



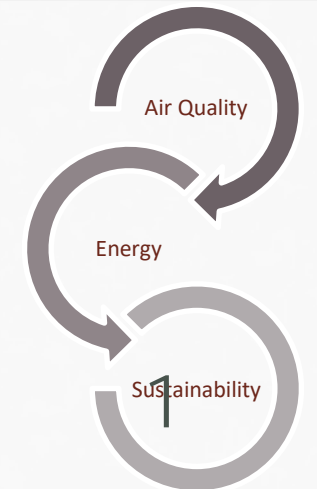
STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION



DIVISION OF AIR QUALITY
AIR QUALITY, ENERGY, AND SUSTAINABILITY

OVERVIEW OF NEW JERSEY'S APPROACH TO RISK SCREENING

MARAMA AIR TOXICS TRAINING WORKSHOP
AUGUST 21 - 23



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Swarthmore, PA

Outline

1. Health Risk Assessment
2. NJ's Risk Screening Process
3. Air Toxics Reporting Thresholds
4. Risk Screening Worksheet



Who conducts a Health Risk Assessment?

Air Pollution Control (APC) Permit Applicants, whether for a preconstruction permit or Title V Operating Permit, which have the potential to emit air toxics must conduct a Health Risk Assessment if:

- Any Hazardous Air Pollutant (HAP) emitted above their Reporting Thresholds
- Any non-HAP odor causing compounds emitted with reference odor concentrations, such as hydrogen sulfide and ammonia
- Any other air toxic emitted which may pose a health risk, such as silica

When do you conduct a Health Risk Assessment?

- New Source (major and minor)
- Modification (major and minor)
- Renewal (Title V)



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Overview of the Risk Screening Process

First Step – Screening by evaluating potential air toxic emission rates:

Any air toxic which is a HAP will be emitted in excess of the Reporting Thresholds (RT) in N.J.A.C. 7:27-17 “Control and Prohibition of Air Pollution by Toxic Substances and Hazardous Air Pollutants”

- RT developed to be protective of public health
- If below the RT, no further risk evaluation is necessary
- If above the RT, air toxic needs to be listed on application and must be evaluated to determine potential health risk impacts

Any air toxic which is not a HAP must be evaluated to determine potential health risk impacts no matter the emission rate

Overview of the Risk Screening Process

Second Step: Risk Screening Worksheet

Evaluate HAP and non-HAP air toxics listed on permit application with the “NJDEP Division of Air Quality Risk Screening Worksheet for Long-Term Carcinogenic and Noncarcinogenic Effects and Short-Term Effects”

- Excel spreadsheet provides a conservative estimate of the potential health impact
- Can be used for the majority of source operations which emit air toxics

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TABLE 2
Reporting Threshold
(Potential to emit)

<u>CAS Number</u>	<u>Air Contaminant</u>	<u>Reporting Threshold (lbs/yr)</u>	<u>SOTA Threshold (lbs/yr)</u>
75070	Acetaldehyde	21	10,000
60355	Acetamide	2	2,000
75058	Acetonitrile	2,000	8,000
98862	Acetophenone	1	2,000
53963	2-Acetylaminofluorene	0.04	10
107028	Acrolein	1	80
79061	Acrylamide	0.5	40
79107	Acrylic acid	45	1,200
107131	Acrylonitrile	1	600
107051	Allyl chloride	8	2,000

Air Toxic Reporting Thresholds

Prior reporting thresholds were in effect from 1995 to January, 2018

- Technology based, 112(g) MACT values proposed in 1994, but never adopted
- These MACT values were developed to trigger a case-by-case MACT analysis
- 1/10 of proposed MACT values

Developed revised RT to be more protective of public health and based on today's science

- Proposed as a rule change with stakeholder process
- Scientifically and statistically based
- Formally adopted in February, 2018

