainly characterized by gentle hills, forests, lakes and rivers, and the existing exploration camp. Twenty-one representative PORs were identified as potential receptors, consisting of seasonal cabins around the Project site not owned by First Mining Gold Corp. (FMG), Indigenous points of interest identified through Traditional Knowledge as well as land use studies and consultation, and potential recreational and cabin sites identified through a review of the Ministry of Natural Resources Land Information Ontario geographic datasets (Section 6.3.5; Figure 6.3-2). The baseline sound levels captured at location SP1 are representative of the PORs identified north of the Project site, while SP2 characterizes the PORs identified south of the Project site, in the vicinity of the mine site. The lower baseline sound levels (i.e., those measured at SP1) characterize the representative PORs along the transmission line, as it results in a more conservative assessment.

6.3.2.2 Vibration

A summary of the baseline vibration monitoring is provided in Table 6.3-4. Vibration monitoring data are presented using PPV and root-mean-square velocity. The results from the leaves-off program suggest that, for both monitoring locations, the background PPV is under 0.01 millimetres per second (mm/s) for more than 95% of the data collected and the average root-mean-square velocity is 0.001 mm/s. During the leaves-on program, the background PPV for location SP1 is under 0.01 mm/s for more than 95% of the data collected; however, due to potential wildlife activity, the 95th percentile of the background PPV for location SP2 is 0.2 mm/s. The average root-mean-square velocity is 0.001 mm/s. The representative receptors identified in Section 6.3.2.1 (i.e., POR01 and POR07) were considered for the vibration assessment as well.

6.3.2.3 Traditional Knowledge

As part of the Project, all eight Indigenous communities were contacted to participate in the EA process, and to provide Traditional Knowledge and Traditional Land Use (TK/TLU) information. To date, six Indigenous communities, Cat Lake First Nation, Lac Seul First Nation, Mishkeegogamang Ojibway Nation, Slate Falls Nation, Wabauskang First Nation and the Northwestern Ontario Métis Community, have provided Traditional Knowledge and Traditional Land Use information. Specific TK/TLU information relevant to noise and vibration was not identified.

6.3.3 Identification of Pathways to Potential Effects

The initial step in the assessment process was to identify interactions between the Project and the VC that can result in pathways to potential effects. These potential effects may be direct, indirect and/or positive effects, where applicable. Table 6.3-5 includes the potential interactions of the Project with noise and vibration prior to the application of the mitigation measures. The professional judgment of technical experts with experience in mine projects in Ontario and Canada, as well as input from Indigenous communities, government agencies and the public, informed the identification of those activities and/or interactions that are likely to result in a pathway to a potential effect due to a measurable change in noise and vibration. These pathways to potential effects are further described below for each phase of the Project, along with the rationale for those interactions excluded from further assessment. Section 6.3.4 and Table 6.3-6 provide a description of the mitigation measures applied to these pathways to potential effects during all phases of the Project. The residual effects, after the application of the mitigation measures, are then described and further evaluated in Section 6.3.6, using the criteria and indicators identified in Section 6.3.1.4.

Construction Phase

The construction phase of the Project is expected to occur over a three-year period and will include preparation of the site and the construction of mine infrastructure (Section 5). The following interactions with the Project result in pathways to potential effects from noise and vibration, as described below. After mitigation is applied to each pathway, as described in Table 6.3-6, the residual effects are assessed using the criteria identified for each pathway:

- Site preparation activities for the mine site area, including clearing, grubbing and bulk earthworks, will occur during the initial development of the Project and interact with the acoustic environment. These activities result in a pathway to a potential effect on sound levels due to the operation of equipment. The assessment of potential effects includes changes in sound levels from this pathway.
- The construction of the 230 kilovolt (kV) transmission line, the mine site access road, airstrip, onsite haul roads and access roads, including the development of aggregate source areas, interacts with the acoustic environment. These activities result in pathways to potential effects on sound and

vibration due to the operation of equipment and blasting. The assessment of potential effects on noise includes changes in sound and vibration levels from these pathways.

- Haul trucks and production equipment are predicted to be moving between the fish habitat development area (the main aggregate source for construction material) and dikes, as well as the embankments for the co-disposal facility (CDF). These activities interact with the acoustic environment and result in pathways to potential effects on sound and vibration due to the operation of equipment and blasting. The assessment includes changes in sound and vibration levels from these pathways.
- Dewatering pumps will be used to undertake controlled dewatering of the isolated portion of the north basin of Springpole Lake. These activities interact with the acoustic environment and result in a pathway to a potential effect on sound due to the operation of equipment. The assessment includes changes in sound levels from this pathway.
- Overburden and lake bed sediment will be stripped from a portion of the dewatered open pit basin, and pit development will be initiated. These activities interact with the acoustic environment and result in a pathway to a potential effect on sound due to the operation of equipment. The assessment includes changes in sound levels from this pathway.
- The establishment and operation of the water management and treatment facilities interact with the acoustic environment. These activities result in a pathway to a potential effect on sound due to the operation of pumping equipment. The assessment of potential effects on sound includes changes in sound levels from this pathway.
- The commissioning of the process plant interacts with the acoustic environment. This activity results in a pathway to a potential effect on sound due to the noise emissions from the plant facility. The assessment of potential effects includes changes in sound levels from this pathway.

During construction, the interaction between noise and vibration and the site preparation activities for the mine site area includes the development of the temporary accommodations complex construction, the construction of the remaining buildings and onsite infrastructure, the construction of the central water storage pond, the development of the surficial soil stockpile and the initiation of the ore stockpiles.

There is no plausible interaction between the employment and expenditure activities and noise and vibration during any Project phase.

Operation Phase

The operation phase is anticipated to occur over a 10-year period. During the operation phase, noise and vibration will be generated from a variety of activities at the Project site, including mining operations in the open pit (e.g., blasting and heavy equipment operation), processing activities, and other ancillary and supporting facilities. The following interactions with the Project result in pathways to potential effects from noise and vibration, as described below. After mitigation is applied to each pathway, as described in Table 6.3-6, the residual effects are assessed using the criteria identified for each pathway:

- The process plant will operate until Year 10 by processing stockpiled ore. The operation of the process plant and other ancillary and supporting facilities interacts with the acoustic environment. These activities result in a pathway to a potential effect on sound due to the operation of the plant facility and other equipment. The assessment of potential effects includes changes in sound levels from this pathway.

- The open pit will be in operation until Year 10, when mining will cease. The operation of production drills, loaders, shovels, excavators, track dozers and backhoes inside the open pit interacts with the acoustic environment. These activities result in a pathway to a potential effect on sound due to noise emissions generated from the operation of equipment. The assessment of potential effects includes changes in sound levels from this pathway.
- The extraction of material from the working face of the open pit mine requiring the use of explosives interacts with the acoustic environment. This activity results in a pathway to a potential effect on sound and vibration due to the noise emissions generated from the operation of equipment and blasting. The assessment of potential effects on noise and vibration includes changes in sound and vibration levels from these pathways.
- The operation of trucks and loaders used around the drills in the open pit, in preparation for blasting, interacts with the acoustic environment. This activity results in a pathway to a potential effect on sound and vibration due to the noise emissions generated from the operation of equipment and blasting. The assessment of potential effects on noise and vibration includes changes in sound and vibration levels from these pathways.
- The haulage truck movement is predicted to be primarily between the ore stockpiles and process plant for transportation of ore for mineral processing. The tailings produced from mineral processing will generally be moved to the CDF via a pipeline. The movement of haulage trucks along the haul roads between the open pit, process plant and the CDF interacts with the acoustic environment. These activities result in a pathway to a potential effect on sound due to the noise emissions generated from the operation of equipment. The assessment of potential effects on noise includes changes in sound levels from this pathway.
- The operation of light plant engines during the evening and nighttime in the most active areas of the Project, including the CDF and the open pit, interacts with the acoustic environment. This activity results in a pathway to a potential effect on sound due to the noise emissions generated from the operation of light plant equipment. The assessment of potential effects on noise includes changes in sound levels from this pathway.
- The operation of equipment at the CDF, including track dozers, graders and compactors, interacts with the acoustic environment. This activity results in a pathway to a potential effect on sound due to the noise emissions generated from the operation of equipment. The assessment of potential effects on noise includes changes in sound levels from this pathway.
- The operation of the water management and treatment facilities, including the pumps for the dewatering of the open pit and transferring of water to the central water storage pond, interacts with the acoustic environment. These activities result in a pathway to potential effect on sound due to the noise emissions generated from the operation of pumping equipment. The assessment of potential effects on noise includes changes in sound levels from this pathway.

  The operation and maintenance of mine site infrastructure such as the mine access road, the airstrip and the transmission line, interacts with the acoustic environment. This activity results in a pathway to a potential effect on sound due to the noise emissions generated from the operation of equipment for activities such as regrading gravel surfaces, repairing transmission poles and lines, or management vegetation in the corridor. The assessment of potential effects on noise includes changes in sound levels from this pathway.

- Progressive reclamation activities interact with the acoustic environment. These activities result in a pathway to a potential effect on sound due to the noise emissions generated from the operation of the equipment. The assessment of potential effects on noise includes changes in sound levels from this pathway.

The operation of the accommodations complex is not expected to represent a key source of noise emissions in comparison with the operation of the main equipment fleet on site.

Decommissioning and Closure Phase

During the closure phase, the activities during this five-year period are similar to those that occur during the construction and operation phases, and they use similar mining and construction equipment but on a much smaller scale. Once filling of the open pit ceases, the operation of equipment is not planned, and noise levels are expected to revert to the current baseline conditions. The following interactions with the Project result in pathways to potential effects from noise and vibration, as described below. After mitigation is applied to each pathway, as described in Table 6.3-6, the residual effects are assessed using the criteria identified for each pathway:

- The removal of salvageable assets off site interacts with the acoustic environment. These activities result in a pathway to a potential effect due to the noise emissions generated from the operation of equipment. The assessment of potential effects on noise includes changes in sound levels from this pathway.
- The reclamation of impacted portions of the PDA, such as by regrading, placing of cover and revegetating, as applicable, interacts with the acoustic environment. These activities result in a pathway to a potential effect on sound due to the noise emissions generated from the operation of equipment. The assessment of potential effects on noise includes changes in sound levels from this pathway.
- The demolition, recycling and/or disposal of remaining materials interact with the acoustic environment. These activities result in a pathway to a potential effect due to the noise emissions generated from the operation of equipment. The assessment of potential effects on noise includes changes in sound levels from this pathway.
- The removal and disposal of demolition-related wastes in approved facilities interacts with the acoustic environment. These activities result in a pathway to a potential effect due to the noise emissions generated from the operation of equipment. The assessment of potential effects on noise includes changes in sound levels from this pathway.

Changes in vibration levels are not anticipated during this phase, as no blasting activities are planned.

