

1027458 ONTARIO INC.

Noise and Vibration Assessment

Banwell and McHugh Mixed Use Developments Windsor, Ontario

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1.0 Introduction

1.1 Purpose and Objectives

Dillon Consulting Limited (Dillon) was retained by 1027458 Ontario Inc. (the Developer) to complete a noise and vibration assessment as requested by the City of Windsor for proposed mixed-use developments. The proposed developments are located at the corners of Banwell Road and McHugh Street, and Banwell Road and Leathorne Street, in Windsor, Ontario. This study has been completed in support of Zoning By-law and Official Plan Amendments application for the proposed development.

The noise and vibration assessment presented herein was prepared in accordance with the guidelines and requirements of the City of Windsor, the Ontario Ministry of Environment, Conservation and Parks (MECP) noise publication NPC-300 and MECP's land-use compatibility guidelines (D-series). This assessment focuses on the noise and vibration impacts from nearby transportation sources and stationary sources (i.e., nearby industrial operations) on the proposed development.

1.2 The Project and Surrounding Areas

The proposed developments are located at two lots:

- North 'B' Site the parcel located on the west side of Banwell Road, between the south side of the unassumed section of Leathorne Street and the north side of McHugh Street.
- **South Site** the parcel located north of the VIA Railway corridor at the southwest corner of the Banwell Road and McHugh Street intersection.

There are residential dwellings and light industrial facilities in the immediate vicinity of the proposed development parcel. The north site is bordered by a condominium complex to the north, residential dwellings to the east (across Banwell Road) and west, and McHugh Street to the south. The south site is bordered by McHugh Street to the north, a church to the east (across Banwell Road), residential dwellings to the west, and a VIA Rail right-of-way to the south.

The subject site and surrounding area is shown in **Figure 1**. The conceptual development plan for both sites is shown in **Appendix A**.

The proposed development land parcels are currently vacant. The proposed development at the McHugh site consists of:

- Two 10-storey multiple residential dwellings;
- One eight-storey multiple residenaàl dwelling;
- One six-storey multiple residential dwellings;
- One two-storey business office; and
- One respite home.



The proposed development at the Leathorne site consists of five (5) six-storey multiple residential dwellings.



2.0 Impacts from the Environment on the Proposed Development

This section investigates noise impacts from nearby transportation sources and stationary sources on the proposed development.

2.1 Transportation Noise Assessment

The transportation sources with the potential to impact the proposed development include rail traffic from VIA Rail's right-of-way and road traffic along Banwell Road, McHugh Street, and Tecumseh Road East. Impacts from rail and road were predicted and compared against the applicable criteria in the Ontario Ministry of Environment, Conservation and Parks (MECP) noise guideline publication, *NPC 300 – Environmental Noise Guideline – Stationary and Transportation Sources – Approvals and Planning* (2013). NPC-300 outlines noise level criteria for sensitive land uses, which assist in determining requirements for façade construction, ventilation requirements, warning clauses, and potential noise barriers for the proposed development.

2.1.1 Noise Criteria

The applicable transportation noise criteria, as outlined in Part C of NPC-300, is presented in **Table 1** through **Table 5**. **Table 1** summarizes the indoor sound level limits based on the type of space assessed, time of day, transportation noise source, and the maximum allowable equivalent sound levels from railway sources. The indoor noise levels are based on the assumption of closed windows and doors.

Time of Cases	Time Devied	Equivalent Sound Level - L _{eq}		
Type of Space	lime Period	Road	Rail	
General offices, reception areas, retail stores, etc.	Daytime 07:00 - 23:00	50 dBA	45 dBA	
Living/dining areas of residences, hospitals, nursing homes, schools, daycares, etc.	Daytime 07:00 - 23:00	45 dBA	40 dBA	
Living/dining areas of residences, hospitals, nursing homes, etc. (except schools and daycares)	Night-time 23:00 - 07:00	45 dBA	40 dBA	
	Daytime 07:00 - 23:00	45 dBA	40 dBA	
Siceping quarters or residences	Night-time 23:00 - 07:00	40 dBA	35 dBA	
Sleeping quarters of hotels	Night-time 23:00 - 07:00	45 dBA	40 dBA	

Table 1: Indoor Sound Level Limits for Road and Rail



Table 2 outlines the maximum equivalent plane-of-window sound levels for road and rail where ifexceeded, a detailed building component design assessment is required to ensure the indoor soundlevel limits (see Table 1) are achieved.

Table 2: Requirements for Building Component Assessment

		Equivalent Sound Level - L _{eq}		
Assessment Location	Time Period	Road	Rail ^[1]	
Plane of window for	Daytime (07:00 - 23:00)	65 dBA	60 dBA	
living area or sleeping quarters	Night-time (23:00 - 07:00)	60 dBA	55 dBA	

Note: [1] Whistle noise is included for the building component and indoor noise assessment.

MECP's NPC-300 Noise Guideline outlines façade construction requirements for proposed residential developments within 100 metres of rail tracks, shown in **Table 3**. These requirements apply only to the first row of dwellings.

Table 3: Facade Construction Requirements

Assessment Location	Equivalent Sound Level – L _{eq} 24hr ^[1]	Façade Construction Requirement	
Plane of window for living area or	> 60 dBA	Brick veneer or acoustical equivalent	
sleeping quarters	≤ 60 dBA	No requirement	

Note: [1] Whistle noise is included for façade construction requirements.

Table 4 summarizes potential noise warning clauses and ventilation requirements that should be used to warn of potential annoyance due to existing noise sources related to road and rail. Whistle noise is not included in the determination of warning clause requirements.

Table 4: Ventilation and Warning Clause Requirements for Road and Rail

Assessment Location	Time Period	Equivalent Sound Level - L _{eq} Road/Rail ^[1]	Ventilation and Warning Clause Requirements ^[2]
	Daytime (07:00 - 23:00)	≤ 55 dBA	No Requirement
Plane of window for living area or sleeping quarters		> 55 dBA and ≤ 65 dBA	Provision for the installation of central air conditioning with a Type C warning clause
		> 65 dBA	Installation of central air conditioning with a Type D warning clause



Assessment Location	Time Period	Equivalent Sound Level - L _{eq} Road/Rail ^[1]	Ventilation and Warning Clause Requirements ^[2]
	Nighttime (23:00 - 7:00)	≤ 50 dBA	No Requirement
Plane of window for living area or sleeping quarters		> 50 dBA and ≤ 60 dBA	Provision for the installation of central air conditioning with a Type C warning clause
		> 60 dBA	Installation of central air conditioning with a Type D warning clause

Note: [1] Whistle noise is not included in combined road/rail assessments for warning clause requirements.
 [2] Warning clause types and requirements are provided in Appendix C.

The applicable noise criteria for Outdoor Living Areas (OLAs) specific to surface transportation are presented in **Table 5**. If the 16-Hour Equivalent Sound Level (Leq 16hr) at an OLA is greater than 55 dBA and less than or equal to 60 dBA, noise control measures may be applied to reduce the sound level to 55 dBA. Otherwise, prospective purchasers or tenants should be informed of potential elevated noise levels by way of warning clause Type A. For a Leq 16h of greater than 60 dBA, noise mitigation measures are required to reduce the noise levels to 55 dBA or less. Whistle noise is not included in the determination of the rail outdoor sound level.

Table 5: OLA Level Limits for Road and Rail Noise

Assessment Location	Equivalent Sound Level - Leq 16hr ^{[1],[2]} Noise Control Measures at Road/Rail Clause Requirement		
	≤ 55 dBA	No requirement	
Outdoor Living Area	> 55 dBA and ≤ 60 dBA	Installation of noise control measure OR a Type A warning clause ^[1]	
	> 60 dBA	Installation of noise control measure with a Type B warning clause	

Notes: [1] Daytime only (07:00 - 23:00)

[2] Whistle noise is not included in assessment of rail noise for warning clause requirements.

2.1.2 Transportation Sources

In assessing potential transportation noise impacts on the proposed development, VIA Rail's Chatham subdivision, Banwell Road, McHugh Street, and Tecumseh Street East were analyzed as surface transportation sources. All traffic data used in modelling road and rail traffic is included in **Appendix B**.



Rail Noise Sources

The south site of the proposed development is located directly north of VIA Rail's Chatham subdivision. Daily passenger and freight rail traffic in the area was obtained from VIA Rail as of February 21st, 2023. Daily passenger rail traffic for the year 2034 was projected based on a per annum growth of 2.5%. The City of Windsor's anti-whistling by-law is in effect in the development area; however, during a site visit completed by Dillon staff on March 15th, 2023, whistle noise was observed during train passbys. As there is an at-grade crossing at Banwell Road, trains may use their whistles in an emergency or to warn trespassers. As per the anti-whistling by-law, whistle noise was not considered as a transportation noise source. Rail traffic data forecasted to 2034 is presented in **Table 6**.

Train	Daytime	Nighttime	Daytime	Nighttime	24hr	Speed
Туре	Cars	Cars	Locomotives	Locomotives	Locomotives	[km/h]
	(07:00-	(23:00-	(07:00-23:00)	(23:00-07:00)		
	23:00)	07:00)				
Passenger	66	22	17	6	88	128
Freight	193	193	6	6	386	96

Table 6: Future (2034) Rail Traffic Data

Road Noise Sources

The development area is located west of Banwell Road, north of Tecumseh Road East, and is bisected by McHugh Street. Average annual daily traffic (AADT) for each roadway was determined through two methods:

- 1. Historic AADT counts provided by the City of Windsor; and
- 2. Peak hour turning movement counts (TMC) were gathered in 2023 for the intersections of Banwell Street and McHugh Street, and Banwell Street and Tecumseh Road East. A peak hour TMC to AADT factor of 11 was applied to determine associated AADTs for each roadway.

The maximum AADTs were selected to represent the roadways. A 90% and 10% split for daytime and nighttime traffic volumes, respectively, were used in the analysis. The future traffic volumes were assumed to have a 1.0% annual compound growth rate. The percentage of heavy and medium trucks was taken from the peak hour turning movement counts. The forecasted future (2034) road traffic data is presented in **Table 7**.

Table 7: Future (2034) Road Traffic Data

Roadway	2033 AADT	Medium Trucks (%)	Heavy Trucks (%)	Speed (km/h)
Banwell Road	18,857	1.5	1.41	50



Roadway	2033 AADT	Medium Trucks (%)	Heavy Trucks (%)	Speed (km/h)
McHugh Street	11,726	1.59	1.38	50
Tecumseh Road East	25,837	1.18	1.1	60

2.1.3 Predicted Sound Level

The noise analysis was completed using Cadna/A, a noise propagation software. The Cadna/A software includes the implementation of the Transportation Noise Model (TNM) roadway algorithms, as well as the Federal Transit Administration/Federal Railroad Administration (FTA/FRA) railway algorithms. The model is capable of incorporating various site specific features, such as elevation, berms, absorptive grounds, and barriers to accurately predict noise levels at specific receptors, pertaining to noise emissions from a particular noise source. The model accounts for reduction in sound level due to increased distance and geometrical spreading, air absorption, ground attenuation, and acoustical shielding by intervening structures and topography. The model is considered conservative as it represents atmospheric conditions that promote propagation of sound from source to receptor.

