Screening and Risk Assessment

February 2, 2017

Screening and Risk Assessment Questions

- Which of the program elements and options should be included?
- If De Minimis and Significant Emission Rates are used, how should they be calculated?
- If modeling is used, what should be required?
- What should the requirements be for facilities at each tier of screening and modeling?

Screening and Risk Assessment

Handout: February 2, 2017 Cleaner Air Oregon Advisory Committee

Oregon Health Authority

DEQ State of Oregon Department of Environmental Quality

Screening and Risk Assessment

De minimis emission rate Program Element 16 Include or not?	Significant emission rate Program Element 17 Include or not?	Initial Modeling Program Element 18 Include or not?	Refined Modeling Program Element 19 Include or not?

Options if facility emits below de minimis rate

Facility exempt from further requirements?

Require reporting every 5 years, use in statewide emissions inventory?

Include emissions in nearby cumulative source analysis?

Other options?

Options if facility emits above de minimis emission rate and below significant emission rate

Facility exempt from further requirements?

Require reporting every 5 years, use in statewide emissions inventory?

Include emissions in nearby cumulative source analysis?

Require cumulative analysis or modeling if in a community with environmental justice concerns?

Require pollution controls or pollution prevention?

Other options?

Options if facility emits at above significant emission rate and initial modeling shows less than allowable risk level

Facility exempt from further requirements?

Require reporting every 5 years, use in statewide emissions inventory?

Include emissions in nearby cumulative source analysis?

Require cumulative analysis, refined modeling, or enhanced engagement if in a community with environmental justice concerns?

Require reductions to get below SER including pollution controls, plant-wide emissions offsets, or pollution prevention?

Other options?

Options if initial modeling shows more than allowable risk level and refined modeling shows less than allowable risk level

Exempt from further requirements?

Require 5 year emission reporting?

Include emissions in nearby cumulative source analysis?

Require cumulative analysis, refined modeling, or enhanced engagement if in a community with environmental justice concerns?

Require reductions to get below SER including pollution controls, plant-wide emissions offsets, or pollution prevention?

Other options?

Options if refined modeling shows more than allowable risk level

Require pollution controls or pollution prevention?

Require periodic evaluation and installation of newly available control technology?

Conduct more accurate and detailed risk analysis?

Do not issue permit?

Other options?

LESS ← **Health risk from facility** → **MORE**

How to calculate de minimis?	How to calculate SER	Initial modeling	Refined modeling
Derive de minimis from the RBC Include a safety factor for cumulative risk?	*Derive significant emission rate from the risk based concentration* Include a safety factor for cumulative risk? Sum the ratios of each air toxics emission rate/SER. If result is over 1 (or some other chosen value), require modeling?	*Compare results to allowable risk level* Conservative modeling assumptions? Include cumulative risk? Background? Cross-media pathways?	*Compare results to allowable risk level* Include cumulative risk? Background? Cross-media pathways? Receptor locations? Sensitive populations? Exposure vs. modeled concentrations?

Screening and Risk Assessment

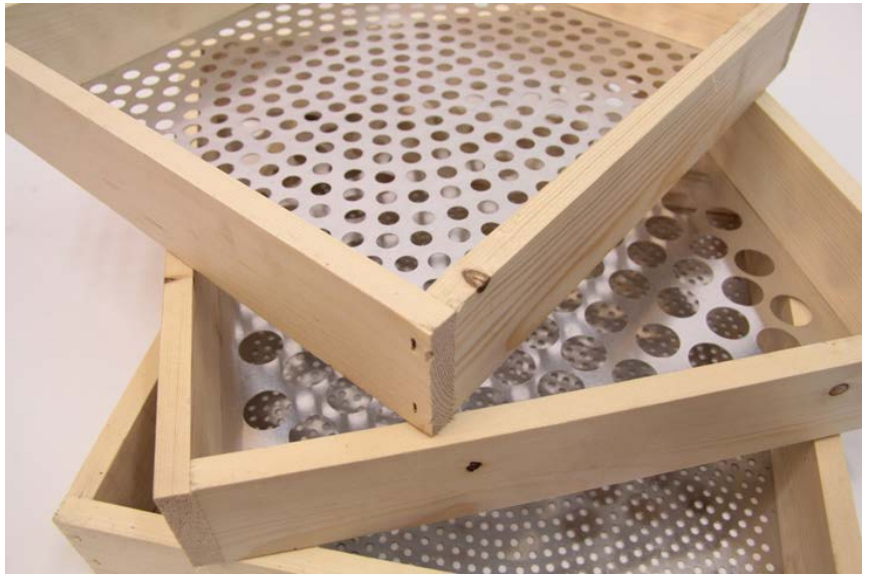
Purpose of screening and risk assessment approach:

1) Identify sources of significant risk
2) Quantify risk
3) Be efficient and cost effective
4) Be consistent across source types
5) Be transparent to users, regulated industry and public

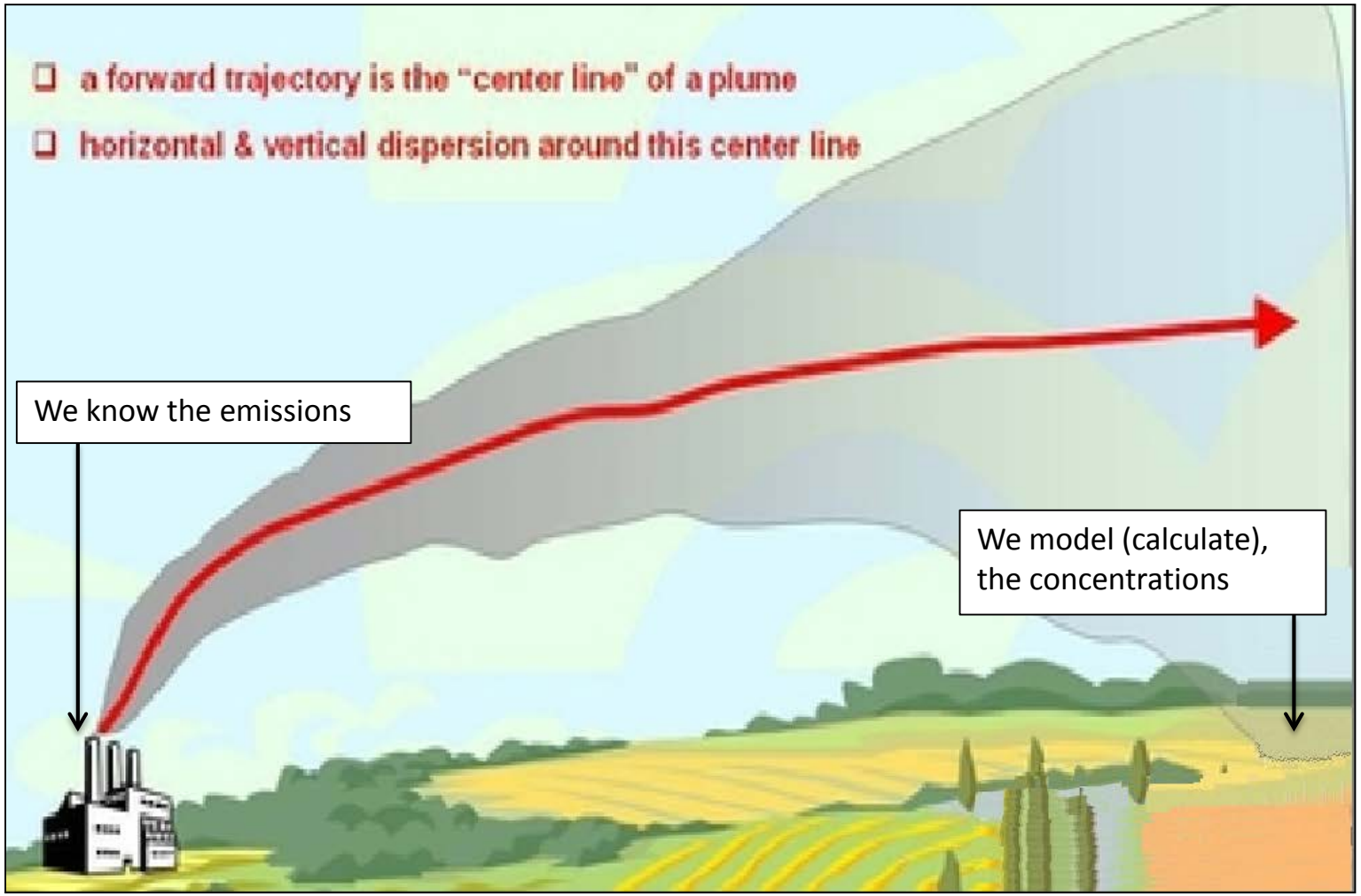
Screening and Risk Assessment

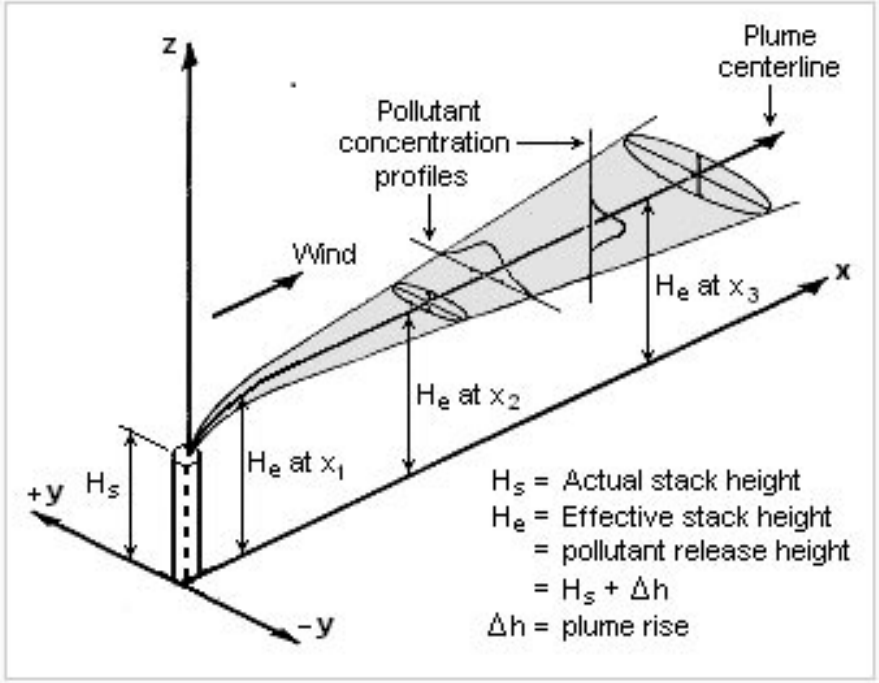
Risk assessments are usually evaluated through a set of screening steps of increasing refinement:

