



COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF HEALTH

September 16, 2020

Patrick McDonnell
Secretary, Pa. Department of Environmental Protection
Rachel Carson State Office Building
400 Market Street
Harrisburg, PA 17101

Dear Secretary McDonnell:

The Pennsylvania Department of Health's (Department's) Division of Environmental Health Epidemiology in the Bureau of Epidemiology was contacted in the fall of 2019 by the Pennsylvania Department of Environmental Protection's (DEP's) Pottsville District Mining Office for an environmental health consultation concerning the environmental fate and human health risks of exposure to naturally occurring asbestos (NOA) at Rockhill Quarry in East Rockhill Township, Bucks County, Pa.

Naturally occurring asbestos is present in specific geological formations found in Pennsylvania. These rock formations, such as ultramafic rock, and serpentine rock, can be either found deep in the ground or in rocks at the surface. The amount of asbestos typically present in this rock can range from less than 1% up to about 25%. Naturally occurring asbestos can be released into the environment from its bound form if the rock is broken, crushed, or frayed either by human activity or via natural weathering processes.

In outdoor rural areas nonadjacent to known asbestos sources, background levels of asbestos in the air are about 10 (fibers/m³) or 0.00001 fibers/mL. Due to the wearing down or disturbance of manufactured products, including insulation, automotive brakes and clutches, ceiling and floor tiles, drywall, roof shingles, and cement, typically found in more urban settings, levels found in cities can be as much as 10-fold higher.

There are several published studies and reports that discuss non-occupational asbestos exposure and describe health issues associated with NOA, manufactured asbestos production facilities, and community health. The most well-known studies concerning asbestos exposure and human health are associated with asbestos mining in Libby, Montana. The most extensive studies of occupationally exposed asbestos lung injury come from this town and surrounding communities.

The Ambler, Pennsylvania Ambient Air Study published in March 1977, showed that asbestos fibers from an asbestos waste pile could be distributed by the wind to a neighboring community, with fiber concentrations in the air diminishing rapidly as distance from source increases. A follow-up study was conducted in the same community between 2008 and 2011.

Although mesothelioma levels were higher in the affected community, only samples collected on the national priority list site exceeded EPA screening values.

Several asbestos-related lung disease cases were observed to be higher in communities surrounding a large defunct asbestos mining operation near Belvedere Mountain Vermont, as compared to control communities. However, as published in the document *A Cross-Sectional Study of Asbestos-Related Morbidity and Mortality in Vermonters Residing Near an Asbestos Mine*, (VDOH 2008), and the follow-up report published in 2009, upon further investigation, many of the previously reported asbestos-associated illnesses were determined to be occupationally related. In western states, NOA exposure risks have been gaining public interest and concern. Two case studies titled, *The presence of asbestos in the natural environment is likely related to mesothelioma in young individuals and women from Southern Nevada*, *Bauman et al. 2015*, and the *El Dorado Hills Naturally Occurring Asbestos Multimedia Exposure Assessment El Dorado Hills, California*,(EPA) document present asbestos hazard to a non-traditional population of citizens. These studies document that environmental exposure to NOA can occur in communities near specific geological formations and may increase the risk of asbestos-related lung diseases. The risk is highly dependent on climate (dry), weather patterns, and activity, e.g., dust storms, type of regional geology, and type of human activities conducted in high NOA areas. As with the defunct, inactive Ambler, Pa., and Belvedere mountain sites, commercial activity at these sites was prohibited. However, recreational activities such as off-road vehicle sports and mountain bicycle riding in areas with high levels of NOA have been shown to lead to increased levels of airborne dust, which results in higher rates of inhaled asbestos fibers.

There are no current federal standards that limit the concentration of asbestos in ambient air in the U.S. Rather, federal regulations set forth restrictions on (1) emission levels from known point sources, (2) the manufacture, importation, processing, and distribution of certain asbestos-containing products and “new uses” of asbestos, and (3) the use and handling of asbestos-containing material during construction, demolition and renovation.

Although state or federal regulations for asbestos in ambient air are rare, due to a historical relationship with asbestos mining, the state of Vermont has set a Stationary Source Hazardous Air Impact Standard for asbestos fibers (Annual Average) at 0.00012 ug/m³.