6.3.4 Mitigation Measures

Measures to be implemented in helping to avoid or minimize the effects of the Project on noise and vibration include the following:

- During construction and operation, site equipment will be operated to meet NPC-300, NPC-119, DFO and Health Canada operational noise and vibration limits at PORs, when applicable.
- Local Indigenous communities and identified PORs will be advised ahead of transmission line construction work periods and as the construction work proceeds.

- Work with local Indigenous communities to coordinate construction activities related to the transmission line to minimize overlap with the timing of traditional land use activities (e.g., fall moose hunt) and other sensitive periods.
- A mechanism will be established for receiving and responding to noise complaints in a timely manner during construction, operation and closure phases.
- Construction of the transmission line will occur primarily during the daytime hours.
- Motorized equipment will be selected or designed with mufflers / silencers to limit noise emissions.
- Reversing alarms should be dimmable with white noise and/or strobe lights, but they will be in accordance with the applicable health and safety regulations.
- Regular inspections will take place to confirm that equipment and machinery used on site is operated in good working condition through regular maintenance.
- The use of engine brakes will be prohibited and engines will need to be stopped for vehicles on standby, depending on seasons and weather.
- Vehicles and equipment will be operated in such a way that impulsive noise is minimized, where possible.
- For helicopter use during transmission line construction, minimum flight altitudes will be maintained unless the helicopters are engaged in construction tasks, landing or departure.
- Prior to construction, a detailed blasting plan will be developed for the Project to determine the maximum allowable explosive loading at various locations within the PDA to aid in complying with NPC-119, Health Canada and DFO limits for vibration at receptors.

In addition, mitigation is inherently designed into the Project for the effects on noise, including the following:

- Building dimensions, layout and orientation will be designed to shield noise sources, where possible.
- Acoustical enclosures will be used in the process plant to limit overall noise emissions from key noise sources, such as the ball mills.
- Generator intakes and exhausts in the process plant will use silencers.

The application of mitigation measures for the pathways to potential effects is illustrated in Table 6.3-6. Mitigation measures described in this section are expected to be effective for their intended purposes given their effective implementation at similar projects.

Monitoring programs will be implemented to verify the accuracy of the predicted effects and assess the effectiveness of the implemented mitigation measures; they may be further optimized in response to monitoring data. Monitoring programs are in place for the Project, with previous data collection completed. An overview of monitoring for the Project going forward is further described in Section 12 and will be refined during the permitting phase to incorporate conditions of approvals and permits. Consultation on the monitoring programs is expected to continue through all phases of the Project.

6.3.5 Analytical Methods

The noise assessment for the Project was completed using the noise prediction software package, Cadna/A, published by Datakustik GmbH, which was configured to implement the International Organization for Standardization 9613-2 (ISO 1996) environmental sound propagation algorithms and, when assessing the airstrip, the Federal Aviation Administration's Integrated Noise Model. The Cadna/A noise modelling software is widely accepted by the consulting industry and the MECP. All steady noise sources were assumed to operate simultaneously to model the predictable worst-case scenarios for mining development phases of the Project: construction (Year -2), pre-production (Year -1), operations peak-production (Year 4) and operations stockpile reclaim (Year 9). Noise associated with the airstrip was predicted independently of the mining operations. The predicted noise levels were compared with the applicable limits established in the MECP guideline NPC-300 (MECP 2013) and the Health Canada Noise Guideline (Health Canada 2017) for determination of potential impact.

For the purposes of the noise modelling assessment, peak noise production in operations was determined to be Year 4, based on the highest potential usage of noise-generating equipment, volume of material being transported, increased activity in the open pit and a fully operational process plant.

Noise levels from the transmission line operation were predicted independently of the mining development phases, following the methods provided in NPC-360, which provides a number of formulae to calculate the average noise levels during steady, light to moderate rain. Calculated noise levels were compared with the applicable limit established in NPC-360 (MECP 2011a).

The selection of potential PORs is based on the guidance provided by the NPC-300 guideline and the Health Canada Noise Guideline, Indigenous points of interest identified through Traditional Land Use studies and engagement, and potential recreational and cabin sites identified through a review of the Ministry of Natural of Resources Land Information Ontario geographic datasets.

The representative PORs considered in this assessment were selected from the potential PORs that were located inside the noise and vibration Regional Study Area. A total of 21 representative PORs were selected, including 6 in the vicinity of the mine site and 15 along the transmission line. The complete list of representative PORs and their Universal Transverse Mercator coordinates are included in Table 6.3-7 and shown in Figure 6.3-2.

Blasting air-overpressure and ground-borne vibration levels have been predicted at PORs in accordance with prediction methods published in literature (Linehan and Wiss 1982; Nicholls et al. 1971). These levels have been assessed against the limits established in the NPC-119 guideline (MECP 1982) and the Health Canada Noise Guideline (Health Canada 2017). In addition, blasting noise and vibration levels have also been assessed at the land–water interface (shoreline) in accordance with DFO's *Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters* (Wright and Hopky 1998). Blasting water-overpressure and ground-borne vibration levels were predicted using the DFO calculation methods and by comparing to the DFO guideline. For the development of site-specific blast design, considerations were given to the DFO guideline values or alternative values developed in consultation with DFO.

6.3.5.1 Assumptions and the Use of the Conservative Approach

There are various types of noise sources identified that are expected to operate at the Project site during all phases of the Project. The equipment list considered in the assessment has been developed based on the information presented in the Technical Report and Pre-Feasibility Study (AGP 2021) prepared for the Project, information provided by the engineering and Project team, and assumptions based on previous

experience from similar projects. The mining equipment selections are representative of the equipment expected to be used for the Project.

Predicted emission levels for Project noise sources were based on commonly accepted engineering methods as well as past measurements of similar equipment. These were determined using the following sources: manufacturer data based on the preliminary equipment selections, WSP Canada Inc.'s sound power level database, noise assessments for similar equipment from other mining projects and reference levels published in the *Roadway Construction Noise Model User's Guide* (U.S. Department of Transportation 2006).

The noise levels were modelled for the four identified periods having the highest equipment volume and/or material handling volume in order to assess the predictable worst-case operational impact, as described in Section 6.3.5.

The list of construction equipment and their use for the access road and transmission line is representative of what is expected to be used for the Project.

In addition, the model used a conservative approach with the following assumptions:

- The Project and surrounding surfaces were modelled as semi-absorptive / reflective.
- Attenuation (reduction in noise) effects of foliage (trees) were not considered.
- The majority of sources were modelled as point sources, while trucks were modelled as line sources and activities occurring over larger areas (e.g., CDF) were modelled as area sources.
- The anticipated equipment volume was modelled in full (i.e., 100% volume), despite the fact that not all equipment may be available at a given time due to reasons such as repair and maintenance.
- All equipment were assumed to be operating for a full hour for the worst-case operation hour, with the exception of production drills and mine access road and transmission line construction, as described in Appendix H-3.
- All steady noise sources were assumed to operate simultaneously.
- The assessment location for all PORs associated with a building is assumed to be at the plane of window, 4.5 m above ground, to represent a potential second storey, which is considered a conservative assessment based on the large distance between the Project and the PORs. The assessment location for all PORs associated with outdoor land uses are assumed to be at a height of 1.5 m.

As a result of these assumptions, the predicted noise emissions may be overestimated, providing a conservative estimate of noise emissions from the Project.

The blasting impact calculations were completed using conservative assumptions to model the predictable worst-case scenario. The blast predictions conservatively assumed that the maximum blast effect would occur closest to each POR. Further, blasting was conservatively assumed to occur at ground level when, in fact, blasting will occur within the open pit (at or below grade level).

In addition, the NPC-119 guideline (MECP 1982) limits were used for the assessment of air-borne overpressure and ground-borne vibration. The air-borne overpressure limit provided in the NPC-119 guideline is more stringent than that in the Health Canada Noise Guideline (Health Canada 2017). It is expected that by assessing the air-borne overpressure levels against the NPC-119 guideline limit, the Health Canada limit will be respected. The DFO guideline (Wright and Hopky 1998) methods were used for calculation of water-overpressure and ground-borne vibration in proximity to Canadian fisheries waters.

6.3.6 Characterization of Potential Residual Effects

An assessment of the potential residual effects was conducted after considering the application of mitigation measures.

6.3.6.1 Noise Levels

Noise modelling was carried out to assess four identified periods of mining development (Year -2, Year -1, Year 4 and Year 9). The combined steady sound levels (1-hour equivalent sound level [$L_{Aeq-1hr}$], A weighted decibels; dBA) for the predictable worst-case hour scenario were calculated at all of the identified PORs using the sound emissions from the individual sources. The periods were assessed for daytime, evening and nighttime, as per provincial and federal compliance limits.

The noise contours for the predictable worst-case mine development scenarios are shown in Figure 6.3-3 to Figure 6.3-7.

A summary of the noise modelling results assessed against the provincial assessment framework (i.e., MECP NPC-300) is presented in Table 6.3-8. As described in detail in Appendix H-3, MECP NPC-300 sound level limits are not applicable at PORs that do not meet the NPC-300 definition of a receptor (POR03 to POR05) or for transmission line construction (i.e., the Project activity occurring near POR08 to POR16, POR20 and POR21) and, therefore, are not applicable at those PORs. Predicted Year -2 daytime noise levels at POR07, POR17, POR18 and POR19 were primarily influenced by mine access road construction and transmission line construction and, therefore, not comparable to MECP NPC-300 daytime sound level limits. Year -2 daytime noise levels in the absence of mine access road construction and transmission line construction are equivalent to the evening / nighttime noise levels. Under the predictable worst-case operational scenario, the modelled noise levels are expected to meet the MECP NPC-300 guideline limits at all PORs during daytime, evening and nighttime periods, for all assessed scenarios.

The modelled noise levels were also assessed against Health Canada Noise Guideline limits for speech interference and sleep disturbance. Under the predictable worst-case hour scenario ($L_{Aeq-1hr}$), the noise levels from activities occurring on the mine site are expected to meet the guideline limits at all PORs during daytime and nighttime periods, for all modelled mine development scenarios. Given the construction scenario assessed, the construction of the transmission line is expected to result in exceedances of the Health Canada Noise Guideline $L_{Aeq-1hr}$ limits at PORs within approximately 400 m of the transmission line right-of-way. Therefore, the noise mitigation measures described in Section 6.3.4 will be implemented during construction of the transmission line to minimize effects at PORs within 400 m of the transmission line. A summary of the noise modelling results with respect to the $L_{Aeq-1hr}$ metric is presented in Table 6.3-5.

The modelled noise levels for each phase were also assessed against the change in percent highly annoyed (%HA, based on the day-night sound level [L_{dn}] metric) criterion. A summary of the noise modelling results with respect to the %HA and L_{dn} metrics is presented in Table 6.3-6. The change in %HA is expected to be compliant with the identified limit of 6.5% for activities occurring at the mine site. Given the construction scenario assessed, the construction of the transmission line is expected to result in an exceedance of the Health Canada Noise Guideline %HA limits at PORs within approximately 500 m of the transmission line right-of-way. Therefore, the noise mitigation measures described in Section 6.3.4 will be implemented during construction of the transmission line to minimize effects at PORs within 500 m of the transmission line.