Air Toxic Reporting Thresholds

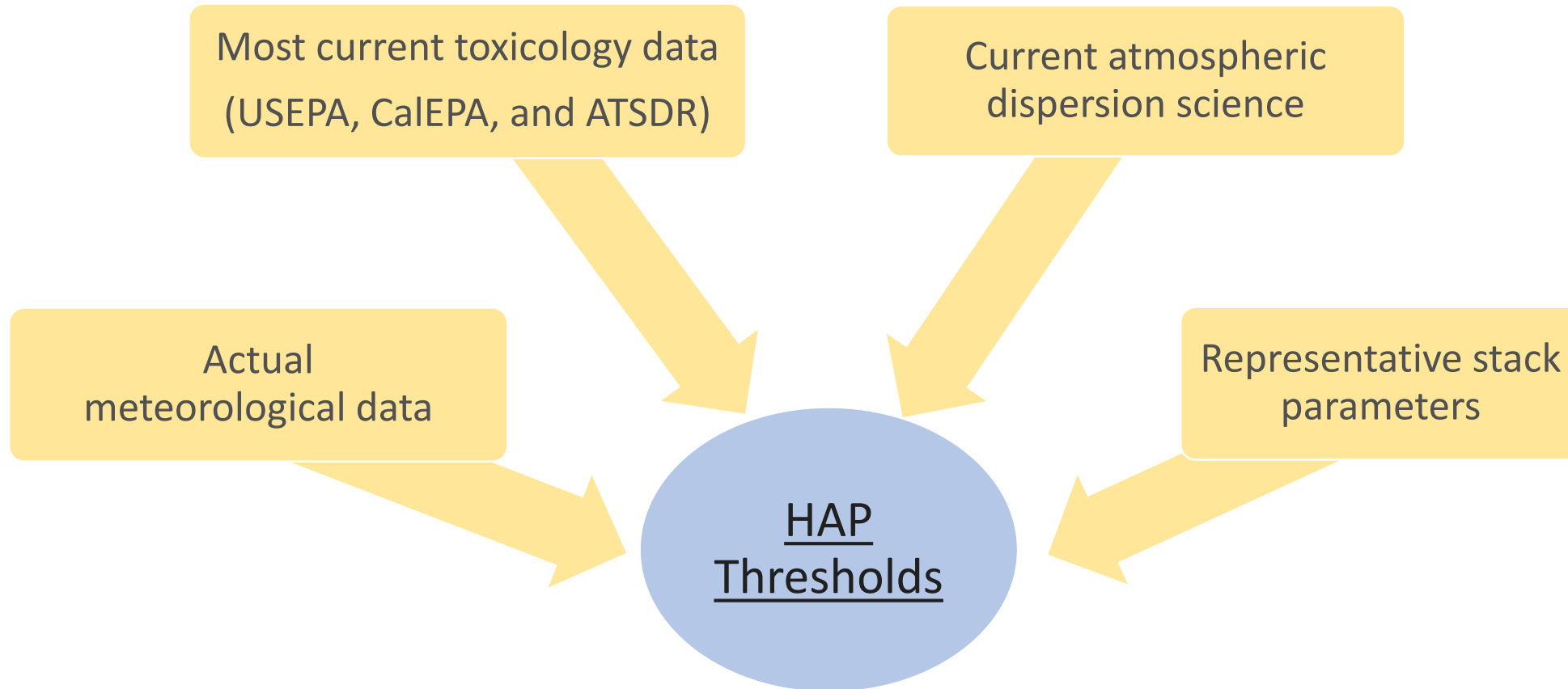
Revised RT developed in three steps:

