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ENVIRONMENTAL QUALITY

AIR PATHWAY ANAYLSIS FOR THE DESIGN OF REMEDIAL ACTION PROJECTS

ENGINEER PAMPHLET

AVAILABILITY

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Environmental Quality
AIR PATHWAY ANALYSIS FOR THE DESIGN OF REMEDIAL ACTION PROJECTS

1. Purpose. This Engineer Pamphlet describes Air Pathway Analysis (APA) procedures. These provide guidance for emission rate and dispersion modeling used to determine public health impacts of air emissions from remedial action projects. Using APA results in the design process for remedial actions helps to justify need and design requirements for perimeter air monitoring systems. It also aids in the design of air pollution control equipment and procedures.

2. Applicability. This pamphlet applies to all USACE commands responsible for the design of remedial action projects. This EP does not apply to remedial action projects designed for the cleanup of radioactive isotopes or other projects designed to abate lead and/or asbestos hazards identified in buildings.

3. Distribution Statement. Approved for public release; distribution is unlimited.

4. References.

a. Executive Order 12580, 23 January 1987.

b. 40 CFR Part 260 through 268, Environmental Protection Agency (EPA) Regulations Implementing the Resource Conservation and Recovery Act (RCRA).

c. 40 CFR 300 through 311, EPA Regulations Implementing the Comprehensive Environmental Response, Compensations and Liability Act (CERCLA).

d. USACE Engineering Manual (EM) 200-l-4, Risk Assessment Handbook, Human Health Evaluation.

e. EPA Publication EPA-450/l-89-001a, Air/Superfund National Technical Guidance Study Series, Volume I-Overview of Air Pathway Assessments for Superfund Sites (revised).

f. EPA Publication EPA-450/1-89-03, Air/Superfund National Technical Guidance Study Series, Volume III-Estimation of Air Emissions from Cleanup Activities at Superfund Sites.

This pamphlet supersedes EP 1110-1-21, dated 30 October 2000.

g. EPA Publication EPA-45 l/R-93-001, Air/Superfund National Technical Guidance Study Series-Models for Estimating Air Emission Rates From Superfund Remedial Actions.

h. EPA Publication EPA-450/l -9 l-00 1, Air/Superfund National Technical Guidance Study Series-Emission Factors for Superfund Remediation Technologies (revised).

i. EPA Publication EPA/625/R-92/0 12, Control of Air Emissions from Superfund Sites.

j. EPA Publication EPA-454/R-95-003, Air/Superfund National Technical Guidance Study Series, Volume V-Procedures for Air Dispersion Modeling at Superfund Sites.

k. EPA Publication 9234.2-22FS, ARARS Fact Sheet, Compliance with the Clean Air Act and Associated Air Quality Requirements.

1. EPA Publication EPA 45 l/R-96-006, Air Superfund National Technical Guidance Study Series-Air/Superfund Guide to Pollutant Toxicity.

5. Discussion.

a. Air quality requirements for remedial action projects are dictated primarily by the air quality control region (AQCR) in the state where the project is located. Designers are encouraged to contact the AQCR for requirements for emission rate action levels, emission controls, and receptor point action levels before starting a project-specific APA.

b. APA is a multi-disciplinary effort, requiring involvement of dispersion modelers, regulatory specialists, and risk assessors. Solicit input from geotechnical engineers when estimating emission rates from soil handling operations and from treatment process engineers when calculating emission rates from treatment processes.

c. This EP is to be used to guide the development of in-house APAs and scopes of work for Architect-Engineer (A-E) developed APAs.

d. Concepts and procedures found in references d through l are critical for the development of APAs. Reference d is available at the Corps of Engineers Publications webpage http://publications.usace.army.mil/publications/. References e through l can be obtained from http://www.epa.gov/nscep/.

6. Definitions.

a. *Emission Rate*. The rate at which contaminants are emitted to the air from point sources (grams/second) and area sources (grams/second-square meter).

b. *Dispersion Modeling*. The process of using an air dispersion model and an emission rate to calculate the concentration of contaminants in the air at a receptor point.

c. Emission Rate Action Level. The regulation or regulatory guideline emission rate for point source emissions.

d. Receptor Point Action Level. The airborne concentration of a contaminant at the receptor, which is considered (by regulation, regulatory guideline, or risk assessment practice) unacceptable for public exposure.

e. Perimeter Air Monitoring Action Level. The airborne concentration of a contaminant to be monitored at the site perimeter that has been demonstrated through dispersion modeling to be in compliance with the receptor point action level.

