TORONTO

STAFF REPORT FOR ACTION

Health Impact Assessment of Biosolids Management Plan for Highland Creek Treatment Plant

Date:	October 7, 2015
To:	Board of Health
From:	Medical Officer of Health
Wards:	43 and 44
Reference Number:	

SUMMARY

The Highland Creek Treatment Plant (HCTP) is located in southern Scarborough in an industrial area, close to the waterfront trail, parkland, and residential areas. As part of the wastewater treatment process, biosolids are currently being managed by two 38-year old multiple hearth incinerators; however, the incinerators are coming to the end of their service life. To support the decision to replace the incinerators, Toronto Water initiated a Schedule "B" Municipal Class Environmental Assessment (Class EA) to identify the best approach for biosolids management that will replace the multiple hearth incinerators. This process is required by the Ontario Ministry of the Environment and Climate Change. Toronto Water requested that Toronto Public Health (TPH) lead a Health Impact Assessment (HIA) as part of the EA process.

The HIA examined the potential for the proposed biosolids management alternatives to affect a number of health determinants in the study area. 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, 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 traffic (namely, safety, odour and noise).

The HIA also examined the potential health impacts along two short-listed proposed traffic 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 relation to pedestrian safety, noise and vulnerable populations. These potential equity impacts should be taken into account when selecting the preferred transportation route.

The report outlines measures that reduce the health impacts of the new biosolids management strategy for HCTP on the community.

RECOMMENDATIONS

The Medical Officer of Health recommends that:

1. City Council direct that when the new biosolids facility is built at the Highland Creek Treatment Plant that:
    a. All risk management measures that were assumed during the Health Impact Assessment and listed in Attachment 7 are implemented;
    b. Route 4, as described in Attachment 1, is implemented as the preferred truck transport route; and

2. The Board of Health forward its decision to the Public Works and Infrastructure Committee to coincide with Committee's consideration of the report from the General Manager, Toronto Water on the Highland Creek Treatment Plant Schedule B Class Environmental Assessment.

Financial Impact

There are no financial impacts from the adoption of this report.

DECISION HISTORY

At its meeting on March 23rd, 2011, Public Works and Infrastructure Committee requested the Medical Officer of Health (MOH) to report to the Public Works and Infrastructure Committee on the potential health impacts of the available biosolids management options for the Highland Creek Treatment Plant (HCTP).
http://app.toronto.ca/tmmis/viewAgendaItemHistory.do?item=2011.PW2.9

On April 26th 2011, the Public Works and Infrastructure Committee received the report from the MOH on the Rapid Health Impact Assessment for Biosolids Management at the HCTP.
http://www.toronto.ca/legdocs/mmis/2011/pw/bgrd/backgroundfile-37363.pdf

On May 17th, 2011, City Council directed City staff to implement the recommended beneficial use biosolids management strategy at the HCTP.
http://app.toronto.ca/tmmis/viewAgendaItemHistory.do?item=2011.PW3.4

At its meeting on November 13th, 2013, City Council directed 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 included a Health Impact Assessment to be conducted under the guidance of the Medical Officer of Health.
http://app.toronto.ca/tmmis/viewAgendaItemHistory.do?item=2013.PW25.6

ISSUE BACKGROUND

The Highland Creek Treatment Plant (HCTP) plant processes 15 percent of Toronto's waste water, producing an average of approximately 100 tonnes of biosolids per day that needs to be managed. The HCTP is located in southern Scarborough situated in an industrial area, close to the waterfront trail, parkland, and residential areas (Figure 1). Biosolids are currently being managed by two 38-year old multiple hearth incinerators; however, the incinerators are 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. The City needs to plan now, to provide time for design and construction of a new biosolids management facility.

Biosolids management at HCTP was included in the Biosolids and Residuals Master Plan, which outlined a plan for all four of the City's waste water treatment plants. The Master Plan identified modern fluidized bed incineration as the preferred option for biosolids management at HCTP. In 2011, Council directed Toronto Water to implement beneficial use at HCTP (namely, 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 focussing on the HCTP facility.

Figure 1: Study Area (Wards 43 and 44) and Location of HCTP.

