Sound Data Leads to Sound Analysis: EPA's RTR Program

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ABSTRACT

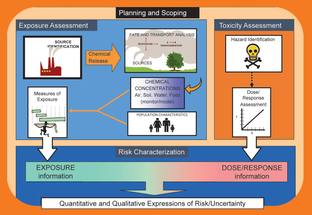
The EPA's Risk and Technology Review (RTR) Program is a combined effort to conduct technology reviews and residual risk assessments under Clean Air Act (CAA) Sections 112(d)(6) and 112(f), respectively. Section 112(d)(6) requires EPA to review and revise technology-based standards or Maximum Achievable Control Technology (MACT) by source category. Section 112(f)(2) requires EPA to conduct risk assessments on these source categories to determine if additional health-based standards are necessary to reduce the residual risk.

In many cases, EPA uses readily available inventory data, like the EPA's National Emissions Inventory (NEI), to predict potential health risks. EPA estimates chronic and acute inhalation exposure concentrations and health risks from each MACT category using the HEM3 model. Further, EPA performs a screening multipathway analysis to identify the potential exposures via non-inhalation routes and environmental effects.

RTR data sources include industry test data and survey responses, NEI, Toxics Release Inventory (TRI), and permit data. The accuracy of risk results is dependent on the quality of inventory data. Key input data impacting RTR modeling results include: pollutant emissions, geocoordinates, and stack and fugitive release parameters. In order to streamline the process of reviewing input data, EPA has developed new and improved quality assurance (QA) procedures and tools to review and correct data, including the use of ArcGIS Online to QA geocoordinates, use of an Access-based QA program, and the "TREX" risk screening tool.

The purpose of this poster is to present these new procedures and tools and illustrate the importance of input data in performing a risk assessment.

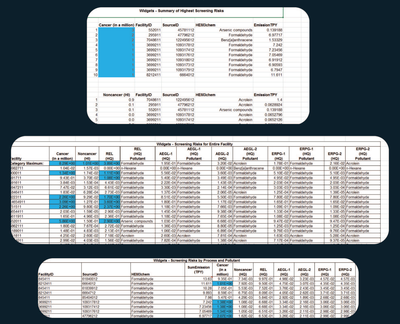
The RTR Air Toxics Risk Assessment Process



TREX Screening Tool

- Developed and run by EPA risk assessors to screen emissions prior to RTR risk modeling. TREX helps identify potential pollutants and emission sources that may be of concern such as: disproportionate emissions from a source, identifying facilities with missing HAPS that should be emitted, identifying HAPs that should not be emitted.
- Includes dispersion calculations for 4 dispersion scenarios using AERMOD that simulate estimated ambient level concentrations at facility fenceline and nearby populated receptors.
- Compares chronic cancer, chronic noncancer, and acute noncancer health benchmarks for each HAP in inventory to the predicted ambient levels at populated and fenceline locations to determine if a HAP and/or stack may have a potential for elevated or unexpected risks.
- Creates a series of summary worksheets that provides: ranked and individual source/HAP specific potential health risks, total facility potential risks; mass of a particular HAP that is required to reach a targeted health benchmark (e.g., Cancer Maximum Individual Risk (MIR) of 1-in-a-million).
- TREX risk estimates are based on health protective assumptions and may not translate into actual risks once a refined risk assessment is performed.

TREX Screening Tool - Example Summary Worksheets



Widgets - Summary of Highest Screening Risks

	Cancer (in a million)	FacilityID	SourceID	HEBSchem	Emission/TPY
1	0.1	3958011	4579812	Arsenic compounds	5.12E-05
2	0.1	3958011	1201MAN12	Formaldehyde	5.1371
3	0.1	3958011	1201MAN12	Benzo[a]pyrene	5.9324
4	0.1	3958011	1580117012	Formaldehyde	7.242
5	0.1	3958011	1580117012	Formaldehyde	7.2436
6	0.1	3958011	1580117012	Formaldehyde	7.2436
7	0.1	3958011	1580108012	Formaldehyde	8.91912
8	0.1	3958011	1580117012	Formaldehyde	8.90593
9	0.1	3958011	1580117012	Formaldehyde	9.1
10	0.1	4272011	8864012	Formaldehyde	11.811

