

Air Quality Review and Comments:
Pawnee Power Plant
Brush, Colorado

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Introduction

The Pawnee Power Plant (Pawnee) is a coal-fired, steam-electric generating station located southwest of Brush, Colorado. I was asked by Public Employees for Environmental Responsibility (PEER) and the Colorado Sierra Club to review a 2017 modeling analysis of Pawnee's emissions performed by the Colorado Department of Public Health and Environment (CDPHE). In their modeling analysis, CDPHE claims that Pawnee's allowable SO₂ limit is 131.75 g/s based on an assumed potential to emit (PTE). However, USEPA Air Markets Program Data (AMPD) for 2019 and 2020 indicate that Pawnee regularly exceeds the allowable SO₂ limit. I performed a modeling analysis of Pawnee's 2019 and 2020 maximum actual SO₂ emissions which resulted in concentrations over two times the 1-hour SO₂ NAAQS. My modeling methods and results will be detailed in the following sections. My modeling files can be downloaded [here](#).

I have broad experience as a consultant. I hold a master's degree in Geography (2012) from California State University, Northridge, where I specialized in GIS and air dispersion modeling. I have performed numerous air quality modeling analyses using AERMOD and other air dispersion models, prepared meteorological data using AERMET, performed health risk assessments, and created an assortment of detailed maps and graphics. I have experience preparing analyses of various emission types from many sources and facilities including natural gas and coal-fired power plants, agricultural fields, and mobile sources. My curriculum vitae can be downloaded [here](#).

I. Pawnee repeatedly exceeds the allowable emission rate of 131.75 g/s specified by CDPHE.

CDPHE modeled an allowable SO₂ emission rate of 131.75 g/s in their 2017 modeling analysis of the Pawnee plant, which resulted in modeled concentrations below the 1-hour SO₂ NAAQS and therefore an attainment designation. However, review of USEPA's AMPD emissions data for Pawnee for years 2019 and 2020 indicate that the plant regularly and substantially exceeds the allowable emission rate.

According to the AMPD data, Pawnee's emissions exceeded the allowable emission rate for a total of 149 hours in 2019. The highest actual emission rate for the year was 583.08 g/s, recorded on hour 19 of February 7th. This is over four times the allowable emission rate specified by CDPHE.

Pawnee's emissions exceeded the allowable emission rate for a total of 200 hours in 2020. The highest actual emission rate for the year was 566.67 g/s, recorded on hour 22 of February 11th. This is also over four times the allowable emission rate specified by CDPHE.

In response to these discrepancies between the allowable and actual emissions, I performed a modeling analysis of Pawnee's maximum actual 1-hour SO₂ emissions for 2019 and 2020. My methods and results are detailed in Section II.

II. Modeling analysis of Pawnee's 2019 and 2020 maximum actual emissions results in concentrations well above the 1-hour SO₂ NAAQS.

As discussed in the previous section, CDPHE's modeling analysis of Pawnee's allowable SO₂ emissions to determine NAAQS compliance includes an emission rate of 131.75 g/s for Pawnee's Unit 1 coal-fired boiler. According to USEPA's AMPD data, this emission rate was exceeded numerous times in 2019 and 2020.

I performed a modeling analysis of the maximum hourly SO₂ emissions for both 2019 and 2020. I modeled using USEPA's AERMOD v. 21112, which is the most recent version to date. I used the same input options, receptors, meteorological data, stack parameters, and building downwash that CDPHE used in their 2017 modeling analysis. I used the same emissions for the nearby sources that CDPHE included in their modeling (Manchief Power Plant, Cargill Meat Solutions, and Western Sugar Cooperative) and only changed the emission rate for Pawnee's Unit 1 coal-fired boiler to reflect the maximum hourly SO₂ emissions for 2019 and 2020. Consistent with CDPHE's methods, I added a background concentration of 10 ppb or 26.2 µg/m³ (based on the design value) from the RM Reservoir Site to my modeled results. Further details about CDPHE's modeling methods are outlined in their 2017 report.¹

My modeled results reveal that, based on 2019 and 2020 maximum actual emissions, Pawnee is in violation of the 1-hour SO₂ NAAQS both with and without background concentrations (Table 1). My modeled results are shown graphically in Figures 1 and 2.

