Air Quality Dispersion Modeling Methodology for the Arizona HAPRACT Rule

Presented to

Arizona HAP Stakeholders

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Presented by

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Objectives

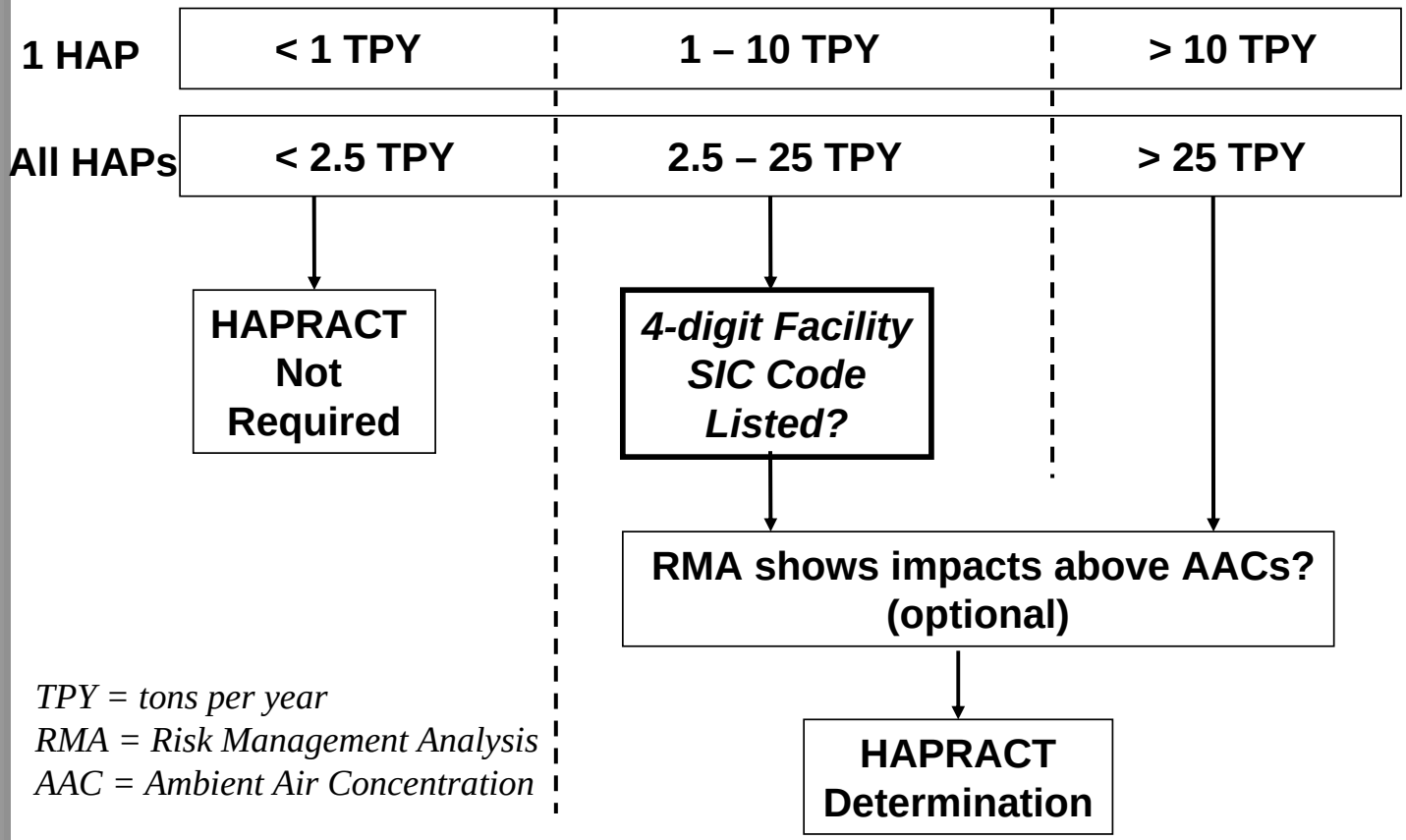
- Present overview of HAPRACT applicability decision process
- Define the role of the modeling in the decision process
- Describe the air dispersion model to be used and its input data
- Describe the assumptions and procedures to be used in conducting the modeling

