

2008



Environmental Assessment Report Air Quality in Montréal

Highlights

Poor air quality days: still, and as always, related to particulate matter!

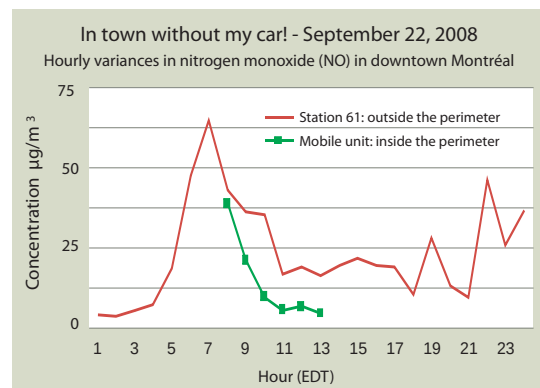
All of the poor air quality days recorded in 2008 were the result of particulate matter in concentrations superior to the standard of $35 \mu\text{g}/\text{m}^3$ (3-hour moving average). The maximum concentration measured for this parameter was recorded Saturday, June 21st, during some fireworks.

2008 Trends

Ozone and nitrogen monoxide concentrations remained at the same levels everywhere on the territory, whereas sulfur dioxide and benzene concentrations decreased in the East End of Montréal.

In town without my car

Once again, the measures recorded in the city block closed to traffic showed a 70% reduction in nitrogen monoxide, clearly indicating that transportation is a major source of pollution downtown.



September 22, 2008

The "In town without my car!" day

Wood heating

The municipal administration agreed in principle to the preparation of an action plan to regulate this activity on the territory and adopted regulations to that effect.

Technical improvement

The Réseau de surveillance de la qualité de l'air (RSQA) acquired state-of-the-art equipment to measure the particulate matter present in the ambient air on the territory of Montréal.

Overview of the RSQA

The Réseau de surveillance de la qualité de l'air (RSQA), operated by the City of Montréal for over 40 years now, is also a partner of Environment Canada's National Air Pollution Surveillance (NAPS) Network.

To improve our knowledge about the distribution of pollutants on the Montréal territory, modifications to existing equipment and additional specific measurement equipment were brought to some monitoring stations. This was the case of the Rivière-des-Prairies (number 55) station, where an apparatus allowing for the analysis of the composition of particulate matter was installed in order to better identify their origin in a residential neighborhood strongly impacted by home wood heating. Also, all of the equipment in the Ontario Street monitoring station (number 12) was relocated, for operational reasons, to 2580 Saint-Joseph Boulevard, within the Molson (number 80) station. Despite these modifications, the network's

total number of stations remained unchanged at 17. Of this number, 12 stations continuously measure airborne pollutants.

It should be mentioned that 2008 was the first year of operation of the Chénier (number 7) monitoring station, set up to collect data to be used by the Direction de la santé publique de Montréal within a study on the incidence of respiratory diseases in the East End of Montréal. A comparison of the results garnered for the SO₂ parameter between this station and those collected at the Saint-Jean-Baptiste Boulevard (number 3) station is available on page 3 of this report.

Thanks to the RSQA, Montréal citizens can inform themselves at all times about their air quality by consulting the Web site at www.rsqa.qc.ca. Attendance statistics show a monthly average of some 4,850 visitors, a clear indication of the Web site's popularity!

RSQA Monitoring Stations on the Island of Montréal

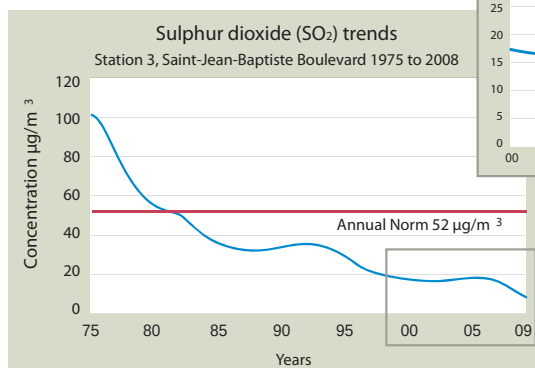


Sulfur dioxide: still more progress!

