UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 1
5 POST OFFICE SQUARE – SUITE 100
BOSTON, MASSACHUSETTS 02109-3912

CONTAINS ENFORCEMENT-SENSITIVE INFORMATION

MEMORANDUM

DATE: November 1, 2018

SUBJ: Request for a Removal Action at the Microfab, Inc. (Former) Superfund Site, Amesbury, Essex County, Massachusetts - **Action Memorandum**

FROM: Wing Chau, On-Scene Coordinator W.C.
Emergency Response and Removal Section II

THRU: William Lovely, Chief
Emergency Response and Removal Section II

Carol Tucker, Chief
Emergency Planning & Response Branch

TO: Bryan Olson, Director
Office of Site Remediation and Restoration

I. PURPOSE

The purpose of this Action Memorandum is to request and document approval of the proposed removal action at the Microfab, Inc. (Former) Superfund Site (the Site), which includes an approximately 13.8-acre property that is located at 104-106 Haverhill Road in Amesbury, Essex County, Massachusetts. Hazardous substances present in chemical storage tanks and electroplating vats at the Site, if not addressed by implementing the response actions selected in this Action Memorandum, will continue to pose a threat to human health and the environment. There are no nationally significant or precedent-setting issues associated with this Site. In addition, there has been no use of the OSC's delegated authority to determine the need for emergency response and to approve and initiate removal actions costing up to $250,000 where site conditions constitute an emergency and up to $50,000 where site conditions do not constitute an emergency.

II. SITE CONDITIONS AND BACKGROUND

CERCLIS ID# : MAD001409408
SITE ID# : 01MK
CATEGORY : Time-Critical

A. Site Description

1. Removal site evaluation

On August 16, 2018, EPA Region 1's Remedial Program requested EPA Region 1's Emergency Planning and Response Branch (EPRB)'s assistance to evaluate whether site conditions at the Microfab, Inc. (Former) Superfund Site warranted a time-critical removal action. On August 31, 2018, EPA and its Superfund Technical Assistance and Response Team (START) contractor mobilized to the Site to perform a removal preliminary assessment and site investigation (PA/SI). Representatives from the Massachusetts Department of Environmental Protection (MassDEP) and the City of Amesbury were also present during the initial site walkthrough of the property and facility.

During the PA/SI, START collected four samples from various chemical storage tanks and one sample of floor sweepings underneath the electroplating lines for heavy metals, cyanide, and pH analyses. START also collected three surface soil samples for heavy metals analysis. The PA/SI confirmed the presence of CERCLA hazardous substances that poses a direct contact threat, as well as a potential for release or further release into the environment. Based upon the PA/SI sampling results and the findings from the MicroFab, Inc. Hazardous Material Survey Report, dated December 2016 and prepared for MassDEP, the PA/SI was concluded and a time-critical removal action was recommended in the Site Investigation Closure Memorandum dated October 16, 2018.

2. Physical location

The Site includes the property located at 104-106 Haverhill Road in Amesbury, Essex County, Massachusetts. The property is identified on the City of Amesbury, Massachusetts Assessor's map as Tax Map 73, Lot 43. Microfab, Inc. (Microfab) acquired the property on November 3, 1966, by deed recorded at the Essex County Registry of Deeds, Southern District, in Book 5404, Page 701. The geographic coordinates of the Site are 42° 50' 32.62" north latitude and 70° 57' 35.43" west longitude.

3. Site characteristics

The Site includes an approximately 13.8-acre property in a mixed commercial, industrial, and residential area. The Site property includes a three-story factory building, which is constructed of brick, corrugated steel, and concrete block, and was built in or about 1950. The building is approximately 102,768 square feet and sits on a concrete foundation with a full basement. The building is in poor condition and of questionable structural integrity, with problems such as roof

leaks and floor collapse in some areas. There are paved parking areas located south of the building.

Industrial activities were conducted at the Site between 1950 and 1987, beginning with Sig-Trans, Inc., which machined metal parts from the 1950s to about 1966. In May 1967, Microfab began manufacturing operations, including manufacturing printed circuit boards, electroplating activities, and other metal finishing operations, until October 1987. Manufacturing operations at the Site ceased in or about 1987, and the Site has been unoccupied since that time.

An unnamed stream runs adjacent to the Site along the west, draining into a large wetland to the south, which is associated with the Merrimack River. A tributary of that unnamed stream runs along the southern border of the Site from east to west. The property is bounded to the north by Haverhill Road (Highway 110), to the east by woodlands and a commercial property, to the west by another commercial property, and to the south by woodlands, the above-reference tributary, and a large wetland. The residential properties nearest to the Site are located to the north across Haverhill Road and 0.25 miles to the south off Middle Road.

While the Site's perimeter has some limited fencing, trespassing occurs quite often according to representatives of the City of Amesbury. The City of Amesbury stated that they have attempted to barricade the building doors, but have not been successful in keeping out trespassers. Since manufacturing operations ceased, the City of Amesbury police department has responded to several fires and other incidents at the Site.

Based on information in EPA's EJSCREEN environmental justice screening tool, zero out of 11 Environmental Justice Indexes for the area within a one-mile radius of the Site exceed the 80th percentile on a national basis. In addition, according to the EJSCREEN tool, the population within one mile is approximately is 2,316. Please see the attached EJSCREEN standard report for more information.

4. Release or threatened release into the environment of a hazardous substance, or pollutant or contaminant

The PA/SI sampling event documented the presence of hazardous substances and confirmed MassDEP's hazardous materials assessment of the Site. Hazardous substances, including ammonium hydroxide, hydrochloric acid, acids, mercury, and lead, are present in chemical storage tanks and electroplating vats in the abandoned and unsecured building at the Microfab, Inc. (Former) Superfund Site. The areas of concern identified during the PA/SI include: the two electroplating lines on the production level floor, two chemical storage tanks in the bulk storage area on the production floor, the four chemical storage tanks in the chemical make-up room in the basement, and the three acid tanks on the ground floor. The following table summarizes the

findings of both the PA/SI sampling event and MassDEP's hazardous materials survey performed in December 2016.