Step I: Determined Modeling Methodology

Step II: Processed the Modeling Results

Step III: Chose the HAP Reporting Thresholds to be Proposed

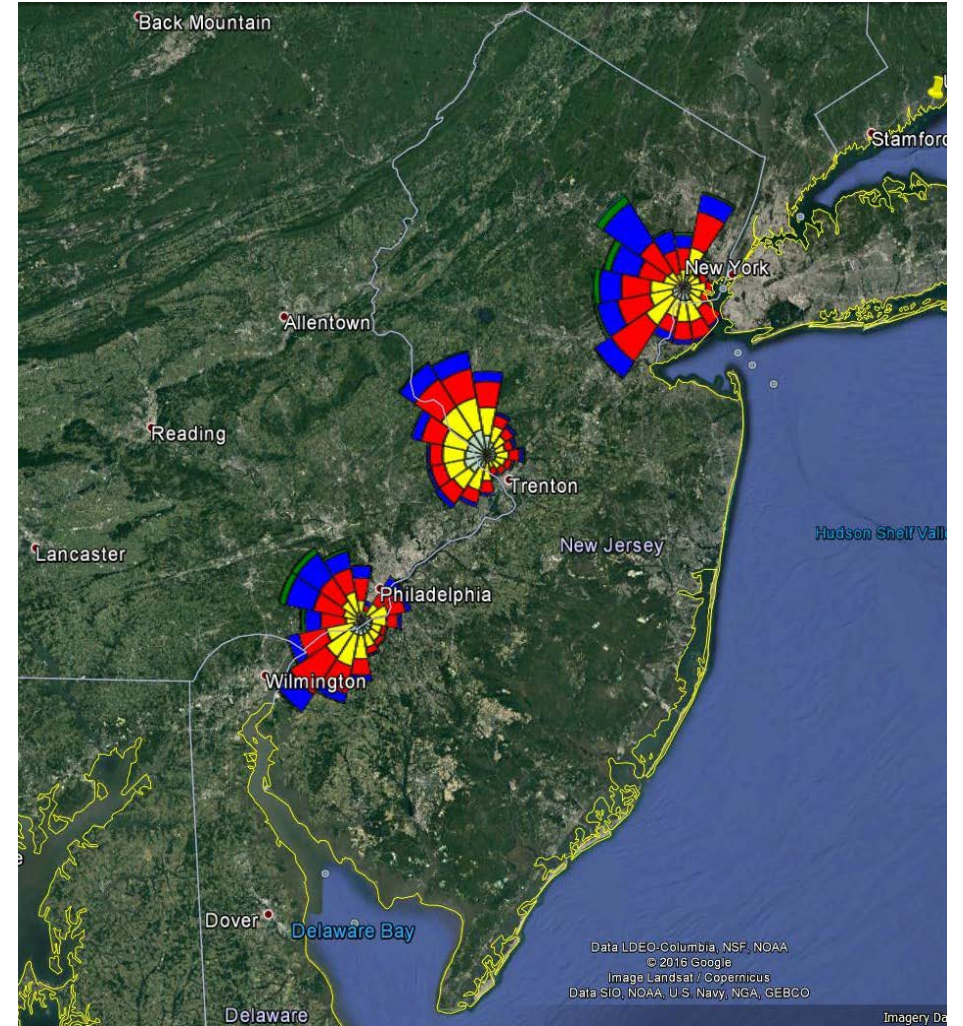
Air Toxic Reporting Thresholds



Step I: Determined Modeling Methodology

AERMOD (v. 15181)

- Land Use – Rural and Urban
- Meteorology – 5 years of data
- Stack heights evaluated from 15 – 250 feet accounting for building downwash
- Relatively low stack velocity and temperature
- Comprehensive receptor grid
- Receptor grid assumed flat terrain