Over the past decade, TPH has participated in the City's process of assessing and selecting biosolid management options that best protect the health of the public. In November 2004, the MOH reported to the Board on the potential risks associated with the use of pelletizers (Health and Ecological Risk Associated with Toronto Biosolids Pellets) and in July 2005, the Board received TPH staff comments on the draft Biosolids and Residuals Master Plan and made recommendations to the General Manager of Toronto Water. Both reports are available at: http://www.toronto.ca/health/reports.

Previous TPH reviews 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. The 2011 Rapid HIA on management options at the HCTP determined that beneficial use was likely the option with the lowest impact on air quality. The Rapid HIA indicated that beneficial use options could have greater negative impacts on quality of community life factors (for example, noise, traffic, and odours) than incineration, but noted that the health impact of quality of community life factors are difficult to access and quantify. The Rapid HIA concluded that since air quality in Toronto is still contributing to illness, from a health point of view, the option with the lowest release of air pollutants was preferred.

COMMENTS

Summary of the Health Impact Assessment (HIA) for HCTP

Toronto Water is undertaking a Schedule B Class EA to select a new biosolids management approach for the HCTP. Toronto Public Health, in collaboration with Toronto Water and the Environment and Energy Division, completed an in-depth Health Impact Assessment (HIA) to better understand the potential health and equity impacts of the biosolids management alternatives available for HCTP. The HIA goes beyond the minimum requirements of the Class EA.

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; newcomers; and seniors participated. An expert review team also provided input.

In 2008, TPH developed a HIA Framework. When assessing potential impacts, HIAs consider the various factors or determinants that effect health and consider both potential positive and negative impacts and the distribution of these impacts within the community. The TPH framework was adapted to the specific needs of this project. Existing background conditions and multiple hearth incinerators were used as reference points to help interpret the results.

A literature review, expert input and consultation with the stakeholders were used to identify and confirm the following primary health areas to include in the HIA:

- Air Quality
- Traffic Safety
- Soil Quality
- Stress and Risk Perception (namely, odours and noise)
- Neighbourhood Characteristics (namely, access to green space and leisure, access to public and active transportation, property values, community and social cohesion)

Climate change and job opportunities were identified as secondary areas of concern.

There are two trucking routes being considered in the HIA. Route 1 along Morningside Ave and Route 4 along Port Union Rd. Attachment 1 provides maps of the two proposed traffic routes.

Biosolids Management Alternatives Assessed in the HIA

Three potential biosolids management approaches or alternatives were assessed in the HIA:

- **Alternative 1:** Replacement of the existing older incinerator technology with new fluidized bed incinerators, and continued transport of ash off-site for management.
- **Alternative 2:** Construction of a new truck loading facility and transport of biosolids off-site for management.
- **Alternative 3:** Construction of a new biosolids drying (pelletizer) facility and transport of pellets off-site.

Table 1 provides a brief summary of the current situation and the key differences between the alternatives.

Table 1: Summary of the Biosolid Management Alternatives.

Current Conditions – Multiple Hearth Incinerator	• Residual solids are incinerated. Ash created as by-product of incineration is stored in lagoons • Trucks are used to haul ash to landfill over a two-week period (approximately 9 trucks per day for a total of 86 trucks per year) • Distance to Green Lane: 228 km
Alternative 1 – Fluidized Bed Incinerator	• New fluidized bed incinerators with advanced pollution control technology • Same as current operating conditions as noted above.
Alternative 2 – Biosolids Transport Off-site for Beneficial Use	• Trucks haul biosolids for management offsite (4-6 trucks per day/5 days a week, or 1000-1500 trucks per year) • Distance of haulage: Variable; average one-way distance is 415 km based on the current situation at Ashbridges Bay Treatment Plant
Alternative 3 – On-site Pelletizer and Transport Off-site for Beneficial Use	• Biosolids are processed to evaporate water and create pellets (less than 10% water content) • Trucks are used to haul pellets offsite (1-2 trucks per day/5 days a week or 250-500 trucks per year) • Distance of haulage: Variable. Average one-way distance is 290 km based on the current situation at Ashbridges Bay Treatment Plant

Findings of the HIA

The following sections provide a short summary and interpretation of each health factor assessed in the HIA. A detailed description of methodology and analysis of each health factor are provided in the HIA report: "Health Impact Assessment of Biosolids Management Alternatives". This report and additional Class EA reports that were used to support the HIA are available at: www.toronto.ca/hctpbiosolidsea.