As it pertains to the health of citizens who live near the Rockhill Quarry, NOA is best to be avoided and left alone. Natural weathering and erosion may increase the risk of exposure to neighboring communities in drier months. Any mechanized activity or kinetic energy that makes physical contact with geological formations that contain asbestos, asbestos-like

material, or elongated mineral fibers will accelerate the natural weathering process. There are varying levels of agreement between DEP, Rockhill Environmental Preservation Alliance (REPA) and Pierson Materials/Hanson Aggregates concerning the amount or type of respiratory elongated mineral fibers (EMF) present. However, environmental and geological sampling commissioned by the aforementioned entities have agreed that actinolite, a type of asbestos fiber, is present in the rock material at the Rockhill Quarry site. Analytical reports also agree that "non-asbestos" mineral material exceeding 3:1 length to width ratio is also present in the geological materials sampled and analyzed from the site.

Both these observations justify pause for further evaluation. Free asbestos fibers of a length greater than $5\mu\text{M}$, with an aspect ratio greater than 3:1, are the most hazardous due to increased lung penetration and deposition. These fibers can cross blood vessels and, if consumed, gastrointestinal walls. Asbestos mineral fibers of these dimensions are difficult for the body to remove and, depending on the site of deposition, can cause scarring and oxidative stress. Fibers with a diameter greater than $3\mu\text{M}$ have not been observed to be respirable and have been observed to be less hazardous. Some types of asbestos fibers, such as chrysotile, can split into fibrils and undergo partial dissolution within the lungs. This breakdown into smaller pieces can lead to increased pulmonary clearance. Amphibole asbestos such as actinolite do not subdivide into fibrils of smaller diameter or break up by length. They are much less soluble in lung fluids, and they have long residence times in the lungs.

Although the presence of these types of minerals have been associated with illness and injury in medical reports, and environmental investigations, the Department does not currently have sufficient data to support the assessment that communities or children who attend schools in close proximity to the Rockhill Quarry are in immediate risk of asbestos or EMF-related illness. There is also a paucity of data available to evaluate whether current or proposed activities on the Rockhill Quarry site are protective of the health of workers on site, adults and children who live near the Rockhill Quarry, and children who attend school near the site. To address these gaps in knowledge, additional environmental sampling should be conducted.

Comprehensive health-based environmental sampling should at least include air and soil sampling for onsite, source, property/fence line, and offsite locations. To produce sample data most applicable to human health, stationary breathing zone and on-person sampling methods should be employed over several weeks, including summer and winter seasons covering various weather conditions. Also, various activity-based personal sampling should be considered. To determine the risk of exposure to vulnerable populations, a thorough

environmental asbestos sampling plan should also include schools, daycares, and hospitals, etc. If evidence of substantial water runoff has been detected, waterbody sampling should be included (river, lake, pond) in the sampling plan, especially if the runoff leaves the site. As an example, the EPA has executed several comprehensive NOA environmental sampling studies involving nearly 400 air samples and 180 soil samples in a Californian community and neighborhood school. The methods and results are presented in the EPA document titled: *El Dorado Hills Naturally Occurring Asbestos Multimedia Exposure Assessment El Dorado Hills, California*. In another NOA EPA document titled *Environmental Monitoring for Asbestos: Sumas Mountain Asbestos Site Selected Residential Properties*, bulk, activity-based, and surface water sampling methods are explained in detail.

Until sufficient data are available to determine the level of onsite and offsite asbestos or hazardous EMF exposure occurs during various activities over more than one season, the risk of asbestos-related illness in the stakeholder population will not be fully understood. As environmental investigations continue at the Rockhill Quarry site, material containing NOA should be addressed with concern. Generally, there are three concepts to consider when NOA has been identified at a location.

If possible, NOA should be avoided and left alone: If rock containing NOA is intact and undisturbed, your risk of exposure is low. Avoid blasting it, crushing it, or grinding it up. If possible, prohibit access or limit activities in the area. Especially avoid digging transporting and or gardening in areas in which NOA has been detected or suspected to be present. Avoid riding bicycles on unpaved surfaces. Avoid riding off-road vehicles such as four-wheelers and dirt bikes in areas with NOA. Also, limit running, hiking, or driving on unpaved surfaces in these areas. If activities in the area determined to have NOA cannot be avoided, then risk minimization procedures should be considered.

- 1) **Have a plan.** Before you disturb rock or soil that is likely to contain asbestos, make sure you have an adequate protocol in place to control and contain the dust. If the enterprise is large and it is anticipated that a large amount of dust may be generated, consider notifying surrounding communities to avoid being outside or downwind of the site of concern prior to the event. Also, partnering with local and state air monitoring teams to determine the NOA fiber levels offsite would be appropriate.
- 2) **Keep it wet and cap it:** If the rock or dirt contains NOA, keep it wet while you're working, and seal it under a layer of clean soil and a layer of pavement, turf, or clean gravel. Also, the risk of lung disease associated with environmentally exposed asbestos depends on several factors. The most important of these are 1) how long you were

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exposed, 2) how long it has been since your exposure started, and (3) whether you smoked cigarettes. Cigarette smoking synergistically interacts with asbestos exposure and will increase your chances of developing lung cancer.

