



6. Evaluating Impacts of Nearby Sources of Air Pollution

6.1. Overview

This section provides guidance on assessment of offsite environmental hazards during the [environmental review process](#) (see Section 5.1). It can be complex to measure and understand the potential risks to school occupants that may be associated with air emissions sources situated in the vicinity of the proposed school location. The local education agency (LEA) (see Section 10) and [school siting committee](#) (SSC) (see Section 3.3) should consider any potential impacts from nearby sources of air pollution early in the selection process. Airborne pollutants from nearby emission sources can directly contaminate the ambient air at the location or be deposited on the site over time. Sources of these air pollutants are varied, but most are human-made, including:

- **Mobile sources** (e.g., cars, trucks and buses on roadways; trains and rail yards; ships and port facilities; planes and airport equipment);
- **Stationary major sources** (e.g., factories, refineries, power plants); and
- **Local area sources** (i.e., collections of small point sources, such as auto-body spray shops or dry cleaners).

The Environmental Protection Agency (EPA) identifies pollutants of interest in evaluating air quality at a particular location either as criteria pollutants or toxic air pollutants, also known as hazardous air pollutants (HAPs).

- **Criteria pollutants** refer to six common air pollutants that are regulated through the development of human health-based and environmentally-based criteria (i.e., science-based guidelines) that are used to set the National Ambient Air Quality Standards (NAAQS).⁶² They are particles (often referred to as particulate matter), ground-level ozone, carbon monoxide, sulfur dioxide (SO₂), nitrogen dioxide (NO₂) and lead. States with areas where ambient concentrations are above the NAAQS (nonattainment areas) are required to develop plans to bring them into attainment.
- **Air toxics** are pollutants that are known or suspected to cause cancer or other serious health effects, such as reproductive effects or birth defects, or adverse environmental effects. The current list of HAPs is available on EPA's Technology Transfer Network Air Toxics website. (www.epa.gov/ttn/atw/188polls) In addition to this list, diesel emissions are considered a mobile source air toxic. Brief summaries of the pertinent toxicity information on these HAPs and information on where more comprehensive and primary data can be obtained are located at www.epa.gov/ttn/atw/hlthef/hapindex.

⁶² U.S. Environmental Protection Agency, "National Ambient Air Quality Standards (NAAQS)." Last modified August 4, 2011. Available at: www.epa.gov/air/criteria.html.

As discussed in the [Environmental Siting Criteria Considerations](#) (see Section 4) and [Environmental Review Process](#) (see Section 5) sections, the initial screen of potential locations for schools should consider potential onsite and nearby environmental and safety hazards. In general, the LEA and SSC should seek to avoid locations that are in close proximity to land uses that may be incompatible with schools, such as those included in [Exhibit 6: Screening Potential Environmental and Safety Hazards](#), particularly in cases where acceptable alternative locations exist that may pose fewer environmental challenges and still meet other important school siting criteria.

If an LEA is considering locations that are in proximity to air pollution sources that may pose potential risks, an understanding of those potential exposures and risks is essential. Due to the many variables involved (such as those included in [Exhibit 5: Factors Influencing Exposures and Potential Risks from Nearby Hazards](#)), assessing risks from air pollution is inherently complex and should be performed by a trained environmental professional with monitoring, modeling and risk assessment expertise. The overall process involves the following components:

- Thorough familiarity with the potential school [location’s layout](#) (see Section 6.2), including local meteorology, topography and the land use of the surrounding neighborhood;
- [Initial assessment of existing air quality monitoring and modeling information](#) (see Section 6.3) to gauge air quality in the neighborhood around a potential school location;
- Development of an [inventory of pollution sources](#) (see Section 6.4) and associated emissions that may impact the air quality at a location;
- [Screening evaluation of potential air quality](#) (see Section 6.5) and, if feasible, health impacts potentially associated with a location’s air

quality based on modeling and/or monitoring assessments; and

- Development of an [environmental assessment report](#) (see Section 6.6) containing descriptions of activities, conclusions and recommendations.

