DILLON CONSULTING

THE PLANNING PARTNERSHIP

Clarkson Air Quality, Noise & Vibration and Radiofrequency Compatibility Overview Study

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Table of Contents

Figures

Tables

Appendices

1.0 Introduction

The City of Mississauga (the City) is undergoing a planning program to intensify land uses surrounding the Clarkson Major Transit Station Area (MTSA) that would also change the intensity of uses in the area. As part of this program, the City is proposing to develop policies for land development that can achieve a minimum density of 150 residents and jobs per hectare. This translates to a minimum addition of 4,000 to 5,000 residents and jobs within 500 to 800 m of the Clarkson GO Station. To achieve this target requires that parts of the lands within the Southdown Employment Area (SEA) be occupied by offices or mid to high density residential uses.

The SEA is considered one of the City's heaviest industrial areas with significant economic importance, and includes a range of industrial uses (e.g., machinery fabrication, automotive part manufacturing, chemical manufacturing, aggregate facilities, wastewater treatment plants, etc.) as well as a blend of mixed-use lands, commercial lands, and undeveloped lands. Based on the City's 2015 Municipal Comprehensive Review of Employment Lands, in comparison to other employment areas within the City's boundary the SEA has one of the third largest shares of vacant land, totalling approximately 154 hectares (380 acres). The existing residential land uses in the immediate vicinity of the employment area are a mix of medium- and low-density.

Introducing sensitive land uses in close proximity to industry can result in adverse effects at the sensitive land uses. The MTSA proposal assessed in this report includes introducing a mix of commercial and residential uses in the lands within the SEA. The objective of this study is to complete a screening-level study of the MTSA proposed plan as it relates to air quality, noise, and vibration as well as radio frequency impact, in order to comment on potentially incompatible land uses and provide the City with recommendations to be able to further assess possible land-use conversions under the MTSA.

2.0 Description of the Study Area

2.1 Study Area

Approximately half of the study area is within the SEA, in the City of Mississauga (**Figure 1**: Clarkson MTSA Southdown Employment Area and the Clarkson Transit Station Area Boundary). The SEA is bound by Lake Ontario to the east, Winston Churchill Boulevard to the south, Canadian National (CN) Railway tracks to the west, and Southdown Road and 4th Road East to the north. This area is primarily zoned as 'Employment'. The north and east sides of the Employment Area are surrounded by low-rise residential neighbourhoods. On the south side, the area borders Lake Ontario. The areas immediately adjacent to the north of the SEA are CN railway tracks. The area to the north of the railway tracks consist of mixed

commercial and residential uses. The Clarkson Go Station is located at the north-east corner of the SEA, in proximity to the Southdown Road and Royal Windsor Drive intersection.

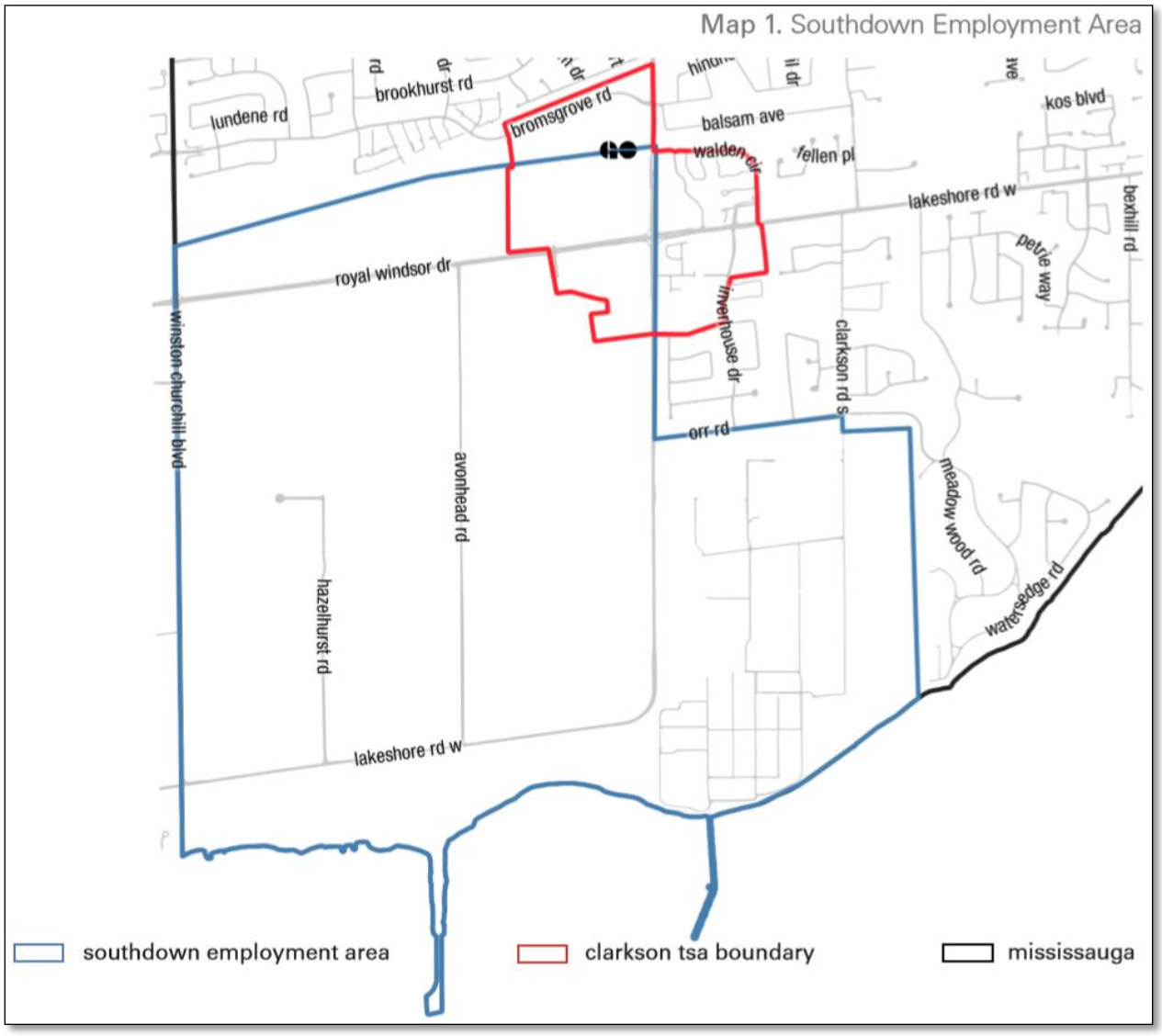

Figure 1: Clarkson MTSA Southdown Employment Area and the Clarkson Transit Station Area Boundary

(Source: Clarkson TSA Study, July 23 2019)

2.2 Preliminary Preferred MTSA Plan

The proposed Preliminary Preferred MTSA Plan (The Plan) being assessed is centered on the Clarkson Mississauga GO Transit station, and generally includes the greater area adjacent to the Royal Windsor Drive, Lakeshore Road West and Southdown Road intersection (approximately 80 hectares). The Plan proposes to intensify the usage of the surrounding Clarkson MTSA and also proposes changes to some of its use. This is proposed to include having some green lands, mixed use, office, open space, residential

(medium and high density), and heritage sites. The Plan also includes enhanced streetscapes, bike lanes, multi-use trails, retail at-grade, and new parks. Proposed mixed use, residential and office space areas are primarily proposed to be to the West of Southdown Road with development heights generally ranging from 5 to 25 storeys.

Roughly half of the Plan area is located within the Southdown employment Area, which includes Class I, II, and II industrial facilities. Some areas near and within the Plan include industrial commercial, industrial general, industrial heavy, and utility usages. Existing residential areas are primarily located to both the east of the Southdown Road and to the North-West of the Clarkson GO station and rail line. Existing employment and commercial areas are generally located along the Southdown Road and Royal Windsor Drive. The MTSA is presented in **Figure 2**: MTSA as of August 26th, 2019.

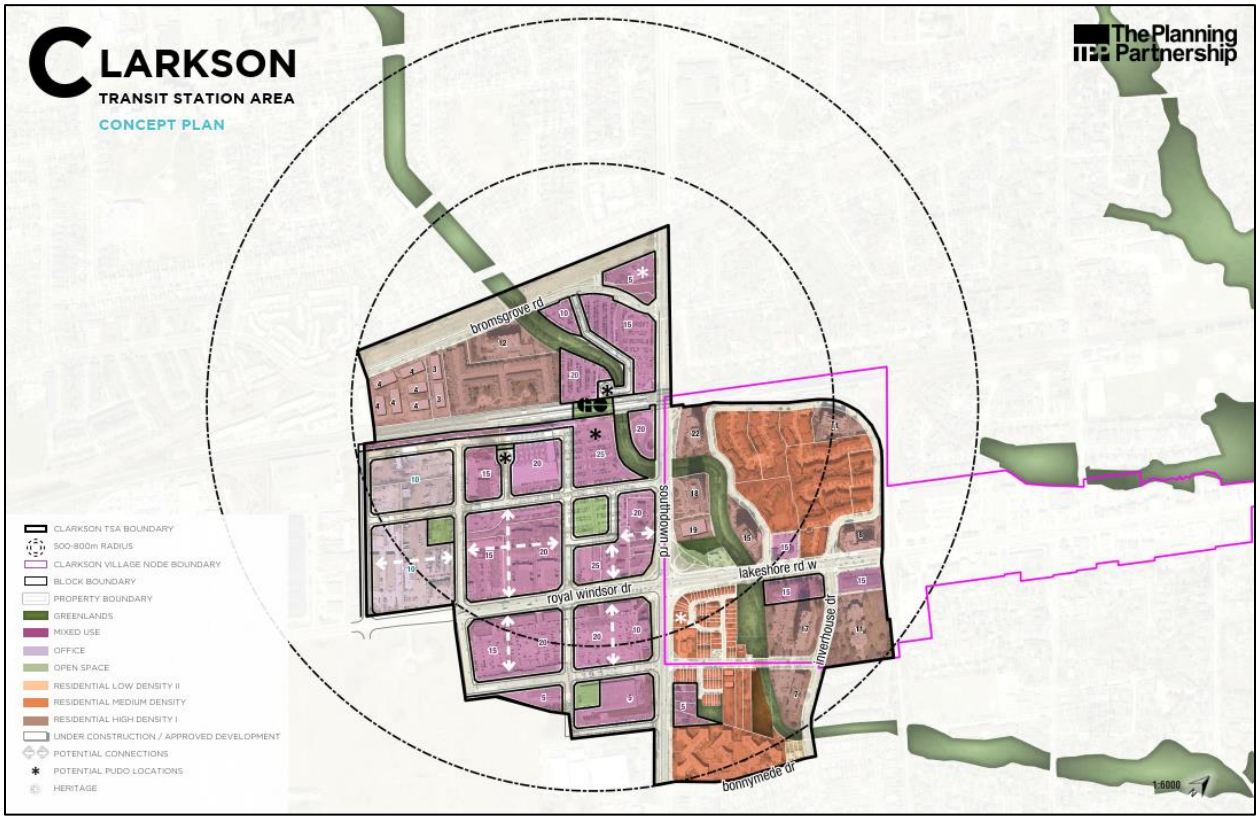

Figure 2: MTSA as of August 26th, 2019

2.3 Local Industries

Within the SEA there are over 50 industries, including manufacturers in the automotive, chemical manufacturing and transport, cement, transportation and logistics, aggregate, and wastewater treatment sectors. Also included in area is the CFRB1010 AM transmission antenna array, which broadcasts Radio Frequency (RF) at 1,010 kHz. This assessment is focussed on compatibility between

these industries and the proposed sensitive land uses within the MTSA. An in-depth consideration of the industries in the vicinity of the MTSA is presented later in the report.

3.0 Applicable Acts, Regulations, and Guidelines

This section provides an overview of the provincial framework and processes that establish the basis for this high-level environmental impact review in the context of land use planning.

3.1 Environmental Protection Act

The 1990 *Ontario Environmental Protection Act (*EPA) is the overarching environmental law in the Province. The purpose of the Act [Section 3. (1)] is "*to provide for the protection and conservation of the natural environment*". In general, the management of impacts to individual environmental media (e.g., air, water, soil) is addressed within separate regulations enacted under the EPA. From a land-use compatibility context, Section 9 and Section 14.1 of the EPA are applicable to the understanding of an industry's obligations. Section 9 (1) states:

> *"No person shall, except under and in accordance with an environmental compliance approval,*
> *(a) use, operate, construct, alter, extend or replace any plant, structure, equipment, apparatus, mechanism or thing that may discharge or from which may be discharged a contaminant into any part of the natural environment other than water; or*
> *(b) alter a process or rate of production with the result that a contaminant may be discharged into any part of the natural environment other than water or the rate or manner of discharge of a contaminant into any part of the natural environment other than water may be altered…"*

Under Section 9 of the EPA it is clearly stated that all industrial uses require an Environmental Compliance Approval (ECA) to operate. This is discussed further under Ontario Regulation 419/05 (the regulation which describes the supporting assessments and documents to obtain an ECA). In summary, Section 9 requires that all industries undergo a technical assessment, including modelling, of their air and noise emissions and the impacts on the surrounding environment. Section 14 of the EPA states:

> *"…a person shall not discharge a contaminant or cause or permit the discharge of a contaminant into the natural environment, if the discharge causes or may cause an adverse effect…"*

The implication of these sections is that all industries which have discharges to the environment – including air emissions and noise emissions – must operate under an approval and, regardless of their approval, may not cause an adverse effect. The EPA defines an adverse effect as:

> *"(a) impairment of the quality of the natural environment for any use that can be made of it,*
> *(b) injury or damage to property or to plant or animal life,*
> *(c) harm or material discomfort to any person,*
> *(d) an adverse effect on the health of any person,*
> *(e) impairment of the safety of any person,*
> *(f) rendering any property or plant or animal life unfit for human use,*

(g) loss of enjoyment of normal use of property, and
(h) interference with the normal conduct of business;"

The adverse effect clause in the EPA is often used in the assessment of nuisance complaints such as noise or odour in a land use compatibility context. This is due to the fact that nuisance contaminants are not assessed at all locations off-site in the preparation of an Environmental Compliance Approval (ECA). For example, odours are not typically assessed at an industrial facility. Therefore, when considering land use changes which may introduce new sensitive receptors in an area, it is important to consider both an industry's current ECA and their operations with respect to nuisance contaminants.

