Health Consultation

Georgia Renewable Power (GRP) Madison Renewable Energy Facility
Colbert, Madison County, Georgia

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GEORGIA DEPARTMENT OF PUBLIC HEALTH

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Health Consultation: A Note of Explanation

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Glossary of Acronyms

ATSDR: Agency for Toxic Substances and Disease Registry

AQG: Air Quality Guidelines

AQI: Air Quality Index

COC: Contaminants of Concern

CVs: Comparison Values

EC: Elemental Carbon

EPA: United States Environmental Protection Agency

EPD: Georgia Environmental Protection Division

DPH: Georgia Department of Public Health

GRP: Georgia Renewable Power

GTQL: Georgia Tobacco Quit Line

GTUPP: Georgia Tobacco Use Prevention Program

IARC: International Agency for Research on Cancer

IRIS: Integrated Risk Information System

MCCPC: Madison County Clean Power Coalition

NTP: National Toxicology Program

NO_2: Nitrogen Dioxide

NIHL: Noise Induced Hearing Loss

$\mu g/m^3$: Micrograms per Cubic Meter

µm: Micrometer

UFP: Ultrafine Particles, Diameter of less than or Equal to 0.1 Micrometer (µm)

OC: Organic Compound

PM: Particulate Matter

SO_2: Sulfur Dioxide

SLM: Sound Level Meter

VOCs: Volatile Organic Compounds

WHO: World Health Organization

Summary

In late May 2022, the Georgia Department of Public Health (DPH) received particulate matter and sound impact data from the Agency for Toxic Substances and Disease Registry (ATSDR) after a declined petition request to investigate Georgia Renewable Power (GRP) Madison Renewable Energy Facility. DPH collaborated with the Georgia Environmental Protection Division (EPD) to gather site specific information about the plant and their operation. In their petition request to ATSDR, the Madison County Clean Power Coalition (MCCPC) community action group were concerned about excessive noise and potential exposure to airborne toxic chemicals emitted from the energy plant. The purpose of this health consultation is to determine whether the GRP Madison Renewable Energy facility (GRP Madison) is the sole contributor of particulate matter (PM) and excessive noise in the area, and to assess if the residents near the energy facility may have been harmed by exposure to particulate matter and excessive noise. The MCCPC was also concerned about excess cancer rates in their community. We reviewed available PM data and sound level data to draw conclusions and make recommendations to reduce exposure and proposed a public health action plan to reduce exposures. DPH reached the following conclusions based on review and evaluation of available data.

Conclusion 1: DPH concludes that meteorological and spatial data indicates that GRP Madison is not the sole source responsible for a great proportion of fine particle matter known as $PM_{2.5}$ and levels exceeding the $PM_{2.5}$ comparison values.

Basis for Conclusion:

- The plant operates 24/7. However, elevated PM concentrations were detected sporadically, and only on some days. The Athens-Clarke County air monitoring station recorded higher PM concentrations than the air near the energy facility in Madison County for several days. The PM concentrations would have to be elevated in all samples collected near the energy facility if it was the sole contributing source of elevated concentration of PM in ambient air.

- There are other known sources of PM around the energy plant. Precursors that lead to the formation of $PM_{2.5}$ are emitted by a variety of sources. There are two major roads, railroad tracks, and agricultural land surrounding the energy plant that could be impacting PM concentrations around the energy plant. The literature identifies all these as sources of $PM_{2.5}$ [Bauer 2016].

- The prevailing wind direction indicates that the highest concentration of PM should be dispersed to the west and east sides of the energy plant. However, the PurpleAir Sensors used to measure PM concentrations were placed in areas that are located south of the plant, and not in the direction of prevailing winds. Therefore, they do not provide an accurate representation of the PM concentrations near the energy plant in the direction of prevailing winds.

- The average 24-hour PM concentrations reported by PurpleAir sensors located in Madison County are relatively similar to the PM concentrations reported by the nearest Athens-Clarke County Ambient Air Monitoring Station. This ambient air monitoring

station is located 15 miles southwest of the energy facility. PurpleAir Sensors represent local air quality rather than site related sources.

- The U.S. Environmental Protection Agency (EPA) scientists have found that PurpleAir sensors either overpredict or underpredict PM concentrations in most locations. The readings of PurpleAir sensors are usually adjusted using correction factors developed by EPA. PurpleAir sensors in Madison County recorded exceptionally high PM concentrations on some days and other days low as 0 $\mu g/m^3$. These readings were adjusted using EPA's local correction factor. After adjustment, the high PM concentrations recorded in Madison County were similar to the Athens-Clarke County Ambient Air Monitoring Station's PM concentrations. However, using the correction factor yielded a higher concentration of $PM_{2.5}$ on days where PurpleAir sensors recorded 0 $\mu g/m^3$.

Next Steps: The MCCPC community action group is concerned about inhaling PM and toxic chemicals released from the GRP Madison site into ambient air. The MCCPC should work with a public or private agency/laboratory to perform ambient air quality testing near the plant following EPA's established guidelines.

Conclusion 2: DPH concludes that exposure to elevated concentrations of $PM_{2.5}$ could harm public health because of an increased risk for adverse health effects among highly sensitive individuals. Harmful health effects are possible based on the following considerations:

Basis for Conclusion:

- Depending on the PM level, any single 24-hour period above the World Health Organization (WHO) Air Quality Guidelines (AQG) could potentially result in harmful effects for highly sensitive and sensitive individuals, and to the general (healthy) public as well. The concentrations of PM detected by PurpleAir sensors exceeded the AQG value of 15 $\mu g/m^3$ at least eighteen times between August 2021 and November 2021. There is a high chance that PM concentrations will exceed the AQG value if measured over a one-year period.

- The Air Quality Index (AQI) category is considered moderate, meaning that highly sensitive individuals could experience adverse health effects. Sensitive individuals have an increased likelihood of experiencing health effects from PM exposures (e.g., persons with severe asthma, COPD, and pre-existing respiratory or cardiovascular disease).

Next Steps: Highly sensitive people should consult their local air quality forecast and consider reducing prolonged or heavy exertions outside on days where air quality is predicted to be poor.

Conclusion 3: DPH concludes that the available data is not sufficient to identify the source of noise levels above 70 decibels (dB). Occasional higher noise levels should not cause noise-induced hearing loss because a 24-hour day typically includes enough quiet time for hearing recovery between high noise level exposures. However, repeated exposure to sound levels above 70 dB over a prolonged period could harm the hearing of individuals living within a 0.45-mile radius of the plant. Sound levels above 55 dB can cause speech interference and annoyance for outdoors activities.

Basis for Conclusion:

The closest Sound Level Meter (SLM) N, located 0.45 miles away from GRP Madison, recorded noise levels above 70 dB for a total of 14 times in a 24-hour period. Also, this SLM was placed near highway 72W and a railroad track, which may have impacted the results. However, it is likely that GRP Madison may also be slightly contributing to the noise level.

Next Steps: The MCCPC community action group, Madison County officials, and residents in Madison County may work together to pass an appropriate ordinance to control noise in Madison County.

Conclusion 4: Increased lung and bronchus cancers in census tract 204, where GRP Madison is located, are likely due to increased smoking prevalence among the population that live in this census tract compared to the state of Georgia.

Basis for Conclusion:
In census tract 204, the estimated prevalence of smoking among adults aged 18 and older was 22.1% in 2020, which is significantly higher than the state of Georgia's average of 15.8%.

Next Steps: Madison County officials and health representatives should increase awareness about tobacco use and related cancers. Federal and State smoking cessation resources are available to the public. The Georgia Tobacco Quit Line (GTQL) is a FREE public health service available to help Georgians quit smoking, vaping, and stop using all forms of tobacco products. GTQL is monitored by the Georgia Tobacco Use Prevention Program (GTUPP) and partners with a national tobacco cessation vendor to provide telephone, text, and web-based services.

Statement of Issues

In late May 2022, the Georgia Department of Public Health (DPH) received particulate matter and sound impact data from the Agency for Toxic Substances and Disease Registry (ATSDR) after a declined petition request to investigate Georgia Renewable Power Madison Renewable Energy Facility (GRP Madison). DPH collaborated with the Georgia Environmental Protection Division (EPD) to gather site specific information about the plant and their operation. In their petition request to ATSDR, the Madison County Clean Power Coalition (MCCPC) community action group were concerned about excessive noise and potential exposure to airborne toxic chemicals emitted from the energy plant.

The purpose of this health consultation is to determine whether the GRP Madison is the sole contributor of particulate matter (PM) and excessive noise in the area, and to assess if the residents near the energy facility may have been harmed by exposure to particulate matter and excessive noise. The MCCPC was also concerned about excess cancer rates in their community. DPH reviewed available PM data and sound level data to draw conclusions and make recommendations to reduce exposure and proposed a public health action plan for future next steps.

