

---

***Oakville Health Protection Air Quality By-Law  
Application for Approval***

***Submitted by:***

***Ford Motor Company of Canada Limited  
Oakville Assembly Complex  
The Canadian Road  
Oakville, ON  
L6J 5C9***

***Prepared by:***

***Horizon Environmental Corporation  
4771 – 50<sup>th</sup> Street SE, Suite 100  
Grand Rapids, Michigan 49512***

---

***September 28, 2012***

## TABLE OF CONTENTS

<b>PUBLIC SUMMARY</b> .....	<b>IV</b>
<b>1 EXECUTIVE SUMMARY</b> .....	<b>1</b>
<b>2 INTRODUCTION</b> .....	<b>2</b>
<b>3 FACILITY DESCRIPTION</b> .....	<b>4</b>
3.1 OVERVIEW .....	4
3.2 LOCATION .....	4
3.3 BUILDINGS .....	5
3.4 RAW MATERIALS, PRODUCTS AND PROCESSES .....	5
3.4.1 COMFORT AND PROCESS HEATING .....	5
3.4.2 PEAK SHAVE GENERATORS .....	5
3.4.3 VEHICLE BODY PAINTING .....	5
3.5 EMISSION SOURCES AND PROCESSES .....	6
3.5.1 COMFORT AND PROCESS HEATING .....	6
3.5.2 PEAK SHAVE GENERATORS .....	6
3.5.3 VEHICLE BODY PAINTING .....	6
3.6 EMISSION CONTROL EQUIPMENT, PROCEDURES AND EMISSIONS MONITORING .....	8
3.6.1 COMFORT AND PROCESS HEATING .....	8
3.6.2 DIESEL-FIRED PEAK SHAVE GENERATORS .....	8
3.6.3 VEHICLE BODY PAINTING .....	8
3.7 IDENTIFICATION AND QUANTIFICATION OF SUBSTANCES RELEASED TO THE AIR .....	8
3.7.1 NATURAL GAS COMBUSTION .....	8
3.7.2 DIESEL-FIRED PEAK SHAVE GENERATORS .....	9
3.7.3 VEHICLE BODY PAINTING .....	9
<b>4 EVALUATION</b> .....	<b>11</b>
4.1 MODELLING APPROACH AND MODEL SELECTION .....	11
4.2 MODEL INPUTS .....	11
4.2.1 FACILITY EMISSIONS ESTIMATE REQUIREMENTS / ESTIMATION METHODS .....	11
4.2.2 MODEL INPUT CHECKLIST .....	12
4.3 MODEL-PREDICTED FPM CONCENTRATIONS.....	17
4.3.1 TOTAL FACILITY INDUCED CONCENTRATIONS .....	17
4.3.2 CUMULATIVE CONCENTRATIONS.....	20
<b>5 MAPPING</b> .....	<b>21</b>
<b>6 HEALTH-RISK ASSESSMENT</b> .....	<b>23</b>
6.1 NUMERIC PROCEDURE .....	23
6.2 GRAPHIC PROCEDURE .....	24
<b>7 APPRAISAL</b> .....	<b>25</b>
7.1 EMISSION CONTROL TECHNOLOGIES .....	25

7.1.1	TALL STACK AND VENTURI SCRUBBER .....	25
7.1.2	REGENERATIVE THERMAL OXIDIZER (RTO) .....	25
7.2	OAKVILLE ASSEMBLY COMPLEX APPRAISAL AND MITIGATION PLANS .....	26
7.2.1	PAINTING OPERATIONS.....	26
7.2.2	NATURAL GAS COMBUSTION .....	26
7.2.3	PEAK SHAVE GENERATORS .....	28
<b>8</b>	<b>ADDITIONAL INFORMATION .....</b>	<b>29</b>

## FIGURES

2-1	LOCATION OF THE OAKVILLE ASSEMBLY COMPLEX
3-1	LAND USE AND SENSITIVE RECEPTORS WITHIN A THREE KILOMETER RADIUS OF THE OAKVILLE ASSEMBLY COMPLEX
3-2	PLANAR VIEW OF BUILDING PROJECTIONS IN RELATION TO EMISSION POINTS
3-3	3-D DEPICTION OF BUILDING PROJECTIONS IN RELATION TO EMISSION POINTS
3-4	PROCESS FLOW DIAGRAM – VEHICLE BODY PAINTING
4-1	CARTESIAN RECEPTOR POINTS ASSOCIATED WITH THE 100 BY 100 KILOMETER CALMET METEOROLOGICAL GRID
4-2	FINE RESOLUTION RECEPTOR POINTS WITHIN THE TOWN OF OAKVILLE
5-1	TOTAL FACILITY INDUCED FPM CONCENTRATIONS, MAXIMAL EMISSIONS SCENARIO
5-2	TOTAL FACILITY INDUCED FPM CONCENTRATIONS, AVERAGE EMISSIONS SCENARIO
5-3	CUMULATIVE FPM CONCENTRATIONS (FACILITY + BACKGROUND), MAXIMAL EMISSIONS SCENARIO
5-4	CUMULATIVE FPM CONCENTRATIONS (FACILITY + BACKGROUND), AVERAGE EMISSIONS SCENARIO
6-1	TOTAL FACILITY INDUCED RISK MAP, MAXIMAL EMISSIONS SCENARIO
6-2	TOTAL FACILITY INDUCED RISK MAP, AVERAGE EMISSIONS SCENARIO
6-3	CUMULATIVE RISK MAP (FACILITY + BACKGROUND), MAXIMAL EMISSIONS SCENARIO
6-4	CUMULATIVE RISK MAP (FACILITY + BACKGROUND), MAXIMAL EMISSIONS SCENARIO

## TABLES

3-1	NATURAL GAS CONSUMPTION (10 <sup>6</sup> CUBIC METRE) BY MONTH AND YEAR
3-2	FPM AND NO <sub>x</sub> ANNUALIZED EMISSION RATES BY NG COMBUSTION SOURCE - MAXIMAL AND AVERAGE EMISSIONS SCENARIOS
3-3	FPM AND NO <sub>x</sub> ANNUALIZED EMISSION RATES FOR PEAKING UNITS – MAXIMAL AND AVERAGE EMISSIONS SCENARIOS

- 3-4 FPM ANNUAL EMISSION RATES FOR PAINTING – MAXIMAL AND AVERAGE EMISSIONS SCENARIOS
- 4-1 STACK LOCATION AND EXHAUST PARAMETERS
- 4-2 MODELLED EMISSION RATES – MAXIMAL AND AVERAGE EMISSIONS SCENARIOS
- 4-3 TOTAL FACILITY INDUCED AND CUMULATIVE CONCENTRATION ASSESSMENT
- 4-4 TOTAL FACILITY INDUCED AND CUMULATIVE CONCENTRATION ASSESSMENT – ON-SITE DAYCARE CENTER
- 6-1 HEALTH RISK ASSESSMENT – NUMERIC PROCEDURE

### **APPENDICES**

- A DISPERSION MODELLING INPUT/OUTPUT FILES AND RELATED DATABASES (DVD-ROM)
- B MODEL INPUT CHECKLIST

## PUBLIC SUMMARY

### **Introduction:**

Ford Motor Company of Canada, Limited (“Ford”) owns and operates the Oakville Assembly Complex located on The Canadian Road in the Town of Oakville, Ontario. The site is comprised of a large vehicle assembly complex that currently produces cross-over utility vehicles including the Ford Edge, Ford Flex, Lincoln MKX and Lincoln MKT and employs approximately 2,900 people. Vehicle assembly involves three principle operations: body assembly and welding, paint, and final assembly. Final assembly includes installation of interior components, powertrain, suspension components and tires. The Oakville Assembly Complex currently produces approximately 60 vehicles per hour and can operate up to 20 hours per day.

In accordance with By-Law 2010-035, the Oakville Assembly Complex is considered a major emitter of Fine Particulate Matter (“FPM”), Volatile Organic Compounds (“VOCs”) and Nitrogen Oxides (NO<sub>x</sub>) as well as both xylene and toluene as volatile secondary organic aerosols (“SOAs”). Sources of the FPM, VOCs and NO<sub>x</sub> are from the burning of natural gas for both comfort and process heating and vehicle painting operations as well as the burning of diesel fuel for the four on-site peak shave generators. The SOAs are emitted from the prime and top coat stages of the painting operations.

Ford operates several key pollution control systems associated with painting, including a Regenerative Thermal Oxidizer (“RTO”), a ‘tall stack’ and a wet venturi scrubber. The RTO is designed and operated to control odours and the emissions of volatile organic compounds. The vehicle is painted utilizing a combination of high solids paint and high efficiency applicators designed to minimize paint usage. Particulate matter removal from painting operations is accomplished by a wet venturi scrubber which is an integral part of the spray booths operation. The ‘tall stack’ mitigates odours from the paint prime and topcoat spray booths.

Ford has also completed several recent actions that mitigate VOCs, NO<sub>x</sub> and PM emissions at the Oakville Assembly Complex. For example, in 2004, the former Ontario Truck Plant was closed and in 2006 the site was, through significant investment, reconfigured as a single flexible manufacturing complex to build cross-over utility vehicles for North American and global customers. The largest of the two paint shops was decommissioned in 2010 with the removal of the structure being completed in 2012, resulting in a reduction of the maximum emission rates for VOCs, NO<sub>x</sub> and PM by 55%, 33%, and 23% respectively. The remaining paint shop was also refurbished and upgraded as part of the site reconfiguration.

In 2012, as part of the company's initiative to achieve a 25% energy reduction over the next five years, employees at Oakville Assembly Complex completed a significant improvement in four zones within two paint booths at the facility. Two zones were decommissioned and the remaining two were converted into inspection zones for operators along each spray booth.

Over the years, numerous initiatives have also been undertaken to reduce emissions from the site:

- In 2007, Ford and its supplier reformulated its paints to reduce Hazardous Air Pollutants (HAPs) to levels recognized by the U.S. EPA as the maximum achievable control.
- In 2009, with the support of the Federal and Ontario government, Ford completed the installation of the unique-in-the world "Fumes to Fuel" technology and research centre. This innovative, patented developmental technology recovers VOC ("Fumes") from the paint system exhaust. After recovery the solvent is used as fuel to generate electricity through a 120kw generator driven by an internal combustion engine or in a more complex and sophisticated scheme the solvent is reformed and used to generate electricity via a 300kw fuel cell to provide power to the plant without combustion. The system has the potential to reduce CO<sub>2</sub>, NO<sub>x</sub>, PM and VOC from the plant and reduce energy consumption. At a production scale, Fumes to Fuel has the potential to make an emission source into a power source for the plant. Research assistance is being provided by Queen's University and the University of Alberta in addition to our internal expertise.

Other environmental highlights related to Oakville Assembly Complex include:

- Ford was a partner in Canada's first pollution prevention agreement in 1992
- Oakville was the first assembly operation in North America to be registered to the ISO14001 Environmental Management System in 1996. System elements include continuous improvement, training and external system audit
- Stormwater management facilities have been added in the Joshua Creek and Wedgewood Creek watersheds to mitigate peak flows and improve water quality.
- Air driven tools have been replaced with more efficient and precise electric tools eliminating a central air compression system

- In 2000, the boilerhouse that provided steam for heating and production was retired in favour of more efficient, lower emission direct fired heating units and conversion of remaining steam applications.
- Tree plantings and site naturalization has been undertaken.

Vehicles are the focal point of our business, and we are proud of the progress being made to lessen the environmental impact of the products we produce. Ford is committed to be among the best in terms of fuel efficiency for every new vehicle we build and continue to strengthen this leadership position going forward with technologies such as EcoBoost™ which is offered in Oakville-assembled vehicles. Ford has implemented an electrification strategy which includes hybrids, plug-in hybrids and battery electric vehicles. Ford has increased the availability of flexible fuel vehicles (FFVs) capable of operating on up to 85% ethanol or up to 20% biodiesel content. Ford has also pioneered the use of biomaterials in our products, including an innovative material made out of wheat straw used to produce the storage bins for the Oakville-built Ford Flex and the use of soy based foam in our vehicle seats. Further information on our efforts in sustainability can be viewed at [www.ford.com/go/sustainability](http://www.ford.com/go/sustainability).

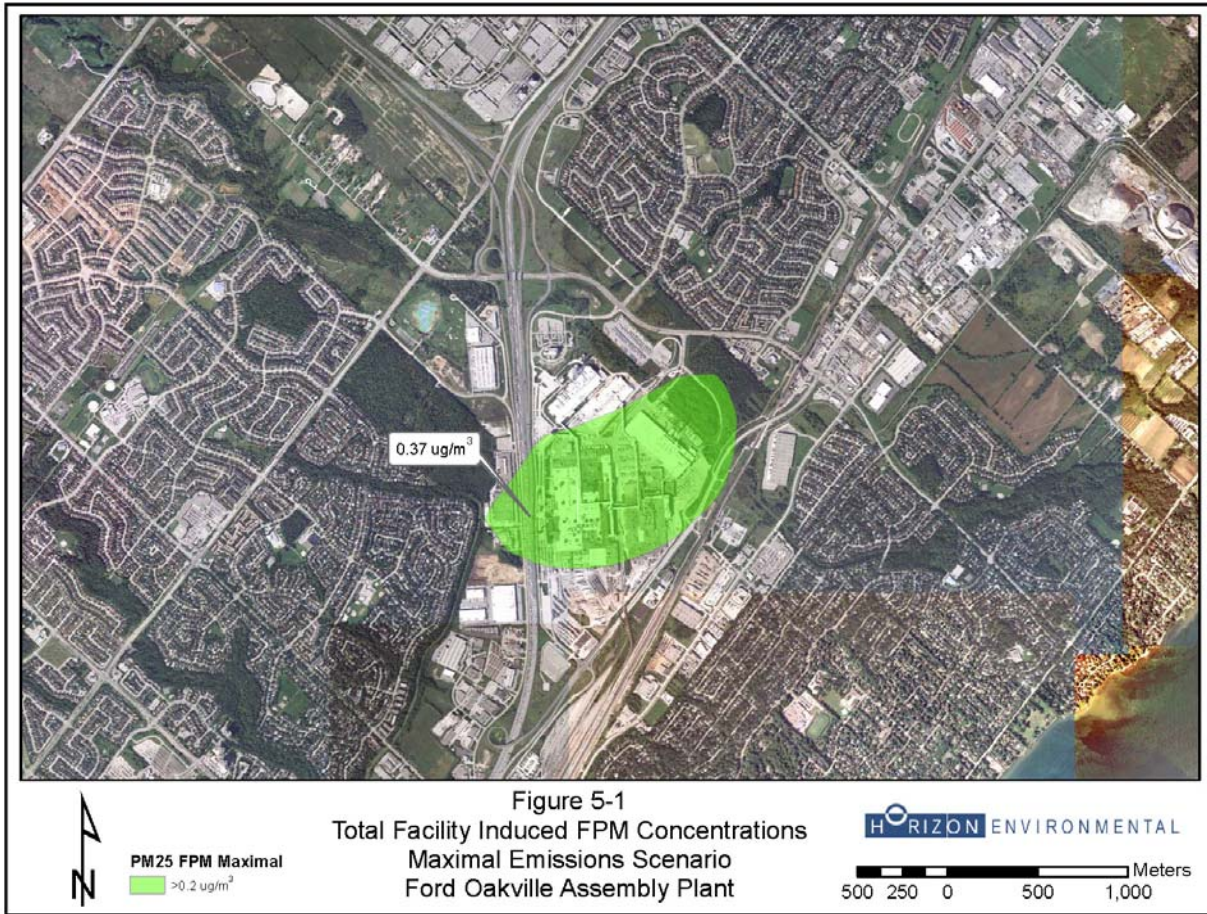
### **Assessment under HPAQB:**

A comprehensive air dispersion modelling analysis of emissions from the Oakville Assembly Complex was performed using the most current U.S. EPA approved version of the CALPUFF dispersion model; in conjunction with databases provided by the Town and the methodology prescribed in the '*Guidance for Implementation of Oakville Health Protection Air Quality By-Law 2010-035 section 5 and 6 approval requirements for major emitters v.5, June 2011*'.

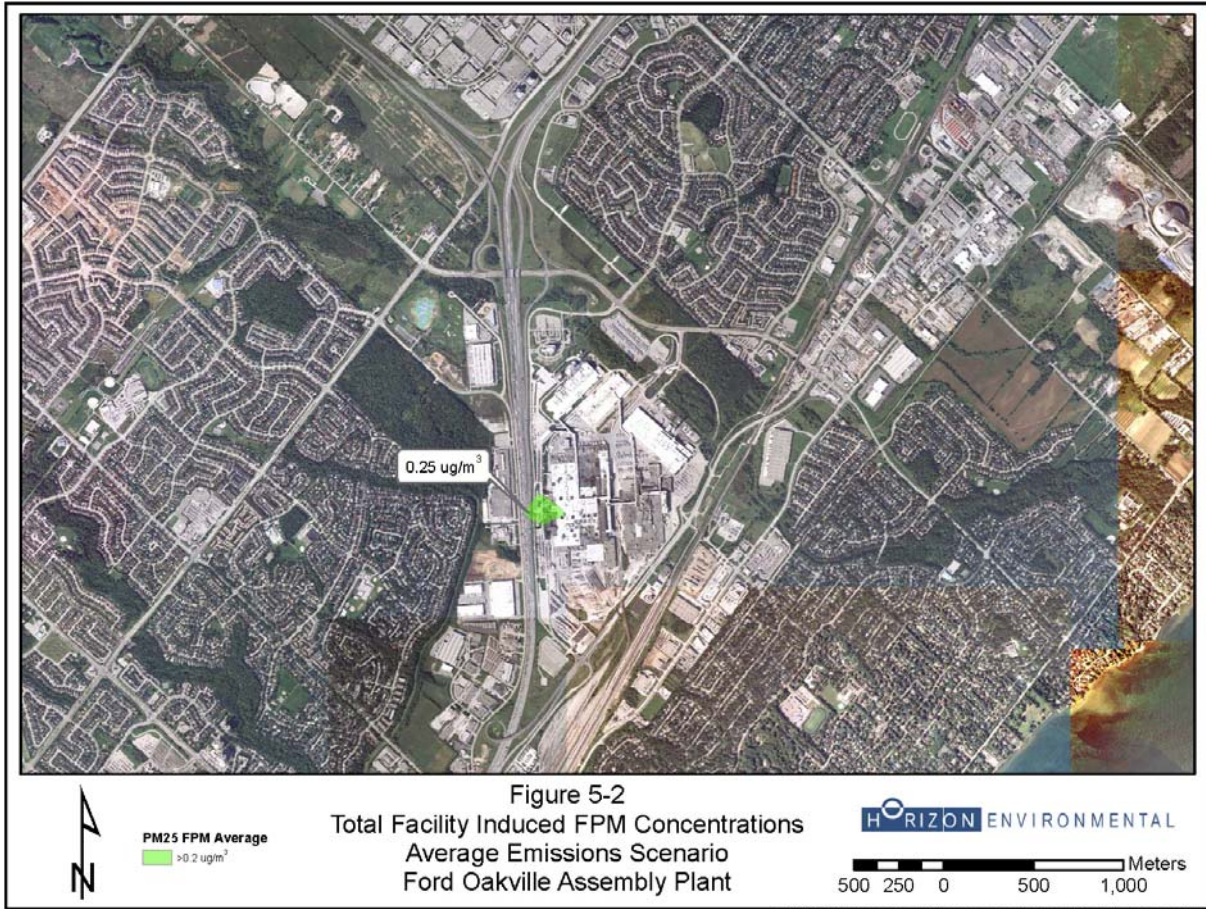
The model included the emissions of FPM, Xylene and Toluene as SOAs, and NO<sub>x</sub> to assess the average and maximum operating conditions. These emissions were used to calculate a Total Facility Induced ("TFI") concentration that was combined with the background FPM concentration provided by the Town of Oakville to obtain an overall predicted concentration.

