

Appendix A. Glossary

The Agency for Toxic Substances and Disease Registry (ATSDR) is a federal public health agency with headquarters in Atlanta, Georgia, and 10 regional offices in the United States. ATSDR's mission is to serve the public by using the best science, taking responsive public health actions, and providing trusted health information to prevent harmful exposures and diseases related to toxic substances. ATSDR is not a regulatory agency, unlike the U.S. Environmental Protection Agency (EPA), which is the federal agency that develops and enforces environmental laws to protect the environment and human health. This glossary defines words used by ATSDR in communications with the public. It is not a complete dictionary of environmental health terms. If you have questions or comments, call ATSDR's toll-free telephone number, 1-888-42-ATSDR (1-888-422-8737).

General Terms

Absorption

The process of taking in. For a person or an animal, absorption is the process of a substance getting into the body through the eyes, skin, stomach, intestines, or lungs.

Acute

Occurring over a short time [compare with chronic].

Acute exposure

Contact with a substance that occurs once or for only a short time (up to 14 days) [compare with intermediate duration exposure and chronic exposure].

Additive effect

A biologic response to exposure to multiple substances that equals the sum of responses of all the individual substances added together [compare with antagonistic effect and synergistic effect].

Adverse health effect

A change in body function or cell structure that might lead to disease or health problems

Aerobic

Requiring oxygen [compare with anaerobic].

Ambient

Surrounding (for example, ambient air).

Anaerobic

Requiring the absence of oxygen [compare with aerobic].

Analyte

A substance measured in the laboratory. A chemical for which a sample (such as water, air, or blood) is tested in a laboratory. For example, if the analyte is mercury, the laboratory test will determine the amount of mercury in the sample.

Analytic epidemiologic study

A study that evaluates the association between exposure to hazardous substances and disease by testing scientific hypotheses.

Antagonistic effect

A biologic response to exposure to multiple substances that is less than would be expected if the known effects of the individual substances were added together [compare with additive effect and synergistic effect].

Background level

An average or expected amount of a substance or radioactive material in a specific environment, or typical amounts of substances that occur naturally in an environment.

Biodegradation

Decomposition or breakdown of a substance through the action of microorganisms (such as bacteria or fungi) or other natural physical processes (such as sunlight).

Biologic indicators of exposure study

A study that uses (a) biomedical testing or (b) the measurement of a substance [an analyte], its metabolite, or another marker of exposure in human body fluids or tissues to confirm human exposure to a hazardous substance [also see exposure investigation].

Biologic monitoring

Measuring hazardous substances in biologic materials (such as blood, hair, urine, or breath) to determine whether exposure has occurred. A blood test for lead is an example of biologic monitoring.

Biologic uptake

The transfer of substances from the environment to plants, animals, and humans.

Biomedical testing

Testing of persons to find out whether a change in a body function might have occurred because of exposure to a hazardous substance.

Biota

Plants and animals in an environment. Some of these plants and animals might be sources of food, clothing, or medicines for people.

Body burden

The total amount of a substance in the body. Some substances build up in the body because they are stored in fat or bone or because they leave the body very slowly.

CAP [see Community Assistance Panel.]

Cancer

Any one of a group of diseases that occur when cells in the body become abnormal and grow or multiply out of control.

Cancer risk

A theoretical risk for getting cancer if exposed to a substance every day for 70 years (a lifetime exposure). The true risk might be lower.

Carcinogen

A substance that causes cancer.

Case study

A medical or epidemiologic evaluation of one person or a small group of people to gather information about specific health conditions and past exposures.

Case-control study

A study that compares exposures of people who have a disease or condition (cases) with people who do not have the disease or condition (controls). Exposures that are more common among the cases may be considered as possible risk factors for the disease.

CAS registry number

A unique number assigned to a substance or mixture by the American Chemical Society Abstracts Service.

Central nervous system

The part of the nervous system that consists of the brain and the spinal cord.

CERCLA [see Comprehensive Environmental Response, Compensation, and Liability Act of 1980]

Chronic

Occurring over a long time [compare with acute].

Chronic exposure

Contact with a substance that occurs over a long time (more than 1 year) [compare with acute exposure and intermediate duration exposure]

Cluster investigation

A review of an unusual number, real or perceived, of health events (for example, reports of cancer) grouped together in time and location. Cluster investigations are designed to confirm case reports; determine whether they represent an unusual disease occurrence; and, if possible, explore possible causes and contributing environmental factors.

Community Assistance Panel (CAP)

A group of people from a community and from health and environmental agencies who work with ATSDR to resolve issues and problems related to hazardous substances in the community. CAP members work with ATSDR to gather and review community health concerns, provide information on how people might have been or might now be exposed to hazardous substances, and inform ATSDR on ways to involve the community in its activities.

Comparison value (CV)

Calculated concentration of a substance in air, water, food, or soil that is unlikely to cause harmful (adverse) health effects in exposed people. The CV is used as a screening level during the public health assessment process. Substances found in amounts greater than their CVs might be selected for further evaluation in the public health assessment process.

