8. Quick Guide to Environmental Issues

Contents

This section provides general information on some of the common environmental issues that the local education agency (LEA), the school siting committee (SSC) and the community may encounter during an environmental review.

8.1. Air Pollution

The potential exposure of children to air pollution is both a general community concern, depending on the overall air quality in any given region, and a very local concern, depending on what sources of air pollution may be located in proximity to a prospective school location. There are many potential sources of air pollution ranging from large scale industries to small businesses located within neighborhoods; a variety of transportation related activities such as roads and transportation hubs; and area sources including agricultural activities and a myriad of other land uses. Major pollutants include:

- **Criteria pollutants** (ozone, particulate matter, carbon monoxide, nitrogen oxides, sulfur dioxide and lead) – Exposure to these pollutants is associated with numerous effects on human health, including increased respiratory symptoms, heart or lung diseases and even premature death (www.epa.gov/air/urbanair/); and

- **Air toxics** include 187 specific pollutants that are known or suspected to cause serious health effects and are regulated as hazardous air pollutants, or HAPs. Examples of toxic air pollutants include benzene, which is found in gasoline; perchloroethlyene, which is emitted from some dry cleaning facilities; and methylene chloride, which is used as a solvent and paint stripper by a number of industries. Examples of other listed air toxics include dioxin, asbestos, toluene and metals such as cadmium, mercury, chromium and lead compounds. (www.epa.gov/air/toxicair)

In 2009/2010, EPA, state and local air pollution control agencies conducted air monitoring at 63 schools in an effort to better understand the air around selected schools throughout the country. Data from this air monitoring initiative can be found at www.epa.gov/schoolair.

Link to air pollution resources: www.epa.gov/schools/siting/resources.html#LINKS_air_pollution.

8.2. Nearby Highways and Other Transportation Facilities (Including Goods Movement)

Recent research has demonstrated a link between exposures to air pollutants from traffic emissions near large roadways and adverse human health effects. The Health Effects Institute (HEI) recently completed a review of a large number of health studies, concluding that near-road exposures "are a public health concern."[69] Although the link between adverse health effects and near-road exposures has been made, the science has not yet progressed to an understanding of how some key elements affect these associations, such as the type and size of roads of concern, the vehicle fleet mix and activities leading to highest exposures, and the distance from the road at which near-road health impacts subside. Most studies on traffic and health focus on roads with high levels of traffic (for example, 100,000 annual average daily traffic or higher). A few studies have reported health effects associated with smaller traffic volumes, with one study showing effects at volumes as low as 10,000 annual average daily traffic in an area. Further, while the health studies reviewed by HEI focused on exposures to traffic emissions, other transportation sources such as rail yards, rail lines, airports and marine ports have similar concerns due to similarities in the type and characteristics of air pollution emissions.

For most transportation sources, air pollutant concentrations are generally highest closest to the source, with concentrations decreasing with distance from the facility. According to the HEI report, studies that have examined gradients in air pollutant concentrations as a function of distance from roadways have indicated "exposure zones for traffic-related air pollution in the range of 50 to 1500 m" from the highways and major roads evaluated. However, the magnitude and extent of these increased air pollutant concentrations can vary based on a number of factors related to emissions from the source, meteorological and topographic conditions affecting pollutant transport and dispersion, and the influence of roadway design and roadside features on pollutant transport and dispersion.

Traffic emissions may vary depending on the total number of vehicles using a road, the level of congestion on the road and the number of heavy-duty trucks present. For rail operations, the number of trains, maintenance activities and line/yard configuration will influence emissions and exposures. Ports and airports will generate emissions from the ships/planes present at the facility, as well as support equipment and operations at the facility. For marine ports, large numbers of heavy-duty trucks may also be present on local roadways to move goods from the port. Air pollutant concentrations near transportation

[69] Health Effects Institute Panel on the Health Effects of Traffic-Related Air Pollution, "Traffic-Related Air Pollution: A Critical Review of the Literature on Emissions, Exposure, and Health Effects," *Health Effects Institute Special Report 17* (January 2010). Available at http://pubs.healtheffects.org/view.php?id=334.

facilities will also be affected by wind direction, wind speed and atmospheric stability. Changes in local topography from natural or roadway design features will also affect air pollutant transport and dispersion, which can lead to varying exposures for school occupants. Thus, air quality may vary based on surrounding terrain and features, such as cut sections, noise walls, vegetation or combinations of these features.