The Ministry of the Environment, Conservation and Parks' (MECP) regulations and guidelines for air, noise and vibration fall under the EPA. **Table 1** provides an overview of the provincial regulations and guidelines that are applicable to the regulation and assessment of air, noise, and vibration.

Table 1: Selected Provincial Environmental Regulations and Guidelines

	Regulations and Guidelines	Environmental Studies and Requirements
General	• D-Series Land Use Compatibility Guidelines • D-1 Guideline: Land Use Compatibility • D-2 Compatibility between Sewage Treatment and Sensitive Land Use • D-3 Environmental Considerations for Gas or Oil Pipelines and Facilities • D-4 Land Use On or Near Landfills and Dumps • D-6 Guidelines: Compatibility between Industrial Facilities	• Land use compatibility studies and mitigation measures
Air Quality	• Ontario Regulation 419/05 (Air Pollution – Local Air Quality) • Ontario Regulation 1/17 (Registrations under Part II.2 of the Act – Activities Requiring Assessment of Air Emissions) • Air Contaminants Benchmarks List: Standards, Guidelines and Screening Levels for Assessing Point of Impingement Concentrations of Air Contaminants • Ontario's Ambient Air Quality Criteria - Sorted by Contaminant Name	• Environmental Compliance Approval (ECA) • Environmental Activity and Sector Registry (EASR) • Emission Summary and Dispersion Modelling (ESDM) Report • Fugitive Dust Management Plan
Noise/Vibration	• NPC-300 Environmental Noise Guideline: Stationary and Transportation Sources • NPC-207 – Impulsive Vibration in Residential Buildings	• Air & Noise Environmental Compliance Approval • Environmental Activity and Sector Registry (EASR) • Acoustic Assessment Report • Noise Abatement Action Plan

	Regulations and Guidelines	Environmental Studies and Requirements
Odour	• Ontario Regulation 419/05 (Air Pollution – Local Air Quality) • Ontario Regulation 1/17 (Registrations under Part II.2 of the Act – Activities Requiring Assessment of Air Emissions	• Air & Noise Environmental Compliance Approval • Environmental Activity and Sector Registry (EASR) • Odour Best Management Practices Plan • Odour Control Report

3.2 D-Series Guidelines

The MECP has published *Land Use Compatibility Guidelines*, referred to as the D-Series of Guidelines (1995). The D-Series Guidelines were prepared under the legislative authority of the *Planning Act*, the EPA, and the Environmental Assessment Act (EAA). The intent of the Guidelines is to minimize or prevent, through the use of buffers and separation of uses, the encroachment of incompatible land uses. The guideline delegates responsibility to the planning authorities within the Province to identify when the D-Series of Guidelines is applicable and requires they be followed where needed. It is important to note that this extends both to the introduction of sensitive land uses on existing industrial lands and vice versa. While the Guidelines were designed to deal with new applications, they provide a useful benchmark for understanding land use conflicts / incompatibility. The Guideline provides definition of three classes of industry (Class I, Class II, and Class III), as well as minimum recommended separation distances and potential areas of influence for each class.

The industrial facilities classes are defined in the Land Use Compatibility guidance document as followed:

Class I Industrial Facility

"A place of business for a small scale, self-contained plant or building which produces/stores a product which is contained in a package and has low probability of fugitive emissions. Outputs are infrequent, and could be point source or fugitive emissions for any of the following: noise, odour, dust and/or vibration. There are daytime operations only, with infrequent movement of products and/or heavy trucks and no outside storage."

Class II Industrial Facility

"A place of business for medium scale processing and manufacturing with outdoor storage of wastes or materials (i.e., it has an open process) and/or there are periodic outputs of minor annoyance. There are occasional outputs of either point source or fugitive emissions for any of the following: noise, odour, dust and/or vibration, and low probability of fugitive emissions. Shift operations are permitted and there is frequent movement of products and/or heavy trucks during daytime hours"

Class III Industrial Facility

"A place of business for large scale manufacturing or processing, characterized by: large physical size, outside storage of raw and finished products, large production volumes and continuous movement of products and employees during daily shift operations. It has frequent outputs of major annoyance and there is high probability of fugitive emissions."

The D-Series Guidelines do not provide for a pass/fail assessment of compatibility between industrial and sensitive land uses, but recommend when a technical assessment should be performed. Based on the classes described above, the Ministry has recommended Potential Influence Areas for industries. These areas represent the separation distance between industry and sensitive receptors within which studies should be performed to demonstrate the uses are compatible.

The Land Use Compatibility: Procedure for Implementation Guideline (D-1-1 Land Use Compatibility and Procedure for Implementation) provides guidance for how land use authorities can protect people and the environment from nuisance impacts from industrial areas. The D-1-1 Guideline explicitly notes that developers of land hold the primary responsibility for identifying and implementing the necessary measures to make a development environmentally acceptable. The MECP further states that this Guideline must be considered during the development applications, land use related plans, as well as municipal official plans, amendments and municipal secondary plans. Section 7.6 of Guideline D-1-1 provides guidance on when site plan control can be used as a tool for requiring study under the D-Series. To this extent a municipality may consider whether changes to the Official Plan are appropriate to allow for site plan control which allows requirements for specific mitigation on a per-development basis.

Section 7.5 of the D-1-1 Guideline indicates that plans of larger developments (specifically subdivision/condominium and consents to sever) located within an area of influence only be permitted "*…if there are no compatibility problems, or if the proponent can demonstrate how incompatibilities will be satisfactorily mitigated to the level of a trivial impact.*"
The D-6 Guidelines' three types of industrial facilities and their respective potential areas of influence are summarized in **Table 2**. The MECP acknowledges that it may be difficult to achieve the recommended minimum separation distance in designated mixed use areas. The guidelines indicate that it is the responsibility of the proponent to carry out the appropriate land use compatibility studies. Compatibility studies are part of the development review process, and involve site-specific modelling exercises based on the 'worst case scenario'. These studies help in determining the appropriateness of introducing sensitive land uses in proximity of industrial establishments.

Table 2: MECP Guidelines on Compatibility Between Industry and Sensitive Uses

Facility Type	Definition	Areas of Influence	Recommended Minimum Separation Distance
Class I Industrial Facility	• Small scale and self-contained plant or building • Stores/produces product in a contained package with low probability of fugitive emissions • Infrequent outputs which could be point source or fugitive emissions for any of the following: noise, odour, dust and/or vibration • Operates only during the daytime • Infrequent movement of products and/or heavy trucks	70 metres	20 metres
Class II Industrial Facility	• Medium scale processing/manufacturing building • Outdoor storage of wastes or materials (i.e., it has an open process) • Occasional outputs of either point source or fugitive emissions for any of the following: noise, odour, dust and/or vibration, and low probability of fugitive emissions • Allows for shift operations and frequent movement of products during daytime hours	300 metres	70 metres
Class III Industrial Facility	• Large scale manufacturing or processing business • Includes outside storage of raw and finished products, large production volumes, continuous movement of goods, and high probability of fugitive emissions • Frequent outputs of major annoyance and daily shift operations	1000 metres	300 metres

Source: MECP, 1995

Assessments under the D-Series Guidelines typically follow the general procedure outlined in Ontario Regulation 419/05 as described in the following section. One area where Series Guidelines may differ from these procedures is in the use of Ontario's Ambient Air Quality Criteria in lieu of the Ministry's Air Contaminants Benchmark list. The D-6 Guidelines are referenced further in the technical assessment portion of this report.

3.2.1 Ontario's Ambient Air Quality Criteria (AAQC)

The AAQC are the most relevant set of air quality criteria with respect to land use compatibility assessments. Whereas the MECP's standards (described in Section 3.3) are to be used for assessing the impact of a single industry, the AAQC can be used to holistically evaluate ambient air quality in an area (i.e., considering **all** industries as well as transboundary and background contributors). In this way, the AAQC are useful to determine if a location is suitable for a proposed land use irrespective of the contribution of a single industrial source, but in consideration of all sources (industrial, transportation, etc.). Depending on the type of Air Quality (AQ) contaminants, the AAQC are based on nuisance or human health impact. Relevant AAQC's are presented in the Local Air Quality section.

3.3 Ontario Regulation 419/05 – Air Quality

The MECP's Environmental Compliance Approval (ECA) process provides a framework with which industries are required to assess their environmental impact. ECAs – or an alternative, simpler approval known as an Environmental Activity and Sector Registry (EASR) application, regulated under Ontario Regulation 1/17 – are issued by the MECP under Section 9 of the EPA. The MECP does allow for certain activities to be exempted from the requirement to hold an ECA, and the list of exemptions is included in O. Reg. 524/98. Activities that are exempt are typically lower risk, as previously determined by the MECP, such as: standby power systems, small wood fuel burning equipment (less than 50kW), and residential air conditioning units.

The MECP requires any industry applying for approval under an ECA or EASR to perform an assessment of air emissions as described in Ontario Regulation 419/05 (O.Reg 419) which pertains to local air quality. O.Reg. 419 outlines the requirements of a technical assessment as well as the standards to be used. The general process of an air quality technical assessment to obtain an ECA or EASR follows these steps:

1. Industries quantify emission rates for each point of release on site.
2. Emissions are assessed using an approved air dispersion model. Point of impingement concentrations of regulated air contaminants (e.g., NO_x, acrolein) are assessed through dispersion modelling at and beyond the property boundary of the facility being assessed. Receptor locations are defined in grid formation with varying resolutions, depending on setback distance from the subject industry (i.e., coarser resolution is used with increased distance from the facility). E*xisting* discrete receptors, including elevated receptors (i.e., air intakes and balconies/terraces of multi-storey buildings) are also included in the pool of receptor locations. Nuisance impacts such as dust and odour are assessed at all *existing* discrete sensitive receptors (e.g., houses, schools, apartment buildings balconies).
3. The predicted ambient air concentrations of regulated air contaminants are compared against the Ministry's Air Contaminants Benchmark list (ACB) to determine compliance.

The implications of O.Reg 419 from a land use compatibility perspective are:

- All industries which operate in compliance with an approval will individually meet the air quality standards for regulated contaminants at all off-site locations, regardless of existing land use. These assessments do not account for the existing ambient concentrations of air contaminants.
- Adding new elevated receptors, such as medium to high density residential to an area may represent new regulatory obligations for industries and potentially lead to compliance issues, as these locations may not have been assessed during the regulatory approval process.
- Adding sensitive receptors in proximity to industry may result in compliance issues for those industries due to nuisance complaints (i.e., odour, dust complaints), as O.Reg 419 does not require assessment of nuisance complaints at most non-existing sensitive land uses.

3.4 NPC-300

The 2013 Environmental Noise Guideline: Stationary and Transportation Sources (NPC-300 Guideline) is the primary guideline used in Ontario to regulate noise emissions. The MECP introduced the Environmental Noise Guideline: Stationary and Transportation Sources (NPC-300 Guideline) in 2013 to address inconsistencies of sound level limits between previous guidelines, including NPC-205, NPC-232, LU-131 and the Noise Assessment Criteria in Land Use Planning: Requirements, Procedures and Implementation.

NPC-300 is designed to address the development of noise sensitive land uses adjacent to noise emitting facilities, including industrial and commercial facilities. Section B10 of the NPC-300 Guidelines states that it is the responsibility of the proponent to ensure that sound level criteria are met and appropriate mitigation measures are in place for stationary noise sources.

According to NPC-300, an agreement for noise mitigation must demonstrate the following:

- The stationary source has the ability to comply with the applicable sound level limits at the new noise sensitive land use;
- Provide certainty that receptor based noise control measures are implemented and maintained;
- Provide consistency for planning noise sensitive land use(s) in the proximity of stationary source(s);
- Address the continuous responsibilities of all the parties to the agreement; and,
- Describe the noise control measures and provide information about how these measures will result in compliance with the applicable sound level limits.

