REPORT

FORMER LONDON PSYCHIATRIC HOSPITAL (LPH) LANDS SUBDIVISION

LONDON, ONTARIO

NOISE AND VIBRATION IMPACT STUDY

RWDI #2104756

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SUBMITTED TO

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VERSION HISTORY

Index	Date	Description	Prepared by	Reviewed by
1	December 2, 2021	Draft	LRC	SVG
2	March 16, 2022	Draft – new layout	LRC	SVG
3	March 28, 2022	Final	LRC	SVG
4	October 12, 2022	Updated to a new site plan and addressed review comments.	LRC	SVG
5	October 31, 2022	Updated to specify massing requirements	LRC	SVG

EXECUTIVE SUMMARY

RWDI was retained to prepare a Noise and Vibration Impact Study for the proposed redevelopment of the former London Psychiatric Hospital Lands located in London, Ontario, into a mixed-use subdivision. The proposed development site is bounded by Oxford Street to the north, the CP Rail Galt Subdivision to the south, Highbury Avenue to the west, and a mix of residential, commercial, and industrial facilities off First Street to the east. Noise due to road and rail traffic, and activities at the commercial and industrial facilities was assessed at the proposed development. Vibration due to nearby rail activities was also assessed at the nearest parcels of the development.

A rail spur line, servicing the adjacent industrial area to the east, was evaluated for potential vibration influences on the site. FTA screening level analysis at two locations within the development predicted vibrations levels below the applicable limits. Thus, no mitigation measures for vibration are required.

Noise from adjacent commercial and industrial facilities was evaluated by modelling and measurements. The significant industrial source noise is produced by Novell Polymers to the east. Measurements and modelling show that sound from this facility has influence on the London Psychiatric Hospital Lands immediately adjacent to this facility. Although an Environmental Compliance Approval or an Environmental Activity and Sector Registry registration is not currently in place, Novell Polymers is subject to the Environmental Protection Act and is required to have an active one. For the purposes of this assessment, it has been assumed that if, and when, the facility obtains an environmental permit, it will have to demonstrate compliance with applicable noise criteria at existing sensitive spaces. The London Psychiatric Hospital Lands can be developed without adding restrictions to the noise emission from existing Novell Polymers operations. The site configuration with a single loaded building (i.e. no sensitive space windows facing the plastic facility) in the block nearest Novell Polymers will protect the remainder of the proposed development space and provide compliance with the applicable sound level limits. Additionally, some height restriction on towers and podiums for mid-rise and high-rise blocks (notably blocks 035, 034, 036, and 038) surrounding the plastics facility will apply based on the current site layout. Select blocks could be noise-sensitive uses with a recommendation for a Class 4 designation, and with installation of central air-conditioning so that the windows can remain closed. The remaining lands can be developed for noise-sensitive use without designating them as Class 4. Therefore, it is recommended that a Class 4 designation is obtained from the municipality for designated lots. Other commercial and industrial facilities did not have a significant noise effect on the proposed development.

The inclusion of noise warning clauses is recommended for:

a. Sound levels due to proximity to transportation sources;
b. Proximity to the rail line;
c. Proximity to sound from industrial land-use; and
d. Class 4 Area Notification as applicable.

The current site plan is not yet at a stage to determine if Ontario Building Code building components are acoustically sufficient to ensure the interior sound levels meet the provincial criteria. It is generally expected that Ontario Building Code components will be acoustically sufficient for much of the development with areas directly adjacent to transportation corridors requiring upgraded components. This is recommended to be assessed in detail once the site plans are at a more advanced stage, such as at Site Plan Approval.

Based on the results of this assessment, the current development configuration is considered feasible with the outlined massing design requirements in the blocks surrounding the Novell Polymers facility.

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1 INTRODUCTION

RWDI was retained to prepare a Noise and Vibration Impact Study for the proposed redevelopment of the former London Psychiatric Hospital Lands into a mixed-use subdivision. The proposed development site in London, Ontario is bounded by Oxford Street to the north, the CP Rail Galt Subdivision to the south, Highbury Avenue to the west, and a mix of residential, commercial, and industrial facilities off First Street to the east.

The proposed development will consist of residential areas, with detached single-family homes, towers up to 10 storeys, an academic area, a transit corridor, and preserved heritage buildings associated with the former hospital. The context site plan is shown in **Figure 1**.

The site is exposed to noise from road traffic on Oxford Street to the north, Dundas Street to the south, Highbury Avenue to the west, and First Street to the east.

The site is exposed to noise from rail traffic on the CP Rail Galt Subdivision to the south, GEXR freight movement to the southeast and a spur line servicing industrial facilities to the east. The CP Rail London yard begins just west of the proposed development. However, the main yard where shunting activities take place is located approximately 1.5 km to the west of the site. At this distance, the impacts from the yard itself are not included in the assessment. However, the track starts branching to provide yard access near the southwest corner of the site. The impacts from additional rail movements along these branches are included in the assessment.

This assessment was completed to support an Official Plan Amendment (OPA) and Zoning By-Law Amendment (ZBA) submission to the City of London. This assessment was based on design drawings dated February 22, 2022, with revisions provided in August 2022.

2 APPLICABLE CRITERIA

Applicable criteria for transportation noise sources (road and rail) and stationary noise sources (i.e. commercial and industrial facilities) are provided in the Ontario Ministry of the Environment, Conservation and Parks (MECP) NPC-300 Environmental Noise Guideline (MOE, 2013). Rail vibration criteria is provided in the Railway Association of Canada Guidelines for New Development in Proximity to Railway Operations (RAC, 2013). The criteria are summarized in **Appendix A**.

The proposed development site has an acoustical environment typical of a major population centre, where the background sound level is dominated by the activities of people, usually road traffic, often referred to as "urban hum". It would therefore be characterized as a “Class 1 Area” under NPC-300.

Mitigation measures relating to the rail lines are based on their classification. The rail line to the south was considered a principal mainline while the tracks to the east are considered a spur line.

3 IMPACT OF THE ENVIRONMENT ON THE PROPOSED DEVELOPMENT

3.1 Transportation Source Assessment

3.1.1 Road Traffic Volume Data

The Ultimate Average Daily Traffic (UADT) was estimated based on the number of lanes for each roadway with assumed day-night split for typical arterial or local roads. The percentage of trucks was taken from turning movement count data at the intersections of each road, which was provided by the City of London. A summary of the traffic data used is included in **Table 1** below with more detailed information included in **Appendix D**.

Table 1: Road Traffic Volumes

Roadway	Ultimate Traffic	% Day/Night	Speed Limit (km/hr)	% Trucks
Dundas St.	36000	85% /15%	60	4.4 %
Highbury Ave.	36000	85% / 15%	60	5.3 %
Oxford St.	36000	85% / 15%	60	5.5 %
First St.	18000	90% / 10%	40	6.7 %

3.1.2 Rail Traffic Volume Data

Freight rail volumes were requested from but were not provided by the rail authorities (CN and CP) in time for the preparation of this assessment. As such, typical volumes based on line-type (e.g. principal main line, secondary line) have been assumed as a basis for the analysis. These may be conservative and should be confirmed with the rail authorities at Site Plan Approval (SPA) stage.

The data used for the analysis is summarized in **Table 2**, with details of the data used included in **Appendix D**.

Table 2: Rail Traffic Volumes and Train Configurations

Train Type	Daytime	Nighttime	Type of Locomotive	No. of Locomotives	No. of Cars	Speed (km/h)
Freight Main (Principal Main Lines)	16	8	Diesel	4	100	56
Freight Yard Branch (Principal Branch Line)	4	2	Diesel	2	20	50
Freight Novell Polymers (Spur Line)	1	0	Diesel	1	6	3

3.1.3 Representative Receptors

The selection of receptors affected by transportation noise sources was based on the drawings reviewed for this assessment. For the large residential buildings each façade was evaluated using the "building evaluation" feature of the Cadna/A noise modelling software.

Outdoor Living Areas (OLAs) would include outdoor areas intended and designed for the quiet enjoyment of the outdoor environment and which are readily accessible from the building. OLAs may include any common outdoor amenity spaces associated with a multi-unit residential development (e.g. courtyards, roof-top terraces), and/or private backyards and terraces with a minimum depth of 4 m provided they are the only outdoor living area for the occupant. Daytime sound levels were assessed at the following identified OLAs:

- OLA_B001: Single Home Backyard
- OLA_B012: Single Home Backyard
- OLA_B025: Single Home Backyard
- OLA_B030: Single Home Backyard
- OLA_B032: Potential Outdoor Amenity Block 32
- OLA_B038: Potential Outdoor Amenity Block 38
- OLA_B058: Open Space Block 58

Specific outdoor amenity spaces for the medium and high-density residential areas were not available at the time of assessment, however, Blocks 32 and 38 were noted to be of concern and an outdoor point at-grade was assessed to ensure a feasible option is available. We therefore recommend that outdoor amenity spaces associated with these portions of the development, as well as the ones assessed within this report, be assessed at SPA.

The OLAs are indicated in **Figure 2**.

3.1.4 Transportation Source Assessment - Analysis and Results

Sound levels due to the adjacent transportation sources were predicted using the Cadna/A software package. The RLS-90 standard (RLS,1990) was used for road traffic and the FRA method (FRA, 2012) was used for rail traffic. The maximum sound levels on each façade were determined as summarized in **Table 3**. These values are then used to determine indoor sound levels due to each type of transportation.

Table 3: Predicted Transportation Source Sound Levels – Plane of Window

Building	Façade	Road		Rail		Notes
		Day L_{EQ}, 16hr dBA	Night L_{EQ}, 8hr dBA	Day L_{EQ}, 16hr dBA	Night L_{EQ}, 8hr dBA	
Block_001	Single Home	52	47	45	45	-
Block_012	Single Home	52	47	45	45	-
Block_025	Single Home	50	44	48	47	-
Block_030	Single Home	48	43	47	47	1
Block_031	Tower	59	55	48	48	-
Block_032	Tower	50	44	54	54	-
Block_034	Tower	49	43	55	55	-
Block_035	Town House Row	45	40	52	52	-
Block_036	Tower	49	45	57	57	2
Block_037	Tower	58	53	58	58	2
Block_038	Tower	52	48	62	62	2
Block_041	Tower	68	63	52	52	2
Block_045	Tower	69	65	50	50	2
Block_046	Tower	67	63	51	51	2
Block_047	Tower	67	63	54	54	2
Block_048	Tower	67	63	57	57	2

Notes:

1. Applicable for low and medium density developments: Provision for future installation of air-conditioning with warning clause "Type C". Applicable for high density developments: Installation of air-conditioning to allow for windows and doors to remain closed with warning clause "Type D". Refer to **Appendix C** for guidance regarding air-conditioning as a noise mitigation measure.
2. The acoustical performance of building components must be specified to meet the indoor sound level criteria. Installation of air conditioning to allow for windows and doors to remain closed with warning clause "Type D". Refer to **Appendix C** for guidance regarding air-conditioning as a noise mitigation measure.

Indoor sound levels are calculated from the levels presented in **Table 3** based on the window. A reduction of 10 dB can be expected through an open window while at least 20 dB reduction can be expected through a typical closed window. The 10 dB reduction is used unless air-conditioning is be installed to allow windows to remain closed and achieve the 20 dB reduction. Portions of the development will require installation of air conditioning to achieve the criteria. In portions of the development where greater than 20 dB reduction is needed, the requirement for upgraded façade components will need to be investigated when detailed site plans are available.

Regardless of the air conditioning and façade construction, a brick veneer or masonry equivalent façade construction for building facades facing and within 100 m of a rail line is specified in the Railway Association of Canada (RAC), Guidelines for New Development in Proximity to Railway Operations. As the there are no site layouts, or massings, we recommend this be revisited at a later stage of the development as design progresses.

In the OLAs the influence of road and rail sound is combined. To assess the impact of transportation noise on the qualifying OLAs for the development, predicted sound level results are summarized in **Table 4**.

Table 4: Predicted Transportation Source Sound Levels - Outdoor Living Areas (OLAs)

Receptor	Description	Daytime L_{EQ}, 16hr dBA	Notes
OLA_B001	Single Home Backyard	49	1
OLA_B012	Single Home Backyard	50	1
OLA_B025	Single Home Backyard	51	1
OLA_B030	Single Home Backyard	48	1
OLA_B032	Potential Outdoor Amenity 32	50	1
OLA_B038	Potential Outdoor Amenity 38	52	1
OLA_B058	Open Space Block 58	50	1

Notes:

1. The predicted sound level meets the NPC-300 criterion for OLAs. Noise control measures are not required.

An OLA with line of sight to the rail line to the south has been identified as having sound levels in excess of the recommended 55 dBA. In this case mitigation should be included to meet the 55 dBA limit where feasible. Alternatively, a warning clause Type A could be implemented into lease and purchase agreements. However, for example Block 38 if the outdoor amenity space is located such that a building provides shielding (as shown in **Figure 2**) to the rail line no mitigation will be required. As noted earlier, once detailed site plans are available, appropriate/tailored noise controls for amenity spaces should be investigated.

Earthen berms are typically recommended along principal mainlines per RAC guidance, however given the setback from the rail to the nearest building berms are not required from an environmental noise perspective if the design guidance for placement of outdoor amenity spaces is followed. Spur lines do not have a requirement for berms per RAC. Therefore, the noise recommendations made in the following sections have been made in the absence of any earthen berms.

3.2 Rail Vibration Assessment

Due to the proximity of the rail spur line servicing the industrial facilities to the east of the development the potential for freight train activity to result in perceptible vibration within the new development was evaluated. FTA screening level analysis was used to predict vibration levels at two locations within the development. The two closest blocks (Block 35 and Block 38) were assessed, and the vibration modeling calculations and assessment locations can be found in **Appendix E**.

The FTA screening analysis indicates that that vibration resulting from rail activity will be below the applicable perception limit at proposed residential areas. As per the City of London Official Plan, Chapter 19, developments within 120 m of rail lines may have their noise and vibration studies circulated to rail agencies for comments. Rail agencies may require vibration measurements to be taken. If required, measurements can be taken and provided in the SPA report.

3.3 Stationary Source Assessment

Noise emissions from industrial and commercial facilities are subject to requirements of the MECP. Unless they are exempt from permit requirements, they are required to either have an Environmental Compliance Approval (ECA) or Environmental Activity and Sector Registry (EASR).

3.3.1 Novell Polymers

One notable facility included in the assessment is Novell Polymers, a plastic processing facility at 539 Commercial Crescent. It is neither exempt nor currently operating under a permit issued by the MECP. They are aware of the requirements and hoped that they will produce a detailed noise study to be available in preparation for site plan approval. However, a study was not made available to RWDI at the time of this report. This assessment is made with the assumption Novell Polymers will be operating stationary sources under a permit from the MECP.

RWDI conducted a site visit to former London Psychiatric Hospital Lands on October 6th, 2021, with the primary goal of measuring the sound levels of the plastic facility's operations. The timing of the site visit was coordinated with the owner of the plastic facility to capture the facility at peak noise emissions for the week. The following sections outline the results of the site visit.

3.3.2 Other Commercial and Industrial Facilities

Additional noise sources associated with adjacent commercial facilities were identified from aerial imagery and included in the assessment from a due diligence perspective. The additional sites included in the assessment are:

- North American Trade Schools – London (847 Highbury Ave N)
- Autoneum (847 Highbury Ave N)
- Lac-Mac (847 Highbury Ave N)
- Andrigo Tile Co Ltd (847 Highbury Ave N)
- Canada Post London Processing Facility (951 Highbury Ave N)
- Various businesses in the Oxbury Centre (1299 Oxford St E)
- U-Haul Dealer (571 Commercial Crescent)
- Apex Motor Express (563 Commercial Crescent)
- Brinks Canada Inc (1495 Spanner St)

The sound levels of these other commercial and industrial facilities were included in the noise model to determine the overall effect of all adjacent commercial/industrial facilities.

The sources included in the stationary source assessment are shown in **Appendix F**, **Figure F.1,** with a detailed view of the plastics facility in **Figure F.2**.

3.3.2.1 Representative Receptors

The worst-case receptor locations were assessed to evaluate the potential stationary source noise impact. Using the "building evaluation" feature of Cadna/A, each façade of the residential buildings was assessed. Given details of the developments massing are not yet available the outdoor points of reception were assessed as the same locations as the outdoor living areas assessed for transportation noise. The locations of the outdoor points assessed are shown in **Figure 2**.

3.3.2.2 Assumed Sources and Sound Power Levels

The sources of sound from the industrial and commercial facilities are represented by measured and proxy data. RWDI proxy data were used for the sound power levels of the HVAC units, dust collector and idling trucks included in the model. The assumed sound power levels included in the screening level stationary source assessment are presented in **Table 5**. The locations of the sources included in the stationary source assessment are illustrated in **Appendix F**, **Figure F-2**.

