SANITARY SEWER REPLACEMENT - KIRWIN AVENUE/LITTLE JOHN LANE

MISSISSAUGA, ONTARIO

CONSTRUCTION MONITORING PLAN

RWDI # 2306558

March 22, 2024

SUBMITTED TO

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1 PURPOSE AND TARGET AUDIENCE

This Construction Noise and Vibration Management Plan has been developed to help manage the project's noise and vibration impacts. The plan is based on the project team's prior experience with managing noise and vibration issues encountered with other projects of a similar nature. This document has been prepared with the intent to be a simple guide for the project team. It provides the recommended monitoring methodology and relevant noise and vibration limits as well as additional resources that can be accessed in events of unique issues associated with the project's construction.

2 LIST OF NOISE AND VIBRATION REFERENCE DOCUMENTS AND PERFORMANCE LIMITS

2.1 Applicable Reference Documents

This is the full list of applicable noise and vibration criteria considered for this project. Limits for noise and vibration are based on these references.

- Ministry of Environment, Conservation and Parks (MECP) Publication NPC-101, Technical Definitions;
- MECP Publication NPC-102, Instrumentation;
- MECP Publication NPC-103, Procedures;
- MECP Publication NPC-104, Sound Level Adjustments;
- MECP Publication NPC-115, Construction Equipment;
- MECP Publication NPC-118, Motorized Conveyances;
- Ministry of Municipal Affairs and Housing (2012) Ontario Building Code;
- IEC Standard 61672; and
- ISO Standard 2631-2:2003, Mechanical vibration and shock – Evaluation of human exposure to whole body vibration.

The following list, although not direct criteria for this project, was used as supporting information for this project.

- U.S. Federal Transit Administration's Transit Noise and Vibration Impact Assessment Manual, FTA Report No. 0123, September 2018 (FTA Manual);
- Toronto Municipal Code Chapter 363, Building Construction and Demolition, Article 5 (City of Toronto Construction Vibration Guideline); and
- U.S. Federal Highway Administration's Construction Noise Handbook, FHWA-HEP-06-015, August 2006 (FHWA Handbook).
- Construction noise control program and mitigation strategy at the Central Artery/Tunnel Project, Erich Thalheimer, Noise Control Engineering Journal, Sep-Oct 2000 (Central Artery/Tunnel Noise Specification).

2.2 Noise and Vibration Limits

A review was completed regarding criteria applied to a point of reception, based on the provincial and applicable municipal noise and vibration limits related to roadway construction work.

- The City of Mississauga Noise By-Law 93-84 prohibits construction activities from "7 pm of one day to 7 am of the next day".
- MECP maintains publications NPC-115 and NPC-118 which specify sound level criteria for specific types of construction equipment, but not their cumulative sound levels at receptors. It is the responsibility of the Construction Contractor's on-site environmental inspector to ensure equipment on the construction site meets the criteria set out in NPC-115 and NPC-118 through equipment datasheets or sound level measurements.

As the above provincial and municipal criteria are not receptor-based, the following is a summary of the guideline limits applied.

2.2.1 Environmental Noise

Using guidance from the City of Mississauga Noise By-Law and in the absence of specific noise guidance within the Province of Ontario, a review of best practices from other regions was conducted. The documents reviewed included the FTA Manual, the FHWA Guide, and the Central Artery/Tunnel Noise Specification. Noise limits presented in **Table 1** were based primarily on the Central Artery/Tunnel Noise Specification with modifications based RWDI's local experience.

The Central Artery/Tunnel Noise Specification provides 20-minute sound level limits. Based on RWDI's experience, complaints associated with construction activities more closely align to shorter averaging periods, such as 10 minutes. Longer averaging times would permit excessive sounds, such as those from use of a hoe-ram, to be allowable for longer periods when they are followed by quiet periods; and hence may still cause complaints despite meeting a limit. The 20-minute limits used for the Central Artery/Tunnel were adjusted to be reflective for a 10-minute averaging period.

Many jurisdictions rely on the equivalent energy-average sound exposure (L_{EQ}) parameter as the basis for assessment. The L_{EQ} parameter is representative for long-term exposures to sound or sounds that are relatively steady in nature. However, sounds that are highly variable, such as many construction activities, tend to relate better to the 10-percentile sound level (L_{10} or sound level exceeded 10% of the time) parameter. As a result, the L_{10} parameter has been maintained here, consistent with the Central Artery/Tunnel Noise Specification.

Instantaneous (or L_{MAX}) limits are intended to capture peak short-term events, such as hammering, that have potential to disturb residents. The implementation of this type of limit helps to capture construction activities that can cause an adverse effect but would not otherwise trigger an exceedance under the sound level limit due to their extremely short duration.

Based on the results of the baseline monitoring, the sound level limits may be adjusted based on the metrics outlined in **Table 1**. Further details about baseline monitoring have been provided in Section 4.

Table 1: Construction Noise Limits

Noise Receptor Type	Daytime (7am to 7pm)		Nighttime (7pm to 7am)[1]	
	$L_{10,10\text{-min}}$ (dBA)	L_{MAX} (dBA)	$L_{10,10\text{-min}}$ (dBA)	L_{MAX} (dBA)
Noise-Sensitive (i.e. Residences, Institutions, etc.)	78 or Baseline + 5 (whichever is louder)	85 90 (impact) [2]	73 or Baseline + 3 (whichever is louder)	80
Commercial (i.e. Businesses, Stores, etc.)	83 or Baseline + 5 (whichever is louder)	-	78 or Baseline + 3 (whichever is louder)	-
Industrial Areas (i.e. Manufacturing, etc.)	88 or Baseline + 5 (whichever is louder)	-	-	-

Note 1 – Nighttime limits have been provided in the event that and exemption for the construction work is granted by the City of Mississauga to allow construction to occur between 7 pm of one day and 7 am of the next day.
2 – Applicable to Impact sources, such as Jackhammers.

