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MEMORANDUM

DATE:	2022-12-01	**RWDI REFERENCE #:** 2301291
TO:	Nimit Mittal	**EMAIL:** nimit.mittal@ainleygroup.com
FROM:	Jessica Confalone	**EMAIL:** Jessica.Confalone@rwdi.com
	Tara Bailey	**EMAIL:** Tara.Bailey@rwdi.com
RE:	**Qualitative Air Quality Assessment in Support of the Town of Caledon – Chinguacousy Road Improvements Environmental Assessment Caledon, Ontario**	

Dear Mr. Mittal,

Ainley Group Consulting Engineers & Planners (Ainley) retained RWDI to complete a qualitative air quality assessment in support of the Chinguacousy Road Improvements Class Environmental Assessment in Caledon, Ontario. The Town of Caledon and Ainley have undertaken a Class Environmental Assessment (EA) for Chinguacousy Road between Mayfield Road and Old School Road (inclusive).

This memo qualitatively addresses air quality impacts based on RWDI's past experience with air quality modelling of roadway emissions. The memo considers both impacts from operation of the project after construction is complete and impacts during construction.

Overview of Approach

A qualitative assessment was completed for this scope of work for both operational and construction impacts from the project. The approach to assessing air quality impacts associated with operation of the project, after construction is complete, consisted of reviewing projected future traffic volumes for Chinguacousy Road, reviewing the proximity and orientation of the road relative to existing and planned sensitive land uses, reviewing the existing air quality conditions, and reviewing data from a previous air quality modelling study by RWDI for another roadway of similar size and traffic. Further information is provided in the sections below.

1.1 Traffic Information

Predicted traffic volumes for Chinguacousy Road from Mayfield Road to Old School Road were provided by Ainley. RWDI focused on the traffic volumes for the years 2031 and 2041, with the respective road improvements to be completed for each horizon year, as follows:

- 2031 improvements will include widening to 4 lanes to north of Tim Manley Ave and road rehabilitation to Old School Road; and,
- 2041 improvements will include widening to 4 lanes from Tim Manley Ave to Old School Road.

The study area for the Project is presented in **Figure 1**. Please refer to **Attachment A** for a summary of the traffic data used for this assessment.

1.2 Contaminants of Interest

Vehicular traffic produces a variety of air contaminants as a result of fuel combustion inside the engine, evaporation of fuel from the tank, brake and tire wear, and re-suspension (also known as re-entrainment) of loose particles on the road surface (silt) as the vehicle travels over the road surface. The following key contaminants have commonly been assessed in air quality studies for Ontario roadway EA's: nitrogen dioxide, carbon monoxide, inhalable particulate matter (PM_{10}), respirable particulate matter ($PM_{2.5}$), benzene, 1,3-butadiene, formaldehyde, acetaldehyde and acrolein.

In the surrogate study used for this assessment, three worst-case air contaminants were assessed: nitrogen dioxide (NO_2), respirable particulate matter ($PM_{2.5}$), and acrolein. These contaminants had the highest ratios of emission rate to air quality threshold.

The term respirable particulate matter refers airborne particles that are small enough to enter the fine passages of a human lung. Nitrogen oxides are gaseous productions of combustion, of which nitrogen dioxide (NO_2) is the most toxic representative. Acrolein is a volatile organic compound (VOC) and is a key representative contaminant of vehicle exhaust hydrocarbons.

1.3 Applicable Guidelines

The Province of Ontario's Ministry of the Environment, Conservation and Parks (MECP) has established criteria for concentrations of airborne contaminants (MECP, 2020). The Ambient Air Quality Criteria (AAQC's) are effects-based levels in air, based on health and/or other effects. They are used in environmental assessments, special air monitoring studies, and assessments of general air quality to determine the potential for adverse effects. The AAQC's are not enforceable standards but are desirable objectives that municipalities should strive to attain.

In addition to provincial AAQC's, the federal Environment and Climate Change Canada (ECCC) has established Canadian Ambient Air Quality Standards (CAAQS) (ECCC, 2017). These are health-based air quality objectives for pollutant concentrations in outdoor air. These objectives are being phased in, with the final and most stringent objective becoming active in the year 2025. Since this assessment is considering the future 2031 and 2041 scenarios, the thresholds applicable for that period have been presented.

The air quality criteria and standards used to assess potential local project impacts are summarized in **Table 1** for the contaminants of interest.

Table 1: Summary of Relevant Air Quality Thresholds

Pollutant	Criterion (µg/m³)	Averaging Period	Source of Threshold Value
$PM_{2.5}$	27	24-hour	CAAQS 2020
	8.8	Annual	CAAQS 2020
NO_2	400	1-hour	AAQC
	200	24-hour	AAQC
	79	1-hour	CAAQS 2025
	22.6	Annual	CAAQS 2025
Acrolein	4.5	1-hour	AAQC
	0.4	24-hour	AAQC

1.4 Existing Ambient Air Quality Measurements

Historical ambient air quality monitoring data from stations within the ECCC National Air Pollution Surveillance (NAPS) Program and MECP ambient air monitoring station network were used to determine background concentrations for the contaminants of interest. In selecting the most appropriate monitoring station(s), consideration was given to whether the station was in a similar land use setting to that of the study area. The most recent raw data between 2016 and 2020 were downloaded and analyzed to determine the appropriate percentiles, annual mean and maximums.