Table 5: Stationary Source Sound Power Level Assumptions

Source	Data Source	Sound Character	Sound Power Level (dBA)	Duty Cycle	
				Daytime and Evening (07:00h 23:00h)	Nighttime (23:00h 07:00h)
HVAC_1Fan	Proxy Data	Steady	82	Continuous	Continuous
HVAC_2Fan	Proxy Data	Steady	85	Continuous	Continuous
HVAC_4Fan	Proxy Data	Steady	88	Continuous	Continuous
HVAC_10Fan	Proxy Data	Steady	92	Continuous	Continuous
HVAC_12Fan	Proxy Data	Steady	93	Continuous	Continuous
Idling Truck	Proxy Data	Steady	92	Continuous	Continuous
Moving Truck	Proxy Data	Steady	104	Continuous	Continuous
Blower Motor	Measured	Steady	105	Continuous	Continuous
Plastic Silos	Measured	Steady	107	Continuous	Continuous
Plastic Conveyor	Measured	Steady	81[1]	Continuous	Continuous
Rail Coupling	Proxy Data	Impulsive	118	9 or more	-
Silo Baghouse	Proxy Data	Impulsive	101	9 or more	9 or more

Notes:

1. Sound Power Level defined per unit length (1 meter).

Sound power level values and duty-cycles for the stationary sources are based on assumptions for the source type and discussions with Novell Polymers. Continuous operation of the HVAC units and idling trucks at area facilities represent the worst-case hour for the daytime and nighttime periods.

3.3.2.3 Analysis and Results

Stationary source noise modelling was carried out using the Cadna/A software package, a commercially available implementation of the ISO 9613 (ISO, 1994 and ISO, 1996) algorithms. The predicted sound levels are assessed against both the Class 1 and 4 Area limits (refer to **Appendix A**).

The predicted sound levels during the worst-case 1-hour from existing stationary sources are presented in **Table 6**.

Table 6: Predicted Stationary Source Sound Levels – Plane of Window

Building	Facade	Sound Levels				Notes
		Continuous Day $L_{EQ\ 1hr}$ dBA	Continuous Night $L_{EQ\ 1hr}$ dBA	Rail Coupling Impulse dBA	Silo Baghouse Impulse dBA	
Block_001	Single Home	44	43	49	37	2
Block_012	Single Home	45	45	50	39	2
Block_025	Single Home	52	51	55	44	1, 2
Block_030	Single Home	52	50	52	43	1, 2
Block_031	Tower	43	43	37	31	-
Block_032	Tower	52	51	53	44	1, 2
Block_034	Tower	55	55	54	47	1, 2
Block_035	Town House Row	47	46	50	43	2
Block_036	Tower	54	54	54	49	1, 2
Block_037	Tower	49	48	49	42	1
Block_038	Tower	55	54	55	48	1, 2
Block_041	Tower	46	45	49	38	2
Block_045	Tower	48	48	40	31	1
Block_046	Tower	48	47	45	37	1
Block_047	Tower	49	48	47	38	1
Block_048	Tower	48	46	47	39	1

Notes:

1. Exceeds the Steady Class 1 50 dBA $L_{EQ\text{-}1hr}$ daytime or 45 dBA $L_{EQ\text{-}1hr}$ nighttime criteria.
2. Exceeds the Impulsive Class 1 50 dBA $L_{EQ\text{-}1hr}$ daytime or 45 dBA $L_{EQ\text{-}1hr}$ nighttime criteria.

Table 7: Predicted Stationary Source Sound Levels - Outdoor Points of Reception

Receptor	Description	Sound Levels			Notes
		Day $L_{EQ\ 1hr}$ dBA	Rail Coupling Impulse dBA	Silo Baghouse Impulse dBA	
OLA_B001	Single Home Backyard	40	42	33	-
OLA_B012	Single Home Backyard	42	46	35	-
OLA_B025	Single Home Backyard	53	53	42	1, 2
OLA_B030	Single Home Backyard	53	51	41	1, 2
OLA_B032	Open Space Block 32	51	48	42	1
OLA_B038	Open Space Block 38	37	41	35	-
OLA_B058	Open Space Block 58	31	28	14	-

Notes:

1. Exceeds the Steady Class 1 50 dBA L_{EQ-1hr} daytime criteria.
2. Exceeds the Impulsive Class 1 50 dBA L_{EQ-1hr} daytime criteria.

As shown in **Table 6** and **Exceeds the** Impulsive Class 1 50 dBA LEQ-1hr daytime or 45 dBA LEQ-1hr nighttime criteria.

Table 7, the daytime-evening and nighttime continuous sound levels at due to existing stationary sources are predicted to exceed the applicable Class 1. These blocks would, however, meet the applicable Class 4 sound level criteria based on the modelling analysis. Sound level contours for the impacts from steady stationary sources are shown in **Appendix F, Figure F.3**.

3.4 Recommendations

Based on the noise and vibration impact assessment results, the following recommendations were determined for the project. Recommendations are provided for both transportation sources and stationary sources. The recommendations should be revisited as the design evolves and information on layouts and massing become available.

3.4.1 Transportation Sources

The following recommendations are provided to address transportation sources.

3.4.1.1 Building Façade Components

Due to the elevated transportation sound levels in the area, acoustical design of the façade components including spandrel, window glazing, and exterior doors, are recommended to be specified for the proposed development. At this stage in the design, detailed massing is not available, and analysis of the Sound Transmission Class (STC) requirements should be assessed when massing is available. It is generally expected that for this development the Ontario Building Code requirements will be sufficient for the majority of the blocks. Those immediately adjacent to major roadways may require upgraded glazing with up to an STC-34, however, depending on the final separation distance to the traffic lanes, the requirements may also be met by the Ontario Building Code.

Note that per NPC-300 exterior walls for dwellings within 300 m of railway tracks will require to be built with a brick veneer or masonry equivalent for the façade with exposure to the railway line.

3.4.1.2 Ventilation Recommendations

Due to the transportation sound levels at the plane of the façade, central air conditioning is recommended for the portions of the proposed development as noted for the representative receptors in **Table 3** to allow for windows and doors to remain closed as a noise mitigation measure. Further, prospective purchasers or tenants should be informed by a warning clause "Type C" or "Type D" as applicable to the unit. These should be revisited as the design evolves. Interior buildings that are shielded from transportation sources will likely have reduced requirements and may not require use of warning clauses.

3.4.1.3 Outdoor Living Areas

An OLA with line of sight to the rail line to the south has been identified as having sound levels in excess of the recommended 55 dBA. In this case mitigation should be included to meet the 55 dBA limit where feasible. Alternatively, a warning clause Type A could be implemented into lease and purchase agreements. It is generally recommended that outdoor amenity spaces are located such that the development itself shields spaces from the nearby transportation corridors. For example, Block 38 if the outdoor amenity space is located such that a building provides shielding (as shown in **Figure 2**) to the rail line no mitigation will be required.

OLAs located deeper within the area to be developed are set back from the transportation corridors and the development itself provides sufficient shielding from the surrounding transportation sources to meet the applicable limits. These requirements were aimed at meeting the 55 dBA criteria based on the overall site layout but should be revisited as design evolves when block layouts are known.

3.4.2 Rail Vibration

The modeling demonstrated that the vibration produced by freight activity is within acceptable limits. Therefore, vibration mitigation is not required for the proposed development. Vibration measurements can be conducted at SPA to confirm this if required by the rail authority or City.

3.4.3 Stationary Sources

The significant stationary source noise is produced by Novell Polymers. Measurements and modelling show that sound from this facility has influence on the London Psychiatric Hospital Lands adjacent to this facility. The Novell Polymers facility is treated as it is currently in compliance with Environmental Protection Act requirements, although the approval or registration is not currently in place. The London Psychiatric Hospital Lands can be developed for residential use without adding restrictions to the noise emissions from existing Novell Polymers operations by a combination of the following measures:

- Suitable layout of the development;
- Massing design that meets the requirements laid out in **Table 8**; and
- Provision of on-building mitigation for some residences in the development through a Class 4 designation.

Table 8: Massing Requirements

Block	Massing Requirements
Block 035	Single loaded multi-residential usage constructed such that there are no windows for noise-sensitive spaces facing the plastic facility. Buildings should span from the northern edge of the block to at least 230 meters to the south. The back façade of the buildings should be in line with the east edge of the block. Gaps between buildings should be narrow to minimizes areas with line of sight to the plastics facility, the massing shown has a maximum 5 meter gap between buildings. Note this gap requirement may vary depending on the depth of the building. Buildings should have a minimum height of 9 meters. Although not shown in the massing used, it is expected that the rest of the block could be developed into single detached homes or town houses of equal height as the single loaded block.
Block 034	Medium density block could consist of a tower up to 30 meters[1] tall on the western portion, with a podium up to 21 meters tall on the eastern portion
Block 036	Medium density block could consist of a tower up to 30 meters[1] tall on the southwestern portion, with a podium up to 6 meters tall on the northeastern portion
Block 038	Medium density block could consist of towers up to 30 meters[1] tall with the northeast portion of the development

Notes:

1. 30 meters represents a typical 10 storey building, buildings greater in height were not assessed but may be feasible.

See **Figure 3** for sample building footprints as used in this assessment. This figure and the information in **Table 8** should be referenced as massing is developed further. Placement of residences, parking, roads and open spaces has been used to minimize the need for other measures, while maximizing usage of the land. The areas in which residential development should be avoided are also shown in **Figure 3.**

To further provide protection through the use of mitigation measures on the residential uses, a "Class 4" designation by the City of London is recommended. This specifically addresses sound of pneumatic product movement at the Novell Polymers' silos. A Class 4 designation allows any sound insulation by design of the façade and glazing of buildings to be considered. The minimum area in which a "Class 4" designation would be required for residential buildings is shown in **Figure 3.** To provide the facility an additional working buffer, and the developer flexibility, Class 4 designation is recommended to be extended to the blocks that are adjacent to the ones shown in the figure.

Further, we recommend that the assumptions used in this analysis are confirmed with the plastics facility as part of SPA.

Due to the proximity of the proposed development to the commercial and industrial facilities, a warning clause "Type E" is recommended to inform prospective occupants of the potential for audible noise from these facilities.

3.4.4 Warning Clauses

The following warning clauses are recommended for the proposed development:

1. NPC-300 Type A to address transportation sound levels at the outdoor amenity spaces, as applicable
2. NPC-300 Type C or D to address transportation sound levels at the plane of window, as applicable
3. Proximity to Railway Line Warning Clause, as applicable
4. NPC-300 Type E to address proximity to commercial/industrial facilities
5. NPC-300 Type F for Class 4 Area Notification for applicable blocks

Warning clauses are recommended to be included on all development agreements, offers of purchase and agreements of purchase and sale or lease. The wording of the recommended warning clauses is included with **Appendix B**. These should be revisited as the design evolves and site layout and massing are known, as some clauses may not be applicable to certain blocks.

4 IMPACT OF THE PROPOSED DEVELOPMENT ON ITS SURROUNDINGS AND ON ITSELF

On-site stationary sources for the towers within development are expected to consist of HVAC related equipment in the roof-top mechanical penthouse as well as various exhaust fans. Further, consideration should be given to control airborne and structure-borne noise generated within the proposed development.

Within the towers themselves the main sources of noise that are likely to affect the uses of the building are the mechanical systems. The potential noise impact of the commercial component of the development is recommended to be reviewed during detailed design, to ensure the applicable criteria will be met.

Provided that best practices for the acoustical design of the building are followed, noise from building services equipment associated with the towers are expected to be feasible to meet the applicable sound level criteria due to the nature (residential/mixed-use) of the proposed development.

On-site stationary sources for the low-rise dwellings are expected to mainly consist of HVAC related equipment. Consideration should be given to control airborne and structure-borne noise generated within the proposed development.

Provided that best practices for the acoustical design of the building and guidelines from NPC-216 (MOE, 1993) are followed, noise from the development are expected to be feasible to meet the applicable sound level criteria due to the residential nature of the proposed dwellings.

We recommend that the potential noise impact of the proposed development is reviewed during detailed design to ensure the applicable sound level criteria will be achieved.

5 CONCLUSIONS

RWDI was retained to prepare a Noise and Vibration Impact Study for the proposed redevelopment of the former London Psychiatric Hospital Lands located in London, Ontario into a mixed-use subdivision.

The following noise control measures would be recommended to be applied selectively in the proposed development:

1. Installation of central air-conditioning so that all residential windows can remain closed to address transportation noise.
2. Brick veneer or masonry equivalent façade construction for building facades facing and within 300 m of the rail line.
3. Locate outdoor amenity spaces such that development itself shields the area from nearby transportation corridors.
    a. Particularly, outdoor amenity spaces with line of sight to the rail line to the south should be avoided.
4. Building massing to include:
    a. Single-loaded multi-story residential usage along the side facing Novell Polymers.
    b. Height restriction on select blocks surrounding Novell Polymers.
5. On-building noise mitigation measures, requiring a Class 4 designation from the City of London.
6. The inclusion of noise warning clauses related to:
    a. Sound levels due to proximity to transportation sources;
    b. Proximity to railway line;
    c. Proximity to commercial/industrial land-use; and
    d. Class 4 Area Notification.

The potential for vibration influences on the site due to the rail spur line servicing the industrial facilities to the east of the development line was evaluated. FTA screening level analysis at two locations within the development predicted vibrations levels below the applicable limits. Thus, no mitigation measures for vibration are required.

At this stage in design the impact of the development on itself and its surroundings could not be quantitatively assessed. However, the impact on both the building itself and its surroundings is expected to be feasible to meet the applicable criteria.

Based on the results of this assessment the design shown in drawings dated February 22, 2022, with revisions provided in August 2022, is considered feasible subject to the mitigation measures and design guidance provided above.

6 REFERENCES

1. Ontario Ministry of the Environment and Climate Change (MOECC), August 2013, Publication NPC-300, Environmental Noise Guideline Stationary and Transportation Sources – Approval and Planning (MOECC, 2013).
2. Ontario Ministry of the Environment and Energy (MOE), 1993, Publication NPC-216, Residential Air Conditioning Devices (MOE, 1993).
3. Richtlinien für den Lärmschutz an Strassen (RLS). BM für Verkehr, Bonn, 1990 (RLS, 1990).
4. Federal Transit Administration, U.S. Department of Transportation, Transit Noise and Vibration Impact Assessment, 2018 (FTA, 2018).
5. Federal Railroad Administration, U.S. Department of Transportation, High-Speed Ground Transportation Noise and Vibration Impact Assessment Impact Assessment, 2012 (FRA, 2012).
6. The Railway Association of Canada (RAC), Guidelines for New Development in Proximity to Railway Operations (RAC, 2013).
7. Institute of Transportation Engineers (ITE), 2010, *Traffic Engineering Handbook, 6th Edition* (ITE, 2010)
8. International Organization for Standardization (ISO), 1994b, International Standard ISO 9613-1:1994, Acoustics – Attenuation of Sound during propagation outdoors. Part 1: Calculation of the absorption of sound by the atmosphere. (ISO, 1994)
9. International Organization for Standardization (ISO), 1996, International Standard ISO 9613-2:1996, Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation (ISO, 1996)
10. Ontario Ministry of the Environment and Climate Change (MOE), 1978, Model Municipal Noise Control Bylaw, which includes Publication NPC-103 – Procedures, and Publication NPC-104 – Sound Level Adjustments.

7 STATEMENT OF LIMITATIONS

This report entitled "Former London Psychiatric Hospital (LPH) Lands Subdivision Noise and Vibration Study" dated October 31, 2022, was prepared by Rowan Williams Davies & Irwin Inc. ("RWDI") for Old Oak Properties ("Client"). The findings and conclusions presented in this report have been prepared for the Client and are specific to the project described herein ("Project"). The conclusions and recommendations contained in this report are based on the information available to RWDI when this report was prepared. Because the contents of this report may not reflect the final design of the Project or subsequent changes made after the date of this report, RWDI recommends that it be retained by Client during the final stages of the project to verify that the results and recommendations provided in this report have been correctly interpreted in the final design of the Project.

The conclusions and recommendations contained in this report have also been made for the specific purpose(s) set out herein. Should the Client or any other third party utilize the report 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 report carefully review the stated assumptions contained herein and to understand the different factors which may impact the conclusions and recommendations provided.

