

Memorandum

Date: May 22, 2026
To: Dan Ralley, City of Hilliard
From: Kaitlin Meszaros, Pinyon Environmental, Inc.
Subject: Air Modeling Review of Proposed Data Center Fuel Cells

Executive Summary

This memo details the review and findings of the provided modeling report prepared for Bloom Energy titled “Evaluation Of Air Emissions From Proposed Fuel Cell Installation” dated March 2026. The purpose of the modeling report was to evaluate carbon dioxide emissions and impacts of a proposed data center on nearby residences and public areas in the City of Hilliard, Ohio. The review covers the methodology and results of the modeling, the interpretation of the results, and the contextual analysis of the emissions and model results for public knowledge.

Based on our review, findings for clarification are included in the Conclusion section, but the conducted modeling is scientifically sound and defensible. The facility and its fuel cells are proposed to emit lower emissions compared to traditional power generation such as stationary combustion turbines as well as current vehicle travel along I-270 east of the communities. Additional details are added within [this memo to contextualize](#) the carbon dioxide emissions and impacts of the proposed data center.

Introduction and Purpose

Pinyon Environmental, Inc. (Pinyon) was retained by the City of Hilliard to evaluate a modeling report prepared for Bloom Energy titled “Evaluation Of Air Emissions From Proposed Fuel Cell Installation” dated March 2026. Following public comment, the City of Hilliard requested additional information regarding a proposed data center in Hilliard, Ohio (hereafter referred to as facility) that will operate 72.91 megawatts (MW) of solid oxide fuel cells (hereafter referred to as fuel cells); a new technology for the City of Hilliard. The modeling report attempts to analyze the potential carbon dioxide (CO₂) impacts from the facility’s fuel cells on nearby neighborhoods. This memo details Pinyon’s findings of the modeling report review along with recommendations for the City of Hilliard’s consideration regarding the analysis.

Background

A [72.91 MW data center](#) is proposed in the City of Hilliard in Franklin County, northwest of Columbus, Ohio. The facility is west of and adjacent to Interstate 270 (I-270), an auxiliary highway connecting the City of Hilliard to Columbus that has an annual average daily traffic volume between 5,001 and 25,000 vehicles (see map in Attachments). The facility is east of and adjacent to the Darby Glen residential neighborhood and Darby Glen Park. The facility proposes to install 1,394 fuel cells totaling 72.91 MW. The fuel cells use natural gas and via contact with an electrolyte, generate electricity without combustion. CO₂ emissions result from this process along with other pollutants

such as nitrogen oxides, carbon monoxide and volatile organic compounds. The facility was granted an air permit from the Ohio Environmental Protection Agency (OEPA) in October of 2025.

Franklin County is currently designated as a maintenance area for ozone meaning it once exceeded both the 2008 and 2015 [National Ambient Air Quality Standards](#). Franklin County was redesignated as a [maintenance area](#) in 2016 for the 2008 ozone standard and in 2019 for the 2015 standard. The maintenance period ends following 20 years remaining below the National Ambient Air Quality Standards when then area is reclassified as Unclassifiable/Attainment. Franklin County is considered attainment for the other criteria pollutants such as nitrogen dioxide, carbon monoxide, particulate matter less than 10 microns in diameter, particulate matter less than 2.5 microns in diameter, sulfur dioxide, and lead.

CO₂ is not a regulated pollutant by the United States Environmental Protection Agency (EPA). Based on community concern on CO₂ emissions associated with the proposed facility, the City of Hilliard requested further information from the proposed data center operator on the fuel cell's CO₂ emissions. The manufacturer of the fuel cells, Bloom Energy, prepared an impacts evaluation of the facility on nearby public areas.

Modeling Analysis Review

In lieu of receiving the modeling files to verify inputs and outputs, Pinyon followed the presented methodology in the provided modeling report, presented modeling inputs, and recreated the conducted modeling analysis described in the modeling report.

Analysis of Modeling Methodology

Pinyon reviewed the modeling methodology outlined in Section 3.2 of the modeling report and recreated the modeling analysis using AERMOD. The emissions rates were verified based on an emissions rate of [833 pounds CO₂ per megawatt-hour \(lb CO₂/MWh\)](#). Stack parameters such as height, diameter, flow, and temperature as well as the location of sources and fence line could not be independently verified based on the information provided in the modeling report. The source documentation for these parameters should be provided for confirmation. The bullets below are based on review of the modeling report and publicly available information:

- ▶ Operating Temperature versus Ambient Temperature

In review of the meteorological data used for the modeling analysis along with the operating temperature range for the fuel cells, it was noted some days fell below the appropriate range published in the [fuel cell specification](#). Though a small subset (8 days out of 5 years below -4 degrees Fahrenheit), it would be beneficial to address the effects of below freezing ambient temperature on the fuel cells' operation, and subsequent impacts on CO₂ emissions when ambient conditions do not meet specification.