Hazardous Substance/ Material	Matrix	Concentration	Estimated Quantity	Bldg. Location/ Sample Location
Lead	Electroplating tank bottoms/ Solids	40.5 mg/l (TCLP)	600 lbs	Plating line
Ammonium Hydroxide Lead Mercury Lead	Solids/crystal in bulk	pH ~9 48,000 mg/Kg 140 mg/Kg 1,900 mg/Kg	2700 lbs	Tanks in Bulk Storage Area on Production Level Floor WS-04 WS-05 WS-05
Hydrochloric Acid	Liquid	pH~1	80-90 gals	Acid Tank on the Ground Floor
Unknown Acids	Liquids	pH~1	160-180 gals	Acid Tanks on the Ground Floor
Lead Lead Lead	Tank bottoms/ Solids	39.4 mg/l (TCLP) 960 mg/Kg 120,000 mg/Kg	To be determined	Storage Tanks in the Chemical Makeup Room WS-02 WS-03

5. NPL status

The Site was included in the final listing of NPL sites by publication in the Federal Register on August 3, 2017 (82 Fed. Reg. 36095).

6. Maps, pictures and other graphic representations

The photo above identifies the two electroplating lines with the numerous openings in the roof area directly above the lines. The photo also shows the graffiti that is prevalent throughout the building, which indicates that trespassing occurs frequently into this unsecured building.

B. Other Actions to Date

1. Previous actions

EPA's removal program conducted a PA/SI on September 14, 2000. On February 26, 2001, EPA and MassDEP representatives met to discuss the findings of the PA/SI report. Elevated levels of arsenic in surface soils and sediment were confirmed by EPA sample analysis, however at that time MassDEP had installed a chain-link fence to restrict public access to these contaminated areas. MassDEP was also undertaking a risk evaluation study and a feasibility

study which satisfied EPA that appropriate actions were being taken by MassDEP to address imminent threats that may have been presented by Site contamination. It was agreed that MassDEP would continue to oversee the Site through the EPA/MassDEP Brownfields partnership. Therefore, a removal action under section 300.415 of the NCP was deemed not necessary at that time.

EPA Region 1 proposed the Site to the National Priorities List (NPL) on September 9, 2016, and the Site was included in the final listing of NPL sites on August 3, 2017.

2. Current actions

EPA's Region 1's Remedial Program has initiated its remedial investigation/feasibility study (RI/FS) process to begin characterizing the Site.

C. State and Local Authorities' Roles

1. State and local actions to date

Prior to NPL listing, MassDEP contracted Amec Foster Wheeler to perform a hazardous materials survey of the onsite building. The hazardous materials survey report, dated December 2016, identified various hazardous materials, including acids, heavy metals in electroplating waste residue, and asbestos containing materials (ACM) within the building.

2. Potential for continued State/local response

MassDEP will continue to provide EPA with technical support during the removal action as needed, and throughout the remedial process, will also continue to work with the remedial project manager (RPM).

III. THREATS TO PUBLIC HEALTH OR WELFARE OR THE ENVIRONMENT, AND STATUTORY AND REGULATORY AUTHORITIES

As described below, the conditions at the Site meet the general criteria for a removal action, as set forth in 40 C.F.R. §300.415(b)(1), in that "there is a threat to public health or welfare of the United States or the environment," and in consideration of the factors set forth in 40 C.F.R. §300.415(b)(2) as described below.

The following substances are hazardous substances as defined by Section 101(14) of CERCLA, 42 U.S.C. 9601 (14):

- Ammonium Hydroxide;

- Hydrochloric Acid;
- Friable Asbestos;
- Mercury; and
- Lead.

Ammonium Hydroxide – Ammonium hydroxide is the hydroxy salt of ammonium ion. It is formed when ammonia reacts with water molecules in solution. According to the National Institute for Occupational Safety and Health (NIOSH)'s International Chemical Safety Cards (ICSC) for ammonium hydroxide, some effects of short-term exposure include: corrosive to the eyes, skin, and respiratory tract. Corrosive on ingestion as well. Inhalation of high concentrations of vapor may cause larygenal oedema, inflammation of the respiratory tract, and pneumonia.

Hydrochloric Acid – According to the National Institutes of Health (NIH)'s compound summary for hydrochloric acid, hydrochloric acid is corrosive to the eyes, skin, and mucous membranes. Acute inhalation exposure may cause eye, nose, and respiratory tract irritation and inflammation and pulmonary edema in humans. Acute oral exposure may cause corrosion of the mucous membranes, esophagus, and stomach. Dermal contact may produce severe burns, ulceration and scarring.

Lead - The Agency for Toxic Substances & Disease Registry (ATSDR) has developed a toxicological profile for lead, which provides the toxicologic and adverse health effects information for exposure to the hazardous substances. The toxicological profile can be reviewed by using the following URL link: https://www.atsdr.cdc.gov/toxprofiles/tp13.pdf. Attached to this action memorandum is ATSDR's fact sheet that addresses the most frequently asked health questions related to lead.

Mercury - The Agency for Toxic Substances & Disease Registry (ATSDR) has developed a toxicological profile for mercury, which provides the toxicologic and adverse health effects information for exposure to the hazardous substances. The toxicological profile can be reviewed by using the following URL link: https://www.atsdr.cdc.gov/ToxProfiles/tp46.pdf. Attached to this action memorandum is ATSDR's fact sheet that addresses the most frequently asked health questions related to mercury.

Asbestos - ATSDR has developed a toxicological profile for asbestos, which provides the toxicologic and adverse health effects information for exposure to the hazardous substances. The toxicological profile can be reviewed by using the following URL link: https://www.atsdr.cdc.gov/ToxProfiles/tp61.pdf. Attached to this action memorandum is ATSDR's fact sheet that addresses the most frequently asked health questions related to asbestos.

Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances or pollutants or contaminants; [§300.415(b)(2)(i)];

The Site is located within a mix-use area consisting of both residential and commercial properties. During the PA/SI, a significant amount evidence of trespassing was observed, including graffiti and beverage containers throughout the building. The hazardous substances, especially the acids, pose a direct contact threat to trespassers who enter into the unsecured building.

Hazardous substances or pollutants or contaminants in drums, barrels, tanks, or other bulk storage containers, that may pose a threat of release [§300.415(b)(2)(iii)];

The PA/SI and MassDEP's hazardous material survey identified chemical storage tanks with some remaining acids and electroplating vats with tank bottoms containing heavy metals. Since there is a regular occurrence of trespassing, these hazardous materials could potentially be released by vandals entering the Site.