Railway Analysis

The railway noise impact assessment was conducted using the FRA algorithm using Cadna/A. The model's inputs are outlined in **Section 2.1.2**.

In order to confirm the modelling results of FRA protocol implemented through Cadna/A a comparative analysis was completed for rail traffic noise modelling, in which the results from FRA in Cadna/A were compared against those of STEAM implemented through STAMSON Version 5.04. This comparative analysis is discussed in **Sub-section 2.1.5**.

Roadway Analysis

The assessment for roadway impact noise was completed using the TNM, developed by the Federal Highway Administration (FHWA), implemented through Cadna/A. The model inputs used for the TNM algorithm are outlined in **Section 2.1.2**.

In order to confirm the modelling results of TNM protocol implemented through Cadna/A a comparative analysis was completed for road traffic noise modelling, in which the results from TNM in Cadna/A were compared against those of ORNAMENT implemented through STAMSON Version 5.04. This comparative analysis is discussed in **Section 2.1.5**.



Sensitive Receptor Locations

For the purposes of this study, the Building Evaluation feature was used in Cadna/A to assess the worstcase façade impacts throughout the proposed development. Based on the preliminary site plan for the proposed development, no Outdoor Living Areas (OLAs) have been identified that require assessment of impact due to transportation noise. The private balconies of the proposed development are assumed to be less than 4m in depth, and therefore are not considered OLAs per MECP NPC-300.

Transportation Noise Impacts – Plane of Window

Table 8 summarizes the predicted building façade noise levels from rail noise sources at the sensitivereceptors within the proposed development.

	Equivalent Sound Level - L _{eq} ^{[1],[2]} [dBA]						
Buidling	Road Impacts		Railway Impacts		Combined Road and		24hr
				1	Kalles		Railway
	Daytime	Nighttime	Daytime	Nighttime	Daytime	Nighttime	Impacts ^[4]
Building 'A'	62	50		= c	63	50	NI / A
(McHugh)	62	56	55	56	63	58	N/A
Building 'B'	62	FG	61	62	62	62	61
(McHugh)	02	50	01	02	05	02	01
Building 'C'	52	46	56	57	57	57	N/A
(McHugh)	55	40	50	57	57	57	N/A
Building 'D'	55	48	60	61	61	67	61
(McHugh)				01	01	02	
Respite							
Home	58	51	46	47	58	52	N/A
(McHugh)							
Building 'E'	62	56	51	52	63	57	N/A
(Leathorne)				32			
Building 'F'	63	57	50	51	63	57	N/A
(Leathorne)							
Building 'G'	64	57	48	50	64	57	N/A
(Leathorne)							
Building 'H'	64	58	48	49	65	58	N/A
(Leathorne)	•••						
Building 'l'	65	59	47	48	65	59	N/A
(Leathorne)	0.5						

Table 8: Combined Road and Rail Noise Prediction Summary Table - Facade Impacts



Notes: [1] L_{eq} represents maximum predicted impacts along façade.

[2] Predicted noise levels that exceed the applicable limits are presented in **bold**.

[3] Combined impacts may not be equal to road plus rail, as maxima may be in different locations along the façade.

[4] 24hr railway impacts are only assessed at the first row of residences that are within 100 m of the railway.

The predicted transportation sound levels for combined road and rail impacts at the building façades of the proposed development are presented in **Figure 2** and **Figure 3**, for the Banwell site and the Leathorne site, respectively.

2.1.4 Noise Control Measures

Façade Construction Recommendations

Based on the predicted façade sound levels shown in **Table 8**, and the threshold criteria outlined in **Table 2**, a detailed building component design analysis is required for Buildings 'A', 'B', 'C', and 'D'. Additionally, based on the threshold criteria for 24-hour rail noise set in **Table 3**, the south façades of Buildings 'B' and 'D' are to be built to a minimum of brick veneer or masonry equivalent construction (an acoustical equivalent of STC 54). An initial building component analysis is shown in **Table 9**. As detailed floor plans are not yet available, typical unit layouts were assumed. The predicted maximum impacts for road, locomotive, and train car noise were used to assess the required glazing for each building.

Tuble 5. Building component Analysis osing Maximum impacts				
Building	Maximum Required Glazing (STC)			
	Living/Dining Area	Sleeping Quarters		
Building 'A' (McHugh)	25	27		
Building 'B' (McHugh)	28	32		
Building 'C' (McHugh)	23	26		
Building 'D' (McHugh)	27	31		

Table 9: Building Component Analysis Using Maximum Impacts

For all other buildings with the proposed development, windows conforming to the Ontario Building Code (OBC) are anticipated to be sufficient to ensure the indoor sound level criteria is met (as outlined in **Table 1**). Windows which meet the structural and energy saving requirements of the OBC typically have STC29 / STC30 ratings.

The above mentioned STC ratings are conservatively calculated and represent the recommended minimum STC ratings for the windows. Windows should be carefully selected to ensure the entire assembly (frame and glazing) meets the specified minimum STC ratings. It is recommended that manufacturer tests and specifications be reviewed by an Acoustical Consultant upon selection.

Sensitive spaces located on corners of buildings, which have multiple façade exposure and potential contribution from multiple sources may require an STC increase of 3. As the design progresses, the

façade and glazing requirements should by reviewed by an Acoustical Consultant, ideally at the Site Plan Approval (SPA) stage, to confirm or update the above recommended STC ratings.

Ventilation Requirements and Warning Clauses

Based on the predicted façade sound levels shown in **Table 8**, and the threshold criteria outlined in **Table 4**, Buildings 'B' and 'D' will require installation of central air conditioning and a Type D warning clause. The remainder of the proposed development requires a provision for the installation of central air conditioning and Type C warning clause.

Additionally, VIA requires that a warning clause regarding the potential for noise and vibration impacts be applied to all sensitive locations within the 300m of the railway right-of-way.

All warning clauses should be included in agreements that are registered on Title for all Offers of Purchase and Sale, lease/rental agreements, and condominium declarations. The list of applicable warning clauses required for the proposed development are provided in **Appendix C**.

2.1.5 TNM/FTA Protocol Confirmation

In order to demonstrate appropriate implementation of Transportation Noise Model (TNM) through Cadna/A, noise modelling results obtained through the TNM protocol were compared against traffic noise modelling using MECP's ORNAMENT implemented through STAMSON version 5.04. Building G, 6th floor, east façade was used for this comparative analysis. The comparison results are presented in **Table 10.**

Table 10: TNM Protocol in Cadna/A and ORNAMENT Comparison

Assessment Location	TNM Cadna/A Result	ORNAMENT STAMSON Result	TNM Cadna/A Modelling Parameters	ORNAMENT STAMSON Modelling Parameters
Building 'G', South Façade, 6 th floor	64 dBA	64 dBA	Ground Absorption = 0.2	Absorptive Ground Surface

Similarly, noise modeling results obtained through FRA protocol through Cadna/A were compared against rail modelling using MECP's STEAM implemented through STAMSON version 5.04. The comparison results are shown in **Table 11.**



Table	e 11: FTA/FRA Pro	tocol in Cadna/	A and STEAM Comparison	
Assessment Location	FTA/FRA Cadna/A Result	STEAM STAMSON Result	FTA/FRA Cadna/A Modelling Parameters	STEAM STAMSON Modelling Parameters
Building 'D', South Façade, 2 nd floor	58 dBA	58 dBA	Ground Absorption = 0.6	Absorptive Ground Surface

The results indicate that the predicted noise impacts obtained through TNM and FRA protocols in Cadna/A and those of ORNAMENT and STEAM are equivalent. The receptor locations assessed in this comparative study are presented in **Figure 4**.

The STAMSON model output is provided in **Appendix D.**

2.2 Stationary Noise Assessment

A review of the site and surrounding area has been conducted to identify potential stationary sources (e.g., industrial / commercials) that have the potential to impact the proposed sensitive use. A site visit was completed by Dillon staff on March 15th, 2023 for the purpose of classifying facilities in proximity to the proposed developments, identifying potential sources of noise, and classifying the acoustic environment.

2.2.1 MECP Guideline D-6 Compability betwea en Industrial Facilities

The MECP's land-use compatibility guidelines (D-series) are intended to prevent or minimize the encroachment of sensitive land uses upon industrial/commercial land uses and vice versa, as these two types of land uses are normally incompatible, due to possible adverse effects (e.g., noise) on the sensitive land use. As per the guideline, potential noise impact from commercial / industrial establishments within the potential influence area/or recommended minimum separation distance, as outlined in D-6 (see **Table 12**), should be assessed.



Industrial Classification ^[1]	Area of Influence	Recommended Minimun Separation Distance
Class I	70 m	20 m
Class II	300 m	70 m
Class III	1000 m	300 m

2.2.2 Facilities

The land use planning guide, *D-6 Compatibility between Industrial Facilities*, was used for the classification of the surrounding industrial facilities and the compatible proximities for the proposed sensitive land use. The criteria for classification of industrial categories are presented in **Appendix E.**

Table 13 describes the industries that were identified with the potential to have noise impacts on the proposed development.

Table 13: Facilities with Proximity to Proposed Development

Facility and Address	Industrial Classification	Descripon` of Operations	Environmental Compliance Approval
Ideas Cabinets and Countertops, 11210 Tecumseh Road E	Class 1	Material cutting, delivery truck movements	No
DonTrans Trucking Facility, 11000 Tecumseh Road E	Class 1	Idling trucks, truck maintenance (pneumatic tools)	No

2.2.3 Staonaä ry Noise Criteria and Area Classificaon`

MECP Publication NPC-300 outlines applicable noise criteria for the proposed development associated with surrounding industrial and commercial stationary noise sources. The noise criteria are defined using area classifications (not to be confused with the D-6 industrial classifications), which are based on the receptor's existing acoustical environment. NPC-300 classification are as follows:

- Class 1 Urban Area;
- Class 2 Semi-Urban / Semi Rural;
- Class 3 Rural Area; and
- Class 4 Areas of Redevelopment and Infill.

Different noise guideline limits apply to each area classification, as shown below in Table 14.



		Exclusionary Sound		Level Limit - L _{eq} 1hr	
Assessment Location	Time Period	Class 1	Class 2	Class 3	Class 4
Plane of window for living area or sleeping quarters	Daytime (07:00 - 19:00)	50 dBA	50 dBA	45 dBA	60 dBA
	Evening (19:00 - 23:00)	50 dBA	50 dBA	40 dBA	60 dBA
	Nighttime (23:00 - 07:00)	45 dBA	45 dBA	40 dBA	55 dBA
Outdoor points of	Daytime (07:00 - 19:00)	50 dBA	50 dBA	45 dBA	55 dBA
reception	Evening (19:00 - 23:00)	50 dBA	45 dBA	40 dBA	55 dBA

Table 14: Exclusionary Limits for Stationary Noise Sources

During the site visit conducted on March 15th, 2023, it was observed that the acoustic environment surrounding the proposed development is dominated by transportation noise and general urban hum during daytime. Based on the nature of the area, the Class 1 urban sound level limits would apply.

