REVIEW OF CITY OF HAMILTON 'STREETS' BY LAW #86-077

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A Literature and Policy Review of Available Municipal Air Quality Enforcement Tools

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The following report is divided into a number of sections. The first section outlines the background and primary purpose of the report, followed by an introduction to the health issues and common sources of Particulate Matter, including Fugitive Dust (PM/FG) and the role of public health in addressing these concerns. The next sections of the report will address the secondary purpose of the project focusing on potential 'tools' available at the municipal level for control and regulation of PM/FG emissions. The report will also initiate the development of a City of Hamilton inventory of work in progress often illustrating the use of suggested municipal 'tools' and Best Practices (BMP) found in the literature. The final section will examine the precedent setting Health Protection Air Quality By Law (HPAQ) passed in the Town of Oakville to regulate the control of PM industrial emissions and some of the requirements necessary for the possible duplication of the by law in Hamilton based on a document review and consultation with Town of Oakville, Environmental Policy Office staff.

The report is part of a larger project being directed by Hamilton Public Health Services (HPHS), especially in their leadership role in both Clean Air Hamilton (CAH) and the Air Quality Task Force (AQTF) to reduce the negative health impact of air pollutants and develop evidence based strategies, programs and policies for prevention, control and mitigation in collaboration with other departments within the City of Hamilton. A key initiative is the procurement of an Airshed Model for the City of Hamilton, currently underway. Once complete, data analysis of the source and emission findings will allow for the development of targeted strategies and initiatives.

Background

At the September 2012 Board of Health meeting, Hamilton Public Health Services (PHS) staff were directed to review the existing By Law 86-077, commonly referred to as the 'Streets' By-law and explore its potential as an air quality enforcement tool. Staff was also directed to explore the availability and utility of other municipal 'tools' to reduce airborne particulate matter (PM)/Fugitive Dust in the City of Hamilton. Leveraging an existing consultancy relationship with the McMaster Institute of Environment and Health (MIEH), PHS requested the assistance of their designated researcher and the following report, as well as, a joint Board of Health (*Streets By Law Review and Options for Dust Control* BOH #14018, July 2014) report in partnership with PHS staff, are the result. All reference documents consulted and interviews conducted for the following report can be found at the end of the document.

Introduction

The main focus of the report is a review of the existing 'Streets' By Law and its current and future potential as an enforcement tool for improving air quality and decreasing the health impact of pollution in Hamilton, as directed by the Board of Health (BOH). The report will also examine an array of alternative tools and best practices available at the municipal level to be employed for the purpose of controlling both fine Particulate Matter ($PM^{2.5}$) and Fugitive Dust. The report also initiates an inventory of work already in progress by both Hamilton Public Health Services and the Corporation focused on air quality improvement in the City. The Municipal Act (2001) allows local governments to set stricter or additional requirements than provincial/federal legislation in order to protect the health of its citizens. For example, air emission by-laws could be based on both the public health and nuisance powers delegated to municipalities thus achieving increased environmental protection and improved public health at the municipal control level. For example, the Oakville Health Protection Air Quality By-Law (HPAQ) is grounded on both of these parameters. The report is based on a policy review of a number of documents pertaining to potential air quality initiatives at the local level (both nationally and internationally), as well as, interviews conducted by the author with key personnel in the City of Hamilton and the Town of Oakville.

A comprehensive air quality management plan which utilizes the concept of an Airshed can be an extremely valuable tool for achieving improved air quality within municipalities. An Airshed has geographic, meteorological, and most importantly political boundaries and focuses on the air pollutants contained or moving within those boundaries. In any Airshed there are multiple sources of air pollution (generated at various location, times and concentrations) and the ability of local government to improve air quality will depend on two critical variables. According to the literature, the first step is to ***identify and inventory varied pollutant sources within the Airshed*** and secondly, ***prioritize the level of community concern*** for each. Finally, the municipality must develop ***focused and targeted strategies*** for prevention, mitigation and regulation. The Air Quality Management plan should be revisited periodically to determine if the goals are achieved and to revise the plan as necessary thus an ***evaluation component with a measureable set of indicators is critical.*** The ability of the municipal government to respond will be limited by the ***resources and staff available***. Another major and critical component for the development of an efficacious Air Quality Management plan is collaboration ***among a comprehensive and diverse group of stakeholders, including all three levels of government, industry, community organizations, academia and citizens.*** Optimum decisions would be grounded in the latest scientific evidence and best management practices. Clean Air Hamilton is a multi-stakeholder collaboration which meets the preceding criteria and has earned a long standing reputation for taking the lead locally on air quality concerns. Clean Air Hamilton also has a long history of community engagement and is a funder for a number of successful educational initiatives, for example an Anti-Idling education campaign. It is also the 'home' of the Air Quality Task Force (AQTF) and will be the chosen lead on a number of the recommendations proposed by Hamilton Public Health Services (PHS) staff and accepted by BOH members in the December 2013 report.

Health Effects

PM and ozone have historically been regulated in North America. They are two of the air contaminants originally regulated in Canada as "criteria pollutants," over 30 years ago. They continue to be important indicators of air quality and ongoing scientific research has confirmed that

even at comparatively low concentrations, these air contaminants are associated with morbidity and mortality in the population. In addition, the pollution concentration estimates associated with these effects are at levels that most Canadians frequently encounter. Thus, there is a compelling public health argument for management and reduction of exposures to these pollutants. Fine or Respirable Airborne Particulate Matter (PM2.5 or less) penetrates deeply into the respiratory system with both cardiovascular and respiratory consequences. The result is increased hospital admissions and premature death especially during high pollution days. Long -term exposure to fine PM is also associated with asthma and lung cancer. Sensitive populations (elderly, children, pre-existing medical conditions) will be more vulnerable and at greater risk. No safe level of exposure has been identified. Many of the health findings in research are based on PM as measured by mass as opposed to source or composition of PM yet airborne particles differ greatly from place to place in size and chemical composition.

PM consists of airborne particles in solid or liquid form, and according to the EPA may be classified as primary or secondary depending on the compounds and processes involved during its formation. Primary PM is emitted at the emissions source in particle form and the formation of secondary PM results from a series of chemical and physical reactions involving different precursor gases, such as sulphur and nitrogen oxides. It is the position of the World Health Organization (WHO) that $PM^{2.5}$ is a complex and possibly interacting mixture of many components, including sulphate, and though these components may differ from one another in terms of their toxicity, taking a 'precautionary stance' the WHO has stated, in the '*absence of clear evidence to the contrary the recommended coefficient should apply equally to all components of PM2.5, including particulate matter measured as sulphate and nitrate. Although all components do not have the same toxicity there is existing evidence to quantify different components in a manner which would gain consensus.'* In October of 2013 the International Agency of Research on Cancer (IARC), a division of WHO classified PM as a carcinogen to humans. Beyond humans it has been shown that agricultural crops, forests, and plants are also affected. The European Union's (EU's) Ambient Air Quality and Cleaner Air Directive for Europe (2008/50/EC) has introduced a new approach for $PM^{2.5}$ in recognition of evidence suggesting that there is no clear concentration of particulate matter below which health effects do not occur. This new approach aims to achieve a reduction in the ***overall exposure of the population to*** $PM^{2.5}$, based on the

concept that greater benefits could be obtained from a ***general reduction in exposure than by a policy aimed at reducing concentrations in geographically-limited "hot spots".***

Sources

The ***major sources of primary $PM^{2.5}$*** are combustion in the energy industries, road transport (both exhaust and non-exhaust emissions), off-road transport, residential sources and small-scale waste burning. The main traffic sources of $PM^{2.5}$ are exhaust emissions from diesel vehicles (cars, light goods vehicles and heavy goods vehicles), together with tyre wear, brake wear and road surface abrasion from all vehicles. There are ***multiple activities which have the potential to generate fugitive dust***, although frequent and high levels of dust particles often originate from activities in the following industrial sectors: agricultural, mining, construction, manufacturing, transportation and utilities, wholesale/retail trade, and service. Many municipalities have utilized both the power of by-laws and other Best Management Practices (BMP) to control emissions from these activities.