Background

The GRP Madison, LLC operates a renewable energy facility at 125 HV Chandler Rd, Colbert, Madison County, Georgia. The site property lies on approximately 52 acres and includes an office, storage units, storage tanks, a pond, a wood biomass-fired stoker boiler, generators, a cooling tower, and a silo. The site is enclosed by fencing equipped with a locked gate. The facility engages in commercial electricity generation and does not have a co-located forest product processing plant on site. Veolia North America operates the plant in Madison County and a sister plant in Franklin County, Georgia. The plant was previously owned by MB Lumber Co, LLC, and was sold to GRP Madison LLC in 2015. Prior to MB Lumber Co, the land was owned by Weyerhaeuser and Russel and Sons Farm.

The facility runs 24/7 and operates a 700MmBtu/hr stoker boiler that can burn biomass and fuel oil as part of normal operations. Older permits authorized burning railroad ties treated with creosote to generate energy [EPD 2018]. In August 2020, burning of railroad ties treated with creosote and naphthenate compound was prohibited in Georgia [HB 857]. Permits prior to 2020 included creosote treated railroad ties as a “clean cellulosic biomass”. Clean biomass is biomass that does not contain contaminants at concentrations not normally associated with virgin biomass material. “Clean cellulosic biomass” means those residuals that are akin to traditional cellulosic biomass, including, but not limited to: forest trimmings, clean unadulterated bark, sawdust, trees, stumps, wood collected from forest fires, agricultural crop residue, and construction and demolition wood [EPD 2018]. No permit allows the burning of any wood products treated with lead or chromate copper arsenate.

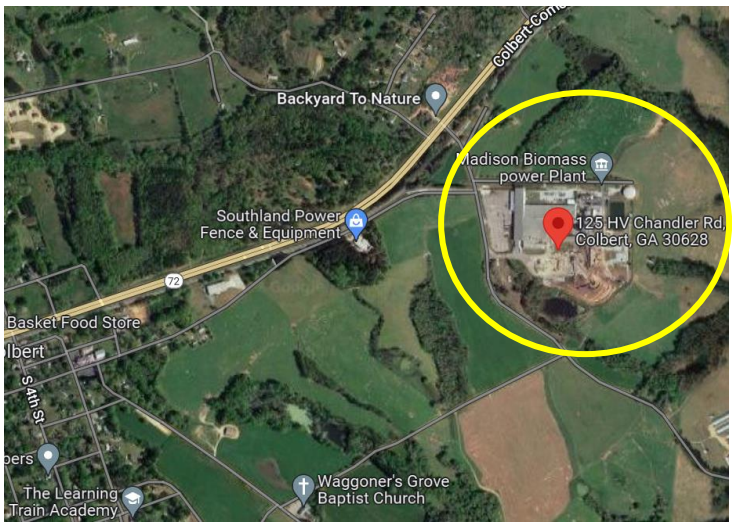

Figure 1: Aerial photo of the GRP Madison (top of photo) and the neighboring property northeast of the manufacturing plant. The yellow circle shows the location of the facility. *Source: Google Maps.*

The Russell and Sons Farm Holding company owns most of the neighboring property around the plant (Figure 1). A residential subdivision is located northwest of the plant, Colbert elementary school is located 2.6 miles west of the plant, and a daycare center is located approximately 1.7 miles west of the plant. The school, daycare center, and commercial/industrial properties (including the site) are connected to the public water system, and all are connected to individual septic systems. The properties surrounding the plant and south of Colbert-Comer Rd are on well water systems. A railroad runs from the plant and connects to the nearby railroad adjacent to Colbert-Comer Rd.

Environmental Contamination

The Georgia Department of Public Health (DPH) received outdoor air monitoring data from August 2021 through November 2021 from the Georgia Environmental Protection Division (EPD), and noise study data from February 19-22, 2021. Outdoor air data were collected using PurpleAir sensors. Particulate matter (PM) concentrations were reported in the data without distinguishing the morphology and chemical composition of the PM (e.g., diesel engine PM, specific heavy metals, polychlorinated biphenyls, acidic content of aerosols, etc.). DPH evaluated data for fine (2.5 micrometer) inhalable particles ($PM_{2.5}$) using ATSDR's *Guidance for Inhalation Exposures to Particulate Matter* (ATSDR 2022). Although ATSDR does not evaluate noise data, DPH evaluated the noise survey data using the recommendations from the National Institute for Occupational Safety and Health (NIOSH), the U.S. Environmental Protection Agency (EPA), and the Centers for Disease Control and Prevention (CDC).

Particulate Matter

Particulate matter (PM) is the generic term for a broad class of chemically and physically diverse solid particles and liquid droplets found in ambient air. Particles originate from a variety of sources, both from stationary (e.g., coal-fired power plants) and mobile sources (e.g., cars and trucks), as well as from natural (e.g., dust storms) sources. In addition to being directly emitted

into the air, particles can be formed in the atmosphere through complex reactions involving chemicals such as sulfur dioxide (SO_2) and nitrogen dioxide (NO_2). PM is a mixture of various components (e.g., metals, elemental carbon, organic compounds, etc.). PM's chemical and physical properties can vary greatly with time, region, meteorology, and source [ATSDR 2022]. PM is classified into three categories: ultrafine particles (diameter of less than or equal to 0.1 micrometer [µm]), fine particles ($PM_{2.5}$ particles with a diameter of less than or equal to 2.5 µm), and thoracic particles (PM_{10} particles with a mean diameter of less than or equal to 10 µm).

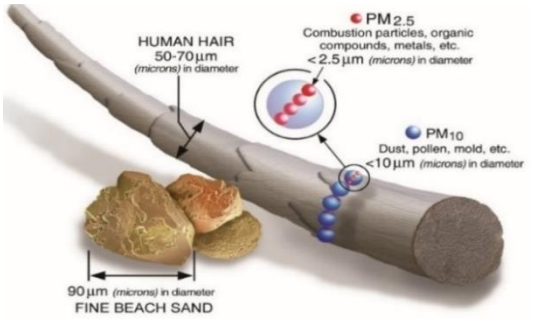

Figure 2: Particulate Matter Basics. *Source: U.S. EPA.*

PM can come from two different kinds of sources — primary or secondary. Primary sources cause particle pollution on their own. For example, wood stoves and forest fires are primary sources. Secondary sources let off gases that can form particles. Power plants and coal fires are examples of secondary sources. Some other common sources of particle pollution can be either primary or secondary — for example, factories, cars and trucks, and construction sites. Smoke from fires and power plant emissions, industrial facilities, and vehicle emissions contain $PM_{2.5}$ [CDC 2022a].

Health Effects of Inhaling Particulate Matter

Exposure to respirable particles with a diameter of less than 10 µm can have both short- and long-term effects on cardiopulmonary function, morbidity, and mortality. Numerous scientific studies have linked particle pollution exposure to [ATSDR 2022, WHO 2013]:

1. Mortality and morbidity rates;
2. Ischemic heart disease, cerebrovascular disease, and heart failure;
3. Systemic inflammation, oxidative stress, and alteration of the electrical processes of the heart (the biomarkers of which illustrate the contribution of $PM_{2.5}$ exposures to cardiovascular disease);
4. Respiratory effects (including aggravated asthma, decreased lung function, and symptoms such as coughing) and infections;
5. Diabetes; and
6. Impaired neurological development in children and "brain aging" and neurological disorders in adults.

PurpleAir Sensors

PurpleAir sensors measure airborne particulate matter (PM) using laser particle counters to count the number of particles by particle size and use the data to calculate mass concentrations of $PM_{1.0}$, $PM_{2.5}$, and PM_{10}. PurpleAir sensors are used by a wide variety of governments, organizations, and citizens to monitor air quality [MassDEP 2021]. The PurpleAir sensor is a self-contained unit that only requires access to power and a Wi-Fi network to operate. EPA scientists have found that PurpleAir sensors consistently overpredict fine particle concentrations in most locations and under high humidity compared to regulatory-grade air monitors that are operated in the same location. While EPA does not use the sensor data for regulatory purposes, the correction equation EPA scientists have developed correct the high bias so that readings can be easily compared [EPA 2022].

Figure 3: PurpleAir Sensor. Images from the Massachusetts Department of Environmental Protection [MassDEP].

Particulate Matter (PM) Assessment

Exposure Pathway

DPH determines exposure to environmental contamination by examining exposure pathways. An exposure pathway is generally classified by environmental medium (e.g., water, soil, air, food). A completed exposure pathway exists when people are exposed through ingestion or inhalation of, or by skin contact with a contaminated medium. An exposure pathway consists of five elements: contaminant source; transport through an environmental medium; exposure point; a route of exposure; and an exposed population. In completed exposure pathways, all five elements are evident and indicate that exposure to a contaminant has occurred in the past, is presently occurring, or will occur in the future.

Identifying sources of PM near the plant is challenging. Available PM data does not distinguish the morphology and chemical composition of the PM. In addition, PM includes emissions from natural and anthropogenic sources and is therefore ubiquitous across every region of the world, whether or not there is a nearby attributable source [ATSDR 2022]. Table 1 shows the exposure pathway for PM near the GRP Madison. A completed exposure pathway does not mean that the exposure will necessarily result in harmful health effects because the likelihood of health effects depends on specific exposure conditions such as exposure duration, contaminant toxicity and concentration, and exposure frequency [ATSDR 2022].

