



ConocoPhillips Alaska, Inc.

**Nuiqsut Air Quality Monitoring Station
Annual Trends Analysis Report**

January 1, 2019 through December 31, 2019

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Acronyms:

- AQMS:** Air Quality Monitoring Station
- AQI:** Air Quality Index
- CPAI:** ConocoPhillips Alaska Inc.
- CO:** Carbon Monoxide
- NO₂:** Nitrogen Dioxide
- O₃:** Ozone
- PSD:** Prevention of Significant Deterioration
- PM_{2.5}:** Particulate Matter ≤ 2.5µm
- PM₁₀:** Particulate Matter ≤ 10µm
- SO₂:** Sulfur Dioxide

I. Introduction

1. Project Summary

ConocoPhillips Alaska Inc. (CPAI) operates an ambient air quality and meteorology monitoring station in Nuiqsut, Alaska, which is located on the Alaska North Slope. The station is located at the northern edge of Nuiqsut, approximately 400 meters north-northwest of the community electrical generators, and comprises the Nuiqsut Ambient Air Quality and Meteorological Monitoring Program. Currently, the Nuiqsut Monitoring Program is being conducted to document air quality in Nuiqsut and the data may also be used to support various ambient air quality impact analyses conducted for oil field development in the nearby areas.

The monitoring program consists of an ambient air quality monitoring station and a meteorological monitoring tower directly mounted to the air quality monitoring structure. The program is designed and operated in accordance with applicable Prevention of Significant Deterioration (PSD) regulations and guidance documents. The specific project objectives of the Monitoring Program are to:

- Collect data to document Nuiqsut air quality and address community concerns related to regional oilfield development.
- Establish a monitoring system to measure, with known accuracy and precision, meteorological parameters at the project site from ground level up to 10 meters.
- Provide required and relevant optional meteorological data for American Meteorological Society/Environmental Protection Agency (EPA) Regulatory Model Improvement Committee Model (AERMOD) modeling system.
- Establish a monitoring system to measure, with known bias and precision, the ambient concentrations of the criteria air quality pollutants: ozone (O₃), carbon monoxide (CO), nitrogen dioxide (NO₂), sulfur dioxide (SO₂), particulate matter (PM) with an aerodynamic diameter of 10 microns or less (PM₁₀), and particulate matter with an aerodynamic diameter of 2.5 microns or less (PM_{2.5}) to establish National Ambient Air Quality Standards (NAAQS) compliance status for the monitoring location.

Data review and validation procedures and monitoring program data and measurement quality objectives (MQO's) are provided in the Nuiqsut Ambient Air Quality and Meteorological Monitoring Station Quality Assurance Project Plan Revision 2.1 approved by Alaska Department of Environmental Conservation in September 2012.

Figure 1 shows a map of the Nuiqsut Air Quality Monitoring Station (AQMS) location and Figure 2 displays an aerial view of the village of Nuiqsut with the AQMS.

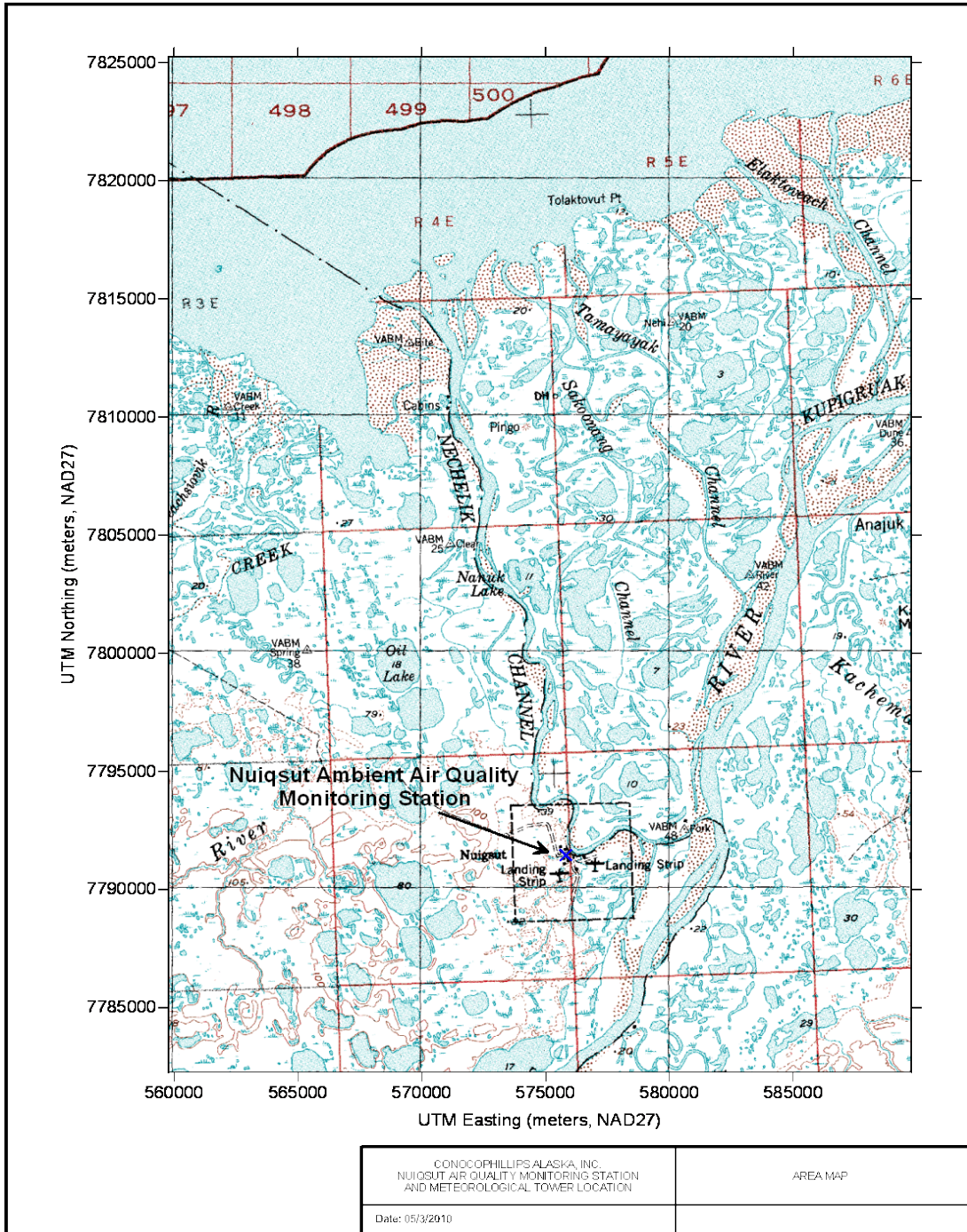


Figure 1: Map of Nuiqsut AQMS location



Figure 2: Aerial view of Nuiqsut village with AQMS location

2. Air Quality Index (AQI)

The Air Quality Index (AQI) is converted from actual observed concentrations to a 0 to 500 scale meant to represent effects on human health. The higher the AQI value, the greater the level of pollutants in the air, and the greater the health concerns. For example, an AQI value of 50 represents good air quality with little potential to affect public health, while an AQI value over 300 represents hazardous air quality. An AQI value of 100 directly corresponds to the national air quality standard (NAAQS) for the pollutant, which is the level EPA has set to protect public health. NAAQS information is present on the following website: <https://www.epa.gov/criteria-air-pollutants/naaqs-table>.

AQI values below 100 are generally thought of as satisfactory. When AQI values are above 100, air quality is considered to be unhealthy – between 100 and 50, unhealthy for sensitive groups of people, then as AQI values get above 150, unhealthy for everyone. Table 1 provides a view of the EPA AQI levels of health concern.