2.2.2 Vibration

Vibration limits are provided for two different scenarios: public annoyance and building damage. The annoyance criterion is based on the ISO 2631-2:2003 standard and a threshold of perception of approximately 0.1 mm/s root-mean-square (RMS). The proposed criterion is equivalent to 72 VdB (referenced to 25.4 x 10^{-6} mm/sec) which is recommended in other standards, such as the FTA Manual, as a public annoyance criterion.

Vibration limits for building damage are generally higher than those for annoyance and are measured in peak particle velocity (PPV). In the absence of specific criteria from the Province or Municipality, guidance was drawn from the City of Toronto Construction Vibration Guideline which are consistent with best practices in other regions. In the guidelines, the overall building damage vibration criteria is divided based on the frequency of the vibration level. For this assessment, the strictest frequency criteria is conservatively applied for PPV limit.

As the 5 mm/s PPV criteria may not be appropriate for heritage buildings, a stricter 3 mm/s criteria from the Swiss Association Standard[1] was used for the ZOI criteria for heritage buildings.

The criteria for annoyance and potential impact are presented in

Table 2.

Table 2: Vibration Exposure Limits Regarding Public Annoyance and Building Damage

Target Guidance/Criteria	Source of Guidance/Criteria	Description of Criteria
Annoyance	ISO 2631-2:2003	0.1 mm/s RMS
Potential Impact/	FTA - Building Category IV and Swiss Association Standard (Heritage Buildings)	3 mm/s PPV
	City of Toronto Construction Vibration Guideline (General Buildings)	5 mm/s PPV

[1] Swiss Association of Standardization, Effects of Vibration on Construction, as cited in Amick H. and Gendreau M. 2000. Construction Vibrations and Their Impact on Vibration Sensitive Facilities, ASCE Construction Congress 6.

	City of Toronto Construction Vibration Guideline (Prohibited Levels)	8 mm/s PPV

3 PREDICTED CONSTRUCTION NOISE AND VIBRATION

The construction activities will take place along Kirwin Avenue, John Street, Little John Lane and Jaguar Valley Drive in Mississauga, Ontario as shown in **Figure 1**. As shown in Figure 1, the purple line is the location of the sewer work, the blue line is watermain work, and the red hatched area (private and City properties). The sewer, watermain and private/City properties have all been considered as a whole for this assessment.