NPC-300 also outlines applicable noise criteria for sensitive land use 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 area classifications are as follows:

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

Different noise guideline limits apply to each area classification, as presented in **Table 3.**

Table 3: Stationary Noise Exclusionary Limits

Assessment Location	Time Period	Exclusionary Sound Level Limit - L_{eq} 1hr			
		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
	Night-time (23:00 - 07:00)	45 dBA	45 dBA	40 dBA	55 dBA
Outdoor points of reception	Daytime (07:00 - 19:00)	50 dBA	50 dBA	45 dBA	55 dBA
	Evening (19:00 - 23:00)	50 dBA	45 dBA	40 dBA	55 dBA

3.5 NPC-207

The MECP (formerly Ministry of the Environment) publication NPC-207 is titled: *Impulse Vibration in Residential Buildings* (Nov. 1983) and it is intended to provide assessment method for determining vibration levels inside occupied residential building that are caused by operation of stationary sources of vibration at industrial facilities (e.g., stamping presses, forging hammers). The publication also provides vibration limits for frequent and infrequent impulses of vibration. The vibration limits are expressed in terms of peak vibration velocity in mm/s and duration of impulses.

3.6 Health Canada Radiofrequency Safety Code 6 (2015)

In June 2015, Health Canada issued Human Exposure Guideline limits for radiofrequency electromagnetic energy in the frequency range of 3 kHz to 300 GHz. The guide (also referred to as Safety Code 6), explains the associated potential impact of exposure to Radiofrequency (RF) fields on human health and specifies references levels for electric and magnetic field strengths. The standards are developed based on acute exposure to RF fields that may result in localized heating or simulation of excitable tissue (e.g., nerve stimulation). The biological response to RF fields is a function of quantum of energy absorption, which depends on the frequency, strength and orientation of the incident fields. On the receiver end (biological response), it also depends on the body mass and its electric properties. The Absorption of RF energy is described in term of Specific Absorption Rate (SAR) (Health Canada, 2015). The electric field and magnetic field standards are set based on SAR or Nerve Stimulation (NS) and are summarized in **Tables 4** and **5**, respectively.

Table 4 – Electric Field Strength Reference Levels – Health Canada

Frequency (MHz)	Reference Level Basis	Reference Level (ERL) (V/m, RMS)		Reference Period
		Uncontrolled Environment	Controlled Environment	
0.003 – 10	NS	83	170	Instantaneous
1.0 – 10	SAR	$87 / f^{0.5}$	$193 / f^{0.5}$	6 minutes

Note:
Uncontrolled environment condition refers to internal electric field strength starting at 1.10 MHz, instantaneous RMS
Controlled environment condition refers to internal electric field strength starting at 1.29 MHz, instantaneous RMS
Frequency 'f' is in MHz. NS: Nerve Stimulation SAR: Specific Absorption Rate
For instantaneous reference levels, at no time the specified levels shall be exceeded.

Table 5 – Magnetic Field Strength Reference Levels – Health Canada

Frequency (MHz)	Reference Level Basis	Reference Level (ERL) (V/m, RMS)		Reference Period
		Uncontrolled Environment	Controlled Environment	
0.003 – 10	NS	90	180	Instantaneous
1.0 – 10	SAR	0.73 / f	1.6 / f	6 minutes

Note:
Uncontrolled environment condition refers to internal electric field strength starting at 1.10 MHz, instantaneous RMS
Controlled environment condition refers to internal electric field strength starting at 1.29 MHz, instantaneous RMS
Frequency 'f' is in MHz. NS: Nerve Stimulation SAR: Specific Absorption Rate
For instantaneous reference levels, at no time the specified levels shall be exceeded.

4.0 Air Quality Review

The following describes the outline of the air quality study presented in this section:

1. Measured concentrations of selected air contaminants within the MTSA are presented in order to describe local air quality.
2. Local meteorological conditions are presented in the form of wind speed and direction. Wind conditions will dictate the dispersion of contaminants within an air shed and are important when considering the impacts of an individual industry on surrounding land uses.
3. Local industries are presented. Only those industries which are expected to contribute substantially to the local air shed have been discussed.
4. The MTSA is presented with a discussion of the design parameters which impact land use compatibility from an air quality perspective for both nuisance contaminants and general air contaminants.
5. Summary recommendations are provided.

4.1 Existing Local Air Quality

4.1.1 Clarkson Airshed Study

In 2001 in response to concerns from the local community the MECP began an ambient air quality monitoring program within the Clarkson Airshed, designated as the Clarkson Airshed Study (the CAS). The CAS focussed on identifying significant sources of air pollutants, ambient air quality monitoring, evaluating contributions from local major industry in comparison to transboundary sources, as well as investigating and discussing abatement options for local industries within the greater Clarkson region. This region is defined in the CAS as the area bounded by Chartell Road (becomes Eighth Line, north of Highway 403), Dundas Street, and Glengary Road, and Lake Ontario. The study was separated into four parts where Part 1 focused on limited monitoring within residential areas, Part 2 on greater and more detailed ambient air quality monitoring, Part 3 on assessing air quality dispersion modelling and source contribution from more distant sources, and Part 4 on ongoing monitoring. In Part 2 the Clarkson Airshed Study conducted the most detailed monitoring, including monitoring of seven pollutants being: total suspended particulates (TSP); inhalable particulate matter (PM_{10}); respirable particulate matter ($PM_{2.5}$); nitrogen oxides (NO_x); nitric oxide (NO); nitrogen dioxide (NO_2); and volatile organic compounds (VOCs). Monitoring was completed over 22 months at six air quality monitoring stations.

Station #46117 (Industrial East) and Station #46128 (Industrial Centre) are closest to the MTSA, (1,350 and 1,150 metres, respectively). During a subsequent phase of the study, three more ambient air quality stations were deployed for additional monitoring of selected VOCs, acrolein, acrylonitrile, and dichloromethane in the area surrounding the MTSA at the following locations:

- 2255 Royal Windsor Drive;

- 2509 Royal Windsor Drive; and,
- 2645 Royal Windsor Drive.

The results from this additional monitoring were included in an addendum to the Phase 2 Clarkson Airshed Study. Relevant Phase 2 results are presented below in the context of the MTSA.

The CAS provides a good review of historical local air quality, although it is important to note that there have been significant changes to the area's industries and air emission contributors. Unprocessed data was not included in the CAS report; results are included in this report in the statistical form they were originally presented (e.g., 98th percentile maximum). These results can be used to understand the trends in air quality within the Clarkson Airshed over the duration of the CAS.

4.1.1.1 Nitrogen Dioxide - NO_2

Results from the CAS show that 98th percentile 24 hr and maximum 1 hr ground-level concentrations of NO_2 were below the AAQC. This indicates that during the CAS, NO_2 concentrations within the airshed were typically within the "desirable concentration… used to assess general air quality resulting from all sources of a contaminant to air"[1]. A summary of the result for the two stations closest to the proposed development area are provided in **Table 6** and **Table 7**.

Table 6: Clarkson Airshed Study 24-hr NO_2 Monitoring Results

Station Name	NO_2 –24 Hour		
	Average (2003 – 2005)	98th percentile (2003 – 2005)	Ambient Air Quality Criteria
Industrial East	14 ppb	40 ppb	100ppb
Industrial Centre	17 ppb	38 ppb	

Table 7: Clarkson Airshed Study 1-hr NO_2 Monitoring Results

Station Name	NO_2 – Max 1 Hour			
	2003	2004	2005	Ambient Air Quality Criteria
Industrial East	74 ppb	134 ppb	53 ppb	200 ppb
Industrial Centre	50 ppb	75 ppb	70 ppb	

[1] Ontario's Ambient Air Quality Criteria, https://www.ontario.ca/page/ontarios-ambient-air-quality-criteria-sorted-contaminant-name, Accessed November 6th, 2019

4.1.1.2 Particulate Matter (fine fraction) - $PM_{2.5}$

Results from the CAS showed elevated concentrations of $PM_{2.5}$. The 24 hr 98th percentile $PM_{2.5}$ concentrations were equal to the AAQC. It should be noted that this occurred infrequently (by definition 98th percentile concentrations are exceeded 2% of the time or 8 days per year for a 24-hour standard) and is not unique to the Clarkson Airshed; $PM_{2.5}$ occasionally exceeds the AAQC in much of Southwestern Ontario. Average and 98th percentile concentrations from the CAS are summarized in **Table 8**.

Table 8: Clarkson Airshed Study $PM_{2.5}$ Monitoring Results

Station Name	$PM_{2.5}$ – 24 Hour		
	Average	98th Percentile	Ambient Air Quality Criteria[1]
	2003-2005	2003-2005	
Industrial East	7 µg/m³	27 µg/m³	27 µg/m³
Industrial Centre	11 µg/m³	25 µg/m³	

[1]The Ambient Air Quality Criteria for $PM_{2.5}$ is currently 30, however the Canada Wide Standard for this contaminant is proposed to decrease to 27 µg/m³ in 2020, therefore this value was used for conservativeness

4.1.1.3 Particulate Matter - PM_{10}

Results from the CAS showed that average 24-hour ground-level concentrations of PM_{10} were below the AAQC. A summary of the results are provided below in **Table 9**.

Table 9: – Clarkson Airshed Study PM_{10} Monitoring

Station Name	PM_{10} – 24 Hour	
	Average	Ambient Air Quality Criteria
	2003-2005	
Industrial East	17 µg/m³	50 µg/m³
Industrial Centre	19 µg/m³	

4.1.1.4 Volatile Organic Compounds - VOCs

Sampling results from the CAS showed elevated ground-level concentrations of certain volatile organic compound (VOCs). **Table 10** shows the results of the initial CAS along with results of additional monitoring within the SEA of selected VOCs, including acrolein, which was completed in an addendum to the CAS. It can be seen that for the VOCs presented in **Table 10**, there were exceedances of the AAQC. At the time of the study there were no AAQC or ACB limits for benzene. These results suggest that the MTSA may require consideration from an air quality perspective prior to implementing any proposed changes to land use within the study area, especially for any residential developments.

Table 10: Clarkson Airshed Study Selected VOC Monitoring Results

Contaminant	Location of Max	Max (µg/m³)	Average (µg/m³)	Ambient Air Quality Criteria		
				Threshold	Limiting Effect	Averaging Time
Benzene	Industrial East	0.92 µg/m³	0.82 µg/m³	0.45 µg/m³	Health	Annual
Dichloromethane[t]	Industrial Centre	245.00 µg/m³	NA	220.0 µg/m³	Health	24 hr
Acrolein[i,t]	2645 Royal Windsor	3.94 µg/m³	NA	0.40 µg/m³	Health	24 hr
	2509 Royal Windsor	2.14 µg/m³	NA			
	2255 Royal Windsor	1.85 µg/m³	NA			

[i] Data for Acrolein summarized from the *Clarkson Airshed Study - A Scientific Approach to Improving Air Quality - Addendum to Part II - The Ambient Air Monitoring Program: South Mississauga (Clarkson) and Oakville Sampling Results for Acrolein, Acrylonitrile and Dichloromethane in Ambient Air, Summer 2007*

[t] Average ground-level concentrations were not available at the time of this report.

4.1.2 Local Air Quality – Current

It is recognized that the data collected in the CAS may not be representative of the current air quality in the MTSA. A number of factors can change within an area which will act to improve air quality, including but not limited to: industrial relocation, improvement in industrial processes, improvements in on-road vehicle performance, and the adoption of zero-emission technologies. Considering this, recent local air quality data was reviewed from the Ministry of the Environment Conservation and Parks (MECP) air pollutant monitoring network to identify if there are any trends in the data in the decade since the CAS was completed. The MECP air pollutant monitoring station nearest to the proposed development area is located at 3359 Mississauga Road N., in Mississauga. NO_x (1 hr average and 24 hr average) and $PM_{2.5}$ (24 hr average) data were obtained from this station for the periods of 2005-2006 and 2016-2017 and are summarized respectively below in **Table 11** and **Table 12**.

Table 11: MECP NOx Ambient Air Quality Monitoring Data (2005-2006, and 2016-2017)

Contaminant		2005-06 (1 hour)	2016-17 (1 hour)	2005-06 (24 hour)	2016-17 (24 hour)
NO_x	Max	261.0 ppb	149.0 ppb	107.6 ppb	64.9 ppb
	90th Percentile	37.0 ppb	21.0 ppb	34.3 ppb	18.3 ppb
	Average	18.1 ppb	10.0 ppb	18.1 ppb	10.0 ppb

Table 12: MECP $PM_{2.5}$ Ambient Air Quality Monitoring Data (2005-2006, and 2016-2017)

Contaminant		2005-06 (24 hour)	2016-17 (24 hour)
$PM_{2.5}$	Max	41.7 µg/m³	24.4 µg/m³
	90th Percentile	17.8 µg/m³	12.1 µg/m³
	Average	8.1 µg/m³	6.9 µg/m³

Although the results presented in **Tables 11** and **12** are not predictive or representative of the concentrations of air contaminant within the MTSA, they do illustrate a declining concentration of air contaminants since the inception of the CAS. NO_x and $PM_{2.5}$ are generated from a variety of processes, with vehicles and industry being the major contributors. VOCs are also largely emitted from vehicles and industrial processes. In consideration of these findings, undertaking an air quality study (update to CAS) to better understand and characterize the existing ambient air quality in the area is recommended prior to permitting the development of additional sensitive land uses in the area.