If a total facility induced concentration is determined to be greater than the By-Law threshold of 0.2 µg/m<sup>3</sup>, then an assessment of the public health effects of the average and maximum operating conditions is required. The maximum TFI for the Oakville Assembly complex is 0.37 µg/m<sup>3</sup> and the average is 0.25 µg/m<sup>3</sup>. The primary contributor to the modeled impact at off-site receptors is building comfort heating. The FPM emissions that impact off-site receptors above the 0.2 µg/m<sup>3</sup>

threshold are similar to any large building that has comfort heating. As these values are above the  $0.2 \mu\text{g}/\text{m}^3$  threshold, a health risk assessment was performed using Version 3.0 of the Illness Cost of Air Pollution ("ICAP") model developed by the Canadian Medical Association. The map below shows the areas of impact relative to the Oakville Assembly Complex. The magnitude and extent of the impacts demonstrates that the Oakville Assembly Complex does not significantly impact the existing airshed in Oakville.

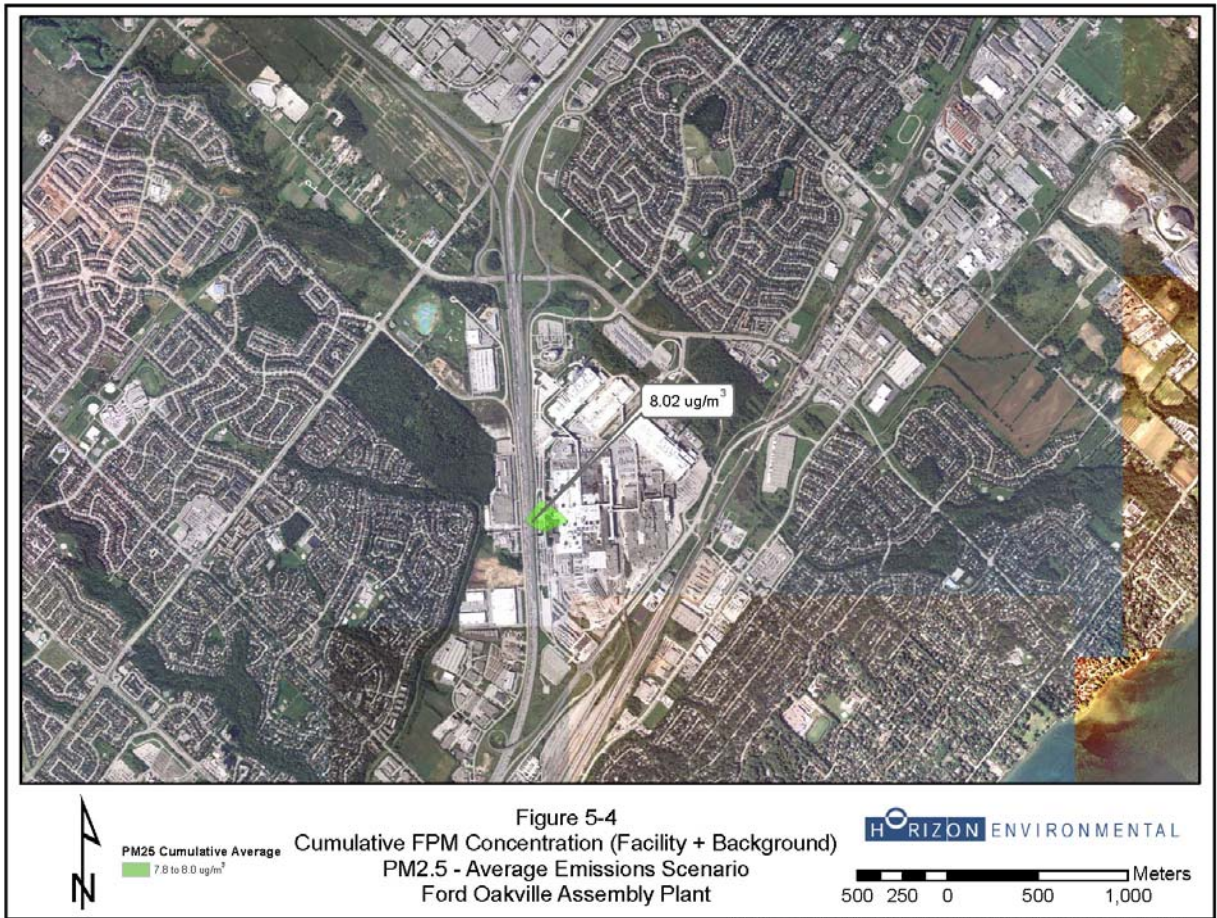






In accordance with the, ‘Guidance for Implementation of Oakville Health Protection Air Quality By-Law 2010-035 section 5 and 6 approval requirements for major emitters v.5, June 2011’, average and maximal concentrations from the Oakville Assembly Complex were combined with the Oakville monitor data. The Oakville monitor data for the 5 year average is  $7.75 \mu\text{g}/\text{m}^3$ ; hourly background FPM concentrations from the Oakville monitor were combined with the Oakville Assembly Complex data, resulting in a 3<sup>rd</sup> rank median result of  $8.0 \mu\text{g}/\text{m}^3$  for the average and a maximum result of  $8.8 \mu\text{g}/\text{m}^3$  for the maximum. The Oakville Assembly Complex contributes only 3% of the Cumulative Concentration for the average and only 4% for the maximum operating conditions. Currently, Canada is proposing a 2015 CAAQS annual standard for FPM of  $10 \mu\text{g}/\text{m}^3$  changing to  $8.8 \mu\text{g}/\text{m}^3$  in 2020 and the U.S. EPA has a health-based annual standard (“NAAQS”) of  $15 \mu\text{g}/\text{m}^3$ . The Oakville Assembly Plant results are below the U.S. EPA threshold as well as the proposed CAAQS demonstrating that the Oakville Assembly Plant does not adversely impact air quality in the Oakville airshed.





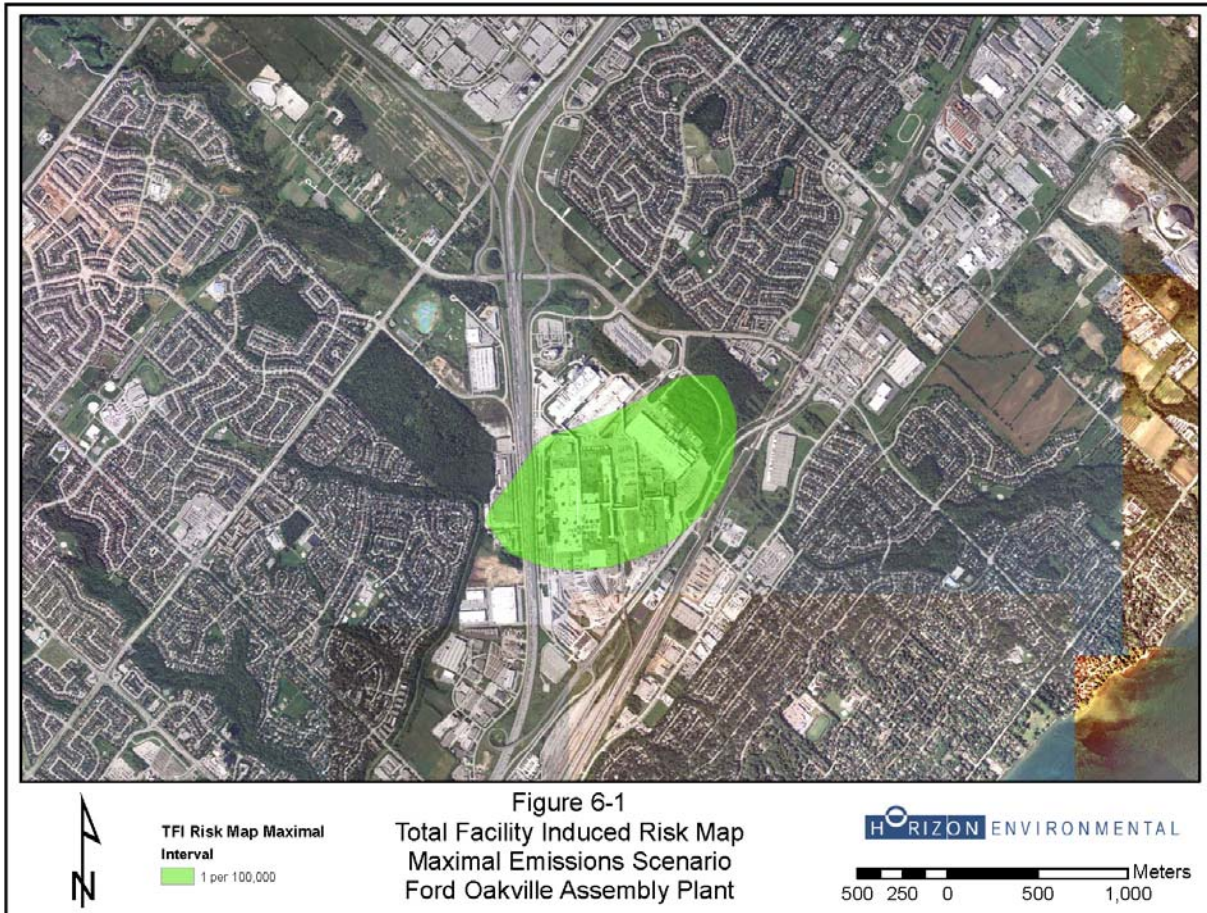
V:\1031\OR\_0301\Layouts\Sept\_2012\Revised\_09\_24\_12\Fig\_5\_4\_PM2.5\_Cumulative\_Average\_Final.mxd

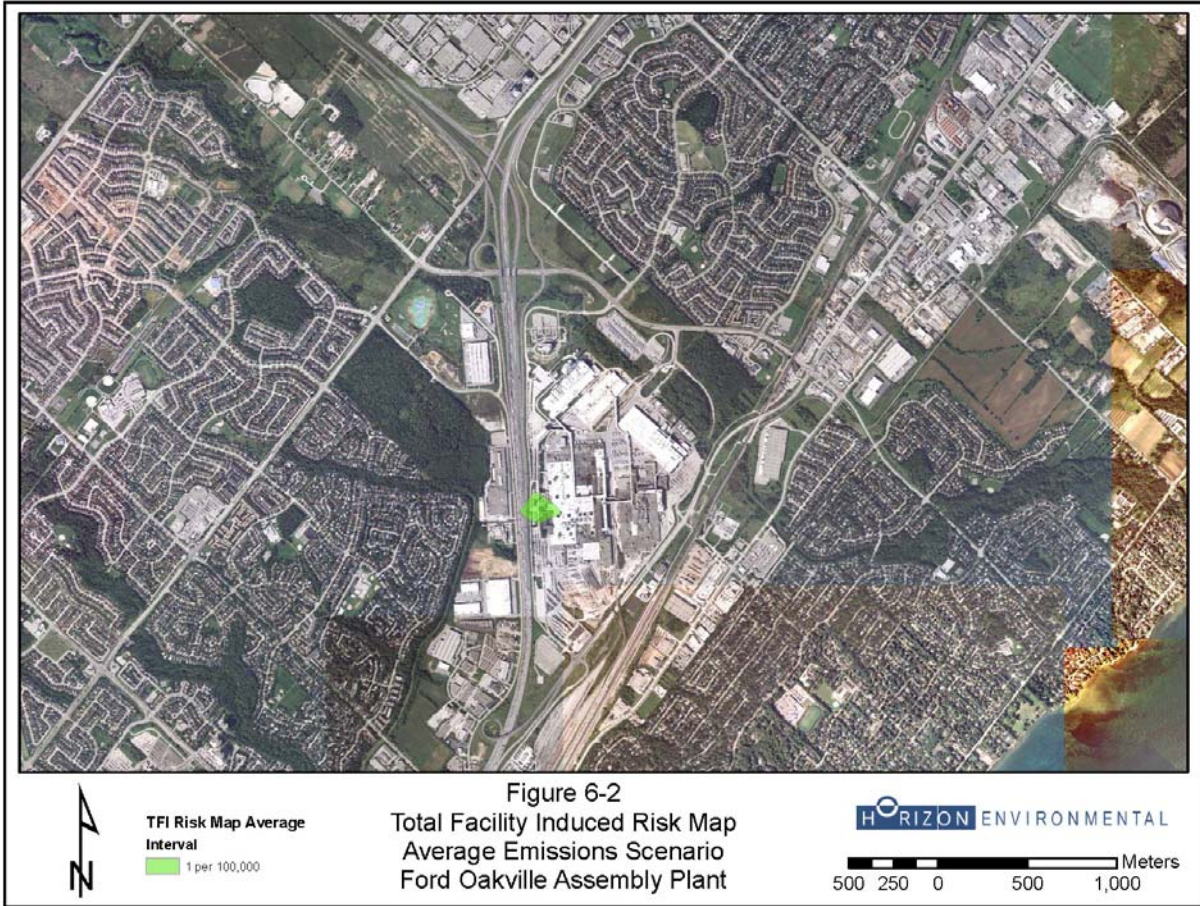
The By-law Guidance requires applicants to conduct a health-risk assessment using a model prepared by the Canadian Medical Association, known as the Illness Cost of Air Pollution (“ICAP”). Using data generated by the ICAP model, the health-risk assessment was conducted and the results are presented following two procedures: numerical and graphical. The numerical procedure assesses the increased risk from FPM. The graphical procedure illustrates the magnitude and extent of the increased risk. The maps below clearly show that the magnitude and extent of the health risk from the Oakville Assembly Complex does not cause a significant risk to the public.

The contour plots further show the following:

- Concentration levels associated with the Oakville Assembly Complex decrease rapidly with distance from the property boundary;

- No sensitive receptors are impacted above the affected airshed threshold of  $0.2 \mu\text{g}/\text{m}^3$  under the annual and maximal annual emissions scenarios; and
- Concentration levels are well below the affected airshed threshold of  $0.2 \mu\text{g}/\text{m}^3$  over the majority of the Oakville airshed.





V:\01\FOR\_0301\Layoda\Sept\_2012\Revised\_09\_24\_12\Fig\_6\_2\_RiskMap\_Average\_Final.mxd

## 1 EXECUTIVE SUMMARY

Pursuant to Section 6.(1)(a) of the Corporation of the Town of Oakville By-law No. 2010-035 (the “By-law”), Ford Motor Company of Canada, Limited (“Ford”) is submitting this Application for Town Approval of its automobile assembly plant located at The Canadian Road, Oakville, Ontario (the “Oakville Assembly Complex”). The Oakville Assembly Complex is regulated under the By-law as an existing major source of fine particulate matter (“FPM”), oxides of nitrogen (“NO<sub>x</sub>”), and volatile organic compound (“VOC”) emissions.

The results of comprehensive atmospheric dispersion modelling analyses and a conservatively-based health risk assessment, conducted in accordance with Sections 5 and 6 of the Guidance for Implementation of Oakville Health Protection Air Quality By-law 2010-035 (Version 5, June 2011), demonstrate that the Oakville Assembly Complex does not adversely impact air quality in the Oakville airshed. Planned emission reductions at the Oakville Assembly Complex are designed to further reduce emissions within the airshed.

This technical report provides detailed emissions estimates, describes the databases and methodology employed in the dispersion modelling analyses, and presents the findings of the health risk assessment conducted in support of the Application for Approval. Information required under the By-law is presented in this technical report.

## 2 INTRODUCTION

Ford Motor Company of Canada, Limited (“Ford”) owns and operates an automobile assembly plant in the Town of Oakville, Ontario (the “Oakville Assembly Complex”). The Oakville Assembly Complex, which has been operating since 1953, currently produces cross-over utility vehicles including the Ford Edge, Ford Flex, and Lincoln MKX. Ford maintains a workforce of approximately 2,900 employees at the Oakville Assembly Complex, which is illustrated in **Figure 2-1**

On February 1, 2010, the Corporation of the Town of Oakville (the “Town”) passed Health Protection Air Quality By-law No. 2010-035 (the “By-law”), which regulates emissions and potential air quality impacts of fine particulate matter<sup>1</sup> (“FPM”) and its precursors<sup>2</sup> from existing and proposed facilities designated by the By-law as major emitting facilities. The Oakville Assembly Complex has the potential to emit FPM, volatile organic compounds (“VOCs”), and nitrogen oxides (“NO<sub>x</sub>”) in quantities above the thresholds specified in Section 1 of the By-law. Therefore, the Oakville Assembly Complex is regulated under the By-law. In accordance with Section 4 of the By-law, Ford submitted required emissions data to the Town on April 29, 2010.

Pursuant to Section 6.1(a) of the By-law, “*Where a person owns or operates a facility in Oakville that causes a major emission to the air, that person shall obtain a facility-specific approval of its air emissions.*” To obtain a facility-specific approval, covered facilities must submit a prescribed fee and an Application for Town Approval that includes the following:

- A description of the facility, including an estimate of average and worst-case emissions;
- Dispersion modelling analyses to evaluate ambient FPM concentrations in the Oakville airshed resulting from average and worst-case emissions from the facility;
- Mapping that illustrates the magnitude and extent of FPM concentrations in the Oakville airshed resulting from average and worst-case emissions from the facility;
- An assessment of public health effects associated with FPM concentrations from the facility as well as from the facility combined with existing FPM levels in the Oakville airshed; and

---

<sup>1</sup> Fine particulate matter is defined under the By-law as airborne particulate matter that is less than or equal to 2.5 microns in aerodynamic mass median diameter.

<sup>2</sup> Precursor pollutants are specified under the By-law as nitrogen oxides, ammonia, sulfur dioxide, volatile organic compounds, and such other pollutants as are specified by the Town.

- An appraisal of any measures available to the facility that would reduce risks to public health.

In accordance with the By-law, Ford is submitting this Application for Town Approval of the Oakville Assembly Complex. Technical analyses required under the By-law were conducted following the applicable provisions of Sections 5 and 6 of the Guidance for Implementation of Oakville Health Protection Air Quality By-law 20100-035 (the “Guidance”). The results of the comprehensive atmospheric dispersion modelling analyses and a conservatively-based health risk assessment demonstrate that the Oakville Assembly Complex does not adversely impact air quality in the Oakville airshed, and the primary contributor to the impact to off-site receptors is building comfort heating.

The contour plots, provided in Section 5 – Mapping, further show the following:

- Concentration levels associated with the Oakville Assembly Complex decrease rapidly with distance from the property boundary;
- No sensitive receptors are impacted above the affected airshed threshold of  $0.2 \mu\text{g}/\text{m}^3$  under the annual and maximal annual emissions scenarios; and
- Concentration levels are well below the affected airshed threshold of  $0.2 \mu\text{g}/\text{m}^3$  over the majority of the Oakville airshed.

Information required under the By-law is presented in this technical report. A description of the Oakville Assembly Complex, including a summary of processes and process emissions, is provided in **Section 3**. The databases, methodology, and results of the dispersion modelling analyses are summarized in **Section 4**. Maps illustrating the magnitude and extent of FPM concentrations in the Oakville airshed are shown in **Section 5**. The methodology and results of the health effects assessment are provided in **Section 6**. Finally, **Section 7** describes planned emission reductions at the Oakville Assembly Complex.



### 3 FACILITY DESCRIPTION

#### 3.1 OVERVIEW

Ford produces finished automobiles at its Oakville Assembly Complex. While there are a number of steps involved in the automobile assembly process, manufacturing-related and support operations at the Oakville Assembly Complex that have the potential to emit direct FPM and/or its precursor pollutants (VOCs, NO<sub>x</sub>) are limited to the following:

- Comfort and process heating using natural gas;
- Operation of diesel-fired electric peak shave generator units; and
- Vehicle body painting.