[Public involvement](#) (see Section 3) is an important part of evaluating the impacts of nearby sources of air pollution. The LEA and SSC should inform the public about the evaluation and give opportunities for public comment on assessment reports and, in cases where mitigation is needed, on potential mitigation measures.

Examples of Local Air Toxics Monitoring (www.epa.gov/schools/siting/resources)

EPA’s Initiative on Assessing Outdoor Air Near Schools: In 2009, EPA embarked on an initiative to understand whether outdoor toxic air pollution poses health concerns to school children. This initiative, “Assessing Outdoor Air Near Schools,” (www.epa.gov/schoolair) is instructive about some of the types of school air monitoring efforts that have been performed and provides useful examples of assessing outdoor air near schools.

Community-Scale Air Toxics Ambient Monitoring Projects (www.epa.gov/ttn/amtic/local): Since 2003/2004, EPA has conducted periodic Community-Scale Air Toxics Ambient Monitoring grant competitions to support state, local and tribal communities in identifying and profiling air toxics sources, characterizing the degree and extent of local air toxics problems, and tracking progress of air toxics reduction activities. The Community-Scale Air Toxics Ambient Monitoring website has grant information, final project reports and a training module, How to Create a Successful Air Toxics Monitoring Project. (www.epa.gov/ttn/amtic/airtox-daw-2011.html#how)

6.2. Location Layout and Study Area

The study area around a potential location will vary with the land use (i.e., urban vs. rural), the nature of nearby emission sources (i.e., major stationary sources, mobile sources, area sources), and the types of pollutants (i.e., gaseous or particulate). The recommended screening perimeters included in [Exhibit 6](#) should be considered as a rule of thumb for the environmental professional. Depending on the wind directions and the existence of large major emission sources upwind of the candidate school location (i.e., the direction of the prevailing wind carries the air from around the source toward the school), the environmental professional may need to adjust the study area.

6.3. Initial Assessment of Area Air Quality

An initial assessment of air quality around a potential school location should make use of existing data that is representative of conditions in the neighborhood around the location.

Air quality monitoring can play multiple roles in the initial assessment. Early in the assessment, the environmental professional should evaluate local air quality monitoring data as a means of initially gauging air quality at a location. To facilitate access to data on criteria pollutants, EPA's AirExplorer website (www.epa.gov/airexplorer) is an online collection of user-friendly tools for visualizing and mapping air monitoring data. AirExplorer allows users to download monitoring data for monitoring sites in a specific area, produce graphs of monitored air quality and visualize locations using Google Earth. As an initial screen of site conditions, monitored air quality data at nearby stations may be compared to the level of the NAAQS. Nearby monitoring data may also be available for assessing air toxics at a potential location. EPA's AirData website (www.epa.gov/air/data) allows users to query and map air quality data from locations across the

country. Compared to criteria pollutant monitoring, air toxics monitoring data are generally more limited in their coverage and in the amount of time the monitors have been operating. State, tribal and local air agencies may also have local air quality monitoring data that can be used in this initial assessment.

Existing air monitors will vary in the extent to which they represent air quality at a particular location. Monitors are more representative of a potential school location when they share similarities in the types of nearby sources, land uses, topography and meteorological conditions present. The environmental professional should document the extent to which existing monitors are likely to represent air quality conditions at a candidate school location.

EPA's National-Scale Air Toxics Assessment (NATA) (www.epa.gov/ttn/atw/natamain) is a screening tool that provides modeled estimates of average ambient air pollutant concentrations, and associated cancer risk, across broad geographic areas such as counties and states. NATA can be used to identify and prioritize emission sources, locations and pollutants of interest for further study. However, NATA is not a definitive means for pinpointing specific risk values at a site or characterizing or comparing risks at local levels, such as between neighborhoods or between candidate school locations. Consequently, other information sources are necessary to assist in developing the initial assessment.

With available data in hand, the environmental professional should conduct an initial assessment of air quality conditions at the candidate location. The environmental professional should note whether local monitoring data are available for both criteria pollutants and air toxics and when available data are limited to NATA. An initial screening assessment of air quality at the location may include comparison of criteria pollutant levels to the NAAQS and characterizing risks associated with air toxics in and around the potential location.