Completed exposure pathway [see exposure pathway].

Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA)

CERCLA, also known as Superfund, is the federal law that concerns the removal or cleanup of hazardous substances in the environment and at hazardous waste sites. ATSDR, which was created by CERCLA, is responsible for assessing health issues and supporting public health activities related to hazardous waste sites or other environmental releases of hazardous substances. This law was later amended by the Superfund Amendments and Reauthorization Act (SARA).

Concentration

The amount of a substance present in a certain amount of soil, water, air, food, blood, hair, urine, breath, or any other media.

Contaminant

A substance that is either present in an environment where it does not belong or is present at levels that might cause harmful (adverse) health effects.

Delayed health effect

A disease or an injury that happens as a result of exposures that might have occurred in the past.

Dermal

Referring to the skin. For example, dermal absorption means passing through the skin.

Dermal contact

Contact with (touching) the skin [see route of exposure].

Descriptive epidemiology

The study of the amount and distribution of a disease in a specified population by person, place, and time.

Detection limit

The lowest concentration of a chemical that can reliably be distinguished from a zero concentration.

Disease prevention

Measures used to prevent a disease or reduce its severity.

Disease registry

A system of ongoing registration of all cases of a particular disease or health condition in a defined population.

DOD

United States Department of Defense.

DOE

United States Department of Energy.

Dose (for chemicals that are not radioactive)

The amount of a substance to which a person is exposed over some time period. Dose is a measurement of exposure. Dose is often expressed as milligram (amount) per kilogram (a measure of body weight) per day (a measure of time) when people eat or drink contaminated water, food, or soil. In general, the greater the dose, the greater the likelihood of an effect. An "exposure dose" is how much of a substance is encountered in the environment. An "absorbed dose" is the amount of a substance that actually got into the body through the eyes, skin, stomach, intestines, or lungs.

Dose (for radioactive chemicals)

The radiation dose is the amount of energy from radiation that is actually absorbed by the body. This is not the same as measurements of the amount of radiation in the environment.

Dose-response relationship

The relationship between the amount of exposure [dose] to a substance and the resulting changes in body function or health (response).

Environmental media

Soil, water, air, biota (plants and animals), or any other parts of the environment that can contain contaminants.

Environmental media and transport mechanism

Environmental media include water, air, soil, and biota (plants and animals). Transport mechanisms move contaminants from the source to points where human exposure can occur. The environmental media and transport mechanism is the second part of an exposure pathway.

EPA

United States Environmental Protection Agency.

Epidemiologic surveillance [see Public health surveillance].

Epidemiology

The study of the distribution and determinants of disease or health status in a population; the study of the occurrence and causes of health effects in humans.

Exposure

Contact with a substance by swallowing, breathing, or touching the skin or eyes. Exposure may be short-term [acute exposure], of intermediate duration, or long-term [chronic exposure].

Exposure assessment

The process of finding out how people come into contact with a hazardous substance, how often and for how long they are in contact with the substance, and how much of the substance they are in contact with.

Exposure-dose reconstruction

A method of estimating the amount of people's past exposure to hazardous substances. Computer and approximation methods are used when past information is limited, not available, or missing.

Exposure investigation

The collection and analysis of site-specific information and biologic tests (when appropriate) to determine whether people have been exposed to hazardous substances.

Exposure pathway

The route a substance takes from its source (where it began) to its end point (where it ends), and how people can come into contact with (or get exposed to) it. An exposure pathway has five parts: a source of contamination (such as an abandoned business); an environmental media and transport mechanism (such as movement through groundwater); a point of exposure (such as a private well); a route of exposure (eating, drinking, breathing, or touching), and a receptor population (people potentially or actually exposed). When all five parts are present, the exposure pathway is termed a completed exposure pathway.

Exposure registry

A system of ongoing followup of people who have had documented environmental exposures.

Feasibility study

A study by EPA to determine the best way to clean up environmental contamination. A number of factors are considered, including health risk, costs, and what methods will work well.

Geographic information system (GIS)

A mapping system that uses computers to collect, store, manipulate, analyze, and display data. For example, GIS can show the concentration of a contaminant within a community in relation to points of reference such as streets and homes.

Grand rounds

Training sessions for physicians and other health care providers about health topics.

Groundwater

Water beneath the earth's surface in the spaces between soil particles and between rock surfaces [compare with surface water].

Half-life ($t^{1/2}$)

The time it takes for half the original amount of a substance to disappear. In the environment, the half-life is the time it takes for half the original amount of a substance to disappear when it is changed to another chemical by bacteria, fungi, sunlight, or other chemical processes. In the human body, the half-life is the time it takes for half the original amount of the substance to disappear, either by being changed to another substance or by leaving the body. In the case of radioactive material, the half life is the amount of time necessary for one half the initial number of radioactive atoms to change or transform into another atom (that is normally not radioactive). After two half lives, 25% of the original number of radioactive atoms remain.

Hazard

A source of potential harm from past, current, or future exposures.