Montréal's East End industrial sector is responsible for 85% of sulfur dioxide (SO₂) air emissions on the Island of Montréal.

Although there has been a marked decrease in SO₂ levels, as shown in the trends graphic since 1975, the Saint-Jean-Baptiste Boulevard (number 3) station, located downstream of the refineries, still registers the greatest annual average of SO₂ on the Island. In 2008, owing to a 24% decrease compared to 2007, the annual average concentration of SO₂ reached its lowest historic level ever at 9.4 µg/m³. This very significant decrease in SO₂ concentrations in 2008 brings to 53% the decrease measured since January 2005; before this date, the situation had been stable over the past five years. The monitoring activities conducted by the Division du contrôle des rejets industriels are responsible for these results.

Installed in Anjou, in January 2008, the Chénier (number 7) station allows for the measurement of air emissions from the Montréal's East End

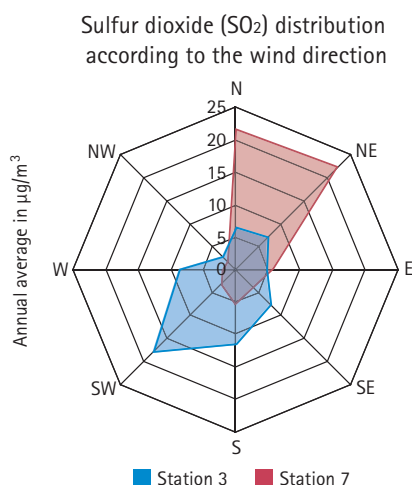


industrial sector when the winds blow in from the North or Northeast. This station is now the fourth SO₂ monitoring station in Montréal.

Measuring airborne SO₂ concentrations, upstream and downstream of the industries, will allow us to broaden our knowledge about the migration of pollutants from the industrial sector.

SO₂ concentrations according to wind direction

The following schedule illustrates average annual concentrations of SO₂ in µg/m³ measured in stations 3 and 7 according to the direction of the wind. The average annual concentration recorded in station 3 was 23% greater than that recorded at station 7. However, the greatest concentrations were measured at station 7, when the winds blew in from a northern and northeastern direction. The wind rose shown below allows one to better visualize the results shown in the schedule.



Wind direction	Wind frequency	Station 3	Station 7
Total	100%	9.4	7.2
C	4.9%	7.1	7.2
N	9.9%	6.5	21.6
NE	11.5%	7.2	22.2
E	5.6%	4.8	5.7
SE	9.1%	7.6	4.5
S	9.4%	11.6	5.5
SW	18.6%	18.0	3.0
W	23.2%	8.5	1.8
NW	7.9%	2.5	1.7