Table 2 summarizes the MECP and NAPS ambient air monitoring stations that were used in the assessment and a list of the monitored contaminants. These monitoring stations are the ones with recent data available that are most representative of the study area. They provide a reasonable representation of existing air quality conditions.

Table 2: Ambient Monitoring Station Information

NAPS ID	MECP ID	Station Name	Location	Contaminants	Year
65101	48006	Newmarket	Eagle St. and McCaffrey Rd.	NO_2, $PM_{2.5}$	2016-2020
62601	N/A	Simcoe	Experimental Farm	Acrolein	2014-2016

1.5 Receptors

A receptor is any location that may experience an undesirable impact due to air emissions associated with the project. The Ontario Ministry of Transportation's (MTO) Environmental Guide for Assessing and Mitigating the Air Quality Impacts and Greenhouse Gas Emissions of Provincial Transportation Projects (MTO, 2020) provides a useful categorization of receptors into two key categories

1. Sensitive Receptors: i.e. residential dwellings; and
2. Critical Receptors: i.e. retirement homes, hospitals, childcare centres, schools and similar institutional buildings.

Based on the Town of Caledon's Zoning Map and Official Plan, the current zoning in the study area consists mainly of agricultural and environmental zones along with future development in the adoption of Ontario Regulation 362/20 that includes lands zoned mixed use and residential as part of The Mayfield West Stage 2 Phase 2 Secondary Plan. Of these uses, the residential and mixed uses can include both sensitive and critical receptors. Please refer to **Attachment B** for the Town of Caledon applicable zoning maps.

1.6 Previous RWDI Studies of Similar Situations

The traffic volumes provided by Ainley were reviewed in addition to the Town of Caledon zoning information. The two documents were studied to determine the land use designations, proximity of potential receptors to the edge of the roadway and the traffic volumes associated with the proposed roadways. From this, the location where the maximum impacts are expected to occur was determined to be along Chinguacousy Road with traffic volumes predicted to be relatively consistent from Mayfield Road to Old School Road for both 2031 and 2041 horizon years. The traffic volumes within the Traffic Report considered two conditions for 2041: one considering that the proposed GTA West highway has been built and the second is without the proposed GTA West highway. For the purposes of this assessment, RWDI has presented the highest 2041 AADTs, which is for the scenario with GTA West. However, as shown in Attachment A, the volumes for 2041 with and without the GTA West are consistent with the volumes for 2041 without GTA predicted as slightly lower. The use of the 2041 traffic volumes with GTA West is, therefore, considered a conservative approach for this assessment.

To assess how local air quality conditions will change due to the preferred alternative design and configuration of the road as well as the increased traffic, RWDI examined data from a previous roadway modelling study. RWDI was retained by the Town of Whitby to conduct an air quality assessment of the proposed Garden Street expansion in Whitby, Ontario. The air quality assessment was completed in support of a Municipal Class Environmental Assessment. Garden Street is a larger roadway than Chinguacousy Road, with a higher traffic volume for the 2031 horizon year and is comparable to volumes predicted for Chinguacousy Road for the year 2041. Therefore, the results from the Garden Street air quality modelling study represent a conservative upper bound estimate of air quality impacts.

In the Garden Street study, computer models for roadway emissions and dispersion of the emissions were used to predict the contribution of the project to air pollutant levels in the immediate area. Background air quality conditions were estimated using air quality monitoring data collected by the MECP and ECCC. The emission modelling was based on the US Environmental Protection Act's (EPA) roadway emissions model, MOVES, for the horizon year of 2021, which corresponds to the earliest design year for that project. The dispersion modelling was based on the US EPA's roadway dispersion model, CAL3QHCR for the horizon year of 2031, which corresponded to the highest traffic volumes among the future no build (Year 2021) and future build (2031) scenarios. The meteorological data sets for the most recent year (2016) used in the analysis were selected based on guidance from the MECP for regulatory dispersion modelling in Ontario (MECP, 2009). Upper air data were obtained from AERMET. Surface data were obtained for Oshawa Airport, with data from Toronto International Airport to supplement missing data.

Table 3 compares the Garden Street project to the Chinguacousy Road project.

