Sarah - Executive procedure as option 1 now. Your comment?

CITY OF TORONTO
DEPARTMENT OF PUBLIC HEALTH

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CITY CLERK'S OFFICE
SECRETARIAT SECTION

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To: Executive Committee

Subject: Emissions Testing of the Incinerator at the Main Sewage Treatment Plant

Origin: City Council, April 21, 1989 (c34exec89028:526)

RECOMMENDATIONS:

1. That City Council consider the options for emission testing at the Main Sewage Treatment Plant incinerator outlined in this report and advise the Medical Officer of Health as to which option it is endorsing.

2. That the appropriate funds be allocated to the Department of Public Health to conduct the emissions testing program that City Council endorses.

3. That this report and City Council's action on it be forwarded to the Commissioner of the Metropolitan Toronto Works Department for information.

BACKGROUND:

At its meeting held on September 19, 1988, City Council adopted a resolution requesting the Acting Medical Officer of Health to recommend a consultant to perform independent emissions and ash testing on the Main Sewage Treatment Plant Incinerator.

Following this the Acting Medical Officer of Health wrote to the Commissioner of Metropolitan Works informing him of City Council's request and requesting emissions tests and ash data to be obtained by the Commissioner from Ortech International consulting firm that would represent a parallel study to that requested by City Council. The Acting Medical Officer of Health also requested access to the Main Sewage Treatment Plant for the independent consultant to be selected by the City to perform emissions and ash testing.

In response, the Deputy Commissioner of Metropolitan Works indicated that the results from Ortech International Incorporated would be provided when they became available. He also advised that he would place Council's request before the Metro Works

Committee on January 11, 1989, after the results of the Ortech International Incorporated testing program were available.

At its meeting of February 23, 1989, City Council reaffirmed its position to request the Acting Medical Officer of Health to hire a consultant to study emissions and ash from the Main Sewage Treatment Plant Incinerator. City Council further recommended that in the event that the Metropolitan Corporation refused to allow the consultant on the property, the City Solicitor be requested to report on any or all legal action necessary.

At its meeting of March 8, 1989, the Works Committee of Metropolitan Toronto directed that the Medical Officer of Health be invited to enter the Ashbridges Bay Main Sewage Treatment Plant at any time. In addition, the Committee invited the City of Toronto to participate in any air emission tests at the Ashbridges Bay Main Sewage Treatment Plant and to pay 50 percent of the cost of such tests, subject to specifications satisfactory to the Commissioner of Works.

COMMENTS:

In October 1988, the Commissioner of the Metropolitan Toronto Works Department retained Ortech International to conduct emissions testing at the Main Sewage Treatment Plant (MSTP) incinerator. The testing undertaken was part of an extensive investigation on the quality of emissions from the MSTP incinerator. The results of this testing became available in April, 1989 and provide a good profile of the MSTP incinerator emissions. Although, there is no reason to doubt that the data are not representative of daily operations, additional testing could confirm or deny Ortech International's results. Its testing was performed for a wide range of organic and inorganic chemicals. The methodologies used by Ortech International for sampling and analysis of contaminants are the same as those recommended by the Ontario Ministry of the Environment (OMOE) for the purposes of stack testing. Ortech International (formerly Ontario Research Foundation) is a highly reputable agency that is recognized for its excellent scientific work.

As a result of Ortech International's testing program, modifications are being made by the Metropolitan Toronto Works Department to the incinerator to improve the emissions quality. The Metropolitan Toronto Works Department Program contains funding for installation of new venturi-type emission scrubbing equipment in 1990. The new scrubbing equipment is expected to be operational in 1991. Given these proposed improvements, any emissions testing undertaken by my Department before installation

of the new equipment should be followed up with testing after the proposed modifications to the incinerator.

City Council's request to hire an independent consultant to conduct further testing on the MSTP incinerator emissions appears to be based on the desire to obtain additional information that confirms or refutes the results of Ortech International's emissions testing for the Metropolitan Toronto Works Department. I am presenting two options to confirm the previous test results, with their budget implications.

One option would be to test the MSTP incinerator emissions for a limited number of chemicals. According to Mr. Gary Wong of the OMOE, Air Resources Branch, either metals or organics could be used as indicators of emission quality. Given the concern over metals in sewage sludge, their toxic potential and the lower cost of testing for metals compared with organics, I would suggest testing for a range of 32 metals in the particulate fraction of the incinerator's emissions. These test results could then be compared with Ortech International's data. If both test results compare well, Ortech International's data could then be interpreted as representative of the incinerator emissions quality. If there are significant discrepancies between the two sets of data, City Council may decide to fund more extensive testing of the MSTP incinerator emissions.