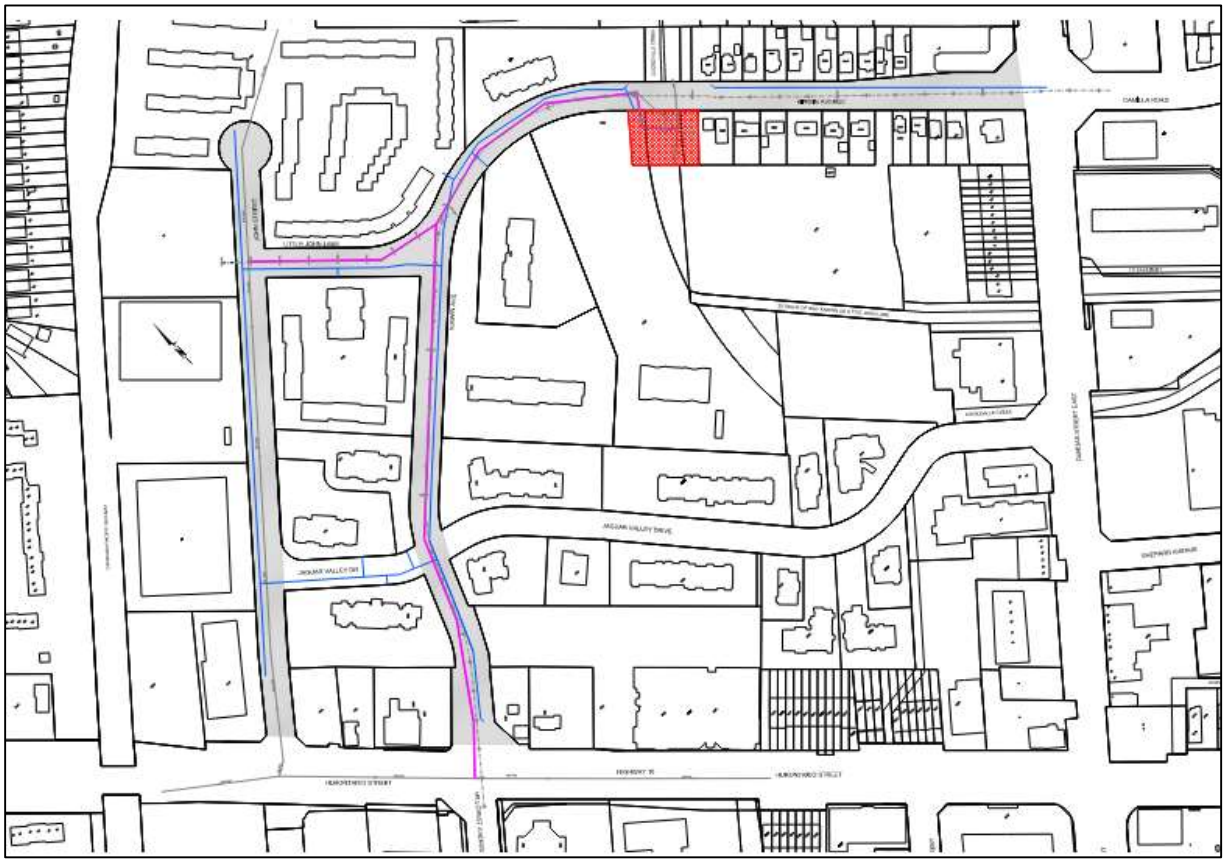


Figure 1: Construction Location

The expected list of equipment to be used during the construction includes the following:

- Backhoes, bulldozers, cranes and excavators
- Jackhammers
- Pavement breakers/Hoe Rams
- Dump trucks, Concrete trucks
- Concrete saws
- Hand tools
- Compactor

- Asphalt Spreader
- Road Roller

The potential impacts for both noise and vibration were estimated based on the best data available to inform the monitoring requirements for the project. At this time, details regarding the specific construction methodology are not available. Conservative approximations regarding equipment duty cycles and quantities based on RWDI's previous experience were implemented into the screening-level modelling. The noise and vibration criteria from Section 2 were used to estimate the extents of the potential impacts on surrounding sensitive receptors.

Zones of Influence (ZOIs) were developed for both potential noise and vibration impacts. ZOIs are used to visually identify areas that are likely to be potentially impacted and inform the monitoring methodology.

As the construction plans and methodologies are finalized, it is necessary to confirm that the ZOIs noted here still represent the predicted noise and vibration impacts at the surrounding communities.

3.1 Environmental Noise

To estimate the Zone of Influence (ZOI), a screening-level noise assessment was completed assuming equipment was operating up to the outer-most edge of the construction area. In the absence of specific construction details, conservative assumptions regarding equipment duty cycles and quantities were implemented into the screening-level modelling. Zones of Influence were developed for each land-use type (e.g., sensitive receptors, commercial uses, and industrial uses) for the construction. The ZOIs are presented in **Appendix A**.

The ZOIs show residential sensitive receptors have the potential to be impacted, including commercial receptors located along Hurontario Street and Dundas Street. Consequently, noise monitoring is required and discussed further in Section 4.

3.2 Vibration

To estimate the Zone of Influence (ZOI), a screening-level vibration assessment was completed assuming equipment was operating up to the outer-most edge of the construction area.

The vibration ZOI was determined by selecting the construction activity with the highest predicted vibration level, as only 1 activity is assumed to occur at a given time. For this work it is assumed the pavement breaker and compactor will generate the most onsite vibration during the entirety of the construction work. Reference vibration levels for the construction equipment were obtained from the FTA Manual.

Typical soil conditions were assumed for vibration propagation for all equipment. This approach is expected to be conservative, and the assumption can be re-visited if more information is available as vibration propagation is highly dependent on soil type.

Two different setbacks were calculated: one for annoyance and one for building damage. The annoyance ZOI is based on the criteria in

Table 2 of 0.1 mm/s RMS which results in a setback of 22 m from the vibration activity to the nearest sensitive receptor. The ZOI is based on the "caution" criteria of 5 mm/s PPV as recommended in the City of Toronto Construction Vibration Guidelines, which results in a setback of 8 m. For Heritage Buildings, a setback of 11.5 m was determined for the ZOI based on the "caution" criteria of 3 mm/s. The ZOIs are included in **Appendix B**.

As the potential Heritage Buildings along Kirwin Avenue (3061 to 3081 Kirwin Avenue) are located within the heritage ZOI, addition review of the buildings is required, as the vibration sensitivity is depended on the type of construction and current building condition. Should the 3061 to 3081 Kirwin Avenue buildings be confirmed with heritage status, an inspection of the building is required to determine if additional monitoring should be completed.

The ZOIs indicate that vibration monitoring will be required within several areas, including the potential heritage buildings located at 3061 to 3081 Kirwin Avenue. Additional discussion on vibration monitoring is included in Section 4.

4 MONITORING REQUIREMENTS

Based on the resulting predicted ZOIs for construction noise and vibration, monitoring is required. Monitoring requirements have been developed based on MECP guidelines and previous monitoring experience.

The Contractor is responsible for ensuring that the construction work is carried out in compliance with Applicable Construction Noise and Vibration Requirements.

4.1 Baseline Noise and Vibration Monitoring

Where monitoring is required, baseline noise and vibration measurements will be conducted immediately prior to the beginning of the construction by the Construction Contractor's Noise and Vibration Consultant. Noise monitoring equipment shall be deployed prior to start of major construction. Activities related to staging and clearing are not considered major construction however baseline levels should not be determined while these activities are occurring.

Baseline noise levels must be established using at least 48-hours of recorded data. High-level anomalous events, such as aircraft or trains, should be excluded from the calculation of the baseline. Caution alerts are not required to be enabled during baseline measurements. The goal is to collect sufficient data to understand the ambient sound and vibration conditions and the diurnal patterns in the area.

A baseline conditions report should be issued within two weeks of completion of baseline measurements by the Construction Contractor's Noise and Vibration Consultant. The report should compare sound level and/or vibration level measurements to the criteria provided in **Table 1 and 2**. If the results of the noise monitoring are higher than the sound or vibration criteria levels, the resulting changes to the sound criteria should be included in the report.