If the environmental professional determines that there is a basis for air quality concern due to high ambient concentrations, or there is insufficient information to determine whether a concern is present, additional site-specific analyses (description to follow) should be considered. For environmental professionals needing more site-specific air quality information, onsite monitoring or local air quality modeling should be considered. Air monitoring and modeling are complex and expensive to conduct. For the monitoring and modeling to provide accurate and relevant information, the activities must be appropriately performed. The assessment plan and the results should be clearly communicated to stakeholders before, during and after completion of the monitoring and/or modeling.

The following steps pertain to refined site-specific analyses that may be performed.

6.4. Inventory of Air Pollutant Sources and Emissions

The environmental professional should develop or obtain an inventory of all the potential pollution sources, both large and small, within the study area. Developing the inventory should include consulting with the state, tribal or local air agency (e.g., permits, monitoring) and EPA Regional Offices (www.epa.gov/aboutepa/index.html#regional) to determine what data resources may be available that can provide additional information for inventory development. The state agencies (www.epa.gov/air/where) are particularly useful in that they may have emissions data or other studies that are not reported at the national level. When local information is unavailable from state, tribal or local air agencies, other information sources can be used, such as EPA's AirData website, (www.epa.gov/air/data) which queries large national databases such as the National Emission Inventory (NEI) (www.epa.gov/oar/data/neidb) and allows users to download emission data on local sources permitted to emit criteria pollutants and air toxics. At a minimum, this pollutant inventory should include:

- The name of each point and industrial area source;
- A description of the source (e.g., point source, mobile source, fugitive emission, major or area source); and
- The distance from the source to the study area.

For point and industrial area sources, also include:

- Their locations (i.e., street address, latitude/longitude);
- The ongoing activity at the source;
- The pollutants emitted or released (i.e., criteria pollutant, or chemical name and Chemical Abstracts Service number for toxics); and
- The emission rate of each pollutant (e.g., pounds/year or tons/year).

Highways and other transportation facilities may be nearby emission sources. However, detailed emissions information is often not readily available for these sources, and mobile source inventories are usually developed by allocating emission factors from broad geographic areas using estimated values. As such, when assessing nearby transportation sources, local data on activity such as use (e.g., vehicles per day, trains per day) and time of operations (e.g., morning/evening rush hours for highways, ship and truck activity in ports) should be collected and applied to emission rate estimates to develop local inventories. The NATA (www.epa.gov/ttn/atw/natamain/) and NEI (www.epa.gov/oar/data/neidb) databases may also contain information on some transportation facilities in an area. The environmental professional should consult with transportation and urban planning agencies to identify the location and activity of all transportation facilities in the area, such as state departments of transportation and metropolitan planning organizations for metropolitan areas with at least 50,000 residents. These organizations can also provide information on future planned infrastructure in the area that may impact air quality around the school location.

More information on considering [nearby highways and other transportation facilities, including goods movement](#) (see Section 8.2), is included in the [Quick Guide to Environmental Issues](#) (see Section 8).

The environmental professional should recognize that all databases have limitations. They may not be up-to-date; they may not have the most accurate location information for some of the sources in the study area; or they may not identify all the potential sources in the study area. Also, the data contained in these databases may be aggregated at some larger level (e.g., county or state level) and lack the necessary detail for the study area. Therefore the environmental professional should be prepared to utilize additional methods, such as an on-the-ground visual survey, often called a “windshield survey,” to complete the pollutant inventory.

A windshield survey is extremely valuable for identifying those sources not available through national and regional databases and agencies, identifying new sources that have recently opened near the location, and verifying whether sources identified in the initial database reviews are still operating. The survey can be informed by maps, aerial photographs, online resources and local government records (e.g., utility records, tax records). Also, documents, such as the South Coast Air Quality Management District’s “Air Quality Issues in School Site Selection Guidance Document,” (www.aqmd.gov/prdas/aqguide/doc/School_Guidance.pdf) can provide the environmental professional with useful guidance for identifying general categories of emission sources for inclusion in the survey.