FIGURES

Site Context Plan

True North

Map Projection: NAD 1983 UTM Zone 17N

Former London Psychiatric Hospital (LPH) Lands Subdivision - London, ON

Project #: 2104756

Drawn by: LRC	Figure: 1
Approx. Scale:	1:10,000
Date Revised:	Oct 27, 2022

Map Document: \\rwdgroup\guelph\Jobs_3\2104756\03WorkItems\20EnvironmentalNoiseAnalysis\ArcGIS\LPHLLPHL.aprx

Outdoor Living Areas (OLAs) and Outdoor Points of Reception (OPR)

True North

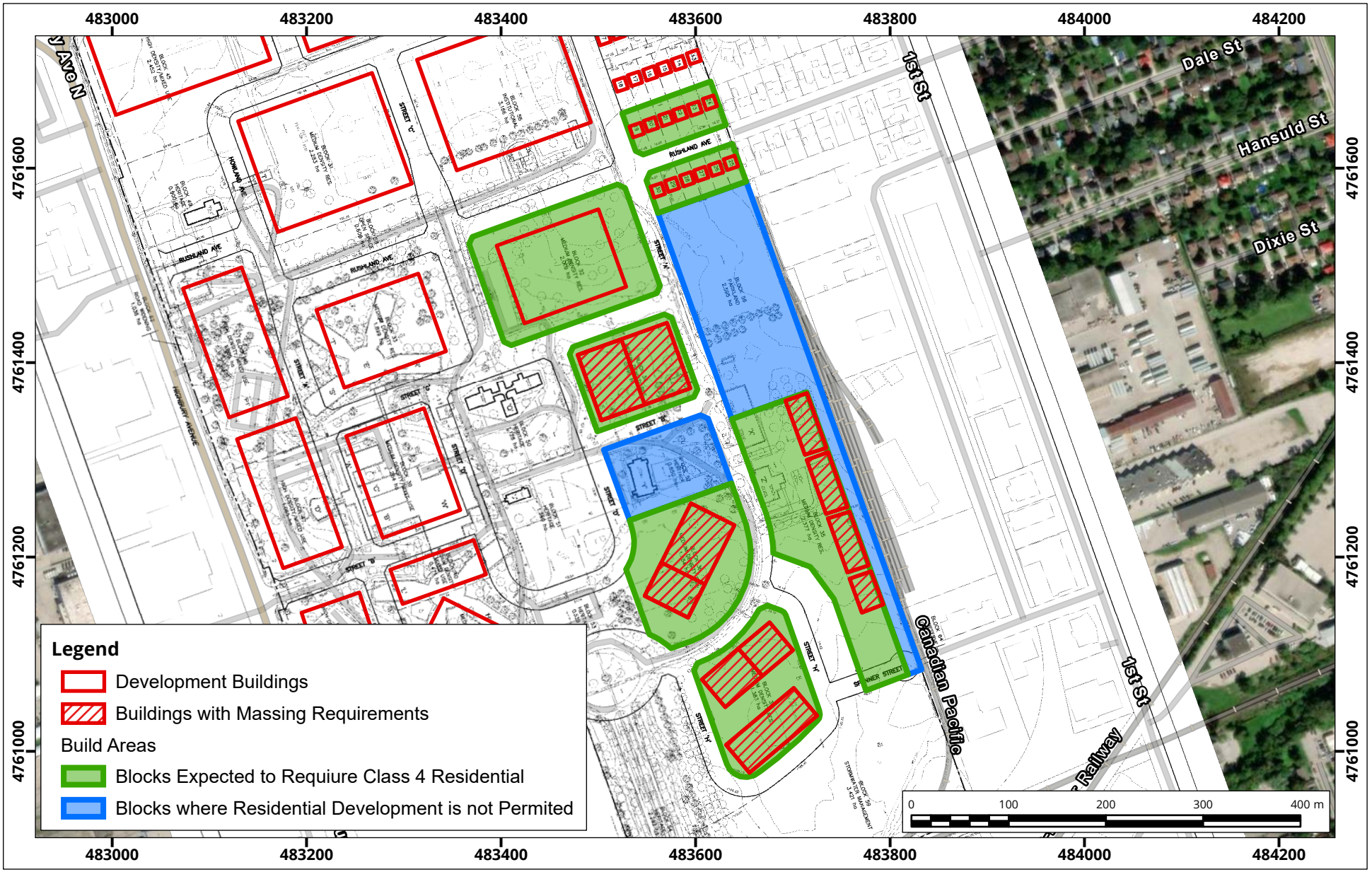
Drawn by: LRC	Figure:	2
Approx. Scale:	1:6,000	
Date Revised:	Oct 27, 2022	

Map Projection: NAD 1983 UTM Zone 17N

Former London Psychiatric Hospital (LPH) Lands Subdivision - London, ON

Project #: 2104756

Map Document: \\rwdgroup\guelph\Jobs_3\2104756\03Worklterms\20EnvironmentalNoiseAnalysis\ArcGIS\LPHL\LPHL.aprx



Build Areas

True North

Drawn by: LRC | Figure: 3

Approx. Scale: 1:5,500

Date Revised: Oct 27, 2022

Map Projection: NAD 1983 UTM Zone 17N

Former London Psychiatric Hospital (LPH) Lands Subdivision - London, ON

Project #: 2104756

Map Document: \\rwdgroup\guelph\Jobs_3\2104756\03Worklterms\20EnvironmentalNoiseAnalysis\ArcGIS\LPHL\LPHL.aprx

APPENDIX A

APPENDIX A: CRITERIA

A.1 Transportation Sources

Guidance from the Ontario Ministry of the Environment, Conservation and Parks (MECP) NPC-300 Environmental Noise Guideline was used to assess environmental noise generated by transportation-related sources. There are three aspects to consider, which include the following:

i. Transportation source sound levels in indoor living areas (living rooms and sleeping quarters), which determines building façade elements (windows, exterior walls, doors) sound insulation design recommendations.
ii. Transportation source sound levels at the plane of the window, which determines air-conditioning and ventilation system recommendations and associated warning clauses which inform the future occupants that windows and doors must be closed in order to meet the indoor sound level criteria.
iii. Transportation source sound levels in Outdoor Living Areas (OLAs), which determines OLA noise mitigation and related warning clause recommendations.

A.1.1 Road and Rail

A.1.1.1 Indoor Sound Level Criteria

For assessing sound originating from transportation sources, NPC-300 defines sound level criteria as summarized in Table 1 for indoor areas of sensitive uses. The specified values are maximum sound levels and apply to the indicated indoor spaces with the windows and doors closed.

Table 1: Indoor Sound Level Criteria for Road and Rail Sources

Type of Space	Source	Sound Level Criteria (Indoors)	
		Daytime $L_{eq,16\ hr}$ 07:00h 23:00h	Nighttime $L_{eq,8\ hr}$ 23:00h 07:00h
Living Quarters Examples: Living, dining and den areas of residences, hospitals, nursing homes, schools and daycare centres	**Road**	45 dBA	
	Rail	40 dBA	
Sleeping Quarters	**Road**	45 dBA	40 dBA
	Rail	40 dBA	35 dBA

NPC-300 also provides guidelines for acceptable indoor sound levels that are extended to land uses and developments which are not normally considered noise sensitive. The guideline sound level criteria presented in Table 2 are provided to inform good-practice design objectives.

Table 2: Supplementary Indoor Sound Level Criteria for Road and Rail Sources

Type of Space	Source	Sound Level Criteria (Indoors)	
		Daytime $L_{eq,16\ hr}$ 07:00h 23:00h	Nighttime $L_{eq,8\ hr}$ 23:00h 07:00h
General offices, reception areas, retail stores, etc.	**Road**	50 dBA	-
	Rail	45 dBA	-
Theatres, places of worship, libraries, individual or semi-private offices, conference rooms, reading rooms, etc.	**Road**	45 dBA	-
	Rail	40 dBA	-
Sleeping quarters of residences, hospitals, nursing/retirement homes, etc.	**Road**	-	40 dBA
	Rail	-	35 dBA
Sleeping quarters of hotels/motels	**Road**	-	45 dBA
	Rail	-	40 dBA

A.1.1.2 Outdoor Living Areas (OLAs)

Outdoor Living Areas (OLAs) would include outdoor areas intended and designed for the quiet enjoyment of the outdoor environment and which are readily accessible from the building.

OLAs may include any common outdoor amenity spaces associated with a multi-unit residential development (e.g. courtyards, roof-top terraces), and/or private backyards and terraces with a minimum depth of 4m provided they are the only outdoor living area for the occupant. The sound level criteria for outdoor living areas is summarized in Table 3.

Table 3: Sound Level Criteria – Outdoor Living Area

Assessment Location	Sound Level Criteria (Outdoors)	
	Daytime $L_{eq,16\ hr}$ 07:00h 23:00h	Nighttime $L_{eq,8\ hr}$ 23:00h 07:00h
Outdoor Living Area (OLA) (Combined Road and Rail)	55 dBA	-

A.1.1.3 Outdoor and Plane of Window Sound Levels

In addition to the sound level criteria, noise control measures and requirements for ventilation and warning clauses requirements are recommended for residential land-uses based on predicted transportation source sound levels incident in the plane of window at bedrooms and living/dining rooms, and/or at outdoor living areas. These recommendations are summarized in Table 4 below.

Table 4: Ventilation, Building Component, and Warning Clauses Recommendations for Road/Rail Sources

Assessment Location	Transportation Sound Level (Outdoors)		Recommendations
	Daytime $L_{eq,16\ hr}$	Nighttime $L_{eq,8\ hr}$	
Plane of Window (Road)	> 65 dBA	> 60 dBA	Installation of air conditioning to allow windows to remained closed. The sound insulation performance of building components must be specified and designed to meet the indoor sound level criteria. Warning clause "Type D" is recommended.
	≤ 65 dBA > 55 dBA	≤ 60 dBA > 50 dBA	Applicable for low and medium density development: Forced-air ventilation system to allow for the future installation of air-conditioning. Warning clause "Type C" is recommended. Applicable for high density development: Air conditioning to allow windows to remained closed. Warning clause "Type D" is recommended.
Plane of Window (Rail [1, 2])	> 60 dBA	> 55 dBA	The acoustical performance of building façade components should be specified such that the indoor sound level limits are predicted to be achieved. Warning clause "Type D" is recommended.
	> 60 dBA ($L_{eq,\ 24hr}$) and < 100m from tracks		Exterior walls consisting of a brick veneer or masonry equivalent for the first row of dwellings. Warning clause "Type D" is recommended.
Outdoor Living Area (Combined Road and Rail [3])	≤ 60 dBA > 55 dBA	-	If sound levels are predicted to exceed 55 dBA, but are less than 60 dBA, noise controls may be applied to reduce the sound level to 55 dBA. If noise control measures are not provided, a warning clause "Type A" is recommended.
	> 60 dBA	-	Noise controls (barriers) should be implemented to meet the 55 dBA criterion. If mitigation is not feasible to meet the 55 dBA criterion for technical, economic or administrative reasons, an exceedance of 5 dB may be acceptable (to a maximum sound level of 60 dBA). In this case a warning clause "Type B" would be recommended.

Notes:

1. Whistle noise is included (if applicable) in the determination of the sound level at the plane of window.
2. Some railway companies (e.g. CN, CP) may require that the exterior walls include a brick veneer or masonry equivalent for the façade facing the railway line, regardless of the sound level.
3. Whistle noise is not included in the determination of the sound level at the OLA.

A.1.1.4 Rail Vibration Criteria

An assessment of rail vibration is generally recommended for developments within 75m of a rail corridor or rail yard, and adjacent to or within a setback of 15m of a transit (subway or light-rail) rail line.

The generally accepted vibration criterion for sensitive land-uses is the threshold of perception for human exposure to vibration, being a vibration velocity level of 0.14 mm/s RMS in any one-third octave band centre frequency in the range of 4 Hz to 200 Hz.

This vibration criterion is based on a one-second exponential time-averaged maximum hold root-mean-square (RMS) vibration velocity level and is consistent with the Railway Associations of Canada (RAC, 2013) guideline, the U.S. Federal Transit Authority (FTA, 2018) criterion for residential land-uses, the Toronto Transit Commission (TTC) guidelines for the assessment of potential vibration impact of future expansion (MOEE/TTC, 1993).

A.2 Stationary Sources

A.2.1 NPC-300 Sound Level Criteria – Stationary Sources

Guidance from the MECP NPC-300 Environmental Noise Guideline is used to assess environmental noise generated by stationary sources, for example industrial and commercial facilities.

Noise from stationary sources is treated differently from transportation sources and requires sound levels be assessed for the predictable worst-case one-hour average sound level (L_{eq}) for each period of the day. For assessing sound originating from stationary sources, NPC-300 defines sound level criteria for two types of Points of Reception (PORs): outdoor and plane of window.

The assessment criteria for all PORs is the higher of either the exclusion limit per NPC-300 or the minimum background sound level that occurs or is likely to occur at a POR. The applicable exclusion limit is determined based on the level of urbanization or "Class" of the area. The NPC-300 exclusion limits for continuously operating stationary sources are summarized in Table 5.

Table 5: NPC-300 Exclusion Limits – Continuous and Quasi-Steady Impulsive Stationary Sources (LAeq-1hr)

Time Period	Class 1 Area		Class 2 Area		Class 3 Area		Class 4 Area	
	Outdoor	Plane of Window	Outdoor	Plane of Window	Outdoor	Plane of Window	Outdoor	Plane of Window
Daytime 0700-1900h	50 dBA	50 dBA	50 dBA	50 dBA	45 dBA	45 dBA	55 dBA	60 dBA
Evening 1900-2300h	50 dBA	50 dBA	45 dBA	50 dBA	40 dBA	40 dBA	55 dBA	60 dBA
Nighttime 2300-0700h	--	45 dBA	--	45 dBA	--	40 dBA	--	55 dBA

Notes:

1. The applicable sound level criterion is the background sound level or the exclusion limit, whichever is higher.
2. Class 1, 2 and 3 sound level criteria apply to a window that is assumed to be open.
3. Class 4 area criteria apply to a window that is assumed closed. Class 4 area requires formal designation by the land-use planning authority.
4. Sound level criteria for emergency backup equipment (e.g. generators) operating in non-emergency situations such as testing or maintenance are 5 dB greater than the applicable sound level criteria for stationary sources.

For impulsive sound, other than quasi-steady impulsive sound, from a stationary source, the sound level criteria at a POR is expressed in terms of the Logarithmic Mean Impulse Sound Level (L_{LM}), and is summarized in Table 6.

Table 6: NPC-300 Exclusion Limits – Impulsive Stationary Sources (L_{LM})

Time Period	Number of Impulses in Period of One Hour	Class 1 and 2 Areas		Class 3 Areas		Class 4 Areas	
		Outdoor	Plane of Window	Outdoor	Plane of Window	Outdoor	Plane of Window
Daytime (0700-2300h)	9 or more	50 dBAI	50 dBAI	45 dBAI	45 dBAI	55 dBAI	60 dBAI
Nighttime (2300–0700h)		-	45 dBAI	-	40 dBAI	-	55 dBAI
Daytime (0700-2300h)	7 to 8	55 dBAI	55 dBAI	50 dBAI	50 dBAI	60dBAI	65 dBAI
Nighttime (2300–0700h)		-	50 dBAI	-	45 dBAI	-	60 dBAI
Daytime (0700-2300h)	5 to 6	60 dBAI	60 dBAI	55 dBAI	55 dBAI	65 dBAI	70 dBAI
Nighttime (2300–0700h)		-	55 dBAI	-	50 dBAI	-	65 dBAI
Daytime (0700-2300h)	4	65 dBAI	65 dBAI	60 dBAI	60 dBAI	70 dBAI	75 dBAI
Nighttime (2300–0700h)		-	60 dBAI	-	55 dBAI	-	70 dBAI
Daytime (0700-2300h)	3	70 dBAI	70 dBAI	65 dBAI	65 dBAI	75 dBAI	80 dBAI
Nighttime (2300–0700h)		-	65 dBAI	-	60 dBAI	-	75 dBAI
Daytime (0700-2300h)	2	75 dBAI	75 dBAI	70 dBAI	70 dBAI	80 dBAI	85 dBAI
Nighttime (2300–0700h)		-	70 dBAI	-	65 dBAI	-	80 dBAI
Daytime (0700-2300h)	1	80 dBAI	80 dBAI	75 dBAI	75 dBAI	85 dBAI	90 dBAI
Nighttime (2300–0700h)		-	75 dBAI	-	70 dBAI	-	85 dBAI

Notes:

1. The applicable sound level criterion is the background sound level or the exclusion limit, whichever is higher.

APPENDIX B

APPENDIX B: WARNING CLAUSES

Warning clauses are recommended to be included on all development agreements, offers of purchase and agreements of purchase and sale or lease. Warning clauses may be used individually or in combination.

The following warning clauses are recommended based on the applicable guidelines; however, wording may be modified/customized during consultation with the planning authority to best suit the proposed development:

B.1 Transportation Sources

NPC-300 Type A: Recommended to address surface transportation sound levels in OLAs if sound level is in the range of >55 dBA but ≤ 60 dBA, and noise controls have not been provided.