4.2 Construction Noise Monitoring

Sound level monitoring shall be carried out by the Construction Contractor's Noise and Vibration Consultant for the duration of the work that encroaches on the ZOI.

4.2.1 Monitoring Locations

Noise monitoring will be required to capture the highest construction noise levels for each sensitive neighborhood. Construction is expected to progress linearly along the construction area. There are residential land uses along Kirwin Avenue, Jaguar Valley Drive, Little John Lane and the south side and northern end of John Street. When work is progressing along these areas one monitor on each side of the work area is required to capture the worst-case impacts in each direction. The monitor should be located near residences in closest proximity to the work. The monitor may be required to be relocated throughout the construction process to different locations along the construction area to capture the loudest activities at the closest residences.

It is understood that monitoring locations will be subject to permissions by owners and should be sited in the best available location given work, security, and access concerns. These monitoring locations may need to be altered depending on the detailed construction plans and methodologies or if complaints are received as construction progresses. Where monitors may be required to be located removed from the nearest residences due to access or security concerns, corresponding adjustments to the applicable limits may be required.

4.2.2 Noise Monitoring Procedures

The intent of the noise monitoring program is to limit the adverse effects from construction noise on adjacent communities. The monitoring program has been designed to flag exceedances before they happen, working in a pro-active manner to prevent adverse effects from occurring.

Previous experience has concluded that the caution alert levels should be set lower than the limits to allow some time for action to be taken, if required. If the alert level is set the same as the limit, then noise management becomes reactive rather than proactive and can result in more complaints. In general, the caution alert level should be set 3-5 dB lower than the limit. However, depending on the response in the area (i.e., complaints) once construction starts, the caution alert levels may be adjusted to best suit the area.

Sound level monitoring shall be carried out by the Construction Contractor's Noise and Vibration Consultant throughout all construction activities. The following actions are required to pro-actively manage construction noise throughout the project:

- If caution levels are exceeded an instantaneous, automatically generated message shall be sent to the Construction Contractor and the City Representative.
- Upon receipt of an automatically generated message, the Construction Contractor's on-site environmental inspector shall confirm and record the cause for the caution alert immediately and take action to adjust activities to prevent continued alerts (including consideration of altering construction techniques).
- If the construction noise limits are exceeded an instantaneous, automatically generated message shall be sent to the Construction Contractor's on-site environmental inspector, the City Representative and other persons to be named at the City.
- Upon generation of an automatically generated message, the cause of each exceedance shall be identified within one (1) hour, when requested by City Representative, and included in each Weekly Construction Noise Measurement Report.

- Within twenty-four (24) hours, a communication (letter or email) explaining the cause of the exceedance and the remedial actions taken to prevent future similar exceedances will be generated for the Construction Contractor and be available to the City Representative when requested.

Weekly Construction Noise Measurement reports will be generated and submitted to the Construction Contractor and be available to the City at their request. Weekly Construction Noise Measurement reports will include:

- A summary of noise measurement data collected during the reporting period (detailed data must be made available on request);
- A comparison of noise data to the applicable sound level limits;
- A summary of exceedances of the noise limits including the location of the exceedance; date and time of the exceedance; probable cause of the exceedance and list of construction work occurring at the time of the exceedance;
- Remedial actions taken to prevent future similar exceedances; and
- A summary of any complaints received during the reporting period.

4.2.3 Noise Equipment Specifications

Sound level monitors (SLMs) must be equipped with wireless telemetry allowing data to be retrieved in real-time. They must also be capable of taking audio recordings before and after trigger limits (as stipulated in **Table 1Error! Reference source not found.**) have been exceeded. In addition, the following requirements apply:

- Audio recording shall be taken a minimum 15 second before and 30 seconds after trigger limits are exceeded or as required to determine source of noise;
- Sound level meters must have a sufficient portable power source, and suitably sized data storage;
- Record baseline noise data for 10-minute periods;
- Record at a minimum L_{MAX} and L_{10} construction sound levels;
- Data logging system is to conform to ANSI S1.4-1983 (R2006) standard "Specification for Sound Level Meters" for Type 1 SLMs;
- SLMs to be field calibrated before each data collection period as well as anytime the equipment is moved or, if not moved, every three months; and
- Baseline readings shall be representative of the normal ambient conditions and shall take into account abnormal noise emitting activities (e.g., aircraft overflights).

Equipment shall be calibrated in accordance with NPC-103.

4.3 Construction Vibration Monitoring

Vibration monitoring shall be carried out by the Construction Contractor's Noise and Vibration Consultant for the duration of the work.

4.3.1 Monitoring Locations

To assess the potential for building damage and annoyance from construction vibration, the Construction Contractor's Vibration Noise and Consultant may conduct both attended and unattended vibration monitoring. Based on the results of the ZOI assessment and the proximity of the construction activities to nearby sensitive receptors and structures, unattended monitors will also be deployed prior to commencement of construction activities that have the potential to generate high vibration levels, e.g., pavement breaking, excavation and compaction. The vibration monitoring shall be carried out by the Construction Contractor's Noise and Vibration Consultant as follows. The construction area can be seen above in **Figure 1** with the ZOIs in **Appendix B**.