Hazardous Substance Release and Health Effects Database (HazDat)

The scientific and administrative database system developed by ATSDR to manage data collection, retrieval, and analysis of site-specific information on hazardous substances, community health concerns, and public health activities.

Hazardous waste

Potentially harmful substances that have been released or discarded into the environment.

Health consultation

A review of available information or collection of new data to respond to a specific health question or request for information about a potential environmental hazard. Health consultations are focused on a specific exposure issue. Health consultations are therefore more limited than a public health assessment, which reviews the exposure potential of each pathway and chemical [compare with public health assessment].

Health education

Programs designed with a community to help it know about health risks and how to reduce these risks.

Health investigation

The collection and evaluation of information about the health of community residents. This information is used to describe or count the occurrence of a disease, symptom, or clinical measure and to evaluate the possible association between the occurrence and exposure to hazardous substances.

Health promotion

The process of enabling people to increase control over, and to improve, their health.

Health statistics review

The analysis of existing health information (i.e., from death certificates, birth defects registries, and cancer registries) to determine if there is excess disease in a specific population, geographic area, and time period. A health statistics review is a descriptive epidemiologic study.

Indeterminate public health hazard

The category used in ATSDR's public health assessment documents when a professional judgment about the level of health hazard cannot be made because information critical to such a decision is lacking.

Incidence

The number of new cases of disease in a defined population over a specific time period [contrast with prevalence].

Ingestion

The act of swallowing something through eating, drinking, or mouthing objects. A hazardous substance can enter the body this way [see route of exposure].

Inhalation

The act of breathing. A hazardous substance can enter the body this way [see route of exposure].

Intermediate duration exposure

Contact with a substance that occurs for more than 14 days and less than a year [compare with acute exposure and chronic exposure].

In vitro

In an artificial environment outside a living organism or body. For example, some toxicity testing is done on cell cultures or slices of tissue grown in the laboratory, rather than on a living animal [compare with in vivo].

In vivo

Within a living organism or body. For example, some toxicity testing is done on whole animals, such as rats or mice [compare with in vitro].

Lowest-observed-adverse-effect level (LOAEL)

The lowest tested dose of a substance that has been reported to cause harmful (adverse) health effects in people or animals.

Medical monitoring

A set of medical tests and physical exams specifically designed to evaluate whether an individual's exposure could negatively affect that person's health.

Metabolism

The conversion or breakdown of a substance from one form to another by a living organism.

Metabolite

Any product of metabolism.

mg/kg

Milligram per kilogram.

mg/cm²

Milligram per square centimeter (of a surface).

mg/m³

Milligram per cubic meter; a measure of the concentration of a chemical in a known volume (a cubic meter) of air, soil, or water.

Migration

Moving from one location to another.

Minimal risk level (MRL)

An ATSDR estimate of daily human exposure to a hazardous substance at or below which that substance is unlikely to pose a measurable risk of harmful (adverse), noncancerous effects. MRLs are calculated for a route of exposure (inhalation or oral) over a specified time period (acute, intermediate, or chronic). MRLs should not be used as predictors of harmful (adverse) health effects [see reference dose].

Morbidity

State of being ill or diseased. Morbidity is the occurrence of a disease or condition that alters health and quality of life.

Mortality

Death. Usually the cause (a specific disease, a condition, or an injury) is stated.

Mutagen

A substance that causes mutations (genetic damage).

Mutation

A change (damage) to the DNA, genes, or chromosomes of living organisms.

National Priorities List for Uncontrolled Hazardous Waste Sites (National Priorities List or NPL)

EPA's list of the most serious uncontrolled or abandoned hazardous waste sites in the United States. The NPL is updated on a regular basis.

National Toxicology Program (NTP)

Part of the Department of Health and Human Services. NTP develops and carries out tests to predict whether a chemical will cause harm to humans.

No apparent public health hazard

A category used in ATSDR's public health assessments for sites where human exposure to contaminated media might be occurring, might have occurred in the past, or might occur in the future, but where the exposure is not expected to cause any harmful health effects.

No-observed-adverse-effect level (NOAEL)

The highest tested dose of a substance that has been reported to have no harmful (adverse) health effects on people or animals.

No public health hazard

A category used in ATSDR's public health assessment documents for sites where people have never and will never come into contact with harmful amounts of site-related substances.

NPL [see National Priorities List for Uncontrolled Hazardous Waste Sites]

Physiologically based pharmacokinetic model (PBPK model)

A computer model that describes what happens to a chemical in the body. This model describes how the chemical gets into the body, where it goes in the body, how it is changed by the body, and how it leaves the body.

Pica

A craving to eat nonfood items, such as dirt, paint chips, and clay. Some children exhibit pica-related behavior.

Plume

A volume of a substance that moves from its source to places farther away from the source. Plumes can be described by the volume of air or water they occupy and the direction they move. For example, a plume can be a column of smoke from a chimney or a substance moving with groundwater.

Point of exposure

The place where someone can come into contact with a substance present in the environment [see exposure pathway].

