

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 Library of Medicine (NIH)

(<http://www.nlm.nih.gov/medlineplus/mplusdictionary.html>)

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Appendix B. ATSDR Comparison Values

ATSDR health assessors use comparison values (CVs) as a screening tool to evaluate environmental data that are relevant to the exposure pathways. These values 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 CVs are not expected to lead to any observable health effect, it should not be inferred that a concentration greater than the screening 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 screening value 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.

ATSDR 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.

ATSDR also uses EPA's maximum contaminant levels (MCLs) as screening values to assess groundwater contamination.

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 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 (≤ 14 days), intermediate (15 to 364 days), and chronic (≥ 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.

EPA Region III Risk-Based Concentration

EPA combines reference doses and carcinogenic potency slopes with "standard" exposure scenarios to calculate risk-based concentrations, 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.

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. ATSDR's Responses to Public Comments

The Agency for Toxic Substances and Disease Registry released the Naval Air Station (NAS) Brunswick Public Health Assessment (PHA) for public review and comment on September 30, 2004. The public comment period was announced in a press release on October 13, 2004. Copies of the PHA were made available for review at Curtis Memorial Library, 23 Pleasant Street, Brunswick, Maine. The PHA was also sent to state and federal agencies and interested members of the general public.

ATSDR received the following comments during the public comment period (September 30 to November 20, 2004). At the request of a community group, ATSDR extended the public comment period to January 27, 2005, to give the group ample opportunity to review the draft health assessment.

- 1. Comment:** One reviewer questioned whether the average reader would understand how ATSDR reached its conclusions on the indoor air exposure pathway. The reviewer felt that the indoor air exposure pathway section was “the most complex and technical aspect of the public health assessment.” To simplify the discussion, the reviewer suggested, ATSDR should add tables and figures to describe monitoring data and the methodology used to estimate indoor air concentrations.

Response: ATSDR has modified the text and added tables to enhance the discussion about the indoor air exposure pathway as suggested by the reviewer. The agency hopes that these changes will help clarify the basis for its conclusion that people who worked in the Fleet and Family Support Center or lived in the Bachelor Enlisted Quarters did not encounter harmful levels of indoor air vapors from the underlying groundwater plumes.

- 2. Comment:** One reviewer suggested that ATSDR discuss the cause of the symptoms reported by the Fleet and Family Support Center employees before the repairs of the building's ventilation system. The reviewer added that while the airborne contaminant concentrations are below those associated with long-term health effects, they appeared to be high enough to pose a nuisance to employees and to cause the symptoms.

Response: The reviewer is referring to the odors, nausea, headaches, and burning eyes reported by workers occupying the Fleet and Family Support Center from 1983 to 1994. Eye irritation, headaches, and nausea are among the symptoms that some people experience shortly after breathing in air containing certain constituents of petroleum hydrocarbons. Even so, it is unclear what triggered the employees' symptoms because air samples collected within the work spaces around that time showed no evidence of airborne contaminants inside the center. Workers' symptoms disappeared after the ventilation system was repaired to divert and exhaust organic vapors from the building, and no symptoms have been reported since then. (Recent air sampling identified most VOCs in the indoor air at concentrations lower than those known to cause health effects from immediate or chronic exposures. The VOC naphthalene was detected at a maximum concentration above its ATSDR screening value. Given the absence of other petroleum constituents in indoor air, the naphthalene likely comes from other workplace sources.)

3. **Comment.** A reviewer questioned whether ATSDR conducted an effective outreach in the community. This reviewer thought that some interested parties might not have been made aware of the PHA or, if they were aware, did not understand its significance for public health. The reviewer felt that, as a consequence, ATSDR should not interpret any lack of public comment on the draft PHA as indicating there is no public concern.

Response. Community response to ATSDR’s activities varies from site to site, dependent upon such factors as identified hazards, the level of community interest and concern, and available resources. As a way to involve the community in ATSDR’s health associated activities, ATSDR released its findings in the PHA for public review and comment on September 30, 2004. Press coverage about the PHA appeared in the local paper on October 13, 2004. ATSDR received two sets of comments on the public comment release draft. As noted in the PHA, ATSDR’s evaluation of the NAS Brunswick site found no threat to the health of the local community. Given these findings, strategies for further involving the community are not necessarily needed. If ATSDR believed that the base posed a public health threat, then it would recommend measures that might include additional outreach to the community. If you are aware of other individuals who may be interested in this site, we encourage you to have them contact ATSDR.

4. **Comment.** A reviewer suggested that the entry for Site 8 in Table 1 contains a significant error. The Jordan Avenue Wellfield is not inactive as the report states. Rather, it supplies a crucial resource for the people of Brunswick. The aquifer protection zone extends into the NAS Brunswick property at the northern end of the runways. Therefore, the reviewer is concerned about the potential negative effects of any base activity in that area on the aquifer recharge zone, and on the viability of the wellfield. The reviewer stated that ATSDR should reassess its findings with regard to this.

Response. ATSDR has corrected information on the status of the Jordan Avenue Wellfield in Table 1. The corrected table is now consistent with information ATSDR used in the assessment of groundwater exposure pathways and present in Section III.B. “Contaminated Groundwater and Drinking Water Use”—that is, that Jordan Avenue Wellfield is active.

5. **Comment.** A reviewer noted that the PHA’s foreword states that ATSDR is required by law to conduct a public health assessment at each of the sites on the EPA National Priorities List. The foreword should also clearly state that the hazardous substances mentioned in the second paragraph are not limited to CERCLA releases or CERCLA sites, but cover a broader array of sources and contaminants. This distinction is important to avoid confusion, misinterpretation, and/or misapplication of ATSDR’s conclusions versus the site-specific risk assessment results and remedial action objectives developed for the CERCLA sites.

Response. The comment is asking ATSDR to clarify that its evaluation is not limited to CERCLA releases. As the foreword states, ATSDR’s public health assessment focuses on public health impact on “...the community as a whole, rather than on individual risks from CERCLA sites.” Accordingly, ATSDR’s first step in the evaluation process requires

its scientists to review environmental data to see how much contamination is at an area, where it is, and how people might come into contact with it. ATSDR obtains these data not only from EPA and the site as part of the CERCLA investigation, but from other government agencies, businesses, and the public. Furthermore, ATSDR's evaluation covers any potentially harmful environmental exposure within the site boundaries, whether or not it is related to a CERCLA site (e.g., lead-based paint in housing, physical hazards, etc.). If the review of the available environmental data shows that people have or could come into contact with hazardous substances, whether from a CERCLA site or via other situations, ATSDR scientists then evaluate whether or not there will be any harmful effects from these exposures. Thus the document investigates not only health hazards from exposure to CERCLA releases, but to other non-CERCLA environmental (non-worker) situations that may affect the site community.