2.2.4 Staonaäry Sources

The noise sources associated with the industries identified in **Section 2.2.2** are outlined below in **Table 15.** The facilities and their corresponding location are presented in **Figure 5.**

Table 15: Stationary Noise Sources

Noise Source ^[1]	Associated Facility	# of Sources	Source Type
Circular saw cutting concrete	Ideas Cabinets and Countertops	1	Point source, steady
Truck movements	Ideas Cabinets and Countertops	1	Line source, steady
Pneumatic tools	DonTrans Trucking Facility	1	Point source, quasi- steady
Idling truck	DonTrans Trucking Facility	2	Point source, steady

Note: [1] Sound power level and spectrum of noise sources are provided in Appendix F.

MECP's publication, *NPC-104 – Sound Level Adjustments*, specifies sound level adjustments (penalties) to be applied to the observed sound level of a source based on its sound quality. NPC-104 specifies that a penalty of +5 dB be applied to any sound that has a pronounced audible tonal quality or cyclical variation, and that a +10 dB penalty be applied to a quasi-steady impulsive sound. "Quasi-steady" is a sequence of impulsive sounds emitted from a source having a time interval of less than 0.5 s, per



MECP's *NPC-101 – Technical Definitions*. Sound level penalties are not accumulated when more than one sound quality applies. Instead, the largest of the applicable penalties shall be used.

The operation of pneumatic tools at the Trucking Depot is assumed to operate as a quasi-steady state impulsive sound. A +10 dB penalty was applied to this noise source.

2.2.5 Noise Sensitive Points of Reception

As per the MECP noise guidelines NPC-300, a Point of Reception (POR), as it applies to impact assessments of stationary sources, means any location on a noise sensitive land use where noise from a stationary source is received. Noise sensitive land uses include the following lands:

- Permanent, seasonal, or rental residences;
- Hotels, motels, and campgrounds;
- Schools, universieas, libraries, and daycare centres;
- Hospitals and clinics, nursing / rerement homes; and
- Places of worship.

The residential buildings and respite home within the McHugh proposed development were considered noise sensitive receptors. The noise sensitive receptors of the Leathorne site were determined to be outside of the Potenal Influence` Area of the identified facilities.

2.2.6 Predicted Sound Levels - Stationary

The noise analysis was completed using CADNA/A, an outdoor noise propagation model, based on ISO Standard 9613, Part 1: Calculation of the absorption of sound by the atmosphere, 1993 and Part 2: General method of calculation (ISO-9613-2:1996). The model is capable of incorporating various site specific features, such as elevation, berms, absorptive grounds, and barriers to accurately predict noise levels at specific receptors, pertaining to noise emissions from a particular source / sources. The ISO based model accounts for reduction in sound level due to increased distance and geometrical spreading, air absorption, ground attenuation, and acoustical shielding by intervening structures and topography. The model is considered conservative as it represents atmospheric conditions that promote propagation of sound from the source to the receiver.

The following assumptions were incorporated in the noise propagation modelling:

- A global ground absorption coefficient of 0.50, representing reflective grounds between sources and receptors, and 0.2, representing paved areas were incorporated in the noise model;
- A second order reflecon` was incorporated in the noise model;
- The ground within the study area is considered to be generally flat with the exception of an exisng` berm located between the McHugh site and the rail right of way; and
- Nearby industries were assumed to only operate during the daytime and evening periods (07:00-19:00).



For the purposes of the staonary assessment, the Building Evaluaon feature in Cadna/A was used to determine building facades with the worst-case noise impacts.

Impacts from the stationary noise sources were predicted through noise propagation modelling. The predicted receptor noise levels (at the proposed development site) were compared against the applicable criteria, as specified in NPC-300 (see **Table 14**).

Table 16 summarizes the predicted building façade daytime noise levels from stationary noise sourcesfrom the surrounding industries at the proposed development.

Building	Maximum Façade Leq (1 hour) (dBA) ^[1]	MECP Compliance
Building 'A' (McHugh)	42	Yes
Building 'B' (McHugh)	47	Yes
Building 'C' (McHugh)	48	Yes
Building 'D' (McHugh)	50	Yes
Respite Home (McHugh)	37	Yes

Table 16: Stationary Noise Impact Summary Table – Surrounding Industries on Proposed Development

Note: [1] Values in exceedance of MECP limits are shown in **bold**.

The predicted stationary noise impacts from the surrounding industries at the proposed development façades are shown in **Figure 5**.

The predicted impacts from the nearby stationary sources meet the MECP NPC-300 Class 1 exclusionary limits at the proposed development.

2.3 Rail Vibraon Assessment

The proposed development is located approximately 55 m from the VIA Chatham Subdivision principal mainline right-of-way. As the proposed development is located within the vibration influence area of 75 metres, per VIA, and the Guidelines for New Development in Proximity to Railway Operations (FCM/RAC, 2013), a vibration assessment for the proposed development is required.

2.3.1 Rail Vibraon Criteriaà

There are no MECP guidelines with respect to railway vibration and proposed sensitive land-uses. Applicable guidelines for vibration impacts due to railway operations are those published in the *Guidelines for New Development in Proximity to Railway Operations* (FCM/RAC, 2013).

Overall vibration levels from railway activities are recommended not to exceed 0.14 mm/s RMS between 4 Hz and 200 Hz on and above the first floor of all dwellings. This criterion is based on the human

perception of ground-borne vibration, published in the International Standard ISO 2631-2. Vibration levels from railway operations meeting this criterion will generally not be perceptible by the occupants.

2.3.2 Rail Vibraon Meaà surements

On March 15th and March 16th, 2023, Dillon staff visited the site of the proposed Banwell and McHugh development to measure rail vibration levels from the ROW. Measurements were conducted 30 m from the ROW using the Instantel Minimate[®] Plus seismograph. The vibration measurement location is shown in **Figure 6**. The instrument is capable of measuring vibrations between 4 and 200 Hz within ± 3 VdB. Measurements were conducted for four passenger train passbys and two freight train passbys between 18:30 on March 15th and 11:00 on March 16th.

The results of the measurements are shown below in Table 17.

Date	Time of Passby	Train Type	Max RMS velocity @ 30 m (mm/s)
March 15 th , 2023	18:35	Freight	0.124
March 15 th , 2023	22:08	Passenger	0.004
March 15 th , 2023	23:55	Passenger	0.004
March 16 th , 2023	03:11	Freight	0.069
March 16 th , 2023	05:55	Passenger	0.004
March 16 th , 2023	10:59	Passenger	0.005

Table 17: Summary of Rail Vibration Measurements

2.3.3 Rail Vibraon Impaàcts

The maximum measured vertical ground-borne vibration level, 0.124 mm/s RMS, is below the 0.14 mm/s RMS FCM/RAC criterion. As the measurements were completed at 30 metres from the railway right-of-way, and the nearest foundation setback is proposed at approximately 55 m, impacts are expected to be less than what is presented in **Table 17**.

Additionally, further reduction of ground-borne vibration levels are expected due to the coupling-loss of the proposed building foundations, which will result in lower vibration levels within the residential units. As such, no vibration mitigation measures are deemed necessary to meet the applicable criterion.

VIA requires that a warning clause regarding the potential for noise and vibration impacts be applied to all residential locations within 300 metres of their right-of-way.

All warning clauses should be included in agreements that are registered on Title for all Offers of Purchase and Sale, lease/rental agreements, and condominium declarations. The list of applicable warning clause requirements for the proposed development are provided in **Appendix C**.

3.0 Conclusions

Dillon Consulting Limited (Dillon) was retained by 1027458 Ontario Inc. to complete a Noise and Vibration Assessment as requested by the City of Windsor for the proposed mixed use developments located at Banwell Street and McHugh Street. This study has been completed in support of Zoning By-law Amendment and Official Plan Amendment applications for the proposed development.

The noise and vibration assessment focuses on the noise impacts from nearby transportation sources and stationary sources (i.e., nearby industrial operations) on the proposed development and vibration impacts from the nearby railway on the proposed development.

Transportation Noise Assessment

As outlined in Section 2.1.4, the results of the transportation noise assessment confirm that the noise impacts on the proposed development can be sufficiently controlled by:

- Buildings 'B' and 'D' require an upgraded glazing of STC 32 and 31, respectively, for sleeping quarters;
- Buildings 'B' and 'D' require a brick veneer or acoustical equivalent (STC 54) façade construction;
- Buildings 'B' and 'D' require the installation of central air conditioning with a Type D warning clause; and
- Buildings 'A', 'C', 'E', 'F', 'G', 'H', and 'I' require the provision for the installation of central air conditioning with a Type C warning clause.

Stationary Noise Assessment

The noise impacts from surrounding commercial and industrial properties on the development were assessed through modelling of stationary sources in Cadna/A using ISO:9613 standards. It was determined that the noise impacts from the surrounding commercial and industrial properties will not exceed MECP requirements.

Rail Vibration Assessment

The maximum measured vertical ground-borne vibration level, 0.124 mm/s RMS, is below the 0.14 mm/s RMS FCM/RAC criterion. As such, no vibration mitigation measures are deemed necessary to meet the applicable criterion.

VIA requires that a warning clause regarding the potential for noise and vibration impacts be applied to all sensitive receptor locations within 300 metres of their right-of-way.



4.0 Closure

This noise and vibration assessment has been prepared based on the information provided and/or approved by 1027458 Ontario Inc. This report is intended to provide a reasonable review of available information within an agreed work scope, schedule, and budget. This report was prepared by Dillon for the sole benefit of the 1027458 Ontario Inc. The material in the report reflects Dillon's judgement in light of the information available to Dillon at the time of this report preparation. Any use which a third party makes of this report, or any reliance on or decisions made based on it, are the responsibilities of such third parties. Dillon accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

We trust that the report is to your satisfaction. Please do not hesitate to contact the undersigned if you have any further questions on this report.

Respectfully Submitted:

DILLON CONSULTING LIMITED

Heggart

Callum Heggart, EIT



Lucas Arnold, P.Eng Associate

Attachments Attachment A: Development Site Plan Attachment B: Road/Rail Traffic Data Attachment C: Warning Clauses Attachment D: Stamson Modelling Attachment E: D-6 Classification Criteria Attachment F: Stationary Source Data

Monthligh

Thom Wright, EIT



1027458 Ontario Inc. *Noise and Vibration Assessment - Banwell and McHugh Mixed Use Developments* March **2023** - 22-5144

Figures



1027458 Ontario Inc. *Noise and Vibration Assessment* March 2023 - 22-5144



Scale 1: 8,000

Figure 1

Project # 22-5144

Mar 2023

Subject Site and Surrounding Area

McHugh St and Banwell Rd, Windsor, Ontario





Figure 2

Project # 22-5144

Mar 2023

Transportation Impacts, McHugh Site Rail and Road - Daytime Plus Max Nighttime

McHugh St and Banwell Rd, Windsor, Ontario





Scale 1: 2,500

Figure 3	
Project # 22-5144	
Mar 2023	

Transportation Impacts, Leathorne Site Rail and Road - Daytime Plus Max Nighttime

Leathorne St and Banwell Rd, Windsor, Ontario





Scale 1: 5,000

Figure 4

STAMSON Comparison Calculation Sites

Project # 22-5144

Mar 2023

McHugh St and Banwell Rd, Windsor, Ontario





Scale 1: 2,750

Figure 5	Impacts of Stationary Sources McHugh Site
Project # 22-5144	
Mar 2023	McHugh St and Banwell Rd, Windsor, Ontario





Scale 1: 1,500

Figure 6

Project # 22-5144

Mar 2023

Location of Vibration Measurements McHugh Site

McHugh St and Banwell Rd, Windsor, Ontario



Appendix A

Development Site Plan



1027458 Ontario Inc. *Noise and Vibration Assessment* March 2023 - 22-5144



Appendix B

Road/Rail Traffic Data





REAL ESTATE

65 Front St. West, Union Station, Rm G-C-021 Toronto, Ontario M5J 1E7

BY EMAIL

21 February 2023

Mr. Thom Wright Dillon Consulting Limited 235 Yorkland Blvd, Suite 800 Toronto, Ontario M2J 4Y8

Dear Sir:

RE: Train Traffic Data – Mile 100.08 VIA's Chatham Subd. - City of Windsor

Further to your request for train traffic information in the vicinity of Banwell Road in the City of Windsor, please find below a summary of typical daily rail traffic.