In summary, all three alternatives provide significant improvements to emissions of air pollutants when compared to the existing incinerator. However, among the alternatives, Alternative 1 is anticipated to result in the highest releases of air pollutants. Alternative 2 and 3 are expected to increase risks related to traffic (safety) and annoyance related to odours and noise (risk of perceptible noise change along Route 1 only).

Potential Air Emissions and Predicted Risk

Inhalation Risk

Air emissions from the facility and trucks and the subsequent risks from inhalation of air contaminants were modelled for each alternative (Attachment 2 provides a list of the contaminants of concern). It was assumed that each alternative will use the most up-to-date pollution control systems. For instance, in the event the fluidized bed incinerator is selected, the City would install advance mercury capture technology and use wet scrubbers to reduce particulate matter and water soluble pollutants. In addition, for all alternatives, haulage trucks would meet emission control standards.

As shown in Attachment 3, the contribution of the HCTP to the overall health risk from air pollution is very small. All the alternatives contribute less than 1% to the total cumulative risk in the study area and are expected to reduce the air quality impacts when compared to the current situation. Among the three alternatives, modern fluidized bed incineration (Alternative 1) is anticipated to result in the highest releases of air pollutants. While there are differences, the contribution from the alternatives to respiratory and cardiovascular induced hospitalizations and mortality is very small (Attachment 3) and the overall risks from the alternatives are well below a health-based thresholds (concentration ratio of 1) for non-carcinogens and 1-in-1 million excess cancer risk (see Figures 2 and 3).

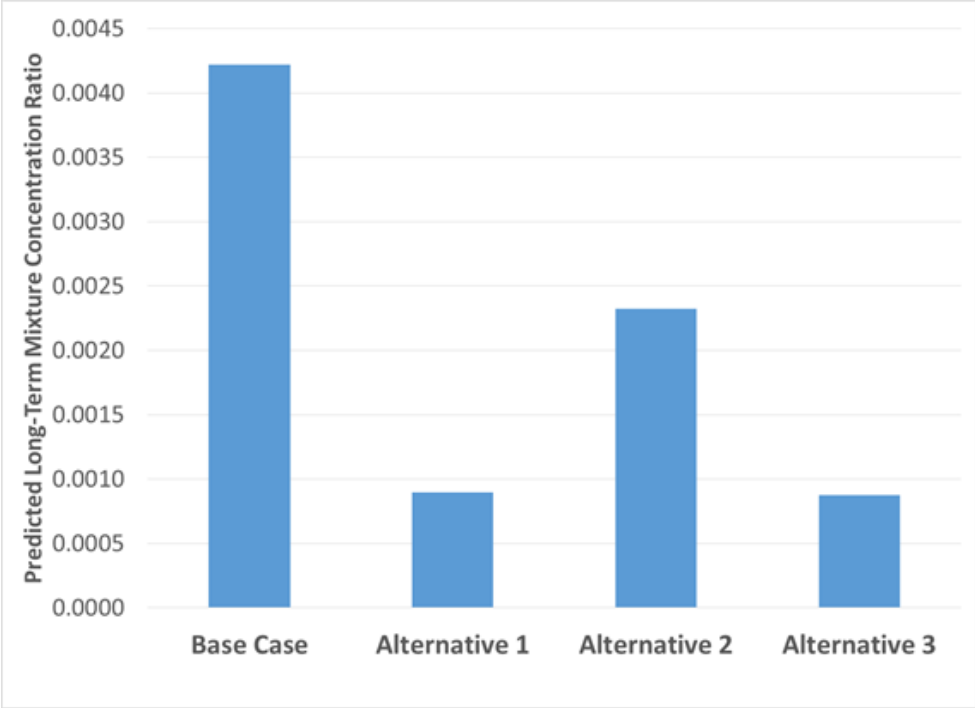

Figure 2: Predicted Long-Term Non-Cancer Risks from Trucking and On-site Emissions for each Alternative and the Current Condition (estimates do not include background air quality).