The complexity and multitude of factors affecting air pollutant concentrations near transportation sources (see Exhibit 5: Factors Influencing Exposures and Potential Risks from Nearby Hazards) make it difficult to recommend a strict set of guidance for safe distances from these source types, particularly given the potential for unintended consequences. Locations in close proximity to major transportation facilities should consider a range of approaches to mitigate or avoid potential exposures. When evaluating potential locations that may be located near a highway or other major transportation facility, several factors should be considered:

- Are there other locations in the community at farther distances from the source that are also being considered? Urban areas may be limited in their ability to find appropriate locations away from major roads and other transportation sources; thus, careful consideration should be given to near-road and other transportation source locations before eliminating them if the only alternatives are to locate schools much farther from the communities being served. Unintended negative consequences to moving schools away from these communities may include increased pollutant exposures during longer bus or personal car commutes, increased traffic on local roads to access schools further from their communities, and lack of walking, biking, or other alternative commute options to school; and

- What options might be feasible for mitigating pollutant concentrations at the site from these offsite sources?

    - Studies suggest that roads in cut sections (i.e., road surface below existing terrain) or that have combinations of noise barriers, vegetation and/or buildings near the roadside may reduce downwind air pollution concentrations;
    - School design techniques may be employed to reduce exposures at near-source schools, such as locating athletic fields, playgrounds and classrooms as far from the source as possible, and locating air intakes in areas on the school building(s) that are least affected by offsite or onsite transportation air pollutant sources;
    - Installing or preserving barriers such as trees, buildings and noise barriers may reduce air pollutant exposures;
    - Filtration devices as part of HVAC design can be used to improve indoor air quality as described in other sections of this guidance; and
    - Adding controls or redesigning offsite sources to reduce school area pollutant concentrations (e.g., replacing or retrofitting port and rail engines/equipment with cleaner technologies, reducing idling at terminal facilities, rerouting existing or projected traffic away from school or other populated areas (e.g., truck-only lanes), and adoption of high density development and transit alternatives).

The section Evaluating Impacts of Nearby Sources of Air Pollution provides information that can assist LEAs and environmental professionals in evaluating potential sources of air pollution early in the site evaluation process (see Section 6).

Links to air pollution resources: www.epa.gov/schools/siting/resources.html#LINKS_air_pollution and www.epa.gov/schools/siting/resources.html#LINKS_highways_and_traffic.

8.3. Volatile Organic Compounds (VOCs) in Soil and Ground Water

The potential for vapor intrusion into overlying buildings has received much attention in the past decade. There is a heightened awareness nationally and internationally by the general public of the potential health concerns related to vapor intrusion.

Vapor intrusion is generally defined as the upward migration of volatile organic compounds (VOCs) into overlying buildings from underground soils and ground water. Common contaminants that may create a vapor intrusion health concern include, but are not limited to, gasoline components (e.g., benzene) and dry cleaning and degreasing solvents. Common dry cleaning and degreasing solvents include perchloroethylene and trichloroethylene.

The presence of these contaminants in the soil or the ground water beneath a building does not always present a vapor intrusion concern. Physical factors, such as soil chemistry, ground water conditions, subsurface features and weather conditions, also affect whether vapor intrusion occurs. Extremes in weather conditions can increase extent of the vapor intrusion (e.g., in times of drought). Likewise, excess precipitation may cause plumes to migrate (e.g., based on water cascading off edges or aprons of gas stations) and/or travel farther (e.g., under nearby schools). These weather and geophysical conditions can result in unanticipated exposures.

