state of the air 2020

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BC LUNG ASSOCIATION CELEBRATING THE CLEAN AIR MONTH OF JUNE

Bowen Island, Vancouver, Canada, Photo by Victor Sauca on Unsplash

Foreword

First of all, I'd like to say thank you to the entire staff of the State of the Air Report. It is a testament to their dedication and diligence that we've been able to publish this year's Report in a timely fashion, despite the many challenges of working remotely during the pandemic.

Air pollution reduces our immune response, increasing both our risk for infection and sensitivity to COVID-19. Accordingly, we begin this Report by examining how air pollutants affect our respiratory system – and what we can do to minimize them.

Large-scale cannabis production releases Volatile Organic Compounds (VOCs) into the air that, if not collected and treated properly, cause adverse effects. We explore the air quality and human health impacts of these emissions, along with the measures government agencies are taking to manage them.

Environmental justice is a growing movement centred on the equitable distribution of environmental benefits and burdens. It recognizes that distinct segments of the population, especially indigenous communities, have historically faced disproportionate pollution exposures – and continue to do so.

Therefore, the movement seeks to ensure all people are protected equally under environmental laws, and that marginalized communities have a say in natural resource development decisions.

This year's Air Quality & Health Workshop had for its theme, "Environmental Justice of Air Quality in the Era of Citizen Science." Among the many presentations: How the public is using low-cost sensors to collect air quality data in communities underserved by regulatory monitors.

This is especially notable as people in these communities are often unduly exposed to environmental hazards (including air pollution), and more vulnerable due to systemic inequities, increasing rates of underlying health conditions (like heart and lung disease).

It gives us great pleasure to recognize Natalie Suzuki as this year's Clean Air Champion. Natalie will always be remembered for helping develop Provincial Air Quality Objectives and national Canadian Ambient Air Quality Standards for fine particulate matter ($PM_{2.5}$).

Before retiring last April, Natalie was involved in many air quality projects – among them, our own State of the Air Report and Air Quality & Health Workshop. We at the BC Lung Association will miss Natalie's passion, expertise, and friendship – and wish her well in retirement!

Until the next edition of our Report, I wish everyone good health, safety, and hope in these uncertain times.

CHRISTOPHER LAM
President and CEO, BC Lung Association

EMERGING ISSUES:

Air Pollution and COVID-19

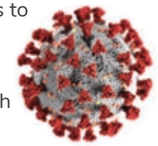
What does it all mean?

The response to COVID-19 has led to a dramatic decrease in economic activity and sharp declines in traffic. These actions have also led to some improvements in air quality – especially the vehicle traffic pollutant nitrogen dioxide – but decreases have been modest and variable. Whether these improvements in air quality will lead to fewer impacts on heart and lung disease is unclear and will require detailed study over time, given the many complexities of these relationships during an unprecedented pandemic.

From a public health perspective, a more immediate and important consideration is the interaction between air pollution and COVID-19 disease severity. Long before the pandemic began, it was understood that air pollution worsened respiratory infections. For example, in 2017 air pollution in Canada was estimated to be responsible for roughly 5% of the 9000 deaths from pneumonia. In the SARS-1 outbreak in 2003, areas with higher air pollution had double the number of deaths. Air pollution doesn't cause these infections nor does it play a major role in transmission, although it can increase coughing which may help spread the virus. More importantly, air pollution affects sensitivity to COVID-19 by degrading our immune response. In our nose, throat and upper airways, mucus traps inhaled bacterial and viral particles. Specialized cells lining the respiratory tract then sweep the mucus upward until it is swallowed or blown into a tissue. Air pollution can degrade these cells and remove their sweeping properties, thus allowing infections to take hold and spread. For example, ear infections – a common childhood infection – begin as respiratory infections but can then spread to the middle ear. Air pollution increases the likelihood of this progression. In the deep lung, where infections can be especially dangerous, immune cells called macrophages provide protection by 'gobbling up' and digesting bacteria and viruses. However, in the presence of air pollution – and fine particles especially – macrophages attempt to also fight the air pollution but are quickly overwhelmed and unable to address the infection. Air pollution may also make it easier for a virus to attach to receptors on cells, increasing the likelihood of an infection taking hold once exposure occurs. In short, air pollution in the midst of a respiratory disease pandemic is a worrying combination.

Air pollution affects sensitivity to COVID-19 by degrading our immune response.

If more people who are infected develop severe infections - those that require hospitalization – then this works against all of the other measures put in place to 'flatten the curve.' Therefore, it is of paramount importance to do all that we can, especially during the pandemic, to reduce air pollution and exposure to air pollutants throughout British Columbia. For this reason, one early action taken in March was to prohibit open burning throughout most populated areas of the province. Moving into summer, implementing complete fire bans (campfires, outdoor fire pits) would be prudent, while health authorities and municipalities need to proactively prepare for potential wildfire smoke events, including developing plans for COVID-safe clean air shelters. Further, individuals potentially sensitive to smoke – those with pre-existing heart and lung disease, type 2 diabetes and pregnant women – should work with health care providers to ensure their conditions are well-managed and consider acquiring room air cleaners. Aggressive action now to retire older high emission woodburning appliances and to prepare to implement bans on use of fireplaces and woodstoves that are not primary heat sources will help reduce this major source of air pollution when colder temperatures arrive in fall and winter along with likely additional waves of COVID-19 infections. Besides their important role in the response to COVID-19, actions to improve air quality have the added benefits of reducing the annual toll of 1,600 deaths and costs of $11.5-billion in British Columbia from heart and lung disease.



EMERGING ISSUES:

Cannabis Health and Air Quality Impacts

Cannabis refers to a group of products derived from the Cannabis sativa or Cannabis indica plant, used for both therapeutic and psychoactive effects. THC is the main psychoactive ingredient of the cannabis plant, responsible for the intoxicating effects, including the "high". It can lead to addiction and is responsible for most of the short-term and long-term health effects.

Short-term health effects of THC containing cannabis products include:

- feeling high and sense of well being
- heightened senses (smell, taste, sight and sound)
- impaired thinking, problem solving, poor memory or concentration

Regular use of THC containing cannabis products can lead to long-term health effects such as:

- Lung damage from smoking cannabis, which can lead to breathing problems and frequent lung infection.
- Mental health issues, including addiction and increased risk of developing or worsening anxiety and depression.
- Increased heart rate up to 3 hours after smoking cannabis, which could lead to a heart attack.
- Impaired brain development in youth resulting in potential deficits in thinking, learning, and memory and increased risk of developing dependence disorders, anxiety and depression.

Commercial cannabis production has grown rapidly in BC since the legalization of recreational cannabis use in Canada in October 2018. In some parts of the province, this includes the development of a number of large-scale production facilities, which have the potential to negatively impact local air quality if air contaminants are not collected and treated.

There are several air quality related issues associated with large-scale cannabis production:

- Cannabis plants emit volatile organic compounds (VOC), which have the potential to contribute to formation of ground level ozone and particulate matter.
- VOC emitted by cannabis plants are odorous and can cause problems for neighbours.
- To manage odours, some cannabis production facilities use odour-masking agents, which also contain VOC.
- The power production equipment required for indoor production of cannabis may generate both nitrogen dioxide and particulate matter, depending on the fuel used.

Potential impacts to local air quality from large-scale production facilities can be managed through appropriate design, construction, and operation. Indoor cultivation and processing in a facility with adequate air treatment can significantly reduce air emissions, which also eliminates the need for odour-masking agents. Metro Vancouver is one air quality agency that has been exploring options for managing emissions from cannabis production and processing operations to prevent impacts from emissions.

Under the Good Production Practices requirements of the Cannabis Regulations, federally licensed producers must have sufficient air filtration to prevent the escape of odours. Before issuing a licence, Health Canada's Licensing team confirms that the applicant has systems in place to help ensure there is sufficient air filtration in areas where cannabis is present. Health Canada then inspects licence holders on a regular basis.

Environmental Justice of Air Quality in the Era of Citizen Science

Highlights from the 2020 Air Quality and Health Workshop

Marginalized communities are often disproportionately exposed to environmental hazards, including ambient air pollution, in comparison with the overall population. At the same time, people living in these communities may also be more vulnerable to the health effects associated with exposure to air pollution. This may be related to systemic inequities resulting in increased stress, poor nutritional status and higher rates of underlying health conditions (such as heart and lung disease).

The concept of Environmental Justice (EJ) began in the US over four decades ago in response to the siting of hazardous waste sites in minority communities. Since then, environmental justice has evolved into both a movement and an area of study, with a focus on equitable distribution of environmental benefits and burdens. The concept of Environmental Justice includes not only equal protection for all people under environmental laws, regulations, and policies, but also significant involvement of potentially impacted communities in environmental policy and natural resource development decisions.

Availability of reliable air quality data is a key factor in managing air quality to protect human health and the environment. While air quality monitoring has been traditionally carried out by government, academia, and industry, the recent introduction of low cost air quality sensors has made it possible for the public to collect their own air quality data. In response to environmental justice issues, many citizen science projects have taken advantage of these low cost sensors to provide local air quality data in areas that are underserved by regulatory monitors. Government and academics have also developed an interest in low cost sensors for providing greater data coverage and studying specific issues.

The 17th annual BC Lung Air Quality and Health Workshop was held on February 11, 2020 with the theme "Environmental Justice of Air Quality in the Era of Citizen Science". Chris Lewis, a member of Squamish Nation Council and Chair of the SFU Board of Governors, opened the day with an acknowledgement of the shared traditional territories of the Coast Salish peoples. He also spoke about the perspectives of local Indigenous communities on the issues of environmental justice and air quality.

Julian Marshall, a professor from University of Washington, delivered the keynote presentation "environmental justice – the big picture". He spoke of existing disparities in the US and approaches for reducing disparity. Amanda Giang is an assistant professor in the Institute for Resources, Environment, and Sustainability and the Department of Mechanical Engineering at UBC Dr. Giang gave an overview of current EJ issues in Canada. She highlighted some key knowledge gaps and described tools and approaches that could be used to better characterize EJ and air quality in Canada.

Environmental justice began in the US over four decades ago in response to the siting of hazardous waste sites in minority communities.

(Cont'd on p.6)

(Cont'd from p.5 -Environmental Justice of AirQuality)

Anjum Hajat, professor at University of California, spoke about the role of social and environmental stressors on health outcomes. She described how stress and air pollution affect similar biological systems and highlighted the need for interventions to address both air pollution and social policy.