Construction is expected to progress linearly along the construction area. As construction progresses a monitor will be required near the residences along Kirwin Avenue, Jaguar Valley Drive, Little John Lane and the south side and northern end of John Street. Monitoring for these locations may be achieved with one monitor on either side of the work area that are moved as work progresses or with multiple monitors simultaneously placed throughout the construction path. The monitors may be required to be relocated throughout the construction process to different locations along the construction area to capture the most significant vibration activities at the closest residences. Additional monitors may be required if complaints from residences are received.

4.3.2 Vibration Monitoring Procedures

The intent of the vibration monitoring program is to limit the adverse effects from construction vibration on adjacent communities. The monitoring program has been designed to flag exceedances before they happen, working in a pro-active manner to prevent adverse effects from occurring.

Previous experience has concluded that the caution alert levels should be set lower than the limits to allow some time for action to be taken, if required. If the alert level is set the same as the limit, then vibration management becomes reactive rather than proactive and can result in more complaints or structural damage. In general, the caution alert level should be set at 0.08 mm/s RMS for annoyance (80% of limit) and 5 mm/s (as per City of Toronto Construction Vibration Guideline). However, depending on the response in the area (i.e., complaints) once construction starts, the caution alert levels may be adjusted to best suit the area.

Vibration monitoring shall be carried out by the Construction Contractor's Noise and Vibration Consultant throughout all construction activities. The following actions are required to pro-actively manage construction vibration throughout the project:

- For structures of concern within the vibration ZOI the following should be completed if possible and if not possible, documentation of attempts to conduct an inspection should be retained.
    - pre-construction consultation and record of comments provided to the applicant by the owners and occupants;
    - pre-construction measurement of background vibration; and
    - pre-construction inspection of adjacent buildings and structures within the ZOIs.
- If caution levels are exceeded an instantaneous, automatically generated message shall be sent to the Construction Contractor and the City Representative.
- Upon receipt of an automatically generated message, the Construction Contractor's on-site environmental inspector shall confirm and record the cause for the caution alert immediately and take action to adjust activities to prevent continued alerts (including consideration of altering construction techniques).
- If the construction vibration limits are exceeded an instantaneous, automatically generated message shall be sent to the Construction Contractor's on-site environmental inspector, the City Representative, and other persons to be named at the City.
- If the building damage construction limits are exceeded, work must cease immediately. Actions must be taken to reduce the vibration levels from the activity before proceeding.
- Upon generation of an automatically generated message, the cause of each exceedance shall be identified within one (1) hour, when requested by City Representative, and included in each Weekly Construction Vibration Measurement Report.
- Within twenty-four (24) hours, a letter explaining the cause of the exceedance and the remedial actions taken to prevent future similar exceedances will be generated for the Construction Contractor and be available to the City Representative when requested.

Weekly Construction Vibration Measurement reports will be generated and submitted to the Construction Contractor and be available to the City at their request. Weekly Construction Vibration Measurement reports will include:

- A summary of vibration measurement data collected during the reporting period (detailed data must be made available on request);
- A comparison of vibration data to the applicable vibration limits;
- A summary of exceedances of the vibration limits including the location of the exceedance; date and time of the exceedance; frequency and PPV level of the exceedance; probable cause of the exceedance and list of construction work occurring at the time of the exceedance;
- Remedial actions taken to prevent future similar exceedances; and
- A summary of any complaints received during the reporting period.

4.3.3 Vibration Equipment Specifications

Vibration monitors must be equipped with wireless telemetry allowing data to be retrieved in real-time. In addition, the following requirements apply:

- Vibration monitors must be capable of capturing the frequency, the RMS level (annoyance) and the PPV level (building damage);
- Vibration monitors must have a sufficient portable power source, and suitably sized data storage;
- Baseline readings shall be representative of the normal ambient conditions.

If a monitor records a vibration event at or above the limit, an email will automatically be issued by the Construction Contractor's Vibration Consultant and to the Construction Contractor's on-site environmental inspector of a vibration event. The email will contain the time of the exceedance as well as the vibration level of the exceedance.

5 MITIGATION OF POTENTIAL IMPACTS

During construction work, there is the potential for construction activities to exceed noise and vibration limits in the surrounding communities. These exceedances will trigger alerts from the monitoring equipment and may result in complaints from the public. Mitigation measures can be implemented to reduce noise and vibration levels in surrounding communities. Before implementing noise and vibration control measures, the most efficient way to reduce impacts at receivers is to increase the separation distance between source and receiver. Where this is not possible, noise and vibration control can include altering construction methodology, mitigating the source of noise or vibration or interrupting the path of noise or vibration between source and receiver. Noise and vibration control can also be implemented at the receiver, but in the case on managing construction noise and vibration, this is not practical.

5.1 Noise

Where complaints are received or sound levels exceed the limits, steps shall be taken to meet the limit or, if this is deemed impractical by the Construction Contractor's Noise and Vibration Consultant, communication with the City and the complainant be introduced to determine a solution to the exceedances.

Noise emissions can be reduced through altering the construction methodology. Examples of measures that would reduce noise levels include:

- Selection of low-noise construction equipment such as electric powered machinery in lieu of diesel-powered machinery, where possible;
- Switching equipment off when not in use, with idling kept to a minimum;
- Reducing equipment use during sensitive time periods, such as during early morning or evening hours;
- If possible, siting any construction staging or storage areas away from sensitive receivers; and
- Ensure equipment is property maintained and operated in an appropriate manner. A documented, regular inspection and maintenance program must be implemented.
- Vehicle on-site speed limits must be met and will be enforced.
- In the presence of persistent noise complaints, all construction equipment should be verified to comply with MOE NPC-115 guidelines.