A summary of the noise modelling results assessed against the Health Canada Noise Guidance L_{Amax} criteria for the assessment of airstrip operations is presented in Table 6.3-10. The modelled sound levels from the airstrip are expected to meet the Health Canada Noise Guidance L_{Amax} sleep disturbance criteria of 60 dBA at all identified PORs.

Helicopter use is expected to support transmission line construction. It is expected to occur during the daytime only and, therefore, Health Canada's L_{Amax} sleep disturbance criteria are not applicable. The %HA associated with helicopter use was calculated based on a helicopter hovering in the vicinity of a POR for a total of one hour in a given daytime period. A summary of the noise modelling results, including the predicted L_{Amax} and calculated %HA, assessed against the Health Canada Noise Guideline %HA criteria for the assessment of helicopter use, is presented in Table 6.3-11. The modelled sound levels from the use of helicopters during transmission line construction are predicted to exceed a change in %HA of 6.5% within approximately 400 m of the transmission line. Therefore, the noise mitigation measures described in Section 6.3.4 will be implemented to minimize effects at PORs within 400 m of the transmission line.

A summary of the noise modelling results assessed against the MECP's NPC-360 guideline for the assessment of the operation of the transmission line is presented in Table 6.3-12. PORs located within 200 m of the transmission line were assessed, as required by NPC-360. The modelled sound levels meet the guideline limit of 55 dBA at all identified PORs.

While the Project is demonstrated to operate in compliance with the applicable provincial and federal sound level limits for its daytime, evening and nighttime operations during the four identified worst-case periods of mine development, the Project is expected to have short-term exceedances of applicable federal sound level limits during construction of the transmission line. However, construction will proceed in a linear fashion along the transmission line route with only a limited amount of time being spent at any particular location. Any exceedance will be temporary in nature, expected to occur only when construction activities are in close proximity to a POR and limited to the vicinity of the transmission line right-of-way.

6.3.6.2 Vibration Levels

The blasting air-borne overpressure (air overpressure peak pressure level [L_{peak}]) and ground-borne vibration (PPV) were assessed against the MECP limits at the two nearest PORs that include building structures (POR01 and POR07). Both receptors are located over 6 km from the boundary of the proposed open pit and fish habitat development area. In addition, the assessment of the blasting water-overpressure (water-overpressure peak pressure level [P_{peak}]) and ground-borne vibration (PPV) against the DFO criteria used three shoreline locations, SL-A, SL-B and SL-C (Figure 6.3-8), that were identified as the closest land–water interfaces to the boundary of the proposed open pit and fish habitat development area.

The maximum allowable explosive loading (in units of kilogram per delay [kg/delay]) at the two PORs, to meet the applicable MECP and Health Canada criteria, are shown in Table 6.3-13. Based on proposed blast parameters, blasting operations can be performed at the Project site in compliance with MECP and Health Canada criteria.

Similarly, the maximum allowable explosive loading at the three shoreline locations, to meet the applicable DFO criteria, are shown in Table 6.3-14. Where the proposed open pit perimeter is quite close to the receptors (i.e., fish habitat), the estimated explosive loading may be impractical for operations to attain. In that case, the explosive loading proposed for the Project was used to estimate exceedances at the receptor. An explosives load of 192 kg/delay was used for blasting carried out adjacent to the proposed open pit perimeter, to estimate potential exceedances of the DFO guideline. The assessment shows that there is no potential for most waterbodies to be impacted by blasting operations. However, during the first year of

operation, there remains a potential for the blasting limits to be exceeded in nearshore areas of Birch Lake (SL-A). A blasting management plan will be prepared prior to construction by a qualified blasting contractor, and where blasting occurs within the vicinity of a fish-bearing waterbody, a detailed blast design will be developed to comply with federal blasting guidelines, which may include measures such as modified explosive charges, set-back distances, fisheries timing windows and, if necessary, implementation of measures as described in the Fish Habitat Compensation and Offsetting Plan. Following these measures, the effects of vibration will be mitigated and there will be no predicted residual effects from Project-related vibration.

6.3.7 Significance of Residual Effects

6.3.7.1 Change in Sound Levels

The noise prediction modelling indicates that no exceedances of applicable limits are expected due to activities at the mine site at the identified PORs and, therefore, no residual noise effects from mine site activities are predicted.

The residual effect associated with noise is the potential exceedance of noise criteria within 500 m of the transmission line during construction. Note that as stated in Section 6.3.4, prior to beginning transmission line construction in a given area, FMG will work with land users to provide notice and minimize noise, as needed. Note that construction will proceed in a linear fashion along the transmission line route with only a limited amount of time being spent at any particular location. The mitigation measures listed in Section 6.3.4 will be refined based on whether activities are occurring at the locations of PORs during the time of construction.

With the proposed design and implementation of mitigation measures, the magnitude of the residual effect of noise from the construction of the transmission line is considered to be Level II, as the applicable federal criteria are predicted to be exceeded at three Traditional Land Use PORs. The duration of the residual effect of noise is considered to be Level I, as the effect will occur only during the period when construction will take place near a confirmed POR that is in use. The geographic extent of the residual effects is confined to the LSA (Level I). The frequency of the residual effects is considered to be intermittent (Level II), but the residual effect is fully reversible, as the noise levels will cease once the construction activities cease (Level I). Therefore, as the duration and geographic extent are considered to be Level I, following the methods presented in Section 6.3.1.5, the residual effect of noise due to construction of the transmission line is predicted to be not significant. The ecological and social context is considered to be low (Level I), as the VC is capable of supporting the predicted change with typical mitigation measures and transmission line construction is a common activity.

The adverse residual effect of noise due to the construction of the transmission line is predicted to be not significant.

6.3.8 Confidence Prediction

The prediction of effects was conducted on the basis of industry standards for modelling of noise and vibration and used input data that were based on information provided from commonly accepted engineering methods and past project experiences, and an understanding of the Project. Based on the conservative assumptions made and feasible mitigation measures, the confidence prediction is high.

6.3.9 References

AGP Mining Consultants (AGP). 2021. NI 43-101 Technical Report and Pre-Feasibility Study on the Springpole Gold Project, Ontario, Canada. Report Date: February 26, 2021.

Cott, P. and B. Hanna. 2005. Monitoring Explosive-Based Winter Seismic Exploration in Waterbodies, 2000–2002. In: S.L. Armsworthy, P.J. Cranford and K Lee, editors. Proceeding of Offshore Oil and Gas Environmental Effects Monitoring: Approaches and Technologies. p. 473–490.

Health Canada. 2017. Guidance for Evaluating Human Health Impacts in Environmental Assessment: Noise. January 2017.

International Organization for Standardization (ISO). 1996. ISO-9613-2. Acoustics – Attenuation of Sound during Propagation Outdoors. Part 2 – General Method of Calculation.

Linehan, P. and J. Wiss. 1982. Vibration and Air Blast Noise from Surface Coal Mine Blasting. AIME Transactions, vol. b272, 1982.

Ministry of the Environment, Conservation and Parks (MECP). 1978a. Publication NPC-115, Construction Equipment of Model Municipal Noise Control By-law.

Ministry of the Environment, Conservation and Parks (MECP). 1978b. Publication NPC-118, Motorized Conveyances of Model Municipal Noise Control By-law.

Ministry of the Environment, Conservation and Parks (MECP). 1982. Noise Pollution Control (NPC) Publication 119 of Model Municipal Noise Control By-law for Blasting in Mines and Quarries. Ontario Ministry of the Environment, Conservation and Parks.

Ministry of the Environment, Conservation and Parks (MECP). 1983. Publication NPC-207, Impulse Vibration in Residential Buildings.

Ministry of the Environment, Conservation and Parks (MECP). 2011a. Publication NPC-360, Protocol for the Measurement and Prediction of Audible Noise from HV Transmission Lines (Final Draft). March 2011.

Ministry of the Environment, Conservation and Parks (MECP). 2011b. Basic Comprehensive Certificates of Approval (Air), User Guide, Appendix A – Supporting Information for an Acoustic Assessment Report or Vibration Assessment Report Required by a Basic Comprehensive CofA prepared by the Environmental Assessment and Approvals Branch, Version 2.1, April 2011

Ministry of the Environment, Conservation and Parks (MECP). 2013. Publication NPC-300, Noise Assessment Criteria for Stationary Sources and for Land Use Planning.

Ministry of the Environment, Conservation and Parks (MECP). 2016. Publication NPC-233, Information to be Submitted for Approval of Stationary Source of Sound.

Ministry of the Environment, Conservation and Parks (MECP). 2017a. Primary Noise Screening Method Guide.

Ministry of the Environment, Conservation and Parks (MECP). 2017b. Secondary Noise Screening Method.

Nicholls, R., C. Johnson, and W. Duvall. 1971. Bulletin 656 – Blasting Vibration and Their Effect on Structures. U.S. Dept. of the Interior, Bureau of Mines, Washington.

Wright, D.G. and G.E. Hopky. 1998. Guidelines for the Use of Explosives in or Near Canadian Fisheries Waters. Can. Tech. Rep. Fish. Aquat. Sci. 2107: iv + 34 p.

United States Department of Transportation, Federal Highway Administration. 2006. FHWA Roadway Construction Noise Model User's Guide.

Table 6.3-1: Noise and Vibration Criteria, Indicators and Rationale

Criteria	Indicator	Rationale
Noise levels	Daytime (07:00 – 19:00) $L_{Aeq-1hr}$, measured in dBA	NPC-300 provides applicable sound level limits for the predictable worst-case one-hour period during the daytime, evening and nighttime periods.
	Evening (19:00 – 23:00) $L_{Aeq-1hr}$, measured in dBA	
	Nighttime (23:00 – 07:00) $L_{Aeq-1hr}$, measured in dBA	
	L_{dn}, measured in dBA Change in %HA	The Health Canada Noise Guidance provides criteria for the change in %HA, which is calculated from the predicted L_{dn}.
Vibration levels	L_{peak}, measured in dBL	NPC-119 provides applicable peak air-borne overpressure level guideline limits for mine blasts monitored at the nearest sensitive receptor. The Health Canada Noise Guidance provides guideline limits for blasting air-overpressure, which is calculated from the number of blasts occurring per day.
	P_{peak}, measured in kPa	DFO provides guideline limits for blasting water-overpressure levels measured at the nearest fish-bearing watercourse.
	Ground-borne PPV, measured in mm/s	NPC-119 provides applicable ground-borne vibration level guideline limits for mine blasts monitored at the nearest sensitive receptor. The DFO provides guideline limits for blasting ground-borne levels measured at the nearest active fish spawning beds during spawning / incubation.

dBL = linear decibels.

