Protection of Community and Neighbourhood Characteristics: Noise Impact Assessment

This document provides an overview of the noise impact analysis completed to date as part of the Detroit River International Crossing (DRIC) Environmental Assessment. The potential change in noise is considered under the broader evaluation factor group "Protection of Community and Neighbourhood Characteristics."

Noise is generally described as unwanted sound. However, noise and sound are often used interchangeably. The unit used for measuring sound is the decibel (dB). To better reflect the response of human receptors to sounds measured by instruments, "*weighting scales*" are used. The "*A weighted scale*" is used to duplicate the human response to the audible frequency range. Sound levels so adjusted are referred to as "*A weighted decibels*" and assigned the unit abbreviation dBA.

Purpose of the Noise Impact Assessment

The Ontario Ministries of Transportation (MTO) and the Environment (MOE) have developed a specific protocol for assessing noise impacts from transportation projects which must be applied to all transportation projects in the province. In general terms, the noise impact is determined by comparing the noise specifically caused by the project with the existing noise experienced by sensitive receptors in the vicinity of the project. Typically, where the project noise exceeds the background/existing noise levels by five or more decibels (dB), mitigation measures including sound barriers are to be considered for the project. However, additional mitigation may also be required in specific circumstances.

How the Analysis was Done

The methodology for estimating noise levels consisted of the following key steps for evaluation of the proposed access roads, and plazas and crossings.

1. Traffic data were established for the base year (2006), as well as for future years (2015, 2025 and 2035), representing baseline conditions and conditions for each Practical Alternative. For each alternative, certain key information was determined, including Annual Average Daily Traffic (AADT), percentage of automobiles, percentage of heavy and medium trucks, speed limit, road elevation, local topography, surrounding ground conditions, etc.

   Practical Alternatives

2. Sensitive noise receptors along each Practical Alternative were identified. The receptors selected for assessment were those that were most potentially impacted (i.e. subject to frontline exposure) by the various alternatives. Multiple receptors were selected to capture the anticipated variations in exposure to noise from traffic based on the alignment of existing roads, the alignment of the Practical Alternatives, and variations in traffic volumes. On this basis, a total of 31 receptors were selected for access road alternatives.

3. Since each Practical Alternative, except for Alternative 3, has a total of two alignment options between St. Clair College and Howard Avenue. It should be noted that the noise impacts on some receptors are assessed for both alignment options, depending on the receptor location, while other

receptors are assessed for only a single alignment option. This two-route alignment was also considered when assessing the portion of the access road from Malden Road to Pulford Street along the proposed Highway 401 with: (1) connection to Plaza A; and (2) connection to other plazas. Overall, a total of 45 assessments were carried out for Alternative 1A and 1B, a total of 43 assessments were conducted for Alternative 2A and 2B, and a total of 36 assessments were conducted for Alternative 3.

4. Baseline (no-build) and project noise levels were estimated at each of the receptors identified for each access road alternative, using the MOE's STAMSON traffic noise model. This was performed for 2015, 2025, and 2035. The key inputs to the STAMSON noise model are: traffic volume, percentage of automobiles, percentage of heavy and medium trucks, posted speed limit, road gradient, road surface type, local topography, surrounding ground surface cover, noise source height, receptor height and source to receptor distance.

5. For Alternative 3 (the end-to-end tunnel option), sound levels emanating from surface roads, the tunnel portals and ventilation buildings were assessed. The sound levels from the surface roads were estimated using the MOE's STAMSON model. The reverberation effect from the tunnel portals was considered negligible based on SENES (the consultants for this study) field measurements and other related published documents and therefore not included in the noise estimation. The different studies suggest that the noise reverberation at the tunnel portals is quite localized and does not extend beyond a short distance (e.g., 20 m or 65 ft) from the portals. Noise from the ventilation building was assessed using the CADNA_A model.

6. Additional assessment was undertaken for noise sensitive receptors that showed more than a 5 dB increase in project sound levels above the no-build sound levels. For each access road segment where such exceedances were predicted, the effect of a 5 m (16 ft) high noise barrier was used to estimate sound level reductions. In cases where multiple receptors exceeded no-build sound levels by more than a 5 dB within a prescribed road segment (e.g., Malden Road to Pulford Street), the mitigation calculation was only performed for the receptor with the highest estimated noise exceedance in that road segment, or for a receptor in the area within the segment with the highest cluster of homes.

Plazas and Crossings

7. The impact of the plaza/crossing alternatives was assessed based on two groups of receptors; a total of 21 and 13 receptors were identified in Sandwich Towne (close to Crossing C) and areas between Ojibway Parkway to Malden Road (close to Plaza A), respectively.