FOR THE COMMANDER:

DIONYSIOS ANNINOS
Colonel, Corps of Engineers
Chief of Staff

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APPENDIX A

Air Pathway Analysis Procedure

A-l. Emission Rate Calculations/Estimations. Develop an emission rate estimate using project-specific models given in references e, f; g, and h. The emission rate estimate is used to determine necessary emission control equipment for point sources. It is also used in dispersion modeling for both point sources and area sources to determine if site emissions comply with receptor point action levels. EPA's Office of Air Quality Planning and Standards Technology Transfer Network (OAQPS-TTN) provides valuable information for estimating and measuring emissions to the public at http://www.epa.gov/ttn/chief/.

a. Point Sources. These are stacks and vents on HTRW treatment process equipment. Contaminants of concern include those present in the environmental medium undergoing treatment, as well as chemicals used in the treatment process, or by-products of the treatment process, which may be released to the air. Consult process engineering staff and references f; g, and h to calculate emission rates from HTRW treatment process point sources. Be sure to account for emission control technology if it is included in the design. Pilot-scale treatability studies and existing full-scale treatment processes, where the processes and contaminants are similar to the project under design, are valuable sources of information for estimating point source emission rates.

b. Area Sources. These are ground level releases to the air over a specified surface area. Examples of this type of a release on HTRW sites include excavations and associated material handling activities, stockpiles, landfills, and lagoons. Emissions are calculated using models specified in references f, g, and h. Emission rate modeling results can be made more realistic by substituting site-specific data (e.g., moisture content, bulk density, particle size distribution, and chemical and physical properties of the contaminants) for the default values specified in the models.

A-2. Dispersion Modeling Procedure. Apply a two-tiered approach when performing dispersion modeling for point sources. Do screening level modeling first, followed by refined dispersion modeling if the results from the first model exceed receptor point action levels. Dispersion modeling for area sources needs only to be done with screening level models.

a. Screening Models. TSCREEN or SCREEN3 are good screening level dispersion models that can be applied to most HTRW remedial action scenarios for both point sources and area sources. Both models are available to the public at no cost from the EPA's Support Center for Regulatory Air Models (SCRAM) web site at http://epa.gov/ttn/scram.

b. Refined Models. Seek professional dispersion modeling support when doing refined dispersion modeling for point sources when screening level modeling results exceed receptor

point action levels. Professional help is critical for selecting the model, evaluating meteorological data, evaluating site-specific model input parameters, and analyzing results.

c. Meteorological Data Needs. Meteorological data, both from the surface and upper air, are necessary input to run refined dispersion models. Sources of both types can be found at http://www.epa.gov/ttn/scram/. The meteorological data at this web site are very comprehensive. The site will likely have data that can be applied to HTRW remedial action designs at any location. Only on rare occasions will it be necessary to collect site-specific data.

A-3. Emissions Acceptability**.** Determine if site-specific emissions to the air are acceptable by comparing modeled emission rates (point sources) and dispersion modeling results to emission rate action levels (point sources) and receptor point action levels (point sources and area sources). Seek support from regulatory specialists and risk assessment staff to define site-specific emission rate and receptor point action levels. In general, emission rate action levels for point sources will be defined by state regulations or regulatory guidelines. Receptor point action levels are also influenced heavily by state regulatory guidelines but often times require risk assessment input because of a lack of state regulatory criteria. It is very important that HTRW remedial action designers contact the state air quality regulators in the air quality region where the project is located very early in the design process to arrive at a mutual understanding of requirements.

a. Point Sources. The following analysis procedure is recommended for point sources.

(1) Review the proposed design to assure that air emission control technology complies with state-specific air pollution control technology requirements/guidelines for all pollutants emitted to the air from the point source.

(2) Compare modeled emission rates to emission rate action levels. Adjust control equipment efficiency, if necessary, to assure compliance with emission rate action levels. Owing to the variability of most point source emissions on HTRW sites, the efficiency of emission control equipment is negotiable with most state regulators.

(3) Compare point source dispersion modeling results to receptor point action levels to assure that point source emissions are acceptable.

b. Area Sources. The following procedure is recommended for area sources.

(1) Compare area source screening level dispersion modeling results to receptor point action levels. Area source emissions are considered acceptable if screening level results are less than receptor point action levels.

(2) Include perimeter air monitoring as part of the remedial action design if screening level dispersion modeling results exceed receptor point action levels. See Appendix B of this document for development of perimeter air monitoring action levels.

