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Subject	ATTACHMENT 2 HCTP New Incinerator Air Pollution Equipment Upgrade Options		
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1. Introduction

The Highland Creek Treatment Plant (HCTP) currently utilizes multiple hearth incineration for management of its biosolids. These incinerators are older technology and nearing the end of their effective lives. Toronto Biosolids Master Plan Update (AECOM, 2009) recommended replacement of the existing incineration equipment with modern fluidized bed incineration technology. Since that report, City of Toronto Council has requested more information on alternate biosolids management solutions for HCTP, including various alternatives to the incineration air emissions approach.

This memo has been prepared to present the costs and air emission control improvements that can be achieved by various air emission control strategies for a new fluidized bed incinerator.

2. Background on Fluidized Bed Incineration

Incineration, using fluidized bed technology, with ash recycling or disposal, has been the preferred thermal technique for municipal wastewater sludge and biosolids management over the last thirty years. This technology has replaced multiple hearth incineration, primarily due to its performance in achieving lower emissions and higher combustion efficiency at a lower operating cost.

There are many air pollution control (APC) devices available to remove pollutants such as particulates, heavy metals, nitrogen oxides (NOx), nitrous oxide (N_2O), sulphur dioxide (SO_2), hydrochloric acid (HCl), mercury (Hg) and dioxins and furans.

In the Toronto Biosolids Master Plan (AECOM, 2009), the HCTP fluidized bed incineration concept was based on a standard APC system, consisting of a Venturi scrubber for particulate removal and an activated carbon bed for mercury removal. This configuration will meet and exceed the Ontario Ministry of the Environment (MOE) requirements when obtaining a Certificate of Approval (MOE permit). As such, this level of design concept is appropriate for a master planning study.

With approval of the fluidized bed technology solution for HCTP, there will be an opportunity to more fully develop the fluidized bed incineration facility design. At that time, other technologies, including those that can achieve more emissions control, can be more fully evaluated to identify the best solution for the HCTP. At this time, this memorandum has been prepared to provide performance and cost information on the potential APC options that can be considered at the preliminary design stage.

In the U.S., there are currently 61 biosolids fluidized bed incineration facilities. Of these, 97% of the biosolids fluidized bed incinerators have Venturi scrubbers, 16% of them have Venturi scrubbers and electrostatic precipitators (ESP), 8% have Venturi scrubbers with activated carbon (for mercury removal), and 3% have unknown APC equipment. Of the 61 biosolids fluidized bed incinerators, none have advanced wet APC equipment as described in this memo and only one has advanced dry APC equipment, though all facilities must meet EPA requirements.

The St. Paul facility currently has advanced dry APC equipment, however the APC equipment is already showing signs of advance deterioration, after only three years of operation. Currently we are not recommending that type of APC technology.

APC technologies presented in this technical memo are commercially available and used in air pollution control systems for industries that generate specific contaminants that require removal. Since advanced technologies are not required for municipal wastewater biosolids to meet Ontario regulatory standards, they are not used.

3. Emissions Removal Technologies

The following sections provide brief descriptions of the individual control techniques that can be used to treat fluidized bed incinerator emissions.

3.1 Particulates and Heavy Metals

Particulates and heavy metals are removed from air emissions to protect public health and the environment. These, present in the incinerator flue gas, can be removed using various types of equipment including Venturi scrubbers, wet electrostatic precipitators (ESP) and baghouses.

Wet Venturi scrubbers constitute a zone of high pressure drop flow constrictions in the flue gas stream into which water is introduced. The scrubber functions by water agglomerating around the particulate causing it to increase in mass and drop out of suspension. The gas stream speeds up as it passes through the Venturi, and then an abrupt change in direction occurs. Due to momentum of the water-coated particulates, they are unable to negotiate the change in direction, and therefore, impact in a collection zone and are transferred to the ash handling system. Venturi scrubbers achieve more than 99.9% removal efficiency of particulates, including heavy metals.

In wet ESPs, the flue gas travels between parallel plates and wires which are charged with very high voltages. A corona forms around the wire, which charges the particulate within the gas stream. Due to the induced charge, the particulate is attracted to the plates, which are wetted with a stream of water. The particulate is collected in the water and is transferred to the ash handling system. Flue gas pressure drops are usually low and water usage can also be fairly low.