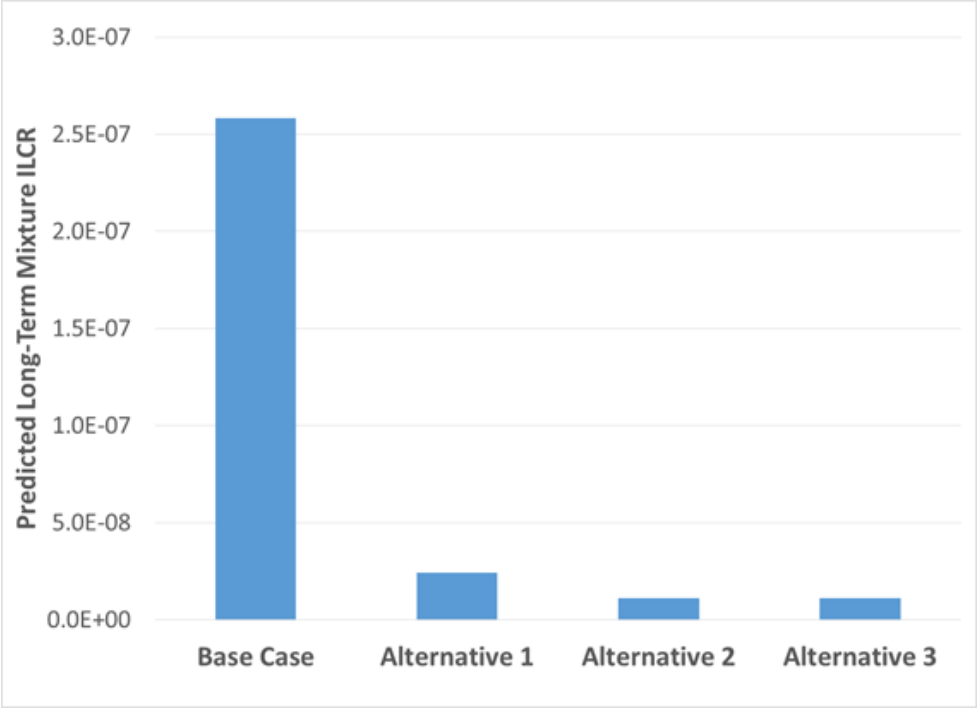

Figure 3: Predicted Long-Term Cancer Risks from Trucking and On-site Emissions for each Alternative and the Current Condition (estimates do not include background air quality), expressed as Incremental Lifetime Cancer Risk (ILCR).

Multi-media Exposure Risk (Air, Soil, Dust and Backyard Produce)
In addition to the potential risk from inhalation of air contaminants, the risk from exposure to the long term accumulation of contaminants in soil, dust and backyard produce was also modelled (Attachment 2 provides a summary of the contaminants included in the multi-media assessment).

All alternatives will result in reductions in risks compared to the current multiple hearth incinerators. Risks from exposure to air, soil, dust, and backyard produce associated with Alternative 1 are higher than Alternative 2 and 3. While there were differences, all of the alternatives are well below health-based standards. The risks for mercury were low; however, despite meeting provincial regulatory requirements, current emissions from the existing multiple hearth incinerators are the largest point source of mercury in the City of Toronto. While the predicted mercury emissions may not be a concern for local health and well-being, inputs of mercury to the environment contribute to a global issue of mercury contamination of the food chain.

Traffic Safety

The management of biosolids at HCTP includes the transport of materials off-site. Traffic volume is one of the factors that can influence the number of collisions in an area. Data on background traffic in the area and injury and fatality rates for Toronto were used to estimate the potential increase in risk of collisions due to trucks travelling to and from HCTP. Alternative 2, off-site management of biosolids, results in the highest increase in truck traffic (0.7 percent). It is estimated even this alternative would result in a very small increase in risk: an additional 0.6 injuries and 0.002 fatalities every 100 years (more details are found in Attachment 4).