Table 1: EPA Air Quality Index Levels of Health Concern

Level	Range	Description
Good	0 to 50	Air Quality is considered satisfactory, and air pollution poses little or no risk.
Moderate	51 to 100	Air Quality is acceptable; however, for some pollutants there may be a moderate health concern for a very small number of people who are unusually sensitive to air pollution.
Unhealthy for Sensitive Groups	101 to 150	Members of sensitive groups may experience health effects. The general public is not likely to be affected.
Unhealthy	151 to 200	Everyone may begin to experience health effects; members of sensitive groups may experience more serious health effects.
Very Unhealthy	201 to 300	Health alert; everyone may experience more serious health effects.
Hazardous	301 to 500	Health warnings of emergency conditions. The entire population is more likely to be affected

The AQI is designed to describe the quality of the air, and what associated health effects might be a concern. When used in a predictive, or forecasting, manner, the AQI calculation weighs higher concentration individual hourly measurements greater and uses those hourly values when determining a daily AQI. This focuses on potential worst-case health effects that may be experienced within a few hours or days after breathing the air. As a result, predictive AQI is often higher than what would be determined if AQI is assigned after calculating the averaging period associated with the NAAQS (i.e. –24-hour average PM_{2.5} or 8-hour average CO for example).

II. Nuiqsut Monitoring Trends Summary

3. Quarterly Air Quality Index (AQI) Trends

Figure 3 through Figure 6 present quarterly actual AQI trends for year 2019 at the Nuiqsut AQMS. Actual AQI represents AQI values directly measured by the AQMS after calculating the averaging period associated with the NAAQS (i.e. 24-hour average $PM_{2.5}$ or 8-hour average CO for example). Each pollutant is plotted with a different marker, so that the reader may interpret which pollutants drive the AQI at various intervals. The daily AQI is defined as the highest of the day, which corresponds to the highest marker on the plot. Pollutants are not plotted if data is not available for at least 75% of the day. Colors corresponding to AQI levels are displayed in the background and actual AQI values on the left axis. Because the AQI at Nuiqsut was not measured above 150 in 2019, some AQI regions are not graphed. AQI levels from good to moderate included are considered satisfactory. Additional AQI information is presented in Appendix A.