4.2 Local Meteorology

Local meteorological data, in the form of wind speed and direction, was gathered from Toronto Island Airport, which was chosen due to its proximity to the study area and the influence of lake effects. Wind speed and direction data for the 2003-2005 period are presented in **Figure 3**. Of note, there is a significant easterly (i.e., blowing from the east) component to local winds, and an even distribution of winds blowing from the northwest through to due south. Considering that the majority of industries considered are south or west of the MTSA, it is expected that winds from the northwest through due south will blow from the industries to the proposed development areas (including proposed residential land uses) with regularity.

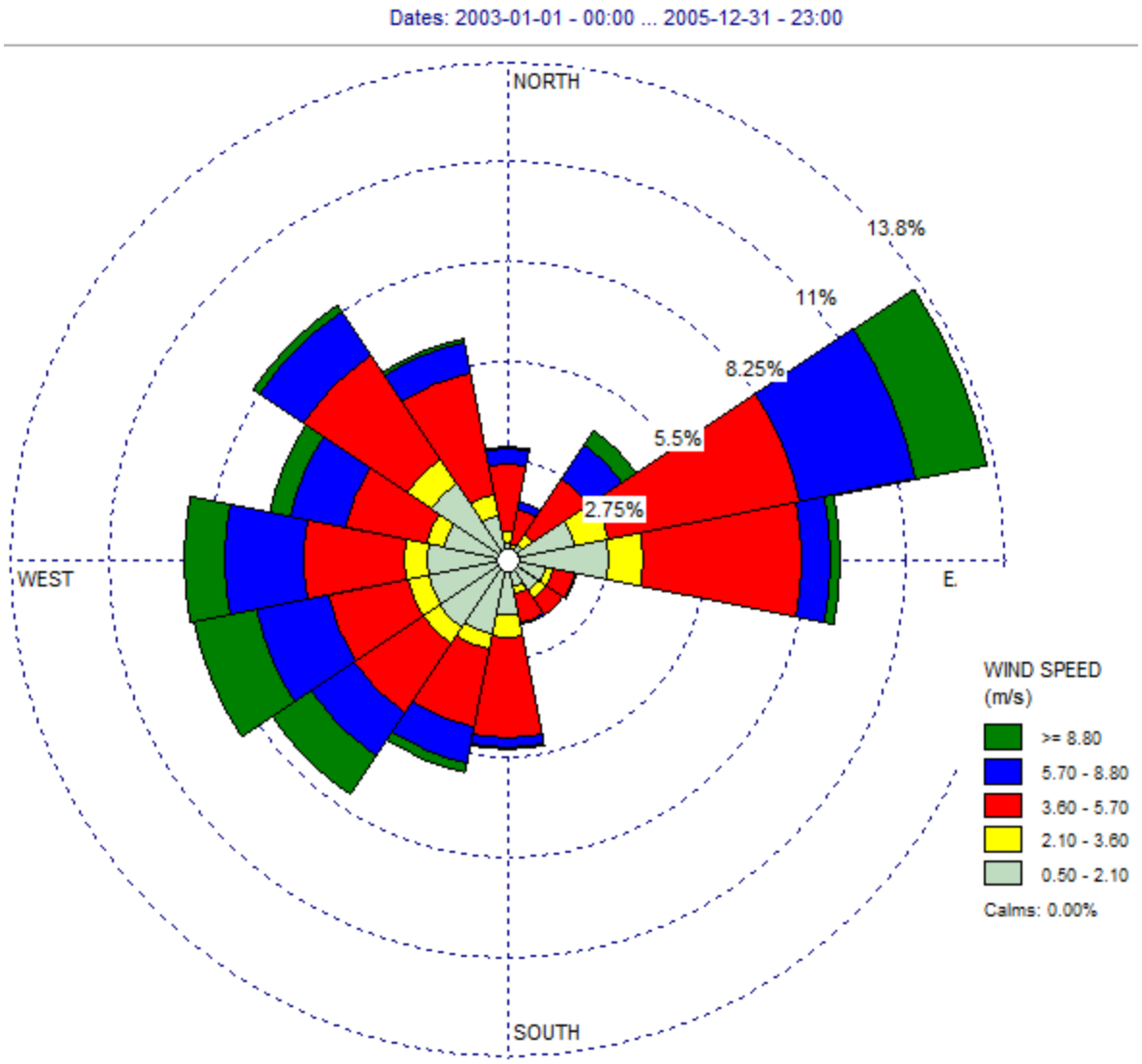

Figure 3: Wind Rose for 2003 through 2005 from Toronto Island Airport

4.3 Existing Industries – Air Quality

The industries in proximity to the MTSA were reviewed from a qualitative standpoint. This review includes consideration of the type of operations at each industry, the proximity to the MTSA, and a summary of the potential impacts which may be expected off-site due to each industry, as presented in **Table 13**. The information presented for each industry was obtained from the industry's ECAs, satellite imagery, and engineering knowledge. This review identifies that there are several class 2 and 3 industries in proximity to the MTSA, and that significant emissions with the potential to impact the MTSA may be expected. It can be seen that some facilities include tall stacks and large features (e.g., storage tanks, operations, boilers, etc.) that would have the potential to result in notable air quality impacts. The industries, with their applicable D-6 classifications, are shown in **Appendix B**.

Table 13: Local Industries within the MTSA – Air Quality

Facility Name	Description of Operations and Features	Distance from Development	D-6 Classification	Potential Impacts Air Quality
CRH Canada Group Inc.	• Large scale cement and aggregate facility (crushing, processing, handling) • Cement storage; • Transloading; • Large stacks	<1 km	3	• Particulate matter • Dust • Combustion by-products
Tri-Phase Environmental	• Aggregate crushing, processing, and handling	<2 km	2	• Particulate matter • Dust • Combustion by-products
Clean Harbors Canada, Inc.	• Liquid and sludge waste facility (receiving, handling and processing) • Chemical and waste storage tanks, • Chemical and waste pump trucks • Laboratory fume hoods; and • Aerosol can crushing.	<1.5 km	2/3	• VOCs • Combustion by-products • Odours
Petro-Canada Lubricants	• Large petrochemical manufacturing and storage; • Intermediate feedstock refined to produce: ○ Lubricants (automotive, industrial and food grade); ○ Greases; ○ Base and process oils; and, ○ Specialty fluids. • Large chemical storage tanks; • Large stacks; • Large boilers; • Transloading; and, • Water and wastewater treatment.	<1 km	3	• VOCs • Combustion by-products • Odours • Particulate matter
Trimac Transportation Services	• Transportation and logistics yard; • Truck and tanker handling and storage • Tanker and truck washing; and • Small stacks	<1.5 km	2	• Combustion by-products • Dust

Facility Name	Description of Operations and Features	Distance from Development	D-6 Classification	Potential Impacts Air Quality
H.L Blachford Limited	• Manufacturing of chemicals used in the rubber, paint and ink industries; • Products generally include pigments and dyes; • Stacks; • Chemical; and, • Storage tanks.	<0.3 km	2	• VOCs • Combustion by-products • General air contaminants • Odour
IPEX Inc.	• PVC manufacturing • Injection moulding and grinding; • Research and development activities; • Stacks; • Chemical storage tanks; and, • Transloading.	<0.5 km	2	• VOCs • Combustion by-products • General air contaminants • Odour
Stackpole Powertrain International ULC	• Manufacturing automotive castings for oil and transmission fluid pumps; • Machining aluminum and steel parts; • Parts washing, assembly and testing; and, • Small stacks.	<0.5 km	2	• VOCs • General air contaminants • Combustion by-products
ICS Universal Drum Reconditioning Limited Partnership	• Re-conditioning, cleaning, and re-furbishing of steel and plastic drums; • Acid and caustic washing of steel tanks; • Caustic wash of plastic drums; • Acid wash of IBCs; • Drum shredding, crushing; • Drum painting; • Recycled drum services; • Chemical storage tanks; and, • Stacks.	<1 km	2	• VOCs • General air contaminants • Combustion by-products

Facility Name	Description of Operations and Features	Distance from Development	D-6 Classification	Potential Impacts Air Quality
Ashland Canada Corp. and Valvoline Canada Corp.	• Chemical and solvent repackaging and blending facility • Receives, stores and distributes chemical products and paint; • Stacks; • Storage tanks; and, • Transloading.	<1.5 km	2	• VOCs • Combustion by-products
2159978 Ontario Limited	• Ready-mix concrete facility; • Road salt storage.	<1.5 km	2	• Dust • Particulate matter
Wastewater Treatment Plant - The Regional Municipality of Halton	• Municipal wastewater treatment facility servicing the Halton Region • Large wastewater treatment processes	<3 km	3	• Odour
Clarkson Wastewater Treatment Plant	• Municipal wastewater treatment facility • Large wastewater treatment processes	<1.5 km	3	• Odour
Mancor Canada Inc.	• Carbon steel manufacturing; • Plasma cutting; • Stamping and light machining; • Welding and painting; • Storage tanks; and, • Small stacks.	<2 km	2	• VOCs • Particulate matter • General air contaminants
UBA Inc.	• Chemical logistics facility, named as key contributor to the Clarkson airshed. (Air/Noise approvals not found); and, • Storage tanks.	<1.5 km	2	• VOCs • Odours
Musket Transport Inc.	• Transportation and logistics yard with truck and tanker handling and storage. *NOTE: Musket Transportation is within the MTSA, and has not been considered further.*	<0.3 km	2	• Dust • Combustion by-products

4.4 MTSA Plan and Study Considerations

The location of the proposed MTSA as well as the relevant industries identified and assessed as part of this study are presented in **Figure 4**. **Figure 5** shows the MTSA plan with proposed building elevations identified for each sub-section of the proposed land use development.

Figure 4: MTSA (shown in pink) and Industries Considered For this Study

Figure 5: MTSA Plan with Building Heights Represented in each Block

Potential incompatibilities between the MTSA and neighbouring industries are primarily dependant on proximity to the industry and elevation of the development. The following sections provide an outline of potential compatibility issues with respect to nuisance contaminants and regulated air contaminants.

4.4.1 Nuisance Contaminants (Dust and Odour)

Dust and odour are typically assessed at existing discrete sensitive receptor locations. Some of the existing industries were established prior to the development of nearby sensitive receptors, and as such may not have been required to assess dust or odour impacts at the proposed development locations at the time of applying for approval through the MECP. As a result, introducing new sensitive receptors can present the following issues:

1. Regardless of which lands were developed first, industries must demonstrate compliance at all sensitive receptors. This means that an industry which currently is operating in compliance with the provincial regulations can become non-compliant when new sensitive receptors are introduced nearby.

2. Introducing sensitive receptors (i.e., residential land uses) in an area which has not been previously assessed for odour or dust may result in significant complaints from new receptors.

Based on the above, assessments for nuisance contaminants should be performed whenever a new sensitive receptor is proposed which may be affected by a likely source of dust or odour. The D-Series Guidelines provide helpful criteria for determining when an assessment is required in the form of Areas of Influence and Recommended Minimum Setback Distances. Depending on the class of the industry (as shown in **Table** 13) the Area of Influence – within which, encroaching industries should be studied – ranges from 70 m (Class I Industries) to 1000 m (Class III Industries) (see **Figures B1** and **B2** in **Appendix B**). **Figure 6** shows the blocks of the MTSA which are within the minimum area of influence of a suspected source of a nuisance contaminant. These blocks should be studied further prior to approval of any land use changes or further intensification within the MTSA.

