# Toxic Air Pollution Impacts

## from the proposed Covanta Energy Chester County WTE Project

A Technical Report

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December 3, 2009

Blue Ridge Environmental Defense League

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# Incineration and Waste-To-Energy

Incineration destroys resources and perpetuates pollution of the environment. Older incinerators have been joined by new burners claiming zero emissions and so-called "green" energy from garbage, tires, sewage sludge and biomass from farms and forests. While some new incinerator technologies—gasification, plasma-arc, and pyrolysis—may have lower emissions than their predecessors of the 1980's, all of them have smoke stacks that emit pollution to the environment. This report presents our assessment of the potential air pollution emissions and local impacts on residents and plant employees in Chester County, South Carolina.

## Air Pollution Emissions

Covanta's incinerator could emit 2.8 million pounds of pollution annually and 575 thousand tons of global warming carbon dioxide. Table 1 lists the annual totals of toxic air pollutants and carbon dioxide which could be emitted from Covanta's proposed waste-to-energy incinerator in Chester County.

**Table 1. Annual Air Pollution Emissions**

| AIR POLLUTANT | POUNDS |
|---|---|
| Carbon dioxide | 1,150,480,000 |
| Nitrogen oxides | 2,079,040 |
| Sulfur dioxide | 323,536 |
| Carbon monoxide | 270,392 |
| Hydrochloric acid | 123,224 |
| Particulates | 36,208 |
| Mercury | 1,284.8 |
| Lead | 152.4 |
| Chromium | 17.52 |
| Cadmium | 15.83 |
| Arsenic | 2.47 |
| Dioxin/furan | 0.039 |

These annual emission totals are based on Covanta's publicly stated proposal to burn 1,600 tons municipal solid waste per day, using a dry scrubber pollution control device injecting lime slurry and a fabric filter.[1] We applied this throughput to the US EPA's AP-42 Emission Factors for municipal waste combustors. These would be the emissions from the plant Arsenic, Cadmium, Chromium, Hydrogen Chloride, and Mercury to the atmosphere ***after*** the hot exhaust gases from waste burning pass through the pollution control devices.

[1] Waste and pollution control information from Covanta Energy's fact sheet "About the Chester County WTE Project"

Emissions from the smokestack are only half the story. Next, we applied these emission rates to computer models which can predict the actual levels of pollution up to six miles (10 kilometers) from the source.

## Air Pollution Analysis

Table 2 details the results of our analysis for five toxic air pollutants: arsenic, cadmium, chromium, hydrogen chloride, and mercury. Figure 1 indicates the fallout region for these pollutants at 800 meter intervals from the plant site. The outer circle is 4000 meters from the proposed smokestack.

**Figure 1. Aerial Map of Covanta Site and Richburg-Fort Lawn Area**

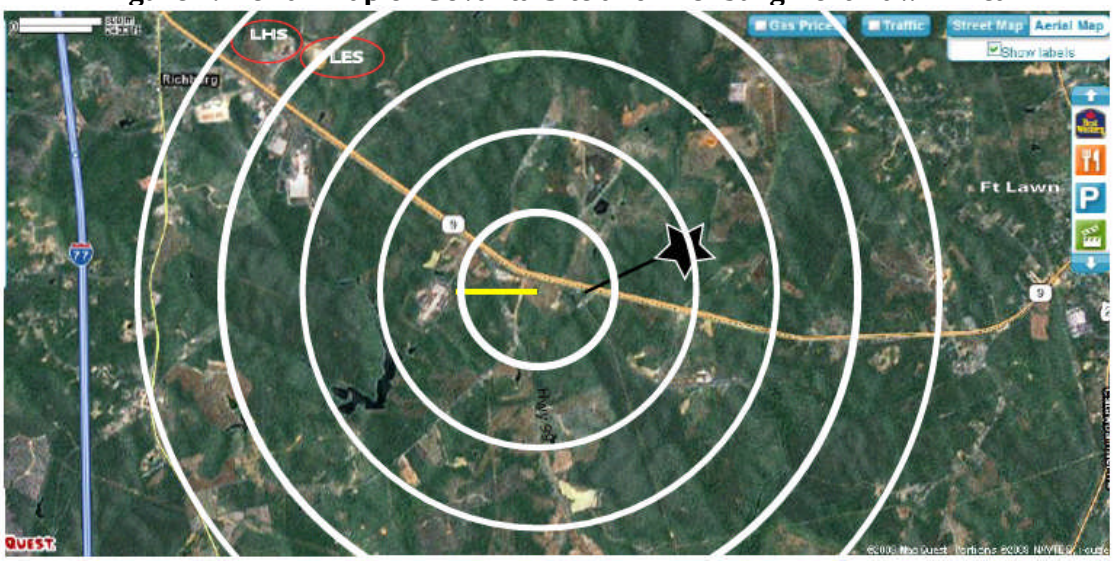



**Table 2: Area Pollution Impacts**

| **Toxic Air Pollutant** | Molecular Weight | Health concern level[2] (mg/m3) | Health concern level[3] (ppm) | Emission rate[4] grams/sec. | **Distance of excess levels (meters)** |
|---|---|---|---|---|---|
| **Arsenic** | 74.92 | 2.3E-07 | 7.5E-08 | 3.55E-05 | **>10,000** |
| **Cadmium** | 112.41 | 5.5E-06 | 1.2E-06 | 2.3E-04 | **>10,000** |
| **Chromium** | 51.99 | 8.3E-08 | 3.9E-08 | 2.5E-04 | **>10,000** |
| **Hydrogen Chloride** | 36.47 | 0.7 | 0.4693 | 1.77 | **1,500** |
| **Mercury** | 200.59 | 0.0006 | 7.3E-05 | 1.8E-02 | **8,500** |
| | | OSHA | | | |
| **Mercury** | 200.59 | 0.05 | 2.5E-03 | 1.8E-02 | **400** |