Completed Exposure Pathway

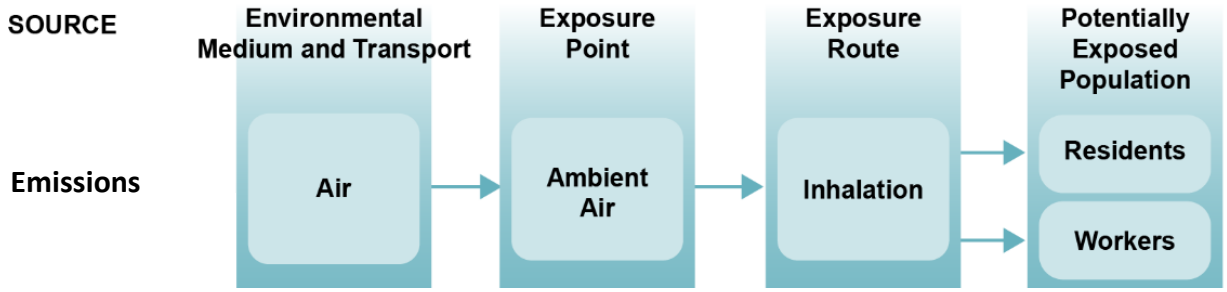

Table 1: Completed Exposure Pathway for PM near GRP Madison Renewable Energy Facility.

Evaluation Process

As a preliminary step in the evaluation process, DPH examines the types and concentrations of chemicals, which are then screened with comparison values generally established by ATSDR and EPA. Comparison Values (CVs) are concentrations of a contaminant that are not expected to be harmful to human health, assuming health-protective conditions of exposure. Concentrations greater than screening levels do not necessarily mean that people will become sick from exposures, but that further evaluation is necessary to evaluate the potential for health effects [ATSDR 2016].

For PM, the most health-protective screening values established are the Air Quality Guidelines (AQGs) from the World Health Organization (WHO) in Geneva [ATSDR 2022]. ATSDR prefers to use 24-hour averages for screening whenever possible against the 24-hour AQG. Depending on the PM level, any single 24-hour period above the AQG potentially could result in harmful effects for sensitive individuals, the general (healthy) public, and for all groups.

The U.S. Air Quality Index (AQI) value is EPA's tool to communicate daily air quality. The AQI is issued nationally to designate real time threats to highly sensitive individuals, sensitive populations, or the general public. It uses color-coded categories and provides statements for each category expressing the air quality in an area, which groups of people may be affected, and steps needed to reduce exposure to air pollution. Note that EPA's AQI slightly exceeds the WHO PM AQGs. For PM concentration assessment, the AQI uses a 24-hour average sampling result. Please see Appendix B for EPA's AQI index chart.

The AQI is a tool used by U.S. EPA to categorize air quality threats in real time to local populations across the United States and is not intended to be used as a surrogate for a presentation of the scientific literature in health assessments. ATSDR uses the AQI only for the purposes of qualitatively assessing the frequency of poor air quality days that may affect different segments of the population. AQI data can be used to support health conclusions made by evaluation of exceedances of screening values, an assessment of how exposures compare to those in the toxicological literature, and an assessment of other data that put these exceedances into context (such as background data or upwind data vs. downwind data, spatial analysis, etc.) [ATSDR 2022].

DPH evaluated the available data for PM from August 2021 to November 2021. All available data were adjusted using GA EPD's PurpleAir Sensor correction factor[1]. The PurpleAir sensor contains 2 channels, A and B. Both channels collect concentrations of PM in the air hourly and are then averaged to daily 24-hour concentrations The 24-hour average PM concentration values were corrected using the EPD's correction factor[1]. The PurpleAir sensor reported a concentration of 0 $\mu g/m^3$ for several days and was adjusted using the correction factor to a concentration of 3.099 $\mu g/m^3$.

The highest daily concentration of PM values was used to obtain AQI values using the AQI calculator. The AQI calculator was developed by EPA [EPA 2019]. EPD's Athens-Clarke County air monitoring station's hourly PM values were averaged to 24-hour data as well and used as background data. The prevailing wind direction from the Athens Municipal Airport was used to determine the wind direction in Madison County near the plant. Figure 7.A in Appendix A shows the prevailing wind direction for the Athens Municipal Airport. Wind directions measured at the Athens-Clarke County airport suggests that PM concentrations will be detected higher to the west/northwest and east/northeast side of the plant.

Table 2 shows the 24-hour corrected average PM concentrations that exceed the WHO's PM AQGs and the relationship to EPA's AQI values for the PM concentrations detected. Table 3 shows four random day PM values recorded at EPD's Athens-Clarke County air monitoring station and at the Madison County PurpleAir sensor.

[1] X*0.5691+3.099 was used as correction factor. X was the average PM value from channel A and B. GA EPD established the local correction factor. EPA has a national correction factor takes into account the relative humidity. However, the local correction factor GA EPD established for the PurpleAir sensor did not since it was side by side data and the relative humidity would have been the same. GA EPD collocated the sensor for approximately three months with the sensor placed onsite at Athens air monitoring station to develop the local correction factor.

Table 2: Total 24-hour Average PM Exceeding WHO PM Air Quality Guidelines (AQGs)

Month	Date (2021)	24-hour PM Concentration at the Athens Clarke County AMS[1] (µg/m^3)*	AQI[1]	24-hour Corrected PM[5] Concentrations in Madison County (µg/m^3)*	AQI[2]	AQI Category	WHO[6] PM Air Quality Guidelines (AQGs)[3]
August	8/13	12.00	50	15.63	58	0 – 50 Concern: Good Color: Green 51-100 Concern: Moderate Color: Yellow Hazard Comment: *Air quality is acceptable. However, there may be a risk for some people, particularly those who are highly sensitive[4] to air pollution.*	15 µg/m^3 (24-hour)
	8/24	13.47	54	17.67	63		
	8/25	13.15	53	18.14	64		
September	9/6	10.94	45	15.35	58		
	9/7	10.58	44	15.83	59		
	9/14	15.83	59	19.01	66		
	9/15	14.90	57	19.33	66		
	9/27	13.70	54	15.09	57		
	9/28	15.74	59	16.75	61		
	9/29	15.50	58	16.96	61		
	9/30	15.86	59	18.83	65		
October	10/1	20.11	68	24.63	77		
	10/2	15.41	58	20.19	68		
	10/15	13.86	55	17.45	62		
	10/21	15.85	59	15.12	57		
November	11/10	24.52	77	21.40	71		
	11/17	21.02	70	19.14	66		
	11/18	20.58	69	15.91	59		

*µg/m^3: micrograms per cubic meter
[1]AMS: Ambient Air Monitoring Station
[2]AQI: Air Quality Index. U.S. EPA's index for reporting air quality.
[3]AQG: Air Quality Guidelines (AQGs) from the World Health Organization (WHO) in Geneva.[2]
[4]Sensitive: ATSDR defines "sensitive" population subgroups as people who are more sensitive to the effects of inhalation exposure to pollutants such as pregnant women, children, and older adults (≥65 years). [3]
[5]PM: Particulate matter
[6]WHO: World Health Organization. It is a specialized agency of the United Nations responsible for international public health.
Green highlighted numbers represent good air quality per the AQI calculator.

[2] WHO 2021 AQG's are screening levels reflect the numeric values for 24-hours. ATSDR does not have health-based guideline value for PM.
[3] https://www.atsdr.cdc.gov/emes/public/docs/Sensitive%20Populations%20FS.pdf

Table 3: Random Days when the 24-hour Concentration of PM at the Athens-Clarke County (AMS) was Higher than 24-hour Corrected PM Concentrations in Madison County.

Month	Date (2021)	24-hour PM Concentration at Athens Clarke County AMS[1] (µg/m^3)*	AQI[2]	24-hour Corrected PM[4] Concentrations in Madison County (µg/m^3)*	AQI[3]	AQI Category	WHO[5] PM Air Quality Guidelines (AQGs)[3]
August	8/16	6.12	25	4.44	18	0 – 50 Concern: Good Color: Green 51-100 Concern: Moderate Color: Yellow	15 µg/m^3 (24-hour)
October	10/20	14.71	56	13.79	54		
	10/23	12.85	52	10.91	45		
	10/27	5.50	23	4.46	18		

*µg/m^3: micrograms per cubic meter
[1]AMS: Ambient Air Monitoring Station
[2]AQI: Air Quality Index. U.S. EPA's index for reporting air quality.
[3]AQG: Air Quality Guidelines (AQGs) from the World Health Organization (WHO) in Geneva.
[4]PM: Particulate matter
[5]WHO: World Health Organization. It is a specialized agency of the United Nations responsible for international public health.
Green highlighted numbers represent good air quality in the AQI calculator. Yellow highlighted numbers represent moderate air quality.