Train Type	Frequency Day (0700- 2300)	Frequency Night (2300- 0700)	Max. Cars	Locomotives	Speed (mph)
Passenger	6	1	8	2	80
Freight	1	1	140	4	60
Way Freight	0	0	0	0	0

On site observations and measurements are recommended to capture actual noise and vibration levels from pass-by train operations.

Please note that rail traffic is subject to change due to varying economic and weather conditions, track maintenance work, holiday periods and emergencies. For the purpose of noise and vibration analysis, train volumes should be escalated 2.5% per annum for a 10-year period.

The above chart identifies 7 scheduled passenger trains, which is 1 less than our pre-COVID schedule. Without being able to confirm the return of the deferred train, please use the info in the chart as above in your study. For your info, VIA is in the process of replacing our corridor rail fleet with new equipment starting later this year, however we do not anticipate any schedule changes in the Toronto-Windsor Corridor at this time.

Anti-whistling by-laws are in effect throughout the City of Windsor, however all engines must sound their bells when occupying at-grade road crossings and they may still use their whistles in an emergency or to warn trespassers. It is noted that Clover Ave. and Lesperance Road level crossings are in close proximity to the subject site.

The mainline track at this location consists of continuously welded rail (CWR) while portions of the service track is bolted rail. Equipment loads are not to exceed 268,000 lbs.





VIA is not in favour of incompatible land uses such as Residential being introduced in close proximity to our busy Chatham Subdivision due to potential safety and environmental conflicts. Development adjacent to our rail corridor is not appropriate without satisfactory noise, vibration and safety mitigation measures as per the attached.

Should you have any questions, please feel free to contact me at 416-956-7669.

Yours truly,

John C. Walsh, P. Eng. Senior Property Manager Real Estate - Central Region







PRINCIPAL MAIN LINE

- A. Noise berm, or combination berm and acoustic fence, adjoining and parallel to the railway rightof-way and having returns at the ends:
 - (i) Minimum total height 5.5 metres above top-of-rail.
 - Acoustic fence to be constructed without openings and of a durable material weighing not less than 20 kg. per square metre (4 lb/sq. ft) of surface area.

Note: The Railway may consider other measures recommended by an approved Noise Consultant satisfactory to the Railway.

- B. Safety setback of dwellings from the railway right-of-way to be a minimum of 30 metres in conjunction with the safety berm noted below. In the absence of a safety berm, we require a dwelling setback of 120 metres.
- C. Ground-borne vibration transmission to be estimated through site testing and evaluation to determine if dwellings within 75 metres of the Railway right-of-way will be impacted by vibration conditions in excess of 0.14 mm/sec. RMS between 4 Hz. and 200 Hz. The monitoring system should be capable of measuring frequencies between 4 Hz and 200 Hz, +/- 3 dB with an RMS averaging time constant of 1 second. If in excess, isolation measures will be required to ensure living areas do not exceed 0.14 mm/sec. RMS on and above the first floor of the dwelling.
- D. Safety berm adjoining and parallel to the railway right-of-way with returns at the ends, 2.5 metres above grade is required despite none being required to address the Railway's noise concerns.
- E. The following clause should be inserted in all offers to purchase, agreements of sale and purchase or lease and in the title deed or lease of each dwelling; "Warning: VIA Rail Canada Inc. or its assigns or successors in interest has or have a right-of-way within 300 metres from the land the subject hereof. There may be alterations to or expansions of the rail facilities on such right-of-way in the future including the possibility that the railway or its assigns or successors as aforesaid may expand its operations, which expansion may affect the living environment of the residents in the vicinity, notwithstanding the inclusion of any noise and vibration attenuating measures in the design of the development and individual dwelling(s). VIA will not be responsible for any complaints or claims arising from use of such facilities and/or operations on, over or under the aforesaid right-of-way."
- F: Any proposed alterations to the existing drainage pattern affecting Railway property must receive prior concurrence from the Railway and be substantiated by a drainage report to the satisfaction of the Railway.
- G. The Developer shall install and maintain at his own expense, a chain link fence of minimum 1.83 metre (6 feet) height along the mutual property line, which shall be maintained by the Owner.
- H. The Owner shall through restrictive covenants to be registered on title and all agreements of purchase and sale or lease provide notice to the public that the safety berm, fencing and vibration isolation measures implemented are not to be tampered with or altered and further that the Owner shall have the sole responsibility for and shall maintain these measures to the satisfaction of VIA Rail.
- I. Pursuant to the Planning Act, the Municipality shall provide this office of the Railway with written notice of the public meeting, by-law and passing of the by-law appropriately zoning the lands hereby proposed for subdivision.
- J. The Owner enter into an Agreement stipulating how VIA Rail's concerns will be resolved and will pay VIA Rail's reasonable costs in preparing and negotiating the agreement.





Morning Peak Diagram	Specified Period One Hour Peak From: 7:00:00 From: 8:00:00 To: 10:00:00 To: 9:00:00
Municipality:WindsorSite #:2302900003Intersection:Banwell Rd & McHugh StTFR File #:1Count date:16-Feb-23	Weather conditions: Person counted: Person prepared: Person checked:
** Signalized Intersection **	Major Road: Banwell Rd runs N/S
North Leg Total: 680 Buses 0 4 0 4 North Entering: 450 Trucks 0 1 0 1 North Peds: 11 Cars 27 374 44 44 Peds Cross: M Totals 27 379 44	Buses 6 Trucks 2 Cars 222 Totals 230 East Leg Total: 596 East Entering: 376 East Peds: 0 Peds Cross: X
Buses Trucks Cars Totals 11 1 302 314 McHugh St	anwell Rd Cars Trucks Buses Totals 39 0 3 42 178 1 5 184 149 0 1 150 E
Buses Trucks Cars Totals	McNorton St
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	Cars Trucks Buses Totals 216 2 2 220
Peds Cross:XCars659CarsWest Peds:1Trucks1TrucksWest Entering:253Buses8BusWest Leg Total:567Totals668Totals	rs 97 174 70 341 Peds Cross: ▶ ks 0 2 1 3 South Peds: 5 es 6 2 1 9 South Entering: 353 ils 103 178 72 South Leg Total: 1021
Comn	nents



Afternoon Peak Diagram	Specified Period One Hour Peak								
5	From: 15:00:00 From: 16:45:00								
	To: 18:00:00 To: 17:45:00								
Municipality:WindsorSite #:2302900003Intersection:Banwell Rd & McHugh StTFR File #:1Count date:16-Feb-23	Weather conditions: Person counted: Person prepared:								
** Signalized Intersection **	Major Road: Banwell Rd runs N/S								
North Leg Total: 946 Buses 0	Buses 0 Trucks 1 Cars 544 Totals 545 Buses 0 East Leg Total: 783 East Entering: 330 East Peds: 1 Peds Cross: X								
Buses Trucks Cars Totals 2 0 342 344 McHugh St	anwell Rd Cars Trucks Buses Totals 43 0 0 43 178 0 0 178 109 0 0 109 E								
Buses Trucks Cars Totals 0 0 14 14 0 0 168 168	McNorton St								
0 0 114 114 0 0 296 Banwell Rd	Cars Trucks Buses Totals 452 1 0 453								
Peds Cross:XCars537CarsWest Peds:1Trucks1TrucksWest Entering:296Buses0BusesWest Leg Total:640Totals538Totals	Ins 142 487 221 850 Peds Cross: ▶ ks 0 1 0 1 South Peds: 1 es 2 0 0 2 South Entering: 853 als 144 488 221 South Leg Total: 1391								
Comn	nents								



Total Count Diagram

Municipality: Windsor	Weather conditions:									
Site #: 2302900003										
Intersection: Banwell Rd & McHugh St										
TFR File # 1	Person counted:									
Count date: 16-Feb-23	Person prepared:									
	Person checked:									
** Signalized Intersection **	Major Road: Banwell Rd runs N/S									
North Leg Total: 4445 Buses 0 13 3 16	Buses 27 East Leg Total: 3731									
North Entering: 2332 Trucks 2 7 1 10	D Trucks 11 East Entering: 1874									
North Peds: 37 Cars 116 1886 304 23	306 Cars 2075 East Peds: 10									
Peds Cross: 🛏 Totals 118 1906 308	Totals 2113 Peds Cross: X									
	anwell Rd									
Buses Trucks Cars Totals 🖓 🎝	Cars Trucks Buses Totals									
28 5 1663 1696										
	N 878 1 10 889									
	$\frac{718}{1054}$ $\frac{0}{1}$ $\frac{1}{10}$									
WCHugh St W	E									
Buses Trucks Cars Totals	McNorton St									
3 0 101 104 亡 5	s									
16 1 745 762 🕞	V									
9 3 675 687 🦳	Cars Trucks Buses Totals									
28 4 1521 Banwell Rd	Image: Market state Image: Market state									
Peds Cross: X Cars 3279 Ca	ars 669 1716 783 3168 Peds Cross: 🛏									
West Peds: 3 Trucks 10 Truc	ks 2 11 1 14 South Peds: 21									
West Entering: 1553 Buses 23 VBus	es 18 16 3 37 South Entering: 3219									
West Leg Total: 3249 Totals 3312 Tota	als 689 1743 787 South Leg Total: 6531									
Comn	nents									