Table 6.3-2: Significance Determination Attributes and Rankings for Noise and Vibration

Attribute	Description	Category
Magnitude	A qualitative or quantitative measure to describe the size or degree of the residual effects relative to baseline conditions	**Level I:** Noise and vibration levels meet federal and provincial criteria at the identified receptor location. **Level II:** Noise or vibration levels exceed either federal or provincial criteria at the identified receptor location. **Level III:** Noise or vibration levels exceed federal and provincial criteria at the identified receptor location.
Geographic extent	The spatial extent over which the residual effect will take place	**Level I:** The effect is restricted to the LSA. **Level II:** The effect extends beyond the LSA. **Level III:** The effect extends beyond the Regional Study Area.
Duration	The time period over which the residual effect will or is expected to occur	**Level I:** The effect occurs over the short term: less than or equal to 3 years. **Level II:** The effect occurs over the medium term: more than 3 years but less than 20 years. **Level III:** The effect occurs over the long term: greater than 20 years.
Frequency	The rate of occurrence of the residual effect	**Level I:** The effect occurs once, infrequently. **Level II:** The effect occurs intermittently or with a certain degree of regularity. **Level III:** The effect occurs frequently or continuously.
Reversibility	The extent to which the residual effect can be reversed	**Level I:** The effect is fully reversible. **Level II:** The effect is partially reversible or potentially reversible with difficulty. **Level III:** The effect is not reversible.

Table 6.3-3: Baseline Sound Levels Summary

Monitoring Location	Sound Metrics Collected							
	Leaves-off Program				Leaves-on Program			
	Daytime L_{Aeq} (07:00-19:00)	Evening L_{Aeq} (19:00-23:00)	Nighttime L_{Aeq} (23:00-07:00)	L_{dn}	Daytime L_{Aeq} (07:00-19:00)	Evening L_{Aeq} (19:00-23:00)	Nighttime L_{Aeq} (23:00-07:00)	L_{dn}
SP1	30	27	22	31	46	37	36	45
SP2	42	40	31	42	54	42	40	52

Notes:

While the locations monitored during the leaves-off and leaves-on programs were relatively consistent, the exact locations were offset from each other due to constraints of access during the field work. Results listed are in dBA. The sound metrics were collected using one-hour values and data collected during periods of inclement weather conditions; site inspections were excluded from the baseline assessment. For each of the metrics, the following processing was considered:

L_{Aeq} – Denotes the logarithmic average of the 1-hour L_{Aeq} collected. The daytime, evening and nighttime periods are defined as per NPC-300.

L_{dn} – Denotes the arithmetic average of the L_{dn} calculated using the collected 1-hour L_{Aeq} data. The level was calculated for a 24-hour period with the nighttime contributions adjusted by +10 dB. The daytime and nighttime periods for calculation of L_{dn}, as per the Health Canada Noise Guideline, are defined as follows: daytime period from 07:00 to 22:00 and nighttime period from 22:00 to 07:00.

Table 6.3-4: Vibration Level Summary

Monitoring Location	Vibration Metrics Collected (1-second)			
	Leaves-off Program		Leaves-on Program	
	PPV (mm/s)	RMS (mm/s)	PPV (mm/s)	RMS (mm/s)
SP1	0.004	0.001	0.006	0.001
SP2	0.004	0.001	0.193	0.001

Notes:

While the locations monitored during the leaves-off and leaves-on programs were relatively consistent, the exact locations were offset from each other due to constraints of access during the field work (i.e., SP1 was placed near Site 10 and SP2 was placed near Site 4).
Denotes all metrics collected using one-second values (excluding data collected during periods of site inspection and maintenance).
For each of the metrics, the following processing was considered:

PPV: Denotes the 95th percentile value of PPV from all monitoring data along the vertical axis.

RMS: Denotes the arithmetic average of RMS velocity from all monitoring data along the vertical axis.

The values presented are rounded to three decimal places.
RMS = root-mean-square velocity.

Table 6.3-5: Potential Interactions of Project Components with Noise and Vibration

Project Component / Activity	Noise and Vibration
Construction Phase	
Site preparation activities for the mine site area, including clearing, grubbing and bulk earthworks	Yes
Construction of the mine access road and airstrip, including the development and operation of aggregate resource areas	Yes
Development of temporary construction camp and staging areas	Yes
Construction of the fish habitat development area	Yes
Construction of the transmission line to the Project site	Yes
Construction of the onsite haul and access roads	Yes
Construction of the dewatering dikes in north basin of Springpole Lake	Yes
Construction of buildings and onsite infrastructure	Yes
Construction of the central water storage pond	Yes
Controlled dewatering of the open pit basin	Yes
Construction of the starter embankments for the CDF	Yes
Stripping of lake bed sediment and overburden at the open pit	Yes
Development of the surficial soil stockpile	Yes
Initiation of pit development in rock	Yes
Initiation of stockpiling of ore	Yes
Establishment and operation of water management and treatment facilities	Yes
Commissioning of the process plant	Yes
Employment and expenditures	-
Operation Phase	
Operation of the process plant	Yes
Operation of open pit mine	Yes
Management of overburden, mine rock, tailings and ore in designated facilities	Yes
Operation of water management and treatment facilities	Yes
Accommodations complex operations	-
Operation and maintenance of mine site infrastructure	Yes
Progressive reclamation activities	Yes
Employment and expenditures	-
Decommissioning and Closure Phase	
Removal of assets that can be salvaged	Yes
Demolition and recycling and/or disposal of remaining materials	Yes
Removal and disposal of demolition-related wastes in approved facilities	Yes
Reclamation of impacted areas, such as by regrading, placing of cover and revegetating	Yes
Filling the open pit with water	Yes
Monitoring and maintenance	Yes
Employment and expenditures	-

Note:
- = The interaction is not expected, and no further assessment is warranted.

Table 6.3-6: Proposed Mitigation Measures for Potential Noise and Vibration Effects

	Phase			
Pathways to Potential Effects / Criteria	**Con.**	**Op.**	**Cl.**	**Proposed Mitigation Measure**
Change in noise levels	•	•	–	Site equipment will be operated to meet NPC-300 and Health Canada operational noise and vibration limits at PORs, when applicable.
	•	–	–	Local Indigenous communities and identified PORs will be advised ahead of transmission line construction work periods and as the construction work proceeds.
	•	–	–	Work with local Indigenous communities to coordinate construction activities related to the transmission line to minimize overlap with the timing of traditional land use activities (e.g., fall moose hunt) and other sensitive periods.
	•	•	•	A mechanism will be established for receiving and responding to noise complaints in a timely manner during construction, operation and closure phases.
	•	–	–	Construction of the transmission line will occur primarily during the daytime hours.
	•	•	•	Motorized equipment will be selected or designed with mufflers / silencers to limit noise emissions.
	•	•	•	Reversing alarms should be dimmable with white noise and/or strobe lights, but they will be in accordance with the applicable health and safety regulations.
	•	•	•	Regular inspections will take place to confirm that equipment and machinery used on site is operated in good working condition through regular maintenance.
	•	•	•	The use of engine brakes will be prohibited and engines will need to be stopped for vehicles on standby, depending on seasons and weather.
	•	•	•	Vehicles and equipment will be operated in such a way that impulsive noise is minimized, where possible.
	•	–	–	For helicopter use during transmission line construction, minimum flight altitudes will be maintained unless the helicopters are engaged in construction tasks, landing or departure.

	Phase			
Pathways to Potential Effects / Criteria	**Con.**	**Op.**	**Cl.**	**Proposed Mitigation Measure**
	•	•	•	Acoustical enclosures will be used in the process plant to limit overall noise emissions from key noise sources, such as the ball mills.
Change in vibration levels	•	•	–	Site equipment will be operated to meet NPC-119, DFO and Health Canada operational vibration limits at PORs, when applicable.
	•	•	–	Prior to construction, a detailed blasting plan will be developed for the Project to determine the maximum allowable explosive loading at various locations within the PDA to aid in complying with NPC-119, Health Canada and DFO limits for vibration at receptors.
	•	•	–	A mechanism will be established for receiving and responding to vibration complaints in a timely manner during construction, operation and closure phases.

Notes:

Con. = construction; Op. = operation; Cl. = closure; ● = mitigation is applicable; – = mitigation is not applicable.

Table 6.3-7: Representative Points of Reception

Point of Reception ID	Description	Assessment Location Height (m)	UTM Coordinates (NAD 83; Zone 15N)	
			Easting (m)	Northing (m)
POR01	Cabin / Lodge Site_13	4.5	547907	5700737
POR02	Traditional Land Use area	1.5	548092	5690987
POR03	Fish harvest	1.5	549656	5690307
POR04	Fish harvest	1.5	544260	5693233
POR05	Fish harvest	1.5	547428	5696234
POR06	Fish harvest	1.5	553496	5695821
POR07	Cabin	4.5	559261	5688223
POR08	Camp	1.5	563621	5672599
POR09	Traditional Land Use area	1.5	590007	5667054
POR10	Traditional Land Use area	1.5	582183	5669202
POR11	Traditional Land Use area	1.5	580530	5668044
POR12	Traditional Land Use area	1.5	586716	5670462
POR13	Traditional Land Use area	1.5	599770	5667769
POR14	Camp	1.5	609062	5668361
POR15	Traditional Land Use area	1.5	597511	5669880
POR16	Slate Falls Nation Community	4.5	597265	5668219
POR17	Traditional Land Use area	1.5	558246	5690430
POR18	Traditional Land Use area	1.5	562850	5691012
POR19	Traditional Land Use area	1.5	565443	5687308
POR20	Traditional Land Use area	1.5	564596	5676227
POR21	Traditional Land Use area	1.5	619312	5674375

NAD = North American Datum; UTM = Universal Transverse Mercator.