Step II: Processed the Modeling Results

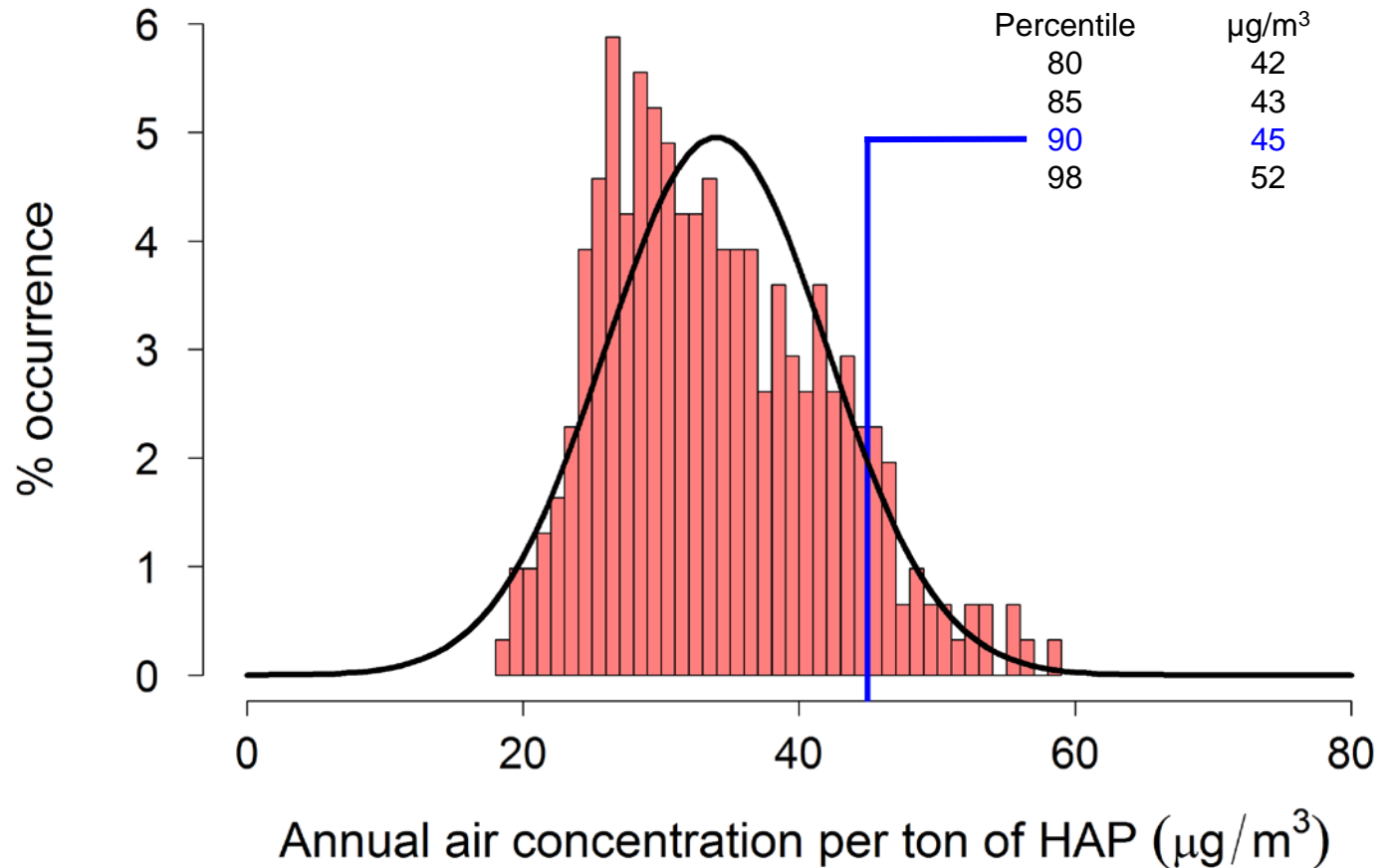
- 855,360 impacts were generated ($\mu\text{g}/\text{m}^3$)
- Only considered stack heights 35 feet or less and property line distances less than 100 feet
 - Representative of data found in NJDEP Air Permits
 - 71% of 27,000 NJ stacks (not including General Permits) are less than 35 feet
 - 41% of these stacks are located 100 feet or less from property line

Step III: Chose the Reporting Thresholds

- 80th, 85th, 90th, and 98th percentiles of the modeled annual impacts were calculated
- 90th percentile (45 $\mu\text{g}/\text{m}^3$) chosen
- Reporting thresholds based each HAP air toxic's individual unit risk factor or reference concentration

Step III: Chose the Reporting Thresholds

Percentage Frequency Distribution of Annual Air Concentrations



Step III: Chose the Reporting Thresholds

What threshold gives us negligible risk?

Using the Department's Health Risk Benchmarks;
one in a million cancer risk, and a **hazard quotient of one**.