	Traffic Count Summary											
Intersection:	Banwell	Rd & M	cHugh S	st	Count [Date: 16-Feb-2	3 М	unicipality: W	'indsor			
	Nort	h Appro	ach Tot	als		No white (Constanting		Sout	th Appro	bach To	tals	
Hour	Incluc	les Cars,	Frucks, & E	Buses	Total	Total	Hour	Inclu	des Cars, [·]	Trucks, & I	Buses	Total
Ending	Left	Thru	Right	Grand Total	Peds	Approaches	Ending	Left	Thru	Right	Grand Total	Peds
7:00:00 8:00:00 9:00:00 10:00:00 15:00:00 16:00:00 17:00:00 18:00:00	Left 0 30 44 48 0 64 60 62	Thru 0 364 379 246 0 297 310 310	Right 0 16 27 23 0 16 12 24	Total 0 410 450 317 0 377 382 396	0 6 11 6 0 10 3 1	0 607 803 619 0 1114 1187 1221	7:00:00 8:00:00 9:00:00 10:00:00 15:00:00 16:00:00 17:00:00 18:00:00	Left 0 0 50 0 103 0 78 0 0 158 0 147 0 153	Thru 0 114 178 152 0 379 454 466	Right 0 33 72 72 0 200 200 204 206	Total 0 197 353 302 0 737 805 825	0 5 1 0 14 1 0
Totals: Hour Ending	308 Easi Incluc	<u>1906</u> t Appro les Cars, ⁻	118 ach Tota Trucks, & E	2332 als Grand Total	37 Total Peds	5551 East/West Total Approaches	S Totals Hour Ending	s: 689 Wes	1743 St Appro des Cars,	787 ach Tot Trucks, & I Bight	3219 als Grand Total	21 Total Peds
7.00.00		0			0	0	7.00.00		0			0
8:00:00 9:00:00 10:00:00 15:00:00 16:00:00 17:00:00 18:00:00	0 125 150 98 0 121 110 115	0 103 184 89 0 160 175 178	0 37 42 37 0 56 47 47	0 265 376 224 0 337 332 340	1 0 3 0 4 1 1	60 629 403 0 698 619 618	7:00:00 8:00:00 9:00:00 10:00:0 15:00:0 16:00:0 17:00:0 18:00:0	0 0 0 6 0 10 0 10 0 22 0 42 0 19 0 17	0 75 104 80 0 186 159 158	0 114 139 89 0 133 109 103	0 195 253 179 0 361 287 278	0111001100
Totals:	719	889	266	1874	<u>10</u>	3427	W Total	s: 104	762	687	1553	3
Hours E Crossing	nding: g Values	7:00 : 0	8:00 240	9:00 360	10:00 204	OF I FATTIC CF	15:00 0	16:00 373	נפנ 17:00 308	18:00 311		



	Passenger Cars - North Approach			Trucks - North Approach						Buses - North Approach						Pedestrians				
Interval	Le	ft	Th	iru	Rig	ght	Le	əft	Th	ru	Rig	ght	Le	əft	Th	ru	Rig	jht	North	Cross
Time	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr
7:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15:00	4	4	50	50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30:00	11	7	116	66	2	2	0	0	1	1	0	0	0	0	0	0	0	0	6	6
7:45:00	16	5	229	113	10	8	0	0	2	1	0	0	0	0	0	0	0	0	6	0
8:00:00	30	14	361	132	16	6	0	0	2	0	0	0	0	0	1	1	0	0	6	0
8:15:00	44	14	468	107	20	4	0	0	3	1	0	0	0	0	3	2	0	0	9	3
8:30:00	54	10	545	77	26	6	0	0	3	0	0	0	0	0	4	1	0	0	11	2
8:45:00	62	8	635	90	34	8	0	0	3	0	0	0	0	0	4	0	0	0	16	5
9:00:00	74	12	735	100	43	9	0	0	3	0	0	0	0	0	5	1	0	0	17	1
9:15:00	95	21	805	70	46	3	0	0	3	0	0	0	0	0	8	3	0	0	18	1
9:30:00	103	8	872	67	53	7	0	0	3	0	1	1	0	0	9	1	0	0	18	0
9:45:00	113	10	924	52	60	7	0	0	3	0	1	0	0	0	9	0	0	0	22	4
10:00:00	122	9	977	53	65	5	0	0	3	0	1	0	0	0	9	0	0	0	23	1
10:15:00	122	0	977	0	65	0	0	0	3	0	1	0	0	0	9	0	0	0	23	0
15:00:00	122	0	977	0	65	0	0	0	3	0	1	0	0	0	9	0	0	0	23	0
15:15:00	135	13	1063	86	68	3	0	0	3	0	1	0	0	0	9	0	0	0	29	6
15:30:00	153	18	1128	65	74	6	0	0	3	0	1	0	0	0	9	0	0	0	31	2
15:45:00	169	16	1195	67	77	3	0	0	4	1	1	0	0	0	10	1	0	0	32	1
16:00:00	185	16	1272	77	80	3	0	0	4	0	2		1	1	10	0	0	0	33	1
16:15:00	197	12	1348	/6	81	1	0	0	5	1	2	0	2	1	13	3	0	0	36	3
16:30:00	207	10	1436	88	84	3	0	0	5	0	2	0	3	1	13	0	0	0	36	0
16:45:00	227	20	1509	/3	89	5	0	0	5	0	2	0	3	0	13	0	0	0	36	0
17:00:00	243	16	15/8	69	92	3	0	0	5	0	2	0	3	0	13	0	0	0	36	0
17:15:00	261	18	1007	89	95	3	1	1	6	1	2	0	3	0	13	0		0	30	0
17:30:00	2/8	17	1/42	/5	101	10	1	0	6	0	2	0	3	0	13	0		0	37	0
17:45:00	290	12	1823	62	110	10	1	0	0	1	2	0	3	0	13	0		0	37	0
10.00.00	204	14	1000	03	116	5	1	0	7	0	2	0	2	0	13	0		0	27	0
18:15:15	304	0	1996	0	116	0	1	0	7	0	2	0	2	0	13	0		0	37	0
10.13.13	304	0	1000	0	110	0	1	0	- 1	0	2	0	5	0	15	0		0	57	0
																	1			



	Passenger Cars - East Approach				Tru	cks - Eas	t Approa	ch		Buses - East Approach						Pedestrians				
Interval	Le	ft	Tr	nru	Rig	ght	Le	əft	Th	ru	Ri	ght	Le	əft	Th	ru	Rig	jht	East	Cross
Time	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr
7:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15:00	18	18	12	12	4	4	0	0	0	0	0	0	0	0	1	1	0	0	0	0
7:30:00	42	24	34	22	13	9	0	0	0	0	0	0	0	0	1	0	1	1	1	1
7:45:00	93	51	71	37	20	7	0	0	0	0	0	0	0	0	1	0	5	4	1	0
8:00:00	125	32	102	31	32	12	0	0	0	0	0	0	0	0	1	0	5	0	1	0
8:15:00	167	42	143	41	45	13	0	0	1	1	0	0	0	0	2	1	6	1	1	0
8:30:00	206	39	186	43	51	6	0	0	1	0	0	0	1	1	4	2	6	0	1	0
8:45:00	236	30	242	56	57	6	0	0	1	0	0	0	1	0	5	1	7	1	1	0
9:00:00	274	38	280	38	71	14	0	0	1	0	0	0	1	0	6	1	8	1	1	0
9:15:00	306	32	310	30	78	7	0	0	1	0	0	0	1	0	6	0	8	0	3	2
9:30:00	330	24	331	21	83	5	0	0	1	0	0	0	1	0	6	0	8	0	4	1
9:45:00	350	20	347	16	96	13	0	0	1	0	0	0	1	0	6	0	8	0	4	0
10:00:00	372	22	369	22	108	12	0	0	1	0	0	0	1	0	6	0	8	0	4	0
10:15:00	372	0	369	0	108	0	0	0	1	0	0	0	1	0	6	0	8	0	4	0
15:00:00	372	0	369	0	108	0	0	0	1	0	0	0	1	0	6	0	8	0	4	0
15:15:00	406	34	417	48	120	12	0	0	1	0	0	0	1	0	7	1	8	0	4	0
15:30:00	443	37	459	42	133	13	0	0	1	0	0	0	1	0	8	1	8	0	4	0
15:45:00	466	23	493	34	146	13	0	0	1	0	0	0	1	0	8	0	8	0	6	2
16:00:00	493	27	526	33	164	18	0	0	1	0	0	0	1	0	9	1	8	0	8	2
16:15:00	526	33	564	38	178	14	0	0	1	0	0	0	1	0	10	1	8	0	9	1
16:30:00	559	33	607	43	193	15	0	0	1	0	0	0	1	0	10	0	8	0	9	0
16:45:00	581	22	653	46	201	8	0	0	1	0	0	0	1	0	10	0	8	0	9	0
17:00:00	603	22	700	47	211	10	0	0		0	0	0		0	10	0	8	0	9	0
17:15:00	630	27	743	43	224	13	0	0		0	0	0		0	10	0	8	0	9	0
17:30:00	658	28	784	41	233	9	0	0	1	0	0	0		0	10	0	8	0	10	1
17:45:00	690	32	831	47	244	11	0	0	1	0	0	0		0	10	0	8	0	10	0
18:00:00	718	28	8/8	4/	258	14	0	0	1	0	0	0		0	10	0	8	0	10	0
18:15:00	718	0	8/8	0	258	0	0	0		0	0	0	1	0	10	0	8	0	10	0
18:15:15	/18	0	878	0	258	0	0	0	1	0	0	0		0	10	U	8	0	10	0



	Passenger Cars - South Approach				Truc	cks - Sout	h Appro	ach		Buses - South Approach						Pedestrians				
Interval	Le	ft	Tr	nru	Rig	ght	Le	əft	Th	ru	Ri	ght	Le	eft	Th	ru	Rig	ght	South	Cross
Time	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr
7.00.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15:00	10	10	18	18	7	7	0	0	1	1	0	0	0	0	3	3	0	0	0	0
7:30:00	21	11	42	24	15	8	0	0	1	0	0	0	3	3	5	2	0	0	0	0
7:45:00	37	16	65	23	26	11	0	0	2	1	0	0	4	1	7	2	0	0	0	0
8:00:00	46	9	104	39	33	7	0	0	2	0	0	0	4	0	8	1	0	0	0	0
8:15:00	64	18	155	51	44	11	0	0	2	0	1	1	5	1	8	0	1	1	1	1
8:30:00	86	22	194	39	64	20	0	0	3	1	1	0	6	1	8	0	1	0	1	0
8:45:00	119	33	235	41	87	23	0	0	4	1	1	0	9	3	10	2	1	0	5	4
9:00:00	143	24	278	43	103	16	0	0	4	0	1	0	10	1	10	0	1	0	5	0
9:15:00	162	19	313	35	115	12	0	0	6	2	1	0	11	1	10	0	1	0	5	0
9:30:00	176	14	354	41	135	20	0	0	6	0	1	0	12	1	10	0	1	0	6	1
9:45:00	195	19	392	38	152	17	0	0	6	0	1	0	12	0	10	0	1	0	6	0
10:00:00	217	22	427	35	175	23	1	1	7	1	1	0	13	1	10	0	1	0	6	0
10:15:00	217	0	427	0	175	0	1	0	7	0	1	0	13	0	10	0	1	0	6	0
15:00:00	217	0	427	0	175	0	1	0	7	0	1	0	13	0	10	0	1	0	6	0
15:15:00	265	48	507	80	229	54	1	0	9	2	1	0	14	1	10	0	1	0	13	7
15:30:00	298	33	595	88	278	49	1	0	9	0	1	0	14	0	12	2	1	0	19	6
15:45:00	325	27	705	110	322	44	2	1	9	0	1	0	15	1	14	2	1	0	20	1
16:00:00	372	47	799	94	373	51	2	0	9	0	1	0	15	0	15	1	3	2	20	0
16:15:00	410	38	903	104	417	44	2	0	9	0	1	0	16	1	16	1	3	0	20	0
16:30:00	442	32	1008	105	460	43	2	0	9	0	1	0	16	0	16	0	3	0	20	0
16:45:00	485	43	1125	117	519	59	2	0	10	1	1	0	16	0	16	0	3	0	20	0
17:00:00	517	32	1250	125	577	58	2	0		1	1	0	17	1	16	0	3	0	21	1
17:15:00	548	31	13/4	124	630	53	2	0		0	1	0	1/	0	16	0	3	0	21	0
17:30:00	585	37	1512	138	689	59	2	0		0	1	0	18	1	16	0	3	0	21	0
17:45:00	627	42	1612	100	740	51	2	0		0	1	0	18	0	16	0	3	0	21	0
18:00:00	669	42	1/16	104	783	43	2	0		0	1	0	18	0	16	0	3	0	21	0
18:15:00	669	0	1/16	0	783	0	2	0		0	1	0	18	0	10	0	3	0	21	0
18:15:15	669	0	1/10	0	183	0	2	0	11	0		0	18	0	10	U	3	0	21	0
							1				1									