We have included a Frequently Asked Questions (FAQ) document and fact sheets developed by the Department on NOA for additional information to protect public health. If there any questions about NOA and the potential health risks associated with NOA exposure, feel free to contact the Department of Health at 717-787-3350 or env.health.concern@pa.gov.

Sincerely,



Rachel L. Levine, MD
Secretary, Department of Health
Commonwealth of Pennsylvania

Resources:

[Toxic Substances Portal - Asbestos](#)

[United States Commerce and Trade Asbestos Definition-title15-chap53-subchapII.pdf](#)
[EPA Restrictions on Discontinued Uses of Asbestos; Significant New Use Rule](#)

[State of Vermont Agency of Natural Resources Air Pollution Control Regulations](#)

[ATSDR Toxicological Profile for Asbestos](#)

[ATSDR Public Health Assessment BoRit Asbestos Ambler PA 2013](#)

[Vermont Department of Health: A Cross-Sectional Study of Asbestos Related Morbidity and Mortality in Vermonters Residing Near an Asbestos Mine 2008](#)

[Environmental Monitoring for Asbestos: Sumas Mountain Asbestos Site Selected Residential Properties](#)

[EPA Naturally Occurring Asbestos El Dorado Hills](#)

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Comparison of soil sampling and analytical methods for asbestos at the Sumas Mountain
Asbestos Site—Working towards a toolbox for better assessment

EPA Naturally Occurring Asbestos Approaches for Reducing Exposure

Naturally occurring asbestos (NOA) are fibrous minerals found in certain rocks or soil as a result of natural geological processes. NOA does not refer to commercially processed, asbestos-containing material, such as insulation and fire protection in buildings or automobile brake linings, or asbestos mining and processing operations. Natural weathering and routine human activities may disturb NOA-bearing rock or soil and release mineral fibers into the air, which poses a greater risk for humans to breathe it in.

WHERE IS NOA FOUND?

In Pennsylvania, NOA is present in only a few specific geological formations and rocks and can be in rock that is deep in the ground or near the surface. Not all of these specific rocks contain NOA; they only have the potential to contain it. You can find out if your home is in an area where NOA may be present by consulting the United States Geological Survey (USGS) reports on NOA available at <https://mrdata.usgs.gov/asbestos> or by contacting the Bureau of Air Quality at Pennsylvania's Department of Environmental Protection (DEP) via telephone: (717)787-9702 or email: RA-epair@pa.gov.



HOW CAN I BE EXPOSED TO NOA?

Environmental exposure to NOA can occur in communities near geological formations that contain NOA, but the risk for exposure is highly dependent on climate, weather patterns and activity, and type of regional geology. You might be exposed to NOA through routine activities that can crush NOA-containing rock or disturb dust in soils that contain NOA fibers, such as working in your yard or garden, digging or shoveling dirt, riding bicycles or driving vehicles on unpaved surfaces, and running and hiking on unpaved surfaces.

HOW CAN NOA MAKE ME SICK?

If NOA is disturbed and asbestos fibers are released into the air and surrounding environment, it can pose a health hazard due to the potential risks associated with breathing in the fibers. Most inhaled fibers are removed from your lungs by being carried away to the stomach or coughed up. However, fibers that are deposited in the deepest parts of the lung are removed more slowly and can stay in place for many years or never be removed from the body. If NOA is not disturbed and fibers are not released into the air, then it does not pose a health risk. Though health risks associated with exposure to NOA (not asbestos used commercially) are not yet fully understood, we know all forms of asbestos are carcinogenic and may lead to adverse health effects, including asbestos-related disease.

Being exposed to NOA does not mean you will develop health problems, and most people don't show any signs or symptoms of asbestos-related disease for 10 to 20 years or more after exposure. Visiting a health provider is necessary to determine whether you are at risk for developing health problems from NOA exposure.

HOW CAN I REDUCE EXPOSURE TO NOA AT HOME?

If you live in an area where NOA has been disturbed and is likely to become airborne, you can limit exposure by taking the following steps:

- Walk, run, hike, and bike only on paved trails.
- Play only in outdoor areas with a ground covering such as wood chips, mulch, or sand.
- Drive slowly over unpaved roads.
- Pave over unpaved walkways, driveways, or roads that may have NOA-containing rock or soil.
- Cover NOA-containing rock or soil in gardens and yards with asbestos-free soil or landscape covering, and pre-wet garden areas before digging in soil.
- Keep windows and doors closed on windy days.
- Use doormats and remove shoes before entering your home, and keep pets from carrying dust or dirt on their fur or feet inside.
- Use a wet mop on non-carpeted floors and a wet rag instead of a duster to dust.
- Wash rugs regularly and vacuum carpet often using a vacuum with a high-efficiency particulate air (HEPA) filter.