Cancer based Threshold

$$\text{Equation 1: } Q = \frac{CR}{URF \times C'}$$

Non-Cancer based Threshold

$$\text{Equation 2: } Q = \frac{RfC}{C'}$$

where:

Q = maximum annual emission rate, ton/yr – **Threshold**

CR = cancer risk; assumed to be 1×10^{-6}

URF = pollutant-specific inhalation unit risk factor, $(\mu\text{g}/\text{m}^3)^{-1}$

RfC = pollutant-specific reference concentration, $\mu\text{g}/\text{m}^3$

C' = normalized annual emission rate, $(\mu\text{g}/\text{m}^3)/(\text{ton}/\text{yr})$

Steps I, II, and III had to be thorough, accurate, statistically sound, and use the most current data since:

- Proposed RT were issued for public comment
- Used to update the Risk Screening Worksheet
- Most importantly, will be used to exempt certain air toxic emissions from further evaluation

The complete procedure of Steps I, II, and III is explained in
“Technical Support Document Updating Hazardous Air Pollutant Reporting Thresholds”
<https://www.state.nj.us/dep/airtoxics/Technical%20Support%20Document.pdf>

Outline

1. Health Risk Assessment
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NJDEP DIVISION OF AIR QUALITY RISK SCREENING WORKSHEET
For Long-Term Carcinogenic and Noncarcinogenic Effects and Short-Term Effects
February 2016

For new or modified source operations. NOT TO BE USED FOR SOURCES WITHOUT STACKS, such as certain dry cleaners, degreasers, storage tanks, and gasoline stations. For information on how to evaluate risk from other kinds of sources, contact Air Quality Evaluation at 609-292-6722.

To see a listing of air toxics by CAS number, click on the "CAS Index" tab at the bottom of this worksheet page.

This is a protected file. Changes are allowed only to certain cells (those in yellow). It is also a "read only" file. To save the data you input, select "File" on the menu above, then "Save as" in your own files, under the name of your choice. Input data only to yellow fields. Incremental cancer risk (IR) and hazard quotient (HQ) will calculate automatically when you type in the stack parameters (stack height and distance to property line) and an emission rate.

For references for toxicity data (URFs and RFCs), see the lists at www.nj.gov/dep/aqpp/risk.html.

Date: _____
 Facility ID No.: _____
 Activity ID No.: _____
 Facility name: _____
 Facility location: _____
 File name (.xls): _____

Emission Unit/Batch Process ID No.: _____
 Emission Point ID No.: _____
 Equipment ID No.(s): _____
 Operating Scenario(s): _____

Stack height: _____ ft
 Distance to property line: _____ ft
 Annual air impact value, C_{at}: _____ (ug/m³)(ton/yr)
 24-hour air impact value, C_{st}: _____ (ug/m³)(lb/hr)

KEY:

Long-Term Effects
 Q = Annual emission rate (in tons per year)
 C = C_{at} x Q = Annual average ambient air concentration
 URF = Unit risk factor (for carcinogenic risk)
 IR = C x URF = Incremental risk (for carcinogen)
 RFC = Reference concentration (for noncarcinogenic effects)
 HQ = C/RFC = Hazard quotient (for noncarcinogenic risk)
 Rslt = The result of comparing the IR or HQ to the negligible threshold (FER if > threshold, Negl. if <= threshold)
 FER = Further Evaluation Required (See Notes for thresholds)
 Negl. = Negligible (See Notes for thresholds)

Short-Term Effects
 Q_h = Hourly emission rate (in pounds per hour)
 C_{st} = C_{st} x Q_h = Short-term average ambient air concentration
 RFC_{st} = Short-term reference concentration (for noncarcinogenic effects)
 HQ_{st} = C_{st}/RFC_{st} = Hazard quotient for short-term noncarcinogenic effects
 Rslt = The result of comparing the HQ_{st} to the negligible threshold (FER if > threshold, Negl. if <= threshold)
 FER = Further Evaluation Required (See Notes for thresholds)
 Negl. = Negligible (See Notes for thresholds)

ID	H	A	P	CAS No.	Air Toxic	LONG-TERM EFFECTS						SHORT-TERM EFFECTS					
						Q (ton/yr)	C (ug/m ³)	URF [(ug/m ³) ⁻¹]	IR	Rslt	RFC (ug/m ³)	HQ	Rslt	Q _h (lb/hr)	C _{st} (ug/m ³)	RFC _{st} (ug/m ³)	HQ _{st}
1	*			75070	Acetaldehyde			2.2E-06			9						
2	*			60355	Acetamide			2.0E-05									
3				67641	Acetone						31000			62000			
4				75365	Acetone cyanohydrin						2						
5	*			75058	Acetonitrile						60						
6	*			98862	Acetophenone						0.02						