Baghouses use sieving, impaction, agglomeration, and electrostatic filtration principles to remove solids from the flue gas inlet. Filtration area is maximized by configuring the fabric filter media into a series of long bags that are tightly packed into a housing compartment. Large dust particles create a barrier that can capture the incoming fine particles. The bags must be routinely cleaned as filter cake build up reduces gas flow. Baghouses have the highest particulate (and metal) removal efficiency, however the system can be subject to extensive corrosion if condensation occurs on the inside wall.

3.2 NOx and N_2O

NOx and N_2O emissions are produced during the combustion process. For fluidized bed incineration of municipal biosolids, with normal combustion control, they are generated in emissions at levels below regulatory standards and therefore, there is typically is no specific APC technology used for their removal. N_2O, however, represents a significant greenhouse gas contributor, with global warming potential of 310 (relative to 1 for CO_2).

To provide removal of these parameters, noncatalytic reduction (SNCR) or selective catalytic reduction (SCR) technologies can be used.

There are two basic SNCR technologies: ammonia injection and urea injection. In both technologies, the chemical is sprayed into the flue gas to react with NOx. While urea is safer than anhydrous ammonia (handling and storage) and has higher reduction efficiency, it also causes the formation of N_2O. Therefore, technologies involving urea are not considered in this memo.

Conventional N_2O counter-measures typically involve high temperature incineration (1,000 ^oC). However, fluidized bed incineration of municipal wastewater sludge and biosolids occurs at much lower temperatures (850 ^oC). To control N_2O emissions, a selective catalytic reduction (SCR) system can be used. In this system, ammonia is injected into the flue gas to reduce NOx emissions by 30-50%. Then a selective catalyst, which can be ammonia or zeolite based, can reduce N_2O emissions by 80%. It should be noted that because dust can interfere with the equipment, N_2O reduction must occur at the end of the APC system. This means that flue gas reheating will be required. Ammonia injection, incomplete reaction of the NOx reducing agent can cause emissions of ammonia (also known as ammonia slip). To minimize this risk, feedback control is used to respond to these slips.

3.3 SO_2 and HCl

Acid gases, in the form of SO_2 (sulphur dioxide) and HCl (hydrochloric acid) generated in the fluidized bed incineration of municipal sludge and biosolids. A Venturi scrubber will achieve approximately 70% removal efficiency for HCl though almost no reduction of SO_2, by direct contact with water without the addition of chemical. Both compounds can be further reduced with limestone addition to the bed, lime injection, or through a wet caustic scrubber.

The limestone added to the fluidized bed during the combustion process will be converted to lime, which neutralizes both SO_2 and HCl. In the case of SO_2, the limestone calcinates and then reacts with the SO_2 in a sulphation reaction. HCl will also combine with the lime, but at significantly lower temperatures. The reaction occurs when the lime carryover (from excess limestone fed to the furnace) on baghouse bags or electrostatic precipitator comes in contact the gas.

Another option for removal is direct lime injection in the flue gas to react directly with the SO_2 and HCl. This produces a material that will be easily captured and collected in the APC equipment and directed to the ash handling system.

Finally, wet caustic scrubbers, which are based on the absorption of acidic gases in the liquid phase, can be used. In basic wet scrubbing, HCl is reduced by a significant amount. However, SO_2 is not removed until a caustic media is added to the scrubber. The caustic media will also further reduce HCl emissions in the flue gas.

3.4 Mercury and Dioxins and Furans

As noted, mercury removal, using an activated carbon bed, is included the recommended solution from the 2009 Toronto Biosolids Master Plan, to meet stringent air quality requirements for mercury emissions. It is estimated that the Master Plan APC equipment, using a Venturi scrubber with activated carbon bed, will achieve 95% and 92% removal of mercury and dioxin compounds, respectively. Activated carbon will also remove other trace organic compounds that may be present in the emissions.

An activated carbon bed consists of a fixed container filled with activated carbon granules, through which flue gas is passed. Mercury and other trace contaminants are adsorbed onto the carbon surface. Once the carbon bed has reached its saturation point, the activated carbon is replaced.

Another method to remove mercury, dioxins and other trace organic compounds involves the use of activated carbon injection.

In activated carbon injection, powered activated carbon (PAC) is added to the flue gas in the dry scrubber. Once the PAC has reacted with the flue gas, a baghouse would be used to remove the spent PAC from the flue gas stream.

