



TRS Trends in Kamloops

Handout to accompany update to Air Quality Roundtable

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Ralph Adams
Air Quality Meteorologist
Environmental Protection Division
Monitoring, Assessment and Stewardship

What is TRS and how is it Measured?

Total Reduced Sulphur gasses (TRS) are a mixture of several gasses that contain sulphur in the reduced form (as opposed to SO_2 where the sulphur is in oxidised form). The most common TRS gasses are Hydrogen sulphide and the mercaptans (aka thiols). Mercaptans include a carbon-sulphur bond. Anthropogenic sources of mercaptans include oil refineries, gas-plants, pulp-mills and sewerage and sewerage treatment plants. Natural sources include marshes, bogs . . . garlic and skunks.

Mercaptans are not considered a health risk at the concentrations found in the atmosphere, but their offensive odour at low levels make them a frequent air quality concern. The Ambient Air Quality Objective most commonly used in BC is the number of hours in a year that the TRS mixing ratio in ppb exceeds 5. This is also the Federal Level A (maximum desirable) objective.

TRS is measured in a rather complex way using the same type of monitor that is used for SO_2 . First the airflow to be sampled is scrubbed of all SO_2 as it passes through a column of chemicals designed to react only with oxidised sulphur compounds. The air, now containing only reduced sulphur compounds is then passed through a chamber kept at 834°C which oxidises all the reduced sulphur compounds to SO_2 . The air is then passed to the SO_2 monitor and the concentration of SO_2 determined. Finally, the concentration of Hydrogen sulphide that would result in that amount of SO_2 is calculated and converted to a mixing ratio in ppb. You will often see the phrase "TRS reported as Hydrogen sulphide" in air quality databases.

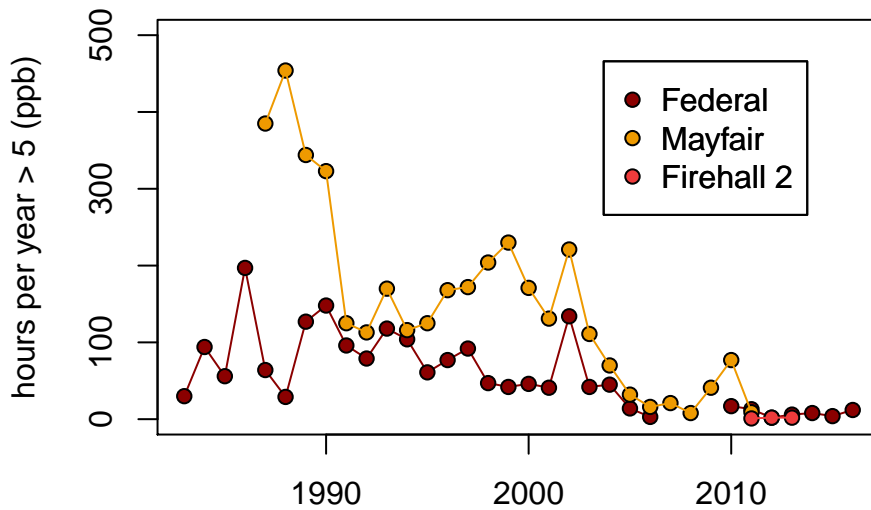


Figure 1: TRS monitoring began at the downtown Federal building in 1983. Several years later monitoring began at the air station in Brocklehurst at the foot of Mayfair Street. The Mayfair site ran until 2012 when the site was sold by the City for development. From 2011 until 2013 a temporary air station was operated at Firehall number 2, when a new site for the Brocklehurst monitor could not be found, the site was closed and the the Federal building airstation became the main Kamloops site. There was a period of several years when the Federal building was under renovation and the station was closed. Over the years there has been a significant decrease in TRS exceedances measured in Kamloops. Historically the values measured at the Mayfair station were higher than those measured at the Federal Station. However, after 2003, the levels at the two stations started to converge. In the last years that data were available for the Brocklehurst area, the values were similar to those measured at the Federal station. In 2014-15 an additional monitor was operated at Kelly Road just North of Macarthur Island, in the year of measurements there was only a single hour that exceeded 5 ppb.