[2] North Carolina Toxic Air Pollutant Guidelines, 15A NCAC 02D .1104
[3] Milligrams per cubic meter divided by molecular weight times 24.45 = parts per million (ppm)
[4] Emissions Data from: US EPS Emission Factors, AP-42, for municipal waste combustors, Tables 2.1-2 and 2.1-4

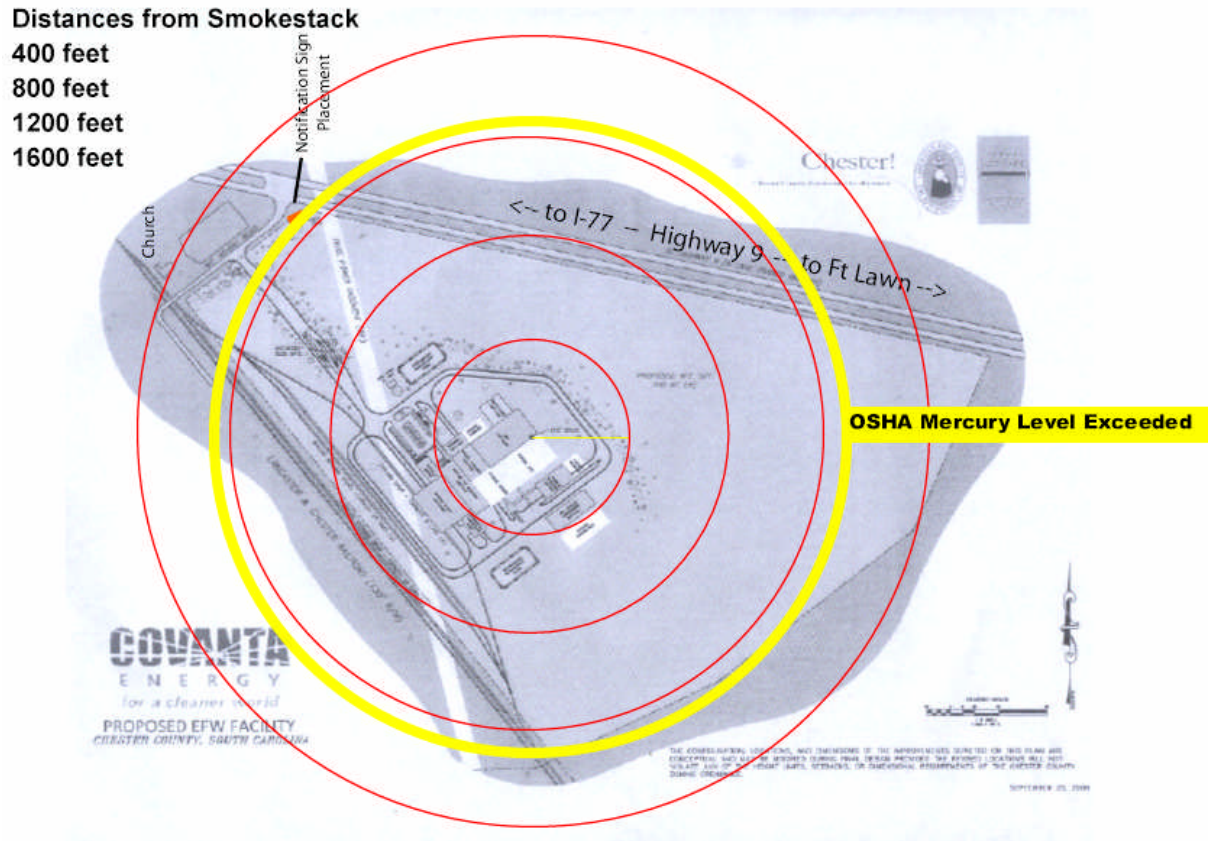
For this report, we applied the US EPA's Worst-case Spreadsheet and Air Pollution Emission Factors to the information provided by Covanta Energy. The worst-case method was developed by the US Environmental Protection Agency and is based upon the SCREEN3 and ISCST3 air pollution models.

The worst-case model predicts high levels of pollution extending over 10 kilometers—six miles—from the proposed Covanta Energy waste-to-energy incinerator. Attachment 2 contains all spreadsheets used in the worst-case analysis. Attachment 3 lists health impacts of the toxic air pollutants.

## Employees at Risk

The Occupational Safety and Health Administration has set limits of 0.05 mg/m3 for mercury vapor for 8-hour shift and 40-hour work weeks. Our analysis indicates that even this higher level would be exceeded over most of the 100 parcel of land identified by Covanta as its selected site on Route 9. Table 2 and Figure 2 indicate the extent of the exceedance of OSHA limits at 400 meters, or 1300 feet, from the incinerator smokestack.

**Figure 2. Plant Workers Exposure to Mercury**



**Conclusion**

Our analysis of smokestack emissions and local ambient impacts indicate a serious potential pollution problem from the proposed Covanta waste-to-energy incinerator. Toxic heavy metals including arsenic, cadmium, chromium and mercury and acidic hydrogen chloride would be emitted at levels which would have a deleterious effect on human health. Even if these levels were deemed to be legal and approved by the South Carolina Department of Health and Environmental Control, their impact would be no less devastating.

Further, incineration destroys valuable and often irreplaceable resources that can and should be recycled. The energy required to extract, transport, process and distribute the replacement materials destroyed by incineration far exceeds any energy gained from incineration. Recycling programs would be forced to compete for materials and could fail due to lack of support. Based on the threat to public health alone, the Blue Ridge Environmental Defense League opposes all forms of incineration either for disposal or for energy production.