Other Factors

Noise and odours are factors that could lead to an increase in stress or a perception of being exposed to toxic substances.

Noise

In the case of HCTP, potential for the truck traffic to increase the noise levels on the transportation routes and the potential for odour releases as the trucks transport biosolids or pellets from the plant to Highway 401were assessed as factors that could contribute to stress.

The potential impact of HCTP-related truck traffic to increase noise levels was assessed along each segment of the proposed traffic routes. The noise assessment was only conducted for Scenario 2, the scenario with the greatest potential truck volume. The routes the trucks would use are already used by a large number of other trucks. The noise assessment done for the Class EA found that the only place where the increase in noise would be noticeable (defined as an increase of 4 decibels) would be on part of Route 1, along a section of Coronation Drive in the community of West Hill. The section of the route has a significant quieter background noise level when compared to the other sections of Route 1 and Route 4. While the predicted increase in noise may be noticeable, it is not significant enough to be a health concern.

Odours

There are a number of sources of odours that could have an impact on the community. For Alternative 2 and 3, odours could be released from trucks transporting biosolids through the community, and to a lesser extent when transporting pellets. Trucks that had not been washed properly could also emit odours. The storage, truck loading and processing facility onsite also have the potential to release odours into the community.

Trucks hauling biosolids or pellets will have odour producing potential as the trucks are not sealed. The assessment found that based on the frequency of truck traffic passing though the community, the odour would only be potentially noticeable when trucks pass and the duration of the impact would be very brief. This potential would be greater on hot days; however, the odours would quickly dissipate. Alternatives 2 and 3 have greater potential for temporary odours along the route compared with Alternative 1, which has no odour producing potential.

Mitigation strategies have been proposed for on-site operations that will minimize the potential for odour releases from the plant. For instance, the biosolids truck loading and the pelletizer facilities will be sealed and odours will be treated before air is emitted from the facility. In addition, trucks transporting biosolids will be hosed down before leaving the facility and wheels will be inspected. Based on the City's experience at the Ashbridges Bay Treatment Plant, these measures would eliminate most odours related to these activities. It is not anticipated that the odours from transporting the biosolids or pellets would be a health concern.

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 additional areas of concern related to neighborhood characteristics. The HIA assessed the following: access to transport (walking, cycling, public transit, and personal vehicles), recreation and leisure, property values, and social cohesion. These factors, their proximity and the potential for each alternative to impact them, were assessed for each alternative. The HIA determined that the alternatives would not adversely impact these factors, and therefore, there are no anticipated health impacts from these factors.

Climate Change
All alternatives result in a reduction of greenhouse gases compared to the existing multiple hearth incinerators, which currently contribute a total of 7.9 tonnes per year (equivalent carbon dioxide). All alternatives are predicted to generate less than 4 tonnes per year. However, overall the greenhouse gas reduction is small, representing between 0.03 to 0.043 percent of the City's reduction goal of 15 million tonnes of CO_2 equivalents per year by 2050.

Employment
Employment is a well established determinant of health. People who are employed in secure, stable and safe working conditions are more likely to experience improved health. The potential impact of the alternatives on overall employment in the City of Toronto and local employment within the study area were explored. None of the alternatives impact the City, the study area or Toronto's employment opportunities to any appreciable extent.

Health Equity
As mentioned above, 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. The HIA found only one aspect of the project which could have some equity-related impacts – the transportation routes.

Each proposed truck 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 than Route 1. More details are available in Attachment 5.

Limitations of the HIA

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.

Overall Assessment

This HIA supplements the Rapid HIA done in 2011 by providing a more in-depth assessment of the potential health impacts of biosolids management alternatives for HCTP. It also enhances the Class EA by providing a thorough review of the alternatives from a health and health equity perspective.

The HIA identified differences among the alternatives (see Attachment 6). Alternative 1 is anticipated to have higher releases of air pollutants than Alternatives 2 and 3, but would be less than the existing incinerator; Alternative 2 and 3 are expected to increase risks related to traffic. Overall, the health impacts are very small and the differences among the alternatives do not result in appreciable differences in health impacts. These conclusions are based on the assumption that all risk management measures included in the HIA (see Attachment 7) are carried forward into the design phase of the project.