Table 6.3-8: Noise Modelling Results ($L_{Aeq-1hr}$)

POR	Time Period	Modelled Noise Levels ($L_{Aeq-1hr}$)[1]				NPC-300 Criteria	HC Criteria	Compliant (Y/N)[1]			
		Year -2	Year -1	Year 4	Year 9			Year -2	Year -1	Year 4	Year 9
POR01	Daytime	27	31	33	30	45	55	Y	Y	Y	Y
	Evening / Nighttime	26	31	33	30	40	40	Y	Y	Y	Y
POR02	Daytime	35	38	37	32	N/A	55	Y	Y	Y	Y
	Evening / Nighttime	34	38	37	32	N/A	40	Y	Y	Y	Y
POR03	Daytime	40	40	43	37	N/A	55	Y	Y	Y	Y
	Evening / Nighttime	37	40	43	37	N/A	n/a	-	-	-	-
POR04	Daytime	31	36	36	30	N/A	55	Y	Y	Y	Y
	Evening / Nighttime	30	36	36	30	N/A	n/a	-	-	-	-
POR05	Daytime	37	43	43	37	N/A	55	Y	Y	Y	Y
	Evening / Nighttime	36	43	43	37	N/A	n/a	-	-	-	-
POR06	Daytime	39	38	41	39	N/A	55	Y	Y	Y	Y
	Evening / Nighttime	35	38	41	39	N/A	n/a	-	-	-	-
POR07	Daytime	44[2]	12	20	20	45	55	Y[2]	Y	Y	Y
	Evening / Nighttime	20	12	20	20	40	40	Y	Y	Y	Y
POR08	Daytime	32	-	-	-	N/A	55	Y	-	-	-
	Evening / Nighttime	-	-	-	-	N/A	40	-	-	-	-
POR09	Daytime	32	-	-	-	N/A	55	Y	-	-	-
	Evening / Nighttime	-	-	-	-	N/A	40	-	-	-	-
POR10	Daytime	40	-	-	-	N/A	55	Y	-	-	-
	Evening / Nighttime	-	-	-	-	N/A	40	-	-	-	-
POR11	Daytime	31	-	-	-	N/A	55	Y	-	-	-
	Evening / Nighttime	-	-	-	-	N/A	40	-	-	-	-
POR12	Daytime	54	-	-	-	N/A	55	Y	-	-	-
	Evening / Nighttime	-	-	-	-	N/A	40	-	-	-	-
POR13	Daytime	37	-	-	-	N/A	55	Y	-	-	-
	Evening / Nighttime	-	-	-	-	N/A	40	-	-	-	-
POR14	Daytime	35	-	-	-	N/A	55	Y	-	-	-
	Evening / Nighttime	-	-	-	-	N/A	40	-	-	-	-
POR15	Daytime	47	-	-	-	N/A	55	Y	-	-	-
	Evening / Nighttime	-	-	-	-	N/A	40	-	-	-	-
POR16	Daytime	48	-	-	-	N/A	55	Y	-	-	-

POR	Time Period	Modelled Noise Levels ($L_{Aeq-1hr}$)[1]				NPC-300 Criteria	HC Criteria	Compliant (Y/N)[1]			
		Year -2	Year -1	Year 4	Year 9			Year -2	Year -1	Year 4	Year 9
	Evening / Nighttime	-	-	-	-	N/A	40	-	-	-	-
POR17	Daytime	51[2]	16	29	28	45	55	Y[2]	Y	Y	Y
	Evening / Nighttime	25	16	29	28	40	40	Y	Y	Y	Y
POR18	Daytime	47[2]	-	22	22	45	55	Y[2]	-	Y	Y
	Evening / Nighttime	21	-	22	22	40	40	Y	-	Y	Y
POR19	Daytime	40[2]	-	15	15	45	55	Y[2]	-	Y	Y
	Evening / Nighttime	29	-	15	15	40	40	Y	-	Y	Y
POR20	Daytime	74	-	-	-	N/A	55	N	-	-	-
	Evening / Nighttime	-	-	-	-	N/A	40	-	-	-	-
POR21	Daytime	63	-	-	-	N/A	55	N	-	-	-
	Evening / Nighttime	-	-	-	-	N/A	40	-	-	-	-

Note:

(1) Modelled periods: Construction Year -2, Construction - Pre-production Year -1, Operations - Peak-production Year 4, Operations Stockpile Reclaim Year 9. Results in dBA.

(2) Predicted Year -2 daytime noise levels at POR07, POR17, POR18 and POR19 were primarily influenced by access road construction and transmission line construction and therefore were not compared to MECP NPC-300 daytime sound level limits. Year -2 daytime noise levels in the absence of access road construction and transmission line construction are equivalent to the evening/nighttime noise levels.

HC = Health Canada; Y = yes; N = no; N/A = not applicable.

Table 6.3-9: Noise Modelling Results (L_{dn} and %HA)

POR	Baseline Level (L_{dn})[1]	Modelled Noise Levels (L_{dn})[2]				Change in %HA[2]				HC Criteria	Compliant (Y/N)			
		Year -2	Year -1	Year 4	Year 9	Year -2	Year -1	Year 4	Year 9		Year -2	Year -1	Year 4	Year 9
POR01	38	33	38	39	36	0.3	0.8	1.0	0.6	6.5	Y	Y	Y	Y
POR02	47	41	44	43	38	0.7	1.3	1.1	0.4	6.5	Y	Y	Y	Y
POR03	38	44	46	49	43	1.3	3.6	5.4	2.2	6.5	Y	Y	Y	Y
POR04	38	36	42	43	36	0.6	1.9	2.0	0.5	6.5	Y	Y	Y	Y
POR05	38	43	49	49	43	1.9	5.4	5.4	2.1	6.5	Y	Y	Y	Y
POR06	38	42	44	47	46	1.8	2.4	4.1	3.1	6.5	Y	Y	Y	Y
POR07	38	42	19	27	27	1.7	0.0	0.1	0.1	6.5	Y	Y	Y	Y
POR08	38	30	-	-	-	0.1	-	-	-	6.5	Y	-	-	-
POR09	38	30	-	-	-	0.2	-	-	-	6.5	Y	-	-	-
POR10	38	37	-	-	-	0.7	-	-	-	6.5	Y	-	-	-
POR11	38	29	-	-	-	0.1	-	-	-	6.5	Y	-	-	-
POR12	38	52	-	-	-	8.6	-	-	-	6.5	N	-	-	-
POR13	38	35	-	-	-	0.4	-	-	-	6.5	Y	-	-	-
POR14	38	33	-	-	-	0.3	-	-	-	6.5	Y	-	-	-
POR15	38	45	-	-	-	2.7	-	-	-	6.5	Y	-	-	-
POR16	38	46	-	-	-	3.5	-	-	-	6.5	Y	-	-	-
POR17	38	49	22	35	34	5.4	0.0	0.5	0.3	6.5	Y	Y	Y	Y
POR18	38	45	-	29	29	3.0	-	0.1	0.1	6.5	Y	-	Y	Y
POR19	38	40	-	21	21	1.1	-	0.0	0.0	6.5	Y	-	Y	Y
POR20	38	72	-	-	-	58.3	-	-	-	6.5	N	-	-	-
POR21	38	61	-	-	-	24.1	-	-	-	6.5	N	-	-	-

Notes:

(1) Arithmetic average of day–night sound levels measured during leaves-off and leaves-on programs.

(2) Modelled periods: Construction Year -2, Construction - Pre-production Year -1, Operations - Peak-production Year 4, Operations Stockpile Reclaim Year 9. Results are in dBA.

HC = Health Canada; Y = yes; N = no.

Table 6.3-10: Airstrip Noise Modelling Results (L_{Amax})

POR	Modelled Noise Level – Airstrip (L_{Amax}, dBA)	HC Criteria (L_{Amax}, dBA)	Compliant (Y/N)
POR01	48	60	Y
POR02	41	60	Y
POR03	43	60	Y
POR04	36	60	Y
POR05	47	60	Y
POR06	47	60	Y
POR07	41	60	Y
POR08	39	60	Y
POR09	23	60	Y
POR10	28	60	Y
POR11	31	60	Y
POR12	23	60	Y
POR13	16	60	Y
POR14	14	60	Y
POR15	17	60	Y
POR16	17	60	Y
POR17	41	60	Y
POR18	33	60	Y
POR19	30	60	Y
POR20	50	60	Y
POR21	13	60	Y

HC = Health Canada; L_{Amax} = maximum equivalent sound level; Y = yes; N = no.

Table 6.3-11: Helicopter Noise Modelling Results (L_{Amax} and %HA)

POR	Baseline Level (L_{dn})[1]	Modelled Noise Levels (L_{Amax}, dBA)[2]	Change in %HA[2]	HC Criteria (%)	Compliant (Y/N)
POR01	38	38	0.0	6.5	Y
POR02	47	39	0.0	6.5	Y
POR03	47	49	0.2	6.5	Y
POR04	38	40	0.1	6.5	Y
POR05	38	46	0.2	6.5	Y
POR06	38	51	0.6	6.5	Y
POR07	38	55	1.4	6.5	Y
POR08	38	44	0.1	6.5	Y
POR09	38	44	0.2	6.5	Y
POR10	38	51	0.6	6.5	Y
POR11	38	43	0.1	6.5	Y
POR12	38	64	6.5	6.5	Y
POR13	38	48	0.4	6.5	Y
POR14	38	47	0.3	6.5	Y
POR15	38	57	2.1	6.5	Y
POR16	38	60	3.6	6.5	Y
POR17	38	59	3.0	6.5	Y
POR18	38	56	1.8	6.5	Y
POR19	38	50	0.6	6.5	Y
POR20	38	83	50.7	6.5	N
POR21	38	72	18.6	6.5	N

Notes:
(1) Arithmetic average of day-night sound levels measured during leaves-off and leaves-on programs.
(2) Assumed the helicopter is operating at its L_{Amax} in the vicinity of a POR for one hour in a daytime period.

HC = Health Canada; L_{Amax} = maximum equivalent sound level; Y = yes; N = no.

Table 6.3-12: Noise Modelling Results – NPC-360 Transmission Line Assessment

POR	Distance to Transmission Line ROW (m)	Modelled Operation Noise Levels ($L_{Aeq-1hr}$) (dBA)	MECP Criteria (dBA)[1]	Compliant (Y/N)
POR20	40	49	55	Y
POR21	155	44	55	Y
Edge of ROW[2]	0	55	55	Y

Notes:
(1) MECP criteria established in NPC-360.
(2) For information purposes, a prediction was carried out at the edge of the ROW.
ROW = right-of-way; Y = yes; N = no.

Table 6.3-13: Allowable Explosive Loading to meet MECP and Health Canada Criteria

Source Point	Location Relative to Pit	MECP Receptors		Allowable Explosive Loading W (kg/delay)	
		POR Name	Distance to POR (m)	Air Overpressure[1]	Vibration[2]
A	NW	POR01	6,642	26,344	77,526
B	SW	POR07	10,791	111,000	204,632
C	SE	POR07	10,428	102,000	191,096

Notes:
(1) The allowable explosive loading in kg/delay to meet the water overpressure limit of 120 dBL, as required by MECP criteria and Health Canada criteria.
(2) The allowable explosive loading in kg/delay to meet the ground vibration limit of 10.0 mm/s, as required by MECP criteria.
NW = northwest; SE = southeast; SW = southwest.

Table 6.3-14: Allowable Explosive Loading to meet DFO Criteria

Source Point	Location Relative to Pit	DFO Receptors		Allowable Explosive Loading W (kg/delay)	
		Shoreline Location	Distance to Shorelines (m)	Water Overpressure[1]	Vibration[2]
A	NW	SL-A	34	19.6	5.1
B	SW	SL-B	461	3,603	933
C	SE	SL-C	718	8,740	2,263

Notes:
(1) The allowable explosive loading to meet the water overpressure limit of 50 kPa.
(2) The allowable explosive loading to meet the ground vibration limit of 13 mm/s.
NW = northwest; SE = southeast; SW = southwest.

