Evaluation of Modeling Methodology Used by EPA to Determine a Benzene Fenceline Monitoring Proposed Action Level in the Coke Ovens Proposed Rule

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In the preamble to the Proposed Rule,[1] EPA describes its methodology for developing an action level for the fenceline monitoring program as follows:

> "We estimated the long-term ambient benzene concentrations at each coke oven facility using the emission inventory and the EPA's American Meteorological Society/EPA Regulatory Model dispersion modeling system (AERMOD). Concentrations were estimated by the model at a set of polar grid receptors centered on each facility, as well as surrounding census block centroid receptors extending from the facility outward to 50 km. For purposes of this modeling analysis, we assumed that the nearest off-site polar grid receptor was the best representation of each facility's fenceline concentration, unless there was a census block centroid nearer to the fenceline than the nearest off-site polar grid receptor or an actual receptor was identified from review of the site map. In those instances, we estimated the fenceline concentration as the concentration at the census block centroid. Only receptors (either the polar or census block) that were estimated to be outside the facility fenceline were considered in determining the maximum benzene level for each facility. The maximum benzene concentration modeled at the fenceline for any coke oven facility is 3 μg/m^3 (annual average)."

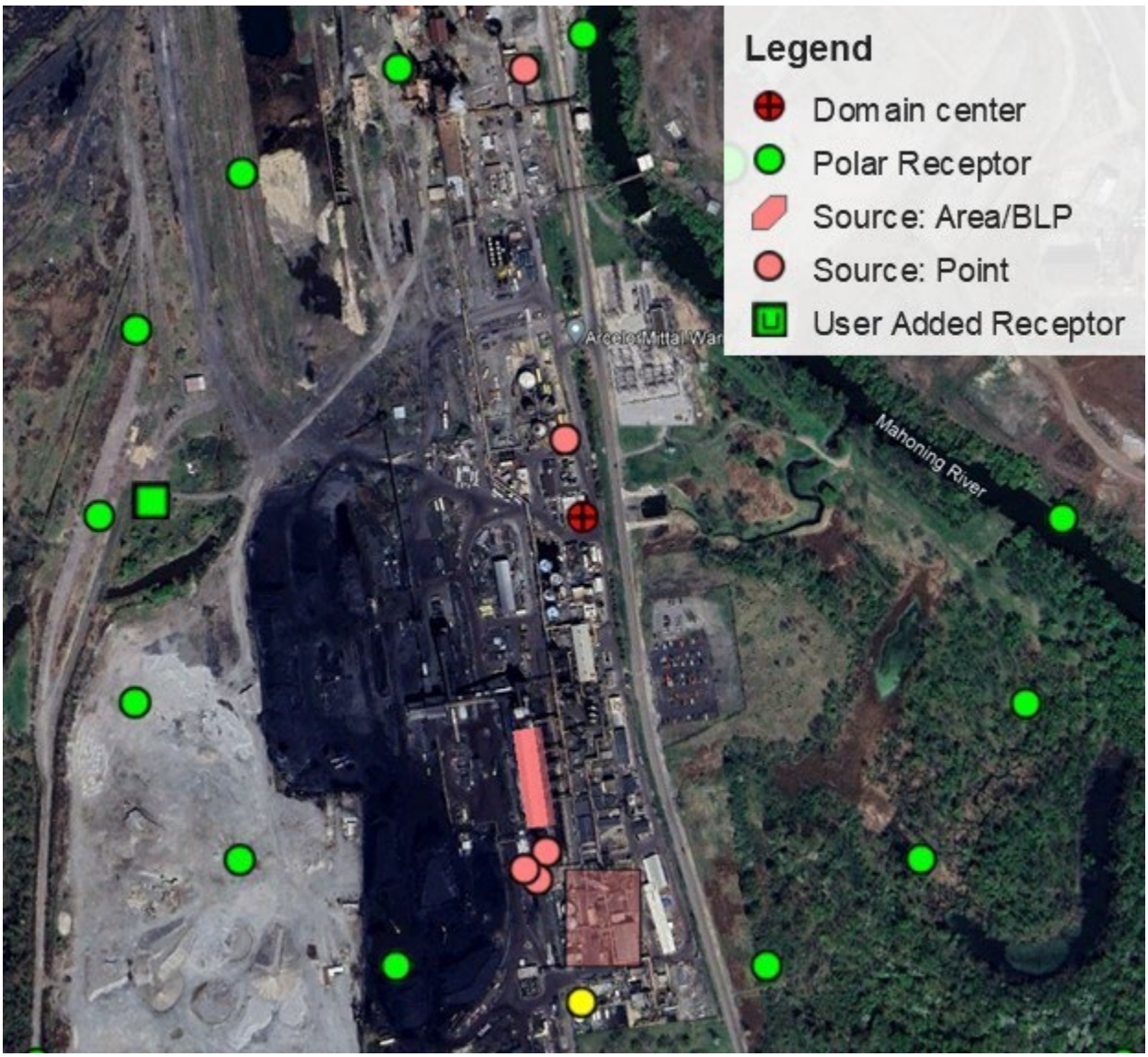
The methodology EPA used in the Proposed Rule for estimating fenceline benzene concentrations underestimates the concentration of benzene at the actual coke facility fenceline. EPA's method described above merely approximates a fenceline for each facility using a polar receptor grid, which incorrectly assumes each facility's fenceline is circular (as shown in Figure 1). Using a polar receptor grid does not accurately represent the true fenceline of a byproduct recovery coke facility where benzene monitors would be located under the proposed fenceline monitoring requirements. Many or all of the polar grid receptors at each facility EPA modeled are located outside of the facility's actual fenceline, resulting in lower modeled concentration estimates than what may be measured by monitors at the true fenceline of the coke facility. All byproduct recovery coke facilities have irregularly shaped or elongated fencelines similar to that shown in Figure 2 for the AM-Warren-OH facility, which was modeled by EPA to have one of the highest fenceline concentrations.