The second option would involve a duplication of all of the testing performed by Ortech International. This would involve testing for 32 different metals, four acid gases, seven combustion gases, 38 polycyclic aromatic hydrocarbons, and five groups of polychlorinated aromatic compounds, which include testing for at least 28 specific congeners and over 15 additional isomers. This option includes expensive analysis for dioxins and furans. This option would cost substantially more than the first option, and ultimately, may not provide significantly more information.

The following cost estimates for the two options are based on consultations with several consulting firms which perform stack sampling and emission analyses. Cost estimates are based on the collection of samples on three consecutive days, as this is a standard sampling protocol. The specific terms of reference for both testing options are listed in Appendices 1 and 2.

Option 1:

Option 1 would require the collection and analysis of samples for 32 metals in the stack emissions. This analysis is estimated to cost between $15,000 and $25,000 for triplicate samples. Therefore, the cost of sampling before and after installation of the scrubbers would be between $30,000 and $50,000.

Option 2:

Option 2 would require the extensive testing of emissions for metals, acid gases and organic compounds. This analysis is estimated to cost between $75,000 and $150,000 for triplicate samples. The total cost of sampling before and after the installation of scrubbers would be between $150,000 and $300,000.

Following selection of either Option 1 or Option 2, I will call for tenders with the appropriate terms of reference and recommend the consultant to City Council for approval. Whichever option City Council decides to endorse, it will be necessary to notify the Commissioner of the Metropolitan Toronto Works Department. I am therefore recommending that this report and City Council's decision be forwarded to him for information.

P.R.W. Kendall, MBBS, MSc, FRCPC
Medical Officer of Health

DS/ht

Appendix 1

TERMS OF REFERENCE FOR OPTION 1:

EMISSIONS TESTING AT THE
MAIN SEWAGE TREATMENT PLANT INCINERATOR

OBJECTIVE:

The objective of this testing program is to confirm previous testing of emissions from the Main Sewage Treatment Plant (MSTP) incinerator. Also, relevant emissions data will be compared with existing standards and guidelines under Regulation 308 of the Environmental Protection Act. Similarly, relevant leachate data will be compared with the Leachate Criteria in Regulation 309 of the Environmental Protection Act.

ANALYSES OF AIR EMISSIONS AND ASH:

Emissions will be tested for the particulate and inorganic species listed in Table 1. Incinerator bottom ash and fly ash will be tested for the same chemicals.

METHODOLOGY:

All sampling will take place during normal operation of the MSTP incinerator. Three tests will be conducted under isokinetic sampling conditions and according to the Ontario Ministry of the Environment (OMOE) Source Testing Code. The consultant should discuss OMOE protocol for sampling and analysis, and any necessary modifications with staff from the Environmental Protection Office.

1. Particulate material and inorganic species, will be sampled in the incinerator emissions using a modified version of the OMOE Method-5 particulate sampling train, as recommended by the OMOE.

2. Incinerator fly ash and bottom ash will be tested for the same chemicals tested for in the emissions. Leachate tests will be conducted according to the protocol described in Regulation 309 of the Environmental Protection Act.

QUALITY CONTROL:

The emissions testing and analyses must provide high quality data. The testing and analytical procedures should include the standard methods for such as the Source Testing Code, the draft CSA Standard Z223.2-M (for continuous gas analysis) and the ASME draft procedures or any other procedures that have been devised or recommended by the OMOE.

Some quality control procedures that should be included are:

a) Calibration of all modified Method-5 train pitot tubes, dry gas meter and thermistors,

b) Calibration of all gas analysis equipment using certified standard gases,

c) Leak-checking of all modified Method-5 and gas analysis sampling equipment before, during and after each test or stack traverse,

d) Analysis of blank impinger solutions, filters, etc., for background concentrations of the same contaminants.

e) Use of standard solutions with each batch of samples for analysis,

f) Duplicate analysis for at least ten percent of the samples during analysis.

DISPERSION MODELLING:

Dispersion modelling will be used to compare emissions with the Regulation 308 guidelines and standards. The calculated maximum concentration of each pollutant will be expressed as a percentage of the appropriate standard or guideline. The dispersion modelling will calculate the point of impingement concentrations for high level receptors as well as ground level receptors, and comparisons will be made with the appropriate guidelines and standards.

