AMR VI

Background Risk and Total Risk Procedure and Clarification

Department of Public Health
Air Management Services
CITY OF PHILADELPHIA

Background

AMR VI Requirements for TV OP

- AMR VI regulation states:
  - The Department (AMS) shall review the existing air toxics concentrations surrounding the emissions source at issue prior to approving or disapproving a Title V operating permit.

- AMR VI Technical guidelines state:
  - The Department will measure the Background Risk by measuring the ambient air concentrations surrounding the facility. The Department will use EPA approved methods to capture and analyze 24-hour grab air samples. The sample analysis will produce a 24-hour average concentration, and the Department will use the 24-hour average to estimate an annual average concentration for TACs in the ambient air surrounding the facility.
  - As the technology and EPA guidance evolve, AMS may adopt new methods to determine the background risk.

Industry Concerns

Background concentration procedure is not well defined

AMS Takeaways:

- How does a 24-hour sample represent a year?
  - Cancer risks are calculated from annual averages, so the concentration must represent a whole year.
  - Seasonal and weekday variation must be accounted.
- What HAPs are sampled for?
- How will the sampling location(s) be decided?
- How are background risks added to the facility risk?

Determining Background Concentration

Contents

- Location of samples
- Sampling procedure for main HAP groups
  - VOCs
  - Carbonyls
  - Metals
- Calculating Risk

Location of Samples

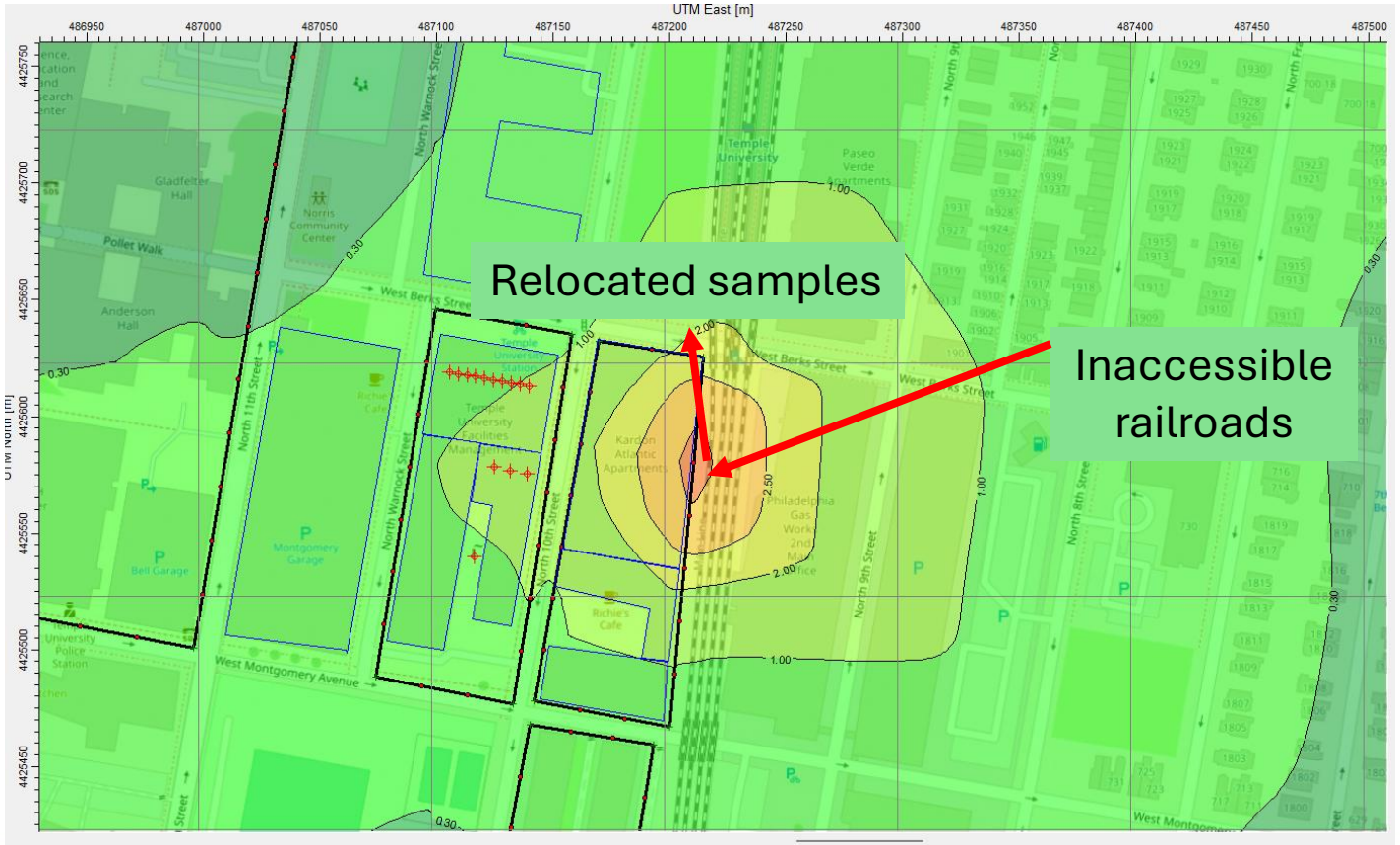
Samples should represent background AND facility impacts