1. Emission thresholds, or
   - Factors or tables to convert emissions to screening concentrations/risk
2. Dispersion modeling
   - Screening level
   - Refined level



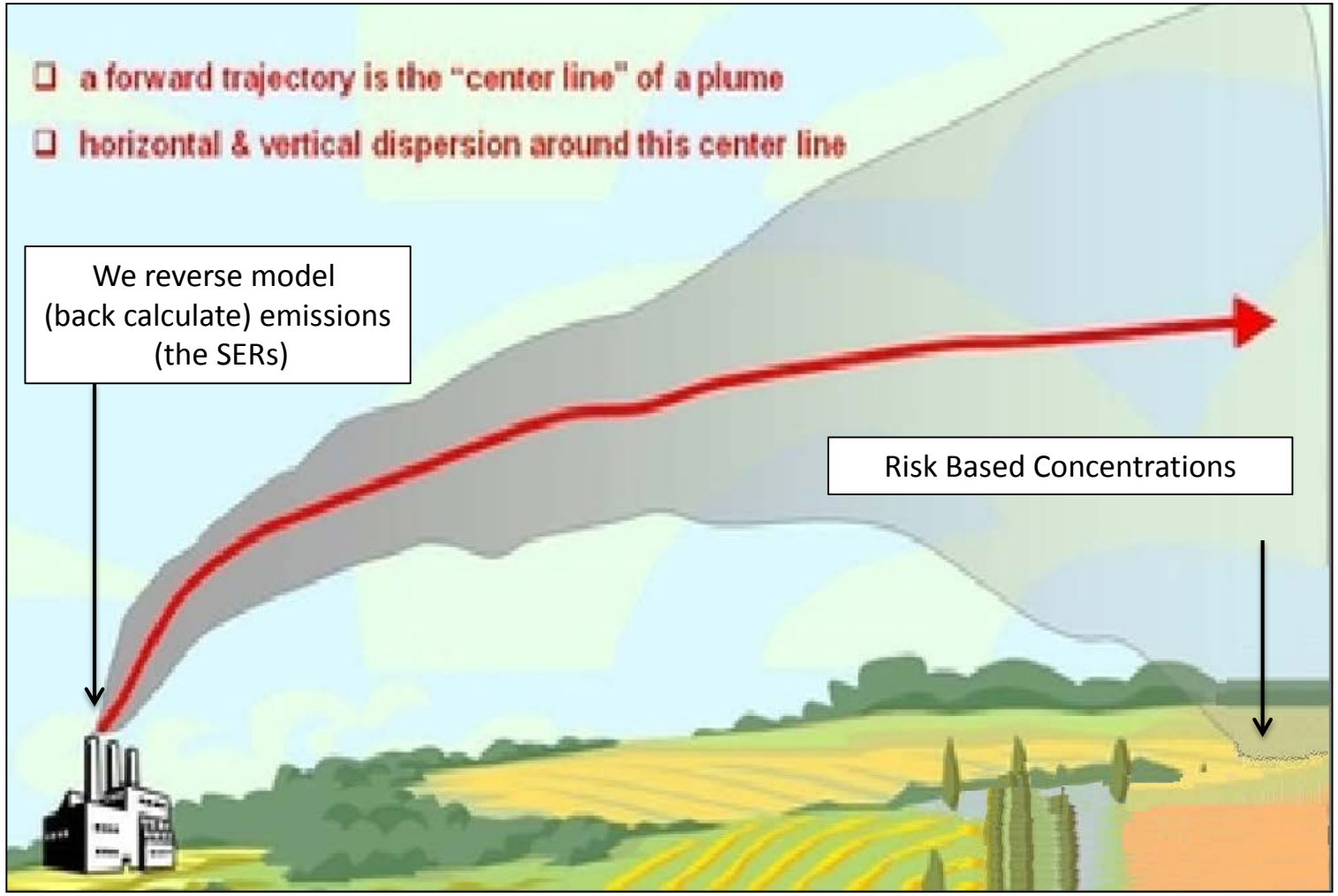
Screening and Risk Assessment





Visualization of a buoyant Gaussian air pollutant dispersion plume

Screening and Risk Assessment



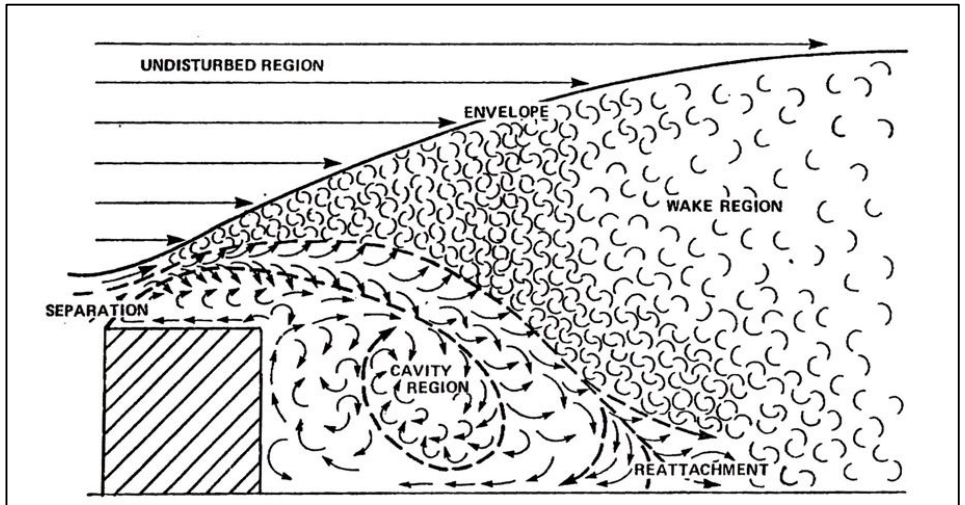
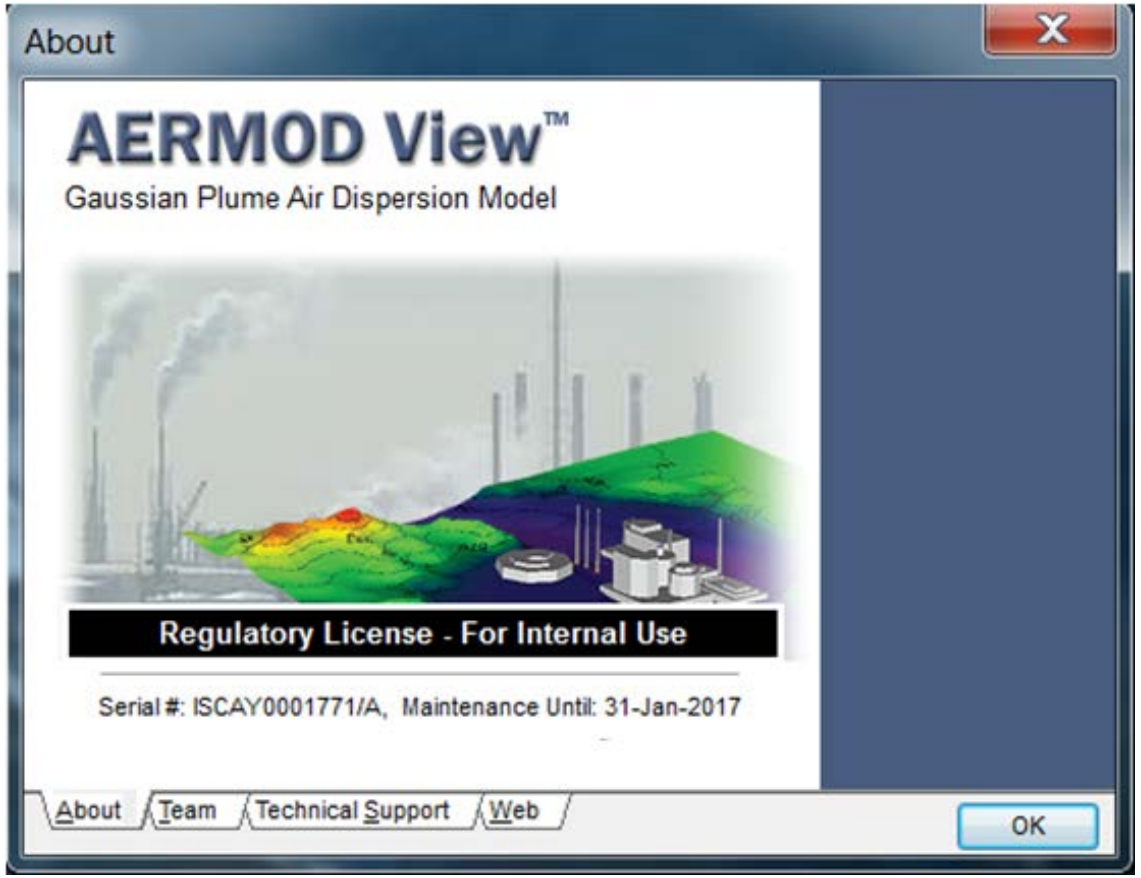


Figure 1. Diagrammatic outline of the envelope and cavity regions in the wake of a building (vertical section).