Streets By-Law Review (Hamilton By-Law #86-077

All policies and procedures must be analyzed within their historical context in terms of both designated responsibility and assigned departmental enforcement. The existing By Law #86-077 was written prior to amalgamation since it references the Region of Hamilton not the current municipal body – the City of Hamilton. Municipalities are not static but organic entities and municipal regulatory tools must reflect the current corporate template in terms of departments and accompanied responsibilities. Currently, the Strategic Planning Department, of Public Works has taken the lead in a policy review and update of the Streets By Law and has coordinated a response between a number of corporate departments, including Municipal Law Enforcement (MLE). It is important to note that particulate matter arising from new developments are neither the responsibility of the MLE nor would fall under the existing 'Streets' by law but would be part of a Registered Subdivision Agreement signed by developers with the Planning and Economic Development Department on behalf of the City of Hamilton and thus, would fall under their jurisdiction to monitor (to be discussed later in the report).

Many sections of the existing by law will be (or have already been) repealed, re-written, and replaced by newer and more appropriate, direction and by laws. For example, a new by law has already been developed which deals specifically with snow removal and adheres to current departmental organizational structure. Thus, it is the opinion of this author that once the current review has been completed and responsibilities for functions/structures assigned to more appropriate and specific departments/representatives, the document will be much *thinner*, and more reflective of the current municipal structure. The remainder will either contain a few very specific unassigned duties or potentially will 'morph' into a new street 'aesthetic' By Law. As one reviewer commented in the working review copy: *"What if anything should there be in the Streets By-law".*

At present, Municipal Law Enforcement (MLE) within the Planning and Economic Development Department (PED) is assigned primary responsibility for enforcement of the by-law. Enforcement is passive since by law investigations are complaint driven. By law officers respond to complaints utilizing education as their primary tool followed by enforcement (issuing tickets) if necessary. MIEH/PHS undertook an analysis of the by law from a health perspective as to its utility as an air quality control tool to reduce airborne particulate matter and thus, improve the health of the general public.

Analysis revealed the primary directive of the by-law is largely 'aesthetic' focusing on the visual condition of the street/road with a secondary focus on the 'proper and unobstructed' flow of public traffic (vehicle and pedestrian). For example, the text outlines measures to be taken for temporary closure of 'streets' for maintenance or special events (including film productions), horticultural additions, etc. The section most likely to have a ***secondary health impact deals with 'Fouling'*** (specifically Sections 9 & 14) either from building or other activities which occur upon a 'street' or 'highway'. Within both of these sections MLE has the right to 'force' compliance with the by-law and/or rectify the issue and bill the expense to the owner or occupant. Tracked materials (mud-tracking) from building sites and other human activities have the potential to 'dry' and become airborne and could have potential health consequences.

Although the by-law refers to many activities from littering, filth, distributing handbills and animal carcasses, MLE has developed an updated information sheet (posted) on the City website which focuses only on 'mud tracking'. The *'Caring for Our City Streets '* information sheet informs the public mud tracking is illegal and describes the process for lodging a complaint. MLE staff generously provided the following statistics on the number of annual complaints received regarding the 'Streets' by-law:

Year	# of Complaints
2010	**171**
2011	**211**
2012	**185**
2013	**251**

To contextualize this data in terms of equating the concerns of the general public on this issue, the City of Hamilton Noise Control By Law averages over 2,000 complaints in any given year. The number of complaints which fail to be resolved by education and to which an officer would issue a ticket are drastically smaller. It would appear the 'Streets' by law is largely underutilized. However, the question remains: "*Could the by-law have utility as a health policy tool*?" As noted earlier, the existing by-law was created prior to amalgamation. Many sections of the cumbersome and largely-dated by law will be (or have already been) repealed, re-written, and replaced by newer and more appropriate, direction and by laws. Within the existing by law a number of corporate activities are also exempt including Municipal vehicles involved in the application of 'sand, salt, a mixture of sand and salt or similar substance to the highway for the purpose of highway or winter highway maintenance, waste collection and highway construction. Many municipalities have advocated Best Practices Management (BMP) for these activities which focus on reduction of PM and improving air quality.

Ultimately, it is recommended that health concerns would be better served by developing an array of Municipal tools and Best Practices which are formed from the latest scientific knowledge, appropriate to the City of Hamilton Airshed concerns, and are more efficacious in reducing levels of airborne PM. As a result of this project Hamilton Public Health Services will be delegating a staff person to represent the Health Protection division in the

'Streets' by law review who will offer a health perspective during the By Law process.

Planning and Economic Development Sub-Division Agreement

Consultation with the Planning and Economic Development (PED) Department revealed the Construction Section of the Growth Management Division administers the development of new residential subdivisions and commercial development within the City of Hamilton. The office has the ability to enforce mud tracking and dust control through a Registered Subdivision Agreement between the developer and the City. Any issues that occur on building sites not governed by this agreement i.e. infill home construction or commercial site plan applications; are enforced by the City's Municipal By-Law Enforcement division. The registered subdivision agreement deals with mud tracking and dust control in Section 3.06. As per this agreement, the developer is required to submit to the City a street cleaning plan for review and approval. In addition to this, a component of the engineering approvals is to submit an erosion and siltation control plan detailing methods employed by the contractor to maintain soils on constructions sites and prevent the migration of soils and debris into watercourses or the City's storm sewer system. The agreement also refers to debris, acceptable road access, burning of garbage, and required street cleaning. A security deposit is required by the developer (owner) to the City of Hamilton. .

With the intent of continual improvement of services, Planning and Economic Development, over the past year, have refined their process to increase accessibility for the public with regards to issues/concerns on development sites by requiring developers to post signs which not only contain Contact Information but maintenance schedules for site cleaning. Complaints can also be referred to Planning and Economic Development and an inspection will take place. Through the terms of the agreement 'clean up' work to comply with Best Practices standards can be required and if the owner does not comply the City will enable the work and charge the costs through the standing agreement. A final option is to follow through with court proceedings in order for the City to recover costs. *Hamilton Public Health Services could potentially collaborate with PED by offering a health perspective based on scientific evidence of the latest Best Practices in construction to control PM and Fugitive Dust.*

A Literature and Policy Review of Available Municipal Air Quality Enforcement Tools

The following section of the report will review a variety of potential 'tools' which can be employed at the municipal level. There are a number of options available which already exist in municipalities across the country and are used to stimulate the growth of a green economy and address air quality issues. Many of these options are available to municipalities in general but the specific tools available to any given municipality will depend on the provincial enabling legislation. ***Municipal policies, education, incentives and outreach can all complement/support by laws in achieving improved air.*** The Municipal Act (2001) allows for local governments to set more stringent or additional requirements than existing provincial or federal legislation. Municipal zoning and land use powers, especially in terms of siting near sensitive receptors such as schools and hospitals can be powerful regulatory tools. A recommended best management practice for local governments can be to recognise air quality concerns in their Official Community Plans since this allows for a comprehensive land use perspective balancing both economic and health concerns for the community. Since planning decisions have an impact on development, infrastructure use and transportation, all of which in turn have an impact on air emissions. As mentioned earlier in the report given the wide range of comprehensive and scientific evidence as to the health consequences of air pollutants, even at low levels, *Hamilton Public Health Services can play a unique role in the review and application of scientific findings and suggestions for application within policy development and program initiatives directed to air quality.*

Planning is a visible articulation of a community's goals and expectations for its future development. An official plan can provide guidance for municipal decisions at many tiers from regional to neighbourhood. It can be the lens to filter urban density policy, the development of green economic development zones, transportation infrastructure, etc. Land-use planning can influence many of the factors which contribute to poor air quality by reducing the societal dependency on single occupancy vehicle travel.