Table 3: Similarities Between Chinguacousy Road and Garden Street

	Chinguacousy Project	Garden Street EA
Traffic Data	10,520 AADT (2031) 21,530 AADT (2041 with GTA West)	24,500 AADT
Build Out Year	2031 and 2041	2031
Contaminants of Interest	$PM_{2.5}$, NO_2, Acrolein	$PM_{2.5}$, NO_2, Acrolein
Ambient Monitoring Stations	**$PM_{2.5}$, NO_2**: Newmarket (MECP ID 48006) **Acrolein**: Simcoe Experimental Farm (NAPS ID 62601)	**$PM_{2.5}$, NO_2**: Oshawa (MECP ID 45026) **Acrolein:** Toronto (Ruskin/Perth St.) (NAPS ID 60418)

In the Garden Street project, receptors were placed with approximately 80 m spacing along each side of the Garden Street Corridor to represent operable windows and outdoor use areas at nearby residences. Receptors ranged from approximately 10 m to 30 m from the centre of the roadway, with the most impacted receptor located approximately 10 m from the centre of the roadway. The estimated AADT in the Garden Street project is approximately two times greater than the projected 2031 traffic volume on Chinguacousy Road and just slightly more than the highest projected volume for 2041. Therefore, modelling results from the Garden Street EA would provide a conservative upper bound of potential air quality impacts for both 2031 and 2041 build out conditions for the project.

Findings: Operational Impacts After Construction

2.1 Background Air Quality Conditions

Table 4 summarizes the ambient air measurements from the air quality monitoring stations previously listed in Table 2**.**

Table 4: Summary of Background Air Quality

Contaminant	Averaging Period	Background Concentration [1] [µg/m³]	Description	Threshold [µg/m³]	Percent of Threshold (%)
NO_2	1-hour	25.5	90th Percentile	400	6%
	24-hour	22.5	90th Percentile	200	11%
$PM_{2.5}$	1-hour	13	90th Percentile	--	--
	24-hour	12	90th Percentile	27	44%
	Annual	6.0	Annual Average	8.8	68%
Acrolein	1-hour [2]	0.07	Maximum	4.5	2%
	24-hour	0.02	90th Percentile	0.4	6%

Notes: [1] For each contaminant, the most recent, applicable available data were used to calculate an average value to represent existing conditions. The 1-hour and 24-hour values in the table above were calculated based on the 90th percentiles over the available years. The values for the annual averaging period were calculated using the annual concentrations averaged over the available years.
[2] 1-hr average ambient acrolein data were not available; the maximum 24-hr concentration was used.

As can be seen from **Table 4**, background concentrations for the contaminants of interest are below the AAQCs and CAAQS. NO_2 and 24-hour acrolein are well below their respective AAQCs with ambient $PM_{2.5}$ below but approaching closer to the thresholds.

2.2 Future Air Quality Conditions

Table 5 presents a summary of the results from the Garden Street air quality modelling study that are used to represent a conservative upper bound prediction of future roadway air quality impacts in the present study. The column labelled as "Predicted Concentration" represents the contribution of the Garden St widening over and above the background concentration, and the column labelled as "Combined Concentration" represents the summed total of the incremental increase and the background. As per the data in the table, the contribution for $PM_{2.5}$ and acrolein is small in relation to the background level, while the contribution for NO_2 is relatively large. In all cases, however, the maximum predicted cumulative concentrations associated with the proposed roadways are less than the thresholds for all contaminants and all averaging periods. The background levels for the Chinguacousy Project are less than those used for the Garden St. assessment with the background levels for NO_2 and $PM_{2.5}$ being very similar to those used in the Garden St assessment and the acrolein background values significantly less than those used in Garden St. While the acrolein background values are less than those used in the Garden St. project, **Table 5** shows that the predicted project impacts would be less than the current background levels. Thus, the project for both the 2031 and 2041 improvements is not expected to cause undesirable levels of air pollutants at any nearby sensitive/critical receptors, and no mitigation measures are recommended for the operational phase of the project.

Table 5: Maximum Predicted Roadway Impacts (μg/m³) from the Garden Street Study (year 2031)

Contaminant	Averaging Period	Predicted Conc.	Background Conc.	Combined Conc.	Threshold	% of Threshold
NO_2	1 hr	87.3	26.9	114	400	29
	24 hr	20.1	26.9	47.0	200	24
$PM_{2.5}$	24 hr	1.94	13.4	15.3	27	57
	Annual	0.64	6.34	7.0	8.8	79
Acrolein	1 hr	0.018	0.75	0.77	4.5	17
	24 hr	0.004	0.30	0.30	0.4	76

In addition, the proposed design will include a multi-use path for active transportation on both sides of the roadway. This path will integrate with the current active transportation network within the Town of Caledon and Region of Peel further promoting active transportation uses within the study area. The additional boulevard proposed on each side of the roadway will also allow for future integration of transit stops and shelters giving consideration for extension of transit service to the area.

