



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.
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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?
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Determining Background Concentration

Contents

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





Location of Samples

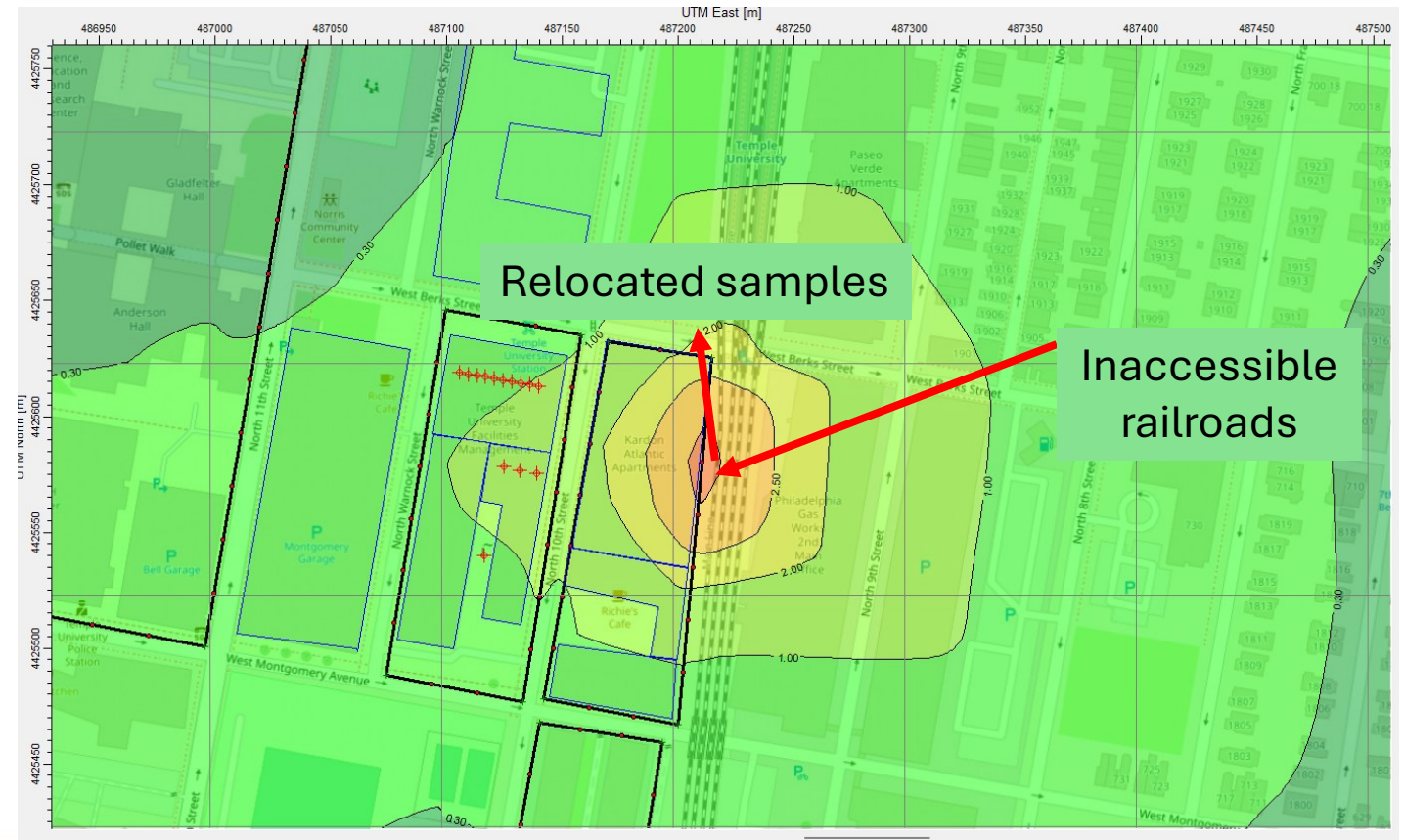
Samples should represent background AND facility impacts

- 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.
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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 1 in 6 days.
 - 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.
 - A longer time frame for passive samplers leads to better results.
 - Accounts for weekday variation.
 - The sampler will be replaced every 6 days
 - 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).
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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 will 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
- $\text{Total Risk} = \text{Sampled VOC Risk} + \text{Sampled Carbonyl Risk} + 7.5 \text{ metals risk}$

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**.
- $\text{Total Risk} = \text{Modelled Risk for one HAP} + \text{Background Risk (sum of all sampled risks)}$

AMS will not double-count concentrations or risks



Questions?



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