Data Evaluation

Table 2 shows the 24-hour average PM from August 2021 to November 2021 that exceeds the WHO PM AQGs. Concentrations of PM in ambient air in Madison County near the energy plant were detected using PurpleAir sensors. For acute duration (≤24-hour) averages are compared to the 24-hour AQG. EPA's AQI is also reported for 24-hour average. DPH did not evaluate for health effects from chronic exposures to PM because a full year of data was not available.

The concentration of PM was slightly elevated in Madison County from August through October 2021, which slightly dropped during the month of November 2021. EPD's Athens-Clarke County air monitoring station recorded comparable concentrations of PM values to Madison County. Table 3 shows some days where EPD's Athens-Clarke County air monitoring station recorded higher concentrations of PM than Madison County.

Maximum concentrations of PM in both counties fall under the AQI moderate category. Table 2 shows three days where the PM level was recorded in AQI in the good category at EPD's Athens-Clarke County air monitoring station. There were eighteen days between August and October 2021 where the AQI category was moderate. Table 3 shows four random days between August 2021 and November 2021, where the Madison County PurpleAir sensor recorded PM concentrations lower than the Athens-Clarke County air monitoring station where

the AQI category was good. The most recent national standard refers to the current 24-hour $PM_{2.5}$ National Ambient Air Quality Standard as 35 µg/m^3. Both counties recorded $PM_{2.5}$ values that were lower than 35 µg/m^3.

Figure 6.A in Appendix A shows the 2000-2020 trend in peak 24-hour $PM_{2.5}$ concentrations nation-wide. The data are based on the 98th percentile of 24-hour concentrations at each monitoring site over a 3- year period, which is the metric used by U.S. EPA to determine attainment of the $PM_{2.5}$ 24-hour National Ambient Air Quality Standard (NAAQS) of 35 µg/m^3. It remains above the WHO AQG of 15 µg/m^3.

Identifying the Source of PM

PM is ubiquitous across every region, whether or not there is a nearby attributable source. Additionally, PM has seasonal trends, and limited data sets may over- or under-estimate PM exposures. Although the dataset is small, meteorological and spatial data indicate that a sole source is not responsible for a great proportion of PM and levels exceeding the PM comparison values. The following reasons eliminate the GRP Madison facility as the sole source for PM in the area.

- The plant operates 24/7. However, elevated PM concentrations are detected only on some days. The Athens-Clarke County air monitoring station recorded higher PM concentrations than Madison County near the energy facility for several days. The PM concentration would have to be elevated every day if the energy plant was the sole contributing source of elevated concentration of PM in ambient air.

- There are other known sources of PM around the energy plant. Precursors that lead to the formation of $PM_{2.5}$ are emitted by a variety of sources. There are two major roads, a railroad track, and agricultural land surrounding the energy plant. The literature identifies all these as source of $PM_{2.5}$ [Bauer 2016].

- The prevailing wind direction indicates that the highest concentration of PM should be dispersed west and east of the energy plant. However, PurpleAir Sensors were installed in areas that were located south of the plant. This does not provide an accurate representation of the PM concentration near the energy plant.

- The average 24-hour PM concentrations are relatively consistent with Athens-Clarke County Ambient Air Monitoring Station. The ambient air monitoring station is located approximately 15 miles southwest of the energy facility. PurpleAir Sensors represent local air quality rather than site related source.

- U.S. EPA scientists have found that PurpleAir sensors consistently overpredict, and sometimes underpredict PM concentrations in most locations. Even with the correction factor used, the $PM_{2.5}$ concentrations were sometimes underpredicted. PurpleAir sensors recorded PM concentrations of 0 µg/m^3 of for few hours the day for several days. These readings were adjusted to 3.099 µg/m^3 using EPA's local correction factor. This yielded a higher concentration of $PM_{2.5}$ in a 24-hour period.

Physical Hazard

Noise/Sound Level Assessment

Noise is often defined as unwanted sound. Sound is the result of pressure changes in a medium (usually air), caused by vibration or turbulence. Sound intensity is the amount of sound energy in a confined space. It is measured in decibels (dB) [CDC 2022]. Noise pollution adversely affects the lives of millions of people. Problems related to noise include stress-related illnesses, high blood pressure, speech interference, hearing loss, sleep disruption, and lost productivity. Exposure to loud noise can cause blood vessels to constrict. This makes the heart work harder to pump the same amount of blood around [CDC 2022]. Over many years, this may contribute to heart disease. Noise Induced Hearing Loss (NIHL) is the most common and often discussed health effect. DPH evaluated available data using EPA's 1974 noise study for NIHL, the interference and annoyance that noise may cause for residents, and the source of excessive noise at Madison County [EPA 1974]. The risk of hearing damage from noise increases with the sound intensity, not the loudness of the sound [CDC 2022b].

The noise survey near GRP Madison was conducted by Arpeggio, a company that specializes in acoustics and audiovisual technology. The survey took place from approximately 10:35 am on Friday, February 19, 2021, to approximately 10:43 am on Monday, February 22, 2021. Five calibrated sound level meters were deployed at 5 different locations (one on the GRP Madison property and four in the community). These offsite locations were chosen by Arpeggio and based on prior experiences with noise. Figure 4 shows the five sites that are identified, along with their approximate distance from the meters on GRP Madison property [Arpeggio 2021]. Table 4 shows the plant's distance from the monitor, noise level, and area around the sound monitors.

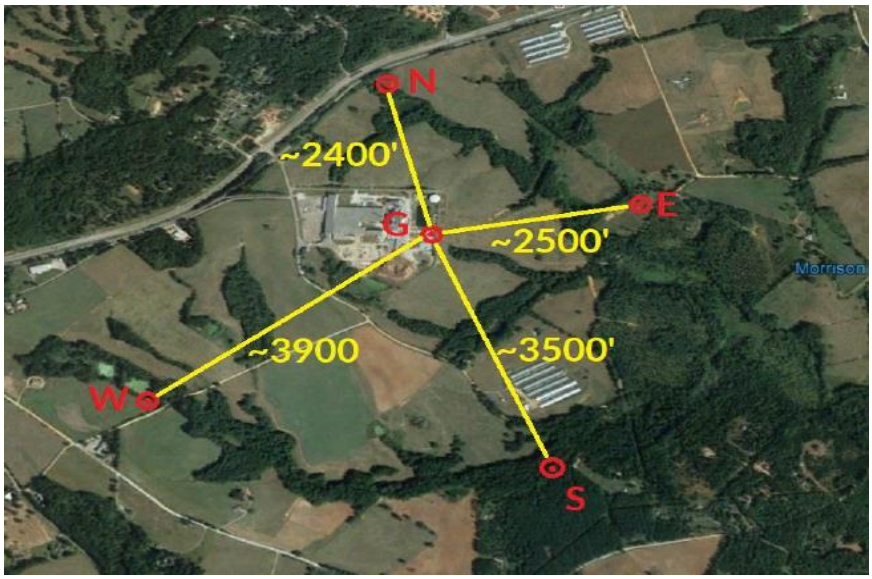

Figure 4: Five Sound Level Meter Locations. The number represents the distance (feet) from the plant monitor, G. This map was created by Arpeggio.

Table 4: Noise Levels at Different Location around the GRP Madison Energy Facility.

SLM[1] ID	Area Description	Distance (miles)	24hr Noise Level Range (dB[2])	24hr Average Noise Level (dB)	Noise Level that causes Hearing Damage
G	Monitor located at GRP property. Near conveyor, dryer, cooling tower, and steam turbine.	Plant Property	66 to 71	67	**70 dBA**[3] or above over a prolonged period may damage hearing. **120 dBA** or above can cause immediate harm to your ears. **55 dBA** or above can cause speech interference and annoyance.
N	Russel and Sons Farm Holding. Near GA Hwy 72W and railroad track.	0.45	46 to 78	52	
E	Private residential property	0.47	40 to 61	50	
S	Private residential property	0.66	36 to 59	46	
W	Russel and Sons Farm Holding. Near Waggoner Grove Church Road.	0.73	41 to 65	47	

[1]SLM: Sound Level Meter[4]
[2]dB: Decibels. Sound is measured in decibels (dB).
[3]dBA: Measurement has been adjusted to consider the varying sensitivity of the human ear to different frequencies of sound.

Data Evaluation

Three of the five SLMs that were placed to record sound levels reported levels under 70 dB. Sound meter G was placed in the GRP Madison facility site and expected to have the highest noise level. However, sound meter N, located 0.45 miles away, recorded a noise level above 70 dB a total of 14 times in a 24-hour period. Sound meter N, closest to the plant, was placed near highway 72W and a nearby railroad track, which may have impacted the result. Sound meter W was placed near Waggoner Grove Church Road, and occasionally recorded sound levels higher than 70 dB in a 24-hour period. The next closest sound meter, E, was located 0.47 miles away east of the plant. This meter did not record a sound level greater than 61dB.