6. **Comment.** A reviewer noted that the PHA incorrectly states or implies in several sections that the NAS Brunswick golf course well and the Dyer's Gate well are located off base.

Response. ATSDR has revised those statements, as suggested, to indicate that the NAS Brunswick golf course well and the Dyer's Gate well are indeed located on base.

7. **Comment.** A reviewer commented the installation of the Dyer's Gate well has shown that one should not assume that water production wells, whether for drinking or for other purposes, will never be installed at NAS Brunswick. There is, stated the reviewer, an underlying assumption in all the records of decision (RODs) *and* in the ATSDR report: because the base is served by a public water supply, there will never be a water supply well installed on base. This has been proven false. The recent installation of the Dyer's Gate well demonstrates that groundwater on base can and will be used as drinking water. The Dyer's Gate well was installed close to a known site (Site 2) with known groundwater contamination. The reviewer felt that until a base-wide groundwater restriction/institutional control is implemented, the risk will exist that other wells may be installed on base.

Response. Because of evidence of environmental contamination, the Navy has implemented institutional controls that apply groundwater use restriction to the entire area of Site 2, as well as with other sites showing groundwater contamination (Sites 1, 3, 4, 7, 9, 11, and 13). These groundwater use restrictions prevent the groundwater in those areas from being used as a source of potable water. Details of the use restrictions are documented in the current NAS Brunswick Operations Instructions. The Operations Instructions are used at NAS Brunswick to identify environmental areas and screen them from inappropriate construction or development activities, such as installation of drinking water wells.

It is unlikely that water from the Dyer's Gate well will affect public health. Even though this well is in the vicinity of Site 2, it is about 80 to 100 feet from the institutional control boundary and roughly 240 to 300 feet from center of the landfill. Furthermore, it does not feed into the public drinking water supply, nor is it planned to: it is used on a small scale for a few workers at Dyer's Gate. Finally, water from the well has been tested

and meets EPA drinking water standards. Because of concerns expressed by MEDEP, the Navy is including the sampling of the well in its Long Term Monitoring Program to determine if it is potable and also if it can draw the groundwater plume to the well. NAS Brunswick continues to provide Brunswick/Topsham Water District water to its work force and residents. Water delivered from this source consistently meets EPA’s safe drinking water standards.

8. **Comment.** A reviewer noted a passage on page 2, Section I, “Summary”: *“Possible exposure to contaminants in on-site or nearby surface water. ATSDR determined that there are no harmful exposures to site-related contamination associated with on-site or nearby surface water bodies.”* The reviewer wishes ATSDR to address potential downstream effects on fisheries in Harpswell Cove and on people who consume fish and/or shellfish from that area.

Response. Information available to ATSDR during its review indicated that the Navy conducts surface water monitoring at NAS Brunswick to study the effects of possible contaminant source areas on surface water quality. More than a hundred surface water and sediment samples were collected from along Mere Brook, Merriconeag Stream, and the unnamed tributaries for a wide range of contaminants. The results show contaminants at locations throughout the air station, but few at levels that exceeded ATSDR’s comparison values (CVs). Detections that did exceed CVs differed by less than an order of magnitude and mostly occurred in pre-1997 sampling rounds. Later sampling rounds show that the detected contaminant concentrations were generally lower—typically below the comparison value. Although Mere Brook empties into Harpswell Cove, a habitat for fish, the contaminants should dissipate before reaching the cove.

For added perspective, ATSDR reviewed fish sampling data collected from Mere Brook by the U.S. Fish and Wildlife Service (USFWS). The 1995 USFWS survey collected more than 130 samples of trout from Mere Brook. While the survey primarily addressed contaminant exposure and the potential effects of fish contamination to ecological receptors, ATSDR used the data to compare contaminant concentrations with Food and Drug Agency (FDA) Action or Tolerance Levels or World Health Organization (WHO) Upper Permissible Limits in foods as a way to screen for potential human health hazards associated with the consumption of Mere Brook. Contaminants considered in the survey included mercury, lead, and organochlorine compounds—contaminants found on site and known to accumulate in freshwater fish. Survey results showed that contaminant levels in fish were below their corresponding FDA or WHO levels.

9. **Comment.** A reviewer noted that Figure 1 is of poor quality and recommended that ATSDR replace it with a map of better print quality that identifies Harpswell Cove and other important features relative to the base boundary.

Response. As suggested, ATSDR has replaced Figure 1 with a higher quality map of the area.

10. **Comment.** A reviewer asked whether the last sentence in the first paragraph of Section II.B.. “Remedial History,” is missing some words.

Response. ATSDR has modified the paragraph as follows: *“Routine activities and former waste disposal practices at NAS Brunswick have resulted in accidental spills or releases of chemicals to the environment. Examples of the former routine activities include on-site disposal of waste oil, food waste, pesticides, and solvents at Sites 1 and 3; incineration and disposal of solid waste at site 2; disposal of asbestos pipes at site 5; and disposal of construction debris at site 6. Figure 2 shows the locations of these sites and others investigated by the Navy at NAS Brunswick. Contaminants released to surrounding soil as a result of these activities include heavy metals and petroleum hydrocarbons. Under certain circumstances, a portion of the contaminants released to the ground seeped through the soil, eventually reaching the underlying groundwater or being carried toward local tributaries.”*

11. **Comment.** A reviewer commented that the convention in other CERCLA documents for NAS Brunswick has been to capitalize “Eastern Plume” and also “Site” when referring to a specific numbered site, such as Site 1 or Site 9. The reviewer suggests that ATSDR do the same in the assessment report.

Response. As the reviewer suggested, ATSDR has modified the PHA to reflect the CERCLA convention of using initial capital letters for “Eastern Plume” and “Site.”

12. **Comment.** A reviewer suggested that ATSDR clarify to the reader that only a partial list of remedial measures is provided in the “Remedial History” section of the PHA.

Response. The bulleted items in the “Remedial History” section of the PHA represent some of the cleanup/remedial measures undertaken by NAS Brunswick to date.