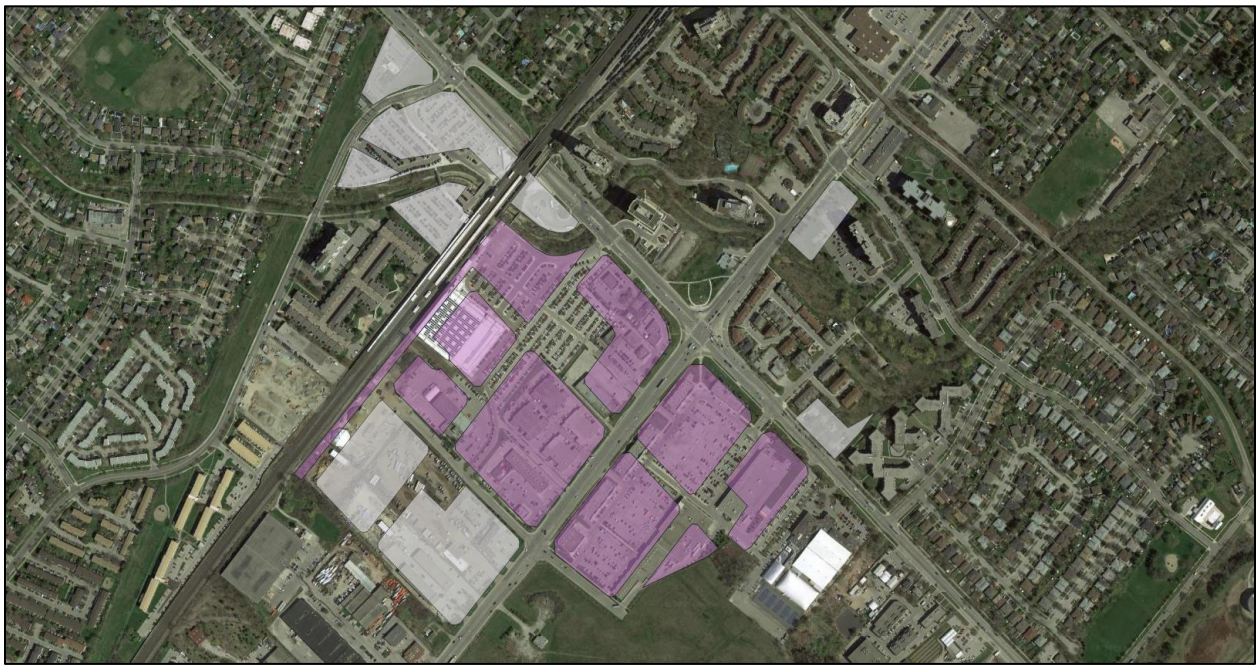

Figure 6: Development Blocks where Nuisance Impact Studies are Recommended (shown in purple)

The proposed office buildings to the west of the MTSA are not identified as requiring assessment despite being within the Area of Influence of several industries. Typically office buildings are not considered sensitive receptors. In order to promote compatibility, it is recommended that any institutional/commercial use include non-operable windows and/or appropriate air contaminant control systems as part of their air handling equipment (e.g., carbon filter for odour).
Non-sensitive outdoor locations (e.g., parks, patios) are typically assessed assuming intermittent use and as such may not result in regulatory compliance issues for the nearby industries, however, they should be considered in the assessment for the potential for nuisance complaints.

4.4.2 General Air Contaminants

All regulated air contaminants are required to be assessed by an industry at any point off-site, including areas that are zoned industrial / commercial. These assessments do not include cumulative impacts from other neighbouring industries and do not account for existing ambient concentrations. The exception to this is elevated points of reception where zoning did not previously allow elevated uses. A new sensitive receptor above ground level (e.g., an apartment window or balcony) represents a new point of reception that an industry would need to demonstrate compliance at. As such, any block within the MTSA which is proposing sensitive uses above three-storeys in height (considered "above ground-level"), and which falls within the Area of Influence as per Guideline D-6, should be assessed. An exception to this recommendation would be when the proposed block is in a similar location to an existing sensitive receptor of similar height for which an assessment has already been completed for industrial approval purposes.

Figure 7 shows the blocks where air quality studies are recommended. It is recommended that a detailed air quality study, including dispersion modelling, be performed prior to allowing more sensitive land uses in the area.

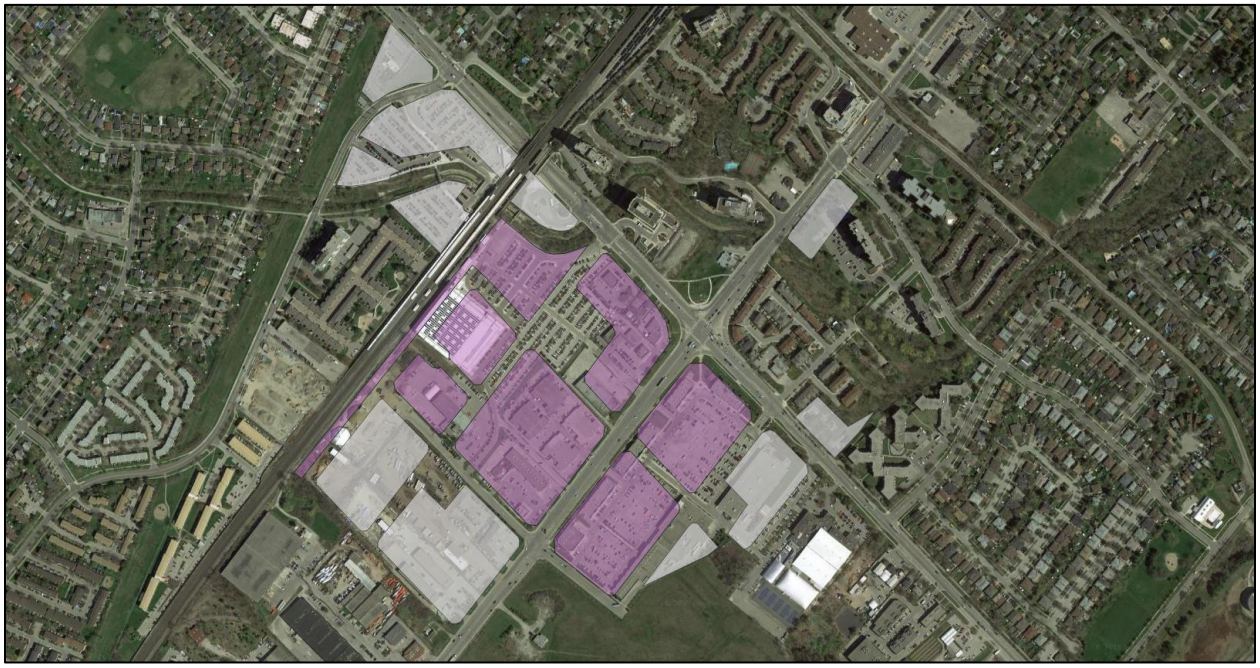

Figure 7: Development Blocks where General Air Contaminants should be assessed (shown in purple)

4.5 Recommendations

Potential Air quality impacts can be mitigated through implementation of control technologies at source; however, a feasibility assessment (technical and financial) is typically a prerequisite. The extent

to which a business is able to mitigate its air and odour emissions should be considered to determine the impact of such mitigations.

Mitigation measures or controls are typically specific to sources or type of contaminant emission rather than an industry or a business and are intended to reduce impacts to meet regulatory requirements rather than eliminate them. There are specific standards / guidelines for air quality and odour as well as methodology to assess such impact so that proponents can determine the need for mitigation measures and then proceed with assessing the feasibility of such measures.

Mitigation can also be achieved through implementation of strategies rather than installation of control technologies, such as elimination of a source of emission or changing operations (e.g., reducing operating hours). Mitigation tends to be assessed on a case-by-case basis. **Table 14** provides a list of commonly applied control technologies for air contaminant and odour emission sources.

Table 14: Commonly applied control technologies for air quality and Odour

Impact Type	Impact Specifications	Common Control Measures
Air Quality	Particulate Matter	Dust collectors / baghouses
		Cyclones
		Electrostatic precipitators
		High temperature ceramic particulate filters
	Nitrogen oxides (NO_X)	Selective Catalytic Reduction (SCR)
	Volatile Organic Compounds (VOCs)	Thermal oxidizers (incinerator)
		Adsorptive technology
	Unburnt Hydrocarbons	Catalytic converters
	Carbon monoxide	Catalytic converters
	Polycyclic Aromatic Hydrocarbons (PAHs)	Catalytic converters
Odour	Stationary odour sources	Bio filters
		Odour neutralizing compounds

The following recommendations are based on the information gathered and discussed above, related to air quality impact of the existing industrial establishments on the proposed development within the MTSA:

1. Prior to implementing any proposed changes to land use within the study area, any blocks identified in **Figure 6** as requiring an assessment for nuisance contaminants should be subject to a thorough review. The assessment should consider combined impacts from local industries (cumulative effect) and should be based on relevant MECP guidelines and regulations, including O.Reg. 419/05.

2. Prior to implementing any proposed changes to land use within the study area, any blocks identified in **Figure 7** as requiring an assessment for general air contaminants should be subject to a detailed study. The study may include a combination of dispersion modelling assessment of local industries and an updated air quality monitoring program to characterize existing local air quality. A dispersion modelling study should be conducted in accordance with relevant guideline documents and protocols set by MECP. For an updated air quality monitoring program, consideration should be given to duration of the program as well as monitoring locations to ensure representative data is gathered. The assessment should use the MECP's ACB and AAQC for determination of potential impacts. The scope of these assessments should be determined on a case-by-case basis by a qualified air quality engineer. It is recommended that these studies be peer reviewed by independent third party specialists.

   For contaminants where the measured ambient levels have historically shown to exceed the relevant standards or criteria (e.g., acrolein, benzene), an air quality based human health risk assessment should be undertaken by a qualified specialist. The scope of the assessment, including relevant guidelines, should be prepared by a qualified human health risk assessor.

3. Given the results of the CAS, irrespective of recommendations 1 and 2, above, it is recommended for the City to consider requiring an air quality based human health risk assessment to be completed for any sensitive land use development within the MTSA, prior to approval.

4. An up-to-date ambient air quality monitoring study, especially for contaminants that had shown levels above the AAQC would allow for better characterization of the existing air quality in the area. The study can then be used by the City as an effective tool in the decision making process related to the planned intensification, while maintaining a factual perspective on future potential human health impacts related to air quality. The duration and monitoring locations are key factors that should be carefully assessed and selected for such a study.

5.0 Noise and Vibration Review

5.1 Noise Impact

Sound is most simply defined as the vibration in the air that we can hear. Vibrating surfaces (such as engines, drums, loudspeakers etc.) typically produce pressure fluctuations in the air. The pressure fluctuations spread out like waves in the air, in all directions, decreasing in intensity with distance from the Source. Our ears sense the pressure fluctuations and create electrical signals that our brain interprets as sound. [3]

Sound has three distinctive characteristics that the ear identifies [4]:

1) Amplitude (loudness or softness) – measured in "Decibels";
2) Frequency or "Pitch" – representing a range of "low" to "high" sounding tones; Pitch is determined by frequency of wavelength, measured in cycles per second or "Herz"; and
3) Time Patterns (variability) – intermittent sounds versus sounds of longer duration; the concept of "Leq" measures sound over a specific time period.

To mimic the ear's sensitivity to sound, sound level data at various frequency spectrum are adjusted (weighted) to create values knows as "A-weighted". The resulting sound levels (A-Weighted) are expressed in unit of A-Weighted decibels) or "dBA".

Sound is considered "Noise" when it is "unwanted" sound. It is usually unwanted because it interferes with human activity or causes an annoyance. Noise levels have increased as urbanization and industrialization have expanded in modern times. Urbanization has concentrated populations in close proximity to each other, and in close proximity to industrialized activities and manufacturing sites. As cities continue to urbanize, the need has arisen to intensify residential housing within existing city limits to curb urban sprawl and promote the efficient use of land and resources. Increased density inevitably brings increased sound levels. The development and expansion of transportation infrastructures (e.g., roads, highways and railways) has resulted in constant transportation related noise.

Human ears can hear a wide range of pressure intensities. The "Decibel" scale was developed to represent the range of audible sounds that human ears can detect in terms of loudness or softness. The Decibel scale represented as "dB" measures the sound pressure level in Decibels. 0 Decibels represents the threshold of hearing. 120-130 Decibels represents the upper end of sound that can be painful or highly uncomfortable. Typical noise sources and their respective sound levels that humans are exposed to regularly are presented in **Figure 8**. Each increase in sound level by approximately 10 dB results in roughly doubling of perception of loudness.

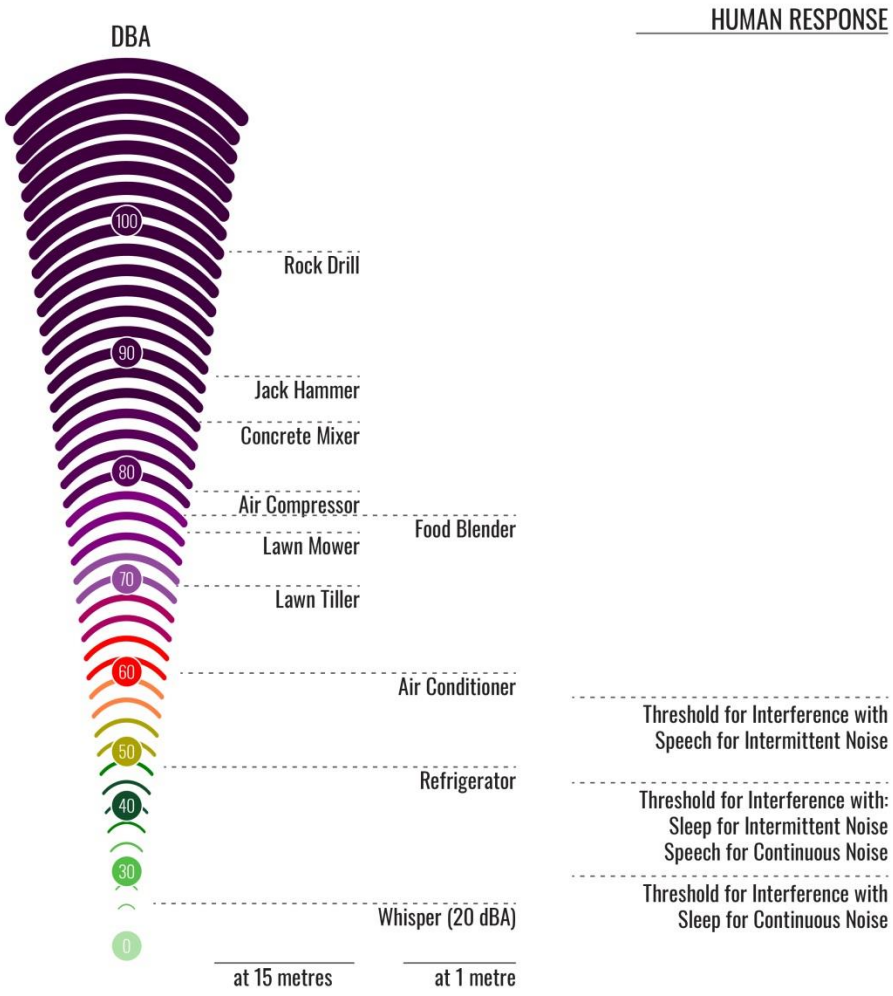

Figure 8: Typical Sources of Noise and Threshold Interference

5.2 Vibration Impact

In general, ground-borne vibration consists of oscillatory waves that propagate from the source through the ground to adjacent buildings. Ground vibration at a receiver location is typically a result of energy propagation through the ground from a source (e.g., industrial facility, rail, blasting) to a receiver by exciting the grounds and creating vibration waves that spread through the soil and rock layers to the foundations of nearby receiver buildings. The vibration can then move from the foundation throughout the rest of the building structure causing windows, walls and objects inside the building to "shake and rattle".