- ▶ Building Downwash

Section 3.3 mentions the limitations of AERMOD when ambient air is adjacent to emissions units due to the potential overestimation or underestimation of building downwash impacts. It is not clear if downwash was included in the modeling analysis. Based on diagrams of the fuel cells and their

proximity to one another with the coordinates provided, it is likely there are downwash impacts from this facility. The stack heights above the buildings, or fuel cell modules, is not clear based on the modeling report and figures in [specification sheets](#) though they seem to be at or below the top of the fuel cell modules rather than a stack above the top of the fuel cell module. The distance between the exhaust height and the module height along with the proximity of the rows of fuel cells, may cause a wake effect creating areas where emissions recirculate with potentially higher turbulence and results in higher ground impacts. The inclusion of building downwash, if not already included, may have a meaningful impact on model results.

▶ Emissions Rates

It is understood that an average emissions rate of 1 gram per second was modeled and then the average hourly emissions rate was multiplied by the result to determine impacts. While there is a slight misinterpretation of the OEPA modeling guidance (see following subsection in this report titled “Unitized Emissions Run”), this methodology is acceptable for this analysis. In many modeling analyses, a worst-case emissions hour is recommended to determine maximum potential impacts from a facility. Similarly, emissions modeling include starts, idling, and even circumstances in which more fuel may be needed to provide the same power output (load fluctuations, ambient conditions, etc.). It is not clear that this worst-case emissions rate was used since the CO₂ emissions factor range in the [fuel cell specification](#) is only for one stated efficiency. Startup, shutdown, and maintenance emissions rates along with the duration of these events should be considered when conducting these analyses to best represent likely operations especially for short-term averaging periods.

▶ Short-Term Averaging Periods

The analysis modeled results for an 8-hour period and annual period. It is understood this was for ease of comparison to the Occupational and Safety and Health Administration’s 8-hour worker exposure limit and for comparison to the ambient annual concentrations. There is a limitation with the 8-hour worker exposure comparison since the exposure of nearby communities will not be limited to 8-hours per day because the proposed operation of the facility is 24 hours per day and 365 days per year. For added context, Pinyon modeled a 1-hour concentration for comparison to the 8-hour recommended exposure limit of 5,000 ppm without the inclusion of downwash to evaluate potential immediate impacts in a shorter time period. With a permissible exposure for 8-hours at below 5,000 ppm, model results in a shorter time frame, such as 1-hour, also below 5,000 ppm may provide additional exposure context on the sensitive receptors. The results are tabled below to mirror Table 3 of the provided modeling report. The 1-hour concentrations at the same locations are also modeled to be below the 5,000 ppm worker exposure limit. Therefore, 1-hour impacts are estimated to be below the worker safety exposure limit determined for a longer period of 8-hours.

Location Name	Approximate Distance From Facility (feet)	Model Predicted CO ₂ 1-Hour Impact (ppm)
Darby Glen Subdivision	800	898
Beacon Subdivision	3,600	310
Beacon Elementary School	4,000	280
Darby Creek Elementary School	15,000	101

ppm = parts per million

Items for Clarification

▶ Clarification On Power Provider

Section 1 states the project will “provide power to the local area”. It is unclear the intent of this statement. If the intent is to provide guarantees to the community that the facility would otherwise be powered by the utility that generates electricity with fossil fuel combustion, clarification may be needed. This statement could be interpreted that electricity from the facility may be sold to the nearby communities.

Following clarification from the City, the proposed data center will generate electricity for onsite use only and will not provide electricity to the utility grid. Therefore, this item remains included to provide clarification of Section 1 of the modeling report.

▶ Stacked Cells

In the Facility and Technology Overview section, it was noted that the fuel cells were stacked. The modeling analysis had 1,394 unique data points each with a 2.06 meter (6.76 feet) height. Offsite impacts and potential building downwash may be impacted by varying emission release heights.

Following clarification from the City, it was confirmed that the fuel cells will not be stacked and the intent of Section 1 of the provided modeling report was to describe the solid oxide parts within the individual fuel cell. Therefore, this item remains included to provide clarification of Section 1 of the modeling report.