HAPRACT Applicability

- Regulations outline procedure to determine need for emissions control technology
- HAPRACT = **H**azardous **A**ir **P**ollutant **R**easonably **A**vailable **C**ontrol **T**echnology
- Regulatory need for HAPRACT decided on a case-by-case basis dependent on
  - Quantity of HAP emissions
  - Type of industry

HAPRACT Applicability

- For new sources based on emissions:



TPY = tons per year
RMA = Risk Management Analysis
AAC = Ambient Air Concentration

HAPRACT Applicability

- Modeling to focus on developing list of intermediate-size facilities potentially subject to HAPRACT
- Categories will be based on primary Standard Industrial Classification (SIC) codes
- Evaluate whether facilities in SIC categories have the potential to produce impacts in excess of the Ambient Air Concentrations (AACs)

Modeling for SIC List Development

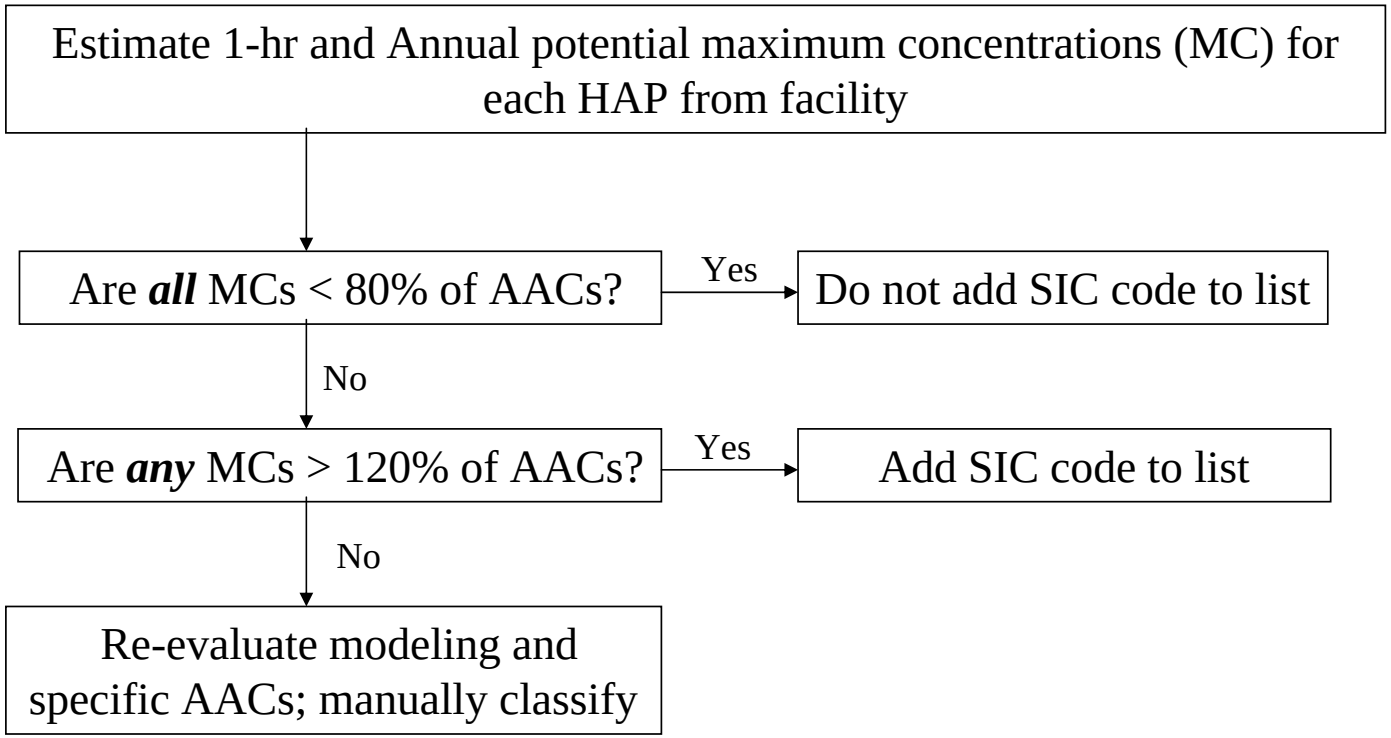
- Build initial list based on SIC categories in Arizona with HAP emissions data available
- Assemble HAP emission quantities and emission point data from readily available sources
  - Toxics Release Inventory (TRI)
  - Arizona HAP Inventory
  - Arizona I-STEPS Emissions Database
  - Maricopa, Pima, and Pinal County Agencies
  - ADEQ Permits & Modeling Files