Zoning is the set of rules for determine land use throughout the municipality. A fundamental purpose of zoning is to avoid conflicts between incompatible uses of property and to ensure that the community develops in an appropriate way. Since air pollution is a potential major source of conflict for example, between communities, neighbours and industries in many ways it goes directly to the purpose of the zoning powers. Zoning can be used strategically to protect 'sensitive' or 'vulnerable' areas which are subject to poor dispersion and poor air quality. It can also be used to shield sensitive receptors like hospitals and schools. Zoning can be used to promote developments that include mixed land use thus increasing walkability.

Development Approval Permits (DAP's)

Development control identifies the requirements to obtain a permit, and the terms and conditions of the permit. Another tool potentially available to local governments is to issue Development Approval Permits (DAP) where local government can require potential developers to provide "development approval information." Development approval information can be defined as information regarding the anticipated impact of the proposed activity or development on the community and can include details on transportation patterns and proximity to public facilities (such as schools or parks). The information can then be utilized to forecast the impact of the development on the local Airshed.

A developer could potentially be requested to prepare any or all of the following:

- *dispersion modeling to demonstrate the effect of the proposed development on ambient air quality;*
- *an assessment of the health impacts of emissions generally or on specific sensitive uses;*
- *information on different available methods for mitigating air emissions;*
- *modelled changes in traffic and the impacts of those changes on local air quality.*

Municipal government can be a leader and an example to citizens through the development of sustainable corporate policies and best practices. For example, eco-procurement policies can be refined to direct the purchasing power of municipal governments to foster growth and lead by the example of Best Practices. For example, purchasing 'Green' Fleets.

Education, outreach and public consultation are powerful and critical tools. For most municipalities with air quality management plans, public education is described as a core strategy or foundation necessary to endorse and execute an action plan. Raising awareness is critical to successfully reducing air emissions. Individuals need to be aware of the power to implement changes at the individual level but also at the structural level by applying social pressure on others and supporting political candidates willing to prioritize pollution/environmental platforms.

Transportation

Traffic Control and congestions are key issues affecting air quality and subsequently, the health of citizens. The modes of transportation a municipality fosters have a direct impact on the health of residents and the environment. Heavy reliance on vehicular traffic, especially sole occupancy results in poor air quality, unacceptable levels of noise and a weakened sense of neighbourhood within the local community. Traffic congestion also contributes to increased costs for the economy through delays in movement.

The greatest challenge is presented in cities or areas of cities where road conditions are already congested, in particular during peak times. In these cases the only way to provide more space for more sustainable modes of transport is to take road space from private cars, either on a permanent or on a temporary 'shift' basis. Although initially there may be resistance to these strategies many have proven to be very successful over time.

Traffic 'evaporation' schemes would be in alignment with PHS in terms of utilizing a social determinants of health perspective. If successful, accessibility is increased for those who do not own private vehicles and simultaneously there would be a reduction in negative health consequences of traffic congestion for all. Thus, there must be a commitment to the development and application of a comprehensive plan for 'moving' goods and people in a healthy manner for the sake of both individual citizens and the local environment. The application of traffic 'evaporation' schemes has been highly successful in European cities by creating 'car free' spaces and re-energizing communities. For example, charging tolls for entry into municipal centers can shift transport choices towards public transit, decreasing smog levels and the plan can be cost recovery which is then re-invested in public transit improvements. Literature suggests the plan must involve all alternative forms of transit in a co-ordinated manner combined with education in order to achieve success.

Case Studies

London, England

Since February 2003 the City of London, England has charged a daily fee for driving private vehicles into the city core in order to reduce traffic congestion and raise revenues for transport improvements. The toll is charged through an automated system that checks vehicles entering the charging zone against a database of motorists who have paid the fee. Despite considerable controversy the program was implemented without major problems, and has substantially reduced traffic congestion, improved bus and taxi service, and is generating revenues. Vehicle traffic speeds have increased due to reduced congestion, bus transit service has improved, and accidents and air pollution have both declined in the City center. In its first year of operation traffic levels were reduced by 18 percent within the city zone during charging hours (http://www.citymayors.com/report/congestion_charge.html) and the reduction was attributed to decreased visits to the zone, transfers to public transport, car-sharing, and increased travel outside of operational hours, finally an increased use of alternative transport vehicles. Public acceptance of the program has also grown since its implementation.

Finland

Planners in Helsinki, Finland, opted for a pragmatic approach to encourage low-density residential transit ridership by focusing on improving efficiencies in their existing transit system. The Helsinki Transportation Plan (approved in 1998) focused on improving door-to-door transport times for specific types of trips, creating a capacity to deliver real-time information to riders, and making connections easier and more pleasant. Transit operators are rewarded for making better connections thus improving the public's perception and support for the transit system. These initiatives were supported by heavy investment in "park and ride" services to improve access to the transit network by strategically locating parking facilities.

Norway

Norway's success with road tolls was a major contributing factor in London City Council adopting their system. Three of Norway's major urban centers – Trondheim, Oslo, and Bergen – have road toll systems in place. In 1991, Trondheim – Norway's third largest city with a population of about 140,000 implemented a "toll ring" area to surround the City's downtown area. All vehicles must pay a toll to enter the ring. As a result of Trondheim's tolls, inbound traffic has declined by 10% during toll periods while non-toll period traffic has increased by 9% and weekday bus use has increased by 7%. Revenues from the tolls are being used for road infrastructure, public transit, and pedestrian and bicycle facilities.

Fugitive Dust Control

Fugitive Dust (FG) can be a major source of different types of particulate matter. Many municipalities have implemented by laws and other Best Management Practices (BMP) to control dust from roads, road cleaning, construction and other activities. The BC Ministry of the Environment has suggested a series of best management practices for dust which can guide municipalities' management of roads and other practices that give rise to emissions. To the extent that the same issues arise for private land owners and operators, the BMPs could also form the basis for a local government bylaw. For example, Prince George's *Clean Air Bylaw* requires anyone sweeping roads or parking lots to use appropriate dust suppressing liquids. It also prohibits road and parking lot sweeping during an air quality advisory issued by the city, as well as introducing some general requirements not to allow dust to escape from a property in a way that is likely to cause human health problems.

There are multiple activities which have the potential to generate fugitive dust, including activities in the following industrial sectors: agricultural, mining, construction, manufacturing, transportation and utilities, wholesale/retail trade, and service. The quantity of dust emitted from construction operations will be related to the area of land being worked, and the level of construction activity (nature, magnitude and duration). Activities on construction sites can be categorized and divided into four basic set of activities carrying varied impacts on air quality and human and vegetation health. These are:

- demolition;
- earthworks;
- construction; and
- trackout.

The potential for dust emissions must be assessed for each activity. Emissions of dust to air can occur during the preparation of the land (e.g. demolition, land clearing, and earth moving), and during construction. Emissions can vary substantially from day to day, depending on the level of

activity, the specific operations being undertaken, and the weather conditions. A large proportion of the emissions result from site plant and road vehicles (track out) moving over temporary roads and open ground. If mud is allowed to get onto local roads, dust emissions can occur at some distance from the originating site. The scale of these impacts depends on the dust suppression and other mitigation measures applied.

A fugitive dust control program is an operating program that is designed to significantly reduce the fugitive dust emissions to the lowest level that a particular source is capable of achieving by the application of control technology that is reasonably available, based on technological and economic feasibility. Dust Control Plans identify the dust sources and describe the dust control measures that will be implemented before, during, and after any dust generating activity for the duration of the project. All mitigation methods for fugitive dust include some combination of ***reducing suspendable dust***, ***preventing its deposit, stabilizing it, enclosing it, and reducing the activities that suspend it.***

U.K. Case Study

Planning and Development in the UK

In the UK all new developments that require planning approval from the local planning authority may be subject to Best Practice Guidance. The guidelines follow three basic hierarchical principles as central control strategies for controlling dust and other emissions and ultimately, human exposure. ***1. Prevention 2) Suppression 3) Containment.*** Air Quality impact evaluations apply to all proposed construction activities, including site cleaning, demolition, and construction phases. A site evaluation must be conducted prior to work activities and mitigation measures are attached to the risk assessment of either low, medium or high sites.