4. Regulation Requirements

4.1 Ontario

The Ontario Ministry of the Environment regulate the environmental impact of biosolids incinerators through air quality limits (Reg. 419, dispersion calculation) and tip of the stack emission limits. These values are shown in Table 1.

Table 1 Ontario Ministry of Environment Air Emission Standards

Pollutants	Regulatory Standards at Tip of the Stack	Regulatory Standards/Guidelines at Ground-Level
Particulate	<20 mg/dRm^3 particulate	100 ug/m^3 (1/2 hr)
Metals	Arsenic 99%	1 ug/m^3 (1/2 hr)
	Cadmium 89%	0.075 ug/m^3 (1/2 hr)
	Chromium 99%	5 ug/m^3 (1/2 hr)
	Lead 92%	1.5 ug/m^3 (1/2 hr)
	Nickel 99%	5 ug/m^3 (1/2 hr)
NOx	--	500 ug/m^3 (1/2 hr)
N_2O	--	27,000 ug/m^3 (1/2 hr)
SO_2	--	830 ug/m^3 (1/2 hr)
HCl	<30 ppm	60 ug/m^3 (1/2 hr)
Mercury	<70 ug/dR^3	5 ug/m^3 (1/2 hr)
Dioxins/furans	<80pg TEQ/Rm^3	0.057 pg TEQ/m^3

4.2 United States

Section 129 of the Clean Air Act required the EPA to develop standards for solid waste combustion processes. In a separate (but related) action, the EPA finalized the rule that identified biosolids (or sewage sludge) as solid waste under the Resource Conservation and Recovery Act.

As a result, the EPA was required to develop new source performance standards (NSPSs) and emission guidelines (EGs) for sewage sludge incineration units (SSIs). On October 14, 2010, the EPA published the proposed NSPSs and EGs for SSIs. Following the proposed rule, a large number of respondents provided comments on the proposed rules. This rule was recently finalized by the EPA on February 21, 2011 and published in the Federal Register on March 21, 2011.

The new rule requires facilities to meet the Maximum Achievable Control Technology (MACT) limits. MACT standards for existing units are based on the best performing 12% of the existing units while MACT standards for new or “modified” units are based on the “best controlled similar unit”. MACT standards have been set for nine pollutants. Table 2 present the USEPA new emission limits compared to the Ontario Ministry of the Environment and the emission reduction that will be required for a new conventional fluidized bed incinerator (without advance air pollution equipment).

Table 2 ES-EPA New Air Emission Standards

Pollutants	Units	US EPA Limit for new FBIs **	MOE Limit for new FBIs	Typical Values for a Conventional FBI	
				Value	% of EPA Limit
Particulate Matter	mg/dscm	6.72	20	2.93	44%
Nitrogen Oxides	ppmvd	21.0	n/a	24.8	118%
Sulphur Dioxide *	ppmvd	3.71	n/a	113	3034%
Hydrogen Chloride *	ppmvd	0.168	30	0.747	444%
Mercury *	ug/dscm	0.700	70	41.2	5876%
Dioxin and Furans Toxic Equivalency	pg/dscm	3.08	80	13.4	436%
Cadmium *	mg/dscm	0.00077	89% removal	0.0009	117%
Carbon Monoxide	ppmvd	18.9	n/a	8.70	46%
Lead *	mg/dscm	0.000434	92% removal	0.007	1697%
Flue Gas Oxygen		n/a	6% min		
Total Hydrocarbons		n/a	100 ppm, 10 min avg 20 ppm, 30 min avg		
Exit Temperature		n/a	700-900 C		
Arsenic *		n/a	99% removal		
Chromium *		n/a	99% removal		
Nickel *		n/a	99% removal		

All concentration values are presented at 11% O_2, 101.3 kPa, 25 C

* Emissions are correlated to biosolids concentrations, so emissions performance may not be transferable between units

** Based on a hybrid of the best performing units in the US. Within the industry, there is doubt that these limits are achievable

5. Air Pollution Control System Options

Various technologies can be combined to achieve increasing levels of air emission control. For this memo, we have developed a number of APC trains consisting of compatible technologies to provide an indication of removal efficiencies that can be achieved and costs for higher levels of control. It is important to note that the information presented here is at a conceptual level, and that APC technology trains will need to be investigated and more fully developed specific to the HCTP at a preliminary design stage.