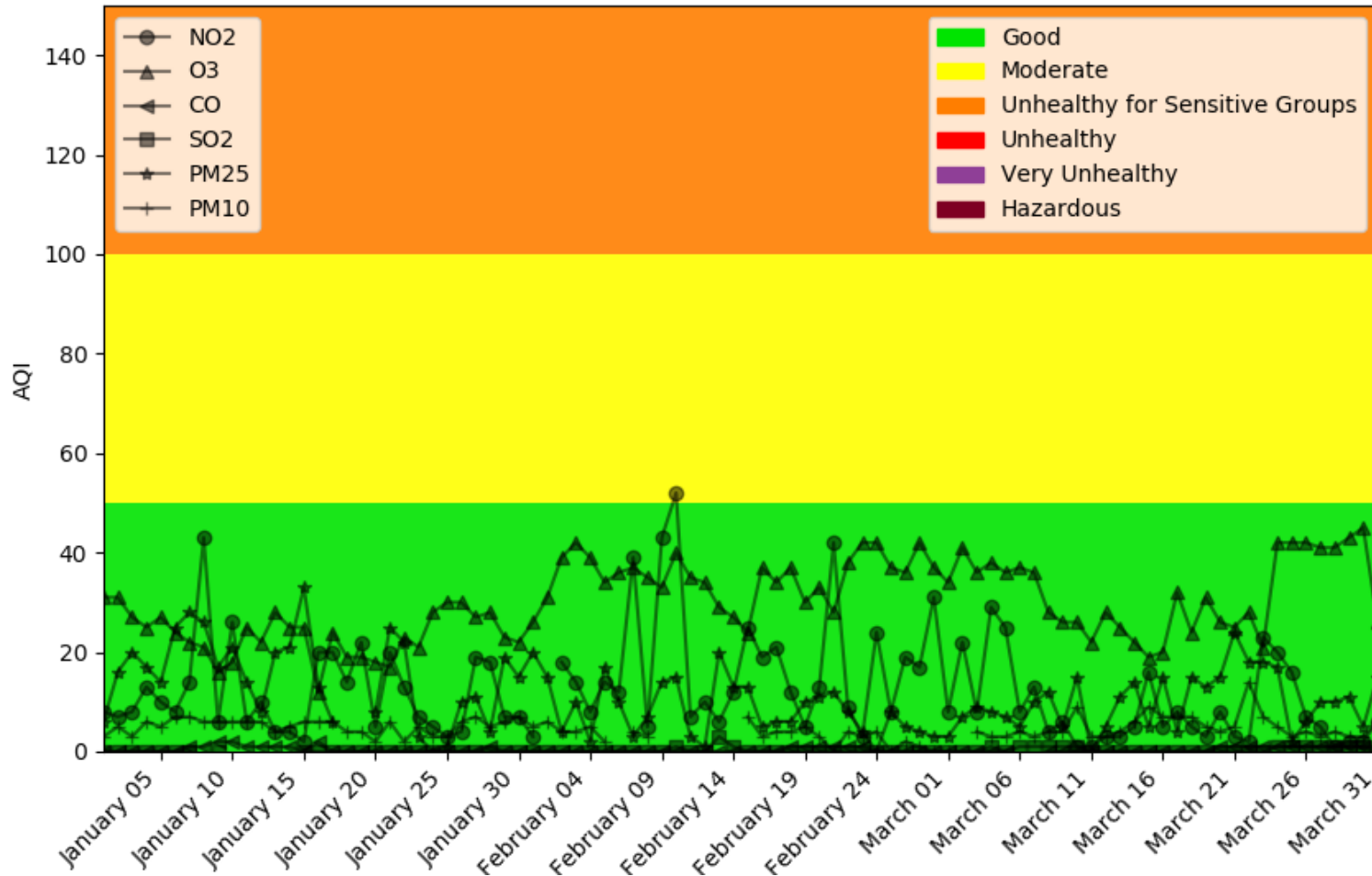


Figure 3: First Quarter 2019 Nuiqsut AQMS Daily Reported AQI Summary

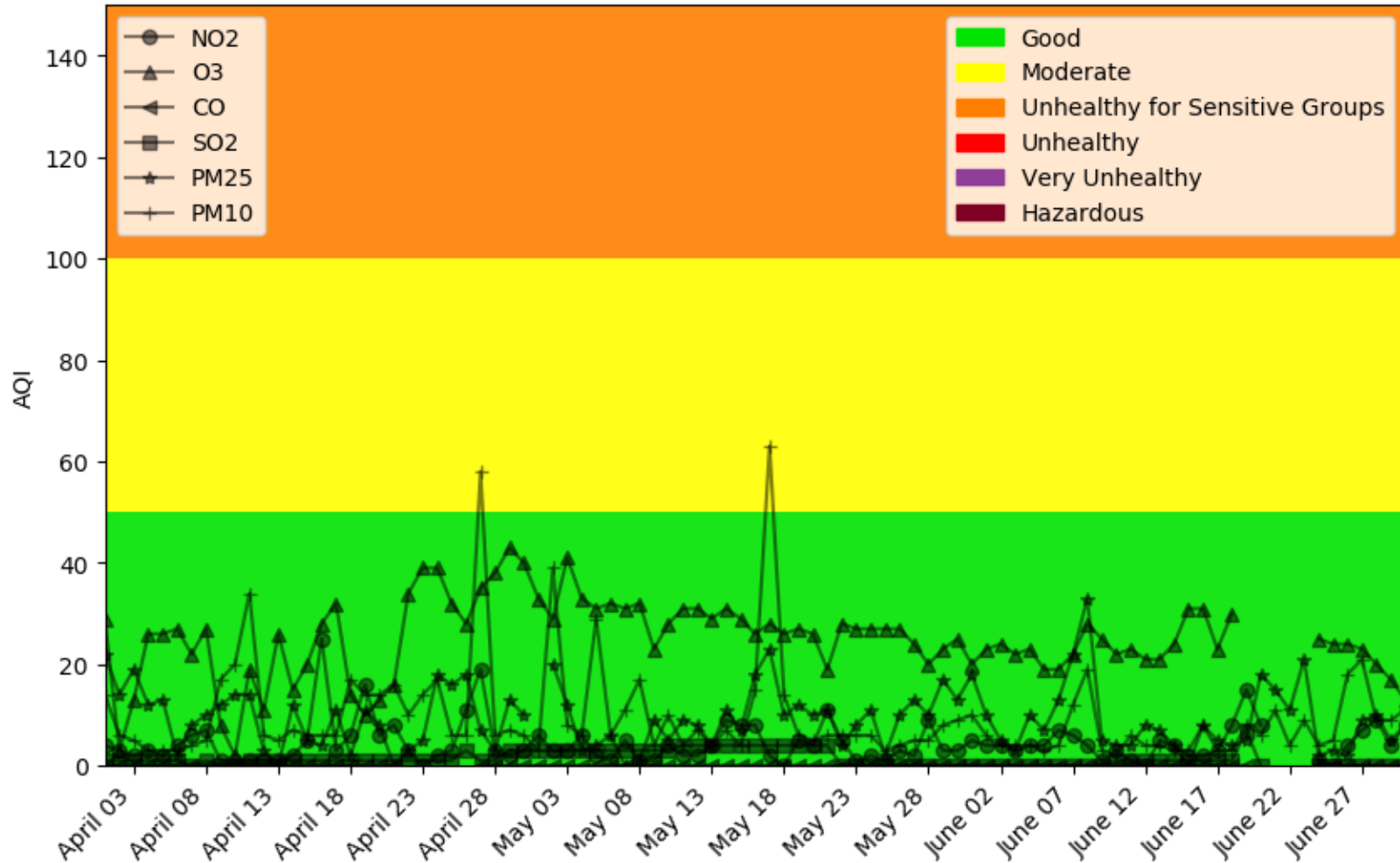


Figure 4: Second Quarter 2019 Nuiqsut AQMS Daily Reported AQI Summary

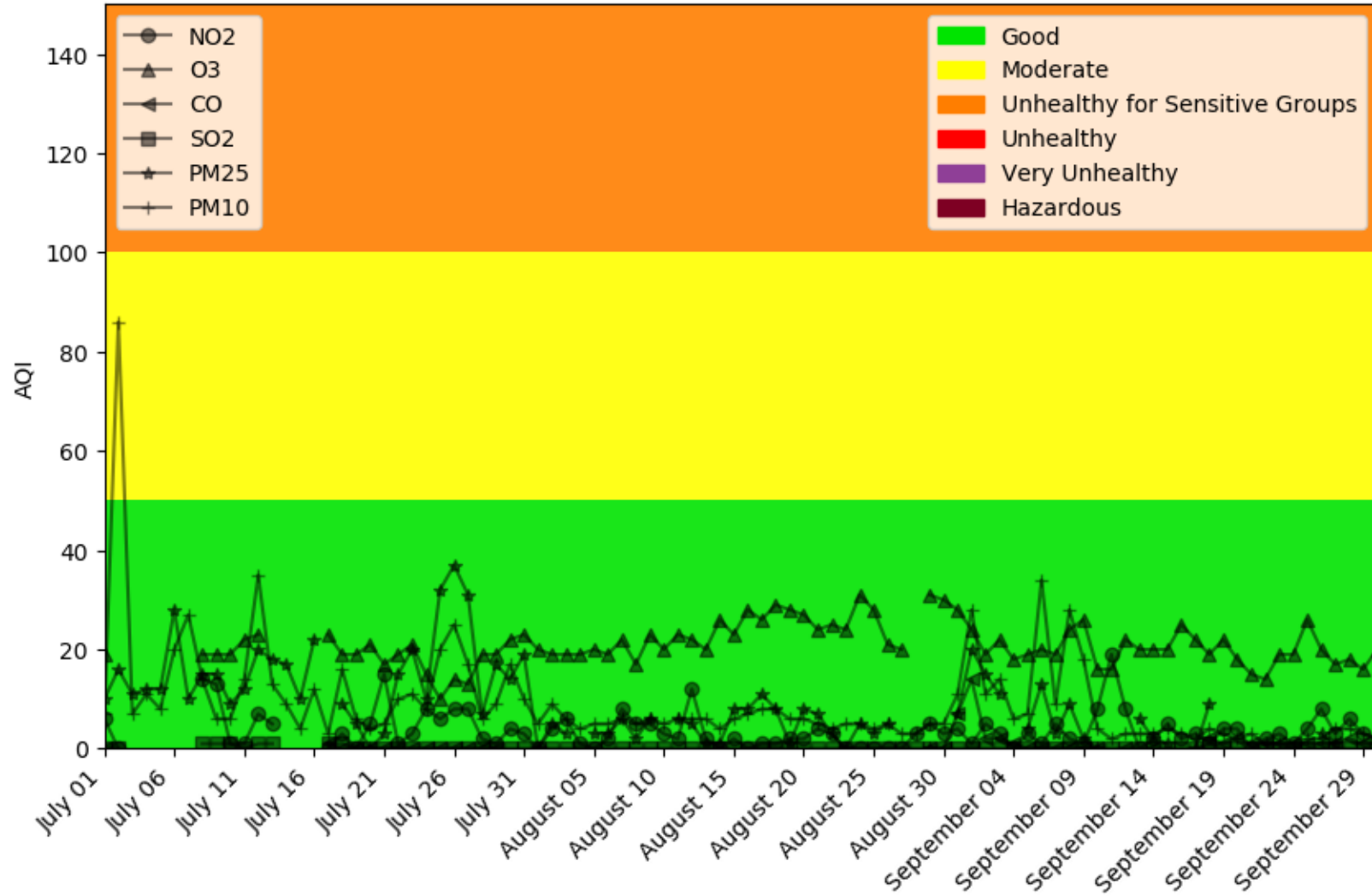


Figure 5: Third Quarter 2019 Nuiqsut AQMS Reported AQI Summary

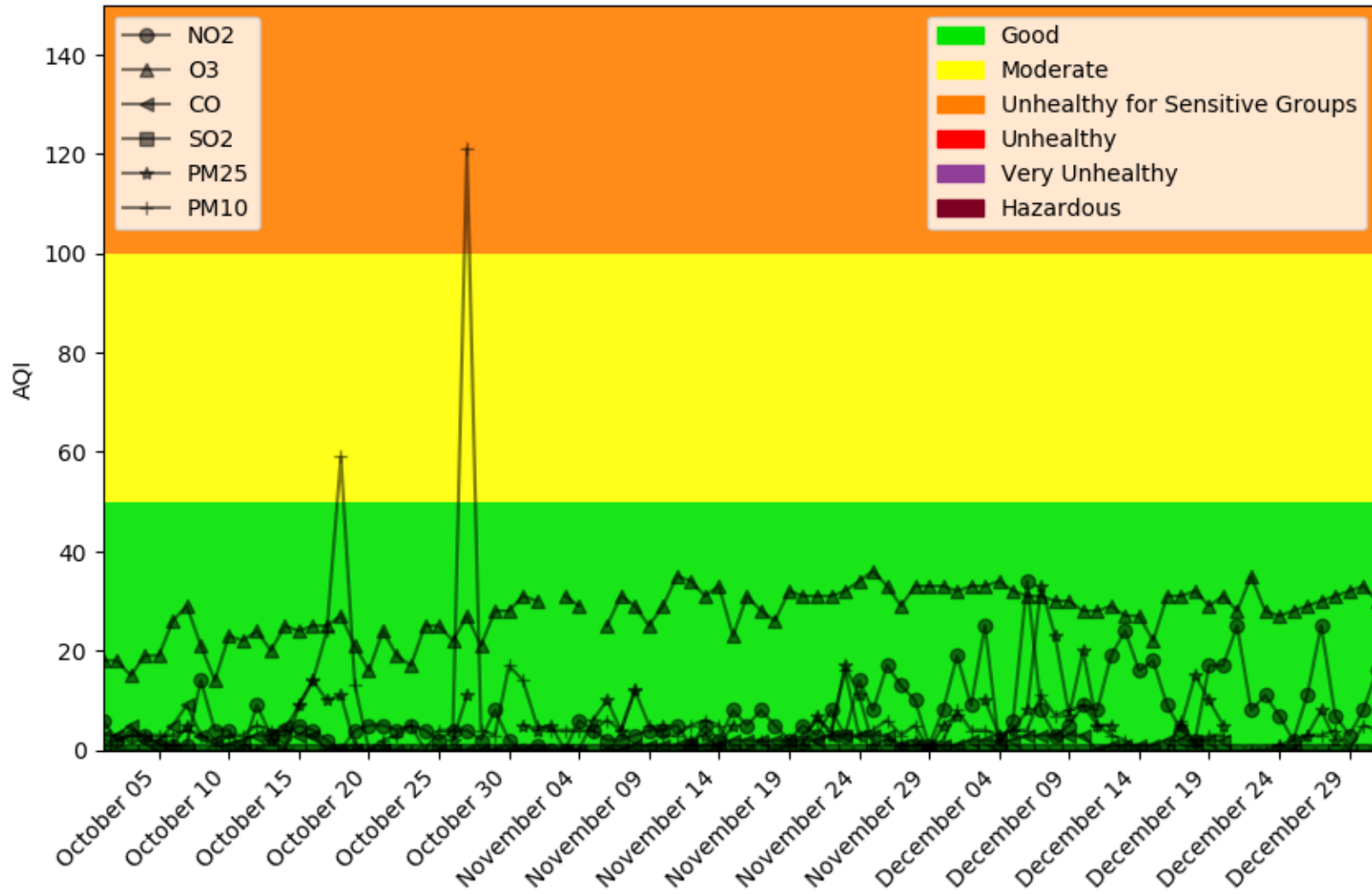


Figure 6: Fourth Quarter 2019 Nuiqsut AQMS Reported AQI Summary