Lauren Pineault, a research analyst from Health Canada described recent studies of traffic related air pollution exposure in Canadian cities. The studies found that the socioeconomic factors associated with disparities varied from city to city and that visible minorities, immigrants, and lower income groups are more likely to be exposed to higher levels of air pollution because they are more likely to live in larger cities with poorer air quality.

David Spink, of Pravid Environmental Inc., spoke on behalf of the community of Fort McKay about the issues they face as a result of oil sands development adjacent to their community and within their traditional territory and the actions that have been taken to address these issues. Annita McPhee, a former three-term President of the Tahltan Central Council, wrapped up the morning with an indigenous perspective on environmental justice in B.C. She highlighted the importance of respectful engagement of indigenous communities and striking a balance between the economy and the needs of local Indigenous populations.

The focus of the afternoon presentations was on low cost sensors and their application in citizen science projects. Andrea Clements, a physical scientist from US Environment Protection Agency, provided an overview of the state of low cost sensor development and highlighted the benefits and limitations of these sensors. Graeme Carvlin from Puget Sound Clean Air Agency, presented on what the agency is doing with low cost sensors and actions they are taking to engage and educate local communities.

Matt Wagstaff, from Envirochem Services Inc., spoke about a mobile monitoring unit developed to evaluate the impact of residential wood smoke in small communities in B.C. Ian Longley, a scientist from the National Insitute of Water and Atmospheric Research in New Zealand then provided an overview of a citizen science project in New Zealand involving school children. As part of this project, the students built their own $PM_{2.5}$ sensors and installed them in their homes to complement a network of outdoor sensors, with a goal of educating the community about residential wood smoke.

Running-Grass, director of Three Circles Center, closed the day speaking about the importance of centering communities in citizen science and environmental justice. He highlighted the need for authentic engagement and community ownership in setting the agenda and decision-making.

The workshop was attended by 132 participants in person with an additional 14 groups joining remotely via webcast. The recordings from the workshop are available on-line (https://bc.lung.ca/health-professionals/air-quality-health-workshop) along with podcast interviews that were completed with each of the speakers the day of the workshop.

2020 Clean Air Champion
Natalie Suzuki

This year's Clean Air Champion should be familiar to regular readers of the State of the Air Report. A top-notch air chemistry engineer and scientist, Natalie Suzuki has graced the report's masthead as member of the working committee since the publication's inception in 2005. She has also been a constant guiding presence in the annual Air Quality & Health Workshop.

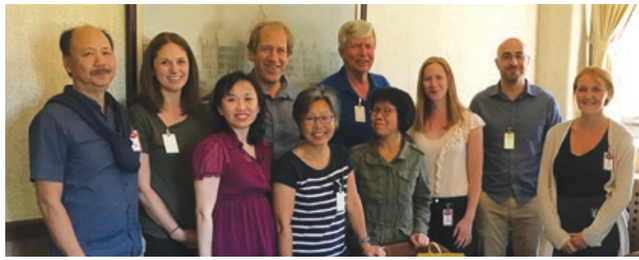
But Natalie's commitment to improving air quality in British Columbia went far beyond her many fruitful partnerships with the BC Lung Association (BCLA) – work that concluded upon her well-earned retirement from public service in April 2020.

In a career spanning over 30 years, the last 20 of which were spent as Air Quality Science Specialist, Natalie wore various hats in countless air quality projects. However, two achievements stand out as her enduring legacy: Helping develop Provincial Air Quality Objectives and national Canadian Ambient Air Quality Standards (CAAQS) for fine particulate matter ($PM_{2.5}$).

"Natalie leaves behind a legacy of improving air quality for all British Columbians and reducing their health risks."

As the science on air quality effects on human health evolved, efforts to develop Canada Wide Standards (CWS) for $PM_{2.5}$ were launched. Natalie recognized that the CWS would not support regional staff's issuance of air quality advisories, so she took the lead in developing a 24-hour $PM_{2.5}$ air quality objective for B.C. It was a bold and unprecedented initiative at that time, requiring both scientific and public relations skills to develop and implement.

Equally important, Natalie represented B.C. on the intergovernmental committee and multi-stakeholder review working group seeking to develop CAAQS for $PM_{2.5}$, ozone, nitrogen dioxide, and sulphur dioxide. The CAAQS is the next generation of national ambient air quality standards created under the Canadian Council of Ministers of the Environment. Natalie served as the B.C. lead for implementation and reporting on the new standards.



Colleagues, partners, and friends alike will always be grateful for Natalie's invaluable contributions to her many working groups – the Air Quality & Health Steering Committee, the Air Quality Liaison Group, and the Regional Ground Level Ozone Strategy Steering Committee, to name a few.

But they'll also remember Natalie for her ability to stay calm under trying circumstances; her gift for communicating difficult issues to government officials and the public; her sharp, dry sense of humour; and – for those who truly knew Natalie – her love of her cat.

"Natalie always impressed me with her dedication, professionalism, and expertise as much as with her kindness and humility," remarked Menn Biagtan, BCLA Vice President for Health Initiatives & Programs.

"I've known Natalie since our UBC undergrad days, and was so happy to get a chance to 'grow up' with her in age and experience (not height!) in the air quality field. Metro Vancouver's air quality program will miss her," mused Roger Quan, Director of Air Quality and Climate Change at Metro Vancouver.

"Natalie leaves behind a legacy of improving air quality for all British Columbians and reducing their health risks," noted Glen Okrainetz, retired Director at the Ministry of Environment and Climate Change Strategy.

Pollution Levels

How does B.C. Measure Up

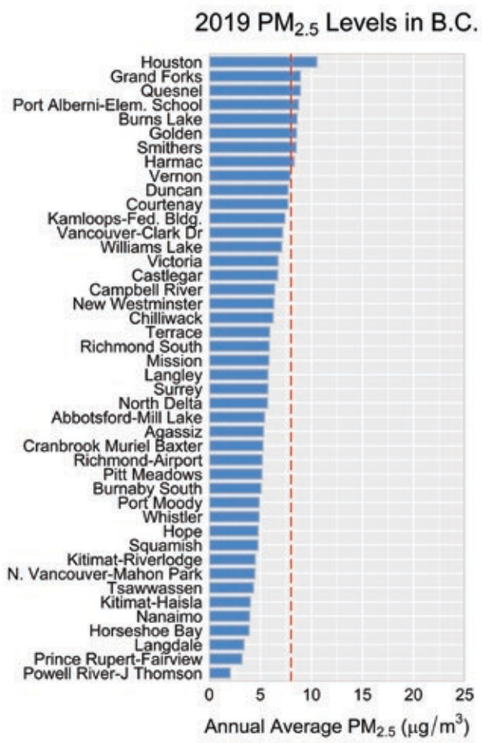
Weather has a significant influence on air quality levels in B.C. In 2019, parts of the province reported record low temperatures—around 9 degrees below normal—due to an Arctic polar vortex that prevailed across Canada from January to February.[1] The cold, stable conditions, and residential wood combustion resulted in a build-up of $PM_{2.5}$ levels and issuance of $PM_{2.5}$-related air quality advisories in a number of communities across northern B.C. The summer wildfire season of 2019 was unexpectedly mild with 21,138 hectares of land burnt in 825 wildfires.[2] In sharp contrast, 1.2 million and 1.35 million hectares were burned in 2017 and 2018 wildfire seasons, respectively. As a result, no wildfire-related air quality advisories were issued in 2019 for Metro Vancouver whereas in the previous year, it stayed under air quality advisories for 18 days due to elevated levels of $PM_{2.5}$ and ground-level ozone.

In the following sections, air quality data collected in 2019 are summarized and compared against provincial or national objectives. Data from all available monitoring sites, except temporary mobile sites and industrial fenceline sites, are summarized in the Technical Appendix.

$PM_{2.5}$ Fine Particulate Matter

Fine particulate matter ($PM_{2.5}$) refers to microscopic particles that are 2.5 micrometres or smaller in diameter. Major sources in B.C. include residential wood combustion, prescribed burning, marine vessels, heavy-duty diesel vehicles, the pulp and paper sector, and the mining sector. Travelling deep into the lungs, inhaled $PM_{2.5}$ can cause short term health effects such as irritation and inflammation and can aggravate health conditions such as asthma and heart disease. There is strong evidence that prolonged exposure to $PM_{2.5}$ increases the risk of chronic disease, such as bronchitis and heart disease.[3]

In 2019, $PM_{2.5}$ was monitored at more than 60 sites across the province for at least a portion of the year. Annual average concentrations ranged from 2.0 µg/m^3 in Powell River-J Thomson to 10.6 µg/m^3 in Houston. A total of 7 sites exceeded the provincial annual objective of 8 µg/m^3 and 3 exceeded the provincial 24-hour objective of 25 µg/m^3. [4] These are down from the previous year where 19 and 24 of the sites exceeded the annual and 24-hour objectives, respectively. The elevated $PM_{2.5}$ levels for 2019 were concentrated in the cold months during periods of stagnant weather, particularly February, when outbreaks of Arctic air produced historic low temperatures across B.C.



1 https://www.canada.ca/en/environment-climate-change/services/top-ten-weather-stories/2019.html#toc5

2 https://www2.gov.bc.ca/gov/content/safety/wildfire-status/about-bcws/wildfire-history/wildfire-season-summary

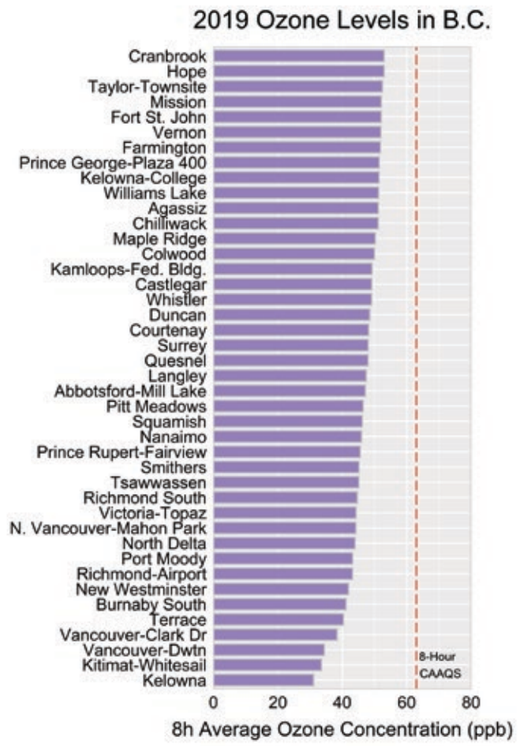
3 Gan, W.Q.; Koehoorn, M.; Davies, H.W.; Demers, P.A.; Tamburic, L.;Brauer,M. 2011, "Long-Term Exposure to Traffic-Related Air Pollution and the Risk of Coronary Heart Disease Hospitalization and Mortality", Environmental Health Perspectives,vol.119, no.4, pp. 501-507.