The HIA identified differences in equity impacts associated with the route used by the trucks servicing the HCTP. Compared to Route 1 (along Morningside Ave), Route 4 (along Port Union Rd) had the lower predicted impact on the community in relation to pedestrian safety, noise and vulnerable populations.

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SIGNATURE

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ATTACHMENTS

Attachment 1: Maps of Trucking Route 1 and Route 4
Attachment 2: List of Contaminants of Concern included in the inhalation and Multi-media Risk Modelling
Attachment 3: Comparison of Risks for Background Local Air Quality, Current Condition and Alternatives
Attachment 4: Estimated Injury and Fatality Rates in the Study Area for all Alternatives.
Attachment 5: Summary of Equity Factors Considered Along the Proposed Truck Routes
Attachment 6: Comparison of Predicted Impact on each Primary Health Factor summarized by Alternative
Attachment 7: Summary of Risk Management Measures Assumed in the HIA for the Alternatives

Attachment 1: Maps of Trucking Route 1 and Route 4

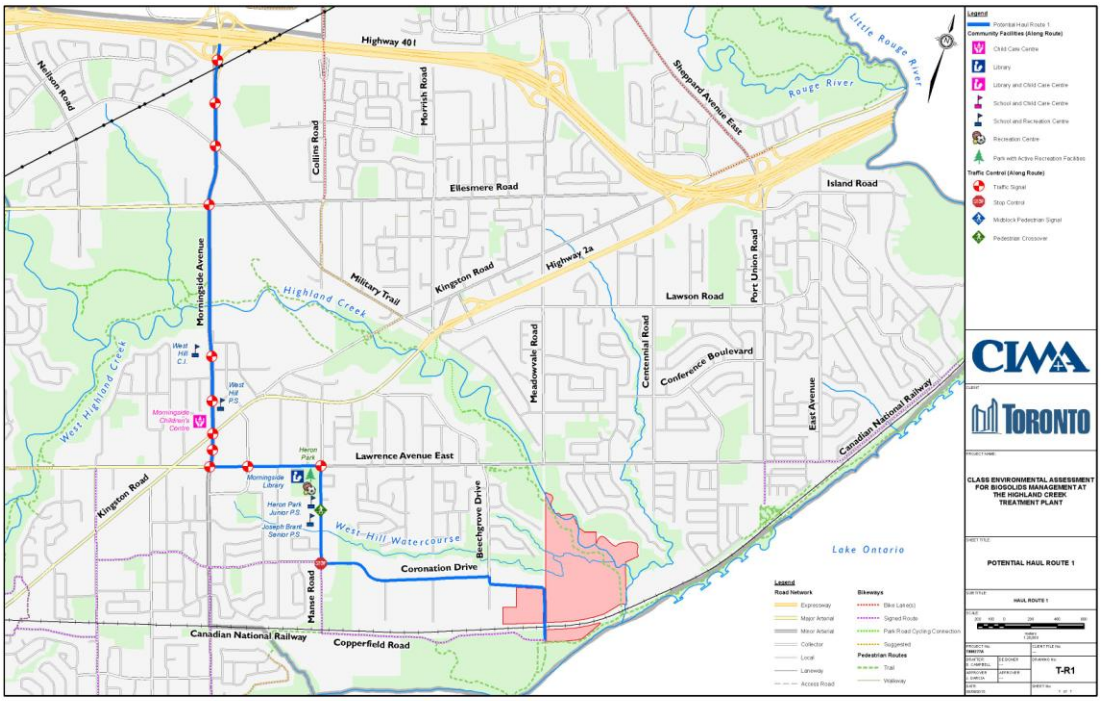

Figure 4: Route 1 - Coronation, Manse, Lawrence and Morningside

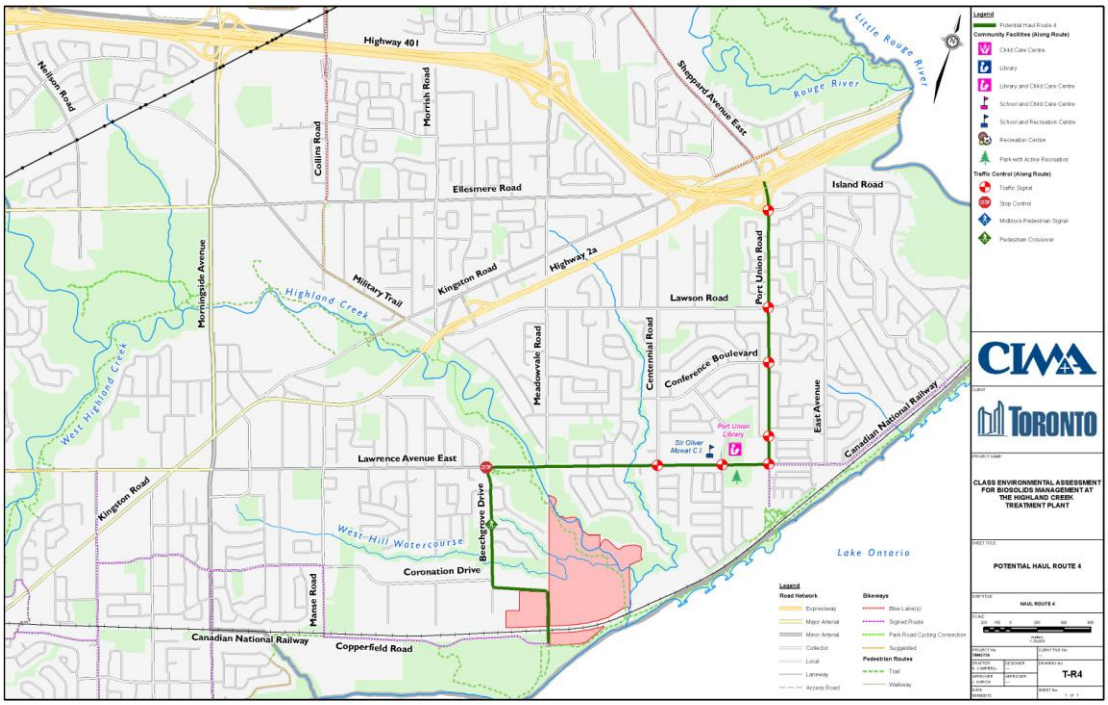

Figure 5: Route 4 - Beechgrove, Lawrence, Port Union Road

Attachment 2: List of Contaminants of Concern included in the Inhalation and Multi-media Risk Modelling