"Purchasers/tenants are advised that sound levels due to increasing road traffic (rail traffic) (air traffic) may occasionally interfere with some activities of the dwelling occupants as the sound levels exceed the sound level limits of the Municipality and the Ministry of the Environment."

NPC-300 Type B: Recommended to address surface transportation sound levels in OLAs if the sound level is in the range of >55 dBA but ≤ 60 dBA, and noise controls have been provided. Recommended to address outdoor aircraft sound levels ≥NEF 30.

"Purchasers/tenants are advised that despite the inclusion of noise control features in the development and within the building units, sound levels due to increasing road traffic (rail traffic) (air traffic) may on occasions interfere with some activities of the dwelling occupants as the sound levels exceed the sound level limits of the Municipality and the Ministry of the Environment."

NPC-300 Type C: Applicable for low and medium density developments only, recommended to address transportation sound levels at the plane of window.

"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."

NPC-300 Type D: Recommended to address transportation sound levels at the plane of window.

"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."

Proximity to Railway Line: Metrolinx/CN/CP/VIA Warning Clause for developments that are within 300 metres of the right-of-way

"Warning: [Canadian National Railway Company] [Metrolinx / GO] [Canadian Pacific Railway Company] [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). CNR/Metrolinx/GO/CPR/VIA will not responsible for any complaints or claims arising from use of such facilities and/or operations on, over or under the aforesaid right-of-way."

B.2 Stationary Sources

NPC-300 Type E: Recommended to address proximity to commercial/industrial land-use

"Purchasers/tenants are advised that due to the proximity of the adjacent industrial/commercial land-uses, noise from the industrial/commercial land-uses may at times be audible."

NPC-300 Type F: Recommended to for Class 4 Area Notification

"Purchasers/tenants are advised that sound levels due to the adjacent industry (facility) (utility) are required to comply with sound level limits that are protective of indoor areas and are based on the assumption that windows and exterior doors are closed. This dwelling unit has been supplied with a ventilation/air conditioning system which will allow windows and exterior doors to remain closed."

APPENDIX C

APPENDIX C: NOISE MITIGATION GUIDANCE

C.1 Acoustic/Noise Barrier

Generally, noise controls to attenuate transportation sound levels at Outdoor Living Areas (OLAs) would consist of the implementation of acoustic/noise barriers with materials that would meet the guidance included in NPC-300, for example:

- A wall, berm, wall/berm combination or similar structure, used as a noise control measure, and high enough to break the line-of-sight between the source and the receptor.
- The minimum surface density (face weight) is 20 kg/m^2
    - Many materials could satisfy the surface density requirement, e.g. wood, glass, concrete, Plexiglas, Acrylite.
    - The required thickness can be determined by dividing the 20 kg/m^2 face weight by the material density (kg/m^3). Typically, this would imply:
        - 50 mm (2") of wood
        - 13 mm (0.5") of lighter plastic (like Plexiglas or PVC)
        - 6 mm (0.25") of heavier material (like aluminum, glass, concrete)
- The barrier should be structurally sound, appropriately designed to withstand wind and snow load, and constructed without cracks or surface gaps. Joints between panels may need to be overlapped to ensure surfaces are free of gaps, particularly for wood construction.
- Any gaps under the barrier that are necessary for drainage purposes should be minimized and localized, so that the acoustical performance of the barrier is maintained.
- If a sound absorptive face is to be included in the barrier design, the minimum noise reduction coefficient is recommended to be NRC 0.7.

C.2 Building Ventilation and Air Conditioning

The use of air conditioning itself is not a noise control measure; however, it allows for windows and doors to remain closed, thereby reducing the indoor sound levels.

NPC-300 provides the following guidance with respect to implementation of building ventilation and air conditioning:

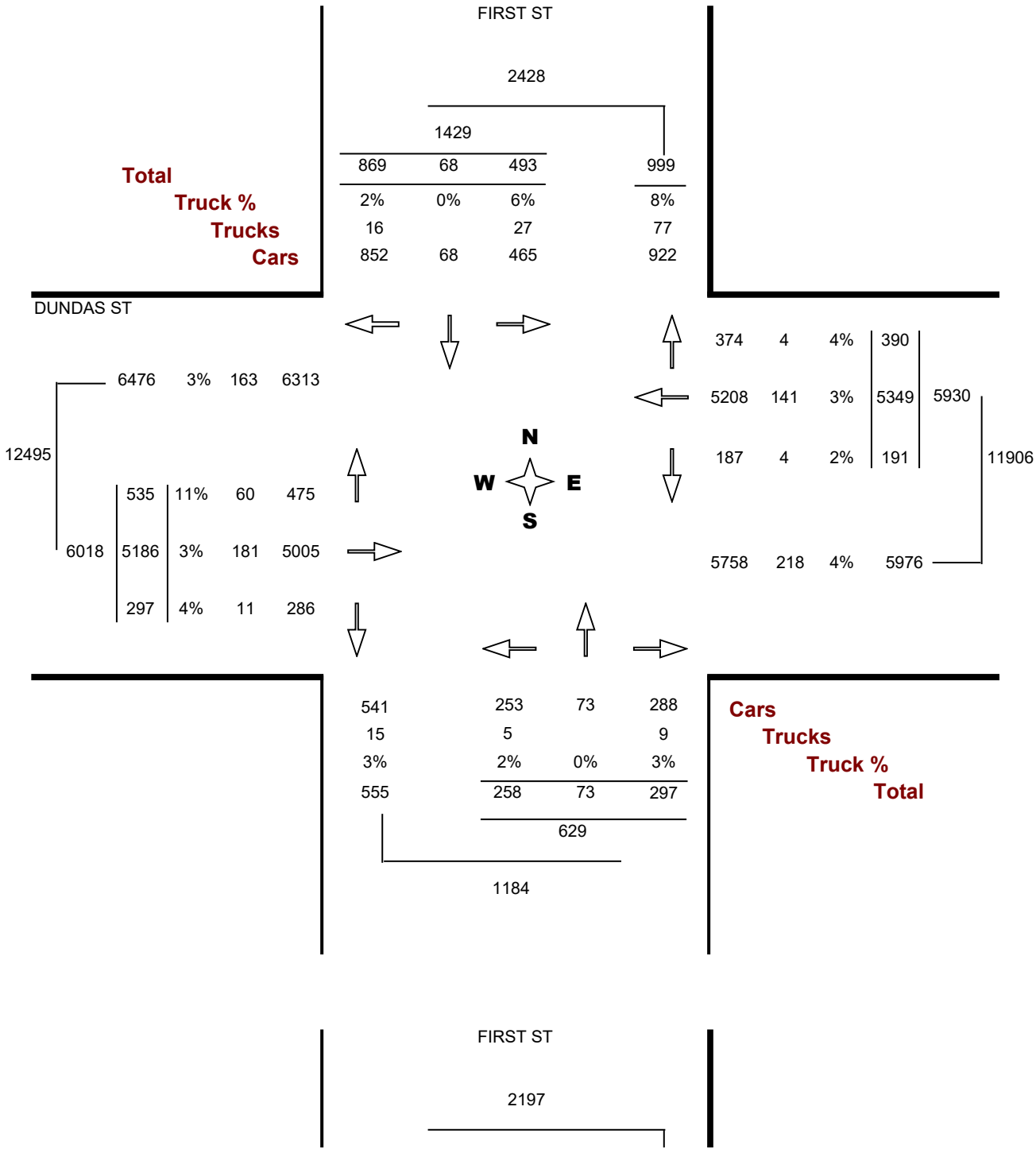
a. the noise produced by the proposed ventilation system in the space served does not exceed 40 dBA. In practice, this condition usually implies that window air conditioning units are not acceptable;
b. the ventilation system complies with all national, provincial and municipal standards and codes;
c. the ventilation system is designed by a heating and ventilation professional; and
d. the ventilation system enables the windows and exterior doors to remain closed.

Air conditioning systems also need to comply with Publication NPC-216, and/or any local municipal noise by-law that has provisions relating to air conditioning equipment.

APPENDIX D

Turning Movements Count - AADT Report

Location..... DUNDAS ST @ FIRST ST
Municipality. LONDON
Traffic Cont. Traffic signal
Count Date.. Wednesday, May 09, 2018 **AADT factor..** 1.8326



Turning Movements Count - AADT Report

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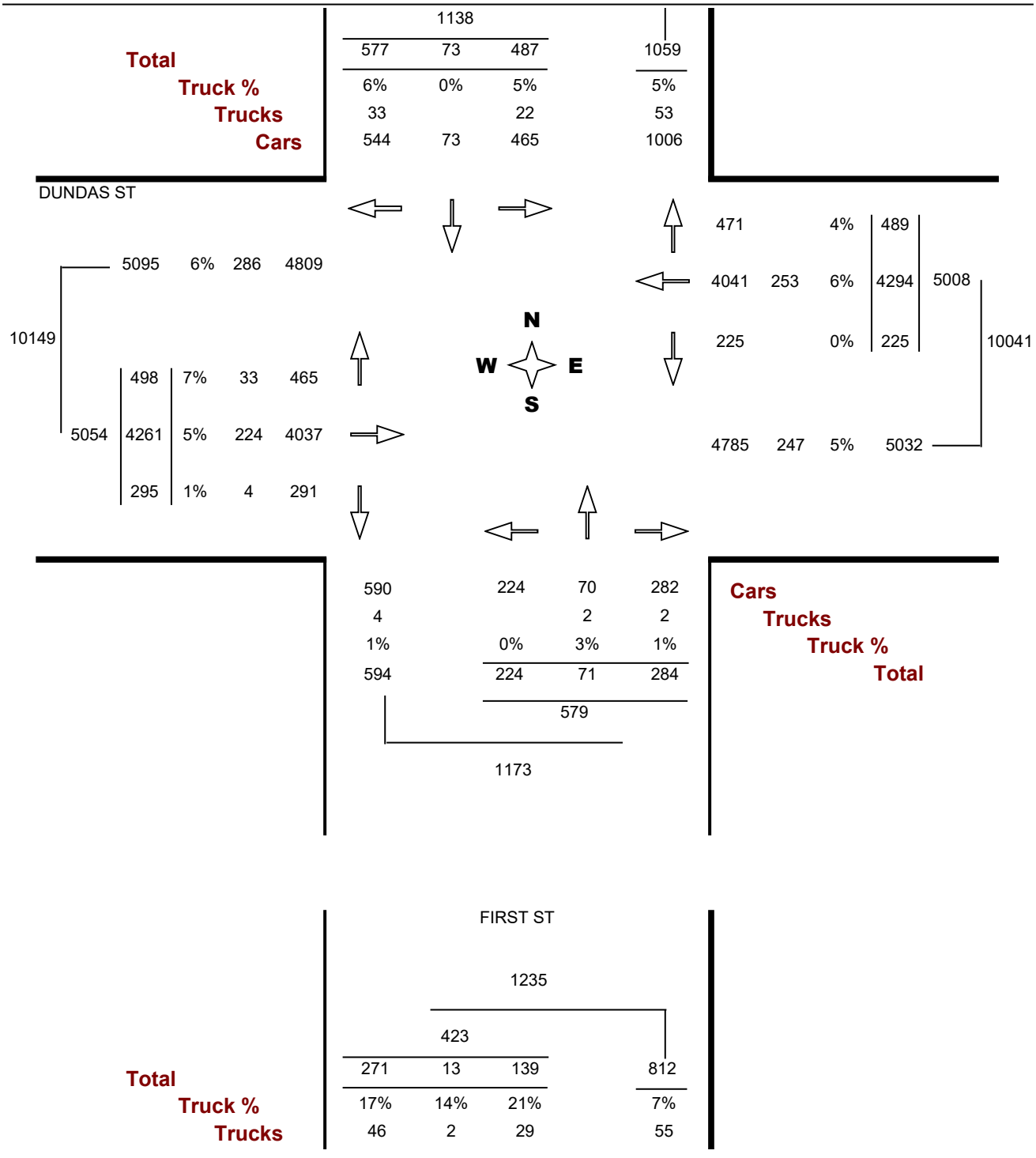
Municipality. LONDON
Traffic Cont. Traffic signal
Count Date.. Wednesday, May 09, 2018 **AADT factor..** 1.8326