Average 24-hour results indicate the highest sound levels were at sound meter N, 0.45 miles away from the GRP Madison site. Average sound levels should not be considered as actual sound levels at the meters because samples were taken for a small snapshot of time, and thus may not have been reflective of any changes that can occur over longer periods of time.

Sound levels above 70 dB over a prolonged period of time may start to damage hearing [CDC[5]]. Exposure to loud sounds can damage the nerve endings in the inner ear. The result can be permanent hearing loss that cannot be corrected through surgery or with medicine[6] [OSHA 2022]. The EPA and the WHO recommend maintaining environmental sounds below 70 dB over

[4] The sound measurement equipment used was all manufactured by Larson-Davis. The sound level meters (SLM) were time synchronized and configured to log several metrics every second for the approximately 72-hour survey.
[5] https://www.cdc.gov/nceh/hearing_loss/what_noises_cause_hearing_loss.html#print
[6]https://www.osha.gov/noise#:~:text=Exposure%20to%20loud%20noise%20kills,through%20surgery%20or%20with%20medicine.

a 24-hour period to prevent noise-induced hearing loss. The EPA also specified limits for speech interference and annoyance for sounds levels above 55 dB for outdoors activities, and 45 dB for indoor activities [CDC 2022, EPA 1974]. The louder the sound, the shorter the amount of time it takes for hearing loss to occur. The longer the exposure, the greater the risk for hearing loss, especially when hearing protection is not used or there is not enough time for the ears to rest between exposures [CDC 2022b]. Please refer to Appendix B, table 5 that shows dB levels and how sound from everyday sources affect hearing.

Health Outcome Data

In February 2023, the DPH Comprehensive Cancer Registry analyzed the 2016 to 2020 cancer incidence data available for Madison County, census tract 204, where GRP Madison is located (shown in Figure 5), and census tracts surrounding census tract 204. Census tracts are geographic entities within counties.

Analysis of a distribution of cancer incidence rates are higher for all cancer sites, liver, lung, and thyroid cancers in Madison County compared to cancer incidence rates for the State of Georgia. Census tract 204 has elevated cancer incidence rates for all cancer sites and for lung and bronchus cancers (Appendix C). In census tract 204, the estimated prevalence of current smoking among adults aged 18 and older was 22.1% in 2020, which is significantly higher than the state average of 15.8%[7]. There is also the potential that census tract 204 had high or similar smoking rates 10 and 20 years ago than they do today.

Cigarette smoking is the number one risk factor for lung cancer. People who smoke cigarettes are 15 to 30 times more likely to get lung cancer or die from lung cancer than people who do not smoke [CDC 2022]. Even smoking a few cigarettes, a day, or occasional smoking increases the risk of lung cancer. Breathing smoke from other people's cigarettes, pipes, or cigars (secondhand smoke) also increases risk for lung cancer.

[7] Data sources: The model-based estimates were generated using BRFSS 2020 or 2019, Census 2010 population counts, or census county population estimates of 2020 or 2019, and ACS 2015-2019. For more information visit https://www.cdc.gov/places.Credit: Centers for Disease Control and Prevention, National Center for Chronic Disease and Health Promotion, Division of Population Health, Atlanta, GA

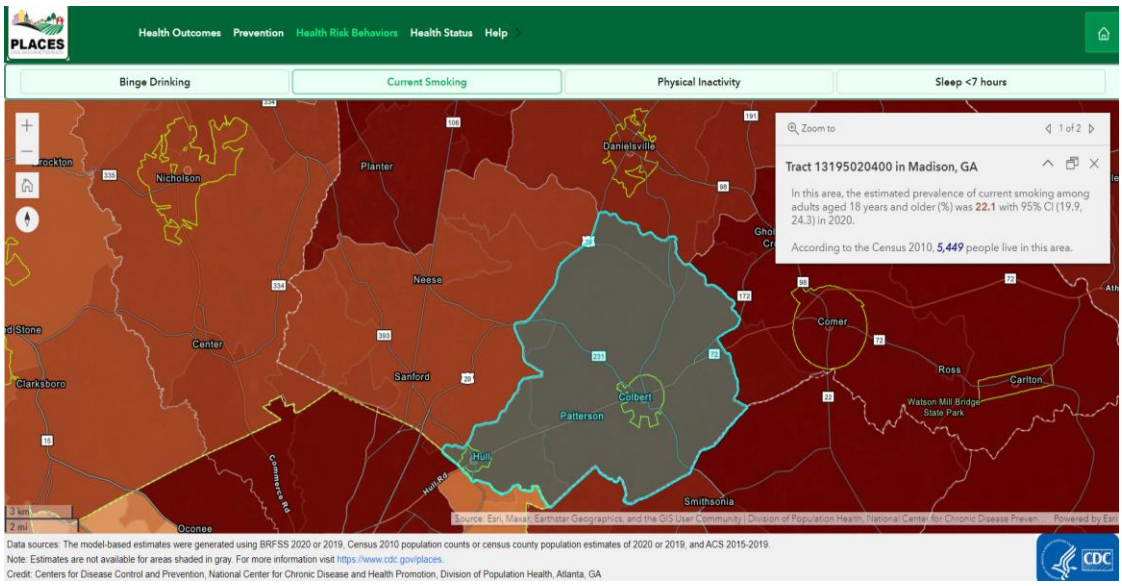

Figure 5: Census Tract reference Map: Madison County, GA.

No other health outcome data such as mortality or birth defects were evaluated. No site-specific health outcome data related to this site exist.

Conclusions

DPH evaluated exposure to PM and sound along with cancer incidence rates in Madison County, census tract 204, and surrounding census tracts and developed the following conclusions:

1. DPH concludes that meteorological and spatial data indicate that the GRP Madison Renewable Energy Facility is not the sole source responsible for a great proportion of $PM_{2.5}$ and levels exceeding the $PM_{2.5}$ comparison values.

2. DPH concludes that exposure to elevated concentrations of $PM_{2.5}$ could harm public health because of an increased risk for adverse health effects among highly sensitive people. Harmful health effects are possible based on the following considerations:

    a. Depending on the concentration of PM, any single 24-hour period above the AQG potentially could result in harmful effects for either highly sensitive or sensitive individuals, the general (healthy) public, or all for all groups. The concentration of PM detected by PurpleAir sensors exceeded AQG value of 15 µg/m³ at least eighteen times during the months of August 2021 to November 2021. There is a high chance that PM concentrations exceeded AQG value more times during the year.

b. The AQI category is moderate, meaning that highly sensitive individuals should be concerned. Sensitive individuals have an increased likelihood of experiencing health effects as a result of exposures (e.g., persons with severe asthma, COPD, and pre-existing respiratory or cardiovascular disease).

3. DPH concludes that the available data is not sufficient to identify the source of the noise level above 70 dB. Occasional higher noise levels should not cause noise-induced hearing loss because the 24 hours a day includes a sufficient amount of quiet time for hearing recovery between high noise level exposures. However, repeated exposure to sound levels above 70 dB over a prolonged period could harm people's hearing living within a 0.45 miles radius of the plant. Sound level above 55 dB can cause speech interference and annoyance for some engaging in outdoor activities. SLM N, which was located 0.45 miles away, recorded noise levels above 70 dB a total 14 times in a 24-hour period. Also, this SLM was placed near highway 72W and a railroad track which may have impacted the result. However, it is likely that GRP Madison facility may also be slightly contributing to the noise level.

4. Increased lung and bronchus cancers in census tract 204, where GRP Madison is located, are likely due to increased smoking prevalence among the population that live in this census tract compared to the state of Georgia. In census tract 204, the estimated prevalence of smoking among adults aged 18 and older was 22.1% in 2020, which is significantly higher than the state of Georgia's average of 15.8%. Tobacco product use can cause cancer throughout the body. Breathing secondhand smoke can cause lung cancer as well.

Recommendations

To protect the health of the individuals around the GRP Madison Renewable Energy Facility, DPH recommends the following actions:

1. Because of the MCCPC's concern about inhaling PM and toxic chemicals released from GRP Madison to ambient air. MCCPC should work with a public or private agency/laboratory to perform ambient air quality testing near the plant following EPA's established guidelines.

2. Highly sensitive people should consult the air quality forecast and consider reducing prolonged or heavy exertion on days where air quality is predicted to be poor.

3. The MCCPC community action group, Madison County officials, and residents of Madison County may pass an appropriate ordinance to control noise in Madison County.

Public Health Action Plan

DPH will:

1. Be available to review and assist with appropriate designing of any future noise study.
2. Continue to review sampling data and take appropriate actions as additional data become available.
3. Continue to respond to all requests for information and health concerns regarding the the breathing of contaminated outdoor air.

DPH is available to review additional data and assist with communicating health risks to residents and community action groups. If you have any questions regarding the findings presented in this health consultation, please contact Anita Saha at (404) 657-6534 or by email at anita.saha@dph.ga.gov.