Screening Worksheet for Air Toxics Listed in an APC Permit Application

NJDEP Division of Air Quality Risk Screening Worksheet for Long-Term Carcinogenic and Noncarcinogenic Effects and Short-Term Effects

Excel spreadsheet which determines a conservative risk - <https://www.state.nj.us/dep/aqpp/risk.html>

Inputs to spreadsheet

- Air toxic emissions in tpy and lb/hr, as appropriate
- Stack height and stack distance to the nearest property line

Outputs for each individual air toxic

- Negl. – Negligible, no further review necessary
- FER – Further Evaluation Required

Certain source operations cannot use the Worksheet

- Storage tanks, dry cleaners
- Stacks that do not discharge vertically
- Stacks with heights less than 10 feet

Screening Worksheet for Air Toxics Listed in an APC Permit Application

For carcinogenic air toxics, cancer risk is determined with the following equation:

$$CR = URF \times C$$

where:

CR = cancer risk; incremental cancer risk for each individual pollutant

URF = pollutant-specific inhalation unit risk factor, $(\mu\text{g}/\text{m}^3)^{-1}$

C = maximum annual average ambient air concentration of a pollutant
 $(\mu\text{g}/\text{m}^3)$

Negligible cancer risk – less than 1 in a million

Screening Worksheet for Air Toxics Listed in an APC Permit Application

For non-carcinogenic air toxics, health risk is determined with the following equation:

$$HQ = \frac{C}{RfC}$$

where:

HQ = Hazard Quotient

C = maximum ambient air concentration of a pollutant ($\mu\text{g}/\text{m}^3$), long- or short-term

RfC = pollutant-specific inhalation reference concentration, $\mu\text{g}/\text{m}^3$

Negligible risk is a Hazard Quotient less than 1

Risk Screening Worksheet Results

Air Toxic	LONG-TERM EFFECTS								SHORT-TERM EFFECTS				
	Q (ton/yr)	C (ug/m ³)	URF [(ug/m ³) ⁻¹]	IR	Rslt	RfC (ug/m ³)	HQ	Rslt	Q _h (lb/hr)	C _{st} (ug/m ³)	RfC _{st} (ug/m ³)	HQ _{st}	Rslt
Acetaldehyde	1.0E+01	4.8E+02	2.2E-06	1.0E-03	FER	9	5.3E+01	FER	5.0E+00	12243.75	470	2.6E+01	FER
Acetamide	0.0E+00	0.0E+00	2.0E-05	0.0E+00	Negl.				5.0E+00	12243.75			
Acetone	1.0E+01	4.8E+02				31000	1.5E-02	Negl.	5.0E+00	4897.5	62000	7.9E-02	Negl.
Acetone cyanohydrin	0.0E+00	0.0E+00				2	0.0E+00	Negl.	5.0E+00	12243.75			
Acetonitrile	1.0E+01	4.8E+02				60	7.9E+00	FER	5.0E+00	12243.75			
Acetophenone	1.0E+01	4.8E+02				0.02	2.4E+04	FER	5.0E+00	12243.75			
Acetylamino fluorene (2-)	0.0E+00	0.0E+00	1.3E-03	0.0E+00	Negl.				5.0E+00	12243.75			
Acrolein	0.0E+00	0.0E+00				0.02	0.0E+00	Negl.	5.0E+00	12243.75	2.5	4.9E+03	FER
Acrylamide			1.0E-04			6							
Acrylic acid						1					6000		