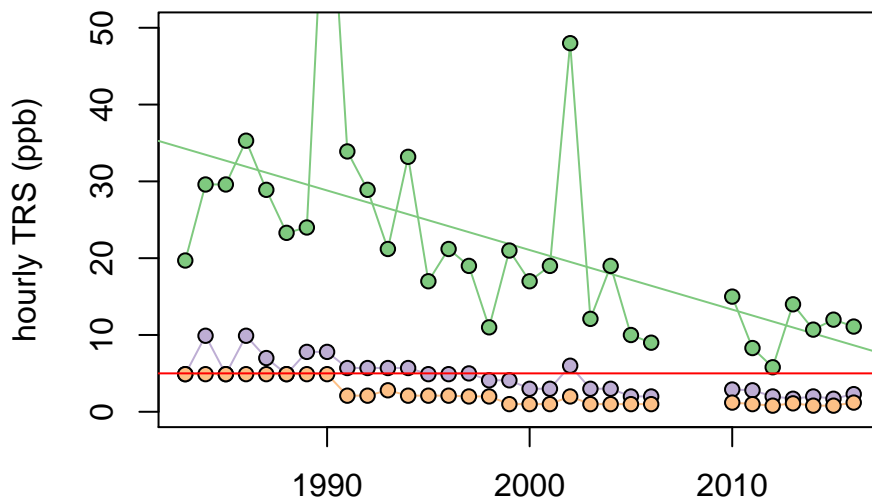


Figure 2: The upper percentiles of the hourly TRS measurements at the Federal station for the entire period of records. The percentiles are: green, the 100th percentile (the maximum); violet, the 99th percentile; and yellow, the 95th percentile. There has been a significant decrease in the hourly maximums over the years. The trend is also visible in the 99th percentile but less pronounced. There is no trend in the 95th percentile. The red line indicates the Level A objective of 5 ppb. For the last decade over 99% of the hourly values have been below 5 ppb. Note that before 1990, the sensors used had a minimum detection limit of 4.9 ppb.

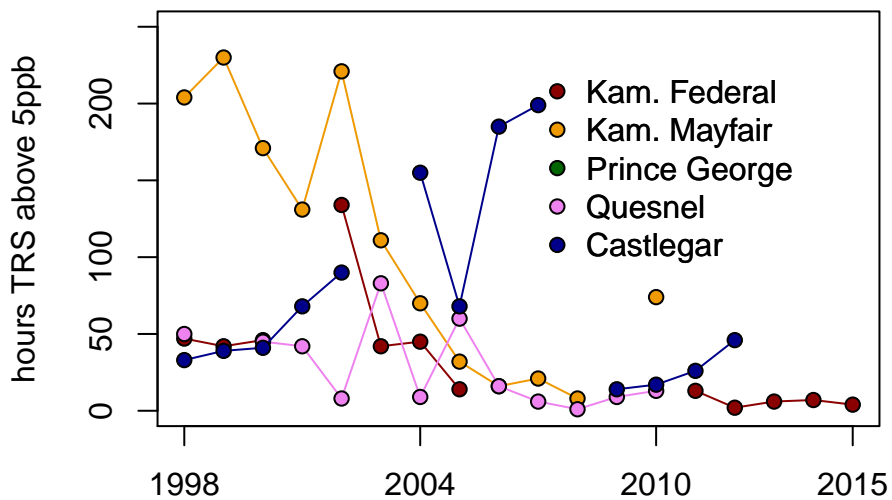


Figure 3: Hours per year that TRS exceeded 5 ppb for the period 1998 to 2015. Prince George, Quesnel and Castlegar also have pulp mills operating in the airshed. Note that the values for Kamloops are slightly different to those shown in figure 1. This is due to the data completion criteria applied. In this figure data are only included if 75% of the hours in a year were collected, and 75% of the hours in each quarter were collected. In figure 1 only the 75% of hours in the year was applied in order to include more data from the Firehall station.

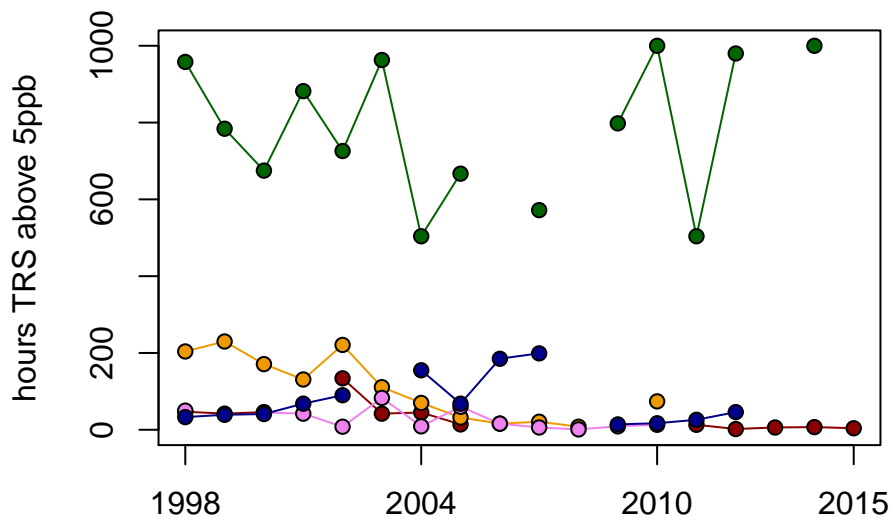


Figure 4: This is the same data as shown in the previous figure but with the y axis increased to show the data from Prince George. The Prince George data are from the downtown station. There is a monitor in a residential area which has lower values. However, in most years these values are still much higher than those recorded at the Federal station in Kamloops.