Noise emissions can also be reduced at source to reduce the sound emitted, including measures such as:

- All backup alarms within the Site shall be low frequency broadband alarms, with the exception of delivery vehicles that access the construction site infrequently;
- Construction Contractor shall demonstrate that they are using the quietest equipment reasonably available and at a minimum they must have effective silencers on their blowers or be fitted with them externally;
- Construction Contractor shall provide efficient intake and exhaust silencers on air equipment; and
- Construction Contractor shall provide efficient intake and exhaust mufflers on internal combustion engines.

Where sound levels cannot be reduced at source, the path between source and receiver can be interrupted with a temporary barrier or enclosure to prevent sound from reaching sensitive receivers. Noise barriers and enclosures are the most common method for interrupting the path. The Construction Contractor shall use noise-reducing enclosures, shrouds, or curtains to reduce noise levels where there are measured or anticipated exceedances, based on alerts from monitoring equipment. For example, concrete cutting and jack hammering shall whenever reasonably possible be undertaken in an enclosure. An example of a temporary curtain is provided in **Figure 2**.

Figure 2: Example of a Temporary Noise Curtain

5.2 Vibration

Where complaints are received or vibration levels exceed the limits, steps shall be taken to meet the limit. In the case of the building damage vibration limit, work must be stopped until a mitigation solution is implemented. For the annoyance vibration limit, if meeting the limit is deemed impractical by the Construction Contractor's Noise and Vibration Consultant, communication with the City and the complainant be introduced to determine a solution to the exceedances.

Vibration emissions are most efficiently reduced through altering the construction methodology. As an example using alternate boring methods, removal of rocks from the excavating area, or using smaller equipment can help to reduce the vibration emitted from construction activities. Whenever possible, construction activities which produce higher levels of vibration should consider alternative construction methods.

One method to help resolve complicated construction vibration control issues is to work collaboratively on-site with the Noise and Vibration Consultant. The Construction Contractor can arrange for the Consultant to attend the site for in-person vibration monitoring to facilitate trial and implementation of mitigation measures if warranted based on frequency and level.

6 COMPLAINT REPORTING

City staff should forward complaints to the Construction Contactor when they are received. Complaints from either the City, or directly from the public, should be formally logged by the Construction Contractor's Environmental Manager or other designated person on-site within 24 hours of receipt. Construction Contractor contact information and a complaint submission procedure should be clearly displayed at key entrances or locations easily accessible to the public.

A complaint form, or a procedure for recording complaints, should be developed and completed for each complaint. At a minimum the form, or procedure, should contain:

- Date and time of complaint and when complainant observed the event(s);
- Complainant name and contact information, including the address of the complainant or a general complainant location;
- Details of the complaint and observed events;
- Description of the construction activities that occurred during the complaint;
- Sound or vibration levels at an associated monitoring station at the time of complaint (where applicable);
- Actions taken by the liaison(s) (i.e., Construction Contactor's on-site environmental inspector);
- Acknowledgement if construction activities were responsible for complaint, or if it was due to an activity outside of the Construction Contractor's control; and
- Confirmation of liaison(s) following up with complainant.

In the event of noise complaints, Construction Contractor shall refer to the completed baseline noise monitoring program for receptor-specific noise limits outside of the provided construction noise action limits in **Table 1** to review potentially lower action limits or caution alert levels and subsequent complaint response protocols. Should a noise complaint be received, the City reserves the right to request the Construction Contractor provide noise data.

In the presence of persistent noise or vibration complaints, alternative control measures may be implemented. Any initial noise and vibration complaint will trigger verification that the general noise and vibration control measures are functioning effectively.

7 RESPONSIBLE PERSONNEL

7.1 Equipment Set up and Maintenance

The City and the Construction Contractor are responsible for obtaining permissions from landowners to deploy instrumentation at the recommended locations. The Construction Contractor's Noise and Vibration Consultant will be responsible for scheduling deployment once permission is granted. The Construction Contractor's Noise and Vibration Consultant will be responsible for maintaining monitoring equipment for the duration of the measurement campaign and obtaining permission to access properties when necessary.

7.2 Equipment Sound Levels

Construction Contractor's on-site environmental inspector is responsible for ensuring equipment meets NPC-115 and NPC-118 requirements through manufacturer certificates or sound level measurements conducted in accordance with NPC-103. The Noise and Vibration Consultant may assist with the noise verification measurements, if necessary.

7.3 Alerts

Monitoring equipment will issue an alert to a common e-mail account that the Construction Contractor's on-site environmental inspectors have access to. It is the responsibility of the Contractor to ensure that on-site inspectors receive, review the alert and create a log of the cause and action taken. The Construction Contractor's Noise and Vibration Consultant can provide support in the form of audio recordings and confirm if construction is the likely cause of the alert. However, it is preferred for the Construction Contractor's on-site environmental inspectors provide this information as they are present on-site and can more easily identify the cause and implement an action.

7.4 Complaints

It is expected that complaints would be received by the City. Given the importance the complaints have, it is important for the complaints to the relayed to the Construction Contractor in a timely manner (i.e., within an hour or less) so they can be dealt with as soon as possible.

7.5 Mitigation

It is the responsibility of the Construction Contractor's on-site environmental inspectors to investigate and/or verify the cause for any alerts and action limit exceedances. If mitigation measures are required, it is the Construction Contractor's responsibility to determine and implement the mitigation measures and indicate the timeline of the implementation in records.