Even though well-designed, well-constructed and well-operated new buildings are generally not susceptible to vapor intrusion, the use of integrated foundation sub-slab venting systems equipped with polyethylene or other vapor barriers is becoming increasingly common in new construction in densely-populated regions of the country, including California, New York and New Jersey. There are many different types of designs for sub-slab venting systems. Most systems, originally developed for protection against naturally occurring radon gas accumulation, consist of a relatively inexpensive network of horizontal perforated Polyvinyl chloride piping installed within an aggregate layer under a poured concrete slab beneath the ground floor of a building. The polyvinyl chloride pipes are connected to a manifold collection system, and the collected vapor is vented by vertical piping up through the roof of the building. In some cases, a synthetic vapor barrier is recommended, or roof-top fans are included to operate the system in a more active mode.

In much the same way that venting systems are used to intercept radon gas before it enters a home, such venting systems are effective in preventing the accumulation of VOCs. Addressing vapor intrusion into older buildings is more of a challenge.

The design and installation of sub-slab venting systems and vapor barriers built into the building foundation are best completed by experienced architectural and engineering firms. The proper installation of a vapor barrier that may overlie a sub-slab venting system is very important. Once installed, the vapor barrier should be inspected, tested and certified by the engineer or architect of record that the barrier was installed correctly and works as designed. Smoke testing is a recognized method to assess proper installation of vapor barriers and other synthetic liners.

The engineer and/or architect of record should furnish a report to the LEA along with the results of the testing, and a copy of the inspection and test results should be included in a report to an oversight regulatory agency.

Performance monitoring of a venting system is equally important. If residual underground soil and ground water contamination exists, the LEA should retain an experienced environmental professional to develop a long-term monitoring plan and periodically complete testing around the school to document that the system is operating properly. Soil gas sampling ports are best integrated into the building design, within a vent piping, or as close to the building as is feasible if the structure already exists.

Link to vapor intrusion/VOC resources: www.epa.gov/schools/siting/resources.html#LINKS_vapor_intrusion_vocs.

Additional information regarding volatile organic compounds can be found here: www.epa.gov/iaq/voc.html#Additional%20Resources.

8.4. Radon

Radon is a naturally occurring, radioactive, soil gas. Inhaling radon can lead to lung cancer. Radon enters buildings through openings in ground contact floors and walls. Well water may also contain radon and contribute to the level of radon in indoor air. Always test for radon in indoor air before testing for radon in water. Fortunately, simple, proven and inexpensive techniques have been used in many schools to keep radon at acceptable levels.

Soil testing a site for radon is not a reliable way to determine if a school building will have high radon levels once constructed. Instead, EPA recommends that all schools in high radon potential areas be built with radon prevention techniques. Such schools should be tested upon completion and periodically over time to ensure the radon is at acceptable levels. EPA recommends the following radon prevention techniques for construction of schools: installation of active soil depressurization systems, pressurizing the building using the HVAC system, and sealing major radon entry routes.

For existing structures, EPA recommends testing all schools for radon. As part of an effective indoor air quality management program, schools can take simple steps to test for radon and reduce risks to occupants if high radon levels are found. The only way to know if elevated radon levels are present is to test. Some states regulate radon-related activities in schools, for example, by requiring schools to take certain actions or licensing radon measurement and mitigation services providers.

Link to radon resources: www.epa.gov/schools/siting/resources.html#LINKS_radon.

8.5. Petroleum Hydrocarbons in Soil and Ground Water

One common environmental issue likely to be encountered at existing and proposed school locations is contamination from petroleum or other fuel or heating oils attributed to petroleum products that have been spilled during use or leaked from old underground storage tank systems and piping. These oil and fuel storage tanks are commonly associated with gas stations or fuel storage areas governed by federal and state environmental regulations. Nonresidential underground storage tanks (including commercial heating oil and commercial motor fuel) can be larger than 10,000 gallons in size. Care should be exercised whenever older petroleum tanks are encountered. Soil and water samples should be obtained from around the underground tank prior to its removal or abandonment, and appropriate budget contingencies should be established by the LEA to address soil and ground water remediation costs associated with leaking petroleum tanks. If the underground storage tank has leaked, it may be necessary to drill monitoring wells and regularly test the water, adding to the cost of remediation.