If you have any questions, contact us at env.health.concern@pa.gov.

Naturally occurring asbestos (NOA) are fibrous minerals found in certain rocks or soil as a result of natural geological processes. They have been reported in 35 U.S. states, including Pennsylvania. In our state, NOA is found in some geological formations, including ultramafic and serpentine rock, and can also be in rock that is deep in the ground or near the surface. NOA does not refer to commercially processed, asbestos-containing material, like insulation, or asbestos mining and processing operations. Natural weathering and routine human activities may disturb NOA-bearing rock or soil and release asbestos fibers into the air, which pose a greater risk for human exposure through breathing it in. If NOA is not disturbed and fibers are not released into the air, then it does not pose a health risk.

HOW CAN SOMEONE BE EXPOSED TO NOA?

Environmental exposure to NOA can occur in communities near geological formations that contain NOA. However, the risk for exposure is dependent on climate, weather patterns and activity, and type of regional geology. One might be exposed to NOA through activities that can crush NOA-containing rock or disturb soils that contain NOA fibers, releasing fibers into the air. These activities can include working in a yard/garden or digging/shoveling, and riding bicycles, driving vehicles, or running on unpaved surfaces.



WHAT ARE HEALTH RISKS OF NOA EXPOSURE?

Health risks associated with NOA exposure (not asbestos used commercially) are not yet fully understood. Recent studies and investigations by the U.S. Environmental Protection Agency and the U.S. Agency for Toxic Substances and Disease Registry are increasing our understanding of potential health risks associated with NOA, but we know all forms of asbestos are carcinogenic and may cause adverse health effects, including asbestos-related disease (like asbestosis, pleural changes and plaques, lung cancer, and mesothelioma).

ASBESTOS-RELATED DISEASES: SIGN, SYMPTOMS, AND TESTING

Most people don't show any signs or symptoms of asbestos-related disease for 10 to 20 years or more after exposure, and symptoms can be similar to those of other health problems. When evaluating a person's risk for asbestos-related disease, you will need to consider how long and how frequently the person was exposed; how long it has been since their exposure started; how much they were exposed to; if they smoke cigarettes (cigarette smoking along with NOA exposure increases risk of asbestos-related disease); the size and type of asbestos they were exposed to; and other pre-existing lung conditions.

- If asbestos-related disease is still suspected after reviewing medical history and performing a physical exam, the following tests may be useful for diagnosis: chest X-ray, pulmonary function test, computerized tomography scan of the chest, bronchoalveolar lavage, or lung biopsy.
- Taking X-rays of children's lungs to look for asbestos-related disease is not currently recommended because changes to the lungs usually take years to develop. In addition, X-ray radiation may pose a higher risk for children.

HOW CAN SOMEONE REDUCE THEIR EXPOSURE TO NOA?

If someone lives in an area where NOA has been disturbed and is likely to become airborne, they can limit exposure by taking the following steps:

- Walk, run, hike, and bike only on paved trails.
- Play only in outdoor areas with a ground covering such as wood chips, mulch, or sand.
- Drive slowly over unpaved roads.
- Pave over unpaved walkways, driveways, or roads that may have NOA-containing rock or soil.
- Cover NOA-containing rock or soil in gardens and yards with asbestos-free soil or landscape covering, and pre-wet garden areas before digging in soil.
- Keep windows and doors closed on windy days.
- Use doormats and remove shoes before entering your home and keep pets from carrying dust or dirt on their fur or feet inside.
- Use a wet mop on non-carpeted floors and a wet rag instead of a duster to dust.
- Wash rugs regularly and vacuum carpet often using a vacuum with a high efficiency HEPA filter.

If you have any questions, contact us at env.health.concern@pa.gov.

Work-related activities may disturb rock or soil containing naturally occurring asbestos (NOA) and release asbestos fibers into the air, increasing the risk of human exposure by breathing these fibers in. If NOA is not disturbed or fibers are not released into the air, then it does not pose a health risk. You can find out if your workplace may have NOA present by consulting the United States Geological Survey (USGS) reports on NOA available at <https://mrddata.usgs.gov/asbestos> or by contacting the Bureau of Air Quality at the PA Department of Environmental Protection (DEP) via telephone: (717)787-9702 or email: RA-epair@pa.gov.