	Passenger Cars - West Approach				Tru	cks - Wes	t Approa	ach		Buses - West Approach						Pedestrians				
Interval	Le	ft	Tr	nru	Rig	ght	Le	əft	Th	ru	Ri	ght	Le	əft	Th	ru	Rig	ght	West	Cross
Time	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr
7:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15:00	1	1	14	14	19	19	0	0	0	0	0	0	0	0	1	1	0	0	0	0
7:30:00	3	2	27	13	41	22	0	0	0	0	0	0	0	0	1	0	0	0	0	0
7:45:00	6	3	48	21	80	39	0	0	0	0	0	0	0	0	3	2	0	0	0	0
8:00:00	6	0	70	22	114	34	0	0	0	0	0	0	0	0	5	2	0	0	0	0
8:15:00	8	2	88	18	160	46	0	0	0	0	0	0	0	0	6	1	0	0	0	0
8:30:00	8	0	118	30	187	27	0	0	0	0	0	0	0	0	6	0	1	1	0	0
8:45:00	9	1	146	28	218	31	0	0	1	1	0	0	0	0	6	0	1	0	1	1
9:00:00	15	6	172	26	250	32	0	0	1	0	0	0	1	1	6	0	3	2	1	0
9:15:00	18	3	194	22	273	23	0	0	1	0	0	0	1	0	7	1	3	0	1	0
9:30:00	18	0	208	14	297	24	0	0	1	0	0	0	1	0	7	0	3	0	2	1
9:45:00	21	3	235	27	320	23	0	0	1	0	0	0	1	0	7	0	3	0	2	0
10:00:00	25	4	251	16	338	18	0	0	1	0	1	1	1	0	7	0	3	0	2	0
10:15:00	25	0	251	0	338	0	0	0	1	0	1	0	1	0	7	0	3	0	2	0
15:00:00	25	0	251	0	338	0	0	0	1	0	1	0	1	0	7	0	3	0	2	0
15:15:00	40	15	321	70	381	43	0	0	1	0	2	1	2	1	9	2	5	2	2	0
15:30:00	51	11	357	36	408	27	0	0	1	0	2	0	2	0	10	1	6		2	0
15:45:00	58	7	396	39	435	27	0	0	1	0	3	1	3	1	13	3	6	0	2	0
16:00:00	65	7	431	35	464	29	0	0	1	0	3	0	3	0	13	0	8	2	2	0
16:15:00	72	7	466	35	494	30	0	0	1	0	3	0	3	0	14	1	9	1	2	0
16:30:00	77	5	512	46	520	26	0	0	1	0	3	0	3	0	15	1	9	0	2	0
16:45:00	82	5	547	35	538	18	0	0	1	0	3	0	3	0	16	1	9	0	2	0
17:00:00	84	2	587	40	5/2	34	0	0		0	3	0	3	0	16	0	9	0	3	1
17:15:00	88	4	629	42	607	35	0	0	1	0	3	0	3	0	16	0	9	0	3	0
17:30:00	93	5	069	40	628	21	0	0		0	3	0	3	0	10	0	9	0	3	0
17:45:00	90	3	715	40	052	24	0	0		0	3	0	3	0	10	0	9	0	3	0
18:00:00	101	5	745	30	0/5	23		0		0	3	0	3	0	10	0	9	0	3	0
10.15.00	101	0	745	0	675	0	0	0		0	2	0	2	0	10	0	9	0	2	0
10.15.15		0	745	0	075	0	0	0		0	5	0	5	0	10	0	9	0	5	0



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Morning Peak Diagram	Specified Period One Hour Peak									
	From: 7:00:00 From: 8:00:00									
	To: 10:00:00 To: 9:00:00									
Municipality: Windsor	Weather conditions:									
Site #: 2302900004										
Intersection: Tecumseh Rd E & Banwell Rd	Person counted:									
TFR File #: 1	Person prepared:									
Count date: 16-Feb-23	Person checked:									
** Signalized Intersection **	Major Road: Tecumseh Rd E runs W/E									
North Leg Total: 1013 Buses 2 3 3	8 Buses 12 East Leg Total: 1082									
North Entering: 652 Trucks 0 4 0	4 Trucks 3 East Entering: 572									
North Peds: 2 Cars 108 401 131	640 Cars 346 East Peds: 6									
Peds Cross: M Totals 110 408 134	Totals 361 Peds Cross: X									
	Banwell Rd									
Buses Trucks Cars Totals										
8 6 673 687										
	N 388 2 5 395									
	$\sqrt{\frac{76}{550}}$									
W S	E 222									
Buses Trucks Cars Totals	Tecumseh Rd E									
5 0 81 86 🖵	s									
1 2 295 298	,									
1 5 101 107	Cars Trucks Buses Totals									
7 7 477 V Banwell R										
Peds Cross: X Cars 578	Cars 177 170 75 422 Peds Cross: 🛏									
West Peds: 0 Trucks 11 Tru	ucks 4 2 3 9 South Peds: 3									
West Entering: 491 Buses 5 J	uses 1 5 0 6 South Entering: 437									
West Leg Total: 1178 Totals 594 To	otals 182 177 78 South Leg Total: 1031									
Com	monte									
Com										



Afternoon Peak Diagram	Specified Period One Hour Peak From: 15:00:00 From: 16:30:00 To: 18:00:00 To: 17:30:00							
Municipality:WindsorSite #:2302900004Intersection:Tecumseh Rd E & Banwell RdTFR File #:1Count date:16-Feb-23	Weather conditions: Person counted: Person prepared: Person checked:							
** Signalized Intersection **	Major Road: Tecumseh Rd E runs W/E							
North Leg Total: 1388 Buses 0 1 0 1 1 1 1 1 5 1 0 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 <td>2 Buses 2 Trucks 3 Cars 870 Totals 875 Buses 2 East Leg Total: 1425 East Entering: 680 East Peds: 3 Peds Cross: X</td>	2 Buses 2 Trucks 3 Cars 870 Totals 875 Buses 2 East Leg Total: 1425 East Entering: 680 East Peds: 3 Peds Cross: X							
Buses Trucks Cars Totals 2 8 654 664 Tecumseh Rd E	anwell Rd Cars Trucks Buses Totals 159 0 0 408 2 1 110 0 0 677 2 1							
Buses Trucks Cars Totals 0 1 198 199 2 4 503 509	Tecumseh Rd E							
0 2 172 174 2 7 873 Banwell Rd	Cars Trucks Buses Totals 737 6 2 745							
Peds Cross:XCars568CarsWest Peds:2Trucks3TrucWest Entering:882Buses0BusWest Leg Total:1546Totals571Total	rs 150 513 104 767 Peds Cross: ► ks 6 2 2 10 South Peds: 1 es 1 2 0 3 South Entering: 780 ls 157 517 106 South Leg Total: 1351							
Comn	nents							



Total Count Diagram

Municipality: Windsor	Weather conditions:										
Site #: 2302900004											
Intersection: Tecumseh Rd E & Banwell Rd											
	Person counted:										
Count dato: 16 Eeb 23	Person prepared:										
	Person cneckea:										
** Signalized Intersection **	Major Road: Tecumseh Rd E runs W/E										
North Leg Total: 6513 Buses 4 12 5 21	Buses 44 East Leg Total: 7224										
North Entering: 3304 Trucks 1 13 2 16	Trucks 16 East Entering: 3563										
North Peds: 17 Cars 583 1945 739 32	267 Cars 3149 East Peds: 20										
Peds Cross: 🛏 Totals 588 1970 746	Totals 3209 Peds Cross: X										
	anwell Rd										
Buses Trucks Cars Totals 🗸 🦊 🥠	Cars Trucks Buses Totals										
21 41 3704 3766											
/	2271 15 14 2300										
	$\frac{533}{2}$ $\frac{533}{2}$ $\frac{8}{1}$ $\frac{542}{542}$										
Tecumseh Rd E W	► 3518 25 20										
Buses Trucks Cars Totals	Tecumseh Rd F										
11 4 746 761											
18 25 2330 2373	· · · · · · · · · · · · · · · · · · ·										
5 17 755 777	Cars Trucks Buses Totals										
34 46 3831 Sanwell Rd	√ 1 √ 3603 34 24 3661										
Pade Crose: X Care 3233 — Ca	re 850 1680 534 3073 Data Cross M										
West Peds: 6 Trucks 38 Truc	ks 25 10 7 42 South Peds: 10										
West Entering: 3911 Buses 18 Buses 18	es 3 28 1 32 South Entering 3147										
West Leg Total: 7677 Totals 3289 Tota	Als 878 1727 542 South Leg Total: 6436										
	~										
Comn	nents										



Traffic Count Summary													
Intersection:	Tecums	eh Rd E	& Banw	ell Rd	Count [Date: 16-Feb-2	3 Munio	pality: Wi	indsor				
	Nort	h Appro	ach Tot	tals		North /Ocorth		Sout	h Appro	ach To	tals		
Hour	Incluc	les Cars, T	Trucks, & I	Buses	Total	Total	Hour	Incluc	les Cars,	Frucks, & E	Buses	Total	
Ending	Left	Thru	Right	Grand Total	Peds	Approaches	Ending	Left	Thru	Right	Grand Total	Peds	
7:00:00 8:00:00 9:00:00 10:00:00 15:00:00 16:00:00 17:00:00 18:00:00	0 96 134 108 0 157 110 141	0 417 408 247 0 279 331 288	0 82 110 80 0 107 98 111	0 595 652 435 0 543 539 540	0 2 0 10 3 2	0 868 1089 792 0 1180 1251 1271	7:00:00 8:00:00 9:00:00 10:00:00 15:00:00 16:00:00 17:00:00 18:00:00	0 109 182 148 0 140 156 143	0 114 177 134 0 378 446 478	0 50 78 75 0 119 110 110	0 273 437 357 0 637 712 731	0 0 3 0 2 1 1	
Totals:	746	1970	588	3304	17	6451	S Totals:	878	1727	542	3147	10	
Hour	Eas Incluc	t Approa les Cars	ach lot á Trucks & F	ais Buses	Total	East/West	Hour Includes Cars, Trucks, & Buses						
Ending	Loft	Thru.	Diaht	Grand	Peds	Approaches	Ending	l off	Thru,	Diabt	Grand	Peds	
7:00:00 8:00:00 9:00:00 15:00:00 16:00:00 17:00:00 18:00:00	0 65 79 64 0 123 109 102	0 264 395 378 0 413 439 411	Right 0 53 98 89 0 165 167 149	0 382 572 531 0 701 715 662	0 6 5 0 4 1 4	0 684 1063 1018 0 1641 1560 1508	7:00:00 8:00:00 9:00:00 10:00:00 15:00:00 16:00:00 17:00:00 18:00:00	0 36 86 78 0 183 193 185	0 217 298 310 0 563 483 502	Right 0 49 107 99 0 194 169 159	0 302 491 487 0 940 845 846	0 0 0 4 1 1	
Totals:	542	2300	721	3563	20	7474	W Totals:	761	2373	777	3911	6	
Hours E			Calc		values T	or traffic Cr		ajor Str	eel				