If new sources are discovered during the windshield survey, or if modifications are observed in known sources, the environmental professional should contact the state or tribal air agency and the EPA Regional Office to fill in data gaps. If source-specific emission details are not available, these agencies may recommend surrogate parameters (e.g., emissions profiles and emission rates) to help complete the inventory. To

quantify the extent of emissions from nearby roads and other sources, emission models may be employed. For example, the environmental professional can use EPA’s Motor Vehicle Emission Simulator (MOVES) (www.epa.gov/otaq/models/moves/index.htm) to calculate emission rates for individual road links, and EPA’s AP-42 (www.epa.gov/ttnchie1/ap42/) can be used for stationary and area sources.

In interpreting the impact of nearby sources on a school location, it is helpful to evaluate meteorological conditions present at the prospective location. For instance, potential school locations that are situated predominantly downwind of an air pollution source may realize greater impacts than those that are located upwind of the source. However, even if a potential location is situated upwind of a source based on historical wind data, there will still be occasions when the location will be downwind of the source. In addition, for highways and other traffic sources, pollutants can travel upwind of the road because of air flows created by the vehicles operating on the roadway. Thus, for roadway sources, there may not be a significant difference between upwind and downwind locations with regard to air pollution impacts.

Based on the inventory and on professional judgment pertaining to the many [factors influencing exposures and potential risks](#) (see Exhibit 5), the environmental professional should determine whether there is reason for initial concern related to air pollutant exposures at the location and determine if onsite ambient air monitoring is warranted prior to choosing the location.

6.5. Screening Evaluation of Potential Air Quality

6.5.1. Local Air Quality Modeling

If the environmental professional determines that additional information pertaining to local air quality beyond that developed in the initial assessment is needed, air quality modeling may be considered as a means to provide this information. In particular, dispersion models are tools that calculate the air quality impacts of nearby sources at downwind locations. They may be used to model ambient concentrations of both criteria pollutants and air toxics and to estimate the magnitude of nearby sources' impacts on air quality at a given location.

Dispersion models require information on emission rates of nearby sources (from an [emission inventory](#) (see Section 6.4) as previously discussed), meteorological conditions at a location, and information on terrain and land use in the vicinity of the candidate location. There are two major categories of dispersion models: screening models and refined models.

- **Screening models** estimate the maximum likely impacts of a given source, generally at the receptor with the highest concentrations. These models are intended to eliminate the need for more detailed modeling in cases that will clearly not create ambient concentrations of concern. For many sources in simple terrain, the SCREEN3 (www.epa.gov/ttn/scram/dispersion_screening.htm) model may be used to estimate maximum ground-level concentrations resulting from a single source. For roadways and intersections, the CAL3QHC model (www.epa.gov/ttn/scram/dispersion_prefrec.htm#cal3qhc) may be used to estimate likely maximum concentrations at locations nearby.

- **Refined models** use detailed local information and simulate detailed atmospheric processes to provide more specialized and accurate estimates of how nearby sources affect air quality at downwind locations. Relative to screening models, refined models can require a significant investment of time and resources to conduct a proper analysis. AERMOD (www.epa.gov/ttn/scram/dispersion_prefrec.htm#aermod) is EPA's general-use model recommended for a wide range of sources in all types of terrain. For most situations, AERMOD is an appropriate model for estimating the impact of nearby sources on air quality near a potential location.

6.5.2. Onsite Air Quality Monitoring and Risk Analysis

If the environmental professional determines that onsite monitoring is warranted, and upon authorization by the LEA, the environmental professional should develop and implement an onsite air quality monitoring and analysis study. The objective of the study is to determine whether the targeted air pollutants identified in the inventory are present at the location in concentrations that may pose either short-term or long-term health risks to children or adults that may utilize the school facility. Monitoring can also capture impacts from sources that were not explicitly included in any local scale modeling, including unreported or unidentified sources. Ambient air monitoring, however, is costly in terms of the time, resources and technical expertise required to generate meaningful data. To minimize these costs as much as possible, a short-term monitoring approach can be used as an initial screen to determine if a location is suitable for future development. In addition, passive and other portable sampling techniques can also be used in screening monitoring to compare and evaluate multiple potential school locations.