The Oakville Assembly Complex also has the potential to emit limited quantities of toluene and xylene, which are volatile secondary organic aerosols (“SOA”) regulated under the By-law. Particulate matter, VOC, and SOA emissions associated with paint operations at the Oakville Assembly are controlled following industry-wide accepted practices, as described in **Section 3.6** of this technical report.

A description of the Oakville Assembly Complex, including detailed emissions estimates and an explanation of emission control practices, is provided below.

#### 3.2 LOCATION

The Oakville Assembly Complex is situated on a 347,000 m<sup>2</sup> parcel of land located at The Canadian Road in northeast Oakville. Lake Ontario is located approximately 2.5 km southeast of the Oakville Assembly Complex. The general location of the Oakville Assembly Complex is shown in **Figure 2-1**.

The area surrounding the Oakville Assembly Complex may be described as mixed industrial, commercial, and residential. Aerial imagery showing land use and sensitive receptors (e.g. health care facilities, schools, day care centers, and residential areas) within a 3 km radius of the Oakville Assembly Complex is provided in **Figure 3-1**.

### 3.3 BUILDINGS

Manufacturing and support operations at the Oakville Assembly Complex currently occur in four main buildings located on the facility property. An aerial view of emission points in relation to building structures is provided in **Figure 3-2**, while a 3-D depiction of emission points in relation to building structures is provided in **Figure 3-3**.

### 3.4 RAW MATERIALS, PRODUCTS AND PROCESSES

#### 3.4.1 Comfort and Process Heating

*Material* – Natural Gas

*Product* – Heat

*Processes* – Building comfort heat, phosphate hot water heaters, e-coat oven, sealer oven, prime and topcoat spray booth air supply houses, prime and topcoat ovens.

#### 3.4.2 Peak Shave Generators

*Material* – Diesel fuel

*Product* – Electricity

*Process* – not applicable

#### 3.4.3 Vehicle Body Painting

*Material* – phosphate materials, e-coat (resin & pigment), sealers, primer paints, basecoat paints, clearcoat paints, purge and cleaning solvents.

*Product* – Painted vehicle body for final assembly

*Process* – The steps involved in the vehicle painting operation are displayed in **Figure 3-4**.

## 3.5 EMISSION SOURCES AND PROCESSES

### 3.5.1 Comfort and Process Heating

Natural gas is fired in various sized burners to: 1) produce building comfort heat; 2) operate the phosphate hot water heaters; 3) provide spray booth air supply temperature control; and 4) run process ovens (all emissions from items 3 and 4 are directed out of the tall stack). Estimated average and worst-case emissions of FPM, NO<sub>x</sub>, and VOCs associated with the combustion of natural gas were calculated using industry standard and widely accepted emission factors published in Section 1.4 of the U.S. EPA's Compilation of Air Pollutant Emission Factors ("AP-42").

### 3.5.2 Peak Shave Generators

Ford maintains and operates four diesel-fired peak shave generators used to self-generate electricity during periods of peak electrical demand. Estimated average and worst-case emissions of FPM, NO<sub>x</sub>, and sulfur dioxide ("SO<sub>2</sub>") associated with the combustion of diesel fuel in the electric generators were calculated using industry standard and widely accepted emission factors published in Section 3.4 of AP-42.

### 3.5.3 Vehicle Body Painting

Vehicle bodies are assembled in the Body Shop from sheet metal components manufactured at other facilities. Dirt and grease are removed from the assembled vehicle body using immersion baths and high pressure sprays. This cleaning process is referred to as the phosphate system. Based on previous testing performed at other Ford facilities, there are no direct VOC or PM emissions from the phosphate system that are regulated under the By-law.

Vehicle bodies then receive a corrosion treatment in the Electrocoat (E-coat) System, which is a water-based system. The process involves immersing the metal bodies, which are grounded, into a bath of electrically charged water based E-coat. The E-coat is deposited on the bodies as they are conveyed through the dip tank. The E-coat is then heat-cured to the vehicle body in a

high-temperature bake oven. Emission associated with the dip tank and curing oven are exhausted to a regenerative thermal oxidizer (“RTO”) control device.

After completing the E-coat operation, vehicle bodies are conveyed to the sealer area where various sealants are applied to body seams and joints for waterproofing and sound deadening. The vehicle then passes through an oven in order to gel the applied sealers. Emissions associated with the sealer oven are exhausted to the RTO control device.

After the sealer oven, vehicles are routed to the prime paint booth, where they are coated with a primer paint. The vehicle then passes through an oven to cure the prime application. Emissions from the prime booth are exhausted to the tall stack. Emissions from the oven are exhausted to the RTO control device.

Upon exiting the prime system the vehicle is routed to one of two identical spray booths where the vehicle receives both a colour and clear coat coatings. The vehicle passes through an oven to cure the basecoat and clearcoat applications. Emissions from the topcoat booths are exhausted to the tall stack. Emissions from the ovens are exhausted to the RTO control device.

Emissions associated with the overall painting process include FPM due to the firing of natural gas in process heaters and painting operations, which is controlled by a wet venturi scrubber. NO<sub>x</sub>, SO<sub>2</sub>, and VOCs may also be emitted from the firing of natural gas in the process heaters.

In addition, the paint shop has the potential to emit VOCs. As part of Ford’s 2010 Emission Summary and Dispersion Model (“ESDM”) submittal to the Ontario Ministry of the Environment (“MOE”), dispersion modelling analyses of speciated VOC compounds, including xylene and toluene, were conducted. Because they are regulated under the By-law as SOA, emissions of xylene and toluene were estimated using speciation estimates from the ESDM submittal.

Upon completion of the painting process, the vehicle is directed to final assembly.

## **3.6 EMISSION CONTROL EQUIPMENT, PROCEDURES AND EMISSIONS MONITORING**

### **3.6.1 Comfort and Process Heating**

Ford operates buildings at the Oakville Assembly Complex with direct-fired heating to optimize temperature and pressure, thereby limiting natural gas usage. The process utilizes natural gas to achieve conditions needed to maintain quality. Natural gas usage is monitored on a monthly basis. The process heating used in the Paint Booths and Ovens is directed through the tall stack.

### **3.6.2 Diesel-fired Peak Shave Generators**

The four peak shave generators are fired weekly for 15 minutes to maintain operational readiness. Ford operates the diesel-fired peaking units to produce electricity when requested as part of the (Demand Response) DR3 program to decrease their electrical consumption from the grid. The diesel fuel usage is measured after each operation.

### **3.6.3 Vehicle Body Painting**

The paint shop utilizes a RTO to control odours and VOC emissions generated by the E-coat Dip Tank / Oven, Sealer, Prime and Topcoat Ovens. The RTO is operated at 1400 deg F, with a destruction efficiency of 95%. The chamber temperature is recorded on a chart recorder / data logger.

Particulate matter removal from painting operations is accomplished by a wet Venturi scrubber that is an integral part of the spray booth design.

## **3.7 IDENTIFICATION AND QUANTIFICATION OF SUBSTANCES RELEASED TO THE AIR**

### **3.7.1 Natural Gas Combustion**

Maximum potential emissions from natural gas (NG) combustion sources are estimated based on equipment design specifications. Given the recent (2010 and 2007) re-modelling and

reconfiguration of the assembly complex from two assembly operations to one, a more realistic maximum operating condition was developed to consider actual equipment experience under the current operating configuration. This was done by examining actual monthly entire-facility natural gas usages for the period 2008 through 2011, which are summarized in **Table 3-1**. The highest monthly usage for each respective month in the four-year period was used to calculate the annual worst-case total emission rate.

**Table 3-2** summarizes for each combustion source, the equipment maximum heat input capacity, maximum natural gas usage capacity, and the resultant gram per second FPM and NO<sub>x</sub> emission rates, using the AP-42 emission factors described in **Section 3.5**.

### 3.7.2 Diesel-fired Peak Shave Generators

Ford occasionally operates four diesel-fired peak shave generators to produce electricity when requested as part of the (Demand Response) DR3 program to decrease electrical consumption from the grid. Worst-case conditions for peak shave operation for this study assume 200 hours of operation over the course of a year. Actual peak shave generator operating hours per year for the period 2008 through 2011 are shown below, while FPM and NO<sub>x</sub> emission rates for maximum and average operating conditions are summarized in **Table 3-3**.

Peak Shave Generators Actual Operating Hours by Year

Year	Hours of Operation
2008	40
2009	40
2010	40
2011	68
<b>Average</b>	<b>47</b>

### 3.7.3 Vehicle Body Painting

Two sources of FPM are associated with painting operations:

- For sources combusting natural gas, FPM emission rates were based on the methodology described in **Section 3.7.1**.
- For painting operations, FPM emission rates were based on particulate matter of 10 µm or less (“PM<sub>10</sub>”) emission factors using paint booth data obtained during internal testing at Ford facilities<sup>3</sup> according to the following equation:

$$\text{PM} = \text{exhaust volume of spray booths} \times \text{emission factor (kg / volume of air)}$$

VOCs (including xylene and toluene) are associated with painting operations as xylene and toluene are constituents found in our paint materials. An example calculation is below:

- Vehicles per hour x Paint usage/vehicle x weight% (xylene or toluene) x (1- process control efficiency)

Worst-case emission estimates are based on maximum production rates. Specific plant operating conditions are summarized below.

#### Plant Operating Conditions

Units Per Hour (JPH)	95
Hours/Day	20
Hours/Year	5,700
Units/Year	376,200

---

<sup>3</sup> Ford Motor Company. Environmental Quality Office, Dearborn Truck Scuff Booth test results, 1999. The test data indicates that FPM comprises 46.7% of the PM<sub>10</sub> emissions.

## 4 EVALUATION

### 4.1 MODELLING APPROACH AND MODEL SELECTION

Comprehensive atmospheric dispersion modelling analyses of emissions from the Oakville Assembly Complex have been conducted in support of the Application for Approval. Utilizing the most current U.S. EPA approved version of the CALPUFF dispersion model (Version 5.8), in conjunction with databases provided by the Town and the methodology prescribed in the Guidance, the dispersion model simulations demonstrate that the Oakville Assembly Complex does not adversely impact air quality in the Oakville airshed. A description of the modelling methodology and related databases is provided below.

### 4.2 MODEL INPUTS

Inputs to CALPUFF necessary to conduct the model simulations include emission source-specific emission rates, stack exhaust parameters, the dimensions of buildings or other structures that could affect wind flow around emission points, meteorological data, receptor points and terrain elevations, land use and coastline data, pollutant-specific chemistry, and background air quality concentration levels. A copy of all the databases input to CALPUFF in support of the Oakville Assembly Complex model simulations is provided in electronic format (DVD-ROM) in **Appendix A**.

The model simulations described in this document were conducted using the Town-provided databases in their entirety and without alteration.

#### 4.2.1 Facility Emissions Estimate Requirements / Estimation Methods

In accordance with the By-law and Guidance, model simulations of emission sources at the Oakville Assembly Complex were conducted under maximal and average operating scenarios. The methodology for estimating emissions from the various fuel combustion sources and coating operations at the Oakville Assembly Complex is detailed in **Section 3.3** through **Section 3.5**.



Combustion source and coating operation emissions will vent through vertically unobstructed stacks. Emissions from processes that could vent through multiple stacks were combined and vented through a single representative stack. Wherever there is variability in stack exhaust parameters among a group of combined emission units, the stack with the expected worst-case dispersion (e.g. lowest height, largest diameter, lowest exit temperature or flow rate) was chosen as the modelled stack.

Modelled stack locations and exhaust parameters are summarized in **Table 4-1**, while modelled FPM, NO<sub>x</sub>, and SOA emission rates, under both the maximal and average emissions scenarios are summarized in **Table 4-2**. As shown in the table, the Oakville Assembly Complex is defined under the By-law as a major emitter of FPM, VOCs, and NO<sub>x</sub>.

The frequency with which emissions within 90% of the worst-case emissions levels will occur is estimated to be one day per week, for fifteen minutes, during the heating season. This is due to the fact that the plant heating is only needed during the winter months and the Peak Shave Generators are kept in standby mode during these months and are only operated for testing once a week for fifteen minutes.

#### **4.2.2 Model Input Checklist**

A description of the key databases and model inputs used in the dispersion modelling analyses of the Oakville Assembly Complex is provided below. A completed copy of the Model Input Checklist, specified under Section 6.5 of the By-law, is provided in **Appendix B**.

##### *Meteorological Data*

Model simulations were conducted using a five year meteorological database (2004 - 2008) generated by the Town using the CALMET meteorological preprocessor. According to the Guidance, processing of meteorological data was conducted, in part, using output from the PSU/NCAR MM5 prognostic model and land use data obtained from United States Geological Survey (“U.S.G.S.”) provided Global Land Cover Characterization (“GLCC”) files with a mesh density of at least 2. The CALMET processing was conducted using “Town settings.

The Town-provided CALPUFF-ready meteorological database was used in the dispersion modelling analyses described in this document.

### *Receptor Grid*

Pursuant to the Guidance, the dispersion model simulations were conducted using the following two sets of receptor points, each provided by the Town:

- A rectangular Cartesian grid that corresponds to the CALMET meteorological preprocessor computational grid; and
- A finer resolution set of discrete receptors within the boundaries of the Town of Oakville.

The rectangular Cartesian grid, which extends 100 km by 100 km with 4 km spacing between receptor points, is comprised of 625 receptor points and is illustrated in **Figure 4-1**.

The finer resolution grid is based on a 125 m receptor spacing and is comprised of 8,349 discrete receptor points. Because it is not an area of exposure to the general public, concentration levels within the emitting facility's property boundary are not assessed. Therefore, consistent with the Guidance, receptor points that fell within the Oakville Assembly Complex property boundary were removed from the grid. The receptor grid, which encompasses the Town of Oakville, is illustrated in **Figure 4-2**.

### *Terrain Elevations*

The Town provided terrain elevations for the Cartesian and finer resolution receptor grids that were based, according to the Guidance, using 1 degree or 3 arc second digital elevation model ("DEM") files with ~90 m resolution. The Town-provided receptor terrain elevations were used without alteration in the CALPUFF simulations.

Terrain elevations were generated for the modelled Oakville Assembly Complex stacks using the AERMAP terrain preprocessor and 7.5 minute DEM files. The AERMAP input and output files are provided in electronic format (DVD-ROM) in **Appendix A**.

### *Building Downwash Elevations*

Due to the configuration of the Oakville Assembly Complex buildings in relation to the location and height of the modelled stacks, emissions venting from certain stacks may be influenced by aerodynamic downwash. In accordance with the Guidance, U.S. EPA's recommended BPIP-

PRIME program was utilized to estimate the maximum projected lateral and vertical dimensions of those buildings or structures that could influence the modelled stacks, on a wind direction-specific basis.

BPIP-PRIME requires as input the dimensions of all existing and proposed buildings or structures that could potentially influence emissions from the modelled stacks. Maximum projected lateral and vertical dimensions of influencing structures, as calculated by BPIP-PRIME, are subsequently input to CALPUFF. An aerial view of emission points in relation to building structures is provided in **Figure 3-2**, while a 3-D depiction of emission points in relation to building structures is provided in **Figure 3-3**. Input/Output files for the BPIP-PRIME simulations are enclosed in electronic format (DVD-ROM) in **Appendix A**.

#### *Coastline Data*

In order to assess the potential influence of Lake Ontario on dispersion in the modelling domain, the subgrid scale coastal module of CALPUFF must be invoked. Data required as input to CALPUFF when using the subgrid scale coastal module includes the coordinates of the land/sea boundary that extends through the modelling domain. A data file delineating the Lake Ontario shoreline, in UTM coordinates, was provided by the Town and was used without alteration in the CALPUFF simulations.

#### *Background FPM Concentrations*

In order to conduct the cumulative impact assessment as directed by the Guidance, background FPM concentration data for the period coincident with the five-year meteorological database (2004 - 2008) are to be directly combined with model-predicted FPM concentrations from the Oakville Assembly Complex. The MOE operates an ambient FPM monitor (Station No. 44017) near the intersection of 8<sup>th</sup> Line and Glenashton Drive in northeast Oakville, which is located approximately 2.5 km west of the Oakville Assembly Complex. A file containing hourly FPM concentrations measured at the Oakville monitor during the five-year period was provided by the Town.

The hourly FPM monitoring data was combined with coincident hourly model-predicted FPM concentrations from the Oakville Assembly Complex as part of the cumulative impact assessment summarized in **Section 4.3.2**.

### *Chemistry Models and Species*

As specified in the Guidance, model simulations to assess the formation of secondary aerosols during plume transport were conducted using the 5-species MESOPUFF II chemistry module in CALPUFF.

Dispersing nitrate (“NO<sub>3</sub>”) ion concentrations, resulting from the oxidation of NO<sub>x</sub> emissions, has the tendency to form ammonium nitrate (“NH<sub>4</sub>NO<sub>3</sub>”) in the presence of ammonia (“NH<sub>3</sub>”). Considering that the oxidation of NO<sub>x</sub> occurs in the presence of ozone and sunlight during plume transport, the level of oxidation that may occur in the trajectory between the Oakville Assembly Complex stacks and points of maximum impact is limited due to the relatively short transport distance. Consequently, any assessment of this transformation would be expected to show no material change in the total facility induced FPM concentration. However, to meet Town requirements, a conservatively-based post-CALPUFF methodology was employed to estimate the potential change in FPM concentration due to the atmospheric transformation of NO<sub>3</sub> ion concentrations to NH<sub>4</sub>NO<sub>3</sub>. The methodology is presented in Section 4.3.1.

### *Additional CALPUFF Inputs*

To assess the chemical transformation of precursor pollutants using the MESOPUFF II scheme, CALPUFF requires as input background ozone and ammonia concentration data. Accordingly, the model simulations were conducted using hourly ozone concentration data from various ambient ozone monitors in the Oakville area, as compiled and provided by the Town. As directed by the Guidance, the model simulations were also conducted using monthly ammonia concentrations of 5.5 µg/m<sup>3</sup> for the maximal emissions scenario and 2.5 µg/m<sup>3</sup> for the average emissions scenario.

When conducting model simulations of toluene or xylene emissions, the Town requires as input to CALPUFF the following monthly SOA background data:

Month	FPM Concentration ( $\mu\text{g}/\text{m}^3$ )	Organic Fraction of FPM	VOC/NO <sub>x</sub> Ratio
January	8	0.2	4
February	8	0.2	4
March	8	0.25	4
April	8	0.25	4
May	8	0.25	4
June	8	0.25	4
July	8	0.25	4
August	8	0.25	4
September	8	0.2	4
October	8	0.2	4
November	8	0.2	4
December	8	0.2	4

These values were used in the SOA simulations under the maximal and average annual emissions scenarios.

As directed by the Guidance, the model simulations were conducted using the following CALPUFF settings:

- Urban wind speed profile (ISC-Urban-1);
- MDISP option set to 2 (Dispersion coefficient use turbulence computed from micrometeorology);
- MPDF option set to Yes (Use PDF method for Sigma-z in the convective boundary layer);
- MCTURB option set to 2 (AERMOD subroutines); and
- MSGTIBL module set to 1 (subgrid scale coastal module is invoked)

Further, the model simulations of direct FPM emissions were conservatively conducted that no plume depletion due to dry or wet depositional effects will occur.