540000 560000 580000 600000 620000

5700000

5680000

5660000

Richardson Lake
Joneston Lake
Casummit Lake
Mink Lake
Penson Lake
Birch Lake
Dole Lake
Keigat Lake
Kapikik Lake
Jackpine Lake
Flannery Lake
Gitche Lake
Hammerton Lake
Wellein Lake
Meen Lake
Simard Lake
Zionz Lake
Durkin Lake
Springpole Lake
Cromarty Lake
Gull Lake
Fawcett Lake
Cluderay Lake
Dorothy Lake
Muskegsagagen Lake
Nabemakoseka Lake
Obaskaka Lake
Superstition Lake
Graydarl Lake
Seagrave Lake
Skingle Lake
Kezik Lake
Scanes Lake
Burley Lake
Bertha Lake
McNaughton Lake
Ruddy Lake
Deaddog Lake
Strachan Lake
Kaginot Lake
Fry Lake
Cavano Lake
Argosy Lake
Bumpy Lake
Upper Kaginot Lake
Moosetegon Lake
Cook Lake
Marsh Lake
Senior Lake
Rockmere Lake
Drum Lake
Ferdinand Lake
Costello Lake
Margaret Lake
Latreille Lake
SLATE FALLS NATION
North Bamaji Lake
Tarpley Lake
Sesikinaga Lake
Snelgrove Lake
Bamaji Lake
Austin Lake
Allison Lake
One Island Lake
Jeanette Lake
Coyston Lake
Roadhouse Lake
Blackstone Lake

X:\CA\CAOAK300-OAK\MIS-FS1-Project\P2021Projects\ONS2104_FMG_Springpole_EIS\11_GIS\EISMXD\Noise_Vibration_LSA_RSA_S6_3.mxd

LEGEND

- Proposed Mine Feature
- Project Development Area
- Local Study Area for Noise and Vibration
- Regional Study Area for Noise and Vibration
- First Nation Reserve
- Existing Road
- Existing Winter Road
- Existing Transmission Line
- Watercourse
- Waterbody

NOTES:
- Topographic information extracted from LIO, MNRF.
- Proposed site plan provided by Ausenco, drawing number 104496-GX-03000-31344-003, Rev 1. 26 June 2023 and modified by WSP July 2023.
- 230 kV transmission line provided by First Mining Gold, April 2024.

0 5 10 20 30 40 50 Kilometres

Datum: NAD83
Projection: UTM Zone 15N

N W E S

First Mining Gold

WSP

SPRINGPOLE GOLD PROJECT

Local and Regional Study Areas for Noise and Vibration

PROJECT N°: ONS2104 | **FIGURE: 6.3-1**

SCALE: 1:225,000 | DATE: July 2024

540000 560000 580000 600000 620000

5700000 5680000 5660000

Richardson Lake
Joneston Lake
Casummit Lake
Mink Lake
Penson Lake
Kapikik Lake
Gitche Lake
Jackpine Lake
Flannery Lake
Hammerton Lake
Wellein Lake
Meen Lake
Simard Lake
Birch Lake
Keigat Lake
Zionz Lake
Dole Lake
Cluderay Lake
Dorothy Lake
Durkin Lake
Fawcett Lake
Muskegsagagen Lake
Nabemakoseka Lake
Obaskaka Lake
Springpole Lake
Cromarty Lake
Gull Lake
Superstition Lake
Graydarl Lake
Kezik Lake
Scanes Lake
Burley Lake
Seagrave Lake
Skingle Lake
Bertha Lake
McNaughton Lake
Ruddy Lake
Deaddog Lake
Strachan Lake
Kaginot Lake
Fry Lake
Argosy Lake
Cavano Lake
Bumpy Lake
Upper Kaginot Lake
Cook Lake
Marsh Lake
Senior Lake
Moosetegon Lake
Rockmere Lake
Drum Lake
Ferdinand Lake
Costello Lake
Margaret Lake
Latreille Lake
North Bamaji Lake
Tarpley Lake
Sesikinaga Lake
Snelgrove Lake
Bamaji Lake
Austin Lake
Allison Lake
One Island Lake
Jeanette Lake
Coyston Lake
Roadhouse Lake
Blackstone Lake

POR01 POR02 POR03 POR04 POR05 POR06 POR07 POR08 POR09 POR10 POR11 POR12 POR13 POR14 POR15 POR16 POR17 POR18 POR19 POR20 POR21

SLATE FALLS NATION

X:\CA\CAOAK300-OAK\MIS-FS1-Projects\2021\Projects\ONS2104_FMG_Springpole_EIS\11_GIS\Noise\Impact_Assessment_Support_Sept2023\MXD\POR_Locations_5.mxd

LEGEND

- Proposed Mine Feature
- Project Development Area
- Local Study Area for Noise and Vibration
- Regional Study Area for Noise and Vibration
- First Nation Reserve
- Existing Road
- Existing Winter Road
- Existing Transmission Line
- Watercourse
- Waterbody

Representative Points of Reception
- Cabin/Lodge/Camp
- TLRU
- Residential

NOTES:
- Topographic information extracted from LIO, MNRF.

0 5 10 20 30 40 50 Kilometres

Datum: NAD83
Projection: UTM Zone 15N

N W E S

First Mining Gold

WSP

SPRINGPOLE GOLD PROJECT

Noise Point of Reception Locations

PROJECT N°: ONS2104 | **FIGURE: 6.3-2**

SCALE: 1:225,000 | DATE: May 2024

560000 580000 600000 620000

5700000

5680000

Richardson Lake
Kapikik Lake
Jackpine Lake
Flannery Lake
Zionz Lake
Keigat Lake
Birch Lake
Dole Lake
Durkin Lake
Springpole Lake
Satterly Lake
Cromarty Lake
Fawcett Lake
Gull Lake
Seagrave Lake
Skingle Lake
Bertha Lake
Ruddy Lake
Deaddog Lake
Christina Lake
Fawthrop Lake
Strachan Lake
Kaginot Lake
Upper Kaginot Lake
Fry Lake
Wesleyan Lake
Senior Lake
Rockmere Lake
Drum Lake
Bumpy Lake
Marsh Lake
Margaret Lake
Latreille Lake
Tarpley Lake
Sesikinaga Lake
Snelgrove Lake
North Bamaji Lake
Bamaji Lake
Austin Lake
Allison Lake
Relyea Lake
L-16
Graydarl Lake

POR01
POR02
POR03
POR04
POR05
POR06
POR07
POR08
POR09
POR10
POR11
POR12
POR13
POR14
POR15
POR16
POR17
POR18
POR19
POR20
POR21

SLATE FALLS NATION

Springpole Lake (North Basin)
Springpole Lake (Southeast Arm)

2 Km

X:\CA\CAOAK300-OAKMIS-FS1-Projects\ONS2104_FMG_Springpole_EIS\11_GIS\Noise\Impact_Assessment_Support_Sept2023\MXD\Noise_Contours_YearMinus2_Daytime_5.mxd

LEGEND

- Proposed Open Pit
- Proposed Dike
- Proposed 230 kV Transmission Line
- Other Proposed Mine Feature
- First Nation Reserve
- Existing Road
- Existing Winter Road
- Existing Transmission Line
- Watercourse
- Waterbody

Points of Reception
- Cabin/Lodge/Camp
- TLRU
- Residential

Noise Contours
- >= 40 dBA
- >= 45 dBA
- >= 50 dBA
- >= 55 dBA
- >= 60 dBA
- >= 65 dBA
- >= 70 dBA
- >= 75 dBA
- >= 80 dBA
- >= 85 dBA

0 5 10 20 30 40 50 Kilometres

NOTES:
- Topographic information extracted from LIO, MNRF.
- Aerial imagery of proposed mine site area provided by First Mining Gold, 2020, surrounding aerial imagery extracted from ESRI basemaps.
- Proposed site plan provided by Ausenco, drawing number 104496-GX-03000-31344-003, Rev 1, 26 June 2023 and modified by WSP July 2023.
- 230 kV transmission line provided by First Mining Gold, April 2024.

