Ethylene Oxide Ambient Sampling Plan for Sterigenics (Willowbrook, IL)

Objective: Characterize ambient concentrations of ethylene oxide (EtO) around Sterigenics facility to inform the following issues:

- Determine the maximum and longer-term concentration(s) in proximity to the facility
- Explore relationship of ambient concentrations to facility operations (vents/fugitive) and EtO usage
- Characterize concentrations in potentially affected nearby neighborhoods to the extent possible based on method sensitivity

Method: The sampling will utilize the TO-15 method for Volatile Organic Compounds (VOCs) using stainless steel SUMMA™ canisters. The sampling duration will be 24-hour periods with the likely change-out times being in mid-morning (e.g., 10am to 10am) to facilitate logistics.

Sites: A total of eight fixed sampling locations will be selected based on the EPA's latest dispersion modeling[1] of the two Sterigenics buildings, community input, and representative seasonal wind data[2]. The locations will include:

- Two locations at the modeled maximum ambient air receptors relative to the facility
- One location located in a predominant upwind location positioned far enough away to exclude source impacts in calm wind situations
- Three locations in residential neighborhoods potentially impacted by the perimeter of the dispersion modeling field and/or located in the predominant downwind direction during the monitoring period
- Two locations in residential neighborhoods as selected by the communities.
  - These locations are outside the dispersion modeling field where impact is expected

Sampling locations will adhere to siting criteria in the National Air Toxics Trends Station (NATTS) Technical Assistance Document[3] to the greatest practical extent. Siting decisions will also serve to avoid potentially biasing interferences such as cigarette smoke and direct vehicle emissions.

Sampling Frequency: Sampling will occur on a 1-in-3 day schedule for a 90 day period, based on the national sampling calendar. Region 5 personnel will handle the on-site logistics including canister shipping and field deployment.

Project Duration: Sampling will continue for a period of 3 months with a projected start-up date of approximately November 19, 2018. Project status will be evaluated in early March (following receipt of all analyses) to determine if any factors (e.g., invalid samples, facility shut downs) would lead to a short-term extension of the project.

Data Reporting and Validation: ERG[4] will validate and report data to OAQPS in 2-week increments. Samples for which identification acceptance criteria are not met will be reported as ND (which means "non-detect"). Concentration data less than the laboratory Minimum Detectable Limit (MDL) will be flagged with the qualifier code MD (which means less than MDL). The MDL will be reported with the

---

[1] Conducted by EPA/OAQPS, utilizing results from Sept 2018 source test
[2] Locations based on November – April wind rose data from Midway airport
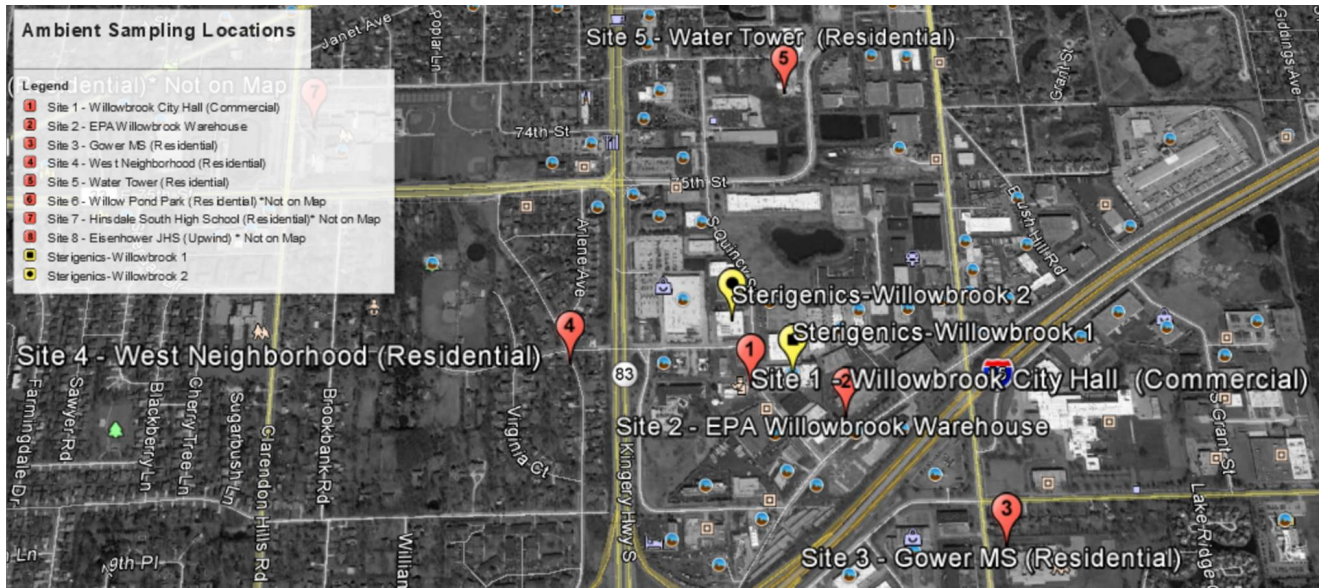[3] https://www3.epa.gov/ttnamti1/airtox.html
[4] Eastern Research Group – EPA's contract laboratory.