Above- or underground heating oil tanks are often regulated by the local fire marshal or health department, depending on the size. In many parts of the country, especially older cities, home heating oil is commonly used as a fuel in homes. Most buried residential underground tanks are smaller than 1,000 gallons in size, but due to their age, poor condition and location (commonly under sidewalks), fuel leaks are commonly encountered. In some instances, fuel tanks are located within basements. These systems present less of a concern, as they can be visually inspected.

The LEA should retain an experienced environmental professional to oversee the removal of underground storage tanks and any excavation that may be necessary to remove and properly dispose of petroleum-impacted soil. Issues concerning underground or aboveground storage tanks should be identified in the preliminary environmental assessment. As discussed in the Environmental Review Process section, the purpose of the preliminary environmental assessment is to identify the presence or the likely presence of any environmental hazards on a property based on historical and current site uses.

Link to underground storage tank resources: www.epa.gov/schools/siting/resources.html#LINKS_Storage_Tanks.

More information related to aboveground storage tanks: www.epa.gov/oilspill/spcc.

8.6. Lead-based Paint Hazards and Lead in Soil and Drinking Water

Lead has been used in a wide range of industrial, commercial and residential products from gasoline, piping, flashing or solder as well as pesticides and paint.

Paint and Soil: Lead was commonly used in paint before the 1978 ban by the Consumer Products Safety Commission on lead-based paint for applications where consumers may be exposed. Building exteriors may contain lead-based paint and soils surrounding older buildings may contain lead at levels that present an unacceptable exposure risk. EPA has promulgated regulations governing both the abatement, as well as the renovation, repair and painting of, among other things, pre-1978 child-occupied facilities, which generally include preschools or building areas where children under six spend a significant amount of time. (See 40 CFR Part 745, Subparts E and L.) For post-1978 buildings and schools in general, representative testing for lead on building exteriors and in surface soils is a best practice. If lead is detected at a concentration in soil that poses a risk to children, the best practice is to have an experienced and licensed hazardous waste professional properly remove and dispose of impacted soils. If lead-based paint hazards exist on the exteriors of post-1978 school buildings, the best practice is to have an EPA or state certified renovator perform renovation, repair and painting work in accordance with EPA's lead-safe work practice requirements for child-occupied facilities found at 40 CFR Part 745 or cap the soils to reduce exposures.

Drinking Water: The LEA should engage an experienced environmental professional to investigate the drinking water quality within existing buildings/structures if the school is served by a municipality. For schools that are to be renovated or expanded, the sampling and analysis of water from taps and fountains where people may be drinking and cooking within the building(s) is a best practice to determine the presence and concentration of lead. This work is best done by an environmental professional experienced in water quality testing. If lead is detected above the EPA action level, the environmental professional should furnish a report to the LEA that identifies the locations of concern and provides options on how best to address the situation. The school should stop using that tap or water fountain until the recommendations from the environmental professional can be enacted.

If a school is a public water system and supplies its own water with a well, it is subject to state and federal Safe Drinking Water Act regulations and should be aware of any lead levels that exceed the EPA action level. LEAs can contact their local drinking water program for assistance.

Link to lead resources: www.epa.gov/schools/siting/resources.html#LINKS_lead.

Additional information regarding sampling drinking water in schools can be found here:

http://water.epa.gov/drink/info/lead/testing.cfm and

http://water.epa.gov/infrastructure/drinkingwater/schools/guidance.cfm.