Figure 7 through Figure 12 present annual pollutant concentrations for year 2019 at the Nuiqsut AQMS with AQI color levels in the background.

Figure 7 displays actual 24-hour average PM_{2.5} concentration in micrograms per cubic meter (µg/m³) to follow the 24-hour averaging period required to determine the NAAQS level for PM_{2.5}. Daily NAAQS PM_{2.5} level is 35 µg/m³ using a 24-hour averaging period, 98th percentile, averaged over 3 years.

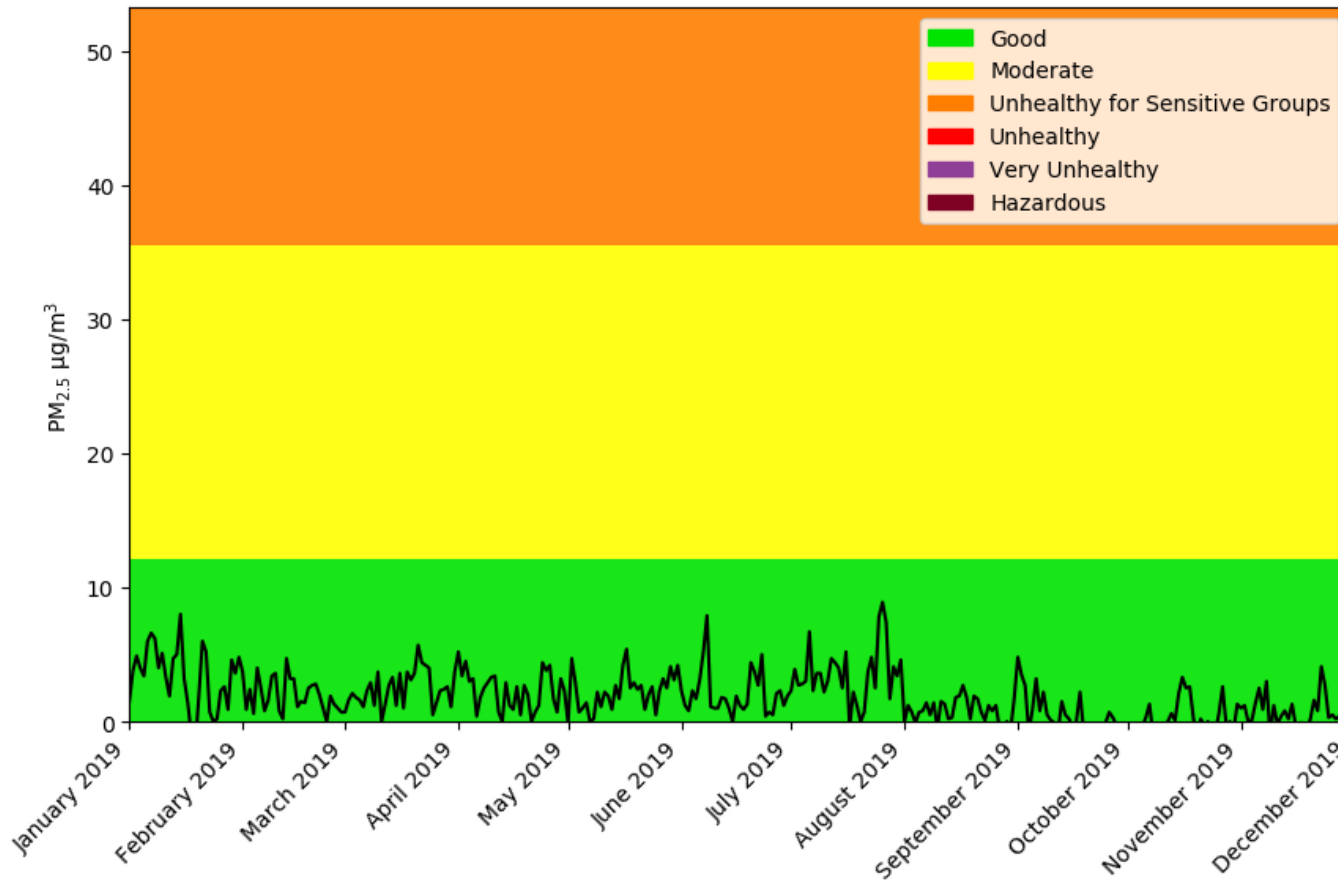
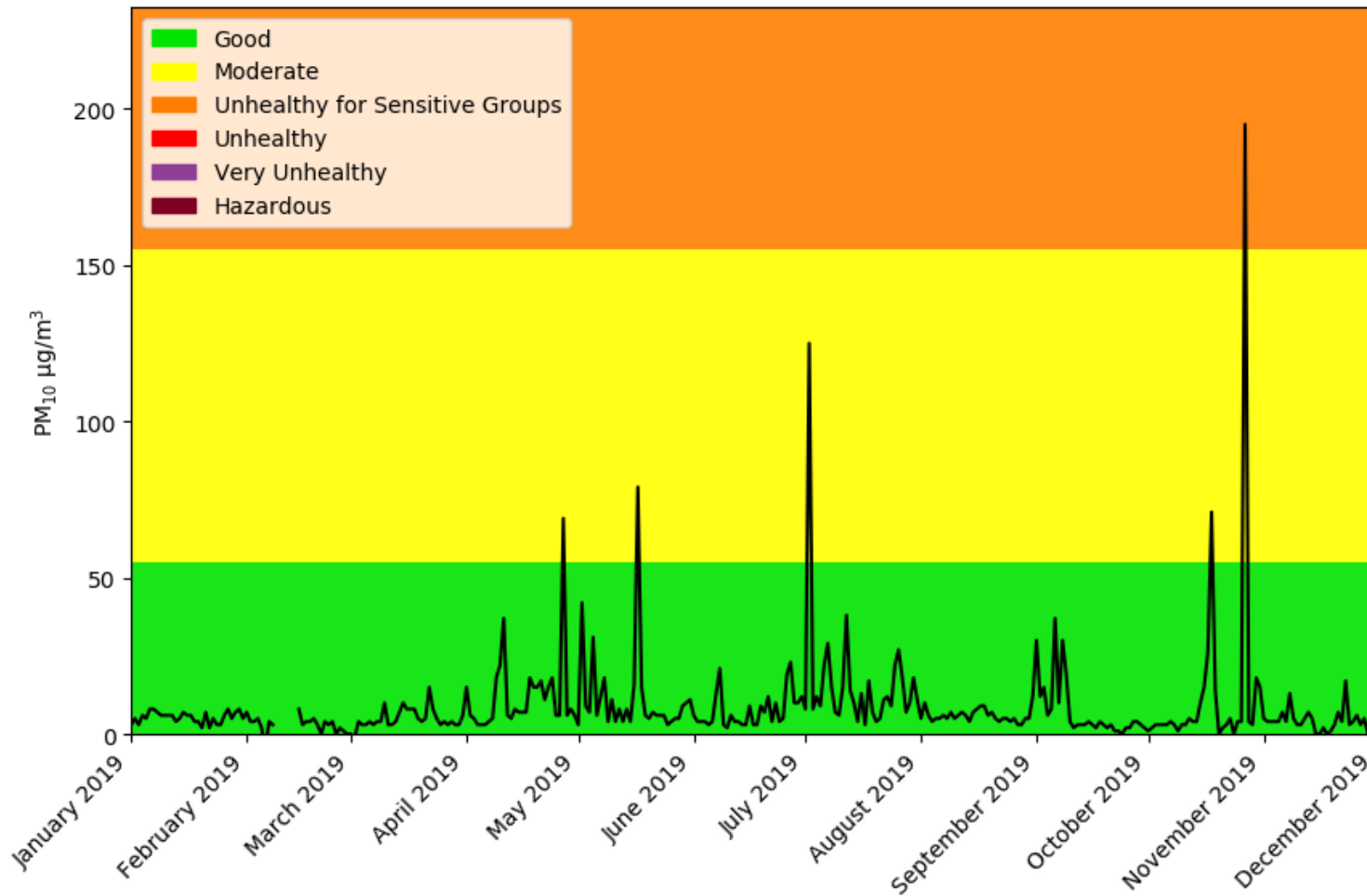


