Class Environmental Assessment for Biosolids Management at the Highland Creek Treatment Plant

HEALTH IMPACT ASSESSMENT OF BIOSOLIDS MANAGEMENT ALTERNATIVES

Ame-Lia Tamburrini

Prepared by:
Habitat Health Impact Consulting

Prepared for:
CIMA Canada Inc.

Developed for:
Dr. David McKeown, Medical Officer of Health of the City of Toronto

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HEALTH IMPACT CONSULTING

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Background

Currently, the Highland Creek Treatment Plant (HCTP) utilizes multiple hearth incinerators for biosolids management. Ash is stored on-site in lagoons, and hauled off-site for disposal over a 2 week period each year. The existing incinerators (referred to as the 'Base Case') are nearing the end of their service life, and a new biosolids management approach is required.

The City of Toronto (City) undertook a Biosolids Master Planning process for all four of its wastewater treatment plants from 2002 to 2009. In 2011, Council directed Toronto Water to implement beneficial use of biosolids from the HCTP) (*i.e.*, biosolids directly applied to land as a nutrient source or further processing of biosolids into a fertilizer product). This decision required the City to undertake a new Class Environmental Assessment focusing on the HCTP facility. In November 13th, 2013, City Council authorised Toronto Water to issue and award a Request for Proposal for the Preparation of a Schedule B Class Environmental Assessment (Class EA) to examine all reasonable and feasible biosolids management alternatives for the HCTP. The Class EA terms of reference included a Health Impact Assessment to be conducted under the guidance of the Medical Officer of Health.

This HIA identifies and characterises the potential health impacts that may result from the three short-listed biosolids management alternatives that are being considered for the HCTP:

- Alternative 1: On-site fluidized bed incineration and off-site ash management
- Alternative 2: Transporting biosolids off-site for further management, and
- Alternative 3: On-site processing of biosolids into pellets (a fertilizer product) and transporting pellets off-site for further management.

The HIA also examines two potential routes for the transport of ash, biosolids or pellets from the HCTP.

The results of the HIA will be considered along with the environmental, social and economic impacts to determine the best biosolids management option for the HCTP.

Study Area

The study area, as determined by the Class EA, includes Wards 43 and 44 within the City of Toronto. This study area, which surrounds the HCTP, was selected because this is the area that could potentially be affected by activities associated with managing biosolids at the treatment plant, or the transport of biosolids from the treatment plant for management off-site.

HIA Process

An HIA Stakeholder Group was formed to inform the assessment by providing local knowledge and perspectives. Groups representing local communities/neighbourhoods; environment and conservation authorities; parks and recreation; children; schools; daycares; people living with low income; and newcomers participated. An expert review team also provided input. Public and stakeholder input were also obtained through the public consultation processes of the Class EA (Public Information Centres and written submissions). The HIA made use of information developed as part of the Class EA, including the Human Health Risk Assessment (HHRA) and transportation and noise assessments.

A literature review, expert input and consultation with the stakeholders were used to develop an HIA plan and determine the scope of the HIA. Preliminary results of the HIA were presented to the stakeholder group and the draft report was reviewed by external experts. Comments received were incorporated into this final report.

Key Findings

Air Quality

Results from the HHRA were used to determine the potential short- and long-term human health risks to individuals in the study area who could be affected by emissions from the three proposed biosolids management alternatives. The HHRA examined the potential exposure to chemical contaminants in air coming from the plant itself as well as from the trucks that would be used for hauling biosolids or processed biosolids product to or from the HCTP.

Health risks were estimated for each of the three biosolids treatment alternatives and compared to the current operations (Base Case). In addition, air emissions of priority substances from sources within and outside Toronto were modelled to provide an

estimate of existing levels of pollutants in Wards 43 and 44. Emission estimates from current operations and the three alternatives were added to the background to provide an estimate of total exposures within the study area.

The HHRA concluded that:

1) All short-term or chronic exposures to toxic air contaminants were well below health benchmarks for the current HCTP incinerators (Base Case) and the three biosolids management alternatives.
2) The three biosolids management alternatives are expected to result in a decrease in average levels of criteria air contaminants (carbon monoxide, nitrogen oxides, ozone, sulphur oxides, particulate matter) across the study area, compared to Base Case conditions.
3) The differences in the potential risk among the three alternatives are very small.
4) Traffic emissions from Highway 401 and other roads represent the most significant sources of air pollution in the study area.
5) The three alternatives contribute less than one percent of the total air exposures to the contaminants of concern modelled in the cumulative air quality assessment, both in the study area overall and locations near the HCTP itself.

Multi-Media Exposure Risk

The HHRA also used a 'multi-media analysis' to examine the potential for health impacts resulting from ingestion, inhalation and dermal exposure to air, soil, dust, and ingestion of home-grown vegetables or fruits. The HHRA found that:

1) For all three alternatives, the health risks due to exposures to the selected contaminants would be well below their associated health benchmarks.

   For all alternatives, health risks related to contaminant risks are anticipated to be lower than for the Base Case.

Traffic Safety

Currently, approximately 86 trucks are used to haul ash (end-product of incineration) from the site to the Green Lane Landfill over a 2-week period every year. Alternative 1 would represent no change from the existing conditions. Alternatives 2 and 3 would require year-round hauling ranging from 1-2 trucks per day (Alternative 3) to 4-6 trucks

per day (Alternative 2). These trucks would result in a very small increase in total truck traffic on the haul routes – an increase in percent of trucks of 0.66% (Alternative 2) and 0.5% (Alternative 3) compared to current truck traffic. The traffic safety risk associated with this increase is very low. Based on the most recent data on rates of traffic injuries and fatalities for Toronto, it is estimated that for all alternatives the risk of injury would increase by less than one injury every 100 years. Given the low risk, the differences between the alternatives are not appreciable.

The two potential routes for the trucks were also assessed. Route 4 (which primarily uses Lawrence Avenue and Port Union Rd) presents a lower risk profile for vulnerable populations, particularly children; it is therefore preferred to Route 1 (which travels along Morningside Avenue).

Neighbourhood Characteristics

Four different factors related to neighbourhood characteristics were considered: access to transport, recreation and leisure, property values, and social cohesion. Based on literature available, input from the local community, the fact that a facility already exists, and that truck traffic would primarily occur along routes that currently have heavy commercial traffic, no impacts to property values, access to transport, recreation and leisure and social cohesion are anticipated. The existing and proposed cycling and pedestrian infrastructure and the temporary nature of odour and noise impacts suggest that there are unlikely to be any adverse impacts on health.

Stress and Risk Perception

Noise generated by truck traffic or odours from transporting biosolids waste associated with Alternative 2 and 3 might cause stress and perceived risk of health impacts. However, if these impacts occur, they would be very small.

Noise was assessed as a worst-case scenario, and therefore differences between the alternatives could not be identified. However, the assessment did conclude that a perceptible (4 decibel) increase in noise could occur along transportation Route 1, along one section of Coronation Drive in the community of West Hill. Also, although odour producing potential will be mitigated on-site, there is some odour producing potential along the haul routes for Alternative 2 and 3. Overall, it is unlikely that these factors would result in negative impacts on health.

Greenhouse gases (GHGs)

The Class EA estimated potential releases of GHGs from fossil fuel burned (natural gas), electricity usage and truck emissions due to hauling. All three biosolids management alternatives are expected to result in a decrease in GHG emissions (measured as carbon dioxide (CO_2) equivalents) compared to current conditions at the HCTP. The current incinerator produces approximately 8.7 thousand kilograms of CO_2 equivalent emissions per year. Alternative 2 has the lowest estimated GHG emissions (1.4 thousand kg $CO_{2\ eq}$), followed by Alternative 1 (1.7 thousand kg $CO_{2\ eq}$) and Alternative 3 (3.4 thousand kg $CO_{2\ eq}$). Given the importance of reducing the global emissions of GHGs, all alternatives are expected to be beneficial to health; however, the difference among the alternatives from a health perspective is not discernable.

Job opportunities

Employment is an important determinant of health. Job opportunities on-site would essentially be the same as current conditions for each of the biosolids management alternatives. While Alternative 2 and 3 would create additional employment due to the haulage of biosolids and pellets off-site these jobs would be available city wide and would be a very small increase in the context of Toronto as a whole.

Health Equity

An important component of an HIA is to evaluate the existing inequalities in the study area and assess the distribution of the potential impacts of the project. Vulnerable populations identified for this HIA by the HIA Stakeholder Group included children, seniors, people with pre-existing health conditions, the low-income population, Aboriginal Peoples and newcomers. The Neighbourhood Improvement Areas are communities in Toronto that fall below the Neighbourhood Equity Score and the City has identified as requiring special attention. The study area includes four of these communities: West Hill, Scarborough Village, Morningside and Woburn.

The three alternatives are not expected to result in inequitable health impacts for the study area population. However, improvements in air quality would be beneficial to children, seniors and people with pre-existing health conditions as well as low-income communities. The community of West Hill, where the HCTP is located, will experience all impacts, both positive (air quality) and negative (traffic-related safety, noise and odour) most intensely, although all impacts will be very small.

The haul routes or transportation routes is one aspect of the biosolids management alternatives that could result in equity-related impacts. Each proposed transportation route was assessed in terms of the proximity to vulnerable populations: Neighbourhood

Improvement Areas, locations with high senior and child/youth populations, schools, churches, senior homes, child care centres, cross walks, and bicycle routes. Route 4 is predicted to have a lower impact on vulnerable populations compared to Route 1 particularly around issues of odour, noise and traffic safety.

Mitigation Measures

A number of standard operating procedures will be put in place to reduce any impacts to community health depending on the preferred alternative that is selected. These measures are listed below:

1) In order to mitigate any potential odours from truck loading, the biosolids or pellet truck loading facilities would be constructed with bay doors that would be closed at all times except when trucks are entering and exiting the facility. Biosolids or pellets would be stored in closed silo bins. Trucks would not be filled until they have entered the facility and the bay doors have closed behind them. The doors will not open again until the trucks are ready to leave (Alternatives 2 and 3).
2) All air from inside the truck loading facility would be captured and treated through an odour control unit before being released to the atmosphere (Alternatives 2 and 3).
3) Similar to 2), odours generated within the pelletization facility will be collected and treated (Alternative 3).
4) Trucks will be washed before leaving the truck loading facility to reduce odour potential on route (Alternatives 2).
5) Mercury capture and wet scrubbers will be installed in stacks to remove mercury, particulate matter and water soluble contaminants (Alternative 1).
6) Trucks will meet emission standards (Alternatives 1, 2 and 3).
7) To reduce potential for air and soil contamination, the City of Toronto Sewer Use Bylaw will continue to be enforced, to minimize the presence of pollutants in biosolids (Alternative 1, 2 and 3).
8) Standard Operating Procedures would be put in place for the safe transport of the biosolids material from the treatment plant to its end destination. Haulers would also be required to have the necessary permits and approvals for the specific biosolids management method being used (Alternative 1, 2 and 3).

9) All operations on-site will have to follow municipal bylaws for noise regulation (Alternatives 1, 2 and 3).

Along with these procedures, the HIA Stakeholder Group and the expert review panel also provided strategies for the City to consider as it moves forward with this and other projects.

Overall Conclusions

The HIA examined the potential for the proposed biosolids management alternatives to affect a number of health determinants in the study area. This HIA supports the Class EA by providing a more in-depth assessment of the potential health impacts of biosolids management alternatives for HCTP and by providing a thorough review of the alternatives from a health risk and health equity perspective.

Overall, the health impacts associated with the alternatives are very small and there are no appreciable differences in health impacts of the three short-listed alternatives. All alternatives evaluated achieve substantial reductions in air emissions compared to the current multiple hearth incinerators. However, among the three alternatives, modern fluidized bed incineration (Alternative 1) is anticipated to result in the highest releases of air pollutants, and the beneficial use alternative and haulage of biosolids off-site (Alternative 2) and on-site pelletizer and haulage off-site (Alternative 3) are expected to increase risks related to HTCP-related truck traffic (i.e., safety, odour and noise).

The HIA also examined the potential health impacts along two short-listed transport routes as all three alternatives involve some trucking of materials off-site. Compared to Route 1 (along Morningside Ave), Route 4 (along Port Union Rd) had lower predicted impacts on the community in terms of pedestrian safety, noise and vulnerable populations. These potential equity impacts should be taken into account when selecting the preferred transportation route.

Acronyms and Abbreviations

CACs	Criteria air contaminants
Class EA	Class Environmental Assessment for Biosolids Management at the HCTP
CO	Carbon monoxide
CO_2	Carbon dioxide
COCs	Chemicals of concern
ECA	Environmental Compliance Approval
GHG	Greenhouse gas
HCTP	Highland Creek Treatment Plant
HHRA	Human Health Risk Assessment
HIA	Health Impact Assessment
MOECC	Ministry of the Environment and Climate Change
N_2O	Nitrous oxide
NIA	Neighbourhood Improvement Area
NOx	Oxides of nitrogen
PAHs	Polycyclic aromatic hydrocarbons
PCBs	Polychlorinated biphenyls
PIC	Public Information Center
THC	Total hydrocarbons
TM	Technical Memoranda
TPH	Toronto Public Health
WHO	World Health Organization

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This HIA was prepared by Habitat Health Impact Consulting on behalf of CIMA for the City of Toronto. Toronto Public Health, who is part of the City of Toronto team, provided overall direction on the HIA. The HIA was authored by the individuals listed in Table 1.

Table 1: Contributing authors for HCTP HIA

Name	Affiliation
Ame-Lia Tamburrini, lead	Habitat Health Impact Consulting
Marla Orenstein	Habitat Health Impact Consulting
Erica Westwood	Habitat Health Impact Consulting
Folake Arinde	Habitat Health Impact Consulting
Josephine Archbold, TPH Project Lead	Toronto Public Health
Ronald Macfarlane	Toronto Public Health

Other important contributors of the HIA included members of the CIMA Class EA team who helped to edit and contribute data to the final HIA.

- Deborah Ross, CH2M HILL
- Erin Longworth, CIMA
- Glenn Ferguson, Intrinsik Environmental
- Anthony Ciccone, Golder Associates

Expert Reviewers

The following technical experts reviewed the scoping stage of the HIA and the final report to provide expert review and critical appraisal of the approach, methods and conclusions of the HIA:

- Dr. Donald C. Cole, Dalla Lana School of Public Health
- François Benoit, Louise St-Pierre and François Gagnon, National Collaborating Centre for Healthy Public Policy (NCCHPP)
- Ms Christiane Thibault, Mr Onil Samuel, Ms Marie-Hélène Bourgault, Ms Michelle Gagné and Ms Karine Chaussé, Environmental Health and Toxicology and Mr Richard Martin, Occupational Health, Biological Risk and Safety at the Institut National de Santé Publique du Québec (INSPQ: National Public Health Institute of Quebec)
- Dr. Paul Gully, Public Health Consultant and Adjunct Professor in the School of Population and Public Health, UBC

HIA Stakeholder Group

Members of the community were invited to provide input on the HIA. The stakeholders invited represented: neighbourhood community groups; organizations representing vulnerable community members and, other non-governmental organizations. The following stakeholders participated as members of the HIA Stakeholder Group:

- Jennifer McKelvie, Centennial Community and Recreation Association
- Allen Elias (with Ron Wooten as alternate), Coronation Community Association
- Richa Sood, Highland Creek Community Association
- Elliotte Boyko, West Rouge Community Association
- Barbara McElgunn, Highland Creek Neighbourhood Liaison Committee
- Mario Silva, Toronto District School Board
- Corrado Maltese, Toronto Catholic District School Board
- Matthew Klaas, Local Immigration Partnership, Toronto East Quadrant
- Brian Parris, Community Development Officer, Toronto Public Health
- Nneka Perry (Michelle as alternate, did not get record of last name), East Scarborough Boys & Girls Club
- Heather Marshall (Emily Alfred as alternate, Toronto Environment Alliance (TEA)
- John Stapleton, Open Policy Ontario
- Arlen Leeming (Adele Freeman as alternate), Toronto Regional Conservation Authority (TRCA)
- Native Child and Family Services of Toronto (included as key informant interview)

Many thanks to everyone who was involved in the Health Impact Assessment process.

1. Introduction

1.1 Overview

The purpose of this Health Impact Assessment (HIA) is to identify and characterise the potential health impacts that may result from three short-listed biosolids management alternatives being considered for the Highland Creek Treatment Plant (HCTP). This HIA was conducted as part of the Class EA for Biosolids Management at the HCTP (Class EA) that will consider the economic, environmental and social effects of the three alternatives. The HIA contributes to the EA by providing an special focus on health to determine the best biosolids management option for the HCTP.

This document has used data and assessments undertaken as part of the Class EA (see Section 1.2) and provides a detailed assessment of potential positive and negative health impacts that could be associated with each of the biosolids management alternatives under consideration. The report includes an outline of standard operating procedures that will be used with each of the alternatives to reduce any impact to the community as well as a summary of feedback from HIA Stakeholders and the expert review panel on possible measures the City could consider when it implements this and other City projects to minimise any adverse impacts or enhance positive ones. The Health Impact Assessment Plan (see Appendix A) and Health Impact Assessment Scoping Phase (see Appendix B) are attached to this report.

1.2 Sources of Information and Data from the Class Environmental Assessment

This HIA relied on many data and information sources developed as part of the Class EA. Below is a list of reports that that were used to support the HIA. These reports are available for download from the City of Toronto website: www.toronto.ca/hctpbiosolidsea.

- HCTP Class EA Human Health Risk Assessment Report
- Air Modeling Report
- Study Area Description, Current Biosolids Management, Future Needs and Problem / Opportunity Statement
- Long List of Biosolids Management Options
- Development of Short-listed Biosolids Management Options
- Evaluation of Potential Noise Impact - Off-site Haul Routes
- Evaluation of Alternative Transportation Modes and Routes

2. About Health Impact Assessment

2.1 Introduction

Health Impact Assessment (HIA) is a process that identifies how a specific policy, project or program could affect health determinants and health outcomes in human communities, and how those effects may be distributed within the population. The purpose of HIA is to provide evidence to assist in decision-making, with an ultimate goal of enhancing the health benefits of the policy, project or program and mitigating potential harms.

2.2 What "Health" Means

Health is a concept that is difficult to define. Most contemporary definitions of health acknowledge that good health is different than merely an absence of disease, and that it incorporates physical, mental, and social well-being.[1] Healthy people are able to cope with everyday activities and to adapt to their surroundings.

Health is influenced by where people live, the state of their environment, their income and education levels, their jobs, and their relationships with friends, family and the larger community. These critical factors are often called '**health determinants'** (or determinants of health) because of their roles in shaping health of individuals and communities. Some health determinants are related to individual behaviours; for example, smoking, eating healthy foods, or using seatbelts. Other health determinants are more closely tied to the physical environment (air and water quality, subsistence resources), activities under the control of institutions (public utilities, land use, access to alcohol and tobacco), working conditions (jobs, income), or the social environment (social, emotional, cultural, and religious supports). Genetics is also a contributor.

These health determinants contribute to **health outcomes** that are ultimately experienced by individuals, such as acute (e.g. gastrointestinal disease) or chronic illness (e.g. hypertension); mental health status (e.g. depression or anxiety); and injuries or trauma (such as broken bones or concussion).

Another important concept is '**health inequity'**. Health inequity refers to unfair or avoidable differences in the distribution of diseases between population groups due to differences in access to health services and/or a healthy environment.[2] Equity is achieved when all people have a fair opportunity to attain their full health potential.[3]

This HIA uses a broad definition of health, focusing on the proposed project's potential impacts on health determinants. The HIA also considers how potential effects may be distributed amongst the population and whether health inequities may be exacerbated or lessened as a result.

2.3 Steps in an HIA

Overview

While each HIA is unique, HIAs typically follow a stepwise methodology that has been developed and standardized over several decades, and documented in a number of guidebooks and toolkits. This HIA follows the framework described in Toronto Public Health HIA Framework (see Figure 1).[4] The framework was adapted to meet the needs of this project.

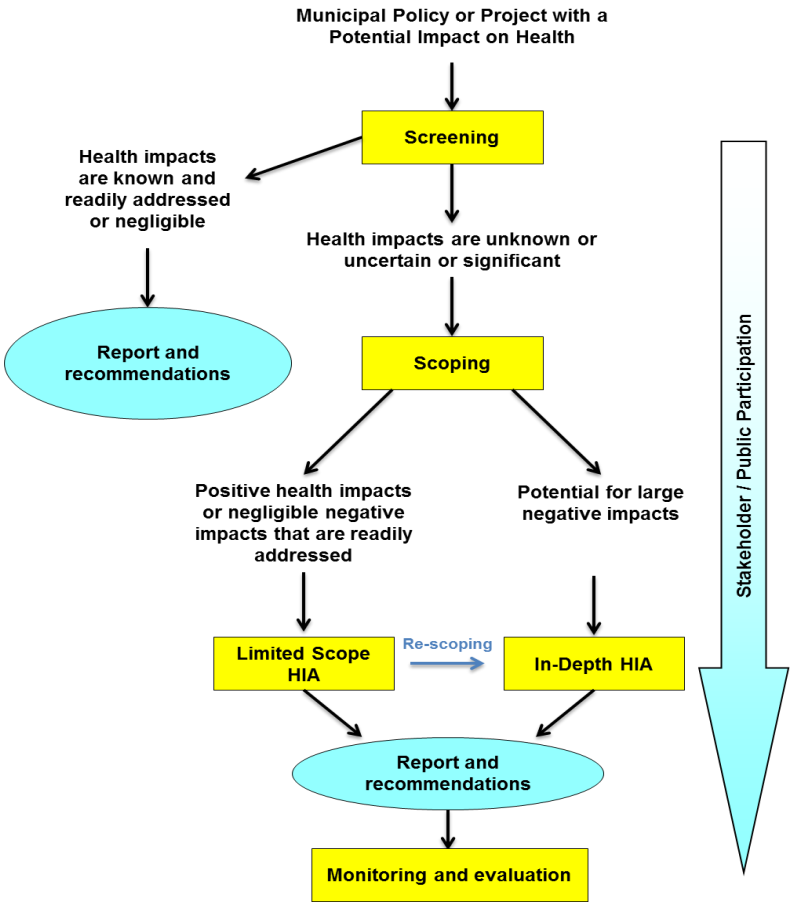

Figure 1: Steps in the HIA Process (adapted from TPH's HIA Framework)

Screening

Screening is the first step in an HIA. It is used to evaluate whether there is need for an HIA and what level of effort may be required. This evaluation is based on factors such as whether an HIA will be useful and timely, and whether it will add value to decision-making.

Scoping

The scoping phase of HIA is used to identify the health areas or health determinants that will be carried forward into the in-depth HIA phase and to determine the level of detail/effort that will be required to support the assessment of effects.

In-depth HIA

Although not explicitly described in TPH's HIA Guidance, there are two components of the in-depth HIA phase that are generally completed: the community profile and the assessment of effects.

Community Profile

The community profile describes the current health status of the study area population and provides other information relevant to understanding health, such as demographic and socio-economic indicators. A community profile serves several purposes:

- It identifies health vulnerabilities, challenges and opportunities in the affected population in order to assess the project's potential to exacerbate problems, and where possible, leverage the opportunity to improve health;
- It identifies the current status of health conditions such that predictions can be made about the extent of change; and
- It identifies potentially vulnerable subsets of the population.

Assessment of Effects

The assessment of effects characterises the health impacts that are predicted to result from the proposed policy, project or program. This process requires information gathering from many sources in order to clarify the connections between proposed activities and resulting health outcomes in the affected population.

Recommendations and Reporting

The recommendations step of HIA is where strategies are developed to mitigate negative impacts and enhance positive effects that were identified during the assessment stage. Reporting refers to developing a report or other communication methods for communicating the results of the HIA to various audiences.

Monitoring and Evaluation

Monitoring and evaluation are steps that happen after the HIA has been completed. During monitoring, the effects of the health impact assessment are tracked overtime; whereas evaluation is the process of determining whether an HIA was effective in meeting its objectives. In an HIA one can evaluate the process, the impact on various stakeholders and more rarely the impact on health outcomes.

Stakeholder / Public Participation

The input of stakeholders is considered to be a key element of HIA. Stakeholder input is used throughout the HIA process, from informing the selection of health topics to be included

(scoping) through to providing input for the assessment of effects and development of recommendations.

A description of the methods used for the HCTP HIA is provided in Section 4.

3. About the Class EA and the HCTP Project

3.1 Description of the HCTP

The Highland Creek Treatment Plant (HCTP), with a rated capacity of 219,000 cubic metres per day (m^3/d), serves the eastern portion of the City. The plant provides conventional activated sludge treatment and discharges to Lake Ontario. Residual solids (sludge) are anaerobically digested and dewatered, and the resulting biosolids are incinerated in two multiple hearth incinerators. Ash (the final produce of incineration) is stored on-site in lagoons. The lagoons are cleaned once per year and ash is hauled off-site for disposal in the City of Toronto Green Lane Landfill. The incinerators are older technology and coming to the end of their service life. Urgent repairs are currently underway to improve reliability and extend the life of the incinerators for a further 10 years.

In light of the remaining service life of the incinerators, a new biosolids management solution is required. To that end, the City has initiated a Schedule B Class Environmental Assessment to identify the best biosolids management alternative to be implemented for the HCTP biosolids in the future. This process has been initiated now to provide adequate time for the design, construction and commissioning of new facilities that are required within the next 10 years.

The following sections present a summary of the three short-listed biosolids management alternatives being considered in the Class EA.

3.2 Biosolids Management Alternatives

Following a review of a long list of potential biosolids management alternatives[5] (as presented in the Class EA Report), three alternatives were identified as feasible for the HCTP. In-depth information on each of the short-listed biosolids management alternatives is provided in the *Development of Short-listed Options* Class EA report. The health impacts of these alternatives are evaluated in the HIA, and the results will be considered with their environmental, community and economic impacts in the Class EA. These alternatives are briefly presented in the following sections.

A do-nothing option is not being proposed for this project since the treatment plant is nearing the end of its life and needs to be replaced in order to effectively manage wastewater for the City of Toronto.

3.2.1 Alternative 1: On-site Fluidized Bed Incineration

For Alternative 1, incineration would continue to be used to manage biosolids at the HCTP. Incineration significantly reduces the volume and mass of biosolids, generating a residual (ash) requiring further management. For this Alternative, the existing multiple hearth incinerators would be replaced with new fluidized bed incineration equipment.

Incineration is the combustion of the organic (carbon containing) solids in wastewater treatment residuals in the presence of oxygen. The process of transforming biosolids into carbon dioxide and water releases a small amount of other substances, such as: carbon monoxide (CO), total hydrocarbons (THCs) and oxides of nitrogen (NOx). The temperature in the combustion zone of furnaces is typically 760 to 870^{o}C. The solids that remain at the end of the process are in an inorganic form commonly known as ash.

Both unprocessed sludge and processed biosolids that have been mechanically dewatered to a solids content of 25-30% are suitable for incineration. Incineration takes advantage of the fuel value of these materials, and the energy recovered can be used in heat exchangers and waste heat boilers to offset other energy uses within the wastewater treatment process. The efficiency of the process is increased by the dryness (% solids) of the incinerator feed material, as well as the organics content.

Incineration results in a large reduction of the biosolids/sludge in both volume and mass in comparison to other management options. The mass of solids in the ash is approximately 20 to 30% of that in the incinerator feed, thus reducing the mass that must be further managed off-site.

Incineration also achieves complete destruction of pathogens (disease-causing organisms), as well as organic contaminants. Depending on the quality of the biosolids being incinerated, trace amounts of contaminants may be released to air along with other products of combustion such as nitrogen oxides and particulate matter (PM). The remaining ash is inorganic and not susceptible to further biological activity or decomposition. It may be disposed as a conventional waste (i.e., non-hazardous).

Currently the HCTP incinerator uses multiple hearth technology which is outdated. The newer, more efficient fluidized bed technology is being considered for municipal wastewater biosolids management at Highland Creek.

Typically, the ash resulting from the incineration process is mixed with effluent water and pumped to ash lagoons where it is stored on-site for extended periods of time or indefinitely. When a lagoon is full, ash is removed and typically hauled to a sanitary landfill site for final disposal. Currently, the on-site lagoons storing the ash at the HCTP are emptied annually in the summer months and the ash is transported to the City's Green Lane Landfill site. It is estimated that this alternative will require approximately 86 40-tonne trucks to remove the ash over a 2-week period every year.

3.2.2 Alternative 2: Biosolids Transport Off-site for Management

For Alternative 2, biosolids would be hauled off-site (without further on-site processing) for management, and either taken to storage or end-use directly, or taken to a facility for further processing into a material that would be distributed and/or marketed. This biosolids management approach would require the City to retain one or more contractors to haul the biosolids off-site.

The City practices this approach for a large portion of the biosolids generated at the Ashbridges Bay Treatment Plant. For that facility, the City has several contracts in place with third party management providers; some who haul biosolids directly to land application and others who provide further processing and management of a fertilizer material or compost. While most of the

biosolids are now being managed this way, a small portion still gets sent to landfill due to limited market demand.

Using this approach at the HCTP, the processing or disposal methods used would not be defined by the City. Rather, this would depend on contractors' proposals as selected through a competitive bid process. The biosolids would be stored, managed and/or disposed off-site by the contractor. Standard Operating Procedures would be put in place in order to ensure the safe transport of the biosolids material from the treatment plant to its end destination. Haulers would also be required to have the necessary permits and approvals for the specific biosolids management method being used.

In order to haul biosolids off-site, a vehicle loading facility would need to be constructed at the HCTP site and biosolids would be hauled from the facility on a daily basis. Additional digester capacity would also be required since some of the biosolids could potentially be directly applied to land (under the Ontario Nutrient Management Act regulations).

In the development of the Class EA Report, it was determined that haulage by trucks with 40-tonne capacity is the preferred transport mode for the biosolids. Since haulage may only occur 5 days per week, 4 to 6 trucks would have to travel to and from the site each day using one of two transportation routes (see section below).

The truck loading facility would allow for temporary storage (3-5 days) of biosolids. Truck loading bay doors would be closed during filling, and all air from building would be collected and treated through an odour control unit before being released to the environment.

All hauling, processing and management methods are regulated through the Ontario Water Resources Act (R.R.O. 1990), the Ontario Environmental Protection Act (R.R.O. 1990) and the Ontario Nutrient Management Act (N.M.A. 2002). Each contractor would be responsible for securing the approvals and permits required for the specific biosolids management method being used.

3.2.3 Alternative 3: Pelletization Process and Distribution of Fertilizer Product

For Alternative 3, new facilities would be constructed at the HCTP site to process biosolids to generate small, dry pellets that can be distributed as a fertilizer product. This management approach is also used at the City's Ashbridges Bay Treatment Plant for a portion of the biosolids generated at that facility.

Pelletization involves using heat to evaporate water from the biosolids generating a finished material with a total solids concentration of 90% or more. The dried material is in pellet form, typically 2 to 4 mm in size, to make it suitable for marketing. The high temperature in the process reduces pathogens the biosolids to below the level of detection*, resulting in a material that can

* In November 2004, TPH released a study titled 'Biosolids Pellet Review Study: Human Health and Ecological Risk Assessment'. This study was commissioned in 2001 in response to public concern over land application of biosolids pellets to be produced by a new pelletization facility being proposed for the Ashbridges Bay Treatment Plant. While recommendations were made, this study concluded that there was no evidence of human health effects associated with land application of biosolids pellets.

be used as a fertilizer product. The fertilizer product must meet Federal Fertilizer Act requirements and if sold as a fertilizer needs to be registered before being put on the market.

Dryers require energy input to elevate the temperature of the water in the biosolids to the point of evaporation. Where available, natural gas is generally used as the source of energy. Alternatively, biogas generated in the digestion process can be used to provide a portion of the energy demand.

Like a number of other organic materials, the dried product must be stored where it can be kept dry. Engineered silos and other systems can be used to meet this need. However, the systems needed to maintain product dryness are expensive, and costs are proportionately higher for long storage periods. Alternatively, the pellets can be bagged or hauled off-site for management/distribution soon after production.

The volume of dried pellets generated from the process is about 30% of the volume of the biosolids feed material due to the low water content of the pellets.† The pellets would need to be hauled from the HCTP site by contractors, requiring a vehicle loading facility to be constructed on-site at the plant. An average of one to two 40-tonne trucks per day would be required to haul pellets from the site using one of two routes (see below).

3.2.4 Transportation Route Options

As part of the Class EA for biosolids management at the HCTP, a transport mode and route analysis was conducted to identify the best method for transporting biosolids and ash off-site.[6] In the comparative analysis of transport mode options (truck, pipeline, rail and water), trucking was determined to be the most suitable mode of transporting biosolids or biosolids products from the HCTP. As documented in the *Evaluation of Alternative Transportation Modes and Routes* report, the trucks used to haul the biosolids or pellets would be equivalent to Designated Tractor-Trailer Combination 2 — Tractor Self-Steer Triaxle Semi-Trailer with a carrying capacity of up to 40 metric tonnes.[6]

To maximize public safety associated with trucking, an evaluation of alternative feasible routes within the study area was completed to identify the best truck routes to and from the HCTP. A total of six potential routes from the HCTP to the nearest Highway 401 intersections were evaluated based on fifteen criteria related to safety, operations and community impact, as shown in Table 2.

† Pellets are 30% of the volume of biosolids feed because of the volume of water that is removed. Incineration results in less material volume, because all the water is removed and about 50% of the solids are destroyed in the process; therefore fewer trucks are required to haul material off-site.

Table 2: Evaluation Criteria for Proposed Routes

Traffic Safety	Operations	Community
• Schools, libraries, child care centres and other community facilities • Pedestrian safety • Pedestrian exposure • On-street parking • Number of required left turns at unsignalized intersections • Bicycle routes • Number of stop signs	• Manoeuverability • Added trucks in background traffic • Total background traffic on arterial roads • Number of traffic signals • Vertical alignment • Transit	• Length of route through residential areas • Legal truck restrictions

An impact score for each of the six potential routes was calculated based on these criteria. After analysis, Routes 4 and 1 had the lowest impact scores under safety and community categories, and were carried forward in the detailed analysis of biosolids management alternatives and Health Impact Assessment for the the Class EA process. Section 7 of this report provides summaries of the criteria and maps of Routes 1 and 4.

For the HIA, both Routes 1 and 4 will be considered during the assessment of health impacts associated with all alternatives. For Alternative 1, haul traffic would be present for two weeks of the year, whereas for Alternatives 2 and 3 haul traffic would occur year-round. The materials being hauled for each alternative will differ as outlined above.

3.2.5 Comparison of Biosolids Management Alternatives

For the assessment of effects it is important to understand the differences between the three alternatives. Table 3 summarizes the information presented in the previous three sections and documented in the Class EA Report, broken down by construction and operations activities, and compares activities to current operations. This information was used during the assessment of impacts in Section 7.0.

Table 3: Comparison of Biosolids Management Alternatives

	Current Conditions	Alternative 1: On-site Fluidized Bed Incineration	Alternative 2: Biosolids Transport Off-site for Management	Alternative 3: Pelletization Process and Distribution of Fertilizer Product
CONSTRUCTION				
New facilities to be constructed	Multiple hearth incineration facility	Fluidized bed incineration facility	New truck loading facility and new anaerobic digester	Pelletization facility, storage silos, truck loading facility
OPERATIONS				
Biosolids processing (see above)	Residual solids anaerobically digested and dewatered followed by incineration.	Residual solids are anaerobically digested and dewatered, followed by incineration	Residual solids are anaerobically digested and dewatered, Dewatered biosolids are conveyed to a truck loading facility to be hauled off site for management	Residual solids are anaerobically digested and dewatered, Dewatered biosolids are conveyed to a drying facility where biosolids are heated to remove water and mechanically processed to form pellets. Pellets are conveyed to truck loading facility to be hauled off site for management
Sources of air pollution from process	Incinerator emissions are emitted though 76 m stack. Natural gas is added to maintain combustion temperatures. Truck traffic	Incinerator gases emitted though 76 m stack. Truck traffic	Truck traffic	Natural gas burning emissions. Truck traffic.
On-site storage	Ash in lagoons	Ash in lagoons	Biosolids stored (<4 days) in closed bins	Pellets stored (<4 days) in closed silos
Material removed from site	Inert ash	Inert ash	Biosolids	Dried pellets
Truck traffic	Two weeks per year, 86 trucks haul ash to City of Toronto Green Lane Landfill	Same as current conditions	Four to six 40-tonne trucks per weekday	One to two 40-tonne trucks per weekday
Truck route distance	Route 1: 225 km Route 4: 228 km to Greenlane Landfill.*	Same as current conditions	Depends on hauler. Average one-way distance = 415 km. Range one-way distance = 161 to 1,110 km	Estimated one-way distance = 290 km Range one-way distance = 220-360 km
Odours	Incineration is a closed process with no potential for odour generation from biosolids. Ash/ash lagoons are odourless.	Same as current conditions	New digester and truck loading facility, and trucks during transport, are potential sources of odour. Truck loading facility odours will be mitigated with closed loading facility with odorous air collection and treatment. Transport odours will be mitigated through truck washing and covering. Minor odours are possible during transport because truck covers are not fully sealed.	Heat drying process and truck loading facility are potential sources of odours. Processing and truck loading facility odours will be mitigated with closed facilities and odorous air collection and treatment.

	Current Conditions	Alternative 1: On-site Fluidized Bed Incineration	Alternative 2: Biosolids Transport Off-site for Management	Alternative 3: Pelletization Process and Distribution of Fertilizer Product
Noise	Arrival and departure of trucks when lagoons are being emptied	Same as current conditions	Trucks hauling biosolids on a daily basis throughout the week during daytime hours	Trucks hauling dried pellets on a daily basis throughout the week during daytime hours
Greenhouse Gas Emissions (kg CO_2 eq/y)**	8,749,000 (high due to supplemental natural gas required)	1,689,000	1,441,000	3,425,000

* the distance between HCTP and the landfill may change overtime as it is expected that Green Lane landfill will not remain active for the entire life of the incinerator

** GHGs were calculated based on electricity, natural gas and diesel fuel required for the full (estimated distance) to application sites. The conversions of organic material into $C0_2$ either though incineration or through natural degradation in the soils are not included in the calculation. For Alternative 2, additional GHG's will be generated from further processing, transportation of processed material management sites, and equipment used to spread on land. For Alternative 3, additional GHG's will be generated from land spreading equipment. These additional GHG's are not quantified at this time, as they will depend on the contract details.

Source: CIMA[5]

3.3 Description of the Class EA Process and the HIA Component

To meet the requirements of the Ontario Ministry of the Environment and Climate Change (Ontario Environmental Assessment Act, R.S.O. 1990), a Class Environmental Assessment (EA) is being carried out to identify the best solution for managing biosolids generated at the HCTP. This Class EA comprises part of the City of Toronto's mandate to provide reliable wastewater servicing to Toronto residents, and is being conducted in accordance with the requirements of a Schedule B project, as defined in the Municipal Class Environmental Assessment document (Municipal Engineers Association, October 2000 as amended in 2007 & 2011). The study will identify and evaluate alternative biosolids management solutions based on studying the community, natural environmental, human health and economic effects (negative and positive) of each alternative. Figure 2 presents an overview of the Class EA process.

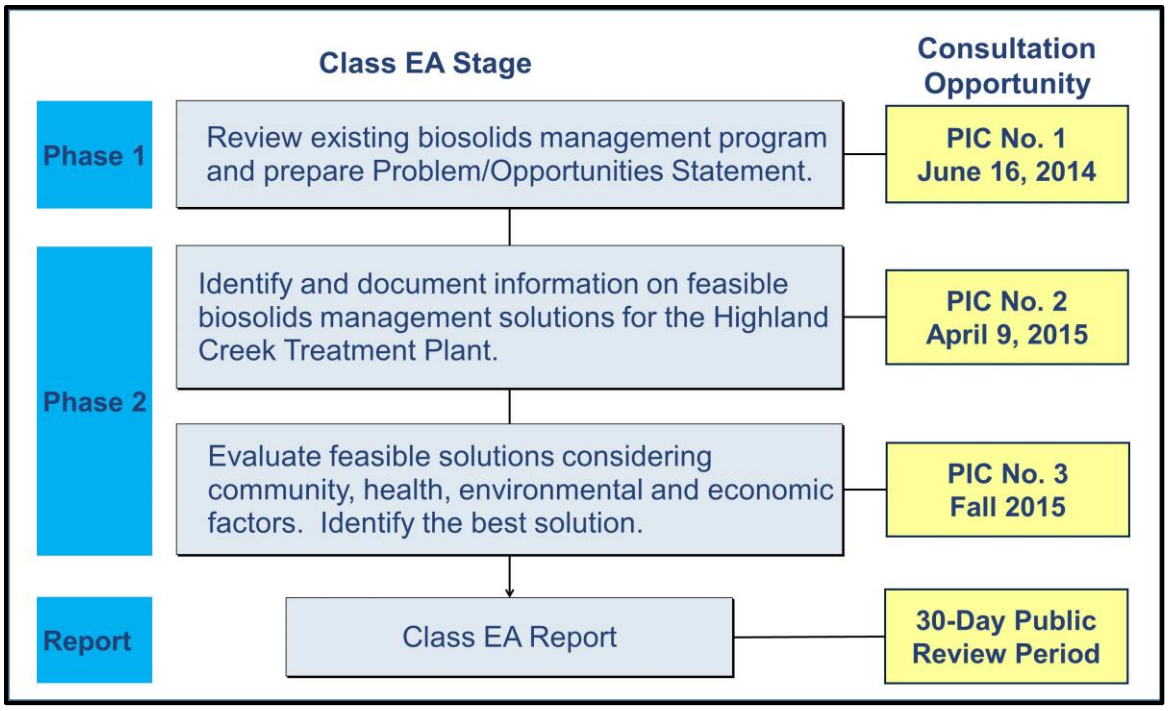

Figure 2: Overview of the Schedule B Class EA Process

A Class EA Report will document the entire study, including consultation activities, and present information on each alternative, including a clear basis for how alternatives were evaluated, and rationale for selection of a preferred biosolids management solution for the HCTP. The recommended solution from the Class EA will be subject to approval by City of Toronto Council before proceeding to an implementation phase.

To evaluate the health effects of the short-listed biosolids management alternatives, a separate HIA was completed. This information will be considered together with economic, environmental and social effects considered within the Class EA using a decision-making process, to select the best biosolids management option for the HCTP. This HIA Report will be an appendix to the Class EA Report. The HIA will be presented to the Toronto Board of Health for their consideration and recommendations. The steps followed during this HIA process are outlined in Figure 3.