WORKPLACE STANDARDS AND REGULATIONS

The Occupational Safety and Health Administration (OSHA) has standards to protect individuals working in the general industry¹, shipyards², and construction³ from the hazards of NOA, and DEP Bureau of Air Quality enforces these standards. The allowable limit of asbestos fibers in workplace air is 0.1 fibers per cubic centimeter during an 8-hour day and 40-hour week. Levels cannot exceed 1.0 fibers per cubic centimeter during a 30-minute period. The employer must regularly monitor and assess workplaces to make sure that no one is exposed to NOA above these limits. If the exposure has the potential to be above these limits, employers must use proper work controls and practices to reduce exposure to the lowest level possible and then supplement with proper respiratory protection to meet them. Exposure monitoring records must be kept for at least 30 years.

WORKPLACE CONTROLS AND PRACTICES TO REDUCE NOA EXPOSURE

If work-related activities in an area with NOA cannot be avoided, then the following procedures should be considered to reduce risk:

- If NOA-exposure is above the allowable limits, have proper hazard communication and warning signs in the area.
- No smoking, eating, drinking or visitations should occur in these areas, and proper PPE must be provided and used to prevent exposure.
- Separate decontamination and lunch areas with proper hygiene practices must be provided to workers exposed to NOA above the limit(s) to avoid contamination. If possible, shower and change clothes before leaving work, and place dirty work clothes in a plastic bag until they can be washed. Do not shake out clothes before washing them.
- Before you disturb rock or soil that is likely to contain NOA, have an adequate protocol in place to control and contain the dust, and notify surrounding communities to avoid being outside or downwind of the site prior to the event.
- If the rock or dirt contains NOA, keep it wet while you are working, and seal it under a layer of clean soil and a layer of pavement, turf, or clean gravel to suppress the spread of dust.
- When drilling rock, put water in the drill stem or use a drill that collects dust. Have an exposure prevention plan for the wastewater and wash equipment when you finish work.
- If disposing of NOA onsite, bury it and cover the surface with organic mulch or soil, or at least 100 millimeters of rock or gravel from a NOA-free source. If the NOA material requires offsite disposal, it must be transported in a sealed vehicle and lawfully disposed of at a disposal site approved by the U.S. Environmental Protection Agency.
- Reduce driving speed on unpaved roads that may contain NOA, and clean vehicles driven over NOA.
- Train workers on the dangers of exposure and how to take precautions. Training records must be kept for at least one year beyond the last date of employment.
- Provide medical surveillance and examinations to workers who experience exposure at or above the allowable limits. Worker medical surveillance records must be retained for the duration of employment plus 30 years.

If you have any questions, contact us at env.health.concern@pa.gov.

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¹ <https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.1001>
² <https://www.osha.gov/laws-regs/regulations/standardnumber/1915/1915.1001>

³ <https://www.osha.gov/laws-regs/regulations/standardnumber/1926/1926.1101>

Q: What is naturally occurring asbestos?

A: Naturally occurring asbestos (NOA) refers to fibrous minerals that are found in certain rocks or soil as a result of natural geological processes. NOA does not refer to commercially processed, asbestos-containing material, such as insulation and fire protection in buildings or automobile brake linings, or asbestos mining and processing operations. Natural weathering and routine human activities may disturb NOA-bearing rock or soil and release mineral fibers into the air, which pose a greater potential for human exposure by inhalation.

Q: What does NOA look like?

A: NOA typically has a crystal formation of thin and long fibers that cannot be seen without the use of a microscope. There are two general classes of asbestos—chrysotile and amphibole. Chrysotile asbestos has long, curly, and flexible fibers and amphibole has fibers that are brittle and rod or needle-shaped.



Chrysotile asbestos fibers.



Amphibole asbestos fibers.

Q: Where is NOA found?

A: The US Geological Survey (USGS) has an ongoing project to map the locations of historical asbestos mines, former asbestos exploration prospects, and natural asbestos occurrences. NOA has been reported in at least 35 states, including Pennsylvania.

In Pennsylvania, NOA is present in specific geological formations, including ultramafic rock and serpentine rock, and can be in rock that is deep in the ground or near the surface. The amount of asbestos typically present in these rock formations can range from less than 1% up to about 25%. Other rock types known to host asbestos include some mafic rocks, metamorphosed dolostones, metamorphosed iron formations, carbonatites, and alkalic intrusions. Not all of these types of rocks contain NOA; they only have the potential to contain it.



Chrysotile asbestos fibers on serpentine stone.

Q: How can I find out if NOA exists near my home or workplace?