4 Based on the annual 98th percentile of daily average

O_3 Ground-level Ozone

Ground-level ozone (O_3) is a reactive gas that forms in the atmosphere from reactions involving nitrogen oxides (NOx) and volatile hydrocarbons in the presence of sunlight. A major source of both NOx and hydrocarbons in B.C. is the transportation sector, including motor vehicles. Short-term exposures to ozone can cause breathing difficulties, an aggravation of asthma symptoms and other lung diseases, and premature death. There is growing evidence that long-term exposures may be associated with the development of respiratory effects, especially in the young and the elderly.

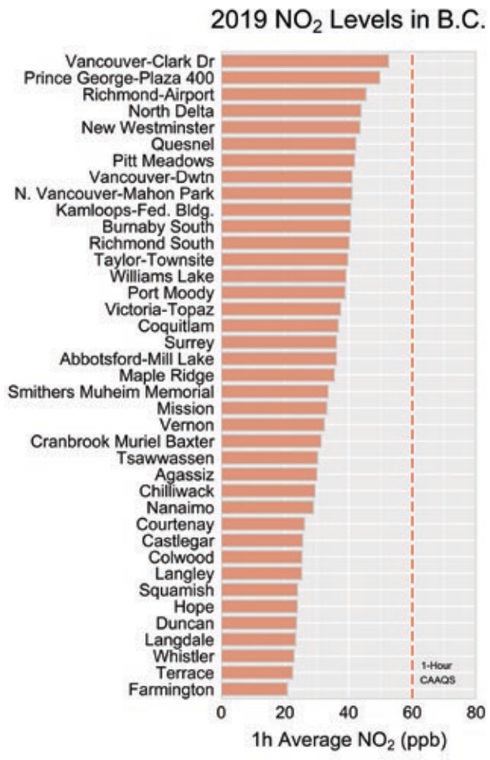
In 2019, ozone was monitored at 47 monitoring sites. Eight-hour concentrations ranged from 31 ppb in Kelowna to 53 ppb in Cranbrook and Hope[5]. No site exceeded the national standard of 63 ppb[5], unlike the previous years where seven sites in the Lower Fraser Valley and Metro Vancouver exceeded the level due to conditions favourable to ozone formation, such as wildfire smoke under sunny, warm conditions.



NO_2 Nitrogen Dioxide

Nitrogen Dioxide (NO_2) is a reddish-brown gas that is associated with emissions from high-temperature combustion. NO_2 is mostly formed in the atmosphere from reactions involving nitrogen oxide (NO) and ground-level ozone. The largest sources of NO in B.C. include the transportation sector and industry. Short-term exposures to NO_2 are linked to respiratory illness, and there is growing evidence of effects from long-term exposure, including cardiovascular mortality, cancer and reproductive effects.

In 2019, NO_2 levels were monitored at more than 50 sites. One-hour concentrations ranged from 21 ppb in Farmington to 53 ppb in Vancouver-Clark Drive.[7] All sites were well below the provincial objective of 100 ppb and the national standard of 60 ppb over one year.[8]



5 Based on the annual 4th highest daily 8-hour maximum concentration over one year.

6 Achievement of the national standard is based on a similar statistical form as presented, averaged over three years.

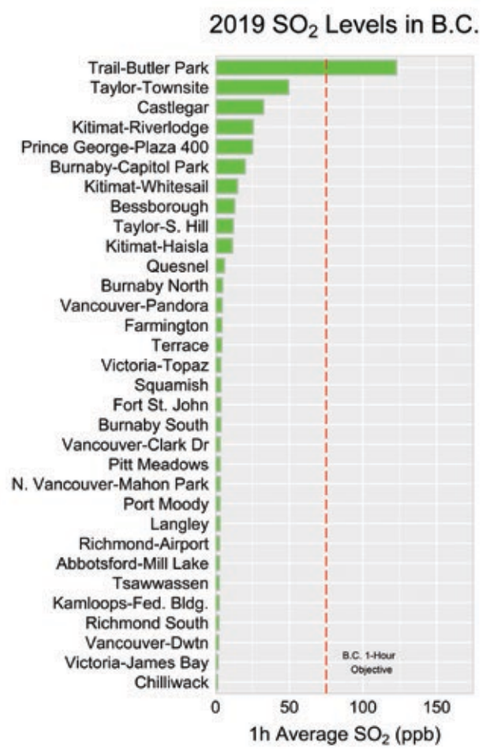
7 Based on annual 98th percentile of daily one-hour maximum concentration.

8 The Canadian Ambient Air Quality Standard (CAAQS) of 60 ppb is based on a three-year average.

SO_2 Sulphur Dioxide

Sulphur dioxide (SO_2) is a colourless, highly reactive gas with a pungent odour. Major sources of SO_2 include the upstream oil and gas sector, metal smelting facilities, the pulp and paper sector, and marine vessels. Short-term exposures to SO_2 can aggravate asthma and increase respiratory symptoms.

In 2019, SO_2 was monitored at 43 sites, excluding mobile and industrial fenceline sites. One-hour SO_2 levels ranged from 2.7 ppb in Chilliwack to 131.3 ppb at Trail-Butler Park.[9] The majority of monitoring sites recorded 1-hour levels less than 10 ppb. Trail-area sites were the only locations to observe exceedances of the provincial objective of 75 ppb in 2019.



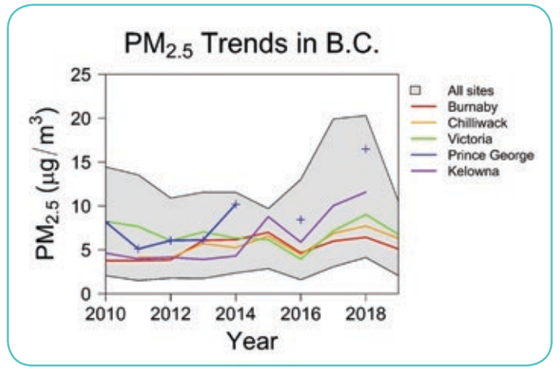
9 Based on the annual 98th percentile of daily one-hour maximum concentrations. The provincial objective of 75 ppb is based on similar statistical form as presented, but averaged over three years. Elevated SO2 levels were also recorded at Trail-Warfield; however, this data is under review and not included in this report.

TRENDS

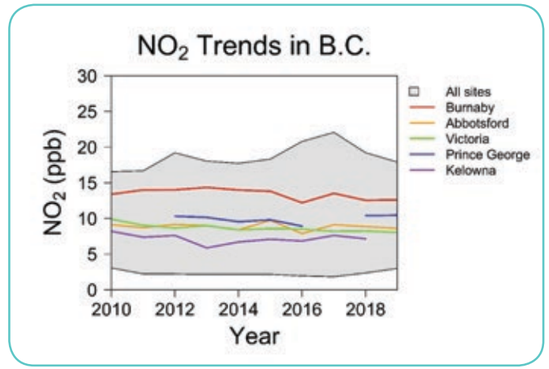
Air Pollution Through the Years

We look at trends in air pollution to assess the effectiveness of actions to improve air quality and to determine the need for additional work. The following figures provide 10-year trends in annual concentrations in the most heavily populated areas of the province, and the minimum and maximum concentrations across all B.C. sites.

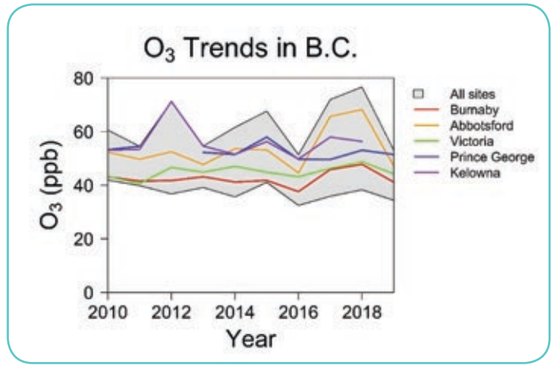
$PM_{2.5}$ levels (shown as annual average) have been increasingly influenced by wildfire smoke over the past decade. In 2014 and 2015, wildfire impacts on $PM_{2.5}$ levels were observed in parts of the province (e.g. Prince George and Kelowna). In 2017 and 2018 especially, wildfire smoke was widespread and several sites, including Prince George, Kelowna, Chilliwack and Victoria, observed their highest average concentrations over the past decade. The mild 2019 wildfire season brought $PM_{2.5}$ below 2017 levels for most sites including Burnaby, Chilliwack, and Victoria.



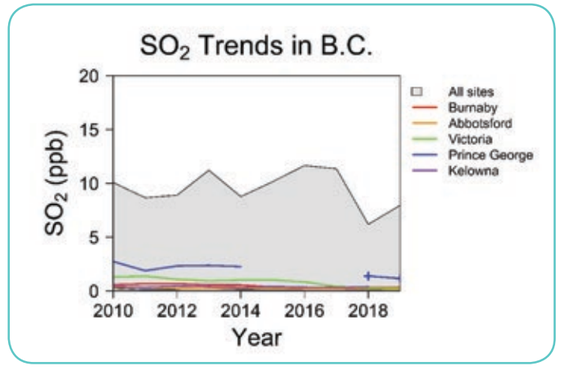
NO_2 levels (shown as annual average) have generally declined in urban areas over the past decade, largely due to more stringent vehicle emission standards and other local actions. There is evidence that trends have plateaued or started to increase. The introduction of vehicles meeting the 2017 Tier 3 emission standards, and an increasing switch towards zero-emission are expected to improve air quality over the next decade as the new technology penetrates vehicle fleets.



Ozone levels (shown as 4th highest daily 8-hour maxima) are also known to be influenced by wildfire smoke. Siberian wildfire smoke in 2012 and B.C. wildfires in 2015, 2017, and 2018 are believed to have contributed to higher ozone levels in these years.[10,11]



SO_2 levels (shown as annual average) in urban areas remain low – less than 3 ppb throughout the last decade. This reflects efforts to reduce sulphur content in motor vehicle and marine fuels and a reduction of emissions from the petroleum refining and cement industries.



10 Teakles, A.D., So, R., Ainslie, B. et al. (2017) Impacts of the July 2012 Siberian fire plume on air quality in the Pacific Northwest. Atmos. Chem. Phys. 17, pp. 2593-2611.