Furthermore, EPA's modeling was conducted using actual emissions for byproduct recovery facilities, rather than allowable emissions, which understates the predicted fenceline benzene concentrations that inform the action level. An action level

[1] 88 Fed. Reg. 55858 (Aug. 16, 2023).

established based on actual emissions is not appropriate and would not properly account for expected emission rates that would occur when production is at or near permitted/allowable capacity. Because benzene emissions associated with non-category sources at a facility have greater uncertainty, and are based on actual emissions rather than allowables, the modeled emission rates should be scaled up based on permitted/allowable throughput. Emissions fluctuate frequently over time and the action level that EPA has proposed by using actual emissions for byproduct recovery sources does not take into account these fluctuations. When a facility's source category allowable emissions are included in the analysis, the monitored benzene concentrations are likely to exceed the proposed action level even though the facility is operating within allowable permit limits.

Figure 1. Modeled Sources and Polar Grid Receptors at AM-Warren-OH



In addition, the approach EPA used in the Proposed Rule does not account for the fact that fenceline monitoring would not differentiate between source category and non-source category benzene emissions, nor between onsite and offsite sources. Fenceline monitors would be expected to predominantly measure benzene emissions from low-lying, less buoyant non-source category sources compared to source category sources, such as coke batteries and battery combustion stacks, which have highly buoyant emission plumes due to temperature. Highly buoyant plumes have much greater potential to disperse far above fenceline monitors and other ground level receptors. Accordingly, fenceline monitors would predominantly register concentrations resulting from low-lying emissions sources, such as byproduct recovery facilities (which are not part of the source category), as well as from offsite regional sources.

Figure 2. Actual Fenceline at AM-Warren-OH

To demonstrate the impact of EPA's methodology, AECOM initially remodeled the AM-Warren-OH facility using receptors located at the facility's true fenceline as shown in Figure 3. Emissions used in the remodeling were based on whole facility allowable emissions estimated by applying a throughput scale-up to actual emissions for the byproduct recovery facility. The initial remodeling indicated that the receptors with the highest benzene modeled concentrations at the facility's fenceline were overwhelmingly due to the byproduct recovery facility (99.06%), while the category sources resulted in very low modeled concentrations (0.94%).

Because the receptor spacing for the initial remodeling run was very wide (approximately 150 meters), additional receptors were added at approximately 25-meter spacing to refine the fenceline remodeling as shown in Figure 4. The highest remodeled fenceline concentration of 11.3 μg/m^3 was nearly four times the proposed benzene action level (3 μg/m^3) in the Proposed Rule.