A: USGS has an ongoing project to map the locations of historical asbestos mines, former asbestos exploration prospects, and natural asbestos occurrences. To locate NOA areas in a specific part of the country, begin by consulting these USGS reports available at <https://mrdata.usgs.gov/asbestos>. If you are unable to find the information you are looking for, you can find out if your home or workplace is in an area where the environment is likely to have NOA by contacting the Bureau of Air Quality at Pennsylvania's Department of Environmental Protection (DEP) via telephone: (717)787-9702 or email: RA-epair@pa.gov.

Q: How can NOA be released in the air and surrounding environment?

A: NOA can be released into the air and surrounding environment from its bound form if rock containing NOA is broken, crushed, or frayed either by human activity or by natural weathering processes, especially in drier months. NOA that is airborne can contaminate nearby water sources.

In outdoor rural areas that are not near known asbestos sources, background levels of asbestos in the air are about 10 fibers per cubic meter (fibers/m³) or 0.00001 fibers per milliliter (fibers/mL). Due to the wearing down or disturbance of manufactured products, including insulation, automotive brakes and clutches, ceiling and floor tiles, drywall, roof shingles, and cement, typically found in more urban settings, levels found in cities can be up to 10 times higher.

Q: What is the United States doing to regulate NOA?

A: The Occupational Health and Safety Administration (OSHA) has standards to protect individuals working in the general industry, shipyards, and construction from the hazards of NOA, and DEP Bureau of Air Quality enforces these standards. The allowable limit of asbestos fibers in workplace air is 0.1 fibers per cubic centimeter during an 8-hour day and 40-hour week (this limit is known as the permissible exposure limit, or PEL). Levels cannot exceed 1.0 fibers per cubic centimeter during a 30-minute period

(also known as the excursion limit, or EL). The employer must ensure that no one is exposed above these limits through regular assessments and monitoring of workplaces covered by standards. If the exposure has the potential to be above the PEL/EL, employers must use proper work controls and practices to reduce exposure to the lowest level achievable and then supplement with proper respiratory protection to meet the PEL. Exposure monitoring records must be kept for at least 30 years.

Additionally, the Environmental Protection Agency (EPA) banned new uses of asbestos in 1989, though uses established before this date are still allowed. EPA also works to ensure that asbestos is controlled in school buildings to prevent exposure. EPA limits asbestos in public drinking water to seven million fibers/L.

DEP's Bureau of Air Quality enforces federal asbestos regulations and state regulations that protect potentially exposed workers and the surrounding community.

Q: How can I be exposed to NOA?

A: Previous studies have documented that environmental exposure to NOA can occur in communities near specific geological formations that contain NOA, but the risk for exposure is highly dependent on climate, weather patterns and activity, and type of regional geology. You might also be exposed to NOA through routine activities that can crush NOA-containing rock or disturb dust in NOA-containing soils. The following are some examples of these activities:

- Working in your yard or garden
- Digging or shoveling dirt
- Riding bicycles on unpaved surfaces
- Riding off-road vehicles such as four-wheelers and dirt bikes
- Running and hiking on unpaved surfaces
- Driving over unpaved surfaces

Q: How can I reduce exposure to NOA at home and the workplace?

A: NOA should be avoided and left alone. If rock containing NOA is intact and undisturbed, your risk of exposure is low.

If you live in an area where NOA has been disturbed and is likely to become airborne, you can limit exposure by taking the following steps:

- Walk, run, hike, and bike only on paved trails.
- Play only in outdoor areas with a ground covering such as wood chips, mulch, sand, pea gravel, grass, asphalt, shredded rubber, or rubber mats.
- Pave over unpaved walkways, driveways, or roadways that may have NOA-containing rock or soil.
- Cover NOA-containing rock or soil in gardens and yards with asbestos-free soil or landscape covering.
- Pre-wet garden areas before digging or shoveling soil.

- Keep pets from carrying dust/dirt on their fur or feet into the home.
- Use doormats and remove shoes before entering your home to prevent tracking in dirt.
- Keep windows and doors closed on windy days and during nearby construction.
- Drive slowly over unpaved roads.
- Use a wet rag instead of a dry rag or duster to dust.
- Use a wet mop on non-carpeted floors.
- Use washable area rugs on your floors and wash rugs regularly.
- Vacuum your carpet often using a vacuum with a high-efficiency particulate air (HEPA) filter.