Air Quality Dispersion Models

AERMOD

EPA refined model



AERSCREEN

EPA screening model

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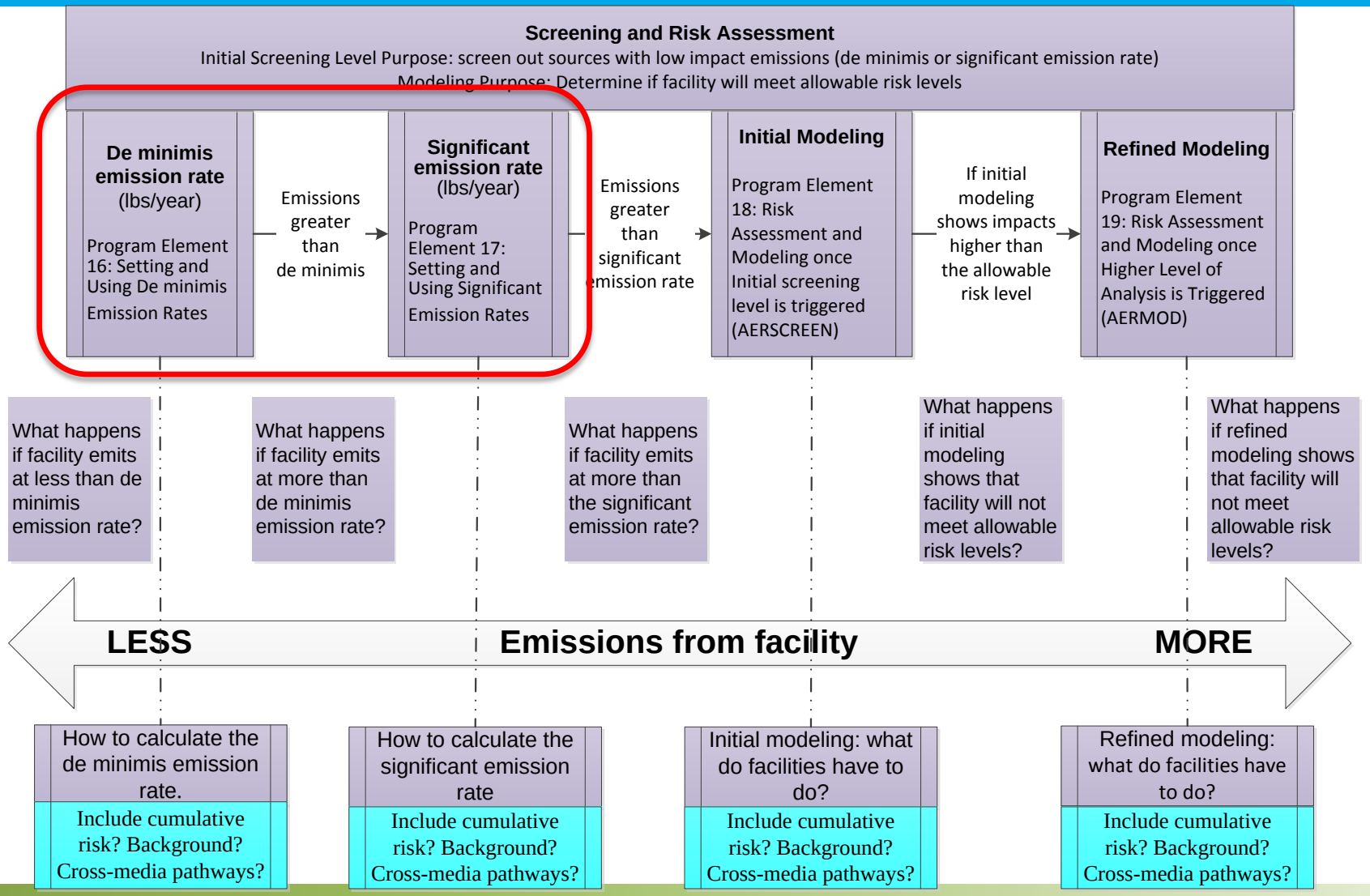


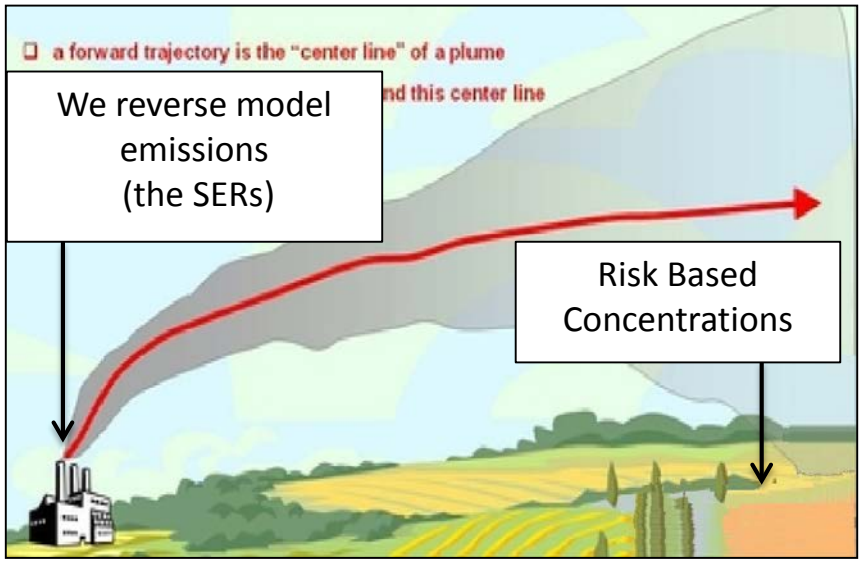
Screening and Risk Assessment

Emissions thresholds: two types to consider:

1. Significant Emission Rates (SERs)
   - Facility emissions below this threshold will result in concentrations/risk below the RBCs

2. De Minimis Emission Rates
   - Facility emissions below this threshold are considered negligible

Program Element 17: Setting and Using Significant Emission Rates



Developing Significant Emission Rates

1) Conservative screening model

2) Annual average SER

3) Worst case meteorology (low wind speeds, stagnation)

4) Model at fenceline locations

5) Seek balance between conservativeness and functionality

Program Element 17: Setting and Using Significant Emission Rates

Technical Workgroup Comments Included:

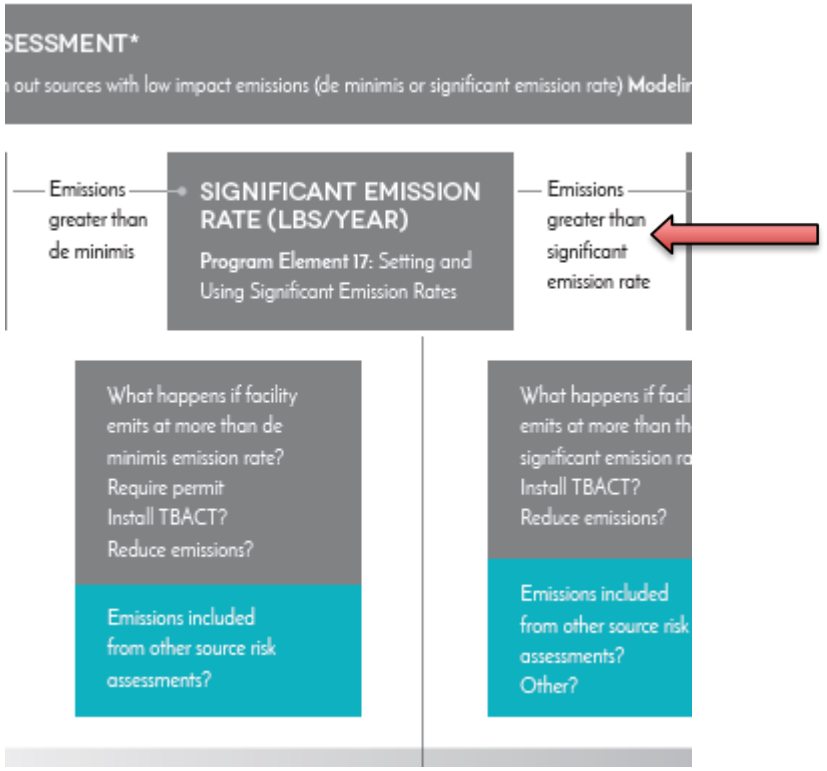
- SERs need to be conservative enough to evaluate sources that pose a public health risk but screen out facilities that do not.
- SERs and their derivation should be clear and transparent.
- Consider ways to incorporate the additive effects of toxics into the screening methodology.

Program Element 17: Setting and Using Significant Emission Rates

Potential elements for setting and using significant emission rates

The following are potential elements for which DEQ and OHA are seeking additional discussion and input from the Advisory Committee. If there are additional elements not included below, please raise them.