Weather conditions that may cause hazardous substances or pollutants or contaminants to migrate or be released [§300.415(b)(2)(v)];

The building is in a state of disrepair. There are portions of the building where it is either collapsed or there are significant holes in the roof. In the area where the electroplating line is located, there are several holes in the roof overhead where precipitation can easily overfill the plating vats and potentially cause the offsite migration of any residual tank bottoms in the vats.

Threat of fire or explosion [§300.415(b)(2)(vi)];

City of Amesbury officials have indicated that trespassing is a frequent problem and that they have responded to several fires and incidents at the Site in the past. Because the Site remains unsecured, vandalism will likely continue to occur which will increase the likelihood of future fires that could potentially release the onsite hazardous substances.

The availability of other appropriate Federal or State response mechanisms to respond to the release [§300.415(b)(2)(vii)];

EPA's Remedial Program and MassDEP have requested assistance from EPRB to address the hazardous substances that pose an imminent and substantial endangerment to human health or the environment.

IV. ENDANGERMENT DETERMINATION

Actual or threatened releases of hazardous substances or pollutants or contaminants from this Site, if not addressed by implementing the response action selected in this Action Memorandum,

may present an imminent and substantial endangerment to public health, welfare, or the environment. In accordance with OSWER Directive 9360.0-34 (August 19, 1993), an endangerment determination is made based on "appropriate Superfund policy or guidance, or on collaboration with a trained risk assessor," which is outlined and discussed in Section III above. Further, OSWER Directive 9360.0-34 explained, "Appropriate sources include, but are not limited to, relevant action level or clean-up standards, Agency for Toxic Substances and Disease Registry documents or personnel, or staff toxicologists." EPA relied on the health and toxicological information from ATSDR's toxicological profiles for the CERCLA hazardous substances. In addition, the CERCLA hazardous substances identified at the Site are also classified as hazardous wastes due to its corrosive characteristics pursuant to 40 C.F.R. § 261.22 and its toxicity characteristics pursuant to 40 C.F.R. § 261.24

V. PROPOSED ACTIONS AND ESTIMATED COSTS

A. Proposed Actions

1. Proposed action description

The actions required to mitigate the threats outlined herein, are given below. The proposed actions will protect public health, welfare, and the environment by removing the hazardous substances from accessible areas of the Site. It is expected that specific removal activities will include, among other things, the following:

- Conduct a site walk with the cleanup contractor;
- Develop a site-specific Health and Safety Plan (HASP);
- Clear vegetation and debris, as needed;
- Install security fencing and, or repair existing fencing;
- Provide security guard service, as needed;
- Collect samples for analysis as needed to develop waste profiles;
- Remove friable asbestos in work zones to ensure safety of response personnel, as needed;
- Transfer waste streams, i.e., Acids, contaminated tank bottoms, and contaminated floor sweepings, into appropriate shipping containers and prepare waste streams for off-site disposal;
- Perform gross decontamination of electroplating vats and floor area underneath the plating lines.
- Cover and secure electroplating lines to prevent plating vats from recharging with rainwater;
- Arrange for transportation and disposal of hazardous substances/waste streams to EPA-approved off-site disposal facilities; and
- Repair response-related damages if necessary.

2. Community relations

A Community Involvement Coordinator (CIC) has been assigned and will assist the OSC by engaging with local and state officials and residents to keep them informed about the removal action. The CIC will prepare press releases and fact sheets as necessary.

3. Contribution to remedial performance

The cleanup proposed in this Action Memorandum is designed to mitigate the threats to human health and the environment posed by the Site. The actions taken would be consistent with and will not impede any future responses. The OSC will continue to coordinate with the Site's RPM to ensure that the proposed actions, to the extent practicable, contribute to the efficient performance of any long-term remedial action with respect to the release or threatened release concerned.

4. Description of innovative technologies and sustainable approaches

In accordance with the December 23, 2013 Memorandum, updated August 02, 2016, issued by Office of Land and Emergency Management as well as the Region 1 Clean and Greener Policy for Contaminated Sites, greener cleanup practices should be considered for all cleanup projects. Greener cleanup is the practice of incorporating practices that minimize the environmental impacts of cleanup actions and maximize environmental and human benefit. Alternative technologies and sustainable approaches will be considered and incorporated, as appropriate, throughout the implementation of the removal action.

5. Applicable or relevant and appropriate requirements (ARARs)

Pursuant to 40 C.F.R. § 300.415(j), removal actions shall, to the extent practicable considering the exigencies of the situation, attain ARARS. Current ARARs identified, but not limited to, are listed below.

Federal ARARs:

Resource Conservation and Recovery Act, Subtitle C, 40 C.F.R. Parts 260-262 and 264: Hazardous Waste Identification and Listing Regulations; Generator and Handler Requirements, Closure and Post-Closure.

Clean Air Act, National Emission Standards for Hazardous Air Pollutants (NESHAPS: 40 C.F.R. § 61.151): Standards for Inactive waste disposal sites that apply to asbestos mills and manufacturing and fabricating. NESHAPS standards for preventing air releases from

inactive asbestos disposal sites, including cover standards, dust suppression, and land use controls.

State ARARs:

310 Code of Massachusetts Regulations (CMR) 40.0000: Massachusetts Contingency Plan.

The OSC will coordinate with State officials to identify additional State ARARs, if any. In accordance with the National Contingency Plan and EPA Guidance Documents, the OSC will determine the applicability and practicability of complying with each ARAR that is identified in a timely manner.

6. Project schedule

Upon approval of the proposed removal action, EPA expects to the initiate the time-critical removal action as soon as the Agency can obtain access to the Site through a judicial court order, estimated some time during late fall/winter of 2018. EPA estimates the removal action will be completed within 3 months.

B. Estimated Costs

COST CATEGORY		CEILING
REGIONAL REMOVAL ALLOWANCE COSTS:		
ERRS Contractor		$200,000.00
Interagency Agreement		$ 0.00
OTHER EXTRAMURAL COSTS NOT FUNDED FROM THE REGIONAL ALLOWANCE:		
START Contractor		$100,000.00
Extramural Subtotal		$300,000.00
Extramural Contingency	10%	$30,000.00
TOTAL, REMOVAL ACTION CEILING		**$330,000.00**

VI. EXPECTED CHANGE IN THE SITUATION SHOULD ACTION BE DELAYED OR NOT TAKEN

Delayed action will increase public health risks due to the potential contact threat posed by the release and/or threat of release of CERCLA hazardous substances at and from the Site. The absence of a removal action described herein will cause conditions at the Site to remain unaddressed, and threats associated with the presence of hazardous substances at the Site will continue to pose a threat to human health and the environment.