	Noncancer (HI)	FacilityID	SourceID	HEBSchem	Emission/TPY
1	0.1	3958011	1201MAN12	Acrolein	0.0928501
2	0.1	3958011	1201MAN12	Acrolein	0.0928501
3	0.1	3958011	4579812	Arsenic compounds	0.139188
4	0.0	3958011	1580117012	Acrolein	0.0852798
5	0.0	3958011	1580117012	Acrolein	0.0852798

Widgets - Screening Risks for Entire Facility

Facility	Cancer (in a million)	Noncancer (HI)	REL (HQ)	AEGL-1 (HQ)	AEGL-2 (HQ)	AEGL-3 (HQ)	AEGL-4 (HQ)	AEGL-5 (HQ)	ERPG-1 (HQ)	ERPG-2 (HQ)	ERPG-3 (HQ)
Widgets Stadium	0.1	0.0	0.0	0	0	0	0	0	0	0	0
10111	1.42E-01	1.11E-02	1.42E-01	0	0	1.55E-02	0	1.55E-02	0	1.78E-02	0
10112	1.42E-01	1.11E-02	1.42E-01	0	0	1.55E-02	0	1.55E-02	0	1.78E-02	0
10113	4.41E-01	1.12E-02	0.0	0	0	1.49E-02	0	1.49E-02	0	4.85E-02	0
10114	4.41E-01	1.12E-02	0.0	0	0	1.49E-02	0	1.49E-02	0	4.85E-02	0
10115	2.42E-01	1.12E-02	2.42E-01	0	0	1.55E-02	0	1.55E-02	0	3.03E-02	0
10411	1.61E-01	6.29E-04	1.71E-01	0	0	3.37E-03	0	2.86E-03	0	1.98E-03	0
10412	1.61E-01	6.29E-04	0.0	0	0	3.37E-03	0	2.86E-03	0	1.98E-03	0
10413	1.42E-01	1.11E-02	1.42E-01	0	0	1.55E-02	0	1.55E-02	0	1.78E-02	0
10414	1.42E-01	1.11E-02	1.42E-01	0	0	1.55E-02	0	1.55E-02	0	1.78E-02	0
10415	4.41E-01	1.12E-02	0.0	0	0	1.49E-02	0	1.49E-02	0	4.85E-02	0
10511	2.42E-01	1.12E-02	2.42E-01	0	0	1.55E-02	0	1.55E-02	0	3.03E-02	0
10512	1.42E-01	1.11E-02	1.42E-01	0	0	1.55E-02	0	1.55E-02	0	1.78E-02	0
10513	1.42E-01	1.11E-02	1.42E-01	0	0	1.55E-02	0	1.55E-02	0	1.78E-02	0
10514	1.42E-01	1.11E-02	1.42E-01	0	0	1.55E-02	0	1.55E-02	0	1.78E-02	0
10515	4.41E-01	1.12E-02	0.0	0	0	1.49E-02	0	1.49E-02	0	4.85E-02	0
10611	1.60E-01	1.57E-02	1.60E-01	0	0	1.95E-02	0	1.95E-02	0	1.47E-02	0
10612	1.60E-01	1.57E-02	1.60E-01	0	0	1.95E-02	0	1.95E-02	0	1.47E-02	0
10613	2.42E-01	1.12E-02	2.42E-01	0	0	1.55E-02	0	1.55E-02	0	3.03E-02	0
10614	2.42E-01	1.12E-02	2.42E-01	0	0	1.55E-02	0	1.55E-02	0	3.03E-02	0
10615	1.98E-01	4.80E-02	1.98E-01	0	0	2.60E-02	0	2.60E-02	0	1.73E-02	0
10711	1.60E-01	1.57E-02	1.60E-01	0	0	1.95E-02	0	1.95E-02	0	1.47E-02	0
10712	2.69E-01	2.67E-02	2.69E-01	0	0	3.30E-02	0	3.30E-02	0	2.49E-02	0
10713	1.42E-01	1.11E-02	1.42E-01	0	0	1.55E-02	0	1.55E-02	0	1.78E-02	0
10714	1.42E-01	1.11E-02	1.42E-01	0	0	1.55E-02	0	1.55E-02	0	1.78E-02	0
10715	1.98E-01	4.80E-02	1.98E-01	0	0	2.60E-02	0	2.60E-02	0	1.73E-02	0