Potential Elements
A. Don't use significant emission rates. All sources must model.
B. Include a significant emission rate. If sources emit at levels **below** the significant emission rate, and there is no de minimis in use, exempt these sources from further requirements and from cumulative analysis of nearby sources.
C. Include a significant emission rate. If sources emit at levels **above** the significant emission rate, • Require TBACT; • Require screening or refined dispersion modeling; and • Include emissions in cumulative analysis of nearby sources.
D. Require permit applicants to provide an emission inventory, dispersion model and demographic overlay in advance of or concurrent with the permit application (Based on the Minnesota PCA and New York DEC approaches)
E. Require a cumulative impact assessment and enhanced community engagement when the demographic emissions overlay shows a potential disparate impact within or adjacent to an EJ community (as defined by regionally-significant thresholds)



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Program Element 16: Setting and Using De Minimis Emission Rates

De Minimis Emission Rates

1) Typically set as a fraction of the SER
   - Washington State example where De Minimis = SER/20

2) If SER derived from RBC, De Minimis also risk based

Program Element 16: Setting and Using De Minimis Emission Rates

How De Minimis Fits

Categorical Exemption

Examples:

Temporary construction activities
Food service activities
Warehouse activities
Janitorial activities

De Minimis

Example

1,1,1-Trichloroethane
0.274 lbs/hr

SER

Example

1,1,1-Trichloroethane
5.46 lbs/hr

Activity or equipment based

Emission rate based

Program Element 16: Setting and Using De Minimis Emission Rates

Technical Workgroup comments include:

- De Minimis levels should be set so that sources that do not pose a public health risk are screened out.
- De Minimis levels could be set lower to account for cumulative risk of multiple pollutants.
- Sources emitting more than De Minimis levels could be required to install TBACT.

Program Element 16: Setting and Using De Minimis Emission Rates

Potential elements for setting and using de minimis emission rates

The following are potential elements for which DEQ and OHA are seeking additional discussion and input from the Advisory Committee. If there are additional elements not included below, please raise them.

Please note that these elements might be affected by other program elements, such as whether to include existing facilities, regulating by whole facility or by individual equipment, and whether cumulative impacts are included in this particular program element.

Potential Elements
A. Do not use a de minimis emission rate threshold
B. Include a de minimis threshold. If sources emit at levels **below** the de minimis, exempt sources from further evaluation requirements, and are not included in other source cumulative analysis
C. Include a de minimis threshold. If sources emit at levels **above** the de minimis, include emissions in cumulative analysis of nearby sources
D. Include a de minimis threshold. If sources emit at levels **above** the de minimis, require registration (for unpermitted facilities) and reporting requirements (every 5 years). These emissions would also be incorporated into the statewide emissions inventory.
E. Include a de minimis threshold. If sources emit at levels **above** the de minimis, require further evaluation to determine if source emits at above the significant emission rate or not.
F. Include a de minimis threshold. If sources emit at levels **above** the de minimis, require TBACT
G. Derive de minimis emission rates from the significant emission rate (for example add a safety factor to account for potential multiple air toxics or other cumulative risk) (For WA it is significant emission rate divided by 20)

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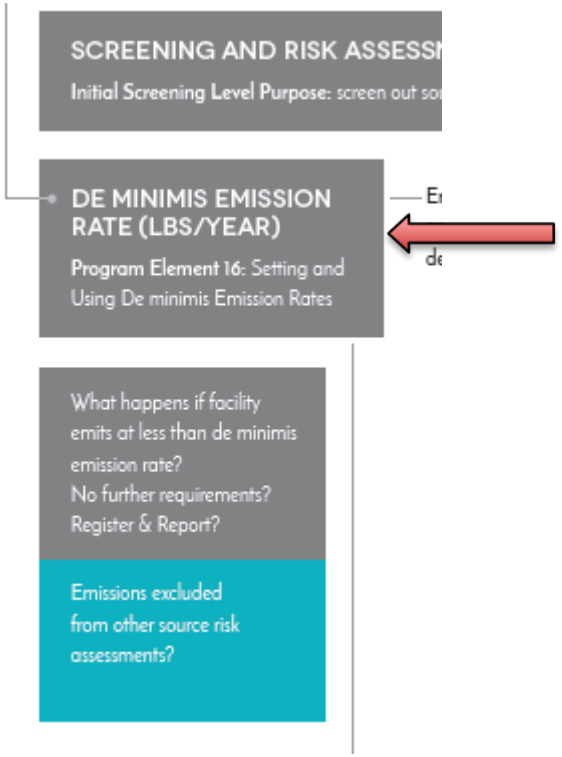


Screening and Risk Assessment

Questions for the Advisory Committee

1) Should the program use de minimis thresholds, SERs, or both?

2) How should De Minimis and SER thresholds be used?

De Minimis and SER Policy Options

De Minimis and SER scenarios

1) If facility emissions are less than De Minimis?

2) If facility emissions are between De Minimis and SER?

De Minimis and SER Policy Options

If facility emissions are less than De Minimis

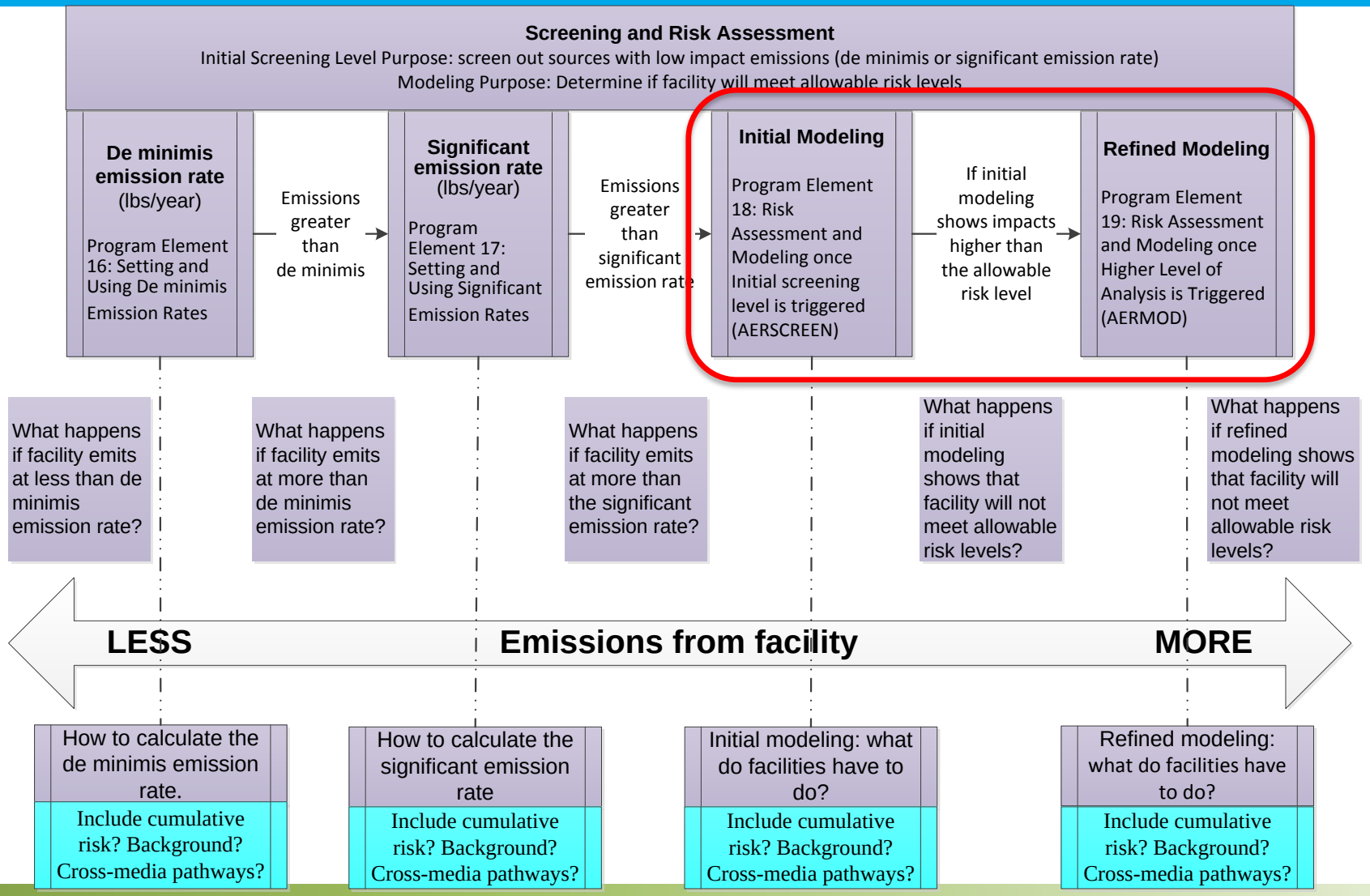
1) Facility exempt from further requirements
2) Require reporting every 3 to 5 years for use in Statewide emissions inventory
3) Include/not include emissions in cumulative nearby source analysis
4) Other options

De Minimis and SER Policy Options

If facility emissions between De Minimis and SER

1) Facility exempt from further requirements
2) Require reporting every 3 to 5 years for use in statewide emissions inventory
3) Include/not include emissions in cumulative nearby source analysis
4) Include in cumulative nearby source analysis if impact in EJ community
5) Require TBACT
6) Other options