Figure 7: Nuiqsut Air Quality Station 24-hour PM_{2.5}

Figure 8 displays actual 24-hour average PM₁₀ concentration in micrograms per cubic meter (µg/m³) to follow the 24-hour averaging period required to determine the NAAQS level for PM₁₀. NAAQS PM₁₀ level is 150 µg/m³ using a 24-hour averaging period, not to be exceeded more than once per year on average over 3 years.



PM₁₀ is naturally occurring in the vicinity of Nuiqsut. Elevated concentrations occur when silt is lifted from the Colville River banks during periods of high winds.

Figure 8: Nuiqsut Air Quality Station Daily Average PM₁₀

Figure 9 displays actual daily maximum hourly average NO₂ concentration in parts per billion (ppb). NAAQS NO₂ level is 100 ppb for the 98th percentile of hourly average daily maximum concentrations over 3 years.

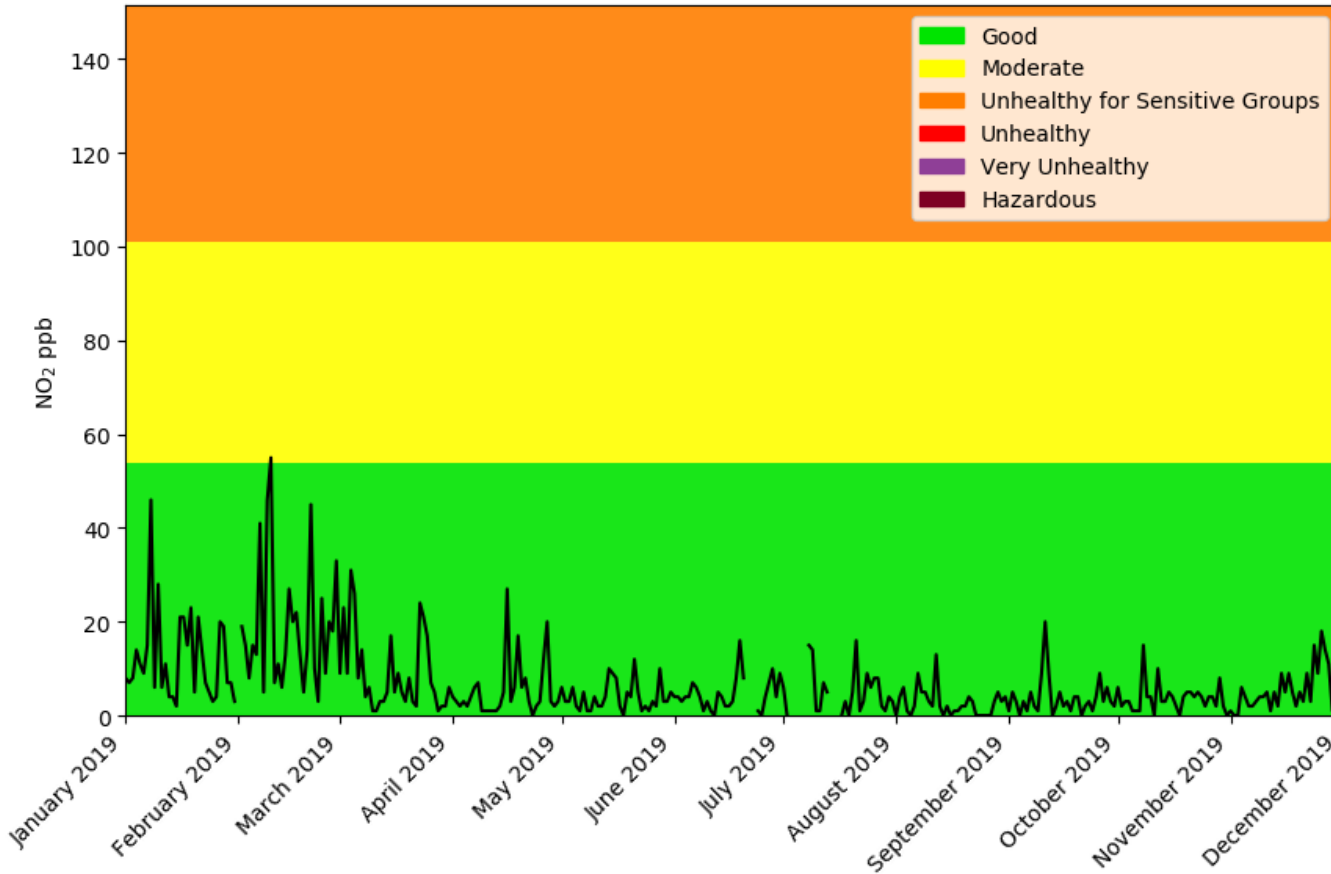


Figure 9: Nuiqsut Air Quality Station Daily Maximum of Hourly Average NO₂

Figure 10 displays the daily maximum of eight-hour rolling average CO concentrations in parts per million (ppm). NAAQS CO level is 35 ppm daily maximum using an 8-hour rolling averaging period, not to be exceeded more than once per year.