Population

A group or number of people living within a specified area or sharing similar characteristics (such as occupation or age).

Potentially responsible party (PRP)

A company, government, or person legally responsible for cleaning up the pollution at a hazardous waste site under Superfund. There may be more than one PRP for a particular site.

ppb

Parts per billion.

ppm

Parts per million.

Prevalence

The number of existing disease cases in a defined population during a specific time period [contrast with incidence].

Prevalence survey

The measure of the current level of disease(s) or symptoms and exposures through a questionnaire that collects self-reported information from a defined population.

Prevention

Actions that reduce exposure or other risks, keep people from getting sick, or keep disease from getting worse.

Public availability session

An informal, drop-by meeting at which community members can meet one-on-one with ATSDR staff members to discuss health and site-related concerns.

Public comment period

An opportunity for the public to comment on agency findings or proposed activities contained in draft reports or documents. The public comment period is a limited time period during which comments will be accepted.

Public health action

A list of steps to protect public health.

Public health advisory

A statement made by ATSDR to EPA or a state regulatory agency that a release of hazardous substances poses an immediate threat to human health. The advisory includes recommended measures to reduce exposure and reduce the threat to human health.

Public health assessment (PHA)

An ATSDR document that examines hazardous substances, health outcomes, and community concerns at a hazardous waste site to determine whether people could be harmed from coming into contact with those substances. The PHA also lists actions that need to be taken to protect public health [compare with health consultation].

Public health hazard

A category used in ATSDR's public health assessments for sites that pose a public health hazard because of long-term exposures (greater than 1 year) to sufficiently high levels of hazardous substances or radionuclides that could result in harmful health effects.

Public health hazard categories

Public health hazard categories are statements about whether people could be harmed by conditions present at the site in the past, present, or future. One or more hazard categories might be appropriate for each site. The five public health hazard categories are no public health hazard, no apparent public health hazard, indeterminate public health hazard, public health hazard, and urgent public health hazard.

Public health statement

The first chapter of an ATSDR toxicological profile. The public health statement is a summary written in words that are easy to understand. The public health statement explains how people might be exposed to a specific substance and describes the known health effects of that substance.

Public health surveillance

The ongoing, systematic collection, analysis, and interpretation of health data. This activity also involves timely dissemination of the data and use for public health programs.

Public meeting

A public forum with community members for communication about a site.

Radioisotope

An unstable or radioactive isotope (form) of an element that can change into another element by giving off radiation.

Radionuclide

Any radioactive isotope (form) of any element.

RCRA [see Resource Conservation and Recovery Act (1976, 1984)]

Receptor population

People who could come into contact with hazardous substances [see exposure pathway].

Reference dose (RfD)

An EPA estimate, with uncertainty or safety factors built in, of the daily lifetime dose of a substance that is unlikely to cause harm in humans.

Registry

A systematic collection of information on persons exposed to a specific substance or having specific diseases [see exposure registry and disease registry].

Remedial investigation

The CERCLA process of determining the type and extent of hazardous material contamination at a site.

Resource Conservation and Recovery Act (1976, 1984) (RCRA)

This Act regulates management and disposal of hazardous wastes currently generated, treated, stored, disposed of, or distributed.

RFA

RCRA Facility Assessment. An assessment required by RCRA to identify potential and actual releases of hazardous chemicals.

RfD [see reference dose]

Risk

The probability that something will cause injury or harm.

Risk reduction

Actions that can decrease the likelihood that individuals, groups, or communities will experience disease or other health conditions.

Risk communication

The exchange of information to increase understanding of health risks.

Route of exposure

The way people come into contact with a hazardous substance. Three routes of exposure are breathing [inhalation], eating or drinking [ingestion], or contact with the skin [dermal contact].

Safety factor [see uncertainty factor]

SARA [see Superfund Amendments and Reauthorization Act]

Sample

A portion or piece of a whole. A selected subset of a population or subset of whatever is being studied. For example, in a study of people the sample is a number of people chosen from a larger population [see population]. An environmental sample (for example, a small amount of soil or water) might be collected to measure contamination in the environment at a specific location.

Sample size

The number of units chosen from a population or an environment.

Solvent

A liquid capable of dissolving or dispersing another substance (for example, acetone or mineral spirits).

Source of contamination

The place where a hazardous substance comes from, such as a landfill, waste pond, incinerator, storage tank, or drum. A source of contamination is the first part of an exposure pathway.

Special populations

People who might be more sensitive or susceptible to exposure to hazardous substances because of factors such as age, occupation, sex, or behaviors (for example, cigarette smoking). Children, pregnant women, and older people are often considered special populations.

Stakeholder

A person, group, or community who has an interest in activities at a hazardous waste site.

Statistics

A branch of mathematics that deals with collecting, reviewing, summarizing, and interpreting data or information. Statistics are used to determine whether differences between study groups are meaningful.

Substance

A chemical.