13. **Comment.** A reviewer suggested that ATSDR revise its description of the slurry wall associated with Sites 1 and 3 to clearly state that neither the slurry wall nor the cap completely surrounds or covers the waste because neither extends into the Weapons Compound. ATSDR should also point out that groundwater within the slurry wall was extracted until the bulk of the waste was dewatered. This was done to keep contaminants from migrating from the waste through the gap in the slurry wall and into Mere Brook.

Response. ATSDR disagrees with the reviewer’s comment. NAS Brunswick constructed a slurry wall around the landfill waste at Sites 1 and 3 in 1996. They then installed a low-permeability Resource Conservation and Recovery Act (RCRA)–compliant 12-acre cap over the 8.5 to 10 acres of waste. The cover extends beyond the top of the slurry wall and diverts clean water from the landfill.

14. **Comment.** A review felt the PHA should describe how community health concerns were identified, such as who ATSDR spoke with and how “community” was defined. Was there input from people other than NAS Brunswick personnel?

Response. ATSDR did not receive direct communication about concerns in the community beyond the comments offered during the public comment period. As a way to gather information on community health concerns during the public health assessment process, ATSDR interviewed the base public affairs personnel who addresses community questions and concerns about NAS Brunswick and met with other base personnel (including the industrial hygienist, natural resources, public works, and housing). ATSDR also reviewed the results of the base’s survey of community concerns. The primary concern identified through these sources focused on the impact of Site 8 on the Jordan Wellfield. One individual also asked about the potential for site contamination to affect Mere Brook and Harpswell Cove. Both of these issues have been addressed in this PHA.

As part of its community relations activities, NAS Brunswick formed a restoration advisory board (RAB). The RAB is made up largely of local community members. The RAB meets periodically to review base documents and comment on actions and proposed actions by NAS Brunswick.

- 15. Comment.** A reviewer asked why the PHA includes demographic information, since it later cites the base’s restrictions for access as a primary reason people are not at risk.

Response. ATSDR’s goal is to identify people who have been or are being exposed to harmful levels of site-related contaminants. Even though the base has restricted access, contaminants could still migrate off site to areas where people could contact them. Therefore ATSDR scientists must, among other things, identify persons who could come in contact with the contaminants of concern at a point of exposure. ATSDR begins by becoming familiar with the site and its setting to determine who is most likely to have been exposed and to be exposed, to contaminants (as well as how the exposure can occur). ATSDR uses demographic data (such as age, sex, and race) to estimate an area’s current population. This results in a more accurate characterization of the surrounding community’s population in a shorter period of time. It also helps the agency to develop communication and health education efforts, if necessary, for the local community and to identify potential environmental justice issues at a site. ATSDR used data products from Census 2000 to provide small-area population for the NAS Brunswick area.

- 16. Comment.** A reviewer wanted ATSDR to clarify which group of people might be at risk for exposures, as cited in Section II.E. “*ATSDR examines land use to determine what activities might put people at risk for exposure to contaminants...*” Specifically, the reviewer wanted to know: “What people? The 10,322 people within 1 mile of the base? The on-site worker, resident, construction worker, trespasser, and/or recreational user?” To avoid confusion, ATSDR should present only the demographic information that is pertinent, or state more clearly who the “people” are.

Response. ATSDR discusses small-area demographic data to create community profiles as a logical first step in its public health activities for a community near hazardous waste sites. The profile primarily addresses the population living near the site but, depending on the exposure pathway, may also include visitors or workers subject to non-work-related exposure.

17. **Comment.** A reviewer pointed out a statement in Section II.E., “Land Use”:
“Groundwater underlying the site is described as a potential source of drinking water, but NAS Brunswick currently is serviced by a public water supply system.” According to the reviewer, this passage is incorrect and must be revised to reflect that groundwater at the site is a source of drinking water and there are currently no means to prevent additional wells from being installed in some areas of the base.

Response. The comment is referring to the base’s use of the golf course well and the Dyer’s Gate well. The base uses these wells, but only on a limited basis. The Dyer’s Gate well provides water for only a few employees. Likewise, the golf course well is only used by visitors to the golf course. Neither well feeds into the main drinking water supply for the NASB community. As noted above, water from the Dyer’s Gate well has been tested and meets EPA drinking water standards. Still, NAS Brunswick receives the vast majority of its drinking water from the Topsham/Brunswick Water District. This water is regularly tested for compliance with drinking water standards.

18. **Comment.** A reviewer suggested that the discussion in the “Land Use” section address likely scenarios should the base close or be transferred, or should land uses change.

Response. As suggested, ATSDR has added information about base closure/transfer procedures to the Land Use discussion. The RODs for NAS Brunswick contain language about specifying measures that will be taken in the event of transfer, leasing, or closure of the base property affected by site-related contamination. The language indicates that the Navy will notify EPA and MEDEP in accordance with the Federal Facility Agreement prior to the change. In cooperation with EPA and MEDEP, the Navy will include use restrictions, such as institutional controls, in all documents regarding the transfer or lease so as to prevent the use of and contact with site groundwater and soil.

19. **Comment.** A reviewer noted that ATSDR uses CVs as screening values and brings them up throughout the report. The reviewer felt that this generic term is not useful or informative: rather, ATSDR should cite the specific relevant screening criteria in the text.

Response. Section III of the PHA describes ATSDR CVs and how the Agency uses them. ATSDR typically uses the most conservative (or lowest) ATSDR health-based CVs (e.g., EMEG, CREG, RMEG) when selecting contaminants for further evaluation, EPA’s MCL, or other health-based screening values for the corresponding media. These comparison values are not used by ATSDR as predictor of adverse health effects or for setting a cleanup level. Their purpose is to provide health assessors with a means of selecting environmental contaminants for further toxicologic evaluation. Considering this, ATSDR scientists often use the generic term of “comparison value” throughout the PHA as a way to simplify the language in the discussion of our screening process within the PHA.

20. **Comment.** A reviewer questions why ATSDR did not use the Maximum Exposure Guidelines (MEGs) established by the Maine Department of Environmental Protection (MEDEP) as CVs. The reviewer notes that the MEGs are more stringent than the MCLs

in some instances, and have been used in site-specific risk assessments and in setting cleanup goals that the Navy must meet.