▶ Unitized Emissions Run

The [Ohio EPA Engineering Guideline](#) provides the option to use an emissions rate of 1 gram per second when multiple pollutants are being modeled (question 10). However, the response to question 8 of the same guideline document states that short-term standards like 8-hour should model short-term allowable emissions rates or peak short-term rates. Long-term averaging periods like annual standards can use actual or average emissions rates. The use of the actual emissions rates for 8-hour and annual concentrations were below the 8-hour exposure limit and ambient concentrations of CO₂ and verified in the modeling report. The purpose of this comment is for clarification and correct interpretation of the modeling guidelines.

▶ Comparison to Ambient Air

It is agreed that the results of the modeling analysis are at their highest (27.7 ppm), between 6% and 8% of current ambient air ranging between 350 and 450 ppm. However, additional context on this comparison is necessary. The 27.7 ppm is additive to current ambient air levels which are noted by various national and international agencies as being on an upward trend compared to the mid-20th century. The [National Oceanic and Atmospheric Administration published in 2025](#) that in the 1960s, average ambient air CO₂ concentrations were less than 320 ppm as observed at Mauna Loa Observatory which is approximately 100 ppm less than current ambient air. Incremental increases, though a fraction of current ambient air levels, should be considered across a larger time frame and larger geographic area considering the lifetime and transport of CO₂ in the atmosphere.

Contextual Analysis Review

The modeling report stated its attempt was to put the installation of the fuel cells in context. Based on review of the modeling report, the contextual aspect of the fuel cell installation is insufficient to address questions raised by the community.

- ▶ Comparison to Stationary Combustion Turbines

Additional details should be considered regarding the comparison of fuel cells to stationary combustion turbines. The provided modeling report states the average 1,100 lb CO₂/MWh for stationary combustion turbines is over 30% more CO₂ emissions than fuel cells. This could not be corroborated. In review of the [Appendix Table B-1](#) of the cited report, the range of CO₂ emissions from the best performing turbines is 907 to 1,123 lb/MWh with an average of 1,074 lb/MWh which is 29% higher than the fuel cell's 833 lb/MWh. Furthermore, the fuel cell manufacturer has [published data](#) stating natural gas power plants emit 960 lb/MWh which lowers the percent difference to 15%. It is agreed that traditional natural gas power generation will have more CO₂ emissions than the fuel cells per electricity output. This clarification is to provide more accurate context for the comparison.

- ▶ Tangible Comparisons

For the public to understand and grasp the increase in CO₂ emissions from the facility, a more relatable comparison is included in this memo (see Attachments). The EPA released a [GHG equivalencies calculator](#) where emissions or energy data can be converted into commonplace activities and sources. The provided annual CO₂ emissions of the facility were input into the calculator and the following equivalencies were output:

- ▶ 56,283 gasoline-powered passenger vehicles driven for one year
- ▶ 614,464,651 miles driven by an average gasoline-powered passenger vehicle
- ▶ 32,405 homes' energy use for one year

As previously mentioned, the facility is adjacent to I-270; an auxiliary highway that averages between 5,001 and 25,000 daily vehicles or between 1,825,365 and 9,125,000 vehicles per year. Using the equivalencies, the facility's CO₂ emissions are equivalent to 0.6% to 3% of the traffic along I-270 over the course of a year.

Conclusion

Pinyon reviewed the modeling report provided for the fuel cell facility proposed for the City of Hilliard in Franklin County as well as recreated the model based on the information provided in the report. Questions for consideration to refine the modeling analysis are below for the City of Hilliard.

- ▶ Better understanding of the impact of colder and warmer temperatures on the fuel cell operation as it relates to potential CO₂ emissions
- ▶ Inclusion of downwash or scientific justification as to its exclusion
- ▶ Clarification that the maximum emissions rate was used for short-term averaging periods

- ▶ Better understanding of the necessary maintenance activities for the fuel cells as it relates to potential CO₂ emissions