A-4. Emission Control Requirements.

a. Point Sources. Point source emissions can be controlled. Emission control equipment should be applied to point sources if required by state regulations or if emission rate action levels or receptor point action levels are exceeded.

b. Area Sources. Area source emissions are very difficult to control. The most effective way to control area source emissions is to control the rate of contaminated material handling. The remedial action project designer should specify handling rate restrictions if screening level dispersion modeling results for area source emissions exceed receptor point action levels. Designers may develop other methods to control area source emissions from HTRW sites, but all methods chosen should be supported by screening level dispersion modeling results exceeding receptor point action levels.

A-5. Air Emission Monitoring Requirements.

a. Monitor emissions from point sources at the stack to assure that air pollution control equipment (if used) is working properly or to assure that emission rate modeling assumptions are correct. Do not attempt to characterize point source emissions using ambient air sampling methods at the site perimeter or at off-site sampling locations. Daily variability in wind speed and direction is too great and makes it impossible to characterize point sources at these locations

b. Monitor emissions from area sources when screening level dispersion modeling results exceed receptor point action levels. Use ambient air monitoring techniques at the site perimeter to check the effectiveness of controls and procedures for limiting emissions to the air from the area source. Specify use of appropriate sampling equipment and analytical methods. See the Appendix B of this document to develop perimeter air monitoring action levels.