Impacts During Construction

Construction activities involve heavy equipment that generates air pollutants and dust; however, these impacts are temporary in nature. The emissions are highly variable, difficult to predict, and depend on the specific activities that are taking place and the effectiveness of the mitigation measures. The best manner to deal with these emissions is through diligent implementation of operating procedures such as application of dust suppressants, reduced travel speeds for heavy vehicles, efficient staging of activities and minimization of haul distances, covering up stockpiles, etc. It is recommended that to minimize potential air quality impacts during construction, the construction tendering process should include requirements for implementation of an emissions management plan. Such a plan would set out established best management practices for dust and other emissions. Some of the best practices include the following:

- Use of reformulated fuels, emulsified fuels, exhaust catalyst and filtration technologies, cleaner engine repowers, and new alternative-fuelled trucks to reduce emissions from construction equipment.
- Regular cleaning of construction sites and access roads to remove construction-caused debris and dust.
- Dust suppression on unpaved haul roads and other traffic areas susceptible to dust, subject to the area being free of sensitive plant, water or other ecosystems that may be affected by dust suppression chemicals.
- Covered loads when hauling fine-grained materials.
- Prompt cleaning of paved streets/roads where tracking of soil, mud or dust has occurred.
- Tire washes and other methods to prevent trucks and other vehicles from tracking soil, mud or dust onto paved streets or roads.
- Covered stockpiles of soil, sand and aggregate as necessary.
- Compliance with posted speed limits and, as appropriate, further reductions in speeds when travelling sites on unpaved surfaces.

Conclusions

During the operational phase of the project for both 2031 and 2041 build out years, vehicle emissions as a result of the proposed roadway improvements are not expected to cause undesirable cumulative air pollutant levels (i.e., levels above the applicable thresholds). The implementation of the project with the design elements allowing for alternative transportation methods also indicates the potential for air quality impacts to be minimized through promotion of active and public transportation alternatives. Impacts of construction activities on air quality are expected to be temporary in nature and can be mitigated through implementation of an emissions management plan.

Respectfully submitted by:
RWDI

J Confalone

Jessica Confalone, B.E.Sc., MMI
Project Manager

5. References

1. Ministry of the Environment, Conservation and Parks (MECP), 2020. *Ambient Air Quality Criteria*. Retrieved from https://www.ontario.ca/page/ontarios-ambient-air-quality-criteria

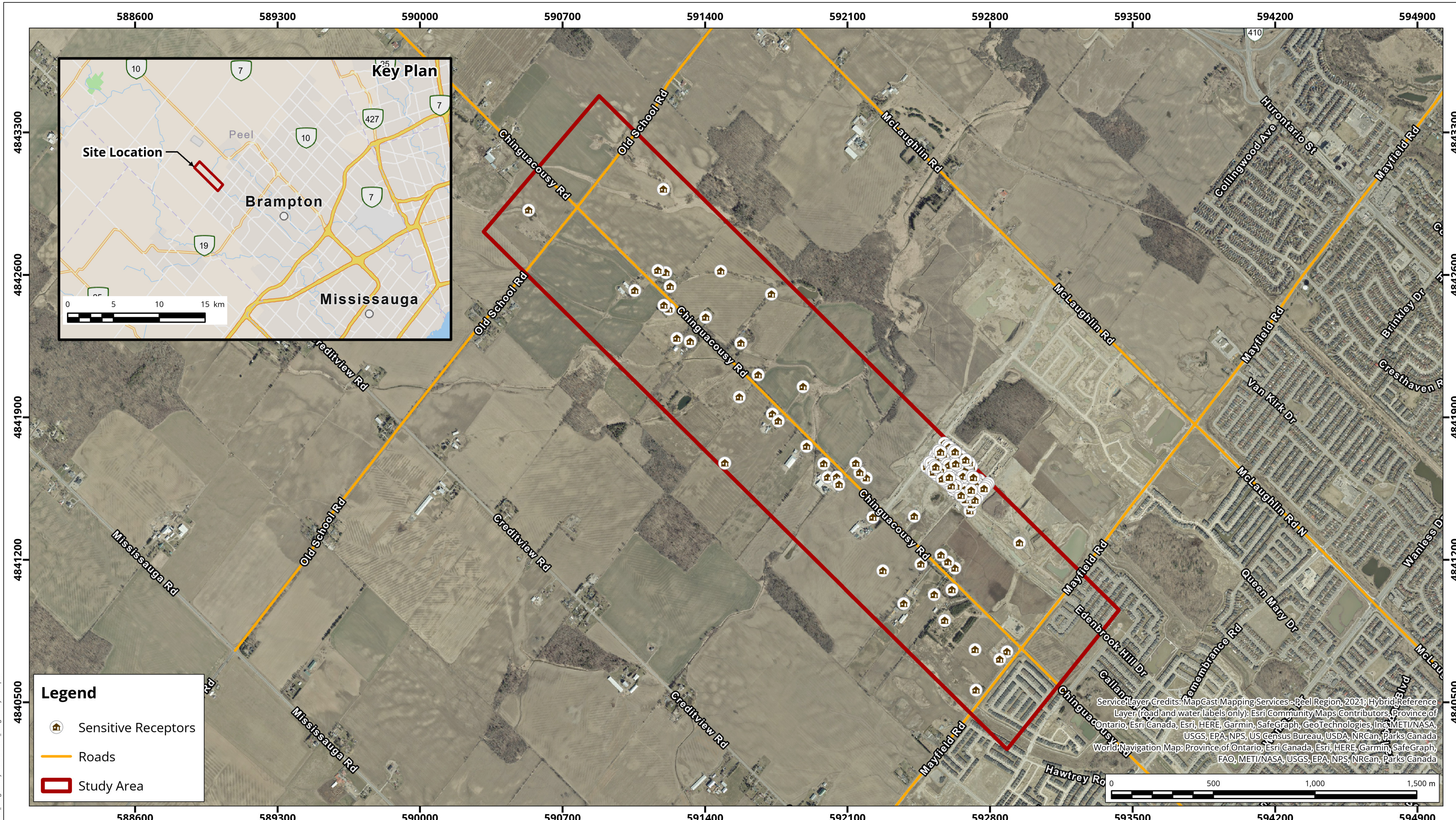
2. Environment and Climate Change Canada (ECCC), 2022. *National Air Pollution Surveillance Program*. Retrieved from https://data-donnees.ec.gc.ca/data/air/monitor/national-air-pollution-surveillance-naps-program/?lang=en