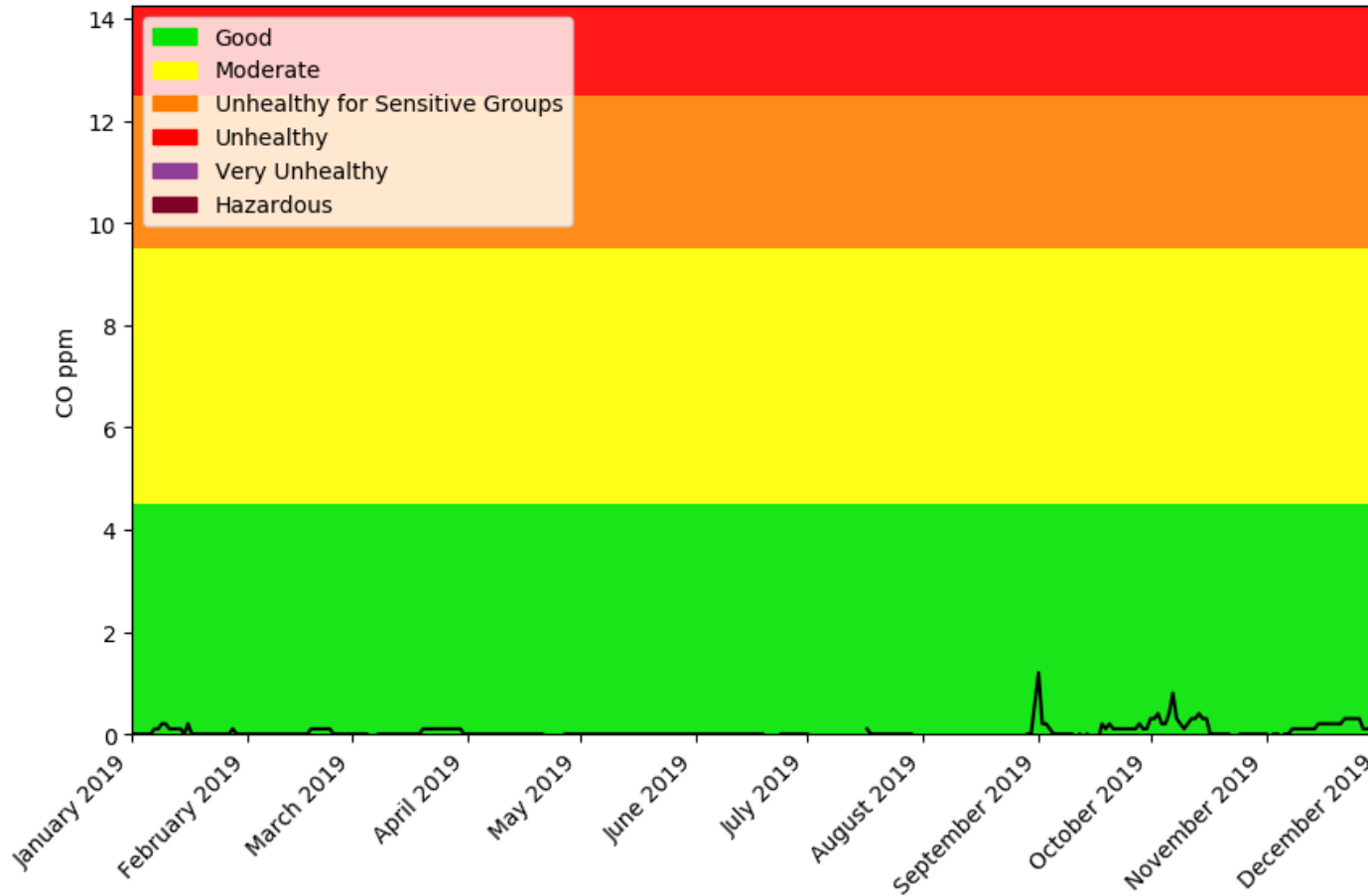


Figure 10: Nuiqsut Air Quality Station 8-Hour Rolling Average CO

Figure 11 displays actual hourly average SO₂ concentration in parts per billion (ppb). NAAQS SO₂ level is 75 ppb daily max of one-hour averages, not to be exceeded more than once per year.