Response. ATSDR uses CVs as screening values: if a contaminant’s concentration exceeds the relevant CV, ATSDR selects the contaminant for further evaluation. ATSDR does not use CVs to predict risk or adverse health effects, or in setting cleanup levels. CVs are developed from the available scientific literature on exposure and health effects. Each reflects an estimated contaminant concentration that is *not expected* to cause adverse health effects for a given chemical. CVs are generally based on contaminant concentrations *many times lower than levels at which no effects were observed* in experimental animals or human epidemiologic studies. As a result, ATSDR considers these values to be conservative and protective of public health. To illustrate, ATSDR compared CVs (in this case, EPA’s MCLs) to MEGs. For five of the seven chemicals presented in Table 3, the CVs were lower than or equal to the MEGs. The other two were selected for further evaluation anyway, because their concentrations exceeded CVs.

Table 3. Contaminant Concentrations in the Groundwater of the Eastern Plume

Chemical	Range of Concentrations in Groundwater (ppb) for Contaminants That Exceeded Screening Values		Comparison Values for Drinking Water (ppb)
	Shallow (Near Source)	Deep (Downgradient)	
1,1-Dichloroethene	ND-6	ND-1,810	7 MCL/ 0.6 MEG
1,1-Dichloroethane	ND-130	ND-170	800 RBC/ 70 MEG
cis-1,2-Dichloroethene	63-680*	ND-98*	70 MCL/ 70 MEG
trans-1,2-Dichloroethene	*	*	100 MCL/ 140/MEG
1,1,1-Trichloroethane	13-1,200	11-11,000	200 MCL/ 200 MEG
Trichloroethylene	5-770	6-2,800	5 MCL/ 32 MEG
Tetrachloroethylene	ND-42	ND-68	5 MCL/ 7 MEG

* 1,2-Dichloroethene was reported by the laboratory as total 1,2-DCE.

21. **Comment.** A reviewer commented that ATSDR should add text to explain why its assumptions and statements regarding risk may differ from those presented in other CERCLA-related documents for NAS Brunswick, including RODs. The reviewer says the document should make it clear to readers and decision-makers how this ATSDR risk evaluation (methods, assumptions, screening criteria, etc.) differs from previous risk evaluations conducted by/on behalf of the Navy.

Response. As stated in the foreword to the PHA, the aim of ATSDR’s evaluation is to find out if people are being exposed to hazardous substances and, if so, whether that exposure is harmful and should be stopped or reduced. For this reason, ATSDR’s goal is different from those of regulatory agencies that set cleanup standards. An explanation of ATSDR’s role in the health assessment process, and how it may differ from other agency’s role, appears in the foreword.

22. **Comment.** A reviewer asked whether ATSDR had considered consumption of fish and shellfish in areas downstream from the NAS Brunswick sites.

Response. The reviewer appears to be concerned about contaminants migrating from NAS Brunswick to Harpswell Cove. ATSDR did not have biota data to assess contaminant levels in fish downstream of the base. Information available to ATSDR during its review indicated that the Navy conducts surface water monitoring at NAS Brunswick to study the effects of possible contaminant source areas on surface water quality. More than a hundred surface water and sediment samples were collected from along Mere Brook, Merriconeag Stream, and the unnamed tributaries for a wide range of contaminants. The results show contaminants at locations throughout the air station, but few chemicals were present at levels that exceeded ATSDR’s CVs. Detections that did exceed CVs differed by less than an order of magnitude and mostly occurred in pre-1997 sampling rounds. Later sampling rounds show that the detected contaminant concentrations were generally lower—typically below the ATSDR’s CVs. Because only low levels were found downstream of these sites and still on base, ATSDR would not expect sufficient quantities of contaminants to migrate beyond the site boundaries to a fish and shellfish habitat about 1 mile away. The low levels on site are expected to further decrease with natural processes and distance from the site. The lack of clear evidence of high levels of contaminants migrating toward the cove led ATSDR to consider that the cove was not being affected by site-related contaminants.

23. **Comment.** A reviewer commented that the PHA’s definition of “aquifer” should be revised—it is a geologic unit capable of storing and transmitting significant quantities of water.

Response. ATSDR has reviewed its description of aquifers and does not find it necessary to change it.

24. **Comment.** A reviewer commented that the description of the overburden in the PHA requires some qualification; because not all three units are found everywhere across the base and till (a fourth unit) has been recorded at a few locations.

Response. The reviewer suggests that the PHA does not sufficiently present certain information about the overburden beneath the base. ATSDR believes that characterization of the aquifer potentially affected by groundwater contamination at a site is important, however, only as it relates to contaminant movement to points of human exposure. The PHA does discuss selected points that are important to the exposure pathway evaluation. As it mentions, groundwater in the overburden that could be used as a drinking water supply is encountered under unconfined and that it is located at about 10 to 80 feet below ground surface (bgs). Equally important to our evaluation of exposure is the fact that in most places on base, the clay unit of the overburden overlies bedrock and acts as a confining layer that greatly limits downward movement of groundwater (and contamination) into the bedrock.

- 25. Comment.** In Section III.B., “Contaminated Groundwater and Drinking Water Use, Discussion,” ATSDR states that “*Even so, the bedrock beneath the air station produces only limited amounts of groundwater.*” A reviewer commented that this statement requires qualification. The vast majority of monitoring wells on base are overburden wells; the very few bedrock wells are in the vicinity of the Eastern Plume. Any definitive statement regarding bedrock characteristics on a base-wide scale must therefore be properly qualified. Furthermore, the recent geophysical investigation in the vicinity of Site 11 has indicated a number of likely bedrock fracture zones. Drilling into one of these zones has confirmed the presence of highly fractured bedrock at relatively shallow depths, although information on groundwater flow rates or yields is not yet available. The reviewer says that ATSDR should revise the statement accordingly.

Response. ATSDR intended the statement to indicate that the bedrock aquifer produces limited groundwater relative to other aquifers. This is based on information in NAS Brunswick documents that describe the local hydrogeology. The groundwater in the Brunswick area occurs both in unconsolidated sediments and in underlying bedrock. Of these layers, the most productive aquifers are in the unconsolidated sediment sand and gravel. Site documentation goes on to state that aquifers in the bedrock produce a limited quantity of groundwater in wells. It should be noted that groundwater in the bedrock aquifer is under local artesian pressure, which limits downward movement of groundwater to the deeper layers.