3. Environment and Climate Change Canada (ECCC), 2017. *Canadian Ambient Air Quality Standards.* Canada. Retrieved from http://airquality-qualitedelair.ccme.ca/en/

4. Ontario Ministry of Transportation (MTO), 2020. *Environmental Guide for Assessing and Mitigating the Air Quality Impacts and Greenhouse Gas Emissions of Provincial Transportation Projects*.

5. Ministry of the Environment, Conservation and Parks (MECP), 2017. *Air Dispersion Modelling Guideline for Ontario, version 3.0. PIBs# 5165e03*.

FIGURES



Study Area

Map Projection: NAD 1983 UTM Zone 17N

Chinguacousy Road - Caledon, Ontario

True North

Project #: 2202637

Drawn by: RCL	Figure: 1
Scale:	1:18,000
Date Revised:	Oct 27, 2022

Map Document: D:\GIS\desktop\2301291_ChinguacousyRoad\P2301291_ChinguacousyRoad.aprx

ATTACHMENT A

Figure 6: Future Traffic Volumes without GTA West

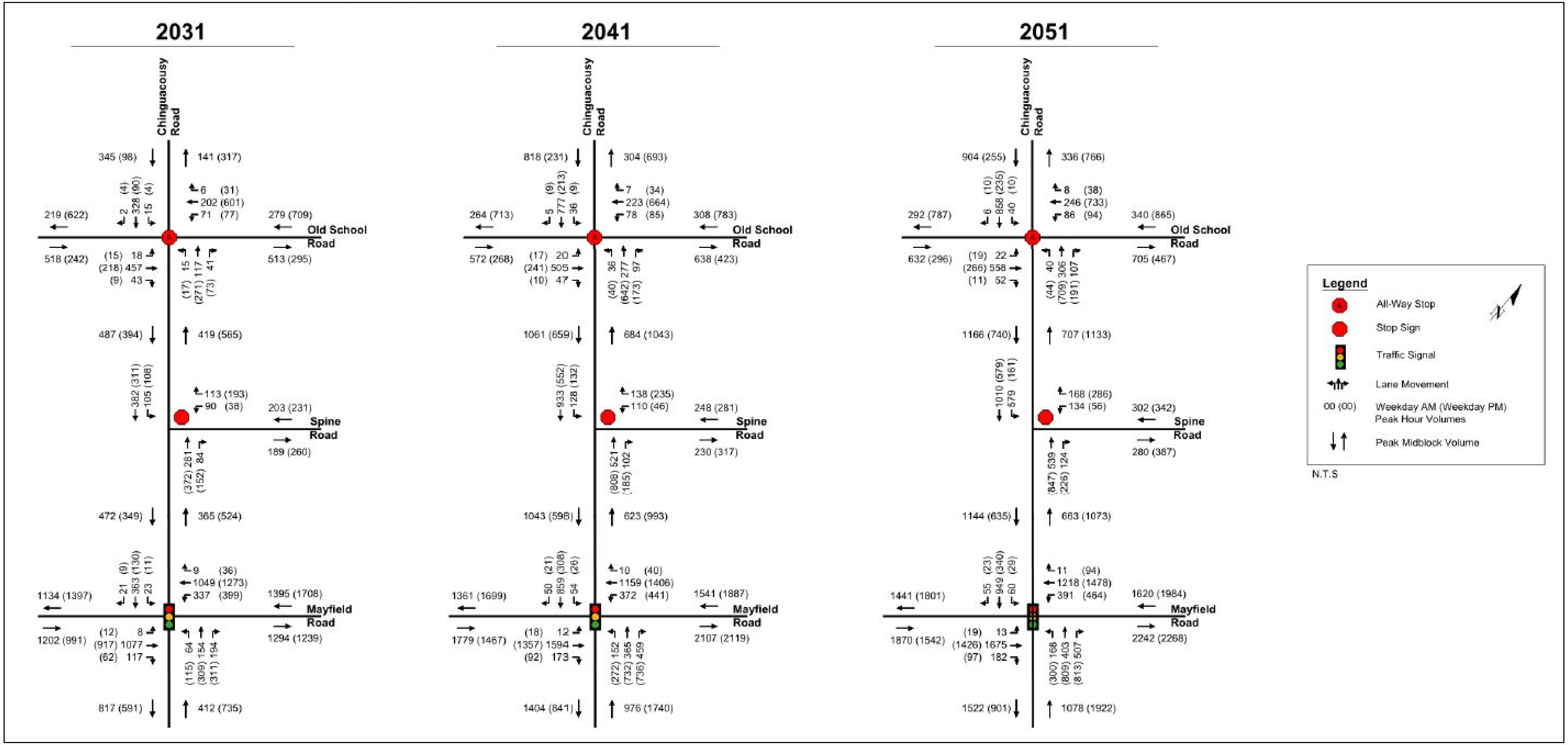
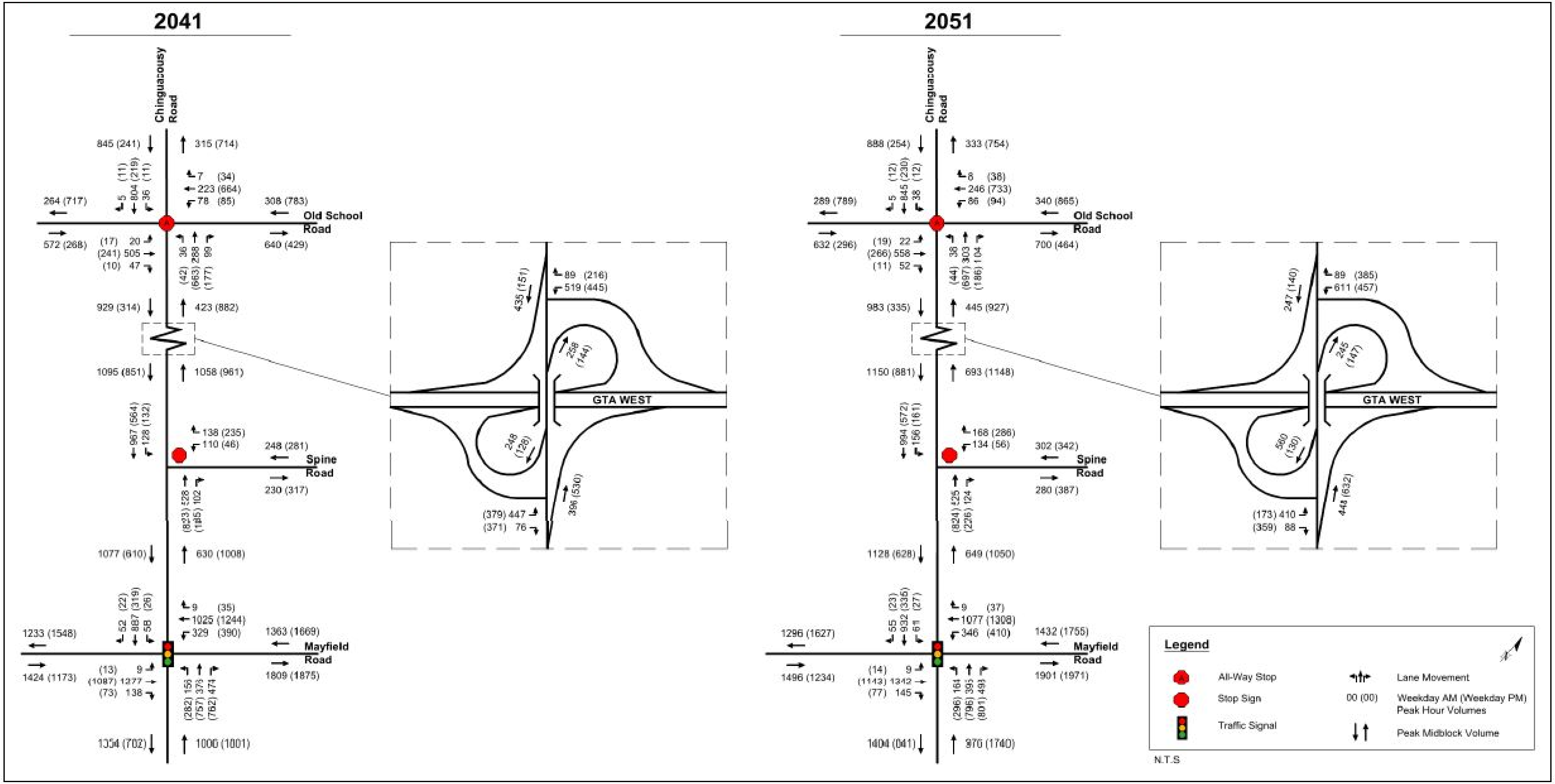
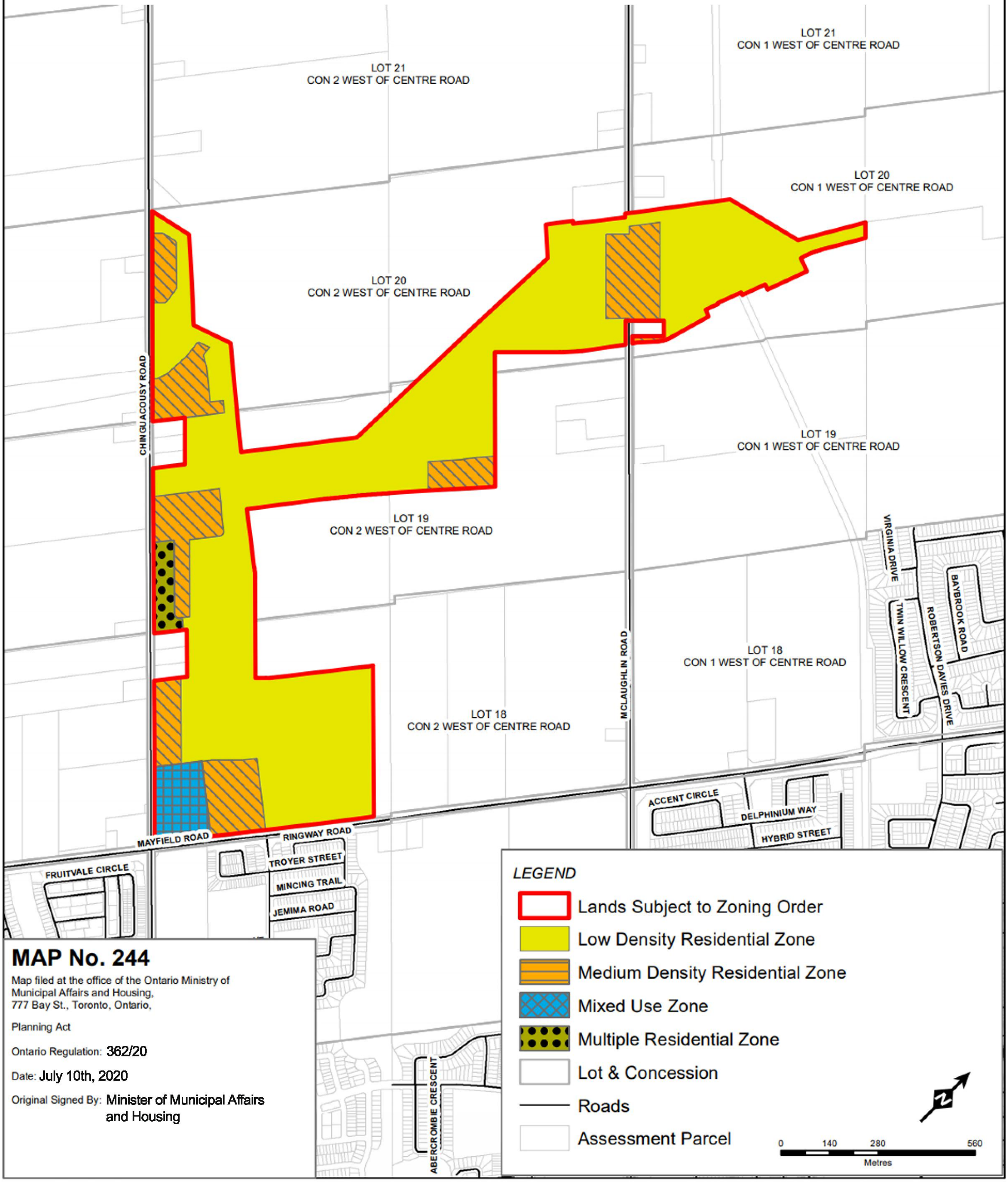