Screening and Risk Assessment



Program Elements 18-19: Risk Assessment and Dispersion Modeling

Dispersion Modeling

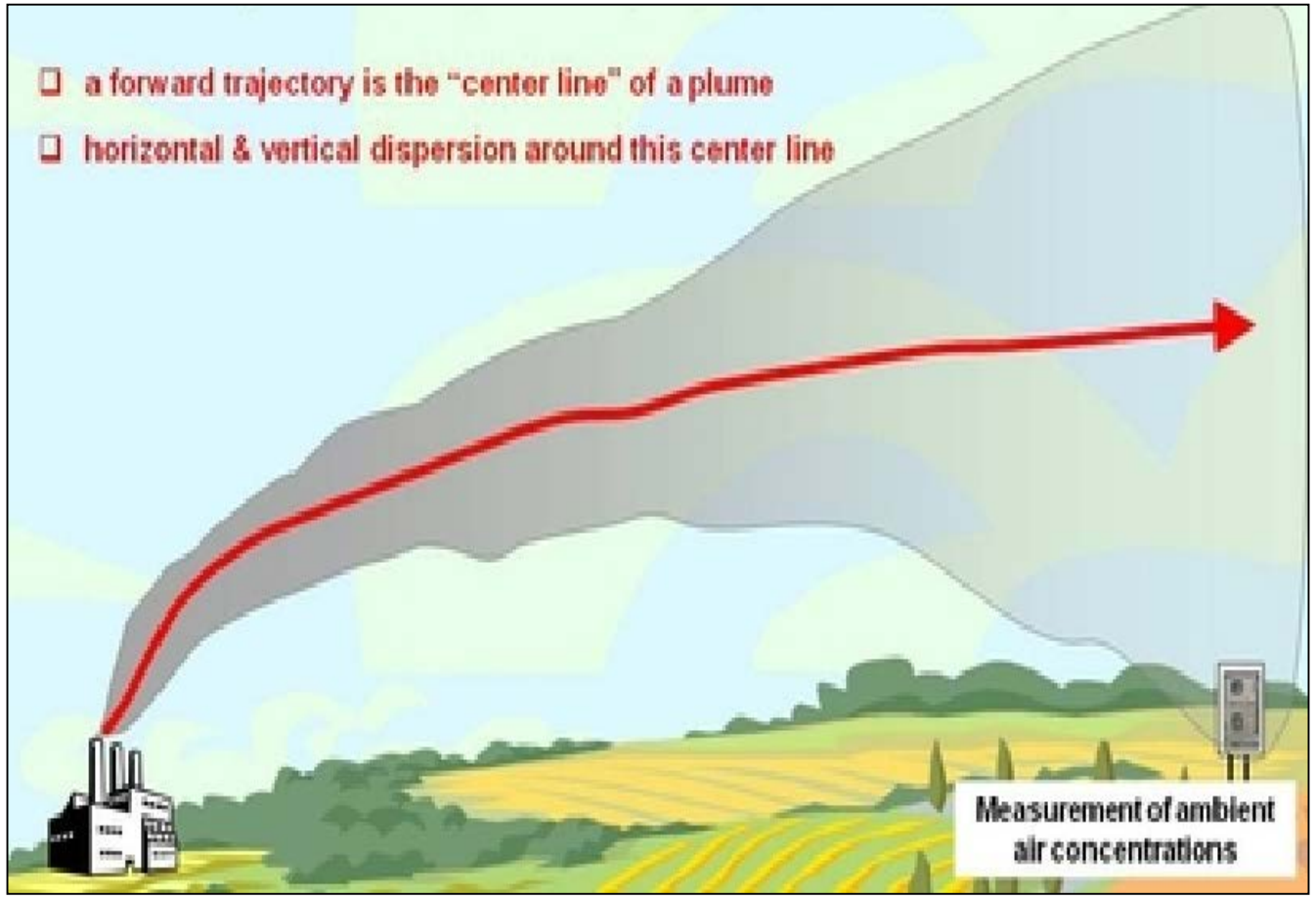
What is a model?

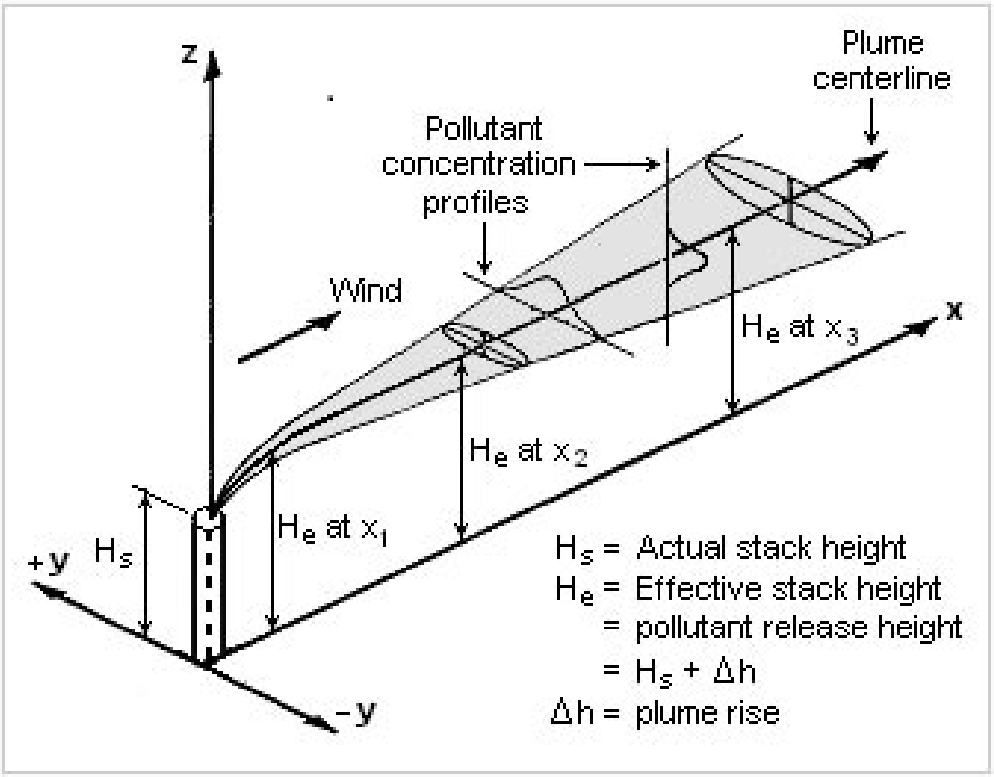
- A dispersion model is a mathematical representation of the transport and diffusion of emissions that occur as a result of winds and instability in the atmosphere.

Why model?

- More flexible and less resource intensive than monitoring.
- Individual source contributions to concentrations can be estimated.
- Effectiveness of control measures can be evaluated.

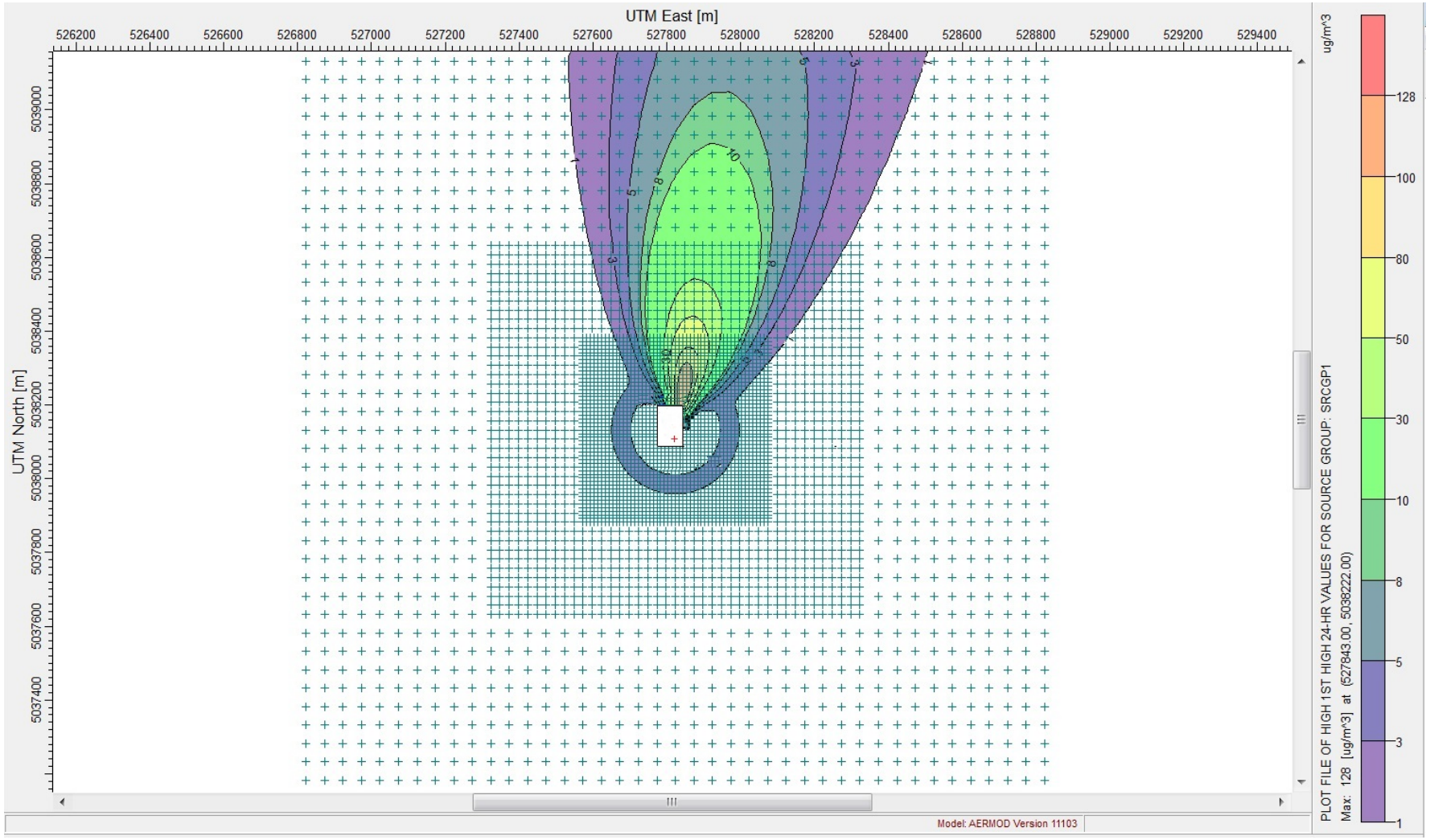
Program Elements 18-19: Risk Assessment and modeling using Dispersion Modeling