A proper facility site plan; must identify all potential fugitive dust emission sources; contain a facility site plan map; contain data on daily traffic volumes; assign dust control methods including frequency

of application; must record and monitor on a daily basis and erect fences or use windbreakers complementary to the size of the stockpile as barriers.

Vegetation

Vegetation can be a useful mitigation tool for FG. It can be both a practical and cost effective land use practice that can assist in suppressing airborne particulates, which ultimately improves air quality. Vegetation can supplement other shorter-term mechanical solutions that are more focused on blocking or suppressing the dust. It can reduce levels of fugitive dust by absorbing and filtering the airborne particulates, reducing local temperature variability, and blocking wind reducing the movement of particles. Vegetation strategies have been successfully applied in Michigan, USA in heavy industrial areas where you have a clustering of industrial facilities, transportation infrastructure and an abundance of fugitive dust sources, including natural meteorological processes that can further exacerbate air pollution, and all of which endanger both human health and the environment. Studies also show that fugitive dust and PM negatively impact natural habitats and ecosystems. Particles that settle on soil and water can alter the nutrient and chemical balance that plants and animals need to survive.

As a result of this project the MIEH researcher has conducted a preliminary consultation with the Hamilton Industrial Environmental Association (HIEA) Technical Committee regarding a possible survey of Fugitive Dust Management Plans and Practices within HIEA members. In collaboration with PHS the pilot could potentially be extended to include a wider scope of industries not currently members of HIEA. Results would be shared in an aggregate manner for education and awareness to both industry participants and the general public.

City of Hamilton -Inventory of A/Q Initiatives

Toronto and Hamilton have a long history of applying municipal initiatives to address poor air quality, beginning in the early to mid-1990s. Many municipalities in southern Ontario have historically created some form of advisory committee or implementation structure to develop recommendations for action. In Hamilton both Vision 2020 and Clean Air Hamilton have taken the lead on local air quality research, developed and supported pilot projects, created corporate policy directives, and conducted public education campaigns.

As stated earlier in the report evidence suggests each municipality must:

- *first identify and inventory their major pollutant sources/concerns,*
- *review their available resources,*
- *and prioritize, in public consultation with their citizens a set of strategic practices.*

Hamilton Public Health Services as a leading member of Clean Air Hamilton, specifically through the Air Quality Task Force (2013) has begun this process in collaboration with stakeholders to procure an Airshed model for the City of Hamilton. Board of Health members approved this key staff recommendation at the December 2013 meeting (BOH#13029). It will be implemented in 2014 and conclude in 2015, at which time HPHS staff will report the findings to BOH members and the data gathered will assist in the identification of air pollution emissions by sector (residential, commercial, industrial, transportation, etc.) and hopefully, become the foundation for the development of a City based Air Quality Management Plan which will outline the appropriate municipal tools and strategies to monitor and improve air quality. There is evidence to support dispersions modelling as a critical process for mapping potential sources complemented by mobile monitoring data with the goal of continuously updating information and ensuring the map is current to inform mitigation strategies.

A brief inventory of work already in progress in Hamilton reveals a number of departments are already focused on air quality as either a primary or secondary goal of policy, programming and initiatives. *As the leading organization for public health in the City, HPHS can partner with specific departments and offer a valuable and unique perspective to many of these initiatives, if invited to the 'table'. It would be important to complete this inventory before proceeding with new strategies in order to maximize limited resources.*

Public Health Services has a crucial role to play by partnering with Planning and Economic Developing in reviewing the Official Plan from a *health perspective*. PHS staff can offer a wide range of comprehensive and scientific evidence as to the health consequences of PM (in particular fine PM), Ozone, and other pollutant substances, even at low levels and thus, suggest Best Practices going forward. This collaboration is already a recommendation contained within the Air Quality Task Force (AQTF) (BOH December 2013). For example, in B.C. local governments must consult with the Medical Health Officer (MOH) or the regional health board before the enactment of a by law where the goal is to address a health concern, such as air pollution. This does not imply that the MOH or the health board has veto over the proposed by law being considered by the local government; simply that *their views on the need for the bylaw and its effects on public health is an important consideration.* The preamble to **Prince George's *Clean Air Bylaw***, refers to the municipality's authority to regulate the protection, promotion, or preservation of health and the maintenance of sanitary conditions in the municipality in order to regulate open burning and fugitive dust control.

Anti-Idling By-Law 07-160

Hamilton currently has an anti-idling by law (By-Law 07-160), which prohibits the unnecessary Idling of Vehicles within the City of Hamilton and thus is available as a municipal air quality enforcement tool. The by law prohibits motor vehicles from idling in excess of three consecutive minutes in a sixty-minute period. There are a number of motor vehicles (usually owned by the

corporation) and situations/activities which are exempt. It is important for each municipality to consider their constraints when drafting by laws. For example, instead of an enforcement officer standing by a bus to monitor idling times allowed, research suggests it may be more efficacious and account for limited resources by considering the development of "no-idling" zones. *PHS staff in collaboration with MLE staff could review the current usage of the existing by law (similar to the process enacted for the 'Streets' by law project) and consider its impact as an air quality enforcement tool and if necessary suggest any improvements. For example, PHS could review the health impact of idling zones versus anti-idling time allotments based on scientific evidence. In the past Clean Air Hamilton and member organizations have taken the lead in an education campaign and there may be a need for renewal of their efforts.*

Transportation Initiatives

Transportation Needs of Seniors

In 2012 the Hamilton Council on Aging hosted a transportation workshop with seniors in Hamilton. The purpose of the workshop was to bring older adults together with decision-makers, academics advocates, experts and community service providers to discuss the challenges and opportunities that currently exist and those which can be anticipated with respect to transportation in the future. As the Hamilton population 'ages' and individual citizens experience compromised mobility in conjunction with decreased motor vehicle usage, the need for public or quasi-public transportation options will increase. The primary finding of the workshop was that *'convenience'* was a key variable for individuals in choosing a mode of transportation. The challenge of an aging population who has organized their lives around sole vehicular transport will not be easily resolved. The challenge for the City is that public transit use is low which affects bus capacity and ultimately the comprehensiveness of service delivery.

The final report of the workshop recommended a policy directive toward the development of *"complete streets"* and increased use of public transit. The report suggested success would be dependent on time, education and 'buy-in' from citizens, businesses (stores, banks) and health care providers who are the decision makers in terms of service location. The current trend towards big

box stores and centralization of services away from neighbourhoods confounds this effort. Finally, the report refers to evidence in other jurisdictions that Light Rapid Transit (LRT) would help both image and ridership with the Hamilton Street Railway (HSR). The HSR might benefit from a public awareness campaign designed to improve its brand image and increase usage. More sensitivity on the part of drivers to the needs and abilities of older adults was also recommended.

Hamilton Street Railway (UPass) Program

The U-Pass program adopted by both Simon Frazer University and the University of British Columbia provides student *with a reduced fare, and an all access transit pass*. The goals of the mandatory U-Pass Program for students include providing lower cost access to transportation and reducing single occupancy vehicles and congestion. Hamilton Street Railway currently has an agreement with post-secondary institutions in Hamilton to offer students an annual transit pass (UPass) as part of their institutional fee structure. Full-time McMaster students first negotiated their UPass in 1996. The program expanded to Mohawk and Redeemer in recent years. Currently, students pay $126.15 per 8-month school year for unlimited use of the HSR. The fee is calculated as 145% of the cost of a regular monthly pass.

Transportation and the Relationship to Chronic Disease

Dr. Nin Tranh, Associate Medical Officer of Health (AMOH) for Hamilton Public Health Services, recently collaborated with other Medical Officers on a report investigating the importance of public transportation and the built environment in terms of their critical relationship to chronic disease. Urban form is the cumulative outcome of numerous decisions made on individual development proposals and local infrastructure by municipalities and the private sector. Policies that encourage compact urban form also require mechanisms and incentives for implementation along with a comprehensive evaluation plan. Dr. Tranh presented the report to BOH members on June 16th (BOH #14017) with the following recommendations:

(a) That the Board of Health endorse the report Improving Health by Design in the Greater Toronto-Hamilton

Area, and support in principle the funding and sustainable implementation of the Big Move, strengthening provincial policies and integrating health into municipal planning;

(b) That Public Health Services work with the City Manager's Office, Public Works, and Planning and Economic Development to report back on the specific recommendations contained in the Improving Health by Design in the Greater Toronto-Hamilton Area report and what local actions could be implemented;

(c) That Public Health Services continue to work with the City Manager's Office, Public Works, and Planning and Economic Development regarding transportation planning and land-use planning to maximize health benefits.