December 3, 2009

Louis A. Zeller
Science Director

***Not Here, Not There, Not Anywhere***

## Attachment 1

### South Carolina Waste Incinerator Guidelines

**61-62.1.** Definitions and General Requirements. [SC ADC 61-62.1]

51. Municipal Waste Combustor, MWC, or Municipal Waste Combustor Unit - Any setting or equipment that combusts solid, liquid, or gasified municipal solid waste including, but not limited to, field-erected incinerators (with or without heat recovery), modular incinerators (starved-air or excess-air), boilers (i.e., steam generating units) and furnaces (whether suspension-fired, grate-fired, mass-fired, or fluidized bed-fired, etc.), air curtain incinerators, and pyrolysis/combustion units. Municipal waste combustors do not include pyrolysis/combustion units located at a plastics/rubber recycling units. Municipal waste combustors do not include internal combustion engines, gas turbines, or other combustion devices that combust landfill gases collected by landfill gas collection systems.

95. Waste-Any discarded material including but not limited to used oil, hazardous waste fuel, hazardous waste, medical waste, municipal solid waste, sludge, waste fuel, and waste classification Types 0 through 6 or any material which as a result of use, storage, or handling has become unsuitable for its original purpose due to the presence of impurities or loss of original properties.

a. Type 0 - Trash, a mixture of highly combustible waste such as paper, cardboard, wood boxes, and combustible floor sweepings, from commercial and industrial activities. The mixture contains up to 10% by weight of plastic bags, coated paper, laminated paper, treated corrugated cardboard, oily rags and plastic or rubber scraps.
   Typical composition: 10% moisture, 5% incombustible solids and has a heating value of approximately 8500 BTU per pound as fired.
b. Type 1 - Rubbish, a mixture of combustible waste such as paper, cardboard cartons, wood scrap, foliage and combustible floor sweepings, from domestic, commercial and industrial activities. The mixture contains up to 20% by weight of restaurant or cafeteria waste, but contains little or no treated papers, plastic or rubber wastes.
   Typical composition: 25% moisture, 10% incombustible solids and has a heating value of approximately 6500 BTU per pound as fired.
c. Type 2 - Refuse, consisting of an approximately even mixture of rubbish and garbage by weight. This type of waste is common to apartment and residential occupancy.
   Typical composition: up to 50% moisture, 7% incombustible solids, and has a heating value of approximately 4300 BTU per pound as fired.
d. Type 3 - Garbage, consisting of animal and vegetable wastes from restaurants, cafeterias, hotels, hospitals, markets, and like installations.
   Typical composition: up to 70% moisture, up to 5% incombustible solids and has a heating value of approximately 2500 BTU per pound as fired.
e. Type 4 - Human and animal remains, consisting of carcasses, organs and solid organic wastes from hospitals, laboratories, abattoirs, animal pounds, and similar sources.
   Typical composition: up to 85% moisture, 5% incombustible solids, and having a heating value of approximately 1000 BTU per pound as fired.
f. Type 5 - By-product waste, gaseous, liquid or semi-liquid, such as tar, paints, solvents, sludge, fumes, etc., from industrial operations. BTU values shall be determined by the individual materials to be destroyed.
g. Type 6 - Solid by-product waste, such as rubber, plastics, wood waste, etc., from industrial operations. BTU values shall be determined by the individual materials to be destroyed.

## ATTACHMENT 2

On the following pages are US EPA Worst-case Spreadsheet data for toxic air pollutants from a 50 Megawatt waste-to-energy municipal waste combustor. Each toxic pollutant is presented in a separate table: Arsenic, Cadmium, Chromium, Hydrogen Chloride and Mercury.

COVANTA WTE Chester, SC

**Enter the peak emission rate of the contaminent of concern**

hydrogen chloride

| | | | | | |
|---|---|---|---|---|---|
| | **Peak (30 min) Emission Rate =** | **1.772** | **g/s** | **61.56** | **tons/yr** |
| | **MW=** | **36.47** | | | |
| NC AAL | **Concern level** | **0.4693** | **ppm** | **700** | **ug/m3** |

| | Distance (M) | Point | Area | Volume | Worst | Recommendation |
|---|---|---|---|---|---|---|
| | **100** | 1.31E+03 | 4.18E+04 | 1.36E+04 | **4.18E+04** | reduce emissions |
| point | **200** | 7.13E+02 | 1.66E+04 | 7.57E+03 | **1.66E+04** | reduce emissions |
| | **300** | 4.91E+02 | 8.99E+03 | 4.88E+03 | **8.99E+03** | reduce emissions |
| | **400** | 3.77E+02 | 5.70E+03 | 3.43E+03 | **5.70E+03** | reduce emissions |
| | **500** | 3.06E+02 | 3.97E+03 | 2.56E+03 | **3.97E+03** | reduce emissions |
| | **600** | 2.59E+02 | 2.94E+03 | 2.06E+03 | **2.94E+03** | reduce emissions |
| | **700** | 2.19E+02 | 2.28E+03 | 1.67E+03 | **2.28E+03** | reduce emissions |
| | **800** | 1.91E+02 | 1.85E+03 | 1.39E+03 | **1.85E+03** | reduce emissions |
| | **900** | 1.92E+02 | 1.54E+03 | 1.19E+03 | **1.54E+03** | reduce emissions |
| | **1000** | 1.92E+02 | 1.30E+03 | 1.03E+03 | **1.30E+03** | reduce emissions |
| | **1100** | 1.89E+02 | 1.13E+03 | 8.99E+02 | **1.13E+03** | reduce emissions |
| | **1200** | 1.90E+02 | 9.85E+02 | 7.95E+02 | **9.85E+02** | reduce emissions |
| volume | **1300** | 1.89E+02 | 8.72E+02 | 7.09E+02 | **8.72E+02** | reduce emissions |
| | **1400** | 1.88E+02 | 7.79E+02 | 6.38E+02 | **7.79E+02** | reduce emissions |
| area | **1500** | 1.85E+02 | 7.01E+02 | 5.78E+02 | **7.01E+02** | reduce emissions |
| | **1600** | 1.82E+02 | 6.35E+02 | 5.26E+02 | **6.35E+02** | its OK |
| | **1700** | 1.78E+02 | 5.79E+02 | 4.82E+02 | **5.79E+02** | its OK |
| | **1800** | 1.74E+02 | 5.30E+02 | 4.44E+02 | **5.30E+02** | its OK |
| | **1900** | 1.70E+02 | 4.88E+02 | 4.10E+02 | **4.88E+02** | its OK |
| | **2000** | 1.66E+02 | 4.51E+02 | 3.85E+02 | **4.51E+02** | its OK |