Table 2: List of Contaminants of Concern included in the Inhalation and Multi-media Risk Modelling.

Chemicals of Concern	Incinerator Emissions		Trucking Emissions	
	Inhalation	Multi-media	Inhalation	Multi-media
Acetaldehyde	●		●	
Acrolein	●		●	
Antimony	●	●		
Arsenic	●	●	●	●
Barium	●	●	●	●
Benzene	●		●	
Beryllium	●	●		
Boron	●	●		
1,3-Butadiene	●		●	
Cadmium	●	●	●	●
Carbon monoxide	●		●	
Carbon tetrachloride	●			
Chloroform	●			
Chromium	●	●	●	●
Cobalt	●	●	●	●
Copper	●	●	●	●
1,4-Dichlorobenzene	●			
1,2-Dichloroethane	●			
Dichloromethane	●			
Ethylene dibromide	●			
Formaldehyde	●		●	
Lead	●	●	●	●
Manganese	●	●	●	●
Mercury	●	●	●	●
Molybdenum	●	●	●	●
Nickel compounds	●	●	●	●
Nitrogen Oxides	●		●	
Ozone	●		●	
$PM_{2.5}$	●		●	

Chemicals of Concern	Incinerator Emissions		Trucking Emissions	
	Inhalation	Multi-media	Inhalation	Multi-media
PM_{10}	●		●	
Polychlorinated biphenyls (PCBs)	●	●		
Polychlorinated dibenzo-p-dioxins and furans	●	●		
Polycyclic aromatic hydrocarbons (PAHs)	●	●	●	●
Selenium	●	●	●	●
Strontium	●	●		
Sulfur Dioxide	●		●	
Tetrachloroethylene	●			
Toluene	●			
Trichloroethylene	●			
Vinyl Chloride	●			
Zinc	●	●	●	●

As per the Ontario Ministry of Environment and Climate Change requirements, each contaminant of concern was assessed for each project-alone scenario. The risk estimates are orders of magnitude below human health-based benchmarks (estimated at greater than 1000% below benchmarks).