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Report Preparation

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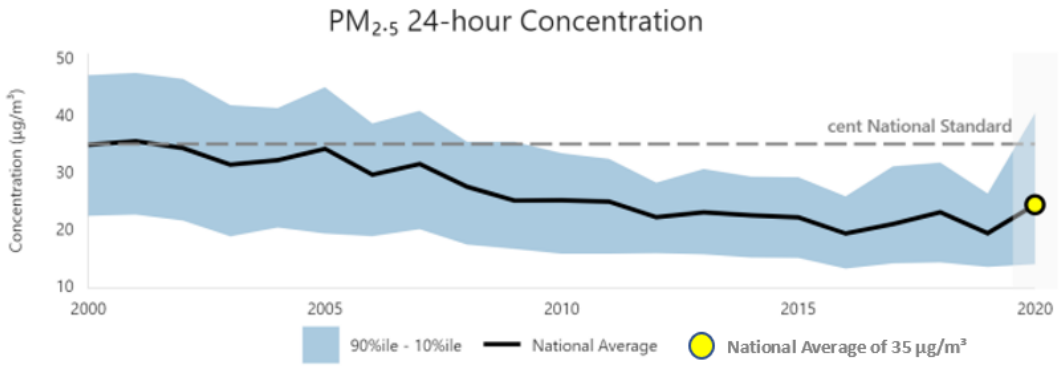
Appendix A: Images and Maps for $PM_{2.5}$



The "Most Recent National Standard" refers to the current 24-hour $PM_{2.5}$ National Ambient Air Quality Standard of 35 µg/m³. The data trend is based on monitoring sites nationwide measuring $PM_{2.5}$ that have sufficient data to assess $PM_{2.5}$ trends since 1990. The corrected 24-hour $PM_{2.5}$ concentration at Madison County never exceeded 25 µg/m³ from August through November 2021. This is lower than the 24-hour $PM_{2.5}$ National Ambient Air Quality Standard of 35 µg/m³.

Source: U.S. EPA. 2021a. Our Nation's Air – Trends Through 2020. 2021. Available at: gispub.epa.gov/air/trendsreport/2021/

Figure 6.A: Peak 24-hour $PM_{2.5}$ Concentrations in the U.S., 2000-2020, µg/m^3

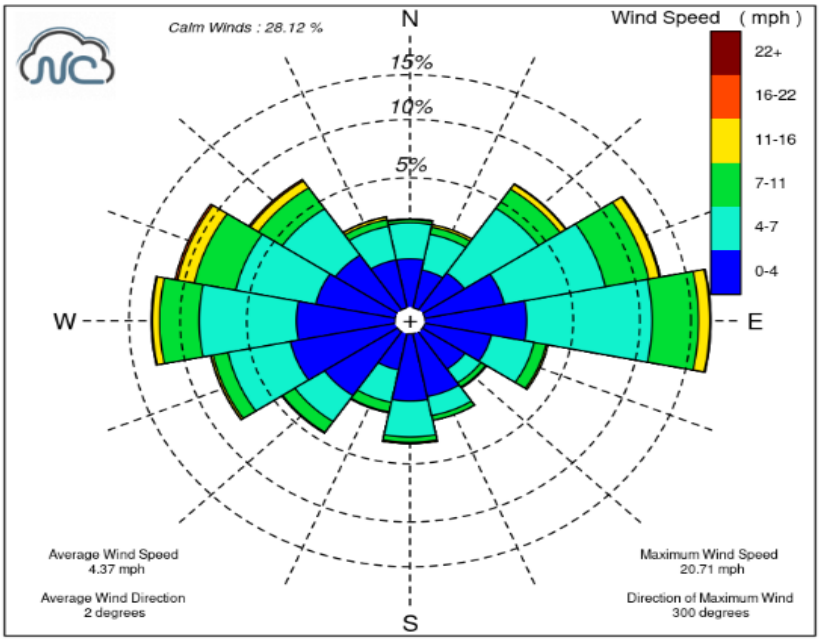


Figure 7.A: Wind Rose Map for Athens Municipal Airport from January 1, 2021, to December 31, 2021. Wind roses show the general direction winds blew from, wind speeds and how often winds blew. *Source: Environmental Protection Division (EPD).*

Appendix B: Tables

Everyday Sounds and Noises	Average Sound Level (measured in decibels)	Typical Response (after routine or repeated exposure)
Softest sound that can be heard	0	Sounds at these dB levels typically don't cause any hearing damage.
Normal breathing	10	
Ticking watch	20	
Soft whisper	30	
Refrigerator hum	40	
Normal conversation, air conditioner	60	
Washing machine, dishwasher	70	You may feel annoyed by the noise
City traffic (inside the car)	80–85	You may feel very annoyed
Gas-powered lawnmowers and leaf blowers	80-85	Damage to hearing possible after 2 hours of exposure
Motorcycle	95	Damage to hearing possible after about 50 minutes of exposure
Approaching subway train, car horn at 16 feet (5 meters), and sporting events (such as hockey playoffs and football games)	100	Hearing loss possible after 15 minutes
The maximum volume level for personal listening devices; a very loud radio, stereo, or television; and loud entertainment venues (such as nightclubs, bars, and rock concerts)	105–110	Hearing loss possible in less than 5 minutes
Shouting or barking in the ear	110	Hearing loss possible in less than 2 minutes
Standing beside or near sirens	120	Pain and ear injury
Firecrackers	140–150	Pain and ear injury

Table 5: Common Sources of Noise and Decibel Level. *Source: CDC*

Table 6: U.S. Environmental Protection Agency Particulate Matter AQI designations and Health Statements

AQI Category	24-hr Average PM_{10} Concentration ($\mu g/m^3$)	24-hr Average $PM_{2.5}$ Concentration ($\mu g/m^3$)	***Health Statements*** ***Sensitive Groups:*** *Pregnant women, children, and the elderly (≥65 years)* ***Highly Sensitive Groups:*** *sensitive individuals or individuals in the general population with pre-existing health conditions that make them more susceptible to adverse health outcomes from exposure.*	
			Conclusion	**Recommendation**[¶]
Good	0 – 54	0 - 12.0	None.	None.
Moderate	55 – 154	12.1 - 35.4	**Exposures in this range cause:** 1. Respiratory symptoms in unusually sensitive individuals; 2. Exacerbation of cardiopulmonary disease.	Unusually sensitive[*] people should consider reducing prolonged or heavy exertion.
Unhealthy for Sensitive Groups	155 – 254	35.5 - 55.4	**Exposures in this range cause:** 1. Increased likelihood of respiratory symptoms in sensitive groups; 2. Exacerbation of symptoms of or death from pre-existing cardiopulmonary disease.	People with heart or lung disease, older adults, children, and people of lower socioeconomic status should reduce prolonged or heavy exertion.
Unhealthy	255 – 354	55.5 - 150.4	**Exposures in this range cause:** 1. Increased likelihood of respiratory symptoms in sensitive groups; 2. Exacerbation of symptoms of or death from pre-existing cardiopulmonary disease; and 3. Increased likelihood of respiratory effects in the general public.	People with heart or lung disease, older adults, children, and people of lower socioeconomic status should avoid prolonged or heavy exertion; everyone else should reduce prolonged or heavy exertion.
Very Unhealthy	355 – 424	150.5 - 250.4	**Exposures in this range cause:** 1. Increased likelihood of respiratory symptoms in sensitive groups; 2. Significant exacerbation of symptoms of or death from pre-existing cardiopulmonary disease; and 3. Significant increase in respiratory effects in general population.	People with heart or lung disease, older adults, children, and people of lower socioeconomic status should avoid all physical activity outdoors. Everyone else should avoid prolonged or heavy exertion.
Hazardous	425 – 604	250.5 – 500.4	**Exposures in this range cause:** 1. Serious aggravation of respiratory symptoms in sensitive groups; 2. Serious exacerbation of symptoms of or death from pre-existing cardiopulmonary disease; and 3. Serious risk of respiratory effects in general population.	Everyone should avoid all physical activity outdoors; people with heart or lung disease, older adults, children, and people of lower socioeconomic status should remain indoors and keep activity levels low.