If work-related activities in an area determined to have NOA cannot be avoided, then risk minimization procedures should be considered. These include (but may not be limited to):

- If NOA-exposure is above the PEL/EL, have proper hazard communication and warning signs in the area.
- No smoking, eating, drinking, or visitations should occur in these areas, and proper PPE must be provided and used to prevent exposure.
- Separate decontamination and lunch areas with proper hygiene practices must be provided to workers exposed above the PEL to avoid contamination. If possible, shower and change clothes before leaving work, and place dirty work clothes in a plastic bag until they can be washed. Do not shake out clothes before washing them.
- Before you disturb rock or soil that is likely to contain NOA, have an adequate protocol in place to control and contain the dust, and notify surrounding communities to avoid being outside or downwind of the site prior to the event.
- If the rock or dirt contains NOA, keep it wet while you're working, and seal it under a layer of clean soil and a layer of pavement, turf, or clean gravel to suppress the spread of dust.
- When drilling rock, put water in the drill stem or use a drill that collects dust. Wash equipment when you finish work.
- If disposing of NOA onsite, bury it and cover the surface with organic mulch or soil, or at least 100 millimeters of rock or gravel from an NOA-free source. If the NOA material requires offsite disposal, it must be transported in a sealed vehicle and lawfully disposed of at a disposal site approved by the U.S. Environmental Protection Agency.
- Reduce driving speed on unpaved roads that may contain NOA and frequently clean vehicles driven on roads that may contain NOA.
- Train workers on the dangers of exposure and how to take precautions. Training records must be kept for at least one year beyond the last date of employment.
- Provide medical surveillance and examinations to workers who experience exposure at or above the PEL/EL. Worker medical surveillance records must be retained for the duration of employment plus 30 years.

For full regulations regarding NOA at the workplace, please visit OSHA's Asbestos website at <https://www.osha.gov/SLTC/asbestos/>.

Q: How can NOA enter and leave my body?

- **Inhalation:** Breathing in the asbestos fibers is the primary way people are exposed to NOA. If you breathe asbestos fibers into your lungs, some of the fibers will be deposited in the air passages and on the cells that make up your lungs. Most fibers are removed from your lungs by being carried away or coughed up in a layer of mucus to the throat, where they are swallowed into the stomach. This usually takes place within a few hours. Fibers that are deposited in the deepest parts of the lung are removed more slowly, and some can remain in place for many years and may never be removed from your body.
- **Ingestion:** If you swallow asbestos fibers (either those present in water or those that are moved to your throat from your lungs), nearly all the fibers pass along your intestines within a few days and are excreted through bowel movements. A small number of fibers may penetrate cells that line your stomach or intestines, and a few penetrate all the way through and get into your blood. Some of these become trapped in other tissues, and some are removed in your urine.
- **Skin contact:** If you get asbestos fibers on your skin, very few of these fibers, if any, pass through the skin into your body.

Q: How can being exposed to NOA affect my health?

A: NOA may be a health risk if disturbed, and asbestos fibers are released into the air and surrounding environment. Airborne asbestos fibers can pose a health hazard because of the potential risks associated with inhalation of the fibers. If NOA is not disturbed and asbestos fibers are not released into the air, then it will not pose a health risk.

Being exposed to NOA does not mean you will develop health problems. Visiting a health provider is necessary to determine whether you are at risk for health problems from NOA exposure. Many things need to be considered when evaluating your risk, including:

- How long and how frequently you were exposed.
- How long it has been since your exposure started.
- How much NOA you were exposed to.
- If you smoke cigarettes (cigarette smoking with NOA exposure increases your chances of getting an asbestos-related disease, such as lung cancer).
- The size and type of asbestos to which you were exposed.
- Other pre-existing lung conditions.

However, health risks associated with exposure to asbestos that is naturally occurring in the environment (i.e., not asbestos used commercially) are not yet fully understood. Recent studies and investigations by EPA, the US Agency for Toxic Substances and Disease Registry (ATSDR) are increasing our understanding of the potential health risks associated with NOA. Still, we know all forms of asbestos are carcinogenic and have the potential to lead to adverse health effects.

Q: What are some types of asbestos-related diseases and their symptoms?

A: Asbestos-related diseases can be either non-cancerous or cancerous:

Non-cancerous

- **Asbestosis** is scarring of the lungs. It is typically caused by very high exposure levels over a prolonged period of time, as seen in work-related asbestos exposure. Smoking increases the risk of developing asbestosis. Some late-stage symptoms include progressive shortness of breath, a persistent cough, and chest pain.
- **Pleural changes** or **pleural plaques** include thickening and hardening of the pleura (the lining that covers the lungs and chest cavity). Most people will not have symptoms, but some may have decreased lung function. Some people may develop persistent shortness of breath with exercise or even at rest if they have significantly decreased lung function.