### 4.3 MODEL-PREDICTED FPM CONCENTRATIONS

Utilizing CALPUFF, in conjunction with databases provided by the Town and the methodology prescribed in the Guidance, model simulations of the Oakville Assembly Complex have been conducted to assess FPM concentrations in the Oakville airshed. In accordance with the Guidance, the model simulations were conducted over a five year meteorological database (2004 – 2008) using average and maximal annual emission rates to predict the following:

- **Average annual concentrations:** the 3<sup>rd</sup> rank (median) of the annual FPM concentration over the five year meteorological database generated from the average annual emissions; and
- **Maximal (worst-case) annual concentrations:** the highest annual FPM concentration over the five year meteorological database generated from the maximal annual emissions.

Average and maximal annual emission rates were modelled to assess average and maximal annual concentrations due to the following:

- The Oakville Assembly Complex, specified in the Guidance as the Total Facility Induced (“TFI”) concentration; and
- The Oakville Assembly Complex in conjunction with background FPM concentrations measured at the Oakville ambient monitor, specified in the Guidance as the Cumulative concentration.

The results of the CALPUFF simulations are summarized below.

#### 4.3.1 Total Facility Induced Concentrations

Consistent with the Guidance, model simulations to assess average and maximal annual TFI concentrations were conducted in three steps. The first step consisted of modelling direct FPM emissions from Oakville Assembly Complex in conjunction with facility-emitted inorganic precursors (NO<sub>x</sub>). The second step consisted of modelling toluene and xylene emissions to assess SOA formation during plume transport. Impacts from these two simulations were then summed.

For the third step, a conservatively-based post-CALPUFF methodology was employed to estimate the potential change in FPM concentration due to the atmospheric transformation of NO<sub>3</sub> ion concentrations to NH<sub>4</sub>NO<sub>3</sub> in the transporting plume. The methodology is based on the conservative assumption that the entire quantity of NO<sub>3</sub> ion concentrations predicted by CALPUFF transforms to NH<sub>4</sub>NO<sub>3</sub> and that the resultant NH<sub>4</sub>NO<sub>3</sub> concentrations remain in equilibrium. Under this methodology, the NO<sub>3</sub> to NH<sub>4</sub>NO<sub>3</sub> transformation can be estimated by scaling the CALPUFF-predicted NO<sub>3</sub> ion concentrations by the molecular weight of NH<sub>4</sub>NO<sub>3</sub>, as shown in the following equation:

$$\text{NH}_4\text{NO}_3 \text{ Concentration} = \text{NO}_3 \text{ Concentration} \times \frac{\text{Molecular Weight of NH}_4\text{NO}_3}{\text{Molecular Weight of NO}_3}$$

$$\text{NH}_4\text{NO}_3 \text{ Concentration} = \text{NO}_3 \text{ Concentration} \times \frac{80.052 \text{ grams/mol}}{62.005 \text{ grams/mol}}$$

$$\text{NH}_4\text{NO}_3 \text{ Concentration} = \text{NO}_3 \text{ Concentration} \times 1.291$$

The results of the model simulations across the five-year meteorological database are presented in **Table 4-3**. As shown in the table, the maximum predicted TFI concentration under the average annual emissions scenario is 0.25 µg/m<sup>3</sup>, while the maximum predicted TFI concentration under the maximal annual emissions scenario is 0.37 µg/m<sup>3</sup>. Individual year maximum predicted TFI concentrations are also presented in **Table 4-3** for informational purposes. Receptor-specific direct FPM, NO<sub>3</sub>, NH<sub>4</sub>NO<sub>3</sub>, and total FPM impacts resulting from the three step methodology are provided in **Appendix A**.

The table below shows the approximate percent contribution of the primary sources of FPM at three unique off-site receptors. Illustrated in **Figures 5-1** and **5-2**, the West receptor is an off-site location bordering the Queen Elizabeth Way (“QEW”). It is at this receptor location where the highest modeled TFI concentrations occur under the maximal and annual average emissions scenarios. As shown in the table, approximately 98% of the contribution to the maximal and average annual TFI concentration is from building comfort heating

**FPM Source Contribution at Off-site Receptors**

		West (QEW)		SE (by Peak Shave Generators)		NE (by Paint Shop)	
		(ug/m3)	(%)	(ug/m3)	(%)	(ug/m3)	(%)
Maximum Emissions	Peak Shave Generators	6.20E-03	1.7%	5.32E-02	36.4%	1.46E-02	6.4%
	RTO, TS	1.68E-03	0.5%	1.08E-03	0.7%	1.47E-03	0.6%
	Heating	3.60E-01	97.9%	9.19E-02	62.9%	2.11E-01	92.9%
	Total	3.68E-01	100.0%	1.46E-01	100.0%	2.27E-01	100.0%
Average Emissions	Peak Shave Generators	1.62E-03	0.9%	1.33E-03	1.5%	3.22E-03	1.8%
	RTO, TS	6.45E-04	0.4%	5.80E-04	0.7%	1.11E-03	0.6%
	Heating	1.77E-01	98.7%	8.58E-02	97.8%	1.73E-01	97.6%
	Total	1.80E-01	100.0%	8.77E-02	100.0%	1.77E-01	100.0%

Receptor Location (km)      (East, North)      607.353      4815.267      608.103      4814.767      608.353      4815.392

Pursuant to Section 1 of the By-law, an increase in annual average FPM concentration of more than 0.2 µg/m<sup>3</sup> constitutes an “affected airshed”. However, model-predicted TFI impacts above the affected airshed threshold, under either the average or the maximal annual emissions scenario, are not indicative of an adverse air quality impact due to the emitting facility. Rather, the threshold is used to determine whether a cumulative impacts analysis, taking into account the emitting facility and ambient background FPM concentrations, should be conducted.

As shown in **Table 4-3**, model-predicted impacts from the Oakville Assembly Complex are above the 0.2 µg/m<sup>3</sup> threshold under both the average and the maximal annual emissions scenarios, thus triggering the cumulative impacts analysis requirement. However, mapping of the TFI impacts, summarized in **Section 5** and conducted in accordance with the applicable requirements of the By-law and the Guidance, demonstrates that the areal extent of the impacts modelled above the affected airshed threshold is limited, primarily, to non-sensitive or non-residential public receptors located in the immediate vicinity of the Oakville Assembly Complex. Considering the magnitude and extent of the TFI impacts, the model simulations demonstrate that the Oakville Assembly Complex does not cause an adverse air quality impact in the Oakville airshed.

*Impacts at On-site Sensitive Receptors*

As shown in **Figure 3-1**, there is a daycare center located in the northwest portion of the Oakville Assembly Complex property. Because this is a sensitive exposure location, additional model simulations of average and maximal annual emissions from the Oakville Assembly Complex were conducted over a single receptor point located at the on-site daycare center. The results of the model simulations are summarized in **Table 4-4**. As shown in the table, resultant impacts are well under the affected airshed threshold of 0.2 µg/m<sup>3</sup>. Therefore, the modelling



analyses demonstrate that the Oakville Assembly Complex does not cause an adverse air quality impact at the on-site sensitive receptor.

#### **4.3.2 Cumulative Concentrations**

Consistent with the Guidance, average and maximal annual Cumulative concentrations were assessed by combining the TFI concentrations with background ambient FPM concentrations, as measured at the Oakville monitor. Average and maximal Cumulative concentrations across the five-year meteorological database are presented in **Table 4-3**. As shown in the table, the Cumulative concentration under the average annual emissions scenario is  $8.0 \mu\text{g}/\text{m}^3$ , while the Cumulative concentration under the maximal annual emissions scenario is  $8.8 \mu\text{g}/\text{m}^3$ . Individual year Cumulative concentrations are also presented in **Table 4-3** for informational purposes. Maps illustrating the magnitude and extent of the Cumulative concentration levels are provided in **Section 5**.

It is important to note that the Oakville Assembly Complex contributes only 3% of the Cumulative concentration under the average annual emissions scenario and only 4% of the Cumulative concentration under the maximal annual emissions scenario. The remaining concentration under both emissions scenarios is reflective of FPM measurements at the Oakville monitor.

Currently, Canada is proposing a 2015 CAAQS annual standard for FPM of  $10 \mu\text{g}/\text{m}^3$  changing to  $8.8 \mu\text{g}/\text{m}^3$  in 2020, and the U.S. EPA has a health-based annual standard (“NAAQS”) of  $15 \mu\text{g}/\text{m}^3$ . As shown in **Table 4-3** and illustrated in **Section 5**, the conservatively-based average and maximal annual Cumulative concentrations comply with the NAAQS and proposed CAAQS in the vicinity of the Oakville Assembly Complex.

## 5 MAPPING

Pursuant to Section 6(3)(c)(i) of the By-law and Section 3.3 of the Guidance, if model-predicted TFI concentrations produced by a facility under either the average or maximal annual emissions results in an affected airshed, then mapping to delineate the extent of the affected airshed within the Town is required. An affected airshed is defined as the area experiencing an increase in FPM concentration of more than  $0.2 \mu\text{g}/\text{m}^3$ , expressed as an annual average, due to a major emissions source. The model-predicted TFI concentrations summarized in **Section 4.3.1** indicate that the Oakville Assembly Complex may create an affected airshed in the Town. However, it should be noted that the Town-mandated  $0.2 \mu\text{g}/\text{m}^3$  affected airshed threshold is not a health-based concentration limit and is not indicative of an adverse or unhealthy air quality impact resulting from the operation of the Oakville Assembly Complex.

Utilizing ArcView Geographic Information Systems software and sub-meter resolution aerial imagery obtained from the U.S.G.S, concentration contour maps illustrating the magnitude and extent of FPM impacts associated with the Oakville Assembly Complex have been developed. In accordance with Section 6(3)(c) of the By-law and Section 3.3.1 of the Guidance, contour plots of the TFI concentrations under both the average and maximal annual emissions scenarios were created using the following methodology:

- Concentration contours were generated based on the combined model-predicted impact of direct FPM, precursor FPM, and SOA;
- Concentration contours for each plot were set at an interval of  $0.2 \mu\text{g}/\text{m}^3$ ; and

The location and magnitude of the maximal TFI concentration value was identified on each contour plot. The frequency with which emissions within 90% of the worst-case emissions levels will occur is estimated to be one day per week, for fifteen minutes, during the heating season.

The TFI concentration contour plot for the maximum annual emissions scenario is provided in **Figure 5-1**, while the TFI concentration contour plot for the annual average emissions scenario is provided in **Figure 5-2**. The plots were generated using the Guidance-suggested contour interval of  $0.2 \mu\text{g}/\text{m}^3$ . As shown on the two figures, maximal TFI concentrations under the two emissions scenarios occur along or immediately adjacent to the northeast portion of the Oakville Assembly Complex property boundary. The contour plots further show the following:

- Concentration levels associated with the Oakville Assembly Complex decrease rapidly with distance from the property boundary;
- No sensitive receptors are impacted above the affected airshed threshold of  $0.2 \mu\text{g}/\text{m}^3$  under the annual and maximal annual emissions scenarios; and
- Concentration levels are well below the affected airshed threshold of  $0.2 \mu\text{g}/\text{m}^3$  over the majority of the Oakville airshed.

As shown in the two figures, significant public receptors (e.g., schools, hospitals, etc.) that are currently located in northeastern section of Oakville fall outside of the affected airshed produced by the Oakville Assembly Complex. Consequently, the model simulations demonstrate that the Oakville Assembly Complex does not cause an adverse air quality impact in the Oakville airshed.

Where a facility produces an affected airshed, then pursuant to Section 6(3)(c)(ii) of the By-law, additional maps that illustrate “*within the affected airshed, the average and worst-case annual ambient concentrations of fine particulate matter, a contour plots, at one microgram per cubic metre intervals...*” must be prepared. The Guidance clarifies that the ambient concentration levels represent the cumulative impact of the Oakville Assembly Complex and background FPM concentration levels, as measured at the Oakville ambient monitor.

In accordance with the By-law and the Guidance, contour plots showing the magnitude of the cumulative concentration level within the affected airshed have been developed. The cumulative concentration contour plot for the maximum annual emissions scenario is provided in **Figure 5-3**, while the cumulative concentration contour plot for the annual average emissions scenario is provided in **Figure 5-4**. The plots were generated using a contour interval of  $0.2 \mu\text{g}/\text{m}^3$ . As shown on the two figures, the model-predicted affected airshed produced by the Oakville Assembly Complex does not impact any on-site or off-site sensitive receptor points.

## 6 HEALTH-RISK ASSESSMENT

Pursuant to Section 3.4 of the Guidance, if a facility causes a major emission such that it creates an affected airshed, then a health-risk assessment must be conducted to assess whether a public health effect will occur in the Town as a result of the major emission. The By-law defines public health effect as “*the risk of an adverse impact on public health within the affected airshed, derived from chronic exposure to PM<sub>2.5</sub>.*” According to the Guidance, the assessment is to be conducted using health-risk coefficients generated by the Illness Cost of Air Pollution (“ICAP”) model developed by the Canadian Medical Association.

The overall assessment of the affected airshed shows that both maximal and average emission scenarios are not likely to cause a significant public health effect. The frequency with which emissions within 90% of the worst-case emissions levels will occur is estimated to be one day per week, for fifteen minutes, during the heating season.

Consistent with the Guidance, the health-risk assessment was conducted utilizing the following two procedures:

### 6.1 NUMERIC PROCEDURE

The numeric health-risk assessment procedure is a two step process designed to assess the increased risk of premature non-traumatic mortality within the affected airshed (i.e., the area where the model-predicted TFI FPM concentrations are above 0.2 µg/m<sup>3</sup>) due to chronic exposure to FPM. The first step consists of identifying the model-predicted maximal TFI FPM concentration and the maximal cumulative FPM concentration over the five-year period. The second step consists of multiplying these concentration values by the following values specified in the Guidance:

- Background non-traumatic mortality rate for Oakville – (432 / 100,000)
- Risk increase per µg/m<sup>3</sup> – 1.1% (0.011)

The numeric procedure is followed to estimate the increased risk within the affected airshed for both the average and the maximal annual emissions scenarios. The estimated risk increase within the TFI affected airshed produced by the Oakville Assembly Complex under the both the

average and the maximal annual emissions scenarios is summarized in **Table 6-1**. The increased risk based on the cumulative FPM concentration under the average and the maximal annual emissions scenarios is also provided in the table. An example risk calculation, based on the maximal TFI concentration, is provided below:

$$\text{Risk Increase} = (0.57 \mu\text{g}/\text{m}^3) * (432) * (1.1 / 100) = 2.7 \text{ per } 100,000$$

## 6.2 GRAPHIC PROCEDURE

The graphic procedure is designed to illustrate the magnitude and extent of the increased risk within the affected airshed under both the average and the maximal annual emissions scenarios. Utilizing the model-predicted TFI concentrations produced by the Oakville Assembly Complex over the receptor points located within the affected airshed, concentration values are scaled to display results in terms of the increased risk of non-traumatic mortality per 100,000 people. As specified in the Guidance, a factor of 4.75 is used to generate the increased risk estimates. This procedure is followed to generate contour maps associated with the maximal TFI FPM concentrations and the maximal cumulative FPM concentrations.

Following this procedure, the increased risk of non-traumatic mortality within the affected airshed is illustrated in the following figures:

**Figure 6-1** Total Facility Induced Risk Map, Maximal Emissions Scenario

**Figure 6-2** Total Facility Induced Risk Map, Average Emissions Scenario

**Figure 6-3** Cumulative Risk Map, Maximal Emissions Scenario

**Figure 6-4** Cumulative Risk Map, Maximal Emissions Scenario

\*NOTE: The frequency with which emissions within 90% of the worst-case emissions levels will occur is estimated to be one day per week, for fifteen minutes, during the heating season.

As shown in the figures, the graphic procedure confirms that the Oakville Assembly Complex does not adversely impact air quality in the Oakville airshed.

## 7 APPRAISAL

### 7.1 EMISSION CONTROL TECHNOLOGIES

Pursuant to Section 3.5 of the Guidance, a facility is required to appraise any measures available that would reduce the risks to public health if an affected airshed is created within the boundaries of the town, including costs and other implications of implementing such measures. As described in **Section 5**, annual and maximal average emissions associated with the operation of the Oakville Assembly Complex generates a model-predicted affected airshed over a very limited area within the Town of Oakville.

The Oakville Assembly Complex has three main emission control technologies:

- The ‘tall stack’
- A regenerative thermal oxidizer (RTO)
- A venturi scrubber / water wash system

#### 7.1.1 Tall Stack and Venturi Scrubber

Emissions from the prime, basecoat and clearcoat paint booth operations as well as the emissions from the wet venturi scrubber, controlling the particulate matter from painting operations are directed to the ‘tall stack’. Modelling in accordance to the requirements of the By-law and as discussed in the Evaluation section (**Section 4**) of this report indicate emissions from the tall stack have no impact on the Town of Oakville. Therefore, additional control technologies, emission mitigation plans or emission mitigation techniques will not be evaluated for the paint booth operations at the Oakville Assembly Complex.

#### 7.1.2 Regenerative Thermal Oxidizer (RTO)

Emissions from the E-coat, Sealer Gel, Prime and Topcoat ovens are directed to an on-site RTO. The RTO is assumed to have a destruction efficiency of 95%.

## 7.2 OAKVILLE ASSEMBLY COMPLEX APPRAISAL AND MITIGATION PLANS

Three main sources exist for the generation of FPM at the Oakville Assembly Complex:

- Painting Operations (RTO, Tall Stack (TS))
- Natural Gas Combustion (Comfort Heating & process heating)
- Peak Shave Generators (Generators)

The table below reflects three unique receptor points and their emission source contributions.

**FPM Source Contribution at Off-site Receptors**

		West (QEW)		SE (by Peak Shave Generators)		NE (by Paint Shop)	
		(ug/m3)	(%)	(ug/m3)	(%)	(ug/m3)	(%)
Maximum Emissions	Peak Shave Generators	6.20E-03	1.7%	5.32E-02	36.4%	1.46E-02	6.4%
	RTO, TS	1.68E-03	0.5%	1.08E-03	0.7%	1.47E-03	0.6%
	Heating	3.60E-01	97.9%	9.19E-02	62.9%	2.11E-01	92.9%
	Total	3.68E-01	100.0%	1.46E-01	100.0%	2.27E-01	100.0%
Average Emissions	Peak Shave Generators	1.62E-03	0.9%	1.33E-03	1.5%	3.22E-03	1.8%
	RTO, TS	6.45E-04	0.4%	5.80E-04	0.7%	1.11E-03	0.6%
	Heating	1.77E-01	98.7%	8.58E-02	97.8%	1.73E-01	97.6%
	Total	1.80E-01	100.0%	8.77E-02	100.0%	1.77E-01	100.0%

Receptor Location (km)	(East, North)	607.353	4815.267	608.103	4814.767	608.353	4815.392
------------------------	---------------	---------	----------	---------	----------	---------	----------

### 7.2.1 Painting Operations

As discussed in **Section 7.1**, emissions from painting operations are directed to either the tall stack or the RTO. Therefore, the focus of the mitigation plans will not be directed at painting operations at the Oakville Assembly Complex.

The Oakville Assembly Complex has a Fumes-To-Fuel Research Facility, who's mission is to develop and demonstrate a fumes abatement system that could revolutionize manufacturing processes by creating a breakthrough in reducing VOC emissions, while at the same time generating energy. This is a long term research project with the ultimate goal of becoming production-ready.

### 7.2.2 Natural Gas Combustion

Natural gas is fired in various sized burners to: 1) produce building comfort heat; 2) operate the phosphate hot water heaters; 3) provide spray booth air supply temperature control; and 4) run

process ovens. Modelling in accordance to the requirements of the By-law and as discussed in the Evaluation section (**Section 4**) of this report indicate emissions from natural gas combustion are the largest source of FPM from the Oakville Assembly Complex. Emissions from Items 3 and 4 are directed through the tall stack and does not impact the Oakville airshed. Therefore, a FPM emission reduction plan will focus on natural gas consumption for comfort/building heating at the Oakville Assembly Complex. The comfort/building heating emissions are the predominant source within the affected airshed..