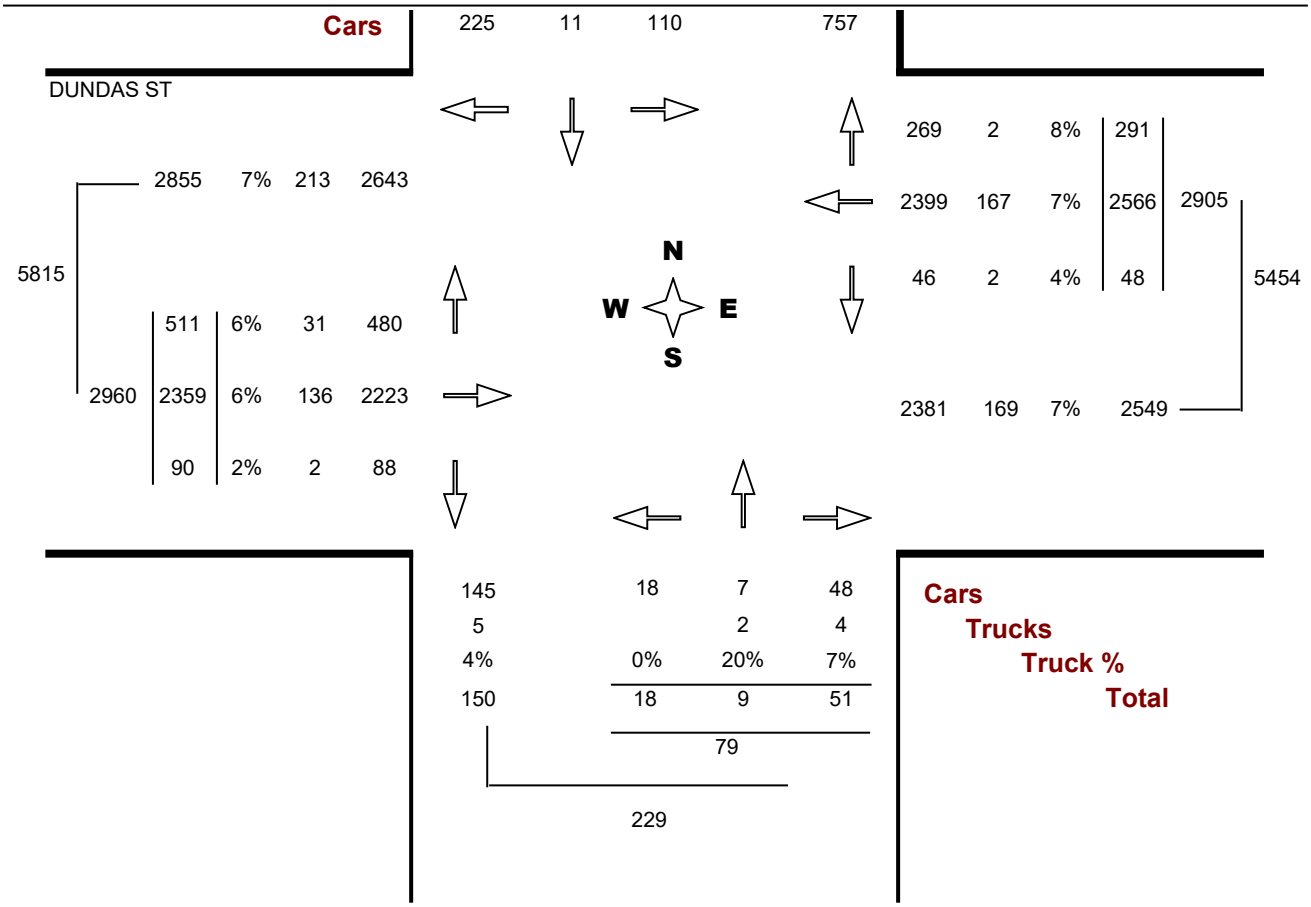
Turning Movements Count - AADT Report

Location..... DUNDAS ST @ FIRST ST

Municipality. LONDON

Traffic Cont. Traffic signal

Count Date.. Wednesday, May 09, 2018 **AADT factor..** 1.8326



Turning Movements Count - AADT Report

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Municipality. LONDON
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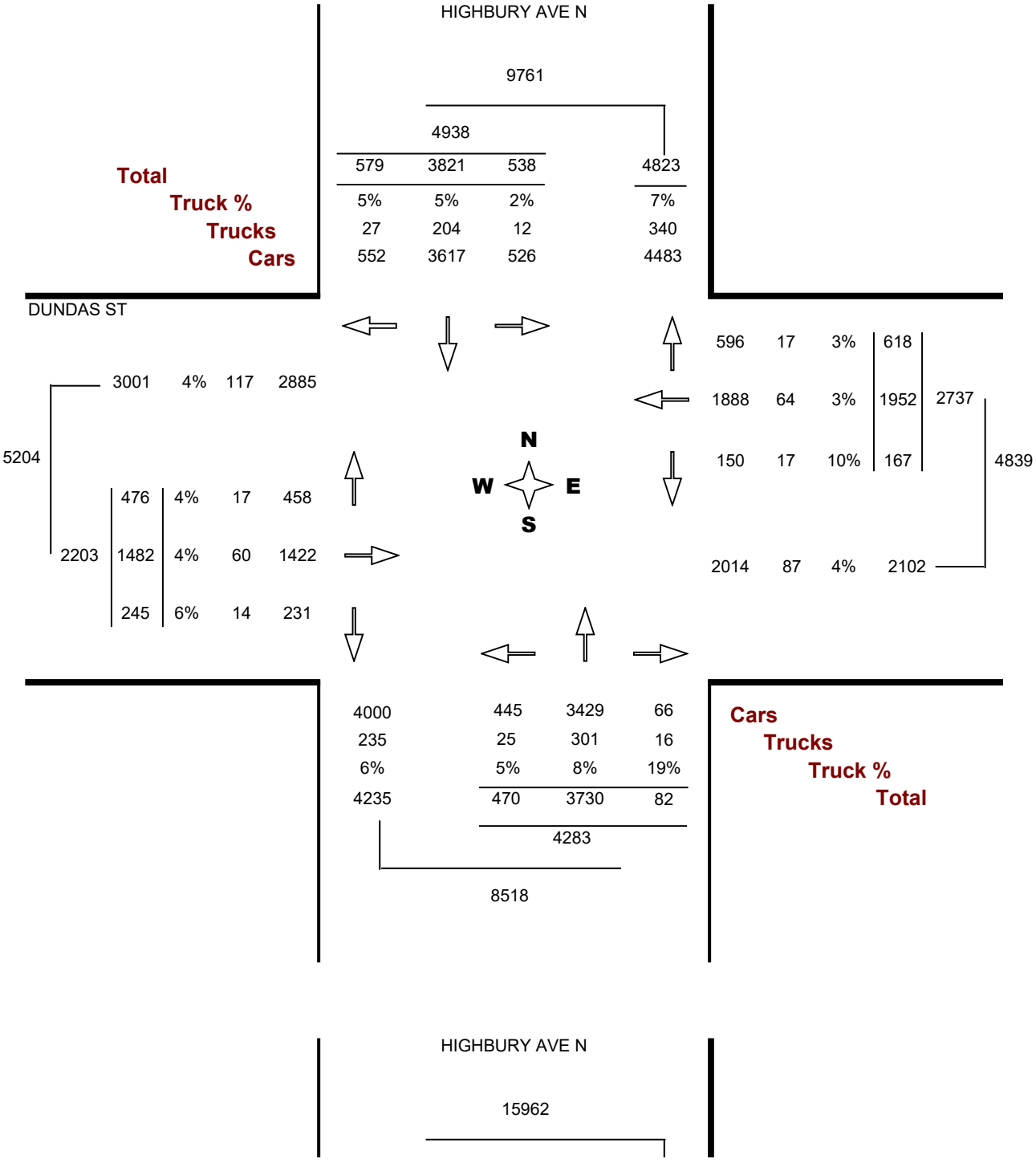


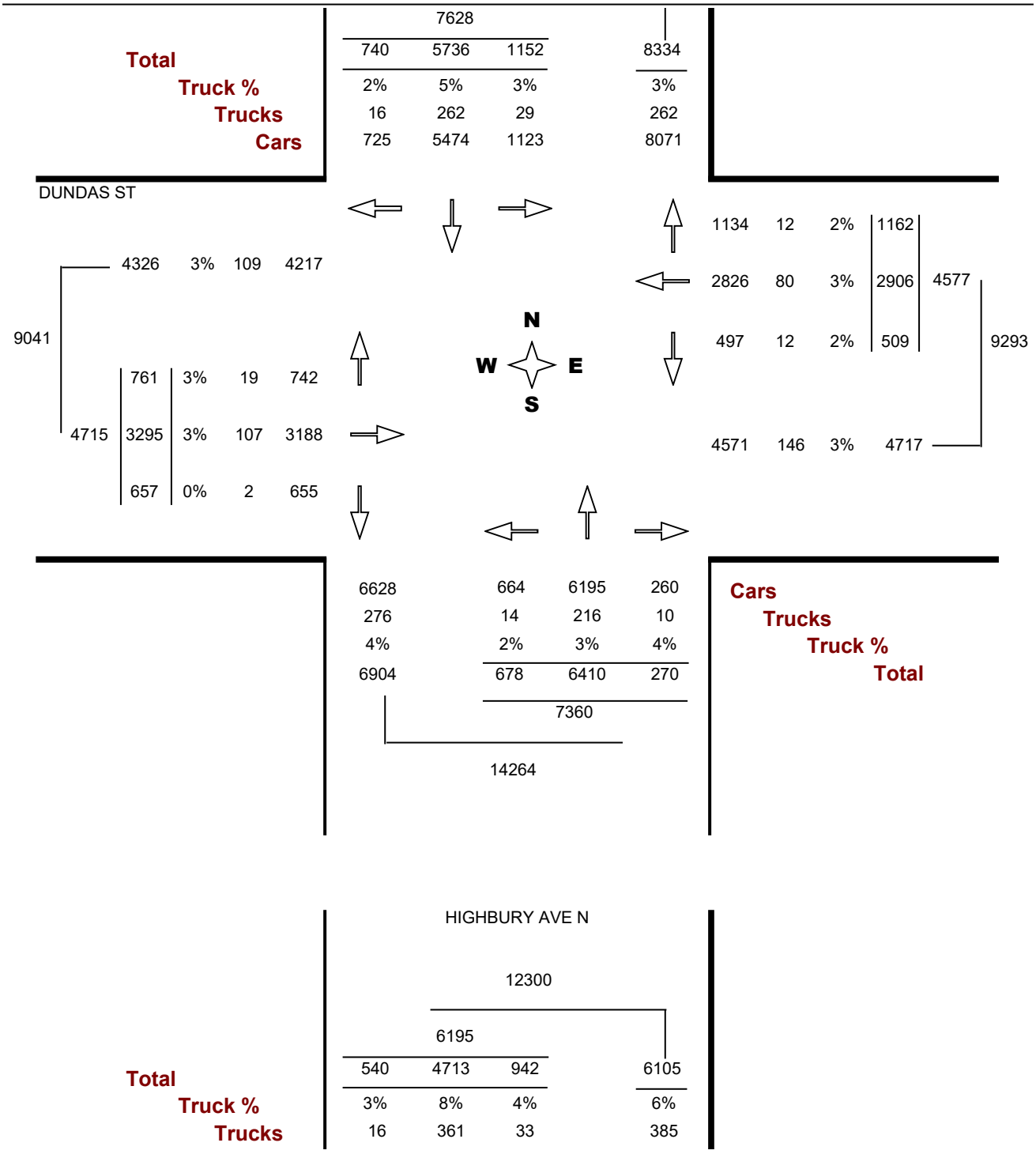
Turning Movements Count - AADT Report

Location..... DUNDAS ST @ HIGHBURY AVE N

Municipality. LONDON

Traffic Cont. Traffic signal

Count Date.. Monday, May 13, 2019 **AADT factor..** 1.942556



Turning Movements Count - AADT Report

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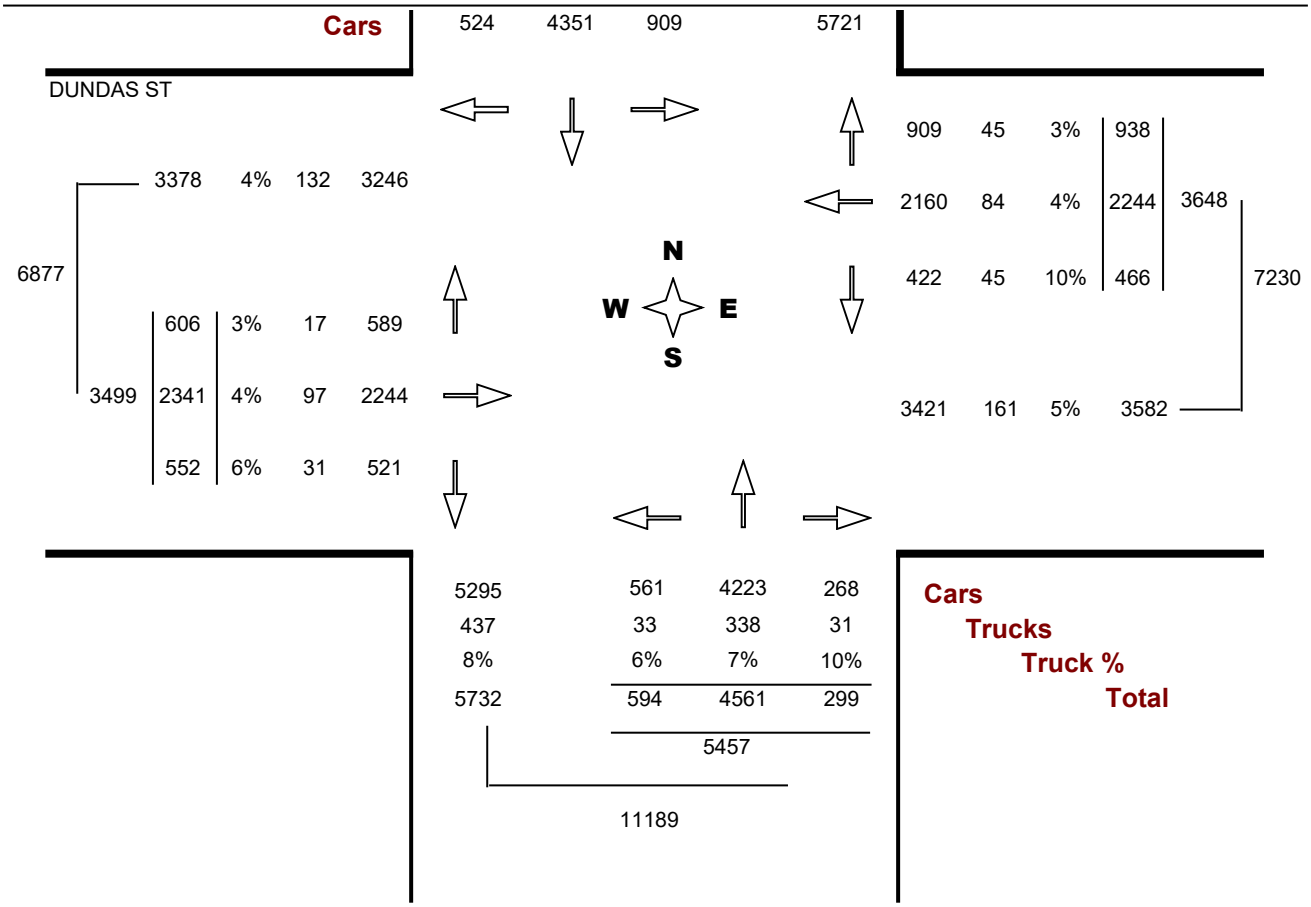
Municipality. LONDON

Traffic Cont. Traffic signal

Count Date.. Monday, May 13, 2019 **AADT factor..** 1.942556



Turning Movements Count - AADT Report

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Municipality. LONDON
Traffic Cont. Traffic signal
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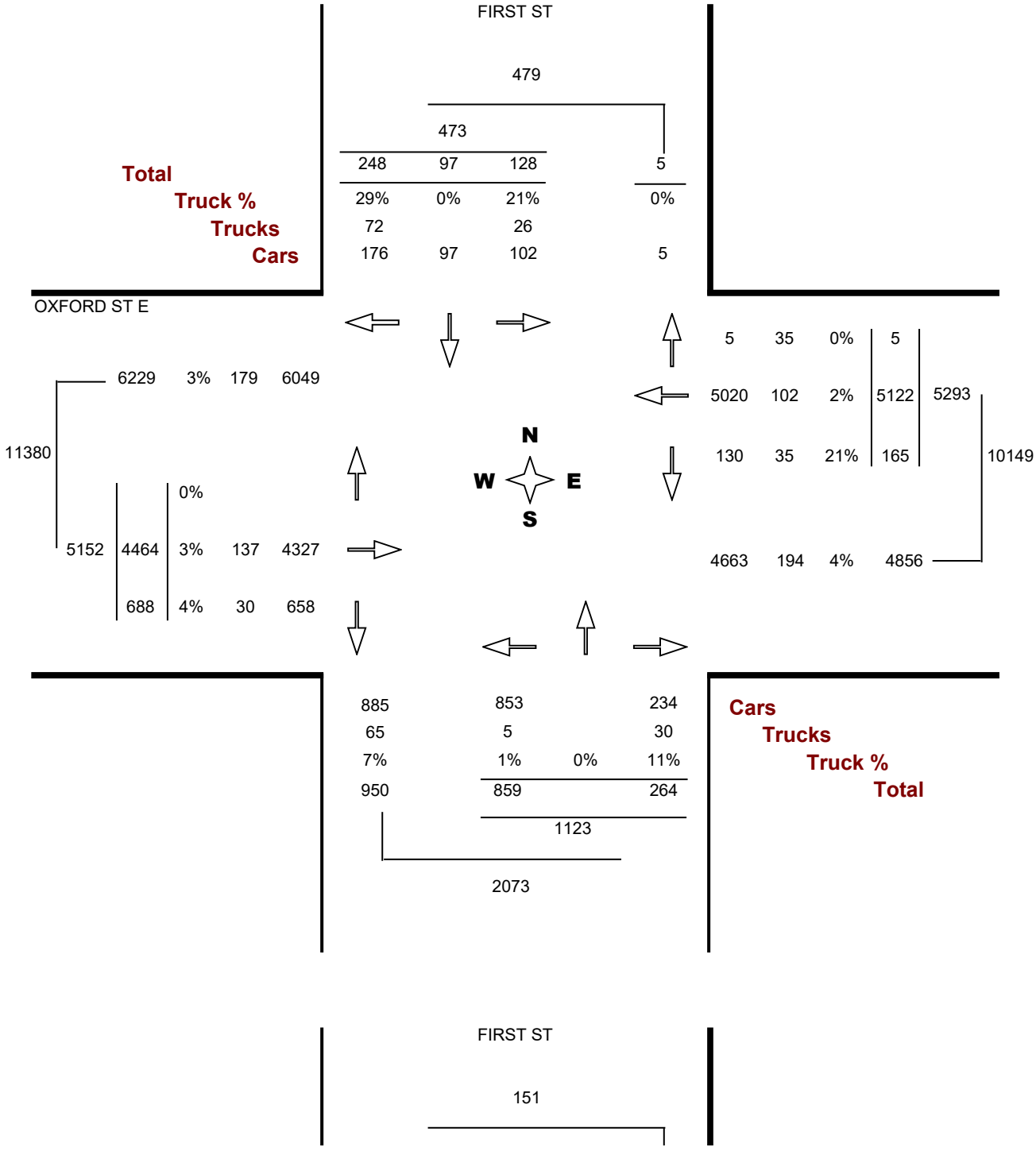