concentration. Samples reported as non-detect values will be assigned a value of ½ MDL for averaging purposes. Validated data will be posted on a publicly available web site within 5 business days of ERG's reporting to EPA.
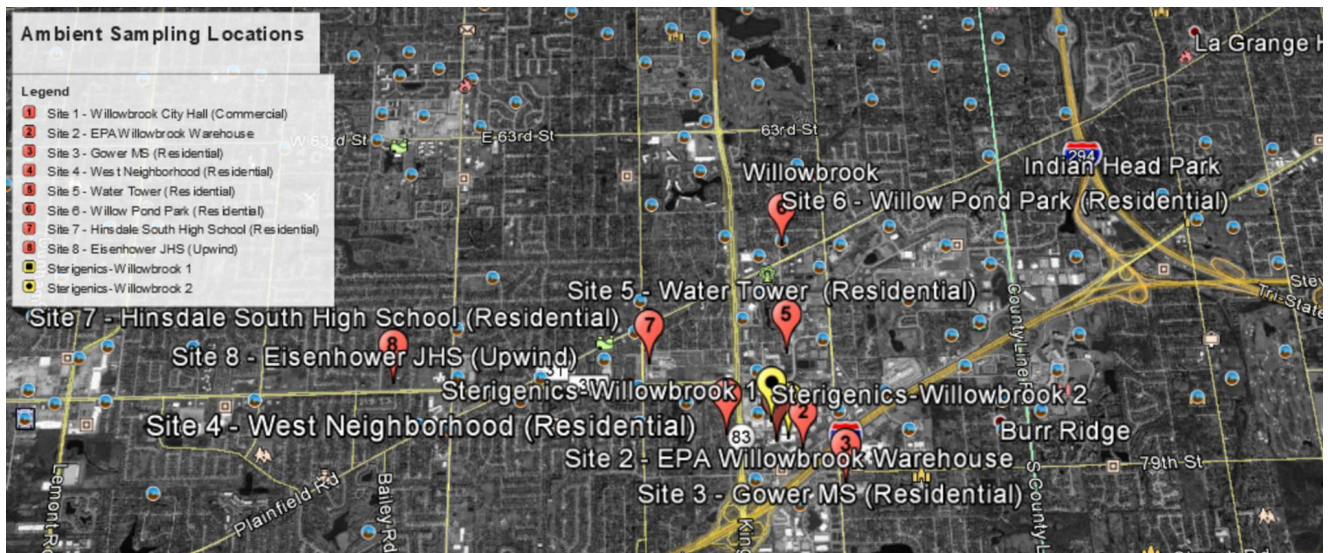
Region 5 will operate a portable meteorological station on the rooftop of their Willowbrook facility. Meteorological data (wind speed, wind direction, temperature, relative humidity) will be averaged on an hourly basis and collected for the duration of the project to facilitate analysis. EPA will also work with Sterigenics to make production and EtO usage data available for correlation with ambient results.