From 2007 to 2010, the Oakville Assembly Complex has already reduced its natural gas consumption by 35% through:

- Significant new program investment reconfiguring the site to a single flexible manufacturing complex and RTO refurbishment; and
- Decommissioning (2010) and subsequent demolition (2012) of its second paint shop

Ford Motor Company also has a current global initiative to reduce energy consumption by 25% over the next five years as well as to reduce CO<sub>2</sub> emissions per vehicle produced by 30% from 2010 to 2025. The Oakville Assembly Complex will focus their improvement initiatives on process energy use, such as painting operations.

- The following initiatives at Oakville Assembly Complex are planned by the end of 2012 which result in a net reduction of 64,369,000 kWh, to support Ford's 5-year 25% energy reduction goal:
  - Booth Size Optimization
  - Spray Booth Idle Mode Design
  - Enthalpy Based Air Supply House Controls
  - Departmental Metering
  - Paint Compressor Controls
- Investment costs for all the energy reduction actions listed above total \$650,000.

\*NOTE: All electricity and natural gas reductions identified above were combined into one unit of measure (kWh).



### 7.2.3 Peak Shave Generators

Ford occasionally operates four diesel-fired peak shave generators to produce electricity when requested as part of the (Demand Response) DR3 program to decrease electrical consumption from the grid. Worst-case conditions for peak shave operation for this study assume 200 hours of operation over the course of a year. This worst-case condition is most likely to occur for only 15 minutes per week during the heating season. Modeling in accordance to the requirements of the By-law and as discussed in the Evaluation section (**Section 4**) of this report indicate emissions from the peak shave generators contribute as a source of FPM under the maximum operating scenario from the Oakville Assembly Complex. As part of the FPM reduction plan, the Oakville Assembly Complex plans to retrofit the four existing peak shave generators with air pollution control equipment that will reduce emissions from the generators as follows:

- NO<sub>x</sub> emissions - 95% reduction
- FPM emissions - 80% reduction
- Reduce noise level to <90 decibels

These actions are planned for implementation by 2015 with investment costs estimated at approximately \$2 million dollars.

## 8 ADDITIONAL INFORMATION

In 2004, the former Ontario Truck Plant was closed and in 2006 the site was reconfigured as a single flexible manufacturing complex, building cross-over utility vehicles for North American and global customers. The largest of the two paints shops was decommissioned in 2010 and the removal of the structure has been completed, reducing maximum emission rates for VOCs, NOx and PM by 55%, 33%, and 23% respectively. The remaining paint shop has been refurbished and upgraded.

In 2007, Ford and its supplier reformulated its paints to reduce Hazardous Air Pollutants (HAPs) to levels recognized by the U.S. EPA as the maximum achievable control.

From 2002 to 2010, Ford has reduced its VOCs emissions per vehicle by 57% at the Oakville Assembly Complex, with the most significant reductions occurring from 2007 to 2010.

From 2007 to 2010, Ford has reduced its natural gas consumption by over 35%.

Also, as part of the company's initiative to achieve a 25% energy reduction over the next five years, employees at Oakville Assembly Complex recently completed a significant improvement in four zones within two paint booths at the facility. Two zones were decommissioned and the remaining two were converted into inspection zones for operators along each spray booth.

To accomplish this, two 250 hp exhaust fans were shut off in the decommissioned zones and the volume of air pushed into the corresponding six air supply houses was reduced. A total of 170,000 cubic feet of conditioned air per minute – a measure of the volume of air supplied to the spray booths – are saved with the implemented changes. These improvements have positive environmental impacts as they result in an estimated reduction of 1,557,000 m<sup>3</sup> (55,000 MMft<sup>3</sup>) of natural gas consumption and 4,700,000 KWh less energy to filter and heat the air supplied to these zones.

Additional information can be found on the Oakville Assembly Complex FPM Presentation accompanying this application.

**TABLE 3-1**  
**NATURAL GAS CONSUMPTION (10<sup>6</sup> CUBIC METRE) BY MONTH AND YEAR**  
**FORD - OAKVILLE ASSEMBLY COMPLEX**

<b>Month/Year</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>Maximum for Month</b>
Jan	5.9	6.3	6.9	7.4	7.4
Feb	6.6	3.8	5.7	6.2	6.6
Mar	6.2	4.6	4.5	5.6	6.2
Apr	4.1	3.5	2.9	3.8	4.1
May	3.1	2.0	2.0	2.4	3.1
Jun	1.5	1.4	1.4	1.4	1.5
Jul	0.8	1.3	0.9	0.9	1.3
Aug	1.2	0.7	1.0	1.3	1.3
Sep	1.5	1.5	1.7	1.5	1.7
Oct	3.3	3.1	2.7	2.9	3.3
Nov	4.2	3.9	3.6	4.0	4.2
Dec	4.9	5.6	6.9	4.9	6.9
Total	43.3	37.8	40.2	42.2	47.5
Average	40.9				

**TABLE 3-2  
FPM AND NO<sub>x</sub> ANNUALIZED EMISSION RATES BY NG COMBUSTION SOURCE - MAXIMAL AND AVERAGE EMISISSONS SCENARIOS  
FORD - OAKVILLE ASSEMBLY COMPLEX**

NG Combustion Source	Maximum Heating Capacity	Maximum Hourly Natural Gas Use <sup>1</sup>	AP-42 Maximum FPM Emission Rate <sup>2</sup>	AP-42 Maximum NO <sub>x</sub> Emission Rate <sup>3</sup>	AP-42 Average FPM Emission Rate <sup>4</sup>	AP-42 Average NO <sub>x</sub> Emission Rate <sup>5</sup>
	(MMBTU/Hour)	(MMCF/hr)	(g/sec)	(g/sec)	(g/sec)	(g/sec)
OAC Body 2 HVAC	72.6	1.30E-02	8.11E-03	1.07E-01	6.99E-03	9.19E-02
OAC Paint 1 HVAC	88.3	1.58E-02	9.87E-03	1.30E-01	8.50E-03	1.12E-01
OAC Body 1 HVAC	118.6	2.13E-02	1.33E-02	1.75E-01	1.14E-02	1.50E-01
Phosphate Boilers (2)	21.0	3.77E-03	2.35E-03	3.09E-02	2.02E-03	2.66E-02
E-Coat Oven	35.0	6.28E-03	3.92E-03	5.15E-02	3.37E-03	4.44E-02
E-Coat Scuff	12.6	2.26E-03	1.41E-03	1.86E-02	1.21E-03	1.60E-02
Sealer Booth	23.8	4.27E-03	2.66E-03	3.50E-02	2.29E-03	3.02E-02
Sealer Gel Oven	9.3	1.67E-03	1.04E-03	1.37E-02	8.96E-04	1.18E-02
Prime Booth	35.4	6.35E-03	3.96E-03	5.21E-02	3.41E-03	4.49E-02
Prime Oven	24.5	4.40E-03	2.74E-03	3.61E-02	2.36E-03	3.11E-02
Prime Scuff	12.6	2.26E-03	1.41E-03	1.86E-02	1.21E-03	1.60E-02
Topcoat #1 Booth	94.9	1.70E-02	1.06E-02	1.40E-01	9.13E-03	1.20E-01
Topcoat #1 Oven	22.0	3.95E-03	2.46E-03	3.24E-02	2.12E-03	2.79E-02
Topcoat #2 Booth	94.9	1.70E-02	1.06E-02	1.40E-01	9.13E-03	1.20E-01
Topcoat #2 Oven	22.0	3.95E-03	2.46E-03	3.24E-02	2.12E-03	2.79E-02
Spot Repair	17.4	3.12E-03	1.95E-03	2.56E-02	1.68E-03	2.21E-02
Topcoat Scuff	25.1	4.50E-03	2.81E-03	3.70E-02	2.42E-03	3.18E-02
RTO	24.0	4.31E-03	2.69E-03	3.53E-02	2.31E-03	3.04E-02
Metal Repair Booth	9.0	1.62E-03	1.01E-03	1.33E-02	8.67E-04	1.14E-02
Blackout/Wax Booth	17.4	3.12E-03	1.95E-03	2.56E-02	1.68E-03	2.21E-02
Foam Booth	26.8	4.81E-03	3.00E-03	3.95E-02	2.58E-03	3.40E-02
Paint Circ. Boiler	4.0	7.18E-04	4.48E-04	5.89E-03	3.85E-04	5.07E-03
OAC Final Assembly Bldg. HVAC	271.7	4.87E-02	3.04E-02	4.00E-01	2.62E-02	3.44E-01
Central Office CHQ Bldg. HVAC	11.7	2.10E-03	1.31E-03	1.72E-02	1.13E-03	1.48E-02
Total		1.96E-01	1.22E-01	1.61E+00	1.05E-01	1.39E+00

**Notes:**

- 1 Based on NG heat content of 1050 BTU per SCF, and maximum annual NG consumption for 2008-2011 of 47.5 m<sup>3</sup> compared to 168.3 m<sup>3</sup> potential emissions.
- 2 AP-42 PM emission rate from NG combustion of 7.6 lb/MMSCF NG (Emission Factor Rating D), all PM assumed to be FPM, annualized based on 5700 hours operation per year.
- 3 AP-42 NO<sub>x</sub> emission rate from NG combustion of 100 lb/MMSCF NG (Emission Factor Rating B), annualized based on 5700 hours operation per year.
- 4 By ratio of Average:Maximum NG consumption for 2008-2011 of 40.9:47.5 or 0.86 .
- 5 By ratio of Average:Maximum NG consumption for 2008-2011 of 40.9:47.5 or 0.86 .
6. Several SCC codes apply to operations: 1-05-001-06, 1-02-006-03, 4-02-900-013, 4-02-010-01 & 1-05-001-06.

**TABLE 3-3**  
**FPM AND NO<sub>x</sub> ANNUALIZED EMISSION RATES FOR PEAKING UNITS - MAXIMAL AND AVERAGE EMISIONS SCENARIOS**  
**FORD - OAKVILLE ASSEMBLY COMPLEX**

Diesel-Fired Combustion Source	Maximum Heating Capacity	Maximum Annual Heating Capacity <sup>1</sup>	AP-42 Maximum FPM Emission Rate <sup>2</sup>	AP-42 Maximum NOx Emission Rate <sup>3</sup>	AP-42 Average FPM Emission Rate <sup>4</sup>	AP-42 Average NOx Emission Rate <sup>5</sup>
	(MMBTU/Hour)	(MMBTU/Year)	(g/sec)	(g/sec)	(g/sec)	(g/sec)
Peaking Unit #1	6.8	1,360	1.96E-03	3.72E-02	4.60E-04	8.73E-03
Peaking Unit #2	6.8	1,360	1.96E-03	3.72E-02	4.60E-04	8.73E-03
Peaking Unit #3	6.8	1,360	1.96E-03	3.72E-02	4.60E-04	8.73E-03
Peaking Unit #4	6.8	1,360	1.96E-03	3.72E-02	4.60E-04	8.73E-03
Total	27.2	5,440	7.84E-03	1.49E-01	1.84E-03	3.49E-02

**Notes:**

- 1 Based on 200 hours peaking unit operation per year, diesel heat content of 1050 BTU per SCF.potential emissions.
- 2 AP-42 PM emission rate from peaking units of 0.1 lb/MMBTU diesel fuel (Emission Factor Rating B), all PM assumed to be FPM.
- 3 AP-42 NOx emission rate from peaking of 1.9 lb/MMBTU diesel fuel (Emission Factor Rating B).
- 4 AP-42 PM emission rate from peaking units of 0.1 lb/MMBTU diesel fuel (Emission Factor Rating B), all PM assumed to be FPM, prorated for 47 hours operation.
- 5 AP-42 NOx emission rate from peaking of 1.9 lb/MMBTU diesel fuel (Emission Factor Rating B), prorated for 47 hours operation.
6. The SCC code for the diesel fired peak saving generators is 2-02-001-02.

**TABLE 3-4**  
**FPM ANNUALIZED EMISSION RATES FOR PAINTING - MAXIMAL AND AVERAGE EMISISONS SCENARIOS**  
**FORD - OAKVILLE ASSEMBLY COMPLEX**

Source	Exhaust Volume	PM <sub>10</sub> Emissions <sup>1 2</sup>	Maximum FPM Emission Rate <sup>3</sup>	Average FPM Emission Rate <sup>4</sup>
	(m3/sec)	(g/sec)	(g/sec)	(g/sec)
Tall Stack - Prime, Topcoat #1 & # 2 Booths	1071.8	0.230	1.11E-02	4.21E-03
E-Coat Scuff	28.3	0.024	1.11E-02	4.21E-03
Prime Scuff	31.0	0.024	1.11E-02	4.21E-03
Topcoat Scuff	34.0	0.024	1.07E-01	4.08E-02

**Notes:**

- 1 Control Factor and Emission Factor: Ford Motor Company. Environmental Quality Office, Dearborn Truck Scuff Booth test results. 1999
- 2 Based on 95 jobs per hour, 5700 hours of operation, adjusted for Oakville air flow rates.
- 3 PM<sub>10</sub> is 46.7% FPM from Ford studies.
- 4 Average FPM emission rates are based on the ratio of the maximum number of paint jobs that may be conducted per year (95 jobs per hour, 5700 hours per year) and the average actual production during the period 2008 to 2011, which produces a factor of 0.38.

**TABLE 4-1  
STACK LOCATION AND EXHAUST PARAMETERS  
FORD - OAKVILLE ASSEMBLY COMPLEX**

Stack Description	Stack ID	Stack Coordinate (UTM)		Stack Height		Stack Diameter		Exit Gas Temperature		Exhaust Flow Rate (acfm)	Exit Velocity (m/s)
		Easting	Northing	(ft)	(m)	(in)	(m)	(F)	(K)		
OTC Tall Stack	OACTS	608162.6	4815726.3	345.0	105.2	252.0	6.40	68	293	1,391,230	20.410
OAC RTO	OACRTO	608046.9	4815817.8	65.6	20.0	98.0	2.49	421	489	140,428	13.610
OAC Foam/Urethane	OACFOAM	608206.4	4815556.0	81.0	24.7	53.9	1.37	68	293	41,636	13.330
OAC Paint Bldg	OACPNT	608109.9	4815651.7	64.0	19.5	11.8	0.30	500	533	580	3.870
OAC Final Assembly	OACFNL	607679.8	4815307.4	36.4	11.1	11.8	0.30	500	533	580	3.870
OAC Body 2	OACBDY2	607984.5	4815271.9	63.3	19.3	11.8	0.30	500	533	580	3.870
OAC Body 1	OACBDY1	607788.9	4815917.3	53.5	16.3	11.8	0.30	500	533	580	3.870
Canadian HQ	CHQ	607462.7	4816193.9	62.3	19.0	11.8	0.30	500	533	580	3.870
OAC E-coat Scuff	ESCUFF	607962.4	4815767.3	53.5	16.3	68.1	1.73	68	293	59,170	11.880
OAC Prime Scuff	PSCUFF	607995.5	4815737.1	53.5	16.3	66.1	1.68	68	293	59,275	12.620
OAC Topcoat scuff	TSCUFF	608027.7	4815709.0	53.5	16.3	66.1	1.68	68	293	59,275	12.620
OAC Glass Install	OACGLASS	607650.7	4815549.4	33.5	10.2	20.1	0.51	68	293	5,393	12.460
Peaking unit 1	PEAK1	607944.7	4814918.0	24.5	7.5	11.4	0.29	480	522	1,595	11.400
Peaking unit 2	PEAK2	607949.3	4814923.6	24.5	7.5	11.4	0.29	480	522	1,595	11.400
Peaking unit 3	PEAK3	607953.1	4814928.8	24.5	7.5	11.4	0.29	480	522	1,595	11.400
Peaking unit 4	PEAK4	607957.0	4814933.8	24.5	7.5	11.4	0.29	480	522	1,595	11.400

**TABLE 4-2  
MODELED EMISSION RATES - MAXIMAL AND AVERAGE EMISSIONS SCENARIOS  
FORD - OAKVILLE ASSEMBLY COMPLEX**

**Maximal Emissions Scenario**

Stack Description	Stack ID	FPM		NOx		Toluene <sup>1</sup>		Xylene <sup>1</sup>	
		(lbs/yr)	(g/s)	(lbs/yr)	(g/s)	(lbs/yr)	(g/s)	(lbs/yr)	(g/s)
OTC Tall Stack <sup>2</sup>	OACTS	6,603	9.50E-02	23,034	3.31E-01	37,846	5.44E-01	508,777	7.32E+00
OAC RTO <sup>3</sup>	OACRTO	1,064	1.53E-02	14,004	2.01E-01	378	5.44E-03	2,377	3.42E-02
OAC Foam/Urethane	OACFOAM	209	3.00E-03	2,744	3.95E-02	0	0.00E+00	0	0.00E+00
OAC Paint Bldg <sup>4</sup>	OACPNT	1,407	2.02E-02	18,507	2.66E-01	0	0.00E+00	0	0.00E+00
OAC Final Assembly	OACFNL	2,112	3.04E-02	27,793	4.00E-01	100	1.44E-03	698	1.00E-02
OAC Body 2	OACBDY2	564	8.11E-03	7,422	1.07E-01	0	0.00E+00	0	0.00E+00
OAC Body 1	OACBDY1	922	1.33E-02	12,134	1.75E-01	0	0.00E+00	0	0.00E+00
Canadian HQ	CHQ	91	1.31E-03	1,197	1.72E-02	0	0.00E+00	0	0.00E+00
OAC E-coat Scuff	ESCUFF	600	8.63E-03	1,290	1.86E-02	0	0.00E+00	0	0.00E+00
OAC Prime Scuff	PSCUFF	600	8.63E-03	1,290	1.86E-02	0	0.00E+00	0	0.00E+00
OAC Topcoat Scuff	TSCUFF	697	1.00E-02	2,570	3.70E-02	0	0.00E+00	0	0.00E+00
OAC Glass Install	OACGLASS	0	0.00E+00	0	0.00E+00	549,688	7.91E+00	0	0.00E+00
Peaking unit 1	PEAK1	136	1.96E-03	2,584	3.72E-02	0	0.00E+00	0	0.00E+00
Peaking unit 2	PEAK2	136	1.96E-03	2,584	3.72E-02	0	0.00E+00	0	0.00E+00
Peaking unit 3	PEAK3	136	1.96E-03	2,584	3.72E-02	0	0.00E+00	0	0.00E+00
Peaking unit 4	PEAK4	136	1.96E-03	2,584	3.72E-02	0	0.00E+00	0	0.00E+00

**Average Emissions Scenario**

Stack Description	Stack ID	FPM		NOx		Toluene		Xylene	
		(lbs/yr)	(g/s)	(lbs/yr)	(g/s)	(lbs/yr)	(g/s)	(lbs/yr)	(g/s)
OTC Tall Stack <sup>2</sup>	OACTS	1,366	1.96E-02	11,970	1.72E-01	14,382	2.07E-01	193,335	2.78E+00
OAC RTO <sup>3</sup>	OACRTO	916	1.32E-02	12,058	1.73E-01	144	2.07E-03	903	1.30E-02
OAC Foam/Urethane	OACFOAM	180	2.58E-03	2,362	3.40E-02	0	0.00E+00	0	0.00E+00
OAC Paint Bldg <sup>4</sup>	OACPNT	1,211	1.74E-02	15,935	2.29E-01	0	0.00E+00	0	0.00E+00
OAC Final Assembly	OACFNL	1,819	2.62E-02	23,930	3.44E-01	38	5.48E-04	265	3.82E-03
OAC Body 2	OACBDY2	486	6.99E-03	6,391	9.19E-02	0	0.00E+00	0	0.00E+00
OAC Body 1	OACBDY1	794	1.14E-02	10,447	1.50E-01	0	0.00E+00	0	0.00E+00
Canadian HQ	CHQ	78	1.13E-03	1,030	1.48E-02	0	0.00E+00	0	0.00E+00
OAC E-coat Scuff	ESCUFF	132	1.89E-03	1,111	1.60E-02	0	0.00E+00	0	0.00E+00
OAC Prime Scuff	PSCUFF	132	1.89E-03	1,111	1.60E-02	0	0.00E+00	0	0.00E+00
OAC Topcoat Scuff	TSCUFF	215	3.10E-03	2,212	3.18E-02	0	0.00E+00	0	0.00E+00
OAC Glass Install	OACGLASS	0	0.00E+00	0	0.00E+00	208,882	3.00E+00	0	0.00E+00
Peaking unit 1	PEAK1	32	4.60E-04	607	8.73E-03	0	0.00E+00	0	0.00E+00
Peaking unit 2	PEAK2	32	4.60E-04	607	8.73E-03	0	0.00E+00	0	0.00E+00
Peaking unit 3	PEAK3	32	4.60E-04	607	8.73E-03	0	0.00E+00	0	0.00E+00
Peaking unit 4	PEAK4	32	4.60E-04	607	8.73E-03	0	0.00E+00	0	0.00E+00

**Notes:**

1. Most recently reported toluene and xylene emissions from the MOE ESDM submittal, Table D-4.
2. Processes: Prime Booth, Topcoat #1 Booth, Topcoat #2 Booth.
3. Processes: E-Coat Oven, Sealer Gel Oven, Prime Oven, Topcoat #1 Oven, Topcoat #2 Oven, RTO Combustion.
4. Processes: OAC Paint HVAC, Phosphate Boilers (2), Sealer Booth, Spot Repair, Metal Repair Booth, Blackout/Wax Booth, Paint Circ.Boiler.
5. There are several SCC codes associated with operations: 4-02-016-02, 4-02-016-01, 4-02-016-19, 4-02-016-06, 4-02-016-07 & 4-02-016-05.