[†] *Adapted from: https://www.airnow.gov/sites/default/files/2020-05/aqi-technical-assistance-document-sept2018.pdf*

[¶] *For several reasons (e.g. greater urban and regional exposure in urbanized areas, less access to healthcare, greater prevalence of respiratory and cardiovascular disease), people of lower socioeconomic status are also more likely to have increased risk for adverse health outcomes from exposure to elevated PM (Pratt et al. 2015).*

[*] *The U.S.EPA does not have a formal definition of an* ***unusually sensitive*** *person. For health assessment purposes, health assessors should assume "unusual sensitivity" is a subjective term that suggests an individual's personal susceptibility based on their health status, sensory vulnerability, and pre-existing conditions at the time of exposure. ATSDR uses the term "highly sensitive" in place of "unusually sensitive".*

Table 7: Long Term Effects Related to Exposure to Noise

Long-term effects related to exposure to noise and classification of the evidence for a causal relationship between noise and effect. The last three columns contain information on the observation threshold of an effect for which the causal relationship with noise exposure (second column) is judged to be sufficient.[a]

Effect	Classification of evidence[b]	Exposure situation	Observation threshold		
			Metric	Value (dB(A)	Indoors/ outdoors[c]
Hearing impairment	Sufficient	Occ	$L_{Aeq,8h}$	75	Indoors
		Env	$L_{Aeq,24h}$	70	Indoors
		Occ unb	$L_{Aeq,8h}$	< 85	Indoors
Hypertension	Sufficient	Occ ind	$L_{Aeq,8h}$	< 85	Indoors
		Env	L_{dn}	70	Outdoors
Ischemic heart disease	Sufficient	Env	L_{dn}	70	Outdoors
Biochemical effects	Limited	Occ			
		Env			
Immune effects	Limited	Occ			
		Env			
Birth weight	Limited	Occ			
		Env air			
Congenital effects	Lacking	Occ			
		Env			
Psychiatric disorders	Limited	Env air			
Annoyance	Sufficient	Occ office	$L_{Aeq,8h}$	< 55	Indoors
		Occ ind	$L_{Aeq,8h}$	< 85	Indoors
		Env	L_{dn}	42[d]	Outdoors
Absentee rate	Limited	Occ ind			
		Occ office			
Psychosocial well-being	Limited	Env			
Performance	Limited	Occ env			
	Sufficient	School	$L_{Aeq,school}$	70	Outdoors
Sleep disturbance, changes in					
Sleep pattern	Sufficient	Sleep	$L_{Aep,night}$	< 60	Outdoors
Awakening	Sufficient	Sleep	SEL	55	Indoors
Sleep stages	Sufficient	Sleep	SEL	35	Indoors
Subjective sleep quality	Sufficient	Sleep	$L_{Aep,night}$	40	Outdoors
Heart rate	Sufficient	Sleep	SEL	40	Indoors
Hormone levels	Limited	Sleep			
Immune system	Inadequate	Sleep			
Mood next day	Sufficient	Sleep	$L_{Aep,night}$	< 60	Outdoors
Performance next day	Limited	Sleep			

Abbreviations: env, living environment; ind, industrial; occ, occupational situation; school, exposure of children at school; unb, unborn: exposure of pregnant mother. [a]The table is adapted from Table 1 of the 1994 Health Council report (6). [b]Classification of evidence of causal relationship between noise and health. [c]Value relates to indoor or outdoor noise assessment. [d]The observation threshold for

Appendix C: Cancer Incidence Rates

Table 8: Age-Adjusted Cancer Incidence Rates for the State of Georgia, 2016-2020

	Total		Males		Females	
Site	Cases	Rate	Cases	Rate	Cases	Rate
All Sites	271197	462.8	140582	525.7	130572	417.4
Oral Cavity	7553	12.5	5406	19.4	2144	6.7
Esophagus	2621	4.3	2029	7.4	591	1.8
Stomach	3632	6.3	2158	8.2	1474	4.7
Colon and Rectum	22688	39.2	12101	45.7	10586	33.8
Liver	4208	6.7	3169	11.0	1038	3.1
Pancreas	7768	13.3	3983	15.2	3785	11.8
Larynx	2088	3.4	1669	6.0	418	1.2
Lung and Bronchus	34351	57.8	18479	70.1	15869	48.4
Bone and Joints	505	0.9	278	1.1	227	0.8
Melanoma	14307	25.0	8396	32.6	5910	19.6
Breast	--	--	--	--	40278	129.0
Uterine Cervix	--	--	--	--	2186	7.9
Uterine Corpus	--	--	--	--	7782	23.7
Ovary	--	--	--	--	2989	9.6
Prostate	--	--	38433	134.2	--	--
Testis	--	--	1110	4.5	--	--
Kidney and Renal Pelvis	10313	17.5	6509	24.0	3804	12.0
Bladder (Incl in situ)	10130	17.8	7751	31.7	2378	7.5
Brain and Other Nervous System	3265	5.9	1755	6.8	1510	5.1
Thyroid	6332	11.5	1676	6.3	4656	16.4
Hodgkin Lymphoma	1310	2.5	677	2.6	632	2.3
Non-Hodgkin Lymphoma	9918	17.4	5487	21.4	4426	14.2
Multiple Myeloma	5009	8.6	2626	10.1	2380	7.5
Leukemias	7990	14.3	4579	18.2	3410	11.3

Average annual rate per 100,000, age-adjusted to the 2000 US standard population.

Note: Due to the COVID-19 pandemic, Georgia and the United States experienced a decrease in cancer diagnoses in 2020. This drop in incidence was estimated to be about 7-10% as compared to previous years.

Suggested Citation: Georgia Department of Public Health, Georgia Comprehensive Cancer Registry, 2023.

Cancer Incidence, 2016-2020
Madison County, Georgia
Data Summary

All Cancer Sites

- 971 new cancer cases were diagnosed in Madison County from 2016 to 2020, an average of 194 new cases per year.
- About 102 males and 93 females are diagnosed with cancer every year in Madison County.
- The overall age-adjusted cancer incidence rate in Madison County is 502.5 per 100,000 population. This is significantly higher than the rate for Georgia (462.8 per 100,000).
- Males are 16% more likely than females to be diagnosed with cancer in Madison County.

Males

- The overall age-adjusted cancer incidence rate for males in Madison County is 541.8 per 100,000 population. This is higher than the rate for Georgia males (525.7 per 100,000), but this difference is not statistically significant.
- Prostate, lung, and colorectal are the top cancer sites among males in both Madison County and the State of Georgia.
- The age-adjusted prostate cancer incidence rate is significantly lower for males in Madison County (101.5 per 100,000) than for Georgia males (134.2 per 100,000).
- The age-adjusted lung cancer incidence rate is significantly higher for males in Madison County (97.9 per 100,000) than for Georgia males (70.1 per 100,000).
- The age-adjusted colorectal cancer incidence rate is higher for males in Madison County (57.6 per 100,000) than for Georgia males (45.7 per 100,000), but this difference is not statistically significant.
- The age-adjusted liver cancer incidence rate is significantly higher for males in Madison County (20.7 per 100,000) than for Georgia males (11.0 per 100,000).

Females

- The overall age-adjusted cancer incidence rate for females in Madison County is 468.6 per 100,000 population. This is significantly higher than the rate for Georgia females (417.4 per 100,000).
- Breast, lung, and colorectal are the top cancer sites among females in both Madison County and the State of Georgia.
- The age-adjusted breast cancer incidence rate is higher for females in Madison County (150.5 per 100,000) than for Georgia females (129.0 per 100,000), but this difference is not statistically significant.
- The age-adjusted lung cancer incidence rate is significantly higher for females in Madison County (69.0 per 100,000) than for Georgia females (48.4 per 100,000).
- The age-adjusted colorectal cancer incidence rate for females in Madison County (34.4 per 100,000) is similar to that for Georgia females (33.8 per 100,000).

Table 9: Age-Adjusted Cancer Incidence Rates for Madison County, GA, 2016-2020

	Total		Males		Females	
Site	Cases	Rate	Cases	Rate	Cases	Rate
All Sites	971	502.5	508	541.8	463	468.6
Oral Cavity	32	15.1	21	19.7	11	~
Esophagus	8	~	***	~	<5	~
Stomach	10	~	***	~	<5	~
Colon and Rectum	82	45.5	49	57.6	33	34.4
Liver	25	12.2	20	20.7	5	~
Pancreas	21	10.7	10	~	11	~
Larynx	9	~	***	~	<5	~
Lung and Bronchus	168	82.4	95	97.9	73	69.0
Bone and Joints	<5	~	<5	~	<5	~
Melanoma	55	28.8	35	39.0	20	19.8
Breast	--	--	--	--	141	150.5
Uterine Cervix	--	--	--	--	<5	~
Uterine Corpus	--	--	--	--	35	32.2
Ovary	--	--	--	--	8	~
Prostate	--	--	101	101.5	--	--
Testis	--	--	<5	~	--	--
Kidney and Renal Pelvis	38	18.4	25	24.7	13	~
Bladder (Incl in situ)	42	21.5	35	38.0	7	~
Brain and Other Nervous System	12	~	6	~	6	~
Thyroid	29	19.7	9	~	20	26.6
Hodgkin Lymphoma	6	~	<5	~	<5	~
Non-Hodgkin Lymphoma	37	18.6	24	26.5	13	~
Multiple Myeloma	16	7.9	6	~	10	~
Leukemias	19	10.9	13	~	6	~

Average annual rate per 100,000, age-adjusted to the 2000 US standard population.
Rates highlighted in yellow are significantly lower than the state rate (p<.05).
Rates highlighted in orange are significantly higher than the state rate (p<.05).
~ Rates not calculated where the count is less than sixteen.
***** Data suppressed for confidentiality purposes**

Note: Due to the COVID-19 pandemic, Georgia and the United States experienced a decrease in cancer diagnoses in 2020. This drop in incidence was estimated to be about 7-10% as compared to previous years.

Suggested Citation: Georgia Department of Public Health, Georgia Comprehensive Cancer Registry, 2023.