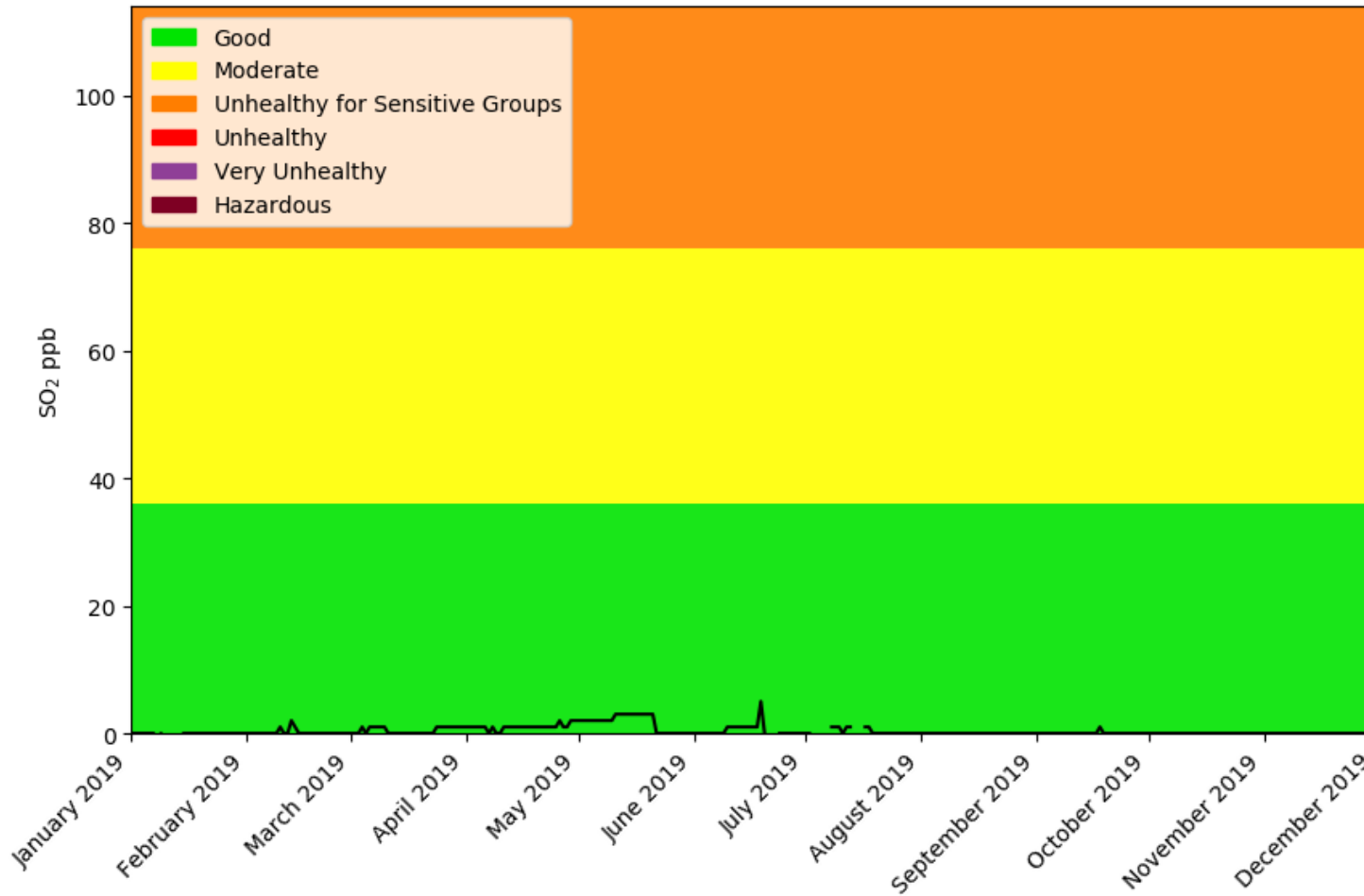
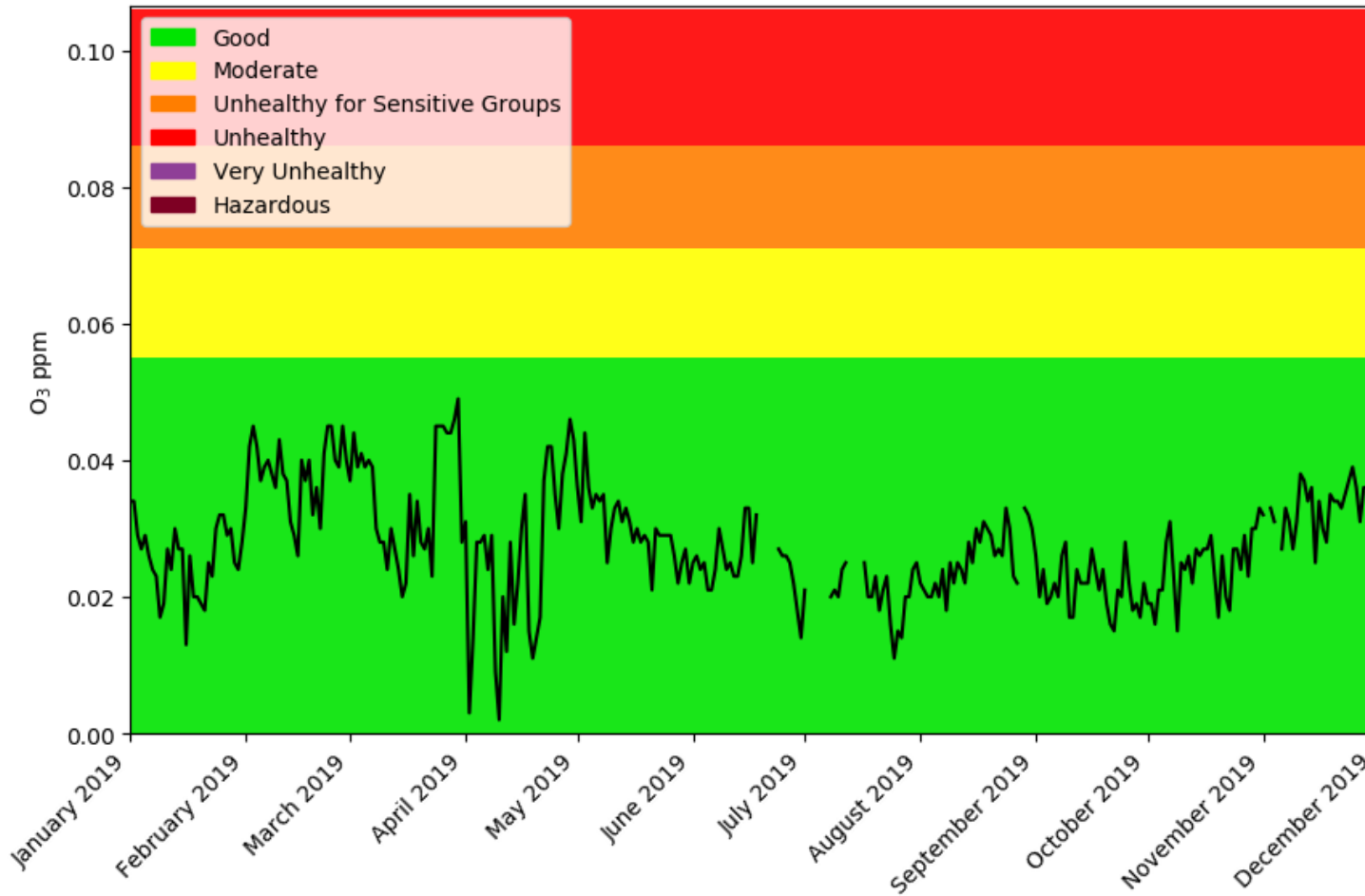


Figure 11: Nuiqsut Air Quality Station Daily Max of One-Hour Average SO₂

Figure 12 displays actual daily maximum of 8-hour rolling average O₃ concentration in parts per million (ppm). NAAQS O₃ level is 0.070 ppm annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years.



O₃ is naturally occurring in ambient air and ranges from zero to more than 50 ppb throughout the year.

Figure 12: Nuiqsut Air Quality Station 8-hour O₃

4. Annual Meteorological Trends

Figure 13 provides the annual wind rose for the Nuiqsut AQMS. The wind direction represents from where the wind is blowing. The center of the wind rose represents the AQMS. A wind rose gives a succinct view of how wind speed and direction are typically distributed at a specific location. Presented in a circular format, the wind rose shows the frequency of winds blowing from particular directions. The length of each "spoke" around the circle is related to the frequency of time that the wind blows from a particular direction. Each concentric circle represents a different frequency, emanating from zero at the center to increasing frequencies at the outer circles.

Caption	Description
N	North
E	East
S	South
W	West
Wind Class (MPH)	Color
0.25 – 2.8	Brown
2.8 – 5.5	Yellow
5.5 – 8.3	Red
8.3 – 11.0	Blue
> 11.0	Green

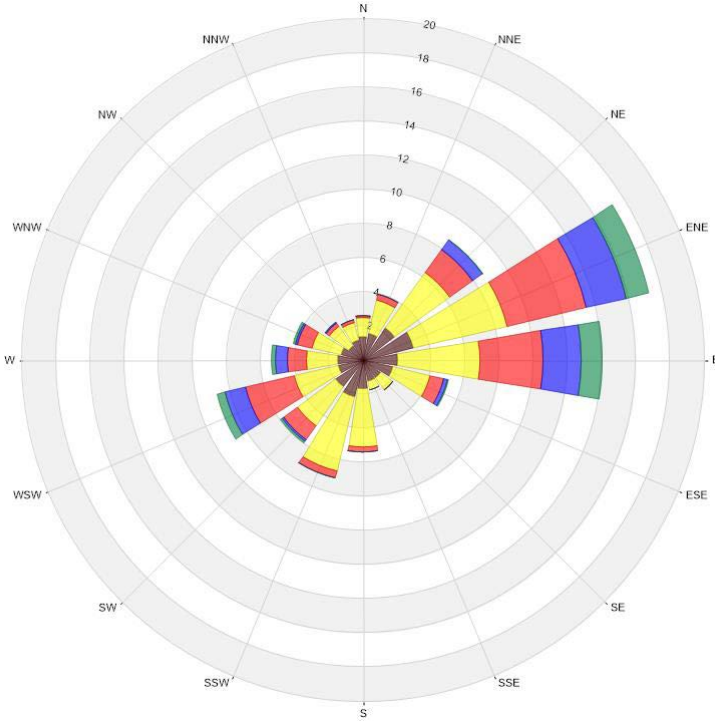


Figure 13: Nuiqsut Annual Hourly Average Wind Rose

Figure 14 provides annual wind speed data in miles per hour (mph) and Figure 15 features annual temperature data in degrees Fahrenheit (°F) for the Nuiqsut AQMS.