- 26. Comment.** A reviewer requested that ATSDR add information about residents on Coombs Road, which is east of the base, to the discussion on private wells.

Response. As indicated by the Topsham/Brunswick Water District, the public water main on Route 24 ends at the intersection of Route 24 and Board Road. Residences located south of the intersection, including those on Coombs Rd, rely on private water supplies. Neither the water district nor MEDEP routinely maintains records on private wells in Brunswick. Some private well information (depth, date drilled) is maintained through the Maine Geological Survey database. According to this database, five private wells are located on Coombs Road. ATSDR has added this information to PHA. The Maine Geological Survey points out, however, that the database is neither comprehensive nor inclusive of water quality testing information. As stated in the PHA, the MEDEP monitors a private drinking water well on Purington Road, Brunswick. This well is located closer to boundaries of the Eastern Plume than residences on Coombs Road. Recent sampling of the Purington Road well shows that the well water is safe to drink.

- 27. Comment.** A reviewer wondered why the Eastern Plume is the only on-site (on-base) area discussed with regard to groundwater contamination. The reviewer recommended that ATSDR either add an assessment of potential exposures/risks associated with other known areas with groundwater contamination (e.g., Site 9, the Navy Exchange or NEX) or clearly explain why the assessment is limited to the Eastern Plume.

Response. ATSDR reviewed groundwater monitoring data associated with all the IRP sites. ATSDR’s aim is, however, to determine whether and to what extent exposure

occurs. Because of this, its evaluation focuses on contaminants in the groundwater that had or have the potential to migrate to exposure points, such as drinking water supplies off-site, at Dyer’s Gate, or at the golf course. ATSDR focused much of its attention on the Eastern Plume because it appears to be the only contaminant plume with the potential to threaten drinking water supplies, as it is moving toward site boundaries. This information has been added to the text of the PHA.

- 28. Comment.** A reviewer commented that the description of Site 4 in Section III.B., “Contaminated Groundwater and Drinking Water Use,” should mention that, because samples were never collected from the suspected pit location beneath Building 584, the need for additional soil sampling at Site 4 will be assessed if the building is ever demolished (refer to page 9 of the 1998 ROD for the site).

Response. Recommendations for additional soil sampling if the building is removed are presented in the description of Site 4 in Table 1. Since the text in question is within the groundwater discussion, and soils surrounding the pit do not appear to be an ongoing source of groundwater contamination, ATSDR will keep the recommendation in the discussion in Table 1.

- 29. Comment.** A reviewer suggested that ATSDR note that the potential for bedrock contamination in the vicinity of Site 11 is currently being investigated.

Response. According to Claudia Sait of MEDEP, MEDEP shares the Navy opinion that this site no longer poses a concern. More recent investigations showing only trace levels of groundwater contaminants at Site 11 indicate that residual soils at the site no longer contribute to the contamination in the Eastern Plume. As of 2002, a large infiltration gallery (leach field) constructed over a portion of Site 11 has accepted clean treatment plant effluent without any detectable changes to the downgradient groundwater quality.

- 30. Comment.** The PHA states that the highest concentrations of contaminants occur in the center of the Eastern Plume, while very low concentrations occur along the plume’s boundaries. A reviewer notes that some of the highest concentrations were detected at well MW-311, which is close to the eastern edge, not the center of the plume.

Response. According to NAS Brunswick’s long-term monitoring plan (February 2000) for the Eastern Plume, MW311 is an “interior” plume deep monitoring well. According to MEDEP’s definition, interior wells are located in areas of known contamination, not at the boundaries or perimeters of the plume. Based on this definition, ATSDR believes that the data for well MW-311 capture information on the level of contaminants in the interior or center of the plume.

- 31. Comment.** A reviewer suggested that ATSDR revise the discussion of bedrock contamination in Section III.B., “Contaminated Groundwater and Drinking Water Use,” to reflect that the potential for bedrock contamination is currently being investigated in the vicinity of Site 11.

Response. According to September 2004 correspondence from Claudia Sait, MEDEP, there is no longer a concern at Site 11. According to Ms. Sait, "...further investigations and the near disappearance of contaminants in monitoring wells close to Site 11 strongly suggest that the remaining Site 11 soils no longer serve as a source of contamination to the Eastern Plume." Furthermore, a large leach field was constructed over a portion of Site 11. It has been accepting clean treatment plant effluent since then without detectable change in groundwater quality immediately downgradient.

- 32. Comment.** A reviewer recommended that ATSDR add a statement that the Navy will continue to monitor surface water as part of the long-term monitoring program for the Eastern Plume.

Response. Under the discussion on Contaminated Groundwater and Drinking Water Use, in Section III.C. ATSDR has added a statement to indicate that the Navy will continue to monitor surface water as part of the long-term monitoring program for the Eastern Plume.

- 33. Comment.** A reviewer stated that the discussion of the extraction well network for the Eastern Plume should state that during 2004, typically only four of the six wells described were actually operating.

Response. ATSDR has added this information to its discussion of the extraction wells in Section III.B.

- 34. Comment.** A reviewer noted that ATSDR's use of "perimeter" and "sentinel" with regard to monitoring well locations is not consistent with usage in the Eastern Plume long-term monitoring reports, specifically the terms' definition in the footnotes of Table 2 in recent monitoring event reports (see Monitoring Event Report 23, issued in December 2004, for example). The reviewer added that sentinel wells do nothing to "ensure that the plume is not migrating off base." Rather, they are intended to determine *if* the plume migration has spread so that additional necessary remedial measures can be implemented.

Response. The reviewer suggests that ATSDR refrain from using the terms "perimeter" and "sentinel" when describing certain wells monitored as part of the long-term monitoring program. Although the terms may not have been used in the monitoring report, MEDEP has suggested them as appropriate for describing wells located along the "boundary" and at "off-site" locations, respectively. As suggested, ATSDR has revised the description of sentinel wells to mention that they help identify whether the plume has spread so that the additional measures can be implemented.

- 35. Comment.** A reviewer recommended that ATSDR specify how far the golf course well is from Site 16 and how far the Dyer's Gate well is from Site 2.

Response. ATSDR has added those distances to the discussion on the golf course and Dyer's gates wells in Section III.B. of the public health assessment. The golf course well

is adjacent to the survey area of Site 16. The Dyers's Gate well is located about 80 to 100 feet from the institutional control boundary and roughly 240 to 300 feet from center of the landfill at Site 2.

