EPD Ethylene Oxide Ambient Air Monitoring
Fact Sheet

Brief History

The Environmental Protection Agency (EPA)'s most recent National Air Toxics Assessment (NATA), released in August 2018, identified two areas in Georgia requiring further study to better understand possible public health risks from exposure to ethylene oxide. The two known sources of ethylene oxide contributing to the NATA results in Georgia were facilities that sterilize medical devices using ethylene oxide. Although the NATA was released in 2018, the findings were based on information collected in 2014. Using more up-to-date information about the two sterilization facilities identified in the NATA, the Georgia Environmental Protection Division (GA EPD) modeled the impact of the facilities' ethylene oxide emissions on neighboring communities. GA EPD determined that the risk was not as high as suggested in EPA's screening modeling. However, the change in how EPA characterized the risk from ethylene oxide emissions triggered Georgia guidance to require the maximum degree of reduction in emissions of ethylene oxide at both sterilization facilities. Additionally, GA EPD sought to identify all stationary sources of ethylene oxide emissions in Georgia to further assess their potential public health risk. GA EPD modeling identified another sterilization facility not identified in the NATA and located in Fulton County that also required additional air pollution controls.

Monitoring Study Development

GA EPD relied on modeling data to determine where to locate the ambient monitoring sites near the two identified sources, Becton-Dickinson (BD) in Covington and Sterigenics in Cobb County. The term *ambient* refers to areas with public access (e.g., parks, schools). Dispersion models help identify possible areas of higher ethylene oxide concentration around each facility. Wind rose data from weather stations located at airports near each facility allowed GA EPD to determine primary and secondary wind patterns. As a result, GA EPD selected four sampling locations around each facility covering the primary upwind direction, primary downwind direction, secondary upwind direction and secondary downwind direction. In Fall 2019, monitoring began near BD and Sterigenics. In January 2020, monitoring began in Fulton County. GA EPD is using passive sampling systems to monitor for ethylene oxide in these locations because passive samplers do not require access to electricity. GA EPD also monitors for ethylene oxide at a rural background site and an urban background site. The urban background site is at a National Air Toxics Trends Site, one of 27 such sites nationwide that focuses on monitoring for air toxics. An ambient monitoring station near a major highway is also being utilized to see if vehicle traffic affects ethylene oxide measurements.

What are the goals of the study?

The goals of the monitoring study are as follows:

- Characterize ambient levels of ethylene oxide near sterilization facilities
- Establish background concentration of ethylene oxide in areas where there are no known sources of ethylene oxide
- Provide ethylene oxide data for risk characterization by other agencies

Community Scale Air Toxics Monitoring Grant

In November 2020, EPA awarded GA EPD a Community Scale Air Toxics Monitoring Grant to continue our work and evaluate ethylene oxide monitoring technologies and methods. We will use the Georgia National Air Toxics Trends Site to compare two sampling methods, traditional

pressurized sampling and passive sampling, as well as test a new continuous ethylene oxide monitor. We will also compare different laboratory analyses methods as part of this grant.

Why have a Quality Assurance Project Plan?

GA EPD has an EPA-approved Quality Assurance Project Plan (QAPP) which we developed to ensure that the data collected is of the highest quality. We updated the QAPP in April 2020 to incorporate the sampling in Fulton County. We recently submitted another revised QAPP to EPA to incorporate the comparative study funded by the Community Scale Air Toxics Monitoring Grant.

Summary of Monitoring Project

GA EPD has scheduled sample collection every 6 days at four sites around identified facilities in Cobb and Newton Counties, along with three sites in Fulton County, in order to capture primary and secondary upwind and downwind concentrations. In addition, one sample is collected every 6 days at our South DeKalb (urban background) site, and one sample is collected every 12 days at our remote General Coffee (rural background) site. Once a month, an additional sample, or collocated sample, is collected at one site in Cobb, Newton, Fulton Counties as well as at our South DeKalb site side-by-side using identical sampling equipment to test the precision and reproducibility of the sampling method. In order to assess the gradient of ethylene oxide concentration and how far it can travel away from each facility, a sample is collected up to 1 mile from each facility.

Quality Assurance Procedures

GA EPD maintains thorough and strict quality assurance processes that follow our EPA-approved QAPP. When sampling does not go as planned but the quality of the data has not been compromised, we add a qualifier code to reflect the deviation from the established procedures. We continuously evaluate quality control (QC) measures to verify that the data is acceptable. In order to ensure data of the highest quality, we check sampling units prior to sample collection, we complete precision checks by taking two samples side-by-side at the same location and at the same time. We perform technical system audits on sampling equipment and keep a field logbook where all information can be recorded and verified. Additionally, trip blanks are collected once per month in Cobb, Newton, and Fulton Counties to ensure sample handling procedures in the field do not lead to contaminated field samples.

Results received through October 2020:

The following graph illustrates the data we have collected at each site (Figure 1) and the average concentrations measured at each site (Figure 2), with concentrations in units of micrograms per cubic meter ($\mu g/m^3$).