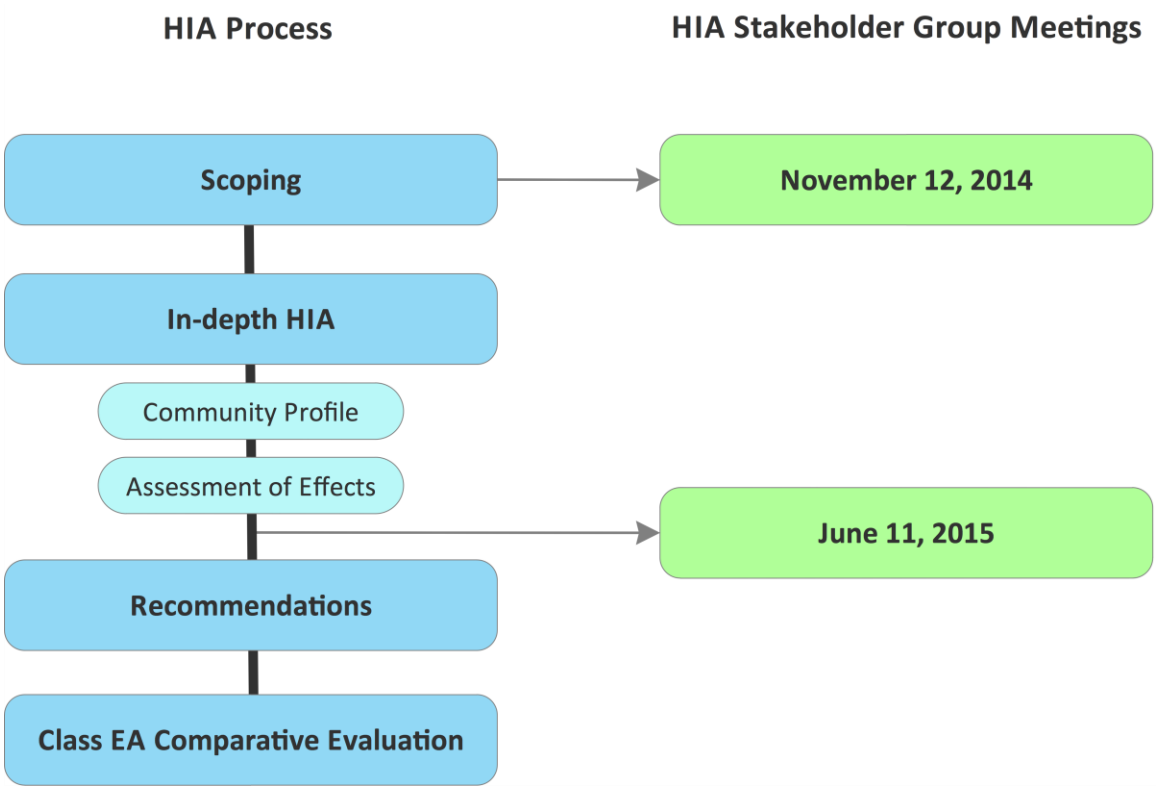

Figure 3: HCTP HIA Process and HIA Stakeholder Meetings

4. Methods

4.1 Governance of the HIA

This Health Impact Assessment was conducted as part of the Class EA for Biosolids Management at the HCTP. The Class EA was commissioned by the City of Toronto who retained CIMA Canada Inc. to conduct the project. The City of Toronto team includes Toronto Public Health (TPH), who is providing overall direction on the HIA. Habitat Health Impact Consulting conducted the HIA which is included as part of the Class EA, as a subconsultant to CIMA. The HIA took over one year to complete, beginning in July 2014 and finishing in September 2015.

The HIA was completed in three steps and summarized in HIA-related reports as outlined in Table 4.

Table 4: Documentation Completed as Part of the HCTP HIA

Report	Stages	Date of completion
Health Impact Assessment Plan	The details of the HIA process were documented, including planned engagement activities and stakeholders, and proposed integration with the Class EA (See Appendix A).	November 2014
Health Impact Assessment Scoping Phase	The health areas of concern for the HIA and the geographic and temporal boundaries were identified and documented (See Appendix B).	June 2015
Health Impact Assessment of Biosolids Management Alternatives	All stages of the HIA were documented (in this report) with a focus on HIA results and recommendations.	October 2015

4.2 Stakeholder Involvement

A broad range of community stakeholders participated in a HIA Stakeholder Group. This group met on two different occasions during the HIA to make the HIA process more transparent, inclusive and representative of diverse perspectives of the affected community. Stakeholders were also invited to provide additional comments outside the Stakeholder meeting and through the EA consultation process. The following organizations comprised the members of the HIA Stakeholder Group:

- Highland Creek Neighbourhood Liaison Committee
- Centennial Community and Rate Payers' Association
- Coronation Community Association
- Highland Creek Community Association
- West Rouge Community Association

- Local Immigration Partnership, TO East
- Toronto District School Board
- Toronto Catholic District School Board
- Community Development Officer, Toronto Public Health
- East Scarborough Boys & Girls Club
- Toronto Regional Conservation Authority
- Toronto Environmental Alliance
- Open Policy Ontario

The following organizations were also invited to be part of the HIA Stakeholder Group, but were unavailable to participate:

- Canadian Association for Physicians for the Environment
- Canadian Environmental Law Association
- Conseil Scolaire de district catholique Centre-Sud
- East Scarborough Storefront Hub
- Friends of the Guild Park and Gardens
- Kinstron Galloway Orton Park Action
- Local Immigration Partnership, Toronto East Quadrant (participated in first meeting)
- Mornelle Court Coalition
- Native Child and Family Services of Toronto (included as key informant interview)
- Ontario Early Years Centre
- Rotary Club – Toronto East
- Scarborough East
- Scarborough Baseball Association
- Scarborough Basketball Association
- Scarborough Centre for Healthy Communities
- Scarborough College Athletics Association
- Scarborough Residents Unite
- Scarborough Village Action for Neighbourhood Change
- City of Toronto: Parks, Forestry and Recreation
- Toronto Catholic District School Board (participated in first meeting)
- Toronto East Community Awareness and Emergency Planning
- Wellesley Institute
- West Hill Community Association
- West Rouge Sports & Recreation Association

In addition to the HIA Stakeholder Group, the HIA was informed by members of the public, public groups and agencies engaged through the Class EA, a key informant (Native Child and Family Services of Toronto), City and government officials who had an interest in the outcome of the HCTP management plan and the Class EA consultant team.

The roles of the different stakeholder groups and how they were involved in the HIA process are described in Appendix A: the HIA Plan.

4.3 Screening

This HIA did not include a typical screening process as the decision to conduct an HIA was part of the terms of reference for the Class EA for biosolids management at the HCTP.

The City of Toronto (City) undertook a Biosolids Master Planning process for all four of its wastewater treatment plants from 2002 to 2009. In 2011, Council directed Toronto Water to implement beneficial use at Highland Creek Treatment Plant (HCTP) (*ie.,* biosolid cakes directly applied to land as a nutrient source or further processing of biosolids into a fertilizer product). This has required the City to undertake a new Class EA focusing on the HCTP facility. On November 13th, 2013, City Council authorised Toronto Water to issue and award a Request for Proposal for the preparation of a Schedule B Class Environmental Assessment (Class EA) to examine all reasonable and feasible biosolids management alternatives for the HCTP. The EA terms of reference included a Health Impact Assessment to be conducted under the guidance of the Medical Officer of Health.

4.4 Scoping Overview

The second report produced for the HIA details the scoping process for the HIA for the biosolids management alternatives at the HCTP (Appendix B: HIA Scoping Phase). In summary, the scoping phase used the following sources of information to determine the health areas of greatest importance to carry forward into the in-depth HIA:

- Review of input from the 1st Public Information Centre (PIC) held for the Class EA – June 16th, 2014
- HIA Stakeholder Group meeting – November 12th, 2014
- Literature review, including previous HIAs on biosolids management and TPH's Biosolids Pellet Review Study conducted in 2004[7]

In addition to the information provided above, the scoping report was reviewed by the expert review panel to ensure the scoping phase captured all relevant health areas and that rationale for the inclusion of health areas was accurate. The results of the scoping process are summarized in section 5.0 of this report.

4.5 In-Depth HIA Information Sources

The in-depth HIA relied on a variety of quantitative and qualitative data sources for describing existing conditions and predicting future effects. Secondary datasets that were accessed include:

- Canadian Census of Population
- Canadian Community Health Survey
- National Household Survey
- Toronto Public Health Ward Health Profiles and Health Status Reports
- Neighbourhood Improvement Area Profiles
- Wellbeing maps for the City of Toronto

This information was supplemented as required using peer reviewed literature, grey literature, compiled data (e.g. data on traffic volumes for Route 1 and 4 used for the Class EA report: *Evaluation of Alternative Transportation Modes and Routes*), HIA Stakeholder Group input, and input from others engaged in the Class EA process.

In addition, the HIA relied on several additional reports prepared for the Class EA, as follows:

- HCTP Class EA Human Health Risk Assessment Report
- Air Modelling Report
- Study Area Description, Current Biosolids Management, Future Needs and Problem / Opportunity Statement
- Long List of Biosolids Management Options
- Development of Short-listed Biosolids Management Options
- Evaluation of Potential Noise Impact - Off-site Haul Routes
- Evaluation of Alternative Transportation Modes and Routes

As stated previously, these reports are available on the City of Toronto's HCTP webpage (www.toronto.ca/hctpbiosolidsea).

Although the study area for this HIA comprises Toronto's Wards 43 and 44 (see Section 5.1 for explanation), not all data used for this report line up perfectly with these boundaries. For example, some health data are only available at the neighbourhood level; neighbourhood boundaries do not align with Ward boundaries and therefore some data extends beyond the study area. This is the case, for example, for the neighbourhood of Woburn. Only the south eastern portion of Woburn fits within Ward 43; however, data is reported for the entire neighbourhood of Woburn. Where possible, data are reported at both the level of the Ward and the neighbourhood to resolve any discrepancies.

Eight of Toronto's 140 neighbourhoods fall within the boundaries of the study area. Table 5 shows the neighbourhoods whose boundaries fall within Wards 43 and 44. The study area is also presented in Figure 4, where grey on the map indicates Neighbourhood Improvement Areas (NIA) (see Section 6.6 for a discussion of NIAs).

Table 5: Neighbourhoods within Toronto's Ward 43 and Ward 44

Neighbourhoods		Wards
Number	**Name**	
131*	Rouge	44
133	Centennial Scarborough	44
134	Highland Creek	44
135	Morningside	43
136*	West Hill	43/44
137*	Woburn	43
139*	Scarborough Village	43
140	Guildwood	43

*The boundaries for these neighbourhoods lie within the boundaries of multiple wards.

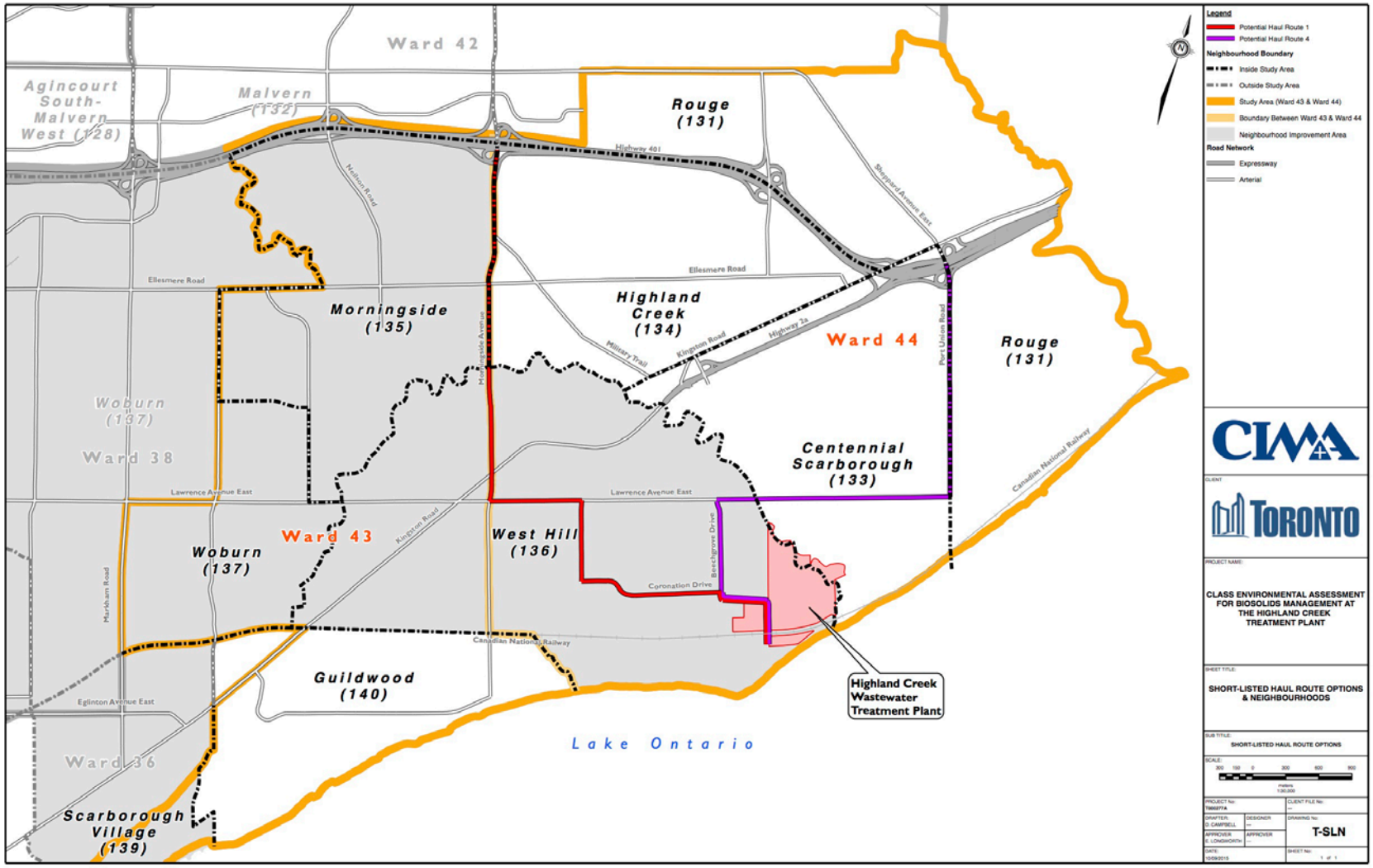

Figure 4: Study Area for HCTP HIA

4.6 Methods for Assessing Impacts

This HIA uses a combination of qualitative and quantitative information to systematically characterise potential health impacts. Each of the three biosolids management alternatives is compared to the current operating conditions and existing conditions in the study area as well as amongst each other.

The assessment of effects considers how different population groups within the study area may be impacted, taking into consideration the following factors:

- Geographic proximity to the project
- Exposure pathways for contaminants of concern
- Proposed transportation routes for project-related traffic
- Existing burden of diseases or health vulnerabilities
- Level of concern related to stakeholder's proximity to the project, or other factors.

For each health area, the potential impacts are characterized using the following parameters:

1. Potential risk: describes the health risk in terms of direction (adverse or beneficial); magnitude or severity (very small, small, medium or large change); and the confidence in prediction.
2. Comparison to Base Case: describes the expected change from the existing incinerator.
3. Comparison to Alternatives: describes how the effect may differ among the alternatives.
4. Equity: Presents equity considerations, including a description of the spatial and temporal distribution of impacts and whether the impact disproportionately affects vulnerable groups.

4.7 Limitations

While this HIA uses the best information available, there still remain a number of limitations in the assessment

There is little literature that describes or documents health impacts associated with biosolids management facilities. The literature that does exist focuses on greenfield developments as opposed to the replacement of a biosolids management facility with newer biosolids management technologies. The best available information was used and the assessment represents the best prediction based on current knowledge.

Also, most health outcomes are multi-factorial; that is, they are influenced by a wide variety of causes, and changes in health outcomes can rarely be confidently credited to a single factor. For HIAs, this means that a future change in health outcomes from current conditions cannot be easily connected to activities of the HCTP Biosolids Management Alternatives or to any other single source. However, the difficulty in measuring change does not mean that the HCTP Biosolids Management Alternatives will not have an influence on health outcomes; rather, it

means a health impact assessment can only identify the pathways of influence and appropriate mitigation and enhancement strategies that align with predicted effects, rather than predicting a quantitative change from current conditions.

5. Scope of the HIA

This section describes the geographic and temporal boundaries used in the HIA and identifies the communities that are included in the study area. The scope also identifies the health areas that are carried through to the assessment of impacts.

5.1 Geographic Boundaries

Geographic boundaries refer to the geographic area in which the HIA will examine impacts to community health. For the Class EA and the HIA, the study area has been defined as Wards 43 and 44 within the City of Toronto. This study area, which surrounds the HCTP, was selected because this is the area that could potentially be affected by activities associated with managing biosolids at the treatment plant, or the transport of biosolids from the treatment plant for management off-site. Within the study area there will be distinct zones where effects may be experienced differently or there may be different levels of concern related to the stakeholder's proximity to the project. The assessment of effects will consider how effects may be distributed within the study area according to the following criteria:

- Geographic proximity to the project
- Exposure pathways for contaminants of concern
- Proposed transportation routes for project-related traffic
- Existing burden of diseases or health vulnerabilities
- Level of concern related to stakeholder's proximity to the project, or other factors.

The HIA is focused on the concerns, perspectives and potential health impacts within the study area. Health effects as a result of transportation outside the study area boundaries, and any further processing, storage, distribution, beneficial use, distribution or disposal of biosolids or biosolids-products is outside the scope of this study.

With respect to assessing the health impacts of large (40 tonne) trucks, the study area boundaries extend to Highway 401, but does not include the highway itself. This is because the maximum of four to six additional trucks that could be added for biosolids hauling represent a very small increase in the more than 400,000 vehicles that travel on Highway 401 each day within the City.

Comments received during the review of the scoping of the HIA identified that the assessment was not based on a full life-cycle assessment of potential impacts of biosolids management options. Concern was raised that this could result in the HIA underestimating the risk from the beneficial use of biosolids, by not incorporating the potential health impacts of the application of biosolids on farmland or the impacts on greenhouse gas emissions. However, by not taking a life-cycle assessment approach the assessment also did not incorporate benefits of recycling nutrients, a key point raised by a First Nations stakeholder. In addition, the benefits of offsetting

the need for conventional fertilizers, which require energy intensive mining and processing, were not taken into account.

Toronto Public Health staff have reviewed the most recent literature on the potential health impacts of the beneficial use of biosolids. While uncertainties remain regarding certain contaminants such as microorganisms, prions, and unregulated contaminants such as endocrine disruptors, pharmaceuticals, and personal care products, as in previous reviews undertaken, this review did not identify any evidence of outbreaks of infectious disease or reported health problems related to the beneficial use of biosolids when proper procedures have been followed. Moreover, the negative and positive impacts of beneficial use on agricultural or other lands have been studied and broadly consulted on by the Ministry of the Environment and Climate Change, Ontario Ministry of Agriculture, Food and Rural Affairs, and other regulating agencies outside of Ontario.

The potential for use of biosolids on land within the study area has been raised. There is a chance that a resident within the study area may purchase and apply a fertilizer product that has been produced using biosolids that originated from the HCTP. This would only be possible for materials that are registered under federal legislation as a fertilizer. As per regulation, these products will meet the quality requirements for fertilizers. Toronto Public Health has reviewed the health and environmental risk of biosolids pellets. The Biosolids Pellet Review Study – Human Health and Ecological Risk Assessment study showed that with the use of reasonable risk management measures that biosolids pellets could be used without adverse impacts to public health.[7] For these reasons, the study of the impacts of the beneficial use of biosolids was determined to be out of scope for this HIA.

5.2 Temporal Boundaries

Temporal boundaries refer to the time period over which the HIA will examine impacts to community health.

This HIA considers impacts associated with the operation phase only. For the HCTP proposed plans, the operation of the biosolids management alternative is expected to last 30 years. Impacts during the construction phase are assessed and addressed in the Class EA. Impacts from the construction phase were not included in the HIA scope because impacts would be temporary (1-2 years) and the City would implement measures to minimize any adverse impacts during construction.

5.3 Health Areas Included in the HIA Assessment

To determine the health areas to carry forward into the HIA, all information from four information sources (first and second Public Information Centre (PIC), HIA Stakeholder Group meeting, literature review and expert input) was combined into a matrix. The following criteria were applied to select health areas to be considered in the HIA:

- Primary health areas - Health areas that were identified by the four information sources as priority areas of concern.

- Secondary health areas - Health issues raised but not identified as a priority area of concern by the HIA stakeholder group, and were not mentioned by other members of the community in the Class EA PIC.
- Tertiary health areas – Health areas raised but not identified as a priority by any of the four information sources. These health areas were explored by the study team to ensure significant health impacts were not overlooked.

Table 6 lists the health areas that were identified during the scoping phase, as detailed in the HIA Scoping Phase report (Appendix B).

Table 6: Health Areas Identified During Scoping Phase of HIA

Primary health areas	Secondary health areas	Tertiary health areas
• Air quality • Odour • Traffic safety • Noise • Water and soil quality • Housing / property values • Recreation and leisure	• Neighbourhood characteristics • Access to transport • Stress – risk perception • Community and social cohesion	• Climate change • Spills • Fires / explosions • Job opportunities / economics

There are several factors that are not explicitly identified in Table 6 that were noted at the first HIA Stakeholder Group meeting; these were equity, positive health impacts, healthy child development, and centralized/decentralized treatment of waste. The HIA did not explore these issues as separate health areas, rather positive health impacts, equity and healthy child development were explored within each of the health areas. For example, air quality was assessed in the HIA for potential health harms in the surrounding population as well as health benefits, which would be the case if the proposed alternatives resulted in a lower release of air contaminants than current operations. To explore equity, the HIA discussed whether each health area impact would unfairly or unjustly affect vulnerable population groups in the study area. As well, instead of including healthy child development (defined as an enriched environment for child development) as a health factor in and of itself, potential effects on children (as well as other vulnerable groups) were considered for each health factor examined.

Based on expert opinion, three other health areas were removed from the assessment: Fires and explosions; spills; and water quality. The risk of fires and explosions was mentioned by the stakeholder group and will not be addressed in the HIA because safety features will be built into the design of the facility to prevent fires and explosions, and contain them if they do occur. Due to the location of the HCTP, and the location of the closest residence, the risk of a fire spreading to the local community is very low.

Spills were also mentioned by stakeholders as a potential route of exposure to contaminants resulting from the biosolids management alternatives being proposed for HCTP. Risk of spills is being assessed in the Class EA as a potential environmental issue. Since HCTP is an existing facility there are already existing measures in place to prevent spills and manage them if they do occur. These measures will continue to be in place and will be modified for any new technologies and processes associated with the biosolids management alternative selected. Also, biosolids

materials that could be hauled (ash, biosoilds, and/or pellets) are in solid form and are free from levels of contaminants that would be harmful to human health if deposited on the ground. The solid form means that if biosolids spill they do not behave as a liquid but rather they are similar to a wet clay that can be piled. This is due to the dewatering process. If there was an accident with a truck (for example it tipped over) and the biosolids were accidentally spilled, the biosolids would not runoff, rather it would sit as waste and need to be removed by equipment used for solid waste (e.g., front-end loader). Moreover, biosolids cannot leak from a truck. For these reasons, spills were not carried through into the HIA assessment.

Lastly, water quality impacts were not considered in the HIA or HHRA because the deposition of contaminants of concern (COCs) from the various alternatives was assumed to be not sufficiently elevated so as to result in an adverse health impact (either ecological or human health) to the nearest bodies of water of significance. Moreover, as described above, the risk of spills of biosolids is very low. This is confirmed by the outcome of the multimedia assessment (See Multimedia Exposure Risk section) which showed no health risks from soil accumulation of COCs over time, even without considering the risk reduction potential of dilution when COCs fall into nearby large water bodies, namely Lake Ontario.

Final Health Areas

During the In-depth HIA phase, the health areas listed in Table 6 were re-examined by experts in the fields of HIA and public health and re-organized in way that made sense for the examination of health effects. In doing so, some health areas were combined together and some were removed, as described above. Table 7 depicts the final list of health areas that are considered in this report.

Table 7: Final Health Areas Considering in the In-depth HIA

Primary health areas	Secondary health areas

• Air quality
• Soil quality, namely multi-media exposure risk
• Traffic safety
• Neighbourhood characteristics
  ○ Access to transport
  ○ Community and social cohesion
  ○ Housing / property values
  ○ Recreation and leisure
• Stress and risk perception (odour and noise)
	• Climate change
	• Job opportunities / economics

5.3.1 Logic Diagram

The health areas described above are presented in the form of a logic diagram or pathway diagram in Figure 5. The logic diagram represents potential effects stemming from the proposed operations phases. These diagrams are commonly utilized in the field of HIA to describe the links between project activities and health outcomes.

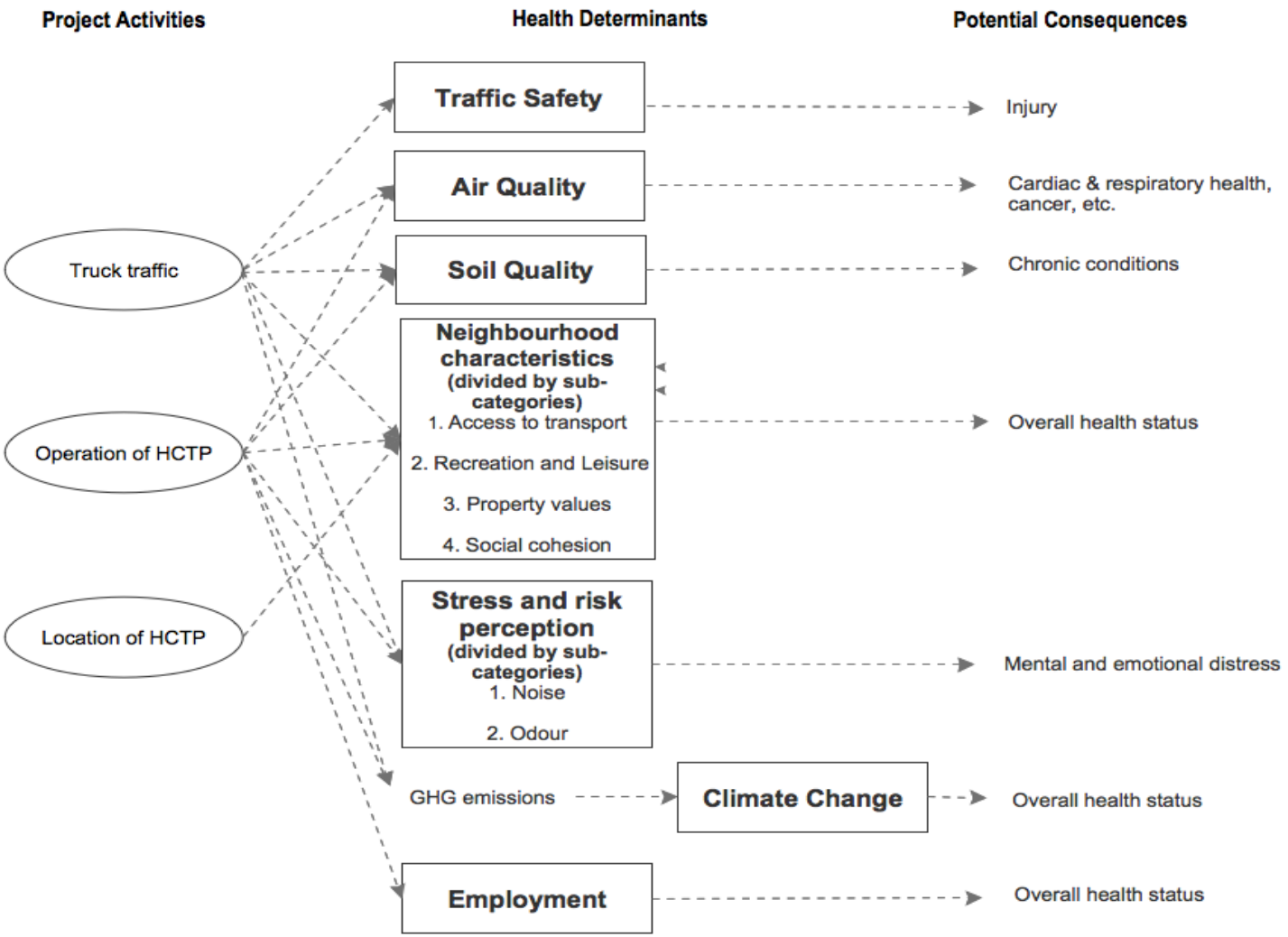

Figure 5: Logic Diagram of Potential Health Effects during HCTP Operations

6. Community Profile

It is common practice in HIA to describe the study area and the health status of the study area population. Describing the health status of affected populations is important in HIA for several reasons. First, it helps to identify what health challenges are currently being experienced, in order to identify whether these may be exacerbated by the proposed project. Second, it helps to identify potentially vulnerable population groups that may experience health inequities as a result of the proposed activities and the distribution of the potential inequities. The data that is collected and presented for a community health profile should therefore be specific to the health areas being assessed in the HIA.

A detailed community health profile is presented in Appendix E. This section summarizes the main conclusions of the profile to provide the reader with pertinent information for the assessment of health effects.

6.1 Description of Study Area

The HCTP is located at 51 Beechgrove Drive, at the mouth of Highland Creek, in the southeastern Scarborough community of West Hill in Toronto's Ward 44. The plant serves an area of approximately 15,250 hectares (37,682 acres) with approximate boundaries of Warden Avenue to the West, Steeles Avenue to the North, Rouge River to the east, and Lake Ontario to the south. The HCTP provides wastewater treatment for approximately 500,000 residents within this service area.

The most predominant land uses within the study area, as shown in Figure 6, are residential and open space, shown in yellow and green, respectively. Open space land designations include zones of natural and recreational uses, golf courses and other areas such as marinas and cemeteries. Most of the open space land designated areas are local parks and ravines located in the vicinity of the tributaries of the Highland Creek watershed and the Lake Ontario waterfront.

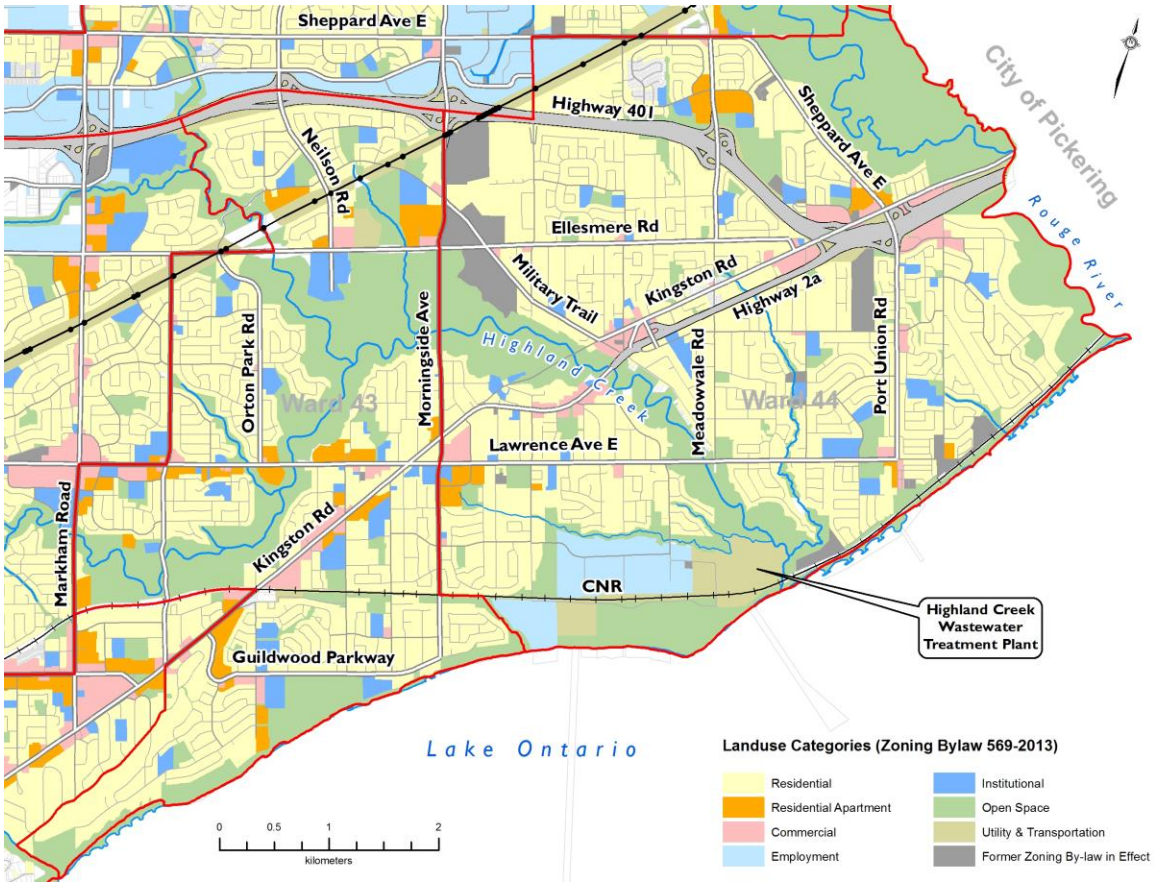

Figure 6: General Land Uses in Study Area (as presented in documentation for the Class EA)

Other land uses within the study area include:

- A pocket of approximately 69 hectares of employment/industrial designated lands, located on the south area of Ward 44, immediately to the west of the HCTP, on the north and south sides of the Canadian National Railway, shown in purple in Figure 6.
- A number of small commercial and institutional areas spread across the study area, shown in pink and blue in Figure 6.
- A wide utility corridor traverses the north boundaries of the study area in a northeast to southwest direction, shown in grey in Figure 6. This hydro corridor encompasses existing power and natural environmental features.
- The 401 highway traverses the northern boundary of the study area. Highway 401 is utilized by more than 400,000 vehicles each day.

6.2 Health Conditions in Study Area

A variety of information from readily available information sources for Wards 43 and 44 and the City of Toronto (used as a comparison) were collected to gain an understanding of the current health status of the study area population and to identify health vulnerabilities. The community profile (Appendix E) reports on demographics, immigration status, minority and Aboriginal populations, education, employment and income as well as on health outcomes related to child health, injuries, mental well-being, chronic health conditions, and infectious diseases.

Information from this profile that is pertinent to understand for the assessment of impacts is presented below.

- From a socio-economic perspective, the study area population does not substantially differ from Toronto as a whole. Like Toronto, the study area is ethnically diverse and includes a mix of high and low income populations.
- Ward 44 is slightly more socio-economically advantaged compared to Ward 43, showing higher levels of income, education and lower levels of employment – this may mean that Ward 44, in general, is less susceptible to health impacts resulting from changing environmental conditions associated with the 3 alternatives.
- Ward 43 also has a higher proportion of children and newcomers than Ward 44 and the Toronto. Children and newcomers are particularly susceptible to certain health impacts.
- The seniors population is similar in both Wards compared to Toronto as a whole; however, there is a particularly high proportion of seniors in the community of Guildwood. The location of seniors is important for the assessment of air quality, traffic safety, soil quality and stress and risk perception.
- From a health perspective, the study area is similar to the Toronto as a whole. However, Scarborough Village and West Hill tend to have higher levels of some poor health conditions compared to the Toronto average (e.g. low birth weight, proportion of physician visits used for mental health, diabetes, and high blood pressure). No other consistent trends are present for health outcome data.
- Since the HCTP is located in the community of West Hill particular attention will be paid to impacts on that community, especially since it is already noted as being a more vulnerable community (see Vulnerable Populations below). In general, Scarborough Village is not directly impacted by HCTP operations.

6.3 Vulnerable Population Groups

Vulnerable populations are those groups of people who are at risk of experiencing poorer health outcomes because of pre-existing social, economic, cultural, or geographic characteristics. A number of potentially vulnerable groups for this HIA were identified by the HIA Stakeholder Group, including: children, seniors, people with pre-existing health conditions, low income populations, Aboriginal Peoples, and newcomers. Poor environmental conditions (e.g. air

pollution, excessive noise) tend to impact the health of children, seniors and people with pre-existing health conditions more so than other population groups.[8] Low-income populations and Aboriginal Peoples are known to experience health inequities when compared to other population groups.[9],[10] Finally, although newcomers often arrive to Toronto with better health status than many long-time residents, research has shown that newcomer health tends to decline over time and often more quickly than other residents.[11]

A central tenet of health impact assessment is to prevent health inequities from being exacerbated in affected populations and to protect those who are vulnerable to poor health outcomes from being impacted by changes in their environment. It is therefore important to consider these population groups when assessing health impacts of the proposed biosolids management alternatives.

Another way to identify vulnerable populations is to look for local indicators of inequity. In the *Toronto Strong Neighbourhood Strategy 2020,* the City of Toronto identified four neighbourhoods within the study area that qualify as Neighbourhood Improvement Areas (NIA). NIAs are defined as neighbourhoods that have a low overall Neighbourhood Equity Score, based on measures of economic opportunities, social development, healthy lives, and participation in decision-making and physical surroundings. The NIAs in the study area are: Scarborough Village (139), West Hill (136), Woburn (137), and Morningside (135). The equity scores for each of the neighbourhoods in Ward 43 and 44 are compared to the neighbourhood equity benchmark in Table 8. Neighbourhoods falling below this equity benchmark require special attention and are supported by Neighbourhood Action Teams.

Table 8: Neighbourhood Equity Scores for Study Area Neighbourhoods

	Neighbourhood Equity Score	Neighbourhood Equity Benchmark
Scarborough Village	33.94	42.89
Morningside	36.89	
West Hill	37.25	
Woburn	39.01	
Rouge	48.81	
Highland Creek	58.77	
Guildwood	66.19	
Centennial Scarborough	70.75	

Source: City of Toronto[12]

The data presented in the community profile (Appendix E) generally align with the data presented in Table 16; where the neighbourhoods of West Hill, Scarborough Village, Morningside and Woburn generally had poorer health outcomes and socio-economic conditions than the other neighbourhoods in the study area. Scarborough Village has the lowest equity score so is likely to be the most vulnerable of the neighbourhoods in the study area. As such, these four neighbourhoods can be considered vulnerable for the purpose of the assessment in Section 7 and are considered when effects are characterized for equity. Section 9 explicitly summarizes the potential impacts to vulnerable groups and equity as a result of the proposed biosolids management alternatives for HCTP.

7. Assessment Results

7.1 Primary Health Areas

7.1.1 Air Quality

In the Toronto area, air quality is a major concern both among citizens and among City and public health officials. In 2014, Toronto Public Health estimated that air pollution originating from within and beyond the City was associated with approximately 1,300 premature deaths and 3,550 hospitalizations annually. Over half of Toronto's air pollution is emitted from within the city, and includes traffic sources, industrial sources, residential and commercial sources, and off-road mobile sources such as rail, air, and marine traffic.[13]

In order to evaluate the potential for adverse health effects to occur from changes in air quality associated with the three short-listed biosolids management alternatives, a Human Health Risk Assessment (HHRA) was carried out as part of the Class EA, available at: www.toronto.ca/hctpbiosolidsea.

Approach

A full description of the methods and results of the HHRA can be found in the HCTP Class EA Human Health Risk Assessment Final Report.[14] In brief, the HHRA was used to determine the potential short- and long-term human health risks to individuals in the surrounding community who may be impacted by emissions from any of the proposed biosolids management alternatives. Each of the three biosolids treatment alternatives were compared to predicted health risks related to the existing conditions arising from the operation of the current HCTP multiple hearth incinerators. The HHRA examined both the potential for exposure to chemical contaminants in air from the plant itself, and also from related activities including the diesel truck traffic for hauling biosolids or processed biosolids product. Each alternative was also "added" to the existing background air quality conditions in the Wards to get a sense of the "cumulative risks" for each option within the Study Area. The methods and assumptions used in this HHRA were designed to be highly health protective and have a built-in tendency to overestimate, rather than underestimate, potential health risks. The HHRA methods and results also underwent third-party peer review by experts at both Toronto Public Health and Public Health Ontario.

To assess potential risks related to the projected emissions from the either on-site emission sources or transportation route emission sources for off-site management, the project team selected key sensitive locations representative of the surrounding community. These locations are shown in Figure 7.

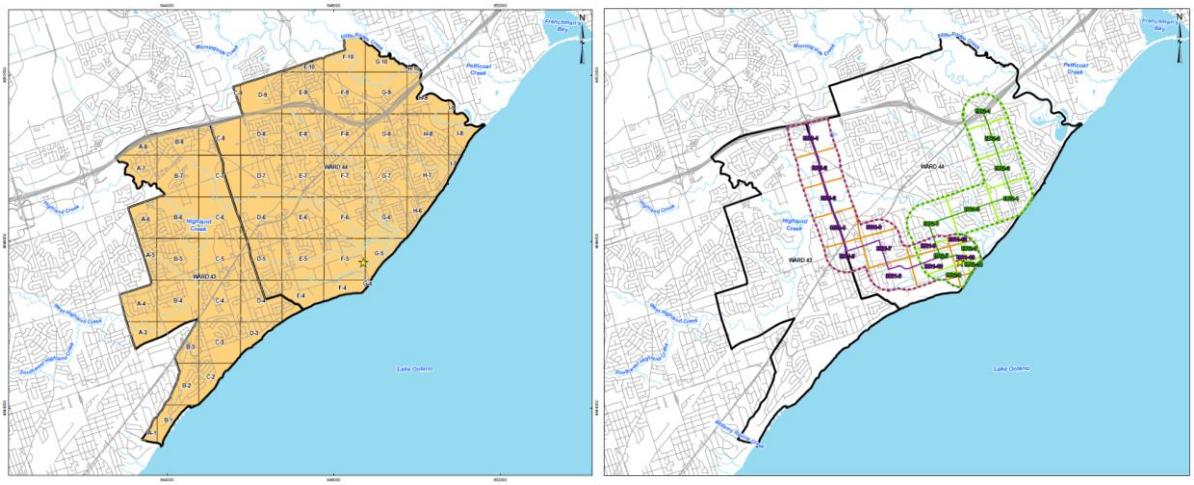

Figure 7 HHRA Receptor Grid Locations for Emissions at HCTP and Along Transportation Routes

The area surrounding the HCTP is composed of mixed industrial, parkland and residential uses. However, as part of the health protective (conservative) approach, the study area was assessed as though it were entirely residential, and assumed people would be exposed to the maximum ground-level air concentrations predicted for those locations (exposed 24-hours per day and 365 days per year). The HHRA also assumed that individuals were born in Toronto with the facility operating at maximum capacity for 30 years, and to live at that location for their entire lifetime (i.e., 80 years). As per Health Canada (2012) guidance, the assessment took into account the different health risks that are associated with five discrete life stages:

- Infant (birth to 6 months of age);
- Preschool child/toddler (7 months to 4 years of age);
- Child (5 to 11 years of age);
- Adolescent (12 to 19 years of age); and,
- Adult (≥ 20 years of age, assuming an 80 year lifespan).

The City of Toronto routinely assesses the health impacts related to 30 key contaminants on their Priority Air Contaminants (PAC) list. In addition to these contaminants, a series of detailed screening steps were undertaken to add any additional chemicals of concern (COCs) which may be emitted from any of the proposed biosolids management alternatives but were not on the original PAC list.

Table 9 provides a list of the chemicals evaluated in the HHRA.