Widgets - Screening Risks by Process and Pollutant

FacilityID	SourceID	HEBSchem	Location (TPY)	Cancer (in a million)	Noncancer (HI)	REL (HQ)	AEGL-1 (HQ)	AEGL-2 (HQ)	ERPG-1 (HQ)	ERPG-2 (HQ)
3958011	1201MAN12	Formaldehyde	13.1	0.1	0.0	0.0	0	0	0	0
3958011	1201MAN12	Formaldehyde	10.8	0.0	0.0	0.0	0	0	0	0
3958011	4579812	Arsenic compounds	0.0	0.1	0.0	0.0	0	0	0	0
3958011	1201MAN12	Formaldehyde	0.0	0.1	0.0	0.0	0	0	0	0
3958011	1580117012	Formaldehyde	0.0	0.1	0.0	0.0	0	0	0	0
3958011	1580117012	Formaldehyde	0.0	0.1	0.0	0.0	0	0	0	0
3958011	1580108012	Formaldehyde	0.0	0.1	0.0	0.0	0	0	0	0
3958011	1580117012	Formaldehyde	0.0	0.1	0.0	0.0	0	0	0	0
3958011	1580117012	Formaldehyde	0.0	0.1	0.0	0.0	0	0	0	0
4272011	8864012	Formaldehyde	0.0	0.1	0.0	0.0	0	0	0	0

RTR Location Coordinate QA Steps

RTR Requirements

- Latitudes and longitudes are required for each emission release point in RTR modeling files.
- Latitudes and longitudes are reported in decimal degrees to the fifth decimal place at a minimum. The fifth decimal place corresponds to approximately 3 ft.
- Negative signs for longitudes are also required.

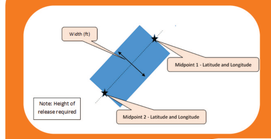
RTR QA

- Plot all coordinates and fugitive releases using ArcGIS.
- Publish ArcGIS Online maps for review.
- Using ArcGIS Online as a QA tool offers several benefits:
  - –Maps can be reviewed and edited by anyone with internet access; GIS software and experience are not required to make edits.
  - –Revised coordinate information is easily extracted from the online map.
  - –Multiple people can access a map and make revisions simultaneously, and there is still only one set of revisions to extract after review is complete.

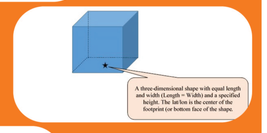
Facility vs Release Point Coordinates

- The green triangle shows the original facility-level inventory coordinates.
- The yellow triangle shows corrected release point level coordinates provided by the facility.
- The original cancer MIR was greater than 200-in-1 million. After several release points were corrected, the revised cancer MIR was 7-in-1 million.

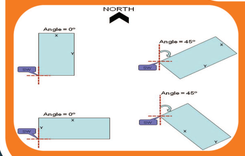
Depiction of Fugitive 2D Source Parameters



Depiction of Fugitive 3D Source Parameters

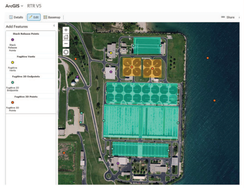


Depiction of Fugitive Area Source Parameters



ArcGIS Online Map QA Tool Example

- The figure shows an example map for a facility. The green rectangles are fugitive 2D sources; the orange squares are fugitive 3D sources; the purple dots are stack releases; and the yellow dots are fugitive vents.
- All release types can be easily reviewed and revised as needed.
- The example map shows the types of revisions typically needed for coordinates in RTR modeling files (note the incorrect locations in the water).



QA of Fugitive Areas

Original Fugitive Areas: Cancer MIR was greater than 40-in-1 million

Revised Fugitive Areas: Cancer MIR of 20-in-1 million

- The rectangles represent the areas of the fugitive releases.
- The original plot indicates that the Fugitive Angles are incorrect. Latitudes and longitudes are not correctly located at the southwest corner for fugitive area releases. These releases are in residences and not within the site boundary.