11 Influence of 2015 and 2017 wildfire smoke on ozone levels in the Lower Fraser Valley are discussed further in: Lower Fraser Valley Air Zone Report (2015-2017) at: https://www2.gov.bc.ca/gov/content/environment/air-land-water/air/reports/latest-air-zone-reports.

UPDATES from Partner Agencies

metrovancouver
SERVICES AND SOLUTIONS FOR A LIVABLE REGION

Air Quality and Climate Change Planning

Metro Vancouver is seeking public feedback on a series of discussion papers that explore opportunities to reduce greenhouse gas emissions and air contaminants in the region. The first three discussion papers focus on three of the largest contributors of emissions in our region: transportation, buildings, and industry. The discussion papers will support implementation of Climate 2050 and the Clean Air Plan, and identify and prioritize goals and actions to reduce emissions and impacts in our region over the next five to ten years, and support the transition to a carbon neutral and climate resilient region by 2050. For more, visit www.metrovancouver.org and search 'Clean Air Plan' or 'Climate 2050'.

Regional Air Quality Objectives

Metro Vancouver updated regional ambient air quality objectives for nitrogen dioxide, ozone, and carbon monoxide in 2019. The new objectives will drive continuous improvement in regional air quality and further protect public health and the environment. The objectives will continue to be used for air quality planning, air quality advisories, air permit decisions, and regulatory development.

'Near Road' Air Quality Monitoring Study

Metro Vancouver's regional air quality has continually improved over the past several decades, but a new national Near Road Air Quality Monitoring pilot study confirms that concentrations of air contaminants are higher near major roads. More than one million Metro Vancouver residents – nearly half the population – live within 250 metres of a major road, according to the study, which was conducted by Metro Vancouver with Environment and Climate Change Canada, the Ontario Ministry of Environment, Conservation and Parks and the University of Toronto.

The study helped to determine public exposure to air contaminants such as fine particulate matter, black carbon, nitrogen oxides, and volatile organic compounds. The study also indicated that while large trucks make up only 6% of traffic at the near-road station, they contribute a disproportionate amount of vehicle-related emissions. Metro Vancouver is operating the near-road station on a permanent basis and looking to develop a program to reduce emissions and exposure to traffic-related air pollutants.

Regulatory Updates

The Metro Vancouver Board has adopted a new bylaw to manage residential wood burning. Wood smoke from residential indoor wood burning is the most significant source of $PM_{2.5}$ emissions in the region, contributing more than a quarter of the total annual $PM_{2.5}$ emissions. Exposure to wood smoke is of particular concern in densely populated urban areas, due to the proximity of a single smoking chimney to multiple neighbours. The new bylaw will reduce wood smoke emissions through a phased approach that will include seasonal restrictions, registration requirements, and limits on the operation of older more polluting wood-burning appliances.

Metro Vancouver tightened its rules for older non-road diesel engines, requiring owners of older forklifts, excavators and other engines to register their equipment by January 31, 2020. All "Tier 0" and "Tier 1" non-road diesel engines, which have little-to-no emission controls, must now be registered and labelled as part of the Non-Road Diesel Engine Emission Regulation Bylaw, introduced in 2012 to manage emissions and protect the region's overall air quality. Tier 0 and 1 engines that have not been registered will not be able to operate in the region after this date.

Metro Vancouver is seeking feedback on a proposed alternative approach to regulating emissions from open-air burning of vegetative debris. Several thousand open-air burning events of vegetative debris occur in various sizes across the region each year, leading to smoke emissions that contain fine particulate matter, nitrogen oxides, volatile organic compounds, and other harmful compounds, some of which are associated with health and environmental issues and climate change. Metro Vancouver currently authorizes emissions from this activity through site-specific approvals. The proposed regulation is intended to provide a streamlined, more efficient way to authorize open-air burning of vegetative debris, where specified requirements are met.

For updates on consultation activities, visit www.metrovancouver.org/services/air-quality/consultation.

Caring for the Air

Metro Vancouver's annual Caring for the Air Report has more air quality and climate change stories at www.metrovancouver.org/air.

Fraser Valley Regional District (FVRD)

Residential Radon

The FVRD is working with health professionals to support regional initiatives on improving radon awareness and protect residents from potential exposure to this radioactive gas. In 2019 the FVRD organized and hosted a workshop on radon awareness for building professionals, planners, and engineers within the region. The workshop focused on various aspects of radon risk including health information, regulations, and methods to monitor and mitigate radon accumulation in buildings.

Regional Ground Level Ozone Strategy

A need to update the 2014 Regional Ground Level Ozone Strategy (RGLOS) emerged from changes observed in regional ozone formation patterns and precursor balance The FVRD chairs the RGLOS Steering Committee of regional air quality experts working to prepare an update for the Strategy, expected in 2020-21.

Small Community Monitoring

2019 saw an increase in interest for Citizen Science among scientists and communities and for use of portable sensors for air quality testing. The FVRD is in the process of reviewing potential application of this technology to provide improved air quality services to our small, rural, and remote communities where regular stationary monitoring is not feasible.

(Cont'd on p.14)

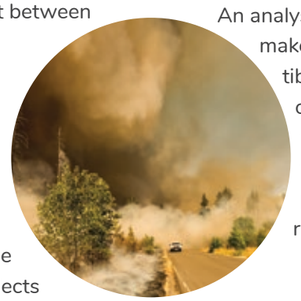
(Cont'd from p.13 - Updates: From Partner Agencies)

Health Canada | Santé Canada

Quantifying and Monetizing the Health Impact of Air Pollution

Health Canada, in collaboration with colleagues at Environment and Climate Change Canada, updated estimates of health impacts of air pollution. Using the Air Quality Benefits Assessment Tool they estimate that 1,600 premature deaths in B.C. in calendar year 2015 can be linked to above-background air pollution (fine particulate matter, nitrogen dioxide and ozone) from all sources, with an economic valuation of $11.5B per year (http://publications.gc.ca/site/eng/9.874080/publication.html). Nationally, the health burden of air pollution was estimated at 14,600 premature deaths, 2.7 million asthma symptom days, and 35 million acute respiratory symptom days, with a total economic valuation equal to $114B per year.

HC has also analysed national health impacts attributable to wildfire smoke in recent years (doi.org/10.1016/j.scitotenv.2020.138506). Based on exposures derived from chemical transport modeling of wildfire emissions, this study estimates that between 2013 and 2018 (2016 excluded), 65 to 1,900 premature deaths per year in B.C. can be attributed to smoke during the wildfire season (May-September). The range of impacts over the different study years reflects the variability in the location and magnitude of the wildfires.



A science assessment of the link between exposure to traffic-related air pollution and adverse outcomes relating to asthma, allergies and lung function is expected to be published in the coming months.

Recent Research

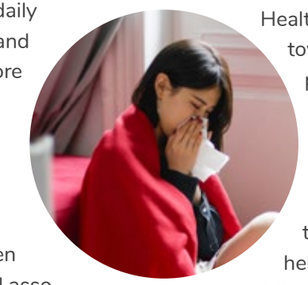
Health Canada scientists, with their many collaborators, published more than 50 air pollution research papers in the last year. Health Canada participated in an international evaluation that showed independent associations between short-term exposure to particulate matter and daily all-cause, cardiovascular, and respiratory mortality in more than 600 cities across the globe (DOI: 10.1056/NEJMoa1817364). Another study analysed approximately 1 million births in 24 Canadian cities between 1999 and 2008 and found associations between daily O_3 in the week before delivery and preterm birth (doi.org/10.1186/s12940-018-0440-8).

An analysis of risk factors that make people more susceptible to the health effects of air pollution found that overall, one to two thirds of the Canadian population is at higher risk and that the greatest susceptibility occurs outside of major urban centres. Other publications related to a wide range of health outcomes, pollution sources and exposure, pollutant characteristics, and new investigative methods.

AQHI

Work continues on refining the Air Quality Health Index and, in collaboration with BC MENV and BC CDC, new research was published on the application of an alternative formula for wildfire smoke conditions (doi.org/10.17269/s41997-019-00237-w).

Indoor Air



Health Canada is working towards finalizing proposed Formaldehyde Emissions from Composite Wood Products Regulations. The regulations are intended to help reduce exposure of Canadians to formaldehyde emissions in indoor air from composite wood products sold, offered for sale or imported into Canada.

Health Canada will be publishing draft Residential Indoor Air Quality Guidelines for acrolein and carbon dioxide in the coming year and presenting a new risk assessment prioritization process. New assessments have been initiated on xylenes and benzene.

BRITISH COLUMBIA | Ministry of Environment and Climate Change Strategy

Regulatory Updates

Open burning of vegetative debris in B.C. is generally governed by the Open Burning Smoke Control Regulation (OBSCR), and a new form of the regulation was recently enacted and came into effect on September 15, 2019. Among the several changes in the new regulation that enhance the management of open burning in the Province, significant provisions have been introduced for the protection of air quality in communities, such as:

- Dividing the Province into three Smoke Sensitivity Zones – High, Medium and Low.
- Strictest burning requirements in the High zone immediately around communities.
- Increases to mandatory setbacks from residences, businesses, schools and hospitals.
- Defining exemptions for backyard burning and agricultural burning.

Implementation of the new regulation is well under way throughout the province, and more information is available at the OBSCR website.

AQOs framework and NO_2 updates

The Ministry of Environment and Climate Change Strategy (ENV) has recently published an updated Provincial Framework for Developing Provincial Air Quality Objectives. The intent of the framework is to outline the process and key considerations for developing air quality objectives in the province, mainly through key goals, guiding principles and general approach. Guided by this framework and recognizing the important role of the established Canadian Ambient Air Quality Standards (CAAQS), the Ministry is committed to reviewing and updating its own interim ambient air quality objectives (AQOs) for nitrogen dioxide (NO_2) that were adopted in 2014. This process is currently underway and will actively involve key stakeholders. The new AQOs for NO_2 will be accompanied by an updated application guide to inform the AQOs' implementation in B.C.

Provincial Wood Stove Exchange Program

The Ministry has recently committed to funding the Provincial Wood Stove Exchange Program for the next two years at $300,000 annually. This funding will continue to support the 21 local programs currently being offered in the province, which involve several regional districts and municipal partners. Program incentives include: $250 for changing to a cleaner-burning wood stove; $400 for changing to qualifying cleaner heating appliances such as electric heat pumps or pellet-fuelled stoves; which is bumped up to $500 for "Red Zone" communities, where levels of fine particulate matter ($PM_{2.5}$) exceed the Canadian Ambient Air Quality Standards. Moreover, individual communities may provide additional incentives to residents depending on their own local program funding. More information on the Provincial Wood Stove Exchange Program can be found at: https://www2.gov.bc.ca/gov/content/environment/air-land-water/air/air-pollution/smoke-burning/exchange.