Throughout the monitoring activity, the environmental professional should review the monitoring and analysis procedures to confirm compliance with the appropriate quality assurance and quality control (QA/QC) protocols

and assess local meteorological conditions during monitoring activities to identify any possible impacts on the sample collection. There are a number of studies and programs described on EPA’s website that provide examples of local monitoring activities. EPA’s “Assessing Outdoor Air Near Schools” (www.epa.gov/schoolair) Initiative provides useful guidance for this approach relative to air monitoring and the determination of potential adverse health impacts. EPA’s Community-Scale Air Toxics Ambient Monitoring Projects (www.epa.gov/ttn/amtic/local) website should also be consulted for recommendations on conducting air toxics monitoring analyses. Both websites include information on QA project plans for outdoor air monitoring. The NO₂ near-road monitoring website (www.epa.gov/ttnamt1/nearroad) provides some information on pilot studies conducted at several cities in the United States using passive sampling devices.

6.5.3. Development of Pollutant Specific Screening Criteria

An important step in determining a location’s acceptability is the identification of a set of screening criteria for each of the targeted air pollutants. These criteria should be protective of children’s health. As discussed in [Principle 1](#) (see Section 1.4.1) in the [About the Guidelines](#) (see Section 1) section, children are more vulnerable to environmental exposures than adults.

For criteria pollutants, these criteria may be based on comparison with the relevant NAAQS. For air toxics, the criteria should screen for the potential of adverse health effects resulting from both short-term (i.e., acute) and long-term (i.e., chronic) exposures at the location. If using a dispersion model to assess potential exposures, the output should be formatted to reflect the averaging times relevant to the screening criteria. In a short-term monitoring study, established reference concentrations, dose-response assessments or other similar benchmarks may not be available for all of the pollutants detected. Consequently, the environmental professional may need to employ other

approaches to identify appropriate screening criteria, including the development of surrogates for use in lieu of established acute values. The environmental professional will also need to evaluate the air sampling data for potential adverse health impacts resulting from chronic exposures to pollutants at the location. Therefore, the environmental professional should develop health-based screening criteria that can be used as long-term comparison levels. The development of suitable screening criteria for chronic exposures depends on the availability of two different types of long-term comparison levels:

- A cancer-based comparison level that is an estimated continuous (i.e., 24 hours per day, 365 days per year) exposure concentration set at an acceptable lifetime cancer risk. EPA typically considers lifetime cancer risks in the range of 1 in one million to 100 in one million to be acceptable. In some situations, other acceptable risk levels could be appropriate.
- A noncancer-based comparison level, such as the reference concentration or a comparable value, which is the estimated continuous (i.e., 24 hours per day, 365 days per year) exposure concentration considered likely to be without adverse effects over a lifetime.

In deriving the chronic screening criteria, priority should be given to the use of relevant and appropriate air standards (e.g., the NAAQS) as well as EPA’s risk assessment guidance and precedents. Data from EPA’s Integrated Risk Information System (www.epa.gov/iris/) can also be used to derive the appropriate screening criteria. Integrated Risk Information System contains both Inhalation Unit Risk values for chemicals with carcinogenic effects and reference concentrations for chemicals with chronic, noncancer health effects. Other data sources can be found on the following websites:

- EPA Office of Air’s Technology Transfer Network Air Toxics (www.epa.gov/ttn/atw/toxsource/summary);

- California Environmental Protection Agency Office of Environmental Health Hazard and Assessment (www.oehha.ca.gov/air);
- Texas Commission on Environmental Quality (www.tceq.texas.gov/toxicology);
- New Jersey Department of Environmental Protection (www.state.nj.us/dep/daq/); and
- Agency for Toxic Substances and Disease Registry (www.atsdr.cdc.gov/mrls).