COVANTA WTE Chester, SC

**Enter the peak emission rate of the contaminent of concern**

mercury

| | | | | | | |
|---|---|---|---|---|---|---|
| | **Peak (30 min) Emission Rate =** | | | **0.018** | **g/s** | **0.642** | **tons/yr** |
| | **MW=** | | | **200.59** | | | |
| NC AAL | **Concern level** | | | **0.000073** | **ppm** | **0.599** | **ug/m3** |

| | **Distance (M)** | **Point** | **Area** | **Volume** | **Worst** | **Recommendation** |
|---|---|---|---|---|---|---|
| | **100** | 1.36E+01 | 4.36E+02 | 1.42E+02 | **4.36E+02** | reduce emissions |
| | **200** | 7.43E+00 | 1.73E+02 | 7.89E+01 | **1.73E+02** | reduce emissions |
| | **300** | 5.12E+00 | 9.37E+01 | 5.09E+01 | **9.37E+01** | reduce emissions |
| | **400** | 3.93E+00 | 5.94E+01 | 3.58E+01 | **5.94E+01** | reduce emissions |
| | **500** | 3.19E+00 | 4.14E+01 | 2.67E+01 | **4.14E+01** | reduce emissions |
| | **600** | 2.70E+00 | 3.07E+01 | 2.15E+01 | **3.07E+01** | reduce emissions |
| | **700** | 2.29E+00 | 2.38E+01 | 1.74E+01 | **2.38E+01** | reduce emissions |
| | **800** | 1.99E+00 | 1.93E+01 | 1.45E+01 | **1.93E+01** | reduce emissions |
| | **900** | 2.00E+00 | 1.60E+01 | 1.24E+01 | **1.60E+01** | reduce emissions |
| | **1000** | 2.01E+00 | 1.36E+01 | 1.07E+01 | **1.36E+01** | reduce emissions |
| | **1100** | 1.98E+00 | 1.17E+01 | 9.37E+00 | **1.17E+01** | reduce emissions |
| | **1200** | 1.98E+00 | 1.03E+01 | 8.29E+00 | **1.03E+01** | reduce emissions |
| | **1300** | 1.97E+00 | 9.09E+00 | 7.40E+00 | **9.09E+00** | reduce emissions |
| | **1400** | 1.96E+00 | 8.12E+00 | 6.65E+00 | **8.12E+00** | reduce emissions |
| | **1500** | 1.93E+00 | 7.31E+00 | 6.02E+00 | **7.31E+00** | reduce emissions |
| | **1600** | 1.90E+00 | 6.62E+00 | 5.49E+00 | **6.62E+00** | reduce emissions |
| | **1700** | 1.86E+00 | 6.03E+00 | 5.03E+00 | **6.03E+00** | reduce emissions |
| | **1800** | 1.82E+00 | 5.53E+00 | 4.63E+00 | **5.53E+00** | reduce emissions |
| | **1900** | 1.77E+00 | 5.09E+00 | 4.27E+00 | **5.09E+00** | reduce emissions |
| | **2000** | 1.73E+00 | 4.70E+00 | 4.02E+00 | **4.70E+00** | reduce emissions |
| | **2100** | 1.68E+00 | 4.38E+00 | 3.75E+00 | **4.38E+00** | reduce emissions |
| | **2200** | 1.63E+00 | 4.10E+00 | 3.52E+00 | **4.10E+00** | reduce emissions |
| | **2300** | 1.58E+00 | 3.84E+00 | 3.31E+00 | **3.84E+00** | reduce emissions |
| | **2400** | 1.54E+00 | 3.61E+00 | 3.11E+00 | **3.61E+00** | reduce emissions |
| | **2500** | 1.49E+00 | 3.41E+00 | 2.94E+00 | **3.41E+00** | reduce emissions |
| | **2600** | 1.45E+00 | 3.22E+00 | 2.78E+00 | **3.22E+00** | reduce emissions |
| | **2700** | 1.41E+00 | 3.05E+00 | 2.64E+00 | **3.05E+00** | reduce emissions |
| | **2800** | 1.37E+00 | 2.89E+00 | 2.51E+00 | **2.89E+00** | reduce emissions |
| | **2900** | 1.33E+00 | 2.75E+00 | 2.39E+00 | **2.75E+00** | reduce emissions |
| | **3000** | 1.29E+00 | 2.62E+00 | 2.29E+00 | **2.62E+00** | reduce emissions |
| | **3500** | 1.13E+00 | 2.12E+00 | 1.86E+00 | **2.12E+00** | reduce emissions |
| | **4000** | 9.97E-01 | 1.77E+00 | 1.56E+00 | **1.77E+00** | reduce emissions |
| | **4500** | 8.89E-01 | 1.51E+00 | 1.33E+00 | **1.51E+00** | reduce emissions |
| | **5000** | 8.00E-01 | 1.30E+00 | 1.16E+00 | **1.30E+00** | reduce emissions |
| | **5500** | 7.25E-01 | 1.15E+00 | 1.02E+00 | **1.15E+00** | reduce emissions |
| | **6000** | 6.61E-01 | 1.02E+00 | 9.04E-01 | **1.02E+00** | reduce emissions |
| point | **6500** | 6.07E-01 | 9.13E-01 | 8.12E-01 | **9.13E-01** | reduce emissions |
| | **7000** | 5.59E-01 | 8.26E-01 | 7.36E-01 | **8.26E-01** | reduce emissions |
| | **7500** | 5.19E-01 | 7.55E-01 | 6.73E-01 | **7.55E-01** | reduce emissions |
| volume | **8000** | 4.84E-01 | 6.94E-01 | 6.19E-01 | **6.94E-01** | reduce emissions |
| area | **8500** | 4.52E-01 | 6.41E-01 | 5.72E-01 | **6.41E-01** | reduce emissions |
| | **9000** | 4.24E-01 | 5.95E-01 | 5.31E-01 | **5.95E-01** | its OK |