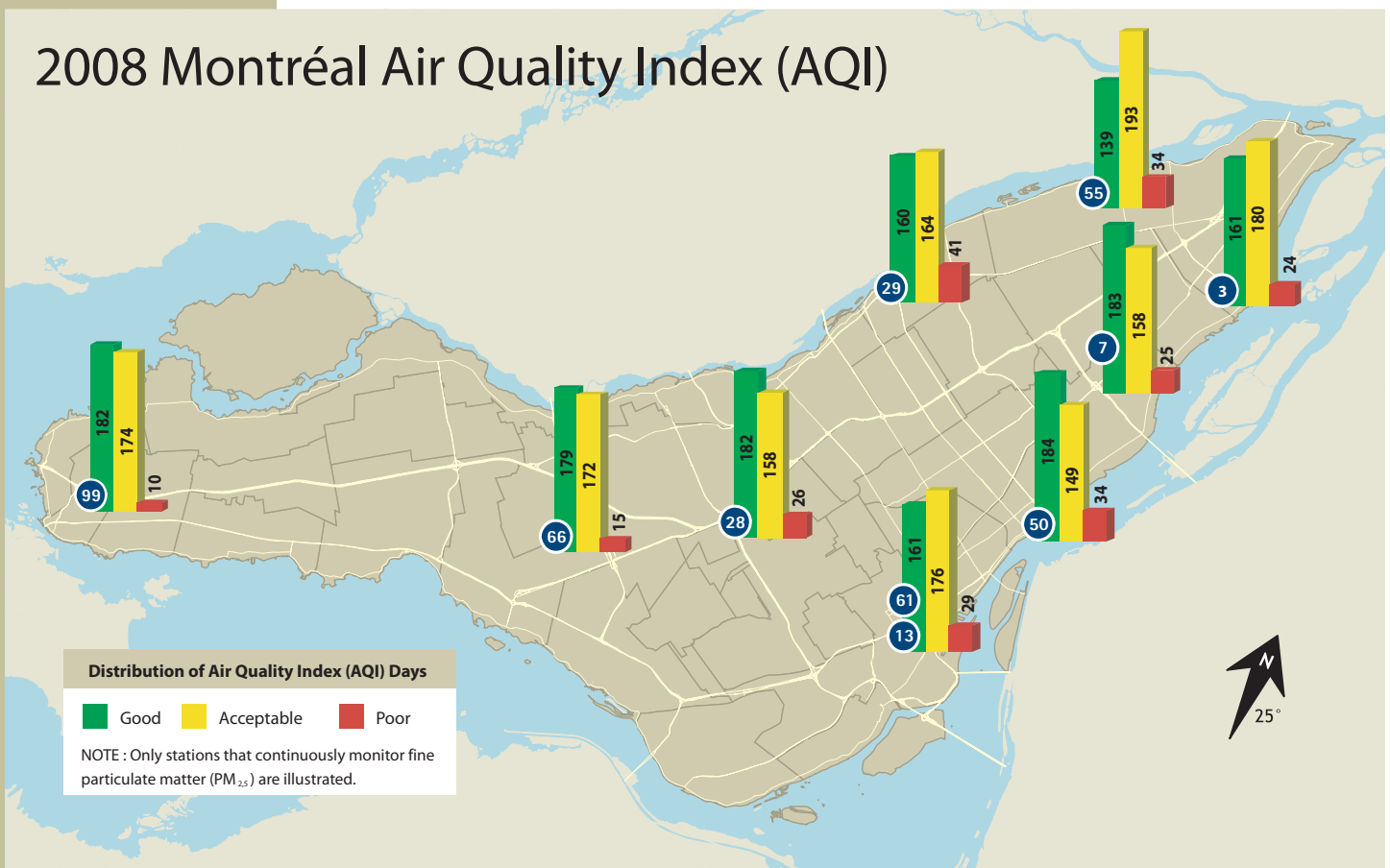
Improvements in the measurement technologies of particulate matter

Initiated at the beginning of 2008, the set up of new particulate matter (PM_{2.5}) measurement equipment was completed in January 2008, except at station 99 located in Sainte-Anne-de-Bellevue, where this installation was conducted in June 2008. Consequently, this parameter will henceforth be measured using the TEOM-FDMS (Tapered Element Oscillating Microbalance - Filter Dynamic Measurement System) technology. This modification takes into account the volatile component of particulate matter. By getting closer to the method of reference used by the U.S. Environmental Protection Agency (EPA), the concentrations measured are likely to be greater than the results otherwise obtained with the previous method and this, especially during the cold season.

The continuous measurements of particulate matter conducted in nine monitoring stations strategically located on the territory allow one to establish the distribution pattern of this pollutant and to act on local sources. These sources are primarily wood heating, during the winter, and industries and transportation, throughout the year. According to health specialists, there is no safe threshold for particulate matter (PM_{2.5}). Therefore, it needs to be said, that any and all measures, accomplished collectively or individually, to reduce the levels of this pollutant contribute to improving, not just air quality, but also citizens' life expectancy.¹

1. POPE, C. Arden III, et al. "Fine-Particulate Air Pollution and Life Expectancy in the United States", *New England Journal of Medicine*, 360; 4, January 22, 2009.