8.7. Polychlorinated biphenyls (PCBs) in Fluorescent Light Ballasts, Window Caulking and Soil Associated with Older Buildings

Polychlorinated biphenyls (PCBs) were widely used in electrical and manufacturing processes before they were banned 30 years ago. If an older building is being considered as a possible location or exists on a site proposed for a school, the LEA should engage an experienced environmental professional to investigate existing buildings/structures to determine the presence of PCB-containing equipment/fixtures and building materials. PCBs can be found in light fixtures, electrical equipment (transformers), older paint formulations and older window caulk products. If elevated concentrations of PCBs are found, an environmental professional should furnish a report to the LEA that documents their occurrence and remediation options and costs. The environmental professional should also identify and follow the federal and state regulatory requirements for handling, storage and marking of PCB-containing items.

Ballasts: Many schools in the United States built before 1979 have light ballasts containing PCBs. The PCBs are contained within the light ballast capacitors and in the ballast potting material. Until the late 1970s, PCBs were commonly used as insulators in electrical equipment because they have high tolerance to heat, do not burn easily and are nonexplosive.

Congress banned the manufacture of PCBs in the United States in 1977 because of their toxic effects. In 1979, EPA banned the processing or use of PCBs, except in totally enclosed equipment. However, a large number of fluorescent light ballasts that were installed prior to these bans may contain PCBs and may still be in use in schools.

Intact, operational ballasts where PCBs remain in the ballasts and potting material may not pose a health risk or an environmental hazard. However, as they age, the ballasts degrade. Depending on the number of operating hours, the typical life expectancy of a magnetic fluorescent light ballast is between 10 and 15 years. The failure rate prior to the end of the useful life of ballasts is about 10 percent. After this typical life expectancy, ballast failure rates increase significantly. All of the pre-1979 ballasts in lighting fixtures that are still in use are now far beyond this life expectancy, increasing the risk of leaks or even fires, which would pose a health and environmental hazard. A PCB containing ballast may also be lacking in thermal overload protection, increasing the possibility of fires or leaks. The hazard can be worsened by mishandling by personnel who are unaware of the presence of PCBs in the lighting ballasts. A ballast that has been damaged or mishandled can increase exposure of students and school personnel to PCBs.

Caulk and Soil: Recent studies conducted by EPA have identified a potential exposure risk to PCBs because they were used in the past for certain window caulk and rubberized paint formulations to make them more flexible and durable. As a result, PCBs may be found in soil that surrounds older buildings. Representative testing of surface soils and deteriorated window caulk for PCBs in buildings that were built or renovated between 1950 and 1978 is a best practice. If PCBs are found in deteriorated window caulking, the best practice is to have an experienced and licensed contractor properly remove and dispose of the caulking. Similarly, if PCBs are detected in soils, the best practice is to have an experienced and licensed contractor properly remove and dispose of impacted soils.

Links to PCBs resources: www.epa.gov/schools/siting/resources.html#LINKS_pcbs and www.epa.gov/pcbsincaulk/guide/guide-sect4.

8.8. Asbestos-Containing Material Surveys

Asbestos is a naturally occurring mineral fiber that has been used in a wide variety of products as an insulator and fire-retardant. The Asbestos Hazard Emergency Response Act (AHERA), a provision of the Toxic Substances Control Act, became law in 1986. AHERA requires local education agencies (LEAs) to inspect their schools for asbestos-containing building material and prepare management plans to prevent or reduce asbestos hazards.

If an older building is being considered for a possible school location, the LEA should engage an experienced environmental professional to determine the presence of asbestos-containing materials and its condition using recognized testing methods. Asbestos-containing materials may be found on interior and exterior pipe/duct insulations, equipment and boiler insulations, fire brick, HVAC units, plaster materials, floor and ceiling tiles, mastics/glues, roofing materials, window glazing caulks, wire wrap, between old wooden flooring (for noise reduction) and fireproofing materials. Asbestos may also be found in vermiculite insulation. The environmental professional should furnish a report to the LEA that includes the test results, an itemized inventory of all suspected asbestos-containing materials, and a corresponding cost estimate to abate such conditions (including management in place, where appropriate) and conduct the appropriate testing in accordance with all applicable regulatory agency and code requirements.