COVANTA WTE Chester, SC

**Enter the peak emission rate of the contaminent of concern**

mercury

| | | | | | |
|---|---|---|---|---|---|
| | **Peak (30 min) Emission Rate =** | **0.018** | **g/s** | **0.642** | **tons/yr** |
| | **MW=** | **200.59** | | | |
| OSHA | **Concern level** | **0.00609** | **ppm** | **49.96** | **ug/m3** |

| | **Distance (M)** | **Point** | **Area** | **Volume** | **Worst** | **Recommendation** |
|---|---|---|---|---|---|---|
| | **100** | 1.36E+01 | 4.36E+02 | 1.42E+02 | **4.36E+02** | reduce emissions |
| | **200** | 7.43E+00 | 1.73E+02 | 7.89E+01 | **1.73E+02** | reduce emissions |
| volume | **300** | 5.12E+00 | 9.37E+01 | 5.09E+01 | **9.37E+01** | reduce emissions |
| area | **400** | 3.93E+00 | 5.94E+01 | 3.58E+01 | **5.94E+01** | reduce emissions |
| | **500** | 3.19E+00 | 4.14E+01 | 2.67E+01 | **4.14E+01** | its OK |
| | **600** | 2.70E+00 | 3.07E+01 | 2.15E+01 | **3.07E+01** | its OK |
| | **700** | 2.29E+00 | 2.38E+01 | 1.74E+01 | **2.38E+01** | its OK |
| | **800** | 1.99E+00 | 1.93E+01 | 1.45E+01 | **1.93E+01** | its OK |
| | **900** | 2.00E+00 | 1.60E+01 | 1.24E+01 | **1.60E+01** | its OK |
| | **1000** | 2.01E+00 | 1.36E+01 | 1.07E+01 | **1.36E+01** | its OK |

COVANTA WTE Chester, SC

**Enter the peak emission rate of the contaminent of concern**

cadmium

| | | | | | | |
|---|---|---|---|---|---|---|
| | **Peak (30 min) Emission Rate =** | | | **0.00023** | **g/s** | **0.008** **tons/yr** |
| | **MW=** | | | **112.41** | | |
| NC AAL | **Concern level** | | | **0.000001196** | **ppm** | **0.005** **ug/m3** |