Datum: NAD83
Projection: UTM Zone 15N

N W E S

First Mining Gold

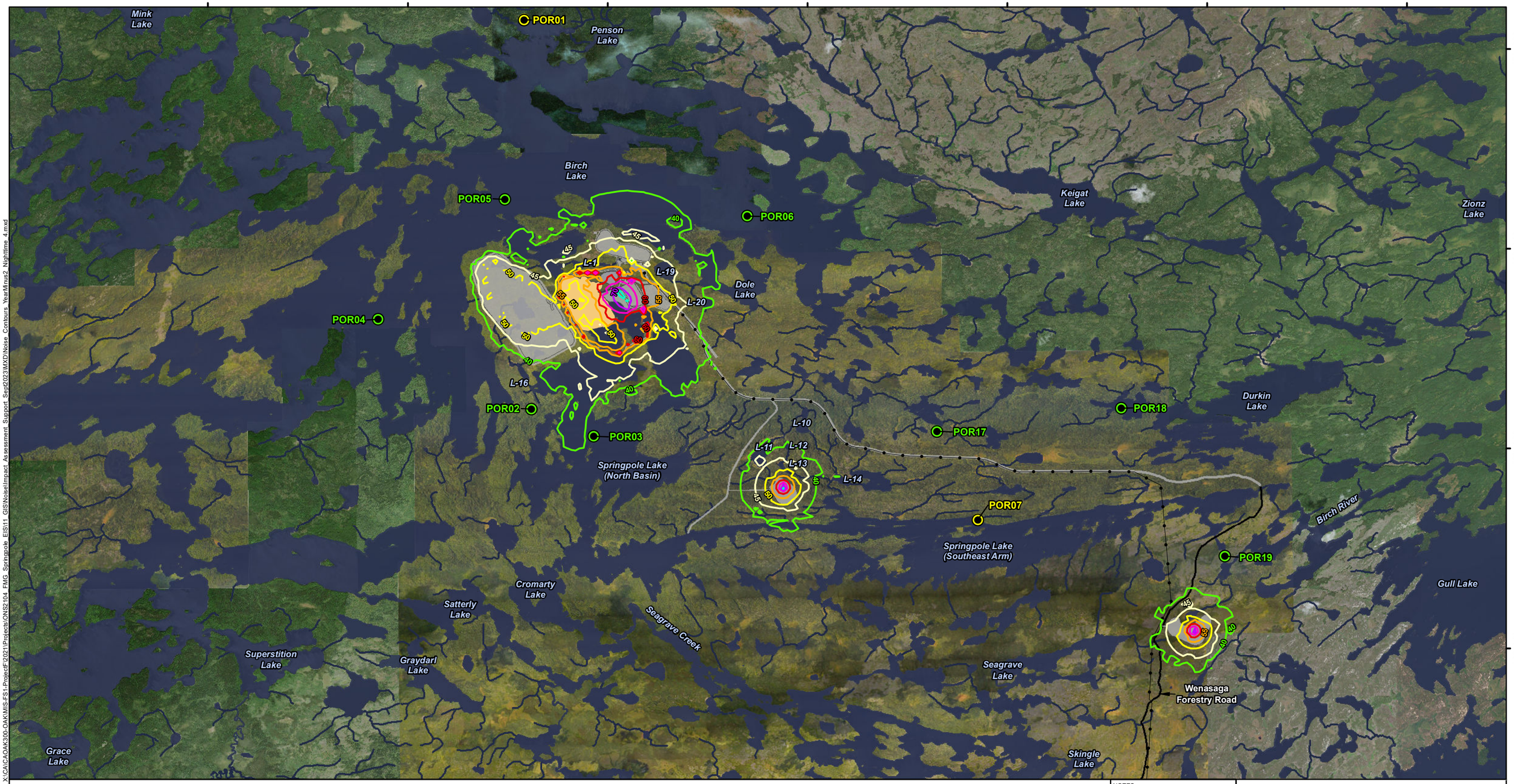
WSP

SPRINGPOLE GOLD PROJECT

Noise Contours (L_{Aeq}) for Construction (Year -2) Phase – Daytime

PROJECT N°: ONS2104 | **FIGURE: 6.3-3**

SCALE: 1:210,000 | DATE: May 2024



X:\CA\CAOAK300-OAK\MIS-FS1-Project\F2021\Projects\ONS2104_FMG_Springpole_EIS\11_GIS\NoiseImpact_Assessment_Support_Sep2023\MXD\Noise_Contours_YearMinus2_Nighttime_4.mxd

LEGEND

- Proposed Open Pit
- Proposed Dike
- Proposed 230 kV Transmission Line
- Other Proposed Mine Feature
- Watercourse
- Waterbody
- Existing Road

Points of Reception

- Cabin/Lodge/Camp
- TLRU

Noise Contours

- >= 40 dBA
- >= 45 dBA
- >= 50 dBA
- >= 55 dBA
- >= 60 dBA
- >= 65 dBA
- >= 70 dBA
- >= 75 dBA

0 2.5 5 10 15 20 Kilometres

NOTES:
- Topographic information extracted from LIO, MNRF.
- Aerial imagery of proposed mine site area provided by First Mining Gold, 2020, surrounding aerial imagery extracted from ESRI basemaps.
- Proposed site plan provided by Ausenco, drawing number 104496-GX-03000-31344-003, Rev 1. 26 June 2023 and modified by WSP July 2023.
- 230 kV transmission line provided by First Mining Gold, April 2024.

Datum: NAD83
Projection: UTM Zone 15N

First Mining Gold

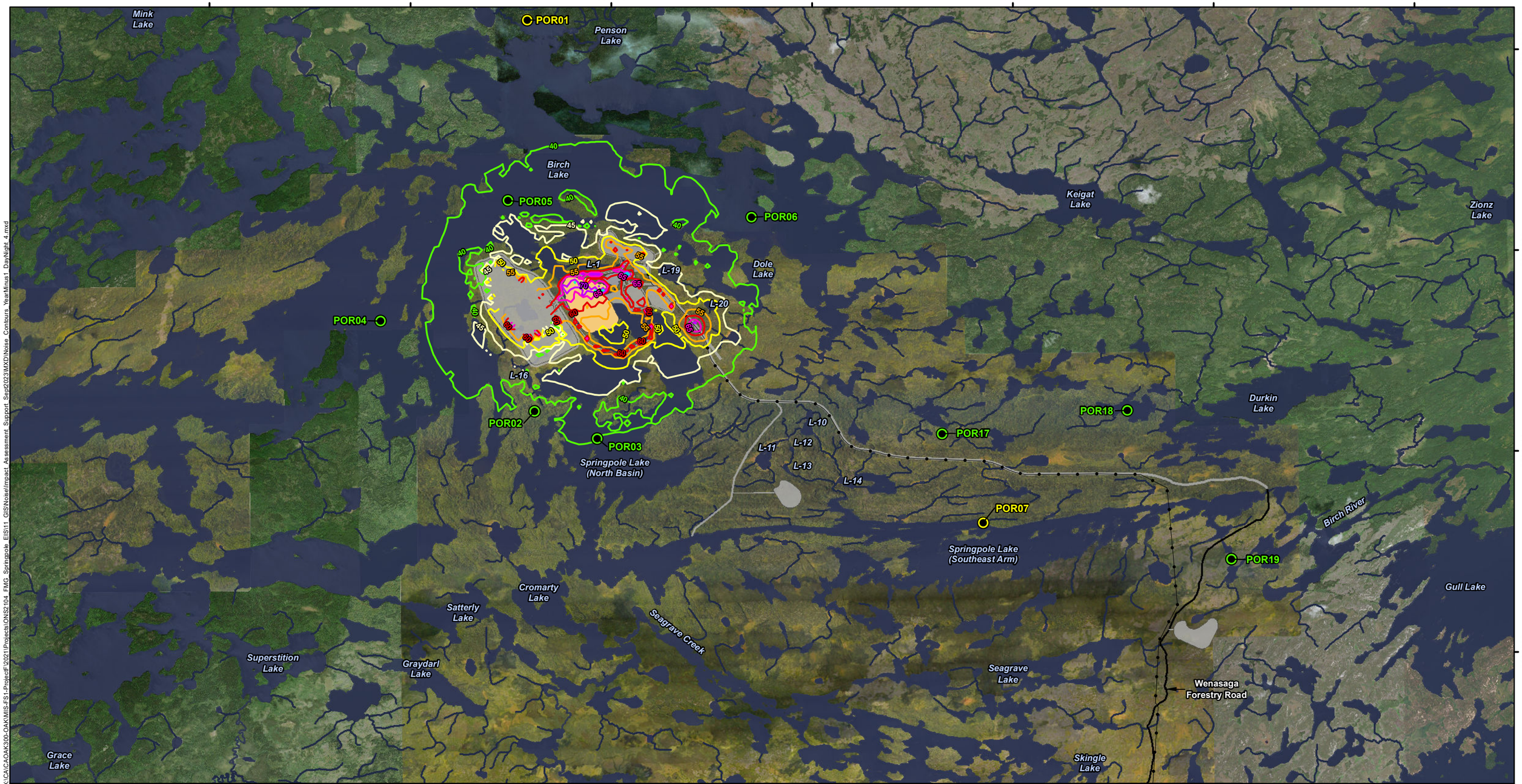
WSP

SPRINGPOLE GOLD PROJECT

Noise Contours (L_{Aeq}) for Construction (Year -2) Phase – Evening/Nighttime

PROJECT N°: ONS2104 | **FIGURE: 6.3-4**

SCALE: 1:90,000 | DATE: May 2024



X:\CA\CAOAK300-OAK\MIS-FS1-Project\F'2021\Projects\ONS2104_FMG_Springpole_EIS\11_GIS\NoiseImpact_Assessment_Support_Sep2023\MXD\Noise_Contours_YearMinus1_DayNight_4.mxd

LEGEND

- Proposed Open Pit
- Proposed Dike
- Proposed 230 kV Transmission Line
- Other Proposed Mine Feature
- Watercourse
- Waterbody
- Existing Road

Points of Reception

- Cabin/Lodge/Camp
- TLRU

Noise Contours

- >= 40 dBA
- >= 45 dBA
- >= 50 dBA
- >= 55 dBA
- >= 60 dBA
- >= 65 dBA
- >= 70 dBA
- >= 75 dBA
- >= 80 dBA

0 2.5 5 10 15 20 Kilometres

NOTES:
- Topographic information extracted from LIO, MNRF.
- Aerial imagery of proposed mine site area provided by First Mining Gold, 2020, surrounding aerial imagery extracted from ESRI basemaps.
- Proposed site plan provided by Ausenco, drawing number 104496-GX-03000-31344-003, Rev 1. 26 June 2023 and modified by WSP July 2023.
- 230 kV transmission line provided by First Mining Gold, April 2024.

Datum: NAD83
Projection: UTM Zone 15N

N W E S

First Mining Gold

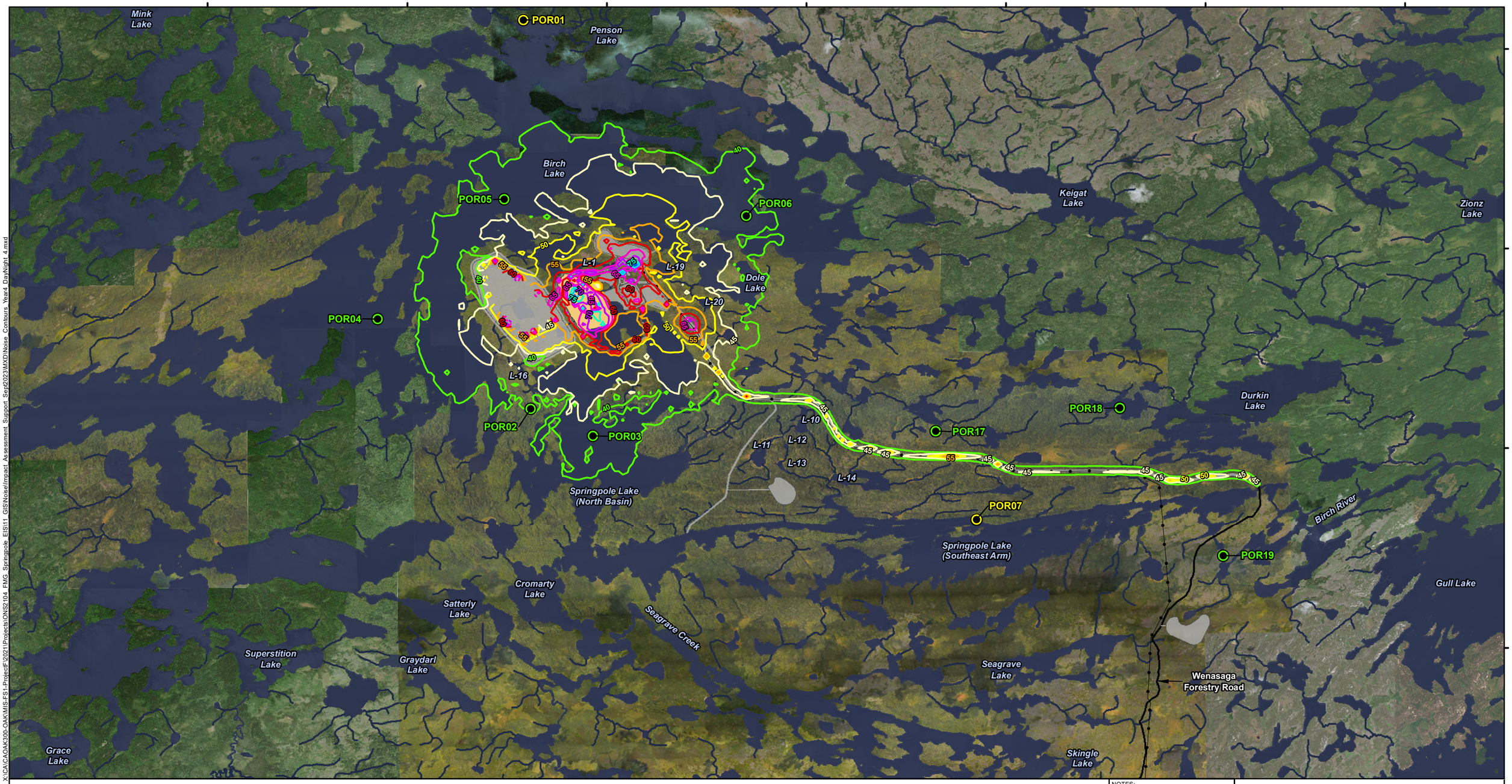
wsp

SPRINGPOLE GOLD PROJECT

Noise Contours (L_{Aeq}) for Pre-Production (Year -1) Phase Daytime/Evening/Nighttime