Visualization of a buoyant Gaussian air pollutant dispersion plume

Program Elements 18-19: Risk Assessment and Dispersion Modeling



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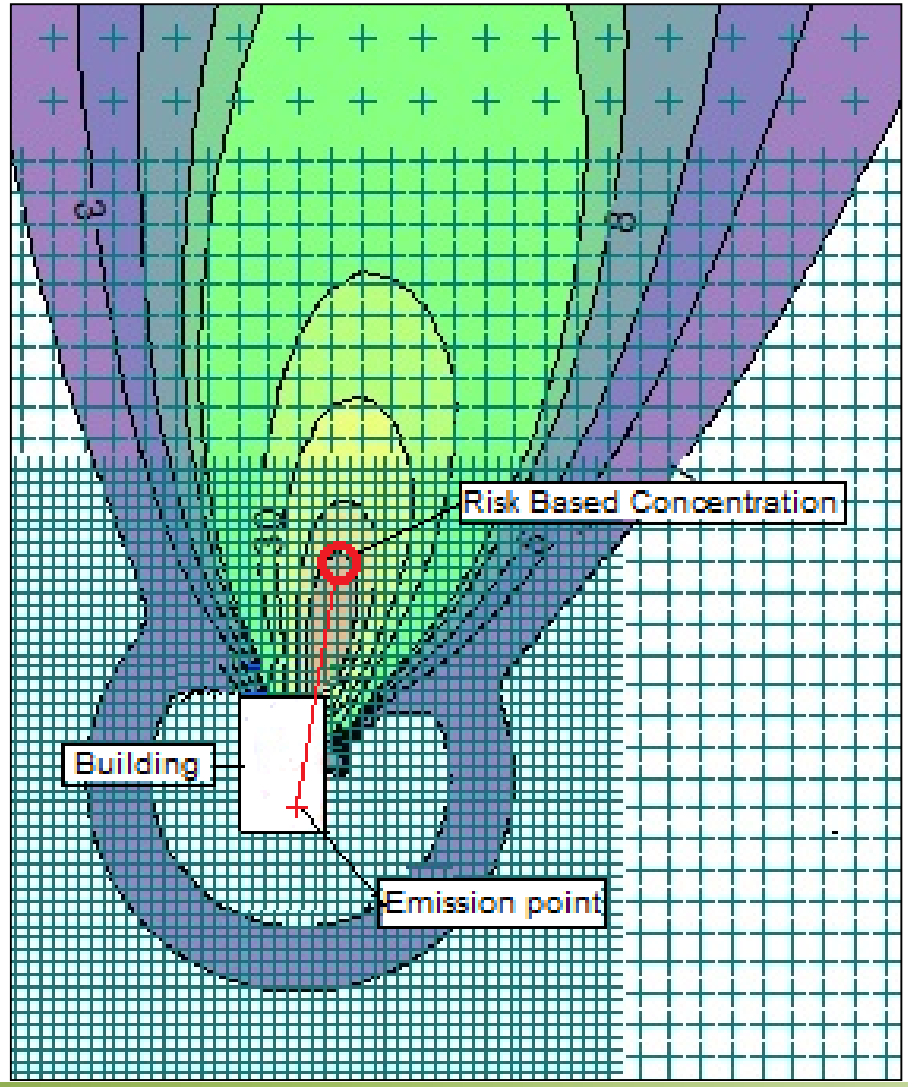
Program Elements 18-19: Risk Assessment and Dispersion Modeling



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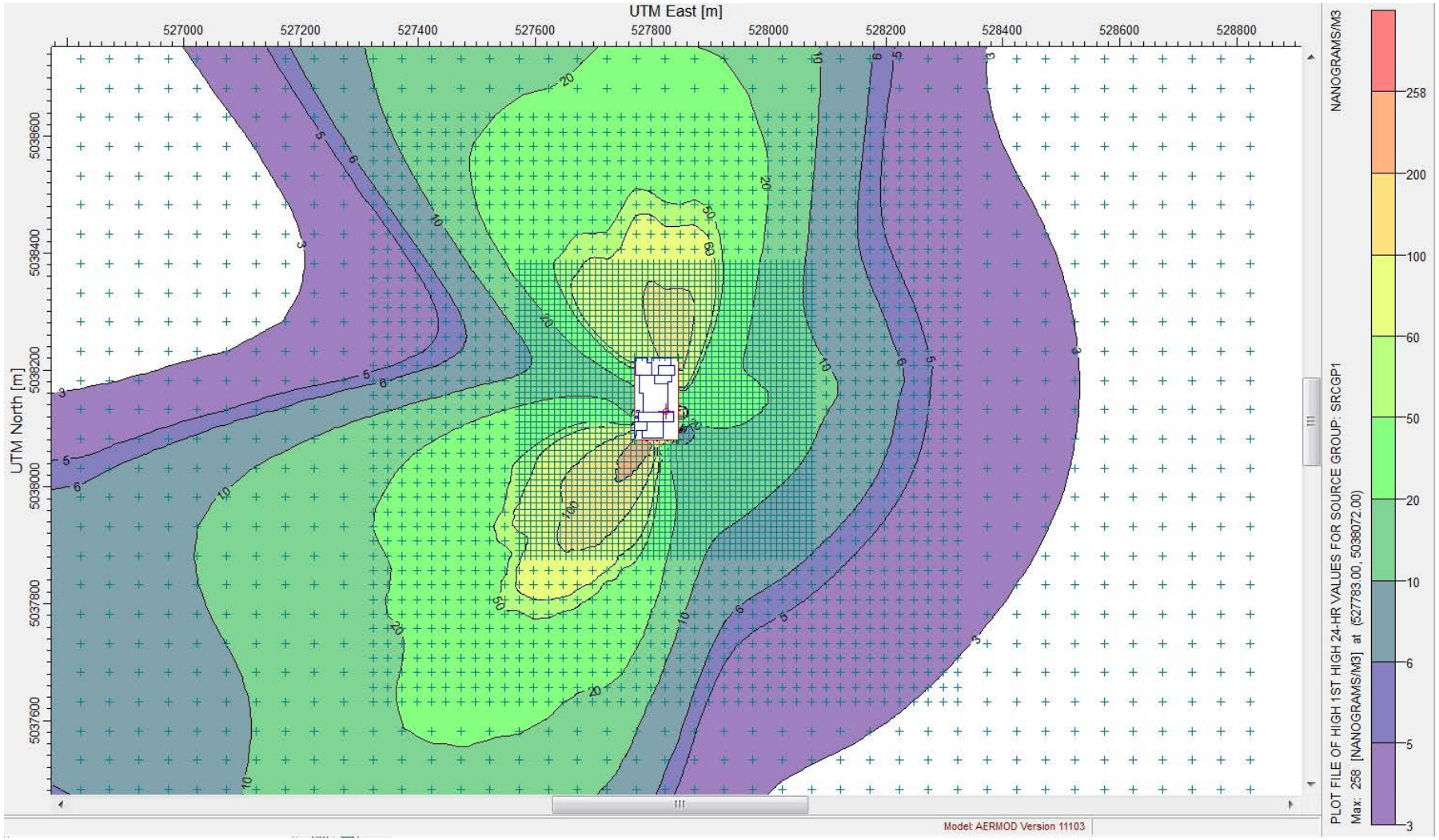

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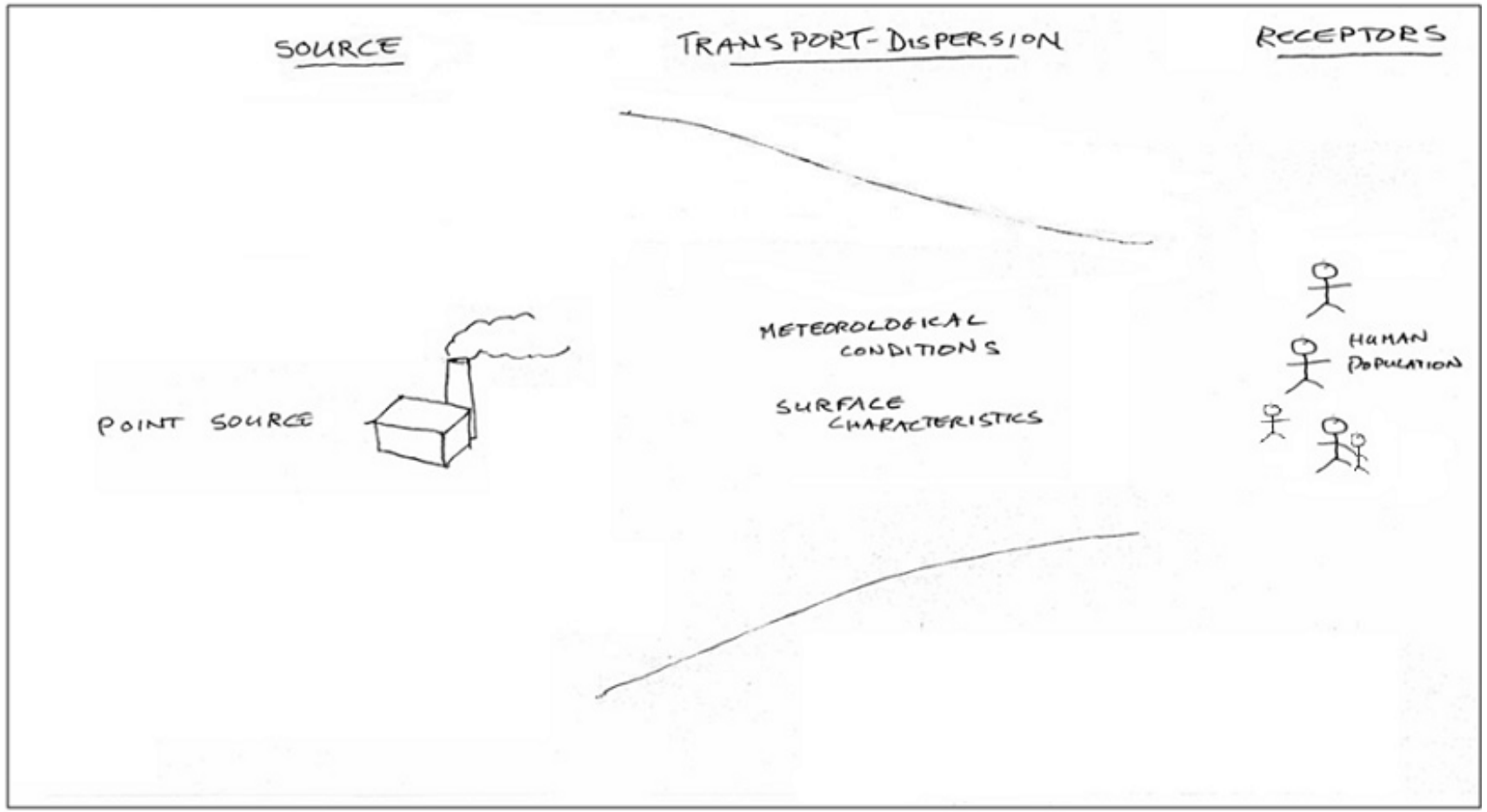
Program Elements 18-19: Risk Assessment and modeling using Dispersion Modeling