Substance-specific applied research

A program of research designed to fill important data needs for specific hazardous substances identified in ATSDR's toxicological profiles. Filling these data needs would allow more accurate assessment of human risks from specific substances contaminating the environment. This research might include human studies or laboratory experiments to determine health effects resulting from exposure to a given hazardous substance.

Superfund [see Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and Superfund Amendments and Reauthorization Act (SARA)]

Superfund Amendments and Reauthorization Act (SARA)

In 1986, SARA amended the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and expanded the health-related responsibilities of ATSDR. CERCLA and SARA direct ATSDR to look into the health effects from substance exposures at hazardous waste sites and to perform activities including health education, health studies, surveillance, health consultations, and toxicological profiles.

Surface water

Water on the surface of the earth, such as in lakes, rivers, streams, ponds, and springs [compare with groundwater].

Surveillance [see public health surveillance]

Survey

A systematic collection of information or data. A survey can be conducted to collect information from a group of people or from the environment. Surveys of a group of people can be conducted by telephone, by mail, or in person. Some surveys are done by interviewing a group of people [see prevalence survey].

Synergistic effect

A biologic response to multiple substances where one substance worsens the effect of another substance. The combined effect of the substances acting together is greater than the sum of the effects of the substances acting by themselves [see additive effect and antagonistic effect].

Teratogen

A substance that causes defects in development between conception and birth. A teratogen is a substance that causes a structural or functional birth defect.

Toxic agent

Chemical or physical (for example, radiation, heat, cold, microwaves) agents that, under certain circumstances of exposure, can cause harmful effects to living organisms.

Toxicological profile

An ATSDR document that examines, summarizes, and interprets information about a hazardous substance to determine harmful levels of exposure and associated health effects. A toxicological profile also identifies significant gaps in knowledge on the substance and describes areas where further research is needed.

Toxicology

The study of the harmful effects of substances on humans or animals.

Tumor

An abnormal mass of tissue that results from excessive cell division that is uncontrolled and progressive. Tumors perform no useful body function. Tumors can be either benign (not cancer) or malignant (cancer).

Uncertainty factor

Mathematical adjustments for reasons of safety when knowledge is incomplete. For example, factors used in the calculation of doses that are not harmful (adverse) to people. These factors are applied to the lowest-observed-adverse-effect-level (LOAEL) or the no-observed-adverse-effect-level (NOAEL) to derive a minimal risk level (MRL). Uncertainty factors are used to account for variations in people's sensitivity, for differences between animals and humans, and for differences between a LOAEL and a NOAEL. Scientists use uncertainty factors when they have some, but not all, the information from animal or human studies to decide whether an exposure will cause harm to people [also sometimes called a safety factor].

Urgent public health hazard

A category used in ATSDR's public health assessments for sites where short-term exposures (less than 1 year) to hazardous substances or conditions could result in harmful health effects that require rapid intervention.

Volatile organic compounds (VOCs)

Organic compounds that evaporate readily into the air. VOCs include substances such as benzene, toluene, methylene chloride, and methyl chloroform.

Other glossaries and dictionaries:

Environmental Protection Agency (<http://www.epa.gov/OCEPAterms/>)

National Center for Environmental Health (CDC)
(<http://www.cdc.gov/nceh/dls/report/glossary.htm>)

National Library of Medicine (NIH)
(<http://www.nlm.nih.gov/medlineplus/mplusdictionary.html>)

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Appendix B. Comparison Values

ATSDR health assessors use comparison values (CVs) as screening tools to evaluate environmental data that are relevant to the exposure pathways. CVs represent media-specific contaminant concentrations that are much lower than exposure concentrations observed to cause adverse health effects. This means that CVs are protective of public health in essentially all exposure situations. If the concentrations in the exposure medium are less than the CV, the exposures are not of health concern and no further analysis of the pathway is required. However, while concentrations below the CV are not expected to lead to any observable health effect, it should not be inferred that a concentration greater than the CV will necessarily lead to adverse effects. Depending on site-specific environmental exposure factors (for example, duration of exposure) and activities of people that result in exposure (time spent in area of contamination), exposure to levels above the CV may or may not lead to a health effect. Therefore, ATSDR's CVs are not used to predict the occurrence of adverse health effects. Rather, they are used by ATSDR to select contaminants for further evaluation to determine the possibility of adverse health effects.

CVs used in this PHA include:

Cancer Risk Evaluation Guide (CREG)

Estimated contaminant concentrations that would be expected to cause no more than one excess cancer in a million (10^{-6}) persons exposed over a 70-year life span. ATSDR's CREGs are calculated from EPA's cancer slope factors (CSFs).

Environmental Media Evaluation Guide (EMEG)

EMEGs are based on ATSDR minimal risk levels (MRLs) and factor in body weight and ingestion rates. An EMEG is an estimate of daily human exposure to a chemical (in mg/kg/day) that is likely to be without noncarcinogenic health effects over a specified duration of exposure to include acute, intermediate, and chronic exposures.