Attachment 3: Comparison of Risks for Background Local Air Quality, Current Condition and Alternatives.

Table 3: Comparison of Risks for Background Local Air Quality, Current Condition and Alternatives.

Type of Health Outcome	Existing Local Air Quality	Current Condition Existing Incinerator	Alternative 1 -Fluidized bed incinerator	Alternative 2 - Off-Site Haulage	Alternative 3 – On-site Pelletizer plus haulage
Respiratory and cardiovascular induced hospitalizations and mortality	7%	0.0056% contribution	0.00041%[a] contribution	0.00015%[a] contribution	0.00012%[a] contribution
Concentration Ratio Long term non-cancer risks[b]	2.1	0.0042	0.00090	0.0023	0.00088
Cancer risks (compared to 1-in-million)[c]	76 in one million	0.25 in one million	0.024 in one million	0.011 in one million	0.011 in one million

[a] Represents an improvement from the existing incinerator of 93%, 97% and 98%, respectively for Alternative 1, 2 and 3.

[b] Concentration ratio greater than 1 indicates that further investigation is warranted.

[c] Cancer risks greater than 1-in-a-million indicates that further investigation is warranted.

Air emission sources for the three alternatives are as follows:

- Exhaust from trucks used to haul the ash, biosolids or pellets (all three alternatives).
- Fluidized bed incinerator stack (Alternative 1).
- The pelletizer which uses natural gas as a fuel source to dry the pellets (Alternative 3).

Attachment 4: Estimated Injury and Fatality Rates in the Study Area for all Alternatives.

Table 4: 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	**Route 4**	**Route 1**	**Route 4**	**Route 1**	**Route 4**
Total vehicle kilometers per year (route length x number of trucks)	595	510	9100	7800	3031	2598
Estimated number of injuries per 100 years	0.039	0.033	0.595	0.510	0.198	0.170
Estimated number of fatalities per 100 years	0.00013	0.00011	0.00200	0.00172	0.00013	0.00013
Data Source: City of Toronto Transportation Service's data for 2008. (Injury and fatality rates for City of Toronto and total vehicle kilometres travelled).						

These estimates are based on the best available data, but have limitations. They are based on average injury and fatality rates for vehicles in the 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 injury and deaths would still be small.

Attachment 5: Summary of Equity Factors Considered Along the Proposed Truck Routes.

Table 5: Summary of Equity Factors Considered Along the Proposed Truck Routes.

	Route 1 (distance: 7 km)	Route 4 (distance: 6 km)
Neighbourhood Improvement Area (NIA)	Morningside West Hill	West Hill
Schools	4	1
Child care / recreation centres / library	3	2
Transit stops	12 transit stops	2 transit stops
Seniors population	Same as City average	Same as City average
Youth population	Morningside has highest youth population in study area	Same as City average
Bike Route	No bike routes	Bike route planned along Port Union road
Residential areas	500 m through residential areas 1 km stretch of non-buffered sidewalk	650 m through residential areas
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
Pedestrian safety	1 crosswalk	1 crosswalk
Recreation/leisure sites	Passes 4 sites	Passes 1 site
Potential for Perceptible Noise	Small but noticeable increase in noise (3-5 dBA) along one segment of route	No increase in noise

Attachment 6: Comparison of Predicted Impact on each Primary Health Factor summarized by Alternative

Table 6: Comparison of Predicted Impact on each Primary Health Factor summarized by Alternative.

	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 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.

Attachment 7: Summary of Risk Management Measures Assumed in the HIA for the Alternatives.

- 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)