| | **Distance (M)** | **Point** | **Area** | **Volume** | **Worst** | **Recommendation** |
|---|---|---|---|---|---|---|
| | **200** | 9.16E-02 | 2.13E+00 | 9.73E-01 | **2.13E+00** | reduce emissions |
| | **300** | 6.30E-02 | 1.15E+00 | 6.27E-01 | **1.15E+00** | reduce emissions |
| | **400** | 4.84E-02 | 7.32E-01 | 4.41E-01 | **7.32E-01** | reduce emissions |
| | **500** | 3.93E-02 | 5.10E-01 | 3.29E-01 | **5.10E-01** | reduce emissions |
| | **600** | 3.33E-02 | 3.78E-01 | 2.64E-01 | **3.78E-01** | reduce emissions |
| | **700** | 2.82E-02 | 2.93E-01 | 2.15E-01 | **2.93E-01** | reduce emissions |
| | **800** | 2.45E-02 | 2.37E-01 | 1.78E-01 | **2.37E-01** | reduce emissions |
| | **900** | 2.46E-02 | 1.97E-01 | 1.53E-01 | **1.97E-01** | reduce emissions |
| | **1000** | 2.47E-02 | 1.67E-01 | 1.32E-01 | **1.67E-01** | reduce emissions |
| | **1100** | 2.43E-02 | 1.45E-01 | 1.16E-01 | **1.45E-01** | reduce emissions |
| | **1200** | 2.44E-02 | 1.27E-01 | 1.02E-01 | **1.27E-01** | reduce emissions |
| | **1300** | 2.43E-02 | 1.12E-01 | 9.11E-02 | **1.12E-01** | reduce emissions |
| | **1400** | 2.41E-02 | 1.00E-01 | 8.20E-02 | **1.00E-01** | reduce emissions |
| | **1500** | 2.38E-02 | 9.00E-02 | 7.42E-02 | **9.00E-02** | reduce emissions |
| | **1600** | 2.34E-02 | 8.15E-02 | 6.76E-02 | **8.15E-02** | reduce emissions |
| | **1700** | 2.29E-02 | 7.43E-02 | 6.19E-02 | **7.43E-02** | reduce emissions |
| | **1800** | 2.24E-02 | 6.81E-02 | 5.70E-02 | **6.81E-02** | reduce emissions |
| | **1900** | 2.18E-02 | 6.27E-02 | 5.27E-02 | **6.27E-02** | reduce emissions |
| | **2000** | 2.13E-02 | 5.79E-02 | 4.95E-02 | **5.79E-02** | reduce emissions |
| | **2100** | 2.07E-02 | 5.40E-02 | 4.62E-02 | **5.40E-02** | reduce emissions |
| | **2200** | 2.01E-02 | 5.05E-02 | 4.33E-02 | **5.05E-02** | reduce emissions |
| | **2300** | 1.95E-02 | 4.74E-02 | 4.07E-02 | **4.74E-02** | reduce emissions |
| | **2400** | 1.89E-02 | 4.45E-02 | 3.84E-02 | **4.45E-02** | reduce emissions |
| | **2500** | 1.84E-02 | 4.20E-02 | 3.62E-02 | **4.20E-02** | reduce emissions |
| | **2600** | 1.78E-02 | 3.97E-02 | 3.43E-02 | **3.97E-02** | reduce emissions |
| | **2700** | 1.73E-02 | 3.76E-02 | 3.25E-02 | **3.76E-02** | reduce emissions |
| | **2800** | 1.68E-02 | 3.56E-02 | 3.09E-02 | **3.56E-02** | reduce emissions |
| | **2900** | 1.64E-02 | 3.39E-02 | 2.94E-02 | **3.39E-02** | reduce emissions |
| | **3000** | 1.59E-02 | 3.23E-02 | 2.82E-02 | **3.23E-02** | reduce emissions |
| | **3500** | 1.39E-02 | 2.61E-02 | 2.30E-02 | **2.61E-02** | reduce emissions |
| | **4000** | 1.23E-02 | 2.18E-02 | 1.92E-02 | **2.18E-02** | reduce emissions |
| | **4500** | 1.10E-02 | 1.86E-02 | 1.64E-02 | **1.86E-02** | reduce emissions |
| | **5000** | 9.85E-03 | 1.61E-02 | 1.42E-02 | **1.61E-02** | reduce emissions |
| | **5500** | 8.93E-03 | 1.41E-02 | 1.25E-02 | **1.41E-02** | reduce emissions |
| | **6000** | 8.14E-03 | 1.25E-02 | 1.11E-02 | **1.25E-02** | reduce emissions |
| | **6500** | 7.47E-03 | 1.13E-02 | 1.00E-02 | **1.13E-02** | reduce emissions |
| | **7000** | 6.89E-03 | 1.02E-02 | 9.06E-03 | **1.02E-02** | reduce emissions |
| | **7500** | 6.39E-03 | 9.30E-03 | 8.29E-03 | **9.30E-03** | reduce emissions |
| | **8000** | 5.96E-03 | 8.55E-03 | 7.62E-03 | **8.55E-03** | reduce emissions |
| point | **8500** | 5.57E-03 | 7.90E-03 | 7.05E-03 | **7.90E-03** | reduce emissions |
| | **9000** | 5.23E-03 | 7.33E-03 | 6.54E-03 | **7.33E-03** | reduce emissions |
| | **9500** | 4.92E-03 | 6.83E-03 | 6.10E-03 | **6.83E-03** | reduce emissions |
| area/volume | **10000** | 4.65E-03 | 6.39E-03 | 5.71E-03 | **6.39E-03** | reduce emissions |