5.1 Base Case (2009 Master Plan)

In the base case, the APC system consists of a single Venturi scrubber and activated carbon bed for mercury removal. As noted, this APC system will adequately treat emissions to meet current regulatory standards. Venturi scrubbers have historically been used for fluidized bed incineration facilities at the G.E. Booth WWTP in Mississauga, and the Duffin Creek WPCP in Whitby; both facilities are currently adding activated carbon beds for mercury control.

For the Highland Creek TP, the capital cost of the base case APC system is estimated at $8.0 million and yearly operating and maintenance costs are $340,000.

Table 3 Base Case Pollutant Reduction Efficiency

Pollutants	Removal Efficiency
Particulate/metals	> 99.9%
NOx	0%
N_2O	0%
SO_2	0%-
HCl	70%
Mercury	95%
Dioxin/furans	92%

5.2 Option 1: Wet System

The wet system includes acid gas removal by limestone addition in the fluidized bed, added to the base case of Venturi scrubber and activated carbon bed.

The increment capital cost of the limestone addition system is estimated at $2.5 million, with an annual operating cost of $30,000. This system could also include NOx/N_2O, as described for Option 2.

Table 4 presents the pollutant reduction efficiency for specific air pollutants for Option 1.

Table 4 Option 1 Pollutant Reduction Efficiency

Pollutants	Removal Efficiency
Particulates/metals	>99.9%
NOx	--
N_2O	--
SO_2	50% - 70%
HCl	91%
Mercury	95%
Dioxin/furans	92%

5.3 Option 2: NOx and N_2O Control

NOx and N_2O emissions control can be achieved by installing a selective catalytic reduction (SCR) system, added to the base case of venture scrubber and activated carbon bed. The increase in capital cost, from the Master Plan base case is $5.0 million, with an annual operating and maintenance cost of $130,000.

Table 5 presents the pollutant reduction efficiency for specific air pollutants for Option 2.

Table 5 Option 2 Pollutant Reduction Efficiency

Pollutants	Removal Efficiency
Particulates /metals	> 99.9%
NOx	30% to 50%
N_2O	80%
SO_2	--
HCl	70%
Mercury	95%
Dioxin /furans	92%

This system could also include acid gas control, as described for Option 1.

5.4 Option 3 Pollutant Reduction Efficiency

This dry system is state-of-the-art for air pollution control. This system has been used at municipal solid waste incineration facilities for the past 20 years, with an excellent track record.

This system will consist of a combination of:

- Cooling tower
- SCR system
- Activated carbon injection
- Lime injection
- Mixing reactor
- Baghouse
- Flue gas reheater

This system will perhaps meet the new US-EPA emission limits requirements.

The estimated incremental capital cost for Option 4 relative to the base case $10.0 million, with an estimated annual operating and maintenance cost of $270,000.

Table 6 Option 3 Pollutant Reduction Efficiency

Pollutants	Pollutant Reduction Efficiency
Particulates/metals	> 99.998%
NOx	40 - 60%
N_2O	80%
SO_2	50 - 60%
HCl	94 - 95.5%
Mercury	90%
Dioxin/furans	90%

It should be noted that St. Paul, Minnesota currently have an advance dry air pollution system that meet the US-EPA emission requirements, but is different than the one we are proposing. However that installation is already showing advance sign of deterioration, after only three years of operation. Because of the risk related to that dry system we have decided not to include that technology as part of this memo.

5.5 Option 4 Advanced Wet System

This system would consist of advanced wet APC devices. This treatment train has not been demonstrated for air emission control but the technologies are compatible so a system of this type could be provided. In addition to the base case, including a Venturi scrubber and activated carbon bed, the system would include a wet caustic scrubber, an electrostatic precipitator and selective catalytic reduction, for advanced acid gas, particulate/metals and NO_x/N_2O removal, respectively. This system will also meet the new US-EPA emission limits requirements.

The increment capital cost relative to the base case estimated at $11.0 million, with an annual operating and maintenance cost of $400,000.

Table 7 presents the pollutant reduction efficiency for Option 4.