- The location with the estimated maximum contribution from the facility will be sampled
- A simplified AERMOD simulation will be created by AMS to identify the location with the maximum expected impact from the facility
- All sources that contribute HAPs will be modeled for a single representative HAP or other pollutant chosen by AMS.
- Source parameters, meteorology, building downwash, and terrain characteristics will be used.
- After running the model, the modeled location with the highest impact will be chosen as the sample location.
    - The accessible location closest to the maximum modeled concentration will be used.

Example: Sample Location

Example of a typical demonstration

- Modeled sources as red crosses
- Property lines as black boxes (multiple)
- Buildings as blue outlines
- Contours show the concentration gradient
- Location of maximum inaccessible
- Closest accessible location chosen



Sampling Procedure

Some basics for all samples

- Must represent a full year of data to be used for cancer risk.
- Must account for seasonal variation.
- Must account for weekday variation.
- Must sample the most important HAPs.
- Must be feasible.
    - Only sample for HAPs that can be sampled.
- Must be reliable.

Sampling VOCs

EPA Method TO-15

- 24-hour canister samples are taken at the sample location and analyzed at the lab.
- Samples are repeated for each season.
  - Same as EPA sampling schedule.
  - Accounts for weekday variation.
- Samples will be taken for a full year.
  - Accounts for seasonal variation.
  - Represents a full year.

Sampling Carbonyls

Radiello Passive Samplers and Picarro Formaldehyde Analyzer

- Radiello passive samplers will sample ambient air for 6 days and be analyzed with HPLC.
  - Results will be determined by AMS. A longer time frame for passive samplers leads to better results.
  - Accounts for weekday variation.
- The sampler will be replaced at the same time that the VOC canister is collected.
- Samples are taken for a full year.
  - Accounts for seasonal variation
  - Represents a full year
- Picarro real-time analyzer 24-hour average (temporally aligned with VOC sample) will be compared to the passive sample results to assess accuracy (if acquired).

Sampling Metals

Sampling metals is infeasible

- Instead, regulatory metals sample averages are used.
- Additionally, a Cr VI / Total Chromium ratio of 0.03 is used based on a literature review*.

  This reduces BG Cr VI risk, which unrealistically influenced many risk assessments.

Table: CrVI ratio and Background Risk		
	Max Risk	Avg Risk
3% Cr VI	3.3	1.4

- Based on 5 years of data (2020 – 2025), the combined risk from all airborne metals is approximately 7.5 in a million.
- Therefore, 7.5 in a million could be added as the background metals risk.

** (Reference: 2025-Hexavalent-Chrome-Study-Report-FINAL)*

Removing Negligible Risks Prior to Calculation

What values must be included in the Risk Calculation

- Many HAPs will be sampled, and many will have very low concentrations.
- AMS may only include HAPs that exceed the reporting thresholds for facility-wide emissions.
- AMS will only include HAPs that contribute to 90% of the background or total risk.

Calculating Background Risk

Risks are summed from samples

- VOC risks are calculated for each pollutant and added together.
- Carbonyl risks are calculated for each pollutant and added together.
- Metals risks are taken as 7.5 in a million.

- Background Risk = VOC Risk + Carbonyl Risk + 7.5 metals risk

Calculating Total Risk

Option 1: No planned new sources at the facility

- Background risk is the Total Risk
- Total Risk = Sampled VOC Risk + Sampled Carbonyl Risk + 7.5 metals risk

Option 2: Planned sources at the facility that are not operating

- Background Risk must be added to the Facility Incremental Risk.
- Planned sources are modeled, and a risk is calculated for each HAP **separately.**
- Modeled risk from **each individual HAP** is added to the background for a **pollutant-specific Total Risk.**
- Total Risk = Modelled Risk for one HAP + Background Risk (sum of all sampled risks)

AMS will not double-count concentrations or risks



Questions?

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