In contrast to air-borne noise, ground-borne vibration is not a phenomenon that people normally experience every day. While vibration exists all around, it is typically below the threshold of perception for humans. However, ground-borne vibration can be a concern for occupants of buildings in proximity to railway corridors, heavy industries with stamping operation, or mining sites with blasting operation.

Ground-borne vibration is almost never annoying to people who are outdoors. Although the motion of the ground may be perceived, without the effects associated with the shaking of a building, the motion does not provide the same adverse human reaction. The perception of vibration arises inside a building. The vibration of floors and walls may cause feelable vibration, rattling of items such as windows or dishes on shelves, or a rumble noise. The rumble is the noise radiated from the motion of the room surfaces. In essence, the room surfaces act like a giant loudspeaker causing what is called ground-borne noise.

Annoyance from vibration often occurs when the vibration exceeds the threshold of perception by only a small margin. A vibration level that causes annoyance will be well below the damage threshold for normal buildings. Building damage is typically not a concern for development in proximity of industrial / commercial establishment as ground vibration would not excess of 10 mm/sec, Root-Mean Square (RMS), required to cause structural damage. However, the effects of vibration on occupants include fear of damage to the occupied structure and its contents, as well as more direct adverse effects such as distraction, irritation and subsequent interference with quiet activities or sleep patterns. To put all this into perspective, the background vibration velocity level in typical residential areas is usually less than 0.03 mm/sec RMS. This is well below the threshold of perception for humans which is around 0.1 mm/sec RMS. Some typical vibration sources, their associated velocity levels and human/structural responses are presented in **Figure 9**.

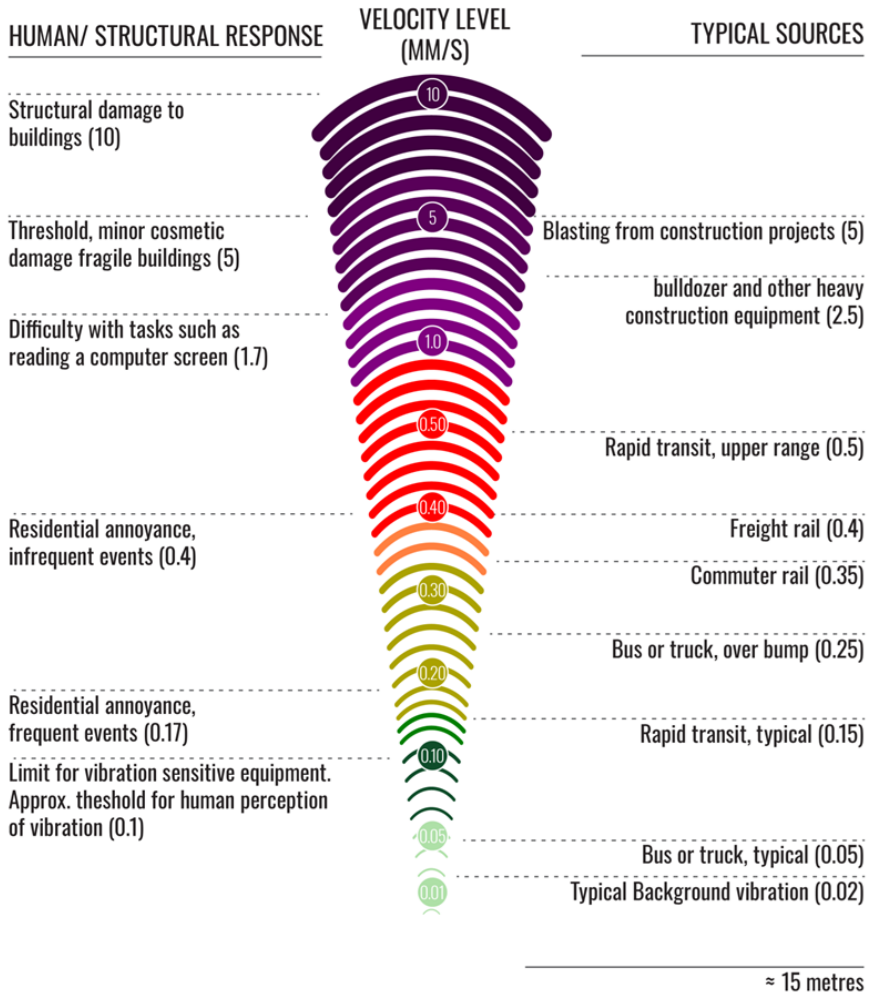

Figure 9: Typical Vibration Sources, Levels and Human /Structural Response

5.3 Existing Industries – Noise & Vibration Review

The industries in proximity to the MTSA were reviewed from a qualitative noise and vibration impact perspective. This review includes consideration of the type of operations at each industry, the proximity to the MTSA, and a summary of the potential impacts which may be expected beyond the property boundaries of the facilities, as presented in **Table 15.**

The information presented for each industry was obtained from the ECAs, satellite imagery, and Dillon's experience and engineering knowledge of various industrial processes / operations / activities in relation to noise and vibration emissions.

Table 15: Local Industries within the MTSA

Facility Name	General Facility Description	Distance from Development	D-6 Classification	Potential Impacts Noise & Vibration
CRH Canada Group Inc.	Large scale cement and aggregate facility (crushing, processing, handling)	<1 km	3	Noise Ground Vibration*
Tri-Phase Environmental	Aggregate crushing, processing, and handling	<2 km	2	Noise Ground Vibration*
Clean Harbors Canada, Inc.	Liquid and sludge waste facility (receiving, handling and processing)	<1.5 km	2/3	Noise
Petro-Canada Lubricants	Large petrochemical manufacturing and storage facility for Lubricants	<1 km	3	Noise
Trimac Transportation Services	Transportation and logistics yard with trucks and tankers storage yard	<1.5 km	2	Noise
H.L Blachford Limited	Manufacturing of chemicals used in the rubber, paint and ink industries	<0.3 km	2	Noise
IPEX Inc.	PVC manufacturing and Injection moulding and grinding	<0.5 km	2	Noise
Stackpole Powertrain International ULC	Manufacturing automotive castings for oil and transmission fluid pumps;	<0.5 km	2	Noise
ICS Universal Drum Reconditioning Limited Partnership	Re-conditioning, cleaning, and re-furbishing of steel and plastic drums;	<1 km	2	Noise
Ashland Canada Corp. and Valvoline Canada Corp.	Chemical and solvent repackaging and blending facility	<1.5 km	2	Noise
2159978 Ontario Limited	Ready-mix concrete facility and road salt storage.	<1.5 km	2	Noise
Wastewater Treatment Plant - RMH	Municipal wastewater treatment facility servicing the Halton Region	<3 km	3	Noise
Clarkson Wastewater Treatment Plant	Municipal wastewater treatment facility	<1.5 km	3	Noise

Facility Name	General Facility Description	Distance from Development	D-6 Classification	Potential Impacts Noise & Vibration
Mancor Canada Inc.	Carbon steel manufacturing with plasma cutting, welding, stamping and painting	<2 km	2	Noise Ground Vibration*
UBA Inc.	Chemical logistics facility with transport truck traffic to and from the facility (Air/Noise approvals not found)	<1.5 km	2	Noise
Musket Transport Inc.	Transportation and logistics yard with truck and tanker handling and storage *NOTE: Musket Transportation is within the MTSA, and has not been considered further.*	<0.3 km	2	Noise

* The ground vibration impact is expected to be localized and not to extend notably beyond the property boundaries of the identified industrial facilities.

5.4 Implications of Noise and Vibration on the Proposed Development Plan

Noise Implications

In addition to review of the available ECAs for the above-mentioned industries, daytime and nighttime site noise surveys were conducted by Dillon as part of this study to better characterize the existing noise environment and potential noise / vibration impact that may be experienced at the proposed sensitive land uses. The area can be classified as Class I – Urban (as per NPC-300):

"An area with 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."

The noise levels in the area are primarily influenced by vehicular traffic. During daytime hours, truck traffic serving the industrial and commercial establishments in the area notably increases the traffic noise levels while. Rail related activities from a nearby rail yard as well GO Transit trains are audible within the MTSA areas north of Royal Windsor Drive – Lakeshore Road West. Although the railway noise is intermittent and for short durations, it dominates the noise level in the immediate vicinity of the railway and is more pronounced during nighttime hours, when road traffic is reduced.

Industrial noise sources from heavy industries are more audible to the south of Orr Road and beyond the west boundary of the CFRB 1010 antenna installation areas.

From the pool of industrial facilities in the area that were assessed in this study, the CRH Canada large scale cement and aggregate facility would be considered the most impactful from a noise perspective.

The dominant noise sources at this facility are spread from the south end of the property boundary to near the north end (crushing and stockpiling operations and heavy mobile equipment operation). The north property boundary of this facility is approximately 800m from the closest point of the MTSA with absorptive grounds in between. Absorptive grounds help attenuate noise, however, as the receptor elevation increases (i.e., in case of high rises) the effect of ground absorption diminishes. The operations at CRH Canada can be distinctly audible at the southwest end of the shopping plaza at Royal Windsor Drive and Southdown Road as well as at the west end of the ORC – Ontario Racquet Club. As such, the development areas on the southwest quadrant of Royal Windsor Drive and Southdown Road are likely going to be impacted by industrial operations. It is noted that if an industrial facility is audible at a receptor location, it does not necessarily mean that the facility is exceeding the applicable noise level limits, as described in NPC-300.

The dominant stationary noise sources for Petro-Canada Lubricants facility are mainly at the south end of the facility and as such do not cause a notable impact at receptors north of Orr Road. The dominant noise sources at the wastewater treatment plants are not audible north of Orr Road.

Noise emissions from the rest of the industrial establishments that were reviewed as part of this study are related to truck traffic to / from the sites and therefore fall under road traffic noise impact, as discussed above.

Vibration Implications

From the nearby industries, the ground vibration generation is expected from Mancor Canada Inc. (Stamping operation) as well as CRH Canada and Tri-Phase Environmental (crushing and operation of heavy mobile equipment). Ground vibrations generated at these facilities are expected to diminish rapidly with distance and are not expected to extend significantly beyond the property boundaries of these facilities. As such, ground vibration from nearby industrial sources is not considered a concern for the proposed development plan.

Rail operation along the rail corridor is expected to generate ground vibration that can impact areas on either side of the rail corridor. Typically, notable rail-generated ground vibration can extend 75m or 100m beyond the rail right-of-way and also result in ground borne noise, indoors. Type of train, condition of track and wheels, train travel speed and transfer mobility factor of the grounds in between rail and receiver influence the level of vibration that a receptor would experience from rail operations. For the proposed MTSA plan, it is expected that development within 75m of the rail corridor (north and south side) can experience ground vibration impact.

5.5 Recommendations

Many of the environmental impacts can be mitigated through implementation of existing control technologies at source and/or at receptor; however, a feasibility assessment (technical and financial) is typically a prerequisite.

Mitigation measures or controls are typically specific to sources or type of contaminant emission rather than an industry or a business and are intended to reduce impacts to meet regulatory requirements rather than eliminate them. There are specific standards / guidelines in place for noise and vibration as well as methodology to assess such impacts, so that proponents can determine the need for mitigation measures and then proceed with assessing the feasibility of such measures. Mitigation measures can also be implemented at the receptor location, such as installation of a noise barrier wall at a receptor to reduce noise impact, use building construction materials with appropriate Sound Transmission Class (STC) rating to achieve suitable indoor noise levels, and install vibration isolation at building footing to limit / eliminate ground vibration.

Mitigation can also be achieved through implementation of strategies rather than installation of control technologies, such as elimination of a source of emission or a receptor through acquisition. In scenarios where the implementation and/or operation of a control technology is more costly than acquiring a receptor or a business and eliminating it as a receptor or a source, it would be more cost effective to implement such a strategy than to mitigate through the control technology.