Table 7 Option 4 Pollutant Reduction Efficiency

Pollutants	Pollutant Reduction Efficiency
Particulates/metals	>99.98%
NOx	40 - 60%
N_2O	80%
SO_2	90%
HCl	99.7%
Mercury	95%
Dioxin/furans	92%

5.6 Comparison of Options

Table 8 presents a comparison of the APC system options, in terms of removal efficiency, capital and operating costs.

Table 8 Comparison of APC Options

Pollutants	Base Case	Option 1 Wet System	Option 2 NO_x and N_2O Control	Option 1 and Option 2	Option 3 Dry System	Option 4 Enhanced Wet System
Particulates/metals	>99.9%	>99.9%	> 99.9%	>99.98%	>99.998%	>99.98%
NOx	0%	--	30% to 50%	30% to 50%	40 - 60%	40 - 60%
N_2O	0%	--	80%	80%	80%	80%
SO_2	0%-	50 - 70%	0%	50 - 70%	50 - 60%	90%
HCl	70%	91%	70%	91%	94 - 95.5%	99.7%
Mercury	95%	95%	95%	95%	90%	95%
Dioxin/furans	92%	92%	92%	92%	90%	92%
Incremental Capital Cost Relative to Base Case	-	$2.5 million	$5.0 million	$7.5 million	$10.0 million	$11.0 million
Incremental Annual Operating Cost Relative to Base Case	-	$30,000	$130,000	$160,000	$270,000	$400,000

As noted, all options represent increased removal efficiencies of pollutants, relative to the base case, which meets Ontario regulatory requirements. Options 2, 3 and 4 also include removal of N_2O, which has a significant greenhouse gas footprint.

6. HCTP Emission and Environmental Impact Reduction

This section provided the biosolids incinerator environmental emission improvements that will be achieved by the replacement of the existing HCTP multi-hearth incinerators by new fluidized bed incinerators with and without enhanced air pollution equipment.

It should be noted that the existing multiple hearth incinerators are currently meeting all Ministry of the Environmental (MOE) emission and ground level requirements. However, only the new enhanced air pollution control fluidized bed incinerator will be able to meet the new US-EPA emission requirements.

It should also be noted that Ontario's regulation / guideline for biosolids incineration do not require enhanced air pollution equipment and currently the MOE is not proposing any changes to the existing Ontario requirements for biosolids incineration.

Table 9 summarizes the expected incinerator emission improvements for a new fluidized bed incinerator with and without enhanced air pollution equipment compared to the existing HCTP multiple hearth incinerator.

Ontario Regulation 419 provides the air quality standard that all industry needs to meet in Ontario. Regulation 419-05 outlines the ground level concentration limits for all process emissions. Table 10 presents the percentage of compliance for the existing multiple hearth and proposed fluidized bed incinerators with and without an enhanced wet scrubber. It is noted, all processes are well below the MOE regulatory limits.

Table 9 New Fluidized Bed Incinerator Emission Improvements

Pollutant	Percent Emissions Reduction Comparison:	
	Conventional Fluidized Bed Compared to HCTP Multiple Hearth Incinerator	US EPA Fluidized Bed Compared to HCTP Multiple Hearth Incinerator
Particulates/metals	92.1%	81.9%
NOx	89.7%	91.3%
SO_2	0%	91.6%
HCl	0.0%	76.2%
Mercury	15.9%	98.6%
Dioxin/furans	55.0%	89.7%

Table 10 Ground Level Concentrations as a Percentage of MOE Limits Allowable Under Reg.

Contaminant	Existing Multiple Hearth	New Fluidized Bed	Option 1 & 2 Wet System and NOx Control	Enhanced Wet Scrubber
Particulates/metals	2.6%	0.31%	0.31%	0.006%
NOx	15%	4.5%	2.7%	2.2%
SO_2	27%	10%	4.0%	1.0%
HCl	1.3%	0.41%	0.12%	0.004%
Mercury	0.13%	0.006%	0.006%	0.006%
Dioxin/furans	0.08%	0.006%	0.006%	0.006%

7. Fluidized Bed Incinerator Capital Cost

Table 11 and 12 present the estimated capital cost for the installation of two fluidized bed incinerators in the existing incinerator building. The following assumptions were used in the development of the capital cost.