Table 9: Chemicals of Concern Evaluated in the HHRA for Air Quality

Acetaldehyde	Copper	Polychlorinated biphenyls (PCBs)
Acrolein	1,4-Dichlorobenzene	Polychlorinated dibenzo-p-dioxins
Antimony	1,2-Dichloroethane	and furans
Arsenic	Dichloromethane	Polycyclic aromatic hydrocarbons
Barium	Ethylene dibromide	(PAHs)
Benzene	Formaldehyde	Selenium
Beryllium	Lead	Strontium
Boron	Manganese	Sulfur Dioxide
1,3-Butadiene	Mercury	Tetrachloroethylene
Cadmium	Molybdenum	Toluene
Carbon monoxide	Nickel	Trichloroethylene
Carbon tetrachloride	Nitrogen Oxides	Vinyl Chloride
Chloroform	Ozone	Zinc
Chromium	$PM_{2.5}$	
Cobalt	PM_{10}	

Two specific exposure conditions were evaluated:

- *Project Alone* exposures; and
- *Cumulative* exposures.

The *Project Alone* assessment evaluated the potential health impact related to the predicted ground-level air concentrations of each of the COCs contributed by each of the proposed biosolids management alternatives to off-site residential locations in the surrounding community. The *Cumulative* assessment evaluated the potential health impact related to the predicted ground-level air concentrations of each of the COCs contributed by the proposed biosolids management alternative **plus** the existing background ambient concentrations of the COC based on the Project Team's modelling of local air quality within the Study Area.

Results

The HHRA presented several important conclusions in relation to air quality of the three proposed Alternatives for the HCTP (summarized in Table 10):

1. The HHRA found that there are no unacceptable short-term or long-term (chronic) inhalation health risks associated with any of the biosolids management alternatives, including existing conditions for HCTP incineration. In this case, 'unacceptable' has been defined by the regulatory agencies. Most predicted air concentrations were many orders of magnitude below their corresponding regulatory health-based benchmark.
2. When looking specifically at Criteria Air Contaminants (CACs) (i.e., carbon monoxide, nitrogen dioxide, ozone, particulate matter, and sulphur dioxide), all of the biosolids management alternatives being evaluated for the HCTP are predicted to lead to a small decrease in the average CAC concentration across the study area, compared to the existing conditions. These incremental changes in CAC concentrations were then evaluated for potential impacts on various morbidity and premature mortality rates across the Study Area. Results indicate that each of the proposed biosolids treatment

alternatives would result in a very small improvement in overall morbidity and mortality related to local air quality compared to the existing multiple hearth incinerator.

3. There were differences in the potential levels of risk attributable to the various alternatives. While the proposed fluidized bed incineration alternative had higher short-term risks than the off-site haulage alternatives, the longer term risks were mixed among the alternatives. Alternative 2 had higher long-term non-carcinogenic risks, and the fluidized bed incinerator alternative had higher risks from exposures to carcinogenic chemicals and respiratory and cardiovascular induced hospitalizations and mortality (CACs). Despite these differences among the alternatives, the levels of exposure associated with all three alternatives were orders of magnitude below health benchmarks indicating that potential health impacts are very small and the differences among the alternatives do not result in an appreciable differences in terms of health impacts.

4. The HHRA also examined the potential for health risks associated with cumulative exposure; that is, the total risk from existing background concentrations of COCs and emissions from the different alternatives combined. The HHRA found that the air quality in the study area was mostly impacted by other sources in and outside of Toronto. It is estimated that each of the three alternatives provides a small contribution (less than 1%) to the overall worst-case air quality conditions within the study area. Air quality in the Study Area is influenced primarily by vehicle emissions from Highway 401 and other major roadways.

5. Table 10, reproduced from the HHRA, provides a summary comparison of worst-case short- and long-term mixture risks, incremental lifetime cancer risks, and predicted increases in morbidity and mortality rates for existing local background conditions, base case, and the various treatment alternative scenarios.

6. The impact of the HCTP alternatives in the area immediately adjacent to the HCTP facility was also assessed. This showed that even near the plant, other sources are the major contributors to air pollution, with the HCTP being responsible for less 1% of pollutant levels.

Table 10: Comparison of Worst-Case Risks from Annual Average Air Emissions arising from Proposed Biosolids Alternatives

		PROJECT-ALONE INCREMENTAL RISKS					
Type of Health Outcome[a]	**Existing Local Background Air Quality**	**Existing Incinerator**	**Alternative 1: On-site Fluidized Bed Incineration**	**Alternative 2: Biosolids Transport Off-site for Management**		**Alternative 3: Pelletization Process and Distribution of Fertilizer Product**	
				Traffic Route 1	Traffic Route 4	Traffic Route 1	Traffic Route 4
Short term non-cancer risk	5.1	0.22	0.12	0.0041	0.0038	0.0050	0.0050
Long term non-cancer risk	2.1	0.0042	0.00090	0.0033	0.0023	0.0012	0.00088
Cancer risk	76 in one million	0.25 in one million	0.024 in one million	0.012 in one million	0.011 in one million	0.011 in one million	0.011 in one million
Respiratory and cardiovascular induced hospitalizations and mortality[b]	7%[c]	0.0056% increase	0.00041% increase	0.00016% increase	0.00015% increase	0.00012% increase	0.00012% increase

Notes:

a To be consistent with the approach used in the City of Toronto's LAQ studies, the contributions of CACs were only included in the morbidity and mortality estimations, and not the short- and long-term non-cancer risk predictions.

b The contribution of ozone to premature mortality risks were not included in the current increase calculation as it is difficult to specify the contribution from the specific Alternatives based on the existing data. Given the low concentrations of ozone precursors being emitted by each of the proposed Alternatives, it is unlikely that the proposed Project would result in a significant contribution to ozone formation, and relatedly premature mortality risks.

c The values provided for respiratory and cardiovascular induced hospitalizations and mortality are presented as an increase above existing background conditions. However, if one used the Health Canada Concentration Response Functions to estimate these outcomes based on existing average background concentrations of the CACs, the predicted increase would be approximately 7%.

In summary, the results of the HHRA indicate that all of the proposed biosolids management alternatives would result in an improvement in air quality compared to the existing multiple hearth incinerators. The differences in air emissions among the alternatives do not result in appreciable differences and overall the health impact on the surrounding community would be very small.

Characterization of Potential Effects

The HHRA evaluated the potential for health risks from human exposure to airborne contaminants, from both the HCTP facility and from trucks used to haul material. These effects are summarized below and in Table 11.

Potential Risk: The direction of the effect is beneficial, as all three alternatives are expected to result in a small improvement in air quality across the study area, and therefore a small improvement in overall morbidity and mortality. The confidence can be characterized as high, as the methodology used in the HHRA is both well-established and uses a conservative, health protective approach.

Comparison to Base Case: Compared to existing conditions, all three alternatives are predicted to result in a small improvement, when considering criteria air contaminants. This may translate into a small health benefit in terms of morbidity and mortality.

Comparison among Alternatives: Overall, the health risks associated with the alternatives are very small and the differences among the alternatives do not result in appreciable differences in health impacts. All alternatives evaluated achieve significant reductions in air emissions compared to the current multiple hearth incinerators. However, among the three alternatives, Alternative 1 is anticipated to result in the highest risk related to releases of air pollutants.

Equity: The population groups affected most strongly would be those who are most sensitive to respiratory outcomes: seniors, children and those with pre-existing respiratory or cardiovascular disease. Because this effect comprises a health benefit, the effect is characterized as contributing to health equity.

Table 11: Summary of Potential Effects on Air Quality for the Short-Listed Biosolids Management Alternatives

Rationale	Exposure to airborne contaminants can be associated with cardiac, respiratory, cancer and other health outcomes.
Potential Risk	All three alternatives are likely to result in a small improvement in air quality. Although the direction is beneficial, the improvement is very small and thus the magnitude of the effect is not measurable. The effect would be experienced by a large proportion of the population in the study area. The likelihood of this effect is high.
Comparison to Base Case	Small improvement in air quality for all three alternatives compared to existing conditions.
Comparison Between Alternatives	While there are differences in air emissions and associated risks among the alternatives, the risks were all well below health benchmarks. Therefore, there are no discernible difference between the alternatives in terms of health impacts associated with air emissions.
Equity Considerations	Any expected improvements in air quality would benefit vulnerable populations: seniors, children and those with pre-existing respiratory or cardiovascular disease. The effect is therefore characterized as contributing to health equity.

7.1.1 Multi-Media Exposure Risk

Exposure to contaminants from soil and other media was raised by stakeholders as an issue that should be addressed in the Class EA and HIA process. Stakeholders were concerned that the air emissions from the incinerator and truck exhausts could travel through the air and become deposited on the ground, resulting in the potential for exposure through accidental ingestion of soil and dust and through accumulation into backyard produce. Impacts to drinking water and surface water were also mentioned by stakeholders but were not considered in the HHRA as per the rationale provided in the Scoping Results section.

Approach

The potential for exposure to contamination during the operations phase is addressed through the HHRA[14], which looks at the potential for human exposure through all likely environmental media. The HHRA conducted a "multimedia assessment" that considered the potential for exposure to chemical contaminants via a number of pathways simultaneously. These were:

- **Inhalation:** Inhalation of air impacted by vapours and particulate emitted from the Project-related sources (i.e., emissions from plant operations and truck haulage of biosolids products).
- **Incidental Ingestion of Soil and Dust**: Accidental ingestion of soil and/or dust particles through typical indoor and outdoor activities, especially among children.
- **Incidental Inhalation of Indoor Dust**: Inhalation of suspended dust from project-related sources that was assumed to be carried indoors (*e.g.*, by wind, or human and/pet activities)
- **Dermal Exposure to Soils and Dusts**: Dermal (skin) exposure from direct contact with chemically impacted soil and dust.
- **Ingestion of Locally Grown Produce**: Consumption of vegetables and fruits (such as those grown in backyard gardens) that have had chemicals deposited onto them from air-borne emissions or from root uptake from soil.

Indoor dust, soils and locally grown produce can be affected by contaminants in the air if and when those contaminants are deposited on surfaces. Deposition can occur in "dry" conditions, where particles settle on surfaces (ground, plants or indoor surfaces) or in "wet" methods, where rain or other precipitation takes particles or gas molecules from the air and deposits them on the ground.

Not all of the COC's selected for the air quality are relevant for the multi-media assessment as not all of these will persist in the environment. Each chemical has a half-life (the time required for the chemical to degrade by half of its amount). Chemicals that had a half-life of 6 months or more were included in the multi-media assessment. The other factor that was used in selecting chemicals of concern was the chemicals potential to bio-accumulate (how chemicals accumulate in the body as a result of ingestion, or exposure to contaminated soil or water). Chemicals that remained in the HHRA multi-media assessment had both a half-life greater than 6 months and had the potential to bioaccumulate. The final list is presented in Table 12.

Table 12: Chemicals of Concern Evaluated in the HHRA for Multi-Pathway Assessment

Antimony	Manganese
Arsenic	Mercury
Barium	Molybdenum
Beryllium	Nickel
Boron	Polychlorinated biphenyls (PCBs)
Cadmium	Polychlorinated dibenzo-p-dioxins and furans
Chromium	Polycyclic aromatic hydrocarbons (PAHs)
Cobalt	Selenium
Copper	Strontium
Lead	Zinc

The assumptions used for the multi-media assessment were also health protective (conservative). As with the assessment for impacts from air quality, it was assumed that the resident was born in Toronto and had lived in the study area for their lifetime. In addition, the assumption was made that the soil concentrations would be from day 1 equivalent to the

maximum concentrations that are predicted to be present after the facility's lifetime of deposition. In the case of the multi-pathway assessment, exposures *via* the inhalation, oral and dermal pathways to the select COCs were evaluated for the most sensitive receptor groups living in the surrounding community – preschool children.

Results

The multi-media assessment conducted as part of the HHRA presented several important conclusions:

1. **None of the three alternatives are expected to result in a risk to health** through the simultaneous exposure to the routes noted above (e.g. inhalation of air, ingestion of soil, dust, locally grown produce, and dermal exposure).
2. **The predicted risks are very small.** For instance, the alternative with the greatest risk, Alternative 1 (fluidized bed incinerator) has predicted risk estimates that range from two orders of magnitude to seven orders of magnitude below health based benchmarks (*i.e.,* 100 to 10,000,000 below health based benchmarks) (Table 13). Alternative 2 and 3 are predicted to have even smaller risk estimates.
3. **When comparing the three alternatives with the current multiple hearth incinerator, there is a significant reduction in risk (Table 13).**
4. Modelling suggested that the ***current*** **multiple hearth incinerator** may have resulted in a slight elevation of risk for arsenic and lead, if people were exposed to the maximum air concentrations and other multimedia exposures for a 24-hour period, every day, for 48 years. This level of exposure is highly unlikely to have occurred considering the levels of conservatism built into the HHRA model and the health-based benchmarks. In addition, the model predicted soil levels of lead and arsenic are well below rural background levels of arsenic and lead in Ontario, therefore it is not anticipated that emissions from the past incinerator would result in adverse health impacts. The average levels of lead and arsenic are a more appropriate predictor of actual exposure. The risks predicted using the average media values are orders of magnitude below health-based benchmarks. The HHRA report is available at: www.toronto.ca/hctpbiosolidsea.

Table 13: Comparison of Alternative 1 to Based Case Scenario Expressed as a Percentage Decrease in Non-Carcinogenic Multimedia Exposure Risk Estimates

Chemical of Concern	**Percent Decrease in Hazard Quotient between Alternative 1 and the Existing Base Case [a]** **Alternative 1** New Fluidized Bed Incineration
Inorganic Parameters	
Antimony	91.0 %
Arsenic	91.1 %
Barium	83.9 %
Beryllium	91.0 %
Boron	90.8 %
Cadmium	90.7 %
Chromium	90.7 %
Cobalt	90.4 %
Copper	91.0 %
Lead	90.9 %
Manganese	90.5 %
Mercury	55.6 %
Molybdenum	91.0 %
Nickel	90.3 %
Selenium	91.0 %
Strontium	91.1 %
Zinc	90.8 %
Organic Parameters	
Polychlorinated biphenyls (PCBs)	100.0 %
Polychlorinated dibenzo-p-dioxins and furans (PCDD/F)	92.6 %

[a] Percent reduction in risk estimates was calculated using the average risk estimates and the formula [1 - (Alternative / Base Case)] * 100.

As can be observed in the above table, the results of the multimedia assessment show a significant reduction in risk for all COCs should the Base Case incinerators be replaced by new fluidized bed incinerators. The reduction in potential risk for Alternatives 2 and 3 are even greater.

Characterization of Potential Effect

The HHRA considered the potential impacts emissions may have on soil quality throughout the study area through long-term deposition, and potential health outcomes that could arise from exposures to impacted air, soil, dust, and home garden produce. These health outcomes include both cancer and non-cancer outcomes. Health effects from multi-media exposure risks are summarized in Table 14.

Potential Risk: The direction of the impact is positive, as the HHRA concluded that there would be an improvement to the existing air emission for all the alternatives compared to the existing multiple hearth incinerator. The magnitude is negligible, as the HHRA has shown that the three alternatives are unlikely to produce risk levels that exceed the relevant regulatory benchmarks. Because the HHRA modelling approach is health protective, there is high confidence in this prediction.

Comparison to Base Case: For all other chemicals and for all other alternatives, health risks are lower than the current incinerator.

Comparison among Alternatives: Alternative 1 is associated with the highest non-cancer health risk among the three alternatives. The risks associated with Alternatives 2 and 3 are very similar. Despite these differences, health risks from any of the proposed alternatives are very small from a health outcome point-of-view.

Equity: Because there are no predicted health risks associated with exposure to multi-media exposures, equity considerations are not applicable.

Table 14: Summary of Potential Effects of Multi-media Exposure for the Short-Listed Biosolids Management Alternatives

Rationale	Exposures to impacted air, soils, dusts, and home garden produce can be associated with cancer and non-cancer health outcomes.
Potential Risk	The HHRA concluded that exposures from soil contamination as a result of any of the proposed alternatives would be below health benchmarks. The direction is neutral to beneficial, and the magnitude is negligible. Because the HHRA modelling approach is very health protective, there is high confidence in this prediction.
Comparison to Base Case	All alternatives are lower than the existing incinerator for all chemicals.
Comparison Between Alternatives	The three alternatives are expected to result in decrease in health risk compared to current situation. Among the alternatives, Alternative 1 has the greatest risk, followed by Alternative 2, with Alternative 3 having the lowest risk.
Equity Considerations	Because there is no increase in risk, equity considerations are not applicable.

7.1.2 Traffic Safety

Traffic safety was highlighted as a key concern by stakeholders and is a public health concern, as motor vehicle collisions are a major source of all injuries, the greatest contributor to injury deaths, and are largely preventable.[15]

Traffic safety was examined for the short-listed transportation routes as described in Section 3.2.4. This section focuses on cyclist and pedestrian safety as that was a key concern of stakeholders in the study area.

Transportation Routes

As stated in the introductory chapters of this HIA, a separate transportation analysis was conducted to select the best mode of transporting biosolids and pellets from the HCTP site. That analysis identified that haulage by tractor-trailer truck is the best method and identified two transport routes that could possibly be used, Routes 1 and 4. Route selection was based on a number of factors that are outlined in Table 2 of the introductory chapters of this report.

Out of six possible transportation routes, Route 4 was identified as having the lowest impact levels, while Route 1 received the second lowest impact score. Similarities and differences

between these routes based on the evaluation criteria are outlined in Table 15. Figures 8 and 9 illustrate routes 1 and 4, respectively and show the locations of schools, child care centres, etc.

Table 15: Comparison of Evaluation Criteria for Routes 1 and 4

Evaluation Criteria	Route 1	Route 4
Safety		
Schools, libraries, child care centres and other community facilities	2 schools on Manse Road 2 schools on Morningside Avenue 1 library on Lawrence Avenue East 1 child care centre on Morningside Avenue 1 recreation centre on Lawrence Avenue East	1 school on Lawrence Avenue East 1 library/child care centre on Lawrence Avenue East 1 recreation centre on Lawrence Avenue East
Pedestrian safety - Intersection Pedestrian Signal (IPS), Midblock Pedestrian Signal (MPS), Pedestrian Crossover (PXO)	1 PXO on Manse Road between Coronation Drive and Lawrence Avenue	1 PXO on Beechgrove Drive between Coronation Drive and Lawrence Avenue
Pedestrian exposure	Approximately 1-km stretch with non-buffered sidewalks on Morningside Avenue between West Hill Collegiate Institute and Ellesmere Road	Mostly buffered sidewalks; up to 8-m wide buffers along Port Union Road
On-street parking	On-street parking on narrow road: Manse Road between Coronation Drive and Lawrence Avenue East	On-street parking on wide road: Beechgrove Drive between Coronation Drive and Lawrence Avenue East
Number of Required Left Turns at Unsignalized Intersections	No left turns at unsignalized intersections	No left turns at unsignalized intersections
Bicycle Routes	No bicycle routes along route	No bicycle routes along route (bike route proposed for Port Union Rd.)
Community		
Length of Route through Residential Areas	500 m through residential area along Manse Road	650 m through residential area along Beechgrove Drive
Legal Truck Restrictions	No truck restrictions along route	No truck restrictions along route
Operations		
Manoeuvrability	Northbound left turn lane at the intersection of Manse Road and Lawrence Avenue East is short for a large truck	No geometric restrictions
Added Trucks in Background Traffic	Maximum estimated increment of 0.66% in truck traffic between 6 a.m. and 6 p.m. (from 2.47% to 3.13%) on Coronation Drive between Manse Road and Beechgrove Drive	Maximum estimated increment of 0.50% in truck traffic between 6 a.m. and 6 p.m. (from 10.2% to 10.7%) on Beechgrove Drive between Coronation Drive and Lawrence Avenue East

Evaluation Criteria	Route 1	Route 4
Number of Traffic Signals	11 traffic signals along route	7 traffic signals along route
Total Background Traffic on Arterial Roads	Moderate to high traffic volumes between 6 a.m. and 6 p.m. (12,343 vehicles on Lawrence Avenue East; 13,796 on Morningside Avenue south of Ellesmere; 23,509 on Morningside Avenue north of Ellesmere)	Low to moderate traffic volumes between 6 a.m. and 6 p.m. (7,173 vehicles on Lawrence Avenue East; 10,614 vehicles on Port Union Road)
Vertical Alignment	Average climb grade for outgoing, loaded trucks: 4.6% for 640 m Threshold for 4% grade: 260 m Threshold for 5% grade: 210 m	Average climb grade for outgoing, loaded trucks: 5.0% for 250 m Threshold for 5% grade: 210 m
Transit	12 major transit stops (2 on Manse Road, 4 on Lawrence Avenue East, 6 on Morningside Avenue)	2 major transit stops (1 on Lawrence Avenue East, 1 on Port Union Road)
Source: Evaluation of Alternative Transportation Modes and Routes[6]		

Based on the information from the transportation analysis (Table 15), Route 4 is the preferred option based on safety, community and operations criteria and therefore received the lowest impact score.

It is important to note that the analysis of transportation routes considered current conditions.[6] However, both the Class EA and the HIA note that there are changes being proposed for Port Union Rd. (utilized by Route 4). Proposed changes include: a second northbound travel lane, bicycle lanes in both directions, a section of two-way centre left-turn lane north of Josaly Drive, and a gateway planted median north of Lawrence Avenue to mirror the median to the south.[16] The road design has been modified slightly from the 2004 Environmental Assessment approved design in order to reduce property and other impacts to the community, and the dimensions of various elements of the right-of-way have been updated to reflect current City standards and practices. The new design has been found to be functionally equivalent to the 2004 plan. [16]

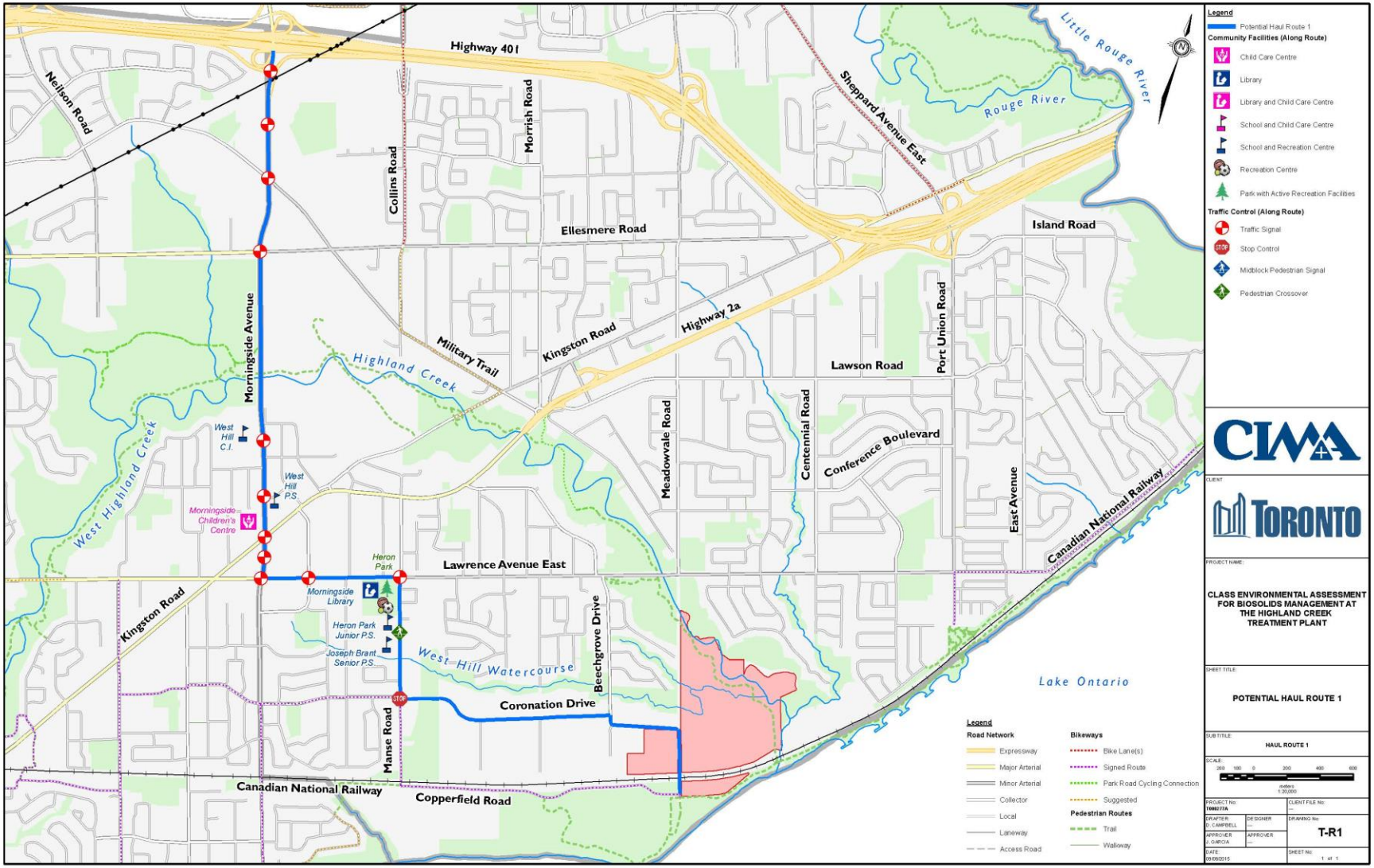

Figure 8: Route 1: Coronation/Manse/Morningside

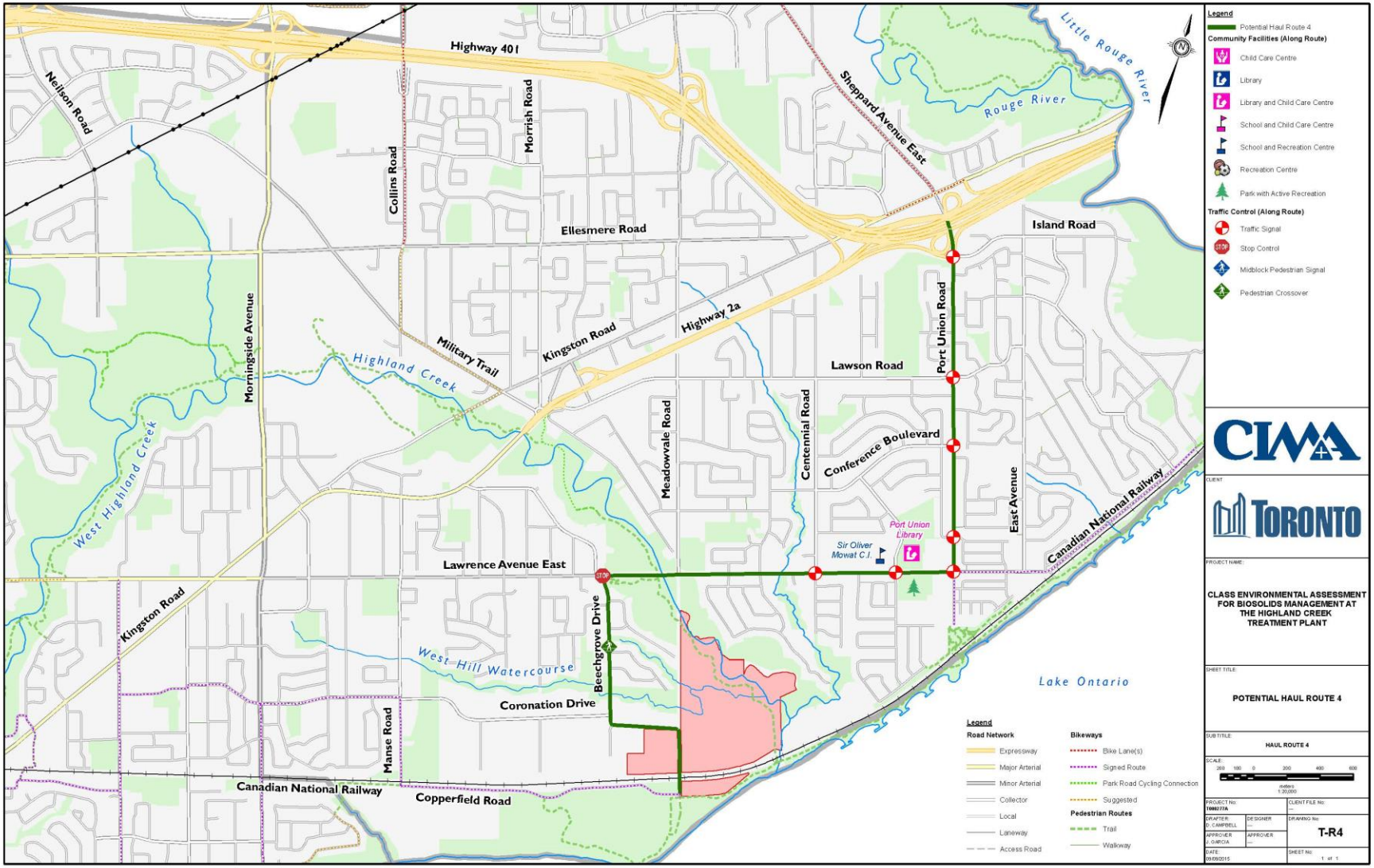

Figure 9: Route 4: Beechgrove/Lawrence/Port Union

Characteristics of Pedestrian and Cyclist Collisions in the City of Toronto

In the City of Toronto, injury and fatality rates due to pedestrian and cyclist collisions with vehicles have been decreasing. Pedestrian injury rates for 2012 were 16 per 1 million walking trips, which is a decrease from 20 per 1 million walking trips in 2003.[17] Likewise, cyclist injury rates decreased from 51 to 33 per 1 million trips in the same time period.

Based on recent reports by Toronto Public Health[17] and Transportation Services at the City of Toronto[18], factors that increase the risk of pedestrian and cyclist collisions in Toronto neighbourhoods are:

- Vehicle speed – fatality rates for pedestrians and cyclists are less than 5% when cars are traveling 30km/h on impact vs. 85% when cars are traveling 50km/h upon impact. The study area has varying speed limits on the transportation routes that have been selected.
- Road type – affects the number of pedestrian and cyclists collisions and the severity of injury. 83.2% of pedestrian and 87.5% of cyclist collisions occur on major and minor arterial roads, compared to 16.5% and 12.3%, respectively for collector and local roads. Pedestrian and cyclist fatalities also occur more often on major and minor arterial roads compared to collector and local roads (84.5% vs. 14.8%, respectively for pedestrian fatalities; 100% and 0% for cyclist fatalities). In the study area, Morningside Ave. is considered minor arterial south of Kingston Rd. and a major arterial north of Kingston Rd. (Route 1) while Lawrence Ave. and Port Union are considered minor arterial roads (Route 4). All other roads utilized for routes 1 and 4 are collector and local roads.
- Intersections are particularly challenging for cyclists and pedestrians. Of cyclists and pedestrians who were involved in a collision with a motor vehicle in Toronto, 69% of collisions occurred at an intersection.[17] There are 11 traffic signals along route 1 and 7 along route 4. Each route also has one pedestrian cross over. Transportation Services recently conducted its own study to determine the top 10 unsafe intersections in the City of Toronto. None of these intersections are within the study area or along the proposed transport routes.[19]

There are also vulnerable populations that are at higher risk of cyclist and pedestrian injuries. According to a recent study by Toronto Public Health, the highest rate of pedestrian injuries was among youth aged 15-24 years old; people aged 65 and older were also at increased risk of major injuries and fatalities.[17] Youth under 19 years of age and adults aged 20-24 comprised the majority of cyclist injuries.[17] As stated in the community profile, Ward 43—and Scarborough Village in particular—has a higher proportion of children (0-14 years) than the City of Toronto average, while Guildwood has a relatively high proportion of seniors. The youth population (15-24 years) is highest in the community of Morningside (16.2%) in the study area.

Collisions in Communities within Study Area

There are few data available for traffic collisions with pedestrians and cyclists at a smaller geographic scale than the City of Toronto. The data that does exist is at the level of the four Community Council Areas (CCA). The HCTP study area falls within the CCA of Scarborough. This geographic area has the lowest number of pedestrian and cyclist collisions with vehicles, seeing only 19% and 11% of all pedestrian and cyclist collisions in the City of Toronto, respectively (2008-2012 data).[17] In comparison,

37% and 61% of all vehicle collisions with pedestrians and cyclists, respectively occur in the Toronto & East York CCA (i.e., downtown Toronto).

HCTP Traffic Volume

Traffic volume is a mediating factor in traffic safety.[20] A higher number of vehicles in a given area generally results in a higher number of collisions. For this reason, it is relevant to understand the projected changes in traffic volume that will be associated with the three options for the HCTP, as well as the context of current traffic volume levels.

An analysis was done of the projected truck traffic for the three biosolids management alternatives during operation of the plant. As shown in Table 16, Alternative 1 is similar to current conditions. Truck traffic is relatively high (86 trucks in total) for a two-week period each year. Alternatives 2 and 3 require a higher total number of trucks in total, and these are spread out over all weeks of the year, resulting in 4-6 trucks per day for Alternative 2 and 1-2 trucks per day for Alternative 3.

Table 16: Additional Truck Traffic by Biosolids Management Alternative

Current conditions	Alternative 1: On-site Fluidized Bed Incineration	Alternative 2: Biosolids Transport Off-site for Management	Alternative 3: Pelletization Process and Distribution of Fertilizer Product
86 trucks used two weeks per year to haul ash. No truck traffic for the remainder of the year.	86 trucks used two weeks per year to haul ash. Approximately 9 trucks per day. No truck traffic for the remainder of the year.	4-6 trucks per day, 5 days a week to haul biosolids. Approximately 1000-1500 trucks per year.	1-2 trucks per day, 5 days a week to haul pellets (fertilizer). Approximately 250-500 trucks per year.
Source: Evaluation of Alternative Transportation Modes and Routes[6]			

The increase in the proportion of traffic volume that comprises heavy vehicles is very small (less than 1%) along both Routes 1 and 4. For Route 1, the HCTP traffic would represent an increase of 0.66% in truck traffic volume, and for Route 4 an increase of 0.5%. Route segment analysis also confirms that the increase in percentage of trucks or heavy vehicles on the road would not be substantially different based on the route segment.

In order to understand how this translates into risk of accidents and injuries for people in the study area, further analysis of the data was undertaken using vehicle collision rates for the City of Toronto. For the year 2008, the latest year for which data is available, there were 654.3 injuries and 2.2 fatalities per billion vehicle kilometers travelled.‡ Applying these data to the study area resulted in a expected increase of 0.595 injuries and 0.0020 fatalities per 100 years associated with Project traffic (worst case scenario: Alternative 1, Route 1). Table 17 describes these rates for each alternative and proposed transportation route. Although estimated increases in fatality rates are almost identical for each alternative, the injury rates differ slightly. Alternative 2 along Route 1 poses the highest increase in risk, with an estimated addition of 0.595 injuries every 100 years (or roughly one injury every 168 years).

‡ The injury and fatality rates were calculated by dividing the number of collision-related injuries and fatalities for the City of Toronto for 2008 (15,720 and 54, respectively) [21] by the number of vehicle kilometers travelled in that year (24,024,702,424 kilometers).[21] This yields 654.3 injures and 2.2 fatalities per billion vehicle kilometers travelled.

Table 17: Estimated Injury and Fatality Rates in the Study Area for All Alternatives

	Alternative 1: On-site Fluidized Bed Incineration		**Alternative 2: Biosolids Transport Off-site for Management**		**Alternative 3: Pelletization Process and Distribution of Fertilizer Product**	
	Based on 85 trucks/year		***Based on 1,300 trucks/year****		***Based on 433 trucks/year***	
	Route 1 (length 7 km)	**Route 4 (length 6 km)**	**Route 1 (length 7 km)**	**Route 4 (length 6 km)**	**Route 1 (length 7 km)**	**Route 4 (length 6 km)**
Total vehicle kilometers per year (route length x number of trucks)	595	510	9100	7800	3031	2598
Injury rate per billion vehicle km	654.3	654.3	654.3	654.3	654.3	654.3
Fatality rate per billion vehicle km	2.2	2.2	2.2	2.2	2.2	2.2
Estimated number of injuries per 100 years *(injury rate x total vehicle kilometers x 100)*	0.039	0.033	0.595	0.510	0.198	0.170
Estimated number of fatalities per 100 years *(fatality rate x total vehicle kilometers x 100)*	0.00013	0.00011	0.00200	0.00172	0.00013	0.00013

Source: Transportation Services[21]
* Based on an assumption of 5 trucks per day, 5 days/week, 52 weeks per year
** Based on an assumption of 1.66 trucks per day, 5 days/week, 52 weeks per year

Although the HCTP plant will utilize trucks as outlined in Table 16, the total increase in truck traffic volume will be very small and will not result in a noticeable increase in traffic safety risk. These estimates are based on the best available data, but have limitations. They are based on average injury and fatality rates for vehicles in Toronto as a whole. Most injuries and fatalities occur on arterial and major roads. Collisions involving trucks also tend to result in more severe injuries. While this could result in an underestimate of the risks, the overall increase in risk of injury and death would still be small.

From a health perspective there are certain characteristics in the transportation analysis that are particularly important to highlight; and other factors are important to bring forward (Table 18). For example, Route 1 transects two neighbourhood improvement areas (NIAs) where Route 1 only transects one NIA. Route 1 also passes though the community of Morningside, which has a relatively high proportion of youth, compared to the City of Toronto. Table 16 also illustrates that there are a higher number of places where youth and elderly may congregate along Route 1 compared to Route 4 (e.g. schools, transit stops).

Table 18: Health Vulnerability Characteristics along Proposed Route Alternatives

	Route 1 (distance: 7 km)	Route 4 (distance: 6 km)
Neighbourhood Improvement Area (NIA)	Morningside West Hill	West Hill
Non-NIA	Highland Creek	Rouge Centennial Scarborough
Schools	4	1
Child care centres	1	1
Recreation centres	1	1
Transit stops	12 transit stops	2 transit stops
Seniors population	Similar to the City of Toronto	Similar to the City of Toronto
Youth population	Morningside has highest youth population in study area	Similar to the City of Toronto

Based on this information, Route 4 is the route that has fewer equity impacts in that it transects fewer communities that are already seen as disadvantaged, it passes by fewer areas where youth and seniors may congregate (e.g. schools, child care centres, transit stops), and does not have exceedingly high numbers of youth or elderly in the communities that the route transects.

Characterization of Potential Effect

Traffic is relevant from a health perspective, in that it has the potential to cause injuries or fatalities through collisions with pedestrians, cyclists or other vehicles.

Two different scenarios for volume of truck traffic associated with HCTP operations exist. Under Alternative 1, trucks will be used in the same way as they are currently: there will be a two-week period of relatively intense truck traffic (~86 trucks) but no truck traffic during the rest of the year. Under Alternatives 2 and 3, there will be a greater total volume of truck traffic, but this will be spread throughout the year (4-6 trucks/day, five days per week under Alternative 2 and 1-2 trucks/day under Alternative 3) with no single period of traffic intensity.

HCTP trucks will travel through neighbourhoods where there is already a high volume of road traffic on collector roads. Two traffic routes (Route 1 and Route 4) are under consideration, both of which have been selected because they represent the best combination of safety, operations and community impact.

Factors other than volume and routing are predicted to be similar under all three alternatives; these include driver behaviour with respect to distracted driving, obeying speed limits, driving under the influence, and vehicle engineering factors.

Potential Risk: The direction of risk is adverse as health effects resulting from increased truck traffic could include injury or fatality. The magnitude is characterized as low, because the predicted risk of injury or fatality associated with any of the proposed alternatives is less than 0.6 predicted injuries every 100 years. Route 4 further minimizes any risk of collisions leading to injury or fatality, particularly among vulnerable road users, compared with Route 1. The confidence in this prediction is moderate as it uses data about traffic and routing that is highly reliable and specific to the project, but relies on a city-wide measure for expected number of collisions per vehicle-kilometre travelled.

Comparison to Base Case: Alternative 1 is the same as Base Case, with the total number and timing of trucks will be used. Alternatives 2 and 3 represent a difference in both quantity and timing of truck traffic.

Comparison among Alternatives: The three alternatives present different levels of traffic safety risk, with Alternative 1 associated with the lowest risk (1 traffic injury every 300 years) and Alternative 2 with the highest risk (1 injury every 168 years if Route 1 is selected, or every 196 years if Route 4 is selected). Because these numbers are very small, the absolute difference in risk among them can be considered very small. However, there are two qualitative differences to note. First, risk is only present for two weeks per year for Alternative 1, and is present year-round for Alternatives 2 and 3. Second, while both have very small risks, Route 4 represents less risk than Route 1, due to overall route length and to lower presence of vulnerable populations.

Equity: The distribution of the effects on traffic safety among vulnerable populations will vary depending on the route chosen. Route 1 travels through the neighbourhoods of West Hill, Highland Creek and Morningside. Route 4 travels through the neighbourhoods of West Hill, Centennial Scarborough and Rouge. Route 4 transects fewer communities that are already seen as disadvantaged, it passes by fewer areas where youth and seniors may congregate (e.g. schools, child care centres, transit stops), and passes through communities that have an average number of youth and seniors. In this sense, Route 4 would be seen as having less of an adverse effect on health inequity than Route 1.

A summary of effects on traffic safety is presented in Table 19.

Table 19: Summary of Potential Effects on Traffic Safety for the Short-Listed Biosolids Management Alternatives

Rationale	Project-related traffic has the potential to cause injuries or fatalities through collisions with pedestrians, cyclists or other vehicles.
Potential Risk	The direction of risk is adverse; however, the magnitude of risk is small, because the risk of injury or fatality associated with any of the proposed alternatives is no higher than 1 predicted injury or fatality every 100 years. Selection of Route 4 over Route 1 has lower risk of collisions leading to injury or fatality, particularly among vulnerable road users.
Comparison to Base Case	Alternative 1: No change from current conditions (86 trucks for a one-week period per year). Alternative 2: Overall increase in truck volume (around 1,300 trucks per year) Alternative 3: Overall increase in truck volume (around 433 trucks per year)
Comparison Between Alternatives	Alternative 1: Lowest overall risk of injuries/mortality from traffic accidents. Risk present for two weeks of year. Alternative 2: Highest risk of injuries / mortality from traffic accidents. Risk present all year. Alternative 3: Intermediate risk of injuries / mortality from traffic accidents. Risk present all year.
Comparison Between Routes	Route 4 is preferable to Route 1 for traffic safety considerations.
Equity Considerations	Route 4 has less of an adverse effect on health inequity than Route 1. Children and seniors may be more greatly affected by any increase in truck traffic.

7.1.3 Neighbourhood Characteristics

In this report, *neighborhood characteristics* refers to a number of physical and social amenities that together create a neighbourhood that is desirable and supportive to live in.

Discussions with stakeholders brought up several areas of concern related to neighborhood characteristics. Some of these (odour, noise and traffic safety) are presented as other sections of this report. Four areas of concern that are not presented elsewhere (access to transport, recreation and leisure, property values, and social cohesion) are discussed below.