Reference Media Evaluation Guide (RMEG)

ATSDR derives RMEGs from EPA's oral reference doses (RfDs). The RMEG represents the concentration in water or soil at which daily human exposure is unlikely to result in adverse noncarcinogenic effects.

EPA's Region III Risk-Based Concentration (RBC)

EPA combines RfDs and CSF with "standard" exposure scenarios to calculate RBCs, which are chemical concentrations corresponding to fixed levels of risk (i.e., a hazard quotient of 1, or lifetime cancer risk of 10^{-6} , whichever occurs at a lower concentration) in water, air, fish tissue, and soil.

EPA's Maximum Contaminant Level (MCL)

The MCL is the drinking water standard established by EPA. It is the maximum permissible level of a contaminant in water that is delivered to a free-flowing outlet. MCLs are considered protective of human health over a lifetime (70 years) for individuals consuming 2 liters of water per day.

CVs are derived from available health guidelines, such as ATSDR's MRLs, EPA's RfDs, and EPA's CSFs. These guidelines are based on the no-observed-adverse-effect levels (NOAELs), lowest-observed-adverse-effect levels (LOAELs), or cancer effect levels (CELs) reported for a contaminant in the toxicological literature. A description of these terms is provided:

Minimal Risk Level (MRL)

MRLs are estimates of daily human exposure to a chemical (i.e., doses expressed in mg/kg/day) that are unlikely to be associated with any appreciable risk of deleterious noncancer effects over a specified duration of exposure. MRLs are calculated using data from human and animal studies and are reported for acute (\leq 14 days), intermediate (15 to 364 days), and chronic (\geq 365 days) exposures.

Reference Dose (RfD)

The RfD is an estimate, with safety factors built in, of the daily, lifetime exposure of human populations to a possible hazard that is *not* likely to cause them harm.

Cancer Slope Factor (CSF)

Usually derived from dose-response models and expressed in milligrams per kilogram per day, CSFs describe the inherent potency of carcinogens and estimate an upper limit on the likelihood that lifetime exposure to a particular chemical could lead to excess cancer deaths.

Lowest-Observed-Adverse-Effect Level (LOAEL)

The lowest dose of a chemical that produced an adverse effect when it was administered to animals in a toxicity study or following human exposure.

No-Observed-Adverse-Effect Level (NOAEL)

The highest dose of a chemical in a study, or group of studies, that did not cause harmful health effects in people or animals.

Cancer Effect Level (CEL)

The CEL is the lowest dose of a chemical in a study, or group of studies, that was found to produce increased incidences of cancer (or tumors).

Appendix C. Response to Public Comments

The Public Health Assessment (PHA) for the Gentile Air Force Station was available for public review and comment from May 6, 2004 through June 28, 2004. Copies of the PHA document were mailed to the residents who attended the January 28, 2004 Open House. Copies were also sent to the agencies that are members of the Gentile AFS Restoration Advisory Board (RAB) or attended the Open House. ATSDR sent flyers to residents near Gentile AFS, and issued a press release to the local media describing the PHA and how interested residents could obtain a copy to review and provide comments. ATSDR also hosted a public availability session on June 14, 2004 and met with residents to describe the PHA evaluation process, results of the evaluation and the resulting document.

ATSDR did not receive any written comments from the residents or agencies. The following comments were voiced by one or more of the residents who attended the public availability session.

1) The Gentile PHA does not include a map describing which way the water is flowing. Will a map be included to reflect this?

The map and text have been modified to describe the direction of the groundwater flow for each of the on-base plumes. It is important to remember that although the plume migration will be in same the direction as the groundwater, the actual distance of the plume migration will depend on the flow rate of the groundwater, the amount of chemical that is leaching into the groundwater from the overlying soil, and the chemical degradation that is occurring within the plume. At Gentile AFS the groundwater flow rates are very low, the contaminant sources of the plumes have been removed, and chemical degradation is occurring within the plume. As a result, the plumes are not migrating off-base; in fact the groundwater monitoring data indicates the size of each plume is getting smaller.

2) What was the disposal process in the 1950's?

Information on the past and current waste generation and disposal practices was gathered early in the environmental investigation process at the air station through interviews with installation employees, records searches, and site inspections. This information describes waste disposal methods that varied by the type of waste generated at the air station. On-site facilities used for solid or liquid waste management included hazardous waste storage, disposal sites, low level radioactive waste disposal sites, and storm sewers. Only one hazardous material and waste storage area, the coal pile storage area (S1), was identified as being in use before the 1960s. Non-hazardous solid waste was either disposed of in one of several designated disposal areas or burned. Miscellaneous construction rubble, hardfill, scrap electronic parts, asbestos domes, some waste oil, or possibly thinners were brought to one of three areas, known as the disposal sites 1,

2, and 3. Items in the disposal site 3 may also have been burned at that site. Another area, the old salvage yard, with possible buried small quantities of scrap materials, crushed electronic crystals, and construction rubble was used to burn rubbish. Two other disposal areas were used to bury electron or vacuum tubes during the 1950s.