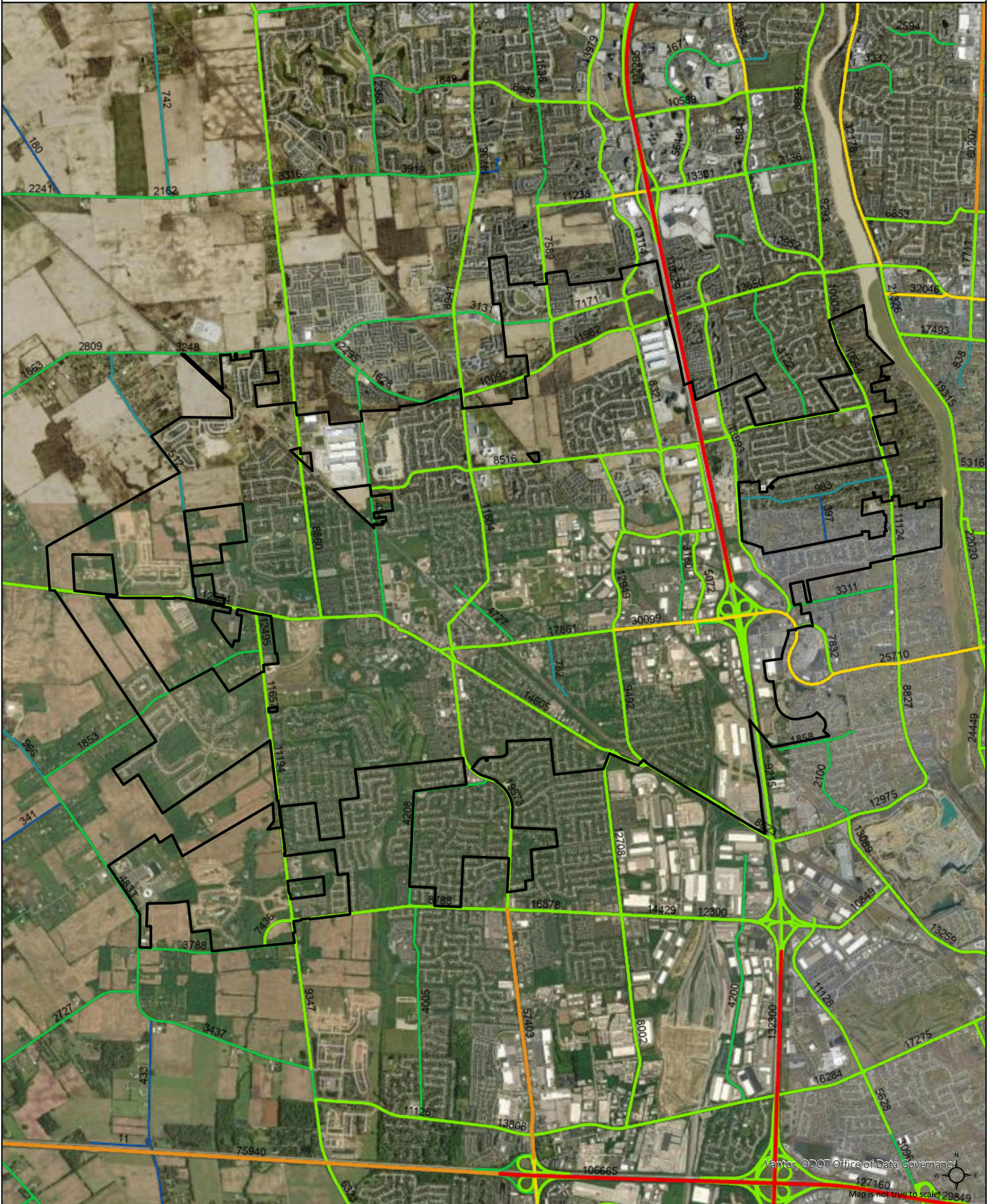
The modeling methodology is sound and defensible for an impacts analysis. The facility and its fuel cells are proposed to emit lower CO₂ emissions compared to traditional power generation such as stationary combustion turbines as well as current vehicle travel along I-270 east of the communities. Pinyon would not recommend using the statements in the modeling report regarding the level of “measurable” impact and that there is “no cause for concern” due to the lack of health standards, toxicity information, and regulatory thresholds developed in the United States for CO₂. The contextual comparison can be used for decision making purposes along with relational data between modeled impacts and ambient conditions as well as emissions from the facility and similar CO₂ emitting sources.

Attachments

AADT

2024 Annualized Average Daily Traffic

CITY - HILLIARD



AADT TOTAL

- 0 - 500
- 501 - 1,000
- 1,001 - 5,000
- 5,001 - 25,000
- 25,001 - 50,000
- 50,001 - 100,000
- 100,001 - 200,000

AADT represents the volume of vehicle traffic on a road for an average day. AADT multiplied by 365 days equates to the total number of vehicles passing that location for 1 year. Traffic counts are collected from approximately 250 permanent locations, 24 hours a day and 365 days a year. These counts help establish patterns and factors. Between 7,000 and 10,000 short term tube counts are collected on a 3-year rotating schedule. Short term counts are adjusted into AADT using the factors developed from the permanent locations. Traffic counts are managed by ODOT's Traffic Monitoring Section within the Office of Technical Services.



