

Appendix 3.5b Detailed Calculation of Emissions from Existing WENT Landfill

Scenario 2 - Operation Year in 2045

Landfill gas used in gas engines for landfill site load	750 m3/hr
Landfill gas used in leachate recovery plant boilers	2500 m3/hr
Landfill gas to flare	690 m3/hr
Therefore,	
Peak landfill gas generation from WENT landfill	3940 m3/hr

With reference to Table 4-4 of USEPA Air Emissions from Municipal Solid Waste Landfills - Background Information for Proposed Standards and Guidelines, March 1991 ((EPA-450/3-90-011a):

Secondary NOx emission from enclosed flare/incinerator	4.9 lb/MM scf LFG
Secondary NOx emission from gas turbine	26.4 lb/MM scf LFG
Secondary NOx emission from boiler	70 lb/MM scf LFG

Unit conversion:

$$\begin{aligned}
 &1 \text{ MM scf} \\
 &= 1000000 \text{ scf} \\
 &= 28316.847 \text{ scm} \\
 \\
 &1 \text{ lb/MM scf} \\
 &= 452.5 \text{ g/MM scf} \\
 &= 0.0159799 \text{ g/scm}
 \end{aligned}$$

Standard conditions (US standard):

$$\begin{aligned}
 &60 \text{ F} \\
 &= 15.555556 \text{ C} \\
 &= 288.555556 \text{ K}
 \end{aligned}$$

Assume LFG at typical ambient temperature:

$$\begin{aligned}
 &25 \text{ C} \\
 &= 298 \text{ K}
 \end{aligned}$$

Therefore,

$$\begin{aligned}
 &1 \text{ m}^3 \text{ at } 25\text{C} \\
 &= 0.9683072 \text{ scm}
 \end{aligned}$$

Therefore,

Landfill gas to flare	690 m3/hr	
	= 668.13199 scm/hr	
	= 0.1855922 scm/sec	
NOx from flare	= 0.0145321 g/sec	total of 2 stacks

Landfill gas used in gas engines for landfill site load	750 m3/hr	
	= 726.23043 scm/hr	
	= 0.2017307 scm/sec	
NOx from gas engines	= 0.0851039 g/sec	total of 2 gas engines exhaust

Landfill gas used in leachate recovery plant boilers	2500 m3/hr	
	= 2420.7681 scm/hr	
	= 0.6724356 scm/sec	
NOx from boilers	= 0.7521811 g/sec	total of 2 boiler exhaust

With reference to Table 4-4 of USEPA Air Emissions from Municipal Solid Waste Landfills - Background Information for Proposed

Secondary SO2 emission from enclosed flare/incinerator	3.0 lb/MM scf LFG
Secondary SO2 emission from gas turbine	3.0 lb/MM scf LFG
Secondary SO2 emission from boiler	3.0 lb/MM scf LFG
Secondary PM emission from enclosed flare/incinerator	Negligible lb/MM scf LFG
Secondary PM emission from gas turbine	37.0 lb/MM scf LFG
Secondary PM emission from boiler	Negligible lb/MM scf LFG
Secondary CO emission from enclosed flare/incinerator	58.0 lb/MM scf LFG
Secondary CO emission from gas turbine	12.5 lb/MM scf LFG
Secondary CO emission from boiler	17.0 lb/MM scf LFG
Secondary HCL emission from enclosed flare/incinerator	12.0 lb/MM scf LFG
Secondary HCL emission from gas turbine	12.0 lb/MM scf LFG
Secondary HCL emission from boiler	12.0 lb/MM scf LFG

Therefore,

SO2 from flare	= 0.0088972 g/sec	total of 2 stacks
SO2 from gas engines	= 0.0096709 g/sec	total of 2 gas engines exhaust
SO2 from boilers	= 0.0322363 g/sec	total of 2 boiler exhaust
PM from flare	= Negligible g/sec	total of 2 stacks
PM from gas engines	= 0.1192744 g/sec	total of 2 gas engines exhaust
PM from boilers	= Negligible g/sec	total of 2 boiler exhaust
CO from flare	= 0.1720131 g/sec	total of 2 stacks
CO from gas engines	= 0.0402954 g/sec	total of 2 gas engines exhaust
CO from boilers	= 0.1826726 g/sec	total of 2 boiler exhaust
HCL from flare	= 0.0355889 g/sec	total of 2 stacks
HCL from gas engines	= 0.0386836 g/sec	total of 2 gas engines exhaust
HCL from boilers	= 0.1289453 g/sec	total of 2 boiler exhaust