Cancerous

- **Lung cancer** is a cancer of the lungs and lung passages. Cigarette smoking, combined with asbestos exposure greatly increases the likelihood of lung cancer. Lung cancer caused by smoking or asbestos looks the same. Symptoms of lung cancer can vary, but late-stage symptoms can include chronic cough, chest pain, unexplained weight loss, and coughing up blood.
- **Mesothelioma** is a rare cancer mostly associated with asbestos exposure. It occurs in the covering of the lungs and sometimes the lining of the abdominal cavity. Some late-stage symptoms include chest pain, persistent shortness of breath, and unexplained weight loss. Coughing up blood is not common.

Q: How long after being exposed to NOA will it take for symptoms of asbestos-related diseases to appear?

A: Most people don't show any signs or symptoms of asbestos-related disease for 10 to 20 years or more after exposure, and almost all knowledge of the development of asbestos-related disease is from exposure to commercially used asbestos or work-related exposure. When symptoms do appear, they can be similar to those of other health problems. Only a doctor can tell if your symptoms are asbestos-related.

Q: What will my doctor typically do if an asbestos-disease is suspected?

A: Your doctor will first take your medical history and perform a physical exam. He or she will then decide if you need additional testing.

Q: What are some tests to help diagnose asbestos-related diseases?

A: Based on your medical history and physical exam, your doctor may or may not recommend any of the following tests if an asbestos-related disease is still suspected:

- A chest X-ray is the most common test used to determine whether you have received sustained exposure to asbestos. The X-ray cannot detect asbestos fibers, but it can detect

early signs of lung changes caused by asbestos. If the chest X-ray shows spots on the lungs, they may or may not be asbestos-related. They may be normal variations or related to infections and other diseases. Only a doctor trained in reading X-rays can determine if a spot is asbestos-related.

- A pulmonary function test (PFT) is a noninvasive breathing test to see how well the lungs are working. In this test, a person blows big breaths into a machine, which measures how much air is exhaled and inhaled over a period.
- A computerized tomography (CT) scan is a type of X-ray machine that usually delivers a much higher dose of radiation than a chest X-ray. A CT scan may be more sensitive than a chest X-ray in detecting the early stages of the disease. A CT scan is recommended only when the chest X-ray is inconclusive.
- For a test called bronchoalveolar lavage (BAL), a small flexible tube is inserted through the nose and down the airway. A small amount of saline solution is injected into the tube and then sucked back up. The fluid obtained contains saline, plus material from the lung. Illness from asbestos exposure generally cannot be predicted from this test. This test is performed only under special circumstances to assess possible disease activity and structural abnormalities.
- For a lung biopsy, samples of lung tissue are taken through a needle while the patient is sedated. This tissue is examined under a microscope. Lung biopsies are rarely performed because diagnosis is usually based on findings from the medical evaluation and other tests. A lung biopsy is not needed for most people who are diagnosed with an asbestos-related disease.
- Urine and sputum tests are not reliable for determining how much asbestos may be in the lungs. Nearly everyone has low levels of asbestos in these materials. These tests cannot predict the risk of illness.

Q: Should I have my children tested?

A: Taking X-rays of children’s lungs to look for asbestos-related disease is not currently recommended because changes to the lung usually take years to develop. In addition, X-ray radiation may pose a higher risk for children.

Q: What are some preventive measures I can take to avoid asbestos-related diseases?

A: If you have an asbestos-related disease or history of significant asbestos exposure, your doctor may recommend that you follow these preventive care guidelines:

- Regular medical examinations
- Regular vaccinations against flu and pneumococcal pneumonia
- Quit smoking if you are a smoker
- Limit further asbestos exposure

Following these preventive care guidelines may help reduce complications from asbestos-related disease or exposure. Your doctor may recommend other supportive care for complications and, if needed, treatment. Supportive care includes interventions that may help the symptoms of the disease, but it does not reverse the disease process.

Q: What is the PA Department of Health doing to address NOA-related concerns in PA counties?

A: PADOH is actively providing consultative support to state regulatory partners concerning the health effects of NOA exposure. Also, the PADOH/Division of Environmental Health Epidemiology will continue to respond to community concerns.

If you have any questions, contact us at env.health.concern@pa.gov.

Resources

ATSDR:

- Naturally Occurring Asbestos: <https://www.atsdr.cdc.gov/noa/index.html>

EPA:

- Managing Air Quality – Ambient Air Monitoring <https://www.epa.gov/air-quality-management-process/managing-air-quality-ambient-air-monitoring>
- Asbestos: <http://www.epa.gov/asbestos>.

US Department of Agriculture (USDA):

- Naturally Occurring Asbestos: https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fseprd551461.pdf
- Naturally Occurring Asbestos Locations in the Contiguous US and Alaska and the 100 Fastest-Growing US Counties: https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5126451.pdf