COVANTA WTE Chester, SC

**Enter the peak emission rate of the contaminent of concern**
chromium

| | | | | | | |
|---|---|---|---|---|---|---|
| | **Peak (30 min) Emission Rate =** | | | **0.00025** | **g/s** | **0.009** **tons/yr** |
| | **MW=** | | | **51.966** | | |
| NC AAL | **Concern level** | | | **0.000000039** | **ppm** | **8E-05** **ug/m3** |
| | **Distance (M)** | **Point** | **Area** | **Volume** | **Worst** | **Recommendation** |
| | **300** | 6.98E-02 | 1.28E+00 | 6.94E-01 | **1.28E+00** | reduce emissions |
| | **400** | 5.36E-02 | 8.10E-01 | 4.88E-01 | **8.10E-01** | reduce emissions |
| | **500** | 4.35E-02 | 5.64E-01 | 3.65E-01 | **5.64E-01** | reduce emissions |
| | **600** | 3.68E-02 | 4.18E-01 | 2.93E-01 | **4.18E-01** | reduce emissions |
| | **700** | 3.12E-02 | 3.24E-01 | 2.37E-01 | **3.24E-01** | reduce emissions |
| | **800** | 2.72E-02 | 2.63E-01 | 1.97E-01 | **2.63E-01** | reduce emissions |
| | **900** | 2.73E-02 | 2.18E-01 | 1.69E-01 | **2.18E-01** | reduce emissions |
| | **1000** | 2.73E-02 | 1.85E-01 | 1.46E-01 | **1.85E-01** | reduce emissions |
| | **1100** | 2.69E-02 | 1.60E-01 | 1.28E-01 | **1.60E-01** | reduce emissions |
| | **1200** | 2.70E-02 | 1.40E-01 | 1.13E-01 | **1.40E-01** | reduce emissions |
| | **1300** | 2.69E-02 | 1.24E-01 | 1.01E-01 | **1.24E-01** | reduce emissions |
| | **1400** | 2.67E-02 | 1.11E-01 | 9.07E-02 | **1.11E-01** | reduce emissions |
| | **1500** | 2.63E-02 | 9.96E-02 | 8.22E-02 | **9.96E-02** | reduce emissions |
| | **1600** | 2.59E-02 | 9.02E-02 | 7.48E-02 | **9.02E-02** | reduce emissions |
| | **1700** | 2.54E-02 | 8.23E-02 | 6.85E-02 | **8.23E-02** | reduce emissions |
| | **1800** | 2.48E-02 | 7.53E-02 | 6.31E-02 | **7.53E-02** | reduce emissions |
| | **1900** | 2.42E-02 | 6.94E-02 | 5.83E-02 | **6.94E-02** | reduce emissions |
| | **2000** | 2.36E-02 | 6.41E-02 | 5.48E-02 | **6.41E-02** | reduce emissions |
| | **2100** | 2.29E-02 | 5.98E-02 | 5.12E-02 | **5.98E-02** | reduce emissions |
| | **2200** | 2.22E-02 | 5.59E-02 | 4.80E-02 | **5.59E-02** | reduce emissions |
| | **2300** | 2.16E-02 | 5.24E-02 | 4.51E-02 | **5.24E-02** | reduce emissions |
| | **2400** | 2.09E-02 | 4.93E-02 | 4.25E-02 | **4.93E-02** | reduce emissions |
| | **2500** | 2.03E-02 | 4.65E-02 | 4.01E-02 | **4.65E-02** | reduce emissions |
| | **2600** | 1.97E-02 | 4.39E-02 | 3.80E-02 | **4.39E-02** | reduce emissions |
| | **2700** | 1.92E-02 | 4.16E-02 | 3.60E-02 | **4.16E-02** | reduce emissions |
| | **2800** | 1.86E-02 | 3.94E-02 | 3.42E-02 | **3.94E-02** | reduce emissions |
| | **2900** | 1.81E-02 | 3.75E-02 | 3.26E-02 | **3.75E-02** | reduce emissions |
| | **3000** | 1.76E-02 | 3.57E-02 | 3.12E-02 | **3.57E-02** | reduce emissions |
| | **3500** | 1.54E-02 | 2.89E-02 | 2.54E-02 | **2.89E-02** | reduce emissions |
| | **4000** | 1.36E-02 | 2.41E-02 | 2.13E-02 | **2.41E-02** | reduce emissions |
| | **4500** | 1.21E-02 | 2.05E-02 | 1.81E-02 | **2.05E-02** | reduce emissions |
| | **5000** | 1.09E-02 | 1.78E-02 | 1.58E-02 | **1.78E-02** | reduce emissions |
| | **5500** | 9.88E-03 | 1.56E-02 | 1.39E-02 | **1.56E-02** | reduce emissions |
| | **6000** | 9.01E-03 | 1.39E-02 | 1.23E-02 | **1.39E-02** | reduce emissions |
| | **6500** | 8.27E-03 | 1.25E-02 | 1.11E-02 | **1.25E-02** | reduce emissions |
| | **7000** | 7.63E-03 | 1.13E-02 | 1.00E-02 | **1.13E-02** | reduce emissions |
| | **7500** | 7.08E-03 | 1.03E-02 | 9.18E-03 | **1.03E-02** | reduce emissions |
| | **8000** | 6.59E-03 | 9.46E-03 | 8.44E-03 | **9.46E-03** | reduce emissions |
| | **8500** | 6.17E-03 | 8.74E-03 | 7.80E-03 | **8.74E-03** | reduce emissions |
| | **9000** | 5.79E-03 | 8.11E-03 | 7.24E-03 | **8.11E-03** | reduce emissions |
| | **9500** | 5.45E-03 | 7.56E-03 | 6.75E-03 | **7.56E-03** | reduce emissions |
| A/V/P | **10000** | 5.14E-03 | 7.07E-03 | 6.32E-03 | **7.07E-03** | reduce emissions |