Figure 5: Future Traffic Volumes with GTA West



ATTACHMENT B

Part Lots 18-20, Concessions 1 & 2, W.H.S.
Town of Caledon, Regional Municipality of Peel



MAP No. 244

Map filed at the office of the Ontario Ministry of Municipal Affairs and Housing, 777 Bay St., Toronto, Ontario,

Planning Act

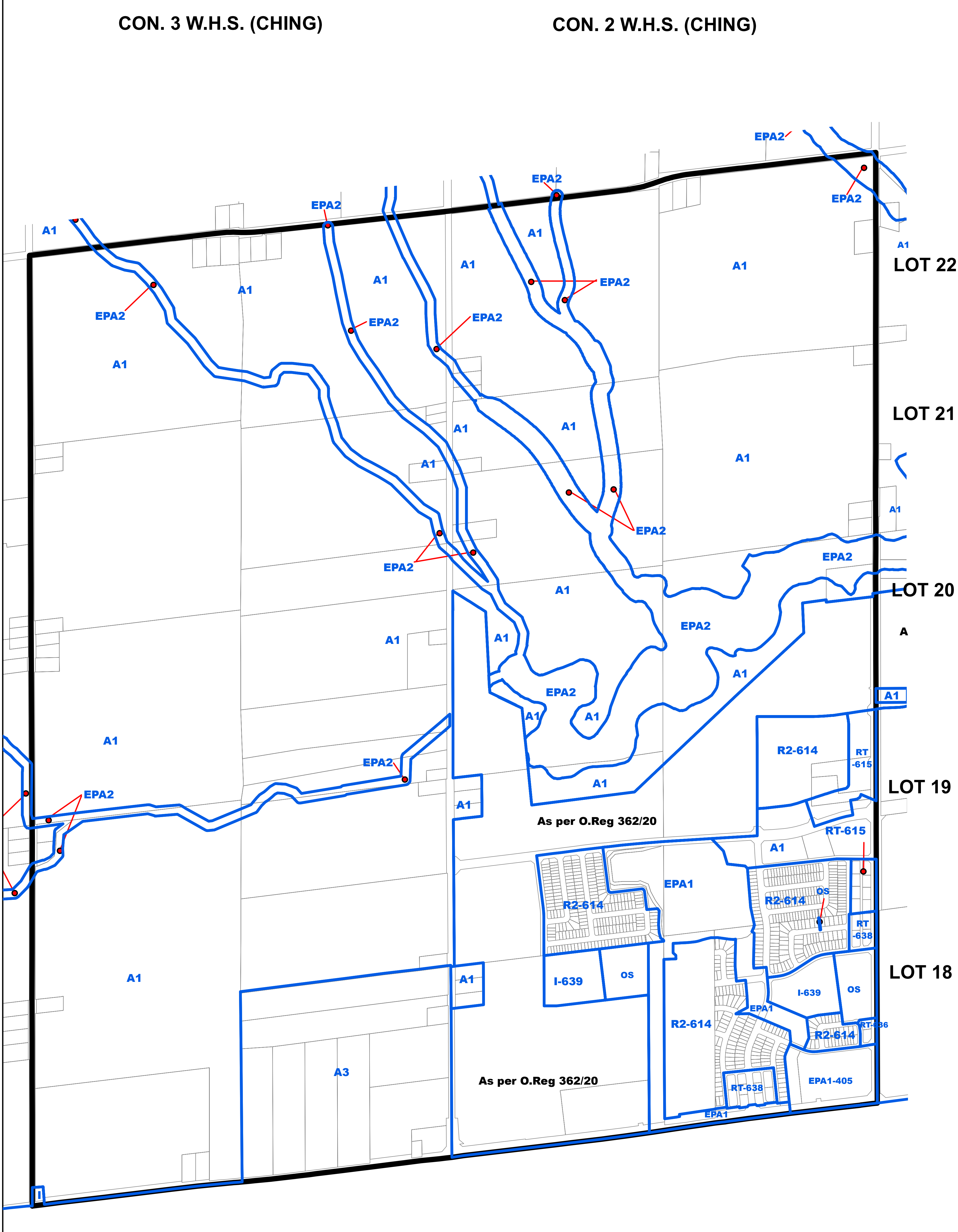
Ontario Regulation: 362/20

Date: July 10th, 2020

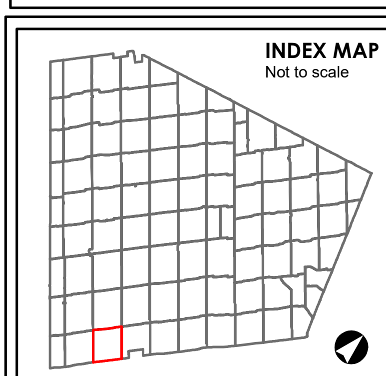
Original Signed By: Minister of Municipal Affairs and Housing

Produced by: GIS Unit - Advanced Analytics & Data Visualization, Data Collection and Decision Support Solutions Branch, Community Services I&IT Cluster.

Ontario



This copy is provided for convenience only. If necessary, the original may be referred to in the office of the Town Clerk.



A2 ZONE SYMBOL

A2-### ZONE SYMBOL
Note: Number of suffixes represent Exceptions which can be looked up in the Exceptions section of the By-law.

ZONE BOUNDARY

SE STRUCTURAL ENVELOPE MAP

NIAGARA ESCARPMENT DEVELOPMENT CONTROL AREA
Lands lying within the Development Control area pursuant to the Niagara Planning and Development Act are subject to permit requirements under Ontario Regulations 685/50, as amended.

OAK RIDGES MORAINE CONSERVATION PLAN AREA BOUNDARY

WELLHEAD PROTECTION AREA BOUNDARY
WP-2 WP-5 WP-10 WP-25
Zone Maps amended to indicate the 2, 5, 10, and 25 year Wellhead Protection Areas.

The base data on this map is provided for convenience only. The Town of Caledon is not responsible for any deficiency or inaccuracy in the base data, and will not accept any liability whatsoever therefor. The reporduction of the base data, in whole or in part, by any means is prohibited without the prior written permission of the Town of Caledon.

BY-LAW 2006-50
ZONE MAP 8
SCHEDULE "A"

0 135 270 540 m

TOWN OF CALEDON

Date: 3 April 2006
Revised: June 11, 2021

File: S:\POLICY SECTION\GIS\zoning_bylaw\2015_mxd