Modeling for SIC List Development

- Match emissions of specific HAP compounds to specific emission points at each facility
  - Limited by detail level available
  - Actual emission points used where identifiable
  - Surrogate emission points used otherwise
- Use screening modeling approach to determine potential for ambient air impacts in excess of the AACs

Modeling for SIC List Development

- Overall decision process:



Modeling for SIC List Development

- Uncertainty in screening modeling incorporated with 80-120% factor
  - Impacts “near” AACs handled on case-by-case basis
- Screening modeling used as 1st tier classification approach
  - Identify potential for significant impacts

Screening Model

- USEPA SCREEN3 model will be used
  - Latest version (Dated 96043)
  - Recommended screening model in ADEQ Modeling Guidelines
- SCREEN3 is routinely used in regulatory screening modeling applications
- Used to determine if more refined analyses are required to address impacts

SCREEN3 Model

- Model features
  - Based on core ISC3 calculations
  - Single source model
  - Point, area, and volume sources
  - Downwash effects
  - Synthetic meteorology matrix (no WD)
  - Simple & complex terrain
  - 1-hour averages only
  - Special calculations (not in ISC3)
    - Flare sources
    - Building wake cavity
    - Shoreline & inversion breakup fumigation

SCREEN3 Model

- Synthetic meteorology matrix
  - 13 wind speeds (1 – 20 m/s or 2 – 45 mph)
  - 6 Pasquill stability classes
  - 54 combinations

    High wind speeds not associated with very stable/unstable categories
  - Mixing heights proportional to wind speed
  - All 54 combinations are evaluated
  - Worst-case concentrations are output
- User converts 1-hour averages to longer periods using predefined scaling factors

SCREEN3 Model

- No wind direction
  - Receptors on plume centerline only
  - Automated or user-chosen distances
  - Mixing heights proportional to wind speed
- Cavity calculations
  - Winds along maximum building length & width used (2 calculations)
  - Estimate length & maximum concentration for each building cavity zone

Model Inputs

- HAP Emission Rates
  - Hourly emission rates used for modeling
  - Potential preferred over actual
  - Annualized divided by 8,760 hours (or annual operating hours, if available)
- Source Characteristics
  - Use source(s) associated with HAP emissions
  - If multiple sources available, select source having most conservative characteristics
  - If no sources identifiable, use synthetic volume source

Model Inputs

- Model Options
  - Regulatory mixing height & cavity options
  - Default anemometer height (10 m)
  - Flat simple terrain
  - Automated receptor distances
  - Rural dispersion
  - Default ambient temperature (293 K)
  - Full meteorology

Model Inputs

- Building Dimensions
  - Heights from inventories preferred
  - Horizontal set to 40 m x 40 m
    - Makes building height controlling factor for downwash effects
- Missing heights estimated as the greater of
  - [Stack height (m) / 1.5] – 0.1, or
    - Produces worst-case downwash effects
  - 3.66 m = 12 ft = single-story
    - Lower bound for building-mounted vents

Model Inputs

- Receptor Distances
  - Distances started at Process Area Boundary (PAB)
  - PAB assumed at 25 m if not available
  - Automated array option used
    - From PAB to 10 km
    - Every 100 m from 100 – 3,000 m
    - Every 500 m from 3,000 – 10,000 m

Model Outputs

- Generates maximum potential concentrations for 1-hour averaging period
  - Choose overall maximum regardless of distance
  - Cavity concentration used only if:
    - Cavity zone extends beyond PAB
    - Cavity concentration is overall maximum
    - Comparing to short-term AAC
- Maximum 1-hour average scaled to annual average using factor of 0.08
  - USEPA recommended factor
  - Used in ADEQ modeling guidance

Model Outputs

- Facilities may have multiple sources identified for a specific HAP
  - If each source has its own emission rate
    - SCREEN3 will be run separately for each source
    - The overall maximum impacts from each source will be added to obtain a facility total impact
  - Otherwise, the maximum impact from the single source with the most conservative emission characteristics will be used