**TABLE 4-3  
TOTAL FACILITY INDUCED AND CUMULATIVE CONCENTRATION ASSESSMENT  
FORD - OAKVILLE ASSEMBLY COMPLEX**

Year	Average Emissions Scenario (detail)				Average Emissions Scenario			Maximal Emissions Scenario			Affected Airshed Threshold (ug/m3)
	Maximum Direct FPM Concentration (ug/m3)	Maximum FPM Concentration Plus Background (ug/m3)	Maximum Inorganic Precursor FPM (NH <sub>4</sub> NO <sub>3</sub> ) (ug/m3)	Secondary Organics Aerosols Concentration (ug/m3)	Total Facility Induced Concentration (ug/m3)	Background Concentration (ug/m3)	Cumulative Concentration (ug/m3)	Total Facility Induced Concentration (ug/m3)	Background Concentration (ug/m3)	Cumulative Concentration (ug/m3)	
2004	2.48E-01	8.39E+00	9.38E-03	3.77E-05	0.25	8.1	8.4	0.30	8.1	8.4	0.2
2005	3.03E-01	8.76E+00	1.15E-02	5.53E-05	0.31	8.5	8.8	0.37	8.5	8.8	
2006	2.52E-01	8.01E+00	9.61E-03	4.43E-05	0.26	7.8	8.0	0.31	7.8	8.1	
2007	2.12E-01	6.74E+00	9.30E-03	5.22E-05	0.21	6.5	6.7	0.28	6.5	6.8	
2008	2.35E-01	6.45E+00	9.52E-03	4.42E-05	0.24	6.2	6.5	0.29	6.2	6.5	

**Notes:**

1. Background concentration is equivalent to the annual average PM2.5 concentration measured at the NE Oakville monitor (Station No. 44017), as provided by the Ministry of the Environment.
2. Affected Airshed Threshold of 0.2 ug/m3 provided by the Town of Oakville.
3. 3rd Rank (median) concentration.
4. Highest concentration.

**TABLE 4-4**  
**TOTAL FACILITY INDUCED CONCENTRATION ASSESSMENT**  
**ON-SITE DAYCARE CENTER**  
**FORD - OAKVILLE ASSEMBLY COMPLEX**

Year	Maximal Emissions Scenario		Average Emissions Scenario	
	FPM (ug/m3)	NH <sub>4</sub> NO <sub>3</sub> (ug/m3)	FPM (ug/m3)	NH <sub>4</sub> NO <sub>3</sub> (ug/m3)
2004	0.098	0.0021	0.077	0.0034
2005	0.097	0.0019	0.075	0.0030
2006	0.073	0.0019	0.057	0.0033
2007	0.092	0.0017	0.072	0.0028
2008	0.087	0.0019	0.069	0.0026

**Notes:**

1. CALPUFF-predicted impacts at the on-site day care center (UTM location: 607608, 4816226).

**TABLE 6-1  
HEALTH RISK ASSESSMENT  
FORD - OAKVILLE ASSEMBLY COMPLEX**

***Total Facility Induced Concentration***

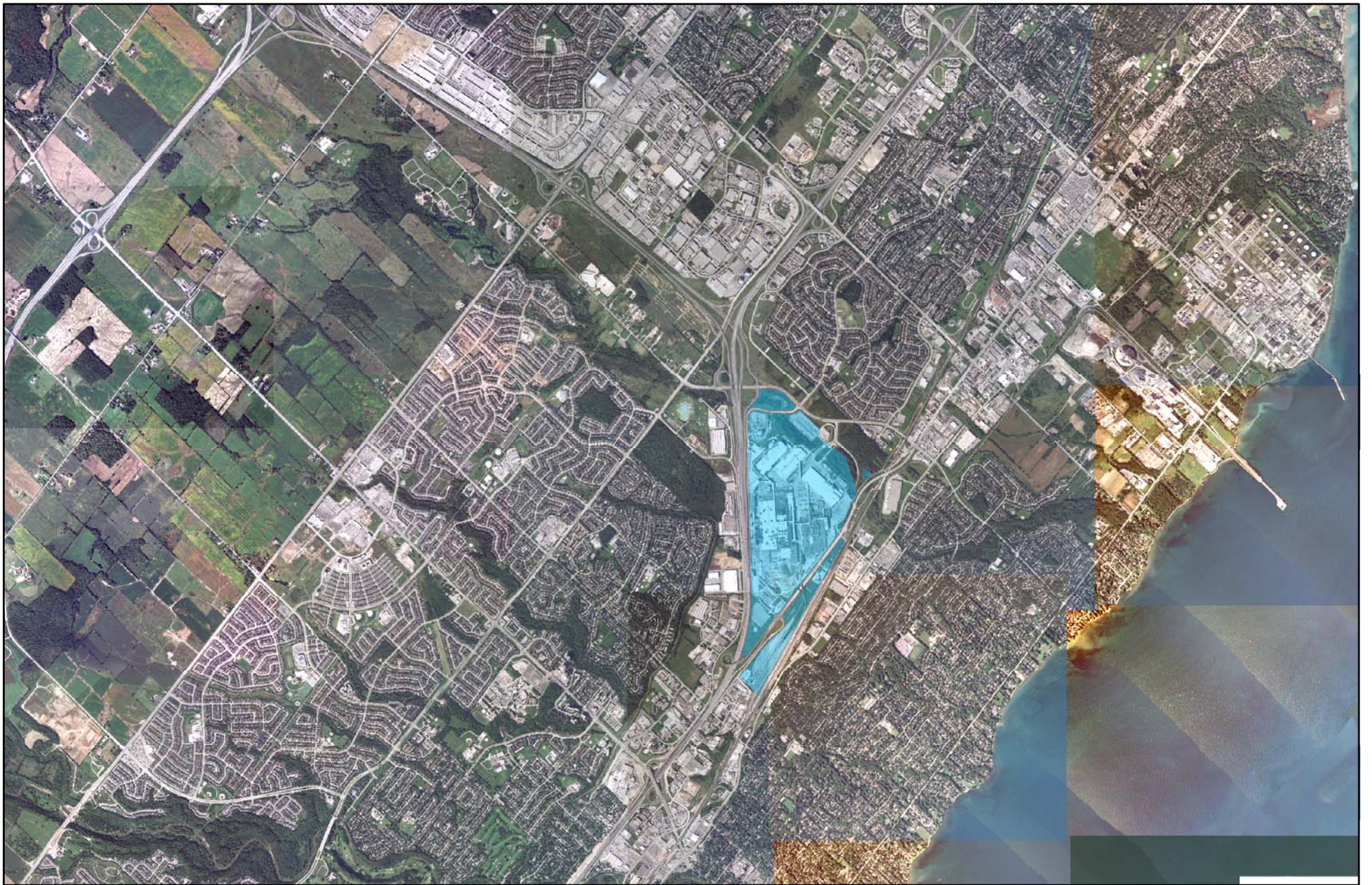
Emission Scenario	Year	Rank	Town-Provided Factors		Total Facility Induced Concentration (ug/m3)	Risk within the Affected Airshed (per 100,000)
			Background NT Mortality Rate (per 100,000)	Risk Increase per ug/m3 (%)		
			Maximal	2005		
Average	2004	Median			0.25	1.2

***Cumulative Concentration***

Emission Scenario	Year	Rank	Town-Provided Factors		Cumulative Concentration (ug/m3)	Risk within the Affected Airshed (per 100,000)
			Background NT Mortality Rate (per 100,000)	Risk Increase per ug/m3 (%)		
			Maximal	2005		
Average	2006	Median			8.0	38.1

**Notes:**

1. Numeric procedure conducted in accordance with Section 3.4.1 of the Guidance for Implementation of Oakville Health Protection Air Quality By-Law 2010-035, V.5 June 2011.
2. According to the Oakville Health Protection Air Quality By-Law Guidance, the annual non-traumatic mortality base rate for Oakville is 432 deaths per 100,000 people.
3. Risk increase factor based on the Illness Cost of Air Pollution (ICAP), Version 3.0 model risk ratio.
4. The frequency with which emissions within 90% of the worst-case emissions levels will occur is estimated to be one day per week, for fifteen minutes, during the heating season.



Ford Oakville Assembly Plant

Figure 2-1  
Location of the  
Ford Oakville Assembly Plant

**H**ORIZON ENVIRONMENTAL

1,000 500 0 1,000 2,000 Meters



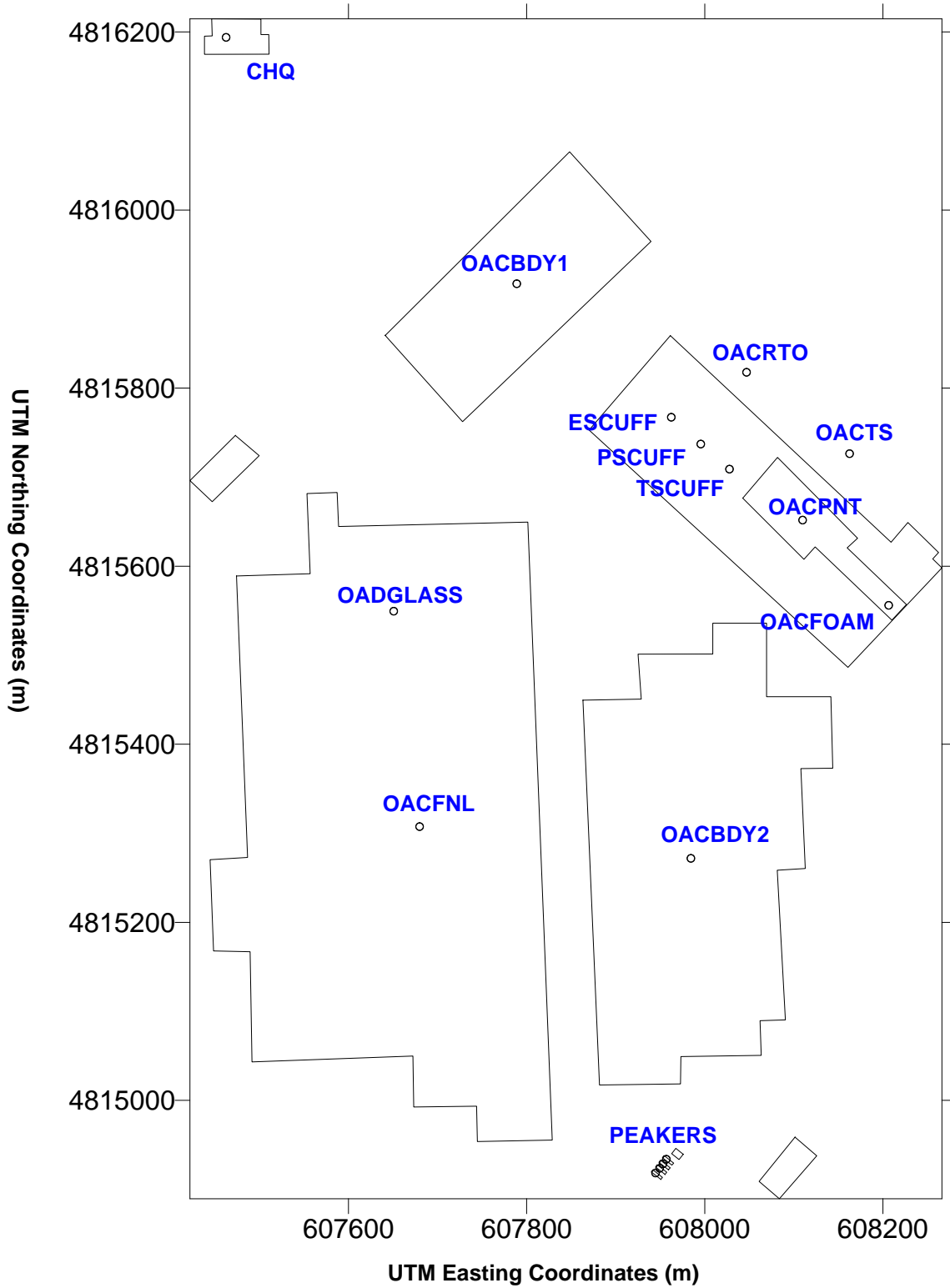
- Child Care Centers
- Medical Centers
- Schools

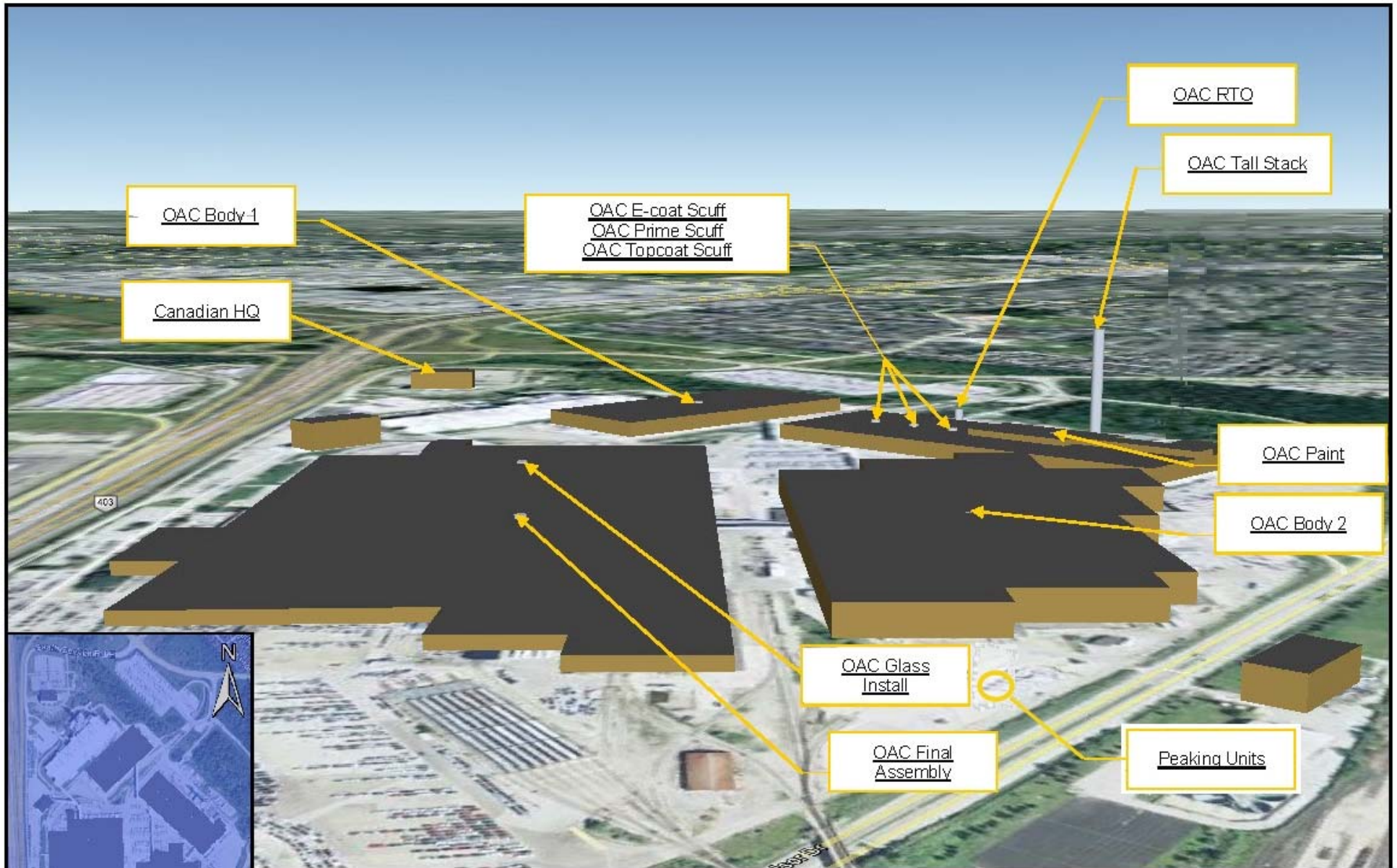
**Figure 3-1**  
**Land Use and Sensitive Receptors**  
**Within a Three Kilometer Radius of the**  
**Oakville Assembly Plant**





**Figure 3-2**  
**Planar View of Building Projections in Relation to Emission Points**  
**Ford Oakville Assembly Plant**

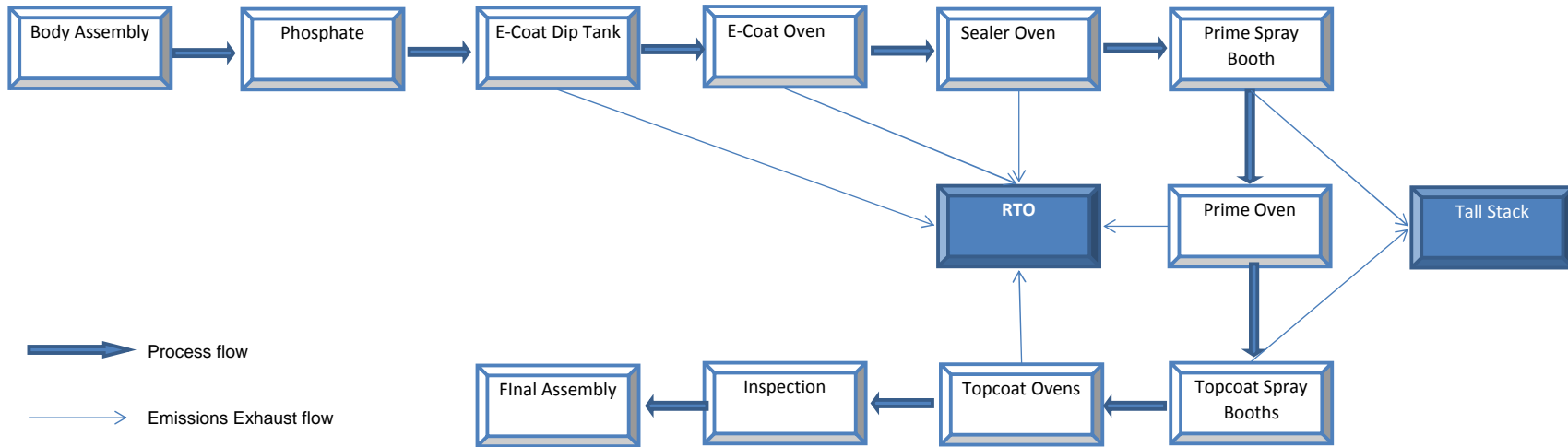




**Figure 3-3**  
**3-D Depiction of Building Projections**  
**in Relation to Emission Points**  
**Ford Oakville Assembly Plant**