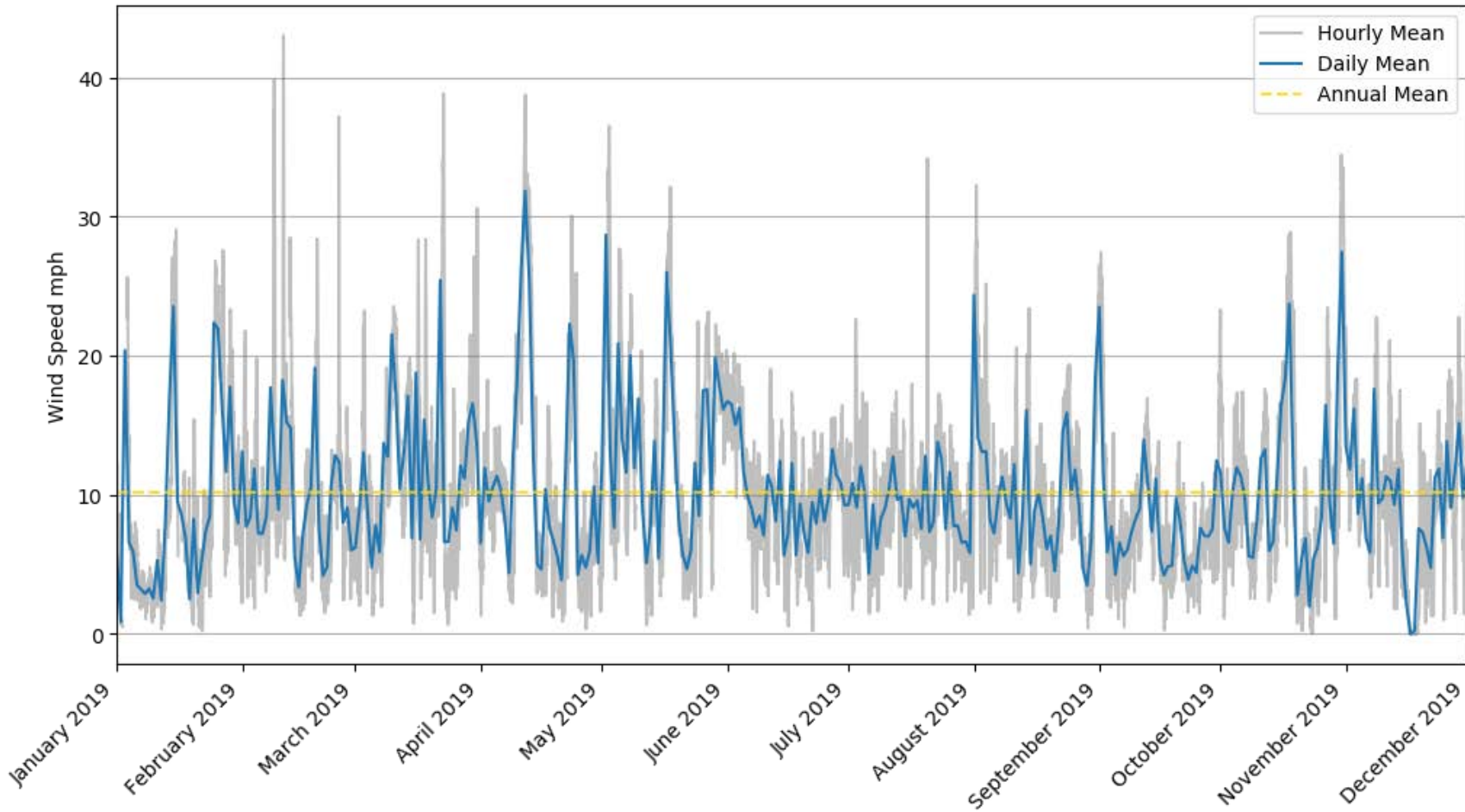


Figure 14: Nuiqsut Annual Wind Speed

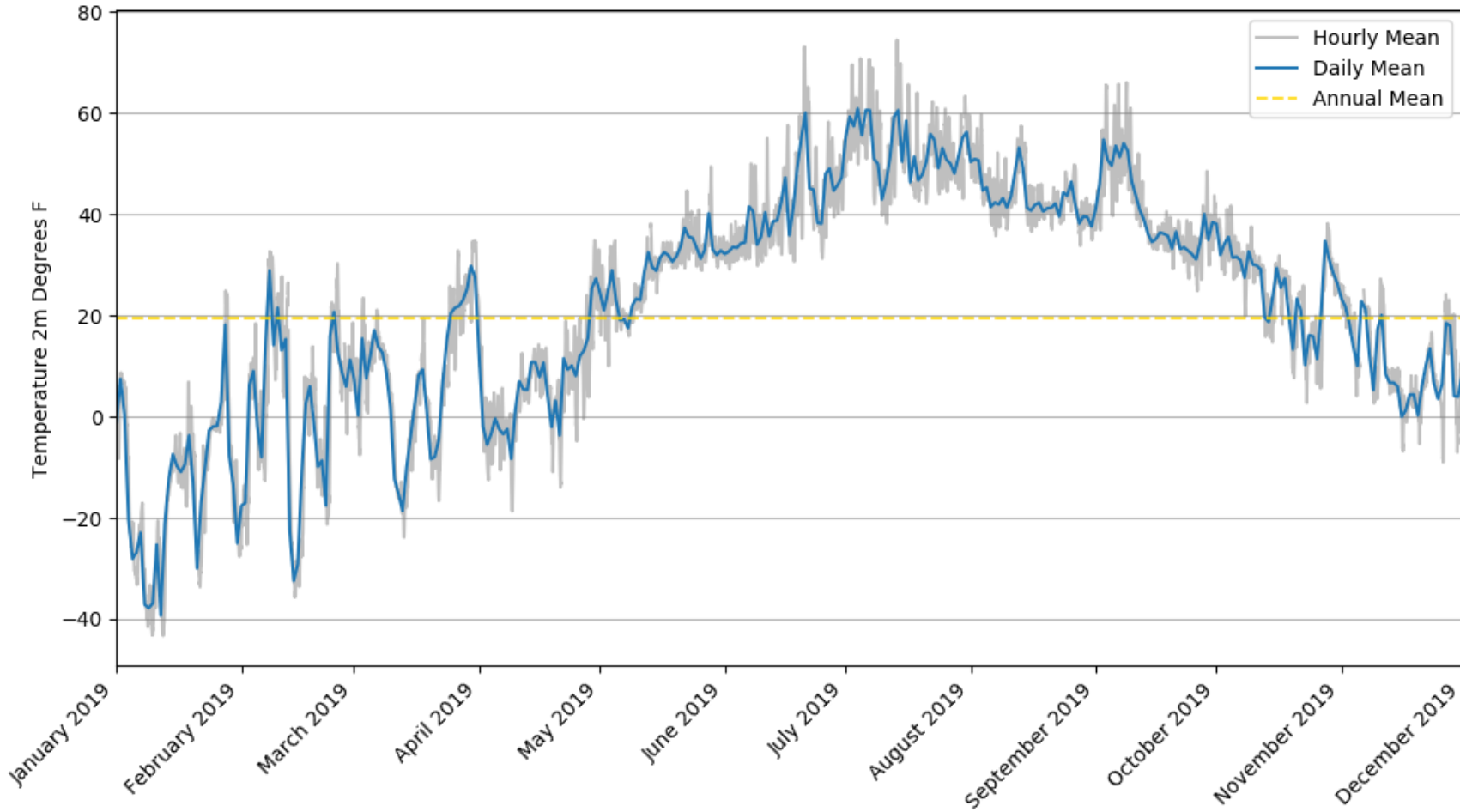


Figure 15: Nuiqsut Annual Hourly Average Ambient Temperature