8. The CADNA-A noise model was used to estimate receptor noise levels for each of the four plaza and corresponding crossing alternatives. This model can be used to predict noise levels from both stationary and mobile noise sources. The modelling approach considered vehicle queuing, idling and acceleration. The key inputs to this model included maximum hourly vehicular traffic (cars and trucks), plaza layout, vehicle sound levels, locations of vehicles at plaza sites. This model was also used to estimate the minimum separation distances between the ventilation building and sensitive receptors for Alternative 3, the end-to-end tunnel option.

9. For mitigation assessment, the height of the acoustic barrier was limited to 4 m (13 ft) on all crossings. The 4 m (13 ft) high acoustic barrier was placed beginning at the exit of the plaza, and continuing along the crossing route. For alternatives involving Plazas B, B1, and C, a 5 m (16 ft) high acoustic barrier was modelled along the new connecting road leading to each of the plaza.

Findings to Date

Practical Alternatives

The below-grade alternatives (1B and 2B) and end-to-end tunnel (3) generally result in lower noise levels at the receptor locations compared with at-grade alternatives (1A and 2A). Only alternatives 2B and 3 show no predicted noise impact in all route segments between Pulford Street to the existing Highway 401. For all alternatives, some exceedances were observed between Malden Road and Pulford Street, with one receptor experiencing a high noise impact (greater than 10 dB exceedances above the no-build sound levels) for all three scenario years (2015, 2025, and 2035). Mitigation measures were considered for noise sensitive receptors that showed more than a 5 dB increase in project sound levels above the no-build sound levels. In all cases, from Malden Road to North Talbot Road along the proposed Highway 401, the 5 m (16 ft) noise barrier was effective in reducing the predicted project noise to within a 5 dB of the no-build sound levels, except for two receptors (R2, R2-A) located on Spring Garden Road along the proposed Highway 401 from Malden Road to Pulford Street. After mitigation, the proposed project will result in no-to-marginal noise impact for all access road alternatives except for the two receptor locations mentioned above. The noise level after mitigation at these two receptor locations ranged from 5 to 7 dB above the no-build sound levels for the different Practical Alternatives in the worst-case year 2035.

The minimum separation distances between the ventilation building and a sensitive noise receptor for Alternative 3 were based on the MOE sound level exclusion limits of 45 and 50 dBA for nighttime and daytime, respectively for urban areas. The ventilation noise is determined to be directional and, when unmitigated, the maximum separation distance estimated to meet the most stringent 45 dBA noise limit is 760 m (2493 ft). Silencers can be installed to mitigate noise from the ventilation building fans associated with the end-to-end tunnel alternative. The mitigation measures are preliminary and will be further developed during the design process.

Plazas and Crossings

The noise generated solely from the plaza locations is not expected to cause a high noise impact at the receptors closest to the plazas. In most cases, the receptors are more than 50 m (164 ft) away from the plazas. However, the noise modelling results identified two areas that might potentially have high noise impact:

Areas between Ojibway Parkway and Malden Road, south of E.C. Row Expressway: Receptors potentially affected, before mitigation, are those located closest (i.e. closest row of houses) to the crossings and approach roadways to the crossings. With mitigation in place, the modelling results showed that for all but two receptor locations (near Ojibway Parkway (R26 and R27), with all crossings that connect to Plaza A options, the proposed 5 m (16 ft) high acoustic barrier on the proposed access road to the crossings in combination with the 4 m (13 ft) high acoustic barrier on the proposed approach roadway to crossings are effective in reducing sound levels to within 5 dB of the no-build sound levels. The sound levels after mitigation for receptor locations R26 and R27 are predicted to be at maximum 7 dB above the no-build sound levels for the different crossings that connect to Plaza A.

In Sandwich Towne with the Crossing C option: This crossing option shows the highest potential for noise impact in the southern portion of Sandwich Towne. The area impacted, prior to mitigation, extends from the crossing outward to Watkins Street in the north and as far east as the Essex Terminal Railway. Amongst all plazas to Crossing C combinations, the Plaza A to Crossing C via Ojibway Parkway combination showed the highest number of exceedances (nine out of 21 receptors). Other plazas to Crossing C combinations showed exceedances occurring at between five to seven receptor locations. However, the noise mitigation modelling results show that a 4 m (13 ft) high acoustic barrier on Crossing C is effective in reducing the project noise levels to within 5 dB of the no-build noise levels in the impacted area of Sandwich Towne for all plazas to Crossing C combination. The cost-effectiveness of a barrier and other mitigation measures requires further study.

The impact assessment results for options with the Plaza A to Crossing A, Plaza A to Crossing C via both Brighton Beach and Ojibway Parkway show that a receptor located in the Brighton Beach community may experience a high noise impact (greater than 10 dB) even with acoustic barriers in place. However, the receptor is located in the remnant residential properties in the Brighton Beach Industrial Park. The mitigation measures are preliminary and will be finalized when the design of the project is completed.

Remaining Activities

- Assess any refinements to roadway alignments.
- Complete the analysis of technically and environmentally preferred alternative.