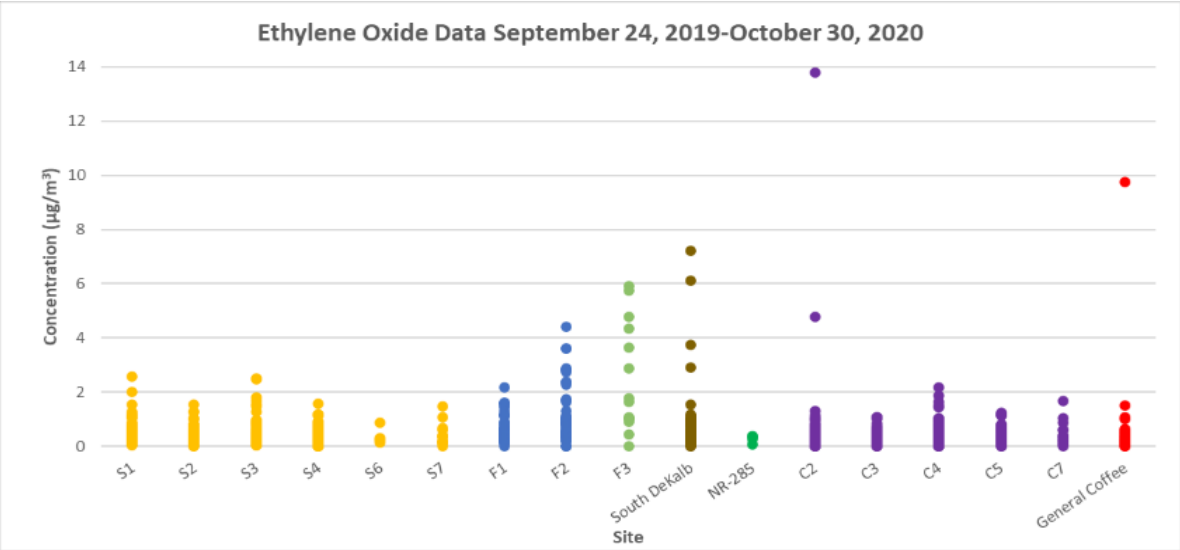

Figure 1 – Summary of all data collected

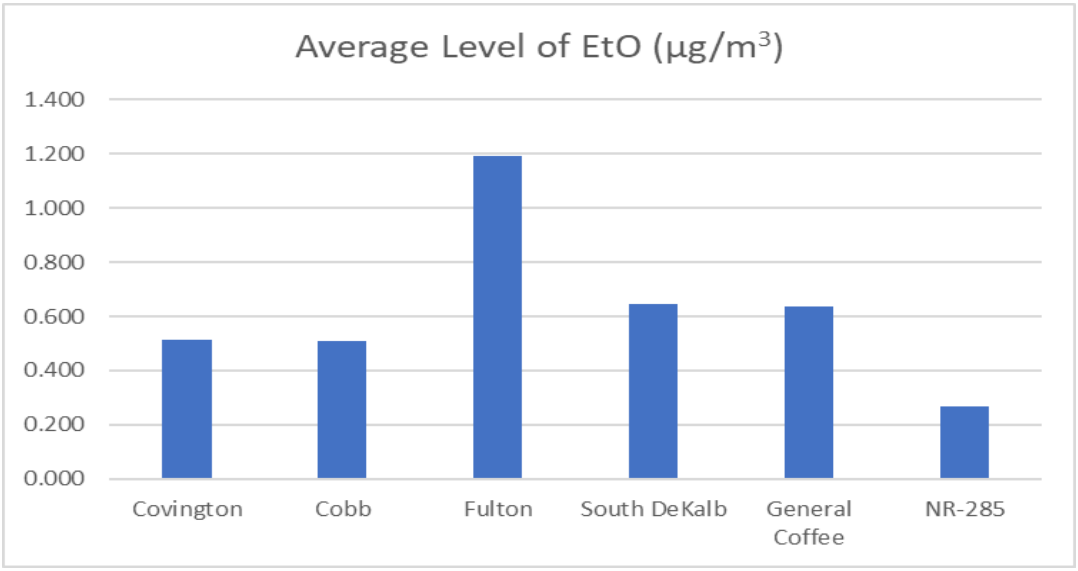

Figure 2 – Average concentrations of ethylene oxide measured per site

Here are some preliminary observations:

- The concentrations GA EPD is measuring near BD and Sterigenics are similar to the concentrations that we are measuring at our urban background site in South DeKalb County. The concentrations measured at General Coffee State Park, our rural background site, are averaging slightly lower. The concentrations we are measuring near another commercial sterilizer in Fulton County are averaging higher.
- The data is variable and the data precision is not good. Also, the results appear to vary depending on the laboratory used to analyze the sample and the type of sampling equipment.

- The EPA method used to analyze for ethylene oxide needs improvement at the low concentrations present in the air. EPA has requested procedural changes along the way, requiring results to be recalculated by the third party lab, and requiring EPD to flag or even eliminate data that met all QAPP criteria.