COVANTA WTE Chester, SC

**Enter the peak emission rate of the contaminent of concern**

ARSENIC

| | | | | | | |
|---|---|---|---|---|---|---|
| | **Peak (30 min) Emission Rate =** | | | **0.0000355** | **g/s** | **0.001** **tons/yr** |
| | **MW=** | | | **74.92** | | |
| NC AAL | **Concern level** | | | **0.000000075** | **ppm** | **2E-04** **ug/m3** |
| | **Distance (M)** | **Point** | **Area** | **Volume** | **Worst** | **Recommendation** |
| | **300** | 9.83E-03 | 1.80E-01 | 9.77E-02 | **1.80E-01** | reduce emissions |
| | **400** | 7.55E-03 | 1.14E-01 | 6.88E-02 | **1.14E-01** | reduce emissions |
| | **500** | 6.13E-03 | 7.95E-02 | 5.14E-02 | **7.95E-02** | reduce emissions |
| | **600** | 5.19E-03 | 5.89E-02 | 4.12E-02 | **5.89E-02** | reduce emissions |
| | **700** | 4.39E-03 | 4.57E-02 | 3.35E-02 | **4.57E-02** | reduce emissions |
| | **800** | 3.83E-03 | 3.70E-02 | 2.78E-02 | **3.70E-02** | reduce emissions |
| | **900** | 3.84E-03 | 3.08E-02 | 2.38E-02 | **3.08E-02** | reduce emissions |
| | **1000** | 3.85E-03 | 2.61E-02 | 2.06E-02 | **2.61E-02** | reduce emissions |
| | **1100** | 3.79E-03 | 2.25E-02 | 1.80E-02 | **2.25E-02** | reduce emissions |
| | **1200** | 3.80E-03 | 1.97E-02 | 1.59E-02 | **1.97E-02** | reduce emissions |
| | **1300** | 3.79E-03 | 1.75E-02 | 1.42E-02 | **1.75E-02** | reduce emissions |
| | **1400** | 3.76E-03 | 1.56E-02 | 1.28E-02 | **1.56E-02** | reduce emissions |
| | **1500** | 3.71E-03 | 1.40E-02 | 1.16E-02 | **1.40E-02** | reduce emissions |
| | **1600** | 3.65E-03 | 1.27E-02 | 1.05E-02 | **1.27E-02** | reduce emissions |
| | **1700** | 3.57E-03 | 1.16E-02 | 9.66E-03 | **1.16E-02** | reduce emissions |
| | **1800** | 3.49E-03 | 1.06E-02 | 8.89E-03 | **1.06E-02** | reduce emissions |
| | **1900** | 3.41E-03 | 9.77E-03 | 8.21E-03 | **9.77E-03** | reduce emissions |
| | **2000** | 3.32E-03 | 9.03E-03 | 7.71E-03 | **9.03E-03** | reduce emissions |
| | **2100** | 3.22E-03 | 8.42E-03 | 7.21E-03 | **8.42E-03** | reduce emissions |
| | **2200** | 3.13E-03 | 7.87E-03 | 6.76E-03 | **7.87E-03** | reduce emissions |
| | **2300** | 3.04E-03 | 7.38E-03 | 6.35E-03 | **7.38E-03** | reduce emissions |
| | **2400** | 2.95E-03 | 6.94E-03 | 5.98E-03 | **6.94E-03** | reduce emissions |
| | **2500** | 2.86E-03 | 6.55E-03 | 5.65E-03 | **6.55E-03** | reduce emissions |
| | **2600** | 2.78E-03 | 6.18E-03 | 5.35E-03 | **6.18E-03** | reduce emissions |
| | **2700** | 2.70E-03 | 5.86E-03 | 5.07E-03 | **5.86E-03** | reduce emissions |
| | **2800** | 2.63E-03 | 5.56E-03 | 4.82E-03 | **5.56E-03** | reduce emissions |
| | **2900** | 2.55E-03 | 5.28E-03 | 4.59E-03 | **5.28E-03** | reduce emissions |
| | **3000** | 2.48E-03 | 5.03E-03 | 4.40E-03 | **5.03E-03** | reduce emissions |
| | **3500** | 2.17E-03 | 4.08E-03 | 3.58E-03 | **4.08E-03** | reduce emissions |
| | **4000** | 1.91E-03 | 3.40E-03 | 2.99E-03 | **3.40E-03** | reduce emissions |
| | **4500** | 1.71E-03 | 2.89E-03 | 2.56E-03 | **2.89E-03** | reduce emissions |
| | **5000** | 1.54E-03 | 2.51E-03 | 2.22E-03 | **2.51E-03** | reduce emissions |
| | **5500** | 1.39E-03 | 2.20E-03 | 1.95E-03 | **2.20E-03** | reduce emissions |
| | **6000** | 1.27E-03 | 1.96E-03 | 1.74E-03 | **1.96E-03** | reduce emissions |
| | **6500** | 1.17E-03 | 1.75E-03 | 1.56E-03 | **1.75E-03** | reduce emissions |
| | **7000** | 1.07E-03 | 1.59E-03 | 1.41E-03 | **1.59E-03** | reduce emissions |
| | **7500** | 9.97E-04 | 1.45E-03 | 1.29E-03 | **1.45E-03** | reduce emissions |
| | **8000** | 9.29E-04 | 1.33E-03 | 1.19E-03 | **1.33E-03** | reduce emissions |
| | **8500** | 8.69E-04 | 1.23E-03 | 1.10E-03 | **1.23E-03** | reduce emissions |
| | **9000** | 8.15E-04 | 1.14E-03 | 1.02E-03 | **1.14E-03** | reduce emissions |
| | **9500** | 7.67E-04 | 1.06E-03 | 9.51E-04 | **1.06E-03** | reduce emissions |
| A/V/P | **10000** | 7.24E-04 | 9.96E-04 | 8.90E-04 | **9.96E-04** | reduce emissions |

**Attachment 3**

# PUBLIC HEALTH IMPACT DATA

## Arsenic (As) The IARC lists element as Group 1, carcinogenic to humans

European Union directive 67/548/EEC, The International Agency for Research on Cancer (IARC)

## Cadmium (Cd) Cadmium and several cadmium-containing compounds are known carcinogens and can induce many types of cancer.

"11th Report on Carcinogens" National Toxicology Program. http://ntp.niehs.nih.gov/index.cfm?objectid=32BA9724-F1F6-975E-7FCE50709CB4C932.

## Chromium (Cr) when ingested, damages the kidneys, the liver and blood cells and is carcinogenic.

Dayan, A. D.; Paine, A. J. (2001). "Mechanisms of chromium toxicity, carcinogenicity and allergenicity: Review of the literature from 1985 to 2000". Human & Experimental Toxicology 20 (9): 439–451.

Newman, D. (1890). "A case of adeno-carcinoma of the left inferior turbinated body, and perforation of the nasal septum, in the person of a worker in chrome pigments". Glasgow Med J 33: 469–470.

Langard, Sverre (1990). "One Hundred Years of Chromium and Cancer: A Review of Epidemiological Evidence and Selected Case Reports". American Journal of Industrial Medicine 17: 189–215..

## Mercury (Hg) Mercury and most of its compounds are extremely toxic. effects include damage to the brain, kidney, and lungs

Clifton JC 2nd (2007). "Mercury exposure and public health". *Pediatr Clin North Am* 54 (2): 237–69, viii.

## Hydrogen chloride (HCl) forms corrosive hydrochloric acid on contact with water found in body tissue. Inhalation of the fumes can cause coughing, choking, inflammation of the nose, throat, and upper respiratory tract, and in severe cases, pulmonary edema, circulatory system failure, and death

*Public health and reference data from Wikipedia*