Access to Transport

Public transportation provides people with access to the places, goods and services they need to be healthy. The availability of public transport is important for getting to work and school, accessing health services,[22] purchasing healthy foods,[23,24] and engaging in social and recreational activities.[25,26] This access may be particularly important for population groups and communities whose local neighbourhoods are lacking these amenities.[27,28] People living in low income neighbourhoods, seniors, people with disabilities and families with young children may be disproportionately affected by a lack of access to public transport.

In Wards 43 and 44, residents see access to transport options as a valued component of their neighborhoods. Residents listed walking, cars and buses, as well as use of the GO train and VIA rail as being particularly important (Appendix B). The HIA Stakeholder Group raised concerns that Alternatives 2 and 3 might impede access to these transport options in the community due to the addition of regular truck traffic (Appendix C).

As described in Section 7.1.3 Traffic Safety, there are two routes being considered for hauling biosolids products off-site. Both pedestrian safety and the number of transit stops were taken into consideration when selecting these short-listed options. Table 20 shows a number of features relevant for access to transport for the two routes under consideration. As shown in the table, both routes include one crosswalk. Route 4 passes 2 major transit stops, while Route 1 passes 12 major transit stops.

However, as described in Section 7.1.3 Traffic Safety, the traffic volumes associated with operations of the HCTP are very low: Alternative 2 will require 4-6 trucks per day (meaning 8-12 trucks passing by), and Alternative 3 will require 1-2 trucks per day (meaning 2-4 trucks passing by). In both cases, the HCTP traffic would represent an increase of less than one percent of the proportion of truck traffic volume, and an even smaller percentage of total traffic volume.[§] The traffic from the HCTP should therefore be non-discernable in the context of existing traffic, and so will not negatively affect access to buses, pedestrian rail and car transport.

[§] For Route 1, the HCTP traffic would represent an increase of 0.66% in truck traffic volume, and for Route 4 an increase of 0.5% [as per the Evaluation of Alternate Transportation Modes and Routes].

Table 20: Characteristics of Route 1 and 4 Important for Access to Transport

Criteria	Route 1	Route 4
Pedestrian safety	1 crosswalk on Manse Road between Coronation Drive and Lawrence Avenue	1 crosswalk on Beechgrove Drive between Coronation Drive and Lawrence Avenue
Pedestrian Exposure	Approximately 1-km stretch with non-buffered sidewalks on Morningside Avenue between West Hill Collegiate Institute and Ellesmere Road	Mostly buffered sidewalks; up to 8 metre-wide buffers along Port Union Road
Transit	12 major transit stops (2 on Manse Road, 4 on Lawrence Avenue East, 6 on Morningside Avenue)	2 major transit stops (1 on Lawrence Avenue East, 1 on Port Union Road)
Source: Evaluation of Alternative Transportation Modes and Routes[6]		

Recreation and Leisure

It is well recognized that physical activity is important for both adult and child wellbeing, including promoting healthy development, preventing disease, increasing lifespan, and improving mental health.[29,30] Physical activity can help to prevent numerous chronic conditions, including heart disease, stroke, high blood pressure, some cancers, type 2 diabetes, and osteoporosis.[31]

While personal choice plays a role in engaging in physical activity, the built environment is also critically important.[32] Venues to engage in physical activity outdoors such as sidewalks, bike paths and parks are important, especially in urban centers.[33,34] Other influences on physical activity include the distance from one's house to green space[33] as well as perceptions of neighbourhood safety, the latter of which is strongly correlated with physical activity in children.[35] Safety, lighting, air pollution, and weather are all also known to influence outdoor physical activity.[36,37] Furthermore, according to one study, areas with lower noise are used for physical activity and can contribute to the wellbeing of the community (i.e. quality of life).[38] This may mean that some people seek out quiet areas to enjoy physical activity.

Stakeholders in community meetings (1st Public Information Centre and 1st HIA Stakeholder Meeting) expressed that recreation and leisure are valued in the community and raised concerns that recreation and leisure could be affected by the HCTP project through increased truck traffic that would prevent access to or enjoyment of recreational spaces or that would be dangerous along bike routes; and through noise or odours that would reduce enjoyment of the waterfront trails.

There are multiple venues for outdoor recreation in the study area. Along the waterfront is the Ontario Lakefront Trail, as well as hard surface trails.[39] The hard surface trail also continues through the wards, crossing Lawrence Avenue and Kingston Road twice, and Morningside Avenue once using roadway bridges. Also in this area are several major parks including East Point Park located southwest of the HCTP site along the waterfront, Morningside Park directly south of Ellesmere Road and west of Morningside Avenue, Colonel Danforth Park near Lawrence Avenue East and Meadowvale Road, and finally Adams Park Field House, slightly west of Port Union Road. There are also bike paths and routes throughout the communities.[39] The City of Toronto is currently obtaining feedback on its 10-year cycling network plan.[40] Within the plan bike routes are being proposed for Port Union Rd (along Route 4) and Military Train and Lawson although this route does not follow either of the proposed transportation routes.

Table 21 summarizes the number of potential places where residents may choose to participate in recreation and leisure activities in the study area along the two proposed routes. The major difference between the routes is the number of schools.

Table 21: Number of Recreation and Leisure Sites along Routes 1 and 4

	Route 1	Route 4
Schools	4	1
Recreation centres	1	1
Park with active recreation facilities	1	1
Source: Evaluation of Alternative Transportation Modes and Routes[6]		

With respect to traffic interference with recreation and leisure, the transportation analysis[6] showed that there will be a very minimal increase in truck traffic associated with alternatives 2 and 3 (0.66% and 0.5% increase, respectively). Alternative 1 will represent the same amount of traffic as current operations. Therefore currently, it is not anticipated that cycling or pedestrian activities will be impacted by the additional trucks on the road for Alternatives 2 and 3. Furthermore, the cycling and pedestrian infrastructure in the neighbourhoods (i.e., sidewalks, roadway bridges) minimize interaction between vehicles and cyclists and pedestrians. As previously stated, a bike lane is being proposed for Port Union Rd. (Route 4). The introduction of a bike lane will increase safety for cyclists along that route; however, a bike lane may also mean that more cyclists will begin using Port Union Rd for commuting and recreation which would have the effect of increasing absolute risk of an accident, even though the overall accident rate may decrease.

In terms of noise and odours, minimal impacts are expected. A perceptible noise increase is expected along one section of Coronation Drive if Route 1 is selected as the main transportation route (see section 7.1.4 for an in-depth discussion on noise impacts). However, it is not anticipated that this very small noise increase will prevent people from participating in recreational activities as the noise increase will be temporary (only present when trucks pass). With respect to odour, mitigation strategies being proposed for on-site operations will minimize odour production (See Recommendations) with each of the alternatives. Trucks hauling biosolids or pellets will have odour producing potential; however, like noise the odour would be temporary and only be noticeable when trucks pass by receptors. Alternatives 2 and 3 have greater potential for temporary odours along the route compared with Alternative 1, which has no odour producing potential. It is not anticipated that these odours will prevent people from participating in recreational activities.

Property Values

Research has documented a number of factors that can affect property values in the context of industrial facilities nearby. These include real or perceived risks of living near the industrial facility; distance from the facility; and timing, with a greater impact observed during project construction than once the facility is operating.[41,42,43,44] However, the presence of industrial facilities does not always have an adverse impact. Some studies have found no result on property values in neighbouring communities, or no significant change in individuals' willingness to buy homes nearby.[41,44,45]

For the most part, the literature that documents the impacts of industrial developments on property values do not apply to the HCTP context. First of all, the studies tend to focus on greenfield developments, where new facilities are being proposed on previously undeveloped land. In the case of the HCTP, the site is one where incineration currently takes place. Additionally, the studies that found changes in property values are generally linked to much larger changes than will be associated with the HCTP. For example, one study found that an increase in 1,000 vehicles per day resulted in a property value decrease of 1% in urban areas.[46] In contrast, the maximum increase in traffic volume being proposed for the HCTP is 6 vehicles per day (Alternative 2). However, although the increase in traffic volume being proposed for Alternatives 2 and 3 is very small, it is still an increase in traffic on already busy roads; given this information, property values will likely not decrease as a result of the proposed alternatives.

In conclusion, since available information suggests that the increase in truck traffic is unlikely to result in an impact on property values, no impact on health is expected.

Social Cohesion

Social cohesion is defined as "the quality of social relationships and the existence of trust, mutual obligations and respect in communities or in the wide society that helps to protect people and their health".[47] The pathways between social cohesion and health are complex. Socially cohesive communities foster social participation and strong relationships, leading to physical and social well-being, while a lack of cohesion can increase social disorder, conflict and inequality.[48,49] Social cohesion can be especially important for older populations, to protect against the deterioration of well-being as one ages.[48]

At the HIA Stakeholder meeting that was held in November, 2014, stakeholders mentioned that differing community opinions on the alternatives may create tension among community members and lead to a dissipation of social cohesion. However, the group also mentioned that the process of working together throughout the HIA may enhance social cohesion (HIA Scoping Phase report – Appendix B). Participation in the HIA process, when inclusive and well conducted, has been suggested to strengthen cohesiveness.[50]

Based on feedback from local stakeholders and the professional opinion of the HIA team that has attended all Public Information Centre meetings and witnessed interactions between community members, tensions regarding the biosolids management alternatives are unlikely to result in a change of social cohesion or an effect on health outcomes. Community tension is more likely related to major capital projects on a greenfield site or a new industrial site slated to be built in close proximity to dense residential areas, or in situations where recreation or the environment are in direct conflict with the opportunity for significant job creation. Highland Creek Water Treatment Plant began operating in the community in 1956 with the multiple hearth incinerators being introduced in 1976. The plant and the incinerators have been operating in this industrial area over a significant duration.

<u>Characterization of Potential Effect</u>

Four different issues related to neighbourhood characteristics have been described: access to transport, recreation and leisure, property values, and social cohesion. Table 22 summarizes the potential effects on neighbourhood characteristics.

Potential risk: Available evidence suggests that none of the biosolids management alternatives will have an impact on neighbourhood characteristics. Risks to health from these factors are not expected to occur.

Published research literature, anecdotal information from PIC members and discussions with TPH all indicate that project-related changes in access to transport, recreation and leisure, property values and social cohesion are not expected. Because there are multiple lines of evidence pointing to this conclusion, the confidence in the prediction is high.

Comparison to Base Case: Alternative 1 is similar to the Base Case and therefore changes to neighbourhood characteristics are not expected. Since Alternatives 2 and 3 would add trucks to the roadways on a regular basis, there is a difference from Base Case in terms of how the Project interacts with the community for these two alternatives; potentially increasing noise, odour and level of traffic on the roads; however, the predicted impact is too small to result in adverse health impacts. In addition, the Highland Creek Treatment Plant has been present in this community since 1956. None of the alternatives would increase or significantly change the footprint of the existing facility. Therefore, the impact of the shift from the existing multiple hearth incinerators to any one of the alternatives is very small.

Comparison among Alternatives: A difference in truck traffic is the only way in which the alternatives differ with respect to neighbourhood characteristics, as the current incinerator already exists. Given the existing number of trucks on the road and the small projected increase in trucks from Alternatives 2 and 3, the resulting small changes in traffic, noise and odour are not expected to result in a meaningful difference in neighbourhood characteristics or overall wellbeing.

Equity: Because there are no health effects expected in terms of neighbourhood characteristics, there are no predicted impacts to overall health equity in the study area. However, Route 4 is preferred as this route intersects less often with vulnerable populations, namely children and seniors.

Table 22: Summary of Potential Effects on Neighbourhood Characteristics for the Short-Listed Biosolids Management Alternatives

Rationale	Changes to access to transport, recreation and leisure, property values and social cohesion resulting from project activities could alter overall sense of health and well-being.
Potential Risk	Evidence suggests that effects of the Project on neighbourhood characteristics will not result in adverse health impacts.
Comparison to Base Case	Alternative 1 is similar to Base Case and therefore no change is expected. Alternatives 2 and 3 differ from Base Case in terms of Project traffic on the road; however, these changes are very small and not expected to result in adverse impacts.
Comparison among Alternatives	A difference in truck traffic is the only way in which the Alternatives differ with respect to neighbourhood characteristics. Due to the potential increase in traffic, noise and odour, the risk of impact is greatest with Alternative 2 and smallest with Alternative 1, with Alternative 3 in between. However, the differences are small and not anticipated to result in adverse impacts to health.
Equity Considerations	Because there are no anticipated impacts to health from changes in neighbourhood characteristics, no impacts on equity are expected. However, Route 4 is preferred as this route intersects less often with vulnerable populations, namely children and seniors.

7.1.4 Stress – Risk Perception

There are a number of factors associated with the HCTP biosolids management alternatives that have the potential to cause stress or annoyance in the local population. Stress and annoyance are primarily a nuisance to those who experience them, but unmanaged stress also has physical health consequences.[51] Exposure to stress can also contribute to behaviours such as smoking, over-consumption of alcohol and less-healthy eating habits.

Community engagement activities have brought forward specific aspects of the HCTP biosolids management alternatives that may cause stress or annoyance. These include:

- Unpleasant odours from the truck traffic and treatment plant;
- Increased noise from the truck traffic and treatment plant;
- Increased risk of collisions and traffic congestion;
- Reduced enjoyment of adjacent recreational trails;
- The potential for inequitable distribution of potential risks among different population groups, and;
- Stress related to the uncertainty of the future of the HCTP and the extended decision-making process.

The primary effects of the HCTP alternatives on many of these areas are examined in other sections of this HIA. Alternative 1 is similar to current operations, therefore it is expected that this alternative would not result in an increase in stress. It is difficult to quantify how many people might experience increased stress related to truck traffic, noise and odours from Alternatives 2 and 3. However, as discussed elsewhere the impact related to these factors on the community would be very small and not expected to result in adverse health impacts. It is therefore not expected that these factors would increase stress in the population in the study area. It is also unlikely that these alternatives would have any impact on access and enjoyment of recreational trails in the area.

Given the small impact of all the alternatives on health, the potential for inequitable distribution of risk is unlikely to cause stress. Stress related to uncertainty on the future of the HCTP is likely to happen among some study area residents, and can best be mitigated through engagement activities throughout the HIA and the Class EA process and the making of the final decision on the selection of the alternative to be implemented at HCTP.

An additional concern that has been raised by stakeholders is the potential for human exposure to environmental contamination. However, no current data were available for the level of stress related to operations of the current incinerator and how that might change when a new facility is built. As described under the sections on Air Quality and Multimedia Exposure Risk, an HHRA conducted as part of the Class EA found that all of the proposed biosolids alternatives will result in a decrease in risk compared to the current situation. It is therefore unlikely that any of the alternatives would increase stress related to concerns about pollution.

The remainder of this section addresses the impacts of noise and odour on stress and annoyance levels as these two factors have not been addressed elsewhere in the HIA.

Noise

The proposed alternatives for the HCTP have the potential to cause noise via truck traffic through the neighbourhoods.

Excessive noise may lead to annoyance and adverse health impacts. The World Health Organization (WHO) indicates that "people annoyed by noise may experience a variety of negative responses, such as anger, disappointment, dissatisfaction, withdrawal, helplessness, depression, anxiety, distraction, agitation or exhaustion."[52] Two cross-Canada studies have found that people who have reported being highly annoyed by noise are more likely to experience a disturbance of daily activities (e.g. sleep, oral and written communication) and to perceive the noise as having a negative impact on their health.[53,54] Noise is also associated with sleep disturbance, cardiovascular disease, and decreased school performance in children.[55] Seniors, children and people with chronic illness tend to be more sensitive to noise disturbances.[56]

In order to assess noise associated with HCTP plant operations, a noise impact assessment was completed.[57] The assessment examined the potential for noise from off-site truck traffic associated with transporting biosolids or processed biosolids product from the HCTP site to Highway 401.

On-site noise emissions were not included in the assessment as the HCTP will be required to comply with Ministry of the Environment and Climate Change (MOECC) Environmental Compliance Approval (ECA) requirements, and it is understood the HCTP is currently operating under a valid ECA and the City will apply for an application for an amended ECA, as required. It is expected that a detailed acoustic assessment that would assess on-site activities would be prepared to support any application for an amended ECA.

The noise impact assessment was conducted based on the following information:

- Biosolids haul trucks will be included in the assessment as heavy trucks (i.e. gross vehicle weight is greater than 12,000 kg), which have three or more axles and are designed for the transportation of cargo;
- Based on current plant flows for biosolids and processed biosolids product and assuming a 5-day week, a range of 2-6 biosolids haul trucks per day. This assessment is conservatively based on a maximum of 2 trucks per hour travelling to and from the HCTP (a total of 4 truck pass-bys at any receptor along the haul routes);
- Haulage hours are limited to 06:00 to 18:00 inclusive, and;
- The impact for Routes 1 and 4 only were assessed (see Section 7.1.3 on Traffic Safety for a description of these routes).

Table 23: Traffic Noise Impact Summary

Route/Section	Minimum Existing Road Traffic Noise Level [1] 0600 to 1800 hours	Future Road Traffic Noise Level [1]	Noise Level Increase (dB)	Qualitative Rating [2]
Route 1/Section 1	60	61	1	Insignificant3
Route 1/Section 2	54	58	4	Noticeable
Route 1/Section 3	58	60	2	Insignificant
Route 1/Section 4	59	61	2	Insignificant
Route 1/Section 5	64	65	1	Insignificant
Route 4/Section 1	60	61	1	Insignificant
Route 4/Section 2	59	60	1	Insignificant
Route 4/Section 3	59	61	2	Insignificant
Route 4/Section 4	70	70	0	Insignificant
Route 4/Section 5	69	69	0	Insignificant

Notes: [1] One Hour Equivalent Noise Level (L_{eq})

[2] As defined in MOECC Noise Guidelines – MOECC, 1998

[3] The Noise assessment defines insignificant as an increase of less than 3 dBA

Source: Evaluation of Noise Impact – Off-site Haul Routes[57]

Each assessed haul route (Route 1 and Route 4) was broken down into five distinct road sections (Table 23). When the noise assessment was conducted it was assumed that all noise would occur during time periods of minimal traffic - this provides a health protective estimate of the qualitative rating of noise because noise is more perceptible in quieter environments.

The noise assessment showed that minimum background noise levels in the study area ranged between 54 and 70 dBA. These noise levels fall within the qualitative description of normal suburban residential community to very noisy urban residential community according to Health Canada's noise guidelines for environmental assessments.[62] The report concludes that a noticeable increase (defined as an increase of 3 to 5 dBA) in existing 1-hour L_{eq} noise levels of 4 dB, could occur at only one point, along Coronation Drive between Beechgrove Drive and Manse Road (Route 1) if the maximum assumed HCTP off-site traffic were to occur during a period of lowest existing traffic volume (Table 23). A noticeable increase in noise may lead to annoyance in some residents or users of the area when the trucks pass by. It is however unlikely that this increase in noise would result in negative impacts on health over existing conditions.

Given that the only area where a noticeable increase noise is located is in the community of West Hill, an NIA community, and that the noise assessment indicates that Route 4 has less risk of noise impact compared to Route 1, the use of Route 4 would minimize any potential inequitable noise impacts due to HCTP-related truck traffic.

Odour

Odour from industrial and commercial activity is an issue that can result in community concern. At its mildest, experiencing unwanted odour can be unpleasant or an annoyance. It has been suggested that certain persistent and intense odours could have health impacts; however there is still no consensus on the nature of the impacts.[58] [59]

In and near Toronto, odours from industrial and commercial sources have caused considerable anger, frustration and upset among affected community members[60,61,62]. Spurred by complaints about odours from the HCTP, in 2005 the City commissioned a Plant Wide Odour Assessment [63]. The assessment found that odours at that time did occasionally extend the plant boundary and caused complaints from neighbours, particularly those along the north plant boundary. The study recommended a series of projects to alleviate odour concerns relating to the plant. After a series of additional planning measures, the contract for the construction of the odour control projects was awarded in 2014.[64]

Table 24 shows the projected effects on odour of operations of the three different alternatives. This information was summarized from the *Development of Short-listed Biosolids Management Options* report which was prepared for the Class EA.[5]

The three alternatives do vary in their potential to produce odour during the operation phase, as described in Table 24. Mitigation measures planned for Alternative 2 and 3 to reduce the potential for odour release are described in the Recommendations section, and include:

- The facilities would be constructed with bay doors which would be closed at all times except when trucks are entering and exiting the facility.
- Biosolids would be stored in closed silo bins.
- Trucks would not be filled until they have entered the facility and the bay doors have closed behind them.
- The doors will not open again until the biosolids are sealed in the tankers and trucks are ready to leave
- All air from inside the facility would be captured and treated through an odour control unit before being released to the atmosphere
- All trucks will be washed before leaving the facility.
- All trucks would be covered but not sealed.

Alternative 1 has the least potential to produce odours that require mitigation; Alternatives 2 and 3 each have additional odour producing potential compared with current conditions. However, with planned

mitigations in place, none of the three options is likely to generate odours that are perceptible off-site. That said, haul trucks once loaded and on the roads for Alternative 2 and 3 may generate some odour perceptible to passers-by. This odour producing potential will be mitigated to the greatest extent possible by washing all trucks down before they leave the HCTP site and by covering trucks. Regardless, some odour may persist. Since trucks will be moving and will not remain idle on neighbourhood streets, any potential perceived odour will be temporary and transient.

Based on the mitigation measures being employed on-site and off-site, Alternative 2 and 3 may have only temporary and minimal effects on odour; however it is possible that some people may be annoyed by even the temporary odour. However, no impacts on health are anticipated from this brief exposure to odour.

Table 24: Odour Effects During Operations

Alternative 1: On-site Fluidized Bed Incineration	**Alternative 2: Biosolids Transport Off-site for Management**	**Alternative 3: Pelletization Process and Distribution of Fertilizer Product**
Due to the fact that materials are completely combusted resulting in full destruction of pathogens and organic contaminants, there is very low potential for odours both on and off site. The ash is completely inert and therefore when collected in the lagoons and later transported off-site, it will emit no odour.	There is odour potential from the new digester and during biosolids truck loading. Haulage of biosolids along transportation routes may also lead to odour. Mitigation measures to reduce odour are discussed in the Recommendations section of this report. On-site odours are expected to be mitigated. Some short term odours may be present along transportation routes.	The heat drying process has the potential to produce odours. Odours generated within the pelletization facility will be collected and treated. Haulage of biosolids along transportation routes may also lead to odour. Mitigation measures to reduce odour are discussed in the Recommendations section of this report. On-site odours are expected to be mitigated. Some short term odours may be present along transportation routes. The risk of odours along the transportation route is lower than Alternative 2 due to less frequency of trucks and the nature of the pellets.

Characterization of Potential Effect

The Project has the potential to cause odours and noise, which may lead to stress and annoyance in the local population. Stress and annoyance are associated with a variety of biophysical and mental wellbeing impacts. Potential impacts to stress and risk perception are summarized in Table 25 and are described below.

Potential Risk: The direction of potential effect is adverse, as biosolids management alternatives have potential to cause odours and noise and thereby increase stress and annoyance. In terms of noise, Route 4 noise impacts on all segments of the route will be very small; Route 1 may lead to some perceptible noise in the community of West Hill. Odours will be mitigated to the greatest extent possible on-site.

Some temporary and minimal odour effects may result during transportation of biosolids off-site for Alternatives 2 and 3; however, in order to perceive odours receptors would have to be outside and along the traffic route. Overall, the magnitude of risk is characterized as low. Confidence in this prediction is moderate.

Comparison to Base Case: Alternative 1 is similar to Base Case so no change is anticipated. Alternative 2 has the greatest potential of odour production off-site compared to the Base Case due to trucking of biosolids materials. Route 4 has no perceptible difference in noise from Base Case. Along Route 1 is selected, one segment in the community of West Hill may experience noise when trucks pass by, and this may result in annoyance.

Comparison among Alternatives: Alternative 2 has the greatest potential to increase stress and annoyance due to temporary and transient odours being produced off-site along transportation routes; however, perception of odour would depend on proximity to trucks, wind direction, and an individual's sensitivity to smells. Alternative 1 has the least odour-producing potential. Since the noise impact assessment was only completed for the worse-case scenario (Alternative 2 along Route 1), it is not possible to quantitatively differentiate among the alternatives, except to note that the other alternatives would have a lower risk.

Equity: People with pre-existing health conditions, children and seniors may be more greatly impacted by stress related to noise and odour. The community of West Hill may experience noise impacts and subsequent annoyance if Route 1 is selected. Since West Hill is an NIA this impact may be deemed inequitable.

Table 25: Summary of Potential Effects on Stress and Risk Perception for the Short-Listed Biosolids Management Alternatives

Rationale	Changes in odours and noise represent risk factors for increased stress and annoyance.
Potential Risk	Overall, the potential risk is low. Route 4 will have no measureable effect on noise; Route 1 may lead to some perceptible noise in the community of West Hill. Some temporary and minimal odour effects may result during transportation of biosolids off-site for Alternatives 2 and 3; however, odours would only impact people along the haulage route and be most perceptible outside.
Comparison to Base Case	Alternative 1 is similar to Base Case so no change is anticipated. Alternative 2 has the greatest potential of odour production off-site compared to the Base Case. Route 4 has no perceptible difference in noise from Base Case. If Route 1 is selected, one segment in the community of West Hill may experience noise when trucks pass by.
Comparison among Alternatives	Alternative 2 has the greatest potential of temporary and transient odours being produced off-site along transportation routes. Alternative 1 has the least odour-producing potential. Noise impacts were only assessed for the worst case scenario (Alternative 2 along Route 1). However, it is expected that the risk of would be lower for the other alternatives due to lower volumes of truck traffic.
Equity Considerations	If route 1 is selected there may be inequitable impacts. Impacts for stress and annoyance associated with Route 4 are deemed more equitable. People with pre-existing health conditions, seniors and children may be more greatly affected by stress and annoyance.

7.2 Secondary Health Areas

7.2.1 Climate Change

Climate change has the potential to adversely impact health through its effects on the social and environmental determinants of health: clean air, safe drinking water, sufficient food and secure shelter.[65] Driven by increasing levels of greenhouse gases (GHGs) such as carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O)and fluorinated gases,[66] climate change has and will lead to higher average temperatures, rising sea levels, and more frequent extreme weather events.

According to a 2013 report by Toronto's Medical Officer of Health, the climate-driven changes anticipated in Toronto by the year 2049 include overall warming and an increase in extreme weather events such as heat waves and rainstorms.[67] Toronto may also be subject to weather that is more variable and less predictable from one year to the next, with an increase in snow, drought, wind and ice storms.[68]

GHG emissions have been decreasing in Toronto. Compared to 1990 levels, GHG emissions in 2012 were 49% lower for City government and 25% lower for Toronto as a whole.[69] However, climate change effects experienced in Toronto are driven not only by local emissions, but by GHG emissions on a global scale. Thus, while it is important for local industries and organizations to be attentive to their own emissions, the health effects related to climate change that are experienced in Toronto will be affected by activities at a much broader geographic range. Regardless, any efforts made to reduce GHG emissions are positive for public health.

HCTP Proposed GHG Emissions

Greenhouse gas emissions were calculated for the existing multiple hearth incinerators and for each of the biosolids treatment alternatives as total CO_2 equivalents.[5] Where relevant, equivalent CO_2 emissions were calculated from fossil fuel burned (natural gas), electricity usage, truck emissions due to hauling, and N_2O emissions from incineration; total CO_2 equivalents are summarized in Table 26. All values presented are annual, based on operation at the rated capacity of the facility.

Table 26: Total CO_2 Equivalent Emissions for Each Biosolids Management Alternative

	Current conditions	Alternative 1: Fluidized bed incineration	Alternative 2: Biosolids Transport Off-site for Management	Alternative 3: Pelletization Process and Distribution of Fertilizer Product
CO_2 Equivalent Calculations* (kg CO_2 eq/y)	8,749,000	1,689,000	1,441,000	3,425,000
* GHGs were calculated based on electricity, natural gas and diesel fuel required for the full (estimated distance) to application sites. The conversions of organic material into $C0_2$ either though incineration or through natural degradation in the soils are not included in the calculation. For Alternative 2, additional GHG's will be generated from further processing, transportation of processed material management sites, and equipment used to spread on land. For Alternative 3, additional GHG's will be generated from land spreading equipment. These additional GHG's are not quantified at this time, as they will depend on the contract details.				

Each of the estimated GHG emissions for the biosolids management alternatives are lower than for the current conditions at the HCTP. Alternative 2 provides the greatest reduction in GHG emissions, followed

by Alternative 1 and then Alternative 3. Estimating the impact of these small reductions on health is not possible.[70] While GHG emissions do not have a direct and local impact on health and the reductions in GHG emissions are very small, all three alternatives are expected to have a positive impact on human health.

Characterization of Potential Effect

The potential effects on climate change are summarized in Table 27 and are described below.

Potential Risk: The direction of the impact is positive as all alternatives would represent a decrease in GHG emissions. The impact of these emissions on the study area is small and magnitude of the health effect is too small to measure; therefore the risk is considered neutral. A life-cycle assessment was not completed for GHG emissions and therefore the confidence in this outcome is characterized as moderate.

Comparison to Base Case: Compared to Base Case, each of the alternatives is proposed to emit lower GHG emissions.

Comparison among Alternatives: Alternative 2 will have the greatest reduction in GHG emissions, followed by Alternative 1 and then Alternative 3. Although there are differences between the estimated GHG emissions for each alternative, there is no evidence to suggest a difference among the alternatives in terms of health outcomes. However, every reduction in GHG emissions helps protect health on a much larger scale than the study area.

Equity: The temporal distribution is primarily confined to operations. The spatial distribution and distribution across population groups would comprise the entire study area and its residents. The effect would be equitable, as all study area residents would experience effects equally; however some population groups may particularly benefit: people with pre-existing respiratory and cardiovascular disease, children and seniors, low income and Aboriginal populations.

Table 27: Summary of Potential Effects on Climate Change for the Short-Listed Biosolids Management Alternatives

Rationale	Greenhouse gas emissions contribute to climate change which is expected to result in negative impacts to health. Reducing releases of GHG emissions would therefore contribute to health.
Potential Risk	GHG emissions for all proposed alternatives are lower than current GHG emissions at the HCTP.
Comparison to Base Case	Each alternative is predicted to have lower GHG emissions than the base case.
Comparison among Alternatives	Alternative 2 will have the greatest reduction in GHG emissions followed by Alternative 1 and then Alternative 3. There is no difference between the three alternatives in terms of predicted health impacts; however any reduction in GHG emissions contributes to health.
Equity Considerations	Since climate change is a global phenomenon, emissions of GHGs from the HCTP would not have an impact on equity.

7.2.2 Job Opportunities

The health effects of income and employment are well established.[71,72] In general, people who are employed in secure, stable and safe working conditions are more likely to experience better health outcomes stemming from financial security and ability to purchase healthy foods; as well as positive effects on overall health status and mental well-being.

The HCTP biosolids management project is expected to produce some employment opportunities during the construction phase. During the operation phase however, the number of jobs required to run the on-site operation is similar to current conditions. It is challenging to consider the potential increase in job opportunities required for the haulage route, with greater need for truck drivers in the event that Alternatives 2 or 3 are selected. If it is assumed that each additional truck would result in an additional job, Alternative 2 may result in 1 to 2 jobs and Alternative 3 in 4 to 6 additional jobs. These jobs would be filled by the contractors that are hired to haul and manage the biosolids/pellets. It is unknown where these positions would be filled. To the extent that employment in the operations phase goes to residents within the study area, there is the potential for the Project to result in a positive health benefit that extends not just to the employed individual, but also to his/her family. As the HCTP is currently an operating facility employing staff, operations under any of the proposed alternatives is unlikely to meaningfully change employment levels at the facility.

Characterization of Potential Effect

The potential effects on job opportunities are summarized in Table 28 and are described below.

Potential Risk: The potential direction of the impact is positive as employment could result in health benefits. However, Alternative 1 would not result in additional jobs beyond current employment levels at the HCTP, and any increase in employment related to Alternative 2 and 3 would be very small. Therefore, the magnitude of the effect is expected to be neutral. There is low to moderate confidence in the prediction of this effect, as the location of the potential increase in jobs due to haulage off-site is unknown.

Comparison to Base Case: Compared to Base Case, all three alternatives are likely to result in a similar number of jobs during the operations phase.

Comparison among Alternatives: There is no expected meaningful difference among the alternatives in terms of employment opportunities during the operations phase. Although Alternatives 2 and 3 will have jobs available associated with hauling biosolids this is very small.

Equity: Because the Project is not expected to result in new employment opportunities, no equity impacts (positive or negative) are anticipated.

Table 28: Summary of Potential Effects on Job Opportunities for the Short-Listed Biosolids Management Alternatives

Rationale	Provision of jobs provides an opportunity for positive health benefits
Potential Risk	The opportunity of improving health in the study area through the provision of more employment is minimal or non-existent.
Comparison to Base Case	The number of jobs for all three alternatives during operations will be similar to Base Case.
Comparison among Alternatives	Alternatives 2 and 3 will have a few more jobs associated with hauling biosolids however, however the difference in not appreciable.
Equity Considerations	Because the Project is not expected to result in new employment opportunities, no health equity are expected.

8. Impacts on Vulnerable Groups

Vulnerable populations are those groups of people who are at risk of experiencing poorer health outcomes because of pre-existing individual, social, economic, cultural, or geographic characteristics. As outlined in Section 6.4, a number of potentially vulnerable groups for this HIA were identified by the HIA Stakeholders Group. Table 29 summarizes the potential effects on the vulnerable groups that were identified during the HIA.

Table 29: Potential Effects to Vulnerable Groups in the Study Area

Population group	Potential Effects
Children	Although there are likely benefits through improved air quality, there may also be increased risk of traffic accidents and noise; however, all predicted impacts are considered very small.
Seniors	Although there are likely benefits through improved air quality, there may also be increased risk of traffic accidents and noise; however, all predicted impacts are considered very small.
People with pre-existing health conditions	People with pre-existing health conditions may benefit from improved air quality resulting from all alternatives; however, the resulting changes are predicted to be very small. Noise may negatively impact this population group, but changes to noise levels are predicted to be very small.
Low income	Few jobs are created by the Project; Morningside and West Hill (NIA communities) may be impacted by truck traffic if Route 1 is selected. Improvements in air quality would contribute to better health in this population.
Aboriginal Peoples	The HIA identified the West Hill neighbourhood as having a high proportion of aboriginal population (Appendix E). The HIA did not identify any specific impacts on Aboriginal Peoples from the HCTP Alternatives. Alternative 3 may have support from Aboriginal Peoples. This statement is based on a key informant who noted a value for technologies that support the cycle of life and returning wastes to the sources they originated from.[73] Improvements in air quality would contribute to health in this population.
Newcomers	Based on the HIA results there is no indication that newcomers will be differentially impacted by any of the proposed alternatives.

In this HIA, very small impacts were predicted for all health areas depending on the alternative. Positive impacts are expected for air quality, multimedia exposure risk, and climate change, where neutral to negative impacts are expected for traffic safety, neighbourhood characteristics, stress and risk perception and employment. The community of West Hill, an NIA community where the HCTP plant is located, will experience all impacts, both positive and negative most intensely, although all impacts will be very small. Route 4 was seen as being less impactful on health inequities in the study area than Route 1.

9. Conclusion and Future Steps

9.1 Summary of HIA Results

The HIA examined the potential health effects resulting from three proposed biosolids management alternatives being considered for the HCTP and for two proposed transportation routes for the off-site haulage required for each alternative.

The HIA identified small differences in potential health impacts among the alternatives. These differences are summarized in Table 30.

Overall, the health impacts associated with the alternatives are very small and the differences among the alternatives do not result in appreciable differences in health impacts.

All alternatives evaluated achieve significant reductions in air emissions compared to the current multiple hearth incinerators.

However, among the three alternatives, modern fluidized bed incineration (Alternative 1) is anticipated to result in the highest releases of air pollutants in the Study Area, and the transporting biosolids off-site alternative (Alternative 2) and on-site pelletizer and haulage off-site (Alternative 3) are expected to increase risks related to traffic (namely, traffic safety, odour and noise).

A difference was found in terms of potential health impacts between the two proposed traffic routes. From a health perspective, transportation Route 4 is healthier than Route 1 in terms of pedestrian safety, noise and equity (see Table 31).

Table 30: Summary of the Health Effects of Biosolids Management Alternatives Compared to Base Case

	Alternative 1: On-site Fluidized Bed Incineration	Alternative 2: Biosolids and Haulage Off-site for Management	Alternative 3: Pelletization Process and Haulage Off-site of Fertilizer Product
Potential Air Emissions and Predicted Inhalation risk	Decrease in exposure compared to current incinerator. Highest carcinogen, and respiratory and cardiovascular risk (more than double Alternative 2).	Decrease in exposure compared to current incinerator. Highest non-carcinogen risks (2.5 times higher than Alternative 1 and 3).	Decrease in exposure compared to current incinerator. Much lower non-cancer risks than other two alternatives. Slightly lower respiratory and cardiovascular risks than Alternative 2. Same carcinogen risk as Alternative 2.
Potential Air Emissions and Predicted Multi-Media Exposure Risk (air, soil, dust, backyard produce)	Decrease in exposure compared to current incinerator. Highest health risk of the three alternatives.	Decrease in exposure compared to current incinerator; Risk is slightly higher than Alternative 3.	Decrease in exposure compared to current incinerator; Risk is the lowest.
Traffic Safety (assumed preferred Route 4 is selected)	Same as current condition. Risk of injury is 0.03 injuries every 100 years.	Highest risk among the alternatives. Risk of injury is 0.51 injuries every 100 years. (15 times Alternative 1; 3 times Alternative 3)	Greater risk than Alternative 1 but lower than Alternative 2. Risk of injury is 0.17 injuries every 100 years. (5 times Alternative 1)
Stress and Risk Perception	Same as current conditions	Slight increase in risk for odours and noise along routes (noise along Route 1). Greater risk than Alternative 3.	Slight increase in risk for odours and noise along routes (noise along Route 1), lower than Alternative 2.

Table 31: Summary of Biosolids Management Impacts by Traffic Routes

	Traffic Route 1	Traffic Route 4
Air Quality	Truck traffic emissions associated with 7 km of driving through study area	Truck traffic emissions associated with 6 km of driving through study area
Multimedia Exposure Risk	Truck traffic emissions associated with 7 km of driving through study area	Truck traffic emissions associated with 6 km of driving through study area
Traffic Safety	Greater transit stops, traffic signals, schools and vulnerable populations.	Fewer transit stops, traffic signals, schools and vulnerable populations.
Neighbourhood Characteristics	No effect on access to transit. Passes four recreation/leisure sites. Increased noise potential. 1 km of non-buffered sidewalk Travels through two Neighbourhood Improvement Areas.	No effect on access to transit. Passes one recreation/leisure sites. No noise potential. 1 km of non-buffered sidewalk Travels through one Neighbourhood Improvement Areas.
Stress and Risk Perception	Small but noticeable increase in noise (3-5dBA) along Coronation Drive, between Beechgrove Drive and Manse Road. Odour potential for 7 km and more potential traffic stops.	No increase in noise. Odour potential for 6 km and fewer potential traffic stops.
Climate Change	7 km route before Hwy 401	6 km route before Hwy 401
Job opportunities	No difference based on route	No difference based on route

10. Recommendations

Recommendations form a key component of any HIA, as it is here where health impacts identified have the potential to be mitigated. Since the HIA did not identify any significant health risks associated with the three alternatives, the need to identify recommendations for mitigation was minimized. However, throughout the Class EA process and through the involvement of the HIA Stakeholder Group and expert review panel a number of recommendations were brought forward. This section describes these mitigation strategies. Alternatives for which the mitigation is relevant are outlined in parentheses.

Standard Operating Procedures

The City has already committed to put in place a series of mitigation measures dependent on which alternative is selected. Below is a list of those strategies:

- In order to mitigate any potential odours from truck loading, the biosolids or pellet truck loading facilities would be constructed with bay doors which would be closed at all times except when trucks are entering and exiting the facility. Biosolids or pellets would be stored in closed silo bins. Trucks would not be filled until they have entered the facility and the bay doors have closed behind them. The doors will not open again until the trucks are ready to leave (Alternatives 2 and 3)
- All air from inside the facility would be captured and treated through an odour control unit before being released to the atmosphere. (Alternatives 2 and 3)
- Odours generated within the pelletization facility will be collected and treated (Alternative 3)
- Trucks will also be washed before leaving the facility to reduce odour potential on route (Alternatives 2)
- Mercury capture and wet scrubbers will be installed in stacks to remove mercury, particulate matter and water soluble contaminants (Alternative 1)
- Trucks will meet emission standards (Alternatives 1, 2 and 3)
- To reduce potential for air and soil contamination, the City of Toronto Sewer Use Bylaw will continue to be enforced, to minimize the presence of pollutants in biosolids (Alternative 1, 2 and 3)
- Standard Operating Procedures would be put in place for the safe transport of the biosolids material from the treatment plant to its end destination. Haulers would also be required to have the necessary permits and approvals for the specific biosolids management method being used (Alternative 1, 2 and 3)
- All operations on-site will have to follow municipal bylaws for noise regulation (Alternatives 1, 2 and 3)

Suggestions by Stakeholders

A final stage in the HIA process was to present the results back to the HIA Stakeholder Group to obtain their feedback on points of clarification for the HIA and to solicit suggestions for the wider decision-making process around projects such as the HCTP. The meeting was held on June 11, 2015, results of which are presented in Appendix D. A summary of the suggestions relevant for the development of the alternatives and future projects for the City of Toronto as provided by the HIA Stakeholder Group are presented below. See Appendix D for a complete list of recommendations and comments.

