

July 31, 2018

MacEwan University – 2018 STARS Submission

OP-2: Outdoor Air Quality Calculations

An inventory of significant air emissions from stationary campus sources was completed by Energy Profiles Limited (EPL) as shown below in Table 1. This information was compiled to meet the reporting requirements outlined in the STARS 2.1 Technical Manual, specifically responding to Part 2 in the section on Outdoor Air Quality (OP-2).

Table 1: Air Emissions from Stationary Sources

Emission Categories	Weight of Emissions (Tons)
Nitrogen oxides (NOx)	9.025
Sulfur Oxides (SOx)	0.039
Carbon monoxide (CO)	5.415
Particulate matter (PM)	0.490
Ozone (O3)	0.0000075
Lead (Pb)	0.0000322
Hazardous air pollutants (HAPs)	0.0003585
Ozone-depleting compounds (ODCs)	0
Other standard categories of air emissions identified in permits and/or regulations	--

In keeping with the industry best practice for quantifying emissions, the following equation was used to estimate emissions from stationary sources at MacEwan University:

$$\text{Emissions (Tons)} = \text{Activity Data (Unit)} \times \text{Emission Factor (Tons/Unit)}$$

Activity data was collected from the following stationary sources in their native consumption units for the fiscal year between July 1, 2016 and June 30, 2017, unless otherwise stated:

- Natural gas combustion by boilers and furnaces
- Diesel fuel use by backup electricity generators
- Laser printing and copying¹

¹ Collected over a calendar year between January 2016 and 2017.

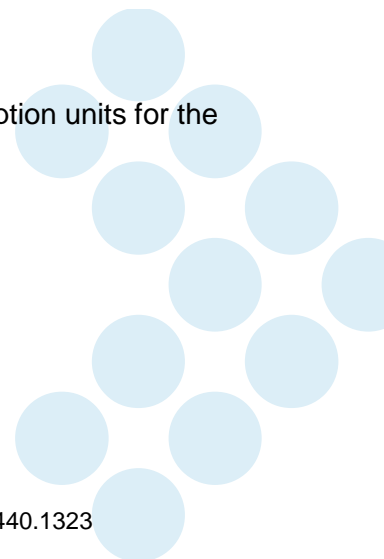


Table 2 below contains the emission factors that were applied to the collected activity data. As per the STARS 2.1 Technical Manual, most of these factors were sourced from the U.S. EPA document AP-42. Other secondary sources were also referenced as required. All emission factors (i.e. intensities) were converted to tons per consumption unit to produce final emission weight values in tons.

Table 2: Emission Factors

Activity	Units	NOx	SOx	CO	PM	O3	Pb	HAPS	Sources
Natural Gas	t/m3	2.24E-06	9.60E-09	1.34E-06	1.22E-07	--	8.00E-12	8.90E-11	U.S. EPA AP-42 ch. 1.4
Diesel	t/L	1.44E-08	5.27E-12	5.39E-11	1.96E-10	--	2.28E-13	6.95E-12	U.S. EPA AP-42 ch. 3.1
Laser Printer	t/page	--	--	--	--	5.70E-13	--	--	Maddalena et al. ^a
Copier	t/page	--	--	--	--	2.75E-11	--	--	Selway et al. ^b

a. Maddalena et al., Quantifying Pollutant Emissions from Office Equipment, California Energy Commission (2011).

b. Selway et al., "Ozone production from photocopying machine," American Industrial Hygiene Association Journal 41, no. 6 (1980).

All relevant stationary sources of emissions identified by STARS were investigated at MacEwan University. For the current reporting year, it was determined that the refrigerants used in the chillers on campus did not need to be recharged. As a result, the weight of ozone-depleting compounds is reported as zero in Table 1.

Using the above information will support a full credit for the OP-2 section in STARS. Please let EPL know if you have any questions or require further clarification on the methodology applied.