An example of how both acute and chronic screening criteria have been established for previous air toxics monitoring studies can be found at www.epa.gov/schoolair/pdfs/UsesOfHealthEffectsInfoEvalSampleResults.pdf.

6.5.4. Evaluation of Potential for Adverse Acute and Chronic Health Impacts

With analytical results in hand and screening criteria in place, the environmental professional can begin an evaluation of the location's potential air quality impacts on acute and chronic health effects. Those sample results showing pollutant concentrations less than the screening criteria indicate acceptable air quality and do not require further action. Those pollutants determined to be present at concentrations above the screening criteria should be flagged for further consideration in the final report.

When evaluating onsite monitoring data, the environmental professional will also need to consider the potential impacts of the location's meteorology on any samples collected. This will require comparing the meteorological data taken on actual sampling days against those data taken onsite over all the days within the monitoring period, as well as available data from a nearby weather station. This will enable the environmental professional to determine the representativeness of the samples collected with respect to what might be expected over the longer term.

For an example of how to compare monitored values to acute and chronic screening criteria, go

to the school air toxics monitoring project at www.epa.gov/schoolair/pdfs/UsesOfHealthEffectsInfoEvalSampleResults.pdf.

When several locations are being considered, a comparison of potential health impacts at alternative locations may help in identifying the location with the lowest risk.

6.6. Development of an Environmental Assessment Report

After completing the comparison, the environmental professional should prepare and submit an environmental assessment report. When developing recommendations for the report, the environmental professional will need to consider and weigh a variety of factors. Among these is the fact that the screening levels were developed specifically to be conservative indicators of the risk of an adverse health effect. Exposures at or above a specific screening level do not necessarily indicate that a risk exists; rather it indicates that as exposures increase above an indicator, there is an increasing potential for risk of adverse health effects.

Taking into account these factors and the results from the environmental assessment, the final report may include one of several recommendations. If no pollutants of concern have been identified at concentrations greater than the acute or chronic screening criteria, the report may conclude that the location is acceptable from an air quality perspective. In those instances in which either or both of the acute or chronic screening criteria are exceeded by a pollutant, the report may conclude that the location is unacceptable from an air quality perspective or that additional measures (e.g., additional monitoring, site-specific risk assessment) are required. If no candidate locations are available that are without air quality concerns, the report should describe what mitigation options may be available for the candidate school location.

At a minimum, the final report to the LEA and SSC should describe and discuss the following:

- **Study area**, including the sources, activities and emissions located within area boundaries;
- **Pollutant inventory process**, including the identification of the pollutants targeted for monitoring;
- **Modeling approach and modeled concentrations** for locations in and around the site;
- **Monitoring approach and results**, including actual measured pollutant concentrations, projections of potential longer term concentrations and a comparison of these concentrations against national and regional averages;
- **Acute and chronic screening criteria**, including the process for selecting and/or deriving the criteria;
- **Comparison of pollutants against the screening criteria**, including potential health effects and toxicity information for those air toxics determined to be at the location;
- **Potential for multipollutant impacts** in those cases where multiple pollutants have been detected at levels above or just below their respective comparison levels;
- **Identification and evaluation of potential contributing sources**;
- **Conclusions and recommendations for next steps**; and
- **Impacts of the uncertainty and limitations** associated with the recommendations arising from limited sampling, location meteorology, available toxicity information, etc.

The draft report should be made available for public comment, as described in the [Meaningful Public Involvement](#), Section 3. The environmental professional should consider public comments in drafting the final report.

The LEA and SSC should review the environmental professional's report and the public comments received on the report and, in light of other assessments being performed at the location, determine next steps. To further clarify its options, the LEA may elect to have the report reviewed by a third party, such as a state, tribal or federal agency, with expertise in the subject area. In addition, the LEA may choose to identify and evaluate actions (regulatory or otherwise) being taken or planned nationally, regionally or locally that may achieve emission and/or exposure reductions in an acceptable time frame. The decision about next steps should be based on the weight of evidence supported by the environmental professional's report, other data developed during the [environmental review process](#) (see Section 5.1), and the potential for future reductions in exposure

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