		Passen	ger Cars	- North A	Passenger Cars - North Approach						ach			В	uses - No	orth Appro	oach		Pedestrians		
Interval	Le	ft	Tł	nru	Rię	ght	L.	əft	Th	ru	Ri	ght	Le	əft	Tł	nru	Rig	jht	North	Cross	
Time	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	
7:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
7:15:00	16	16	58	58	16	16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
7:30:00	36	20	129	71	29	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
7:45:00	61	25	279	150	53	24	0	0	1	1	0	0	0	0	0	0	0	0	0	0	
8:00:00	96	35	415	136	82	29	0	0	1	0	0	0	0	0	1	1	0	0	0	0	
8:15:00	136	40	541	126	108	26	0	0	3	2	0	0	2	2	1	0	0	0	0	0	
8:30:00	164	28	622	81	136	28	0	0	4	1	0	0	3	1	1	0	2	2	1	1	
8:45:00	184	20	717	95	162	26	0	0	4	0	0	0	3	0	1	0	2	0	2	1	
9:00:00	227	43	816	99	190	28	0	0	5	1	0	0	3	0	4	3	2	0	2	0	
9:15:00	253	26	893	77	215	25	0	0	5	0	0	0	4	1	5	1	2	0	2	0	
9:30:00	281	28	959	66	236	21	0	0	5	0	0	0	4	0	6	1	2	0	2	0	
9:45:00	303	22	1013	54	254	18	0	0	5	0	0	0	4	0	6	0	2	0	2	0	
10:00:00	334	31	1060	47	270	16	0	0	6	1	0	0	4	0	6	0	2	0	2	0	
10:15:00	334	0	1060	0	270	0	0	0	6	0	0	0	4	0	6	0	2	0	2	0	
15:00:00	334	0	1060	0	270	0	0	0	6	0	0	0	4	0	6	0	2	0	2	0	
15:15:00	379	45	1131	71	305	35	0	0	7	1	1	1	4	0	6	0	3	1	4	2	
15:30:00	420	41	1206	75	327	22	0	0	8	1	1	0	4	0	6	0	4	1	7	3	
15:45:00	452	32	1269	63	349	22	0	0	10	2	1	0	4	0	7	1	4	0	12	5	
16:00:00	491	39	1332	63	374	25	0	0	10	0	1	0	4	0	9	2	4	0	12	0	
16:15:00	516	25	1420	88	403	29	1	1	10	0	1	0	5	1	12	3	4	0	12	0	
16:30:00	553	37	1512	92	431	28	1	0	11	1	1	0	5	0	12	0	4	0	13	1	
16:45:00	571	18	1586	74	454	23	1	0	11	0	1	0	5	0	12	0	4	0	14	1	
17:00:00	599	28	1659	73	472	18		0	11	0	1	0	5	0	12	0	4	0	15	1	
17:15:00	643	44	1/36	11	500	28		0	12	1	1	0	5	0	12	0	4	0	15	0	
17:30:00	683	40	1/98	62	527	27	1	0	12	0	1	0	5	0	12	0	4	0	17	2	
17:45:00	715	32	1873	/5	554	27	2	1	12	0	1	0	5	0	12	0	4	0	1/	0	
18:00:00	739	24	1945	12	583	29	2	0	13	1	1	0	5	0	12	0	4	0	17	0	
18:15:00	739	0	1945	0	583	0	2	0	13	0	1	0	5	0	12	0	4	0	17	0	
10.15.15	739	0	1945	0	503	U	2	0	13	0	I	0	5	0	12	0	4	0	17	0	



	Passenger Cars - East Approach							Tru	icks - Eas	t Approa	ch		Buses - East Approach							strians
Interval	Le	ft	Th	iru	Rig	ght	Le	əft	Th	ru	Rig	ght	Le	eft	Th	ru	Rig	ght	East	Cross
Time	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr
7:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15:00	12	12	33	33	11	11	0	0	0	0	0	0	0	0	0	0	1	1	0	0
7:30:00	26	14	93	60	21	10	1	1	1	1	0	0	0	0	1	1	2	1	0	0
7:45:00	40	14	172	79	39	18	1	0	3	2	0	0	0	0	2	1	2	0	0	0
8:00:00	64	24	259	87	51	12	1	0	3	0	0	0	0	0	2	0	2	0	0	0
8:15:00	80	16	340	81	74	23	1	0	3	0	0	0	0	0	3	1	3	1	1	1
8:30:00	99	19	438	98	92	18	1	0	3	0	0	0	0	0	4	1	3	0	1	0
8:45:00	126	27	553	115	117	25	2	1	3	0	1	1	0	0	6	2	4	1	2	1
9:00:00	140	14	647	94	146	29	3	1	5	2	1	0	1	1	7	1	4	0	6	4
9:15:00	157	17	729	82	167	21	5	2	5	0	1	0	1	0	7	0	4	0	7	1
9:30:00	170	13	817	88	193	26	5	0	7	2	1	0	1	0	8	1	4	0	8	1
9:45:00	186	16	923	106	218	25	5	0	9	2	1	0	1	0	9	1	4	0	10	2
10:00:00	202	16	1018	95	235	17	5	0	9	0	1	0	1	0	10	1	4	0	11	1
10:15:00	202	0	1018	0	235	0	5	0	9	0	1	0	1	0	10	0	4	0	11	0
15:00:00	202	0	1018	0	235	0	5	0	9	0	1	0	1	0	10	0	4	0	11	0
15:15:00	233	31	1133	115	278	43	5	0	10	1	2	1	1	0	10	0	4	0	13	2
15:30:00	265	32	1214	81	319	41	5	0	10	0	2	0	1	0	10	0	4	0	13	0
15:45:00	299	34	1315	101	361	42	5	0	11	1	2	0	1	0	11	1	5	1	15	2
16:00:00	324	25	1427	112	398	37	6	1	12	1	2	0	1	0	11	0	5	0	15	0
16:15:00	351	27	1539	112	442	44	6	0	12	0	2	0	1	0	11	0	5	0	16	1
16:30:00	381	30	1657	118	483	41	6	0	12	0	2	0	1	0	12	1	5	0	16	0
16:45:00	411	30	1763	106	528	45	6	0	12	0	2	0		0	12	0	5	0	16	0
17:00:00	433	22	1864	101	565	37	6	0	12	0	2	0		0	13	1	5	0	16	0
17:15:00	463	30	1974	110	603	38	6	0	12	0	2	0	1	0	13	0	5	0	16	0
17:30:00	491	28	2065	91	642	39	6	0		2	2	0		0	13	0	5	0	19	3
17:45:00	514	23	2163	98	6/9	3/		1	14	0	2	0		0	14	1	5	0	20	1
18:00:00	533	19	2271	108	714	35	8	1	15	1	2	0		0	14	0	5	0	20	0
18:15:00	533	0	2271	0	714	0	8	0	15	0	2	0		0	14	0	5	0	20	0
10.15.15	533	0	2271	0	/14	0	0	0	15	0	2	0		0	14	0	5	0	20	0
																	1			



	Passenger Cars - South Approach						Truc	cks - Sout	th Appro	ach		Buses - South Approach							trians	
Interval	Le	eft	ті	hru	Rig	ght	L	eft	Th	ru	Ri	ght	Le	əft	Tł	nru	Rig	ght	South	Cross
Time	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr
7:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15:00	15	15	17	17	8	8	1	1	1	1	0	0	0	0	3	3	0	0	0	0
7:30:00	41	26	44	27	17	9	2	1	1	0	0	0	0	0	6	3	0	0	0	0
7:45:00	66	25	73	29	28	11	2	0	2	1	0	0	0	0	8	2	0	0	0	0
8:00:00	106	40	102	29	50	22	2	0	2	0	0	0	1	1	10	2	0	0	0	0
8:15:00	144	38	147	45	69	19	4	2	3	1	1	1	1	0	12	2	0	0	1	1
8:30:00	182	38	191	44	89	20	5	1	4	1	2	1	1	0	12	0	0	0	1	0
8:45:00	237	55	238	47	108	19	5	0	4	0	2	0	2	1	14	2	0	0	2	1
9:00:00	283	46	272	34	125	17	6	1	4	0	3	1	2	0	15	1	0	0	3	1
9:15:00	322	39	305	33	144	19	9	3	6	2	4	1	2	0	16	1	0	0	4	1
9:30:00	359	37	330	25	158	14	11	2	6	0	4	0	2	0	16	0	0	0	4	0
9:45:00	392	33	358	28	181	23	12	1	6	0	4	0	2	0	17	1	0	0	6	2
10:00:00	425	33	401	43	199	18	12	0	7	1	4	0	2	0	17	0	0	0	6	0
10:15:00	425	0	401	0	199	0	12	0	7	0	4	0	2	0	17	0	0	0	6	0
15:00:00	425	0	401	0	199	0	12	0	7	0	4	0	2	0	17	0	0	0	6	0
15:15:00	462	37	486	85	231	32	14	2	7	0	4	0	2	0	18	1	0	0	6	0
15:30:00	483	21	577	91	266	35	16	2	7	0	4	0	2	0	19	1	0	0	7	1
15:45:00	522	39	662	85	291	25	17	1	8	1	4	0	2	0	20	1	0	0	8	1
16:00:00	560	38	772	110	317	26	17	0	8	0	4	0	2	0	23	3	1	1	8	0
16:15:00	595	35	861	89	344	27	18	1	8	0	4	0	2	0	25	2	1	0	8	0
16:30:00	626	31	959	98	369	25	19	1	8	0	4	0	2	0	25	0	1	0	8	0
16:45:00	667	41	1080	121	400	31	21	2	9	1	6	2	2	0	26	1	1	0	9	1
17:00:00	710	43	1213	133	425	25	23	2	10	1	6	0	2	0	26	0	1	0	9	0
17:15:00	744	34	1333	120	448	23	24	1	10	0	6	0	3	1	26	0	1	0	9	0
17:30:00	776	32	1472	139	473	25	25	1	10	0	6	0	3	0	27	1	1	0	9	0
17:45:00	818	42	1579	107	505	32	25	0	10	0	6	0	3	0	27	0	1	0	9	0
18:00:00	850	32	1689	110	534	29	25	0	10	0	7	1	3	0	28	1	1	0	10	1
18:15:00	850	0	1689	0	534	0	25	0	10	0	7	0	3	0	28	0	1	0	10	0
18:15:15	850	0	1689	0	534	0	25	0	10	0	7	0	3	0	28	0	1	0	10	0
1																				