Links to asbestos resources: www.epa.gov/schools/siting/resources.html#LINKS_asbestos.

A list of EPA regional asbestos contacts is available at: www.epa.gov/asbestos/pubs/regioncontact.

Additional guidance on asbestos programs for schools can be found at EPA's asbestos website: www.epa.gov/asbestos.

8.9. Mold

Leaks, condensation and high humidity can result in significant mold contamination of structures. Buildings that are intended for reuse should be evaluated for evidence of prior moisture problems and potential for future moisture and mold issues. In buildings where mold issues are identified, proper assessment and remediation of both the underlying moisture problems and cleanup of existing mold should be completed prior to occupancy. Potential health effects and symptoms associated with mold exposures include allergic reactions, asthma and other respiratory complaints.

Link to mold resources: www.epa.gov/schools/siting/resources.html#LINKS_mold.

Additional guidance regarding mold remediation in schools can be found here: www.epa.gov/mold/mold_remediation.

8.10. Chemicals in Schools

Existing buildings may contain improperly stored, hazardous and outdated chemicals, which can pose a risk to students, staff and other school occupants. From elementary school maintenance closets to high school chemistry labs, schools use a variety of chemicals. When they are mismanaged, these chemicals can put students and school personnel at risk from spills, fires and other accidental exposures. The Schools Chemical Cleanout Campaign website gives K-12 schools information and tools to responsibly manage chemicals. To view the Schools Chemical Cleanout Campaign website, visit www.epa.gov/schools/programs and click on Schools Chemical Cleanout Campaign.

Link to chemicals in schools resources: www.epa.gov/schools/siting/resources.html#LINKS_chemicals_in_schools.

8.11. Heavy Metals in Soil and Ground Water

In addition to lead, metals such as arsenic, cadmium, mercury and chromium can be found in paint pigments and older pesticide formulations. Metals may also have been released to the environment from commercial or industrial operations. Metals do not degrade in the environment, and as a result, can be found in soil and ground water in many areas. Although low background levels of metals may not represent a health concern, elevated levels of metals in soil are frequently encountered across the country.

Metals are also found in older masonry products. A standard of care needs to be undertaken if masonry materials from older buildings are to be crushed and recycled as fill material. This issue has only recently surfaced in environmental assessments of older building slated for demolition. Older masonry materials may contain elevated levels of metals, such as beryllium and cadmium that may not be suitable for onsite recycling. This is especially true if masonry materials are painted. Representative samples of the masonry should be obtained by an experienced environmental professional to determine whether the masonry is suitable for onsite recycling.

Links to resources on specific metals: www.epa.gov/schools/siting/resources.html#LINKS_lead,

www.epa.gov/schools/siting/resources.html#LINKS_arsenic and www.epa.gov/schools/siting/resources.html#LINKS_mercury.

The following links provide information regarding laws and regulations and technical approaches related to ground water and soil.

Ground Water: www.epa.gov/lawsregs/topics/water.html#ground,

http://water.epa.gov/type/groundwater/index.cfm and www.epa.gov/schools/siting/resources.html#LINKS_drinking_water.

Soil: www.epa.gov/gateway/science/land and www.epa.gov/superfund/index.

8.12. Pesticides

Pesticides may be encountered on existing and proposed school sites. If a proposed school was historically used for residential or agricultural purposes, surface and subsurface soils should be tested for pesticides such as chlordane, dieldrin, lead arsenate and dichlorodiphenyltrichloroethane as well as other pesticides associated with the crops or agricultural activities at that site. If there is a well on the property, the water should also be tested if it is likely to be used for consumption. Pesticides used for termite protection at schools were routinely sprayed adjacent to building foundations. If a school building is proposed for demolition or expansion, soils should be tested for pesticides in areas proposed for disturbance. Proper health and safety precautions should be employed by workers that may come in contact with pesticides. Excavation and offsite disposal of soil found to contain pesticides may be required prior to or during school construction.