- 36. Comment.** A reviewer commented that, in Section III B., ATSDR states that toluene detection is considered to be a laboratory artifact because it was below method detection limits. The reviewer says this statement must be revised. If toluene was detected below the method detection limit, the concentration reported should be considered an estimated value. The determination that the detection is a laboratory artifact must be supported by quality control results, which are not reported in ATSDR's text.

Response. The reviewer is referring to the toluene that was detected in the Dyer's Gate well at levels below method detection. NAS Brunswick installed a new well at Dyer's Gate in 2003. Water from the well has passed a standard residential analysis for drinking water. The well was also tested for VOCs, PCBs, pesticides, and total and dissolved metals. Toluene was the only organic compound found at detectable levels. According to the base's water program manager, that detection was considered to be a laboratory artifact because the level involved was below method detection limits. Most importantly from a health perspective, the toluene value, even if we consider it an estimated value, was well below ATSDR's CV for toluene in drinking water. Contaminants at levels well below their CVs are not expected to result in harmful effects.

- 37. Comment.** A reviewer recommends adding a description of the surface water sampling aspects of the Navy's long-term monitoring program to the discussion on surface water sampling in Section III.C.

Response. ATSDR has provided a description of the surface water sampling activities included in the final Long-Term Monitoring Program for the Eastern Plume (February 2000) to Section III.C. as follows: "*A total of five surface water sampling locations are included in the Long-Term Monitoring Plan for the Eastern Plume: one location at the eastern limit of the plume along Merriconeag Stream and the other four sample locations along Mere Brook (two within the plume and two locations beyond the limit of the plume). All surface samples are analyzed for VOCs.*"

- 38. Comment.** A reviewer noted that the discussion in Section III.C., "Possible Exposure to Contaminants in On-Site or Nearby Surface Water Bodies," appears to attribute polycyclic aromatic hydrocarbons (PAHs) solely to flight line runoff, yet PAHs are known and documented to be associated with CERCLA sites. The reviewer asks that ATSDR provide the basis for Mr. Kempf's statement and clarify which contaminants and what locations he was referring to. The reviewer also requests that ATSDR add text that identifies the sites where PAHs have been identified as site-related contaminants.

Response. Benzo(a)pyrene and PAHs are considered to be byproducts of aircraft engine combustion that are washed from aircraft flight line pavements and into surface water by storms. This information was provided by Mr. Paul. Kempf, the Water Program Manager at NAS Brunswick in a letter (July 8, 2004) to ATSDR.

- 39. Comment.** A reviewer asked why ATSDR limited its evaluation on deer to Sites 5, 7, and 8 when soil is contaminated at almost all the other sites, and the contamination at Sites 5 and 8 was removed and replaced with clean fill almost 10 years ago. In addition, the reviewer wonders about possible exposure to seeps and sediment associated with Sites 1, 2, 3, and 9, along with the Eastern Plume. Are the contaminants found at these NAS Brunswick sites similar to those documented in studies at other military facilities? The reviewer asks that ATSDR present findings that take all the sites into account.

Response. ATSDR selected Sites 5, 7, and 8 because they represent areas with elevated concentrations of soil contaminants where deer could feasibly graze. That is, these sites lack barriers that might serve to restrict access by grazing deer and contain, or previously contained, surface soil with elevated concentrations of contaminants. Sites 1, 2, and 3 are restricted areas that are surrounded by intact chain-linked fences. Soil at Site 9 contained few contaminants at levels below ATSDR comparison values for soil.

No deer tissues data had been collected at NAS Brunswick. As a way to assess possible uptake of contaminants by deer, ATSDR reviewed the findings of studies that investigated whether grazing deer at other military sites had accumulated chemical contaminants similar (i.e., PAHs, pesticides, and metals) to those found at NAS Brunswick. As noted in the PHA, the studies showed that the deer demonstrated limited ability to bioaccumulate the contaminants at these sites.

- 40. Comment.** Noting that figure 6 shows the NEX, not Site 9, a reviewer recommended that ATSDR add a good figure of Site 9 to the report. The reviewer says that text in the first paragraph should be revised to indicate that the ash landfill is found underneath Buildings 218 and 219 (see pages 2-2 and 2-3 of the 1999 Site 9 ROD). The paragraph at the bottom of the page should summarize long-term monitoring data that are more recent than the 1994 data.

Response. ATSDR apologizes for the incorrect reference to Figure 6 as the figure for the BEQ and Site 9. A figure depicting Site 9 has been added to the PHA as Figure 7. As suggested, ATSDR has modified the discussion to indicate that a portion of the land underneath Buildings 218 and 219 was reportedly used as a 125- by 75-foot ash landfill in the 1940s and 50s.

- 41. Comment.** A reviewer asked that ATSDR add the dates when nearby residential wells were sampled. It is the reviewer's understanding that only the new home on Purington Road has been sampled recently and that data for other residential wells is at least 10 years old.

Response. The most recent complete private well survey in the area of NAS Brunswick was conducted in 1990. This survey identified 23 off-base private wells within 1 mile of the site. Since that survey, a new residence with a deep private well in the bedrock (reportedly used for drinking water) was built a couple of hundred feet from the plume's eastern extent, on Purington Road. It is the closest known drinking water well to the base—downgradient of the Eastern Plume. MEDEP's tests confirm that this well contains no VOCs. Given this finding, ATSDR believes that other bedrock wells located further

away or away from the direct path of the plume would likewise be free of contaminants. The dates of these sampling events are provided in the PHA.

- 42. Comment.** A reviewer expressed concern about potential impacts on downstream fisheries and human consumption. The reviewer questions ATSDR’s statement that concentrations are expected to decrease through remediation and natural attenuation before the water reaches the downstream waterways. The reviewer adds that the Eastern Plume is only now reaching the vicinity of monitoring well MW-331 and discharging to surface water, so concentrations may increase in that area. The reviewer says the potential for natural attenuation to substantially reduce contaminant concentrations has not been proven. Data available from the December 2004 Monitoring Event 23 Report for Sites 1 and 3 and the Eastern Plume indicate that conditions favorable for monitored natural attenuation are not consistent throughout the Eastern Plume.