SO_2 AQHI-Plus for Kitimat

Earlier in 2018, ENV initiated a pilot project to alert the Kitimat public of periods when sulphur dioxide (SO_2) levels are elevated. In collaboration with Environment and Climate Change Canada (ECCC), an updated Air Quality Health Index (AQHI-Plus for SO_2) has been developed and recently implemented. The AQHI-Plus provides a way to include pollutants such as SO_2 and $PM_{2.5}$, which may cause short-term health impacts not otherwise captured by the AQHI. The AQHI-Plus for SO_2 is currently implemented in Kitimat to alert the public when levels of SO_2 may affect the general population as well as persons with chronic respiratory conditions like asthma.

Air Quality Subscription Service

The Ministry is now offering an Air Quality Subscription Service, whereby citizens can sign up to receive email notifications for Air Quality Advisories, Smoky Skies Bulletins and SO_2 Alerts for Kitimat. Furthermore, SMS notifications via text messages are currently under development within this subscription service.

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www.gov.bc.ca/bcairquality
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www.hc-sc.gc.ca/ewh-semt/air/index-eng.php
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BC MINISTRY OF HEALTH
http://www2.gov.bc.ca/gov/content/governments/organizational-structure/ministries-organizations/ministries/health
Health Protection Branch
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Victoria, B.C. V8W 3C8
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NORTHERN HEALTH AUTHORITY
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Prince George, B.C. V2L 5B8
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ISLAND HEALTH AUTHORITY
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FRASER HEALTH AUTHORITY
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Suite 400, Central City Tower
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state of the air 2020

technical appendix

Bowen Island, Vancouver, Canada, Photo by Victor Sauca on Unsplash

2019 BC Lung State of the Air Report -- Technical Appendix

Data Source:

B.C. Ministry of Environment and Climate Change Strategy, Metro Vancouver, Prince Rupert Port Authority

Units:

All data presented in ppb except $PM_{2.5}$, which is presented in micrograms per cubic metre

Monitoring sites:

Monitoring is often conducted to address various objectives that may include measuring concentrations representative of: community exposure, industrial impacts, background concentrations, etc.
For the State of Air Report, monitoring sites immediately adjacent to industrial facilities were not included unless these sites were also near areas of high population density.

Data completeness:

Data completeness criteria have been relaxed relative to previous reports to enable reporting of data from more stations.
In this report, a valid day has data for at least 18 hours (75%).
A valid year has data for at least 60% of days in each quarter and 75% of of hours over an entire year, with the following exceptions.
For peak (4th highest) 8-hour ozone levels, a valid 8-hour period has data for at least 6 hours, a valid day has data for at least 18 hours, and a valid year has at least 75% of days in the second and third quarters (April 1 to September 30).
For peak (1-hour) SO_2 and NO_2 levels, a valid daily maximum includes those days where less than 18 hours are available in a day but the maximum concentration exceeds the objective level.
Annual mean $PM_{2.5}$ levels are based on the annual mean of daily $PM_{2.5}$ concentrations.
Where data completeness requirements are not met, only number of hours per year, maximum value and number of exceedances are shown.

Collocated monitors:

Where more than one $PM_{2.5}$ monitor is operating at a single site, data are shown for the monitor currently considered the primary reporting monitor and/or the monitor reporting a complete year of data.
A common example is the collocation of new FEM instruments alongside the TEOM instruments. This is done primarily for testing purposes, to ensure satisfactory FEM performance prior to establishing the FEM instrument as the primary reporting monitor and decommissioning the older TEOM instrument.

Disclaimer:

While the information in these data summaries are believed to be accurate, the data summaries are provided as is without any warranty, and may be subject to change as changes to the underlying database occur.

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2019 Fine Particulate Matter

Site	Year	No. Valid Hrs	Annual Avg	Percentiles (1h)					Max 1h	No. Valid Days	24h Average			% of Valid Days Per Quarter			
				25th	50th	75th	98th	99th			Annual Avg	Annual 98th Percentile*	Annual Max	Q1	Q2	Q3	Q4
Abbotsford-Airport	2019	8675	5.76	2.64	4.51	7.22	19.92	24.41	144.54	362.00	5.75	16.37	22.34	96.7%	100.0%	100.0%	100.0%
Abbotsford-Mill Lake	2019	8675	5.43	2.51	4.24	6.79	18.40	23.39	178.28	362.00	5.44	13.80	28.34	100.0%	96.7%	100.0%	100.0%
Agassiz	2019	8601	5.35	2.90	4.58	6.77	15.43	17.73	44.19	358.00	5.33	13.00	16.34	96.7%	96.7%	100.0%	98.9%
Burnaby South	2019	8449	5.10	2.42	4.18	6.68	15.66	18.36	146.94	351.00	5.09	11.76	17.78	100.0%	100.0%	89.1%	95.7%
Burnaby-Kensington	2019	8594	4.51	2.17	3.81	5.97	13.62	15.71	27.02	358.00	4.51	9.85	12.07	97.8%	100.0%	97.8%	96.7%
Burns Lake	2019	8514	8.60	2.49	5.58	11.57	34.93	41.12	108.75	354.00	8.60	22.47	36.64	100.0%	100.0%	97.8%	90.2%
Campbell River	2019	8346	6.45	2.83	5.02	7.95	24.80	29.93	96.60	352.00	6.42	15.42	20.35	93.3%	100.0%	92.4%	100.0%
Castlegar	2019	8089	6.71	2.76	5.09	9.00	22.70	26.86	76.96	337.00	6.72	17.79	26.11	72.2%	96.7%	100.0%	100.0%
Chilliwack	2019	8535	6.30	2.77	5.13	8.44	19.61	22.29	60.20	352.00	6.27	14.73	18.94	98.9%	94.5%	95.7%	96.7%
Colwood	2019	7111	.	.	.	.	.	.	.	298.00	.	.	16.06	98.9%	95.6%	98.9%	33.7%
Courtenay	2019	8627	7.73	3.00	5.00	9.00	38.00	43.00	85.00	359.00	7.74	24.42	30.04	97.8%	95.6%	100.0%	100.0%
Cranbrook Muriel Baxter	2019	7716	5.29	0.64	2.48	6.73	29.03	33.59	81.69	315.00	5.28	13.50	36.03	91.1%	90.1%	65.2%	98.9%
Crofton Elementary	2019	4934	.	.	.	.	.	.	.	201.00	.	.	18.70	.	80.2%	53.3%	85.9%
Crofton-Substation	2019	8673	5.57	3.00	5.00	7.00	17.00	19.28	168.00	365.00	5.58	13.00	17.67	100.0%	100.0%	100.0%	100.0%
Duncan-College St	2019	8640	7.73	3.00	6.00	10.00	29.00	35.00	66.00	361.00	7.74	21.67	33.92	100.0%	95.6%	100.0%	100.0%
Duncan-Deykin	2019	8686	7.18	3.00	6.00	10.00	22.00	25.15	214.00	362.00	7.18	17.88	26.83	100.0%	97.8%	98.9%	100.0%
Fort St. John	2019	6298	.	.	.	.	.	.	.	260.00	.	.	38.64	97.8%	95.6%	63.0%	29.3%
Golden	2019	8722	8.54	2.98	5.55	10.24	37.70	45.94	130.41	364.00	8.56	23.22	54.04	100.0%	98.9%	100.0%	100.0%
Grand Forks	2019	8697	8.94	3.42	6.15	11.06	35.73	42.66	84.96	362.00	8.93	24.45	30.88	100.0%	100.0%	100.0%	96.7%
Harmac	2019	8673	8.34	3.00	6.00	11.00	36.00	45.00	137.00	364.00	8.34	25.54	37.67	100.0%	100.0%	98.9%	100.0%
Hope	2019	8476	4.81	2.51	4.11	6.25	13.58	15.86	61.88	351.00	4.80	9.98	15.56	98.9%	98.9%	97.8%	89.1%
Horseshoe Bay	2019	8298	3.93	1.92	3.30	5.21	11.62	13.77	84.58	339.00	3.91	9.35	20.36	90.0%	86.8%	94.6%	100.0%
Houston	2019	8621	10.55	2.62	5.68	11.59	61.60	74.42	131.11	359.00	10.56	30.78	44.78	100.0%	93.4%	100.0%	100.0%
Kamloops-Fed. Bldg.	2019	8644	7.40	3.69	6.09	9.90	20.75	23.19	46.47	355.00	7.43	16.86	20.67	100.0%	94.5%	97.8%	96.7%
Kelowna-College	2019	3847	.	.	.	.	.	.	.	159.00	.	.	13.33	100.0%	75.8%	.	.
Kelowna-KLO Road	2019	2639	.	.	.	.	.	.	.	110.00	.	.	18.64	.	.	20.7%	98.9%
Kitimat-Haisla	2019	7836	4.04	1.00	3.00	6.00	15.00	19.00	55.00	329.00	4.03	10.54	16.83	100.0%	100.0%	94.6%	66.3%
Kitimat-Riverlodge	2019	8582	4.53	2.00	4.00	6.00	16.00	20.00	153.00	359.00	4.53	10.79	24.08	100.0%	98.9%	94.6%	100.0%
Kitimat-Whitesail	2019	8617	4.39	2.00	4.00	6.00	14.00	19.00	65.00	360.00	4.39	10.29	19.88	100.0%	100.0%	94.6%	100.0%
Langdale	2019	8333	3.45	0.00	2.00	5.00	15.00	17.00	32.00	359.00	3.42	9.42	11.29	96.7%	98.9%	100.0%	97.8%
Langley	2019	8593	5.77	2.29	4.07	6.89	23.52	29.02	112.28	357.00	5.77	18.01	26.50	98.9%	100.0%	97.8%	94.6%
Lavington	2019	3048	.	.	.	.	.	.	.	126.00	.	.	20.68	100.0%	39.6%	.	.
Mission	2019	8647	5.87	2.18	4.27	7.65	21.83	27.93	104.11	359.00	5.86	17.24	27.30	98.9%	100.0%	94.6%	100.0%
N. Vancouver-2nd Narrows	2019	8359	6.93	3.68	5.85	8.90	20.56	22.65	45.78	347.00	6.94	14.74	18.99	100.0%	98.9%	98.9%	82.6%
N. Vancouver-Mahon Park	2019	8606	4.47	2.26	3.82	5.89	13.40	15.79	43.70	355.00	4.49	11.07	14.07	98.9%	98.9%	93.5%	97.8%
Nanaimo	2019	8583	3.97	1.00	3.00	6.00	14.00	16.00	186.00	358.00	3.96	10.42	43.88	100.0%	95.6%	96.7%	100.0%