Mitigation tends to be assessed on a case-by-case basis. **Table 16** provides a list of commonly applied control technologies for noise and vibration.

Table 16: Commonly applied control technologies for noise and vibration

Impact Type	Impact Specifications	Common Control Measures
Noise	Stationary noise sources	Silencers Acoustic Louvers
		Acoustic enclosures Noise barrier wall
		Noise berm
Vibration	Stationary vibration sources	Isolation pads / adsorptive pads
		Foundation isolation

Based on the high level qualitative assessment completed for this study, the following recommendations are suggested:

- For developments that are located in the southwest quadrant of Royal Windsor Drive and Southdown Road, a detailed noise impact assessment should be undertaken for each of the proposed residential buildings to ensure that appropriate noise mitigation measures are going to be implemented in the design and construction of the sensitive-receptor buildings such that the applicable noise limits are met.

- For developments within 75m of the rail corridor, a detailed noise and ground vibration assessment should be undertaken to ensure that appropriate noise (including Ground Borne Noise) and vibration mitigation measures are implemented in the design and construction of the sensitive-receptor buildings such that the applicable noise and vibration limits are met.

6.0 Radiofrequency Review

The Bell Media Corporation operates the CFRB 1010 AM radio transmission antenna array on a relatively large parcel of land located south of Royal Windsor Drive, west of Southdown Road. The subject land parcel is adjacent to the proposed mixed used development areas within the MTSA. As part of this review study, a high-level assessment of Radiofrequency (RF) field impact on the proposed development was completed to determine potential RF field strength and determine if mitigation measures are required.

6.1 Analysis and Impacts

The CFRB1010 AM antenna array has a power rating of 50 kW and transmits at centre frequency of 1,010 kHz. The actual locations of the antennas and the power / frequency ratings were used to model the electric field for both daytime and nighttime. The reference level (i.e., standard) for the electric field, based on Health Canada's Standard for human exposure was determined to be at 86.57 V/m. Computer modelling was completed to determine the electric field strength (in Volt per meter, V/m) for the transmitter antenna array for daytime and nighttime. The model-predicted levels for daytime and nighttime are presented in Figures 1 and 2 in **Appendix A**. The results indicate that the electric field strength is well below the human exposure limit of 86.57 V/m.

The AM antennas are designed to generate strong electric fields for audio signal transmission. The magnetic field strength generated by the AM antenna array is considered to be negligible, and would fall well below the Health Canada's human exposure levels, especially at distances of greater than 10m from the antennas. The magnetic field strength is far less than that of the electric field strength and as such, it is not considered in the analysis.

6.2 Mitigation and Recommendation

Although the analysis indicates that the electric field strength for MTSA study areas is less than the Health Canada Standard for human exposure, the same field strength can notably interfere with electronic devices such as radios, clocks, phones and televisions that may be used in the nearby proposed buildings.

Installation of architectural features on building façade, such as conductive interconnected metallic features that are grounded can be used to dissipate the electric field of the transmitted RF at the building façade. Use of grounded wiring to aluminum frame of windows is also an effective way to limit the electric field in the interior space. It is the commendation of this study that a detailed RF assessment and mitigation analysis be undertaken by the developers prior to the design of buildings so that appropriate mitigative measures can be incorporated in the design of the buildings.

7.0 Closure

This Report has been prepared based on the information provided by or through The Planning Partnership (TPP), the City of Mississauga and publically available data. 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 and its subcontractor, Vitatech Electromagnetics, for the sole benefit of TPP and the City of Mississauga. The material in the report reflects Dillon's judgment 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 and its subcontractor 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.

8.0 References

Health Canada. 2015. Safety Code 6: Limits of Human Exposure to Radiofrequency Electromagnetic Energy in the Frequency Range from 3 kHz to 300 GHz.

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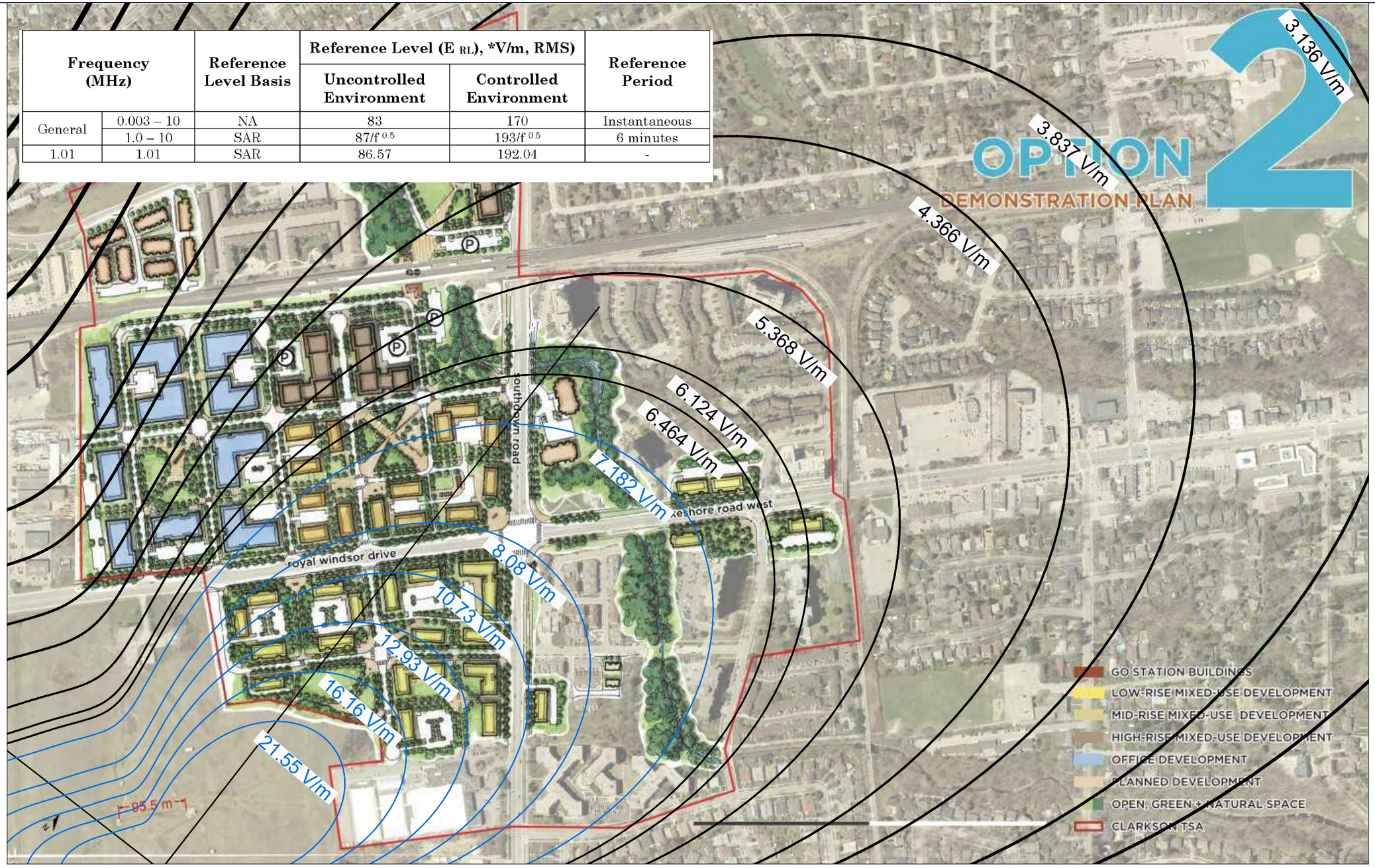
Appendix A

Radio Frequency Analysis

Frequency (MHz)		Reference Level Basis	Reference Level (E_{RL}), *V/m, RMS)		Reference Period
			Uncontrolled Environment	Controlled Environment	
General	0.003 – 10	NA	83	170	Instantaneous
	1.0 – 10	SAR	$87/f^{0.5}$	$193/f^{0.5}$	6 minutes
1.01	1.01	SAR	86.57	192.04	-



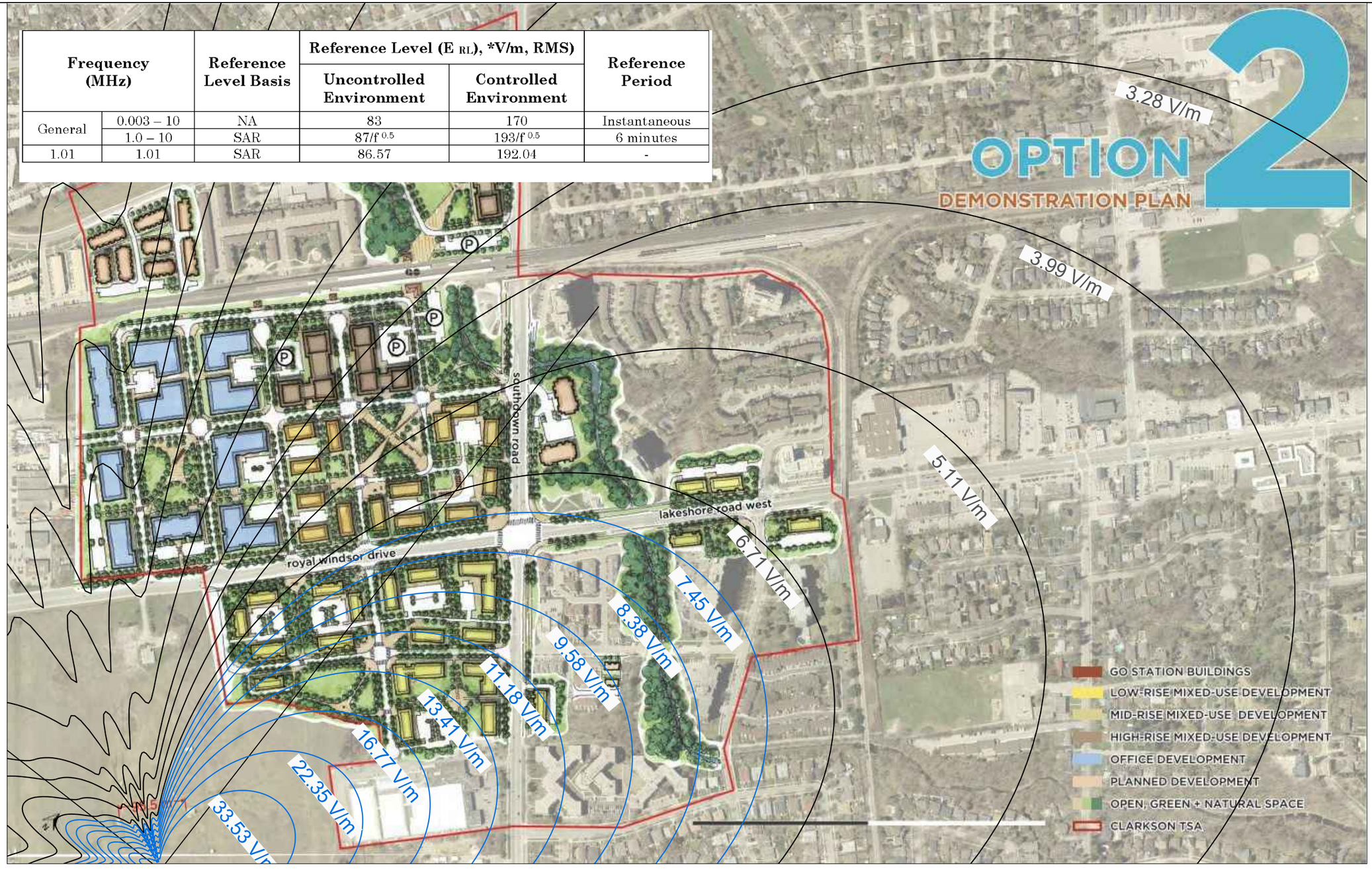
VITATECH ELECTROMAGNETICS

Figure #1		CBRF Toronto AM Antenna		
Issue: 1.0		Dillion Consulting Limited		
VTE-3172C		Daytime Electric Field Strength		
Prepared By	Date	Tranmitter	Frequency	Field Elevation
JPH	11/01/2019	CFRB Tononto	1,010 kHz	Ground

Levels from CFRB Toronto, ON - Daytime Plot

Extrapolated Electric Field Strength Levels based on Linear Decay

Frequency (MHz)		Reference Level Basis	Reference Level (E_{RL}), *V/m, RMS)		Reference Period
			Uncontrolled Environment	Controlled Environment	
General	0.003 – 10	NA	83	170	Instantaneous
	1.0 – 10	SAR	$87/f^{0.5}$	$193/f^{0.5}$	6 minutes
1.01	1.01	SAR	86.57	192.04	-



VITATECH ELECTROMAGNETICS

Figure #2	CBRF Toronto AM Antenna		
Issue: 1.0	Dillion Consulting Limited		
VTE-3172C	Nighttime Electric Field Strength		
Prepared By / Date	Tranmitter	Frequency	Field Elevation
JPH / 11/01/2019	CFRB Tononto	1,010 kHz	Ground