Turning Movements Count - AADT Report

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Traffic Cont. Traffic signal
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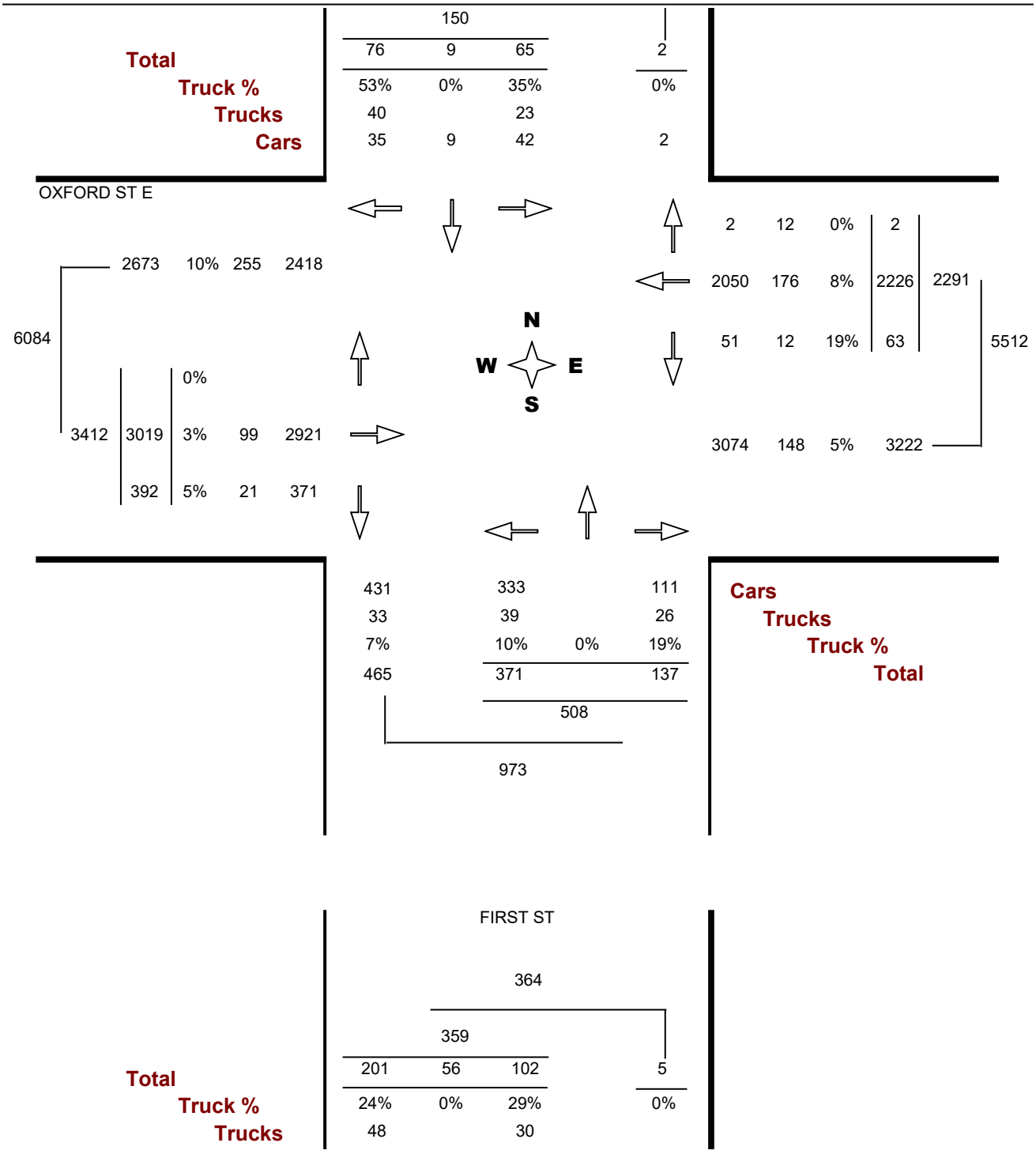


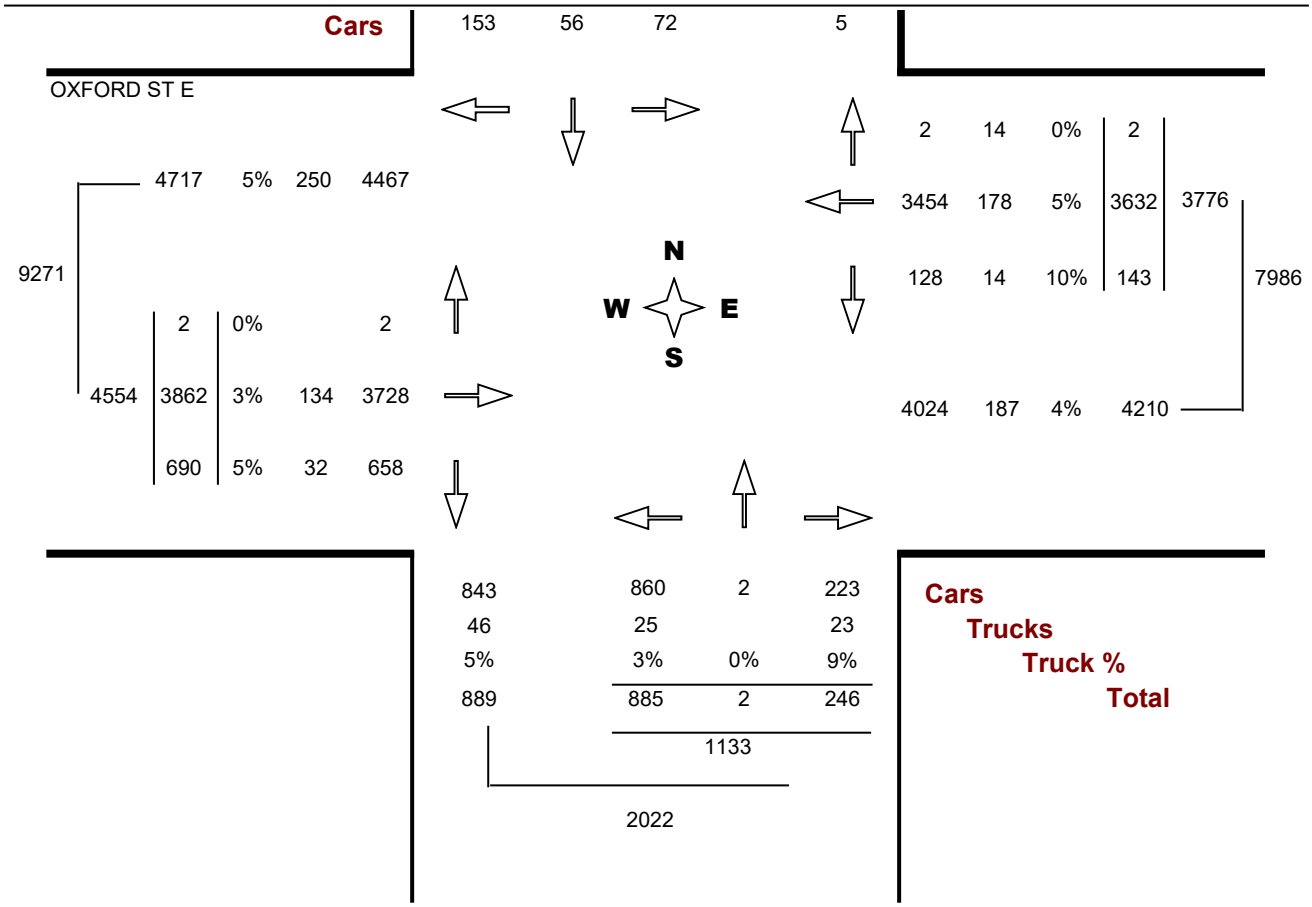
Turning Movements Count - AADT Report

Location..... FIRST ST @ OXFORD ST E

Municipality. LONDON

Traffic Cont. Traffic signal

Count Date.. Thursday, June 20, 2019 **AADT factor..** 1.759483



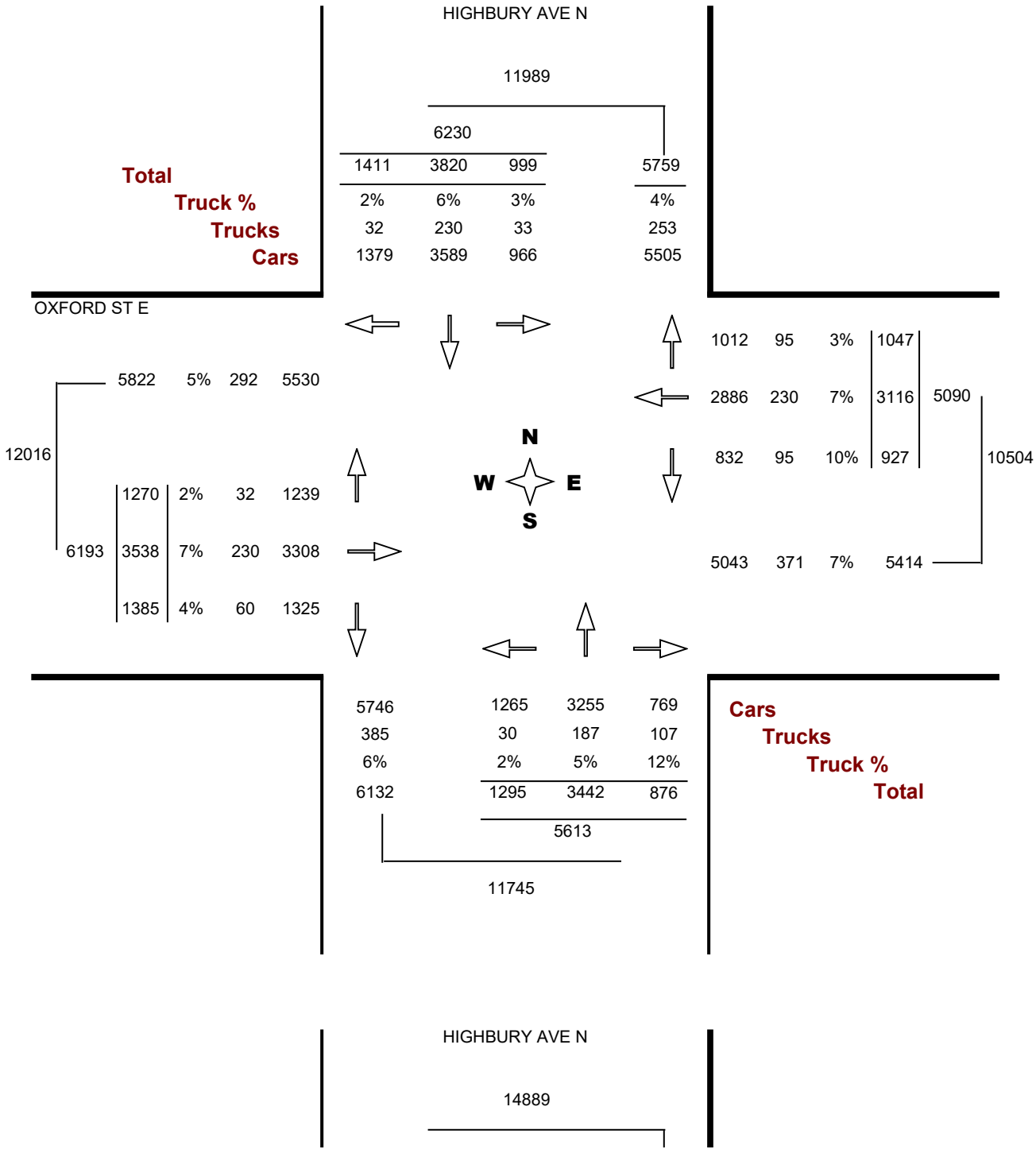
Turning Movements Count - AADT Report

Location..... HIGHBURY AVE N @ OXFORD ST E

Municipality. LONDON

Traffic Cont. Traffic signal

Count Date.. Thursday, September 28, 2017 **AADT factor..** 1.759483



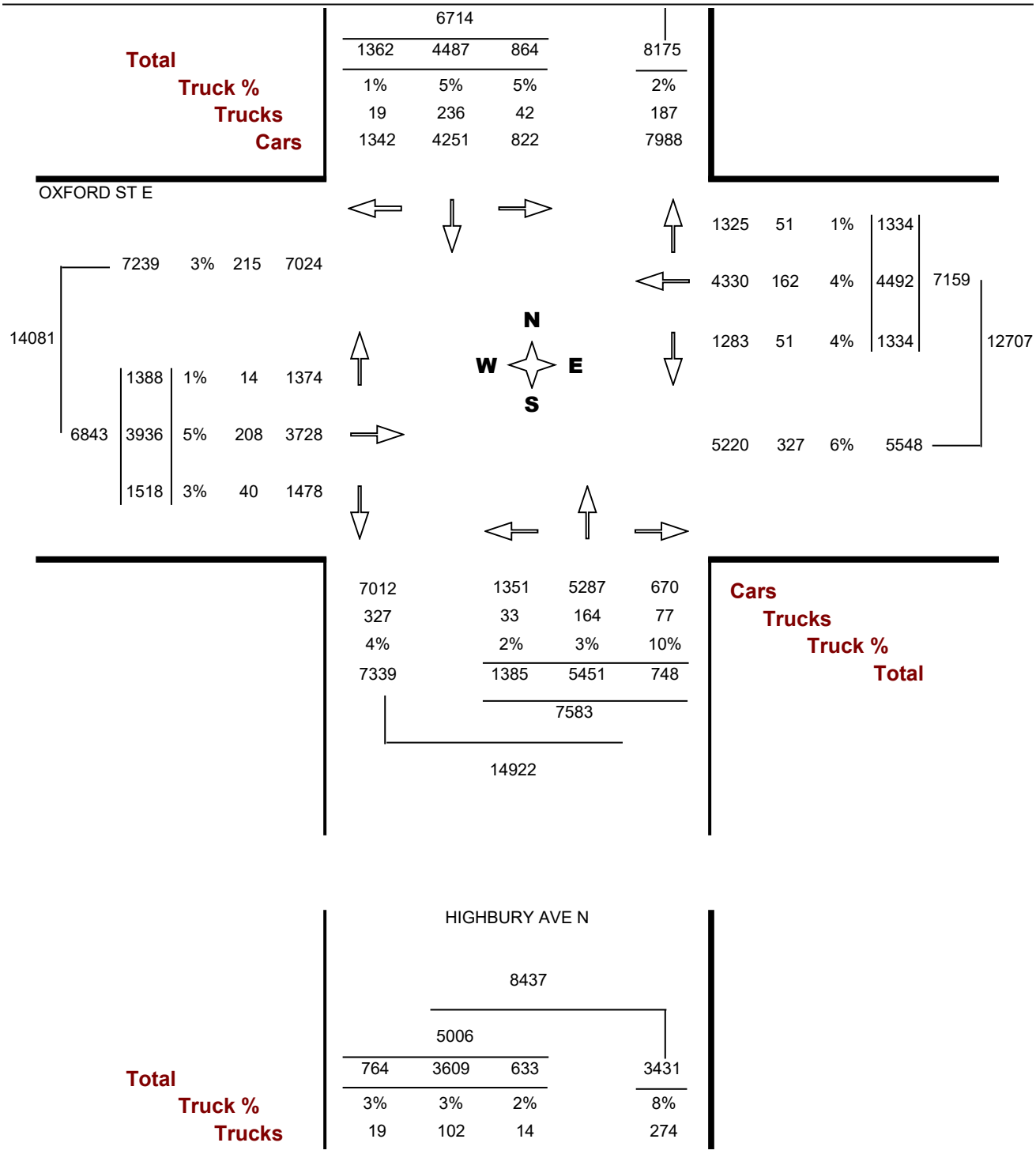
Turning Movements Count - AADT Report

Location..... HIGHBURY AVE N @ OXFORD ST E

Municipality. LONDON

Traffic Cont. Traffic signal

Count Date.. Thursday, September 28, 2017 **AADT factor..** 1.759483



Turning Movements Count - AADT Report

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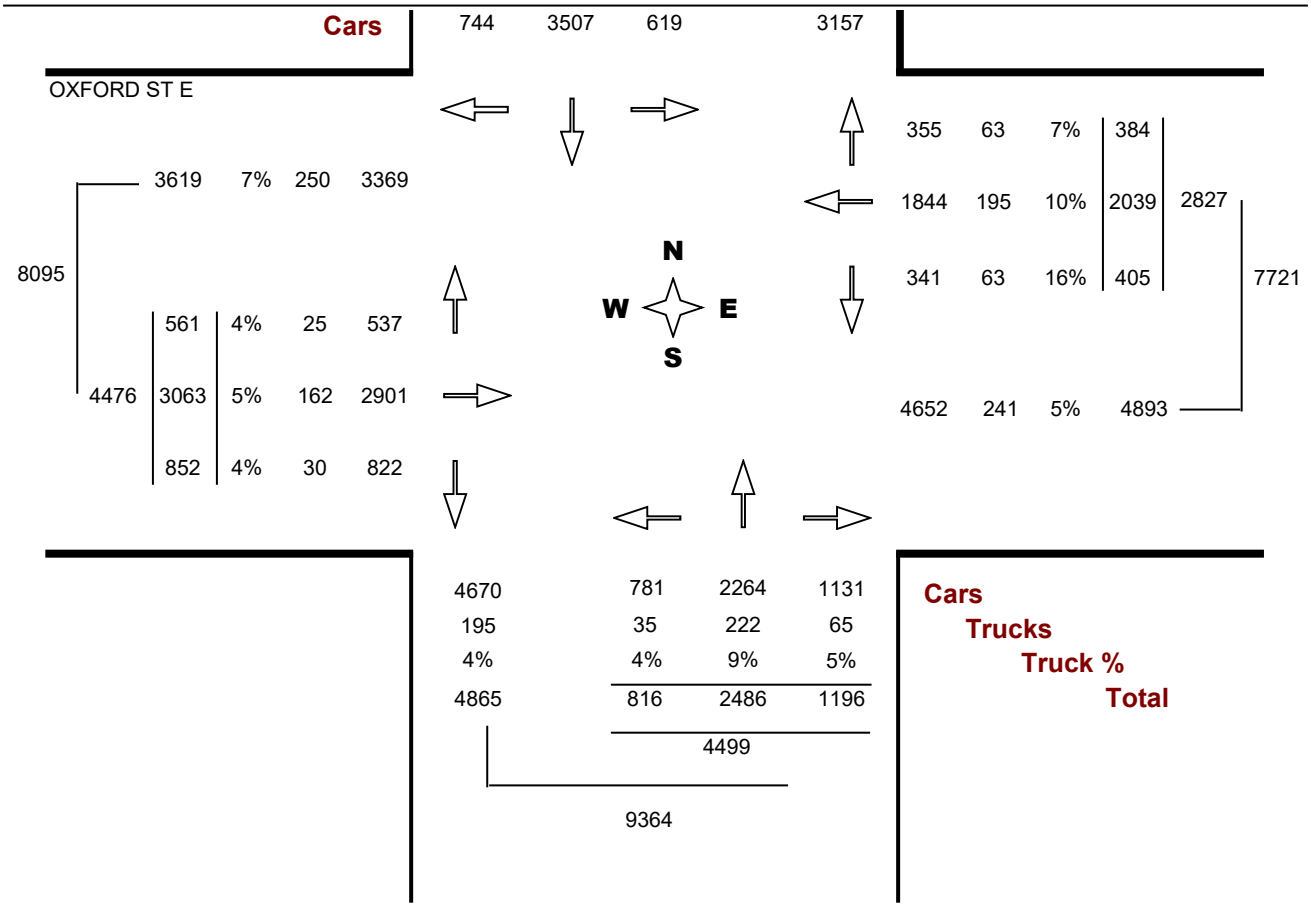