RTR Pollutant Emission and Stack Parameter QA Steps

- In addition to location coordinates and fugitive dimensions, other key input parameters in RTR modeling files are pollutant emissions and stack parameters.
- EPA is using a new Microsoft Access based QA tool to identify emissions outliers and out of range or missing stack parameters.
- The tool also provides an easy way for users to revise data and track the revisions over time.
- The tool is easily updated when modeling file requirements change.

RTR QA Tool Results – Possible Emissions Outliers

Pollutant QA Checks

Pollutant QA Checks: Pollutant Counts

Pollutant Counts | Emission Outliers

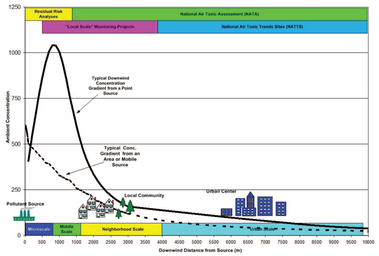
Pollutant	Number of Facilities Reporting	Percentage Reporting	Issue?	Reason
Manganese Compounds	1	0.80%	YES	Few Facilities Reporting
Methanol	72	57.60%	NO	
Methyl Isobutyl Ketone (Hexone)	82	65.60%	NO	
Methyl Methacrylate	55	44.00%	NO	
Methylene Chloride (Dichloromethane	52	41.60%	NO	
N,N-Dimethylaniline	50	40.00%	NO	
Naphthalene	66	52.80%	NO	
Nickel Compounds	56	44.80%	NO	
Phenol	51	40.80%	NO	
Styrene	65	52.00%	NO	
Tetrachloroethylene (Perchloroethyle	50	40.00%	NO	
Toluene	95	76.00%	NO	
Trichloroethylene	50	40.00%	NO	
Triethylamine	51	40.80%	NO	
Vinyl Acetate	51	40.80%	NO	
Xylenes (Mixed Isomers)	103	82.40%	YES	More Facilities Should Report

Total Number of Facilities	125
Number of Potential Issues	4

QA of Pollutants and Emissions

- QA of pollutants and emissions is important because risk factors are assigned to pollutants during modeling and a few pounds of one pollutant may lead to higher risks than several tons of another.
- RTR modeling requires reporting of hazardous air pollutants (HAPs) by individual species because risk factors associated with individual HAPs within a compound group can vary by several orders of magnitude.
- All metal and cyanide compounds are apportioned to individual metals and hydrogen cyanide equivalents in the model preprocessor. For example, emissions of lead chromate are apportioned to both lead and chromium.
- Actual Chronic , Allowable Chronic and Actual Acute Emissions are modeled for RTR source category.
- CAS numbers are used to identify HAPs in RTR modeling file.
- Requirements for Chromium, Mercury, Polycyclic Organic Matter, and Dioxins/Furans
  - –Chromium reported as elemental chromium or chromium and compounds is speciated into hexavalent and trivalent chromium
  - –Mercury reported as elemental mercury or mercury and compounds is speciated into particulate divalent mercury, gaseous divalent mercury, and elemental gaseous mercury.
  - –Polycyclic Organic Matter is reported as individual polyaromatic hydrocarbons and all must be speciated in the modeling file.
  - –Dioxins/Furans are reported by individual congeners and all must be speciated in the modeling file.

Air Toxics Program Impacts – Geographic Scales



RTR Fugitive Parameter QA Steps

- Fugitive releases are modeled as fugitive vents, fugitive 2D sources, fugitive 3D sources, or fugitive areas.
- Fugitive vents are typically less than 10 square feet, examples are single roof or wall vents.
- Fugitive 2D sources are greater than 10 square feet, examples are an elongated roof vent or wastewater holding pond.
- Fugitive 3D sources consist of multiple releases, examples are a building with many wall and roof vents or an outdoor material storage pile.
- Fugitive area sources are similar to 2D sources, but the required modeling inputs are different.
- All fugitive releases are plotted in ArcGIS and maps are published online for review.

Summary

The accuracy of RTR risk results are dependent on the quality of modeling input data. Industry, state, and local agencies and the EPA expend significant time and resources to improve RTR modeling input data. To reduce the resources and time to prepare RTR modeling files, data providers are encouraged to QA and revise data prior to submittal of information to the EPA. To improve the quality of data in RTR modeling files, the EPA has developed QA procedures and tools to review data and augmentation procedures to revise data.