VII. OUTSTANDING POLICY ISSUES

There are no precedent-setting policy issues associated with this site.

VIII. ENFORCEMENT ... For Internal Distribution Only

See attached Confidential Enforcement Strategy.

The total EPA costs for this removal action that will be eligible for cost recovery are estimated to be $330,000 (extramural costs) + $100,000 (EPA intramural costs) = $430,000 X 1.4957 (regional indirect rate) = **$643,151** [1].

IX. RECOMMENDATION

This decision document represents the selected removal action for the Microfab, Inc. (Former) Superfund Site in Amesbury, Massachusetts, developed in accordance with CERCLA, as amended, and is not inconsistent with the National Contingency Plan. The basis for this decision will be documented in the administrative record to be established for the Site.

Conditions at the Site meet the NCP Section 300.415 (b)(2) criteria for a removal action due to the following:

Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances or pollutants or contaminants [§300.415(b)(2)(i)];

Hazardous substances or pollutants or contaminants in drums, barrels, tanks, or other bulk storage containers, that may pose a threat of release [§300.415(b)(2)(iii)];

Weather conditions that may cause hazardous substances or pollutants or contaminants to migrate or be released [§300.415(b)(2)(v)];

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[1]Direct Costs include direct extramural costs $330,000 and direct intramural costs $100,000. Indirect costs are calculated by using regional indirect rate in effect at time cost estimate is prepared, and is expressed as a percentage of the direct costs 49.57% x $430,000, consistent with EPA's full cost accounting methodology effective October 01, 2018. These estimates do not include pre-judgment interest, do not take into account other enforcement costs, including Department of Justice costs, and may be adjusted during the course of a removal action. The estimates are for illustrative purposes only and their use is not intended to create any rights for responsible parties. Neither the lack of a total cost estimate nor deviation of actual total costs from this estimate will affect the United States' right to cost recovery.

Threat of fire or explosion [§300.415(b)(2)(vi)];

The availability of other appropriate Federal or State response mechanisms to respond to the release [§300.415(b)(2)(vii)];

I recommend that you approve the proposed removal action. The total extramural removal action project ceiling if approved will be $330,000.

APPROVAL:_____ DATE: 11/2/18

DISAPPROVAL:_____ DATE:_____

EJSCREEN Report (Version 2018)

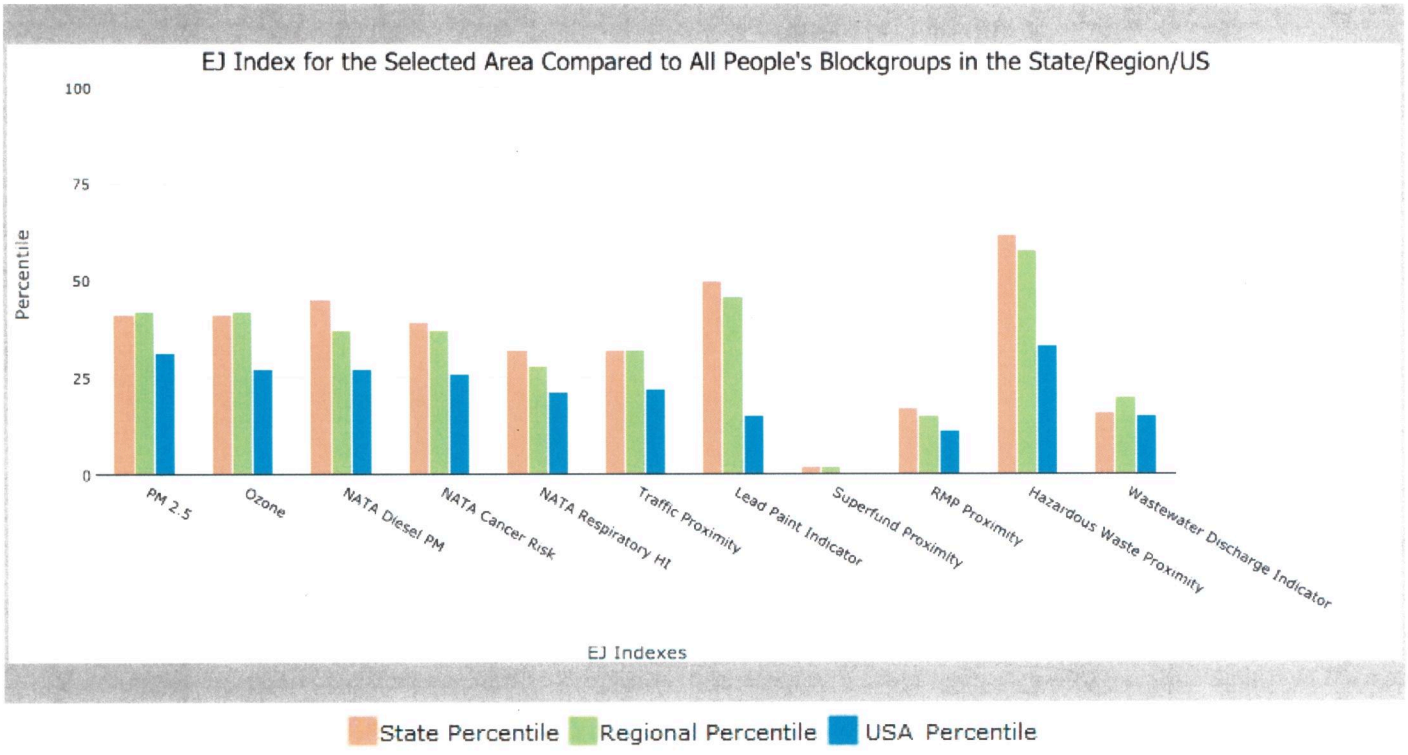
1 mile Ring Centered at 42.843173,-70.960181, MASSACHUSETTS, EPA Region 1