Cancer Incidence, 2016-2020
Census Tract 204* in Madison County, Georgia
Data Summary

All Cancer Sites

- 175 new cancer cases were diagnosed in Census Tract 204 (CT204) in Madison County from 2016 to 2020, an average of 35 new cases per year.
- About 19 males and 16 females are diagnosed with cancer every year in CT204.
- The overall age-adjusted cancer incidence rate in CT204 is 549.0 per 100,000 population. This is significantly higher than the rate for Georgia (462.8 per 100,000).
- Males are 34% more likely than females to be diagnosed with cancer in CT204.

Males

- The overall age-adjusted cancer incidence rate for males in CT204 is 638.5 per 100,000 population. This is higher than the rate for Georgia males (525.7 per 100,000), but this difference is not statistically significant.
- Prostate and lung are the top cancer sites among males in both CT204 and the State of Georgia.
- The age-adjusted prostate cancer incidence rate could not be calculated because there were fewer than sixteen cases, but there does not appear to be an excess of cases.
- The age-adjusted lung cancer incidence rate is significantly higher for males in CT204 (160.7 per 100,000) than for Georgia males (70.1 per 100,000).
- The age-adjusted colorectal cancer incidence rate could not be calculated because there were fewer than sixteen cases, but there does not appear to be an excess of cases.

Females

- The overall age-adjusted cancer incidence rate for females in CT204 is 475.9 per 100,000 population. This is higher than the rate for Georgia females (417.4 per 100,000), but this difference is not statistically significant.
- Breast and lung are the top cancer sites among females in both CT204 and the State of Georgia.
- The age-adjusted breast cancer incidence rate is higher for females in CT204 (163.6 per 100,000) than for Georgia females (129.0 per 100,000), but this difference is not statistically significant.
- The age-adjusted lung cancer incidence rate could not be calculated because there were fewer than sixteen cases, but there does not appear to be an excess of cases.

* Defined using the Decennial Census 2010 census tract boundaries

Table 10: Age-Adjusted Cancer Incidence Rates for Census Tract 204*, Madison County, GA, 2016-2020

	Total		Males		Females	
Site	**Cases**	**Rate**	**Cases**	**Rate**	**Cases**	**Rate**
All Sites	175	549.0	96	638.5	79	475.9
Oral Cavity	7	~	***	~	<5	~
Esophagus	<5	~	<5	~	<5	~
Stomach	<5	~	<5	~	<5	~
Colon and Rectum	14	~	8	~	6	~
Liver	<5	~	<5	~	<5	~
Pancreas	7	~	<5	~	<5	~
Larynx	<5	~	<5	~	<5	~
Lung and Bronchus	36	110.8	25	160.7	11	~
Bone and Joints	<5	~	<5	~	<5	~
Melanoma	12	~	7	~	5	~
Breast	--	--	--	--	26	163.6
Uterine Cervix	--	--	--	--	<5	~
Uterine Corpus	--	--	--	--	6	~
Ovary	--	--	--	--	<5	~
Prostate	--	--	14	~	--	--
Testis	--	--	<5	~	--	--
Kidney and Renal Pelvis	<5	~	<5	~	<5	~
Bladder (Incl in situ)	<5	~	<5	~	<5	~
Brain and Other Nervous System	<5	~	<5	~	<5	~
Thyroid	6	~	<5	~	<5	~
Hodgkin Lymphoma	<5	~	<5	~	<5	~
Non-Hodgkin Lymphoma	6	~	***	~	<5	~
Multiple Myeloma	<5	~	<5	~	<5	~
Leukemias	<5	~	<5	~	<5	~

Average annual rate per 100,000, age-adjusted to the 2000 US standard population.
Rates highlighted in yellow are significantly lower than the state rate (p<.05).
Rates highlighted in orange are significantly higher than the state rate (p<.05).
*** Defined using the Decennial Census 2010 census tract boundaries**
~ Rates not calculated where the count is less than sixteen.
***** Data suppressed for confidentiality purposes**

Note: Due to the COVID-19 pandemic, Georgia and the United States experienced a decrease in cancer diagnoses in 2020. This drop in incidence was estimated to be about 7-10% as compared to previous years.

Suggested Citation: Georgia Department of Public Health, Georgia Comprehensive Cancer Registry, 2023.

Cancer Incidence, 2016-2020
Census Tract 204 plus Surrounding Census Tracts* in Madison County, Georgia
Data Summary

All Cancer Sites

- 476 new cancer cases were diagnosed in Census Tract 204 plus surrounding census tracts (CT204plus) in Madison County from 2016 to 2020, an average of 95 new cases per year.
- About 49 males and 46 females are diagnosed with cancer every year in CT204plus.
- The overall age-adjusted cancer incidence rate in CT204plus is 507.3 per 100,000 population. This is higher than the rate for Georgia (462.8 per 100,000), but this difference is not statistically significant.
- Males are 14% more likely than females to be diagnosed with cancer in CT204plus.

Males

- The overall age-adjusted cancer incidence rate for males in CT204plus is 542.4 per 100,000 population. This is higher than the rate for Georgia males (525.7 per 100,000), but this difference is not statistically significant.
- Prostate, lung, and colorectal are the top cancer sites among males in both CT204plus and the State of Georgia.
- The age-adjusted prostate cancer incidence rate is lower for males in CT204plus (105.4 per 100,000) than for Georgia males (134.2 per 100,000), but this difference is not statistically significant.
- The age-adjusted lung cancer incidence rate is significantly higher for males in CT204plus (107.0 per 100,000) than for Georgia males (70.1 per 100,000).
- The age-adjusted colorectal cancer incidence rate is higher for males in CT204plus (62.9 per 100,000) than for Georgia males (45.7 per 100,000), but this difference is not statistically significant.

Females

- The overall age-adjusted cancer incidence rate for females in CT204plus is 475.9 per 100,000 population. This is higher than the rate for Georgia females (417.4 per 100,000), but this difference is not statistically significant.
- Breast, lung, and colorectal are the top cancer sites among females in both CT204plus and the State of Georgia.
- The age-adjusted breast cancer incidence rate is higher for females in CT204plus (152.1 per 100,000) than for Georgia females (129.0 per 100,000), but this difference is not statistically significant.
- The age-adjusted lung cancer incidence rate is higher for females in CT204plus (64.9 per 100,000) than for Georgia females (48.4 per 100,000), but this difference is not statistically significant.
- The age-adjusted colorectal cancer incidence rate is higher for females in CT204plus (39.8 per 100,000) than for Georgia females (33.8 per 100,000), but this difference is not statistically significant.

* Defined using the Decennial Census 2010 census tract boundaries - inlcudes 204, 202, and 203

Table 11: Age-Adjusted Cancer Incidence Rates for Census Tract 204 plus Surrounding Census Tracts*, Madison County, GA, 2016-2020

	Total		Males		Females	
Site	Cases	Rate	Cases	Rate	Cases	Rate
All Sites	476	507.3	247	542.4	229	475.9
Oral Cavity	14	~	***	~	<5	~
Esophagus	<5	~	<5	~	<5	~
Stomach	5	~	<5	~	<5	~
Colon and Rectum	44	51.0	25	62.9	19	39.8
Liver	14	~	***	~	<5	~
Pancreas	12	~	5	~	7	~
Larynx	<5	~	<5	~	<5	~
Lung and Bronchus	85	85.8	51	107.0	34	64.9
Bone and Joints	<5	~	<5	~	<5	~
Melanoma	31	33.0	20	45.1	11	~
Breast	--	--	--	--	70	152.1
Uterine Cervix	--	--	--	--	<5	~
Uterine Corpus	--	--	--	--	17	32.4
Ovary	--	--	--	--	<5	~
Prostate	--	--	50	105.4	--	--
Testis	--	--	<5	~	--	--
Kidney and Renal Pelvis	15	~	9	~	6	~
Bladder (Incl in situ)	16	16.4	***	~	<5	~
Brain and Other Nervous System	6	~	<5	~	<5	~
Thyroid	17	25.3	5	~	12	~
Hodgkin Lymphoma	<5	~	<5	~	<5	~
Non-Hodgkin Lymphoma	15	~	8	~	7	~
Multiple Myeloma	10	~	<5	~	***	~
Leukemias	7	~	***	~	<5	~

Average annual rate per 100,000, age-adjusted to the 2000 US standard population.
Rates highlighted in yellow are significantly lower than the state rate (p<.05).
Rates highlighted in orange are significantly higher than the state rate (p<.05).
*** Defined using the Decennial Census 2010 census tract boundaries - inlcudes 204, 202, and 203**
~ Rates not calculated where the count is less than sixteen.
***** Data suppressed for confidentiality purposes**

Note: Due to the COVID-19 pandemic, Georgia and the United States experienced a decrease in cancer diagnoses in 2020. This drop in incidence was estimated to be about 7-10% as compared to previous years.

Suggested Citation: Georgia Department of Public Health, Georgia Comprehensive Cancer Registry, 2023.

Figure 8.A: 2010 Census- Census Tract reference Map: Madison County, GA.