Levels from CFRB Toronto, ON - Night time Plot

Extrapolated Electric Field Strength Levels based on Linear Decay

Appendix B

Guideline D-6 Industrial Classification

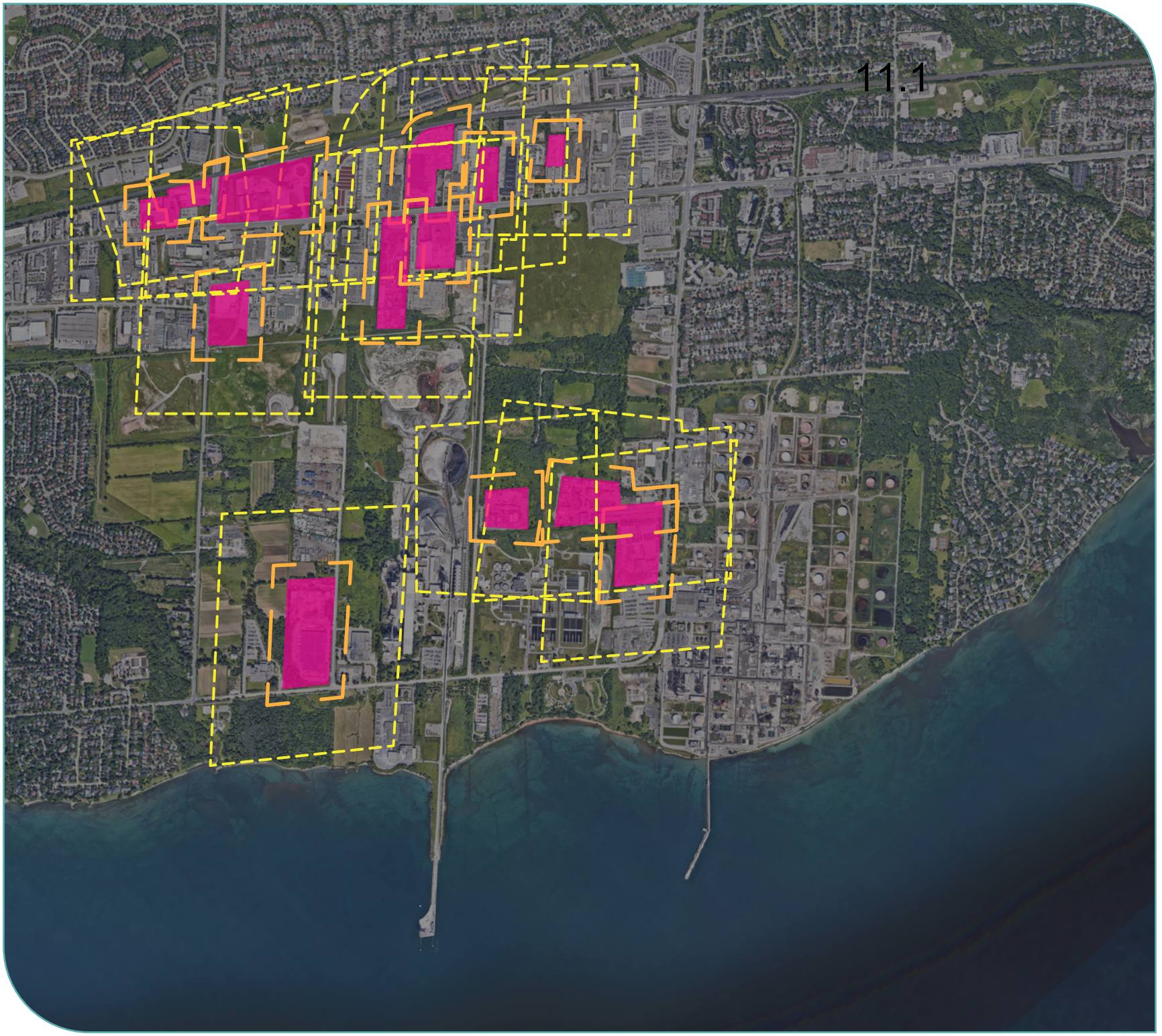


Figure B1:
Areas of influence of Class 2 Industrial Facilities

Legend

- Industrial Facility
- 70m Recommended Minimum Separation Distance
- 300m Area of Influence

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19-1221	FINAL	10/16/19

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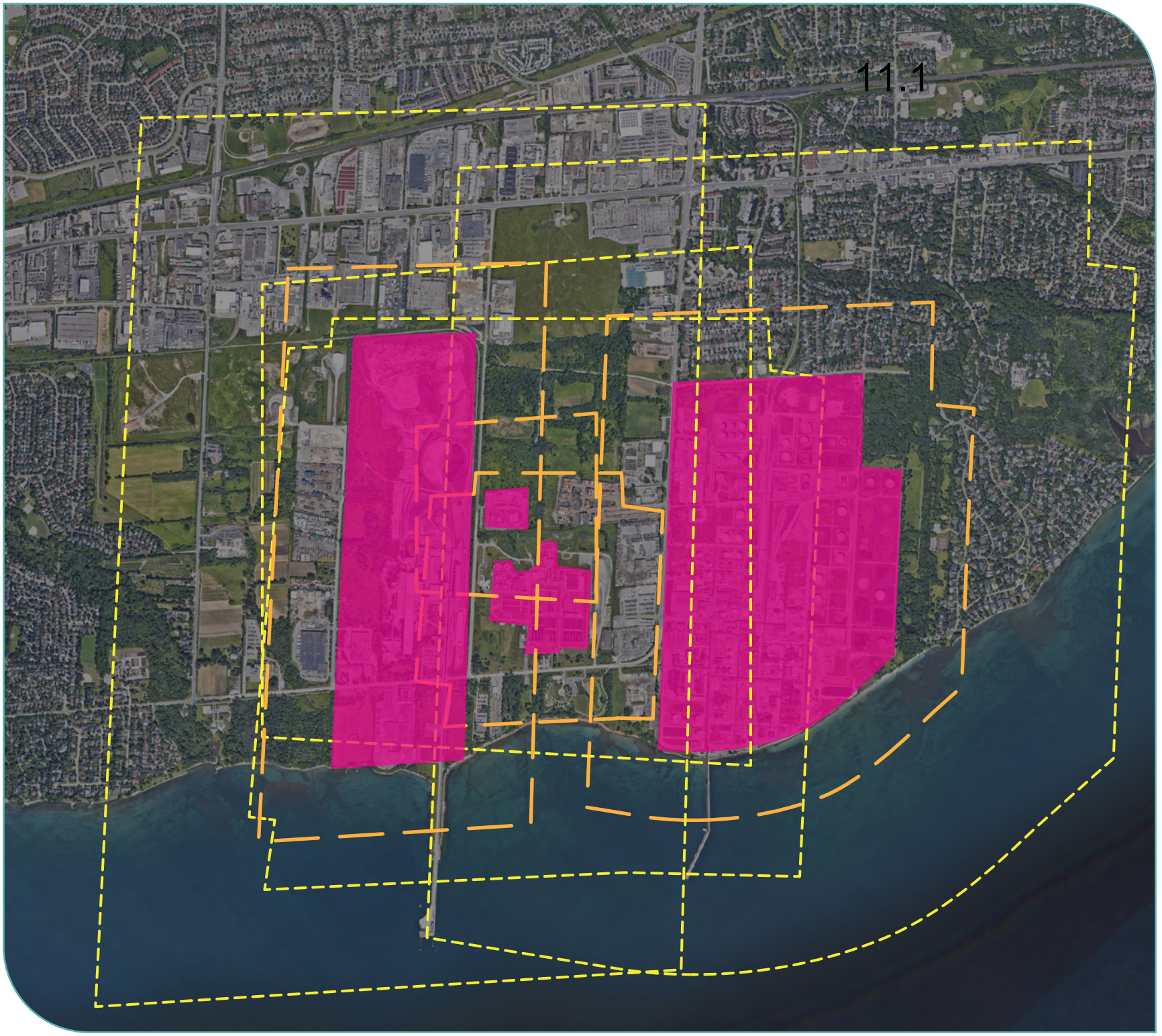

Figure B2:
Areas of influence of Class 3 Industrial Facilities

Legend

- Industrial Facility
- 300m Recommended Minimum Separation Distance
- 1000m Area of Influence

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PROJECT:	STATUS:	DATE:
19-1221	FINAL	10/16/19

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Addendum

To: Romas Juknevicius, M.PL., RPP – City of Mississauga
Taral Shukla, MCIP, RPP – City of Mississauga
Wai Ying Di Giorgio, BLA, OALA – The Planning Partnership

From: Amir Iravani – Dillon Consulting Limited
Hamish Hains – Dillon Consulting Limited

Date: March 10, 2020

Subject: Addendum – Summary of CASIA Ambient Air Monitoring and Recent Air Quality Trends

Our File: 19-1221

This is an addendum to the *Clarkson Air Quality, Noise & Vibration and Radiofrequency Compatibility Overview Study* report (Clarkson Main Report) (Dillon Consulting Limited – January 2020). The purpose of this addendum is to provide an update to the air quality section of the Clarkson Main Report based on the more recent ambient air quality reports that were provided by the Clarkson Airshed Industrial Association (CASIA) for the 2012 to 2018 calendar years (inclusively).

CASIA is an industrial partnership located in the Clarkson area that undertakes regular air quality monitoring in response to the Clarkson Airshed Study (CAS) completed by the Ministry of the Environment, Conservation and Parks (MECP) (formerly MOE) in 2006.

Review of CASIA Reports

CASIA maintains an air monitoring network within the Clarkson airshed. The CASIA air monitoring network is comprised of the following three monitoring stations:

1. STN44086 – Deer Run: monitors $PM_{2.5}$ and NO_X (as NO_2)
2. STN46118 – Meadow Wood Park: monitors $PM_{2.5}$, NO_X (as NO_2), CO, and O_3
3. STN44666 – PCLI Admin: meteorology station

The list of air contaminants monitored at each station is also indicated above.

This addendum discusses updated results from these stations for NO_2 and $PM_{2.5}$. Results for NO_2 are compared against Ontario's Ambient Air Quality Criteria (AAQC), while $PM_{2.5}$ is compared against the Canadian Ambient Air Quality standards (CAAQS). For the purposes of this report, conservatively, the maximum concentrations of common air contaminants between the two stations are presented. Dust, odour, volatile organic compounds (VOCs), and speciated VOCs are not monitored by the CASIA air network.

Nitrogen Dioxide - NO_2

Results from the CASIA monitoring reports does not indicate a significant change in either the 98th percentile of the 24-hour average concentration or the maximum hourly concentration of NO_2 between

2012 and 2018. However, the maximum 1-hour and 98th percentile of the 24-hour average concentrations of NO_2 decreased from the 2003-2005 CAS concentrations. Results from both CASIA and CAS for the maximum 1-hour and 98th percentile of the 24-hour average concentrations of NO_2 are well below the 2020 AAQC. A summary of the CASIA NO_2 monitoring results in comparison to the CAS NO_2 monitoring results is provided **Table 1**.

Table 1. NO_2 CASIA and CAS Results Summary Table

Pollutant	Statistical Form	2020 AAQC (ppb)	CAS	CASIA					
			2003-2005 (ppb)	2012 (ppb)	2013 (ppb)	2014 (ppb)	2016 (ppb)	2017 (ppb)	2018 (ppb)
NO_2	98th percentile of the 24-hour average concentrations	100	40	19.8	24.3	27.0	19.3	19.3	18.0
NO_2	Maximum 1-hour concentrations	200	134	65.0	56.0	80.0	65.0	52.0	51.0

Particulate Matter (fine fraction) - $PM_{2.5}$

CASIA monitoring results indicate a decrease in the 3-year average of the 98th percentile daily concentrations of $PM_{2.5}$ from 2015 to 2018. Both CAS and CASIA data show that the 3-year average of the annual 98th percentile daily concentrations of $PM_{2.5}$ were at or below the CAAQS 2020 standard of 27 µg/m^3. A summary of the results is provided in **Table 2**.

Table 2. $PM_{2.5}$ CASIA and CAS Results Summary Table

Pollutant	Statistical Form	2020 CAAQS (µg/m^3)	CAS	CASIA				
			2003-2005 (ppb)	2014 (µg/m^3)	2015 (µg/m^3)	2016 (µg/m^3)	2017 (µg/m^3)	2018 (µg/m^3)
$PM_{2.5}$	3-yr average of the annual 98th percentile of the daily 24-hour average concentrations	27	27	27	27	25	23	22

Summary and Closure

The CASIA monitoring results indicate that there have been decreases in NO_2 and $PM_{2.5}$ concentrations between 2014 and 2018. Measured concentrations of NO_2 remain below the Ontario AAQCs. The three year average annual 98th percentile daily concentration of $PM_{2.5}$ has been measured to exceed the CAAQS for 2014/15 and less than the standard for 2016 - 2018. It is noted that the exceedances of $PM_{2.5}$ concentrations is not unique to the Clarkson Airshed. In fact, the $PM_{2.5}$ ambient concentrations occasionally exceed the CAAQS in much of Southwestern Ontario.

CASIA does not monitor for VOCs and as such no results are presented for VOC concentrations in the Clarkson area. In the absence of more recent VOC monitoring data, the conclusions provided in the Clarkson Main Report (based on historical data from the CAS) remain the same.