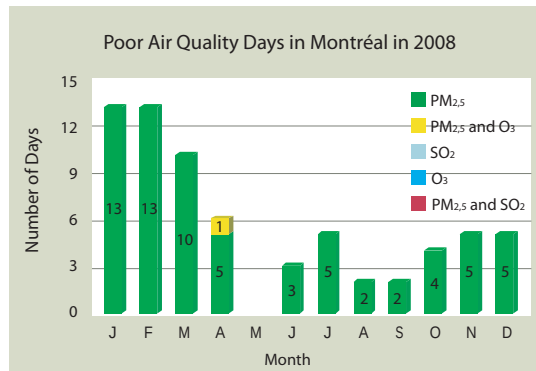
2008 Montréal Air Quality Index (AQI)



Number of bad air quality days on the rise

In 2008, the RSQA recorded 68 bad air quality days. The great concentrations of particulate matter were the sole agents responsible for 67 of these days, i.e. all but one. Just one bad air quality day resulted from the combination of particulate matter ($PM_{2.5}$) and ozone.

The monthly distribution of bad air quality days is shown in the opposite figure. The months of January to March accounted for 36 of these bad days whereas the month of May had none. The high winter values are not surprising since it is widely recognized that it is particularly in winter that TEOM-FDMS allow for more accurate measurements. However, since the conditions favorable to the formation of ozone were not present during the summer of 2008, no bad air quality day due to the presence of ozone was recorded in the months of June, July and August.



Also, it is worthwhile mentioning that, contrary to previous years and for the first time since 2004, sulfur dioxide did not cause any bad air quality days and this, owing to the efforts realized by the petroleum sector in the East End of Montréal.

The issue of wood heating

Wood heating's contribution to airborne emissions of particulate matter is ever increasing and, in 2006, accounted for some 61% of total estimated emissions. This proportion is much greater than that associated with transportation (14%) or even industry (22%)².

Given the adverse health effects of particulate matter on citizens, City Council, on March 31st, passed a motion on the elaboration of an action plan to curb the pollution caused by wood heating. Calling on the governments of Canada and Québec and the Direction de la santé publique de Montréal, the action plan includes both an awareness campaign and the adoption of a by-law.

Draft regulations on combustible solid stoves were written and submitted to elected officials. These regulations prohibit the installation of combustible solid stoves except for EPA certified pellet burning stoves and this, both in new and existing constructions. However, that equipment that is

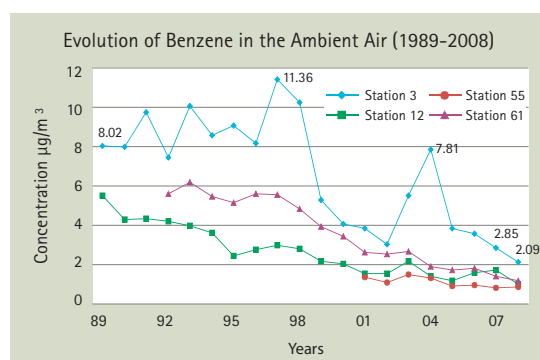
already in place and trades using wood stoves are excluded from the regulations. A public consultation process is planned for sometime in 2009.

2. National Pollutant Release Inventory, Environment Canada, 2006.



Benzene: still a downward trend

With an annual average of $2.09 \mu\text{g}/\text{m}^3$, the benzene concentrations measured at monitoring station number 3, located on Saint-Jean-Baptiste Boulevard, upstream of the Montréal East End petrochemical plants, showed a decrease of 27% compared to the year 2007.