PROJECT N°: ONS2104 | **FIGURE: 6.3-5**

SCALE: 1:90,000 | DATE: May 2024



X:\CA\CAOAK300-OAK\MIS-FS1-Project\F20211Projects\ONS2104_FMG_Springpole_EIS\11_GIS\NoiseImpact_Assessment_Support_Sep2023\MXD\Noise_Contours_Year4_DayNight_4.mxd

LEGEND

- Proposed Open Pit
- Proposed Dike
- Proposed 230 kV Transmission Line
- Other Proposed Mine Feature
- Watercourse
- Waterbody
- Existing Road

Points of Reception

- Cabin/Lodge/Camp
- TLRU

Noise Contours

- >= 40 dBA
- >= 45 dBA
- >= 50 dBA
- >= 55 dBA
- >= 60 dBA
- >= 65 dBA
- >= 70 dBA
- >= 75 dBA
- >= 80 dBA
- >= 85 dBA

0 2.5 5 10 15 20 Kilometres

NOTES:
- Topographic information extracted from LIO, MNRF.
- Aerial imagery of proposed mine site area provided by First Mining Gold, 2020, surrounding aerial imagery extracted from ESRI basemaps.
- Sensitive Receptor locations provided by First Mining Gold, June 2021.
- Proposed site plan provided by Ausenco, drawing number 104496-GX-03000-31344-003, Rev 1. 26 June 2023 and modified by WSP July 2023.
- 230 kV transmission line provided by First Mining Gold, April 2024.

Datum: NAD83
Projection: UTM Zone 15N

FIRST MINING GOLD

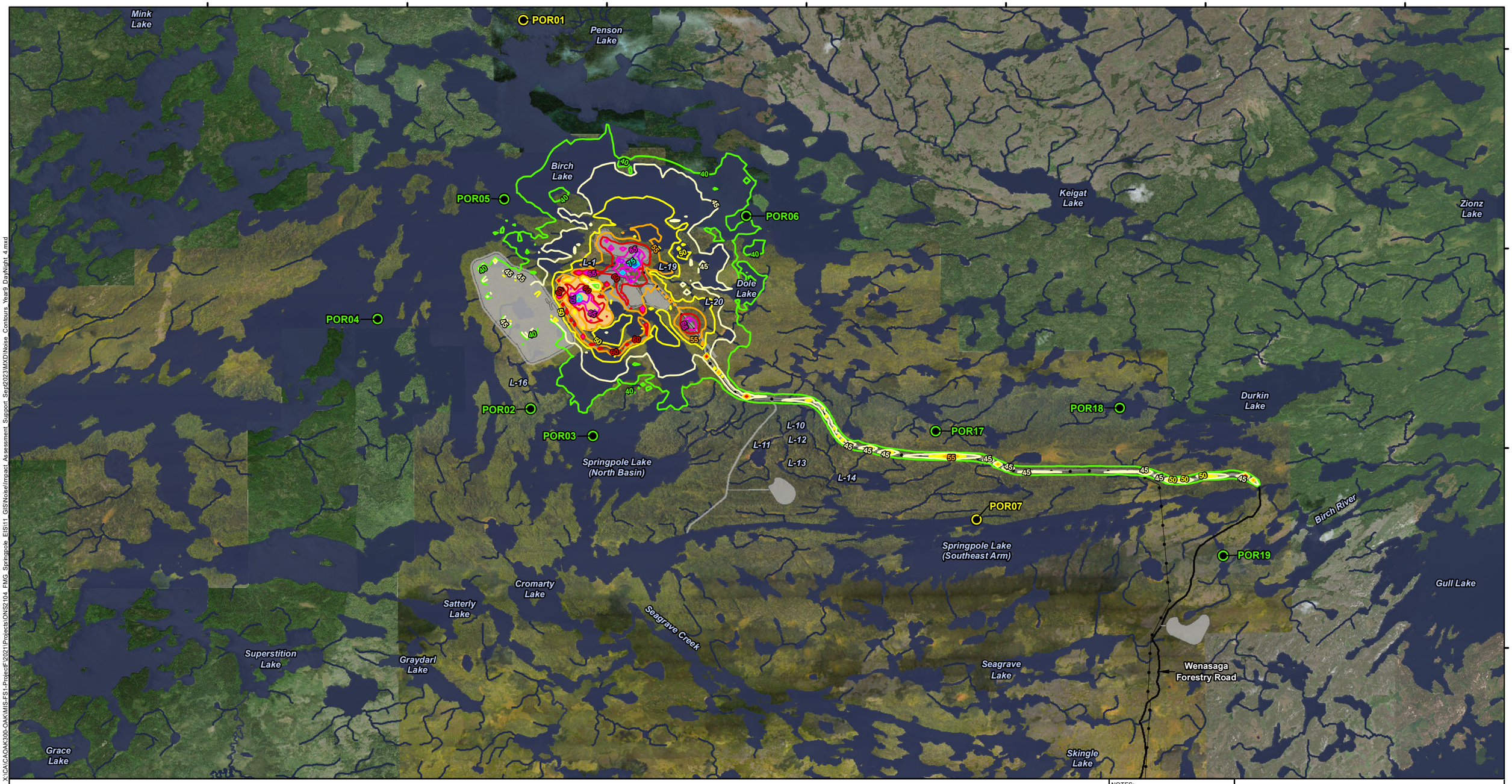
wsp

SPRINGPOLE GOLD PROJECT

Noise Contours (L_{Aeq}) for Peak Production (Year 4) Phase Daytime/Evening/Nighttime

PROJECT N°: ONS2104 | **FIGURE: 6.3-6**

SCALE: 1:90,000 | DATE: May 2024



X:\CA\CAOAK300-OAK\MIS-FS1-Project\F20211Projects\ONS2104_FMG_Springpole_EIS\11_GIS\NoiseImpact_Assessment_Support_Sep2023\MXD\Noise_Contours_Year9_DayNight_4.mxd

LEGEND

- Proposed Open Pit
- Proposed Dike
- Proposed 230 kV Transmission Line
- Other Proposed Mine Feature
- Watercourse
- Waterbody
- Existing Road

Points of Reception

- Cabin/Lodge/Camp
- TLRU

Noise Contours

- >= 40 dBA
- >= 45 dBA
- >= 50 dBA
- >= 55 dBA
- >= 60 dBA
- >= 65 dBA
- >= 70 dBA
- >= 75 dBA
- >= 80 dBA
- >= 85 dBA

0 2.5 5 10 15 20 Kilometres

NOTES:
- Topographic information extracted from LIO, MNRF.
- Aerial imagery of proposed mine site area provided by First Mining Gold, 2020, surrounding aerial imagery extracted from ESRI basemaps.
- Proposed site plan provided by Ausenco, drawing number 104496-GX-03000-31344-003, Rev 1. 26 June 2023 and modified by WSP July 2023.
- 230 kV transmission line provided by First Mining Gold, April 2024.

Datum: NAD83
Projection: UTM Zone 15N

FIRST MINING GOLD

WSP

SPRINGPOLE GOLD PROJECT

Noise Contours (L_{Aeq}) for Stockpile Reclaim (Year 9) Phase Daytime/Evening/Nighttime

PROJECT N°: ONS2104 | **FIGURE: 6.3-7**

SCALE: 1:90,000 | DATE: May 2024

542500 545000 547500 550000 552500 555000 557500 560000 562500 565000

5700000 5697500 5695000 5692500 5690000 5687500

POR01

Penson Lake

6642 m

Birch Lake

Central Water Storage Pond

Ore Stockpile

Dole Lake

L-1

Process Plant Area

L-19

L-20

A

Open Pit

C

B

Co-Disposal Facility

Surficial Soil Stockpile

Airstrip

L-16

10428 m

10791 m

230 kV Transmission Li

L-10

Effluent Pipeline

L-12

L-11

L-13

L-14

Springpole Lake (North Basin)

Aggregate Source

POR07

Springpole Lake (L-15)

Springpole Lake (Southeast Arm)

Main Access Road

Burkin Lake

ENLARGED AREA

L-1

Birch Lake

Process Plant Area

Central Water Storage Pond (CWSP)

SL-A

34 m

A

Phase 1 Pit

High / Mid Grade Ore Stockpile

Surficial Soil Stockpile

Fish Habitat Development Area

Main Open Pit

C

718 m

East Dike

SL-C

B

461 m

Co-Disposal Facility

West Dike

SL-B

Haul Road

Springpole Lake (North Basin)

Springpole Lake (North Basin)

500 m

LEGEND

- Reference Source Point
- Points of Reception
- Shoreline Point
- Proposed Open Pit
- Proposed Dike
- Proposed 230 kV Transmission Line
- Other Proposed Mine Feature
- Watercourse
- Waterbody

0 1 2 4 6 8 10 Kilometres

NOTES:
- Topographic information extracted from LIO, MNRF.
- Aerial imagery provided by First Mining Gold, 2020.
- Sensitive Receptor locations provided by First Mining Gold, June 2021.
- Proposed site plan provided by Ausenco, drawing number 104496-GX-03000-31344-003, Rev 1. 26 June 2023 and modified by WSP July 2023.

Datum: NAD83
Projection: UTM Zone 15N

N W E S

First Mining Gold

WSP

SPRINGPOLE GOLD PROJECT

Blasting Impact Assessment Points of Reception

PROJECT N°: ONS2104

FIGURE: 5-2

SCALE: 1:62,500

DATE: June 2024

P:\2021\Projects\ONS2104_FMG_Springpole_EIS\11_GIS\Noise\Blasting_Impact_Assessment\MXD\Blasting_Impact_Assessment_POR_5.mxd