Lorenzo Carboni

From: Amy Patenaude
Sent: Monday, August 9, 2021 8:13 AM
To: Lorenzo Carboni
Subject: FW: London Psychiatric Hospital Lands - RWDI Project No. 2104756

Amy Patenaude | Senior Technical/Administrative Assistant
Americas Noise/Acoustics/Vibration
RWDI
600 Southgate Drive, Guelph, ON N1G 4P6 Canada
Tel: (519) 823-1311 ext 2393 | Fax: (519) 823-1316
rwdi.com

From: CP Proximity-Ontario <CP_Proximity-Ontario@cpr.ca>
Sent: Friday, July 23, 2021 5:23 PM
To: Amy Patenaude <Amy.Patenaude@rwdi.com>
Subject: RE: London Psychiatric Hospital Lands - RWDI Project No. 2104756

Good Afternoon Amy,

Thank you for reaching out to CP Real Estate. Please note that our CP Real Estate Team has changed its position regarding the sharing of its proprietary & confidential rail data and will no longer be providing rail data or yard specs to third parties. We appreciate that this is a change to what was previously provided by our group. Further, rail traffic data is merely a snapshot in time, and traffic volumes are subject to fluctuation as a function of market demand.

Information that I am able to share would be that current operations along any CP track include regular freight trains travelling through, 24 hours a day, 7 days a week. Current operations at any CP yard would include servicing tracks and trains would be moving in and out of the area, as well as regular yard operations including (but not limited to) switching and shunting of trains, material storage, and material delivery. With these operations, engines are constantly running and the operations are continuous, loud and cause a lot of vibration. Rail traffic volume on any part of our North American network is a function of market demand. Traffic volumes fluctuate regularly as market demand for goods and commodities shifts or as export patterns change and does not have a set schedule. . Any development near railway infrastructure should assume the potential for frequent train activity at any time of the day or night, on any day of the year. There is also the possibility of increasing operations in future being increased, including adding or moving track or any other railway related use.

CP's approach to development in the vicinity of rail operations is encapsulated by the recommended 2013 Proximity Guidelines developed through collaboration between the Railway Association of Canada and the Federation of Canadian Municipalities. Those guidelines are found at the following website address: http://www.proximityissues.ca/

The safety and welfare of residents can be adversely affected by rail operations and CP is not in favour of residential uses that are not compatible with rail operations.

Should the captioned development proposal receive approval, CP respectfully requests that the recommended guidelines be followed.

Thank you,

CP Proximity Ontario

CP Proximity Ontario
CP_Proximity-Ontario@cpr.ca
7550 Ogden Dale Road SE, Building 1
Calgary AB T2C 4X9

From: Frank Gulas <Frank_Gulas@cpr.ca>
Sent: July 22, 2021 2:27 PM
To: CP Proximity-Ontario <CP_Proximity-Ontario@cpr.ca>
Subject: FW: London Psychiatric Hospital Lands - RWDI Project No. 2104756

Hi Crystal,

Can you provide the response for this one… another request for Train data

Thanks

Frank Gulas
Manager Real Estate –
Ontario & Manitoba
O 403-319-3436
F 403-319-3727
7550 Ogden Dale Road SE
Calgary AB T2C 4X9

From: Amy Patenaude <Amy.Patenaude@rwdi.com>
Sent: Thursday, July 22, 2021 1:01 PM
To: Frank Gulas <Frank_Gulas@cpr.ca>
Cc: Lorenzo Carboni <Lorenzo.Carboni@rwdi.com>; Slavi Grozev <Slavi.Grozev@rwdi.com>; Eva Johnston-Iafelice <Eva.Johnston-Iafelice@rwdi.com>
Subject: FW: London Psychiatric Hospital Lands - RWDI Project No. 2104756

Hello Frank,

Simon provided me with your address for our request.

Thank you.

Amy

Amy Patenaude | Senior Technical/Administrative Assistant
Americas Noise/Acoustics/Vibration
RWDI
600 Southgate Drive, Guelph, ON N1G 4P6 Canada
Tel: (519) 823-1311 ext 2393 | Fax: (519) 823-1316
rwdi.com

From: Simon Deschamps <Simon_Deschamps@cpr.ca>
Sent: Thursday, July 22, 2021 2:59 PM
To: Amy Patenaude <Amy.Patenaude@rwdi.com>
Cc: Lorenzo Carboni <Lorenzo.Carboni@rwdi.com>; Slavi Grozev <Slavi.Grozev@rwdi.com>; Eva Johnston-Iafelice <Eva.Johnston-Iafelice@rwdi.com>
Subject: RE: London Psychiatric Hospital Lands - RWDI Project No. 2104756

Amy,

I'm no longer with the Real Estate Group.

Please send your email to Frank_Gulas@cpr.ca – Manager Real Estate Ontario

Thanks
Simon

Simon Deschamps
Project Manager - Facilities
O 905-803-3201 **C** 416-882-7726
800 – 1290 Central Parkway W
Mississauga, ON L5C 4R3

From: Amy Patenaude <Amy.Patenaude@rwdi.com>
Sent: Thursday, July 22, 2021 11:34 AM
To: Simon Deschamps <Simon_Deschamps@cpr.ca>
Cc: Lorenzo Carboni <Lorenzo.Carboni@rwdi.com>; Slavi Grozev <Slavi.Grozev@rwdi.com>; Eva Johnston-Iafelice <Eva.Johnston-Iafelice@rwdi.com>
Subject: London Psychiatric Hospital Lands - RWDI Project No. 2104756

Good day,

We are doing a noise study for the above-noted project. We are looking for:

- Growth rate per annum for a 10-year period
- Day and night train volumes
- Average number of cars per train
- Number of Locomotives per train
- Maximum permissible speed
- Whistles used at crossings in the area
- Type of track (continuously welded, or jointed)
- Any idling of locomotive in the vicinity, and approximate duration of idling

Thank you.

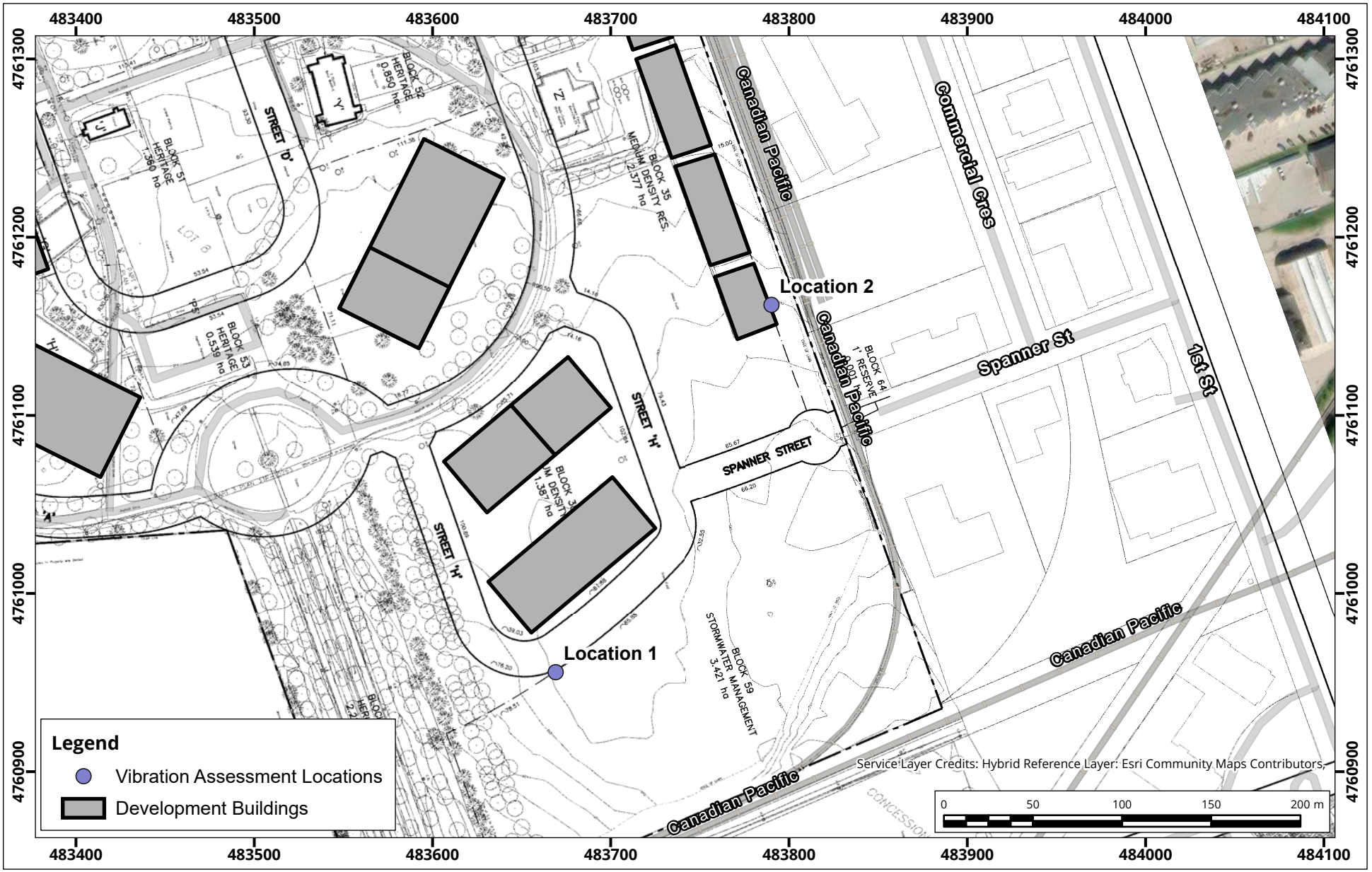
Amy

Amy Patenaude | Senior Technical/Administrative Assistant
Americas Noise/Acoustics/Vibration
RWDI
600 Southgate Drive, Guelph, ON N1G 4P6 Canada
Tel: (519) 823-1311 ext 2393 | Fax: (519) 823-1316
rwdi.com

Rail Volumes

Freight Rail Line Class	Characteristics	Freight Train Modelling Assumptions
Principal Main Line	• Traffic volume generally exceeds 10 trains per day • High speeds, usually exceeding 80 kph (50 mph) • Includes heavy trains with 3 or 4 locomotives per train, commuter and passenger trains	• Assume one freight train per hour, or 16 trains per 16-hour day and 8 trains per 8-hour night (24 total per 24 hours) • Continuously welded rail • 100 kph speed • Assume 4 locomotives per train
Secondary Main Line	• Traffic volume generally exceeds 10 trains per day • High speeds, usually exceeding 80 kph (50 mph) • Trains generally of light to moderate weight with 3 or 4 locomotives per train • Majority of traffic may be commuter and passenger trains	• Assume one freight train per 2 hours, or 8 trains per 16-hour day and 4 trains per 8-hour night (12 total per 24 hours) • Continuously welded rail • 80 kph speed • Assume 3 locomotives per train
Principal Branch Line	• Regular scheduled traffic, usually less than 5 trains per day • Low speeds, generally limited to 50 kph (30 mph) • Trains generally of light to moderate weight with 1 or 2 locomotives per train but may include heavier trains with more units	• Assume one freight train per 4 hours, or 4 trains per 16-hour day and 2 trains per 8-hour night (6 total per 24 hours) • Continuously welded rail • 50 kph speed • Assume 2 locomotives per train
Secondary Branch Line	• Intermittent, unscheduled traffic, usually less than 1 train per day • Low speeds, generally limited to 50 kph (30 mph) • Trains generally of light to moderate weight with 1 locomotive per train	• Assume one freight train per 8 hours, or 2 trains per 16-hour day and 1 train per 8-hour night (3 total per 24 hours) • Continuously welded rail • 50 kph speed • Assume 1 locomotive per train
Spur Line	• Unscheduled traffic on a demand basis • Low speeds, limited to 24kph (15 mph) • Trains generally of light to moderate weight with 1 locomotive per train	• Assume one freight train per 12 hours, or 1 train per 16-hour day and 1 train per 8-hour night (2 total per 24 hours) • Jointed rail • 24 kph speed • Assume 1 locomotive per train
NOTES:	1. Canadian Rail Atlas has been used to determine rail line classification and ownership (i.e., CN/CP/other) 2. Commuter (GO) and passenger (VIA) rail volumes are based on data received from the responsible authority.	

APPENDIX E



Vibration Assessment Locations

True North

Drawn by: LRC | Figure: E.1

Approx. Scale: 1:3,000

Date Revised: Oct 27, 2022

Map Projection: NAD 1983 UTM Zone 17N

Former London Psychiatric Hospital (LPH) Lands Subdivision - London, ON

Project #: 2104756

Map Document: \\rwdgroup\guelph\Jobs_3\2104756\03Worklterms\20Environmental\NoiseAnalysis\ArcGIS\LPHL\LPHL.aprx

U.S. DoT Federal Transit Administration - "Transit Noise and Vibration Impact Assessment"

"FTA Vibration Screening Model"

Job No. 2104756 Scenario Branch Line to Block 38
Job Name Former London Psychiatric Hostpital Lands Subdivision

Note: All vibration levels in dB are VdB re: 1 μin/s

1a. Define Train

			Resulting Adjustments
Train Type	F	(F) reight, (L)RT/Rapid Transit, (B)us	
Train Speed	54	km/h	-3.5
Stiff Suspension?	n	Vertical resonance frequency greater than 15 Hz (y/n, usually n)	0
Resilient Wheels?	n	No effect on vibration, included to match standard (y/n)	0
Worn wheels?	n	Worn wheels or wheels with flats (y/n, usually no for new or well maintained system)	0

1b. Define Track Type

Rail Type	CWR	Jointed Track (J) or Continuous Welded Rail (CWR)	0
Worn or Corrugated track?	n	Worn track (y/n, usually n for new or well maintained system)	0
Special Trackwork?	y	Crossovers, diamonds, frogs, etc. (y/n)	10

Mitigation Features

Floating slab trackwork?	n	Concrete floating slab on spring isolators (y/n)	0	
High Resilience Fasterners?	n	Used with concrete track slabs (y/n)	0	0
Resiliently Supported Ties?	n	Concrete ties on rubber blocks, with resilient fasteners (y/n)	0	
Ballast mats?	n	Rubber mat placed over concrete, under the ballast (y/n)	0	

TTC Streetcar System Only (Based on RWDI Measurements W07-5120C)

New Track Tech. Max vibration	n	For maximum vibration from TTC new track tech (apply no other mit feature)	Mutually exclusive choices	0
New Track Tech., Avg Vibration	n	For average vibration from TTC new track tech (apply no other mit feature)	May also both be "n"	0

Other Path Features

Elevated Structure?	n	On berm or bridge (y/n)	0
In open cut?	n	No effect on vibration, included to match standard (y/n)	0

Subway Systems Only

Relative to bored tunnel:

Station	n	0
Cut and Cover	n	0
Rock-Based	n	0

Base Vibration Level at 3 m	94.5	VdB, FTA base curve levels at 3 m from track
Total Train and Track Type Adjustments	6.5	VdB
Adjusted Vibration Level at 3 m	**101.0**	VdB, including train type and track type adjustements above.