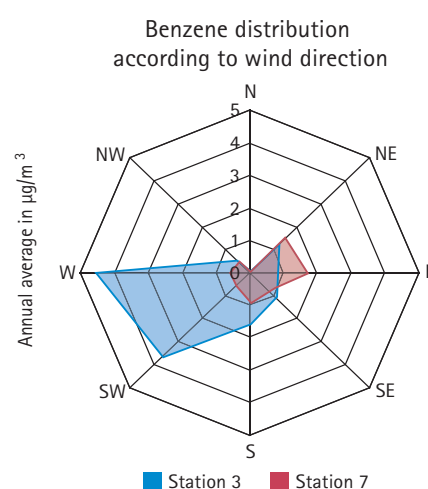
This year, adding station 7 in the Borough of Anjou, allowed for the measurement of benzene concentrations upstream of the refineries and the observation of certain variations according to the wind direction. As demonstrated in the following schedule, the annual average recorded for this station is of the same magnitude as that recorded in stations 55, Rivière-des-Prairies, and 61,

Annual benzene average

Stations	3	7	55	61
Annual average 24 hr $\mu\text{g}/\text{m}^3$	2.09	1.09	0.87	1.15

Maisonneuve. However, a more detailed analysis of these results, considering the wind direction, indicates that, under the influence of northeastern winds, the concentrations measured at station 7 were greater than those of station 3. And, quite the opposite, when the winds blow in from the west or southwest, it is station 3 that has the greatest concentrations of benzene.

The wind rose illustrates this situation very clearly.

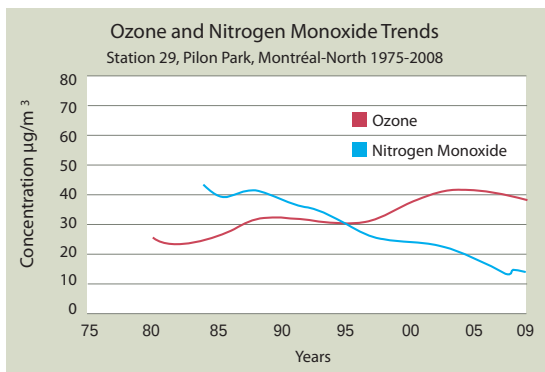


The concerted actions of the RSQA, the Division du contrôle des rejets industriels and those responsible for the industrial environment of the East End of Montréal once again contributed to improving air quality.



Ozone and nitrogen monoxide trends

As a result of a wet and cold summer, ozone and nitrogen monoxide concentrations remained stable in 2008. Trend curves are available on the Web site at www.rsqa.qc.ca in the *Historique et tendance* section.



Thank you very much...

Over the years, Claude Gagnon has driven the RSQA to an enviable level of excellence in terms of monitoring air quality in urban environments. Claude's expertise and that of the team that he put together, allowed the RSQA to exert its influence and be recognized by his counterparts in other cities and by Quebec and Canadian authorities. After having spent 28 years monitoring, analysing and improving the quality of the air that Montrealers breathe, Claude retired in May 2009. We would take this opportunity to extend to him our sincere gratitude and our best wishes for a long and peaceful retirement.



Annual number of smog warnings

Each year, the number of smog warnings issued by Info-Smog varies according to climate conditions. The program in which the City of Montréal participates as well as the Direction de la santé publique de Montréal, the MDDEP and Environment Canada, was launched in 1994. Forecasts are prepared twice a day using models designed by the Meteorological Services of Environment Canada and issued on all of the partners' Web sites.

The schedule shown below lists the number of days with smog warnings issued in the course of the past five years.

Tally of the annual number of smog warnings

Year	2004	2005	2006	2007	2008
Summer	3	10	2	14	3
Winter	17	14	7	12	16
Total	20	24	9	26	19

Summer: April to October 2008

Winter: November 2007 to March 2008

Although the measuring equipment for particulate matter was replaced by better performing models (see page 4), the number of smog warnings issued recorded during the most recent winter season was only slightly superior to that of the winter of 2007 and is quite similar to the corresponding number for the winters of 2004 and 2005.