2019 Fine Particulate Matter

Site	Year	No. Valid Hrs	Annual Avg	Percentiles (1h)					Max 1h	No. Valid Days	24h Average			% of Valid Days Per Quarter			
				25th	50th	75th	98th	99th			Annual Avg	Annual 98th Percentile*	Annual Max	Q1	Q2	Q3	Q4
New Westminster	2019	8731	6.34	3.56	5.37	7.99	18.22	21.61	71.87	364.00	6.34	13.62	21.17	100.0%	100.0%	98.9%	100.0%
North Delta	2019	7883	5.71	3.03	4.84	7.48	16.38	19.11	53.31	323.00	5.72	12.93	17.26	93.3%	74.7%	91.3%	94.6%
Pitt Meadows	2019	8620	5.17	2.17	4.35	7.00	16.27	19.16	55.09	360.00	5.17	13.07	21.77	97.8%	100.0%	96.7%	100.0%
Port Alberni-Elem. School	2019	7932	8.72	4.00	6.00	10.01	32.98	37.99	170.91	329.00	8.75	23.50	29.00	100.0%	98.9%	62.0%	100.0%
Port Moody	2019	8644	4.89	2.29	4.11	6.52	14.16	17.31	190.04	361.00	4.91	9.88	15.95	100.0%	100.0%	95.7%	100.0%
Powell River-J Thomson	2019	8054	2.07	0.30	1.36	2.82	9.47	12.53	66.00	336.00	2.07	5.69	9.47	72.2%	100.0%	95.7%	100.0%
Prince George-Plaza 400	2019	4614	.	.	.	.	.	.	.	192.00	.	.	35.01	100.0%	98.9%	13.0%	.
Prince Rupert Fairview	2019	8649	3.23	1.27	2.50	4.34	10.83	13.47	30.29	360.00	3.23	9.07	13.68	100.0%	100.0%	98.9%	95.7%
Quesnel	2019	8737	8.92	3.02	6.45	12.15	33.38	38.97	144.60	364.00	8.93	25.64	35.25	100.0%	98.9%	100.0%	100.0%
Richmond South	2019	8655	5.88	2.88	4.73	7.46	18.81	24.20	84.38	360.00	5.89	15.51	28.93	97.8%	100.0%	97.8%	98.9%
Richmond-Airport	2019	8657	5.21	2.45	4.15	6.65	17.15	20.12	71.53	360.00	5.20	13.68	21.94	98.9%	98.9%	98.9%	97.8%
Smithers	2019	7873	8.52	2.91	5.44	10.56	35.13	41.73	161.19	323.00	8.52	22.21	30.29	65.6%	94.5%	94.6%	98.9%
Squamish	2019	8527	4.80	2.00	4.00	7.00	15.00	17.00	44.00	359.00	4.79	11.13	15.88	98.9%	94.5%	100.0%	100.0%
Surrey	2019	8639	5.76	2.99	4.80	7.29	17.08	19.82	61.38	359.00	5.76	13.25	19.34	96.7%	100.0%	97.8%	98.9%
Terrace	2019	8652	5.92	2.14	3.75	6.98	27.19	34.70	121.42	359.00	5.94	16.17	25.82	100.0%	98.9%	100.0%	94.6%
Tsawwassen	2019	8635	4.34	2.27	3.46	5.38	14.09	16.58	48.38	358.00	4.35	11.09	18.46	98.9%	97.8%	95.7%	100.0%
Valemount	2019	2873	.	.	.	.	.	.	.	118.00	.	.	31.11	30.0%	91.2%	.	8.7%
Vancouver-Clark Dr	2019	8718	7.20	3.88	5.94	8.78	22.14	25.85	179.69	364.00	7.20	18.19	46.19	100.0%	100.0%	98.9%	100.0%
Vanderhoof	2019	6973	.	.	.	.	.	.	.	289.00	.	.	41.04	95.6%	42.9%	80.4%	97.8%
Vernon	2019	8574	7.97	3.66	6.24	10.84	23.54	25.76	78.30	356.00	7.95	18.88	28.66	98.9%	97.8%	97.8%	95.7%
Victoria	2019	8653	6.75	3.00	6.00	8.00	24.00	31.00	110.00	361.00	6.75	16.71	26.13	100.0%	95.6%	100.0%	100.0%
Whistler	2019	8425	4.91	1.00	4.00	6.00	22.00	27.00	73.00	354.00	4.90	14.88	22.21	98.9%	89.0%	100.0%	100.0%
Williams Lake	2019	8652	7.08	2.36	4.87	9.57	26.38	30.77	70.68	358.00	7.10	18.07	21.40	98.9%	93.4%	100.0%	100.0%
*Percentile of 24h average concentrations based on approach outlined in "Guidance Document on Achievement Determination. Canadian Ambient Air Quality Standards for Fine Particulate Matter and Ozone" at:																	
https://www.ccme.ca/files/Resources/air/aqms/pn_1483_gdad_eng.pdf																	

Summary 2019 Ozone

Site	Year	No. Valid Hrs	Annual Avg.	Percentiles (1h)						Daily 8h Max		No. Days >63 ppb	% of Valid Days Per Quarter				
				25th	50th	75th	98th	99th	1h Max	Annual Max	Annual 4th Highest		Q1	Q2	Q3	Q4	Q2+Q3
Vancouver-Dwtn	2019	8656	10.11	2.46	8.01	16.04	30.54	33.21	52.66	38.96	34.42	0.00	97.8	100.0	97.8	96.7	98.9
Vancouver-Clark Dr	2019	8602	11.49	1.18	9.13	19.27	35.64	38.21	47.07	40.82	38.39	0.00	98.9	100.0	100.0	92.4	100.0
North Vancouver Second Narrows	2019	8702	13.60	5.32	12.39	20.14	35.92	38.49	47.50	42.47	39.70	0.00	100.0	98.9	98.9	100.0	98.9
Terrace	2019	7468	17.78	9.22	18.27	25.49	37.83	39.21	49.25	45.61	40.33	0.00	65.6	87.9	94.6	100.0	91.3
Burnaby South	2019	8592	16.97	7.95	16.85	25.07	38.61	40.78	47.15	42.41	41.15	0.00	97.8	97.8	94.6	98.9	96.2
New Westminster	2019	8507	12.62	1.48	9.52	21.34	39.45	41.39	52.81	48.15	41.94	0.00	97.8	98.9	88.0	97.8	93.4
Burnaby-Kensington	2019	8689	17.28	8.20	16.86	25.29	40.13	41.85	52.20	45.16	42.52	0.00	94.4	100.0	100.0	100.0	100.0
Richmond-Airport	2019	8704	16.37	4.64	16.05	25.86	40.38	42.57	52.90	44.02	43.20	0.00	98.9	98.9	98.9	98.9	98.9
Port Moody	2019	8710	13.03	2.72	10.74	20.57	40.15	42.16	56.06	48.91	43.22	0.00	97.8	100.0	100.0	100.0	100.0
North Delta	2019	8588	17.53	7.77	17.41	25.96	40.92	43.12	51.20	45.35	43.95	0.00	96.7	90.1	98.9	100.0	94.5
N. Vancouver-Mahon Park	2019	8689	17.16	7.20	16.67	26.01	40.55	42.87	55.52	50.17	44.22	0.00	98.9	100.0	96.7	100.0	98.4
Victoria-Topaz	2019	8342	19.57	10.45	19.79	27.82	41.75	43.39	49.43	45.90	44.28	0.00	98.9	97.8	97.8	98.9	97.8
Richmond South	2019	8728	16.51	2.93	15.99	27.02	42.16	44.02	55.16	48.30	44.65	0.00	98.9	100.0	100.0	100.0	100.0
Tsawwassen	2019	8651	21.78	13.54	22.69	30.34	42.45	44.04	55.63	46.97	45.11	0.00	97.8	97.8	96.7	98.9	97.3
Smithers	2019	7867	13.45	2.35	10.81	21.61	41.61	43.94	52.29	48.06	45.17	0.00	74.4	90.1	97.8	97.8	94.0
Burnaby-Mtn	2019	8410	25.45	19.00	25.59	32.57	43.46	44.90	59.76	50.74	45.36	0.00	91.1	90.1	98.9	100.0	94.5
Prince Rupert Fairview	2019	8682	20.81	11.01	20.91	30.03	43.13	44.64	49.70	47.45	45.60	0.00	95.6	100.0	96.7	98.9	98.4
Nanaimo	2019	8302	22.34	14.89	22.49	30.02	41.59	43.59	51.22	46.90	45.97	0.00	98.9	98.9	94.6	98.9	96.7
Squamish	2019	8494	17.06	6.40	15.37	26.55	43.70	45.56	56.24	48.84	46.17	0.00	85.6	100.0	100.0	97.8	100.0
Coquitlam	2019	8716	16.32	5.59	15.05	24.65	42.99	45.13	60.94	53.14	46.19	0.00	98.9	100.0	98.9	98.9	99.5
Pitt Meadows	2019	8691	16.84	4.40	16.41	26.68	43.68	45.62	59.40	52.41	46.45	0.00	97.8	100.0	100.0	98.9	100.0
Abbotsford-Mill Lake	2019	8725	19.09	8.30	18.28	28.78	44.66	46.28	64.08	53.96	47.14	0.00	98.9	100.0	100.0	100.0	100.0
Langley	2019	8705	19.97	9.33	19.78	29.67	45.07	46.78	58.40	53.80	47.43	0.00	98.9	98.9	100.0	98.9	99.5
Quesnel	2019	8358	14.33	3.92	12.07	22.66	42.61	45.83	57.11	55.30	48.01	0.00	100.0	91.2	98.9	98.9	95.1
Surrey	2019	8703	20.31	10.50	20.32	29.27	45.60	47.46	55.84	52.19	48.04	0.00	96.7	100.0	100.0	98.9	100.0
Courtenay	2019	8297	19.56	8.21	19.40	29.20	43.86	46.12	55.21	51.10	48.20	0.00	97.8	96.7	95.7	100.0	96.2
Abbotsford-Airport	2019	8613	20.09	9.49	19.44	29.91	45.12	47.11	63.78	55.59	48.29	0.00	95.6	98.9	100.0	100.0	99.5
Duncan	2019	8339	17.65	5.22	16.27	28.19	45.08	47.30	60.57	53.28	48.53	0.00	98.9	98.9	97.8	96.7	98.4
Whistler	2019	8520	21.35	10.35	20.49	31.68	46.58	48.16	56.20	51.93	49.11	0.00	98.9	98.9	95.7	87.0	97.3
Castlegar	2019	8260	19.93	9.81	18.22	28.38	45.50	48.05	57.16	51.89	49.14	0.00	97.8	98.9	91.3	100.0	95.1
Kamloops-Fed. Bldg.	2019	8358	19.64	8.68	19.15	29.44	44.88	47.35	55.63	51.63	49.27	0.00	100.0	96.7	96.7	100.0	96.7
Colwood	2019	8280	21.70	11.30	22.15	30.93	45.98	48.21	60.98	51.69	49.95	0.00	95.6	98.9	100.0	98.9	99.5
Maple Ridge	2019	8726	18.84	7.94	18.42	28.10	45.34	47.51	62.39	56.29	50.24	0.00	98.9	100.0	100.0	100.0	100.0
Chilliwack	2019	8688	18.84	7.00	17.98	29.17	45.39	47.37	70.31	59.21	51.12	0.00	98.9	100.0	100.0	95.7	100.0