Gentile AFS operations also generated waste oils, solvents, and battery acids. Available records indicate how much waste oil or solvent was generated each year and by what process. Some waste oil, such as from routine vehicle maintenance operations for DESC equipment in the maintenance garage, was reportedly containerized and used for fire protection at Wright-Patterson Air Force Base during this time. Small quantities of solvents left over from painting operations were discharged to the sanitary sewers during this time. Routinely, the small quantities of waste oil, solvents, and battery acids were poured over the coal pile at the coal storage area. This practice ended in 1978.

Some waste material, such as runoff from the coal pile (at S1) and blow down from the power plant cooling tower, flowed or discharged into the Gentile AFS storm sewer system in the past. The storm drainage system consists of concrete conduits and open drainage channels that lead to Little Beaver Creek.

All historical waste disposal activities were reviewed through the information gathering process during the early phases of environmental investigations at Gentile AFS. Findings of this review helped identify those disposal sites requiring further investigations under the CERCLA remedial investigation process—a process carried out by the Air Force with oversight from the Ohio EPA. The remedial investigations characterized the nature and extent of contamination at those disposal areas and remedial actions have been undertaken as needed.

3) What was actually burned in the power plant? Were people exposed to emissions or ash from the power plant?

The documents reviewed by ATSDR indicate that coal was the only fuel burned in the coal-fired heating plant boilers. Prior to 1978, waste solvents and oils were periodically applied to the coal pile and then burned in the boilers. Ash, particulates and combustion by-products were released to the air from the boiler smoke stacks. While it is not possible to evaluate the specific exposures, no adverse health effects are expected for the local residents. Please see the Community Concerns section for more details.

4) Were people exposed during the soil removal process?

ATSDR evaluated this concern by considering information from the soil removal work plans, interviews with a contractor following the completion of the soil removal project, and general information from EPA describing the potential for dust emission from similar activities. Prior to

the soil removal process, work plans were developed to outline the procedures at each site identified for excavation. Information contained in these plans specifies site preparation procedures, depth and extent of the soil excavation, and the extent of backfilled required. These plans also describe the dust control measures to be used to minimize airborne soil dispersion during the excavation, storage, and transportation. Furthermore, the plans outline the procedures necessary to ensure a safe work environment under the actual condition that may be encountered during excavation, backfilling, and off-site transport. This includes descriptions of the air sampling to be performed at the worker level and the perimeter of the excavation site (URS 1995, Jacobs 1997, DESC 2002, Shaw 2002).

Information provided by the contractors who performed the excavation described the results of air monitoring and the dust suppression methods. The air monitoring results indicate all of the dust and chemical concentrations were below levels of concern for the workers and not likely to affect neighboring residents. Information compiled by EPA that describes the potential dust emission levels for similar activities was combined with a simple screening model to predict the resulting downwind ambient air concentrations of dust, and soil sampling results were used to identify potential ambient air concentrations of chemicals that were identified in the soil at concentrations above ATSDR's comparison values. Results of this analysis also indicate that local residents were not exposed to contaminants or dust at levels that would be expected to cause health concerns.

5) Are there any significant health differences (cancer) of those folks who worked at Gentile compared to those who did not work at the facility?

ATSDR's focus for the community living near Gentile AFS was to identify how the community may have been exposed to environmental contaminants released at Gentile AFS by the past disposal practices and evaluate if those exposures would be expected to cause health effects. Although environmental contamination was present at Gentile AFS, the results of our evaluation indicates the community is not, and was not, exposed to levels of contaminants that would be expected to cause health effects.

The Ohio Department of Health is reviewing the available cancer data. They expect to complete that report by December 2004. Please contact Mr Robert Indian (614-728-9180) for more information about that study.

6) Why is the State only looking at cancer data from the year 1996-PRESENT? What about the years prior to 1996?

An accurate database describing cancer statistics is only available for Ohio for the years between 1996 and the present. This database includes cancers first diagnosed since 1996. Analysis of this

database is expected to identify if the cancer incidence for the zip-code areas around Gentile AFS are significantly different than other zip-code areas within Ohio.

For more information please contact Mr Robert Indian (614-728-9180) at the Ohio Department of Health.

- 7) People would like to come forward with information that will assist you in your investigation, however, they are afraid to do so because of the language that is included on page 51 of the Gentile PHA - "the USAF cannot authorize or promise you or others any form of immunity from criminal prosecution or civil enforcement under any local, state, or federal laws."**

ATSDR obtained clarification of this statement from the Air Force. This section of text now states "ATSDR met with USAF representatives to address this concern. The information provided to us indicates that the USAF's primary purpose for obtaining information about past spills or waste disposal activities is to be able to fulfill its obligations as a federal environmental steward to protect human health and the environment. However, the USAF does not have the authority to offer or promise immunity from criminal prosecution or civil enforcement initiated by any government agency under local, state, or federal laws if the environmental enforcement agencies believe you are responsible for contamination which endangered human health or the environment."