School Transportation

Obesity is a major health concern among young people due to unhealthy diet and lack of exercise. Using active transportation for the school journey is one of the easiest ways for students to get regular daily physical activity and to reduce their behaviours. The Active and Safe Routes to School (A&SRTS) is a national program encouraging the use of active modes of transportation to and from school. The program includes no idling zones for vehicles around schools, and bus drop-off zones within a safe walking distance of schools. In addition to promoting increased physical activity among children and youth, the A&SRTS program aims to lessen traffic congestion and improve air quality around schools. In Ontario, 100 schools have implemented the program. A motion was passed by Councilor Merulla (Item 9.1) at the March 17, 2014 Board of Health meeting for the City of Hamilton to support such an initiative in the City, as recommended by Hamilton Public Health Services. The motion can be found below:

Active and Sustainable School Transportation (ASST) Charter Motion (Added Item 9.1)

Whereas, schools are now the second biggest car trip generator for the morning commute in the GTHA;

And whereas, a number of Hamilton schools are being considered for closure resulting in larger amalgamated schools

with impacts on transportation choice, community cohesion and health, and the environment;

And whereas, reducing vehicle trips to and from school by promoting more walkable and bikeable neighbourhoods improves pedestrian and cyclist safety, and reduces air pollution and greenhouse gas emissions;

And whereas, making a community and school grounds more walkable and bikeable contributes to total daily physical activity for better health and student performance;

And whereas, the City of Hamilton Public Health Services has been dedicated to the Active and Safe Routes to School initiatives since 2000;

And whereas, the City of Hamilton's Urban Official Plan and Metrolinx's Regional Transportation Plan, The Big Move, includes policy goals for the achievement of an integrated transportation network that impacts health and quality of life;

And whereas, a number of Ontario municipalities and school boards have recently developed and signed their own ASST charters recognizing the value of ASST and demonstrating commitment to take action in support of ASST including Toronto, Ottawa, York, and Waterloo

Therefore be it resolved:

(a) That the Joint City/Board Relations Committee be directed to develop an Active and Sustainable School Transportation Charter to support the long-term commitment to active and sustainable school transportation.

(b) That staff from Public Health Services and Public Works, through the existing Active and Safe Routes to School Steering Committee, be directed to assist the Committee with their deliberations and the development of the Charter.

OAKVILLE: Health Protection Air Quality (HPAQ) By Law (#2010-035)

On Monday, August 12, 2013 City of Hamilton Councilors passed a motion to have staff investigate the potential implementation of a Particulate Matter Reduction By-law in Hamilton which would duplicate the Oakville Health Protection and Air Quality by-law (2010-035) which is focused on regulating PM2.5 and its precursor pollutants. Councilor Brian McHattie introduced the motion at a General Issues Committee and it passed unanimously (General Issues Committee Report, #13-016). His support for the by-law was based on his belief that Hamilton was 'one of the most challenged Airsheds in Ontario'. Councilor McHattie stated that it was estimated that 186 Hamiltonians die prematurely annually from air pollution. The motion was accepted by the entire City Council on Friday, August 16, 2013 (City Council Report, 13-015**).** The motion can be found below.

Proposed Particulate Matter Reduction By-law (Item 9.2)

Whereas Hamilton has one of the more challenged airsheds in Ontario with multiple emitters of air pollution; and

Whereas one of the most dangerous forms of air pollution is fine particulate (i.e., PM2.5 microns in size), causing significant respiratory health issues for Hamiltonians; and

Whereas the Town of Oakville has enacted a Particulate Matter Reduction By-law with the full sanction of the Ontario Ministry of the Environment.

Therefore Be It Resolved:

That Municipal Law Enforcement staff report back on Oakville's Particulate Matter Reduction By-law, with assistance from Legal Services and other departments as required, and how it could be adapted for a similar By-law in Hamilton.

Although Municipal Law Enforcement (MLE) staff were delegated to report back on the feasibility of re-enacting the Oakville PM by law in Hamilton, Hamilton Public Health Services (HPHS), specifically, the Health Hazards Program were asked to offer a health perspective on the proposal. HPHS leveraging an existing consultancy relationship with the McMaster Institute of Environment and Health (MIEH) requested a review of the development and impact of the feasibility of duplicating the Oakville By-Law (2010-035) as part of the current **'Streets By Law Review and Air Quality Project'**. Thus, the following section of the report will offer a background analysis of the development of the Oakville by law, including its public consultation process, and the efficacy of any evaluation components, finally a recommendation of its adaptability for the City of Hamilton. The recommendation is based on a review of Oakville Environmental Office reports/websites and an interview conducted with key personnel.

With the passing of the Health Protection Air Quality (HPAQ) By Law (2010-035) the Town of Oakville staff reported the availability of a tool which assesses and controls the health effects of major emissions of fine particulate matter *(Town of Oakville Council Meeting February 1, 2010).* The stated purpose of the HPAQ By Law was to protect the health of Oakville residents from the effects of fine particulate matter (fine PM) by collecting information on emissions from facilities within Oakville and implementing regulatory controls. During the development stage of the by law Oakville staff undertook a public consultation, followed by a revision process in relation to concerns/issues raised and circulated the By Law for public review before the final version was proposed to council. In summary, the by-law implements a process for the review and approval by Council of facilities that produce major emissions of fine particulate matter and/or 'precursor pollutants', namely substances which, when emitted into the air, produce fine particulate matter, referred to collectively in the by law as "health-risk air pollutants".

The stated rationale for the staff to develop the by law was to address a gap in provincial and federal legislation which failed to set a regulatory standard or ambient levels for fine particulate matter (PM 2.5). A review of applicable health and air quality regulation at the provincial and federal level established that there was no existing regulation on fine PM and precursor pollutant emissions that

limit total concentrations of fine PM within an Airshed, evaluate existing ambient conditions together with new emissions of fine PM, or assess the health impacts of those conditions. Under 'right to know' legislation the City of Toronto had enacted a by-law to report on and monitor emissions of toxic compounds, including fine PM (Chemtrac). The by law affects all facilities (proposed and existing) located within the Town of Oakville who are emitters of health-risk air pollutants defined as fine particulate matter and/or precursor pollutants which, when emitted into the air produce $PM^{2.5}$.

The by-law contains a *two tier process of requirements.* One is a *one time reporting* (unless there is a change in emissions) requirement if a facility emits at least one health risk air pollutant it must inform the town and *secondly, the facility must gain approval* of the town Council if it is classified as a major emitter of health risk air pollutants (defined as emissions of one or more health-risk air pollutants that exceed certain levels as established under the by-law). The information submitted is collected and is utilized to develop a health risk emissions database which is maintained by staff. Staff posts a list of current facilities subject to the by law and considered major emitters on the town website.

The approval process is a risk assessment of the health impact of the facility and an outline of any regulatory controls considered necessary. The application for approval includes submission of:

(a) a description of the facility, including all sources of emissions that may contribute to a major emission of a health-risk air pollutant;

(b) an evaluation of existing and predicted levels of fine particulate matter using an approved atmospheric dispersion model;

(c) mapping of the affected airshed;

(d) an assessment of the public health effects associated with the major emission, taking into account pre-existing levels of fine particulate matter in the affected airshed; and,

(e) an appraisal of any measures available to reduce risks to public health.