Table 1:

| 1-Hour Sulfur Dioxide (SO ₂) | | | | | |
|--|--------------|--------------|-----------------------------------|-------------------------------|----------------------|
| Scenario | UTM X (m) | UTM Y (m) | H4H Conc. (µg/m ³) | NAAQS (µg/m ³) | NAAQS exceedance? |
| CDPHE modeling methods with 2019 maximum actual emissions | 683589 | 4452765 | 407.88 | 196.2 | YES |
| CDPHE modeling methods with 2020 maximum actual emissions | 683589 | 4452765 | 397.14 | 196.2 | YES |
| Results include a background concentration of 26.2 µg/m ³ from RM Reservoir | | | | | |

¹ CDPHE; 1-hour SO₂ Air Quality Dispersion Modeling Analysis for Pawnee Power Plant; Jan 11, 2017. Available here: https://www.epa.gov/sites/production/files/2017-01/documents/pawnee_so2_drr_revised_modeling_analysis_final.pdf

Figure 1:

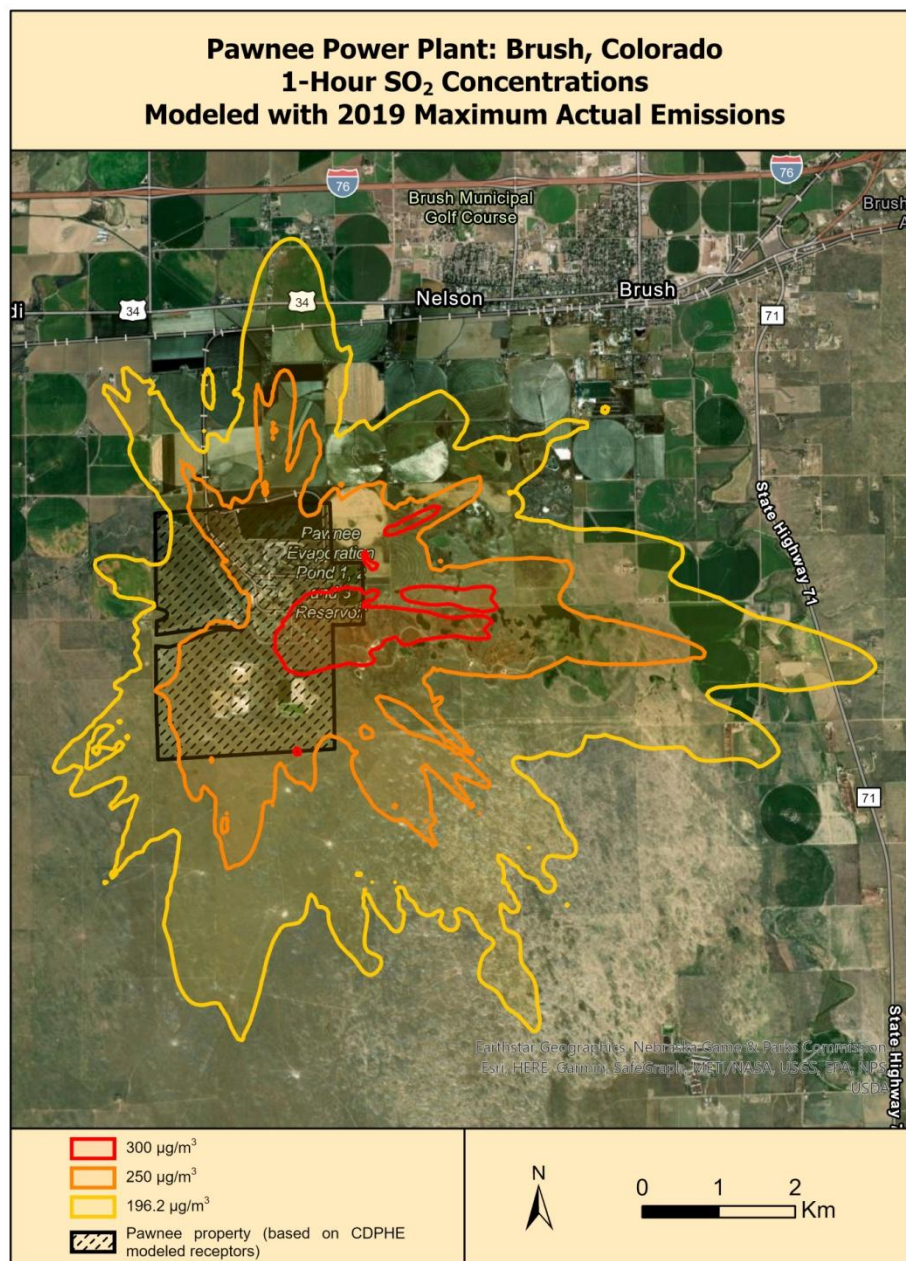
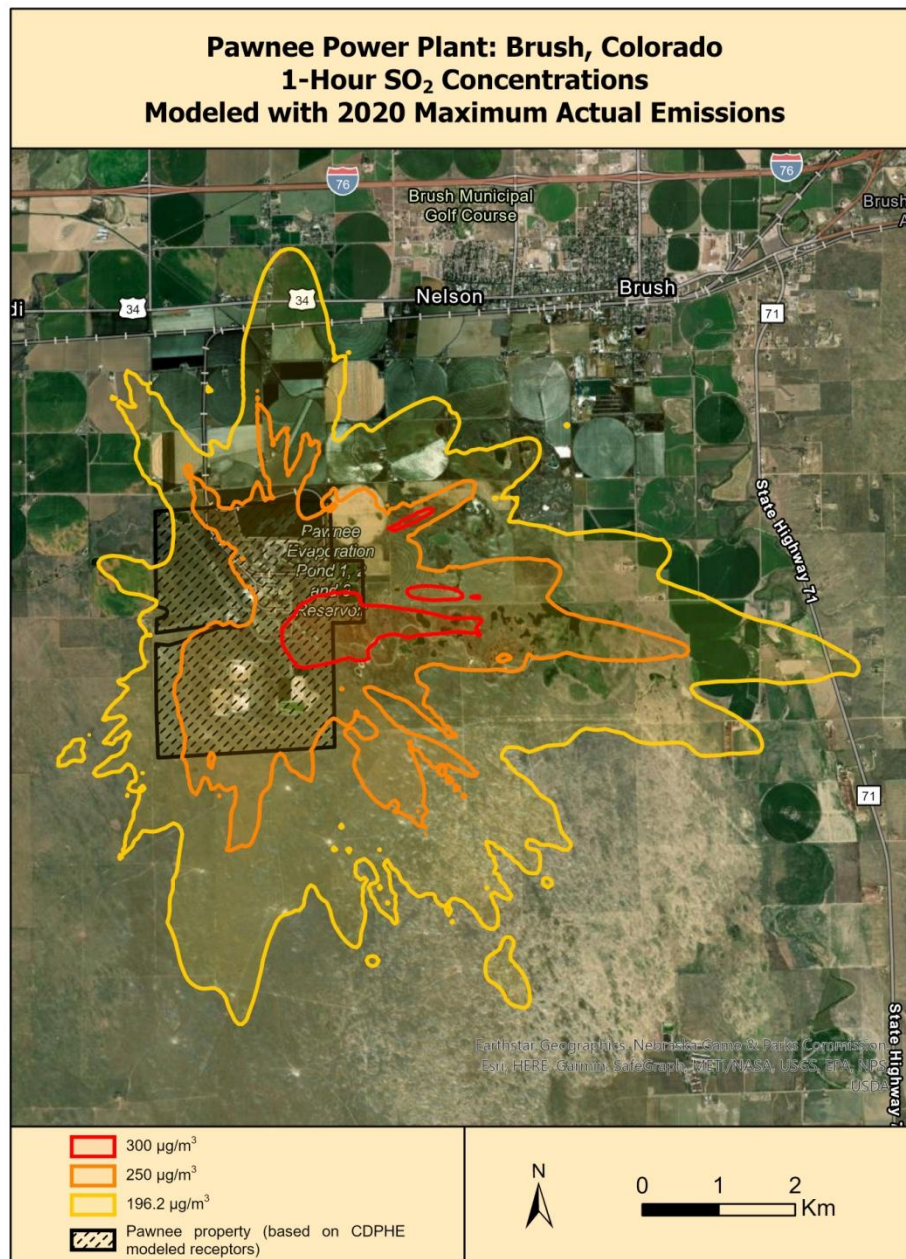