7.1 General Contractor Mark-ups

A mark-up of fifteen percent (15%) for contractor's overhead, profit, mobilization, demobilization, and bonding/insurance etc is included. This 15% mark-up is based on the following:

- Contractor's overhead and profit: 12% (opinion based on current construction market conditions, market availability, and experience on recent tenders received)
- Mobilization and demobilization: 1%
- Bonding and Insurance: 2%

7.2 Escalation

For the purpose of this memorandum, the construction estimate provided above has been shown in 2010 dollars. Escalation is not included in the estimate.

7.3 Contingency Allowance

An allowance of twenty five percent (25%) for contingency has been included. This contingency allowance is based on a conceptual design and the total contingency allowance will decrease as the design develops and more information is available. The contingency includes 5% for change orders. However, this contingency does not include changes in scope of work.

7.4 Assumptions:

- Based on normal construction (that is, five days per week at eight hours/day, 40-hour working week)
- Estimated construction cost is in 2010 dollars
- Unit prices are based on quotations, cost books, and historical data

- Assume Advanced APC valued at approximately $11M per incinerator – maximum emissions scrubbing alternative.
- Equipment estimates are based on vendor quotations or historical data from recently tendered wastewater treatment plant projects (with allowances for installation based on ratios of the equipment cost)
- General Contractor Mark-up: 15%
- Conceptual Contingency Allowance: 25%
- Process Mechanical Allowance to cover piping and ancillary systems (including installation costs)
- Retrofit Allowance for building renovations and facilities that require significant tie-ins to existing facilities
- Engineering, 12% of Capital Cost
- Design, 5% of Capital Cost
- Site Services During Construction, 6% of Capital Cost
- Post Construction, 1% of Capital Cost

7.5 Exclusions:

- City costs
- Geotechnical Work – none expected as work confined to existing building envelope
- Impacts due to inflation and escalation
- Removal of hazardous waste (investigations will be done to determine if any are present) – none expected as works confined to existing building envelope
- Rock excavation - none expected as works confined to existing building envelope
- Non-competitive market conditions (that is, shortage of materials, shortage of skilled labour, among others)
- Additional costs for various approaches for accelerating construction

The following table outlines the preliminary capital cost estimate for the construction of two new fluidized bed incinerators in the existing HCTP incinerator building and the demolition of one of the multiple hearth incinerators. The total project preliminary cost estimate (including capital and engineering but excluding HST) is **$119,400,000 (using the existing building).**

Table 11 - Highland Creek Treatment Plant – Retrofit of Existing Incinerator Building

Preliminary Capital Cost Estimate (2010 dollars)							
	Component Description	**Quantity**	**Unit**	**Unit Cost**	**Installation** % of Mat.	**Total Cost**
1	Fluidized Bed 1 - Supply	1	lump sum	$14,437,500	35%	$19,490,625
2	Fluidized Bed 1 - Demolition	1	lump sum	$1,000,000	Incl.	$1,000,000
3	Fluidized Bed 1 - Auxiliary Equipment	1	lump sum	$1,500,000	100%	$3,000,000
4	Fluidized Bed 1 - Advanced APC	1	lump sum	$6,285,000	75%	$10,998,750
5	Fluidized Bed 2 - Supply	1	lump sum	$14,437,500	35%	$19,490,625
6	Fluidized Bed 2 - Demolition	1	lump sum	$5,000,000	Incl.	$5,000,000
7	Fluidized Bed 2 - Auxiliary Equipment	1	lump sum	$1,500,000	100%	$3,000,000
8	Fluidized Bed 2 - Advanced APC	1	lump sum	$6,285,000	75%	$10,998,750
9	Commissioning	1	lump sum	$1,000,000	Incl.	$1,000,000
10	Permits	1	lump sum	$210,000	Incl.	$210,000
11						
12	**Sub-Total Basic Facility Costs**					$74,188,750
13						
14	**Sub-Total Basic Facility Costs**					**$74,188,750**
15	General Contractor's Overhead & Profit, Mob.,Bonds		% of A	15%		$11,128,313
16	**Sub-Total Basic Facility Costs**					**$85,317,063**
17	Conceptual Design Contingency		% of B	20%		$17,063,413
18	Construction Contingency (Change Orders)		% of B	5%		$4,265,853
19	**Total Estimated Construction Costs**					**$106,646,328**
20	**Engineering**		% of C	12%		**$12,797,559**
21	**Total Estimated Capital Costs, Excluding HST**					**$119,443,888**