Approximate Population: 2,316

Input Area (sq. miles): 3.14

Microfab Site

Selected Variables	State Percentile	EPA Region Percentile	USA Percentile
EJ Indexes			
EJ Index for PM2.5	41	42	31
EJ Index for Ozone	41	42	27
EJ Index for NATA* Diesel PM	45	37	27
EJ Index for NATA* Air Toxics Cancer Risk	39	37	26
EJ Index for NATA* Respiratory Hazard Index	32	28	21
EJ Index for Traffic Proximity and Volume	32	32	22
EJ Index for Lead Paint Indicator	50	46	15
EJ Index for Superfund Proximity	2	2	0
EJ Index for RMP Proximity	17	15	11
EJ Index for Hazardous Waste Proximity	62	58	33
EJ Index for Wastewater Discharge Indicator	16	20	15



This report shows the values for environmental and demographic indicators and EJSCREEN indexes. It shows environmental and demographic raw data (e.g., the estimated concentration of ozone in the air), and also shows what percentile each raw data value represents. These percentiles provide perspective on how the selected block group or buffer area compares to the entire state, EPA region, or nation. For example, if a given location is at the 95th percentile nationwide, this means that only 5 percent of the US population has a higher block group value than the average person in the location being analyzed. The years for which the data are available, and the methods used, vary across these indicators. Important caveats and uncertainties apply to this screening-level information, so it is essential to understand the limitations on appropriate interpretations and applications of these indicators. Please see EJSCREEN documentation for discussion of these issues before using reports.

EJSCREEN Report (Version 2018)

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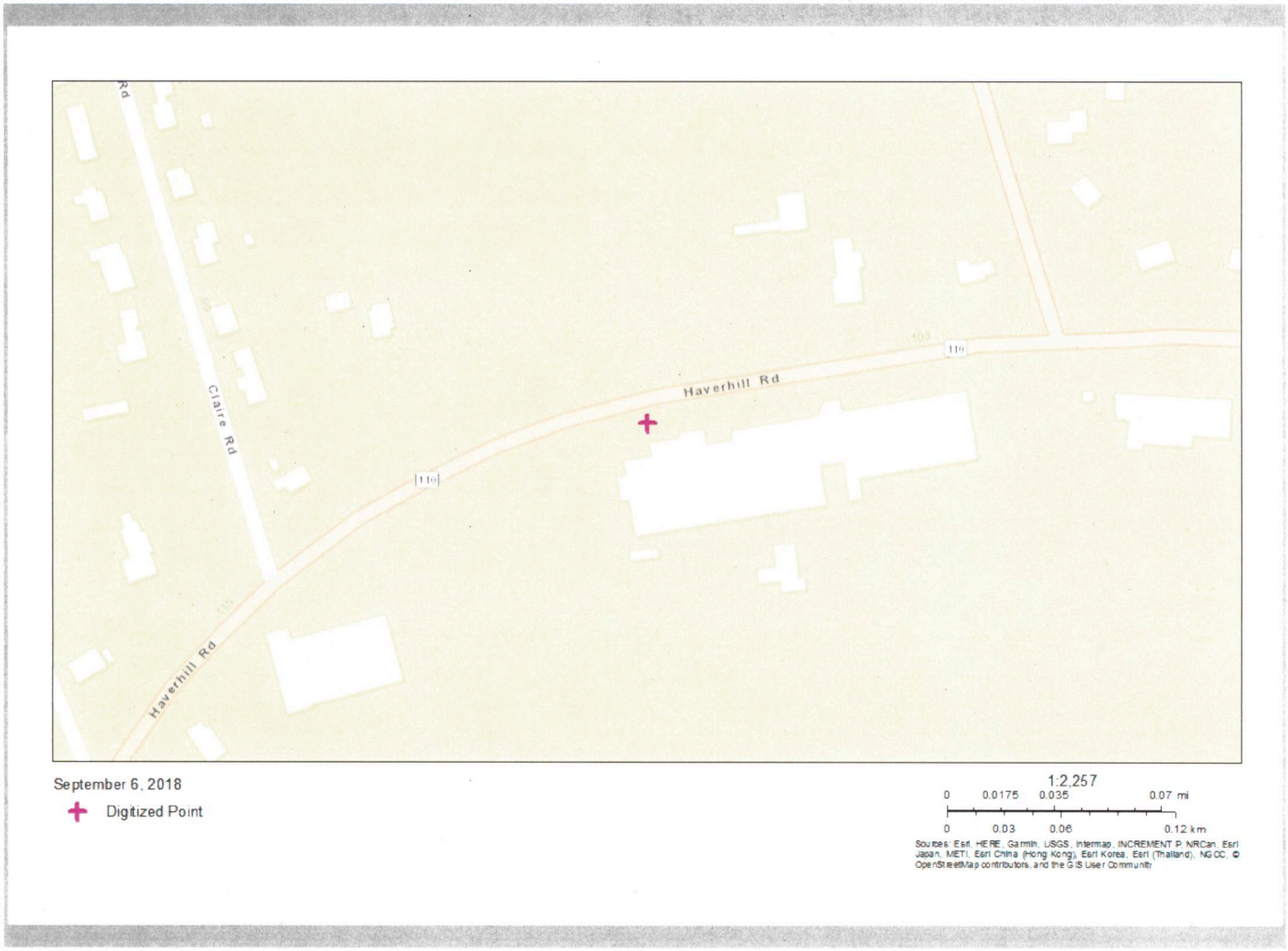
Microfab Site



Sites reporting to EPA	
Superfund NPL	1
Hazardous Waste Treatment, Storage, and Disposal Facilities (TSDF)	0

EJSCREEN Report (Version 2018)