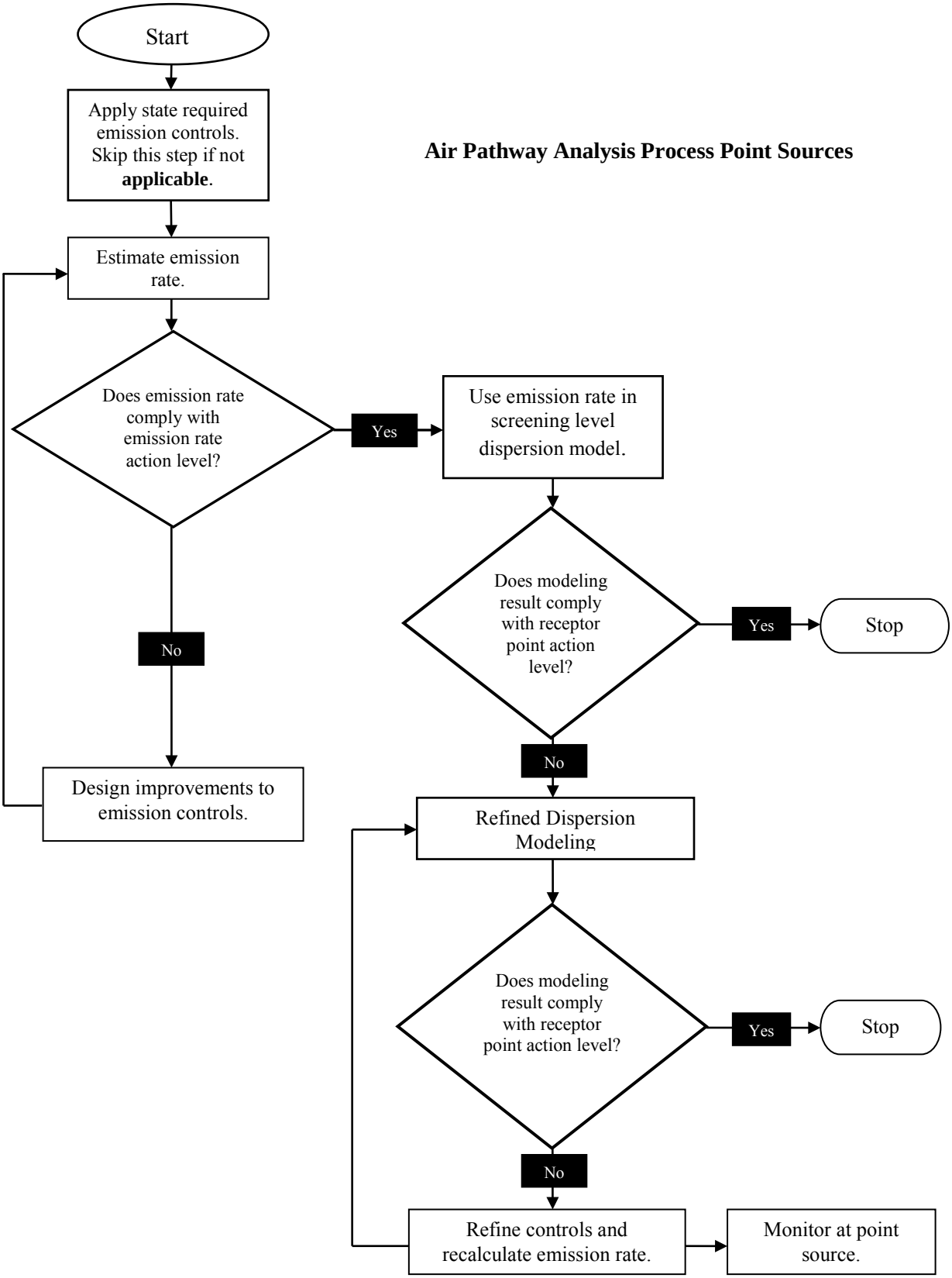

Figure A-1. Point Source APA Summary Flow Chart

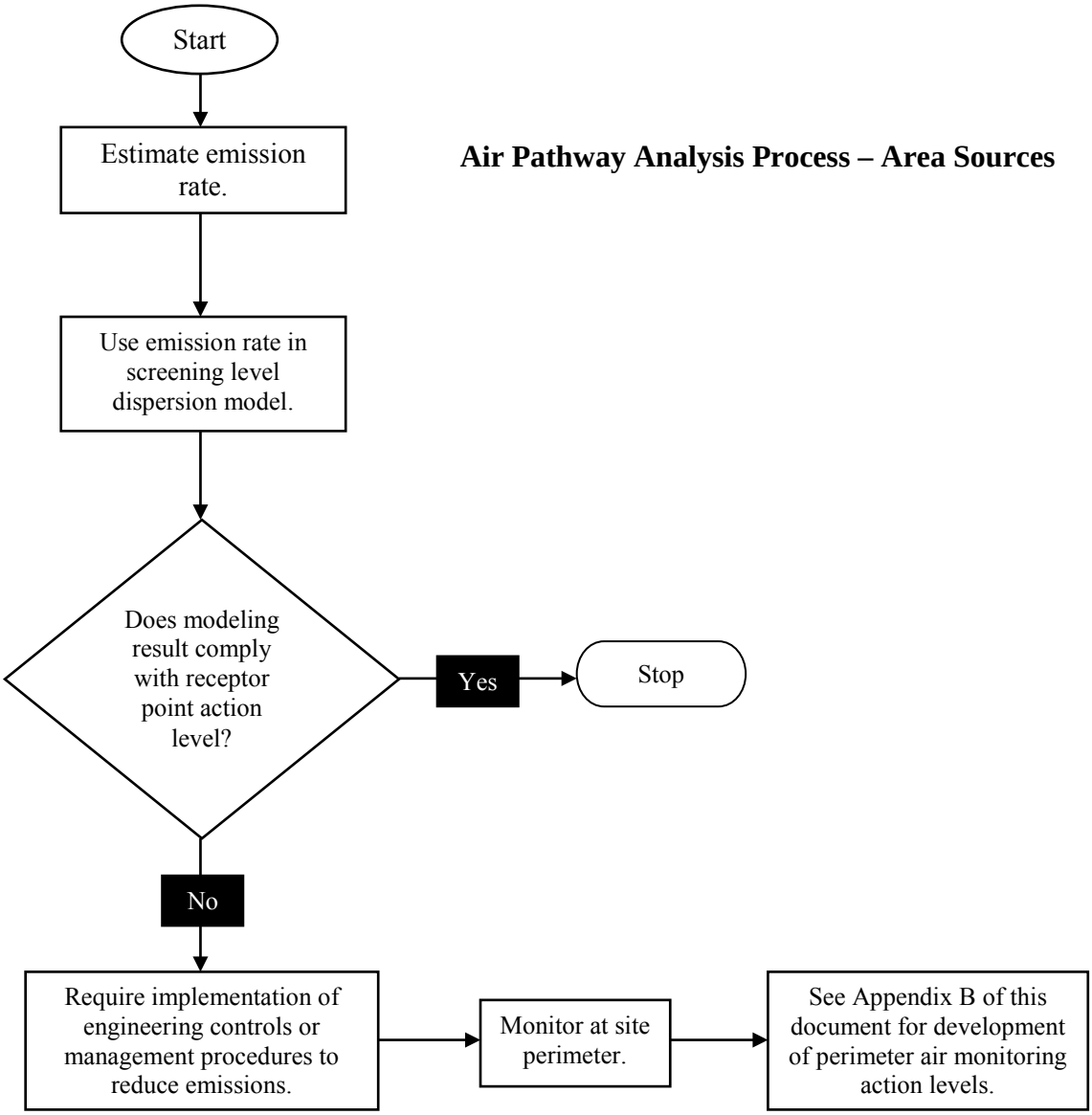

Figure A-2. Area Source Flow Chart

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APPENDIX B

Perimeter Air Monitoring Action Level Development

B-l. Area Sources. Develop perimeter air monitoring action levels when perimeter air monitoring is included as part of a remedial action design. The procedure for developing perimeter air monitoring action levels applies to area sources only. Follow the step by step procedure described below to calculate these action levels.

a. Use SCREEN 3 to calculate a dilution factor between the site perimeter and the receptor point location.

b. Multiply the receptor point action level by the SCREEN3 dilution factor to derive the perimeter air monitoring action level.

c. Monitor for and enforce the perimeter air monitoring action level at the site perimeter.

