Equation 2-1: Health Canada Air Quality Health Index (AQHI)

$$AQHI = \left(\frac{1000}{10.4}\right)\left[\left(e^{0.000871[NO_2]}-1\right)+\left(e^{0.000537[O_3]}-1\right)+\left(e^{0.000487[PM_{2.5}]}-1\right)\right]$$

Where:

- AQHI = air quality health index

- $[NO_2]$ = ambient air NO_2 concentration in ppb, 3-hour average

- $[O_3]$ = ambient air O_3 concentration in ppb, 3-hour average

- $[PM_{2.5}]$ = ambient air $PM_{2.5}$ concentration in μg/m^3, 24-Hour average

The equation weighs ambient NO_2 levels higher than O_3 and $PM_{2.5}$ and therefore the AQHI is relatively more sensitive to changes in ambient levels of NO_2 than it is to O_3 and $PM_{2.5}$. For this reason ambient NO_2 levels are of particular relevance and concern in terms of keeping AQHI values in the Community low.

The Community's health and KCAC objectives for NO_2 were used to determine the potential impacts of Background, Baseline, Application and Planned Development on air quality in Fort McKay.

2.3.3.5 NO𝑥 Impact Assessment

In this community based assessment, the impact of regional NO𝑥 emissions on NO_2 levels in the Community, and associated health and air quality impacts, are discussed, and to the extent possible, assessed, for the five development scenarios/ cases: Pre-development, Current, Base, Application and Planned Development. This assessment uses information from Shell's EIA and regional air quality data.

Pre-development Scenario

In the absence of industrial development, ambient NO_2 levels in Fort McKay would be expected to be very low and largely based on a regional background level. At the request of Fort McKay, Shell had an assessment prepared that provided estimates of NO_2, SO_2 and $PM_{2.5}$ concentrations in Fort McKay for a period around 1965 which would represent pre-development air quality in the Community (Golder 2009).

Table 2-24 provides the estimate of "pre-development" SO_2 levels in Fort McKay from this assessment.