Response. Conditions may be inconsistent, but contaminant concentrations in groundwater are generally low and decreasing. It is important to point out that the type of contaminant that has migrated in groundwater—e.g., toward fish habitats brought up by the reviewer—is associated with the class of compounds known as volatile organic compounds. The chemical and physical properties for this type of contaminant are important to our understanding of the overall fate of these contaminants in the NAS Brunswick area. Most importantly, some of these properties indicate that volatile organic compounds will volatilize from surface water faster than from groundwater. That is because, in surface water, the contaminant is in direct contact with air. Because of the quick degradation, ATSDR would rarely expect to see the groundwater compounds in surface water at measurable concentrations.

- 43. Comment.** In regard to possible vapors in on-site buildings above or near groundwater contamination, a reviewer agrees with MEDEP (see page 4 of MEDEP’s August 31, 2004 letter) that the multiple reports of indoor air problems in the 1990s from the NEX spills and the current strength of petroleum contamination in adjacent soil and groundwater are evidence that people occupying the Fleet and Family Support Center did indeed encounter harmful levels of indoor air vapors from the underlying groundwater plume. The reviewer thinks ATSDR should change its conclusion.

Response. ATSDR found no long-term health hazard associated with the air inside the Fleet and Family Support Center. The Fleet and Family Support Center sits downgradient of the NEX service station (Building 538), where—before the family center was built—gasoline started leaking into the subsurface soil. Employees of the family center reported complaints of certain health effects. While there is known contamination associated with the upgradient service station, no contamination specific to the plume was detected inside the family center at levels known to cause health. Furthermore, symptoms reported by the employees in 1994 disappeared once the ventilation system was repaired, and there appears to be no current problem with indoor air quality.

Today, the base is assessing the potential effectiveness of *in situ* denitrification-based biodegradation to mitigate residual petroleum hydrocarbons remaining below the

groundwater interface. The preliminary results show that groundwater concentrations of petroleum hydrocarbons have recently increased by several orders of magnitude due to releases of contaminants from soils. As a result, petroleum hydrocarbons may migrate to downgradient locations and likewise increase in concentration in downgradient wells during future sampling rounds. Even though there is no current long-term health hazard associated with the air inside the center, ATSDR encourages the Navy to continue to track the groundwater contamination associated with the upgradient gasoline release and potential impact on the family center.

- 44. Comment.** A reviewer pointed out that, in item 6 on page 39 (Section VII, “Public Health Action Plan,” “Completed Actions”), “preventing” should be replaced with “to prevent.” The reviewer believes this is an important distinction. The intent of the remedial action was containment, but subsequent data indicate that the influence of the extraction wells is limited and natural hydrogeologic conditions also influence the lack of migration to Harpswell Cove. The reviewer also asks ATSDR to identify the source for the 1999 soil removal from Sites 4 and 13 in item 8 on page 40. The reviewer does not recall any significant remedial action at those sites in 1999. The reviewer believes the removal of material and debris from Site 8 and removal of debris from Sites 15 and 16 should also be added to item 8.

Response. The comment suggests that ATSDR modify language to clarify that status of the remedial action. ATSDR modified the sentence slightly as follows. *“The Navy installed an extraction and treatment system in 1995 as an interim action to contain the Eastern Plume as a measure to prevent it from migrating further toward Harpswell Cove.”* The goal of this action is to contain the plume. If this measure is unsuccessful, then the base is required to evaluate and implement other measures that can achieve sufficient containment.

- 45. Comment.** A reviewer suggested that ATSDR add several activities to those mentioned in the Public Health Action Plan section: soil removal at Site 7, the barracks demolition and landfill removal at Site 9, and the additional investigation at Site 2.

Response. ATSDR agrees with the reviewer’s suggestion and has added information on planned activities under the Public Health Action Plan: *“The Navy plans to remove contaminated soil from Site 7, demolish the barracks and remove the landfill at Site 9, and conduct additional investigation at Site 2.”*

- 46. Comment.** A reviewer commented that the Navy’s long-term monitoring plan is not limited to the Eastern Plume, as stated in planned activities under the Public Health Action Plan.

Response. ATSDR agrees with the comment and has updated the discussion on planned activities under the Public Health Action Plan: *“The Navy will be conducting long-term monitoring along the Eastern Plume and at other sites (e.g., Site 1 and 3) where contamination in groundwater exceeds regulatory guidelines.”*

47. **Comment.** A reviewer suggested that ATSDR update the discussion on planned activities under the Public Health Action Plan to indicate that NAS Brunswick is considering institutional controls to restrict groundwater use basewide.

Response. ATSDR has updated the discussion under planned activities to indicate that NAS Brunswick is considering basewide institutional controls for groundwater.

48. **Comment.** Regarding Table 1’s information on Sites 1 and 3, a reviewer noted that the 1992 ROD estimated the size of Sites 1 and 3 combined to be about 10 acres, not 60.

Response. According to the 1992 Record of Decision for Sites 1 and 3, “The general area of Site 1 covers more than 60 acres, although the specific area of documented refuse disposal is much smaller, approximately 8.5 acres. Site 3, contiguous to Site 1, occupies an area of approximately 1.5 acres.”

49. **Comment.** Referring to Sites 1 and 3 in Table 1, the reviewer asked ATSDR to revise the statement regarding the drop in the water table to read, “The groundwater table had dropped below the landfill waste except at one location.”

Response. ATSDR has revised the statement as suggested.

50. **Comment.** Again regarding Sites 1 and 3 in Table 1, a reviewer suggests that ATSDR add that material from Site 11 was also placed under the landfill cap at Sites 1 and 3.

Response. ATSDR has revised the statement as suggested.

51. **Comment.** Regarding Table 1’s information on Site 2, the description of the Orion Street Landfill South should be corrected to state that the base, not the landfill, was closed from 1946 to 1951. The reviewer believes the passage on sediment in the third column should be amended according to page 10 of the ROD, which states that environmental contamination attributable to Site 2 was found in leachate seeps and sediment and in stream sediment. The reviewer thinks a section for leachate seeps and sediment should also be added to the third column. As the ROD points out, these media had the highest levels of contaminants (a variety of inorganics and low levels of DDT).

Response. ATSDR agrees with the comment: the landfill may have operated for less than 10 years because the Air Station was closed from 1946 to 1951. Although the base was closed from 1946 to 1951, the September 1998 ROD for Site 2 indicates that non-military tenants may have used the property during that time. ATSDR modified the discussion for Site 2 to reflect this change.