1 mile Ring Centered at 42.843173,-70.960181, MASSACHUSETTS, EPA Region 1

Approximate Population: 2,316

Input Area (sq. miles): 3.14

Microfab Site

Selected Variables	Value	State Avg.	%ile in State	EPA Region Avg.	%ile in EPA Region	USA Avg.	%ile in USA
Environmental Indicators							
Particulate Matter (PM 2.5 in µg/m^3)	7.23	7.27	33	7.37	39	9.53	11
Ozone (ppb)	39	38.6	63	39.6	49	42.5	24
NATA* Diesel PM (µg/m^3)	0.548	0.872	33	0.713	<50th	0.938	<50th
NATA* Cancer Risk (lifetime risk per million)	34	35	48	33	50-60th	40	<50th
NATA* Respiratory Hazard Index	1.7	1.6	60	1.5	60-70th	1.8	50-60th
Traffic Proximity and Volume (daily traffic count/distance to road)	75	290	45	320	48	600	46
Lead Paint Indicator (% Pre-1960 Housing)	0.29	0.51	26	0.45	32	0.29	60
Superfund Proximity (site count/km distance)	0.99	0.14	97	0.14	98	0.12	98
RMP Proximity (facility count/km distance)	0.68	0.66	68	0.56	72	0.72	67
Hazardous Waste Proximity (facility count/km distance)	0.16	3.3	14	2.5	22	4.3	33
Wastewater Discharge Indicator (toxicity-weighted concentration/m distance)	0.0013	0.082	75	0.11	68	30	69
Demographic Indicators							
Demographic Index	6%	25%	6	24%	6	36%	1
Minority Population	4%	26%	12	23%	16	38%	9
Low Income Population	7%	24%	17	25%	15	34%	8
Linguistically Isolated Population	1%	6%	40	4%	46	4%	45
Population With Less Than High School Education	2%	10%	20	10%	18	13%	13
Population Under 5 years of age	3%	5%	25	5%	25	6%	18
Population over 64 years of age	12%	15%	37	16%	33	14%	42

* The National-Scale Air Toxics Assessment (NATA) is EPA's ongoing, comprehensive evaluation of air toxics in the United States. EPA developed the NATA to prioritize air toxics, emission sources, and locations of interest for further study. It is important to remember that NATA provides broad estimates of health risks over geographic areas of the country, not definitive risks to specific individuals or locations. More information on the NATA analysis can be found at: https://www.epa.gov/national-air-toxics-assessment.

For additional information, see: www.epa.gov/environmentaljustice

Lead – ToxFAQs™

CAS # 7439-92-1

This fact sheet answers the most frequently asked health questions (FAQs) about lead. For more information, call the CDC Information Center at 1-800-232-4636. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to lead can happen from breathing workplace air or dust, eating contaminated foods, or drinking contaminated water. Children can be exposed from eating lead-based paint chips or playing in contaminated soil. Lead can damage the nervous system, kidneys, and reproductive system. Lead has been found in at least 1,272 of the 1,684 National Priority List (NPL) sites identified by the Environmental Protection Agency (EPA).

What is lead?

Lead is a naturally occurring bluish-gray metal found in small amounts in the earth's crust. Lead can be found in all parts of our environment. Much of it comes from human activities including burning fossil fuels, mining, and manufacturing.

Lead has many different uses. It is used in the production of batteries, ammunition, metal products (solder and pipes), and devices to shield X-rays. Because of health concerns, lead from paints and ceramic products, caulking, and pipe solder has been dramatically reduced in recent years. The use of lead as an additive to gasoline was banned in 1996 in the United States.

What happens to lead when it enters the environment?

- Lead itself does not break down, but lead compounds are changed by sunlight, air, and water.
- When lead is released to the air, it may travel long distances before settling to the ground.
- Once lead falls onto soil, it usually sticks to soil particles.
- Movement of lead from soil into groundwater will depend on the type of lead compound and the characteristics of the soil.

How might I be exposed to lead?

- Eating food or drinking water that contains lead. Water pipes in some older homes may contain lead solder. Lead can leach out into the water.
- Spending time in areas where lead-based paints have been used and are deteriorating. Deteriorating lead paint can contribute to lead dust.
- Working in a job where lead is used or engaging in certain hobbies in which lead is used, such as making stained glass.
- Using health-care products or folk remedies that contain lead.

How can lead affect my health?

The effects of lead are the same whether it enters the body through breathing or swallowing. Lead can affect almost every organ and system in your body. The main target for lead toxicity is the nervous system, both in adults and children. Long-term exposure of adults can result in decreased performance in some tests that measure functions of the nervous system. It may also cause weakness in fingers, wrists, or ankles. Lead exposure also causes small increases in blood pressure, particularly in middle-aged and older people and can cause anemia. Exposure to high lead levels can severely damage the brain and kidneys in adults or children and ultimately cause death. In pregnant women, high-levels of exposure to lead may cause miscarriage. High-level exposure in men can damage the organs responsible for sperm production.

How likely is lead to cause cancer?

We have no conclusive proof that lead causes cancer in humans. Kidney tumors have developed in rats and mice that had been given large doses of some kind of lead compounds. The Department of Health and Human Services (DHHS) has determined that lead and lead compounds are reasonably anticipated to be human carcinogens and the EPA has determined that lead is a probable human carcinogen. The International Agency for Research on Cancer (IARC) has determined that inorganic lead is probably carcinogenic to humans and that there is insufficient information to determine whether organic lead compounds will cause cancer in humans.

Agency for Toxic Substances and Disease Registry
Division of Toxicology and Human Health Sciences

ATSDR

CS265956-A

Lead

CAS # 7439-92-1

How can lead affect children?

Small children can be exposed by eating lead-based paint chips, chewing on objects painted with lead-based paint, or swallowing house dust or soil that contains lead.

Children are more vulnerable to lead poisoning than adults. A child who swallows large amounts of lead may develop blood anemia, severe stomachache, muscle weakness, and brain damage. If a child swallows smaller amounts of lead, much less severe effects on blood and brain function may occur. Even at much lower levels of exposure, lead can affect a child's mental and physical growth.

Exposure to lead is more dangerous for young and unborn children. Unborn children can be exposed to lead through their mothers. Harmful effects include premature births, smaller babies, decreased mental ability in the infant, learning difficulties, and reduced growth in young children. These effects are more common if the mother or baby was exposed to high levels of lead. Some of these effects may persist beyond childhood.

How can families reduce the risks of exposure to lead?

- Avoid exposure to sources of lead.
- Do not allow children to chew or mouth surfaces that may have been painted with lead-based paint.
- If you have a water lead problem, run or flush water that has been standing overnight before drinking or cooking with it.
- Some types of paints and pigments that are used as make-up or hair coloring contain lead. Keep these kinds of products away from children.
- If your home contains lead-based paint or you live in an area contaminated with lead, wash children's hands and faces often to remove lead dusts and soil, and regularly clean the house of dust and tracked in soil.

Is there a medical test to determine whether I've been exposed to lead?