REPORTING:

1. The consultant will produce a report of the testing program which will include:

   - description of the MSTP incinerator operating conditions

   - description of sampling procedures

- description of analytical procedures

- results of the analyses and where applicable the detection limits, precision data and statistical significance.

2. The operating conditions, as identified in the MSTP Incinerator log book.

3. Emission data will present concentrations and emission rates of the chemicals, averaged over the sampling time.

4. Any problems with incineration operations or testing will be identified in the report.

COST:

The costs will be presented as follows:

- Cost per test for sampling

- Cost per test for analyses

The total costs for three sets of tests, plus the calculations and an itemized list of any additional expenses expected to be incurred.

TIME FRAME:

This testing program is to be completed as soon as possible. The consultant will submit a schedule, showing time required for sampling, analyses and report production.

Appendix 2

TERMS OF REFERENCE FOR OPTION 2:

EMISSIONS TESTING AT THE
MAIN SEWAGE TREATMENT PLANT INCINERATOR

OBJECTIVE:

The objective of this testing program is to confirm previous testing of emissions from the Main Sewage Treatment Plant (MSTP) incinerator. Also, relevant emissions data will be compared with existing standards and guidelines under Regulation 308 of the Environmental Protection Act. Similarly, relevant leachate data will be compared with the Leachate Criteria in Regulation 309 of the Environmental Protection Act.

ANALYSES OF EMISSIONS AND ASH:

Emissions will be tested for particulate and inorganic species (listed in Table 1), gases and acid gases (listed in Table 2), polycyclic aromatic hydrocarbons (listed in Table 3) and chlorinated organic compounds (listed in Table 4). Incinerator bottom ash and fly ash will be tested for the same organic and inorganic chemicals.

METHODOLOGY:

All sampling will take place during normal operation of the MSTP incinerator. Three tests will be conducted under isokinetic sampling conditions and according to the Ontario Ministry of the Environment (OMOE) Source Testing Code. The consultant should discuss OMOE protocol for sampling and analysis, and any necessary modifications with staff from the Environmental Protection Office.

1. Particulate material, inorganic species, hydrogen chloride and hydrogen fluoride will be sampled in the incinerator emissions using a modified version of the OMOE Method-5 particulate sampling train, as recommended by the OMOE.

2. Chlorinated organics and polycyclic aromatic hydrocarbons (PAHs) will be sampled in the incinerator emissions using an OMOE Method-5 sampling train further modified using the American Society of Mechanical Engineers ASME draft procedures.

3. Total hydrocarbons will be sampled according to the OMOE protocol, "Guidelines on Continuous Total Hydrocarbon Analysis of Point Source Emissions".

4. Incinerator fly ash and bottom ash will be tested for the same organic and inorganic chemicals tested for in the emissions. Leachate tests, will be conducted as described in Regulation 309 of the Environmental Protection Act will be performed.

QUALITY CONTROL:

The emissions testing and analyses must provide high quality data. The testing and analytical procedures should include the standard methods for such as the Source Testing Code, the draft CSA Standard Z223.2-M (for continuous gas analysis) and the ASME draft procedures or any other procedures that have been devised or recommended by the OMOE.

Some quality control procedures that should be included are:

a) Calibration of all modified Method-5 train pitot tubes, dry gas meter and thermistors,

b) Calibration of all gas analysis equipment using certified standard gases,

c) Leak-checking of all modified Method-5 and gas analysis sampling equipment before, during and after each test or stack traverse,

d) Analysis of blank impinger solutions, filters, etc., for background concentrations of the same contaminants.

e) Use of standard solutions with each batch of samples for analysis,

f) Duplicate analysis for at least ten percent of the samples during analysis,

g) If possible, confirm PCDD and PCDF analyses by duplicate analysis of at least ten percent of the sample extracts at the OMOE dioxin laboratory,

h) Use high grade reagents for cleaning equipment, as impinger solutions and for recovering samples,

i) Analysis of all proving rinsings from the trace organic trains for total background concentrations of polychorinated biphenyls and chlorobenzenes using GC/ECD techniques, and PAHs using high performance liquid chromatography,

j) Use of a blank dioxin sampling train to measure background concentrations at the sampling site and,

k) Use of labelled spiking compounds for dioxin train sample extraction and analysis.

DISPERSION MODELLING:

Dispersion modelling will be used to compare emissions with the Regulation 308 guidelines and standards. The calculated maximum concentration of each pollutant will be expressed as a percentage of the appropriate standard or guideline. The dispersion modelling will calculate the point of impingement concentrations for high level receptors as well as ground level receptors, and comparisons will be made with the appropriate guidelines and standards.