7.6 Changes to Construction

It is the Construction Contractor's responsibility to inform the Contractor's Noise and Vibration Consultant of the construction schedules and construction locations.

7.7 Reporting Data

The Construction Contractor's Noise and Vibration Consultant will be responsible for providing weekly and monthly Noise and Vibration Reports. If requested, it is the responsibility of the Construction Contractor to provide the City with all necessary reports as well as information on the alerts and actions taken.

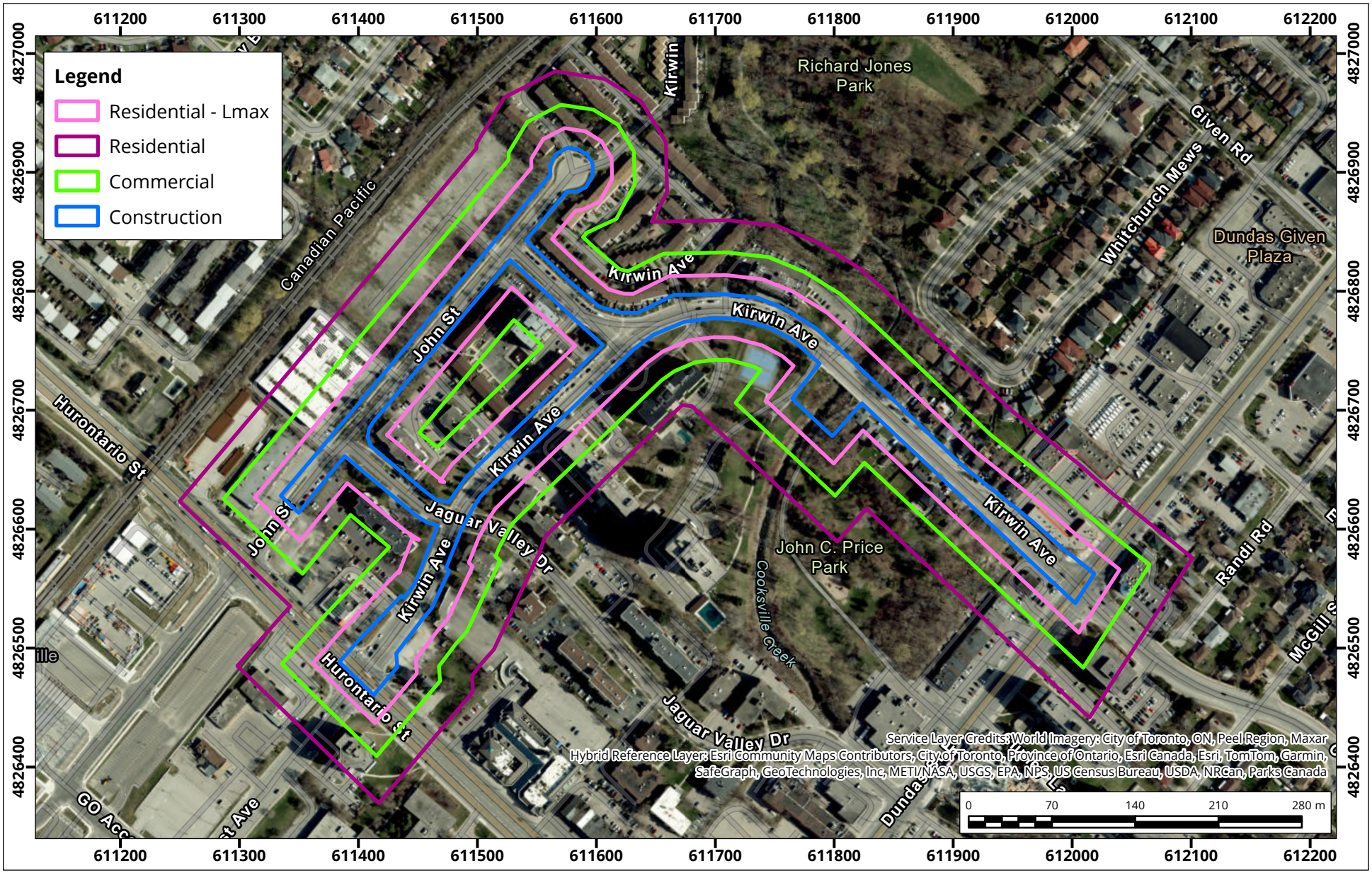
8 STATEMENT OF LIMITATIONS

This document entitled "Sanitary Sewer Replacement - Kirwin Avenue/Little John Lane – Construction Monitoring Plan" was prepared by RWDI AIR Inc. ("RWDI") for IBI GROUP ("Client"). The findings and conclusions presented in this document have been prepared for the Client and are specific to the project described herein ("Project"). The conclusions and recommendations contained in this document are based on the information available to RWDI when it was prepared. Since the contents of this document may not reflect the final design or operations of the Project or subsequent changes made after the date of this document, it is recommended that RWDI be retained by the Client during the final stages of the project to verify that the results and recommendations provided in this document have been correctly interpreted in the final design of the Project.

The conclusions and recommendations contained in this document have also been made for the specific purpose(s) set out herein. Should the Client or any other third party utilize the document and/or implement the conclusions and recommendations contained therein for any other purpose or project without the involvement of RWDI, the Client or such third party assumes any and all risk of any and all consequences arising from such use and RWDI accepts no responsibility for any liability, loss, or damage of any kind suffered by Client or any other third party arising therefrom.