A blood test is available to measure the amount of lead in your blood and to estimate the amount of your recent exposure to lead. Blood tests are commonly used to screen children for lead poisoning. Lead in teeth or bones can be measured by X-ray techniques, but these methods are not widely available. Exposure to lead also can be evaluated by measuring erythrocyte protoporphyrin (EP) in blood samples. EP is a part of red blood cells known to increase when the amount of lead in the blood is high. However, the EP level is not sensitive enough to identify children with elevated blood lead levels below about 25 micrograms per deciliter (µg/dL). These tests usually require special analytical equipment that is not available in a doctor's office. However, your doctor can draw blood samples and send them to appropriate laboratories for analysis.

Has the federal government made recommendations to protect human health?

The Centers for Disease Control and Prevention (CDC) recommends that states test children at ages 1 and 2 years. Children should be tested at ages 3–6 years if they have never been tested for lead, if they receive services from public assistance programs for the poor such as Medicaid or the Supplemental Food Program for Women, Infants, and Children, if they live in a building or frequently visit a house built before 1950; if they visit a home (house or apartment) built before 1978 that has been recently remodeled; and/or if they have a brother, sister, or playmate who has had lead poisoning. CDC has updated its recommendations on children's blood lead levels. Experts now use an upper reference level value of 97.5% of the population distribution for children's blood lead. In 2012-2015, the value to identify children with blood lead levels that are much higher than most children have, is 5 micrograms per deciliter (µg/dL). EPA limits lead in drinking water to 15 µg per liter.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2007. Toxicological Profile for lead (Update). Atlanta, GA: U.S. Department of Public Health and Human Services, Public Health Service.

Where can I get more information?

For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Human Health Sciences, 1600 Clifton Road NE, Mailstop F-57, Atlanta, GA 30329-4027.

Phone: 1-800-232-4636.

ToxFAQs™ Internet address via WWW is http://www.atsdr.cdc.gov/toxfaqs/index.asp.

ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

Mercury - ToxFAQs™

CAS # 7439-97-6

This fact sheet answers the most frequently asked health questions (FAQs) about mercury. For more information, call the CDC Information Center at 1-800-232-4636. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to mercury occurs from breathing contaminated air, ingesting contaminated water and food, and having dental and medical treatments. Mercury, at high levels, may damage the brain, kidneys, and developing fetus. This chemical has been found in at least 714 of 1,467 National Priorities List (NPL) sites identified by the Environmental Protection Agency (EPA).

What is mercury?

Mercury is a naturally occurring metal which has several forms. The metallic mercury is a shiny, silver-white, odorless liquid. If heated, it is a colorless, odorless gas.

Mercury combines with other elements, such as chlorine, sulfur, or oxygen, to form inorganic mercury compounds or "salts," which are usually white powders or crystals. Mercury also combines with carbon to make organic mercury compounds. The most common one, methylmercury, is produced mainly by microscopic organisms in the water and soil. More mercury in the environment can increase the amounts of methylmercury that these small organisms make.

Metallic mercury is used to produce chlorine gas and caustic soda, and is also used in thermometers, some dental fillings, and batteries. Mercury salts are sometimes used in skin lightening creams and as antiseptic creams and ointments.

What happens to mercury when it enters the environment?

- Inorganic mercury (metallic mercury and inorganic mercury compounds) enters the air from mining ore deposits, burning coal and waste, and from manufacturing plants.
- It enters the water or soil from natural deposits, disposal of wastes, and volcanic activity.
- Methylmercury may be formed in water and soil by small organisms called bacteria.
- Methylmercury builds up in the tissues of fish. Larger and older fish tend to have the highest levels of mercury.

How might I be exposed to mercury?

- Eating fish or shellfish contaminated with methylmercury.
- Breathing vapors in air from spills, incinerators, and industries that burn mercury-containing fossil fuels.
- Release of mercury from dental work and medical treatments.
- Breathing contaminated workplace air or skin contact during use in the workplace.
- Practicing rituals that include mercury.

How can mercury affect my health?

The nervous system is very sensitive to all forms of mercury. Methylmercury and metallic mercury vapors are more harmful than other forms, because more mercury in these forms reaches the brain. Exposure to high levels of metallic, inorganic, or organic mercury can permanently damage the brain, kidneys, and developing fetus. Effects on brain functioning may result in irritability, shyness, tremors, changes in vision or hearing, and memory problems.

Short-term exposure to high levels of metallic mercury vapors may cause effects including lung damage, nausea, vomiting, diarrhea, increases in blood pressure or heart rate, skin rashes, and eye irritation.

Mercury

CAS # 7439-97-6

How likely is mercury to cause cancer?

There are inadequate human cancer data available for all forms of mercury. Mercuric chloride has caused increases in several types of tumors in rats and mice, and methylmercury has caused kidney tumors in male mice. The EPA has determined that mercuric chloride and methylmercury are possible human carcinogens.

How can mercury affect children?

Very young children are more sensitive to mercury than adults. Mercury in the mother's body passes to the fetus and may accumulate there, possibly causing damage to the developing nervous system. It can also pass to a nursing infant through breast milk. However, the benefits of breast feeding may be greater than the possible adverse effects of mercury in breast milk.

Mercury's harmful effects that may affect the fetus include brain damage, mental retardation, incoordination, blindness, seizures, and inability to speak. Children poisoned by mercury may develop problems of their nervous and digestive systems, and kidney damage.

How can families reduce the risk of exposure to mercury?

Carefully handle and dispose of products that contain mercury, such as thermometers or fluorescent light bulbs. Do not vacuum up spilled mercury, because it will vaporize and increase exposure. If a large amount of mercury has been spilled, contact your health department. Teach children not to play with shiny, silver liquids.

Properly dispose of older medicines that contain mercury. Keep all mercury-containing medicines away from children.

Pregnant women and children should keep away from rooms where liquid mercury has been used.

Learn about wildlife and fish advisories in your area from your public health or natural resources department.

Is there a medical test to determine whether I've been exposed to mercury?

Tests are available to measure mercury levels in the body. Blood or urine samples are used to test for exposure to metallic mercury and to inorganic forms of mercury. Mercury in whole blood or in scalp hair is measured to determine exposure to methylmercury. Your doctor can take samples and send them to a testing laboratory.

Has the federal government made recommendations to protect human health?

The EPA has set a limit of 2 parts of mercury per billion parts of drinking water (2 ppb).

The Food and Drug Administration (FDA) has set a maximum permissible level of 1 part of methylmercury in a million parts of seafood (1 ppm).