REPORTING:

1. The consultant will produce a report of the testing program which will include:

   - description of the MSTP incinerator operating conditions
   - description of sampling procedures
   - description of analytical procedures
   - results of the analyses and where applicable the detection limits, precision data and statistical significance.

2. The physical characteristics of the flue gases will be reported for each test.

3. Emission data will present concentrations and emission rates of the chemicals, averaged over the sampling time.

4. Any problems with incineration operations or testing will be identified in the report.

COST:

The costs will be presented as follows:

- Cost per test for sampling
- Cost per test for analyses

The total costs for three sets of tests, plus the calculations and an itemized list of any additional expenses expected to be incurred.

TIME FRAME:

This testing program is to be completed as soon as possible. The consultant will submit a schedule, showing time required for sampling, analyses and report production.

TABLE 1

PARTICULATE AND INORGANIC SPECIES

Particulate Material

Aluminum
Antimony
Arsenic
Barium
Beryllium
Bismuth
Boron
Cadmium
Chromium
Cobalt
Copper
Iron
Lead
Lithium
Magnesium
Manganese
Mercury
Molybdenum
Nickel
Phosphorus
Potassium
Selenium
Silicon
Silver
Strontium
Tellurium
Tin
Titanium
Vanadium
Zinc

TABLE 2

GASES AND ACID GASES

Total Hydrocarbons
Hydrogen chloride
Hydrogen fluoride
Sulfur dioxide
Nitrogen oxides

TABLE 3

POLYCYCLIC AROMATIC HYDROCARBONS

Tetralin
Naphthalene
Quinoline
2-Methyl naphthalene
1-Methyl naphthalene
2-Chloronaphthalene
Biphenyl
Acenaphthylene
Acenaphthene
Fluorene
Phenanthrene
Anthracene
2-Methyl anthracene
0-Terphenyl
1-Methyl phenanthrene
9-Methyl phenanthrene
Fluoranthene
Pyrene
9, 10-dimethyl anthracene
m-Terphenyl
p-Terphenyl
Benzo(a)fluorene
Benzo(b)fluorene
Benzo(b)anthracene
Triphenylene + Chrysene
Benzo(b)fluoranthene
Benzo(k)fluoranthene
7, 12-Dimethyl Benzo(a)anthracene
Benzo(e)pyrene
Benzo(a)pyrene
Perylene
3-Methyl Cholanthrene
Indenol(1,2,3,c,d)Pyrene
Dibenzo(a,c)anthracene and Dibenzo(a,h)anthracene
Picene
Benzo(g,h,i)perylene
Coronene
Dibenzo(a,e)pyrene

TABLE 4

CHLORINATED ORGANIC COMPOUNDS

2,3,7,8 tetrachloro dibenzo-p-dioxin
1,2,3,7,8 pentachloro dibenzo-p-dioxin
1,2,3,4,7,8 hexachloro dibenzo-p-dioxin
1,2,3,6,7,8 hexachloro dibenzo-p-dioxin
1,2,3,7,8,9 hexachloro dibenzo-p-dioxin
1,2,3,4,6,7,8 heptachloro dibenzo-p-dioxin

2,3,7,8 tetrachloro dibenzofuran
1,2,3,7,8 pentachloro dibenzofuran
2,3,4,7,8 pentachloro dibenzofuran
1,2,3,4,7,8 hexachloro dibenzofuran
1,2,3,6,7,8, hexachloro dibenzofuran
1,2,3,7,8,9 hexachloro dibenzofuran
2,3,4,6,7,8 hexachloro dibenzofuran
1,2,3,4,6,7,8 heptachloro dibenzofuran

Total tetrachloro dibenzo-p-dioxins
Total pentachloro dibenzo-p-dioxins
Total hexachloro dibenzo-o-dioxins
Total heptachloro dibenzo-p-dioxins
Octachloro dibenzo-p-dioxin

Total tetrachloro dibenzofurans
Total pentachloro dibenzofurans
Total hexachloro dibenzofurans
Total heptachloro dibenzofurans
Octachloro dibenzofuran

Total dichlorobenzenes
Total trichlorobenzenes
Total tetrachlorobenzenes
Pentachlorobenzene
Hexachlorobenzene

Total dichlorophenols
Total trichlorophenols
Total tetrachlorophenols
Pentachlorophenol

Total polychlorinated biphenyls

(For chlorinated benzenes and phenols, amounts of each isomer found shall be reported.)