Summary 2019 Ozone

Site	Year	No. Valid Hrs	Annual Avg.	Percentiles (1h)						Daily 8h Max		No. Days >63 ppb	% of Valid Days Per Quarter				
				25th	50th	75th	98th	99th	1h Max	Annual Max	Annual 4th Highest		Q1	Q2	Q3	Q4	Q2+Q3
Agassiz	2019	8725	18.85	8.04	18.06	28.57	44.45	46.04	69.31	53.73	51.16	0.00	98.9	100.0	100.0	100.0	100.0
Williams Lake	2019	7983	19.63	8.28	18.93	28.59	47.44	49.44	58.77	54.17	51.24	0.00	80.0	92.3	98.9	100.0	95.6
Prince George-Plaza 400	2019	8369	18.56	6.65	17.87	27.94	45.20	47.95	62.89	54.78	51.47	0.00	100.0	95.6	100.0	98.9	97.8
Farmington	2019	8368	25.15	16.97	25.77	33.62	47.12	49.52	60.74	54.70	51.85	0.00	98.9	97.8	98.9	97.8	98.4
Vernon	2019	8328	19.21	7.63	17.74	29.33	46.00	47.51	57.34	54.56	51.98	0.00	97.8	97.8	95.7	98.9	96.7
Fort St. John	2019	7548	23.53	15.07	23.28	31.22	47.25	49.71	67.56	56.43	52.08	0.00	98.9	81.3	95.7	79.3	88.5
Mission	2019	8701	20.75	11.41	20.25	29.53	44.82	47.13	70.02	56.85	52.11	0.00	96.7	100.0	98.9	98.9	99.5
Taylor-Townsite	2019	8289	21.09	10.59	20.91	30.16	47.75	49.77	61.17	57.77	52.48	0.00	98.9	95.6	95.7	95.7	95.6
Hope	2019	8716	18.82	6.84	17.67	29.34	45.87	48.46	72.04	56.59	52.99	0.00	98.9	100.0	100.0	100.0	100.0
Cranbrook	2019	7719	25.46	16.57	25.53	33.94	48.26	50.52	58.27	55.10	53.01	0.00	97.8	94.5	71.7	98.9	83.1
Kelowna-College	2019	3485	28.31	.	.	.	.	.	.	.	.	.	100.0	67.0	.	.	33.3
Kelowna-KLO Road	2019	2520	14.01	.	.	.	.	.	.	.	.	.	.	.	20.7	96.7	10.4
Kitimat-Whitesail	2019	4189	14.94	.	.	.	.	.	.	.	.	.	.	.	93.5	96.7	47.0

Summary 2019 Nitrogen Dioxide

Site	Year	No. Valid Hrs	Annual Avg	Percentiles (1h)					Max 1h	Annual 98th Percentile of D1HM*	No. Days			% of Valid Days Per Quarter			
				25th	50th	75th	98th	99th			>100 ppb	>60 ppb	>42 ppb	Q1	Q2	Q3	Q4
Abbotsford-Airport	2019	8517	7.12	2.92	5.68	10.02	21.03	23.44	39.82	29.10	0	0	0	97.8	89.0	98.9	100.0
Abbotsford-Mill Lake	2019	8713	8.62	4.11	6.93	11.65	25.05	28.79	40.41	36.10	0	0	0	100.0	98.9	100.0	100.0
Agassiz	2019	8694	7.25	3.18	5.52	10.19	21.76	23.66	31.58	30.00	0	0	0	100.0	97.8	100.0	100.0
Burnaby-Kensington	2019	8619	10.11	5.43	8.52	13.09	28.41	31.62	48.67	39.50	0	0	3	100.0	100.0	100.0	95.7
Burnaby-Mtn	2019	8660	6.94	3.31	5.66	8.90	24.35	28.23	43.93	35.90	0	0	1	98.9	97.8	100.0	100.0
Burnaby South	2019	8558	12.61	6.86	10.95	16.96	31.49	34.72	48.86	40.50	0	0	3	97.8	100.0	94.6	98.9
Castlegar	2019	8207	5.44	2.19	4.18	7.39	17.75	19.66	29.34	25.50	0	0	0	92.2	100.0	98.9	97.8
Chilliwack	2019	8679	7.46	3.63	6.20	10.10	21.05	23.27	35.93	29.40	0	0	0	98.9	100.0	100.0	97.8
Colwood	2019	8293	4.53	1.33	3.39	6.31	16.39	18.77	29.58	25.30	0	0	0	98.9	100.0	98.9	96.7
Coquitlam	2019	8689	9.66	4.78	7.93	12.95	27.18	30.01	44.76	36.70	0	0	3	98.9	100.0	100.0	100.0
Courtenay	2019	7997	3.77	1.33	2.60	4.86	14.94	17.71	33.69	26.10	0	0	0	97.8	83.5	100.0	100.0
Cranbrook	2019	8351	4.50	1.33	2.51	5.91	19.93	23.74	41.06	31.30	0	0	0	100.0	100.0	97.8	100.0
Duncan	2019	8326	4.24	1.69	3.28	5.75	14.08	16.32	31.31	23.60	0	0	0	100.0	98.9	98.9	100.0
Farmington	2019	8366	2.89	0.79	1.61	3.65	13.07	15.33	34.11	20.70	0	0	0	98.9	98.9	98.9	98.9
Fort St John	2019	5054	.	.	.	.	.	.	.	.	0	0	4	36.7	95.6	71.7	32.6
Hope	2019	8619	5.22	2.29	4.03	7.24	15.99	18.14	27.75	23.80	0	0	0	93.3	100.0	100.0	100.0
Kamloops-Fed. Bldg.	2019	8355	10.86	5.08	8.52	14.57	33.23	36.00	46.90	40.60	0	0	6	100.0	98.9	97.8	100.0
Kelowna-College	2019	3490	.	.	.	.	.	.	.	.	0	0	0	100.0	65.9	.	.
Kelowna-KLO Road	2019	2534	.	.	.	.	.	.	.	.	0	0	0	.	.	20.7	97.8
Kitimat Whitesail	2019	4182	.	.	.	.	.	.	.	.	0	0	0	.	.	96.7	97.8
Langdale	2019	8183	4.14	2.07	3.36	5.36	12.58	14.90	30.96	23.30	0	0	0	96.7	93.4	96.7	100.0
Langley	2019	8597	6.03	2.63	4.70	8.27	19.37	21.56	34.21	25.20	0	0	0	98.9	100.0	100.0	95.7
Maple Ridge	2019	8725	7.99	3.70	6.23	10.40	25.83	28.99	48.05	35.50	0	0	1	98.9	100.0	100.0	100.0
Mission	2019	8725	6.77	3.04	4.97	8.72	23.03	26.25	41.11	33.10	0	0	0	98.9	100.0	100.0	100.0
Nanaimo	2019	8295	5.56	2.12	4.49	7.70	17.71	20.12	44.37	28.90	0	0	1	100.0	98.9	96.7	100.0
New Westminster	2019	8713	15.96	9.38	15.14	21.34	35.30	38.79	57.50	43.50	0	0	14	97.8	98.9	100.0	100.0
North Delta	2019	8599	12.44	5.65	10.50	17.31	34.11	38.18	53.95	43.80	0	0	14	95.6	92.3	100.0	100.0
N. Vancouver-Mahon Park	2019	8688	11.55	5.61	9.54	15.65	31.58	34.29	46.02	41.00	0	0	5	98.9	100.0	95.7	100.0
N. Vancouver-2nd Narrows	2019	8678	13.58	6.67	10.71	16.89	44.62	53.74	105.35	83.20	2	27	79	100.0	100.0	98.9	100.0
Pitt Meadows	2019	8691	8.43	3.46	7.02	11.52	27.04	31.03	49.08	41.80	0	0	6	97.8	100.0	100.0	100.0
Port Moody	2019	8687	11.07	6.16	9.88	14.67	27.66	30.85	43.47	38.80	0	0	2	100.0	97.8	100.0	100.0
Powell River-Wildwood	2019	6379	.	.	.	.	.	.	.	.	0	0	0	100.0	100.0	87.0	16.3
Prince George-Plaza 400	2019	8378	10.46	3.59	7.44	14.25	38.57	42.45	54.43	49.70	0	0	29	100.0	97.8	100.0	100.0
Prince Rupert-Fairview	2019	8399	4.82	1.57	3.51	6.85	16.73	19.67	34.94	27.60	0	0	0	96.7	100.0	84.8	100.0
Quesnel	2019	8376	7.90	2.83	5.25	10.53	30.12	34.68	49.95	42.20	0	0	8	100.0	98.9	100.0	100.0
Richmond South	2019	8718	11.76	4.35	9.97	17.52	32.32	35.61	46.60	40.10	0	0	5	100.0	100.0	100.0	100.0
Smithers	2019	7324	6.15	2.27	4.35	8.05	24.58	28.08	36.78	33.50	0	0	0	66.7	85.7	87.0	100.0
Squamish	2019	8622	5.75	2.93	4.89	7.52	16.57	18.54	30.27	23.90	0	0	0	94.4	100.0	98.9	100.0
Surrey	2019	8705	9.17	4.15	7.17	12.58	27.01	29.86	42.81	36.10	0	0	2	98.9	100.0	100.0	100.0
Taylor-Townsite	2019	8206	6.71	1.51	3.89	9.41	28.51	32.62	51.06	39.70	0	0	6	97.8	98.9	96.7	91.3
Terrace	2019	8314	3.00	0.63	1.39	3.75	15.13	18.32	27.45	22.40	0	0	0	100.0	95.6	97.8	100.0
Tsawwassen	2019	8692	6.66	2.43	4.66	9.28	22.42	24.61	43.40	30.20	0	0	1	97.8	97.8	100.0	100.0
Vancouver-Clark Dr	2019	8604	17.91	10.66	16.69	23.91	40.97	44.08	61.58	52.50	0	1	42	100.0	100.0	100.0	93.5
Vancouver-Dwtn	2019	8722	16.08	10.61	15.37	20.73	31.35	33.93	46.38	41.00	0	0	4	98.9	100.0	100.0	100.0
Vernon	2019	8330	8.67	3.92	6.80	11.90	25.40	28.03	36.42	32.30	0	0	0	100.0	97.8	96.7	100.0
Victoria-Topaz	2019	8341	8.03	3.24	6.37	11.12	25.34	28.23	55.85	37.40	0	0	3	100.0	97.8	98.9	100.0
Whistler	2019	8689	3.90	1.50	2.64	4.76	16.07	18.35	26.08	22.80	0	0	0	100.0	98.9	97.8	100.0
Williams Lake	2019	8118	6.53	1.78	3.93	8.78	27.62	32.11	65.49	39.10	0	1	5	88.9	93.4	100.0	100.0