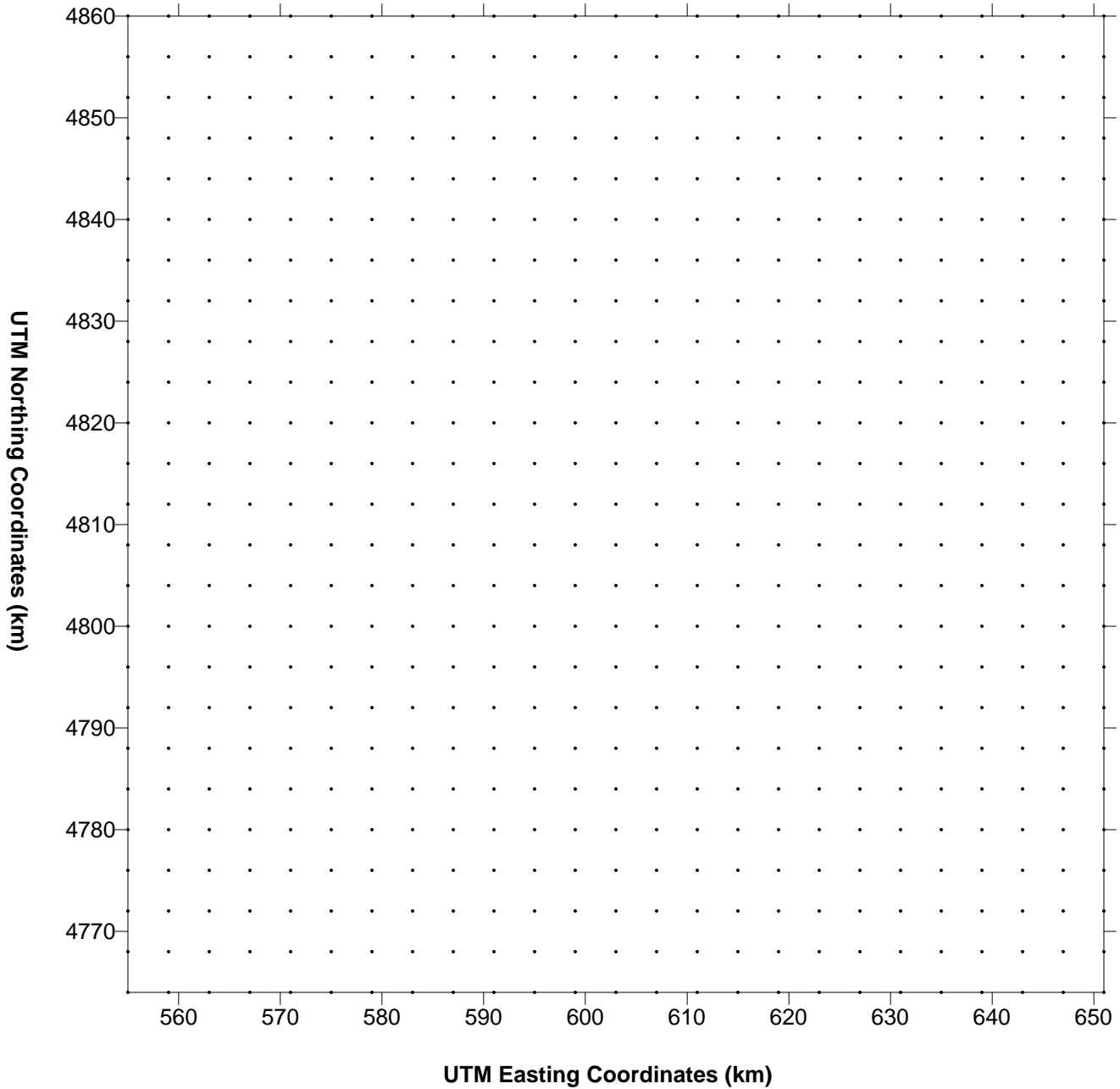
September 2012

**Figure 3-4**  
**Process Flow Diagram - Vehicle Body Painting**

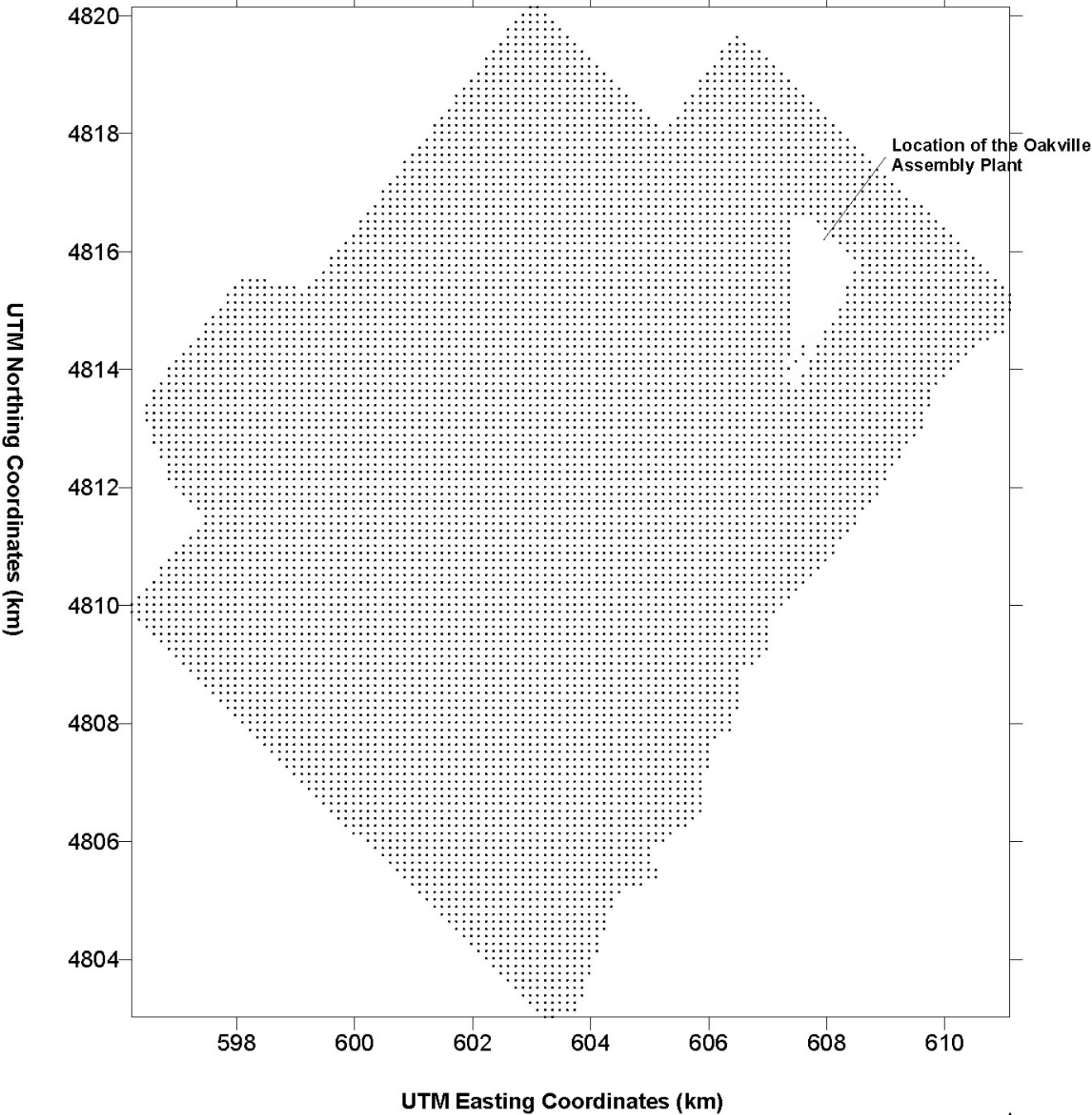


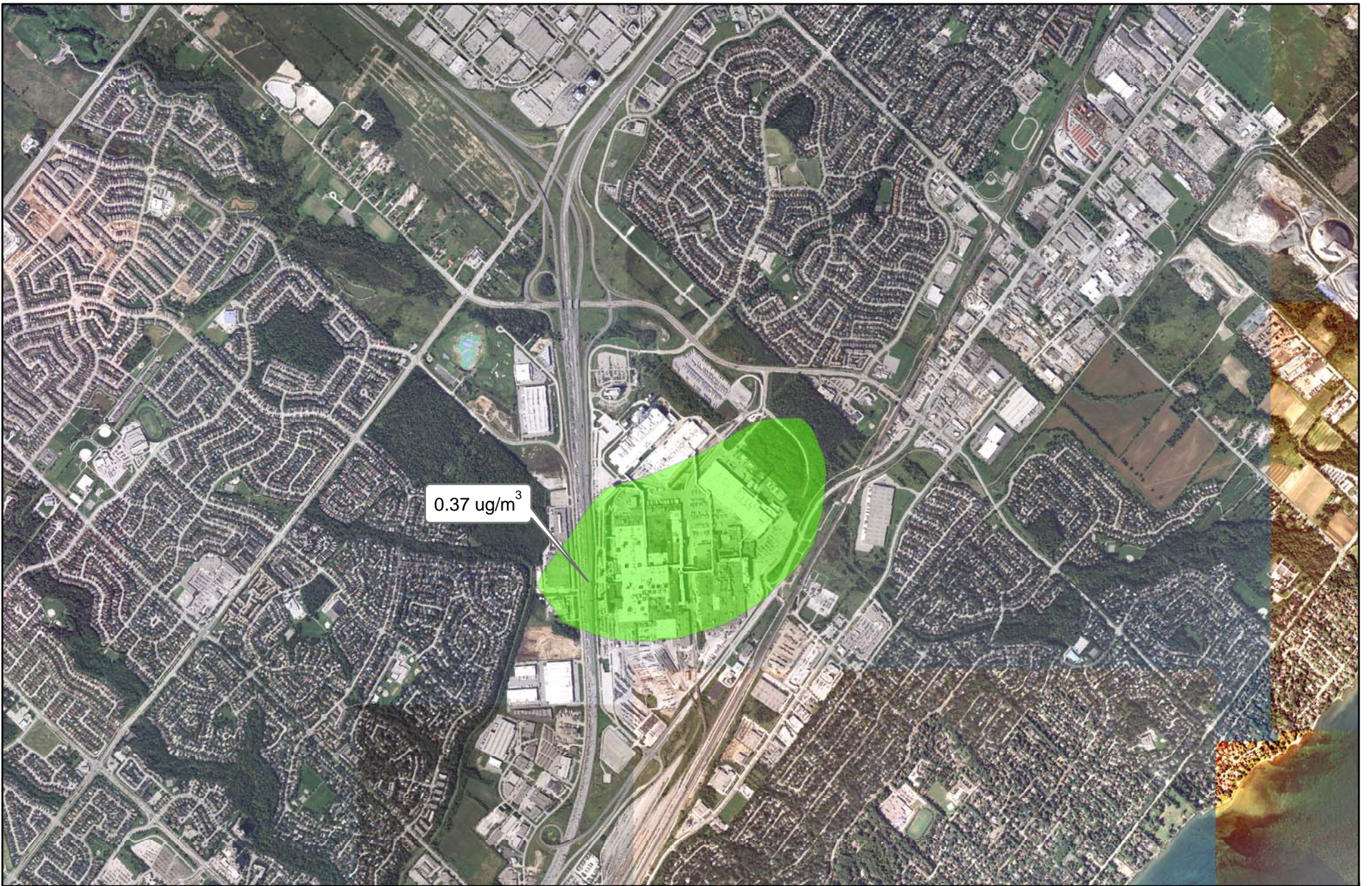


**Figure 4-1**  
**Cartesian Receptor Points Associated with the**  
**100 by 100 Kilometer CAMET Meteorological Grid**  
**Ford Oakville Assembly Plant**



**Figure 4-2**  
**Fine Resolution Receptor Points within the Town of Oakville**  
**Ford Oakville Assembly Plant**

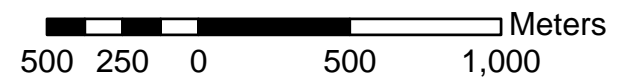




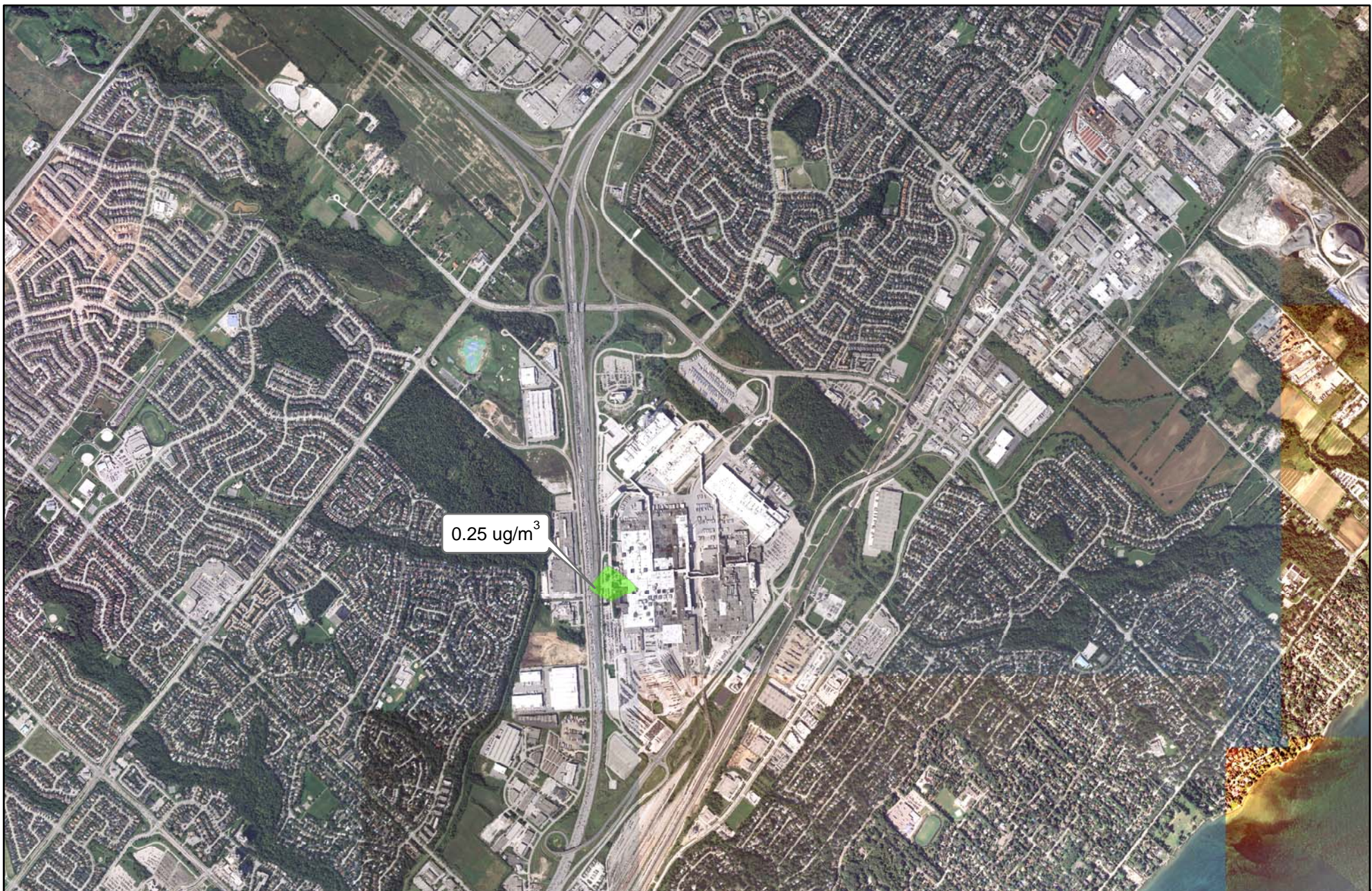
0.37 ug/m<sup>3</sup>

Figure 5-1  
 Total Facility Induced FPM Concentrations  
 Maximal Emissions Scenario  
 Ford Oakville Assembly Plant

HORIZON ENVIRONMENTAL



PM25 FPM Maximal  
 >0.2 ug/m<sup>3</sup>



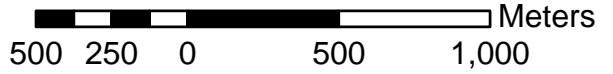
0.25 ug/m<sup>3</sup>

Figure 5-2  
 Total Facility Induced FPM Concentrations  
 Average Emissions Scenario  
 Ford Oakville Assembly Plant