Basically, the Air Force intends to use information about past spills or waste disposal activities to ensure that the environmental investigations and remediations at Gentile AFS are protective of human health and the environment, not to prosecute people who were involved with, or have knowledge of, those activities. However, the Air Force cannot prevent other state or federal environmental enforcement agencies from pursuing criminal or civil investigations.

ATSDR contacted representatives of the Ohio EPA and U.S. EPA to identify the policy of these agencies regarding potential criminal or civil investigation or prosecution. Ohio EPA encourages past workers or those that have firsthand knowledge of past spills or disposal activities at the former Gentile Air Force Station to provide that information to Ohio EPA. If you have such information, please contact Mike Proffitt at (937) 285-6603. It is not Ohio EPA's usual practice to prosecute past workers involved with these activities, especially if they occurred before 1980 when federal and state hazardous waste laws went into effect. However, if someone knows about spills or disposal occurring now at the site (including dumping into the creek or dumping on-site), please contact the Ohio EPA's Southwest District Office at 937-285-6357. Such dumping is illegal in Ohio and offenders may be prosecuted.

The U.S. EPA does not provide counsel to non-EPA persons as to their legal liabilities or options. Persons concerned about liability under CERCLA or any other statute should consult an

attorney. There are defenses to CERCLA liability set forth in CERCLA 107 and individuals may want to consult an attorney for advice on whether they qualify for one of those defenses.

During the public comment period of this PHA, ATSDR (a non-regulatory agency) offered to talk with people who had concerns and wanted to remain anonymous.

8) How can this evaluation be valid if some people are reluctant to share information because they are afraid they could be fired?

The environmental investigation conducted by the Air Force incorporated concerns and suggestions from the OEPA, EPA, and City of Kettering. The investigation included a historical investigation of previous operations by reviewing previously published environmental reports (dating back to 1979), previously published information about the mission and operations conducted on-base, and personal interviews with people who worked on base and had first-hand knowledge about the material use and disposal processes. These investigations were designed to identify on-base locations where spills or waste disposals may have occurred.

Each of the identified locations was inspected for visual evidence of spills or disposal. Hundreds of soil, groundwater, surface water, and sediment samples were taken from Gentile AFS and analyzed for the chemicals that were used or possibly released on base. Individually, each sample identifies the chemical concentration for a particular location. Combined together, the sampling results illustrate the potential for extensive contamination to exist on base. The sampling results for Gentile AFS clearly show a number of small spill or disposal areas are located around the base. The fact that the concentrations quickly drop to background levels for samples taken a short distance away from the spill or disposal sites indicates that Gentile AFS is not affected by wide-spread contamination.

The available historical and environmental data indicates there is no evidence that current or future users of Gentile AFS are exposed to contaminants at levels that could cause health effects.

9) Was the community exposed to contaminants from Gentile AFS in the past that could cause health problems?

Probably not. As described in the text, the major past exposure pathways for Gentile-area residents were exposure to contaminants measured in the groundwater via residential drinking water, exposure to contaminants in the creek sediment and surface water, and exposure to contaminants in the soil by on-base gardeners and produce consumers.

There was no past exposure to Gentile-related groundwater contaminants; there is no evidence that groundwater contaminants migrated off-base at levels that could affect private drinking

water wells in the past. Currently all residents are connected to the municipal drinking water system and receive water that meets all state and federal standards.

Sampling data from the creek was not obtained until 1977. The sampling data indicates that adults and children who frequently played in the creek were not exposed to contaminants at levels that would be expected to cause health effects. Because of the lack of historical data for the creek, ATSDR cannot definitively evaluate the potential exposure of children or adults who frequently played in the creek prior to 1977. However, the available sampling data suggests that the major contaminant contributor to the creek was the coal pile. These data indicate that the concentrations were likely highest of Gentile AFS property near the coal pile. As a result, while ATSDR cannot definitively evaluate this potential exposure, it appears that children and adults who played in the creek prior to 1977 were likely not exposed to contaminant levels that would be expected to cause health effects.

People who used the on-base garden or ate produce from those gardens were not exposed to contaminants at levels that would be expected to cause health concerns. ATSDR used maximum concentration of each contaminant measured in the soil to estimate the potential exposure of both gardeners and produce consumers; these concentrations are not expected to have been significantly higher in the past.

10) Comment from the Air Force: The document should note that clean fill was added to the creek bed after the sediment removal so no one is exposed to the PAHs that were measured in the confirmatory samples.

Modifications were made to the text to clarify that 1 to 6 feet of clean fill was added to the creek bed following the removal of the original sediment. As noted in the text, this would essentially eliminate any potential exposure to the contaminants which remained in the creek bed following sediment removal. ATSDR also modified the text to clarify that the exposure analysis for adults and children who played in the creek following sediment removal was based on potential exposures to the PAHs measured in the sediment of the eastern drainage ditch. This conservative evaluation indicates that children or adults who frequently play in the eastern ditch would not be exposed to contaminants at levels that could cause health problems.

DESC/Gentile Air Force Station—Kettering, OH

Working Draft

Gentile Air Force Station—Kettering, OH