Summary 2019 Nitrogen Dioxide

Site	Year	No. Valid Hrs	Annual Avg	Percentiles (1h)					Max 1h	Annual 98th Percentile of D1HM*	No. Days			% of Valid Days Per Quarter			
				25th	50th	75th	98th	99th			>100 ppb	>60 ppb	>42 ppb	Q1	Q2	Q3	Q4
*Percentiles of daily 1-hour maximum (D1HM) based on "Guidance on Application of Provincial Air Quality Objectives for NO_2" at:																	
https://www2.gov.bc.ca/assets/gov/environment/air-land-water/air/reports-pub/no2_ago-implementation_guide.pdf																	

Summary 2019 Sulfur Dioxide

Site	Year	No. Valid Hrs	Annual Avg	Percentiles (1h)					Max	No. Valid Days	Percentiles (D1HM)*			No. of Days		% of Valid Days Per Quarter			
				25th	50th	75th	98th	99th			97.5th	98th	99th	>75 ppb	>70 ppb	Q1	Q2	Q3	Q4
Abbotsford-Airport	2019	8352	0.20	0.07	0.13	0.25	0.84	1.21	5.22	360	2.4	2.6	3.1	0	0	96.7	100.0	100.0	97.8
Abbotsford-Mill Lake	2019	8711	0.15	0.04	0.09	0.16	0.88	1.29	6.40	364	2.7	2.8	3.4	0	0	100.0	98.9	100.0	100.0
Bessborough	2019	8069	0.36	0.10	0.19	0.36	1.75	2.75	30.07	350	13	16.8	20.9	0	0	91.1	94.5	98.9	98.9
Burnaby North	2019	8705	0.49	0.14	0.31	0.62	2.26	2.99	8.52	362	4.8	5	6	0	0	96.7	100.0	100.0	100.0
Burnaby South	2019	8241	0.34	0.11	0.20	0.41	1.68	2.09	19.36	357	3.6	3.6	4.5	0	0	97.8	100.0	94.6	98.9
Burnaby-Capitol Park	2019	8738	0.52	0.07	0.16	0.42	3.74	7.07	53.14	365	20.1	22.6	28.7	0	0	100.0	100.0	100.0	100.0
Burnaby-Kensington	2019	8661	0.38	0.13	0.26	0.51	1.56	2.01	12.18	361	4.2	4.3	6.3	0	0	95.6	100.0	100.0	100.0
Castlegar	2019	8356	1.64	0.04	0.12	0.84	16.12	21.63	40.93	363	32.6	33.6	39.5	0	0	97.8	100.0	100.0	100.0
Chilliwack	2019	8364	0.14	0.05	0.10	0.18	0.60	0.87	4.77	364	1.4	1.8	2.7	0	0	98.9	100.0	100.0	100.0
Farmington	2019	8248	0.28	0.08	0.15	0.30	1.41	2.09	44.54	355	4.3	4.9	10.5	0	0	98.9	98.9	98.9	92.4
Fort St. John	2019	7139	0.32	0.14	0.21	0.32	1.59	2.12	10.15	304	3.6	4.3	5.4	0	0	83.3	71.4	98.9	79.3
Kamloops-Fed. Bldg.	2019	8361	0.23	0.09	0.17	0.28	0.93	1.22	11.07	362	2.5	2.7	4.3	0	0	100.0	98.9	97.8	100.0
Kelowna-College	2019	1582	.	.	.	.	.	.	.	68	.	.	.	.	.	75.6	.	.	.
Kelowna-KLO Road	2019	2534	.	.	.	.	.	.	.	109	.	.	.	.	.	.	.	20.7	97.8
Kitimat Haul Road	2019	8299	4.55	0.17	0.61	4.14	37.61	46.59	86.98	360	71.3	73	81.6	5	9	100.0	97.8	100.0	96.7
Kitimat-Haisla	2019	8335	0.26	0.04	0.08	0.14	2.40	4.09	72.84	365	11.5	14.3	17.9	0	1	100.0	100.0	100.0	100.0
Kitimat-Riverlodge	2019	8328	0.51	0.06	0.13	0.25	4.93	8.51	66.56	363	25.6	31.5	39	0	0	98.9	98.9	100.0	100.0
Kitimat-Whitesail	2019	8320	0.37	0.07	0.12	0.18	3.39	5.58	43.65	362	15	18.2	21.7	0	0	98.9	98.9	98.9	100.0
Langdale	2019	7171	0.64	0.20	0.37	0.72	3.32	4.31	13.42	307	7.4	7.7	9.4	0	0	96.7	83.5	96.7	59.8
Langley	2019	8605	0.17	0.06	0.09	0.17	1.03	1.39	7.45	359	3	3.1	3.7	0	0	98.9	100.0	100.0	94.6
N. Vancouver-Mahon Park	2019	8659	0.25	0.06	0.14	0.30	1.24	1.65	8.86	358	3.1	3.1	4.2	0	0	98.9	100.0	93.5	100.0
North Vancouver Second Narrows	2019	8694	0.28	0.08	0.17	0.37	1.17	1.42	5.69	362	2.3	2.4	3.3	0	0	98.9	98.9	98.9	100.0
Pitt Meadows	2019	8328	0.37	0.12	0.22	0.43	1.73	2.19	6.97	362	3.1	3.6	4.7	0	0	96.7	100.0	100.0	100.0
Port Moody	2019	8446	0.27	0.04	0.11	0.28	1.75	2.09	4.81	362	3	3.1	3.9	0	0	98.9	97.8	100.0	100.0
Prince George-Plaza 400	2019	7817	1.16	0.14	0.36	0.99	8.77	12.96	43.52	338	25.3	28.5	31.2	0	0	93.3	76.9	100.0	100.0
Prince Rupert-Fairview	2019	8686	0.27	0.11	0.22	0.37	0.88	1.00	2.56	361	1.4	1.4	1.6	0	0	96.7	100.0	98.9	100.0
Quesnel	2019	8248	0.41	0.20	0.32	0.47	1.43	2.00	20.35	356	6	6.3	9.6	0	0	94.4	97.8	100.0	97.8
Richmond South	2019	8627	0.26	0.06	0.15	0.34	1.23	1.44	4.84	365	2.3	2.5	3	0	0	100.0	100.0	100.0	100.0
Richmond-Airport	2019	8324	0.37	0.11	0.24	0.50	1.51	1.85	6.90	364	2.8	2.9	3	0	0	98.9	100.0	100.0	100.0
Squamish	2019	7680	0.28	0.12	0.21	0.34	1.08	1.32	7.33	330	3.6	4.9	5.8	0	0	80.0	97.8	95.7	88.0
Taylor-S. Hill	2019	8367	0.40	0.06	0.12	0.28	2.89	4.68	61.36	365	12.1	16.7	26.4	0	0	100.0	100.0	100.0	100.0
Taylor-Townsite	2019	8371	0.95	0.08	0.18	0.47	9.21	17.07	76.80	365	49.6	50.6	57.8	1	3	100.0	100.0	100.0	100.0
Terrace	2019	7642	0.48	0.11	0.23	0.59	2.48	2.92	7.45	326	4.2	4.4	5.3	0	0	100.0	68.1	90.2	98.9
Trail-Birchbank	2019	7924	5.33	0.22	0.65	5.41	38.78	46.97	176.56	343	72.6	77.6	93.8	8	11	97.8	85.7	90.2	100.0

Summary 2019 Sulfur Dioxide

Site	Year	No. Valid Hrs	Annual Avg	Percentiles (1h)					Max	No. Valid Days	Percentiles (D1HM)*			No. of Days		% of Valid Days Per Quarter			
				25th	50th	75th	98th	99th			97.5th	98th	99th	>75 ppb	>70 ppb	Q1	Q2	Q3	Q4
Trail-Butler Park	2019	7923	7.49	0.37	1.67	6.58	61.94	80.33	195.17	345	122.8	131.3	147	73	78	96.7	86.8	90.2	100.0
Trail-Columbia Gardens Airport	2019	8363	3.25	0.18	0.49	2.95	23.40	29.91	71.47	365	47.9	54.1	59	0	1	100.0	100.0	100.0	100.0
Tsawwassen	2019	8494	0.17	0.02	0.08	0.22	0.90	1.25	4.82	358	2.5	2.5	3.6	0	0	94.4	97.8	100.0	100.0
Vancouver-Clark Dr	2019	8505	0.41	0.15	0.30	0.54	1.51	1.82	7.13	359	3.1	3.1	4.1	0	0	100.0	100.0	100.0	93.5
Vancouver-Dwtn	2019	8725	0.31	0.12	0.23	0.40	1.18	1.41	5.07	364	2.1	2.2	2.7	0	0	98.9	100.0	100.0	100.0
Vancouver-Pandora	2019	8730	0.59	0.23	0.42	0.75	2.29	2.91	11.97	364	4.5	4.8	6.6	0	0	98.9	100.0	100.0	100.0
Victoria-James Bay	2019	8320	0.10	0.02	0.06	0.10	0.60	0.80	3.13	347	1.7	2.2	2.5	0	0	87.8	92.3	100.0	100.0
Victoria-Topaz	2019	8344	0.28	0.08	0.15	0.35	1.41	1.90	7.01	364	3.6	4	5.6	0	0	100.0	98.9	100.0	100.0
Williams Lake	2019	79	.	.	.	.	.	.	.	3	.	.	.	.	.	3.3	.	.	.