B-2. Point Sources. The procedures for developing perimeter air monitoring action levels do not apply to point sources. Monitor point sources at the stack using emission rate monitoring techniques to determine compliance with emission rate action levels.

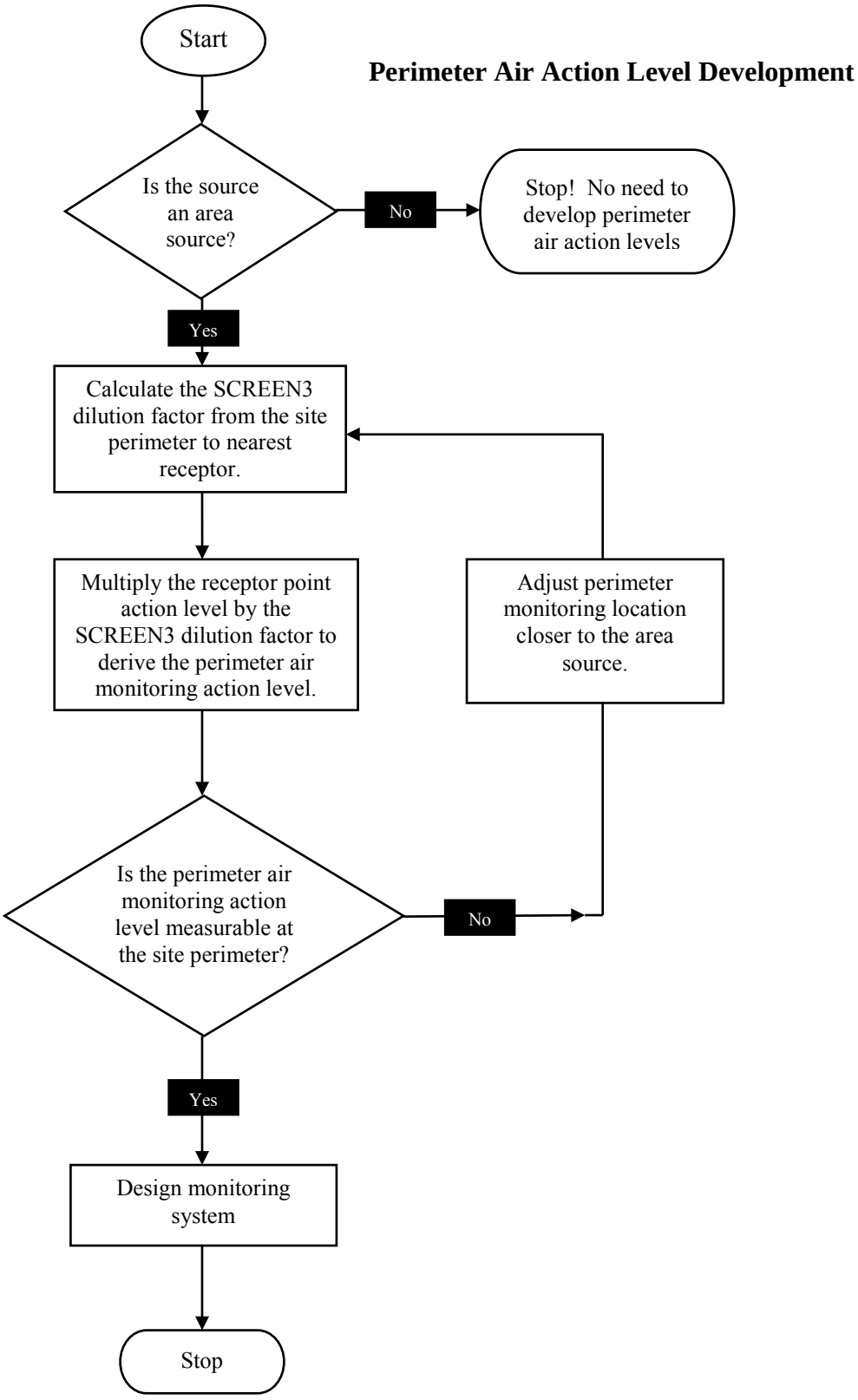

Figure B-1. Action Level Development Flow Chart