Approval is a transparent process where the facility application is circulated for comment to appropriate agencies (including the Halton Regional Health Department) and undergoes a consultant peer review. Once the public health impact is assessed Council is responsible (with staff

recommendation) for approving the application with or without conditions or it may refuse approval if the facility in question is considered a 'public nuisance.' The approval process is a cost recovery process for the Town of Oakville since the facility requests a compulsory fee of $25,000 which is used to defray the administrative and peer review costs associated with the application approval process.

Facilities which are approved must submit an annual report for the first three years detailing the actual emissions of major pollutants emitted. Facilities subject to the by-law that fail to report or obtain an approval would be subject to prosecution, and liable upon conviction to a fine of up to $100,000 for a first offence, and $10,000 a day for each day or part of a day that the offence continued for any subsequent offence. A transition phase was developed for existing facilities covering a term of one year.

Public Consultation

In the first three weeks of January 2010 staff conducted a public consultation process on the proposed by law. The public consultation process consisted of two public meetings, the creation of a designated e-mail address and a media campaign utilizing local media. Invitations were also sent to chosen business associations and individual business owners.

Over the course of the consultation a total of one hundred and fifty (150) individuals (both business owners and other community members) attended the two meetings and two hundred and thirty-seven (237) written comments were received. Thus, over a restricted time period a total of three hundred and eighty seven (387) responses were received and the results revealed 75% (290) supported the by-law and 25% (97) had reservations.

Those in support of the by law referred to:

- public health concerns

- focused on enforcement and implementation

Those with reservations referred to:

- the by-law as unnecessary- respondents wanted to be sure the benefits of the by-law in relation to the time/cost of implementation were of equal benefit. Respondents questioned the availability of enforcement capability to effectively monitor the by law and the review capacity to address all of the applications.
- some believed it created a climate of uncertainty for business-respondents in particular for a significant number of smaller companies affected by the by law, such as body shops and paint shops.
- a reduction in economic competitiveness and business requires a level playing field
- confusion regarding the details of the by law. Respondents stressed the need for transparency in the by law and protocols for the mitigation plan. They also wanted some mechanism or standards to ensure consistency in the peer reviews.
- some questioned the value of the by law and believed facility emissions were only one aspect of poor air quality. In fact, "given that industry is not the major producer of fine particulate matter in the region, believed the by law would fail to accomplish its primary goal of reducing levels of fine particulate matter.
- other respondents believed the 'real' source was trans-boundary air pollution; and since the by-law only addressed the fraction that local industry contributed, it would be ineffective.

A number of the comments and questions referred to TransCanada's proposed gas-fired power plant in Oakville. Many residents questioned whether this by law was a step towards stopping TransCanada from locating in Oakville. Some respondents were concerned about the short time frame of the public consultation. Others requested the town delay their response until the province declared their intent to regulate fine particulate matter.

In response to the results of the public consultation, staff clarified which facilities would be affected, definitions were given increased clarity and a transition phase was introduced to allow business

preparation time to meet the requirements. City staff made themselves available for consultation throughout the reporting and approval process. Currently, staff continue to work collaboratively with facilities both those affected by the reporting and the approval components of the by law.

Staff requested the threshold levels in the by-law be consistent with the National Pollutant Release Inventory (NPRI) reporting thresholds. An initial screening of Certificate of Approval (C of A -Air) permit holders under the Environmental Protection Act resulted in an initial estimate of a few hundred facilities who would be impacted by the reporting section of the by law and approximately a couple of dozen would be considered 'major emitters' and be required to conduct a health impact assessment.

The fee schedule operated as follows: facilities required to report their emissions of fine PM and precursor pollutants but who are not major emitters would be exempt from fees; those designated as 'major emitters' could potentially pay up to $25,000 plus additional fees for the external consultation required for assessments (estimated at $5,000 to over $40,000) depending on the size of the major emitter's operations and complexity of emissions).

By Law not a stand alone Air Quality Initiative

Staff acknowledged that fine PM is a complex issue and an array of initiatives in all sectors are part of the Air Quality Management plan in Oakville with the by-law only one 'tool' for improving local air quality. Thus, similar to Hamilton an array of initiatives is in operation. The town is focusing on reducing vehicular emissions through the implementation of master plans for transportation focused on promoting alternate modes of transportation rather than the use of single occupancy vehicles. The town supports the development of sustainable neighbourhoods through the Official Plan 'Livable Oakville' which addresses both vehicular and residential sources, as well as, energy efficiency and conservation actions. In addition, the town is committed to a review and implementation of internal initiatives through building LEED buildings with green energy generation features, greening the fleet and Town buildings, and promoting environment and energy stewardship and conservation throughout the community.

In summary, the town implemented a comprehensive and holistic series of initiatives, an Air Quality Management Plan with the goal of improving air quality (see 'Let's go Green', and 'State of the Environment Reports'). Finally, staff and council continue to advocate at the Provincial and Federal government level for the development of a tri-partite focus to improve air quality and increase health status for residents.

Budget requirements according to Staff included: new staffing and budget allocations that involved effective enforcement of the by-law, including periodically retaining peer reviewers and air quality modelers, assigning staff to carry out education and outreach to support the by law implementation and data management, and retaining a consultant to develop guidance documents for general assessment and air modelling. The estimated budget for research, by law development, legal costs for responding to an OMB challenge, and compilation of an eco-submission to the Ontario Environmental Commissioner was approximately $350,000. A one year contract was created by the Town to hire an air quality technician to oversee the implementation of the by law. This position also assumed responsibility for other air quality programs, such as the Town's anti-idling program and the collection of air monitoring data. An additional fund of $1 million was approved by Council to be spent on legal and consulting fees for the Town to hire consultants to respond to TransCanada's Environmental Review Report as well as to cover resources for a court challenge.

Evaluation consists of an annual report by staff on total health risk of air pollutants emissions, expressed in kilograms. Staff reports to Council have not only outlined a successful reduction in PM emissions in Oakville but a number of secondary successes, in terms of assistance and improvement in industrial processes for small and medium sized facilities and improved occupational health and safety for workers in smaller facilities, to name a few. Thus, based on a review of key reports and an extensive interview with key personnel the author would suggest the following requirements are a minimum requirement necessary in order to consider the adaptability of the Oakville by law in Hamilton. Legal requirements must be considered by the City of Hamilton, Legal Department and are outside the scope of this project report.

Minimum Requirements to include:

Based on an extensive document review and lengthy consultation with Key Staff in the Town of Oakville who carry the primary responsibility for the by law implementation and enforcement, the potential for adapting Oakville's Health Protection Air Quality (HPAQ) By Law would be contingent on a number of variables including but not limited to the following:

- *Overwhelming consensus and support from all council members*
- *Sizeable designated budget based on actual Oakville implementation costs multiplied by the increased number of facilities potentially affected in Hamilton*
- *Public consultation with all stakeholders to gauge support for the initiative*
- *Review of the staff and financial cost of the development, implementation and ongoing enforcement of the by law weighed against the potential efficacy of the by law as an air quality enforcement tool for the reduction of PM*
- *Cost of evaluation of the by law either internally by staff or externally through a consultant*
- *The utility of the by law as a potential tool within a comprehensive air quality management plan versus a 'stand-alone' project*
- *Consideration of the potential legal costs of an OMB challenge to the by law*
- *Consideration of Provincial and Federal responsibility, as well as, the municipal responsibility for air quality*
- *Consideration of the Economic impact of the existence of the by law in terms of the business and industrial sector*

Conclusion

As stated at the beginning of this report, Public Health Services staff were directed at the September 2012 Board of Health meeting, to review the existing By Law 86-077, commonly referred to as the 'Streets' By-law and explore its potential as an air quality enforcement tool. Staff were also directed to explore the availability and utility of other municipal 'tools' to reduce airborne particulate matter (PM)/Fugitive Dust in the City of Hamilton. The report illustrates a number of potential 'tools' available to municipalities and the critical role to be played by Hamilton Public Health Services in an advisory capacity through the review of the most efficacious and strategic use of resources to improve air quality and ultimately, increase the health status of the Hamilton population. The report also begins the important work of compiling a Hamilton Inventory of work already in progress and suggests a number of places for partnership and collaboration among City of Hamilton corporate departments and Public Health Services.