Pesticides in ground water generally occur as a result of leaching from soil into ground water as well as injection of soil fumigant pesticides into the ground. The potential presence of pesticides in ground water should also be considered if an onsite source of drinking water is required.

Aerial- as well as ground-based applications of pesticides can result in unintended spread of pesticides from the intended target location to other locations due to equipment, application techniques, applicator error or weather or other application conditions. The drift of spray and dust from pesticide applications can expose people, wildlife and the environment to pesticide residues that can cause health and environmental effects and property damage.

While large scale aerial spraying of agricultural operations has resulted in poisoning of farm workers, children and others, spray drift can occur during any pesticide application, including in suburban or urban environments. Drift can even occur during indoor use of pesticides.

Potential pesticide usage near prospective school sites in rural, suburban as well as urban locations should be considered and evaluated for potential to expose children or staff to pesticides. Where such potential exists, steps to mitigate potential exposures should be considered and implemented. Potential mitigation approaches include:

- Oversight and strict enforcement of product label use directions and drift restrictions;
- Use of drift reducing application technologies and best management practices; and
- Buffer zones based on case- and site-specific considerations.

Links to pesticide resources: http://www.epa.gov/schools/siting/resources.html#LINKS_pesticides.

8.13. Securing Safe Soil and Fill

Soil and fill materials should not always be assumed to be free of contaminants. Depending on the source of soil and fill materials to be imported to a school site, the soil and fill may contain contaminants as well as construction and demolition debris. Not only does fill material imported to a school site need to be suitable from an engineering perspective, the soil may need to meet environmental quality standards. It is recommended that material be tested and the architect or engineer of record approves the placement of fill material on school sites before it is delivered to the site. Contract documents should clearly state that imported fill materials need to meet established environmental quality specifications.

Contract documents should clearly state that fill and topsoil imported to a proposed school site be suitable for the intended future use of the property as a school, from both an engineering and environmental quality perspective, and that the quality of the imported fill and topsoil shall not change the environmental classification of the property from an unrestricted to a restricted use. Similarly, the exportation of excess fill and topsoil that originates from a proposed school site should not be assumed to be free of contaminants. Low levels of contaminants are commonly found, especially in urban and former agricultural areas. The LEA and its environmental professional are responsible for ensuring that the exportation of fill material is suitable for property to which it is delivered.

When testing is necessary to document fill and soil quality, representative samples of the fill and soil should be tested for such contaminants as pesticides, PCBs, metals and polycyclic aromatic hydrocarbons.

Additional information regarding legacy land use or contamination can be found here: www.epa.gov/superfund/health/index.

8.14. Historic Fill

Historic fill is generally defined as nonindigenous material that was imported to a site to raise the topographic elevation. Examples of historic fill may include: construction debris, dredge spoils, incinerator residue, demolition debris, fly ash or nonhazardous solid waste.

Prior to the turn of the past century, it was a common practice in certain areas of the United States to fill low-lying areas to reduce mosquito breeding grounds and expand urban land on which to build. In many instances, this historic fill material originated from an offsite location, and its environmental quality was never determined.

Most historic fill contains low levels of pollutants, but some historic fill can have poorer quality.

In some instances there can be economic and impracticability issues associated with removal of such large quantities of historic fill materials, which in some areas of the northeastern United States can be 20 feet thick. In these instances, construction of various impervious and engineering controls is currently an accepted practice.

Additional information regarding legacy land use or contamination can be found here: www.epa.gov/superfund/health/index.

8.15. Institutional and Engineering Controls

Institutional controls are legal and administrative controls used to prevent human exposure to residual contamination and protect the integrity of the remedy. Examples of institutional controls include zoning, notices and warnings, easements, restrictive covenants, other land or resource use restrictions, permits/governmental controls and administrative orders.

Engineering controls: Examples of engineering controls include the placement of two feet (or more) of clean soil/fill material (suitable for residential uses) and turf grass on playgrounds and athletic fields, impervious engineered surface parking lots and building slabs, landfill soil caps, impermeable liners, other containment covers, underground slurry walls, fences, air filtration devices and physical and planted vegetation barriers.