- Consider how this project fits in with other infrastructure and community improvements in the community (i.e. how does it contribute to quality of life now and in the future)
- Consider sharing data from this study with others working on other EAs or other projects in order to feed into the "bigger picture"
- Consider how to leverage financial benefits derived from Alternative 2 and 3 back into the community (e.g. Build important facilities in community (access to food and shopping), provide jobs to local residents; use a community advisory board to decide on benefits to the community; installing bike lanes in the community to offset truck traffic) (Alternatives 2 and 3)
- Provide better communication around extra trucks being added to the 401 – residents are interested in the cumulative impact over the long term from other activities in the community (Alternative 2 and 3)
- Consider what may happen along the trucking routes in the future (e.g. new developments, change of land use, bicycle routes) (Alternative 2 and 3).
- Health impacts of (biosolids management) enhancements should be integrated into the HIA results (Alternatives 1, 2 and 3)
- Risk/accountability of pellet end point (i.e. labeling, usage, etc.) should be discussed with the community (Alternative 3)
- Consider having the haul trucks move biosolids materials on road during the night time (less risk of accidents and nuisance), and choose the option with the least number of trucks (Alternative 1, 2 and 3)
- Make sure contractors that manage biosolids and pellets are good actors with environmental, social and health impacts (i.e. ongoing evaluation) (Alternatives 1, 2 and 3)

Additional Suggestions by Expert Review Panel

Finally, the final HIA report underwent review by the expert review panel. Within this processes reviewers suggested additional mitigation strategies that could be considered. They are summarized below:

- To reduce noise from trucks, include clauses in any agreements made with contractors that specify the type of trucks (e.g. heavy trucks with low-noise emission, if possible) or the equipment to be used (e.g., exhaust stack outlet, muffler shell, exhaust pipes, etc.) or driving techniques to be used (e.g. no use of "Jake" or "Jacobs" braking except in emergencies, a

driving style that reduces noise when accelerating and decelerating). Regular maintenance of vehicles should also be specified (Alternatives 1, 2 and 3)

- To maximize employment in the local area we recommend preferential hiring at the HCTP for the surrounding population (Alternatives 1, 2 and 3)
- Consider safer road design, using, where relevant, traffic calming schemes to mitigate impacts on road safety and promote active transportation and physical activity (Alternatives 1, 2 and 3)
- To minimize air quality impacts from trucks look at alternative means of power for the trucks such as natural gas or electricity, even though the overall impact of the trucks is deemed unimportant (Alternatives 1, 2 and 3).
- To manage stress in the community, the results of ongoing regulatory oversight should be actively communicated to the affected communities through the Neighbourhood Liaison Group of the HCTP. The same applies to communicating about the risk of spills and the occurrence of spills and remediation (Alternatives 1, 2 and 3)
- To manage stress in the community, there should be a mechanism specific to the project for voicing concerns (e.g. perhaps through the Liaison Group) (Alternatives 1, 2 and 3)
- To reduced greenhouse gas events from occurring, consider using the haul trucks later in the day, outside of heavy traffic times (Alternatives 1, 2 and 3)

11. Appendices

Appendix A: HIA Plan

City of Toronto

CLASS ENVIRONMENTAL ASSESSMENT FOR BIOSOLIDS MANAGEMENT AT THE HIGHLAND CREEK TREATMENT PLANT

TECHNICAL MEMORANDUM NO. 7
HEALTH IMPACT ASSESSMENT PLAN
FINAL

Prepared by:

Habitat
HEALTH IMPACT CONSULTING

CIMA+
Partners in excellence

7880 Keele Street, Suite 201
Vaughan, Ontario
L4K 4G7
Canada
Phone: (905) 695-1005
Fax: (905) 695-0525
www.cima.ca

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Preparation and Review Log

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1	June 3, 2014	Ame-Lia Tamburrini, Habitat	Deborah Ross, CIMA	
2	June 30, 2014	Ame-Lia Tamburrini, Habitat	Glenn Ferguson, Intrinsik	Deborah Ross, CIMA
3	September 3, 2014	Ame-Lia Tamburrini, Habitat	Marla Orenstein, Habitat	Deborah Ross, CIMA
4	Oct 15, 2014	Ame-Lia Tamburrini, Habitat, Deborah Ross	Erin Longworth, CIMA	Deborah Ross
5	November 24, 2014			Deborah Ross

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Executive Summary

Introduction

A Class Environmental Assessment (Class EA) is being conducted to identify a preferred biosolids management solution for the Highland Creek Treatment Plant (HCTP), a City of Toronto wastewater treatment facility located at 51 Beechgrove Drive, in the south eastern Scarborough community of West Hill in Toronto's Ward 44. Three biosolids management alternatives have been identified as feasible for the HCTP and will be carried forward for detailed evaluation in the Class EA and HIA, as follows[1]:

- Replacement of the existing older incinerator technology with new fluidized bed incinerators, and transport of ash off-site for management
- Construction of a new truck loading facility at the HCTP, and transport of biosolids off-site for management
- Construction of a new biosolids drying (pelletizer) facility at the HCTP, and transport of pellets off-site for management as a registered fertilizer product.

As part of the Class EA, a Health Impact Assessment (HIA) will be completed to provide information on the potential health effects (positive or negative) in the local community, from the short-listed biosolids management alternatives. This information will be considered together with economic, environmental and social effects, to select the best biosolids management solution for the HCTP.

The HIA is a systematic process that aims to "identify what potential changes in the determinants of health might result from a policy, program or project, and what effects these changes may have on the health of the population."[2] Ultimately, the HIA results inform decision-makers about these potential effects so that these can be considered in the planning process to identify the best solutions. This HIA will inform the Class EA study for biosolids management at the HCTP, and will follow the process outlined in the Toronto Public Health (TPH) HIA Framework.

Key features of the HIA that will be completed on the short-listed biosolids management alternatives for the HCTP are summarized in the following paragraphs.

Focus on Determinants of Health

The HIA framework reflects the World Health Organization's definition of health, which states that health is influenced by a wide range of factors including environmental, social, and cultural determinants.[3] These determinants of health range from exposure to chemical pollutants to how neighbours interact with one another. This broad definition of health covers the health concerns of importance to members of the community who could potentially be affected by a project. The health concerns of the community about the biosolids management alternatives will be taken into account

1 The short-list of feasible options is preliminary and subject to modification with input from Class EA consultation process. The final list of short-listed options will be carried through the HIA.

2 Toronto Public Health. 2008. TPH Health Impact Assessment Framework. Prepared by Jacque Whitford.

3 World Health Organization (WHO). 1999. Health Impact Assessment: Main concepts and suggested approach. The Gothenburg Consensus Paper, December 1999. WHO Regional Office for Europe. European Centre for Health Policy.

in the HIA and the Class EA decision-making process to select a biosolids management solution for the HCTP.

HIA Focus Areas

The HIA will focus on the local study area, defined as Wards 43 and 44, because this is the area that will potentially be affected by biosolids management activities at the HCTP, or the transport of biosolids from the HCTP through the community.

Some population groups may be more susceptible to health impacts than others, and are referred to as vulnerable populations. The HIA will ensure that these population groups will be considered in the assessment of health effects. For this project, examples of vulnerable populations that may be relevant include children, seniors and people with existing health conditions.

The consideration of equity is a guiding principle in the field of HIA.[4] This HIA will consider how potential impacts may be distributed amongst the population and identify any impacts that may be unequitably distributed (i.e., impacts distributed in a way that puts an already disadvantaged group at even greater disadvantage). Explicitly considering equity will ensure that any biosolids management option that is selected will contribute to health equity.

Information Sources

Primary sources of information that will be used to complete the HIA are as follows:

- Class EA study: Published information and actual data from operating biosolids facilities and transport vehicles, like those included in the short-listed options, will be used to determine for each biosolids management alternative, the features that may contribute to potential health effects. Information will be developed though this study on effects such as contaminant emission rates, odours and noise from facilities and vehicles, as well as traffic related effects.
- Human Health Risk Assessment (HHRA): An HHRA will be completed as part of the HIA to determine the potential toxicological risks due exposure through air, soil and water, from emissions associated with the biosolids management alternatives. A cumulative air impact assessment and deposition modelling (to land and water) of emission contaminants will be used to provide information on the exposure levels for use in the HHRA.
- Stakeholder consultation: For this HIA, stakeholders are those people or groups within the study area that may be affected by any of the biosolids management alternatives being evaluated for the HCTP. To understand the health concerns of stakeholders, a Stakeholders Group will be formed for this HIA. The Stakeholders Group will include representation of the members of the community, community groups and vulnerable populations within the community. The Stakeholders Group will meet twice during the study, to provide input on the health areas of concern to be evaluated in the HIA, and to provide input on the detailed HIA results. In addition, all comments received from other members of the public through the Class EA process will be documented and considered in the HIA.

[4] Toronto Public Health. 2008. TPH Health Impact Assessment Framework. Prepared by Jacque Whitford.

- Key Informants: Key informants are individuals with expertise in a specific topic area pertinent to the HIA. Where information is required to support the evaluation of potential health effects in specific health areas, this information will be requested from key informants. .

HIA Outcome

The HIA will document the potential health impacts in the priority determinants of health areas, for each of the three biosolids management alternatives being evaluated for the HCTP. The HIA will be documented as a stand-alone report. The results of the HIA will be used in the comparative evaluation of biosolids management alternatives for the HCTP, within the scope of the Class EA, to identify the best solution for the HCTP. The recommended solution from the Class EA will be subject to approval by City of Toronto Council before proceeding to an implementation phase.

Project Team

The Class EA project for biosolids management at the HCTP is being led by Toronto Water, who provides overall responsibility for planning, implementation and delivery of water and wastewater services to City residents. The City's team includes representation from Toronto Public Health (TPH). This HIA study is being led by TPH.

1. Introduction

1.1 Background on the Highland Creek Treatment Plant

The City of Toronto has four wastewater treatment plants, including the Highland Creek Treatment Plant (HCTP). The HCTP has a rated capacity of 219,000 cubic metres per day (219 ML/d) and services approximately 500,000 people in the eastern portion of the City. The wastewater treatment process produces treated clean water that is discharged into Lake Ontario, and generates a residual (sludge) that must be further managed. Sludge generated in the wastewater treatment process is treated biologically by anaerobic digestion and mechanically processed to remove a significant portion of water. The resulting treated, stable material, referred to as 'biosolids', is high in organic and nutrient content.

The HCTP is located at 51 Beechgrove Drive, at the mouth of Highland Creek, in the south eastern Scarborough community of West Hill in Toronto's Ward 44, as shown in Figure 1.

Figure 1 Location of Highland Creek Wastewater Treatment Plant at 51 Beechgrove Drive, Toronto

Approximately 40,000 wet tonnes of dewatered biosolids are generated each year at the HCTP. Currently, the biosolids are incinerated in two multiple-hearth incinerators. The resulting inorganic,

inert ash is stored on-site in lagoons. The lagoons are cleaned once per year and ash is currently hauled to the City's Green Lane municipal landfill site for disposal.

The multiple-hearth incinerators have been operating for 38 years, and are approaching the end of their service life. In order to provide continued operation consistent with applicable regulatory standards, the City initiated a major maintenance and refurbishment program for the incinerators.

1.2 Description of Class Environmental Assessment and HIA Component

The primary purpose of the Class Environmental Assessment (EA) is to identify the best solution for managing biosolids generated at the HCTP, as part of the City of Toronto's mandate to provide reliable wastewater servicing to Toronto residents. To meet the requirements of the Ontario Ministry of the Environment and Climate Change (Ontario Environmental Assessment Act, R.S.O. 1990), the Class EA study is being carried out in accordance with the requirements of a Schedule B project, as defined in the Municipal Class Environmental Assessment document (Municipal Engineers Association, October 2000 as amended in 2007 & 2011). The study will identify and evaluate alternative biosolids management solutions. The best biosolids management solution will be selected by studying the community, natural environmental, human health and economic effects (negative and positive) of each alternative.

Figure 2 presents an overview of the Class EA process.

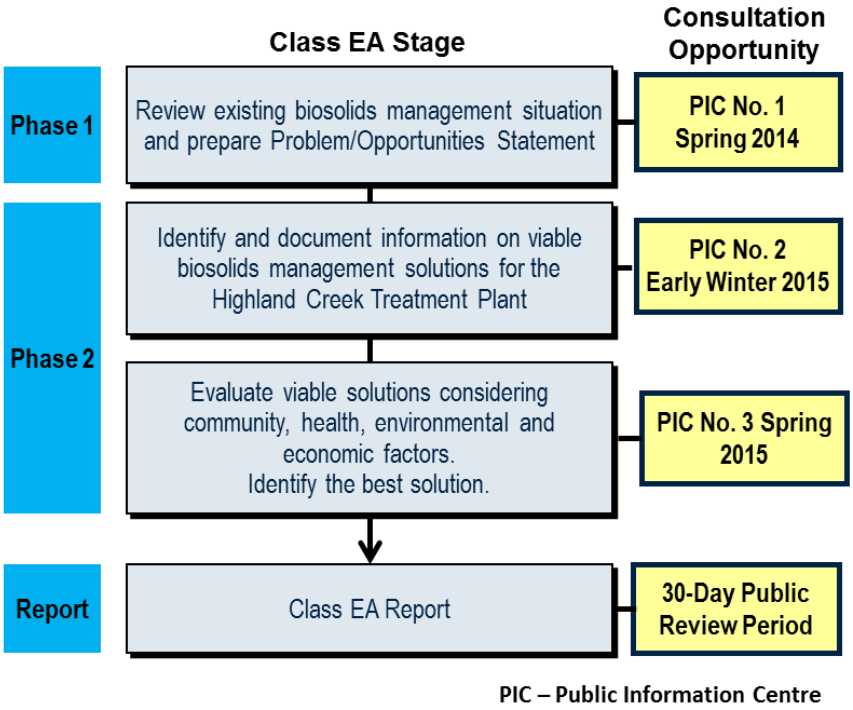

Figure 2 Overview of the Schedule B Class EA Process

+ **Phase 1 (completed):** The project history was reviewed, and the features of the study area have been documented. The biosolids management needs and criteria have been

documented, and a Problem/Opportunities Statement has been prepared that explains why the project is required and what opportunities may be realized by the project.

+ **Phase 2:** A long list of potential biosolids management approaches was screened to identify a preliminary list of three (3) feasible alternatives for the HCTP. For each feasible alternative, features, impacts and measures to minimize risks will be documented to enable a comparative, detailed evaluation of the alternatives to identify the best biosolids management solution for the HCTP. Information that will be considered in the detailed evaluation includes effects related to public health, environment, community and costs.

The three biosolids management alternatives that have been identified as feasible for the HCTP and will be carried forward for detailed evaluation in the Class EA and HIA, as follows[5]:

+ Replacement of the existing older incinerator technology with new fluidized bed incinerators, and transport of ash off-site for management
+ Construction of a new truck loading facility at the HCTP, and transport of biosolids off-site for management
+ Construction of a new biosolids drying (pelletizer) facility at the HCTP, and transport of pellets off-site for management as a registered fertilizer product.

To evaluate the health effects of the short-listed biosolids management alternatives, this HIA will be completed. A separate HIA report will be produced that will document the HIA process and outcomes. Figure 3 presents how the HIA will be integrated within the Class EA decision-making process.

A Class EA Report will document the entire study, including consultation activities, and present information on each alternative, including a clear basis for how alternatives were evaluated, and rationale for selection of a preferred biosolids management solution for the Highland Creek Treatment Plant. The HIA report will be an appendix to the Class EA report.

The recommended solution from the Class EA will be subject to approval by City of Toronto Council before proceeding to an implementation phase.

1.3 Purpose of this Document

Four technical memoranda (TM) will be completed as part of the HIA, within the overall Class EA, as follows:

+ TM-7: HIA Plan (this document)
+ TM-9: HIA Background Information Review
+ TM-10: HIA Scoping
+ TM-11: In-Depth HIA Results and Recommendations.

[5] The short-list of feasible options is preliminary and subject to modification with input from Class EA consultation process. The final list of short-listed options will be carried through the HIA.

- This TM introduces the purpose of the HIA and summarizes the steps that will be followed to complete the HIA, including a plan for stakeholder engagement to provide information to the HIA.
- This document is intended to lay out the HIA process in sufficient detail to provide clarity and common understanding of the intentions and outcomes among all participants in the HIA.

Figure 3 Integration of the HIA within the Class EA Decision-Making Process

2. Description of Health Impact Assessment

2.1 Introduction

Health Impact Assessment (HIA) is a process that identifies how a specific policy, project or program could potentially affect health outcomes and health determinants in human populations, as well as the distribution of potential impacts within the population. The purpose of HIA is to produce evidence-based information on potential health effects, which can be used in decision-making, with an ultimate goal to enhance the health benefits of the policy, project or program and mitigate potential harms.

Some population groups may be more susceptible to health impacts than others, and are referred to as vulnerable populations. The HIA specifically considers vulnerable population groups in the assessment of health effects.

The consideration of equity is a guiding principle in the field of HIA.[6] The HIA will assess how potential effects may be distributed amongst the population and identify any impacts that may be unequitably distributed (i.e., impacts distributed in a way that puts an already disadvantaged group at even greater disadvantage).

2.2 Approach to HIA

2.2.1 Overview

The HIA process for the HCTP biosolids management alternatives follows guidance provided in TPH's HIA Framework to the greatest extent possible.[7] A depiction of the HIA process as outlined in the framework is provided in Figure 4. In general, the HIA will follow a stepwise methodology that has been developed, documented and standardized.

This provides more explanation of the factors considered through an HIA. Each step of the process, as it applies to the HIA for the HCTP biosolids management alternatives is discussed in more detail in Section 2.3.

[6] Toronto Public Health. 2008. TPH Health Impact Assessment Framework. Prepared by Jacque Whitford.

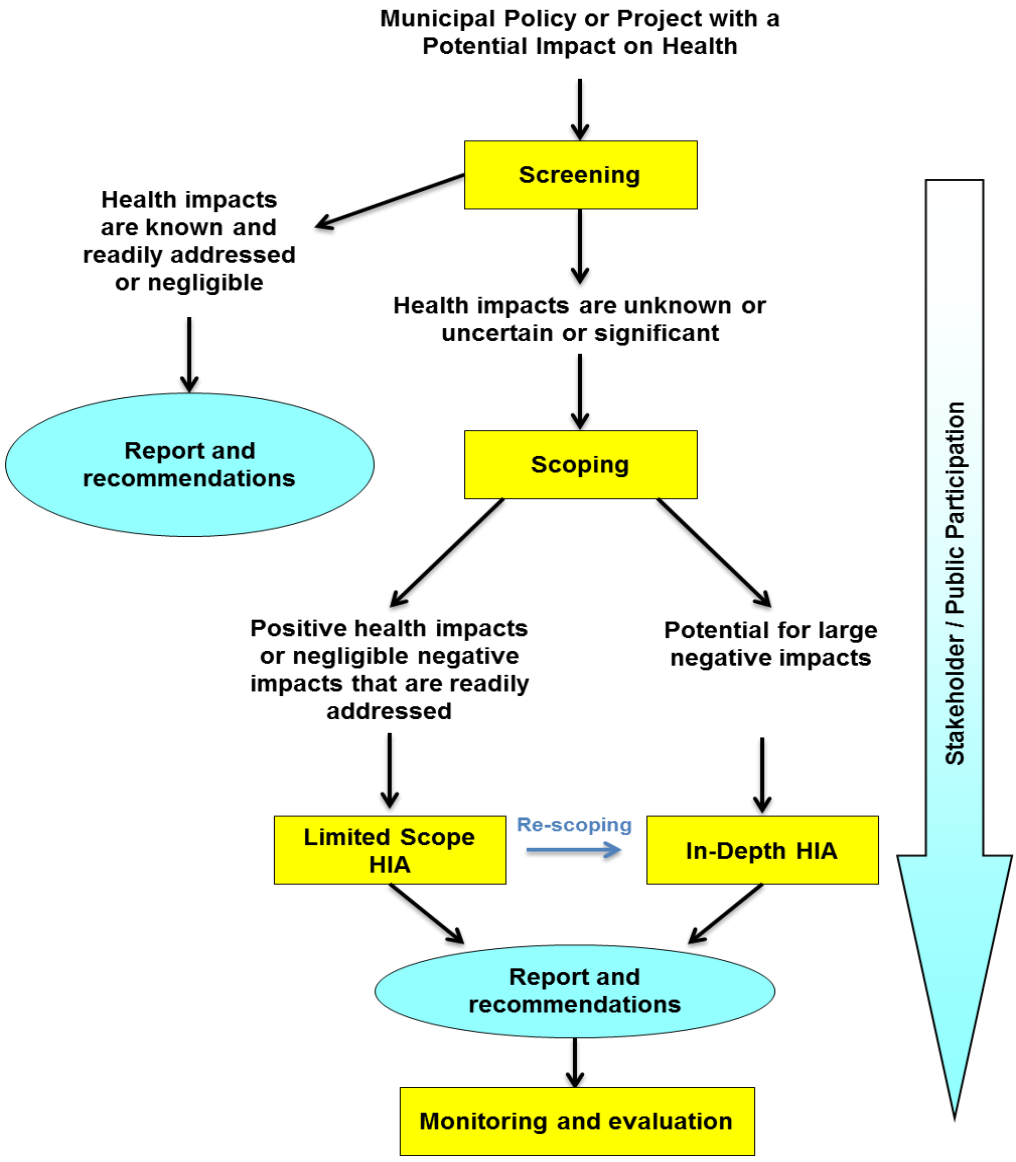

Figure 4 Steps in the HIA Process

2.2.2 Determinants of Health

Health is largely determined by where people live, the state of their environment, income and education levels, their jobs, and their relationships with friends, family and the larger community. These critical factors are often called 'health determinants' (or determinants of health) because of their roles in shaping health in individuals and communities. Some health determinants are under the direct control of individuals: for example, the choice to smoke, to eat healthy foods, or to use seatbelts. Other health determinants are more closely tied to the physical environment (air and water quality, subsistence resources), activities under the control of governments (public utilities,

land use, access to alcohol and tobacco), working conditions (jobs, income), or the social environment (social, emotional and religious supports).

These health determinants can contribute to biomedical health outcomes (illnesses) such as hypertension or gastrointestinal illness; mental health states such as depression or anxiety; and injuries or traumas, such as broken legs or concussions. They can also contribue to other important health indicators such as death rates, healthy births and overall well-being.

HIA embraces this broader definition of health and health determinants. This broad consideration of health takes into account the health concerns of importance to the populations potentially affected by a project, program or policy, and uses this information, together with quantitative risk assessment data, to predict the health effects of a the proposed program, policy or project. **Appendix A** includes examples of health determinants, as outlined in TPH's HIA Framework.

2.2.3 Equity

Health inequity refers to unfair differences in the distribution of diseases between population groups or in access to health services.[7] It also implies that all people should have a fair opportunity to attain his or her full health potential.[8] The consideration of equity is a guiding principle in the field of HIA.[9]

The HIA considers how potential effects may be distributed amongst the population and identify any effects that may be unequitably distributed (i.e., impacts distributed in a way that puts an already disadvantaged group at even greater disadvantage).

[7] Whitehead M. The concepts and principles of equity and health, Copenhagen, World Health Organisation, Regional Office for Europe, 1990

[8] World Health Organization (WHO). 1999. Health Impact Assessment: Main concepts and suggested approach. The Gothenburg Consensus Paper, December 1999. WHO Regional Office for Europe. European Centre for Health Policy.

[9] Toronto Public Health. 2008. TPH Health Impact Assessment Framework. Prepared by Jacque Whitford.

3. HIA for HCTP Biosolids Management Alternatives

3.1 HIA Study Area

For this project, the study area for the HIA has been defined as Wards 43 and 44 within the City of Toronto. Within the study area there will be distinct zones where effects may be experienced differently or there may be different levels of concern related to the stakeholder's proximity to the project. The assessment of effects will consider how effects may be distributed within the study area according to the following criteria:

- Geographic proximity to the project
- Locations in projected release areas for contaminants of concern
- Proposed transportation routes for project-related traffic
- Existing burden of diseases or health vulnerabilities
- Existing high level of exposure to environmental hazards
- Level of concern related to stakeholder's proximity to the project, or other factors.

All short-listed biosolids management solutions are feasible, and would be constructed and operated within the City's strict environmental and sustainability policies and relevant provincial and federal health and safety and environmental regulations. This HIA is intended to differentiate between the health effects (positive and negative) of the short-listed biosolids management alternatives to the local community (Ward 43 and 44), to provide information that will help in the decision-making to select the best alternative.

The HIA is focussed on the concerns, perspectives and potential health impacts within the study area. Health effects as a result of transportation outside the study area boundaries, and any further processing, storage, distribution, beneficial use or disposal of biosolids or biosolids-products is outside the scope of this study. If concerns are identified by communities outside of the City of Toronto in the future, the City will work within the rules and regulations to address the issue, as appropriate.

The health impacts of large trucks (40 tonne) on the local community will be assessed in the HIA. The study area boundaries extend only to Highway 401 because the four to six additional trucks that could be added for biosolids hauling represent a negligible increase in the more than 400,000 vehicles that travel on Highway 401 each day within the City.

The study area does not include remote sites where biosolids may be ultimately applied to agricultural land. The negative and positive impacts of beneficial use on agricultural land have been studied and broadly consulted on by the Ministry of the Environment and Climate Change, Ontario Ministry of Agriculture, Food and Rural Affairs, and other regulating agencies outside of Ontario. The findings have been used as a basis to develop provincial health, safety and environmental regulations. The City carefully considered this background when it included beneficial use as one of the preferred biosolids management approaches for the Ashbridges Bay Treatment Plant.

Climate change is the most significant environment and public health issue of our time. The City of Toronto is committed to reducing its contribution to climate change and preparing for the impacts of climate change. Each biosolids management option being considered for the Highland Creek

Treatment Plant will generate greenhouse gases, which are contributors to climate change. As part of the decision-making process, greenhouse gas generation from each biosolids management alternative will be considered, together with other health, social, environmental and cost effects, to identify the best biosolids management approach.

3.2 HIA Steps

3.2.1 Overview

The purpose of this HIA, to be completed within the overall scope of the Class EA for Biosolids Management at the HCTP, is to provide information on the potential health effects of the short-listed biosolids management alternatives. As noted, this information will be considered together with economic, environmental and social effects using a decision-making process, to select the best biosolids management option for the HCTP.

The HIA will document the overall potential health effects, and effects in all of the identified priority health areas, for each of the three biosolids management alternatives being evaluated for the HCTP and will include recommendations for mitigation of negative and enhancement of positive health effects for each of the alternatives.

The HIA will use information developed by the project team on the effects of the biosolids management alternatives, input from an HIA Stakeholders Group representing the community, input from the public through the Class EA consultation process, and other key informants who provide specialist knowledge in priority health areas, to support the assessment.

The following sections outline the stages of the Health Impact Assessment that will be completed as part of the Class EA for Biosolids Management at the Highland Creek Treatment Plant.

3.2.2 Screening

The Screening step in the HIA framework is used to evaluated whether there are sufficient potential health effects, or health related concerns about a project, program or policy, such that the HIA process is warranted and will add value to support decision-making.

The decision to proceed with an HIA for the HCTP biosolids management alternatives, as part of the Class EA, was made by the City when developing the scope of the Class EA. This decision was based on the significant public interest in the project historically, and need to have full support from the City and Toronto Public Health (TPH) to be able to move forward in the implementation of biosolids management solution for the HCTP.

As background, the City undertook a Biosolids Master Planning process for all four of its wastewater treatment plants from 2002 to 2009. This process resulted in a recommendation for replacement of the aging incineration equipment with new fluidized bed incineration at the HCTP. This recommendation was not approved by Toronto City Council, who directed that a program to haul biosolids off-site for beneficial use be implemented at the HCTP. In order to follow Council's direction to implement a management option that was not the one recommended in the Master Plan, the City needed to undertake a new planning study, a Schedule B Class EA. The City

consulted with the Ontario Ministry of Environment and Climate Change, to confirm the need for a Class EA study.

3.2.3 Scoping

In the Scoping phase of the HIA, health areas that will be carried forward into the in-depth HIA will be identified, and technical work will be completed to support the assessment of effects. The following activities will be conducted in the Scoping stage to identify priority health areas:

- Background information review: This review will include information provided by the Class EA project team on the potential health effects due to construction and long-term operation (i.e., hauling and on-site processing) of the short-listed biosolids management alternatives. In addition, input from the study area community that identified stakeholder concerns about potential health-related issues will be documented. This includes a review of comments from PIC No. 1 for the Class EA (held on June 16, 2014), as well as previous consultation during the Biosolids Master Plan. This information will be presented in Technical Memorandum No. 9 (TM-9).
- HIA Stakeholder Group Meeting No. 1: The purpose of this meeting will be to identify and prioritize health areas of importance to the study area community to be carried forward into the detailed HIA. Details on the Stakeholder Group meeting are provided in Section 4.
- Draft assessment methodology: The assessment methodology and information sources will be developed for the detailed HIA.

Technical Memorandum 10 (TM-10) will document the Scoping activities and results. Specifically the report will include: a description of the Stakeholder Group meeting and the results of that meeting, a summary of all health areas that will be considered in the HIA including rationale for incorporating or not incorporating health areas that were originally identified in the background information review stage, and a description of the potentially affected communities. Although the assessment methodology will be discussed during this stage it will be included in TM-11 which will present the in-depth HIA.

3.2.4 In-Depth HIA

Community Profile

The community profile describes the current health status of the study area population and compares it to the City of Toronto and sub-population groups within the study area. This comparison will allow the HIA to identify issues of importance to health equity and identify sensitive receptors for various impacts being assessing in the In-depth HIA.

For the community profile, information on health outcomes and health determinants will be collected from existing data sources.

Data sources that will be accessed include, but are not limited to:

- Canadian Census
- Canadian Community Health Survey
- Toronto Public Health Ward Health Profiles and Health Status Reports

- Toronto Public Health Inequalities Report 2008
- Wellbeing Maps for the City of Toronto
- Urban Health Equity Assessment and Response Tool (Urban HEART)
- HIA Stakeholders Group
- Key informant interviews, as required.

Assessment of Effects

Information from various sources will be collected and consolidated to support the assessment of how the biosolids management alternatives being evaluated for the HCTP may affect the health of the study area community. The following information sources will be used in the in-depth assessment of health effects:

- **Transport Mode and Route Assessment:** Each biosolids management alternative will require some form of transport of biosolids, processed biosolids or residue (ash) from the HCTP site. Through a review of transportation modes, hauling by 40 tonne truck was identified as the preferred means for transport. Two potential routes through the study area were short-listed to be carried forward in the detailed evaluation of the alternatives. For these two routes, information will be documented on traffic-safety related factors (e.g., increase in traffic, land uses along routes, sidewalks and bicycle lanes) that will be carried forward for assessment within the in-depth HIA.
- **Cumulative Air Impact Assessment and Human Health Risk Assessment:** Contaminant emissions from biosolids management alternatives (processing and transport) may result in a net increase or decrease to the baseline air quality within the study area air shed. The project team will model this increase or decrease in background airborne contaminant levels, as well as the deposition to soil and water, for each short-listed alternative. A Human Health Risk Assessment (HHRA) will be carried out to assess the toxicological effects of exposure to airborne contaminants, and contaminants in soil and water, as a result of each biosolids management alternative.
- **Noise Assessment:** Biosolids management options may cause possible increases in noise level due to on-site activities or truck traffic. Noise levels for the short-listed biosolids management options modelled, and this information will be used within the HIA to assess the potential health effects as a result of noise level increases or decreases to community receptors.

This information will be supplemented as required using peer reviewed literature, grey literature, statistical databases, the HIA Stakeholder Group input, and interviews with key informants, as required, in order to characterize the potential health impacts for each of the biosolids management alternatives.

The assessment of effects will be documented in TM-11. This TM will describe the assessment methodology and sources of information, data gaps and limitations of the analysis, and a systematic and transparent assessment of positive and negative health effects associated with each biosolids management option.

The in-depth HIA will be presented to the HIA Stakeholder Group as described in Section 4. Feedback from the Stakeholder Group will be incorporated into the final in-depth HIA.

Recommendations for Mitigation and Enhancement of Health Impacts

The HIA will provide recommendations for each of the short-listed biosolids management alternatives for mitigation of negative effects and enhancement of positive health effects, as needed. The recommendations will be developed based on information from the HIA Stakeholder Group, key informants, as required, as well as from public health research literature.

Comparative Evaluation Model

While the HIA report will be prepared as a stand-alone document, the results of the HIA will also be integrated into the overall evaluation of biosolids management alternatives for the Highland Creek Treatment Plant, within the scope of the Class EA. As a final step in the in-depth HIA, recommendations will be developed about how to use the HIA results within the decision-making model used in the Class EA to evaluate the combined effects in the categories of health, environment, social (community) and economics.

4. Stakeholder Involvement in the HIA

Community stakeholders will participate either as, part of the HIA Stakeholder Group, as a general member of the public or as a key informant, if required. These roles are explained in the following sections.

4.1 HIA Stakeholder Group

4.1.1 Overview

Consultation is a key component of health impact assessments. As stated in the *Best Practices for Stakeholder Participation in HIA* guidance document:

> *"Stakeholder participation is an important component of the HIA process. Broad inclusion of stakeholders enhances the expression of HIA core values: democracy, equity, sustainable development, and ethical use of evidence, as described by the World Health Organization. Ensuring stakeholder involvement and leadership helps promote a vision of an* ***inclusive, healthy, and equitable community,*** *in which all people, regardless of income, race, gender, or ability, can participate and prosper."*[10]

The identification of stakeholders for HIA is a topic that has been discussed in a number of HIA guidance documents, including:

- Jacques Whitford. 2008. Toronto Public Health Impact Assessment Framework. Prepared by Jacques Whitford for Toronto Public Health.
- Stakeholder Participation Working Group of the 2010 HIA of the Americas Workshop. 2012. Guidance and Best Practice for Stakeholder Participation in Health Impact Assessments – V.1
- National Research Council. 2011. Improving Health in the United States. The Role of Health Impact Assessment.

These guidance documents recommend that the selection of stakeholders have the following features:

- Include representatives from community and other stakeholder groups
- Accurately reflect the greater public interest, to the extent possible
- Be diverse to allow for a well-rounded understanding of community and political realities related to the project being examined.

A broad range of community stakeholders, who represent diverse points of view within the study area, will participate in a HIA Stakeholder Group for the HIA of biosolids management alternatives for the HCTP. The Stakeholder Group consultation process ensures that the HIA process is transparent and inclusive.

The responsibilities of the HIA Stakeholder Group members include:

[10] Stakeholder Participation Working Group of the 2010 HIA in the Americas Workshop. Best Practices for Stakeholder Participation in Health Impact Assessment. Oakland, CA, October 2011.

- Participation in workshops (see Section 4.1.2 for a description of workshops)
- Responding to data/information requests, as necessary
- Providing insight into the community in a manner that is respectful of all HIA Stakeholder Group members and the cultural diversity of the community
- Reviewing and commenting on documents produced to present the HIA process.

Appendix B provides a list of stakeholders that have been invited to the HIA Stakeholder Group, categorized by type of organization or viewpoints that they represent.

The HIA Stakeholder Group will primarily represent the diverse perspectives of the affected community. Members of the HCTP Class EA project team (as discussed in Section 5), who represent expert guidance to provide information on the health areas included in the HIA, will participate in the HIA Stakeholders Group. The list of potential Stakeholder Group members was formulated based on recommendations from various organizations and individuals with extensive experience in the local study area. Specifically, input was received from Toronto Public Health and the HCTP Class EA project team, and comments were reviewed that had been generated during the Public Information Centre held on June 16, 2014.

Invitations were sent from Toronto Public Health to the potential Stakeholders Group members listed in Appendix B requesting their participation.

4.1.2 Stakeholder Group Meetings

The HIA Stakeholder Group will meet at two points in the HIA process for workshops at the Scoping stage and the In-Depth HIA stage. In addition to these workshop-style meetings, members will also be asked to respond to data/information requests, as required, and review and provide input to the HIA process. The proposed contents of each workshop are described below.

Scoping Workshop

The Scoping stage of the HIA involves determining what health issues will be included in the in-depth assessment stage and prioritizing impacts based on the level of public concern. .

The scoping workshop will address the following topics:

- HIA Overview: What is health; an overview of HIAs; rationale for conducting HIA; and how it is currently being used in Canada
- HIA and the Highland Creek Treatment Plant Class EA study: Overview of the Class EA; why HIA is being used for this project; and how HIA will be incorporated into the larger Class EA.
- Roles and responsibilities: Review of roles and responsibilities of the HIA Stakeholder Group members
- Biosolids Management Alternatives: Overview of the short-listed biosolids management alternatives.

These four discussion points will set the stage for a scoping exercise where HIA Stakeholder Group members identify health issues of importance to include in the HIA and prioritize health areas to be examined. The results of this meeting will be included in development of the HIA Scope, to be documented in Technical Memorandum No. 10.

In-Depth HIA Workshop

The In-Depth HIA stage includes development of a community profile and characterizing the potential impacts resulting from the short-listed biosolids management options. The HIA Stakeholder Group members will be involved in proving input into the draft In-Depth HIA and helping to identify recommendations for mitigation and enhancement measures. The HIA Stakeholder Group may also be involved in defining health-related criteria recommended for the decision-making model, which will be used within the Class EA study, to select the best biosolids management option for the Highland Creek Treatment Plant.

The In-Depth HIA meeting will address the following topics:

- Summary of results: The project team will present preliminary results of the In-Depth HIA.
- Comments and revisions: The Stakeholder Group will provide feedback on preliminary findings of the HIA.
- Recommendations: The Stakeholder Group will be asked to identify recommendations for actions that can be taken in concert with the short-listed biosolids management options to mitigate any negative effects and enhance any positive effects.

Class EA Decision-Making Model: The group may help to define goals and objectives for the protection of health, and criteria to achieve these goals. These will be considered in the development of the overall decision-making approach to select the best biosolids management alternative for the Highland Creek Treatment Plant.

4.2 Members of the Public, Public Groups and Agencies

Through the Class EA process, there will be ongoing opportunity for members of the public, public groups and agencies to provide comment and input on the study as it progresses, including three public information centres (PICs). At these PICs, information on the progress and results of the HIA will be presented. Input and comments from interested individuals or groups on the HIA will be documented and considered in developing the HIA results.

A schedule of consultation and communications activities that will be carried out during the Class EA for biosolids management at HCTP, as listed in the Public Consultation and Communications Plan, is included in **Appendix C**.

4.3 Key Informants

Key informants are individuals with expertise in a specific topic area pertinent to the HIA. Key informants may be interviewed to obtain technical information on health areas of importance identified by the HIA Stakeholder Group if the Class EA team lacks the expertise to address a particular topic area. Selection of key informants, if required, will take place following input from the HIA Stakeholder Group Meeting No. 1. If input from key informants is required, communication with them will occur via phone interview.

5. Other **HIA Participants**

5.1 Overview

In addition to the direct contributors to the HIA, as described in Section 4, there are several other direct and indirect participants who have an interest in the outcomes of HIA of the biosolids management alternatives for the HCTP and/or the overall Class EA. These include:

- Toronto Water, who is the Class EA project proponent and responsible for the planning and delivery of water and wastewater services to the City
- The Medical Officer of Health and Toronto Public Health, who is leading the HIA component of the Class EA, and is responsible for the health of Toronto residents
- Toronto City Council, whose approval of the Class EA recommendation will be required for the project to proceed.

In addition, the Ontario Ministry of the Environment and Climate Change oversees the Class EA process regulated under the Environmental Assessment Act. This Ministry will ultimately be responsible for issuing Environmental Compliance Approval for any new facilities constructed at the HCTP. To ensure that the Act and future regulatory requirements will be met, the City project team is consulting with the Ministry through this Class EA study.

The consultant project team is a team of experts in subject areas related to the Class EA and HIA, and will support the City's project team through these processes.

The following sections provide more information on the members of the City and consultant project team.

5.2 City of Toronto and Toronto Public Health Project Team

Members of Toronto Public Health and the City of Toronto are playing an integral role in the Class EA and HIA. Table 1 presents the individual team members from the City and Toronto Public Health included on the project team. Josephine Archbold from Toronto Public Health (TPH) will provide direction for the HIA, represent the views of the Medical Officer of Health (MOH), and bring expertise in the field of HIA and public health in Toronto.

5.3 Consultant Project Team

The consultant team that is responsible for providing technical support to the Toronto project team for all components of the Class EA and HIA. These team members and their roles on the project are outlined in Table 2.

Table 1 City of Toronto and Toronto Public Health Project Team

Team Member Role	Name and Accreditation	Role Description	Organization
Class EA Project Team Lead	Nancy Fleming, P.Eng.	Overall project responsibility and coordination and management of the consulting team. Represents the interest of the City in providing safe drinking water, collecting and treating wastewater, and providing stormwater management services to City residents.	Toronto Water
Toronto Public Health Lead	Josephine Archbold, M.Sc.	City Project Lead for the Health Impact Assessment (HIA) of biosolids management alternatives.	Toronto Public Health (TPH)
Toronto Environment and Energy Lead	Christopher Morgan, Ph.D.	Oversight of the cumulative air impact assessment modelling for emissions from the biosolids management alternatives.	Toronto Environment and Energy Division (EED)
Toronto Public Consultation Coordinator	Josie Franch	Coordination and facilitation of communications and consultation for the Class EA.	Toronto Public Consultation Unit
Contract Management	Pritish Roy, P.Eng	Provides engineering expertise and contract management of consultant.	Engineering and Construction Services

Table 2 Members of the Consultant Project Team

Team Member Role	Name and Accreditation	Role Description	Organization
Consultant Team Project Manager and Biosolids Management Specialist	Deborah Ross, M.A.Sc., P.Eng.	Overall responsibility for the consultant team and delivery of the Class EA study. Specialist expertise in the development of biosolids management alternatives costs and impacts.	CIMA
Health Impact Assessment (HIA) Lead	Ame-Lia Tamburrini, M.Sc.	HIA lead to evaluate broad health related impacts of all biosolids management alternatives.	Habitat Health Impact Consulting
Human Health Risk Assessment (HHRA) Lead	Glenn Ferguson, Ph.D., QPRA	Human health risk assessment lead, to evaluate specific health related impacts of biosolids management alternatives due to air contaminant emissions.	Intrinsik Environmental Sciences
Cumulative Air Impact Assessment Lead	Anthony Ciccone, Ph.D., P.Eng.	Modelling of cumulative air emission impacts on the air shed surrounding the Highland Creek Treatment Plant to provide information to support the HHRA and HIA.	Golder Associates

Appendix A

Examples of Determinants of Health

Categories of Determinants of Health	Examples of Specific Health Determinants	
Social and cultural factors	Social support, social cohesion Social isolation Participation in community and public affairs Family connections Cultural and spiritual participation Expression of cultural values and practices Racism	Discrimination Attitudes to disability Fear of prejudice Level of fear of crime Reputation of the community/area Perception of safety
Economic factors	Creation and distribution of wealth Income level Affordability of adequate housing	Availability and quality of employment /education/training Skills development opportunities
Environmental Factors (including living and working conditions)	Housing conditions and location Working conditions Quality of air Quality of water (surface, groundwater, drinking water) Quality of soil Waste disposal Energy	Urban design Land use Biodiversity Sites of cultural significance A change in the emission of greenhouse gases Public transport and communications networks Noise Exposure to pathogens
Population-based services	Access to, and quality of: Employment and education opportunities Workplaces Housing Public transport Health care Disability services	 Social services Child care Leisure services Basic amenities Policing
Individual and behavioural factors	Personal behaviours (e.g. diet, physical activity, smoking, alcohol intake, drug use) Life skills Personal safety People belief in the future and sense of control in their lives Employment status	Educational attainment Level of income and disposable income Stress levels Self-esteem and confidence Access to employment
Biological factors	Sex Biological age	Race Disability
Equity factors	Distribution of health impacts based on existing health status, environmental quality, capacity to cope with health pressures, etc.	