If EPA decides to move forward with finalizing any fenceline monitoring requirements, EPA must revise the modeling methodology to establish an action level that accurately reflects the expected concentrations that would be measured at the true fenceline of each facility using allowable emissions for all facility sources.

Figure 3. Remodeled Fenceline Receptors and Sources at AM-Warren-OH

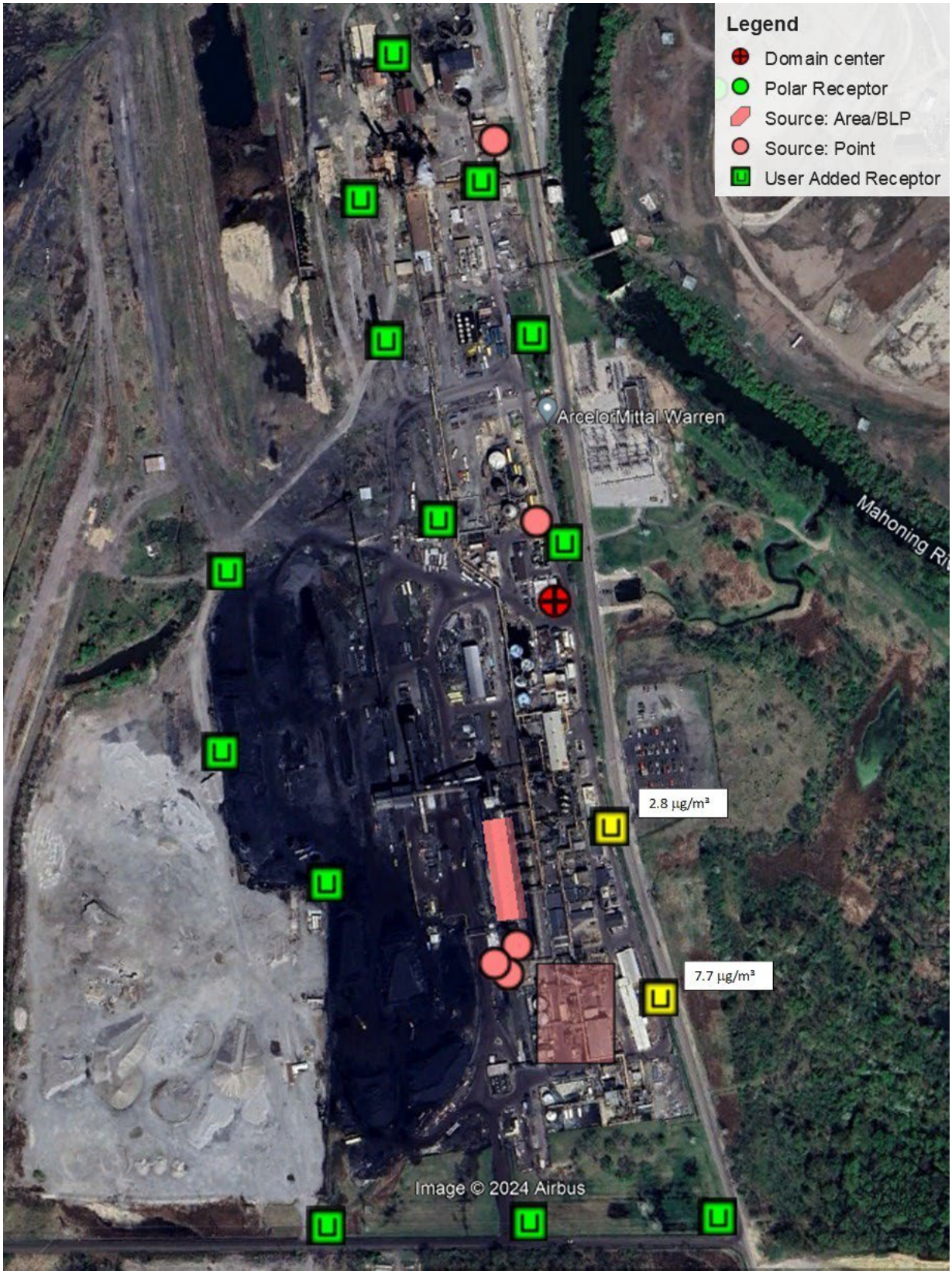


Figure 4. Refined Modeled Fenceline Receptors and Sources at AM-Warren-OH