2. Define Path

Efficient propagation in soil	n	Accounts for clay soils or other mediums with efficient propagation (y/n)	Mutually exclusive choices	0
Propagation in rock layer	n	Accounts for lower attenuation with distance in rock versus soil (y/n)	May also both be "n"	0.0
Total Path Type Adjustments	0.0	VdB		

3a. Vibration Level at Given Receptor

Source-Receiver distance	**100**	m, from track to receptor (DISTANCE should be less than 100 m)		-28.5
Total distance and path adjustments	-28.5	VdB		
Vibration Level at distance	**72.6**	VdB	**0.108** mm/s r.m.s.	

U.S. DoT Federal Transit Administration - "Transit Noise and Vibration Impact Assessment"

"FTA Vibration Screening Model"

Job No. 2104756 Scenario Branch Line to Block 35
Job Name Former London Psychiatric Hostpital Lands Subdivision

Note: All vibration levels in dB are VdB re: 1 μin/s

1a. Define Train

			Resulting Adjustments
Train Type	F	(F) reight, (L)RT/Rapid Transit, (B)us	
Train Speed	3	km/h	-28.6
Stiff Suspension?	n	Vertical resonance frequency greater than 15 Hz (y/n, usually n)	0
Resilient Wheels?	n	No effect on vibration, included to match standard (y/n)	0
Worn wheels?	n	Worn wheels or wheels with flats (y/n, usually no for new or well maintained system)	0

1b. Define Track Type

Rail Type	J	Jointed Track (J) or Continuous Welded Rail (CWR)	5
Worn or Corrugated track?	n	Worn track (y/n, usually n for new or well maintained system)	0
Special Trackwork?	y	Crossovers, diamonds, frogs, etc. (y/n)	10

Mitigation Features

Floating slab trackwork?	n	Concrete floating slab on spring isolators (y/n)	0	
High Resilience Fasterners?	n	Used with concrete track slabs (y/n)	0	0
Resiliently Supported Ties?	n	Concrete ties on rubber blocks, with resilient fasteners (y/n)	0	
Ballast mats?	n	Rubber mat placed over concrete, under the ballast (y/n)	0	

TTC Streetcar System Only (Based on RWDI Measurements W07-5120C)

New Track Tech. Max vibration	n	For maximum vibration from TTC new track tech (apply no other mit feature)	Mutually exclusive choices	0
New Track Tech., Avg Vibration	n	For average vibration from TTC new track tech (apply no other mit feature)	May also both be "n"	0

Other Path Features

Elevated Structure?	n	On berm or bridge (y/n)	0
In open cut?	n	No effect on vibration, included to match standard (y/n)	0

Subway Systems Only

Relative to bored tunnel:

Station	n	0
Cut and Cover	n	0
Rock-Based	n	0

Base Vibration Level at 3 m	94.5	VdB, FTA base curve levels at 3 m from track
Total Train and Track Type Adjustments	-13.6	VdB
Adjusted Vibration Level at 3 m	**80.9**	VdB, including train type and track type adjustements above.

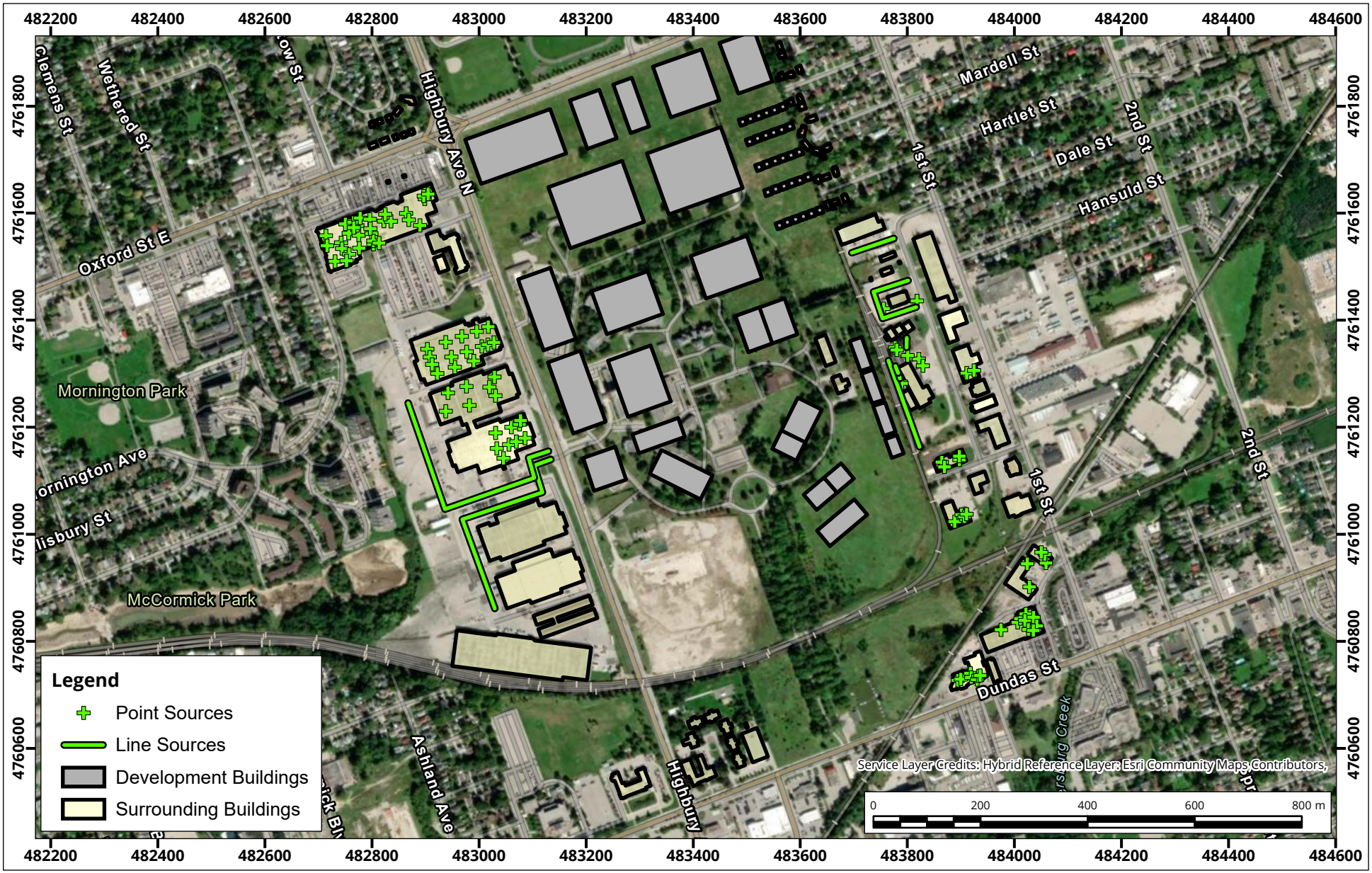
2. Define Path

Efficient propagation in soil	n	Accounts for clay soils or other mediums with efficient propagation (y/n)	Mutually exclusive choices	0
Propagation in rock layer	n	Accounts for lower attenuation with distance in rock versus soil (y/n)	May also both be "n"	0.0
Total Path Type Adjustments	0.0	VdB		

3a. Vibration Level at Given Receptor

Source-Receiver distance	**15**	m, from track to receptor (DISTANCE should be less than 100 m)		-9.5
Total distance and path adjustments	-9.5	VdB		
Vibration Level at distance	**71.4**	VdB	**0.095** mm/s r.m.s.	

APPENDIX F



Map Document: \\rwdgroup\guelph\Jobs_3\2104756\03WorkItems\20EnvironmentalNoiseAnalysis\ArcGIS\LPHLLPHL.aprx

Stationary Sources

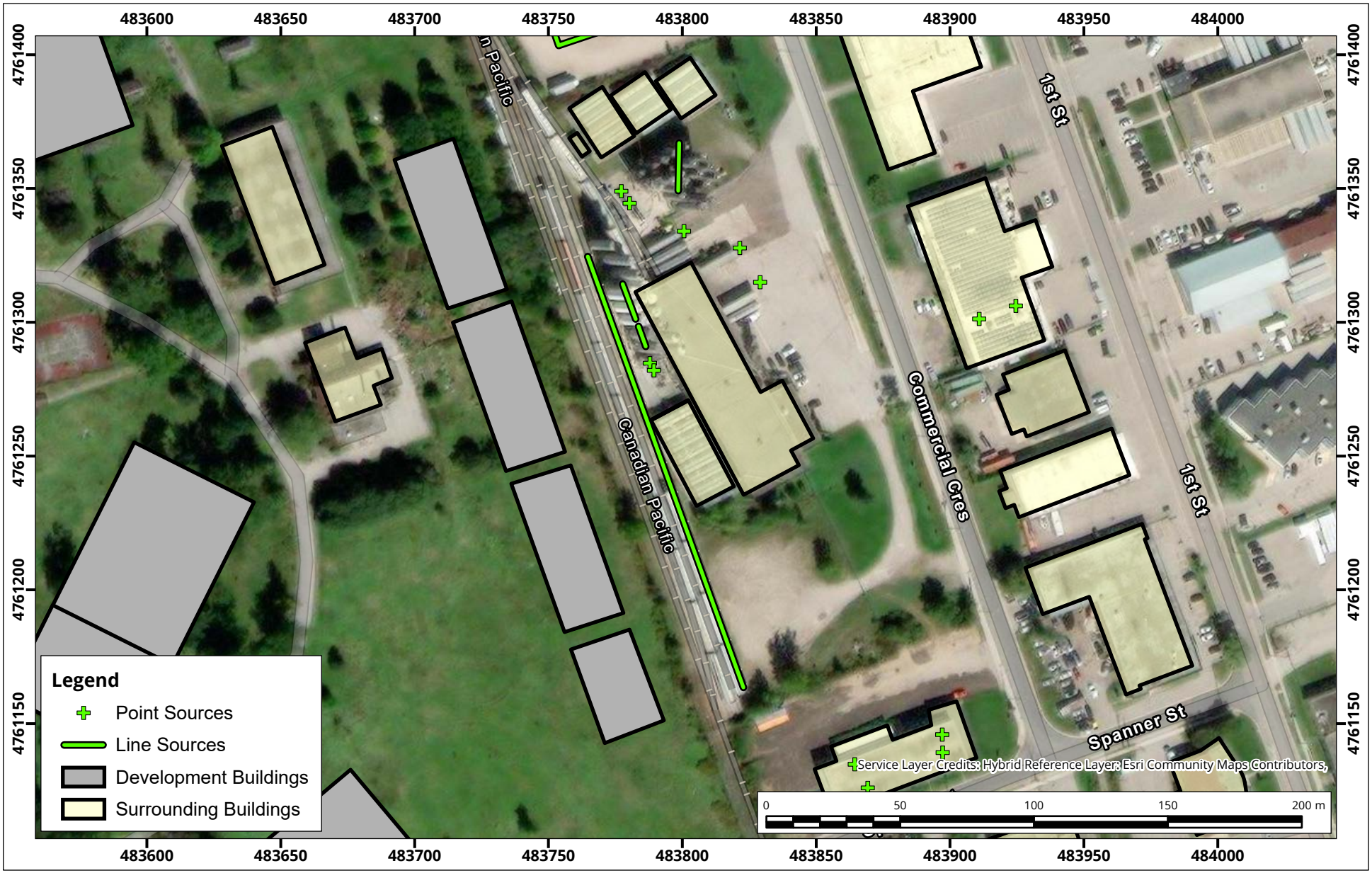
True North

Map Projection: NAD 1983 UTM Zone 17N

Former London Psychiatric Hospital (LPH) Lands Subdivision - London, ON

Project #: 2104756

Drawn by: LRC	Figure: F.1
Approx. Scale:	1:10,000
Date Revised:	Oct 27, 2022



Map Document: \\rwdgroup\guelph\Jobs_3\2104756\03Worktems\20EnvironmentalNoiseAnalysis\ArcGIS\LPHL\LPHL.aprx

Stationary Sources

Plastics Facility at 539 Commercial

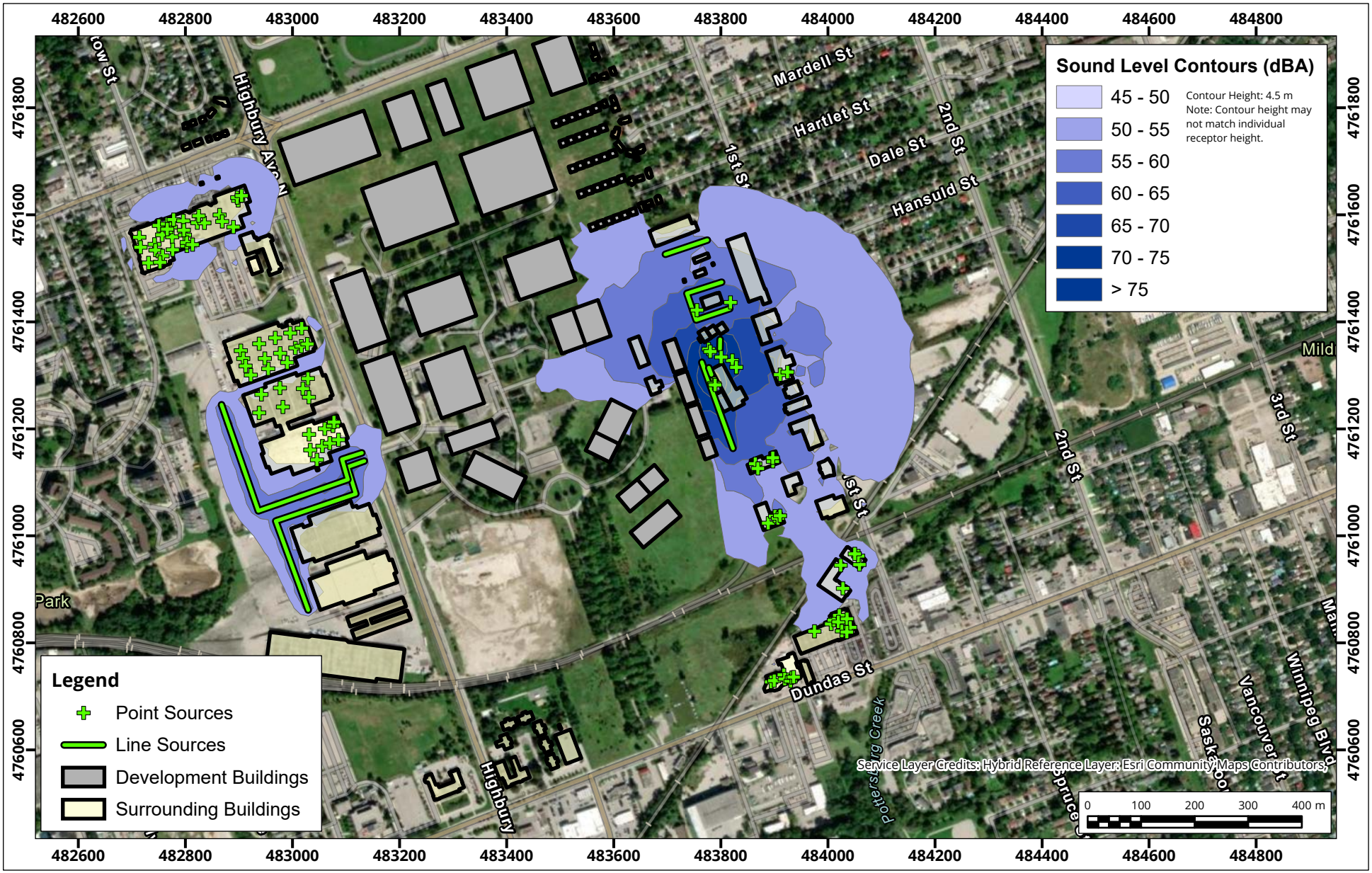
Map Projection: NAD 1983 UTM Zone 17N

Former London Psychiatric Hospital (LPH) Lands Subdivision - London, ON

True North

Project #: 2104756

Drawn by: LRC	Figure: F.2
Approx. Scale:	1:2,000
Date Revised:	Oct 27, 2022



Stationary Source Sound Level Contours

Daytime (0700h to 2300h)

Map Projection: NAD 1983 UTM Zone 17N

Former London Psychiatric Hospital (LPH) Lands Subdivision - London, ON

True North

Project #: 2104756

Drawn by: LRC	Figure: F.3
Approx. Scale:	1:10,000
Date Revised:	Oct 27, 2022

Map Document: \\rwdgroup\guelph\Jobs_3\2104756\03Worklterms\20EnvironmentalNoiseAnalysis\ArcGIS\LPHLLPHL.aprx