Source: *A Guide to Health Impact Assessment: A Policy Tool for New Zealand* (PHAC, 2005)

Appendix B

List of Invitees for the HIA Stakeholder Group

Stakeholder	Rationale for Inclusion
Personally Affected	
Community Associations	These experts can bring forward the views and concerns of the affected community. They will also provide recommendations that represent community knowledge.
Representative of the Neighbourhood Liaison Committee (NLC)	This committee represents concerns of community members regarding the Highland Creek Treatment Plant. Representatives can also provide key concerns of environmental advocates in the local area and solutions that are driven by environmentally conscious individuals.
Vulnerable community members representation	Organizations that provide services to a broad range of vulnerable population groups in the study area. This expert can speak to needs and concerns of these community members and recommendations to ensure the HIA addresses these concerns.
Municipal Services	
Toronto Public Health local representative	TPH in Ward 44 can bring locally relevant information on the health status of the affected population as well as on health services in the local area.
Local Health Care Providers	Health care providers can provide insight into overall population health including health vulnerabilities.
Parks and recreation	The Scarborough waterfront and Highland Creek walking and biking trails leading to it are important assets in the community. These representatives can speak to any effects on recreation.
Non-governmental Organizations (NGOs)	
NGOs	These representatives can provide input on key interest areas of relevance to the HIA including environmental, equity and health related issues of relevance to the local community as well as the broader City of Toronto stakeholders.
Other	
School boards	These experts can provide information on transportation and safety concerns for children living in the project area.
Local Business Groups	These organizations help to stimulate local business in their jurisdictions. They can bring an economic perspective to the discussion.

Appendix C

Class EA Communications and Consultation Activities

Activity	Description	Schedule/Timing
Project Contact List	A list containing mailing information for: • Contact representatives for review agencies • Contact representatives for interested stakeholder groups (e.g., • Interested members of the public	Updated on an on-going basis based on requests to be added to (or excluded from) the List.
Notice of Project Commencement	To announce the start of the project and provide project contact information	May 2014
Newsletter No. 1	First newsletter to present the project background, description of Highland Creek TP and Class EA process	May 2014
Notice of Public Information Centre (PIC) No. 1	To announce the date, time and location of the first PIC	May/June 2014
PIC No. 1	Open house opportunity to introduce the project and meet with the project team	June 16, 2014
Newsletter No. 2	Second newsletter to present information on the biosolids management alternatives, results of screening and short-list to be evaluated in detailed for HCTP, and information on the HIA	November 2014
Newsletter No. 3	Third newsletter to present information on environmental, health and community impacts and costs of short-listed alternatives, and information on decision-making process	Spring 2015
Notice of PIC No. 2	To announce the date, time and location of the second PIC	April/May 2015
PIC No. 2	Open house opportunity to present detailed information on alternatives, evaluation process and preliminary recommendation	May 2015
Newsletter No. 4	Fourth newsletter to present information on the preferred alternative and a summary of input received through the consultation process.	May 2015
Notice of Project Completion	To announce the completion of the project, and that the Class EA Report is available for review and final comment for a 30-day review period. During this period, the project team will try to address and resolve any outstanding issues or concerns raised by the public.	May/June 2015

Appendix B: HIA Scoping Phase

City of Toronto

CLASS ENVIRONMENTAL ASSESSMENT FOR BIOSOLIDS MANAGEMENT AT THE HIGHLAND CREEK TREATMENT PLANT

TECHNICAL MEMORANDUM NO. 10
HEALTH IMPACT ASSESSMENT
SCOPING PHASE

Prepared by:

Habitat
HEALTH IMPACT CONSULTING

CIMA+
Partners in excellence

7880 Keele Street, Suite 201
Vaughan, Ontario
L4K 4G7
Canada
Phone: (905) 695-1005
Fax: (905) 695-0525
www.cima.ca

June 25, 2015

T000277A

Preparation and Review Log

Version	Date	Prepared by (Deliverable Lead)	QC Reviewer	Project Manager Sign-off
1	December 22, 2014	Ame-Lia Tamburrini, Habitat	Marla Orenstein, Habitat	Deborah Ross, CIMA
2	January 5, 2015	Ame-Lia Tamburrini, Habitat	Deborah Ross, CIMA	Deborah Ross, CIMA
3	March 4, 2015	Ame-Lia Tamburrini, Habitat	Marla Orenstein, Habitat	Deborah Ross, CIMA
4	June 25, 2015	Ame-Lia Tamburrini, Habitat	Marla Orenstein, Habitat	Deborah Ross, CIMA

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Appendix

Executive Summary

Introduction

Technical Memorandum 10 (TM-10) presents the scoping phase of the Health Impact Assessment (HIA) that is being conducted as part of the Class Environmental Assessment (EA) for biosolids management at the Highland Creek Treatment Plant (HCTP). Three Technical Memoranda will be completed to present the HIA, as follows:

+ TM-7: HIA Plan
+ TM-10: HIA Scoping
+ TM-11: In-Depth HIA Results and Recommendations.

The purpose of the scoping stage of HIA is to identify the key health areas to address in the subsequent step, the in-depth assessment phase. In addition, scoping sets boundaries for the assessment, including temporal and geographic boundaries, and identifies affected populations. The scoping stage for the HCTP HIA follows guidance provided in Toronto Public Health's HIA Framework.[1]

Biosolids Management Alternatives

There are three short-listed options under consideration in the HCTP Class EA, as follows:

+ Alternative 1: On-site fluidized bed incineration – For this option, existing incinerators will be replaced with fluidized bed incinerators. The end product would be inert ash that would be hauled off-site.
+ Alternative 2: Biosolids transport off-site for management – Biosolids would be hauled off-site (without further on-site processing) for management, and either taken to storage or end-use directly, or taken to a facility for further processing into a material that would be distributed and/or marketed.
+ Alternative 3: Pelletization and distribution of fertilizer product - Bew facilities would be constructed at the HCTP site to process biosolids to generate a material that would be hauled off-site and distributed as a fertilizer product.

[1] Toronto Public Health. 2008. TPH Health Impact Assessment Framework. Prepared by Jacques Whitford.

Information Sources

To identify the health areas of greatest importance to examine in the HIA, the project team used three sources of input, as follows:

+ Comments and input received from the 1st Public Information Centre held for the Class EA in November 2014
+ Results from the first HIA Stakeholder Group meeting
+ Published literature, including previous HIAs on biosolids management and a Biosolids Pellet Review Study.

Study Area and Populations

The HIA study boundaries are the same as those described for the Class EA (TM-1), defined as Wards 43 and 44.

Some population groups may be more susceptible to health impacts than others, and are referred to as vulnerable populations. In addition to the general population, the HIA specifically considers these groups in the assessment of health effects. For this project, examples of vulnerable populations that may be relevant include children, seniors and people with existing health conditions.

HIA Health Areas

To identify which health areas will be examined in the HCTP HIA, all health areas that were identified from the three information sources were combined into a matrix. Health areas were prioritized based on their importance for the HIA Stakeholder Group and the number of information sources that identified it as an issue. Based on these results, the HIA will consider sixteen health areas to varying degrees.

Primary Health Areas - These areas will be examined in detail in the HIA:

- Air quality
- Odour
- Traffic safety
- Noise
- Water and soil quality
- Housing/property values
- Recreation and leisure

Secondary Health Areas - These will be addressed in the HIA but with less detailed examination than primary health areas:

- Neighbourhood characteristics
- Access to transport
- Stress and risk perception
- Community and social cohesion

Tertiary Health Areas - These health areas will be addressed minimally in the HIA:

- Climate change
- Spills
- Fires/explosions
- Centralized/decentralized treatment
- Job opportunities/economics

Healthy child development was an area of concern mentioned by the stakeholder group. This aspect will be addressed as a vulnerable population group for all health areas, rather than as a health area in an of itself.

Next Steps

The next step following scoping is the in-depth HIA, in which the current health status of the study area population will be characterized and the potential impacts of the three biosolids management alternatives will be assessed. The HIA will be incorporated into the overall evaluation of biosolids management alternatives for the HIA, within the scope of the Class EA, planned for completion in 2015.

1. Introduction

1.1 Purpose of TM-10

Technical Memorandum 10 (TM-10) presents the scoping phase of the Health Impact Assessment (HIA) that is being conducted as part of the Class Environmental Assessment (EA) for biosolids management at the Highland Creek Treatment Plant (HCTP). Three Technical Memoranda will be completed to present the HIA, as follows:

+ TM-7: HIA Plan
+ TM-10: HIA Scoping
+ TM-11: In-Depth HIA Results and Recommendations.

The purpose of TM-10 is to present the health areas that will be carried forward into the In-depth HIA assessment. Rationale for the selection of health areas for the HIA, and the exclusion of others is provided. TM-10 also provides information on the study area for the In-depth HIA to provide background for the assessment of impacts.

1.2 Purpose of Scoping in HIA

As stated in Toronto Public Health's HIA Framework, scoping is the link between the initial determination that an HIA is needed and the undertaking of the assessment.[2] The goal of scoping is to identify the key health areas to address in the in-depth assessment phase of the HIA. In addition, scoping sets boundaries for the assessment, including temporal boundaries, geographic boundaries, and the identification of affected populations. Scoping is carried out so that the HIA focuses on the health areas relevant to the projects being evaluated, and makes the best use of the resources available.

[2] Toronto Public Health. 2008. TPH Health Impact Assessment Framework. Prepared by Jacques Whitford.

2. Biosolids Management Alternatives to be Assessed

2.1 Description of the Highland Creek Treatment Plant

The Highland Creek Treatment Plant, with a rated capacity of 219 cubic metres per day (ML/d), serves the eastern portion of the City. The plant provides conventional activated sludge treatment and discharges to Lake Ontario. Residual solids (sludge) are anaerobically digested and dewatered, and the resulting biosolids are incinerated in two multiple hearth incinerators. Ash is stored on-site in lagoons. The lagoons are cleaned once per year and ash is hauled off-site for disposal in the City of Toronto Green Lane Landfill. The incinerators are older technology, and a major maintenance program has been implemented to extend their service life so that they can meet regulatory requirements for a maximum period of 10 years.

In light of the remaining servicing life of the incinerators, a new biosolids management solution is required. To that end, the City has initiated a Schedule B Class Environmental Assessment to plan for the biosolids management solution at the Highland Creek Treatment Plant. This process has been initiated now to provide adequate time for the design, construction and commissioning of new facilities that are required within the next 10 years.

2.2 Description of Biosolids Management Alternatives

2.2.1 Introduction

Following a review of a long list of potential biosolids management solutions (as presented in Technical Memorandum No. 2), three alternatives were identified as feasible for the Highland Creek Treatment Plant. The health impacts of these alternatives will be evaluated in the HIA, and the results will be considered with their environmental, community and economic impacts in the Class EA. These alternatives are presented briefly reviewed in the following sections.

2.2.2 Alternative 1: On-Site Fluidized Bed Incineration

For Alternative 1, incineration would continue to be used to manage biosolids at the Highland Creek Treatment Plant. Incineration significantly reduces the volume and mass of sludge of biosolids, generating a residual (ash) requiring

further management. For this Alternative, the existing incinerators would be replaced with new fluidized bed incineration equipment.

Incineration is the combustion of the organic (carbon containing) solids in wastewater treatment residuals in the presence of oxygen to form carbon dioxide, water and very low levels of regulated exhaust emissions such as carbon monoxide (CO), total hydrocarbons (THCs) and oxides of nitrogen (NO_x). The temperature in the combustion zone of furnaces is typically 760 to 870 ^{o}C. The solids that remain at the end of the process are in an inorganic form commonly known as ash.

Both unprocessed sludge and processed biosolids that have been mechanically dewatered to a solids content of 25-30% are suitable for incineration. Incineration takes advantage of the fuel value of these materials, and the energy recovered can be used in heat exchangers and waste heat boilers to offset other energy uses within the wastewater treatment process. The efficiency of the process is increased by the dryness (% solids) of the incinerator feed material, as well as the organics content.

Incineration results in a large reduction of the biosolids/sludge in both volume and mass in comparison to other management options. The mass of solids in the ash is approximately 20 to 30% of that in the incinerator feed, thus reducing the mass that must be further managed off-site.

Incineration also achieves complete destruction of pathogens (disease-causing organisms), as well as organics. The remaining ash is inorganic and not susceptible to further biological activity or decomposition. It may be disposed as a conventional waste (i.e., non-hazardous).

While in the past there have been two common incineration technologies used for sludge and biosolids: multiple hearth and fluidized bed, the multiple hearth technology is outdated and only the newer, more efficient fluidized bed technology is being installed for municipal wastewater biosolids management.

Typically, the ash resulting from the incineration process is mixed with effluent water from the scrubbers and pumped to ash lagoons where it is stored on-site for extended periods of time or indefinitely. When a lagoon is full, ash is removed and typically hauled to a sanitary landfill site for final disposal. Currently the on-site lagoons storing the ash at the Highland Creek Treatment

Plant are emptied annually and the ash is transported to the City's Green Lane Landfill site. In July 2013, sixty-four truckloads of ash totalling 2,100 tonnes was removed from Highland Creek Treatment Plant as part of its annual ash lagoon cleaning (City of Toronto, 2014).

At facilities where there is inadequate space for ash storage lagoons, ash is settled in settling basins, dewatered, temporarily stored and hauled off-site on a regular basis.

In recent years, there has been more emphasis on finding beneficial uses for ash, including such uses as landfill cover, soil amendment, an ingredient in concrete, a fine aggregate in asphalt, a flowable fill material, and an additive in brick manufacturing (Water Environment Federation, 2009). For these uses, additional ash processing, including on-site dewatering and truck loading facilities are required to enable the ash to be hauled off-site to a facility that will utilize the material on a regular basis.

2.2.3 Alternative 2: Biosolids Transport Off-site for Management

For Alternative 2, biosolids would be hauled off-site (without further on-site processing) for management, and either taken to storage or end-use directly, or taken to a facility for further processing into a material that would be distributed and/or marketed. This biosolids management approach would require the City to retain one or more contractors to haul the biosolids off-site.

The City practices this approach for a large portion of the biosolids generated at its City's largest wastewater treatment facility, the Ashbridges Bay Treatment Plant. For that facility, the City has several contracts in place with third party management providers; some who haul biosolids directly to land application or landfill, and others who provide further processing and management of a fertilizer material or compost.

Using this approach at the Highland Creek Treatment Plant, the processing or disposal methods used would not be defined by the City. Rather, this would depend on contractors' proposals as selected through a competitive bid process. The biosolids would be stored, managed and/or disposed off-site by the contractor.

In order to haul biosolids off-site, a vehicle loading facility would need to be constructed at the Highland Creek Treatment Plant site and biosolids would be hauled from the facility on a daily basis. In TM-3, it was determined that haulage by trucks with 40-tonne capacity is the preferred transport mode for the biosolids. On average, 3.7 trucks per day would need to be loaded to haul the biosolids generated off-site. However, since haulage may only occur 5 days per week, there would be 5 to 6 trucks to and from the site each day.

The truck loading facility would allow for temporary storage (3-5 days) of biosolids. Truck loading bay doors would be closed during filling, and all air from building would be collected and treated through an odour control unit before being released to the environment.

All hauling, processing and management methods are regulated. Each contractor would be responsible for securing the approvals and permits required for the specific biosolids management method being used.

2.2.4 Alternative 3: Pelletization Process and Distribution of Fertilizer Product

For Alternative 3, new facilities would be constructed at the Highland Creek Treatment Plant site to process biosolids to generate a material that can be distributed as a fertilizer product. This management is approach is also used at the City's Ashbridges Bay Treatment Plant for a portion of the biosolids generated at that facility.

Biosolids drying, or pelletization, is the use of heat to evaporate water from biosolids, generating a finished material with a total solids concentration of 90% or greater. The dried material is in pellet form, typically 2 to 4 mm in size, to make it suitable for marketing. The high temperature in the process reduces pathogens within the biosolids to below detection level, resulting in a material that can be registered as a fertilizer product.

Dryers require significant energy input to elevate the temperature of the water in the biosolids to the point of evaporation. Where available, natural gas is generally used as the source of energy. Alternatively, biogas generated in the digestion process can be used to provide a portion of the energy demand.

Like a number of other organic materials, the dried product must be stored where it can be kept dry. Engineered silos and other systems can be used to meet this

need. However, the systems needed to maintain product dryness are expensive, and costs are proportionately higher for long storage periods. Alternatively, the pellets can be bagged or hauled off-site for management/distribution soon after production.

The volume of dried pellets generated from the process is about 30% of the volume of the biosolids feed material due to the low water content of the pellets. The pellets would need to be hauled from the Highland Creek Treatment Plant site by contractors, requiring a vehicle loading facility to be constructed on-site at the plant. An average of one to two 40-tonne trucks per day would be required to haul pellets from the site.

3. Scoping Methods

3.1 Overview of Scoping Methods

The scoping stage of the HCTP HIA follows the guidance provided in TPH's HIA Framework. Three sources of input were used to develop the scope of the HIA, as follows:

+ Review of input from the 1st PIC Public Information Centre held for the Class EA
+ HIA Stakeholder Group meeting
+ Literature review, including previous HIAs on biosolids management and a Biosolids Pellet Review Study

Each of these sources are discussed in the following sections.

3.2 Input from Public Information Centre

As part of the Class EA process, three Public Information Centres (PICs) are being held to present information to the public on the Class EA study process and biosolids management alternatives and to solicit feedback regarding the study. The PICs therefore represent a valuable source of information about the factors related to biosolids management at the Highland Creek Treatment Plant that are important to the community. Incorporating this information into HIA scoping ensures that the in depth assessment phase of the HIA focuses on impacts that are most relevant and of highest priority for the communities included in the study area.

The first of the three PICs was held on June 16th, 2014. Public comment sheets were distributed and collected from attendees and were received via mail following the meeting. In total, 30 comment sheets were collected. Table 1 summarizes comments about potential impacts to health determinants and health outcomes as they relate to the information presented.

Table 1 Health Concerns Recorded from the Class EA PIC No. 1

Health Outcomes/ Determinants	Health Concerns
Air quality	Emissions (airborne contaminants) from single source (stack) vs. multiple sources (trucks, diesel fuel)
	Emissions related to trucks accelerating/coming to a stop.
Environmental quality (e.g., surface and ground water)	Potential spills while trucking through residential areas; school nearby
	Potential for contamination of soil and groundwater (through biosolids land application)
	Potential for release of contaminants to air (through biosolids land application)
	Potential for contamination of surface water by spill or runoff (through biosolids land application)
	Greenhouse gas
Food safety	Exposure to contaminants from food grown in soil where biosolids have been used as fertilizer.
Traffic safety and injuries	Additional truck traffic on bicycle routes
	Trucking through residential community
Noise	Traffic-related noise
Odour	Potential for odour from trucking biosolids through community
Property values	Potential impact on property values due to biosolids management option (trucking)
Recreation	Trucking effect on recreational spaces in the study are

3.3 HIA Stakeholder Group Meeting

So that the HIA addresses health issues that are of importance to a wide range of potentially affected populations, a HIA Stakeholder Group was formed. Stakeholders for this group were identified to represent diverse perspectives of the communities included in the study area.

The types of organizations that were invited to be a part of the HIA Stakeholder Group included:

+ Local health care providers
+ Community associations/groups in the study area

+ School boards
+ Organizations that represent vulnerable community members
+ Parks and recreation
+ Non-government organizations (environmental, conservation, equity and health focussed)

The first HIA Stakeholder Group meeting was held on November 12th, 2014, and included 15 participating members plus members of the project team. The meeting was used to introduce the stakeholders to the Class EA and HIA, and to scope the health areas of greatest importance to focus on in the in-depth assessment phase of the HIA. The results of the meeting are summarized in Appendix A.

Although the project team made every effort to include a wide range of stakeholders, there were stakeholders invited to the meeting who chose not to participate. However, after analyzing who attended the workshop, participants identified that the only group that was not represented was the urban Aboriginal population. Efforts have been made and will continue to be made to engage this group.

Through smaller group working sessions, health areas of potential concern were identified. The small working groups reported back in plenary and all the health concerns were recorded on large flip chart paper. Each participant was then provided nine sticky dots and asked to place the dots on their health areas of greatest concern. They could select nine priorities or place all their dots on their health area of greatest concern. The 'dots' column in Table 2 summarizes the number of sticky dots that were placed by participants beside each of the health areas that were identified in the small working groups.

Table 2 Results of HIA Stakeholder Group Prioritization of Health Impacts

Rank	Dots	Health Impacts	Notes
1	17	Air quality	Dust, traffic and trucks idling, emissions, youth, asthma
2	13	Odour	Operations, trucks
3	11	Traffic Safety	Road safety, road infrastructure/quality
4	9	Noise	Trucks
4	9	Healthy child development	
5	7	Neighbourhood characteristics	
5	7	Access to transport	Public transit, active transportation, accessibility
6	6	Water and soil quality	Deposition, spills
6	6	Property values	
7	5	Climate change	
7	5	Fires/explosions	Proximity to train tracks
8	4	Stress - risk perception	
8	4	Centralized/decentralized treatment	Dealing with biosolids at one location instead of having other communities deal with the problem
9	3	Recreation and leisure in area	
10	2	Spills	
10	2	Job opportunities/economics	
10	2	Community and social cohesion	Process bringing people together; polarization of community on decision

3.4 Literature Review

3.4.1 Review of Previous HIAs on Biosolids Management

The scoping step included a review of previous health impact assessments that have been completed on similar projects. This was done to ensure that there were no significant health topics that should be addressed that had not already been brought forward through the Class EA PIC or the HIA Stakeholder Group meeting.

A search of the literature resulted in eight HIAs conducted on various types of solid waste management technologies. Six of these HIAs were excluded because they focused on energy-from-waste facilities that utilize municipal waste as fuel. Municipal waste contains many contaminants that are not found in biosolids and undergoes a very different management process at the site. Due to the significant differences in the sources, and physical and chemical composition of biosolids and industrial or municipal solid waste these studies were not considered in the review.

The remaining two HIAs focused on biosolids. One HIA focused solely on health effects related to land application of biosolids in the local community. Since land application is not part of the scope of the HIA (see Section 4.1.1), this study was also not included in the review of HIAs. The second was a rapid HIA conducted on previously proposed biosolids management approaches for the Highland Creek Treatment Plant[3]. The rapid HIA examined health impacts associated with incineration and beneficial use (i.e., land application as regulated under the Nutrient Management Act) options.

The health areas that were considered in this HIA assessment are presented in Table 3.

3.4.2 Biosolids Pellet Review Study

In November 2004, TPH released a study titled 'Biosolids Pellet Review Study: Human Health and Ecological Risk Assessment'. This study was commissioned in 2001 in response to public concern over land application of biosolids pellets to be produced by a new pelletization facility being proposed for the Ashbridges Bay Treatment Plant. The study examined the potential human and ecological health effects associated with 25-year use of pellets on City-owned property, on park land, and on residential property. Population groups that were specifically considered included young children, adult residents and workers applying pellets on land.

[3] Rapid Health Impact Assessment for Biosolids Management at the Highland Creek Treatment Plant. Staff report from the Medical Officer of Health, April 7, 2011.

Table 3 Health Areas Examined in the Rapid HIA for Highland Creek Biosolids Management Alternatives

Biosolids Management Alternatives	Health Concerns Examined
1. Incineration 2. Beneficial use (land application, as regulated under the Nutrient Management Act)	Air quality Greenhouse gases Toxic chemicals Odour Surface and water quality Soil quality Land use and built environment Noise Housing and community/social cohesion Traffic Physical activity Leisure Equity

A quantitative health risk assessment was conducted to determine the chemical, biological and ecological risk associated with metals and key organic chemicals present or potentially present in Toronto biosolids pellets. Overall the study concluded that there is no evidence to date that microbiological or chemical concerns are sufficiently significant to preclude land application of pellets for agricultural or horticultural purposes. The report presented a number of recommendations to Toronto Works Committee to address uncertainties in data, including continued monitoring of the pelletization process and testing of pellet quality, making amendments to the Toronto Sewer By-law to restrict disposal of some waste products, and the undertaking of additional health studies. While recommendations were made, this study concluded that there was no evidence of human health effects associated with land application of biosolids pellets.

The Biosolids Pellet Review Study can be found on the City of Toronto's website[4].

4 http://www1.toronto.ca/wps/portal/contentonly?vgnextoid=e752105d4cff1410VgnVCM10000071d60f89RCRD&vgnextrefresh=1&s=biosolids

4. Scoping Results

4.1 Study Boundaries

4.1.1 Geographic boundaries and potentially affected communities

Geographic boundaries refer to the geographic area in which the HIA will examine impacts to community health. For the Class EA and the HIA, the study area has been defined as Wards 43 and 44 within the City of Toronto. This study area, which surrounds the Highland Creek Treatment Plant, was selected because this is the area that could potentially be affected by activities associated with managing biosolids at the treatment plant, or the transport of biosolids from the treatment plant for management off-site. Within the study area there will be distinct zones where effects may be experienced differently or there may be different levels of concern related to the stakeholder's proximity to the project. The assessment of effects will consider how effects may be distributed within the study area according to the following criteria:

+ Geographic proximity to the project
+ Locations in projected release areas for contaminants of concern
+ Proposed transportation routes for project-related traffic
+ Existing burden of diseases or health vulnerabilities
+ Background exposures to contaminants Level of concern related to stakeholder's proximity to the project, or other factors.

The HIA is focussed on the concerns, perspectives and potential health impacts within the study area. Health effects as a result of transportation outside the study area boundaries, and any further processing, storage, distribution, beneficial use, distribution or disposal of biosolids or biosolids-products is outside the scope of this study.

With respect to assessing the health impacts of large (40 tonne) trucks, the study area boundaries extends to Highway 401, but does not include the highway itself. This is because the four to six additional trucks that could be added for biosolids hauling represent a negligible increase in the more than 400,000 vehicles that travel on Highway 401 each day within the City.

Stakeholders have expressed concerns related to the practice of spreading biosolids, or processed biosolids managerials, on agricultural land and other beneficial uses. The study area does not include remote sites where biosolids may be ultimately applied to agricultural land. The negative and positive impacts of beneficial use on agricultural land have been studied and broadly consulted on by the Ministry of the Environment and Climate Change, Ontario Ministry of Agriculture, Food and Rural Affairs, and other regulating agencies outside of Ontario. The findings have been used as a basis to develop provincial health, safety and environmental regulations. The City carefully considered this background when it included beneficial use as one of the preferred biosolids management approaches for the Ashbridges Bay Treatment Plant.

The potential for use of biosolids on land within the study area has been raised. There is a chance that a resident within the study area may purchase and apply a fertilizer product that has been produced using biosolids that orginated from the Highland Creek Treatment Plant. This would only be possible for materials that are registered under federal legislation as a fertilizer. As per regulation, these products will meet the quality requirements for fertilzers, and will be labled to present source materials and nutrient value. As presented above, the Human Health and Ecological Assessment of Toronto Biosolids Pellets study showed that biosolids pellets could be used without adverse impacts to public health[5]. For these reasons, the beneficial use of biosolids is considered out of scope for this HIA.

4.1.2 Temporal Boundaries

Temporal boundaries refer to the time period over which the HIA will examine impacts to community health.

In general, for HIAs conducted on industrial projects the temporal boundaries commonly include both the construction and operations phases of the project. For the HCTP proposed plans, the construction phase for any given option is expected to last between 1 and 2 years. New operations at the plant is expected

[5] Toronto Public Health, 2004. Biosolids Pellet Review Study – Human Health and Ecological Risk Assessment. Prepared for Toronto Public Health by Jacques Whitford Limited. http://www1.toronto.ca/wps/portal/contentonly?vgnextoid=e752105d4cff1410VgnVCM10000071d60f89RCRD&vgnextrefresh=1&s=biosolids

to last beyond 30 years. The HIA will separate impacts associated with construction and operation in the assessment of effects.

4.2 Health Determinants Included in the HIA assessment

To determine the health areas to carry forward into the HIA, all information from the three information sources was combined into a matrix, as shown in **Error! Reference source not found.**. The following criteria were applied to select health areas to be considered in the HIA:

+ Primary health areas - Health areas that were identified by the three information sources as priority areas of concern are considered of primary importance for the HIA.
+ Secondary health areas - Health issues raised but not identified as a priority area of concern by the HIA stakeholder group, and were not mentioned by other members of the community in the Class EA PIC will be addressed in the HIA but with less detailed examination than primary health areas.
+ Tertiary health areas – Health areas raised but not identified as a priority by any of the three information sources. These health areas will be addressed minimally in the HIA. Details on how these health areas are being addressed and why they are included are provided in Table 4.

There are factors that are not explicitly discussed in the Table 4 that were expressed at the first HIA Stakeholder Group meeting, these being equity and positive health impacts. The HIA will not be exploring these issues as separate health areas but rather incorporate them into the assessment of impacts for each health area. For example, air quality will be assessed in the HIA for potential health harms in the surrounding population as well as health benefits, which would be the case if the proposed alternatatives resulted in a lower release of air contaminants than current operations. To explore equity, the HIA will discuss whether air quality impacts will unfairly or unjustly affect certain population groups in the surrounding communities. This approach will be taken for each of the health areas of importance.

Table 4 Health Areas to be Included in the In-Depth Assessment Phase of the HIA

Health area (Listed in priority order based on 1st HIA Stakeholder Group Meeting)	Information source			HIA Level of Assessment	Rationale/Comments on Level of Assessment
	Class EA PIC Input	First HIA Stakeholder Group meeting (ranked order)	Previous HIA		
Air quality	✓	✓ (1)	✓	Primary	Raised by all three information sources
Odour	✓	✓ (2)	✓	Primary	Raised by all three information sources
Traffic Safety	✓	✓ (3)	✓	Primary	Raised by all three information sources
Noise	✓	✓ (4)	✓	Primary	Raised by all three information sources
Water and soil quality	✓	✓ (6)	✓	Primary	Raised by all three information sources
Housing/property values	✓	✓ (6)	✓	Primary	Raised by all three information sources
Recreation and leisure in area	✓	✓ (9)	✓	Primary	Raised by all three information sources
Neighbourhood characteristics		✓ (5)		Secondary	Raised by HIA stakeholder group
Access to transport		✓ (5)		Secondary	Raised by HIA stakeholder group
Stress – risk perception		✓ (8)		Secondary	Raised by HIA stakeholder group
Community and social cohesion		✓ (10)	✓	Secondary	Raised by HIA stakeholder group
Climate change		✓ (7)	✓	Tertiary	Climate change will be examined in the Class EA rather than in the HIA; however, a brief discussion of the association between climate change and health will be

Health area	Information source			HIA Level of	Rationale/Comments on Level of
					included in the HIA.
Spills	✓	✓ (10)		Tertiary	Spills can affect water and soil quality. An assessment of water and soil quality was identified as a Primary health area.
Healthy Child Development		✓ (4)		Tertiary	Children were identified as a vulnerable population group in the HIA Stakeholder Meeting. Instead of including healthy child development as a health area in and of itself, all health areas will be examined as to their effect on children and other vulnerable population groups.
Fires/explosions		✓ (7)		Tertiary	Since these incidents are rare and are not part of normal construction and operations, they will be examined in a separate section of the Class EA as part of accidents and malfunctions. A brief summary of this section will be included in the HIA as it pertains to health outcomes.
Centralized/decentralized treatment		✓ (8)		Tertiary	Although the concept of dealing with waste in the area that it was created in is an important societal conversation, the linkages to health for the local population are not well justified. This topic will be qualitatively explored in the HIA but not assessed in detail.
Job opportunities/economics		✓ (10)		Tertiary	Although employment and community economics have strong ties to health, this health determinant ranked as one of the lowest for the HIA Stakeholder Group. Job

Health area	Information source			HIA Level of	Rationale/Comments on Level of
					creation is also likely to be minimal. For these reasons, jobs and economic opportunities will be minimally discussed in the HIA.
Abbreviations: HIA – Health impact assessment; PIC – Public Information Centre					

5. Next Steps

The next step following scoping is the in-depth HIA, which will be completed by July 2015. During the in-depth HIA, the HIA team will characterize the current health status of the study area population and gather information from various sources to support the assessment of how the biosolids management alternatives being evaluated for the HCTP may affect the health of the study area community. The results of the HIA will be presented to the HIA Stakeholder Group and recommendations will be formulated to mitigate any identified health impacts. The HIA will be incorporated into the overall evaluation of biosolids management alternatives for the Highland Creek Treatment Plant, within the scope of the Class EA, planned for completion in 2015.

Appendix C: Summary of 1st HIA Stakeholder Meeting

Health Impact Assessment of Biosolids Management Alternatives for the Highland Creek Treatment Plant

Stakeholders Meeting No. 1

Meeting Notes

Date: Wednesday, November 12, 2014
Location: Royal Canadian Legion, 45 Lawson Rd, Scarborough
Time: 4:30 pm – 8:30 pm
Attendees: Refer to Attachment A

The purpose of this meeting was to identify health issues of importance to the HIA Stakeholders Group and prioritize health impacts that will be explored in the Health Impact Assessment being undertaken as part of the Class EA.

Item	Discussion

1. Introductions and values

The meeting began with opening remarks by Ronald Macfarlane followed by introductions of the City and consultant teams involved in the Class Environmental Assessment (EA) and the participants in the Health Impact Assessment (HIA) Stakeholder Group. Attendees and the organization they represent are listed in Attachment A.

During introductions, members of the HIA Stakeholder Group were asked to provide characteristics of the neighbourhoods they lived in that they valued. The purpose of this exercise was to identify commonalities amongst the participants. Neighbourhood values include:

+ Spirit of the people
+ Health of the people
+ Youth
+ Giving people a voice
+ Beauty
+ Walkability
+ Trails
+ Clean air, soil, water, food
+ Safety, child friedly
+ Odour spaces
+ Recreation
+ Green space

2. Opening Remarks

City and consultant team members introduced a number of topic areas related to the Class EA and the HIA. The speakers and topics covered were as follows:

+ Ronald Macfarlane, Toronto Public Health: Opening remarks, rationale for including an HIA within the Class EA for Biosolids Management at the HCTP, purpose of the HIA Stakeholder Group
+ Josephine Archbold, Toronto Public Health: Overview of health, health impact assessment (HIA), examples of other HIA's being conducted by TPH, including a case study example of one TPH HIA
+ Deborah Ross, CIMA: Description of the current HCTP operations, description of biosolids, the short-list of biosolids management alternatives being considered in the Class EA, Class EA process and integration of HIA results into the Class EA

The presentation materials are provided as Attachment B.

3. Small Group Work to Identify Relevant Health Areas

The participants were divided into three groups, according to the organizations they represent, as follows (shown in Attachment A):

1: Community (neighbourhood) organizations:

2: Organizations representing vulnerable populations

3: Environment, parks, recreation and other groups

The three groups were asked to identify health areas of most importance for any or all of the biosolids management alternatives. After clarification questions were answered, the three groups began to work through TPH's scoping tool, to help to identify the important health areas. Discussions were recorded by facilitators at each table using TPH's scoping tool (Attachment C).

4. Plenary Discussion to Prioritize Relevant Health Areas

All health issues that were identified in the small groups were then discussed in plenary and recorded on flip-chart paper. Once all issues were recorded, each participant had the opportunity to place nine dots next to health areas that they believed were of greatest importance to examine in the HIA. The results of this exercise are presented in Table 1, from the most dots to the least dots.

During this exercise, vulnerable population groups were also identified that may be more affected by the various options being considered for biosolids management. The vulnerable populations identified were as follows:

+ Children
+ People with existing health conditions
+ People employed at the facilities
+ Aboriginal Peoples
+ Lower socio-economic status/environmental justice communities
+ Seniors
+ Newcomers (especially along Kingston Rd.)

Table 1 Prioritization of Health Areas

# of Dots	Health Impacts	Clarification Comments Provided by the Groups
17	Air quality	Dust, traffic and trucks idling, emissions, youth, asthma
13	Odour	Operations, trucks
11	Traffic Safety	Road safety, road infrastructure/quality
9	Noise	Trucks
9	Healthy Child Development	
7	Neighbourhood characteristics	
7	Access to transport	Public transit, active transportation, accessibility
6	Water and soil quality	Deposition, spills
6	Property values	
5	Climate change	
5	Fires / explosions	Proximity to train tracks
4	Stress – risk perception	
4	Centralized / decentralized treatment	Dealing with biosolids at one location instead of having other communities deal with the problem
3	Recreation and leisure in area	
2	Spills	
2	Job opportunities / economics	
2	Community and social cohesion	Process bringing people together; polarization of community on decision

5. Next Steps

The results of the prioritization exercise will be combined with other information collected during the HIA Scoping stage to confirm the final list of the health areas to carry forward into the assessment phase of the HIA. HIA Stakeholder Group will meet again, in spring of 2015, to discuss the results of the HIA and provide feedback on recommendations. In the meantime, the HIA Stakeholder Group will receive updates on the Class EA process for biosolids management at HCTP through regular project emails.

Attachment A: Attendees at the 1st HIA Stakeholder Group meeting

Category	Participants
City and Consultant Team for Class EA and HIA	Nancy Fleming, Toronto Water
	Josie Franch, Toronto Public Consultation Unit
	Josephine Archbold, Toronto Public Health
	Rosie Mishaiel, Toronto Public Health
	Ronald Macfarlane, Toronto Public Health
	Deborah Ross, CIMA
	Erin Longworth, CIMA
	Glenn Ferguson, Intrinsik Environmental Sciences Inc.
	Ame-Lia Tamburrini, Habitat Health Impact Consulting
Community Groups (Table #1)	Centennial Community Association
	Coronation Community Association
	Highland Creek Community Association
	West Rouge Community Association
	Highland Creek Neighbourhood Liaison Committee
Organizations representing Vulnerable Community Members (Table #2)	Local Immigration Partnership, TO East
	Toronto District School Board
	Toronto Catholic District School Board
	Community Development Officer, Toronto Public Health
	East Scarborough Boys & Girls Club
NGOs, Other (Table #3)	Toronto Regional Conservation Authority (TRCA)
	Toronto Environment Alliance (TEA)
	Open Policy Ontario

The following organizations were also invited, but declined participation:

+ Canadian Association for Physicians for the Environment
+ Canadian Environmental Law Association.
+ Conseil Scolaire de district catholique Centre-Sud
+ East Scarborough Storefront Hub
+ Friends of he Guild Park and Gardens
+ Kinstron Galloway Orton Park Action
+ Mornelle Court Coalition
+ Native Child Scarborough
+ Ontario Early Years Centre

+ Rotary Club – Toronto East
+ Scarborough East
+ Scarborough Baseball Assocation
+ Scarborough Basketball Association
+ Scarborough Centre for Healthy Communities
+ Scarborough College Athletics Association
+ Scarborough Residents Unite
+ Scarborough Village Aciton for Neighbourhood Change
+ (City of) Toronto Parks, Forestry and Recreation
+ Wellesley Institute
+ West Hill Community Association
+ West Rouge Sports & Recreation Association

Attachment B: Presentation Materials

City of Toronto

Class Environmental Assessment for Biosolids Management at the Highland Creek TP

HIA Stakeholder Group Meeting No. 1

November 12, 2014

TORONTO Public Health

Purpose and Role of HIA Stakeholder Group

+ **Role of HIA Stakeholder group:**
  - To provide insight into the health effects of the biosolids management options being considered for the HCTP.
+ **Specific tasks include:**
  - Identify health areas of importance to examine in the HIA and Class EA (tonight's meeting)
  - Provide input into HIA results for the biosolids management options (next meeting)

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Agenda

- **Welcome and introductions**
- **Introduction to:**
  - Health Impact Assessment (HIA)
  - Class Environmental Assessment (Class EA)
  - Biosolids Management Options

Break

- **Small group work - Identify health issues**
- **Large group discussion - Prioritize health issues**
- **Wrap-up and next steps**

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Introductions

TORONTO Public Health

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City Project Team

- **Toronto Water**
  - Nancy Fleming, Project Manager
- **Toronto Public Health (TPH)**
  - Josephine Archbold, HIA Lead
  - Ronald Macfarlane
  - Rosie Mishaiel
- **Public Consultation**
  - Josie Franch
- **Toronto Environment and Energy Division**
  - Christopher Morgan

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Consultant Project Team

- **Ame-Lia Tamburrini, Health Impact Assessment Lead**
- **Deborah Ross, Class EA Project Manager**
- **Erin Longworth, Project Engineer**
- **Glenn Ferguson, Human Health Risk Assessment Lead**

TORONTO 6

HIA and its Role in Supporting Decision-Making in a Healthy City

Toronto Public Health

7

What is health?

World Health Organization

Toronto

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Health Impact Assessment (HIA)

+ What is it?

- Systematic method to assess how a proposal or policy affects population health, and the distribution of effects within the population

+ What does it do?

- Assesses the health impacts of a policy or project
- Informs decision-making
- Mitigates health consequences
- Assesses the distribution of these impacts in the population

World Health Organization

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Types of Assessments

- Environmental Assessment
- Environmental Impact Assessment
- Strategic Environmental Assessment
- Sustainability Assessment
- Social Impact Assessment
- Economic Impact Assessment
- Integrated Impact Assessment
- Regulatory Impact Assessment
- Environmental Risk Assessment, etc…

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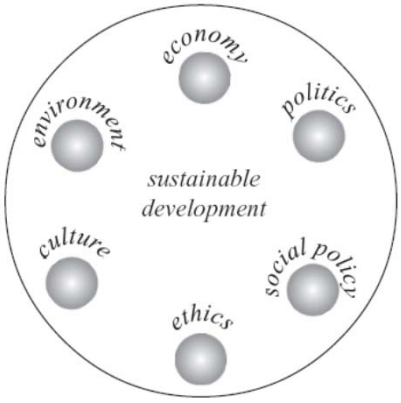
Why HIA?

- **HIA evolved because it was thought that health was not adequately addressed in other impact assessments**



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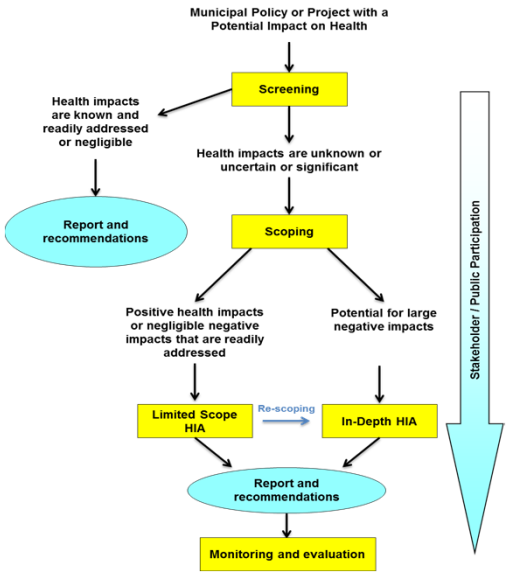
TPH HIA Framework



Source: Toronto Public Health

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Stakeholders Role within the TPH Framework

- **HIA is focussed on the concerns, perspectives and potential health impacts within the study area**
- **There are a number of sources that provide information to an HIA, including:**
  - Stakeholders
  - Literature, published information
  - Technical studies
  - Key informers – subject area specialists
- **Stakeholders:**
  - Are people or groups of people who may be affected by the project
  - Provide information to the HIA team to help at two phases of the HIA:
    - Scoping: Identify the health concerns related to the project in the community
    - In-depth HIA: Provide input and feedback on the findings of the HIA

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Examples of HIA Completed by TPH

- **St. Clair streetcar right-of–way**
- **Mixed waste processing study**
- **Proposed Casino**
- **Artificial turf on sports fields & playgrounds**
- **Urban Agriculture**
- **Billy Bishop Airport Expansion**

Photo by Andrea Zaratin from the Torontoist Flickr Pool.