Figure 2:



While I modeled Pawnee's maximum emissions from AMPD data, it should be noted that there are many other hours in 2019 and 2020 with lower emission rates that would also cause modeled results well above the 1-hour SO₂ NAAQS. My results indicate that Pawnee's emissions are responsible for almost all of the modeled concentrations, without a significant contribution from nearby modeled sources (Table 2).

Table 2:

| Facility contributions of modeled results | | | | | |
|---|--|-----------------------------|-------------------------------|------------------------------|------------------------------------|
| Scenario | Total Modeled Results (µg/m ³) | Pawnee (µg/m ³) | Manchief (µg/m ³) | Cargill (µg/m ³) | Western Sugar (µg/m ³) |
| 2019 H4H 1-hour SO ₂ | 381.68 | 381.57 | 0.03 | 0.07 | 0.02 |
| 2020 H4H 1-hour SO ₂ | 370.94 | 370.82 | 0.03 | 0.07 | 0.02 |
| Modeled results do not include RM Reservoir background concentrations | | | | | |

Conclusion

Pawnee's attainment status is based on modeling performed by CDPHE, which included an allowable SO₂ emission rate that is often substantially exceeded according to USEPA's AMPD data. I performed a modeling analysis using CDPHE's methods and simply adjusting Pawnee's emissions to reflect the maximum actual emissions data. In this scenario, results indicate concentrations far above the 1-hour SO₂ NAAQS. This is true even when not accounting for nearby sources or background concentrations. Clearly, Pawnee's Unit 1 coal-fired boiler is capable of emissions far greater the PTE assumed by CDPHE. This discrepancy needs to be addressed, and Pawnee's attainment status must be reconsidered.