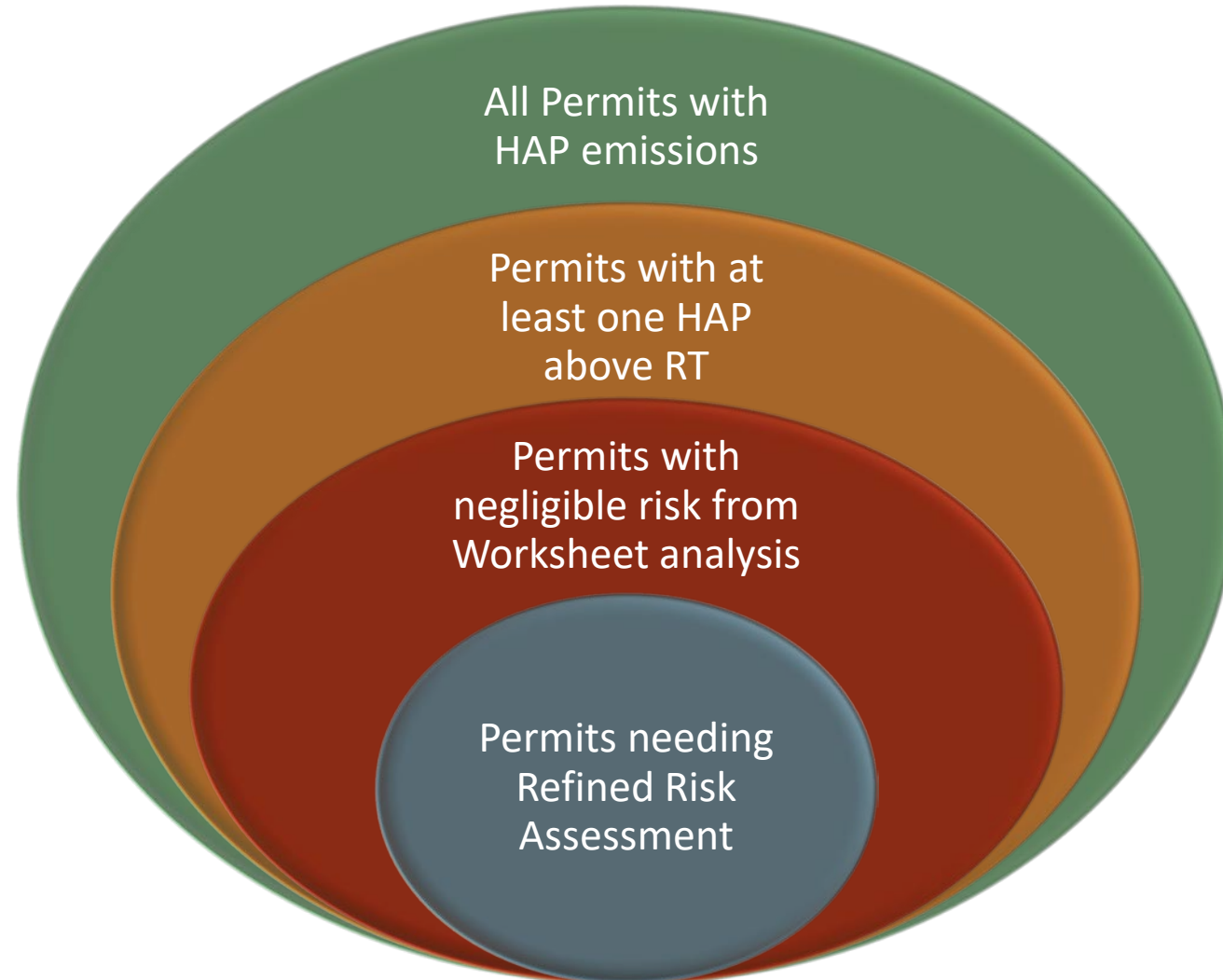
<https://www.state.nj.us/dep/aqpp/risk.html>

Screening Worksheet for Air Toxics Listed in an APC Permit Application

If “Further Evaluation Required” (FER) is the output, a facility can either:

- Adjust parameters, as feasible, to lower risk to Negligible Impact using the Risk Screening Worksheet; or
- Conduct a Refined Risk Assessment
 - Use a computer model, such as AERMOD
 - Provide a plot plan to determine impact on plume from other structures
 - Calculate risk (CR and HQ) using same formulas as Worksheet
 - Impact ($\mu\text{g}/\text{m}^3$) predicted by AERMOD should be lower than with the Risk Screening Worksheet

NJ Levels of Risk Assessment Analysis



Questions?