As the reviewer noted, environmental contamination attributable to Site 2 is observed in the leachate and sediment associated with seeps, and in stream sediments. Accordingly, ATSDR has added a section on leachate to the discussion of Site 2 in Table 1, as follows: “*Leachate: Metals (e.g., mercury and iron) were found at levels above background concentrations. Low levels of pesticides (less than 1.0 milligram per kilogram [mg/kg])*”

and polycyclic aromatic hydrocarbon (PAH) compounds (maximum of 1.7 mg/kg) were also detected. These contaminants are consistent with the historical land use and disposal of incinerated wastes at this site. Buried ash would contribute to metal contamination in leachate downgradient of the landfill. The low levels of pesticides detected are assumed to be residual concentrations resulting from historical, basewide use of these compounds in the 1960s and 1970s.”

- 52. Comment.** A reviewer questioned the statement in the last column of Table 1 that cited factors that limit exposure to individuals, such as lack of public access and groundwater use.

Response. ATSDR based its decisions, as those cited in Table 1, on the data available at the time of the preparation of this public health assessment. The data indicated that certain sites posed limited concern for exposures because of lack of public access and groundwater use.

- 53. Comment.** Regarding Table 1’s information on Site 7, a reviewer asked that ATSDR indicate the source of the surface water data. The reviewer also asked that ATSDR add that the Navy intends to perform a soil removal action to remove contaminated soil.

Response. The surface water samples were collected between 1988 and 2002, primarily through the base’s long-term monitoring program. They were analyzed for VOCs, SVOCs, and metals. As noted in the PHA, cadmium was detected at a maximum concentration of 43.4 ppb, above the ATSDR CV for drinking water. This information has been added to the table. Other analytes were either not detected or detected at concentrations below CVs. As requested, ATSDR has added that the Navy intends to remove contaminated soil at Site 7.

- 54. Comment.** Regarding Table 1, Site 9, fourth column, a reviewer asked ATSDR to add that the demolition of the barracks and removal of the landfill material is planned for 2005.

Response. ATSDR has added that information.

- 55. Comment.** Regarding Table 1, Site 11, a reviewer indicated that the site description is wrong and should be consistent with the description in the bullet on page 17 of this report.

Response. ATSDR modified the discussion on Site 11 in the table to reflect the description provided earlier in the document.

- 56. Comment.** Regarding Table 1, Site 12, a reviewer stated that the entry should note that groundwater has not been tested at the site.

Response. ATSDR has added that information.

57. **Comment.** Regarding Table 1, Site 17, a reviewer states that high concentrations of pesticides—not low levels as indicated in the PHA—were detected in soil at the Building 95 site. The reviewer noted that this prompted a soil removal action.

Response. ATSDR has added that high levels of DDT were detected in the soil at Building 95. For clarification, ATSDR has also added that the Navy completed a soil removal action in 1994–1995 to remove DDT-contaminated soil from Site 17. After the removal, soil samples were found to contain low levels of pesticides and herbicides.

58. **Comment.** A reviewer suggested that ATSDR add historical information about the highest detected concentration to the discussion of the Eastern Plume in Table 1 on page 61.

Response. Under the description of the Eastern Plume in Table 1, ATSDR presents maximum concentrations taken from available data collected during the 1988–1989 RI field activities and long-term monitoring starting in 1995. These data indicate that groundwater was contaminated with VOCs that extend south from sites 4, 11, and 13 to about New Gurnet Road. Some of the highest concentrations were attributed to trichloroethylene (up to 770 ppb) and tetrachloroethylene (up to 80 ppb) were in the shallow portion (30 to 40 feet bgs) of the overburden in the center of the plume. Lower concentrations, typically less than ATSDR’s CVs, were measured along the boundaries of the plume and in more recent sampling rounds.

59. **Comment.** A reviewer notes that Table 2 indicates that the golf course well and Dyer’s Gate well are located off site. The reviewer asked ATSDR to remove them from this table and revise the discussion to state that only one nearby residential well has been tested recently and that data for other residential wells in the area are at least 10 years old.

Response. ATSDR has modified the table to indicate that the wells evaluated in the table include on-site and off-site private wells that may serve NAS Brunswick workers or local residents.

60. **Comment.** A reviewer asked ATSDR to clarify that the studies mentioned in the last column of Table 2 were not performed at NAS Brunswick and also indicate whether the contaminants, concentrations, and settings studied are the same as those found at NAS Brunswick.

Response. The comment refers to relevant studies that found that deer that graze in contaminated areas do not accumulate harmful levels of toxins. Information about the studies is presented in the discussion in Section III.D of the PHA. As requested, ATSDR has added this information to Table 2

61. **Comment.** A reviewer commented that the entry in Table 4 for Site 8 should note that the site was excavated in 1995 and its contaminated soil was removed.

Response. As suggested, Table 4 has been updated to mention that the Navy, with community involvement, has completed the site remediation, as outlined in the 1993

ROD for Site 8. The selected remedy involved excavation and removal of PAH-contaminated soil; backfilling with clean soil, construction debris, and rubble; and transportation of the contaminated material to Sites 1 and 3 (where it was used as part of the landfill cap). Cleanup activities, including site restoration, were completed in the fall of 1995. No land use restrictions, monitoring, or 5-year reviews are necessary at this area, since all materials were removed.

- 62. Comment.** A reviewer noted that it is not clear how to interpret the population distribution found on the four small maps at the bottom of Figure 3. The western and southern portions of the base have no (or limited) residential development—it is concentrated in the northeast section of the base (see Figure 2). The reviewer asked ATSDR to add an explanatory footnote to the figure or use other maps that better illustrate the population distribution on the base.

Response. Figure 3 is intended to depict the demographics of the population living within a 1-mile buffer beyond the NAS Brunswick site boundaries. The four smaller figures show the population density and the demographics for sensitive populations (i.e., children, the elderly, and females of child bearing age) living in a 1-mile buffer of the site perimeter.

- 63. Comment.** A reviewer wanted to know what food sources other than venison ATSDR considered.

Response. Fish consumption was eliminated because surface water bodies on base are not used or are restricted from recreational use, and surface water contaminants are not expected to migrate from the base at levels that could accumulate in downstream fish habitats. Produce was also eliminated because no gardens exist in known areas of soil contamination. For this reason, ATSDR evaluated consumption of venison as the only possible exposure pathway involving food consumption.