Regarding the program for the summer of 2008, very few smog warnings were issued contrary to the situation experienced over the previous summer. The weather conditions that prevailed over the summer months strongly affected this result. Indeed, there were 44 rainy days in June, July and August, and very few days posted temperatures exceeding 30 °C during this period (only 5). And, rather unusually, the three smog warnings showing in the schedule were issued in April, when particulate matter and ozone levels were high and this, despite the fact that temperatures were seasonal.

Overall, the total number of days with smog warnings in 2008 was smaller than that recorded in 2007.

Canada-wide standards: a new start!

Preoccupied by the high concentrations of particulate matter and ozone in the ambient air and their adverse effects on human health and the environment, Canada-wide standards were adopted in June 2000 by the Canadian Council of Ministers of the Environment with the exception of Québec. These standards now represent the target concentrations to be achieved by the year 2010.

For ozone, the criteria of 127 µg/m³ (daily 8-hour moving maximum) is set based on the average of the 4th greatest annual maximums, calculated over three consecutive years. For particulate matter (PM_{2.5}), the criteria of 30 µg/m³ (daily 24-hour maximum) is determined on the basis of the average annual value of the 98th percentile, also calculated over three consecutive years.

Given that 2010 was designated as the deadline in terms of analysing the situation with these pollutants in the ambient air, with these results, for the year 2008, we begin a chronological series that will constitute the first reference year.

Indeed, this is one of the reasons that motivated the installation and start-up, at the very beginning of 2008, of better performing particulate matter measuring devices. As indicated in page 4 of this report, volatile particulate matter is now included in the concentrations measured on a continuous basis by the TEOM-FDMS apparatus.

The schedules opposite show the results obtained at the various monitoring stations relative to the objectives of the Canada-wide standards. This comparison is established even though all federal guidelines were not observed, since their observance would have entailed a much more complex exercise exceeding the scope of this report.

With respect to ozone, the summer of 2008, with its cool temperatures, and wet and gloomy weather, was probably not very representative of recent years, but if ever the coming summers were similar to the summer of 2008, the Canada-wide standard would be met at all monitoring stations on the Island of Montréal.

Following the installation of the TEOM-FDMS measuring devices, the PM_{2.5} results observed for the year 2008 exceeded the Canada-wide standard at all RSQA monitoring stations.

These results clearly indicate that source reduction measures for this pollutant will have to be implemented to attain the objectives set for 2010.

Particulate matter (PM_{2.5}) in µg/m³ Criteria : 30 µg/m³

STATION	Annual value of 98 th percentile 24 hrs			3-year average
	2008	2009	2010	
3	31			31
7	31			31
13	33			33
28	35			35
29	31			31
50	31			31
55	32			32
66	34			34
99*	--			--

* Incomplete data for the year 2008

Ozone (O₃) in µg/m³ Criteria : 127 µg/m³

STATION	4 th daily maximum 8-hr moving ave.			3-year average
	2008	2009	2010	
1	123			123
3	115			115
28	100			100
29	117			117
55	124			124
61	92			92
66	119			119
68	115			115
99	124			124

Reproduction authorized conditional on the source being acknowledged: GAGNON, C., D. BOULET and R. MALLET (2008). *Air quality in Montréal*. Annual report 2008, City of Montréal, Service des infrastructures, transport et environnement, Direction de l'environnement et du développement durable, Division de la planification et du suivi environnemental, RSQA, 8 p.

Production
Service des infrastructures, transport et environnement
Direction de l'environnement et du développement durable

Information
514 280-4368
dianeboulet@ville.montreal.qc.ca

Web Site
www.rsqa.qc.ca

Coordination
Service des communications et des relations avec les citoyens

Photographs
City of Montréal

Acknowledgements
C. BESSETTE, V. CHALUT, Y. GARNEAU, S. MELANÇON, P. PAQUETTE and C. ROY for their collaboration to this report.

Printed in Canada
ISBN 978-2-922388-36-7