Finally, it is imperative that the Client and/or any party relying on the conclusions and recommendations in this document carefully review the stated assumptions contained herein to understand the different factors which may impact the conclusions and recommendations provided.

APPENDIX A



Construction Noise ZOI

True North

Drawn by: JKK	Figure: A.1
Approx. Scale: 1:4,500	
Date Revised: Mar 21, 2024	

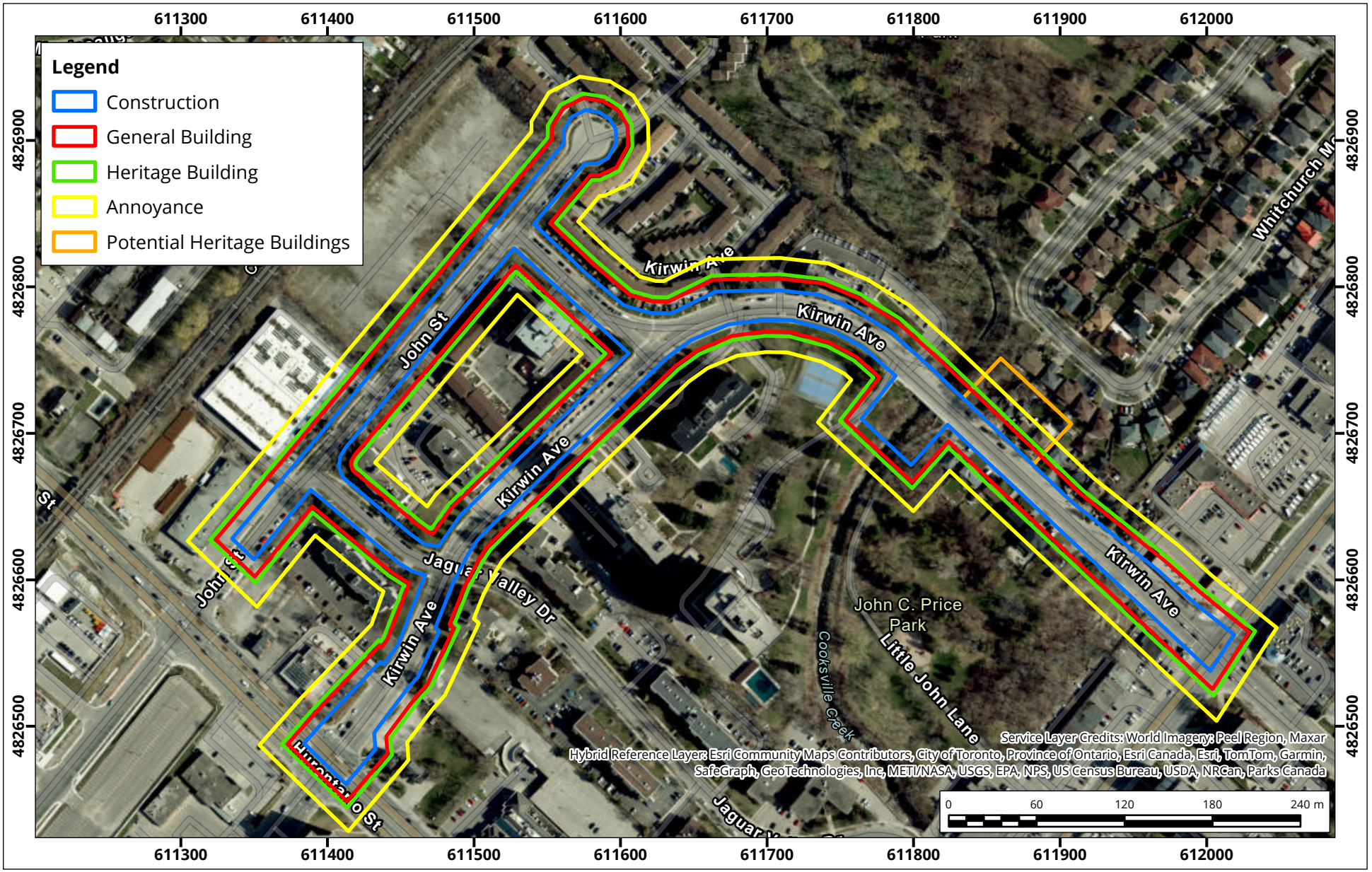
Map Projection: NAD 1983 UTM Zone 17N

Sanitary Sewer Replacement - Kirwin Avenue - Mississauga, Ontario

Project #: 2306558

Map Document: \\rwdgroup\guelph\AM_Jobs\2023\2306558\03WorkItems\20EnvironmentalNoise\Figures\Kirwin\OntarioLUP ArcGIS Template\OntarioLUP.aprx

APPENDIX B



Construction Vibration ZOI

True North

Drawn by: JKK | Figure: B.1

Approx. Scale: 1:3,650

Date Revised: Mar 21, 2024

Map Projection: NAD 1983 UTM Zone 17N

Sanitary Sewer Replacement - Kirwin Avenue - Mississauga, Ontario

Project #: 2306558

Map Document: \\rwdlgroup\guelph\AM_Jobs\2023\2306558\03WorkItems\20EnvironmentalNoise\Figures\Kirwin\OntarioLUP ArcGIS Template\OntarioLUP.aprx