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Case Study – Proposed Expansion to Billy Bishop Toronto City Centre Airport

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Factors Considered in the HIA

Environmental
- Air quality
- Noise
- Traffic
- Climate change
- Wildlife
- Odour
- Light pollution
- Fuel transport
- Water quality

Economic
- Income
- Employment
- Tourism
- Healthcare costs
- Property values
- Transportation Costs

Social and Cultural
- Feeling safe in the community
- Recreation
- Cultural activities
- Community services
- Community character
- Community plan (waterfront revitalization)

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Three Conditions Considered

1. **Existing conditions without the airport**
2. **Maximum operations under existing Tripartite Agreement**
3. **Future conditions assuming 25% of turboprop flights are replaced by jets**

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Summary of Findings

Potential Health Risk	Health Impact of BBTCA relative to a baseline of "no airport"	Health Impact of permitting Jets, relative to current conditions
Environmental		
Air quality	**Negative**	**Negative**
Noise	**Negative**	**Unchanged or Positive**
Traffic	**Negative**	**Negative**
Climate change	**Negative**	**Negative**
Water quality	**Negative**	**Negative**
Economic		
Income	**Positive**	**Positive**
Employment	**Positive**	**Positive**
Tourism	**Negative and positive**	**Negative and positive**
Healthcare costs	**Negative**	**Negative and positive**
Property values	**Uncertain**	**Uncertain**
Infrastructure	**Negative**	**Negative**
Social and Cultural		
Feeling safe in the community	**Negative**	**Negative**
Recreation	**Negative**	**Negative**
Cultural activities	**Negative**	**Negative**
Community services	**Negative**	**Negative**
Community Character	Not known	**Negative**

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Decision-Making in a Healthy City

- **Based on the HIA, the key greatest concerns for health were:**
  - Air quality
  - Traffic and congestion
  - Noise
- **Recommendations were made by the BOH to Council to factor into their decision, expected in 2015**

http://app.toronto.ca/tmmis/viewAgendaItemHistory.do?item=2013.HL27.3

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Class Environmental Assessment for Biosolids Management at Highland Creek Treatment Plant

TORONTO Public Health

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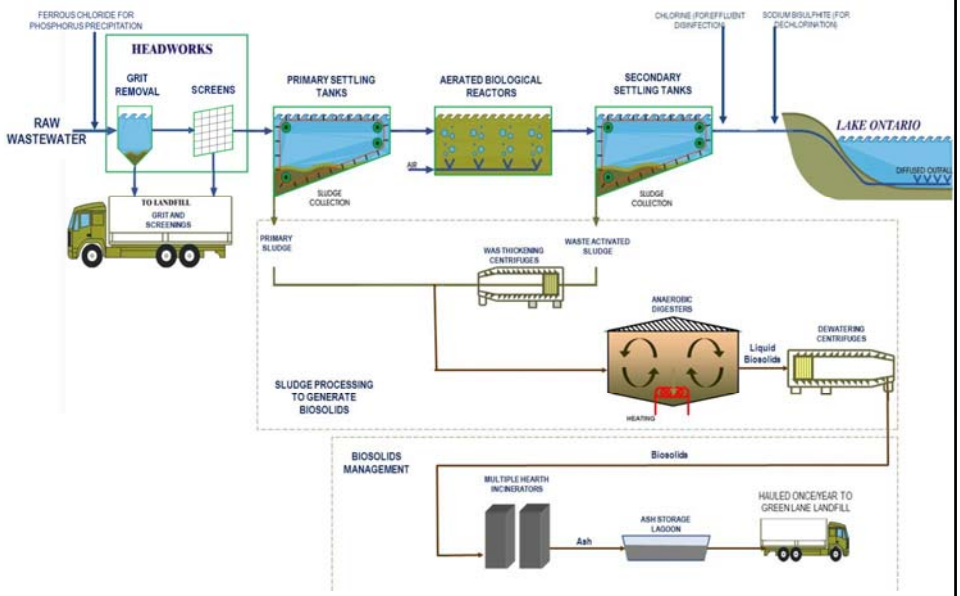
Highland Creek Treatment Plant (HCTP)

- Estimated connected population of 500,000
- Rated capacity of 219 ML/d, generates approximately 40,000 wet tonnes of biosolids each year
- Services the south east portion of the City

Wastewater and Biosolids Treatment Processes



Rationale for the HCTP Biosolids Management Class EA

- The existing multiple hearth incinerators were commissioned in 1976 and are nearing the end of their useful life
- The incinerator emissions meet all regulatory standards
- Urgent repairs to multiple hearth incinerators are underway, and will extend the life of the incinerators for a further 10 years
- The City needs to plan now, to provide time for design and construction of a new biosolids management facility

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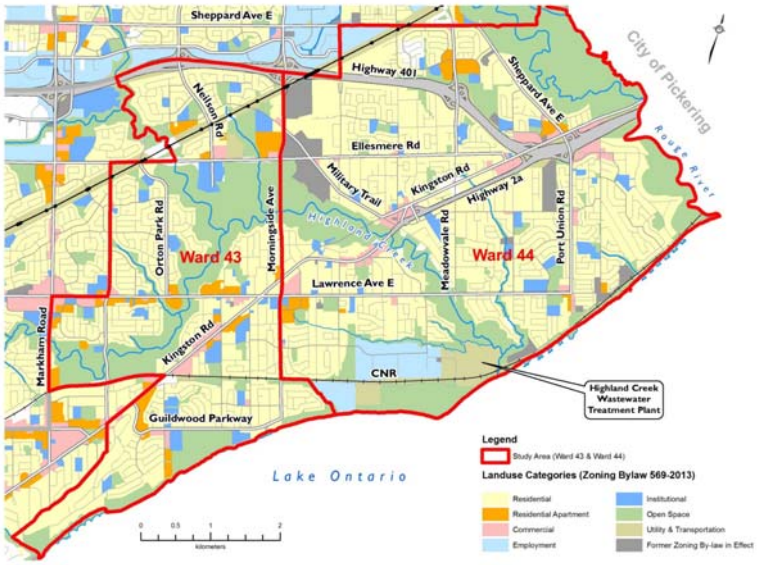
Project Study Area



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Project Study Area

+ **The Class EA will assess the relative impacts (positive and negative) of the short-listed biosolids management alternatives to the local community (Ward 43 and 44)**

+ **Outside of Class EA scope:**
  - Transportation outside the study area boundaries (to Hwy 401) - the small number of additional trucks that may be required represent a negligible increase in the more than 400,000 vehicles that travel on Highway 401 each day within the City
  - Any off-site processing, storage, distribution, beneficial use or disposal of biosolids or biosolids-products – these would be constructed and operated within the relevant health and safety and environmental regulations

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Premise of Class EA

+ **All biosolids management alternatives are governed by relevant health and safety and environmental regulations**

+ **Only those alternatives that meet regulations are being considered for the HCTP**

+ **This Class EA study will evaluate the relative benefits and impacts of each alternative, to select the best approach for the HCTP**

+ **This study will not evaluate the regulations governing biosolids management**

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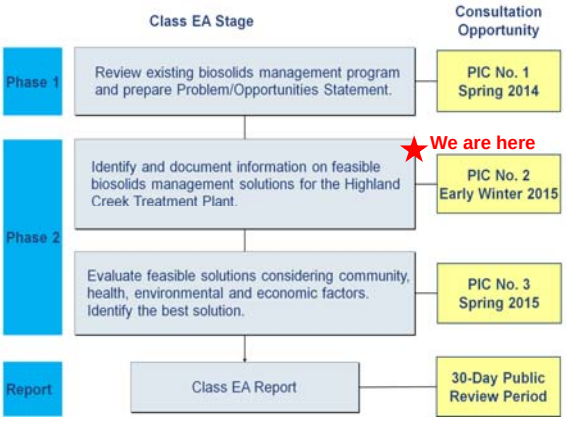
What is the Class EA Process?

+ **The Class EA follows step-wise process to evaluate options and identify a preferred approach for managing biosolids**



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How will alternatives be assessed in the Class EA Process?

- Possible positive and negative impacts under each category (shown to right) will be investigated for each feasible biosolids management option
- A decision-making approach will be used to compare alternative biosolids management approaches
- Health Impact Assessment (HIA) will be used to assess health impacts for each option
- The best biosolids management approach for the Highland Creek Treatment Plant will be the one with the lowest negative impacts and the greatest positive impacts

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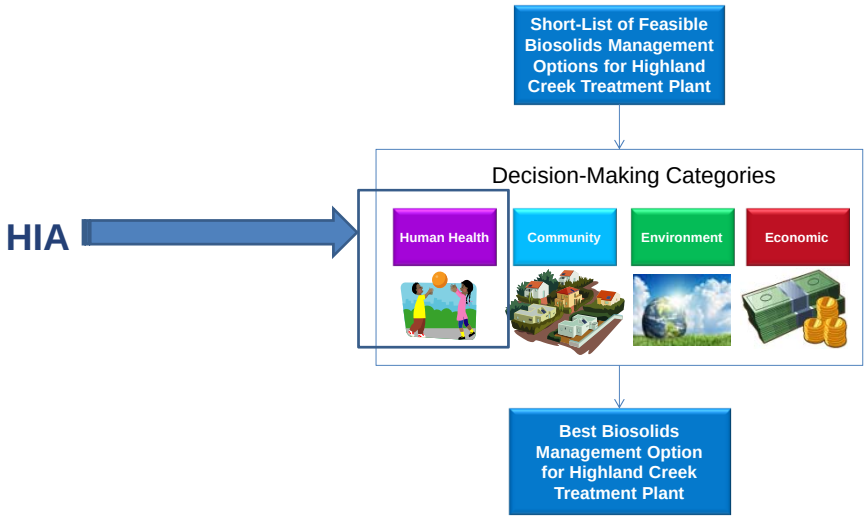
How will alternatives be assessed in the Class EA Process?



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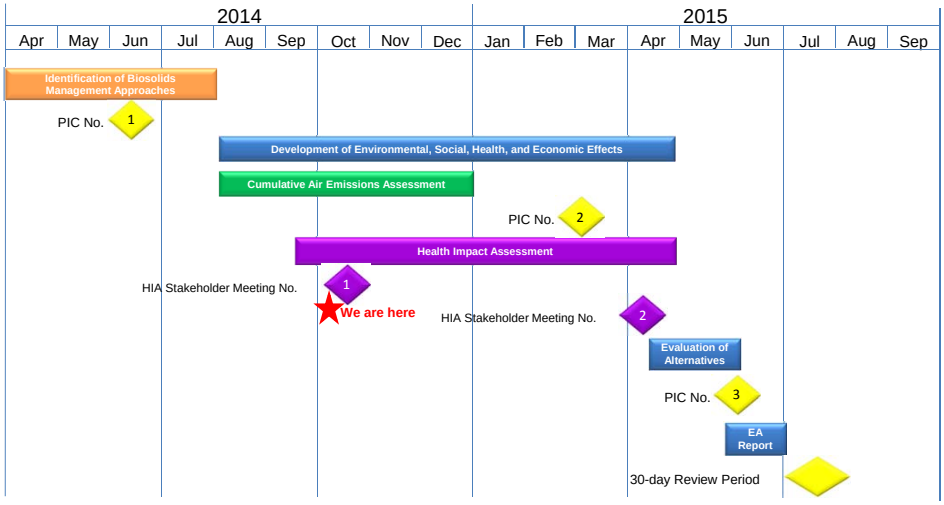
Project Schedule and Public Consultation Opportunities



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Short-List of Feasible Biosolids Management Options

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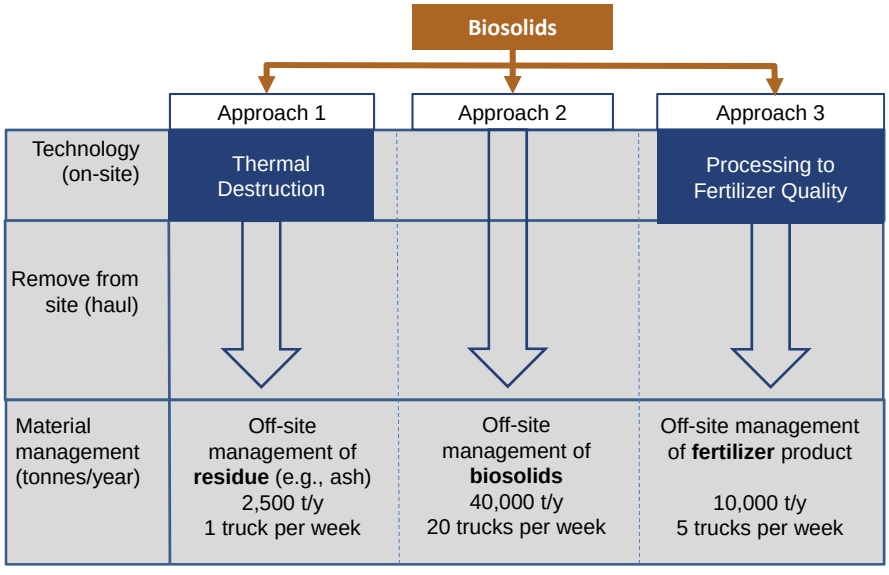
Three Available Approaches to Biosolids Management



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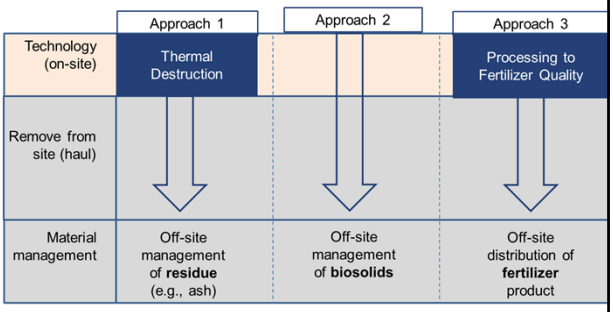
Approaches to Biosolids Management at HCTP

+ **Long-list of on-site processing technologies within:**
  - Approach 1 – Thermal destruction
  - Approach 3 - Processing to fertilizer quality



+ **For Approach 2**
  - A range of technologies and management options are available, depending on the contracts secured by the City – at the Ashbridges Bay TP, contracts include beneficial use, landfill, composting and processing to fertilizer products

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Approaches to Biosolids Management at HCTP

+ **Long-list of on-site processing technologies for Approach 1 and 3**

+ **For all three approaches, off-site management of material is provided by a contractor**

+ **All off-site management approaches are governed by regulations – contractors must have required permits and approvals**

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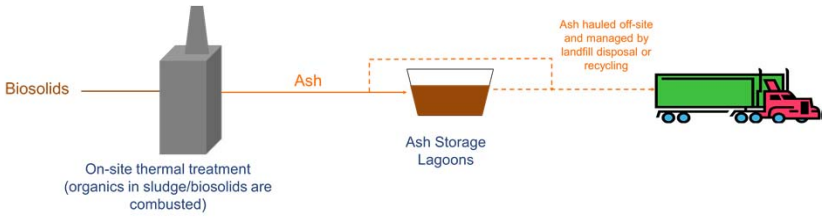
Selection of Short-Listed Biosolids Management Options

+ **To minimize risks to the City, the long-list of approaches and technologies was screened**
+ **Must-meet criteria:**
  - 2 years of demonstrated experience (at similar scale)
  - Can fit within the HCTP site
  - Provides reliability for year-round operations
  - No processes that increase quantity of biosolids on-site (that must be hauled from the plant)

Option 1 – On-site Fluidized Bed Incineration



Existing Highland Creek Treatment Plant Incineration Building and ash storage lagoon

Option 1 – Fluidized Bed Incineration

+ **Incineration**
  - Fluidized bed incineration equipment would replace existing multiple-hearth incinerators
  - High temperature is used to burn the organic content of biosolids - organics are removed and pathogens are killed
  - Residual is inert ash
  - Minimal additional fuel demand in the combustion process and there is opportunity to recover heat
+ **Air Emissions**
  - Emissions would be cleaned to remove particles.
  - Significantly lower levels of contaminants than the Provincial standards.
+ **Ash**
  - Two approaches available for off-site ash management
    - Landfill
    - Recycling, e.g., cement manufacturing.

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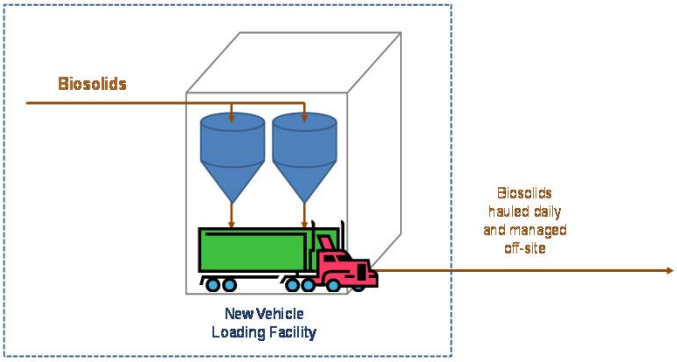
Option 2 – Haul Biosolids Off-Site



Biosolids managed by contractor. Examples of approaches include:
- Beneficial use on land
- Further processing (e.g., pelletization, composting, Lystek), distribution as fertilizer product
- Landfill disposal

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Option 2 – Haul Biosolids Off-Site

- The City would hire contractors to haul the biosolids from the HCTP
- A new vehicle loading facility would be built at the HCTP with short-term (3 to 5 days) storage capacity
- Trucks would be loaded inside a building – odorous air in the building would be collected and treated
- 4 to 6 large tanker trucks (with 40 tonne capacity) every day
- Hauled biosolids would be stored, managed or disposed of off-site by the contractor(s)
- The City will require that each contractor have approvals and permits required for the specific biosolids management method being used, e.g., application to agricultural land under the Ontario Nutrient Management Act and regulations

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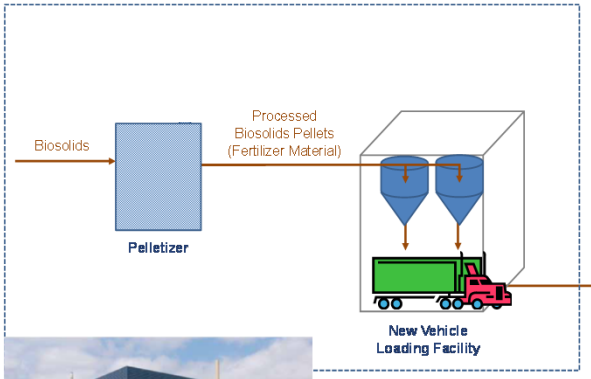
Option 3 – On-Site Pelletization (Thermal Drying)



Pelletized material distributed as a fertilizer product by contractor

Example Pelletizer (thermal drying) facility in Washington, USA

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Option 3 – On-Site Pelletization (Thermal Drying)

- New facilities at HCTP – pelletizer processing facility, storage silos, truck loading facility, odour collection and treatment
- Process uses heat to evaporate water and equipment to mechanically process the biosolids – high temperature kills pathogens
- Dried material is in the form of pellets, 2 to 4 mm in size
- Natural gas is the primary fuel used to heat the biosolids and evaporate the water – biogas can also be used
- Pellet material meets quality standards and can be registered under the Federal Fertilizers Act, enabling distribution as a fertilizer product
- 1 to 2 large tanker trucks (with 40 tonne capacity) per day

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Potential Impacts of Biosolids Management Options

Biosolids Management Activities with Potential Impacts	Possible Impact (Positive or Negative)						
	Noise	Odour	Air Quality (Emissions)	Traffic	Aesthetics	Environmental (e.g., greenhouse gas, risk of spills)	Economics (Cost)
On-site construction of new facilities for biosolids processing	x	x	x	x	x	x	x
Normal day-to-day operation of biosolids facilities	x	x	x	x	x	x	x

The Class EA study is a systematic process to assess all impacts (positive or negative) of the biosolids management alternatives being considered, to identify the best biosolids management solution for the Highland Creek Treatment Plant.

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Questions

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Agenda

- **Welcome and introductions**
- **Introduction to:**
  - Health Impact Assessment (HIA)
  - Class Environmental Assessment (Class EA)
  - Biosolids Management Options
- **Break – We are Here** ⇦
- **Small group work - Identify health issues**
- **Large group discussion - Prioritize health issues**
- **Wrap-up and next steps**

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Attachment C: Small Group Discussion - Notes

Notes from Table 1 – Community Organizations

Notes from Table 1 – Community Organizations					
	Options			Priority	Comments/Evidence
Determinants of Health	**Incineration**	**Offsite Management**	**Pelletization**	**1-less important 2-important 3-very important**	**Please think about the three options. Is the impact similar or different for the options? Please describe the differences.**
Environmental Factors	***Impact***				
Air quality	Positive	Negative	Not Enough Information	3	**I**: Improve based on ACORN study **OM**: Large concentration of vulnerable groups, trucking would affect low income **P**: Where will natural gas be coming from and how much will be used? Sole option or coupled with other processes?
Odour	Neutral (no longer be an issue)	Negative	Not Enough Information/ Understanding	3	**I:** Still eggy smell but could be from other process **OM:** how will it be collected and trated? **P:** Overall unsure how any new processes would affect odour at plant and of passing trucks.
Water quality	Neutral	Negative	Not Enough Information	3	No Comments
Soil quality	Positive or Neutral	Negative	Negative	3	**I:** Split between positive and neutral **OM:** Stack and tail pipe emissions can impact soil quality **P:** Negative because of trucking and emissions
Land use	Negative	Negative	Negative	3	**I:** One person said neutral impact **OM:** Negative because of trucks and facilities **P:** "Mostly Negative" because of trucks and facilities
Vegetation	Neutral	Negative	Negative	1	**I:** No comment **OM:** Potential for spilling from trucks **P:** Trace metals of unknown composition that could be potentially harmful

Notes from Table 1 – Community Organizations					
	Options			Priority	Comments/Evidence
Determinants of Health	**Incineration**	**Offsite Management**	**Pelletization**	**1-less important 2-important 3-very important**	**Please think about the three options. Is the impact similar or different for the options? Please describe the differences.**
Noise	Neutral	Negative	Negative	3	**I:** No comment **OM:** More facilities and trucks **P:** More facilities and trucks
Built Environment	Negative	Negative	Negative	3	**I:** One person said neutral impact **OM:** Negative because of trucks and facilities **P:** "Mostly Negative" because of trucks and facilities
Traffic Safety	Neutral	Negative	Negative	3	**I:** One person said neutral impact **OM:** Spillage, quality of roads may degrade faster due to increased volume of heavy duty vehicles, more road congestion and longer commute times **P:** Volume of trucks, quality of roads may degrade faster due to increased volume of heavy duty vehicles, more road congestion and longer commute times
Climate Change	Neutral	Negative	Negative	3	**I:** Potentially positive but one person said negative due to burning **OM:** Truck emissions **P:** Burning of natural gas
Dust	Neutral	Negative	Negative	3	**I:** No comment **OM:** Trucks cause dust **P:** Trucks cause dust
Social and economic factors	***Impact***				
Income and social status	Neutral	Neutral	Neutral	x	No comment
Community and Social Cohesion	Neutral	Negative	Negative	x	**I:** No comment **OM:** Polarized the community as it caused protests regarding the trucking **P:** Polarized the community as it caused protests regarding the trucking

Notes from Table 1 – Community Organizations					
	Options			Priority	Comments/Evidence
Determinants of Health	**Incineration**	**Offsite Management**	**Pelletization**	**1-less important 2-important 3-very important**	**Please think about the three options. Is the impact similar or different for the options? Please describe the differences.**
Housing and Living Conditions	Neutral	Negative	Negative	x	**I:** No comment **OM:** Property value affected by trucks **P:** Property value affected
Vulnerable Populations	x	x	x	x	Youth, elders, child-bearing and asthmatics are negatively affected by burning processes, smelly plants and emissions from trucks, spillage Low-income people at Morningside and Kingston and other priority neighbourhoods in the area are negatively affected by burning and use of trucks
Neighborhood Characteristics	x	x	x	x	Walking, buses, cars are major modes of transportation ("we don't have subways or trains") Trucks will have a significantly negative impact on these commuters (congestion, travel time, pollution) and increase the risk of collision
Overall Feedback	***Comments***				
Group had issue with losing "centralized control" of waste management and options 2 and 3 become very decentralized Overall, the group favours incineration					

Notes from Table 2 – Schools, Toronto Public Health, Community-based Organizations

Notes from Table 2 – Schools, Toronto Public Health, Community-based Organizations							
	Potential Impacts					Priority	Comments/Evidence
Determinants of Health	**Positive**	**Neutral**	**Negative**	**Not enough information**	**N/A**	**1-less important 2-important 3-very important**	**Please think about the three options. Is the impact similar or different for the options? Please describe the differences.**
Environmental Factors							
Air quality	☐	☐	☒	☐	☐	3	Especially incineration: asthmatic kids, community health centres, hospitals
Odour	☐	☐	☒	☐	☐	1	No an issue for incineration Not an issue for the other options assuming odours are captured and treated and there is a negligible impact from the trucks (i.e., even a small odour will not have a significant impact if it passes by quickly and the daily frequency is low)
Water quality	☐	☒	☐	☐	☐		Considered out of scope as land application of the biosolids within scope.
Soil quality	☐	☒	☐	☒	☐		Soft split neutral and not enough info on study area (i.e., would the biosolids be used in the study area?); some discussion on discussion of the air emissions from the incinerator, but thought to be better than current incinerator, mixed
Land use	☐	☐	☒	☐	☐	1	Intensity of land use option 1 & 3
Vegetation	☐	☒	☐	☐	☐	1	
Noise	☐	☐	☒	☐	☐	1	Noise from trucks

Notes from Table 2 – Schools, Toronto Public Health, Community-based Organizations							
	Potential Impacts					Priority	Comments/Evidence
Determinants of Health	**Positive**	**Neutral**	**Negative**	**Not enough information**	**N/A**	**1-less important 2-important 3-very important**	**Please think about the three options. Is the impact similar or different for the options? Please describe the differences.**
Built Environment	☐	☒	☐	☐	☐	1	Footprint of HCTP already there and roads already built, so impact of all options considered neutral
Traffic Safety	☐	☐	☒	☐	☐	3	For all options traffic safety is a serious issue, mostly option 2 - collisions, biking
Green house gas emissions	☐	☐	☒	☐	☐	3	Incineration biggest impact
Other: Worst case scenarios, catastrophic incident, Emergency, Fire	☐	☐	☒	☐	☐	3	All options Major impact on rail lines, passenger trains because of proximity of facility to VIA, freight and Go Train lines
Other (Specify)	☐	☐	☐	☐	☐		
Social and economic factors							
Income and social status	☐	☐	☒	☐	☐	2	All options, real estate and property values - Perception, negative perception to community
Economic security/working conditions	☐	☒	☐	☐	☐	1	It was not considered that any of the options would be a significant source of local jobs

Notes from Table 2 – Schools, Toronto Public Health, Community-based Organizations							
	Potential Impacts					Priority	Comments/Evidence
Determinants of Health	**Positive**	**Neutral**	**Negative**	**Not enough information**	**N/A**	**1-less important 2-important 3-very important**	**Please think about the three options. Is the impact similar or different for the options? Please describe the differences.**
Education and literacy	☐	☒	☐	☐	☐	3	- Projects like this are tremendous for engaging public - Valuable outcome of process, but not important to research as part of the HIA study
Food security	☐	☒	☐	☐	☐	1	- Question of whether the biosolids and/or pelletizer options could have an impact on food security by providing readily available fertilizer to the local community
Family cohesion	☐	☒	☐	☐	☐	1	
Community and social cohesion	☐	☒	☐	☐	☐	1	- Possibly a process outcome: risk of polarizing effect on communities
Crime/violence	☐	☒	☐	☐	☐	1	
Housing /living conditions	☐	☒	☐	☐	☐	1	- Lots of people (new comers) on hotel/motel strip on Victoria, participants wondered about the impact on them with regards to truck traffic, odour and emissions from incinerator
Social support networks	☐	☒	☐	☐	☐	1	
Social inclusion	☐	☒	☐	☐	☐	1	
Culture	☐	☒	☐	☐	☐	1	

Notes from Table 2 – Schools, Toronto Public Health, Community-based Organizations							
	Potential Impacts					Priority	Comments/Evidence
Determinants of Health	**Positive**	**Neutral**	**Negative**	**Not enough information**	**N/A**	**1-less important 2-important 3-very important**	**Please think about the three options. Is the impact similar or different for the options? Please describe the differences.**
Stress / well-being	☐	☐	☒	☐	☐	3	All options: - concerns about hiccups - feeling anxious - perception of risk
Healthy child development	☐	☐	☒	☐	☐	3	- Most vulnerable - Expression that this is the most important factor to consider for all projects, no comments specifically regarding the impact of this project on healthy child development other than it has to be studied
Other (Specify)	☐	☐	☐	☐	☐		
Other (Specify)	☐	☐	☐	☐	☐		
Lifestyle factors							
Diet /nutrition	☐	☒	☐	☐	☐	1	
Physical activity	☐	☒	☐	☐	☐	1	
Smoking	☐	☒	☐	☐	☐	1	
Alcohol	☐	☒	☐	☐	☐	1	
Drug use	☐	☒	☐	☐	☐	1	
Sexual behaviour	☐	☒	☐	☐	☐	1	
Aggressive/violent behaviour	☐	☒	☐	☐	☐	1	

Notes from Table 2 – Schools, Toronto Public Health, Community-based Organizations							
	Potential Impacts					Priority	Comments/Evidence
Determinants of Health	**Positive**	**Neutral**	**Negative**	**Not enough information**	**N/A**	**1-less important 2-important 3-very important**	**Please think about the three options. Is the impact similar or different for the options? Please describe the differences.**
Other (Specify)	☐	☐	☐	☐	☐		
Other (Specify)	☐	☐	☐	☐	☐		
Access to services							
Health services (e.g. primary care, specialized care, sexual health, mental health, etc)	☐	☒	☐	☐	☐	1	
Education (e.g. preschool, primary school, high school, post-secondary, apprenticeship, adult training, etc)	☐	☒	☐	☐	☐	1	
Social services (e.g. social assistance, child-care, employment support, housing/shelter support, counseling, etc)	☐	☒	☐	☐	☐	1	
Transport (e.g. public transit, active transportation, affordability, accessibility, etc)	☐	☐	☒	☐	☐	3	Very important that the options do not adversely impact transit and active transportation
Recreation/Leisure (e.g. parks, arts, sport and culture)	☐	☐	☒	☐	☐	2	Impact of spills

Notes from Table 2 – Schools, Toronto Public Health, Community-based Organizations							
	Potential Impacts					Priority	Comments/Evidence
Determinants of Health	**Positive**	**Neutral**	**Negative**	**Not enough information**	**N/A**	**1-less important 2-important 3-very important**	**Please think about the three options. Is the impact similar or different for the options? Please describe the differences.**
Other (Specify)	☐	☐	☐	☐	☐		
Other (Specify)	☐	☐	☐	☐	☐		
Other Determinants							
Other (Specify)	☐	☐	☐	☐	☐		
Other (Specify)	☐	☐	☐	☐	☐		
Other (Specify)	☐	☐	☐	☐	☐		

Notes from Table 2 – Schools, Toronto Public Health, Community-based Organizations						
	Potential Impacts					Comment
Populations	**Positive**	**Neutral**	**Negative**	**Not enough Information**	**N/A**	**Please describe in what way you think an impact might happen and where within the study area you think this impact might happen. In other words, are there locations in the study area that are more vulnerable to impacts?**
Aboriginal peoples (e.g., First Nations, Inuit, Métis, etc.)	☐	☒	☐	☒	☐	- Be sure to engage this population - High aboriginal population in city
Age –related groups (e.g., early years/children, adolescence/youth, seniors, women of child-bearing age, etc)	☐	☐	☒	☐	☐	- Element of sensitivity
Care givers (e.g., persons providing unpaid support, including people with dependants, young carers, etc)	☐	☒	☐	☐	☐	
Health Conditions (e.g., cancer, diabetes, AIDS, mental illness, addictions/substance use, etc)	☐	☐	☒	☐	☐	- Asthma, age, seniors
Disability (e.g., physical, deaf, deafened or hard of hearing, visual, intellectual, developmental, learning,, etc.)	☐	☒	☐	☐	☐	
Employed persons or worker groups (e.g., occupations, sectors, unionized/non-unionized, etc)	☐	☒	☐	☐	☐	
Ethno-racial communities (e.g., racialized groups, ethno-cultural communities)	☐	☒	☐	☐	☐	
Francophone (including new immigrant francophones, deaf	☐	☒	☐	☐	☐	

Notes from Table 2 – Schools, Toronto Public Health, Community-based Organizations						
	Potential Impacts					Comment
Populations	**Positive**	**Neutral**	**Negative**	**Not enough Information**	**N/A**	**Please describe in what way you think an impact might happen and where within the study area you think this impact might happen. In other words, are there locations in the study area that are more vulnerable to impacts?**
communities using LSQ/LSF etc.)						
Homeless (including marginally or under-housed, etc.)	☐	☒	☐	☐	☐	
Immigrants and migration status (e.g. undocumented, tourists, temporary visa, refugees, asylum seekers, newly arrived immigrants, permanent residents, other immigrant group)	☐	☒	☐	☐	☐	
Linguistic communities (e.g., uncomfortable using English or French, literacy affects communication, etc.)	☐	☒	☐	☐	☐	
Low income or economically disadvantaged (e.g., unemployed, underemployed, precariously employed, in receipt of social assistance, etc.)	☐	☒	☐	☐	☐	
Marital status (e.g. single, married, divorced, common-law, etc)	☐	☒	☐	☐	☐	
Religious/faith or persons with political beliefs (e.g. recognized religious denominations, atheists, other belief systems, political groups, etc)	☐	☒	☐	☐	☐	

Notes from Table 2 – Schools, Toronto Public Health, Community-based Organizations						
	Potential Impacts					Comment
Populations	**Positive**	**Neutral**	**Negative**	**Not enough Information**	**N/A**	**Please describe in what way you think an impact might happen and where within the study area you think this impact might happen. In other words, are there locations in the study area that are more vulnerable to impacts?**
Neighbourhood characteristics (e.g., neighbourhood improvement areas (NIAs), , under-serviced areas, geographic/social isolation, etc.)	☐	☐	☒	☐	☐	- Issues with overburdened communities
Sex/gender (e.g., male, female, women, men, trans, transsexual, transgendered, two-spirited, etc.)	☐	☒	☐	☐	☐	
Sexual orientation (e.g., heterosexual, lesbian, gay, bisexual)	☐	☒	☐	☐	☐	
Other: Please describe the population(s) below						
Other (Specify)	☐	☐	☐	☐	☐	
Other (Specify)	☐	☐	☐	☐	☐	

Notes from Table 3 – NGO's, Parks and Recreation, TRCA

Notes from Table 3 – NGO's, Parks and Recreation, TRCA							
	Potential Impacts					Priority	Comments/Evidence
Determinants of Health	**Positive**	**Neutral**	**Negative**	**Not enough information**	**N/A**	**1-less important 2-important 3-very important**	**Please think about the three options. Is the impact similar or different for the options? Please describe the differences.**
Environmental Factors							
Air quality	☒	☐	☒	☐	☐		- Could improve over current conditions - All options release pollutants thermal options – metals released
Odour	☐	☐	☒	☐	☐		
Water quality	☐	☐	☒	☐	☐		- Pollutants released into the air can then be deposited onto surface waters. - Spillage - Sewer-Use Bylaw helps reduce levels of pollutants released through biosolids management
Soil quality	☐	☐	☒	☐	☐	1 or 2	
Land use	☐	☐	☐	☐	☒	1	- Already here
Vegetation	☐	☐	☐	☐	☒	1	
Noise	☐	☐	☒	☐	☐	3	
Built Environment	☐	☐	☐	☐	☒		
Traffic Safety	☐	☐	☒	☐	☐		- Truck turnings

Notes from Table 3 – NGO's, Parks and Recreation, TRCA							
	Potential Impacts					Priority	Comments/Evidence
Determinants of Health	**Positive**	**Neutral**	**Negative**	**Not enough information**	**N/A**	**1-less important 2-important 3-very important**	**Please think about the three options. Is the impact similar or different for the options? Please describe the differences.**
Climate change	☐	☐	☐	☒	☐		- Net carbon impact of 3 options
Other (Specify)	☐	☐	☐	☐	☐		
Other (Specify)	☐	☐	☐	☐	☐		
Social and economic factors							
Income and social status	☐	☐	☐	☐	☒		
Economic security/working conditions	☐	☐	☐	☐	☐	1	Impact on number and types of jobs between options Health and safety of workers – difference between options
Education and literacy	☐	☐	☐	☐	☒		
Food security	☐	☐	☐	☐	☒		
Family cohesion	☐	☐	☐	☐	☒		
Community and social cohesion	☐	☐	☐	☐	☒		
Crime/violence	☐	☐	☐	☐	☒		
Housing /living conditions	☐	☐	☐	☐	☒		
Social support networks	☐	☐	☐	☐	☒		
Social inclusion	☐	☐	☐	☐	☒		

Notes from Table 3 – NGO's, Parks and Recreation, TRCA							
	Potential Impacts					Priority	Comments/Evidence
Determinants of Health	**Positive**	**Neutral**	**Negative**	**Not enough information**	**N/A**	**1-less important 2-important 3-very important**	**Please think about the three options. Is the impact similar or different for the options? Please describe the differences.**
Culture	☐	☐	☐	☐	☒		
Stress / well-being	☐	☐	☒	☐	☐		Stress caused by the uncertainty and the long decision-making process
Healthy child development	☐	☐	☐	☐	☒		
Other (Specify)	☐	☐	☐	☐	☐		
Other (Specify)	☐	☐	☐	☐	☐		
Lifestyle factors							
Diet /nutrition	☐	☐	☐	☐	☒		
Physical activity	☐	☐	☐	☐	☒		
Smoking	☐	☐	☐	☐	☒		
Alcohol	☐	☐	☐	☐	☒		
Drug use	☐	☐	☐	☐	☒		
Sexual behaviour	☐	☐	☐	☐	☒		
Aggressive/violent behaviour	☐	☐	☐	☐	☒		
Other (Specify)	☐	☐	☐	☐	☐		
Other (Specify)	☐	☐	☐	☐	☐		

Notes from Table 3 – NGO's, Parks and Recreation, TRCA							
	Potential Impacts					Priority	Comments/Evidence
Determinants of Health	**Positive**	**Neutral**	**Negative**	**Not enough information**	**N/A**	**1-less important 2-important 3-very important**	**Please think about the three options. Is the impact similar or different for the options? Please describe the differences.**
Access to services							
Health services (e.g. primary care, specialized care, sexual health, mental health, etc)	☐	☐	☐	☐	☒		
Education (e.g. preschool, primary school, high school, post-secondary, apprenticeship, adult training, etc)	☐	☐	☐	☐	☒		
Social services (e.g. social assistance, child-care, employment support, housing/shelter support, counseling, etc)	☐	☐	☐	☐	☒		
Transport (e.g. public transit, active transportation, affordability, accessibility, etc)	☐	☐	☐	☐	☒	?	
Recreation/Leisure (e.g. parks, arts, sport and culture)	☐	☐	☐	☐	☒	?	
Other (Specify)	☐	☐	☐	☐	☐		
Other (Specify)	☐	☐	☐	☐	☐		
Other Determinants							
Other (Specify)	☐	☐	☐	☐	☐		
Other (Specify)	☐	☐	☐	☐	☐		
Other (Specify)	☐	☐	☐	☐	☐		
Notes from Table 3 – NGO's, Parks and Recreation, TRCA							

Notes from Table 3 – NGO's, Parks and Recreation, TRCA							
	Potential Impacts					Priority	Comments/Evidence
Determinants of Health	**Positive**	**Neutral**	**Negative**	**Not enough information**	**N/A**	**1-less important 2-important 3-very important**	**Please think about the three options. Is the impact similar or different for the options? Please describe the differences.**
	Potential Impacts					**Comment**	
Populations	**Positive**	**Neutral**	**Negative**	**Not enough Information**	**N/A**	**Please describe in what way you think an impact might happen and where within the study area you think this impact might happen. In other words, are there locations in the study area that are more vulnerable to impacts?**	
Aboriginal peoples (e.g., First Nations, Inuit, Métis, etc.)	☐	☐	☐	☐	☐		
Age –related groups (e.g., early years/children, adolescence/youth, seniors, women of child-bearing age, etc)	☒	☐	☒	☐	☐	- Children: air pollution	
Care givers (e.g., persons providing unpaid support, including people with dependents, young carers, etc)	☐	☐	☐	☐	☐		
Health Conditions (e.g., cancer, diabetes, AIDS, mental illness, addictions/substance use, etc)	☒	☐	☒	☐	☐	- More at risk	
Disability (e.g., physical, deaf, deafened or hard of hearing, visual, intellectual, developmental, learning,, etc.)	☐	☐	☐	☐	☐		
Employed persons or worker groups (e.g., occupations, sectors, unionized/non-unionized, etc)	☒	☐	☒	☐	☐	Differences in occupational risks and quality of jobs between options	

Notes from Table 3 – NGO's, Parks and Recreation, TRCA							
	Potential Impacts					Priority	Comments/Evidence
Determinants of Health	**Positive**	**Neutral**	**Negative**	**Not enough information**	**N/A**	**1-less important 2-important 3-very important**	**Please think about the three options. Is the impact similar or different for the options? Please describe the differences.**
Ethno-racial communities (e.g., racialized groups, ethno-cultural communities)	☐	☐	☐	☐	☐		
Francophone (including new immigrant francophones, deaf communities using LSQ/LSF etc.)	☐	☐	☐	☐	☐		
Homeless (including marginally or under-housed, etc.)	☐	☐	☐	☐	☐		
Immigrants and migration status (e.g. undocumented, tourists, temporary visa, refugees, asylum seekers, newly arrived immigrants, permanent residents, other immigrant group)	☐	☐	☐	☐	☐		
Linguistic communities (e.g., uncomfortable using English or French, literacy affects communication, etc.)	☐	☐	☐	☐	☐		
Low income or economically disadvantaged (e.g., unemployed, underemployed, precariously employed, in receipt of social assistance, etc.)	☐	☐	☐	☐	☐		
Marital status (e.g. single, married, divorced, common-law, etc)	☐	☐	☐	☐	☐		
Religious/faith or persons with political beliefs (e.g. recognized religious denominations,	☐	☐	☐	☐	☐		

Notes from Table 3 – NGO's, Parks and Recreation, TRCA							
	Potential Impacts					Priority	Comments/Evidence
Determinants of Health	**Positive**	**Neutral**	**Negative**	**Not enough information**	**N/A**	**1-less important 2-important 3-very important**	**Please think about the three options. Is the impact similar or different for the options? Please describe the differences.**
atheists, other belief systems, political groups, etc)							
Neighbourhood characteristics (e.g., neighbourhood improvement areas (NIAs), , under-serviced areas, geographic/social isolation, etc.)	☐	☐	☐	☐	☐		
Sex/gender (e.g., male, female, women, men, trans, transsexual, transgendered, two-spirited, etc.)	☐	☐	☐	☐	☐		
Sexual orientation (e.g., heterosexual, lesbian, gay, bisexual)	☐	☐	☐	☐	☐		
Other: Please describe the population(s) below							
Other (Specify)	☐	☐	☐	☐	☐		
Other (Specify)	☐	☐	☐	☐	☐		

Appendix D: Summary of 2nd HIA Stakeholder Meeting

Health Impact Assessment of Biosolids Management Alternatives for the Highland Creek Treatment Plant

Stakeholders Meeting No. 2

Meeting Notes

Date: Thursday, June 11, 2015
Location: Royal Canadian Legion, 45 Lawson Rd, Scarborough
Time: 4:30 pm – 8:30 pm
Attendees: Refer to Attachment A

The purpose of this meeting was to present the preliminary results of the Health Impact Assessment (HIA) to the HIA Stakeholder Group and to obtain feedback on where the HIA needed more clarity. Stakeholders were also asked for input on recommendations to enhance the findings of the HIA.