	Passenger Cars - West Approach						Tru	cks - Wes	t Approa	ich			В	uses - W	est Appro	bach		Pedestrians		
Interval	Le	eft	Tł	nru	Riç	ght	L	əft	Th	ru	Ri	ght	Le	əft	Tł	nru	Riç	ght	West	Cross
Time	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr
7:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15:00	6	6	34	34	7	7	0	0	2	2	0	0	0	0	0	0	0	0	0	0
7:30:00	13	7	78	44	15	8	1	1	3	1	1	1	2	2	0	0	0	0	0	0
7:45:00	17	4	146	68	34	19	1	0	5	2	1	0	3	1	2	2	0	0	0	0
8:00:00	32	15	209	63	48	14	1	0	5	0	1	0	3	0	3	1	0	0	0	0
8:15:00	46	14	281	72	63	15	1	0	5	0	1	0	3	0	3	0	1	1	0	0
8:30:00	65	19	345	64	90	27	1	0	5	0	1	0	5	2	3	0	1	0	0	0
8:45:00	91	26	412	67	121	31	1	0	5	0	5	4	8	3	3	0	1	0	0	0
9:00:00	113	22	504	92	149	28	1	0	7	2	6	1	8	0	4	1	1	0	0	0
9:15:00	125	12	574	70	177	28	1	0	8	1	8	2	9	1	6	2	3	2	0	0
9:30:00	149	24	650	76	201	24	1	0	9	1	8	0	9	0	7	1	3	0	0	0
9:45:00	169	20	719	69	225	24	1	0	12	3	9	1	9	0	9	2	3	0	0	0
10:00:00	189	20	800	81	243	18	2	1	15	3	9	0	9	0	10	1	3	0	0	0
10:15:00	189	0	800	0	243	0	2	0	15	0	9	0	9	0	10	0	3	0	0	0
15:00:00	189	0	800	0	243	0	2	0	15	0	9	0	9	0	10	0	3	0	0	0
15:15:00	241	52	932	132	301	58	3	1	16	1	12	3	9	0	12	2	3	0	1	1
15:30:00	279	38	1077	145	344	43	3	0	17	1	12	0	10	1	12	0	3	0	1	0
15:45:00	329	50	1217	140	387	43	3	0	19	2	12	0	11	1	12	0	3	0	4	3
16:00:00	369	40	1355	138	432	45	3	0	20	1	13	1	11	0	13	1	4	1	4	0
16:15:00	419	50	1478	123	485	53	3	0	21	1	13	0	11	0	13	0	4	0	4	0
16:30:00	461	42	1608	130	528	43	3	0	21	0	13	0	11	0	13	0	5	1	4	0
16:45:00	508	47	1710	102	566	38	3	0	21	0	14	1	11	0	13	0	5	0	5	1
17:00:00	562	54	1837	127	598	32	3	0	21	0	15	1	11	0	13	0	5	0	5	0
17:15:00	601	39	1983	146	654	56	3	0	23	2	15	0	11	0	15	2	5	0	5	0
17:30:00	659	58	2111	128	700	46	4	1	25	2	15	0	11	0	15	0	5	0	6	1
17:45:00	702	43	2211	100	725	25	4	0	25	0	16	1	11	0	17	2	5	0	6	0
18:00:00	746	44	2330	119	755	30	4	0	25	0	17	1	11	0	18	1	5	0	6	0
18:15:00	746	0	2330	0	755	0	4	0	25	0	17	0	11	0	18	0	5	0	6	0
18:15:15	/46	0	2330	0	/55	0	4	0	25	0	1/	0	11	0	18	0	5	0	6	0
																			1	

Appendix C

Warning Clauses



1027458 Ontario Inc. *Noise and Vibration Assessment* March 2023 - 22-5144

Warning Clauses

Warning clauses should be included in agreements of Offers of Purchase and Sale, lease/rental agreements and condominium declarations.

Type C: "This dwelling unit has been designed with the provision for adding central air conditioning at the occupant's discretion. Installation of central air conditioning by the occupant in low and medium density developments will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the sound level limits of the Municipality and the Ministry of the Environment."

Type D: "This dwelling unit has been supplied with a central air conditioning system which will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the sound level limits of the Municipality and the Ministry of the Environment."

VIA Rail Warning Clause: "Warning: VIA Rail Canada Inc. or its assigns or successors in interest has or have a right-of-way within 300 metres from the land the subject hereof. There may be alterations to or expansions of the rail facilities on such right-of-way in the future including the possibility that the railway or its assigns or successors as aforesaid may expand its operations, which expansion may affect the living environment of the residents in the vicinity, notwithstanding the inclusion of any noise and vibration attenuating measures in the design of the development and individual dwelling(s). VIA will not be responsible for any complaints or claims arising from use of such facilities and/or operations on, over or under the aforesaid right-of-way."

Appendix D

Stamson Modelling



1027458 Ontario Inc. *Noise and Vibration Assessment* March 2023 - 22-5144

STAMSON 5.0 NORMAL REPORT Date: 28-03-2023 09:21:38 MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT Filename: banrail.te Time Period: 16 hours Description: Rail data, segment # 1: -----Train! Trains! Speed !# loc !# Cars! Eng !ContType!!(km/h) !/Train!/Train! type !weld 1. Pass ! 1.0/1.0 ! 128.0 ! 17.0 ! 66.0 !Diesel! Yes Data for Segment # 1: ------Angle1Angle2: -90.00 deg90.00 degWood depth: 0(No woods : 0 (No woods.) No of house rows : 0 Surface 1 : (Absorptive ground surface) Receiver source distance : 78.50 m Receiver height:4.50 mTopography:1 (Flat/gentle slope; no barrier) No Whistle Reference angle : 0.00 Rail data, segment # 2: -----Train! Trains! Speed !# loc !# Cars! Eng !ContType!!(km/h) !/Train!/Train! type !weld ! 1.0/1.0 ! 96.0 ! 6.0 !193.0 !Diesel! Yes 1. Data for Segment # 2: ------Angle1Angle2: -90.00 deg90.00 degWood depth:0(No woods) (No woods.) No of house rows : 0 Surface : 1 (Absorptive ground surface) Receiver source distance : 78.50 m Receiver height : 4.50 m Topography : 1 : (Flat/gentle slope; no barrier) Topography 1 No Whistle Reference angle : 0.00 Results segment # 1: LOCOMOTIVE (0.00 + 55.38 + 0.00) = 55.38 dBA

Angle1 Angle2 Alpha RefLeq D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq _____ -90 90 0.50 67.30 -10.75 -1.17 0.00 0.00 0.00 55.38 _____ WHEEL (0.00 + 44.28 + 0.00) = 44.28 dBA Angle1 Angle2 Alpha RefLeq D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq -90 90 0.60 57.13 -11.50 -1.35 0.00 0.00 0.00 44.28 _____ Segment Leq : 55.70 dBA Results segment # 2: ------LOCOMOTIVE (0.00 + 53.42 + 0.00) = 53.42 dBA Angle1 Angle2 Alpha RefLeq D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq _____ -90 90 0.50 65.33 -10.75 -1.17 0.00 0.00 0.00 53.42 WHEEL (0.00 + 46.12 + 0.00) = 46.12 dBA Angle1 Angle2 Alpha RefLeq D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq _____ -90 90 0.60 58.97 -11.50 -1.35 0.00 0.00 0.00 46.12 _____ Segment Leq : 54.16 dBA Total Leq All Segments: 58.01 dBA

TOTAL Leq FROM ALL SOURCES: 58.01

STAMSON 5.0 NORMAL REPORT Date: 24-03-2023 11:26:49 MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT Filename: banwell.te Time Period: 16 hours Description: Road data, segment # 1: Banwell -----Car traffic volume : 16491 veh/TimePeriod Medium truck volume : 255 veh/TimePeriod Heavy truck volume : 239 veh/TimePeriod Posted speed limit : 50 km/h Road gradient:0 %Road pavement:1 (Typical asphalt or concrete) Data for Segment # 1: Banwell -----Angle1Angle2: -90.00 deg90.00 degWood depth:0(No woods)No of house rows:0Surface:1(Absorptive) (No woods.) Surface (Absorptive ground surface) : 1 Receiver source distance : 17.00 m Receiver height : 16.50 m Topography : 1 Reference angle : 0.00 (Flat/gentle slope; no barrier) Results segment # 1: Banwell ------Source height = 1.09 m ROAD (0.00 + 64.27 + 0.00) = 64.27 dBAAngle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq _____ -90 90 0.22 65.52 0.00 -0.66 -0.59 0.00 0.00 0.00 64.27 _____ Segment Leq : 64.27 dBA Total Leq All Segments: 64.27 dBA

TOTAL Leq FROM ALL SOURCES: 64.27

Appendix E

D-6 Classification Criteria



1027458 Ontario Inc. *Noise and Vibration Assessment* March 2023 - 22-5144

Category	Outputs	Scale	Process	Operations/Intensity	Possible Examples
Class I	 Noise: Sound not audible off property Dust and/or Odour: Infrequent and not intense Vibration: No ground borne vibration on plant property 	 No outside storage Small scale plant or scale is irrelevant in relation to all other criteria for this Class 	 Self-contained plant or building which produces/stores a packaged product. Low probability of fugitive emissions 	 Daytime operations only Infrequent movement of products and/or heavy trucks 	 Electronics manufacturing and repair Furniture repair and refinishing Beverages bottling Auto parts supply Packaging and crafting services Distribution of dairy products Loundry and linear supply
Class II	 Noise: Sound occasionally audible off property Dust and/or Odour: Frequent and occasionally intense Vibration: Possible groundborne vibration, but cannot be perceived off property 	 Outside storage permitted Medium level of production allowed 	 Open process Periodic outputs of minor annoyance Low probability of fugitive emissions 	 Shift operations permitted Frequent movement of products and/or heavy trucks with the majority of movements during daytime hours 	 Laundry and inter supply Magazine printing Paint spray booths Metal command Electrical production manufacturing Manufacturing of dairy products Dry cleaning services Feed packing plant
Class III	 Noise: sound frequently audible off property Dust and/or Odour: Persistent and/or intense Vibration: Ground-borne vibration can frequently be perceived off property 	 Outside storage of raw and finished products Large production levels 	 Open process Frequent outputs of major annoyances High probability of fugitive emissions 	 Continuous movement of products and employees Daily shift operations permitted 	 Manufacturing of paint and varnish Organic chemicals manufacturing Breweries Solvent recovery plants Soaps and detergent manufacturing Manufacturing of resins and costing Metal manufacturing

Appendix F

Staonaäry Source Data



Stationary Source	Spectrum Type	31.5 Hz	Spectrum [dB] 31.5 Hz 63 Hz 125 Hz 250 Hz 500 Hz 1000 Hz 2000 Hz 4000 Hz 8000 Hz												
Circular Saw Cutting Concrete	L _n (10 m)		85	74	72	70	72	76	82	77	113				
Truck Movements	L _w	112.2	112	110.9	105.9	102.3	100.9	101	96	90.6	107.1				
Pneumatic Tools	L _w	93.6	88.9	93.4	86.8	90.3	89.4	96.6	96.1	95.9	102				
Truck Idling	L _w	99.5	100.8	96.2	92.8	95.3	95.2	92.8	86.6	79.1	99.3				

References

Ontario Ministry of Environment Publication NPC-300, Environmental Noise Guideline, Stationary and Transportation Sources- Approval and Planning, October 2013.

US FTA Transit Noise and Vibration Impact Assessment Manual, 2018

Guidelines for New Development in Proximity to Railway Operations, Railway Association of Canada and Federation of Canadian Municipalities, May 2013.