The report is part of a larger project being directed by Hamilton Public Health Services (HPHS), especially in their leadership role in both Clean Air Hamilton (CAH) and the Air Quality Task Force (AQTF) to reduce the negative health impact of air pollutants and develop evidence based strategies, programs and policies for prevention, control and mitigation in collaboration with other departments within the City of Hamilton. A key initiative is the procurement of an Airshed Model for the City of Hamilton, currently underway. Once complete, data analysis of the source and emission findings will allow for the development of targeted strategies and initiatives. Public Health Services will then be able to present a more comprehensive set of recommendations to Board of Health members in the future which can form the foundation for an Air Management Plan.

REFERENCE DOCUMENTS REVIEWED AND INTERVIEWS CONDUCTED

Health Effects

Castrilli, J. F. CELA Counsel (2013) *The Legal and Regulatory Implications of IARC Classifying Outdoor Air Pollution and Particulate Matter as Carcinogenic to Humans*. October, 22. Retrieved from: http://www.cela.ca/blog/2013-10-22/legal-implications-IARC-classifying-air-pollution-human-carcinogen

Gage, A. and S. Saha (2006) *The Clean Air By Laws Guide*, West Coast Environmental Law, West Hasting Street, Vancouver, B.C.

International Agency of Research on Cancer - IARC. (World Health Organization (WHO). http://www.iarc.fr/

National Atmospheric Emissions Inventory http://naei.defra.gov.uk/overview/ap-overview

Ng. C. & K. B. Newbold (2009) *Modeling Air Pollution Dispersion & Concentration and the Use of Air Pollution Models in Epidemiological Studies*. McMaster Institute of Environment and Health (MIEH). McMaster University, Hamilton, Ontario. Prepared for Hamilton Public Health Services.

Ng. C. & K. B. Newbold (2009) *Sources and Health Effects of Air Pollution: An Analysis of Total Suspended Particulate Matter, Polycyclic Aromatic Hydrocarbons, Volatile Organic Compounds, Nitrogen Oxides, Sulphur Oxides, Carbon Monoxide, and Ground Level Ozone.* McMaster Institute of Environment and Health (MIEH). McMaster University, Hamilton, Ontario. Prepared for Hamilton Public Health Services.

Municipal Air Quality 'Tools'

Duncan, J. (Sierra Legal) (2007) *The Municipal Powers Report Municipal By Laws and Best Practices for Community Health and Environmental Protection in Canada*. Toronto, Ontario. Retrieved from http://www.ecojustice.ca/publications/reports/the-municipal-powers-report/attachment

Evans, G., P. Shellard, K. Teschke (2014**)** *Caring for the Air Metro Vancouver***.**

http://www.metrovancouver.org/services/air/Documents/Caring_for_the_Air-MV2014.pdf

Gage, A. and S. Saha (2006) *The Clean Air By Laws Guide, West Coast Environmental Law*, West Hasting Street, Vancouver, B.C.

Ministry of Municipal Affairs and Housing (2004) *Building Strong Communities: Municipal Strategies for Cleaner Air*, Toronto, Ontario. Retrieved from: http://www.mah.gov.on.ca/Page1307.aspx

Thompson, D. and S. A. Joseph (2011) *Building Canada's Green Economy: The Municipal Role.* Federation of Canadian Municipalities, Ottawa Ontario www.fcm.ca. Retrieved from: https://fcm.ca/Documents/reports/Building_Canadas_green_economy_the_municipal_role_EN.pdf

Vehicular Traffic and Air Quality Initiatives

Allstrom, Margot (2004**)** *Reclaiming City Streets for people. Chaos or quality of life?* European Commission Directorate **-** General for the Environment. Retrieved from http://ec.europa.eu/environment/pubs/pdf/streets_people.pdf

City of London, UK (Traffic congestion scheme):
http://www.citymayors.com/report/congestion_charge.html

London's 6 month report can be viewed at: http://www.tfl.gov.uk/tfl/downloads/pdf/congestion-charging/cc-6monthson.pdf

Helsinki, Finland http://library.witpress.com/pages/PaperInfo.asp?PaperID=9560

Norway -Trondheim, Oslo, and Bergen (Road Toll Schemes). Retrieved from: http://www.vegvesen.no/_attachment/109072/binary/187602.

For further information on Norway's experience with road tolls see: http://www.uofaweb.ualberta.ca/ipe//pdfs/TransportPaper-Brathen_Odeck.pdf and http://www.zietlow.com/docs/odeck.pdf For more general information on road pricing options see: http://www.vtpi.org/tdm/tdm35.htm.

O'Connor, D. (2012) "*Moving away from reliance on a car: A conversation about creating integrated transportation options that meet the needs of an aging population*". Workshop Report, June 13. Prepared for Hamilton Council on Aging and the Hamilton Age-Friendly Collaborative. Hamilton, Ontario

Air Quality Improvement Initiatives

A-MAPS Environmental Inc. (2011). *Municipal Air Quality Information System "A la Carte"* Ottawa, Ontario, Canada (info@amapsenv.com)

Bay Area Air Quality Management District CEQA(2012) *California Environmental Quality Act. Air Quality Guidelines.* Retrieved from: http://www.baaqmd.gov/~/media/Files/Planning%20and%20Research/CEQA/BAAQMD%20CEQA%20Guidelines_Final_May%202012.ashx?la=en

Connolly, E., *et.al.,* (2013) *Daily Air Quality Index (DAQI). Update on Implementation of the Daily Air Quality Index Information for Data Providers and Publishers.* Department of Environment, Food and Rural Affairs, U.K. Retrieved from: http://uk-air.defra.gov.uk/

Dance, Matthew (2010) *The State of Edmonton's Ambient Air Quality.* The Edmonton Sustainability Papers. Discussion Paper 2, Edmonton, Calgary

Elevate Consulting in association with the Sheltair Group (2006) *A Provincial Airshed Planning Framework Consultation Discussion Paper* (2006). Prepared for the Ministry of Environment. ISBN 0-7726-5605-3 Retrieved from: http://www.bcairquality.ca/reports/pdfs/airshedplan_provframework.pdf

Monks, Paul et al., (Air Quality Expert Group) (2012) *Fine Particulate Matter (PM2.5) in the United Kingdom,* Prepared for the Department of Environment Food and Rural Affairs; Scottish Executive; Welsh Government; and Department of the Environment in Northern Ireland. www.defra.gov.uk/environment/quality/air/

National Round Table on the Environment and the Economy (2008) *Developing Ambient Air Quality Objectives for Canada Advice to the Minister of the Environment.* Ottawa, Canada. www.nrtee-trnee.ca ISBN 978-1-894737-15-9

National Atmospheric Emissions Inventory http://naei.defra.gov.uk/overview/ap-overview

Report of the Medical Officers of Health in the GTHA : Hamilton, Peel, Simcoe-Muskoka, Toronto (2014) *Improving Health By Design in the Greater Toronto Hamilton Area.* Toronto, Ontario. Retrieved from: http://www.peelregion.ca/health/resources/healthbydesign/pdf/moh-report.pdf

The Active and Safe Routes to School (A&SRTS) National Program. Retrieved from:

http://www.saferoutestoschool.ca/

Fugitive Dust

Boulder County Public Health. *Take Control of Your Dust Fugitive Dust Best Management Practices.* www.BoulderCountyAir.org

Cheminfo Services Inc. (2005) *Best Practices for the Reduction of Air Emissions From Construction and Demolition Activities.* Prepared for Environment Canada, Transboundary Issues Branch. Retrieved from: https://www.yumpu.com/en/document/view/21011141/best-practices-for-the-reduction-of-air-emissions-from-construction-

Commission Staff Working Paper (2011) *Establishing guidelines for determination of contributions from the re-suspension of particulates following winter sanding or salting of roads under the Directive 2008/50/EC on ambient air quality and cleaner air for Europe.* European Commission, Brussels, EU. Retrieved from: http://ec.europa.eu/environment/air/quality/legislation/pdf/sec_2011_0207.pdf

Greater London Authority and London Councils (2006) *The control of dust and emissions from construction and demolition: Best Practice Guidance*
London, UK. www.london.gov.uk www.londoncouncils.gov.uk

Hawaii Administrative-Rules, *Fugitive Dust Fact Sheet*, Section 11-60.1-33. Retrieved from: http://health.hawaii.gov/cab/files/2013/08/Hawaii-Fug-Dust-Fact-Sheet_V-2-DW-RT-BC-FINAL-8-19-13-1-.pdf

Hobbs, M. L. (Honourable), Minister of the Environment (2001) *Good Practice Guide for Assessing and Managing the Environmental Effects of Dust Emissions,* Wellington, New Zealand. Retrieved from: http://www.mfe.govt.nz ISBN 0-478-24038-4

Holman *et al* (2014) *IAQM Guidance on the assessment of dust from demolition and construction,* Institute of Air Quality Management, London. **www.iaqm/wp-content /uploads/guidance/dust_assessment.pdf**.