Program Elements 18-19: Risk Assessment and Dispersion Modeling

Dispersion Modeling

1) Initial Screening Level: AERSCREEN

2) Refined Modeling Level: AERMOD

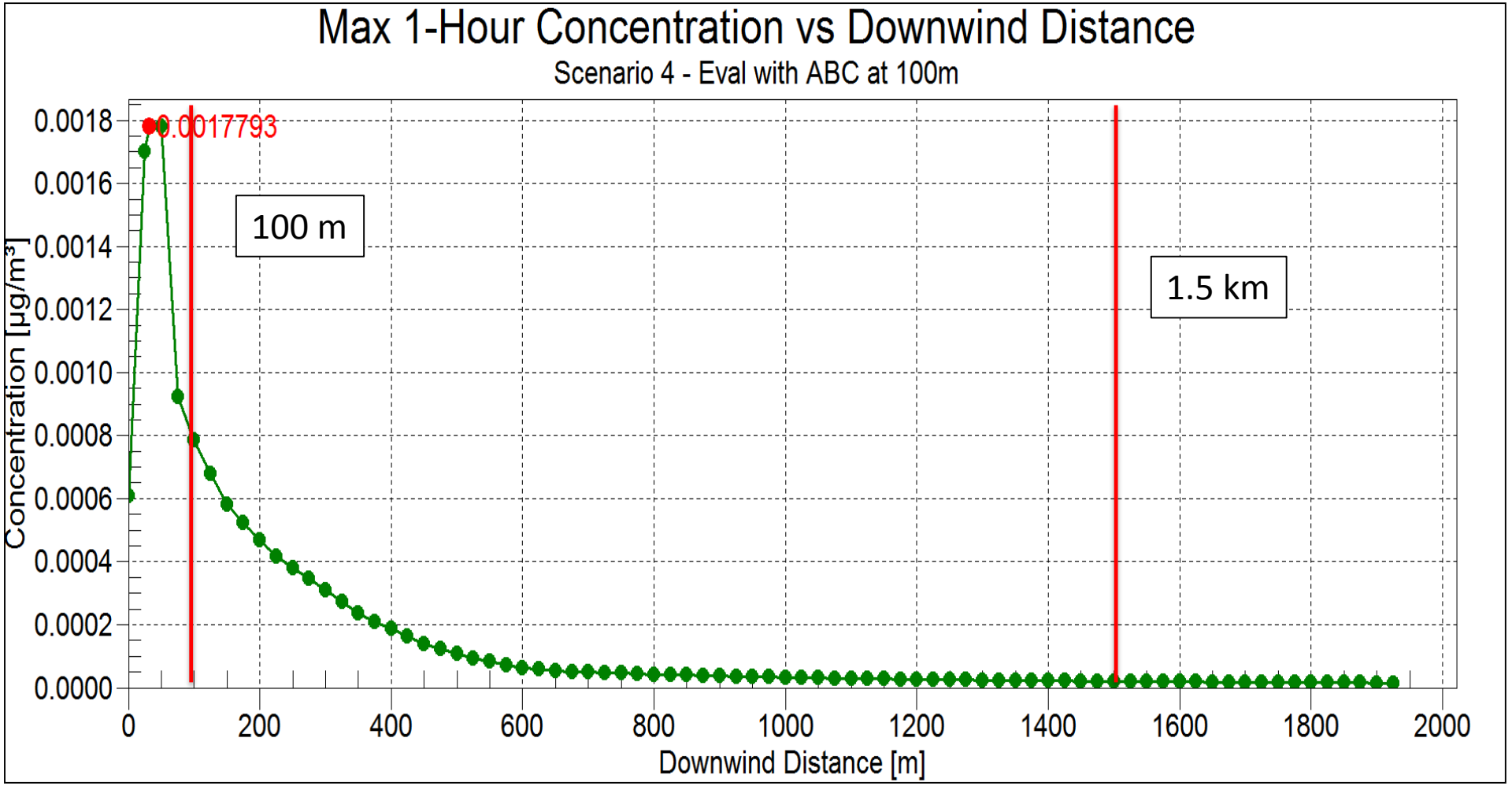
Program Element 18: Risk Assessment and modeling using AERSCREEN

AERSCREEN:

- Is a screening model that produces estimates of "worst-case" 1-hour concentrations for a single source
- Uses worst case meteorological data
- Includes conversion factors to estimate "worst-case" 24-hour and annual concentrations.
- Produces concentration estimates that are intended to be greater than those produced by AERMOD.

Program Element 18: Risk Assessment and modeling using AERSCREEN

AERSCREEN



Program Element 18: Risk Assessment and modeling using AERSCREEN

Technical Workgroup comments include:

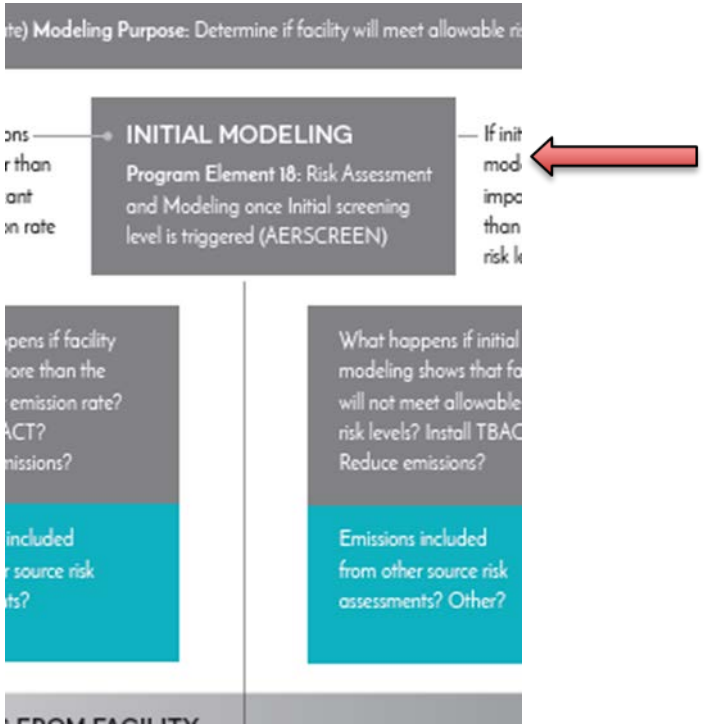
- A screening model as a first step is a wise approach to conservatively estimate impacts at the fenceline.
- Model results can vary depending on the assumptions and data used in the model.
- Location of receptors representing human activity may change and require a new analysis.

Program Element 18: Risk Assessment and modeling using AERSCREEN

Potential elements for risk assessment and modeling once initial screening level is triggered (AERSCREEN)

The following are potential elements for which DEQ and OHA are seeking additional discussion and input from the Advisory Committee. If there are additional elements not included below, please raise them.

Potential Elements
A. Default receptor location at fenceline for initial analysis
B. Default receptor location beyond fenceline to where people live and/or work.
C. In addition to running AERSCREEN, evaluate impact distance and presence of potential nearby sources. If significant other sources are present, require refined modeling, including cumulative impact analysis.
D. Facility-wide or single piece of equipment
E. Require an assessment of whether the facility is in an environmental justice area, and if so, require refined modeling
F. Require permit applicants to provide an emission inventory, dispersion model and demographic overlay in advance of or concurrent with the permit application (Based on the Minnesota PCA and New York DEC approaches)



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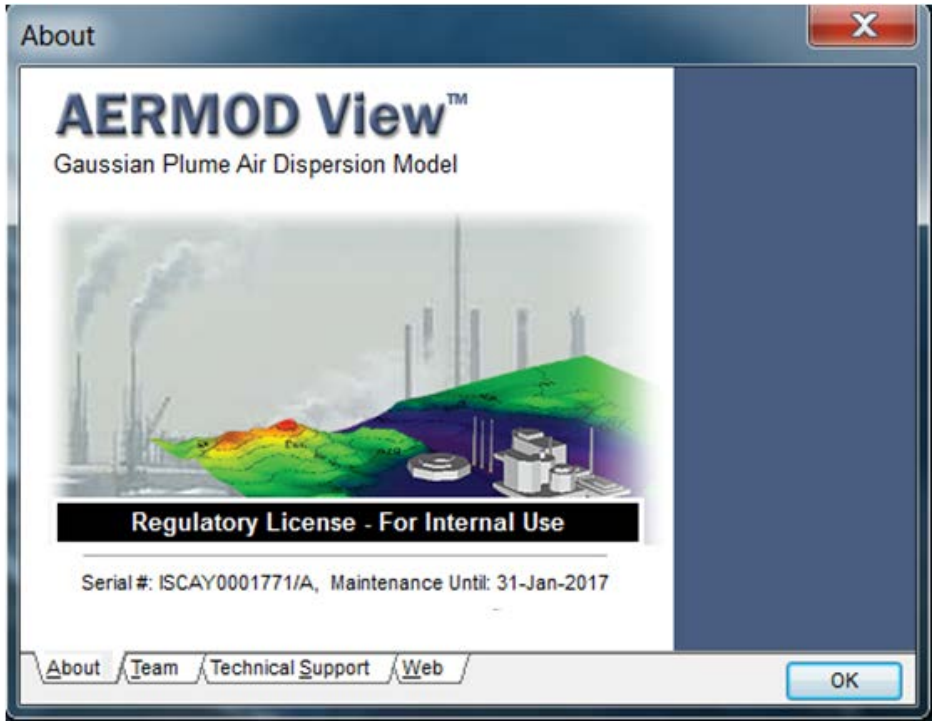
Program Element 19: Risk Assessment and modeling using AERMOD