Best construction and performance management practices should be used when an engineering control in the form of a clean soil cover is necessary to eliminate direct contact exposure to soil found to contain pollutants. The most common practice is to isolate the underlying soil using geotextile and visual barrier materials (such as polyethylene orange construction/snow fencing material). Two feet of clean fill and soil is placed over the geotextile and visual barrier. The visual barrier serves as a "marker layer" to warn anyone who might dig into the soil that soil below this marker contains pollutants in soil that should not be disturbed. However, sites that contain an area of contaminated soil/fill may require additional engineering controls to encapsulate the contaminated layer of soil/fill. For example, a layer of crushed stone underneath the clean fill layer will provide a "capillary break" that limits the upward and downward movement of water or leachate. This layer will also prevent burrowing animals and worms from transporting contaminated soil into the clean fill and potentially to the surface. LEAs should review EPA's requirements for encapsulating contaminated soils.

Underground utilities are best installed within clean soil zones to mitigate exposure should future repairs, alterations, improvements or disturbances be necessary. Such "clean utility corridors" are recommended when an engineering control is necessary for a particular property to eliminate a potential direct contact exposure to pre-existing soils that may contain residual contamination. A clean utility corridor is defined as a linear trench that is excavated to support the installation of underground utilities; the trench is restored to grade, after the installation of utilities, using clean soil or fill materials. Clean utility corridors reduce the potential for damage to an existing engineering control when future utility repairs, alterations or improvements are necessary.

Planting trees with extensive root systems should be avoided if a site is constructed with a multilayered engineering control barrier. When an engineering control, in the form of a clean landscaped soil cover of sufficient thickness, is employed, trees and shrubs should be planted in clean soil zones specifically excavated to accommodate their root systems. Trees and shrubs should be kept away from water wells and septic fields. This often requires excavation to a depth of four to six feet to accommodate the root ball of the tree or shrub.

Link to cleanup regulations and processes: www.epa.gov/schools/siting/resources.html#LINKS_cleanup_regulations_and_processes.

Additional information regarding cleanup programs and standards can be found here: www.epa.gov/oswer/cleanup/index and www.epa.gov/oswer/cleanup/programs.

Additional information regarding risk assessment processes can be found here: www.epa.gov/oswer/riskassessment.

8.16. Capacity for Long-term Maintenance of Engineering and Institutional Controls

The use of institutional and engineering controls can be an effective method for eliminating direct contact exposure. Where there is concern about an LEA's capacity and ability to manage sites with institutional and engineering controls (see Sections 7.2.6 and 7.3.6, under "Local capacity to manage institutional and engineering controls"), LEAs are encouraged to enroll prospective sites in their state or tribal voluntary cleanup/ brownfields response program to ensure oversight of assessment and cleanup efforts and to identify a process for an LEA, working with their regulatory partners, to oversee continued safe site management. If an institutional or an engineering control is necessary to eliminate direct contact exposure, the LEA should adequately budget for periodic inspections, maintenance and repair/replacement of the controls.

An institutional control, in the form of a notice to the property deed, can specify certain actions to be completed by the property owner and will identify the various reporting requirements to document that the engineering control remains intact. This "deed notice" typically:

- Informs the owner (and future owners) of the property to maintain the engineering controls and to notify the regulatory agency prior to any alterations, improvements or disturbances in the area (i.e., the restricted area);
- Sets forth the schedule to conduct periodic inspections of the area; and
- Specifies any particular certification requirements that the engineering control remains intact.

Long-term stewardship resources: www.epa.gov/schools/siting/resources.html#LINKS_longterm_stewardship.

Additional information regarding cleanup programs and standards can be found here: www.epa.gov/oswer/cleanup/index and www.epa.gov/oswer/cleanup/programs.

Additional information regarding risk assessment processes can be found here: www.epa.gov/oswer/riskassessment.