Institute of Air Quality Management (IAQM) (2014) *Guidance on the assessment of dust from demolition and construction.* London, UK. Retrieved from: **www.iaqm.co.uk**

Michigan Department of Environmental Quality (2014) *Managing Fugitive Dust: A Guide for Compliance with the Air Regulatory Requirements for Particulate Matter Generation.* March, www.michigan.gov/deq

Roberts, J. W. et.al., (1975). Cost and Benefits of Road Dust Control in Seattle's Industrial Valley,

Journal of the Air Pollution Control Association, Vol. 25,(9).

Ministry of Water, Land and Air Protection, BC (2005) *Best Management Practices to Mitigate Road Dust from Winter Traction Materials, BC* Retrieved from: http://www.bcairquality.ca/reports/pdfs/roaddustbmp_june05.pdf

University of Michigan: Urban and Regional Planning Program (2008) *Breathing Easier in Southwest Detroit: Mitigating Fugitive Dust with Vegetation*. Michigan, USA. Retrieved from: http://sitemaker.umich.edu/urpoutreachreports/environment___land_use__e_/da.data/00000000000000000000000000000000000003016372/ReportFile/fugitivedustsouthwestdetroit.pdf
Website: http://taubmancollege.umich.edu/planning/students/student_work/project_galleries/breathing_easier/

Utah Government, Utah Department of Environmental Quality: Division of Air Quality *Fugitive Dust Control Plan (FDCP).* R307-309-6. Retrieved from: http://www.airquality.utah.gov/; http://www.rules.utah.gov/publicat/code/r307/r307-309.htm

Watson, J. G. and J. C. Chow (2000) *Reconciling Urban Fugitive Dust Emissions Inventory and Ambient source contribution estimates: Summary of current knowledge and Needed Research.* Energy and Environmental Engineering Center-Desert Research Institute, Nevada, USA.

By Law Templates

City of Duncan, Vancouver Island, B.C. By Law # 3089
Being a Bylaw to Regulate Wood Burning Appliances and Air Quality

Prince George Clean Air By Law, B. C. #8266
http://princegeorge.ca/cityhall/legislativeservices/citybylaws/Bylaw%20Documents/BL8266_Clean_Air_Bylaw_V2.pdf

Oakville By Law, Town of Oakville, By Law #2010-035
http://www.oakville.ca/assets/general%20-%20environment/HPAQB2010-035.pdf

Toronto's Environmental Reporting and Disclosure Bylaw (Municipal Code Chapter 423)
http://www.toronto.ca/legdocs/municode/1184_423.pdf

Local Municipal Reports/Interviews

Ontario *Municipal Act*, 2001, S.O. 2001, c. 25, section 130\

Hamilton

Hamilton Reports

Lawson, M., S. Radisic, B. Montgomery (2013) *Air Quality Task Force Action Plan* (BOH #13029), December 2, Board of Health, City of Hamilton.

Clean Air Hamilton (2013) *Air Quality Progress Report 2012*, Hamilton, Ontario. Retrieved from: http://www.cleanair.hamilton.ca/downloads/CAH%20Report%202012%20-%20Final.pdf

Lawson, M. & M. McKeary, (2014) *Streets By Law Review and Options for Dust Control* (BOH #14018), July 10, Board of Health, City of Hamilton

Tran, Dr. N. (2014) *Improving Health by Design in the Greater Toronto-Hamilton Area* (BOH #14017), June 16, Board of Health, City of Hamilton.

Winning, A. (2011) *Dust Fall Outs Resulting from Unpaved Parking Lots and Roads Within Industrial Properties* (PW11091, Public Works Committee, November 21, City of Hamilton.

Hamilton Interviews

Ammendolia, Carlo, ***Growth Management Division***, Planning and Economic Development, April 2014

Coombs, Kim & Kelly Barnett, ***Municipal Law Enforcement,*** Planning and Economic Development, March 2013

Hamilton Industrial Environmental Association (HIEA), Hamilton, Ontario, April May 2014 http://www.hiea.org/

Morkunas, Ruta, ***Business Programs***, Public Works, 2013/2014

Oakville

Oakville Interviews

Toth, Cindy and Jeffrey Lee, ***Environmental Policy***, Town of Oakville, May 29, 2014.

Oakville Reports

2012 *Annual Report for the Health Protection Air Quality By-law 2010-035* (HPAQB), Town of Oakville.

Environmental Policy Department, *Health Protection Air Quality By Law Implementation and* other Air *Quality Initiatives*, Oakville Report, Community Services Committee, November 13, 2013.

Let's Go Green (2012) Town of Oakville
http://www.oakville.ca/assets/general%20-%20environment/2012LetsGoGreen.pdf

Oakville-Clarkson Airshed Action Plan and Air Quality Pilot (OCAAP) (2010), Oakville, Ontario. Retrieved from: *http://www.oakville.ca/environment/oakville-clarkson-airshed.html*

Oakville's State of the Environment Report, Town of Oakville
http://www.oakville.ca/environment/state-of-oakville-environment-report.html

Town of Oakville By Law: http://www.oakville.ca/assets/general%20-%20environment/HPAQB2010-035.pdf

Town of Oakville By Law Information and Application Web Page:
http://www.oakville.ca/environment/health-protection-air-quality.html

Town of Oakville Council Meeting Report, February 1, 2010
http://www.durhamenvironmentwatch.org/Incinerator%20Health/Oakville%20Staff%20Report%20on%20Health%20Protection%20&%20AQ%20bylaw.pdf

OTHER REFERENCE DOCUMENTS

Develop an official community plan that sets out objectives and policies for dealing with air quality issues. Use policies to flag locations with high-risk land uses (e.g. daycares and schools) in relation to busy roads. Designate truck routes in the transportation network plan, and develop a land use plan that avoids incompatible land uses such as polluting sources near schools, hospitals, and residences.

Develop with Care 2012: Environmental Guidelines for Urban and Rural Development in BC. Supporting Information – Air Quality is a key resource and technical guidance for policies.

Use the zoning bylaw to regulate air pollution related to uses and operations that are tied to structures and other development. For example, setbacks can provide a buffer area between an industrial operation and a public road.

West Coast Environmental Law's Clean Air Bylaws Guide describes the opportunities and appropriate use of zoning bylaws to prevent conflict related to air pollution.

Develop an anti-idling bylaw to minimize vehicle transportation emissions in the community.

Idle Free BC has resources on a number of communities that have anti-idling bylaws such as Williams Lake, Kamloops, Abbotsford, North Vancouver, Whistler, Gibsons, and other communities.

Develop bylaws for wood-burning appliances and backyard burning.

Powell River Regional District has a wood-burning appliances bylaw.

The B.C. Ministry of Environment offers a model municipal bylaw for backyard burning.

Develop or amend policies and regulations for on-site construction to control fugitive dust.

Prince George's Clean Air Bylaw includes regulations for dust control.

Develop policies for managing lands, equipment, and facilities in ways that minimize air pollution and maximize water conservation opportunities.

City of Richmond's Environmental Purchasing Guide