AERMOD

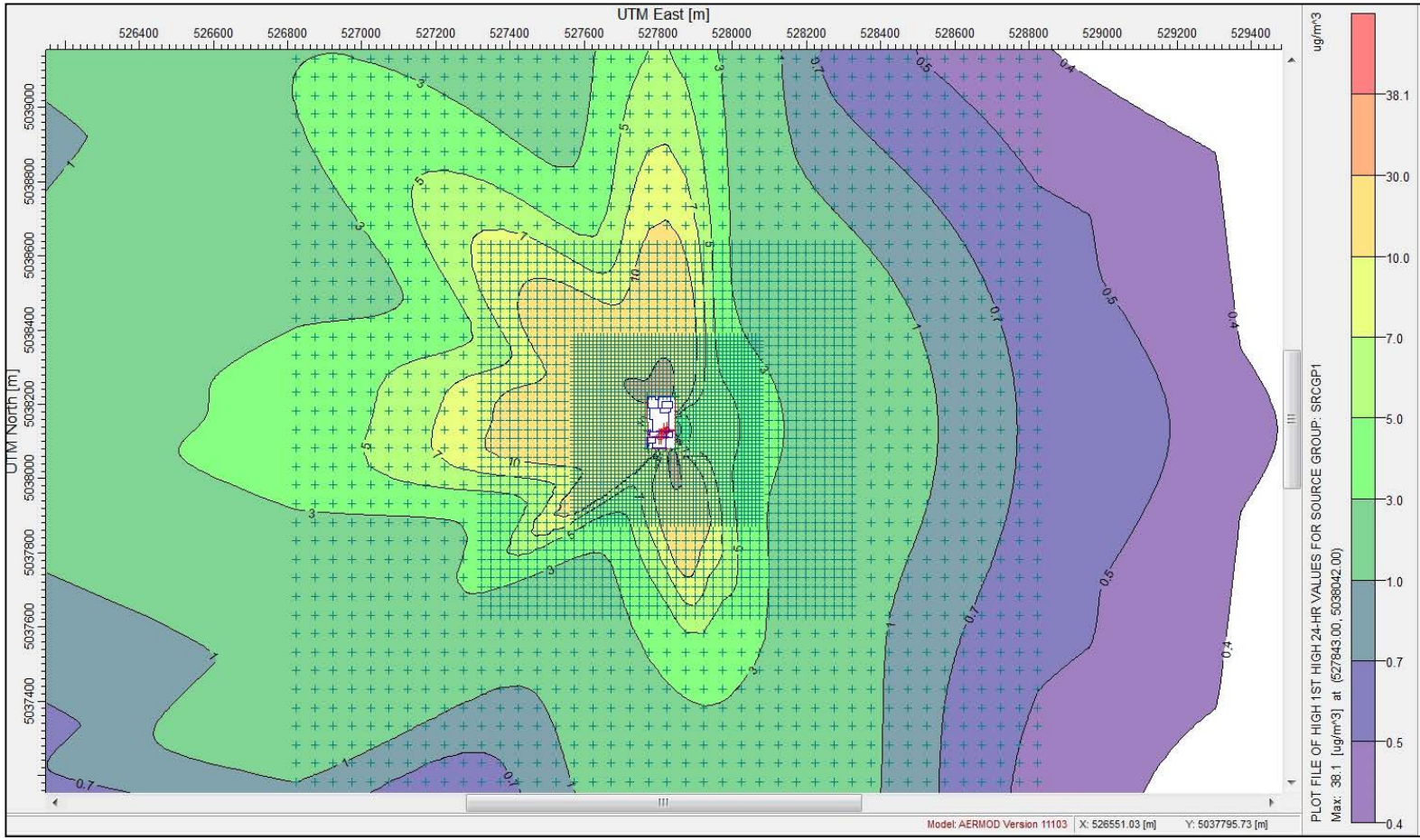
- Is a steady-state plume model
- Uses actual meteorology representative of the source area
- Incorporates a refined air dispersion algorithm
- Includes treatment of both surface and elevated sources
- Evaluates both simple and complex terrain.



Program Element 19: Risk Assessment and modeling using AERMOD

AERMOD

- Results are more realistic
- Can model multiple sources
- Can define property boundary/fenceline to define ambient air
- Can locate receptors in areas of concern



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Program Element 19: Risk Assessment and modeling using AERMOD

Technical Workgroup comments included:

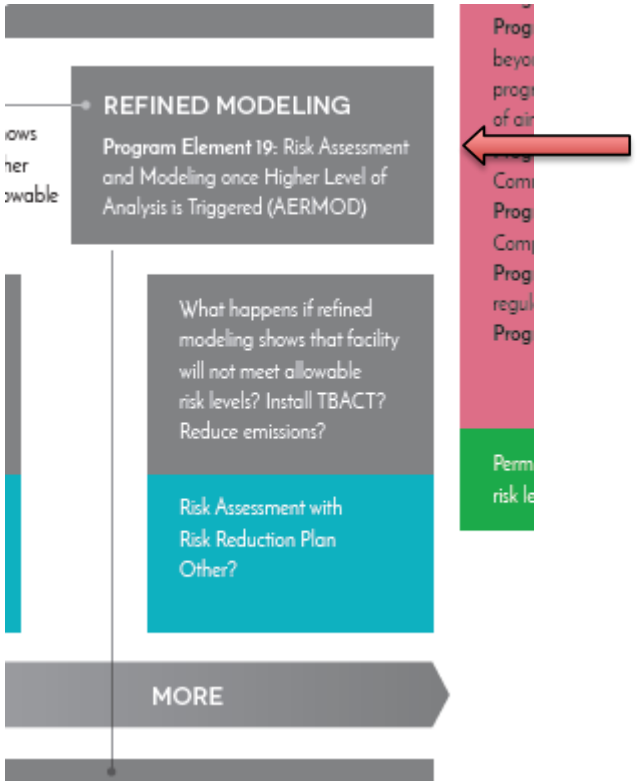
- Require AERMOD for refined dispersion modeling using site specific data (emissions, building and stack data, meteorology).
- AERMOD modeled predictions are estimates of ambient concentrations assuming continuous exposure, not actual exposure concentrations, which vary by receptor locations and receptor types (residential, commercial or sensitive).
- Refined steps in the risk analysis can be adjusted based on exposure frequency and duration, making the analysis more realistic but less conservative.

Program Element 19: Risk Assessment and modeling using AERMOD

Potential elements for risk assessment and modeling once higher level of analysis is triggered (AERMOD)

The following are potential elements for which DEQ and OHA are seeking additional discussion and input from the Advisory Committee. If there are additional elements not included below, please raise them.

Potential Elements
A. Include multiple air toxics in the refined analysis
B. Include cumulative risk from air toxics that are prevalent in background or from nearby sources in the refined analysis
C. Default receptor location at fenceline for all levels of analysis
D. Choose receptor locations based on acute vs chronic/carcinogenic effects (fenceline or occupied area locations)
E. Locate specific receptors at locations with sensitive populations (schools, hospitals, etc.) to collect information about community impacts
F. Require permit applicants to provide an emission inventory, dispersion model and demographic overlay in advance of or concurrent with the permit application (Based on the Minnesota PCA and New York DEC approaches)



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Screening and Risk Assessment

Questions for the Advisory Committee

How should modeling results be used?

Modeling Policy Options

Dispersion modeling scenarios

1) If emissions are greater than the SER, but initial screening modeling shows facility results less than allowable risk levels.

2) If initial screening modeling shows facility results greater than allowable risk levels.

3) If refined modeling shows facility results greater than allowable risk levels.

Modeling Policy Options

If facility emissions greater than the SER but initial modeling results less than allowable risk levels:

1) Facility exempt from further requirements
2) Require reporting every 3-5 years for use in statewide emissions inventory
3) Include/not include emissions in cumulative nearby source analysis
4) Include in cumulative analysis, require refined modeling, enhanced engagement if impacts community with EJ concerns
5) Require reductions to get below SER, including pollution controls (TBACT), plant-wide emission offsets or pollution prevention
6) Other options

Modeling Policy Options

Initial modeling results greater than allowable risk levels and refined modeling less than allowable risk levels:

1) Facility exempt from further requirements
2) Require reporting every 3-5 years for use in statewide emissions inventory
3) Include/not include emissions in cumulative nearby source analysis
4) Include in cumulative analysis, require refined modeling, enhanced engagement if impacts community with EJ concerns
5) Require reductions to get below SER, including pollution controls (TBACT), plant-wide emission offsets or pollution prevention
6) Other options

Modeling Policy Options

If refined modeling results greater than allowable risk levels:

1) Require TBACT, LAER, or pollution prevention
2) Require periodic evaluation and installation of newly available control technology
3) Allow facility to mitigate emissions from other sources
4) Conduct broader risk/benefit analysis to inform a policy decision on whether to issue a permit
5) Enforceable schedule to reduce risk, monitoring, other options
6) Do not issue permit

Additional Slides

Wrap up

Are there any remaining questions on the use of emissions thresholds and dispersion models, or on how the screening steps can be used?