Quality Assurance: One collocated canister will initially be deployed per sampling day at one of the maximum receptor locations to calculate precision. The location of the collocated sample may optionally be rotated through other sampling locations if early data results indicate above MDL readings at other than maximum concentration locations. Additional blank canisters and laboratory replicates will be employed per ERG's standard practice for the NATTS program.
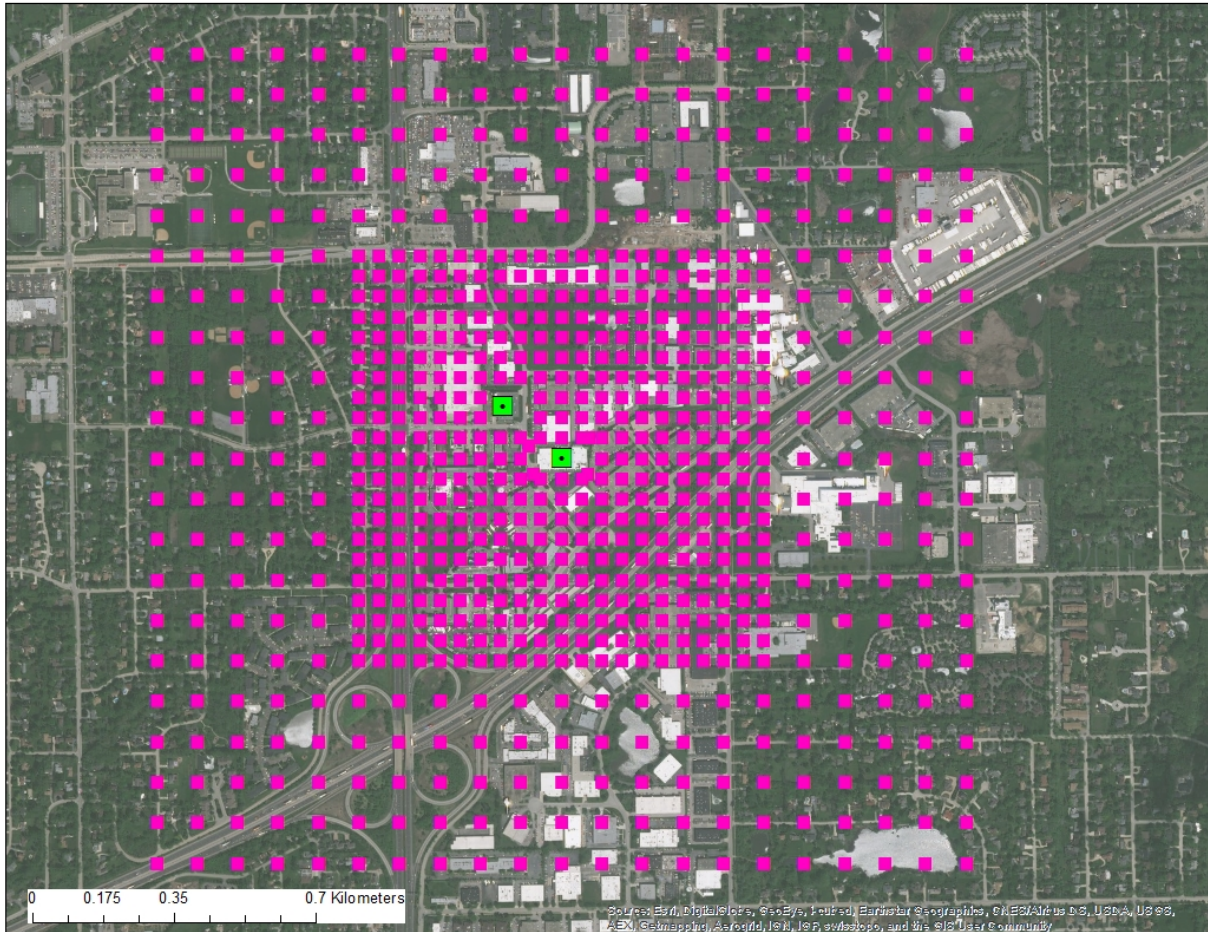
Ambient Sampling Locations

#	Name	Latitude	Longitude	Objective
1	Willowbrook City Hall	41.748471	-87.940782	Maximum Commercial #1
2	EPA Willowbrook Warehouse	41.747084	-87.938337	Maximum Commercial #2
3	Gower Middle School	41.744330	-87.934215	Residential Impact
4	West Neighborhood	41.749042	-87.945638	Residential Impact
5	Water Tower	41.754786	-87.939715	Residential Impact
6	Willow Pond Park	41.763928	-87.939924	Residential – community request
7	Hinsdale South High School	41.753927	-87.953824	Residential – community request
8	Eisenhower Junior High	41.752321	-87.979860	Upwind

Modeling

Air dispersion modeling of Sterigenics was conducted using the latest version of the AERMOD modeling system (version 18081) to inform monitor placement. Emissions input to the model were based on stack results from September 2018 and emissions were modeled with the most recent 5 years of complete meteorological data, 2013 through 2017, using Midway International Airport for the surface meteorological data and Davenport, IA for upper air data. Midway is located approximately 15 km east of Sterigenics and thus adequately representative of the facility.   A 2-km by 2-km receptor grid (758 receptors) was modeled and shown below with the Sterigenics facility denoted by the green squares.

Model Domain

Key metrics output from the model to inform monitor placement were:

- Maximum 24-hour concentration by receptor across the period of 2013-2017
- 5-year seasonal averages by receptor
- 5-year average by receptor

To inform the monitor siting, a scoring system was developed by ranking metrics (the maximum 24-hour concentrations across all receptors, ranking each 5-year average season's concentration by receptor, and ranking the 5-year average concentration by receptor), with a receptor receiving a rank of =1 if it had the maximum concentration for the model run.   Then, the score was calculated for each receptor by adding together its rank for each model run (the 24-hour ranking, each season's rank, and the 5-year average rank of each receptor). For example, a receptor that has the highest 24-hour average

concentration, the highest winter, spring, summer, and fall average concentrations, and highest 5-year average concentration would have a score of 6 (1+1+1+1+1+1). The lower the score, the higher the probability an area will see higher concentrations from the facility. The results of the scoring, along with the monitor locations, excluding the upwind monitor, are shown below. The monitors' locations coincide with local minima (higher concentrations) of the receptor scores.

Monitor locations and Scoring Results