The Occupational Safety and Health Administration (OSHA) has set limits of 0.1 milligram of organic mercury per cubic meter of workplace air (0.1 mg/m^3) and 0.05 mg/m^3 of metallic mercury vapor for 8-hour shifts and 40-hour work weeks.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 1999. Toxicological profile for mercury. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information?

For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Human Health Sciences, 1600 Clifton Road NE, Mailstop F-57, Atlanta, GA 30329-4027.

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ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

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AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

ASBESTOS
CAS # 1332-21-4

Division of Toxicology ToxFAQs™ **September 2001**

This fact sheet answers the most frequently asked health questions (FAQs) about asbestos. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, individual susceptibility and personal habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to asbestos usually occurs by breathing contaminated air in workplaces that make or use asbestos. Asbestos is also found in the air of buildings that are being torn down or renovated. Asbestos exposure can cause serious lung problems and cancer. This substance has been found at 83 of the 1,585 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is asbestos?

Asbestos is the name given to a group of six different fibrous minerals (amosite, chrysotile, crocidolite, and the fibrous varieties of tremolite, actinolite, and anthophyllite) that occur naturally in the environment. Asbestos minerals have separable long fibers that are strong and flexible enough to be spun and woven and are heat resistant. Because of these characteristics, asbestos has been used for a wide range of manufactured goods, mostly in building materials (roofing shingles, ceiling and floor tiles, paper products, and asbestos cement products), friction products (automobile clutch, brake, and transmission parts), heat-resistant fabrics, packaging, gaskets, and coatings. Some vermiculite or talc products products may contain asbestos.

What happens to asbestos when it enters the environment?

Asbestos fibers can enter the air or water from the breakdown of natural deposits and manufactured asbestos products. Asbestos fibers do not evaporate into air or dissolve in water. Small diameter fibers and particles may remain suspended in the air for a long time and be carried long distances by wind or water before settling down. Larger diameter fibers and particles tend to settle more quickly.

Asbestos fibers are not able to move through soil. Asbestos fibers are generally not broken down to other compounds and will remain virtually unchanged over long periods.

How might I be exposed to asbestos?

We are all exposed to low levels of asbestos in the air we breathe. These levels range from 0.00001 to 0.0001 fibers per milliliter of air and generally are highest in cities and industrial areas.

People working in industries that make or use asbestos products or who are involved in asbestos mining may be exposed to high levels of asbestos. People living near these industries may also be exposed to high levels of asbestos in air.

Asbestos fibers may be released into the air by the disturbance of asbestos-containing material during product use, demolition work, building or home maintenance, repair, and remodeling. In general, exposure may occur only when the asbestos-containing material is disturbed in some way to release particles and fibers into the air.

Drinking water may contain asbestos from natural sources or from asbestos-containing cement pipes.

How can asbestos affect my health?

Asbestos mainly affects the lungs and the membrane that surrounds the lungs. Breathing high levels of asbestos fibers for a long time may result in scar-like tissue in the lungs and in the pleural membrane (lining) that surrounds the lung. This disease is called asbestosis and is usually found in workers exposed to asbestos, but not in the general public. People with asbestosis have difficulty breathing, often a cough, and in severe cases heart enlargement. Asbestosis is a serious disease and can eventually lead to disability and death.

ToxFAQs™ Internet address is http://www.atsdr.cdc.gov/toxfaq.html

Breathing lower levels of asbestos may result in changes called plaques in the pleural membranes. Pleural plaques can occur in workers and sometimes in people living in areas with high environmental levels of asbestos. Effects on breathing from pleural plaques alone are not usually serious, but higher exposure can lead to a thickening of the pleural membrane that may restrict breathing.

How likely is asbestos to cause cancer?

The Department of Health and Human Services (DHHS), the World Health Organization (WHO), and the EPA have determined that asbestos is a human carcinogen.

It is known that breathing asbestos can increase the risk of cancer in people. There are two types of cancer caused by exposure to asbestos: lung cancer and mesothelioma. Mesothelioma is a cancer of the thin lining surrounding the lung (pleural membrane) or abdominal cavity (the peritoneum). Cancer from asbestos does not develop immediately, but shows up after a number of years. Studies of workers also suggest that breathing asbestos can increase chances of getting cancer in other parts of the body (stomach, intestines, esophagus, pancreas, and kidneys), but this is less certain. Early identification and treatment of any cancer can increase an individual's quality of life and survival.

Cigarette smoke and asbestos together significantly increase your chances of getting lung cancer. Therefore, if you have been exposed to asbestos you should stop smoking. This may be the most important action that you can take to improve your health and decrease your risk of cancer.

How can asbestos affect children?

We do not know if exposure to asbestos will result in birth defects or other developmental effects in people. Birth defects have not been observed in animals exposed to asbestos.

It is likely that health effects seen in children exposed to high levels of asbestos will be similar to the effects seen in adults.

How can families reduce the risk of exposure to asbestos?

Materials containing asbestos that are not disturbed or deteriorated do not, in general, pose a health risk and can be left alone. If you suspect that you may be exposed to asbestos in your home, contact your state or local health department or the regional offices of EPA to find out how to test your home and how to locate a company that is trained to remove or contain the fibers.

Is there a medical test to show whether I've been exposed to asbestos?

Low levels of asbestos fibers can be measured in urine, feces, mucus, or lung washings of the general public. Higher than average levels of asbestos fibers in tissue can confirm exposure but not determine whether you will experience any health effects.

A thorough history, physical exam, and diagnostic tests are needed to evaluate asbestos-related disease. Chest x-rays are the best screening tool to identify lung changes resulting from asbestos exposure. Lung function tests and CAT scans also assist in the diagnosis of asbestos-related disease.

Has the federal government made recommendations to protect human health?

In 1989, EPA banned all new uses of asbestos; uses established before this date are still allowed. EPA established regulations that require school systems to inspect for damaged asbestos and to eliminate or reduce the exposure by removing the asbestos or by covering it up. EPA regulates the release of asbestos from factories and during building demolition or renovation to prevent asbestos from getting into the environment.

EPA has proposed a concentration limit of 7 million fibers per liter of drinking water for long fibers (lengths greater than or equal to 5 μm). The Occupational Safety and Health Administration has set limits of 100,000 fibers with lengths greater than or equal to 5 μm per cubic meter of workplace air for 8-hour shifts and 40-hour work weeks.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2001. Toxicological Profile for Asbestos. Update. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs™ Internet address is http://www.atsdr.cdc.gov/toxfaq.html . ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.