Item **Discussion**

1. Opening Remarks

City and consultant team members introduced a number of topic areas related to the Class EA and the HIA. The speakers and topics covered were as follows:

- Ronald Macfarlane, Toronto Public Health: Welcome, introduction to the purpose of the meeting and explanation of where we are in the HIA process
- Ame-Lia Tamburrini, Habitat Health Impact Consulting: Overview of agenda for the meeting, introductions
- Deborah Ross, CIMA: Reminder of the current HCTP operations, Class EA process and integration of HIA results into the Class EA, the short-list of biosolids management alternatives being considered in the Class EA, and description of the two short-listed biosolids transport routes.
- Josephine Archbold, Toronto Public Health: Overview of HIA process as a reminder and how HIA helps to support the overall mandate of TPH, outline of the HIA process within the Class EA and where we are now in the process.

2. Presentation of Preliminary HIA and Human Health Risk Assessment (HHRA) Results

Ame-Lia Tamburrini of Habitat and Glenn Ferguson of Intrinsik co-presented the preliminary results of the HIA and HHRA to the participants. The HIA assessed the impact to the study area in terms of both cumulative risk (background plus impact from alternative) and project alone risk. The HIA

identified differences between the alternatives; however, the HIA found that these differences are not discernible from the perspective of health impacts. The air emission studies found that the alternatives will result in substantial reductions in air emissions of contaminants of concern when compared to the existing multiple hearth incinerators. Moreover, the risks associated with the alternatives are small and the predicted contributions to the overall risks to the study area are also small. Predicted project-alone emissions are well below regulatory/toxicological standards and are a small contribution to the current air quality in the study area. When compared to existing air quality, truck traffic, noise and odour, none of the three alternatives are predicted to result in a measurable change in health impacts in the study area.

The HIA identified equity impacts associated with the route selection, with Route 4 having the lowest predicted impact on the community.

Throughout the presentation the City and Consultant team fielded questions about the preliminary results. Overall, the sense was that most participants were generally accepting of the overarching results. However, some stakeholders requested more information on details of the HHRA and odour assessment. Some stakeholders continue to express significant concern regarding the alternatives that are associated with increased truck traffic and the decision to not conduct a life cycle assessment of beneficial use of biosolids (i.e., health assessment of end-of- use).

The participants were asked to raise any outstanding questions and/or concerns in the small group activity that followed so that they could be captured by the note taker.

3. Small Group Work to Identify Questions / Points of Clarification / Recommendations

The participants were divided into the same three groups from the first meeting. The groups were as follows (shown in Attachment A):

1: Community (neighbourhood) organizations:

2: Organizations representing vulnerable populations

3: Environment, parks, recreation and other groups

The three groups were asked to identify outstanding issues, concerns, questions or recommendations with regard to the HIA preliminary results. Each group had a facilitator and a note taker. The facilitator recorded each unique issue/concern/question/recommendation on a Ratings Sheet (see Attachment B). Note takers were present to capture the nuance of the conversation, if there was any.

4. Ideas Ratings Sheets

Following the small group work, Ame-Lia asked the groups to read out loud

each issue/question/concern/recommendation and grouped like-ideas together and placed them on a table at the back of the room with the help of other team members.

Participants were then asked to move around the table and rate their level of agreement for each idea by placing a sticky dot under the appropriate category/column (strong agreement, agreement, neutral, disagreement, strong disagreement, confusion). Participants were also asked to sign each sheet so that there was evidence that each participant had voted their level of agreement only once.

The results of the Ideas Ratings sheet are provided in Table 1 in descending order of agreement. The final column of the table summarizes the study team's response to the ideas/suggestions provided by the HIA Stakeholder Group.

Table 1. Ideas Ratings Sheet Results

	Strong Agree-ment	Agree - ment	Neutral	Disagree-ment	Strong Disagree-ment	Confu -sion	Proposed Recommendation in HIA (City Team response)
1. Expressed community aspiration – how does this project fit in with other infrastrucure and community improvements (i.e. improved quality of life in this community….consider future community) (related to Idea #4, 6, 7 and 8)	8	3					The project team consulted with City Planning and followed up regarding transportation related Environmental Assessements and the City's 10 year bike plan. The City is working on an urban freight strategy. This initiative will help the City better understand and manage truck traffic in the city, including in the study area. For large infrastructure projects the City requires transportation studies to be completed. These studies take into account projected future growth in the area and other projects that are likely to impact traffic. When the 401 is involved, the City also consults with the Ontario Ministry of Transportation. For future HIAs, TPH will invite the local City Planner to participate in the HIA Stakeholder Group. The local City Planner brings the perspective of the Official Plan (guides all development in the City) and the secondary plan (vision for the area). City Planning confirmed there are no significant projects planned in the area that may have an impact on this HIA.
2. Include results of Port Union EA in the assessment of transportation	9	1					City staff followed up on this idea. The Port Union EA has now been incorporatd into both the Class EA and the HIA.

3.	Consider where kids cross (rather than just school locations) in transportation assessment	5	4	1				CIMA will conduct this analysis and bring it forward into the selection of the preferred route.
4.	Sharing data from this study with others to feed into the "bigger picture" (related to Idea #1, 6, 7 and 8)	4	5	1				See response to #1.
5.	How can we leverage financial benefits derived from Alternative 2 and 3 back into the community? E.g. Build important facilities in community (access to food and shopping), jobs	8		2				The City incurrs significant costs to manage biosolids, regardless of the management approach. Unfortunately, there are no current or anticipated financial benefits derived from any alternative. The relative costs of the management alternatives will be assesed with the Class EA.
6.	Better communication around extra trucks on the 401 – cumulative impact over the long term from other activities in the community (related to Idea #1, 4, 7 and 8)	3	5	2				See response to #1.
7.	Consider what may happen along the trucking routes (in the future) e.g. new developments, change of land use, bicycle routes (related to Idea #1, 4, 6 and 8)	3	5	2				See response to #1.
8.	Community advisory board – community improvement advisory to benefit community (related to Idea #1, 4, 6 and 7)	7	1	1	1			A Neighbourhood Liaison Group exists for Highland Creek Waste Water Treatment Plant with members from the community. This group is open and any member of the public can join. If you or your group are interested in joining please contact Josie Franch: jfranch@toronto.ca
9.	Health impacts of enhancements should be integrated into the HIA results	4	3	3				Enhancements will be assessed and selected once the best alternative is approved by City Council.
10.	Examine risk/accountability with pellet end point (i.e. labeling, usage, etc.)	2	5	3				Toronto Public Health staff followed up on this recommendation and reviewed the most recent literature on the potential health impacts of the beneficial use of biosolids. While uncertainties remain regarding certain contaminants such as microorganisms, prions, and unregulated

							contaminants such as endocrine disruptors, pharmaceuticals, and personal care products, as in previous reviews undertaken, this review did not identify any evidence of outbreaks of infectious disease or reported health problems related to the beneficial use of biosolids when proper procedures have been followed.
11. Trucks on road during the night time (less risk of accidents and nuisance)	2	5	1	1	1		This comment has been recorded and will be brought forward into the next stage of the City's process once a preferred option has been selected and approved by City Council
12. Choose option with the least trucks	5	1	3		1		The process to identify the best option for Higland Creek Treatment Plan involved many factors, including the impact of increased truck traffic.
13. Challenge idea that property values will not be impacted by incinerator and truck traffic	2	4	3				This comment has been brought forward and the evidence related to this factor has been re-examined. It is confirmed that the health evidence does not link a reduction in property values to increased truck traffic at the levels that are relevant to this project. For example, there is one study that found a $500 reduction in property values when 1000 trucks were added to the adjacent roads. This intensity of truck traffic is much higher than the predictions for this assessment.
14. Make sure contractors that manage biosolids and pellets are good actors with environmental, social and health impacts (i.e. ongoing evaluation)	2	4	3			1	The City of Toronto already has these provisions in the contractor requirements. However, TPH has raised this issue with TW to explore if further enhancements are warranted. Any required recommendations will be brought forward into the next stage of the process.
15. Consider odour, pollution, noise, and dust from the plant itself (in addition to the trucks)	2	4	3			1	Odour and pollution from the plant operations were considered in the Class EA and the HIA. Noise and dust at the plant site are not expected to change from current conditions and therefore were scoped out of the EA/HIA.

16. Can we put in bike lanes in community to offset increase truck traffic?	1	4	5				The City's 10 year bike lane plan has been consulted (https://torontocyclingnetwork.metroquest.ca/). There are a number of bike lanes that are proposed in Wards 43 and 44. The City must factor in many considerations when planning the best possible routes for future bike lanes. There is currently a bike lane planned for Port Union (Route 4). This plan has been incorporated into the assesement. City Staff will share the preferred option with staff working on the City's bike path plans for their consideration.

Attachment A: Attendees at the 2nd HIA Stakeholder Group Meeting

Category	Participants
City and Consultant Team for Class EA and HIA	Nancy Fleming, Toronto Water
	Josie Franch, Toronto Public Consultation Unit
	Josephine Archbold, Toronto Public Health
	Rosie Mishaiel, Toronto Public Health
	Ronald Macfarlane, Toronto Public Health
	Deborah Ross, CIMA
	Erin Longworth, CIMA
	Glenn Ferguson, Intrinsik Environmental Sciences Inc.
	Ame-Lia Tamburrini, Habitat Health Impact Consulting
Community Groups (Table #1)	Jennifer McKelvie, Centennial Community and Recreation Association
	Ron Wooten as alternate for Allen Elias, Coronation Community Association
	Richa Sood, Highland Creek Community Association
	Elliotte Boyko, West Rouge Community Association
	Barbara McElgunn, Highland Creek Neighbourhood Liaison Committee
Organizations representing Vulnerable Community Members (Table #2)	Mario Silva, Toronto District School Board
	Brian Parris, Community Development Officer, Toronto Public Health
	Michelle Joseph as alternate for Nneka Perry, East Scarborough Boys & Girls Club
NGOs, Other (Table #3)	Emily Alfred as alternate for Heather Marshall, Toronto Environment Alliance (TEA)
	John Stapleton, Open Policy Ontario
	Arlen Leeming, Toronto Regional Conservation Authority (TRCA)

The following organizations were also invited, but were unavailable to participate:

- Canadian Association for Physicians for the Environment
- Canadian Environmental Law Association
- Conseil Scolaire de district catholique Centre-Sud
- East Scarborough Storefront Hub
- Friends of the Guild Park and Gardens

- Kinstron Galloway Orton Park Action
- Local Immigration Partnership, Toronto East Quadrant (participated in first meeting)
- Mornelle Court Coalition
- Native Child and Family Services of Toronto (included as key informant interview)
- Ontario Early Years Centre
- Rotary Club – Toronto East
- Scarborough East
- Scarborough Baseball Assocation
- Scarborough Basketball Association
- Scarborough Centre for Healthy Communities
- Scarborough College Athletics Association
- Scarborough Residents Unite
- Scarborough Village Aciton for Neighbourhood Change
- City of Toronto: Parks, Forestry and Recreation
- Toronto Catholic District School Board (participated in first meeting)
- Toronto East Community Awareness and Emergency Planning
- Wellesley Institute
- West Hill Community Association
- West Rouge Sports & Recreation Association

Attachment B: Sample Ratings Sheet

*Write one **idea** here in large letters:*

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Signatures

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Do you agree? *Fill your one dot below & sign on the right:*

						
Strong Agreement	**Agreement**	**Neutral**	**Disagreement**	**Strong Disagreement**		***Confusion***

Appendix E: Community Profile for HCTP Study Area

Community Health Profile

Prepared for the Health Impact Assessment of Biosolids Management Alternatives

Prepared by:
Habitat Health Impact Consulting

Prepared for:
CIMA Canada Inc.

Developed for:
Medical Officer of Health of the City of Toronto

Oct 19, 2015

Habitat
HEALTH IMPACT CONSULTING

1. Purpose of Community Profile

Describing the health status of affected populations is important in HIAs for several reasons. First, it helps to identify what health challenges are currently being experienced, in order to identify whether these may be exacerbated by the proposed project. Second, it helps to identify potentially vulnerable population groups that may experience health inequities as a result of the proposed activities and the distribution of the potential inequities. The data that is collected and presented for a community health profile should therefore be specific to the health areas being assessed in the HIA.

Each of the health indicators that are presented in the community health profile (e.g. education, child health) may be affected by the proposed HCTP Biosolids Management alternatives. They may also help identify potentially vulnerable population groups. Table 1 describes the rationale for the selection of the indicators included in this HIA.

Table 1: Rationale for Inclusion of Health Indicator Categories in Community Profile

Health Indicator Categories	Rationale for Inclusion
Population size, age distribution	Population size: the number of people describes the size of the population potentially affected by a change in environmental or social conditions. Age distribution: younger and older people tend to be more vulnerable to many of the health areas examined in the HIA: e.g. traffic safety, air quality, noise.
Immigration status	Immigration status is relevant to health because immigrants often face language or education barriers that influence their opportunities for employment, income, housing, and overall wellbeing. These barriers can act as impediments to optimal health, especially for recent immigrants.
Visible minority and Aboriginal populations	Visible minorities and Aboriginal populations may experience barriers to access social, economic and cultural resources due to social exclusion. These population groups can be at higher risk of poor health outcomes.
Education	Low educational attainment is associated with challenges in obtaining health supports; this indicator category therefore identifies potential vulnerability.
Employment and income	Stable employment and high levels of income tend to be protective for health. Groups with lower levels of employment and income experience poorer health outcomes.
Child health	The health of children and newborns is a standard population indicator of overall health within a community. In this case, these indicators help to identify pockets of health vulnerability.
Injuries	Injuries are a preventable health outcome. Where injury rates are high, there may be either behavioural patterns that increase vulnerability or insufficient infrastructure to support and protect health.
Mental wellbeing	Stress and anxiety are factors that limit people's ability to adapt to changes to their environment. A high prevalence rate of indicators related to stress and anxiety may indicate that communities are more vulnerable to adverse effects of change.
Chronic health conditions	People with pre-existing chronic health conditions are often more vulnerable to additional adverse outcomes from biologic, environmental or social stressors. Additionally, chronic conditions affect other health determinants, such as workforce participation and economic impacts.
Infectious diseases	Higher levels of infectious disease indicate increased vulnerability of the population.

It should be noted that the specific indicators that are presented within each health indicator category (e.g. visible minority as a percentage of total population or percent physician visits for asthma) are not necessarily those that would be affected by the Biosolids Management Alternatives. Rather these indicators have been selected because data are available for the study area and because they illustrate important characteristics of relevance to the assessment of impacts of the Project.

2. Data Notes

The notes below are intended to proactively address questions about data quality and interpretation of data. These notes directly stem from comments received from TPH and are addressed at their request.

Age-standardization: To the extent possible, data presented in the tables are age-standardized. Age-standardization allows rates of specific conditions to be compared among populations that have different age structures: in this case, between different communities in the study area and the City of Toronto as a whole. If the age distribution of two populations is quite different—for example, one region has a much higher proportion of seniors—the rates of some health conditions would be expected to be higher simply due to the older age of the population. Age-standardization calculates the rate that would be seen if the two populations had the same age structure. This allows a fair comparison: any differences are due to factors other than a different age structure in the population—for example, differences in the number of people developing disease, the severity of illness, or the effectiveness or availability of treatment. If data were to be used for surveillance and following up on health status overtime, age-specific data, rather than age-standardized data would be more useful.

NHS data: Data presented in Tables 11 through 13 come from the National Household Survey, a voluntary survey that is distributed to a percentage of Canadian households.[1] These data are considered unreliable for small area analysis and TPH's official position is to not use NHS data for surveillance purposes[2]. Within these tables there are discrepancies between what is reported at the Ward level and what is presented at the community level (i.e. the average numbers for the Ward do not correspond with individual values presented for communities). These discrepancies may be due to the unreliable nature of the data for small areas. The reader is reminded that data presented in this report are for descriptive purposes only and are not intended for surveillance purposes.

Comparison to City of Toronto: Comparing both neighbourhood and Ward level data to the City of Toronto data gives a sense of the extent to which specific communities in the study area are disadvantaged or advantaged. The more disadvantaged communities are, compared to Toronto as a whole, the more desirable it is to avoid exacerbation of poor health outcomes and determinants of ill health as a result of proposed activities. In this way, this information helps in the development of recommendations and in determining where impacts may be felt more greatly in the particular populations in the community.

Challenges with health data: As previously stated in Section 4.7 Limitations, it is not possible to ascertain the exact causes of health conditions or social circumstances using cross-sectional data. This point serves as a reminder to the reader that the data presented below are not intended to link to the HCTP Biosolids Management Alternatives or even to current or past operations of the plant. These data simply serve as a description of current health status in a dynamic community that is undergoing change.

3. Demographic and Socioeconomic Profile

Population Size and Age Distribution

The HCTP is located in the community of West Hill. In order to capture the appropriate area of influence, Wards 43 and 44 were defined as the study area (See Scoping Results in HIA Report). In 2011, the study area had a total population of 115,370 people: 55,130 people in Ward 43 and 60,240 in Ward 44. Table 2 shows the age distribution of the population, relative to the rest of Toronto.

Table 2: Age Distribution of the Population in the Study Area, 2011

	Ward 43						Ward 44					Toronto
Neighbourhood	**135**	**136**	**137**	**139**	**140**	**Overall**	**131**	**133**	**134**	**136**	**Overall**	
Total population size												
Population	17,580	26,560	53,330	16,580	9,785	**55,130**	45,905	13,100	13,085	26,560	**60,240**	2,615,090
Age distribution												
ages 0-14 (%)	17.8	18.6	19.3	21.0	13.1	**19.3**	18.6	16.4	13.3	18.6	**15.7**	**15.4**
ages 15-24 (%)	16.2	14.8	14.2	14.7	11.0	**14.1**	15.1	14.6	15.7	14.8	**14.7**	**12.7**
ages 25-64 (%)	52.9	53.0	52.6	52.2	50.4	**51.7**	55.8	54.3	55.8	53.0	**54.9**	**57.4**
ages 65 and over (%)	13.1	13.6	13.9	12.1	25.4	**14.9**	10.5	14.7	15.2	13.6	**14.9**	**14.1**
Median age												
Median age (years)	38.4	39.4	36.1	36.9	49.2	**39**	37.8	43.0	43.2	39.4	**43**	**39**

Neighbourhood names: 131 – Rouge; 133 – Centennial Scarborough; 134 – Highland Creek; 135 – Morningside; 136 – West Hill; 137 – Woburn; 139 – Scarborough Village; 140 – Guildwood

Source: Statistics Canada[3], City of Toronto[4], City of Toronto[5], Toronto Community Health Profiles Partnership[6]

Ward 43 appears to have a higher proportion of children than either Ward 44 or Toronto as a whole, with 19.3, 15.7 and 15.4 percent of the population age 14 or under, respectively. Both Wards have a nearly identical proportion of seniors (65 years and over). At the neighbourhood level, the Guildwood community (140) had the greatest proportion of seniors of all neighbourhoods, with seniors making up over one-quarter of the population; while Scarborough Village (139) had the highest proportion of children, at 21 percent (note that only a portion of Scarborough Village is situated within the study area).

Immigration Status

Immigration status is relevant to health because immigrants often face language or education barriers that influence their opportunities for employment, income, housing, and overall wellbeing. These barriers can act as impediments to optimal health, especially for recent immigrants (newcomers). Table 3 presents data on immigration status within the study area.

Table 3: Immigration Status in the Study Area, 2011

	Ward 43						Ward 44					Toronto
Neighbourhood	**135**	**136**	**137**	**139**	**140**	**Overall**	**131**	**133**	**134**	**136**	**Overall**	
Born in Canada (%)	42	51	39	41	67	**48**	43	62	43	51	**53**	49
Immigrated before 2001 (%)	38	34	35	32	29	**34**	44	29	49	34	**37**	33
Immigrated between 2001 - 2011 (%)	18	15	23	23	4	**17**	12	8	8	15	**9**	16
Non-permanent residents (%)	2	0	3	4	0	**1**	1	1	0	0	**1**	3

Neighbourhood names: 131 – Rouge; 133 – Centennial Scarborough; 134 – Highland Creek; 135 – Morningside; 136 – West Hill; 137 – Woburn; 139 – Scarborough Village; 140 – Guildwood

Source: City of Toronto[7], City of Toronto[8]

The percent of newcomers (immigrated between 2001-2011) is higher in Ward 43 (17%) compared to Ward 44 (9%), but is similar to the City of Toronto overall (16%). At the neighbourhood level there is wide community-to-community variation. Scarborough Village (139) has the highest percentage of new immigrants (23%) and non-permanent residents (4%). Guildwood community (140) has a considerably lower proportion of new immigrants (2001-2011) than the other neighbourhoods in the study area (4%).

Visible Minority and Aboriginal Populations

Members of visible minority (i.e. racialized) groups and First Nations, Métis and Inuit peoples are more likely to be denied the opportunity to participate in Canadian life, or experience social exclusion, than other Canadians.[9] Social exclusion is detrimental to health because it limits access to social, economic and cultural resources. Accordingly, these population groups are more likely to be unemployed, paid lower wages, receive less education and have poorer access to health and social services.[9] Social exclusion contributes to a host of negative health outcomes such as adult-onset diabetes, respiratory disease and cardiovascular disease[9]

Table 4: Visible Minority and Aboriginal Populations by Neighbourhood

	Ward 43					Ward 44				Toronto
	135	136	137	139	140	131	133	134	136	
Visible minority as (%) of population (2011)	72	60	73	70	25	79	38	71	60	49
Aboriginal persons as (%) of total population (2006)	0.26-0.50	0.76-1.25	0.51-0.75	0.26-0.50	0.26-0.50	0.26-0.50	0.51-0.75	0.26-0.50	0.76-1.25	not available

Neighbourhood names: 131 – Rouge; 133 – Centennial Scarborough; 134 – Highland Creek; 135 – Morningside; 136 – West Hill; 137 – Woburn; 139 – Scarborough Village; 140 - Guildwood

Source: City of Toronto[7], Toronto Community Health Profiles Partnership[10]

Table 4 summarizes the readily available data on the visible minority and aboriginal populations in the study area. Most of the neighbourhoods in the study area have visible minority populations that are higher than the Toronto average (49%). Rouge has the highest proportion of visible minorities (79%), while only 25% of the population in Guildwood is identified as belonging to a visible minority group.

There is a great deal of variation in estimated population numbers for Toronto's Aboriginal population. While 2011 National Household Survey data from Statistics Canada reports an estimated 36,995 people identifying as First Nations, Metis, Inuit or other Aboriginal identity residing in the City of Toronto,[11] agencies serving the Aboriginal community estimate that there are 70,000 residents who belong to this community within the city limits.[12] It is important to note that First Nations are often underrepresented in the Canadian Census and that this issue is exacerbated in the National Household Survey. Although recent neighbourhood or ward-level data on Aboriginal populations could not be located, data from 2006 indicates that West Hill had the largest proportion of Aboriginal population (between 0.76 and 1.25% of the total population) among the study neighbourhoods.

Education

Education is strongly tied to health and well-being and is linked to a wide range of biophysical and mental health outcomes. In general, higher levels of education and literacy are associated with more beneficial health outcomes, whereas lower levels of education and literacy are linked to poorer health outcomes.[13]

Table 5 presents summary data on the highest level of educational attainment for the population in the study area.

Table 5: Educational Attainment in the Study Area, 2011

	Ward 43						Ward 44					Toronto
Neighbourhood	**135**	**136**	**137**	**139**	**140**	**Overall**	**131**	**133**	**134**	**136**	**Overall**	
Highest Level of Education among people age 25-64 years												
No certificate (%)	13	13	14	17	6	**20**	9	5	6	13	**14**	11
High school (%)	27	29	26	27	25	**30**	24	19	21	29	**26**	21
Postsecondary certificate, diploma or degree (%)	60	58	60	56	70	**50**	67	77	72	58	**60**	69

Neighbourhood names: 131 – Rouge; 133 – Centennial Scarborough; 134 – Highland Creek; 135 – Morningside; 136 – West Hill; 137 – Woburn; 139 – Scarborough Village; 140 - Guildwood

Source: City of Toronto[7], City of Toronto[8]

As shown in Table 5 educational attainment levels for Wards 43 and 44 are fairly similar, with both wards having lower levels of education when compared to the City of Toronto. The proportion of people in Wards 43, 44 and the City of Toronto, respectively, having attained a post-secondary certificate, diploma or degree is 50%, 60% and 69%.

There is wide variation amongst the communities in the Wards, with Guildwood, Centennial Scarborough, and Highland Creek all having relatively high levels of educational attainment compared to the overall Ward averages. Scarborough Village has the highest percentage of residents having attained no certificate of education within the study area (17%).

Employment and Income

Employment and income are associated with a wide range of health outcomes such as birth weight and infant mortality, self-rated health, adult mortality, cardiovascular and other chronic diseases, acute infectious diseases, mental well-being, social pathologies, and health service utilization.[14,15] Overall, the higher the income and better the employment (i.e., safe, secure and steady) the better off health outcomes tend to be.

Table 6 presents data on key employment and income indicators in the study area.

Table 6: Employment and Income Profile for the Study Area, 2011*

	Ward 43						Ward 44					Toronto
Neighbourhood	**135**	**136**	**137**	**139**	**140**	**Overall**	**131**	**133**	**134**	**136**	**Overall**	
Household Income and housing affordability (2010)												
Average after-tax household income ($)	59,179	55,845	56,220	53,634	79,941	**67,686**	82,581	97,435	93,877	55,845	**100,626**	87,038
Median after-tax household income ($)	50,069	46,803	47,908	40,181	67,678	**51,064**	72,784	86,816	87,321	46,803	**85,722**	58,381
Low income (prevalence, %)	22	25	25	33	9	**24**	12	7	8	25	**11**	19.3
Spending 30% or more of household income on shelter costs (%)	35	29	33	42	21	--	29	20	19	29	--	35
Employment, population 15+ years												
Population 15+ years	14,210	21,440	42,730	12,805	8,340	**44,015**	37,010	10,925	11,170	21,440	**50,275**	2,175,830
Labour force participation rate (%)	61	58	58	58	60	**58**	68	68	66	58	**66**	64
Unemployment rate (%)	13	13	13	14	7	**13**	10	8	9	13	**9**	9

Neighbourhood names: 131 – Rouge; 133 – Centennial Scarborough; 134 – Highland Creek; 135 – Morningside; 136 – West Hill; 137 – Woburn; 139 – Scarborough Village; 140 – Guildwood
Notes: -- data not available
Source: City of Toronto[7], City of Toronto[8]

The data presented in Table 6 suggest that residents of Ward 44 generally experience better socio-economic conditions than the residents of Ward 43. Average and median incomes tend to be lower in Ward 43 than Ward 44, while the unemployment rate is 13% in Ward 43 compared to 9% in both Ward 44 and the City of Toronto. At the neighbourhood level, the communities of Morningside (135), West Hill (136) and Scarborough Village (139) show the lowest income levels and the highest unemployment rates of all the communities in the study area in 2010.

Finally, housing affordability information indicates that 42% of households in Scarborough Village spend 30% or more of household income on housing costs. This indicator is a measure of unaffordable housing. Those households spending more than 30% of their income on housing often limit money spent on food, utilities, and safe shelter options, which can lead to poorer health outcomes.[16] Guildwood (140), Centennial Scarborough (133), and Highland Creek (134) have a relatively low proportion of people in this category.

4. Community Well-Being

This subsection on community well-being presents measures that are commonly used to describe population health and to compare the health of one population group to others.

* See Section 6.2 Data Notes for interpretation of data in this table

Child Health

Early childhood experiences, particularly from birth to six years of age, are critical in shaping the physical and mental health of individuals into adulthood and ultimately contributing to the healthy functioning of communities.[17,18] Early childhood experiences have been linked to lifelong coping skills, resistance to health problems and overall health and wellbeing. Research has found that the longer a child lives under conditions of material and social deprivation, the greater the likelihood they will show adverse health and developmental outcomes.[19]

Table 7 provides available data on child health indicators in the study area.

Table 7: Data on Child Health Indicators in the Study Area, 2009-2011

	Ward 43						Ward 44					Toronto
Neighbourhood	**135**	**136**	**137**	**139**	**140**	**Overall**	**131**	**133**	**134**	**136**	**Overall**	
Low Birth Weight Rate (% of singleton newborn babies)	6.5	7.5*	8.2*	7.8*	5.1	**8.2**	6.4	6.7	7.3	7.5*	**6.2**	5.8
Vulnerable in Terms of Readiness to Learn (% of kindergarten students)	--	--	--	--	--	**28.2**	--	--	--	--	**24.8**	26.9

Neighbourhood names: 131 – Rouge; 133 – Centennial Scarborough; 134 – Highland Creek; 135 – Morningside; 136 – West Hill; 137 – Woburn; 139 – Scarborough Village; 140 – Guildwood

Notes: * indicates significantly different than City of Toronto; -- data not available

Source: Toronto Community Health Profiles Partnership[20]; City of Toronto[21]

Low birth weight is strongly correlated with the newborn's health and ability to survive. Low birth-weight babies—that is, newborns weighing less than 2,500 grams—are much more likely to develop cerebral palsy, learning disabilities, vision problems, respiratory problems and other conditions. Rates of low birth weight were significantly higher than the City of Toronto in West Hill, Woburn, and Scarborough Village.

Readiness to learn measures five key areas of early child development, including physical health and wellbeing, social competence, emotional maturity, language and cognitive development and communication skills and general knowledge, which are known to be good predictors of adult health, education, and social outcomes. Approximately one-quarter of the kindergarten children in the study area and the City of Toronto were classified as vulnerable under this category. Vulnerability in terms of readiness to learn has the potential to influence success in school and increase risk for poor health outcomes in the future.

Injuries

Injuries are a major cause of death and disability. They are the fourth largest cause of death in Canada and the prime cause of death and hospitalization for Canadians under age 45.[22] Injuries also place demand on the healthcare system, including demand on ambulances, medical air transport, emergency services and hospitalization. Table 8 presents data on injury-related emergency department visits for the study area for the period 2009-2011.

Table 8: Injury-related Emergency Department Visits in the Study Area, 2009 - 2011

	Ward 43	Ward 44	Toronto
Children and youth (per 100,000)	9,171	9,575	9,902
Seniors (per 100,000)	9,331	7,704*	9,288
Notes: * indicates significantly different from City of Toronto			
Source: City of Toronto[21]			

As shown in the table, Ward 44, Ward 43 and the City of Toronto had comparable injury-related emergency department visits among children and youth. Ward 44 had lower injury-related emergency department visits among seniors compared to the City of Toronto.

Mental Well-Being

Mental well-being is an important dimension of health. People with good mental health are able to realize their potential, to cope with the normal stresses of life, to work productively and to make a contribution to their community.[23,24] Mental well-being is also linked to a variety of physical health outcomes; for example, stress and anxiety are thought to contribute to the development of many poor health conditions including heart disease, stroke, high blood pressure, upper respiratory disease and poor immune response.[25]

Table 9 presents the percentage of people who visited a doctor for symptoms related to mental health in the study area. In West Hill (136) and Scarborough Village (139), visits to a physician for mental health reasons were statistically significantly higher than the City of Toronto. Rouge (131), Centennial Scarborough (133), Highland Creek (134), and Woburn (137) had a significantly lower proportion of mental health physician visits.

Table 9: Percent of Physician Visits for Mental Health Symptoms in the Study Area, 2012

	Ward 43						Ward 44					Toronto
Neighbourhood	135	136	137	139	140	Overall	131	133	134	136	Overall	
Mental health visits*, aged 20 and over (%)	7.6	8.9*	7.2*	9.2*	8.2	--	7.0*	7.5*	7.0*	8.9*	--	8.1

Neighbourhood names: 131 – Rouge; 133 – Centennial Scarborough; 134 – Highland Creek; 135 – Morningside; 136 – West Hill; 137 – Woburn; 139 – Scarborough Village; 140 – Guildwood

Note: data are age-standardized; -- data not available; *indicates significantly different from the City of Toronto; *Mental health conditions are defined by the occurrence of a doctor`s visit for a symptom related to mental health.

Source: Toronto Community Health Profiles Partnership[26]

Chronic Health Conditions

Chronic conditions are important to individual health because they detract from quality of life and often trigger other health problems. For example, overweight and obesity have been linked to health risks such as Type 2 diabetes, hypertension, cardiovascular disease, and some types of cancer, among other

diseases.[27] Chronic health conditions are also an important public health issue because they are costly and place a significant demand on health care services.[28]

Rates of physician visits for certain chronic diseases for the study area are presented in Table 10. Data were not available at the level of the Ward; therefore, rates are presented at the neighbourhood level for comparison with the City of Toronto.

Table 10: Percent of Physician Visits for Selected Chronic Conditions in the Study Area, age 20+ years, 2012

	Ward 43						Ward 44					Toronto
Neighbourhood	**135**	**136**	**137**	**139**	**140**	**Overall**	**131**	**133**	**134**	**136**	**Overall**	
Diabetes (%)	16.0*	15.4*	16.2*	16.4*	11.1*	--	15.1*	11.7	15.7*	15.4*	--	11.8
High blood pressure or hypertension (%)	28.3*	27.4*	26.7*	26.9*	25.3*	--	26.3*	24.0*	26.6*	27.4*	--	22.7
Asthma (%)	14.0*	14.8*	11.8*	13.2	15.2*	--	14.6*	14.8*	14.8*	14.8*	--	12.7
Chronic obstructive pulmonary disease (%)	9.6	11.0*	8.8*	9.9	9.6	--	8.6*	6.9*	7.2*	11.0*	--	9.6

Neighbourhood names: 131 – Rouge; 133 – Centennial Scarborough; 134 – Highland Creek; 135 – Morningside; 136 – West Hill; 137 – Woburn; 139 – Scarborough Village; 140 – Guildwood
Notes: -- data not available; * indicates significantly different from the City of Toronto; all data are age-standardized
Source: Toronto Community Health Profiles Partnership[26]

The rates of physician visits for chronic disease vary across neighbourhoods in the study area; however, overall the proportion of physician visits for diabetes, high blood pressure and asthma appear higher in Wards 43 and 44 compared to the City of Toronto. Across all locations, these four chronic conditions comprised approximately two-thirds of physician visits.

Morbidity and mortality measures are used to depict the impact of different diseases in a population and to compare this impact over various geographic regions. Rates of hospitalization and mortality from all causes, including cancers, circulatory diseases and respiratory diseases for Wards 43 and 44 and the City of Toronto, are shown in Table 11 (rates were not available at the neighbourhood level).

Table 11: Hospitalization and Mortality Rates for Various Chronic Diseases

	Ward 43	Ward 44	Toronto
Hospitalization rate (per 100,000 people), 2009-2011			
Respiratory diseases	534	404	425
All cancers	311	328	340
Cardiovascular diseases	625	602	667
Mortality rate (per 100,000 people), 2007-2009			
Respiratory diseases	45	45	37
All cancers	136	149	141
Cardiovascular diseases	147	141	125

Source: City of Toronto[29]

Hospitalization rates for cancer and cardiovascular disease were similar across the study area and the City of Toronto between 2009 and 2011, while the estimated hospitalization rates for respiratory disease show some variation. Mortality rates for respiratory disease, cancers and cardiovascular diseases were similar across the Wards between 2007 and 2009.

Infectious Diseases

Infectious diseases are also known as communicable diseases and include any disease that is transmitted from one person to another or from an insect or animal source (such as a mosquito or bird) to a person. Rates for selected infectious diseases in Wards 43 and 44, as well as the City of Toronto, are presented in Table 12 (rates were not available at the neighbourhood level).

Rates of tuberculosis, influenza and sexually transmitted infections did not differ between Ward 43 and Ward 44 and the City of Toronto for the combined period of 2007 to 2011. Enteric diseases (e.g. campylobacter, salmonellosis, giardiasis and cryptosporidiosis) were significantly lower in Ward 44 compared to the City of Toronto.

Table 12: Age-Standardized Incidence Rates for Selected Infectious Diseases, 2007-2011

Reported cases per 100,000 people	Ward 43	Ward 44	Toronto
Tuberculosis (2007 - 2011, per 100,000)	12	8	11
Influenza (2011, per 100,000)	30	36	37
Enteric Diseases (2011, per 100,000)	81	65*	104
Sexually Transmitted Infections (2011, per 100,000)	707	574	548
* indicates significantly different from the City of Toronto			
Source: City of Toronto[21]			

5. Summary of Community Health Profile

This section describes the key summary points from the community profile that are important for understanding the assessment of impacts. Table 13 and Table 14 below summarize all data in table format.

- From a socio-economic perspective, the study area population does not substantially differ from the City of Toronto. Like the City, the study area is ethnically diverse and includes a mix of high and low income populations.
- Ward 44 is slightly more socio-economically advantaged over Ward 43, showing higher levels of income, education and lower levels of employment – this may mean that Ward 44, in general, is less susceptible to health impacts resulting from changing environmental conditions associated with the 3 alternatives.
- Ward 43 also has a higher proportion of children and newcomers than Ward 44 and the City. Children and newcomers are particularly susceptible to certain health impacts.
- The seniors population is similar in both Wards compared to the City; however, there is a particularly high proportion of seniors in the community of Guildwood. The location of seniors is important for the assessment of air quality, traffic safety, soil quality and stress and risk perception.

- From a health perspective, the study area is similar to the city of Toronto. However, Scarborough Village and West Hill tend to have higher levels of some poor health conditions compared to the City (e.g. low birth weight, proportion of physician visits used for mental health, diabetes, and high blood pressure). No other consistent trends are present for health outcome data.
- Since the HCTP is located in the community of West Hill particular attention will be paid to impacts on that community, especially since it is already noted as being vulnerable (see Vulnerable Populations below). In general, Scarborough Village is not directly impacted by HCTP operations.

Table 13: Summary of Demographic and Socioeconomic Indicators for HCTP Study Area

Selected Demographic and Socioeconomic Indicators	Wards		Neighbourhoods		Toronto
	Ward 43	Ward 44	Highest	Lowest	
INDICATORS OF HIGHER VULNERABILITY					
Children, 0-14 years (%)	19.3	15.7	Scarborough Village (21%)	Guildwood (13.1%)	15.4
Youth, 15-25 years (%)	14.1	14.7	Morningside (16.2%)	Guildwood (11.0%)	12.7
Seniors population, 65 and older (%)	14.9	14.9	Guildwood (25.4%)	Rouge (10.5%)	14.1
Newcomers, immigrated between 2001 and 2011 (%)	17	9	Scarborough Village and Woburn (23%)	Guildwood (4%)	16
No certificate, education (%)	20	14	Scarborough Village (17%)	Centennial Scarborough (5%)	11
Low income prevalence (%)	24	11	Scarborough Village (33%)	Centennial Scarborough (7%)	19.3
Spending 30% or more of household income on shelter costs (%)	N/A	N/A	Scarborough Village (42%)	Highland Creek (19%)	35
Unemployment (%)	13	9	Scarborough Village (14%)	Guildwood (7%)	9
INDICATORS OF LOWER VULNERABILITY					
Postsecondary certificate, diploma or degree (%)	50	60	Centennial Scarborough (77%)	Scarborough Village (56%)	69
Average after-tax household income ($)	67,686	100,626	Centennial Scarborough ($97,435)	Scarborough Village ($53,634)	70,945
Median after-tax household income ($)	51,064	85,722	Highland Creek ($87,321)	Scarborough Village ($40,181)	52,149
Labour force participation (%)	58	66	Rouge and Centennial Scarborough (68%)	West Hill, Woburn and Scarborough Village (58%)	64

Table 14: Summary of Community Health and Wellbeing Indicators for HCTP Study Area

Community Health and Wellbeing Indicators	Wards		Neighbourhoods		Toronto
	Ward 43	Ward 44	Significantly higher than Toronto	Significantly lower than Toronto	
Low birth weight rate (% of singleton newborn babies)	↑	=	Woburn Scarborough Village West Hill	--	5.8
Vulnerable in terms of readiness to learn (% of kindergarten students)	=	=	N/A	N/A	26.9
Injury-related emergency department visits, children and youth (per 100,000)	=	=	N/A	N/A	9,902
Injury-related emergency department visits, seniors (per 100,000)	=	↓	N/A	N/A	9,288
Mental health (physician visits, aged 20 and over %)	N/A	N/A	Scarborough Village West Hill	Rouge, Highland Creek, Woburn, Centennial Scarborough	8.1
Diabetes (physician visits, aged 20 and over %)	N/A	N/A	Rouge West Hill Highland Creek Morningside Woburn Scarborough Village	Guildwood	11.8
High blood pressure (physician visits, aged 20 and over %)	N/A	N/A	Morningside West Hill Scarborough Village Woburn Highland Creek Rouge Guildwood Centennial Scarborough	--	22.7
Asthma (physician visits, aged 20 and over %)	N/A	N/A	Morningside Rouge West Hill Centennial Scarborough Highland Creek Guildwood	Woburn	12.7
Chronic obstructive pulmonary disease (physician visits, aged 20 and over %)	N/A	N/A	Rouge Woburn West Hill	Centennial Scarborough Highland Creek	9.6
Respiratory diseases, hospitalization rate (per 100,000)	=	=	N/A	N/A	425
All cancers, hospitalization rate (per 100,000)	=	=	N/A	N/A	340
Cardiovascular diseases, hospitalization rate (per 100,000)	=	=	N/A	N/A	667
Respiratory diseases, mortality rate (per 100,000)	=	=	N/A	N/A	37
All cancers, mortality rate (per 100,000)	=	=	N/A	N/A	141
Cardiovascular diseases, mortality rate (per 100,000)	=	=	N/A	N/A	125
Tuberculosis (per 100,000)	=	=	N/A	N/A	11
Influenza (per 100,000)	=	=	N/A	N/A	37
Enteric diseases (per 100,000)	=	↓	N/A	N/A	104
Sexually transmitted infections (per 100,000)	=	=	N/A	N/A	548

Legend:

↑ significantly higher than the City of Toronto = not significantly different than the City of Toronto

↓ significantly lower than the City of Toronto N/A means not available

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