PM25 FPM Average  
 >0.2 ug/m<sup>3</sup>

HORIZON ENVIRONMENTAL



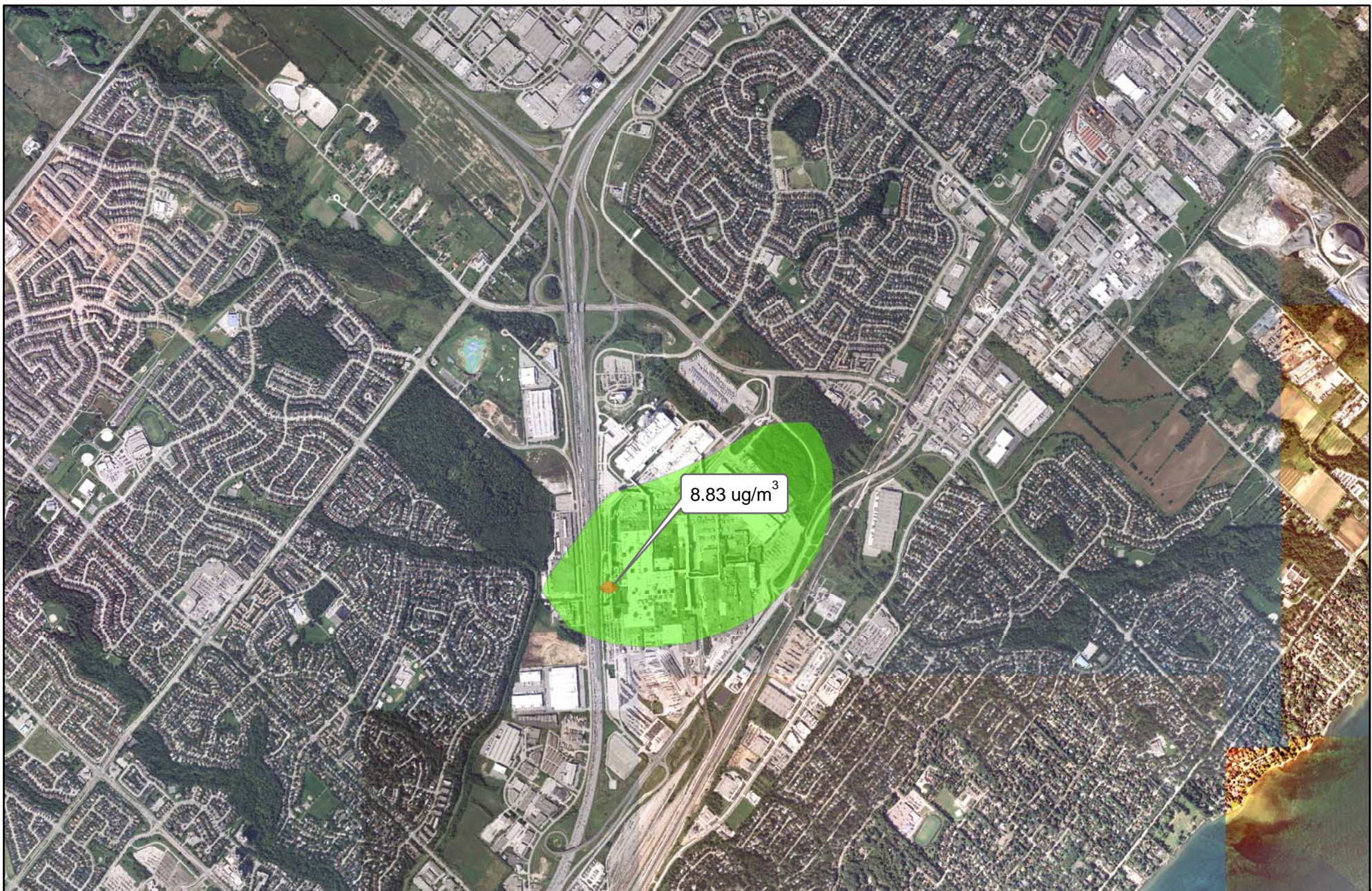
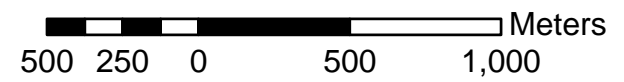
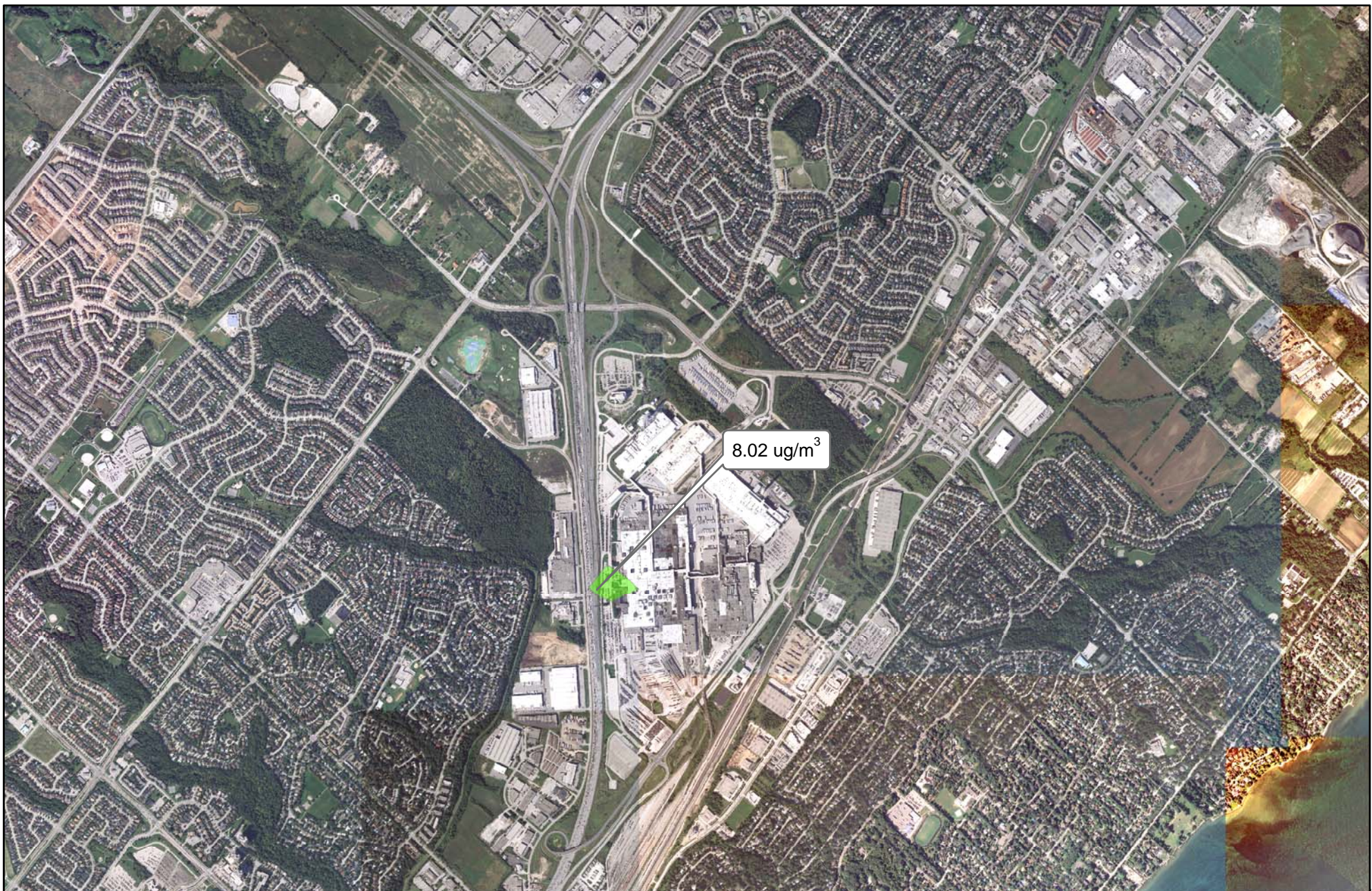


Figure 5-3  
 Cumulative FPM Concentration (Facility + Background)  
 Maximal Emissions Scenario  
 Ford Oakville Assembly Plant

HORIZON ENVIRONMENTAL

PM25 Cumulative Maximal  
 >8.8 ug/m<sup>3</sup>  
 8.6 to 8.8 ug/m<sup>3</sup>





8.02 ug/m<sup>3</sup>



PM25 Cumulative Average  
7.8 to 8.0 ug/m<sup>3</sup>

Figure 5-4  
Cumulative FPM Concentration (Facility + Background)  
PM2.5 - Average Emissions Scenario  
Ford Oakville Assembly Plant

HORIZON ENVIRONMENTAL

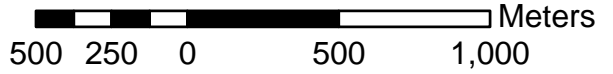




Figure 6-1  
Total Facility Induced Risk Map  
Maximal Emissions Scenario  
Ford Oakville Assembly Plant



**TFI Risk Map Maximal Interval**  
1 per 100,000

**HORIZON ENVIRONMENTAL**

500 250 0 500 1,000 Meters

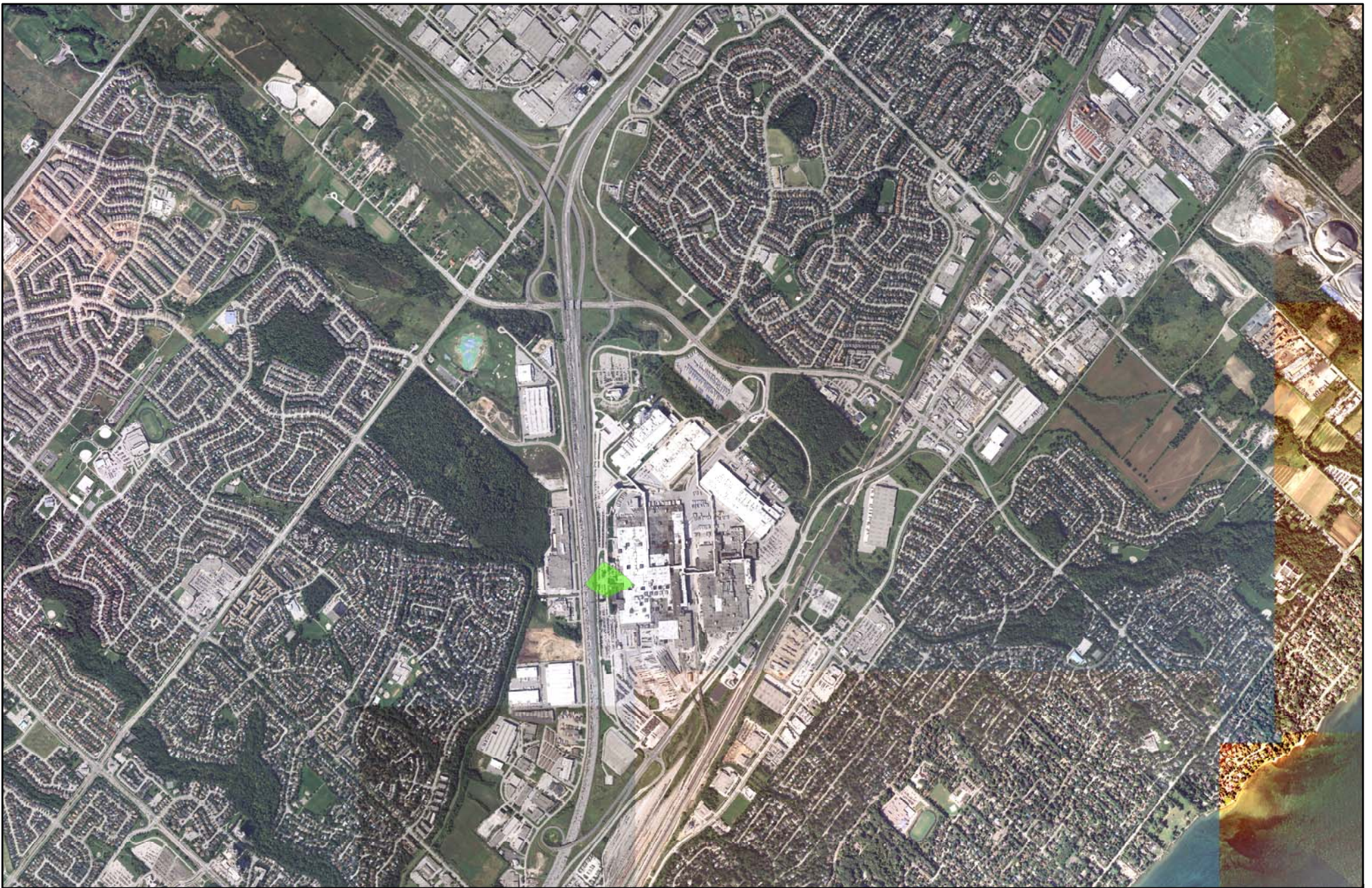


Figure 6-2  
 Total Facility Induced Risk Map  
 Average Emissions Scenario  
 Ford Oakville Assembly Plant

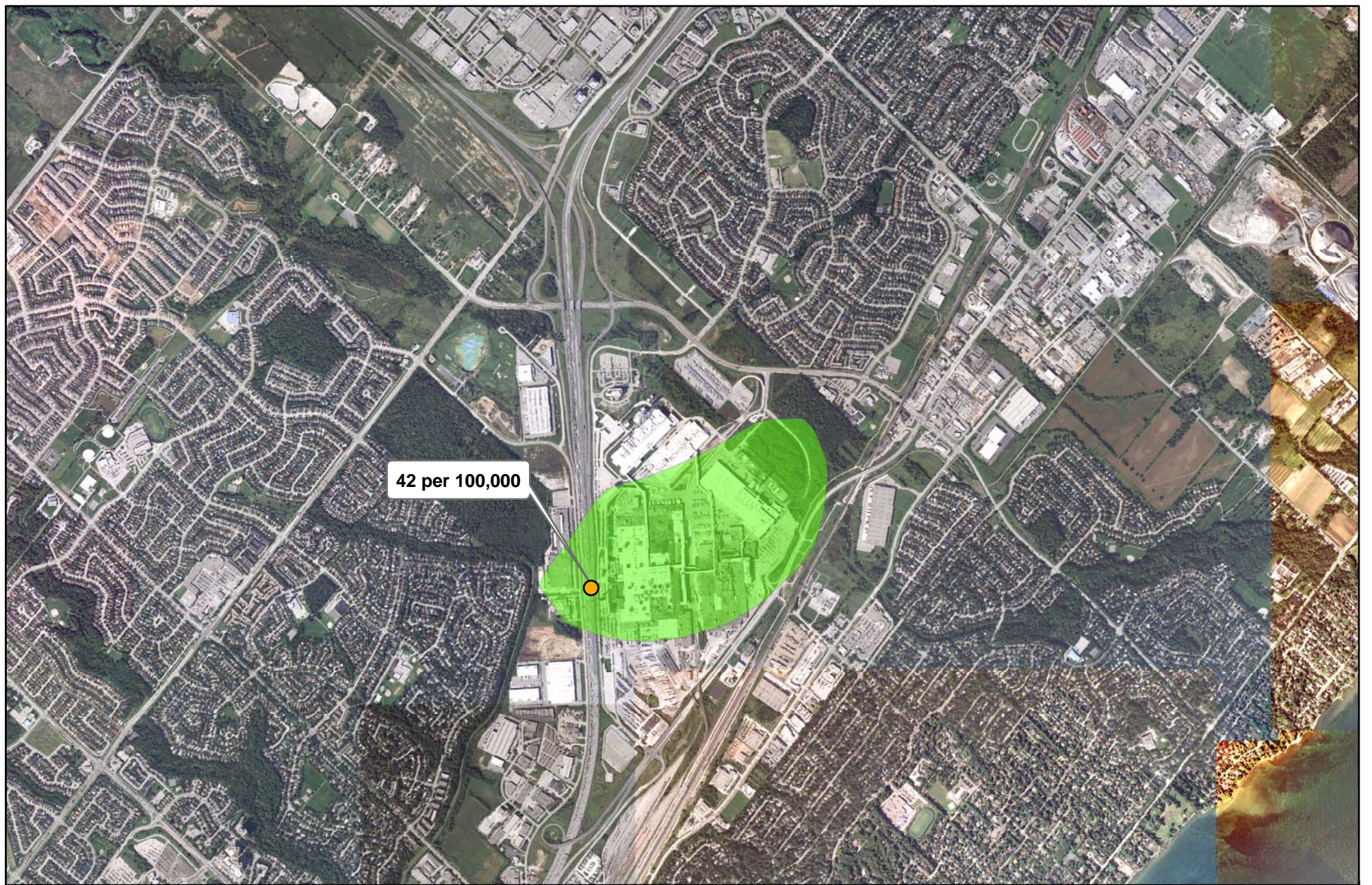


TFI Risk Map Average  
 Interval  
 1 per 100,000

HORIZON ENVIRONMENTAL

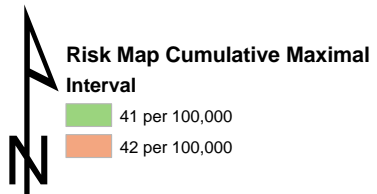
500 250 0 500 1,000 Meters



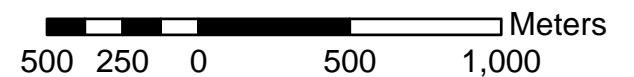


42 per 100,000

Figure 6-3  
 Cumulative Risk Map (Facility + Background)  
 Maximal Emissions Scenario  
 Ford Oakville Assembly Plant



HORIZON ENVIRONMENTAL



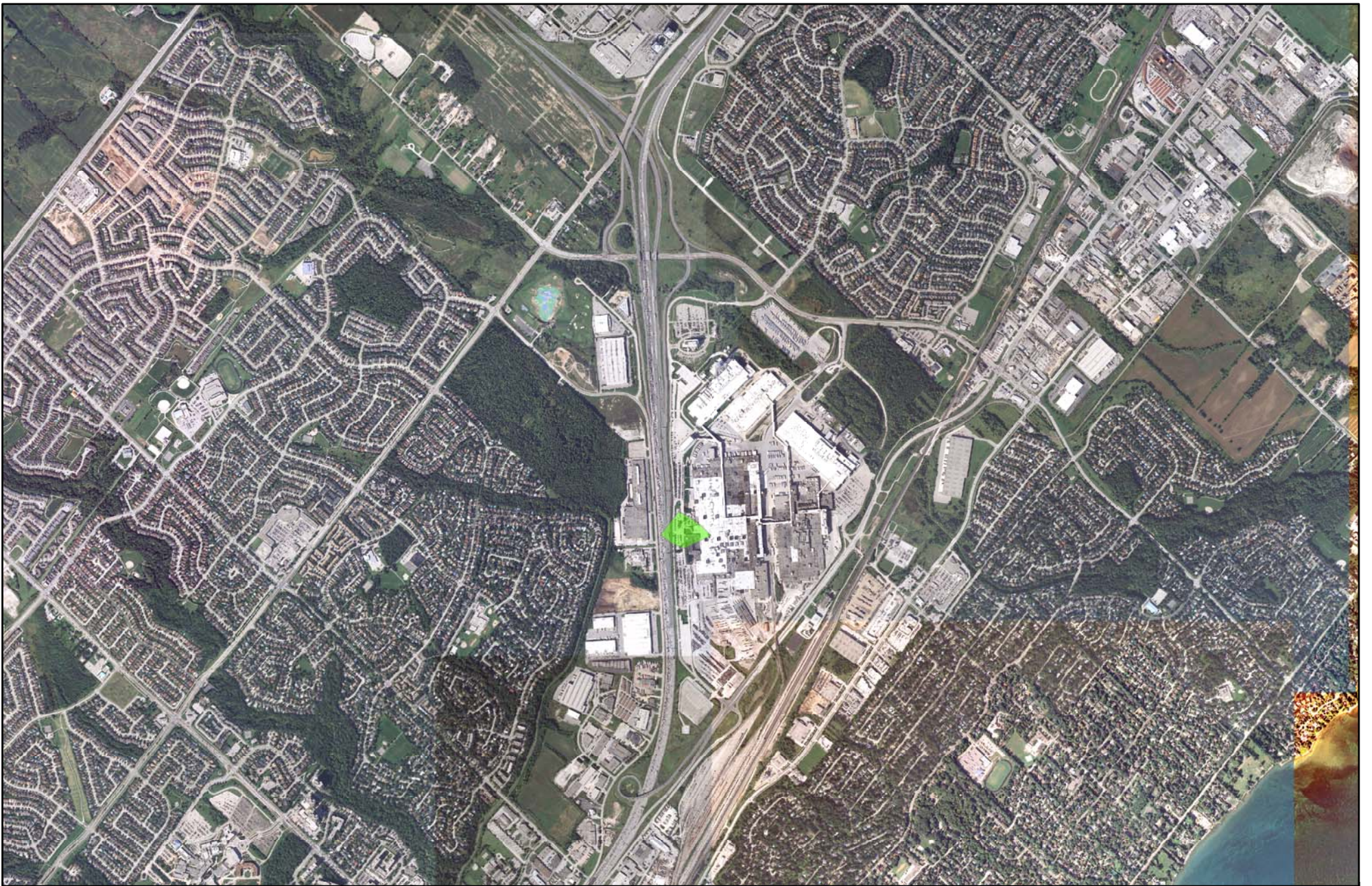


Figure 6-4  
Cumulative Risk Map (Facility + Background)  
PM2.5 - Average Emissions Scenario  
Ford Oakville Assembly Plant

HORIZON ENVIRONMENTAL

500 250 0 500 1,000 Meters

Interval  
38 per 100,000