Ohio Department of Transportation

This map was generated by the Transportation Information Mapping System (TIMS) for the Ohio Department of Transportation (ODOT). ODOT does not make any warranty, expressed or implied, and does not assume any legal liability for the accuracy, completeness or usefulness of the data provided herein. Any use of this information is at the recipient's own risk. This map was generated on 5/4/2026

265,979 Tons of Carbon Dioxide (CO₂) equivalent

This is equivalent to greenhouse gas emissions from:

56,283 gasoline-powered passenger vehicles driven for one year 

<https://epa.gov/energy/greenhouse-gases-equivalencies-calculator-calculations-and-references#vehicles>



213,098

electric-powered passenger

vehicles driven for one year



<https://epa.gov/energy/greenhouse-gases-equivalencies-calculator-calculations-and-references#electricvehicles>



calculations-and-

references#electricvehicles>

614,464,651 miles driven by an average

gasoline-powered passenger vehicle 

<https://epa.gov/energy/greenhouse-gases-equivalencies-calculator-calculations-and-references#miles>



This is equivalent to CO₂ emissions from:

27,151,129 gallons of gasoline consumed 

<https://epa.gov/energy/greenhouse-gases-equivalencies-calculator-calculations-and-references#gasoline>



23,702,562 gallons of diesel consumed 

<https://epa.gov/energy/greenhouse-gases-equivalencies-calculator-calculations-and-references#diesel>




268,030,836 pounds of coal burned 

<https://epa.gov/energy/greenhouse-gases-equivalencies-calculator-calculations-and-references#lbscoal>




3,194 tanker trucks' worth of gasoline


 <https://epa.gov/energy/greenhouse-gases-equivalencies-calculator-calculations-and-references#tankers>



32,405 homes' energy use for one year

 <https://epa.gov/energy/greenhouse-gases-equivalencies-calculator-calculations-and-references#houseenergy>



50,284 homes' electricity use for one year  <https://epa.gov/energy/greenhouse-gases-equivalencies-calculator-calculations-and-references#houseelec>



1,338

railcars' worth of coal burned 

<https://epa.gov/energy/greenhouse-gases-equivalencies-calculator-calculations-and-references#railcars>




558,642

barrels of oil consumed 

<https://epa.gov/energy/greenhouse-gases-equivalencies-calculator-calculations-and-references#oil>




11,084,735

**propane cylinders used for home
barbeques**  <https://epa.gov/energy/greenhouse-gases-equivalencies-calculator-calculations-and-references#propane>




0.064

**coal-fired power plants in one
year**  <https://epa.gov/energy/greenhouse-gases-equivalencies-calculator-calculations-and-references#coalplant>




0.631

**natural gas-fired power plants in
one year**  <https://epa.gov/energy/greenhouse-gases-equivalencies-calculator-calculations-and-references#gasplant>





19,507,686,067



number of smartphones charged  <https://epa.gov/energy/greenhouse-gases-equivalencies->







calculator-calculations-and-references#smartphones>

This is equivalent to greenhouse gas emissions avoided by:

85,262 tons of waste recycled instead of landfilled  <https://epa.gov/energy/greenhouse-gases-equivalencies-calculator-calculations-and-references#recycle> 

12,180 garbage trucks of waste recycled instead of landfilled  <https://epa.gov/energy/greenhouse-gases-equivalencies-calculator-calculations-and-references#gtrucks> 

20,511,384 trash bags of waste recycled instead of landfilled  <https://epa.gov/energy/greenhouse-gases-equivalencies-calculator-calculations-and-references#trash> 

72.1 wind turbines running for a year  <https://epa.gov/energy/greenhouse-gases-equivalencies-calculator-calculations-and-references#wind> 

This is equivalent to carbon sequestered by:

3,989,785 tree seedlings grown for 10 years 

[? <https://epa.gov/energy/greenhouse-gases-equivalencies-calculator-calculations-and-references#seedlings>](https://epa.gov/energy/greenhouse-gases-equivalencies-calculator-calculations-and-references#seedlings)



label/////

242,030 acres of U.S. forests in one year

[? <https://epa.gov/energy/greenhouse-gases-equivalencies-calculator-calculations-and-references#pineforests>](https://epa.gov/energy/greenhouse-gases-equivalencies-calculator-calculations-and-references#pineforests)



1,442 acres of U.S. forests preserved from conversion to cropland in one year [?](#)

[? <https://epa.gov/energy/greenhouse-gases-equivalencies-calculator-calculations-and-references#deforestation>](https://epa.gov/energy/greenhouse-gases-equivalencies-calculator-calculations-and-references#deforestation)

